Town of Colchester
Board of Finance Meeting Minutes
Wednesday, October 21, 2015
Town Hall Meeting – 7:00 p.m.

Amended

Members Present Chairman Rob Tarlov, Art Shilosky, Tom Kane, Rob Esteve, John Ringo
Members Absent: James McNair
Others Present: First Selectman Stan Soby, Selectman Denise Mizla; Board of Education CFO Maggie Cosgrove, Tax Collector Michele Wyatt, Town Clerk Gayle Furman, Superintendent Jeff Mathieu, Director of Public Works Jim Paggioli, Registrar of Voters Dot Mrowka, BA Academy Civic Students, Jim Kelly

1. **CALL TO ORDER:** Chairman Tarlov called the meeting to order at 7:01 p,m.

2. **ADDITIONS TO THE AGENDA:** Item 8 was moved to the November 18th meeting

3. **APPROVAL OF MINUTES: October 7 - Regular Meeting:** J. Ringo motioned to approve the minutes of the October 7, 2015 meeting, seconded by R. Esteve. Vote was unanimous. **MOTION CARRIED.**

(T. Kane arrived at this time)

4. **CITIZEN'S COMMENTS:** None

5. **CORRESPONDENCE:** None

6. **DEPARTMENT REPORTS**
   a. **Finance Department:** M. Cosgrove reported that revenue and expenditures thru September 30th are overall on target. Health insurance reserve account is dramatically higher than it was this time last year. Trend of claims has been favorable.
   b. **Tax Collector:** M. Wyatt reported that as of October 1st there has been 1700 demand statements sent out. If they remain outstanding as of October 31st they will be turned over to collections. There were some issues due to problems with DMV computer system overhaul.

7. **2016-2017 BUDGET: DEPARTMENT INITIATIVES**
   a. **Town Clerk:** G. Furman gave a presentation that included anticipated expenses and revenue for 2016/2017. She also discussed the need for additional staffing and a proposed solutions. (see attached)

8. **BUILDINGS MAINTENANCE, REPAIR AND REPLACEMENT PLANS – J Paggioli and K Jackson :** Moved to November 18th meeting.
    a. **Review of Plans created in 2014**
    b. **Creating Funding Plans**
        i. **Town**
        ii. **BOE – Ron Goldstein and Jeff Mathieu**

9. **ANNUAL REVIEW OF ENERGY PROJECT RESULTS – J. Paggioli and K Jackson:** J. Paggioli gave a synopsis of the report issued by Honeywell. He said in the long run about $374,000 more would have been spent this past year if the energy project had not been done. This is about $85,000 more than the lease payment for the project. This does not take into account the additional money saved by shortening the diagnostic time of any issues. (see attached)

10. **REVIEW OF SNOW REMOVAL**
    a. **Expense Trends:** J. Paggioli gave a detailed report showing the snow totals over the past 66 years, a summary of the hours needed for deicing operations in the 2014-2015 year, and weather predictions for this coming year's snow season. (see attached)
    b. **Budgeting:** If there is a year where there is a surplus in the snow removal budget that money could be put in a snow removal account to be used on a year when over budget, however, there have been very few years that have come in under budget.

11. **FIRST SELECTMAN**
    a. **Report:** The Blight Ordinance Task Force has been selected. Copies of the charge were distributed. Pumpkins and Pooches was successful. Governor Malloy gave the keynote at the CCM Conference. The details of having the Hebron ACO provide coverage for Colchester is being figured out. The contract with KX is in its' last year. A RFP will be issued for dispatch services starting July 1, 2016. Local dispatch out of Company 1 with backup at the EOC is being looked into. A Tri-Board meeting on November 18th needs to be confirmed.
    b. **Transfer requests:** None

12. **LIAISON REPORTS:** A. Shilosky reported that the Commission on Aging is doing a super job, membership is growing, the need is also growing. First Selectman Soby took this time to report that over 600 rides in a month were given for medical needs. Overall 1140 rides were given in one month. Some requests for transportation had to be denied due to capacity being at its max. The Building Committee interviewed for an architect. A decision on an architect will be made on October 22nd at their meeting.

13. **NEW BUSINESS:** None

14. **OLD BUSINESS**
    a. **2016-2017 BUDGET: REVIEW OF DEPARTMENT INITIATIVES PRESENTATIONS:** No new discussion
        i. **Library**
        ii. **IT**

iii. **Recreation**

b. **Discussion and Possible Action - Use of Cap Reserve to be added to Transfer Procedures:** T. Kane motioned to endorse the changes put forth by First Selectman Soby to the Capital Reserves Appropriate Policy, seconded by R. Esteve. Vote was unanimous. **MOTION CARRIED.** (see attached)

c. **Discussion and Possible Action - Bylaws:** Members reviewed changes made by R. Esteve. J. Ringo motioned to approve the bylaws as amended, seconded by A. Shilosky. Vote was unanimous. **MOTION CARRIED.** (See attached)

d. **Recreation Field Subcommittee – update:** D. Mizla reported that no additional meetings have taken place.

e. **Senior Task Force - update:** No update

f. **Budget Communications Subcommittees – updates**
   i. **During Budget Season – next meeting after elections-** No update
   ii. **Off Budget Season -** No update.

g. **BOF Mission statement:** No discussion due to J. McNair not being in attendance.

15. **CITIZEN'S COMMENTS:** None

16. **ADJOURNMENT:** R. Esteve motioned to adjourn, seconded by J. Ringo. Motion was unanimous. **MOTION CARRIED.** Chairman Tarlov adjourned the meeting at 8:45 p.m.

Submitted by,

Dawn LePage

Dawn LePage, Clerk

Town of Colchester
Budget Transfer Procedures
Use of Capital Reserve Fund

1.0 Purpose

The purpose of these procedures is to specify the Board of Selectmen's and Board of Finance's (boards) intent for dealing with budget transfers, or supplemental appropriation of funds throughout the fiscal year, consistent with the Town Charter. It is recognized that the boards have joint responsibility to approve budget transfers and supplemental appropriations. It is also recognized that it is operationally prudent to have certain budget transfers occur at the end of the fiscal year once all line item expenditures are complete.

2.0 Funding of expenditures requiring prior approval of boards

2.1 Supplemental appropriation from fund balance

2.2 Transfer between department budgets

2.3 Transfer of funds from salary or benefit line items within a department budget

2.4 Changes of $1,000 or more in a funded program should be referred to the boards for review with a fiscal impact note.

3.0 Funding of expenditures not requiring prior approval of boards

3.1 Individual line items within a department budget other than salary and benefits may be over-expended as long as the total budget for that department excluding salary and benefits is not over-expended and the over-expenditure does not represent a repurposing of budgeted funds to another use.

3.2 The First Selectman may authorize the over-expenditure of any line item to deal with immediate matters of public safety such as a fire, weather event, or other such incident. The First Selectman shall notify the Boards at their next regular meeting, even if the items cannot be quantified yet.

3.3 The First Selectman may authorize the over-expenditure of any legal line item to defend the Town, its subdivisions and/or its employees in a matter that requires a contemporaneous legal response. The First Selectman shall notify the Boards at their next regular meetings and the Boards should approve legal expenditures for the specific issue up to a defined maximum dollar amount. The First Selectman shall continue to provide updates on the specific legal matter in executive session at subsequent Board meetings until the matter is closed.

4.0 Use of Capital Reserve Fund

4.1 Requests by Department Heads for authorization to use Capital Reserve Funds are to be made to the First Selectman and the Chief Financial Officer. Authorization for expenditures not to exceed $10,000 shall be made by the First Selectman. Authorization for expenditures exceeding $10,000 shall be approved by the Board of Finance upon recommendation of the First Selectman.

4.2 The First Selectman may authorize the over-expenditure of Capital Reserve Funds to deal with immediate matters of public safety such as a fire, weather event, or other such incident. The First Selectman shall notify the Boards at their next regular meeting, even if the items cannot be quantified yet.

Appendix A – Departments

The following are identified as departments for purposes of this policy:

Boards and Commissions

Contingency

First Selectman

Human Resources

Finance

Tax Collector

Assessor

Planning/Building Code Administration

Town Clerk

Registrar of Voters

Information Technology

Police

Fire

Emergency Management

Public Works (including Public Works Administration, Highway, Fleet Maintenance, Grounds Maintenance, Snow Removal, Facilities, and Transfer Station)

Engineering

Youth and Social Services

Cragin Memorial Library

Recreation

Senior Services

Appendix B – Charter Language

§ C-402. Powers and duties of the Board of Selectmen.

I. The Board of Selectmen may recommend to the Board of Finance the approval of the following matters concerning the Board of Selectmen's budget (subject to further approval by the Town Meeting, if so required):

(1) Any supplemental appropriation of funds; and
(2) Any transfer of funds between Town departments.

§ C-601. The Board of Finance.

C. The Board of Finance shall be responsible for developing and presenting to the Town voters the budgets for all Town departments and the overall Town government and shall have all of the powers and perform all of the duties conferred or imposed upon boards of finance by the General Statutes.

(1) The Board of Finance shall have the authority to approve supplemental appropriations from, and transfers within, the Town budget as recommended by the Board of Selectmen, subject to the further approval of the Town Meeting, if so required.

§ C-1203. The Department of Public Works.

A. The Department of Public Works shall be responsible for:
(1) The inspection and construction, reconstruction, care, maintenance, altering, paving, repairing, draining, cleaning and snow clearance of all public places and of all streets, highways, sidewalks and curbs, and of the installation and maintenance of all public lighting, street signs, guideposts and public utilities;
(2) The construction, reconstruction, care, repair and maintenance of all public works and public improvements, except those under the jurisdiction of the Department of Parks and Recreation;
(3) The maintenance, care and improvement of, and construction required in connection with, all public works and public improvements of the Town;
(4) The improvement, repair and maintenance of all equipment, including automotive equipment, used in the Department of Public Works or in any other department, including police, fire and, upon request, school equipment; and
(5) The inspection and construction, reconstruction, care, maintenance and operation of all services provided in the Sewer and Water District.

B. The Department of Public Works shall consist of the Director of Public Works, who shall be the department head, and such other personnel as is deemed necessary by the Board of Selectmen. The Department of Public Works may delegate such responsibilities to other Town departments as necessary for the efficient and effective maintenance of Town facilities.

10/21/15

Town of Colchester Interoffice Memorandum

To: Stan Soby, First Selectman
From: James Paggioli, L.S., Director of Public Works JP
CC: Board of Finance
Date: October 18, 2015
Re: Snow Budget Presentation

At the request of the Board of Finance, a review of the budgeting process for snow removal services was conducted and weather trending data was obtained and evaluated in order to determine if prudent budgetary processes were being observed in light of recent winter weather activities.
Attached herein are reference data sheets that are referred throughout this memo. Source of information were from The National Weather Service, Weather Warehouse, WXedge, NOAA, Weather Underground and various media meteorologists, and History Reports of the Department of Public Works.

The published average snowfall amounts for the Colchester area varies from the Southeast corner of the town (lower 40 inch range) to the Northerly and Northwest portion of the town (upper 40 to 50 inch range), This variance is due primarily to elevational difference between the two end of town. The upper limit is similar to the totals that occur at Bradley Airport annually. Published data would list Colchester as interpreted between Bradley Airport and Groton Airport with the amount being 40.5 inches per year. Numeric averaging at Bradley Airport from 1949 to 2015 totals 49.75 inches per year. (See WXedge graph and Historic Snowfall Total Sheet Bradley Airport) These have been interpolated to the Hartford totals of 40.5 inches of snow occurring on 20.1 days, and Middletown totals of 35.6 inches of snow occurring on 14.4 days.(US Climate data). Looking at the individual year data, the range that has occurred suggest a very wide historic range. At Bradley, the minimum recorded total was 14.9 inches of snow (1988-1989) and the maximum recorded total was 107.1 inches of snow (1995-1996). Of note, the previous year total was 22.3 inches. No set pattern developed that would indicate a clear rising of annual amounts. The variability of the total and how it is delivered (multiple small to medium storms, or few large scale snow events) cannot be adequately long range predicted.

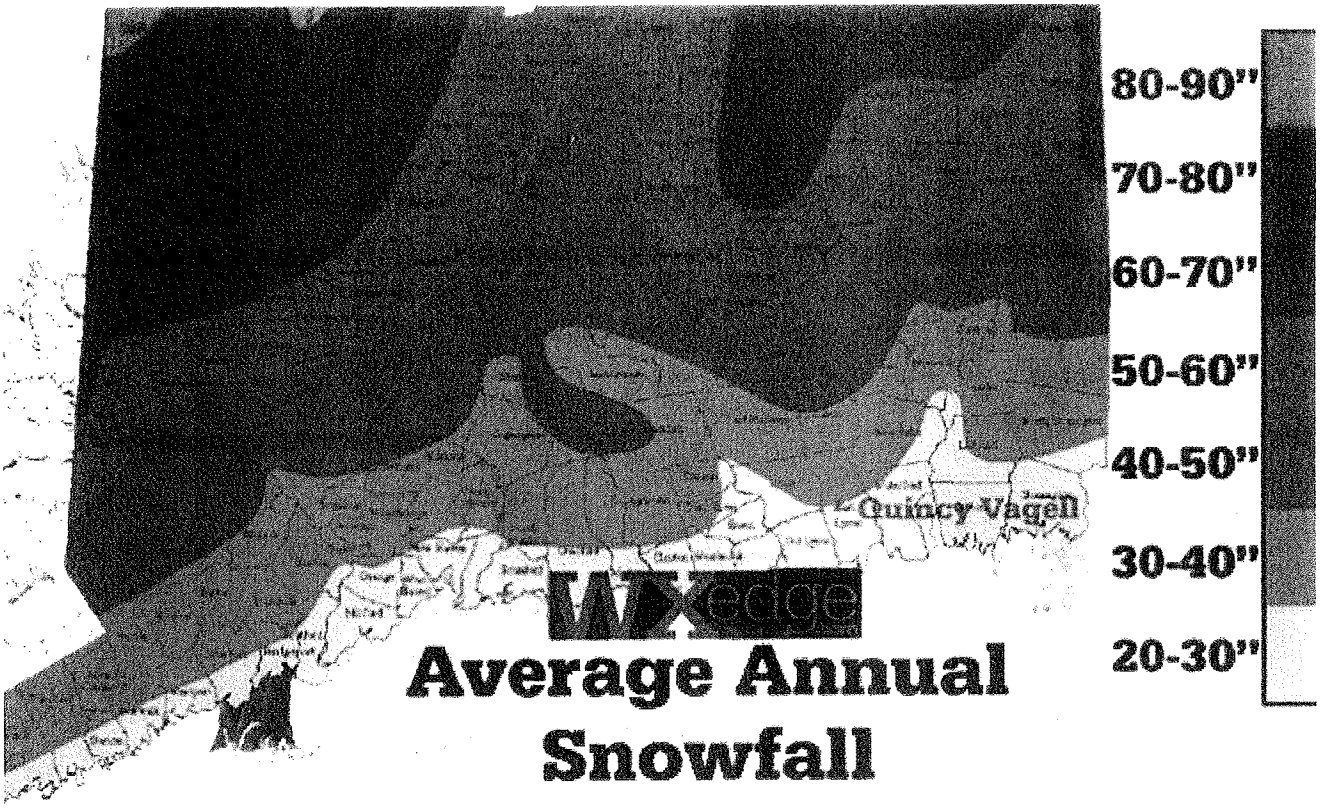
Advances in large scale climate modeling had shown significant advancement in expectations for oncoming seasons, along with historic data of the newer measurement, better forecasting is available. (See Kevin Arnone WXedge article). Ideally, if the same situational data occurred before, then the likelihood of the same result should occur again.

The period between 1955 and 1972 represented a long trend in above average snow fall amounts, (above being consider at greater than 25% of the average). This was also a time where the "Upcoming Global Ice Age" was the fear being generated. 1972 to 1994 represented average to below average snowfall amounts with occasional years being above average within the range.

The Department bases its annual budget on the midpoint between published and numeric averages of the Town at 44 inches of snow and 20.1 days of events. The budgetary model holds relatively stable if the total snow fall and the number of responses is within 25% error. The basis of the snow budget is 4 primary accounts, Overtime labor, Deicing materials, Other Purchased supplies, and Professional Services. Not included is fuel, and vehicle repair items. These can be significant if greater than average storm response (number and/or magnitude) occurs. Professional services are contracted plow routes, the fixed contract for the school parking lots, and loader rental to augment town plow forces should larger events occur, i.e. Blizzards.
In discussion of Blizzards and FEMA events, only a contiguous 48 hours of time may be eligible for a 75% reimbursement. The past two blizzards have taken approximately 5 days to push back all roads, not merely open them to traffic. The town presently has two loaders and three smaller backhoes and relies on contracted services for assistance during catastrophic events.

Based upon the snowfall data and financial records over the past five years, the budgetary method has been sufficient within the 25% variance range, with the exception of years where the range doubles, in either responses or snowfall total. Of significance, where a savings was realized during the FY 11-12 winter, the following winter the cost overage was approximately equal to the previous year's savings. Should the basis be budgeting upon the average be continued, the question should be addressed if a "snowy day" fund be created in order to reserve unexpended funds from a less than average year to be dedicated to future years of over average year.

This present year, FY15-16, the budget for deicing materials was increased to accommodate the increased responses required due to drifting, refreezing and maintain ice free bare pavement roads. Approximately half of the responses of the previous year were specifically in regard to these conditions. If the public expectation was to drive on snow pack covered road ways as is common in the states of northern New England, then these responses would be greatly reduced. However the present expectation of the local public has been to be traveling on bare pavement roadways as soon as possible following a storm and to maintain such until the next storm.



Average Annual Snowfall

Historic Snowfall Total - Bradley Airport Winter of 1949-2015

Published Average 40.5"
27 Years -25% above avg
16 Years -25% below avg.
18 Years - within 25% average

Numeric Average from Data set 49.75"
24 Years -25% above avg
19 Years -25% below avg.
18 Years - within 25% average

Winter Yr	Oct	Nov	Dec	Jan	Feb	Mar	April	Total
14-15	0	5.1	0.7	17.1	31.9	9	0	63.8
13-14	0	0	12.7	10.3	27.1	0.8	0.2	51.1
12-13	0	2.9	12.9	5.9	25.4	9.8	0	56.9
11-12	20.3	0	0	6.8	5.9	1.7	0	34.7
10-11	0	0	14.2	57	15.6	1	1.3	89.1
09-10	0	0	12.8	6.4	11.4	0	0	30.6
08-09	0	0	20.7	12.9	3.9	8	0	45.5
07-08	0	1	18.8	10.6	12.9	4.2	0	47.5
06-07	0	0	0	1.2	11.2	11.6	0	24
05-06	0	3.3	16.6	21.8	22.2	4.8	1.2	69.9
04-05	0	1.5	9.6	27.7	16.3	19	0	74.1
03-04	0	0	23.4	11.1	4	7	0	45.5
02-03	0	0	13.6	15.6	21.4	11.1	2.3	64
01-02	NR	NR	3	NR	NR	NR	NR	3
00-01	NR	NR	8	10.4	21.4	13.5	0	53.3
99-00	NR	NR	NR	NR	NR	13.5	NR	13.5
98-99	NR	NR	NR	NR	NR	NR	NR	0
97-98	NR	NR	NR	NR	NR	NR	NR	0
96-97	NR	NR	NR	NR	NR	NR	NR	0
95-96	0	5.6	20.3	42.8	20.6	17.8	0	107.1
94-95	0	3.9	1.1	5.7	10.1	0	1.5	22.3
93-94	0	0	6.7	31.3	29.4	17.5	0	84.9
92-93	0	0	6.7	10.5	13.8	31.1	0	62.1
91-92	0	0.7	6	1.7	5.3	7.3	2.6	23.6
90-91	0	0	8.1	10.2	5.8	5.7	0	29.8
89-90	0	5.3	14.8	10.5	9	4.3	1.5	45.4
88-89	0	0	6.3	0.6	4.6	3.4	0	14.9
87-88	0	8.6	5.8	22.6	17.6	4.9	0	59.5
86-87	0	8.7	4.9	34	1.6	1.7	0.4	51.3
85-86	0	2	5.8	5.1	13.4	0.2	0.8	27.3
84-85	0	0.1	3.8	6.9	9.4	2.1	1.4	23.7
83-84	0	0	7.9	14.7	1.3	19.3	0	43.2
82-83	0	0	6.5	10.2	29.4	0.2	0.9	47.2
81-82	0	0	13.1	16.7	5.8	6.7	14.3	56.6
80-81	0	8.6	3.9	4.1	0.9	0.2	0	17.7
79-80	1.7	0	0.9	0.2	7.7	5.9	0	16.4
78-79	0	5.1	10.3	8.6	9.2	0	3.6	36.8
77-78	0	1.3	23.4	37	18.1	13.3	0	93.1
76-77	0	0.4	7.3	20	9.1	11	0.3	48.1
75-76	0	0.3	13.4	15.6	5	12.5	0	46.8
74-75	0	0.8	8.5	10.2	19.6	2.5	0.3	41.9
73-74	0	0	3.1	20	5.8	4.8	2.1	35.8
72-73	0.4	2.1	14.8	14.1	5.9	0.4	0.3	38
71-72	0	8.2	6.6	2.9	24.9	13.2	2.7	58.5
70-71	0	0	27	17.7	8.4	12.8	4	69.9
69-70	0	0	35.4	3.2	6.7	14.7	2	62
68-69	0	7.9	13.9	3.4	32.2	4.4	0	61.8
67-68	0	3.7	21.7	7.5	1.6	6.8	0	41.3
66-67	0	0	26.3	3	25.2	33.2	1.4	89.1
65-66	0	0	11	18.4	19.1	10.6	0	59.1
64-65	0	0	12.3	28.7	6	7.8	1.7	56.5
63-64	0	0	17.9	13.8	22	4.1	0	57.8
62-63	0	3.3	15.9	7.7	14.5	13.8	0	55.2
61-62	0	5	11.3	1.6	25.6	0.7	0	44.2
60-61	0	0	17.6	30.6	14.9	15.7	1.4	80.2
59-60	0	0.6	9.1	13.4	4.6	16.9	0	44.6
58-59	0	1.4	8.9	6.9	6.9	19.1	0	43.2
57-58	0	0	5.5	13.3	17.1	12.4	5.1	53.4
56-57	0	1	8.6	18.3	3.5	8.3	5.5	45.2
55-56	0	3	3.4	6.8	14.5	43.3	5.3	76.3
54-55	0	0	2.8	1.2	5.3	11.3	3.6	24.2
53-54	0	2.5	0	13.4	0.8	0	0	16.7
52-53	0	0	0	14	6.4	0	0	20.4
51-52	0	2	12.6	13.6	10.8	7.9	0	46.9
50-51	0	0	8.8	11.8	5.8	4.6	0	31
49-50	0	3.5	10.5	2.6	18.3	5.9	2	42.8
				16.5	16.2	4	0	

49.175 Numeric Average

Snow Removal Budget 5-Year Analysis

		FY 10-11	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16
40103	Budget	$84,100	$90,000	$94,500	$94,500	$110,000	$110,000
Overtime	Actual	$90,035	$55,524	$110,043	$166,300	$224,283	
42333	Budget	$137,846	$132,520	$133,121	$132,556	$135,200	$183,200
Sand, Salt, Gravel	Actual	$144,273	$80,747	$127,731	$182,445	$313,610	
42340	Budget	$29,494	$37,294	$37,294	$16,094	$17,150	$24,450
Other Purchased Supplies	Actual	$27,430	$19,485	$25,594	$26,887	$16,360	
44208	Budget	$41,256	$145,270	$142,252	$160,516	$198,640	$176,880
Professional Services	Actual	$221,278	$134,795	$197,738	$200,919	$346,513	
Storm Events Responses		NM	8	22 -FEMA	40	46- FEMA	
Town Accu Total Snow		87"	18"	102"	77.5"	116.5"	

Annual snowfall average 1981-2010 Hartford 40.5" and 20.1 days of events
Annual snowfall average 1981-2010 Middletown 35.6" and 14.4 days of events

Summary of 2014 -2015 Snow and Deicing Operations

	Date	Storm Type	Accumulation	Duration
1	11/14/2014	Icing	N/A	0050hrs - 0700 hrs
2	11/26/2014	wet snow	5"	1230 hrs-2000 hrs
3	11/27/2014	Refreeze/Overnight	N/A	0130 hrs - 0500 hrs
4	12/9/2014	Freezing rain To Rain	N/A	0200 hrs - 0700 hrs
5	12/11/2014	Freezing rain to trace snow and rain	.5"	0315 hrs - 0730 hrs
6	12/11/2014	Wet roads refreeze as temps drop to 28, Ice	N/A	1730 hrs - 2030 hrs
7	12/21/2014	Ice , partial response hills	N/A	0100 hrs - 0400 hrs
8	12/21/2014	Snow, Trace at end of ice-rain, partial	N/A	0800 hrs - 1115 hrs
9	1/3/2015	Snow turn to rain with warm temps after	3"	1455 hrs - 2100 hrs
10	1/6/2015	Snow	.5"	1000 hrs - 1530 hrs
11	1/6/2015	Snow squall with drop temps, Glazing	.5"	1830 hrs - 2110 hrs
12	1/9/2015	Snow	3"	0400 hrs - 1530 hrs
13	1/12/2015	Ice/rain/refreeze	N/A	0430 hrs - 1500 hrs
14	1/13/2015	Refreezing	N/A	0010 hrs -0700 hrs
15	1/18/2015	Ice	N/A	0850 hrs - 1200 hrs
16	1/18/2015	Partial Call in one truck police req.	N/A	1600 hrs - 1800 hrs
17	1/19/2015	Ice	N/A	0800 hrs - 1100 hrs
18	1/24/2015	Snow	6"	0230 hrs - 1630 hrs
19	1/24/2015	Squall at after end of Forcast, ice	N/A	1800 hrs - 2200 hrs
20	1/26-27/ 2015	Blizzard	24"	1030 hrs - 1900 hrs
21	1/28/2015	Blizzard clean up widen	N/A	0700 hrs - 1800 hrs
22	1/29/2015	Icing	N/A	0400 hrs - 1530 hrs
23	1/30/2015	Snow	3"	0100 hrs -1400 hrs
24	1/31/2015	Drifting/ partial	N/A	1000 hrs - 1430 hrs
25	2/2/2015	Snow	12"	0100 hrs - 2130 hrs
26	2/3/2015	Clean up/ widening	N/A	0400 hrs - 1300 hrs
27	2/4/2015	Icing Partial & Sight Line clean up	N/A	0500 hrs - 1430 hrs
28	2/5/2015	Ice and Snow	4"	0400 hrs - 1530 hrs
29	2/7/2015	Snow	1"	1100 hrs - 1430 hrs
30	2/8/2015	Snow	2"	0130 hrs - 0700 hrs
31	2/8-9/2015	Snow	12"	1830 hrs - 2030 hrs
32	2/10/2015	Clean up/ widening	N/A	0400 hrs - 0800 hrs
33	2/12/2015	Snow	2"	0930 hrs - 1500 hrs
34	2/14-15/2015	Snow, winds	5"	1430 hrs - 1400 hrs
35	2/16/2015	Drifting	N/A	0400 hrs - 1200 hrs
36	2/17/2015	Snow	4"	0630 hrs - 1600 hrs
37	2/18/2015	Drift/refreeze	N/A	0400 hrs - 0945 hrs
38	2/21-22/2015	Snow	6"	1530 hrs - 1500 hrs
39	2/23/2015	Icing Partial	N/A	0200 hrs - 0700 hrs
40	3/1-2/2015	Snow	7"	1200 hrs - 1200 hrs
41	3/3-4/2015	Snow/Ice then rain	3"	1700 hrs - 1130 hrs
42	3/5/2015	Snow	7"	0230 hrs - 2200 hrs
43	3/20-21/2015	Snow	2"	1500 hrs - 0100 hrs
44	3/21/2015	Snow	2"	0900 hrs - 1430 hrs
45	3/28/2015	Snow, Warming in day, Partial	2"	0800 hrs - 1130 hrs
46	3/28/2015	refreeze of days rain	N/A	2000 hrs - 2345 hrs
			Total 116.5"	
			Average Historical Total 38.5 inches	

Summary of 2013 -2014 Snow and Deicing Operations

	Date	Storm Type	Accumulatior	Duration
1	12/1/2013	Icing	N/A	0430hrs - 0950 hrs
2	12/2/2013	Icing	N/A	0500 hrs- 1530 hrs
3	12/9/2013	Snow/Ice	3"	0100 hrs -1530 hrs
4	12/10/2013	Ice/ snow	4"	0500 hrs - 2030 hrs
5	12/11/2013	Ice refreeze	N/A	0400 hrs - 1530 hrs
6	12/14-15/2013	Snow	8"	1000 hrs - 0800 hrs
7	12/16/2013	Refreeze, overnight flurries	N/A	0400 hrs -1530 hrs
8	12/17/2013	Snow -very cold 14deg	5"	0500 hrs - 2300 hrs
9	12/18/2013	Ice drifting	N/A	0400 hrs - 1530 hrs
10	12/19/2013	partial call in two truck ice refreeze	N/A	0400 hrs - 0730 hrs
11	12/30/2013	Rain on 12/29 freezes overnight	N/A	0430 hrs -1530 hrs
12	1/2 -3 /2014	Long - Lt snow, to rain, then snow & rec cold	7"	0115 hrs - 1330 hrs
13	1/4/2014	partial call in 3 trucks, ice and dirt roads	N/A	0800 hrs - 1400 hrs
14	1/5/2014	Ice	N/A	1100 hrs -1400 hrs
15	1/6/2014	Rain to artic cold -flash freeze	N/A	1530 hrs - 1900 hrs
16	1/7/2014	Overnight flurry -ice	.5"	0400 hrs - 0700 hrs
17	1/10/2014	Snow	1.5"	0500 hrs - 15300 hrs
18	1/10-11/2014	Ice	N/A	2115 hrs - 0130 hrs
19	1/15/2014	Icing flurry	N/A	0400 hrs - 0900 hrs
20	1/19/2014	Ice partial call in 4 trucks	N/A	0030 hrs - 0330 hrs
21	1/21-22/2014	Snow	8.5"	1230 hrs - 1530 hrs
22	1/23/2014	Icing/Drifting artic front	N/A	0400 hrs - 1530 hrs
23	1/25/2014	Snow	1.5"	1730 hrs -2330 hrs
24	1/29/2014	Snow -Northern edge of coastal ice storm	1"	0320hrs - 0900 hrs
25	2/3/2014	Snow	6"	0500 hrs -1530 hrs
26	2/4/2014	Icing-refreeze	N/A	0400 hrs - 0730 hrs
27	2/5/2014	Snow	7"	0330 hrs - 1830 hrs
28	2/6/2014	Fluury-Icing -refreeze	N/A	0400 hrs - 0800 hrs
29	2/9-10/2014	Snow	1"	1930 hrs - 0400 hrs
30	2/13-14/2014	Snow-rain-snow -heavy	11"	0400 hrs - 1300 hrs
31	2/15-16/2014	Snow	4"	1300 hrs - 0300 hrs
32	2/16/2014	Drifting/icing partial 3 trucks	N/A	1730 hrs - 2000 hrs
33	2/18/2014	Snow	5"	0700 hrs - 2130 hrs
34	2/19/2014	icing refreeze then warmer in day	N/A	0400 hrs - 1530 hrs
35	2/19-20/2014	Refreeze after darl called in by state police	N/A	2245 hrs - 1530 hrs
36	2/22/2014	Ice	N/A	0415hrs - 0730 hrs
37	3/13/2014	Rain to below freezing icing	N/A	0300 hrs - 0730 hrs
38	3/26/2014	flurries -end of seas cape cod bliz, west edge	.5"	0400 hrs -0700 hrs
39	3/31/2014	sleet-frez rain-snow	2"	0900 hrs - 1500 hrs
40	4/16/2014	Snow ice	1"	0200 hrs - 0830 hrs
			Total 77.5"	
			Average Historical Total 38.5 inches	

Summary of 2012 -2013 Snow and Deicing Operations

	Date	Storm Type	Accumulation	Duration
1	11/7-8/2012	snow	10"	1530hrs - 1730 hrs
2	11/27/2012	snow	6"	0700 hrs - 2130 hrs
3	11/28/2012	Ice refreeze	N/A	0400 hrs -0700 hrs
4	12/24-25/2012	snow	1"	2300 hrs - 0400 hrs
5	12/26-27/2012	wet snow mix	3"	1800 hrs -0230 hrs
6	12/29-30/2012	Snow	12"	1200 hrs - 0600 hrs
7	1/21/2013	overnight flurries - icing	1"	0400 hrs -0900 hrs
8	1/22/2013	Snow	2"	0340 hrs - 0800 hrs
9	1/28/2013	Snow	2"	1200 hrs - 1830 hrs
10	1/28-29/2013	Refreeze icing	N/A	2330 hrs - 0230 hrs
11	2/3/2013	snow flurry	1"	0415 hrs -0800 hrs
12	2/5/2013	Snow Flurry morning	1"	0520 hrs - 1530 hrs
13	2/5/2013	snow flurry - evening	1"	1820 hrs - 2130 hrs
14	2/8-15/2013	Blizzard FEMA Event Multiple day event 24/7	36"	0700 hrs -1530 hrs
15	2/16/2013	new snow	1"	0620 hrs - 0930 hrs
16	2/17/2013	Overnight snow	2"	0130 hrs - 0750 hrs
17	2/25/2013	Black Ice from weekend rain	N/A	0400 hrs - 0700 hrs
18	3/7/2013	Lt snow morning	2"	0330 hrs - 0830 hrs
19	3/7/2013	Pretreat Evening storm	N/A	1300 hrs-1530 hrs
20	3/7-8/2013	Snow unex forecast	18"	2130 hrs - 2030 hrs
21	3/14/2013	Flurry	0.5"	0545hrs-0800 hrs
22	3/18-19/2013	Snow-sleet-frz rain	3.5"	2030 hrs - 1000 hrs
			Total 102"	
			Average Historical Total 38.5 inches	

2015-2016 Winter Predictions

By Kevin Arnone (http://wxedge.com/author/kevinarnone-2/)
Published: October 9, 2015, 12:51 pm | Updated: October 9, 2015, 2:43 pm

One of the greatest sights across Connecticut this time of the year is certainly the leaves starting to show off their vibrant colors (http://wxedge.com/2015/09/16/2015-fall-foliage-forecast/). Just picture it right now, you're taking a drive down the road and you can see the beautiful bright colors in the distance. Unfortunately, not only does this mean summer (http://wxedge.com/2015/03/31/springsummer-forecast/)has come to an end, but winter here in New England is right around the corner. We are just a few weeks into fall (http://wxedge.com/2015/09/16/2015-fall-foliage-forecast/) and already the days are getting much shorter and nights are getting cooler.

(https://lintvwxedge.files.wordpress.com/2015/09/beth-reise2808e-84.jpg) This only means one thing, it's time to showcase the 2015-2016 Winter Predictions for Connecticut. This is my second year putting together a Winter Forecast. To be honest, although winter last year started late in terms of snowfall, the winter predictions were right on! I make this winter forecast based on research from past weather patterns as well as climatology and how it compares to this year. By comparing past years to this year, I can put together a winter

forecast that not only makes sense, but that I'm confident about. I used this same method with this year's summer (http://wxedge.com/2015/03/31/springsummer-forecast/) forecast as well as hurricane predictions (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/), and they were all pretty accurate.

(https://lintvwxedge.files.wordpress.com/2015/10/shutterstock_81428797.jpg)The article is 5 pages, make sure you read them all to get the full winter forecast. I will have links on the bottom of the page that will automatically bring you to the next page, or you can use the number bar below. Thanks for checking out **WXedge.com** (http://wxedge.com/). **Click this link to continue reading to the winter forecast or use the number bar below.** (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/2/)

Meteorologist Kevin Arnone

Thanks for reading! Please friend me on Facebook (https://www.facebook.com/pages/Meteorologist-Kevin-Arnone/361085203906400?ref=hl&focus_composer=true&ref_type=bookmark) and Twitter (https://twitter.com/Kevin_Arnone)!

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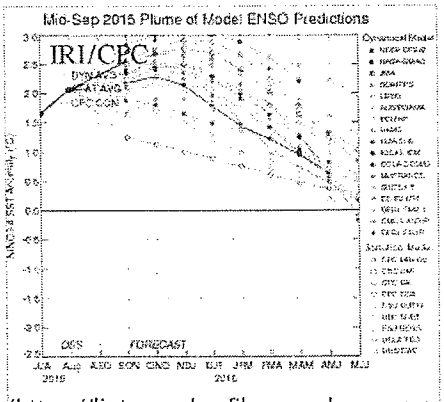
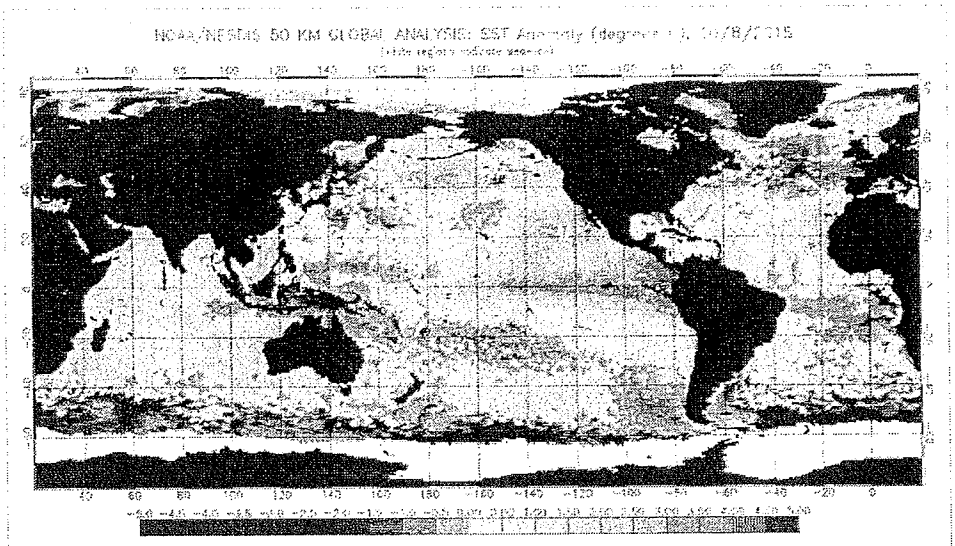
As expected, El Nino has become very strong. As of early October, sea-surface temperature departures in the Pacific Ocean are 2-4 degrees Celsius above normal. You may be asking yourself what sea-surface temperatures in the Pacific Ocean have to do with our weather. Well, the warming of the equatorial Pacific waters have a major influence on the atmospheric pattern across not only the United States but even parts of Europe and Africa. The El Nino intensities are some of the highest numbers I have ever seen. El Nino is forecast to last well into spring (The graph to the right),



(https://lintvwxedge.files.wordpress.com
El Nino Forecast

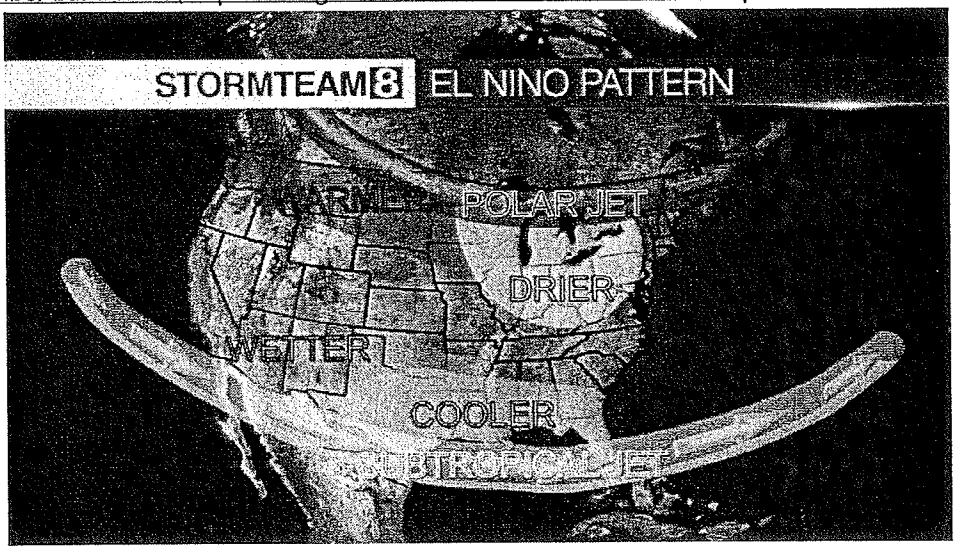
this will be very important for us because precipitation and temperature impacts during moderate to strong El Nino patterns are typically most noticeable during the winter months. What's interesting to note, we already saw impacts from El Nino this summer (http://wxedge.com/2015/03/31/springsummer-forecast/)into fall (http://wxedge.com/2015/09/16/2015-fall-foliage-forecast/). Let me explain: Usually during El Nino patterns, you have a very active Pacific Hurricane (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) season. The 2015 Pacific Hurricane (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/)Season has already recorded 21 named storms, 13 hurricanes (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) in which 8 of them were major hurricanes (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/). It makes sense to have an active season due to much higher sea-surface temperatures (Picture below). On the other end of the spectrum, during El Nino patterns, you also tend to have a lot of wind shear in the Caribbean Sea and Atlantic Basin. Wind shear will cause less convective activity and result in either the weakening of tropical cyclones or literally just stop any tropical development at all. The wind shear this year alone caused storms like Danny, Erika and Fred to weaken in the Atlantic. This is why the 2015 Atlantic Hurricane season (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) has been below average.



(https://lintvwxedge.files.wordpress.com/2015/10/anomnight-current.gif)

Sea Surface Temperatures

Keep in mind, El Nino isn't the sole driver of the atmosphere. There are many other different variables in the weather patterns from day-to-day that also play a very significant role in our weather. Typically during moderate to strong El Nino patterns, you have above average rainfall for much of the southern United States from California to the Carolinas. The northern half is usually drier than normal. Much of the southeast United States will typically be cooler and the northwest will be warmer (Picture below). However, no two El Nino's are exactly alike. I just gave you a lot of information, but what does it really all mean. Click this link to continue reading to the winter forecast or use the number bar below. (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/3/)



(https://lintvwxedge.files.wordpress.com/2015/10/2.jpg)

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The next step in my forecasting process was to look at the intensities of previous El Nino's (Table below). I used the Oceanic Nino Index or ONI on a great weather website GGWeather.COM. The data goes back all the way to 1950. I was able to pin down five years which closely related to the statistics of 2015. The five years are; **1957, 1965, 1972, 1982, and 1997**. These years all had a moderate to strong El Nino pattern.

Running 3-Month Mean ONI values

ENSO Type	Season	JJA	JAS	ASO	SON	OND	NDJ	DJF	JFM	FMA	MAM	AMJ	MJJ
WL	1950 - 1951	-0.6	-0.5	-0.5	-0.5	-0.7	-0.8	-0.8	-0.6	-0.2	0.2	0.2	0.4
WE*	1951 - 1952	0.5	0.7	0.9	0.9	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.2
WE	1952 - 1953	0	0.1	0.2	0.2	0.2	0.3	0.5	0.6	0.7	0.7	0.7	0.7
WE	1953 - 1954	0.7	0.7	0.6	0.6	0.6	0.7	0.7	0.4	0	-0.4	-0.5	-0.5
WL	1954 - 1955	-0.6	-0.7	-0.7	-0.6	-0.5	-0.5	-0.5	-0.6	-0.7	-0.7	-0.7	-0.6
WL	1955 - 1956	-0.6	-0.6	-1	-1.4	-1.6	-1.4	-0.9	-0.6	-0.6	-0.5	-0.5	-0.4
*	1956 - 1957	-0.5	-0.5	-0.4	-0.4	-0.5	-0.4	-0.3	0	0.3	0.6	0.7	0.8
SE	1957 - 1958	1	1.2	1.1	1.2	1.3	1.6	1.7	1.8	1.2	0.8	0.7	0.6
WE	1958 - 1959	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.5	0.4	0.2	0.1	-0.1
	1959 - 1960	-0.3	-0.3	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.1	0	-0.1	-0.2
	1960 - 1961	0	0.1	0.2	0.1	0	0	0	0	-0.1	0	0.1	0.2
	1961 - 1962	0.3	-0.1	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.2
	1962 - 1963	-0.1	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.2	0.1	0.2	0.2	0.4
WE	1963 - 1964	0.7	1	1.1	1.2	1.2	1.1	1	0.6	0.1	-0.3	-0.6	-0.6
WL	1964 - 1965	-0.7	-0.7	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.1	0.1	0.4	0.7
SE	1965 - 1966	1	1.3	1.6	1.7	1.8	1.5	1.3	1	0.8	0.6	0.5	0.2
	1966 - 1967	0.2	0.1	0	-0.1	-0.1	-0.3	-0.4	-0.5	-0.5	-0.5	-0.2	0
WL*	1967 - 1968	0	-0.2	-0.3	-0.4	-0.4	-0.5	-0.7	-0.8	-0.7	-0.6	-0.1	0.2
WE*	1968 - 1969	0.5	0.4	0.3	0.4	0.4	0.5	0.5	1	0.9	0.7	0.6	0.3
WE	1969 - 1970	0.4	0.5	0.8	0.8	0.6	0.7	0.6	0.4	0.4	0.3	0.1	-0.3
WL	1970 - 1971	-0.5	-0.8	-0.8	-0.8	-0.9	-1.2	-1.5	-1.5	-1.1	-0.9	-0.5	-0.7
WL	1971 - 1972	-0.8	-0.7	-0.8	-0.8	-0.9	-0.8	-0.3	-0.4	0	0.3	0.6	0.8
SE	1972 - 1973	1.1	1.3	1.5	1.8	2	1.9	1.7	1.2	0.5	0	-0.4	-0.8
SL	1973 - 1974	-1	-1.2	-1.4	-1.7	-1.9	-1.9	-1.7	-1.5	-1.2	-1	-0.9	-0.8
WL	1974 - 1975	-0.6	-0.4	-0.4	-0.6	-0.7	-0.6	-0.5	-0.5	-0.6	-0.6	-0.7	-0.8
SL	1975 - 1976	-1	-1.1	-1.3	-1.4	-1.5	-1.6	-1.5	-1.1	-0.7	-0.4	-0.3	-0.1
WE	1976 - 1977	0.1	0.3	0.5	0.7	0.8	0.8	0.7	0.6	0.4	0.3	0.3	0.4
WE	1977 - 1978	0.4	0.4	0.5	0.6	0.6	0.6	0.7	0.4	0.1	-0.2	-0.3	-0.3
	1978 - 1979	-0.4	-0.4	-0.4	-0.3	-0.1	0	0	0.1	0.2	0.3	0.3	0.1
WE*	1979 - 1980	0.1	0.2	0.3	0.5	0.5	0.5	0.3	0.1	0.3	0.4	0.5	0.5
	1980 - 1981	0.3	0.2	0	0.1	0.1	0	-0.2	-0.4	-0.4	-0.3	-0.2	-0.3
	1981 - 1982	-0.3	-0.3	-0.2	-0.1	-0.1	0	0	0.1	0.2	0.5	0.6	0.7
VSE	1982 - 1983	0.8	1	1.3	1.6	1.9	2.1	2.3	2.3	2.2	2.1	1.8	1.7
WL	1983 - 1984	0.3	0	-0.3	-0.5	-0.5	-0.5	-0.3	-0.2	-0.3	-0.4	-0.4	-0.4
WL	1984 - 1985	-0.5	-0.2	-0.3	-0.6	-0.9	-1.1	-0.9	-0.7	-0.7	-0.7	-0.7	-0.6
	1985 - 1986	-0.4	-0.4	-0.4	-0.3	-0.2	-0.2	-0.4	-0.4	-0.3	-0.2	-0.1	0
WE	1986 - 1987	0.2	0.4	0.7	0.8	1	1.1	1.1	1.1	1.1	1	0.9	1.1
VE*	1987 - 1988	1.4	1.6	1.8	1.8	1.8	1.7	0.8	0.5	0.1	-0.3	-0.8	-1.2
SL	1988 - 1989	-1.2	-1.1	-1.2	-1.4	-1.7	-1.8	-1.6	-1.4	-1.1	-0.9	-0.6	-0.4
	1989 - 1990	-0.3	-0.3	-0.3	-0.3	-0.2	-0.1	0.1	0.2	0.2	0.2	0.2	0.3
	1990 - 1991	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.2	0.2	0.4	0.6
WE	1991 - 1992	0.7	0.7	0.7	0.8	1.2	1.4	1.6	1.5	1.4	1.2	1.1	0.8
	1992 - 1993	0.3	0.2	0	-0.1	-0.1	0	0.2	0.3	0.5	0.7	0.8	0.5
	1993 - 1994	0.3	0.2	0.2	0.2	0.1	0.1	0.3	0.1	0.2	0.3	0.4	0.4
WE*	1994 - 1995	0.4	0.4	0.4	0.6	0.9	1	0.9	0.7	0.5	0.3	0.2	0
WL	1995 - 1996	-0.2	-0.3	-0.7	-0.9	-1	-0.9	-0.9	-0.7	-0.6	-0.4	-0.2	-0.2
	1996 - 1997	-0.2	-0.3	-0.3	-0.4	-0.4	-0.3	-0.3	-0.4	-0.2	0.1	0.6	1
VSE	1997 - 1998	1.4	1.7	2	2.2	2.3	2.3	2.1	1.8	1.4	1	0.3	-0.1
WL	1998 - 1999	-0.7	-1	-1.1	-1.2	-1.3	-1.4	-1.4	-1.2	-1	-0.8	-0.9	-1
WL*	1999 - 2000	-1	-1	-1.1	-1.2	-1.4	-1.6	-1.5	-1.4	-1.1	-0.9	-0.7	-0.7
WL	2000 - 2001	-0.6	-0.5	-0.5	-0.7	-0.8	-0.8	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1
	2001 - 2002	0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.2	-0.1	0.1	0.2	0.4	0.7
WE	2002 - 2003	0.8	0.9	1	1.1	1.1	1.1	0.9	0.6	0.4	0	-0.2	-0.3
	2003 - 2004	0.1	0.2	0.3	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.2	0.3
WE	2004 - 2005	0.3	0.7	0.7	0.7	0.7	0.7	0.5	0.6	0.5	0.5	0.4	0.2
*	2005 - 2006	0.1	0	0	-0.1	-0.4	-0.7	-0.7	-0.5	-0.4	-0.2	0	0.3
WE	2005 - 2007	0.2	0.5	0.5	0.5	0.6	0.5	0.7	0.5	0	-0.1	-0.2	-0.2
WL	2007 - 2008	-0.5	-0.5	-0.8	-1.1	-1.2	-1.3	-1.4	-1.3	-1.1	-0.9	-0.7	-0.5
*	2008 - 2009	-0.3	-0.2	-0.2	-0.3	-0.5	-0.7	-0.6	-0.7	-0.4	-0.1	0.2	0.4
WE	2009 - 2010	0.5	0.6	0.7	0.9	1.1	1.3	1.3	1.1	0.8	0.5	0	-0.4
WL*	2010 - 2011	-0.8	-1.1	-1.3	-1.4	-1.5	-1.4	-1.3	-1.1	-0.8	-0.6	-0.3	-0.2
WL	2011 - 2012	-0.5	-0.5	-0.7	-0.9	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.3	-0.3
	2012 - 2013	0.1	0.3	0.4	0.4	0.2	-0.2	-0.4	-0.5	-0.3	-0.2	-0.2	-0.2
	2013 - 2014	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.5	-0.5	-0.4	-0.2	0	0
*	2014 - 2015	0	0	0.2	0.4	0.6	0.6	0.5	0.4	0.5	0.7	0.9	1.0
	2015 - 2016	1.2	1.5										

(https://lintvwxedge.files.wordpress.com/2015/10/article.jpg)

El Nino Intensity

I now wanted to compare how certain weather statistics from 2015 compared to the 5 years I picked out. Instead of listing all the years, I made an excel spreadsheet that you can see below. For the shoreline, I used KBDR (Stratford, CT) and for inland I used KBDL (Windsor Locks, CT). These statistics are from January 1st to October 8th of each year. You can see from the data below, the years are pretty similar when comparing "average temperature" and "average precipitation". But to me, one year really stood out. 1997 is almost a spitting image. For both the shoreline and inland, the average temperature is only .1°F off. Average precipitation for the shoreline was roughly 2 inches off, but compared to all the other years, it was certainly the closest. Check out the inland average precipitation, less than an inch off! Long term forecasts are extremely hard to predict. By using past data and comparing weather patterns, you can get a better idea of what the future may hold. Since these two years are very close in terms of weather statistics, it's safe to assume the weather patterns for the rest of the year may be close. I couldn't just stop there though.

Click this link to continue reading to the winter forecast or use the number bar below. (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/4/)

Data From Jan 1 to Oct 8 (Of Respective Years)

	Average Temp (F)		Average Precip (IN)	
Year	Shore	Inland	Shore	Inland
1957	54.6	52.6	22.29	20.85
1965	53.4	52.5	23.87	25.22
1972	53.6	51.7	55.84	48.94
1982	52.3	51.5	38.38	43.57
1997	54.2	52.6	29.7	29.7
2015	54.3	52.5	27.35	30.43

(https://lintvwxedge.files.wordpress.com/2015/10/data-winter.jpg)

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WXedge.com POWERED BY NEWS 8

2015-2016 Winter Predictions

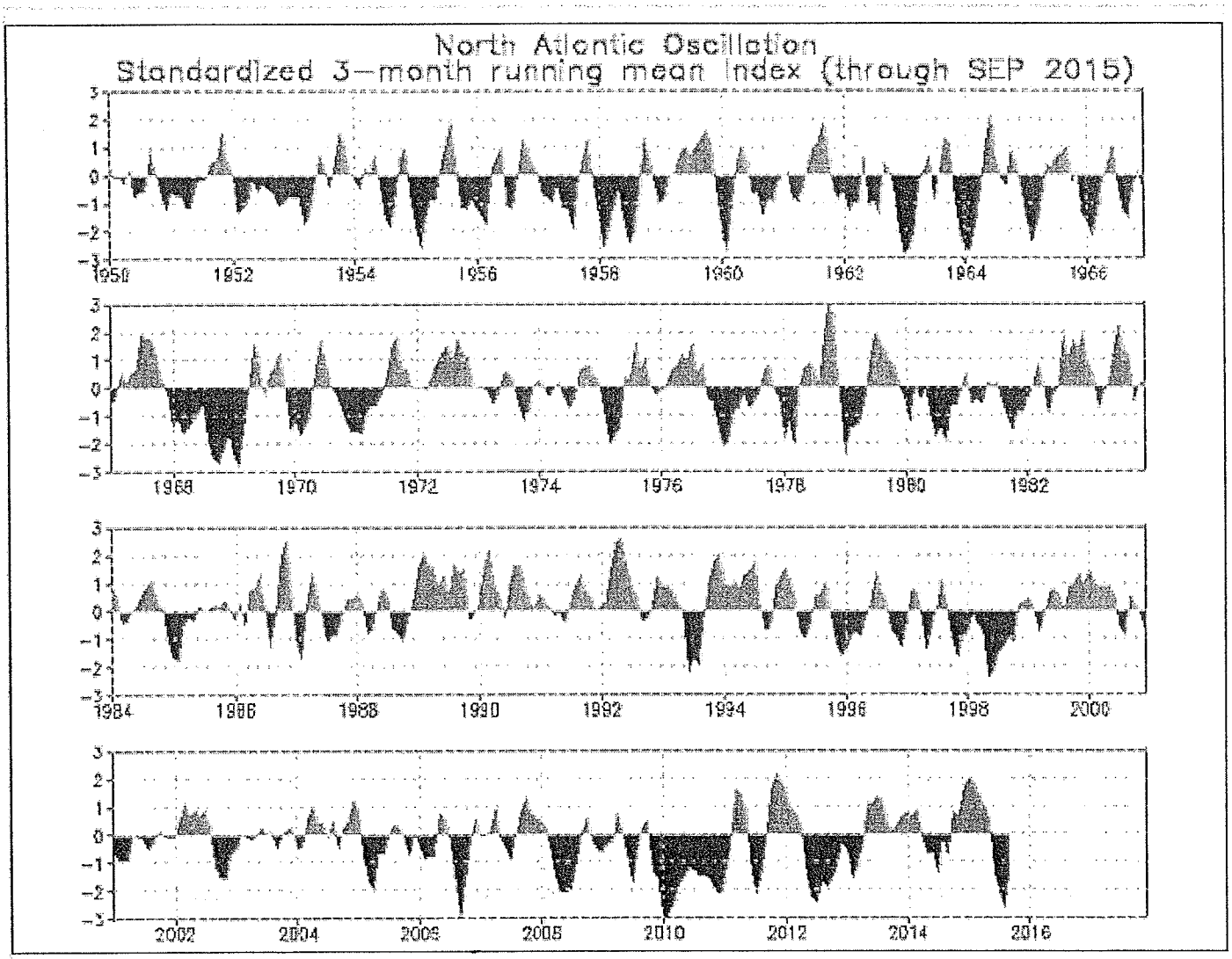
By Kevin Arnone (http://wxedge.com/author/kevinarnone-2/)
Published: October 9, 2015, 12:51 pm | Updated: October 9, 2015, 2:43 pm

Please friend me on Facebook (https://www.facebook.com/pages/Meteorologist-Kevin-Arnone/361085203906400?ref=hl&focus_composer=true&ref_type=bookmark) and Twitter (https://twitter.com/Kevin_Arnone)!

Atlantic Hurricane Season		
	1997	2015
Storms	8	10
Hurricanes	3	3
Major Hurricanes	1	2

Pacific Hurricane Season		
	1997	2015
Storms	19	21
Hurricanes	9	13
Major Hurricanes	7	8

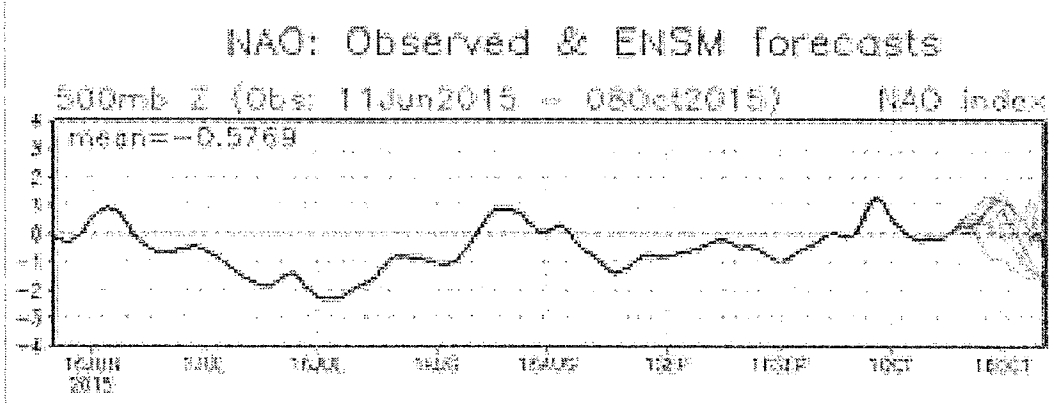
Just to double check that the two years were similar when comparing weather patterns, I wanted to compare the hurricane seasons (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) in both the Pacific and Atlantic (Table above). As we can see from the spreadsheet above, both years were very similar. Both years had an above average year for hurricanes (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) in the Pacific. This makes sense due to very warm ocean temperatures. However, in the Atlantic, it was the other end of the spectrum. Both the 1997 and 2015 season were below average. To make things a little crazier, would you believe in 1997, the hurricane (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) list in the Atlantic had the same names on it as we do this year? WEIRD...



(https://lintvwxedge.files.wordpress.com/2015/10/nao-timeseries.gif)

Past NAO Data

I wanted to now compare the NAO, what's the NAO you ask. It stands for "North Atlantic Oscillation". It's another great way to understand weather patterns. Mostly used in the winter time, it's a great way to recognize where the difference in atmospheric pressure at sea-level may be and how storm systems may travel. Usually during times of negative NAO, storms are more common for us here in New England. Typically, it will mean a dip in the Jet-stream, which will likely bring cooler temperature and maybe more snow our way. I wanted to compare the NAO from 2015 to 1997 (Picture above). If we look at 2015, you can see the NAO was positive for much of the summer (http://wxedge.com/2015/03/31/springsummer-forecast/). Until recently, much of the year has been positive. Although the NAO is negative now, there are some indications of the NAO going positive as we head into the end of the year, this would indicate a less active winter (Picture below). If we compare this to 1997, it's surely the same trend, however the strength of the intensities were not as significant. Now let's talk snow. Click this link to continue reading to the winter forecast or use the number bar below. (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/5/)



(https://lintvwxedge.files.wordpress.com/2015/10/nao_fcst.gif)

NAO Forecast

More stories (http://wxedge.com/author/kevinarnone-2/) by Kevin Arnone

Pages: 1 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/) 2 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/2/) 3 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/3/) 4 5 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/5/)

(https://lintvwxedge.files.wordpress.com/2015/10/shutterstock_35362090.jpg)Now it's time to talk snow. How much snow will you get during the 2015-2016 Winter? Well, let's first look at how much snow we recorded during the 1997-1998 season. I once again used KBDR (Stratford, CT) for the shoreline. Unfortunately, during the late 90s there was no snow observer for KBDL (Windsor Locks, CT), the closest station I found that had an observer was KBOS (Logan Airport in Boston).

1997-1998 Winter for the shoreline recorded 8.9". Well below the normal of 28.7" is normal.

1997-1998 Winter for inland recorded 25.6". Once again well below the normal. 43.8" is normal. (Keep in mind this is Boston)

Last year we saw around 55-60 inches across the state. And due to the blizzard on January 26th, eastern Connecticut saw much more snow.

We can see that the 1997-1998 winter seasons were below average when it came to snowfall. As a matter of fact, of the 5 years I picked out earlier in the article. Only one season was above average for the shoreline, and two were above average for inland towns.

Conclusion: Thanks for taking the time reading my article. I hope you got something out of it or maybe even learned something new about weather or forecasting. Well after several days of research and number crunching. I finally came up with a conclusion on what I think this upcoming winter season will be like. Listen, it's next to impossible for me to give you an exact amount of snow tailored to your location. As you know, ***sometimes*** it's hard to do that from storm to storm. However, from comparing not only the weather patterns but climate data, hurricane season (http://wxedge.com/2015/04/14/2015-hurricane-season-prediction/) and NAO as well. The current indications make me believe we are more likely to have a below average snowfall than above average. Average snowfall for the shoreline is (27.6") and inland is (40.6"). This might be the year of multiple inside runners that produce rain and ice rather than snow.

Typically during strong El Nino patterns the Northeast sees below average snowfall. Obviously I wouldn't base a forecast on just that one statement. But by comparing previous years, hurricane season (http://wxedge.com/2015/04/14/2015-hurricane-season-

prediction/), El Nino intensity, NAO and weather patterns I am more confident. The past 3 seasons have all been above average, but I'm thinking this year will be different. As always, thank you for reading. I really hope you enjoyed it.

Meteorologist Kevin Arnone

Thanks for reading! Please friend me on Facebook (https://www.facebook.com/pages/Meteorologist-Kevin-Arnone/361085203906400?ref=hl&focus_composer=true&ref_type=bookmark) and Twitter (https://twitter.com/Kevin_Arnone)!

More stories (http://wxedge.com/author/kevinarnone-2/) by Kevin Arnone

Pages: 1 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/) 2 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/2/) 3 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/3/) 4 (http://wxedge.com/2015/10/09/2015-2016-winter-predictions/4/) 5

Colchester Town Clerk's Office

Budget 2016-2017

Purpose

- Current and proposed staffing needs

Anticipated Expenses 2016/2017

		Projected	
	2015/2016	2016/2017	
Regular Payroll	107,782	114,262	Assistant will have certification and contractual raise which will increase her hourly pay. Increase of $6,480
Contr Temp Occasional	1,500	6,000	Floater Increase of $4,500
Employee Related Insurance	375	375	To be determined by payroll
FICA & Retirement	15,511	15,511	To be determined by payroll
Copier	4,200	3,700	Based on 1st 3 Months Decrease of $500
Office Supplies	1,500	1,500	No Increase
Technical Reference Materials	1,195	1,195	No Increase
Mileage, Training, Meetings	800	1,000	Price Increases. Increase of $200 Last year had scholarships
Professional Memberships	150	255	Price Increases. Increase of $105
Indexing & Recording	23,000	23,000	No Increase
Postage	2,100	1,800	Based on 1st 3 Months Decrease of $300
Legal Notices	3,000	3,000	No Increase
Printing & Publications	1,800	1,800	No Increase
Micro Filming	700	700	No Increase
Equipment Repairs	300	300	No Increase
Total	163,913	174,398	Increase of 10,485

Anticipated Revenue 2016/2017

	Budgeted	Projected	
	2015/2016	2016/2017	
Conveyance Tax	130,200	200,000	Based on 1st 3 months Increase of $69,800
Land Records	2,400	2,000	Based on 1st 3 months Decrease of $400
Copier Fees	15,800	17,400	Based on 1st 3 months Increase of $1,600
Town Clerk Fees	102,500	85,000	Based on 1st 3 months Decrease of $17,500
Sports Licenses	600	600	Based on Last Year
Dog Licenses	13,500	13,500	Based on Last Year
MERS	2,280	1,750	Based on 1st 3 months and 2015 actual Decrease of $530
Preservation Surcharge	1,949	1,800	Based on 1st 3 months and 2015 actual Decrease of $149
Total	269,229	322,050	Increase of $52,821

Possible Added Revenue 2016/2017

	Budgeted	Projected	
	2015/2016	2016/2017	
Notary Fee (Out of Town) $5	0	325	Based on 1st 3 months Increase of $325
Notary Fee (In Town) $2	0	2,000	Based on 1st 3 months Increase of $2000
Total	0	2,325	Increase of $2,325

What Do We Do?

Administer Oaths – All board and commission members, police, notary etc.

Assist with Record Look Ups – Attorneys, Real Estate Agents, Genealogists, citizens etc.

Boards & Commissions – Posting of agendas and minutes on Website and Board. Updating commission books, updating new members, resignations and member expiration dates, cancellations, meetings.

Copies – Land Records, Maps, Vitals, Certified copies, etc.

Dogs – Licensing, Rabies Clinic, sending reminders, Dog Warden assisting, reports to state.

Elections – Absentee applications and ballots, coordinating with State, ensuring proper statutes and guidelines are being met. creating Ballots, reporting.

Financials – Creating and sending reports in-house and the State agencies daily, monthly, quarterly, and yearly.

Grants – Applying, implementing and reporting.

Historic Records – Maintaining historic documents, preservation sorting, maintaining a proper environment.

Justice of the Peace – Keeping updated list and expirations, filing with the state of any change.

Lawsuits – Copies of all litigation against any town department or employee.

Legal Notices – Ensuring all statutes are met concerning legal notices on meetings, ordinance changes/additions, etc.

Notary Services – Notarizing documents, filing of notaries.

Ordinances- Notifying of changes, filing.

Permits – Burial, Cremation.

Record Preservation Preserving historic records for future use

Recording – Land Records, Trade Names, Maps, liquor permits, etc.

Records Disposition – Properly disposing of information according to state guidelines.

Sports Licenses – issuing and reporting.

Statutes – Implementing all statutes and changes on a daily basis.

Town Meetings – Coordinating town and special town meetings.

Various Phone Calls

Vital Records – Marriage, Birth, Death, DD214's, Adoptions, abstract vitals, Issuing, receiving, filing, reporting to State.

Voting – Updating voter books and indexes, receiving voter registrations to forward to registrars.

Current Staffing

40101 – Regular Payroll	$101,407
Town Clerk – Gayle Furman	$61,713
Assistant Town Clerk – Joanie Campbell	$39,694

40105 – Temporary Occasional	$1,500

41230 – FICA & Retirement	$15,511

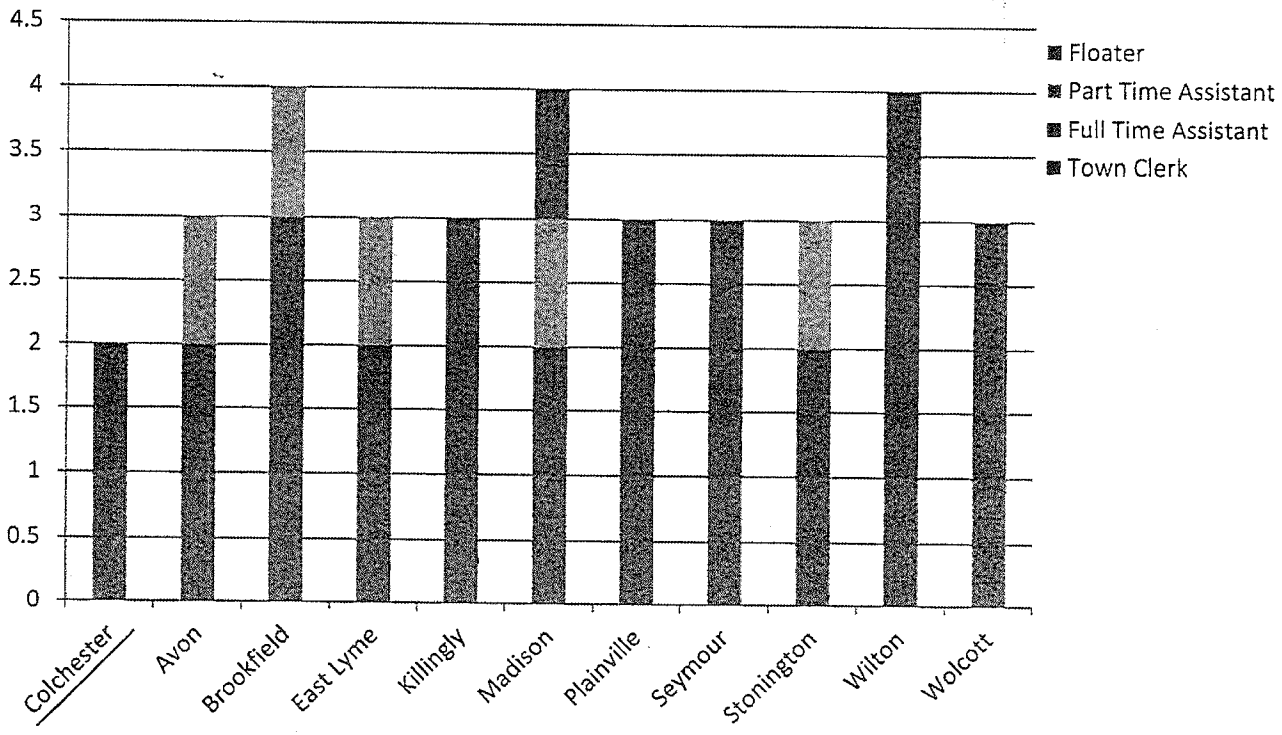
Current Issues

- Vacation coverage
- Busy times
- Sick time coverage
- Customer wait time/care
- Missed Department Head Meetings
- Lunch Coverage
- Multiple Customers/Phone
- No Time for organization or back filing

Town Comparisons

Town	Population	Hours of Operation
Colchester	16,187	42.5
Avon	18,283	40
Brookfield	17,783	42
East Lyme	18,892	40
Killingly	17,269	40
Madison	18,291	37.5
Plainville	17,819	36
Seymour	16,561	38
Stonington	18,556	37.5
Wilton	18,617	40
Wolcott	16,724	40

Source: 2014 Connecticut State Register and Manual



Proposed Solutions

Solution #1 Floater for 400 hours per year

Town Clerk Vacation (not including sick or personal) = 70 hours

Assistant Town Clerk (including vacation, sick, personal and floater day) = 182 hours

Professional Development = 100 hours

Total 352 hours

(or approx. 50 days as a one person office)

352 hours at $15.00/hour = $6,000

Subtract temporary occasional ($1,500)

Asking for $4,500

Solution #2 Town Hall Floater for 988 hours per year

(The Town Hall is open 247 days per year at 4 hours per day)

988 hours at $15.00/hour = $14,820

Subtract temporary occasional from various offices.

Discussion

- Questions

Honeywell

Americas M&V Services

Town of Colchester, CT

Energy Cost Avoidance Report

Year 1 Performance Period

July 2014 – June 2015

Helping customers manage energy resources to improve financial performance

Measurement & Verification Services

Honeywell is pleased to provide this comprehensive report of your energy consumption. This report was processed using an industry-standard program based on proven and accepted engineering formulas for energy conservation and analysis.

Service Contract Number:	40111409
Baseline Period:	July 2010 - June 2011
Guarantee Period:	July 2014 - June 2017
Guarantee Term:	3 Years
Report Preparation by:	Americas M&V Services Team Ryan Deane (M&V Specialist) Joel Bruedigam (Energy Analyst)
Report Creation Date:	September 30, 2015

Table of Contents

1.0 Overview

1.1 Executive Summary

This report documents the measurement and verification activities for the Town of Colchester, CT energy retrofit project for Year 1 of the performance phase (July 2014 – June 2015). It serves to reconcile the guaranteed savings against the measured savings, using methodology outlined in the contract.

The total guarantee term for this project is 3 years (with an option for up to 9 additional years), with the guaranteed savings schedule shown below:

Year	Energy	Operational	Total
1	$265,431	$19,847	$285,278
2	$270,739	$20,443	$291,182
3	$276,154	$21,056	$297,210
4 (Optional)	$281,677	$21,688	$303,365
5 (Optional)	$287,311	$22,338	$309,649
6 (Optional)	$293,057	$23,009	$316,066
7 (Optional)	$298,918	$23,699	$322,617
8 (Optional)	$304,896	$24,410	$329,306
9 (Optional)	$310,994	$25,142	$336,136
10 (Optional)	$317,214	$25,896	$343,110
11 (Optional)	$323,559	$26,673	$350,232
12 (Optional)	$330,030	$27,473	$357,503
Total	$3,559,980	$281,674	$3,841,654

Starting from 7/1/2015, Colchester CT will receive quarterly invoices for the annual agreement price of $31,321 for year 2, billed in advance.

Year 1 Results

Energy Cost Avoidance:	$ 354,189
Operational Savings:	$ 19,847
Total Cost Avoidance:	$ 374,036
Annual Guarantee:	$ 285,278
Excess/Shortfall:	$ 88,758
Percentage of Guarantee:	131%

Year 1 Results by M&V Option

Option A Cost Avoidance - Electrical:	$ 337,082
Option A Cost Avoidance - Water:	$ 21,345
Option A Cost Avoidance – Propane:	$ 1,742
Option A Cost Avoidance – Fuel Oil:	$ 3,135
Option C Cost Avoidance – Fuel Oil:	$ (13,247)
ECM Adjustments:	$ 0
Operational Savings:	$ 19,847
Total Cost Avoidance:	$ 374,036

Cumulative Results

TIME PERIOD		TOTAL COST AVOIDANCE	ANNUAL GUARANTEE	EXCESS/ SHORTFALL
Installation Period		$0	$0	$0
Year 1	07/14 - 6/15	$374,036	$285,278	$88,758
TOTAL		**$374,036**	**$285,278**	**$88,758**

Cumulative Emissions Impact

TIME PERIOD		CO_2 EQUIVALENT REDUCTION (tons)*
Year 1	07/14 - 06/15	1,263
TOTAL		**1,263**

** The CO_2 is calculated by using the EPA sponsored calculator found at http://www.epa.gov/cleanenergy/energy-resources/calculator.html.*

Escalated Baseline Energy, Water, and O&M Rates

The baseline energy rates are shown in the table below. These rates will be escalated by 2% annually to establish the baseline rate for each reporting year.

	Electric				Propane	Fuel Oil	Water/Sewer	
Location	On Peak $/kWh	Off Peak $/kWh	$/kW	$/kVA	$/Gallon	$/gallon	Water $/kGal	Sewer $/kGal
Bacon Academy	$ 0.144	$ 0.134		$ 10.529	$ 1.37	$ 2.377	$ 7.39	$ 6.93
Colchester Elementary	$ 0.139	$ 0.129		$ 12.282	$ 1.37	$ 2.328	$ 7.39	$ 6.93
Jack Jackter Intermediate	$ 0.136	$ 0.128		$ 9.879	$ 1.37	$ 2.236	$ 7.39	$ 6.93
Cragin Library	$ 0.271		$ 12.034			$ 2.236	$ 7.39	$ 6.93
Fire Dept Co #1	$ 0.271		$ 12.036		$ 1.37	$ 2.236	$ 7.39	$ 6.93
Fire Dept Co #2	$ 0.271		$ 11.975		$ 1.20	$ 2.236	$ 7.39	$ 6.93
Fleet Town Garage	$ 0.271		$ 12.034		$ 1.37	$ 2.236	$ 7.39	$ 6.93
Fleet Wash Bay	$ 0.271					$ 2.236	$ 7.39	$ 6.93
P&R Maint. Garage/Concession	$ 0.271		$ 12.034		$ 1.37		$ 7.39	$ 6.93
P&R Sports Lights	$ 0.341						$ 7.39	$ 6.93
Town Hall	$ 0.252		$ 11.843			$ 2.236	$ 7.39	$ 6.93
Town Hall Parking Lights	$ 0.252						$ 7.39	$ 6.93
Youth Center	$ 0.248		$ 12.202			$ 2.236	$ 7.39	$ 6.93
Water Dept. - Cabin Road	$ 0.248				$ 1.37		$ 7.39	$ 6.93
Water Dept. - Taintor Hill	$ 0.252		$ 14.287		$ 1.37		$ 7.39	$ 6.93
Street Lighting	$ 0.161							

Current Energy, Water, and O&M Rates

The current energy rates are shown in the table below.

	Electric				Propane	Fuel Oil	Water/Sewer
Location	On Peak $/kWh	Off Peak $/kWh	$/kW	$/kVA	$/Gallon	$/gallon	$/kGal
Bacon Academy	$0.106	$0.097		$13.040	$1.17	$3.014	$20.80
Colchester Elementary	$0.106	$0.097		$13.040	$1.17	$3.014	$20.80
Jack Jackter Intermediate	$0.106	$0.097		$13.040	$1.17	$3.014	$20.80
Cragin Library	$0.122		$11.960			$3.077	$20.80
Fire Dept Co #1	$0.122		$11.960		$1.17	$3.077	$20.80
Fire Dept Co #2	$0.122		$11.960		$1.17	$3.077	$20.80
Fleet Town Garage	$0.122		$11.960		$1.17	$3.077	$20.80
Fleet Wash Bay	$0.122					$3.077	$20.80
P&R Maint. Garage/Concession	$0.122		$11.960		$1.17		$20.80
P&R Sports Lights	$0.203						$20.80
Town Hall	$0.111		$12.930			$3.077	$20.80
Town Hall Parking Lights	$0.111						$20.80
Youth Center	$0.107		$11.960			$3.077	$20.80
Water Dept. - Cabin Road	$0.107				$1.17		$20.80
Water Dept. - Taintor Hill	$0.107		$12.930		$1.17		$20.80
Street Lighting	$0.148						

Selected Energy, Water, and O&M Rates

The selected energy rates are shown in the table below. During each performance phase the escalated baseline rates will be compared to the current rates and the rates which result in the greatest energy cost avoidance will be selected to calculate the cost avoidance of the ECMs installed in accordance with the contract.

	Electric				Propane	Fuel Oil	Water/Sewer
Location	On Peak $/kWh	Off Peak $/kWh	$/kW	$/kVA	$/Gallon	$/gallon	$/kGal
Bacon Academy	$ 0.144	$ 0.134		$ 10.529	$ 1.37	$3.014	$20.80
Colchester Elementary	$ 0.139	$ 0.129		$ 12.282	$ 1.37	$3.014	$20.80
Jack Jackter Intermediate	$ 0.136	$ 0.128		$ 9.879	$ 1.37	$3.014	$20.80
Cragin Library	$ 0.271		$ 12.034			$3.077	$20.80
Fire Dept Co #1	$ 0.271		$ 12.036		$ 1.37	$3.077	$20.80
Fire Dept Co #2	$ 0.271		$ 11.975		$ 1.20	$3.077	$20.80
Fleet Town Garage	$ 0.271		$ 12.034		$ 1.37	$3.077	$20.80
Fleet Wash Bay	$ 0.271					$3.077	$20.80
P&R Maint. Garage/Concession	$ 0.271		$ 12.034		$ 1.37		$20.80
P&R Sports Lights	$ 0.341						$20.80
Town Hall	$ 0.252		$ 11.843			$3.077	$20.80
Town Hall Parking Lights	$ 0.252						$20.80
Youth Center	$ 0.248		$ 12.202			$3.077	$20.80
Water Dept. - Cabin Road	$ 0.248				$ 1.37		$20.80
Water Dept. - Taintor Hill	$ 0.252		$ 14.287		$ 1.37		$20.80
Street Lighting	$ 0.161						

1.2 M&V Activities

As part of the ongoing M&V activities for Performance Year 1, a site visit was conducted on June 12th 2015. The purpose of the site visit is to verify the status of the energy conservation measures (ECMs) installed for the Town of Colchester and their ability to perform.

Overall, the ECMs were found to be in a condition to maintain the potential to meet the performance guarantee. The site visit results can be found in ***Appendix 5.1: M&V Site Visit.***

2.0 Summary

2.1 Energy Conservation Measures Overview

Energy Conservation Measures by Location

	Lighting & Lighting Controls	Water Conservation	Building Envelope	Control System Upgrades	Mechanical Improvements	Kitchen Hood Controls	Electrical Infrastructure Improvements	Automated Dialers
Bacon Academy	X	X	X	X	X		X	X
Town Hall	X	X	X	X				X
Colchester Elementary	X	X	X	X			X	X
Craigin Memorial Library	X	X	X	X	X			X
Fire Dept. Company #1	X	X	X	X				X
Fire Dept. Company #2	X	X	X					X
Fleet Town Garage	X	X	X		X			X
Fleet Wash Bay	X		X					
Jack Jackter Intermediate	X	X	X	X	X	X	X	X
P&R Maintenance Garage	X		X					
Water Dept - Cabin Road	X		X					
Water Dept - Taintor Hill WTP	X		X	X			X	
Youth Center	X							X

2.2 M&V Methodology

Energy conservation measures (ECM) include the installation of equipment or systems for the purpose of reducing energy use and/or costs. The cost of ECM implementation is recovered through the savings created by the ECM. The Federal Energy Management Program (F.E.M.P) of the U.S. Department of Energy and its Measurement and Verification Guidelines for Federal Energy Projects classify measurement and verification approaches as Options A, B, C, and D. The F.E.M.P. Guideline is based on the International Performance Measurement and Verification Protocol (I.P.M.V.P.).

This project uses Option A and C methodologies, outlined below:

Option A - Retrofit Isolation (Key Parameter Measurement): Determine savings by field measurement of key performance parameter(s) critical to the ECM performance. Measurement frequency ranges from short-term to continuous. Parameters not selected for field measurement are estimated using historic data, manufacturer specifications, or engineering judgment, supported by documentation. Savings are calculated using engineering calculation of baseline and reporting period energy from the key operating parameter(s) measurements and estimated values.

Option C - Whole Facility: Determine savings by measuring energy use at the whole facility or sub-facility level. Continuous measurements of the entire facility's energy use are taken throughout the reporting period to identify the effects of the energy project. Energy use before and after the retrofit project is compared to determine savings.

List of Covered Facilities and ECMs by M&V Methodology

Location	ECMs	M&V Methodology
Bacon Academy	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Control System Upgrades • Mechanical Improvements • Electrical Infrastructure Improvements	Electric: Option A Fuel: Option C
Bacon Academy	• Water Conservation	Water: Option A Fuel: Option C
Bacon Academy	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope • Control System Upgrades • Mechanical Improvements • Electrical Infrastructure Improvements	Fuel: Option C

Summary –M&V Methodology

Location	ECMs	M&V Methodology
Town Hall	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Control System Upgrades • Mechanical Improvements	Electric: Option A Fuel: Option C
Town Hall	• Water Conservation	Water: Option A Fuel: Option C
Town Hall	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope • Control System Upgrades • Electrical Infrastructure Improvements	Fuel: Option C
Colchester Elementary	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Control System Upgrades • Electrical Infrastructure Improvements	Electric: Option A
Colchester Elementary	• Water Conservation	Water: Option A
Colchester Elementary	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope	Fuel: Option A
Craigin Memorial Library	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Control System Upgrades • Mechanical Improvements	Electric: Option A
Craigin Memorial Library	• Water Conservation	Water: Option A
Craigin Memorial Library	• Lighting Retrofit and Occupancy Sensors • Water Conservation	Fuel: Option A
Fire Dept. Company #1	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Control System Upgrades	Electric: Option A
Fire Dept. Company #1	• Water Conservation	Water: Option A
Fire Dept. Company #1	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope	Fuel: Option A
Fire Dept. Company #2	• Lighting Retrofit and Occupancy Sensors • Building Envelope	Electric: Option A
Fire Dept. Company #2	• Water Conservation	Water: Option A

Summary –M&V Methodology

Location	ECMs	M&V Methodology
Fire Dept. Company #2	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope	Fuel: Option A
Fleet Town Garage	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Mechanical Improvements	Electric: Option A
Fleet Town Garage	• Water Conservation	Water: Option A
Fleet Town Garage	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Mechanical Improvements	Fuel: Option A
Fleet Wash Bay	• Lighting Retrofit and Occupancy Sensors	Electric: Option A
Fleet Wash Bay	• Lighting Retrofit and Occupancy Sensors • Building Envelope	Fuel: Option A
Jack Jackter Intermediate	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Mechanical Improvements • Kitchen Hood Controls • Electrical Infrastructure Improvements	Electric: Option A
Jack Jackter Intermediate	• Water Conservation	Water: Option A
Jack Jackter Intermediate	• Lighting Retrofit and Occupancy Sensors • Water Conservation • Building Envelope • Kitchen Hood Controls	Fuel: Option A
P&R Maintenance Garage	• Lighting Retrofit and Occupancy Sensors • Building Envelope	Electric: Option A
P&R Maintenance Garage	• Lighting Retrofit and Occupancy Sensors • Building Envelope	Fuel: Option A
Water Dept - Cabin Road	• Lighting Retrofit and Occupancy Sensors	Electric: Option A
Water Dept - Cabin Road	• Lighting Retrofit and Occupancy Sensors • Building Envelope	Fuel: Option A
Water Dept – Taintor Hill	• Lighting Retrofit and Occupancy Sensors • Electrical Infrastructure Improvements	Electric: Option A
Water Dept – Taintor Hill	• Lighting Retrofit and Occupancy Sensors • Building Envelope • Electrical Infrastructure Improvements	Fuel: Option A
Youth Center	• Lighting Retrofit and Occupancy Sensors	Electric: Option A
Youth Center	• Lighting Retrofit and Occupancy Sensors	Fuel: Option A

The following table outlines the Measurement and Verification Plan conducted by Honeywell to verify proper installation and operations of the installed Energy Conservation Measures. This table varies slightly from what is in the contract but is in accordance with what was agreed upon by Gary McAvoy: Honeywell, Ken Jackson, Jim Paggioli: Town of Colchester, & Tom Coughlin: Celtic Energy.

Measurement and Verification Plan

ECM	Baseline M&V	Post-Retrofit M&V	Annual M&V
ECM 1 - Lighting Retrofit Bacon Academy Town Hall Colchester Elementary Cragin Memorial Library Fire Dept. Company #1 Fire Dept. Company #2 Fleet Town Garage Fleet Wash Bay Jack Jackter Intermediate P&R Maintenance Garage Water Dept – Cabin Road Water Dept – Taintor Hill WTP Youth Center	**Option A - Electric & Fuel**: Statistical measurement of post-retrofit fixture wattage on a random 80% confidence 20% precision statistical sample of each fixture type.	**Option A - Electric & Fuel**: Confirm fixture count. Statistical confirmation of function of controls and measurement of post-retrofit fixture wattage on a random 80% confidence 20% precision statistical sample of each fixture type. Fuel use based on engineering calcs. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Electric & Fuel**: On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.
ECM 2 – Water Conservation Bacon Academy Town Hall Colchester Elementary Cragin Memorial Library Fire Dept. Company #1 Fire Dept. Company #2 Fleet Town Garage Jack Jackter Intermediate	**Option A – Water & Fuel:** Statistical measurement of post retrofit flow rates for each fixture type based on a 90% confidence/10% precision statistical sample.	**Option A – Water & Fuel:** Confirm fixture count. Statistical confirmation of function and measurement of post retrofit flow rates for each fixture type based on a 90% confidence/10% precision statistical sample. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Water & Fuel**: On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.
ECM 3 – Building Envelope Bacon Academy Town Hall Colchester Elementary Cragin Memorial Library Fire Dept. Company #1 Fire Dept. Company #2 Fleet Town Garage Fleet Wash Bay Jack Jackter Intermediate P&R Maintenance Garage Water Dept – Cabin Road Water Dept – Taintor Hill WTP	N/A	**Option A - Electric & Fuel:** Confirm installation of barrier materials and quantities per Scope of Work. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Fuel**: On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.

ECM	Baseline M&V	Post-Retrofit M&V	Annual M&V
ECM 4 – Control System Upgrades Bacon Academy Town Hall Colchester Elementary Cragin Memorial Library Fire Dept. Company #1 Jack Jackter Intermediate Water Dept – Taintor Hill WTP	N/A	**Option A – Electric & Fuel:** Confirm schedules, setpoints, and damper positions in relation to CO2 setpoints and levels (ppm) through short-term trending for sample set of air handling units and spaces. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Electric & Fuel:** On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.
ECM 5 – Mechanical Improvements Bacon Academy Cragin Memorial Library Fleet Town Garage Jack Jackter Intermediate	N/A	**Option A - Electric & Fuel:** Visual confirmation of installed propane-fired hot water heater. Confirm data specifications per scope of work. Verify temperature setting of DHW. Confirm supply / return fan hours of operation and electric output for AHU 17 at Jack Jackter through short-term trending with VFD in operation. Confirm Air-balancing of RTU 3 at Cragin Library to adjust amount of air supplied. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Electric & Fuel:** On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.

ECM	Baseline M&V	Post-Retrofit M&V	Annual M&V
ECM 7 – Kitchen Hood Controls Jack Jackter Intermediate	N/A	**Option A - Electric & Fuel:** Confirmation of installation and proper sequence of operation.	**Option A - Electric & Fuel:** On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.
ECM 8 – Electrical Infrastructure Improvements Bacon Academy Colchester Elementary Jack Jackter Intermediate Water Dept – Taintor Hill WTP	**Option A - Electric & Fuel:** Pre retrofit transformer efficiency measurements. Fuel use based on engineering calcs.	**Option A - Electric & Fuel:** Post retrofit transformer efficiency measurements on the same units measured before the retrofit. Fuel use based on engineering calcs. **Option C - Fuel:** Whole building fuel use analysis including annual adjustment of weather component in heating degree days	**Option A - Electric:** On-site verification of ECM by observation. Review utility unit cost data. **Option C - Fuel:** On-site verification of ECM by observation. Review utility unit cost data, identify and quantity baseline adjustments for current period based on sampled data. Annual utility data collection and analysis. Annual performance reporting.
ECM 9 – Automated Dialers Bacon Academy Town Hall Colchester Elementary Cragin Memorial Library Fire Dept. Company #1 Fire Dept. Company #2 Fleet Town Garage Jack Jackter Intermediate Youth Center	N/A	N/A	N/A

2.3 Reconciliation of Guaranteed Savings

Guaranteed Savings will be determined in accordance with the methodology(s), operating parameters, formulas, and constants described below and/or defined in Attachment G of the Contract.

Option A

For reconciliation of Guarantee Savings employing the Option A method consistent with I.P.M.V.P and/or F.E.M.P., for each ECM, Honeywell will employ an M&V plan which may be comprised of any or all of the following elements:

- Pre-retrofit model of energy consumption or demand
- Post-retrofit measured energy consumption
- Post-retrofit measured demand and time-of-use
- Post-retrofit energy and demand charges
- Sampling plan
- Stipulated Values

The value of the energy savings will be derived from the measured data and engineering formulae included in the Contract and the applicable energy charges as defined in the Contract. In some cases, energy usage and/or demand will be calculated from measured variables that directly relate to energy consumption, demand or cost, such as, but not limited to, measured flow, temperature, current, voltage, enthalpy, or pressure.

Option C

For reconciliation of Guarantee Savings employing the method of utility bill analysis consistent with F.E.M.P. Option C (Fuel Oil savings at Bacon Academy and Town Hall):

Energy usage for the Facilities for such Guarantee Year will be summarized and compared with the adjusted Baseline Period usage for the Facilities through the use of energy accounting software (Metrix).

Option C meters tracked in Metrix are tuned against weather (heating degree days in this project) to calculate a baseline regression model equation showing the effect of Heating Degree Days and number of Billing Days on the expected usage (natural gas or fuel oil). The number of heating degree days (HDD) and billing days for each individual billing period is used to calculate the expected usage based on those HDD and billing period to create the adjusted baseline.

The difference between the Adjusted Baseline Period energy usage and the Guarantee Year energy usage will be the Energy Avoidance. The difference between the Adjusted Baseline Period energy usage multiplied by the applicable energy rate as defined in the Contract, and the Guarantee Year energy usage multiplied by the applicable energy rate, as defined in the Contract, will be used to calculate the Energy Cost Avoidance. Energy cost avoidance may also include, but are not limited to, savings from demand charges, power factor correction, taxes, ratchet charges, rate changes and other utility tariff changes that are reduced as a result of the Honeywell involvement. An energy Baseline was specified in Attachment G of the Contract for the purpose of utility bill analysis. Adjustments will be derived from baseline variables

Baseline Variables

There are variables affecting consumption which warrant adjustment to the baseline, including billing days, weather, cost, runtime and other miscellaneous adjustments. The contract allows the adjustment of the following variables:

Billing Days Adjustment - Typically utility companies do not bill for the same number of days each month. An adjustment is made when the number of days in a pre-installation billing period does not equal the number of days in the corresponding post-installation billing period.

Weather Adjustment - Energy consumption is often weather-related. A regression analysis is performed to identify the relationship between historic meter performance and weather, denoted by heating or cooling degree-day variables. The analysis results in a regression model utilized in calculating the baseline, adjusted for the weather difference between the pre- and post-installation period.

Cost Adjustment - Utility company rate schedules are generally used to calculate the cost of energy consumption. These rates may change frequently. The applicable utility rate schedule as determined by the performance contract is used for cost calculation in the current review period. This schedule achieves an accurate comparison of the pre- and post-installation period cost of energy.

Runtime Adjustment - A building's hours of operation (runtime) typically vary and will affect usage. Set hours of operation are agreed upon on a building-by-building basis and documented in the contract. Review period runtime is tracked on a monthly basis and compared to the agreed upon operating hours. Adjustments can be made in the event actual hours of operation exceed agreed upon hours.

Miscellaneous Adjustments - A change in consumption will occur if the square footage or occupancy levels of the facility change or if the facility adds, deletes, or changes equipment that affects building load. Savings lost or gained by the change can be calculated by standard engineering formulas.

3.0 Cost Avoidance Calculations

3.1 Cost Avoidance Calculations

3.1.1 Option A Avoidance

Option A was selected to calculate electrical and fuel energy avoidance for all ECMs, except for fuel energy at Bacon Academy and Town Hall. The actual performance is based on verification of an accurate baseline, equipment installation/type and operational guidelines, engineering calculations, and/or customer sign-off. Honeywell provides this one-time determination of the quantity of energy avoidance for the first year of the guarantee only. After the ECMs potential-to-save has been verified, Honeywell stipulates the quantity of cost avoidance or determines the cost avoidance from engineering calculations and measurements of specific variables.

The cost avoidance calculations are summarized by ECM, with the actual calculations provided in the Appendix.

The calculation of energy cost avoidance is based upon the utility rate paid during the Guarantee Year, the Baseline Period utility rate, or whichever provides higher cost avoidance.

3.1.1.1 ECM 1 – Lighting Retrofit and Occupancy Sensors

Honeywell has implemented the lighting retrofit project in accordance with an in-depth lighting audit, as detailed in the line by line scope (Contract Appendix C). The following facilities were included:

- Bacon Academy
- Town Hall
- Colchester Elementary
- Cragin Memorial Library
- Fire Dept. Company #1
- Fire Dept. Company #2
- Fleet Town Garage
- Fleet Wash Bay
- Jack Jackter Intermediate
- P&R Maintenance Garage
- Water Dept – Cabin Road
- Water Dept – Taintor Hill WTP
- Youth Center

Measurement and Verification of this ECM uses Option A methodology for Electric (with stipulated burn hours) and Fuel, except for Fuel for Bacon Academy and Town Hall (Option C). A post-retrofit as-built audit was conducted and used to calculate the verified savings for the Option A savings for this ECM. Utility bill data is used to calculate the Option C savings at Bacon Academy and Town Hall during the performance phase.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. As-builts, measurements and calculations for this ECM can be found in ***Appendix 5.2: Lighting As-Builts, Measurements & Calculations.***

Lighting Retrofit and Occupancy Sensors Year 1 Verified Savings

Building	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Water savings (gallons/yr)	Total energy and water cost savings, Year 1 ($/yr)
Bacon Academy	280,260	74	*	0	$41,241
Colchester Elementary	151,342	46	-97	0	$19,644
Jack Jackter Intermediate	117,038	37	-68	0	$30,310
Cragin Library	27,820	7	-18	0	$7,252
Fire Dept Co #1	57,358	9	-30	0	$15,032
Fire Dept Co #2	7,987	2	-3	0	$2,120
Fleet Town Garage	9,084	2	-4	0	$2,421
Fleet Wash Bay	2,671	1	-2	0	$694
P&R Maint. Garage/Concession	6,143	1	-2	0	$1,647
Town Hall	52,883	18	*	0	$13,549
Youth Center	4,609	1	-1	0	$741
Water Dept. - Cabin Road	1,826	1	-1	0	$442
Water Dept. - Taintor Hill	14,232	2	-4	0	$3,558
Total savings	**733,251**	**200**	**(229)**	**0**	**$138,651**

**** The fuel savings for Bacon Academy and Town Hall are verified using Option C methodology.***

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. The supporting documentation for these measurements can be found in ***Appendix 5.2: Lighting As-Builts, Measurements & Calculations.***

Lighting Retrofit and Occupancy Sensors Pre/Post M&V Summary

Fixture	Pre kW	Post kW	Sample Size	STDEV	CV
2' 2 Lamp U T8	63.51		63	0.2169	0.0034
4' 2 Lamp T8	63.91		98	0.6874	0.0070
4' 3 Lamp T8	92.79		140	2.1564	0.0154
2' 3 Lamp NP		49.38	63	0.1213	0.0019
4' 2 Lamp LP		50.34	49	3.7043	0.0756
4' 2 Lamp NP		52.26	89	3.2307	0.0363

3.1.1.2 ECM 2 - Water Conservation

Honeywell has implemented the water conservation project at the following facilities:

- Bacon Academy
- Town Hall
- Colchester Elementary
- Cragin Memorial Library
- Fire Dept. Company #1
- Fire Dept. Company #2
- Fleet Town Garage
- Jack Jackter Intermediate

Measurement and Verification of this ECM uses Option A methodology for Water (with stipulated uses per day rates) and Fuel, except for Fuel for Bacon Academy and Town Hall (Option C). A post-retrofit as-built audit was conducted and used to calculate the verified savings for the Option A savings for this ECM. Utility bill data will be used to calculate the Option C savings at Bacon Academy and Town Hall during the performance phase.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. As-builts, measurements and calculations for this ECM can be found in ***Appendix 5.3: Water Conservation As-Builts, Measurements & Calculations.***

Water Conservation Year 1 Verified Savings

Building	Total energy savings (MMBtu/yr)	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Water savings (gallons/yr)	Total energy and water cost savings, Year 1 ($/yr)
Bacon Academy	0	0	0	*	295,967	$6,156
Colchester Elementary	36	0	0	36	212,995	$5,152
Jack Jackter Intermediate	34	0	0	34	229,379	$5,463
Cragin Library	1	0	0	1	3,724	$98
Fire Dept Co #1	14	0	0	14	75,863	$1,865
Fire Dept Co #2	14	0	0	14	54,273	$1,415
Fleet Town Garage	0	0	0	0	5,876	$128
Town Hall	0	0	0	*	148,104	$3,081
Total savings	**99**	**0**	**0**	**99**	**1,026,182**	**$23,357**

** The fuel savings for Bacon Academy and Town Hall are verified using Option C methodology.*

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. The supporting documentation for these measurements can be found in ***Appendix 5.3: Water Conservation As-Builts, Measurements & Calculations.***

Water Conservation Pre/Post M&V Summary

Fixture	Pre Gal/flush or Gal/Min	Post Gal/flush or Gal/Min	Sample Size	STDEV	CV
# CL FM VC 4" LG 2.2 AE NA NA NA NA NA	2		13	N/A	N/A
# CL FM VC 8" LG 2.2 AE NA NA NA NA NA	2.25		24	0.353553	0.014731
# CO FM VC 4" LG .5 AE NA NA NA NA NA	2		17	N/A	N/A
# CO FM VC 4" LG 1.5 AE NA NA BATT ONK SL	2		9	N/A	N/A
# CO FM VC 4" LG 2 AE MTR NA NA NA NA	2		13	N/A	N/A
# CO FM VC 4" LG 2 AE NA NA NA NA NA	2.2		64	0	0
# CO FM VC 4" LG 2.2 AE NA NA NA NA NA	2.26		27	0.134164	0.004969
# CO FM VC 4" SM 2.5 AE MTR NA NA NA NA	2		12	N/A	N/A
# FV FADA AMST VC ELO OP TS 3.5 3.5 DI SL EX 2" 9" NA NA NA ATT 3.5 0 FLAP 12" LH 3/8" 9" NA NA	3.5		4	0	0
# LAB FM VC 4" TS 2.2 AE NA NA NA NA NA	3.5		19	N/A	N/A
# TT FM AMST VC ELO OP TS 3.5 0 DI SL EX 2" 9" NA NA NA ATT 3.5 3.5 FLAP 12" LH 3/8" 9" NA NA	3.75		9	0.353553	0.039284
# WH VC AMST WD	1		3	N/A	N/A
# WH VC AMST WD 9" .75 1 1 DI SL EX 2" NA NA NA NA 0 0 0	1.228571		48	0.155073	0.003231
Mansfield 147-122CTR		1.6	9	0	0
Neoperl 0.5		0.55	180	0.158114	0.000878
Neoperl 1.0		1	181	0	0
TMU1LN12#CP		0.4625	54	0.051755	0.000958
Toto CT705ELN TMT1LN32#CP		1.3	4	0	0

3.1.1.3 ECM 3 – Building Envelope

Honeywell has implemented building envelope retrofits in accordance with the audit. The following facilities were included:

- Bacon Academy
- Town Hall
- Colchester Elementary
- Cragin Memorial Library
- Fire Dept. Company #1
- Fire Dept. Company #2
- Fleet Town Garage
- Fleet Wash Bay
- Jack Jackter Intermediate
- P&R Maintenance Garage
- Water Dept – Cabin Road
- Water Dept – Taintor Hill WTP

Measurement and Verification of this ECM uses Option A methodology for Electric and Fuel, except for Fuel for Bacon Academy and Town Hall (Option C). A post-retrofit as-built audit was conducted and used to calculate the verified savings for the Option A savings for this ECM. Utility bill data will be used to calculate the Option C savings at Bacon Academy and Town Hall during the performance phase.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. As-builts and calculations for this ECM can be found in ***Appendix 5.4: Building Envelope As-Builts & Calculations.***

Building Envelope Year 1 Verified Savings

Building	Total energy savings (MMBtu/yr)	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Total energy cost savings, Year 1 ($/yr)
Bacon Academy	683	32,768	0	*	$4,731
Colchester Elementary	61	0	0	61	$1,231
Jack Jackter Intermediate	245	12,300	0	203	$7,499
Cragin Library	121	5,905	0	101	$3,676
Fire Dept Co #1	124	3,288	0	113	$3,204
Fire Dept Co #2	39	2,154	0	32	$1,233
Fleet Town Garage	70	2,098	0	62	$1,510
Fleet Wash Bay	4	0	0	4	$60
P&R Maint. Garage/Concession	30	680	0	28	$600
Town Hall	111	7,040	0	*	$1,775
Water Dept. - Cabin Road	26	0	0	26	$390
Water Dept. - Taintor Hill	6	0	0	6	$95
Total savings	**1,520**	**66,235**	**0**	**636**	**$26,004**

**** The fuel savings for Bacon Academy and Town Hall are verified using Option C methodology.***

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. The supporting documentation for this data can be found in ***Appendix 5.4: Building Envelope As-Builts & Calculations.***

Building Envelope Pre/Post M&V Summary

Building	Proposed Crack Length to Seal (sq. ft)	Add/Delete	Verified Crack Length Sealed (sq. ft)
Bacon Academy	40.68	3.05	37.63
Colchester Elementary	4.92	-0.37	5.29
Jack Jackter Intermediate	18.97	1.43	17.54
Cragin Library	6.42		6.42
Fire Dept Co #1	5.03	-2.12	7.15
Fire Dept Co #2	2.41		2.41
Fleet Town Garage	5.7		5.7
Fleet Wash Bay	0.77		0.77
P&R Maint. Garage/Concession	2.3		2.3
Town Hall	5.01		5.01
Water Dept. - Cabin Road	4.98		4.98
Water Dept. - Taintor Hill	0.57		0.57

3.1.1.4 ECM 4 – Control Systems Upgrades

Honeywell has implemented the control system upgrades at the following facilities:

- Bacon Academy
- Town Hall
- Colchester Elementary
- Cragin Memorial Library
- Fire Dept. Company #1
- Jack Jackter Intermediate
- Water Dept – Taintor Hill WTP

Measurement and Verification of this ECM uses Option A methodology for Electric and Fuel (Fuel Oil), except for Fuel for Bacon Academy and Town Hall (Option C). An audit of the setpoints and schedules of the equipment was used to calculate Option A savings. Utility bill data will be used to calculate the Option C savings at Bacon Academy and Town Hall.

In order to achieve savings during the performance phase please insure that all occupied and unoccupied temperature setpoints and occupancy hours are set in accordance with the operating parameters shown in ***Appendix 5.9: Standards of Comfort: Guarantee Period.*** There are no adjustments required for this performance year. However, future adjustments for facilities where setpoints and/or occupancy hours are found to not be in accordance with these standards will be found in ***Section 4.0: Adjustments.***

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. Some sites received control systems upgrades that were only a facility improvement and have no energy savings attached. Trends and calculations for this ECM can be found in ***Appendix 5.5: Control System Trends, Schedules & Calculations.***

Control Systems Upgrades Year 1 Verified Savings

Building	Total energy savings (MMBtu/yr)	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Total energycost savings, Year 1 ($/yr)
Bacon Academy	127	37,157	0	*	$5,365
Colchester Elementary	0	0	0	0	$0
Jack Jackter Intermediate	0	0	0	0	$0
Cragin Library	0	0	0	0	$0
Fire Dept Co #1	0	0	0	0	$0
Town Hall	151	44,310	0	*	$11,170
Water Dept. - Taintor Hill	0	0	0	0	$0
Total savings	**278**	**81,467**	**0**	**0**	**$16,535**

**** The fuel savings for Bacon Academy and Town Hall are verified using Option C methodology.***

An inspection was performed by the M&V Specialist that confirmed that the occupancy schedules and setpoints were implemented in accordance with the operating parameters shown in ***Appendix 5.9: Standards of Comfort: Guarantee Period*** after acceptance of the ECM was completed. The supporting documentation, including trend data and screenshots of the implemented schedules for Bacon Academy and Town Hall can be found in ***Appendix 5.5: Control System Trends, Schedules & Calculations.***

3.1.1.5 ECM 5 – Mechanical Improvements

Honeywell has implemented the Mechanical Improvements, including new DHW, VAV upgrades, boiler controls and air balancing, at the following facilities were included:

- Bacon Academy
- Cragin Memorial Library
- Fleet Town Garage
- Jack Jackter Intermediate

Measurement and Verification of this ECM uses Option A methodology for Electric and Fuel (Fuel Oil), except for Fuel for Bacon Academy (Option C). As-built data was used to calculate the verified savings for the Option A savings for this ECM. Utility bill data will be used to calculate the Option C savings at Bacon Academy during the performance phase.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. As-builts and calculations for this ECM can be found in ***Appendix 5.6: Mechanical Improvements As-Builts, Cx Documents & Calculations.***

Mechanical Improvements Year 1 Verified Savings

Building	Total energy savings (MMBtu/yr)	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Total energy cost savings, Year 1 ($/yr)
Bacon Academy	0	0	0	*	$0
Jack Jackter Intermediate	159	46,499	0	0	$12,595
Craigin Memorial Library	8	2,353	0	0	$637
Fleet Town Garage	0	712	26	-3	$467
Total savings	**166**	**49,564**	**26**	**(3)**	**$13,699**

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. The supporting documentation for this data, including cut-sheets, air-balancing reports, and startup reports can be found in ***Appendix 5.6: Mechanical Improvements As-Builts, Cx Documents & Calculations.***

Mechanical Improvements Pre/Post M&V Summary

Building	ECM	Pre	Post
Bacon Academy	Boiler Burner Upgrade	N/A	85.7% Boiler Efficiency
Bacon Academy	DHW Temperature Reduction	160 F DHW Setpoint	145 F DHW Setpoint Confirmed on-site by MVS
Jack Jackter Intermediate	VAV Upgrades	N/A	Trends located in appendix
Jack Jackter Intermediate	Air Balancing	N/A	Air balancing report confirms work completed
Craigin Memorial Library	DHW replacement	0.92 Energy Factor	2.00 Energy Factor
Craigin Memorial Library	Air Balancing	N/A	Air balancing report confirms work completed
Fleet Town Garage	DHW replacement	0.91 Energy Factor	95% Combustion Efficiency

3.1.1.6 ECM 7 – Kitchen Hood Controls

Honeywell has implemented the Kitchen Hood Controls at the following facility:

- Jack Jackter Intermediate

Measurement and Verification of this ECM uses Option A methodology for Electric and Fuel (Fuel Oil). A post-retrofit inspection conducted and in order to verify proper installation of the equipment.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. As-builts and calculations for this ECM can be found in ***Appendix 5.7: Kitchen Hood Controls As-Builts & Calculations.***

Kitchen Hood Controls Year 1 Verified Savings

Building	Total energy	Electric energy	Electric demand	Fuel savings (MMBtu/yr)	Total energy cost savings,

	savings (MMBtu/yr)	savings (kWh/yr)	savings (kW/yr)		Year 1 ($/yr)
Jack Jackter Intermediate	156	4,891	0	139	$4,186
Total savings	**156**	**4,891**	**0**	**139**	**$4,186**

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. The supporting documentation for this ECM can be found in ***Appendix 5.7: Kitchen Hood Controls As-Builts & Calculations.***

Kitchen Hood Controls Pre/Post M&V Summary

Building	ECM	Pre	Post
Jack Jackter Intermediate	Kitchen Hood Controls	N/A	Verify Installation of Kitchen Hood Controls confirmed on-site by MVS

3.1.1.7 ECM 8 - Electrical Infrastructure Improvements

Honeywell has implemented the Electrical Infrastructure Improvements, including new transformers and power factor correction, at the following facilities:

- Bacon Academy
- Colchester Elementary
- Jack Jackter Intermediate
- Water Dept – Taintor Hill WTP

Measurement and Verification of this ECM uses Option A methodology for Electric and Fuel, except for Fuel for Bacon Academy (Option C). Pre and post retrofit efficiency measurements were completed and used to calculate the verified savings for the Option A savings for this ECM. Utility bill data will be used to calculate the Option C savings at Bacon Academy during the performance phase.

Based on the as-built measurements, the verified energy savings for year 1 are shown in table below. Measurement data and calculations for this ECM can be found in ***Appendix 5.8: Electrical Infrastructure Improvements Measurements & Calculations.***

Electrical Infrastructure Improvements Year 1 Verified Savings

Building	Total energy savings (MMBtu/yr)	Electric energy savings (kWh/yr)	Electric demand savings (kW/yr)	Fuel savings (MMBtu/yr)	Total energy cost savings, Year 1 ($/yr)
Bacon Academy	1,262	370,116	708	*	$60,892
Colchester Elementary	276	134,625	213	-183	$17,634
Jack Jackter Intermediate	339	158,204	298	-200	$38,742
Water Dept. - Taintor Hill	378	110,823	174	*	$30,425
Total savings	**2,255**	**773,768**	**1,393**	**(383)**	**$147,693**

** The fuel savings for Bacon Academy and Town Hall are verified using Option C methodology.*

A summary of the pre and post M&V verification data in accordance with the M&V Plan is shown in table below. Although only 2 transformer efficiency measurements were used, 5 transformers were measured but were not under enough load in order to show meaningful efficiency numbers. The supporting documentation for the measurement data can be found in ***Appendix 5.8: Electrical Infrastructure Improvements Measurements & Calculations.***

Electrical Infrastructure Improvements Pre/Post M&V Summary

Equipment	Pre	Post	Sample Size	STDEV	CV
Transformers	70.65% Efficient		2	1.2020	0.0170
Transformers		89.05% Efficient	2	6.0100	0.0675
Power Factor - Bacon Academy	83.6	99.9	23 hr trend	N/A	N/A
Power Factor - Colchester Elementary	82.8	99.6	23 hr trend	N/A	N/A
Power Factor - Jack Jackter	93.7	99.2	23 hr trend	N/A	N/A

3.1.2 Option C Avoidance

Option C was selected to calculate fuel oil energy avoidance at Bacon Academy and Town Hall. The actual utility bill performance is calculated each year of the guarantee.

The calculation of energy cost avoidance during the performance phase is based upon the utility rate paid during the Guarantee Year or the Baseline Period utility rate, whichever provides higher cost avoidance as per the contract agreement.

The monthly fuel oil by month is shown in the table below. The meter details generated by Metrix can be found in ***Appendix 5.10: Option C Meter Details.***

Monthly Option C Fuel Oil Savings

Fuel Savings (Gal)	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Total Fuel Savings (Gals/yr)**	**Total Fuel Cost Savings ($/yr)**
Bacon Academy	14	(23)	(116)	(341)	(752)	(903)	(1,321)	(1,441)	(1,083)	(541)	(102)	(82)	-6,690	($20,164)
Town Hall	(26)	(23)	14	90	285	340	481	523	397	156	14	(3)	2,248	$6,917

3.1.3 Operational Cost Avoidance

The Operational Cost Avoidance is agreed to and stipulated per Schedule D of the Contract. This annual operational cost avoidance is shown in the following table. Operational cost avoidance escalates by 3% annually.

ECM	O&M Cost Avoidance
Lighting & Lighting Controls	$8,513
Water Conservation	$222
Automated Dialers	$11,112
Total	$19,847

Lighting retrofit and Occupancy Sensors – Operational costs were calculated based on the quantity of lamps and ballasts being replaced, and based on the existing mean lives of the existing and proposed lamps and ballasts.

Water Conservation – Operational costs were calculated based on the quantity of fixtures being replaced, and based on the existing mean lives of the existing and proposed fixtures.

Automated Dialers – Operational costs were calculated based on the conversion of existing telephone systems from phone-line modem technology with IP-based internet technology.

4.0 Adjustments

4.1.1 Adjustments

There are no adjustments required for this performance period.

TOWN

OF

COLCHESTER

BOARD OF FINANCE

BYLAWS

Approved: Board of Finance, 10/21/2015
Date

Record of Revisions:

Revision	Section	Change	Date
Original Issue	All	Newly Adopted	2/1/2012
1	Article 5 Section 1	Previously read "At a December Board meeting following a municipal election a Chair and Vice Chair will be elected."	11/20/2013
2	Article 6 Section 8	Previously read "The dates of Board meetings for the following year shall be set by vote from the members of the Board present at one of the December regular meetings and the forwarded to the Town Clerk prior to year end."	12/4/2013
	Article 8 Section 3	Previously read "Liaisons to the Departments, Boards and Commissions overseen by the Board will be assigned by the Chair at a December Board meeting following a municipal election or as necessary following vacancies."	
3	Article 4 Section 2	Rights and Privileges of the Chair clarified by addition of last sentence	10/21/2015
	Article 6 Section 7	Voting of membership clarified including interpretation of votes that result in a tie.	

ARTICLE 1. NAME, PURPOSE AND AUTHORIZATION

Section 1. The name of the board shall be the 'Board of Finance of the Town of Colchester' (hereinafter referred to as the Board).

Section 2. The Board shall be responsible for developing and presenting to the Town voters the budgets for all Town departments and the overall Town government and shall have all of the powers and perform all of the duties conferred or imposed upon boards of finance by the General Statutes and Town of Colchester Charter § C-601C.

ARTICLE 2. OFFICE OF THE BOARD

Section 1. The office of the Board shall be at the Colchester Town Hall where Board records will be maintained. Copies of all official documents, records, and similar items will be filed or recorded with the Office of the Town Clerk.

Section 2. All correspondence shall be addressed to the Board of Finance, 127 Norwich Avenue, Colchester, CT 06415.

Section 3. Copies of all agendas, minutes and resolutions of the Commission shall be filed with the Office of the Town Clerk.

ARTICLE 3. MEMBERSHIP

Section 1. The Board shall consist of six (6) members elected in accordance with the provisions of the General Statutes and the Town of Colchester Charter § C-202, § C-203, § C601.

Section 2. All members of the Board shall participate fully in Board meetings and activities and shall have such duties as may from time to time be assigned by the Board.

Section 3. Resignation from the Board shall be in written form and transmitted to the Town Clerk who shall promptly forward same to the Board of Finance.

Section 4 The Board shall fill vacancies in accordance with Town of Colchester Charter § C601D.

ARTICLE 4. OFFICERS AND THEIR DUTIES

Section 1. The officers of the Board shall consist of a Chair, and a Vice Chair.

Section 2. The Chair shall preside at all meetings and hearings of the Board and shall have the duties normally conferred by parliamentary usage on such officers. The Chair shall have the authority to appoint committees, call special meetings, and generally perform other duties as may be prescribed in these By-Laws. The Chair has the same basic rights and privileges as all other members, including the right to make motions, to speak in debate, and to vote on all motions.

Section 3. The Vice Chair shall act for the Chair in his absence and have the authority to perform the duties prescribed by that office.

Section 4. All correspondence addressed to the Board shall be presented by the Chairman to the Board at its first meeting held after such mail has been delivered. All mail shall be deemed "received" when so presented.

ARTICLE 5. ELECTION OF OFFICERS

Section 1. At the first meeting subsequent to the second Monday after a Municipal election a Chair and Vice Chair will be elected.

Section 2. Nominations shall be made from the Board membership in attendance and elections of the officers specified in Section 1 of Article 5 shall follow immediately thereafter.

Section 3. A candidate receiving a majority vote from the members of the Board present shall be declared elected and shall serve for two (2) years.

Section 4. Vacancies in offices shall be filled by vote of the Board following the procedures in Sections 2 and 3. The newly elected officer shall serve the unexpired term of the member he has replaced, or until his successor shall take office.

Section 5. An officer can be removed from their position, without cause or by a vote of four members of the Board.

ARTICLE 6. MEETINGS

Section 1. Regular meetings will be held at 7:00 p.m. on the first and third Wednesday of every month, except when the Town Hall is closed due to public holiday or some other reason. In the event of such a scheduling conflict, an alternative meeting date may be scheduled by the Board. All meetings of the Board are open to the public as required by the Connecticut General Statutes.

Section 2. Special meetings shall be called as necessary by the Chair. Notice of such meeting shall be posted in the Office of the Town Clerk in accordance with State Statutes.

Section 3. At all meetings of the board four members shall constitute a quorum and the concurrence of three votes shall be necessary for the transaction of business.

Section 4. Robert's Rules of Order, shall govern the proceedings at the meetings of this Board except as modified by State and Federal Statutes and the Ordinances and Charter of the Town of Colchester or by these By-Laws.

Section 5. While meetings are open to the public they are not public hearings. The agenda shall contain a Public Comment section where the public shall have the right to address the Board on matters not otherwise on the agenda. Requests to speak on items on the agenda shall be made to the Chairman. Decisions on such requests shall be made by the Chairman unless objection is raised by any member, in which case, a vote of the Commission shall decide.

Section 6. At a meeting the Board may vote to go into Executive Session only for those purposes identified in the Freedom of Information Act. The minutes must record the times at which an Executive Session begins and ends.

Section 7. All members participating in the meeting may vote. Board members may participate and vote at the meeting via a speaker phone provided that the means of communication does not hinder the quality of the discussion and that any members of the public attending can clearly hear the discussion. Any vote that results in a tie does not achieve a majority and therefore fails. For matters that require a decision a new motion can be proposed and voted on again until a majority is achieved.

Section 8. The dates of Board meetings for the following year shall be set by vote from the members of the Board present at one of the November regular meetings and the forwarded to the Town Clerk prior to year end.

ARTICLE 7. ORDER OF BUSINESS

Section 1. Unless otherwise determined by the Chair, the order of business at regular meetings shall be:

1. CALL TO ORDER

2. APPROVAL OF PREVIOUS MEETING MINUTES

3. CITIZENS COMMENTS

4. ADDITIONS TO THE AGENDA

5. DEPARTMENT REPORTS

6. FIRST SELECTMAN'S REPORT

7. CORRESPONDENCE

8. LIAISON REPORT

9. OLD BUSINESS

10. NEW BUSINESS

11. CITIZENS COMMENTS

12. ADJOURNMENT

Section 2. The order of business for work and special meetings will be determined by the Chair.

ARTICLE 8. COMMITTEES/ LIAISON ASSIGNMENTS

Section 1. Membership on committees shall be appointed "ad-hoc".

Section 2. Special Committees may be appointed by the Chair for purposes and terms, which the Board approves.

Section 3. Liaisons to the Departments, Boards and Commissions overseen by the Board will be assigned by the Chair at the first meeting subsequent to the second Monday after a Municipal election or as necessary following vacancies.

ARTICLE 9 CODE OF CONDUCT

Section 1. Each member of the Board must disqualify himself: from discussion or acting on an issue by which he will derive a direct or indirect gain or suffer a direct or indirect loss.

Section 2. No member can appear before the Board representing himself or another party .

ARTICLE 10. AMENDMENTS

Section 1. These By-Laws shall be reviewed at a December Board meeting following a municipal election.

Section 2. These By-Laws may be amended by a majority vote of the seated Board.

ARTICLE 11. ADOPTION

These By-Laws shall be adopted by vote of the Board and shall become effective on the date adopted.

Adopted:

Robert J Tarlov 10/21/2015

Chairman Robert Tarlov Dated