New England States Performance Measurement Project

Measure, Share, Improve

Measuring Government Performance: Snow/Ice Removal Operations 2008-2009

NESPMP: 02

April 2010

The Research Bureau

THE NEW ENGLAND STATES GOVERNMENT FINANCE OFFICERS ASSOCIATION

PREFACE

In 2008, the New England States Government Finance Officers Association (NESGFOA) initiated a project to develop and implement a government performance measurement project that would serve as a catalyst for service improvements in participating local governments throughout its six-state jurisdiction. Performance measurement has several purposes:

- Produce reliable performance and cost data for internal and external comparisons over time for selected municipal services.

- Facilitate the use of performance and cost data for service improvement.

- Increase government responsiveness to citizens.

In order to fund this project, NESGFOA made a three-year commitment from its membership resources, secured a three-year grant from the Alfred P. Sloan Foundation, and requested a modest annual stipend from each participating community. NESGFOA contracted with the Worcester Regional Research Bureau to organize and manage the project because of its experience in working with the City of Worcester, MA in government performance measurement during the previous seven years under a grant from the Sloan Foundation.

The goal of this project is to expand the adoption of performance measurement practices at the local level by regularly collecting and reporting timely data on service delivery that are accurate and reliable. These data will assist policymakers, managers, and citizens in determining whether the delivery of a particular service is efficient and effective. The project's overall goal is to improve service delivery and to make government more responsive to its citizens.

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I. INTRODUCTION

During the fall of 2008 municipal officials from six New England towns agreed to study their treatment of municipal roads during snow and ice precipitation events. They realized there was a high degree of public interest in these services being done effectively. Road conditions are very visible to the public, impact public safety, require significant financial resources, represent unpredictable periodic events, and can be addressed using a wide variety of equipment, road treatment materials, and implementation strategies.

There were three initial study goals:

One: *Develop a standardized data collection methodology.*
Determining what operational data to record, designing data collection forms, and establishing individual event-reporting processes took considerable effort by the town representatives. Because it was unclear the extent to which comparative analysis would be possible, data were developed and collected at a very detailed operational level.

Two: *Develop analytical tools to evaluate community effectiveness and operating efficiencies in managing snow and ice operations.*
Because data were collected at a very detailed level, a wide variety of analytical tools and techniques were developed and tested. Final techniques for this study were then selected based on their ability to identify each town's strategy for labor, equipment, and treatment material usage that would also enable comparative analysis with other towns.

Three: *Encourage each town to use study data to improve their operating strategies.*
Using each town's data and comparative analytical tools, differences in town operating strategies and performance could be reviewed to identify improvement opportunities.

II. STUDY APPROACH

Study data collection forms were developed and used for each snow and/or ice occurrence (event). Detailed data collected included labor hours, equipment type and usage, and materials used to treat street surfaces. Both the amount and cost of resources were identified and recorded.

Once data were collected, towns either provided a diary of data for all storms during the 2008/2009 winter season or data from three (sample) storms with different weather characteristics. These data were used to develop and test various analytical techniques.

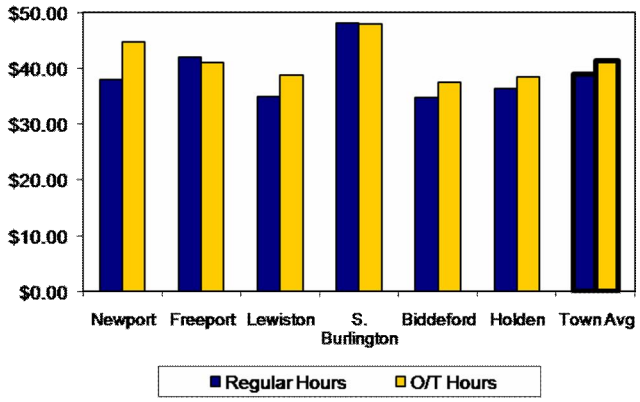
A study review and information exchange meeting was then held in the fall of 2009. A meeting facilitator presented the results from the data analysis tools along with analytical observations. This led to active, focused discussion among the town's employees on different snow and ice operational methods, their strengths and weaknesses.

III. LABOR COST ANALYSIS

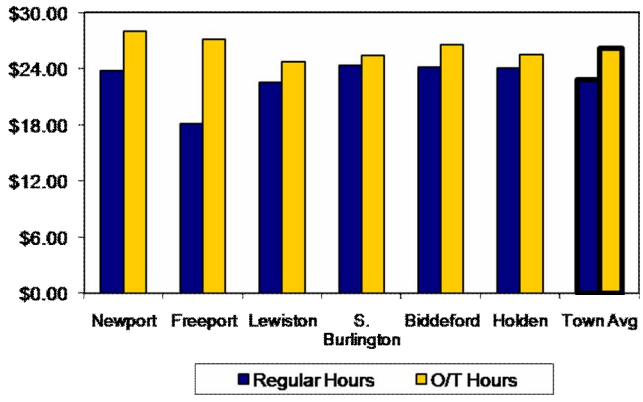
2008/2009 Winter Season

	Newport	Freeport	Lewiston	S. Burlington	Biddeford	Holden	Town Avg
Highest Reg Lbr Hrly Rate (w/ benefits)	$37.97	$41.97	$35.00	$48.06	$34.71	$36.36	**$39.01**
Lowest Reg Lbr Hrly Rate (w/ benefits)	$23.76	$18.11	$22.54	$24.42	$24.20	$24.13	**$22.86**
Highest O/T Lbr Hrly Rate (w/ benefits)	$44.80	$41.06	$38.81	$47.96	$37.44	$38.47	**$41.42**
Lowest O/T Lbr Hrly Rate (w/ benefits)	$28.04	$27.17	$24.74	$25.40	$26.59	$25.52	**$26.24**

Highest Hourly Rates (with benefits)



Lowest Hourly Rates (with benefits)



Observations:

- On average, overtime compensation rates are 6% to 15% higher than regular labor rates. Higher overtime salary levels (1.5 times higher) are significantly offset by lower hourly fringe benefit levels.
- South Burlington used employees with the highest labor hourly rate.
- All towns (except South Burlington) had labor rates relatively close to the study average.

IV. MATERIAL COST AND USAGE COMPARATIVE ANALYTICAL DATA

A. Material Cost Analysis

	Newport	Freeport	Lewiston	S. Burlington	Biddeford	Holden
Salt						
Unit Measure	Ton	Ton	Ton	Ton	Ton	Ton
Unit Cost	$86.18	$67.82	$73.43	$55.42	$51.91	$67.13
Sand						
Unit Measure	Ton	Ton	Ton		Ton	Ton
Unit Cost	$20.00	$6.50	$6.59		$6.80	$15.95
Sand/Salt Mix						
Unit Measure		Ton (1 to 6)	Ton (1 to 5)		Ton (1 to 3)	Ton (1 to 4) (1 to 1)
Unit Cost		$22.42	$19.65		$18.08	$21.28 $39.03
Calcium Chloride						
Unit Measure		Gallons	Gallons			Gallons
Unit Cost		$1.92	$1.25			$1.04
Magnesium Chloride						
Unit Measure					Gallons	
Unit Cost					$0.95	

Observations:

Salt

- Newport pays a significantly higher cost than any other town.
- South Burlington/Biddeford significantly less per ton for salt.
- Freeport/Lewiston/Holden all pay similar per ton cost rates for salt.

Sand

- Newport/Holden pay significantly more per ton for sand.
- Freeport/Lewiston/ Biddeford all pay similar per ton cost rates for sand.

Salt, Salt/Sand Mix

- Newport/South Burlington do not use sand/salt mixtures?
- Freeport/Lewiston use much larger sand ratios in their mixtures.

Calcium Chloride

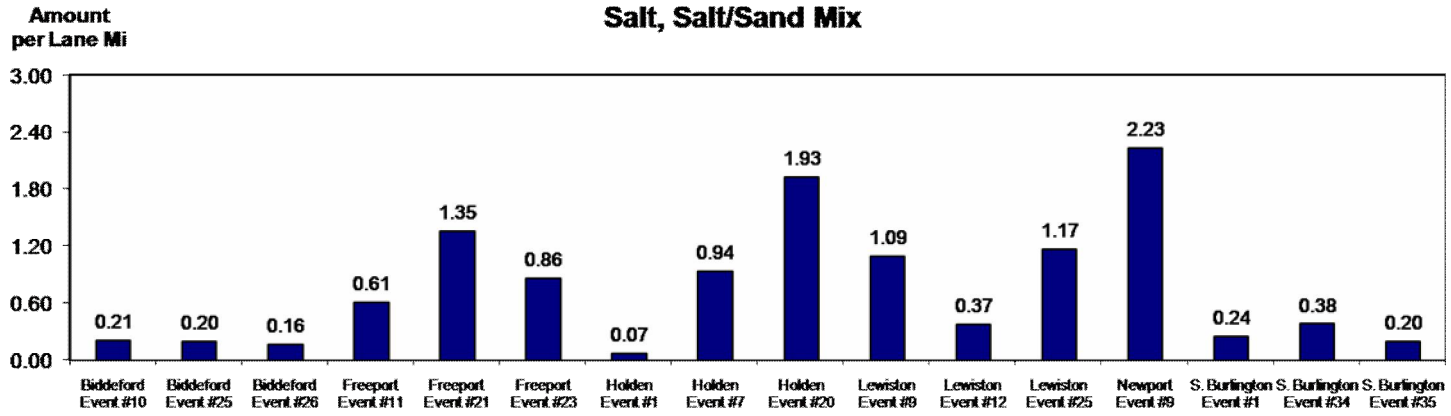
- Freeport/Lewiston/Holden use this material.
- Freeport pays significantly more per gallon for calcium chloride.

Magnesium Chloride

- Only Biddeford uses this material.

B. Material Usage Amount per ***Lane Mile***

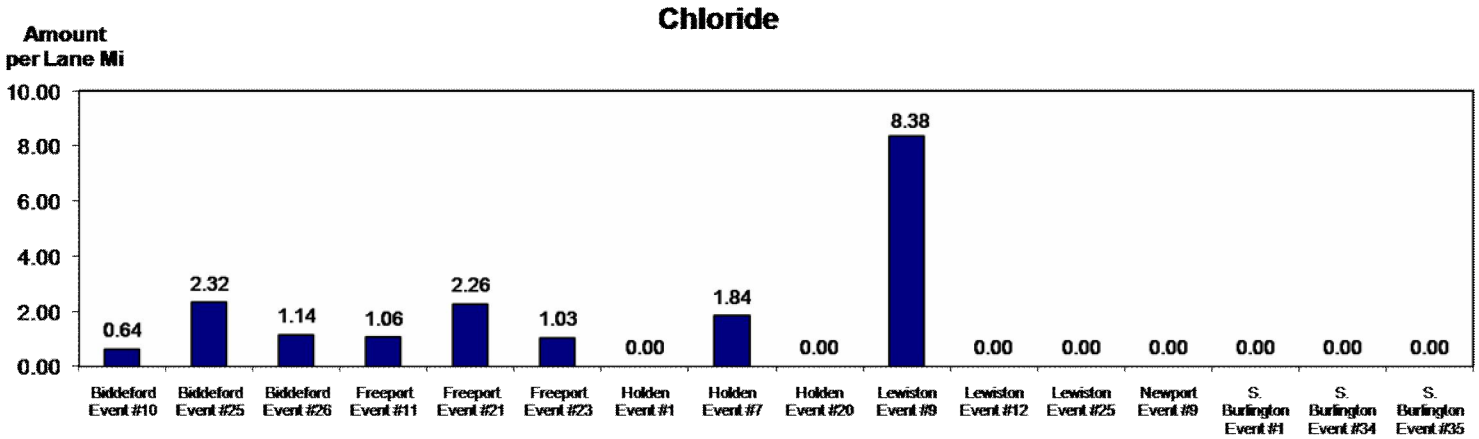
This comparative analysis was completed using a 3 storm sample size from each town. A more extensive analysis will be completed 2009/2010 winter study when more storm data is collected for every town.



Observations:

Salt, Salt/Sand Mix

- Biddeford/South Burlington use significantly less material per lane mile and are fairly consistent in the amount used per storm.
- Newport uses significantly more material per lane mile than all other towns.
- There are significant differences in the amount of material used between various storms for Freeport, Holden and Lewiston.
- We would need more data collected to analyze material usage by storm precipitation levels.



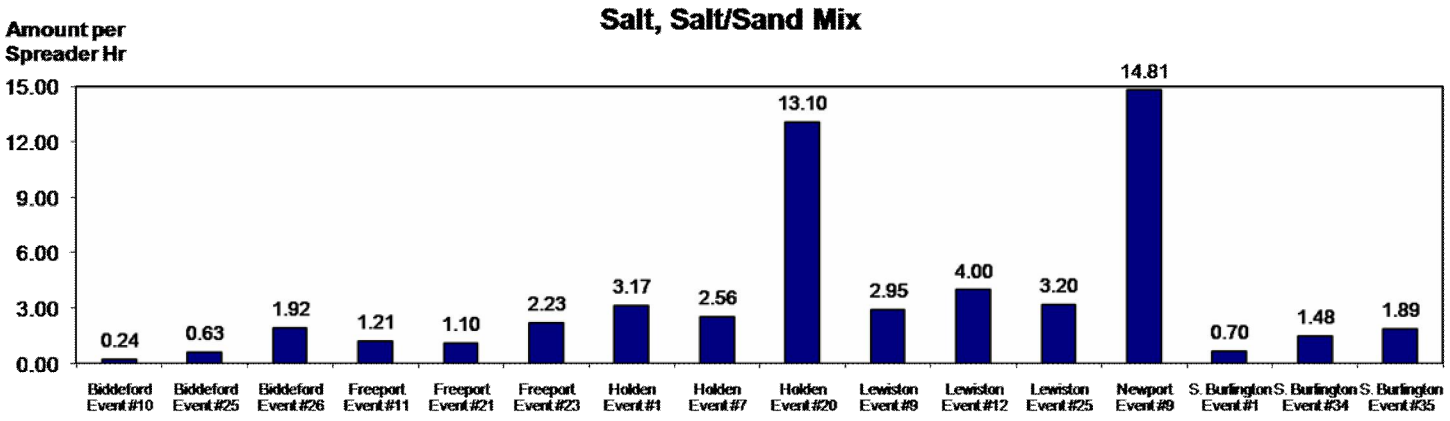
Observations:

Chloride

- Lewiston used significantly more chloride on event #9.
- All other chloride usage appears to be compatible.

C. Material Usage Amount per *Spreader Hour*

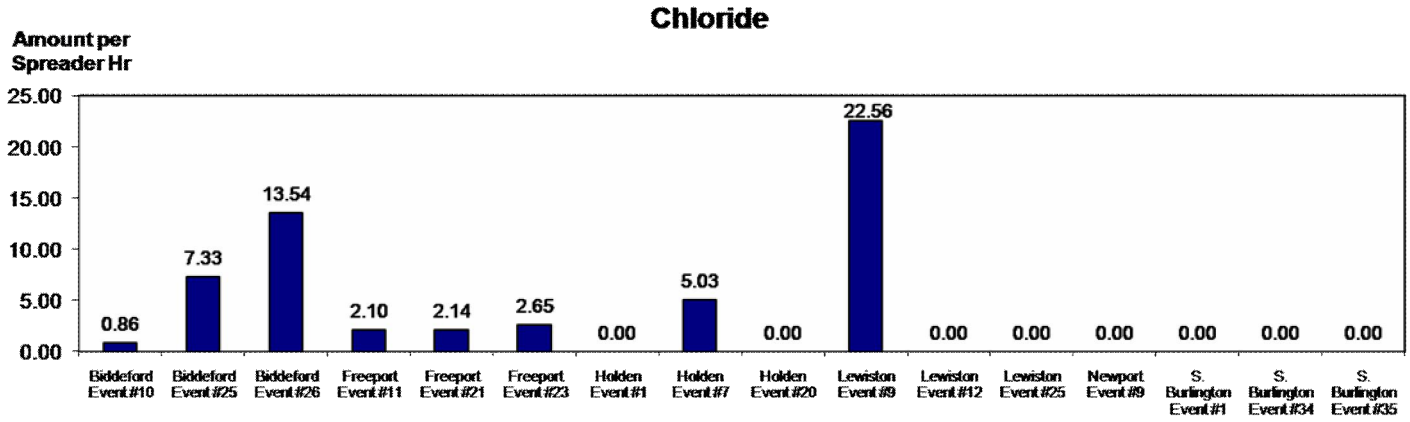
This comparative analysis was completed using a 3 storm sample size from each town. A more extensive analysis will be completed 2009/2010 winter study when more storm data is collected for every town.



Observations:

Salt, Salt/Sand Mix

- Holden Storm #2 and Newport Storm #9 used significantly more material per spreader hour than any other storm event sampled.
- Holden/Lewiston tended to use more material per spreader hour than all other towns



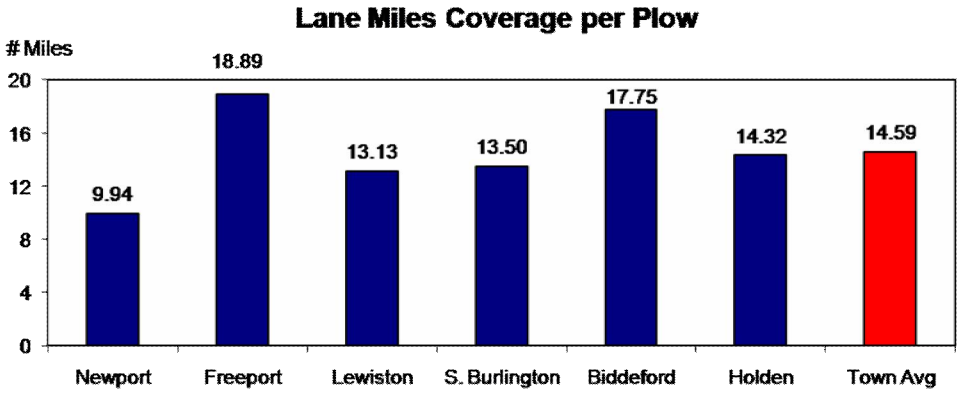
Observations:

Chloride

- Freeport had very consistent usage of chloride per spreader hour.
- Lewiston used a significant amount of chloride per spreader hour on Event #9.
- Biddeford used significantly different amounts of chloride on their three different storms.

V. EQUIPMENT INVENTORY COMPARATIVE ANALYTICAL DATA

A. Equipment Summary – Lane Miles Coverage per Plow

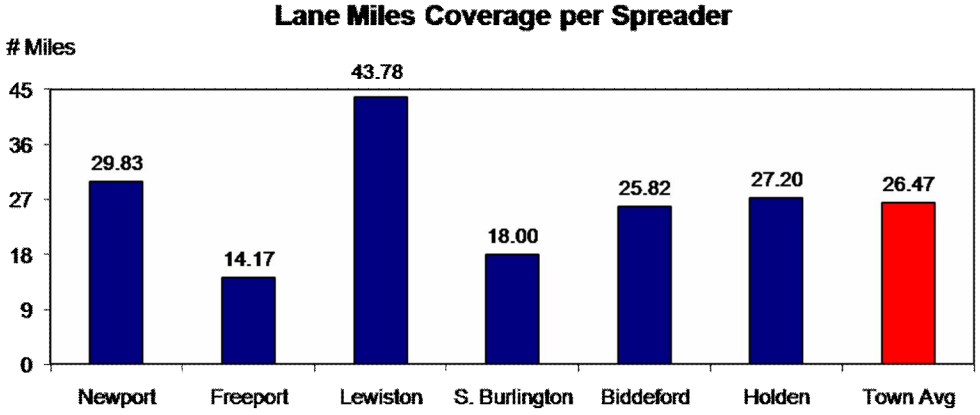


Observations:

Plows

- Freeport/Biddeford expect each plow to cover significantly (at least 20%) more lane miles during their storms.
- Newport expects their plows to cover significantly fewer lane miles during their storms.

B. Equipment Summary – Lane Miles Coverage per Spreader

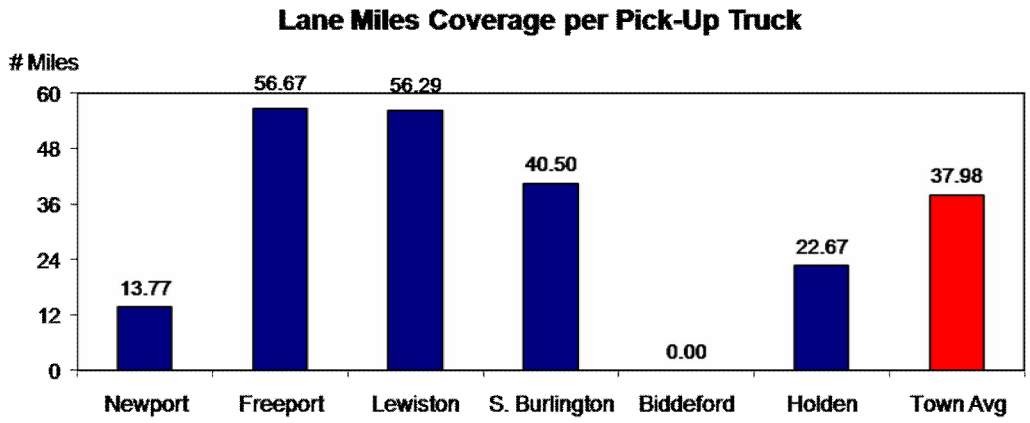


Observations:

Spreaders

- Freeport/South Burlington expect their spreaders to cover significantly fewer lane miles during their storms.
- Lewiston expects their spreaders to cover significantly more lane miles during their storms.

C. Equipment Summary – Lane Miles Coverage per Pick-Up Truck

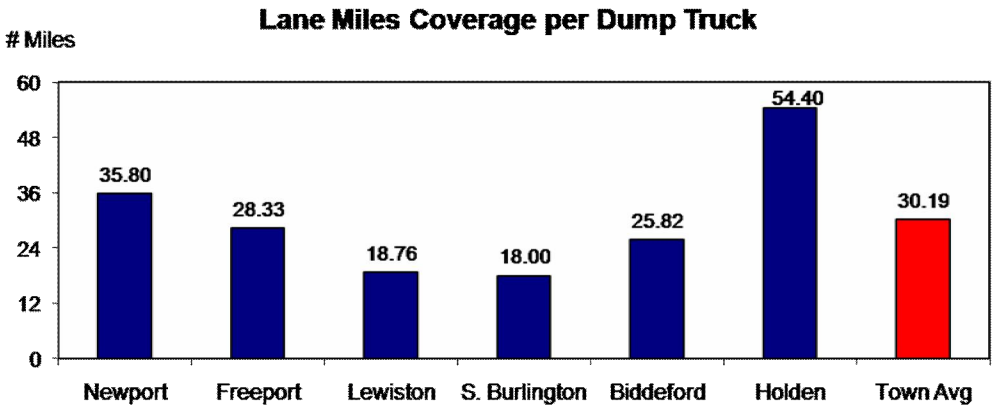


Observations:

Pick-Up Trucks

- Newport/Holden used significantly more pick-up trucks during their storms.
- Freeport/Lewiston used significantly fewer pick-up trucks during their storms.

D. Equipment Summary – Lane Miles Coverage per Dump Truck

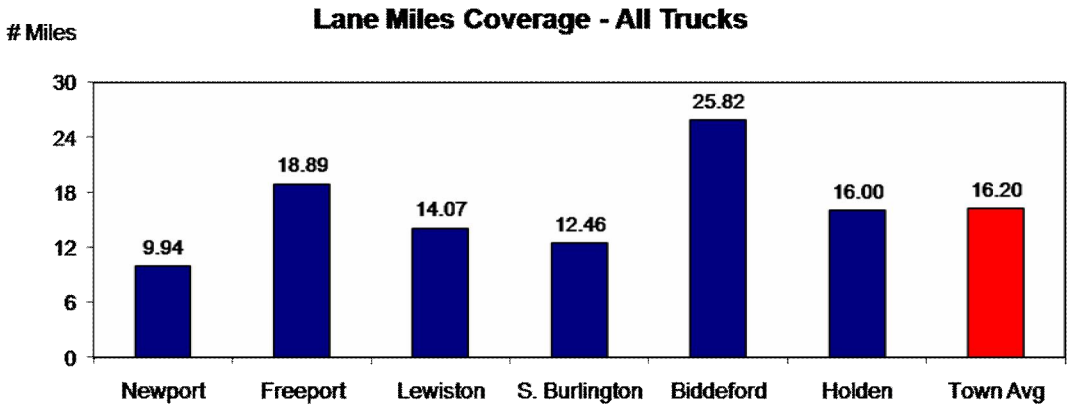


Observations:

Dump Trucks

- Lewiston/South Burlington used significantly more dump trucks during their storms.
- Holden used significantly fewer dump trucks during their storms.

E. Equipment Summary – Lane Miles Coverage All Trucks



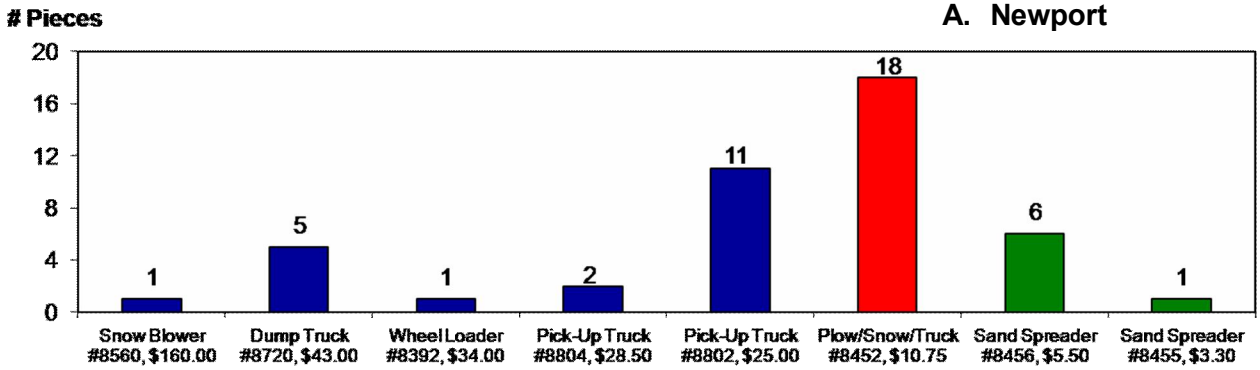
Observations:

All Trucks

- Newport/South Burlington expect their trucks to cover significantly fewer lane miles during their storms. (They use more trucks)
- Biddeford expects their trucks to cover significantly more lane miles during their storms. (They use less trucks)

VI. EQUIPMENT COST PROFILES FOR EACH TOWN

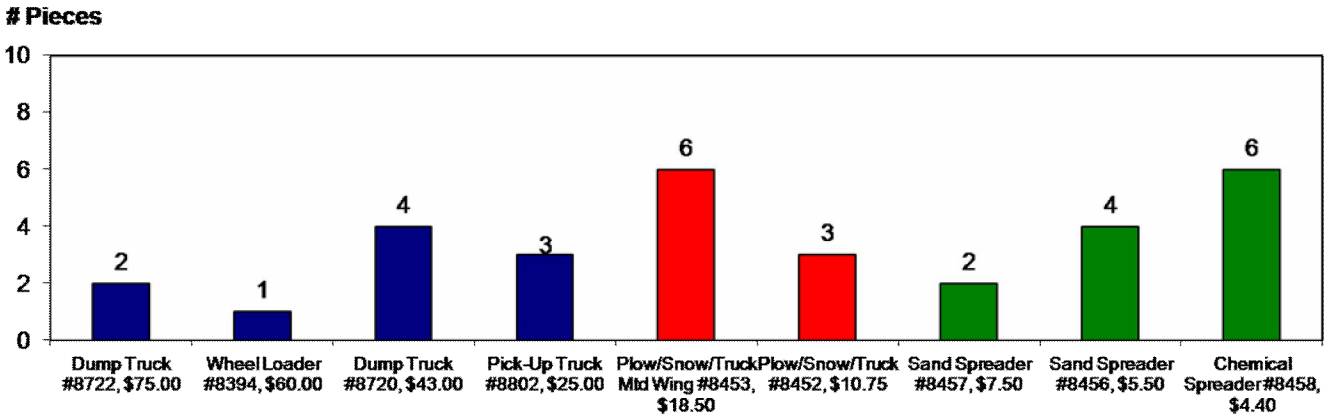
A. Newport



Observations:

- 13 plows on pick-ups and only 5 on dump trucks.

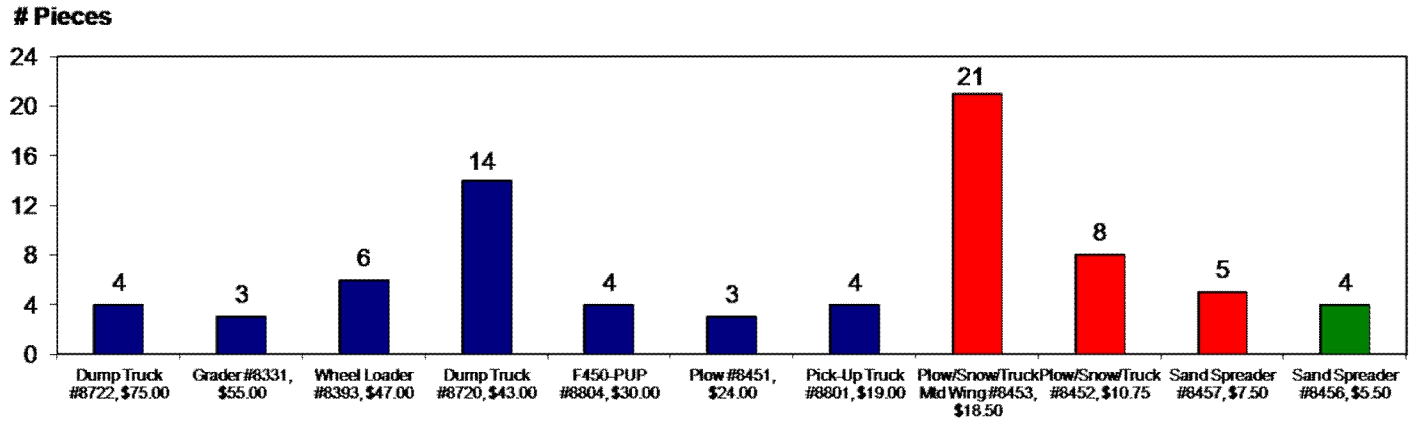
B. Freeport



Observations:

- Uses 6 big dump trucks (high cost).
- Drivers of dump trucks are usually higher hourly paid employees, causing higher labor costs.

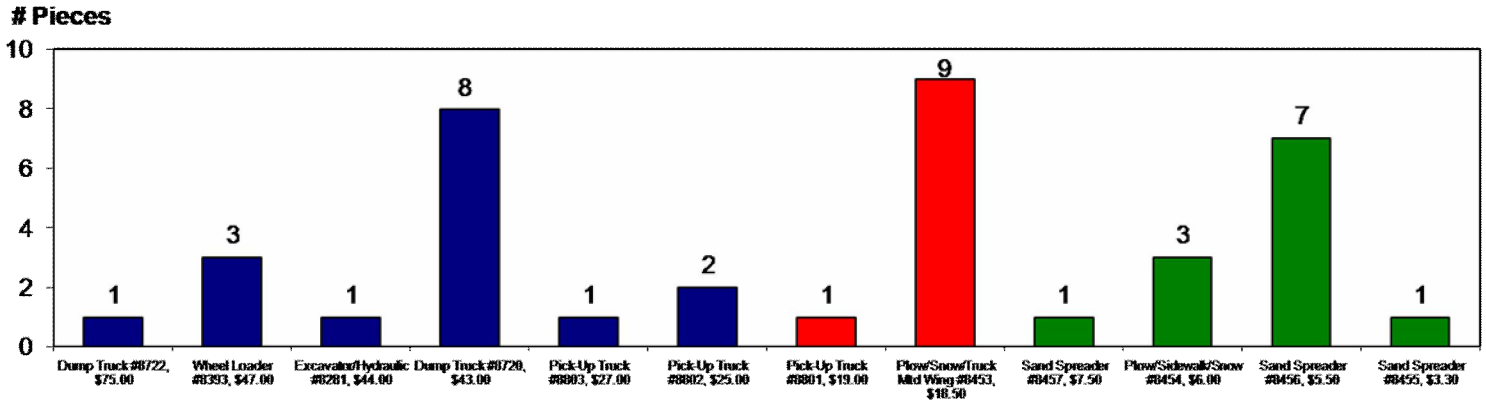
C. Lewiston



Observations:

- Uses 4 big dump trucks and 3 road graders (expensive).

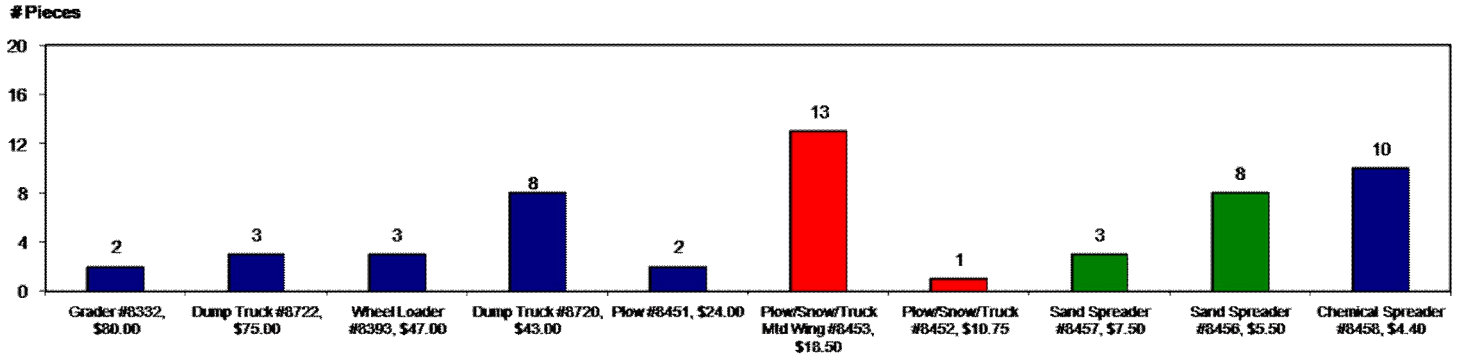
D. South Burlington



Observations:

- Only South Burlington uses an excavator/hydraulic.

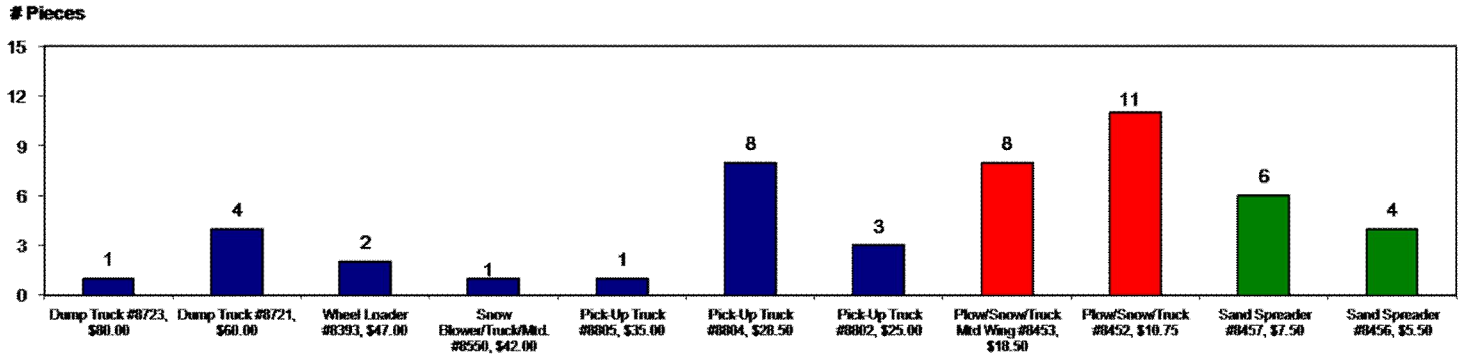
E. Biddeford



Observations:

- Uses 3 big dump trucks and 2 road graders (expensive to operate).

F. Holden



Observations:

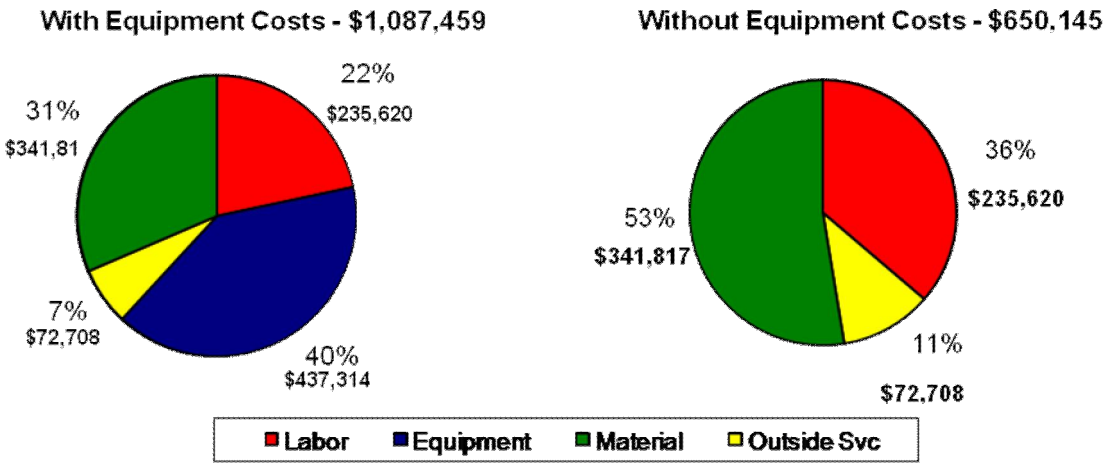
- Uses 5 big dump trucks (expensive to operate).
- Only town that uses snow blower that is truck mounted.

VII. 2008/2009 WINTER SEASON TOWN ANALYSIS

(Lewiston, Freeport, Biddeford)

A. Lewiston Storm Analysis – 2008/2009

Total Storm Cost



SUMMARY DATA

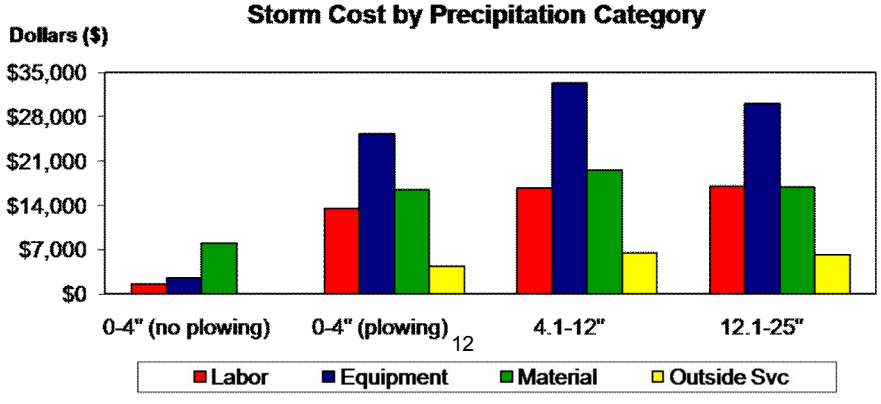
a) Winter Season Profile

	# of Storm Event	% of Storm Events	# of Storm Days	% of Storm Days
0 - 4" (no plowing)	12	46%	13	34%
0 - 4" (plowing)	6	23%	10	26%
4.1 - 12"	4	15%	8	21%
12.1 - 25"	4	15%	7	18%
Total	**26**	**100%**	**38**	**100%**

b) Storm Cost

	Total Storm Cost	Avg Cost per Storm	Avg Cost per Lane Mi
0 - 4" (no plowing)	$146,441	$12,203	$30.97
0 - 4" (plowing)	$354,359	$59,060	$149.90
4.1 - 12"	$305,340	$76,335	$193.74
12.1 - 25"	$281,319	$70,330	$178.50
Total	$1,087,459	$41,825	$106.16

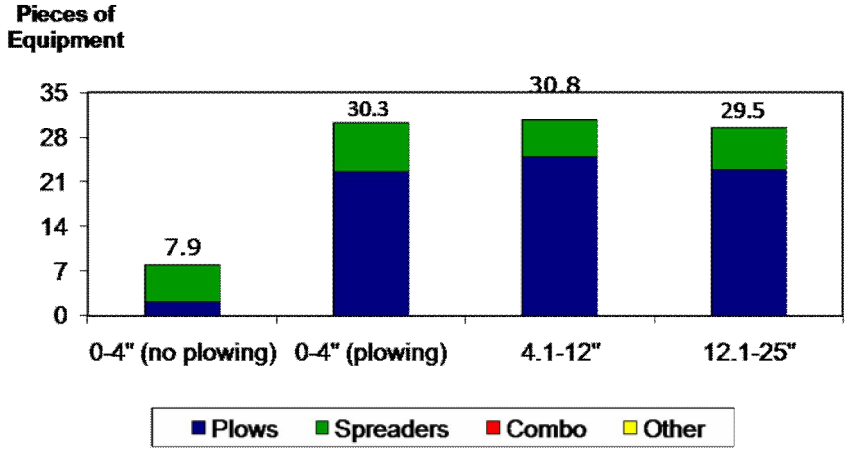
Storm Cost by Precipitation Category



c) Labor Cost

Highest O/T Lbr Hrly Rate (w/ benefits)	$38.81
Lowest O/T Lbr Hrly Rate (w/ benefits)	$24.74
Average Town Labor Cost - All Storms	$31.33

d) Equipment Usage



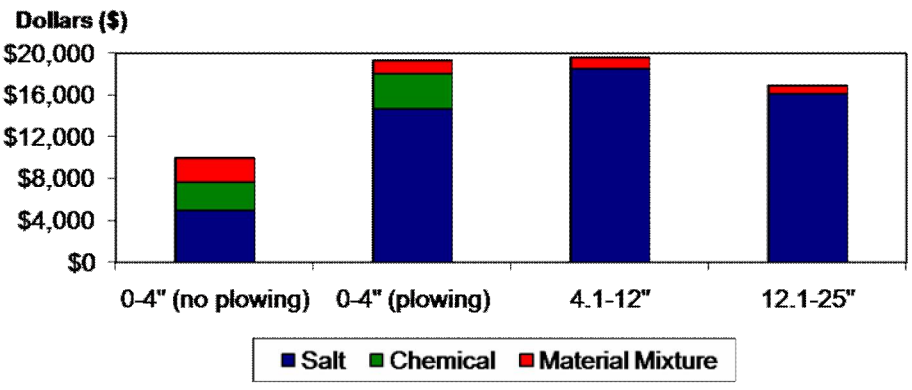
e) Outside Services

Total Cost for all year	$72,708
Average Cost per Storm Used	$5,993
Average Outside Equipment Hourly Cost	$108.24

f) Material Cost Totals

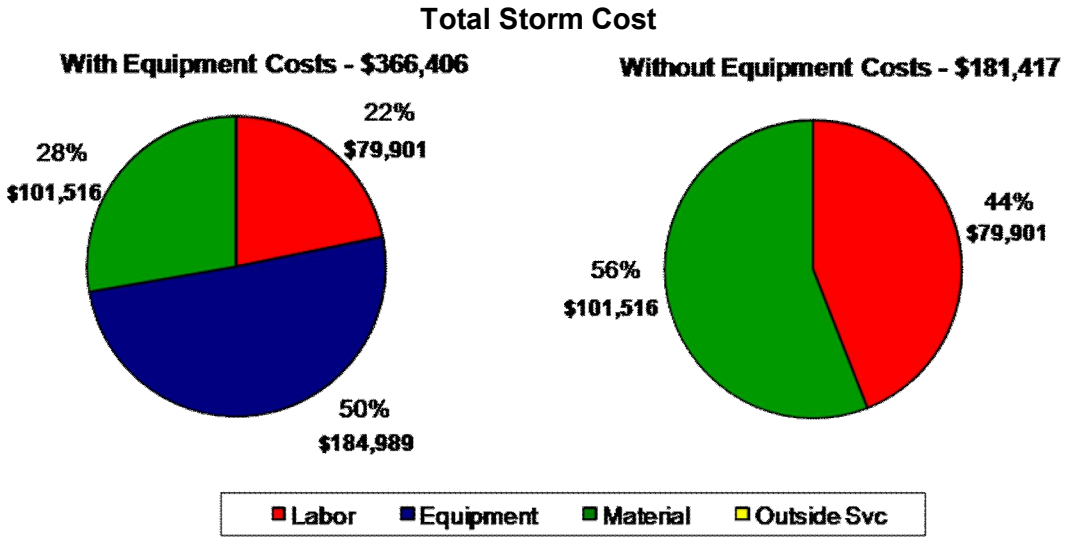
Salt	$286,918
Sand	$0
Chemical	$11,375
Material Mix	$43,524
Total	$341,817

g) Material Cost by Precipitation



	0 - 4" (no plowing)	0 - 4" (plowing)	4.1 - 12"	12.1 - 25"	Total All Storms
# Town Service Roads	186.00	186.00	186.00	186.00	186.00
# Storm Days	1.08	1.67	2.00	1.75	1.46
Total Inches Precip	0.58	1.94	8.50	15.48	4.90
Total # Lane Mileage	394.00	394.00	394.00	394.00	394.00
Total Storm Cost	$12,203	$59,060	$76,335	$70,330	$41,825
Town Labor Hrs - Plowing	13.00	305.45	413.13	371.25	197.16
Town Labor Hrs - Spreaders	36.96	125.08	140.38	139.00	88.90
Town Labor Hrs - Other Equip	0.00	0.00	0.00	0.00	0.00
Total Town Labor Hrs	52.13	436.83	560.75	507.99	289.29
Total Town Labor Cost	$1,567	$13,583	$16,829	$17,000	$9,062
# of Town Vehicles Used - Plows	2.17	22.67	25.00	23.00	13.62
# of Town Vehicles Used - Spreaders	5.75	7.67	5.75	6.50	6.31
# of Town Vehicles Used - Other	0.00	0.00	0.00	0.00	0.00
Total Town Vehicles	7.92	30.33	30.75	29.50	19.92
Total Town Equip Cost	$2,622	$25,300	$33,402	$30,111	$16,820
Total Outside Hrs	0.00	40.95	59.38	57.38	51.67
Total Outside Labor Cost	$0.00	$0.00	$0.00	$0.00	$0.00
Total Outside Equip Cost	$0.00	$4,355.80	$6,475.25	$6,257.00	$5,592.92
# Rental Vehicles - Plows	0	0	0	0	0
# Rental Vehicles - Spreaders	0	0	0	0	0
# Rental Vehicles - Other Equip	0	3	3	3	3
Total Outside Svc Cost	$0	$4,356	$6,475	$6,257	$5,593
Amt Used - Salt	73.4	215.8	273.0	238.0	162.3
Total Cost - Salt	$4,992	$14,675	$18,561	$16,182	$11,035
Amt Used - Sand	0.0	0.0	0.0	0.0	0.0
Total Cost - Sand	$0	$0	$0	$0	$0
Amt Used - Chemical	2133.3	2700.0	0.0	0.0	2275.0
Total Cost - Chemical	$2,667	$3,375	$0	$0	$2,844
Amt Used - Material Mixture	130.7	72.7	59.3	43.3	92.8
Total Cost - Material Mixture	$2,356	$1,310	$1,068	$780	$1,674
Total Material Cost	$8,014	$16,547	$19,630	$16,961	$13,147

B. Freeport Storm Analysis – 2008/2009



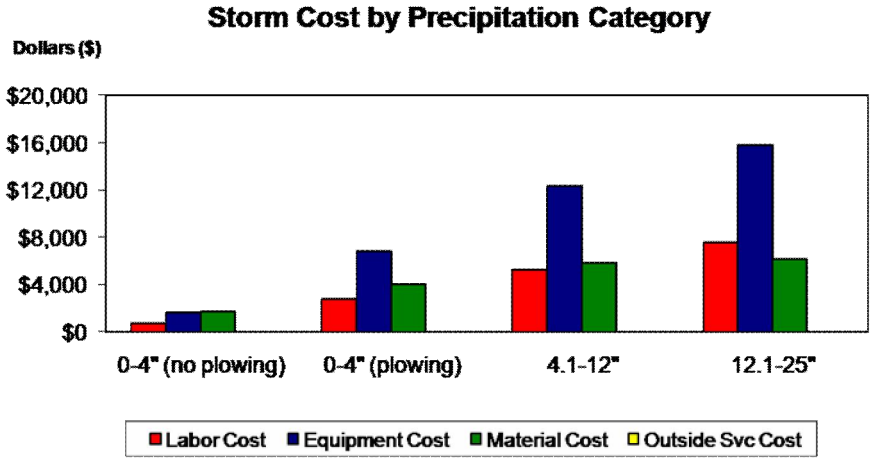
SUMMARY DATA

a) Winter Season Profile

	# of Storm Event	% of Storm Days	# of Storm Days	% of Storm Days
0 - 4" (no plowing)	13	45%	14	33%
0 - 4" (plowing)	8	28%	12	29%
4.1 - 12"	5	17%	10	24%
12.1 - 25"	3	10%	6	14%
Total	**29**	**100%**	**42**	**100%**

b) Storm Cost

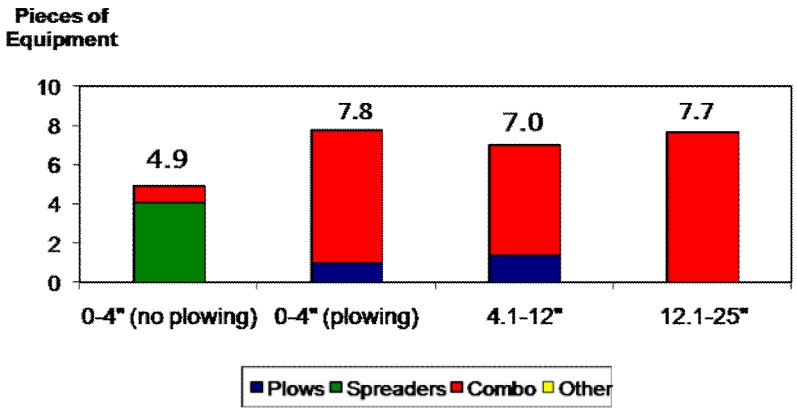
	Total Storm Cost	Avg Cost per Storm	Avg Cost per Lane Mi
0 - 4" (no plowing)	$51,906	$3,993	$23.49
0 - 4" (plowing)	$108,979	$13,622	$80.13
4.1 - 12"	$117,019	$23,404	$137.67
12.1 - 25"	$88,502	$29,501	$173.53
Total	$366,406	$12,635	$74.32



c) Labor Cost

Highest O/T Lbr Hrly Rate (w/ benefits)	$41.06
Lowest O/T Lbr Hrly Rate (w/ benefits)	$18.11
Average Town Labor Cost - All Storms	$32.51

d) Equipment Usage



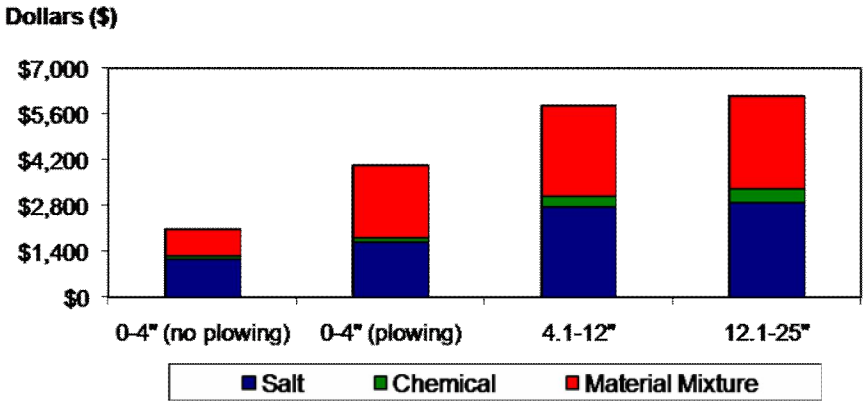
e) Outside Services

Total Cost for all year	$0
Average Cost per Storm Used	$0
Average Outside Equipment Hourly Cost	$0.00

f) Material Cost Totals

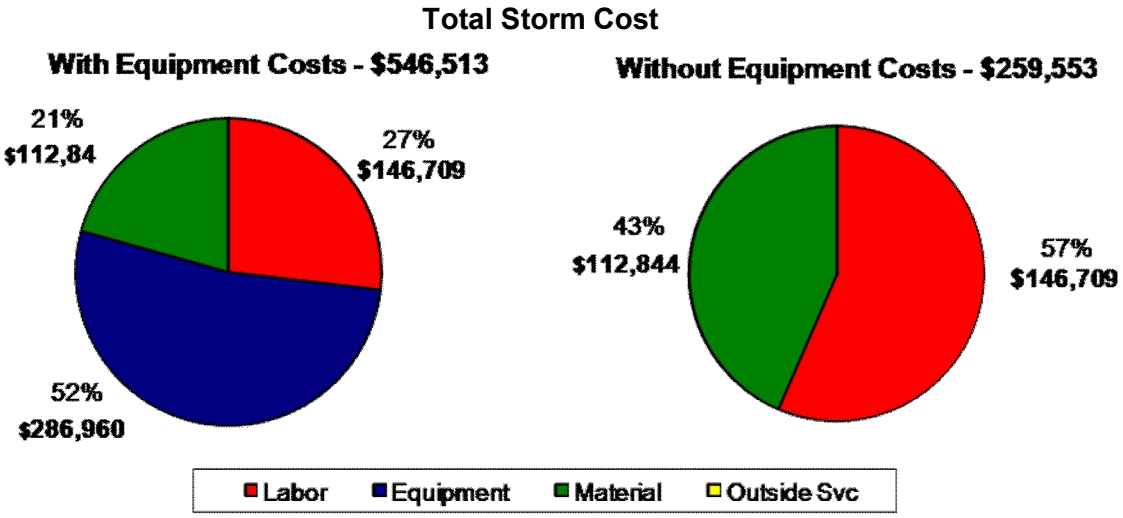
Salt	$47,745
Sand	$0
Chemical	$4,138
Material Mix	$49,633
Total	$101,516

g) Material Cost by Precipitation



	0 - 4" (no plowing)	0 - 4" (plowing)	4.1 - 12"	12.1 - 25"	Total All Storms
# Town Service Roads	85	85	85	85	85
# Storm Days	1.08	1.50	2.00	2.00	1.45
Total Inches Precip	0.77	1.19	7.00	15.33	3.47
Total # Lane Mileage	170.00	170.00	170.00	170.00	170.00
Total Storm Cost	$3,993	$13,622	$23,404	$29,501	$12,635
Town Labor Hrs - Plowing	0.00	89.46	155.98	229.67	136.54
Town Labor Hrs - Spreaders	21.01	0.00	0.00	0.00	21.01
Town Labor Hrs - Other Equip	0.00	0.00	0.00	0.00	0.00
Total Town Labor Hrs	21.01	84.37	155.98	229.67	84.75
Total Town Labor Cost	$677	$2,764	$5,272	$7,541	$2,755
# of Town Vehicles Used - Plows	0.00	8.00	7.00	0.00	7.50
# of Town Vehicles Used - Spreaders	4.78	0.00	0.00	0.00	4.78
# of Town Vehicles Used - Combo	5.50	7.71	7.00	7.67	7.50
# of Town Vehicles Used - Other	0.00	0.00	0.00	0.00	0.00
Total Town Vehicles	4.92	7.75	7.00	7.67	6.34
Total Town Equip Cost	$1,645	$6,834	$12,295	$15,820	$6,379
Total Outside Hrs	0.00	0.00	0.00	0.00	0.00
Total Outside Labor Cost	$0.00	$0.00	$0.00	$0.00	$0.00
Total Outside Equip Cost	$0.00	$0.00	$0.00	$0.00	$0.00
# Rental Vehicles - Plows	0	0	0	0	0
# Rental Vehicles - Spreaders	0	0	0	0	0
# Rental Vehicles - Other Equip	0	0	0	0	0
Total Outside Svc Cost	$0	$0	$0	$0	$0
Amt Used - Salt	17.2	25.0	40.8	42.7	27.1
Total Cost - Salt	$1,167	$1,696	$2,767	$2,894	$1,836
Amt Used - Sand	0.0	0.0	0.0	0.0	0.0
Total Cost - Sand	$0	$0	$0	$0	$0
Amt Used - Chemical	60.0	85.0	220.0	223.3	142.3
Total Cost - Chemical	$115	$131	$317	$429	$237
Amt Used - Material Mixture	36.1	98.4	123.4	125.7	79.1
Total Cost - Material Mixture	$809	$2,206	$2,767	$2,817	$1,773
Total Material Cost	$1,670	$4,025	$5,837	$6,140	$3,501

C. Biddeford Storm Analysis – 2008/2009



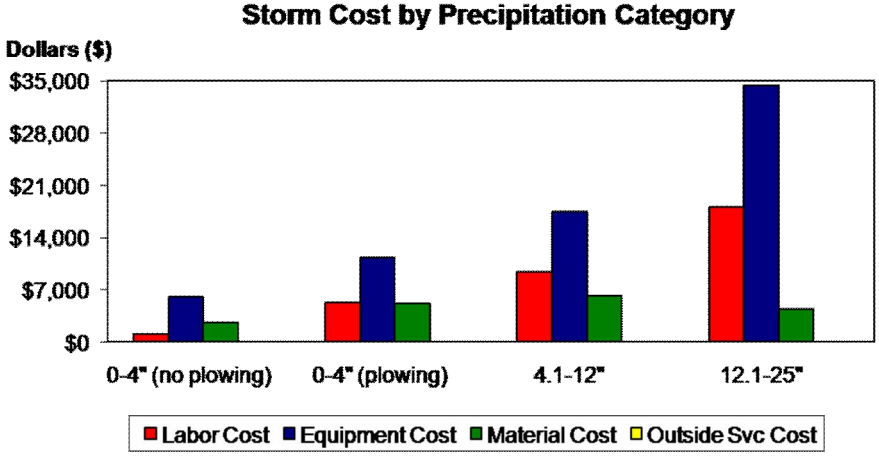
SUMMARY DATA

a) Winter Season Profile

	# of Storm Event	% of Storm Event	# of Storm Days	% of Storm Days
0 - 4" (no plowing)	10	38%	11	28%
0 - 4" (plowing)	8	31%	12	31%
4.1 - 12"	6	23%	12	31%
12.1 - 25"	2	8%	4	10%
Total	**26**	**100%**	**39**	**100%**

b) Storm Cost

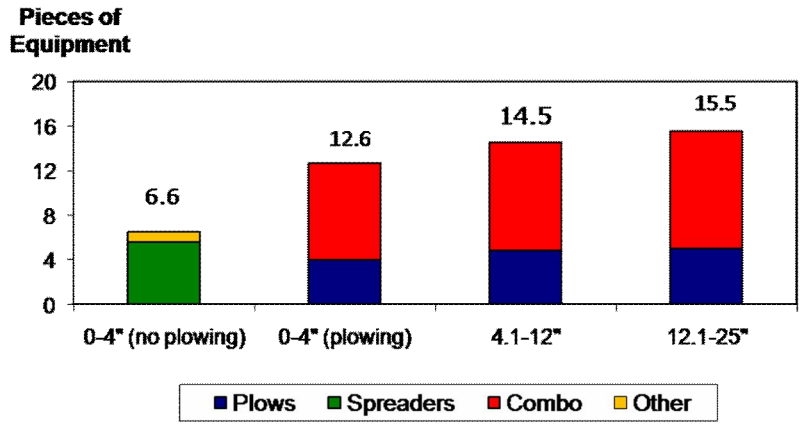
	Total Storm Cost	Avg Cost per Storm	Avg Cost per Lane Mi
0 - 4" (no plowing)	$60,832	$6,083	$21.42
0 - 4" (plowing)	$173,954	$21,744	$76.56
4.1 - 12"	$197,741	$32,957	$116.05
12.1 - 25"	$113,985	$56,992	$200.68
Total	$546,512	$21,020	$74.01



c) Labor Cost

Highest O/T Lbr Hrly Rate (w/ benefits)	$39.62
Lowest O/T Lbr Hrly Rate (w/ benefits)	$24.20
Average Town Labor Cost - All Storms	$31.35

d) Equipment Usage



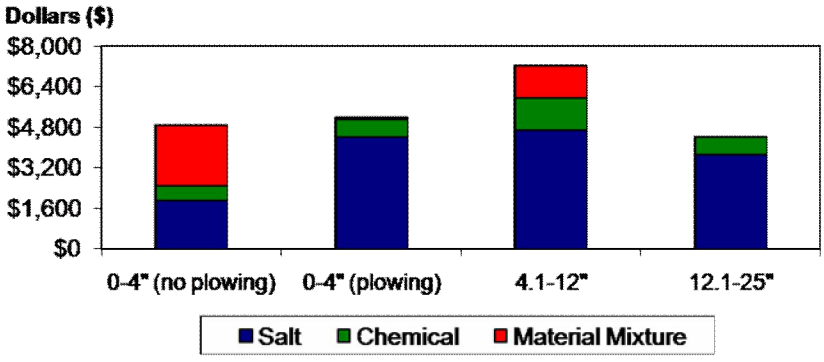
e) Outside Services

Total Cost for all year	$0
Average Cost per Storm Used	$0
Average Outside Equipment Hourly Cost	$0.00

f) Material Cost Totals

Salt	$89,830
Sand	$0
Chemical	$16,830
Material Mix	$6,183
Total	$112,844

g) Material Cost by Precipitation



	0 - 4" (no plowing)	0 - 4" (plowing)	4.1 - 12"	12.1 - 25"	Total All Storms
# Town Service Roads	131.00	131.00	131.00	131.00	131.00
# Storm Days	1.10	1.50	2.00	2.00	1.50
Total Inches Precip	0.00	3.13	7.33	18.00	4.04
Total # Lane Mileage	284.00	284.00	284.00	284.00	284.00
Total Storm Cost	$6,083	$21,744	$32,957	$56,992	$21,020
Town Labor Hrs - Plowing	0.00	174.75	298.08	563.75	269.63
Town Labor Hrs - Spreaders	32.60	0.00	0.00	0.00	32.60
Town Labor Hrs - Other Equip	4.44	0.00	0.00	0.00	4.44
Total Town Labor Hrs	36.60	174.75	298.08	563.75	180.00
Total Town Labor Cost	$1,136	$5,367	$9,357	$18,135	$5,643
# of Town Vehicles Used - Plows	0.00	4.00	4.83	5.00	4.44
# of Town Vehicles Used - Spreaders	5.60	0.00	0.00	0.00	5.60
# of Town Vehicles Used - Combo	0.00	8.63	9.67	10.50	9.25
# of Town Vehicles Used - Other	1.00	0.00	0.00	0.00	1.00
Total Town Vehicles	6.50	12.63	14.50	15.50	10.92
Total Town Equip Cost	$6,083	$11,263	$17,428	$34,437	$11,037
Total Outside Hrs	0.00	0.00	0.00	0.00	0.00
Total Outside Labor Cost	$0.00	$0.00	$0.00	$0.00	$0.00
Total Outside Equip Cost	$0.00	$0.00	$0.00	$0.00	$0.00
# Rental Vehicles - Plows	0.00	0.00	0.00	0.00	0.00
# Rental Vehicles - Spreaders	0.00	0.00	0.00	0.00	0.00
# Rental Vehicles - Other Equip	0.00	0.00	0.00	0.00	0.00
Total Outside Svc Cost	$0	$0	$0	$0	$0
Amt Used - Salt	36.4	85.1	90.4	71.5	66.6
Total Cost - Salt	$1,891	$4,419	$4,692	$3,712	$3,455
Amt Used - Sand	0.0	0.0	0.0	0.0	0.0
Total Cost - Sand	$0	$0	$0	$0	$0
Amt Used - Chemical	611.0	719.9	1,336.7	746.5	885.8
Total Cost - Chemical	$580	$684	$1,270	$709	$842
Amt Used - Material Mixture	133.5	5.0	70.0	0.0	85.5
Total Cost - Material Mixture	$2,414	$90	$1,266	$0	$1,546
Total Material Cost	$2,605	$5,114	$6,173	$4,421	$4,340