Ecological Footprint Report

Period: July 1 2011 – June 31, 2012
April 2013
Oyster River Cooperative School District

Prepared by: Nicole D'Alessio
University of New Hampshire, 2013
Environmental and Resource Economics

Table of Contents

Ecological Footprint Report

Period: July 1 2011 – June 31, 2012
April 2013
Oyster River Cooperative School District

Introduction

The Sustainability Committee

The Oyster River Cooperative School District's Sustainability Committee, established in March 2011, serves to facilitate a sustainability forum regarding the creation, planning and implementation of long-term sustainability initiatives within the Oyster River Cooperative School Distrcit. Aligning itself with the five principles of sustainability: renewability, substitution, interdependence, adaptability, and intuitional commitment, the Committee focuses its efforts in areas related to: food, energy, transportation, school curriculum and community outreach. Since its establishment, the Sustainability Committee has kicked off "No Idling" bus campaigns, Biodiesel Bus conversions, created school gardens, introduced local foods to lunchrooms, provided for the conduction of energy audits, and facilitated community outreach events, among countless other ongoing efforts. This March, the Committee's request for Green Teams was passed, allowing for even more effective sustainability initiatives in the future.

The ORCSD consists of the following schools:

Mast Way Elementary School

Moharimet Elementary School

Oyster River Middle School

Oyster River High School

The Oyster River Sustainability Committee serves as a community change agent, dedicated to planning long-term sustainability initiatives that engage members of the Oyster River Cooperative School District Community and the towns of Durham, Lee and Madbury.

Purpose of this Document

The purpose of this document is for ORCSD Sustainability Committee and community members to maintain a yearly analysis of the district's ecological footprint by benchmarking the following sectors:

Solid Waste and Recycling
Water Consumption
Electricity
Transportation
Paper Consumption
Energy

Layout of this Document

This document is divided into three sections. Part I represents the total measurements for the six sectors in terms of usage, costs, and metric tons of carbon dioxide equivalent emitted ($MTCO_2E$). The Document aims to cover the entire Fiscal Year 2011-2012, but also includes additional benchmark figures from FY 2012-2013 where possible. Totals were computed for the entire district and compared to previous fiscal school years where applicable. Part II serves as an individual school assessment that incorporates each school across the six sectors while comparing to previous fiscal years where applicable. Part III highlights impactful changes and improvements in sustainability since the prior fiscal year and concludes with recommendations for decreasing ORCSD'S ecological footprint in the future with additional recommendations for future Ecological Footprint Reports. Appendices containing consolidated charts with footprint measurements as well as calculation tools are included at the end of the report.

PART 1. TOTAL MEASUREMENTS FOR SOLID WASTE AND RECYCLING, TRANSPORTATION, WATER CONSUMPTION, ENERGY, ELECTRICITY, AND PAPER CONSUMPTION

Totals

Total Costs

Costs						
	Waste	Fleet	Water	Energy		Electricity
				Propane	Natural Gas	
Mast Way	$6,321.11	-	-	$43,562.17	-	$21,434.26
Moharimet	$6,409.84	-	-	$24,137.57	-	$25,697
Middle School	$5,425.14	-	$3,221.40	-	$61,389	$45,697
High School	$7,484.66	-	$3,638.00	-	$106,407.35	$200,359.71
Total	$25,640.75	$182,084.90	$6,859.40	$67,699.74	$167,796.40	$293,187.97

Total Cost	**$743,269.20**
Cost Per Student	$371.63

$MTCO_2E$

MTCO2E				
	Fleet	Energy		Electricity
		Propane	Natural Gas	
Mast Way		157.19		173
Moharimet		90.43		160
Middle School			216	445
High School			972	1,106
Total	533	247.62	1,188	1,885

Total MTCO2E	**3,853.62**
MTCO2E Per Student	1.926

That's the equivalent of the amount of carbon sequestered by 50 tree seedlings per student each year!

Solid Waste and Recycling

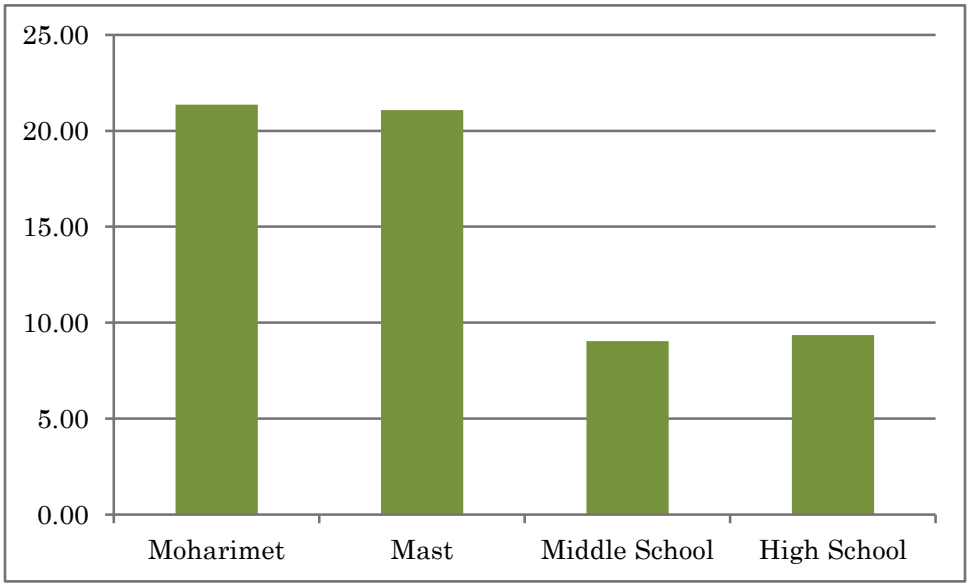
Total Costs for all Schools

School	Solid Waste & Recycling Cost
Mast Way	$6,321.11
Morharimet	$6,409.84
Middle School	$5,425.14
High School	$7,484.66
Total	$25,640.75

As of FY 2012-2013, the structure of the waste disposal system has shifted, and the changes are detailed below.

School	Single Stream	Composting	Trash	Cardboard	Monthly Cost	Yearly Cost	~Yearly Expenditure/ Student
High School	$76	$100.00	$660/haul	$44.50	$220.50	$8,361.60	$10.45
Middle School	$76	$100.00	$180.00	$44.50	$400.50	$4,806.00	$8.01
Moharimet	$76	$100.00	$180.00		$356.00	$4,271.50	$14.23
Mast Way	$76	$100.00	$180.00		$356.00	$4,271.50	$14.23
Total					$1,333.00	$21,710.60	$10.85

Breakdown of Costs Per Student by School



Transportation Fleet

Totals: All Variables for the Transportation Fleet

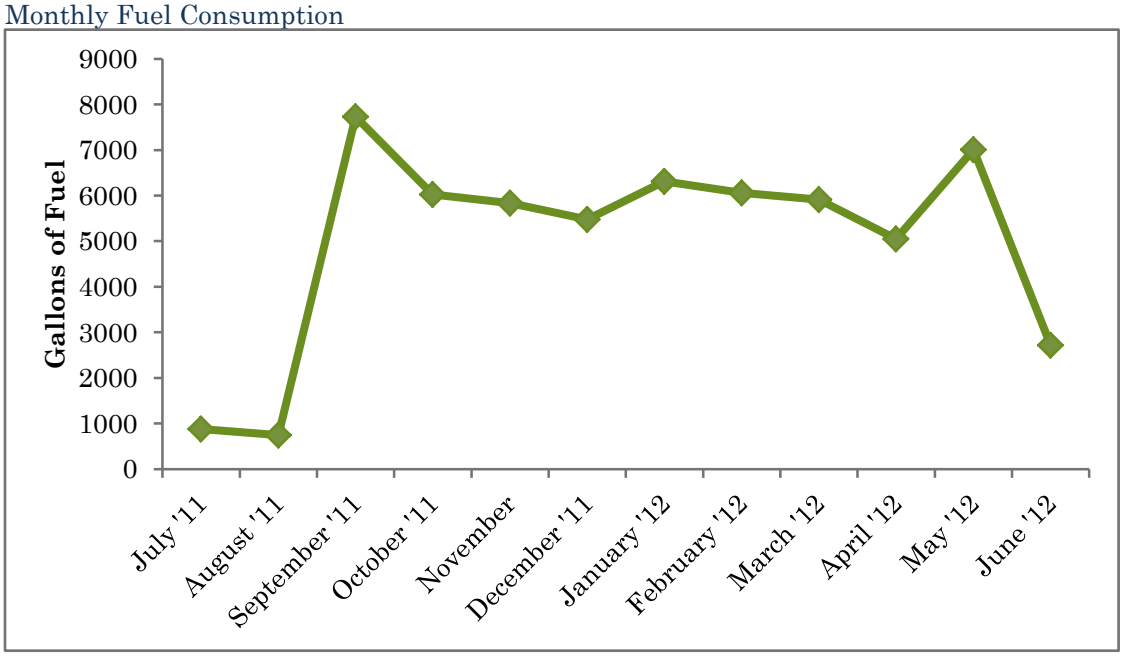
	Totals from July 2011 - June 2012	
	Total	Average Per Bus
Miles Driven	*506,588*	*14071*
Miles Per Gallon	*12,664*	*9.1*
Fuel Consumed (Gallons)	*60,002*	*1666.72*
Maintenance ($)	60,293.90	1722.68
Repairs ($)	97,589	2710.81
Body Work ($)	23,660	657.21
Tires ($)	2,184.40	60.68
Filters	1,311.90	36.44
Total Costs	$182,084.90	$5187.82

Total Carbon Dioxide Emissions

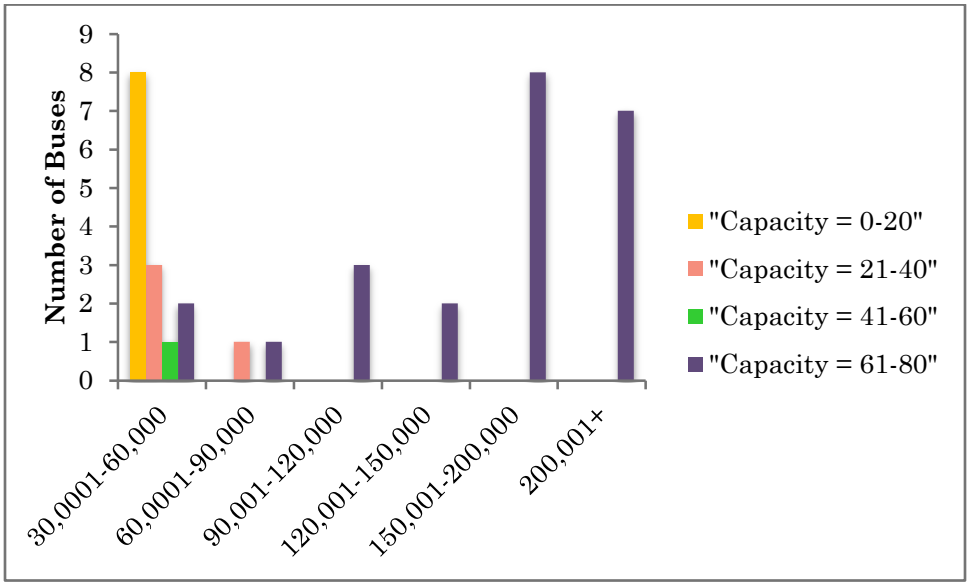
Fuel Consumed (Gallons)	$MTCO_2E$
60,002	533

Fuel Consumed Per Student (Gallons)	$MTCO_2E$ Per Student
30	0.267

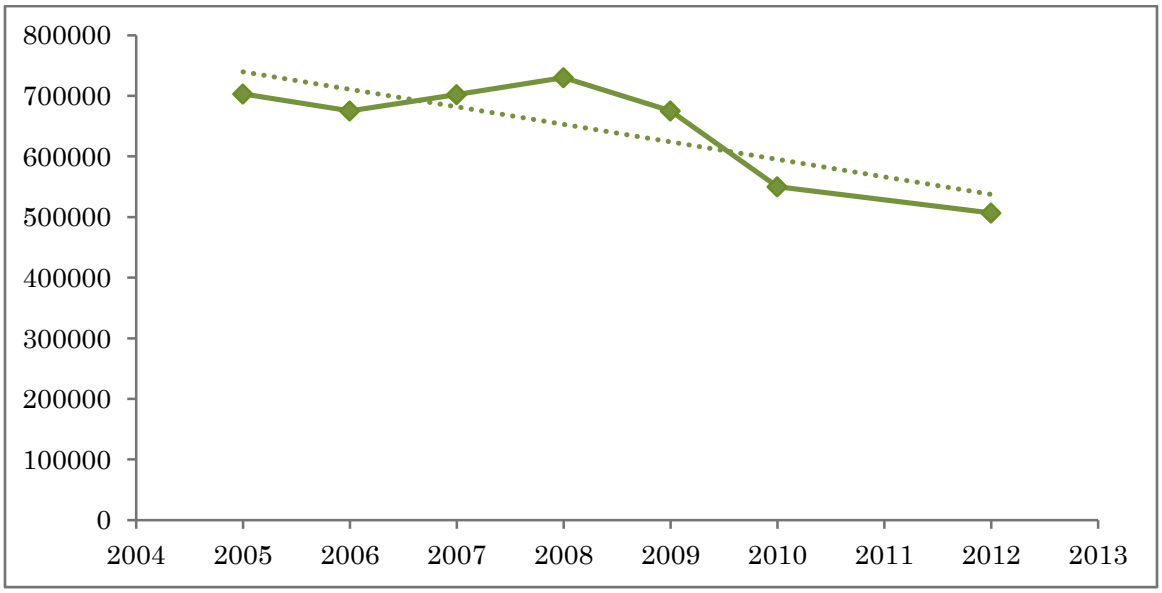
Monthly Fuel Consumption



Annual Mileage by Bus Capacity: Frequencies



Annual Comparison of Miles Driven by the Fleet



Water Consumption

Omitted Data

Of the four schools in the Oyster River district, Mast Way and Moharimet Elementary schools are omitted from this report. Due to the fact that the two elementary schools water sources are wells, the only facilities included in this report are the High School and Middle School.

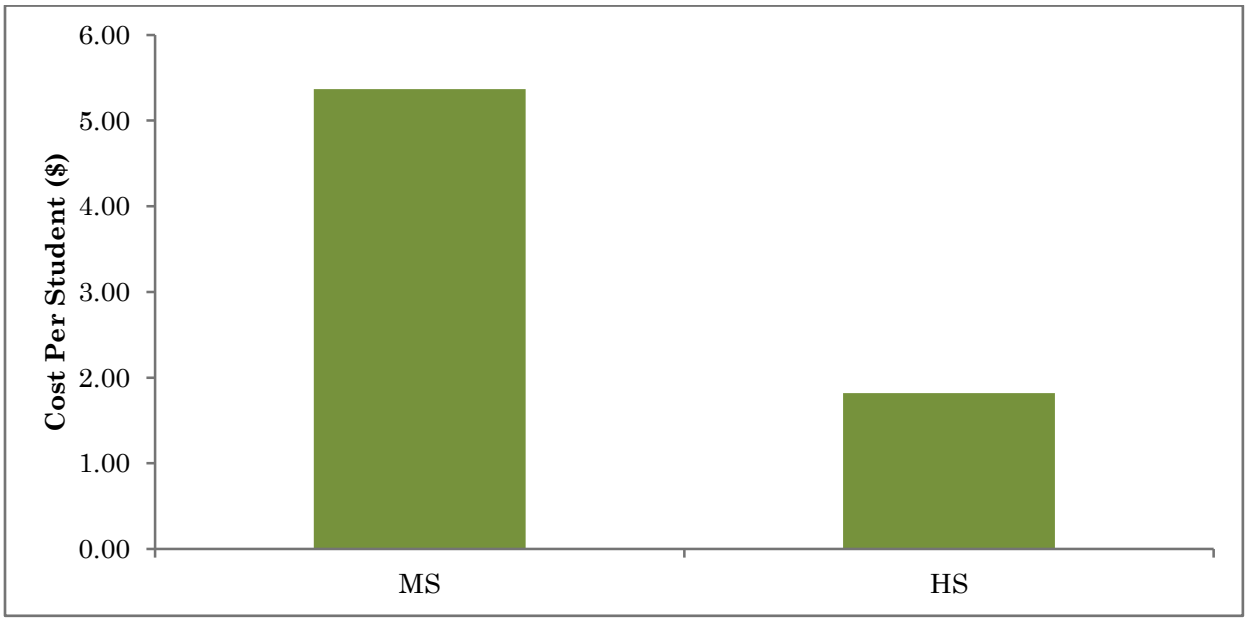
Read Data and Usage

	Read Date and Usage				
School	March '12	September '11	March '11	September '10	April '10
High School	59,968	52,325	22,017	50,344	47,538
Middle School	50,000	41,000	62,000	29,000	57,000
Total Usage	109,968	93,325	84,017	79,334	104,538

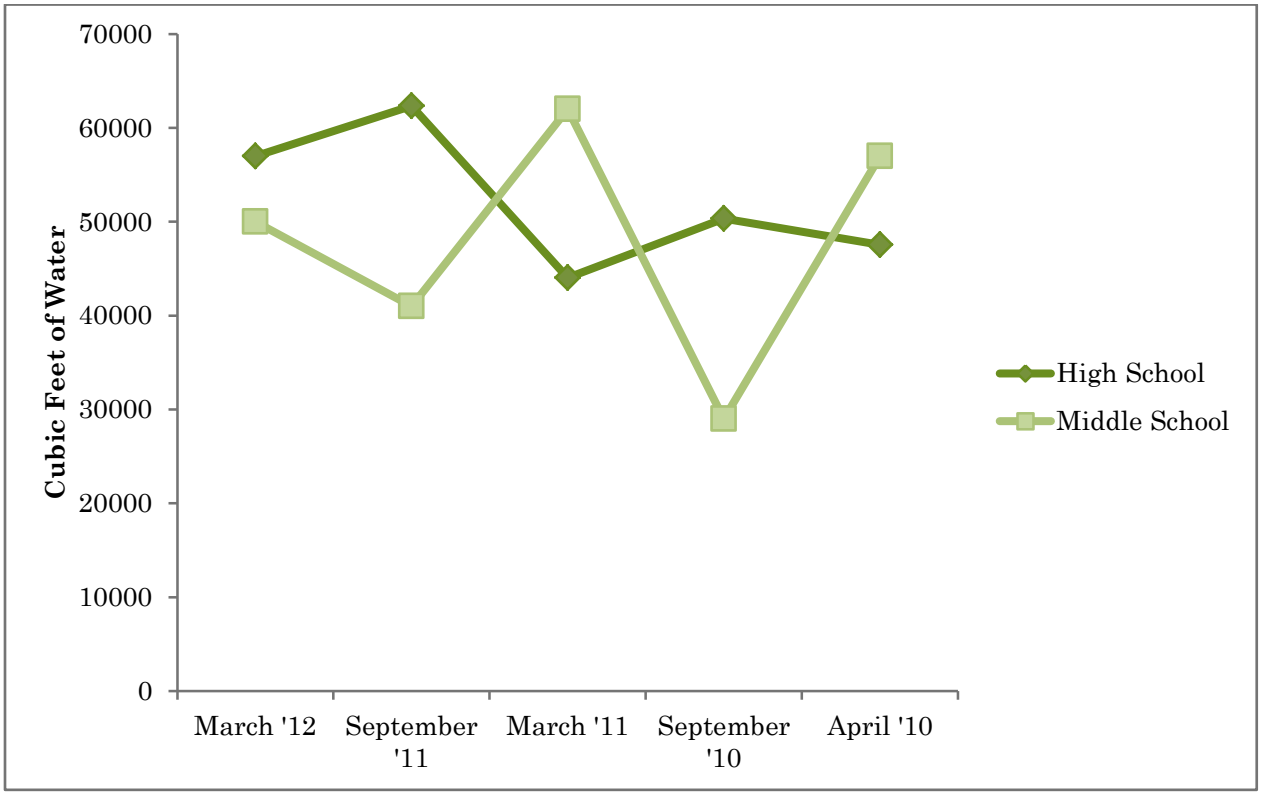
Impact of Hydration Stations on Water Bottle Consumption

School	Number of Units	Water Bottles Saved
High School	2	26,647
Middle School	2	41,722
Mast Way	1	5,848
Moharimet	1	11,983

Breakdown of Water Costs per Student by School



Monthly Water and Sewer Consumption



Cost of Water and Sewage

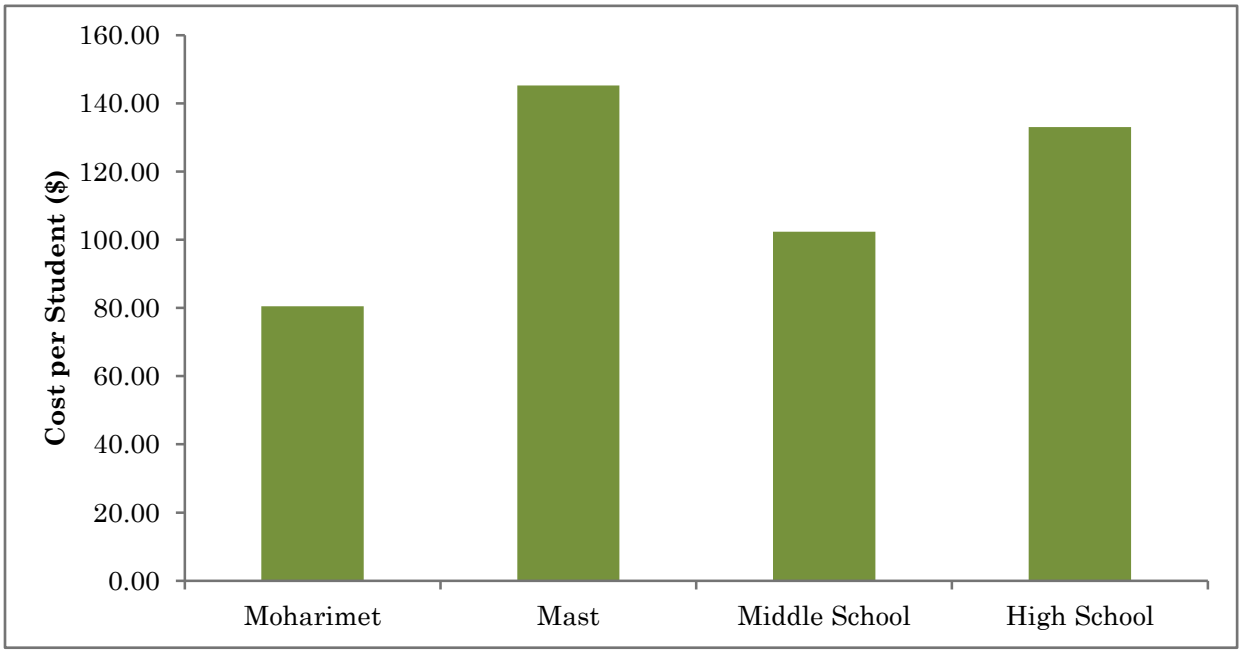
	Water and Sewage Use (Cubic Feet)	Cost
High School	104,232.80	$3,638.00
Middle School	91,000	$3,221.40

Energy

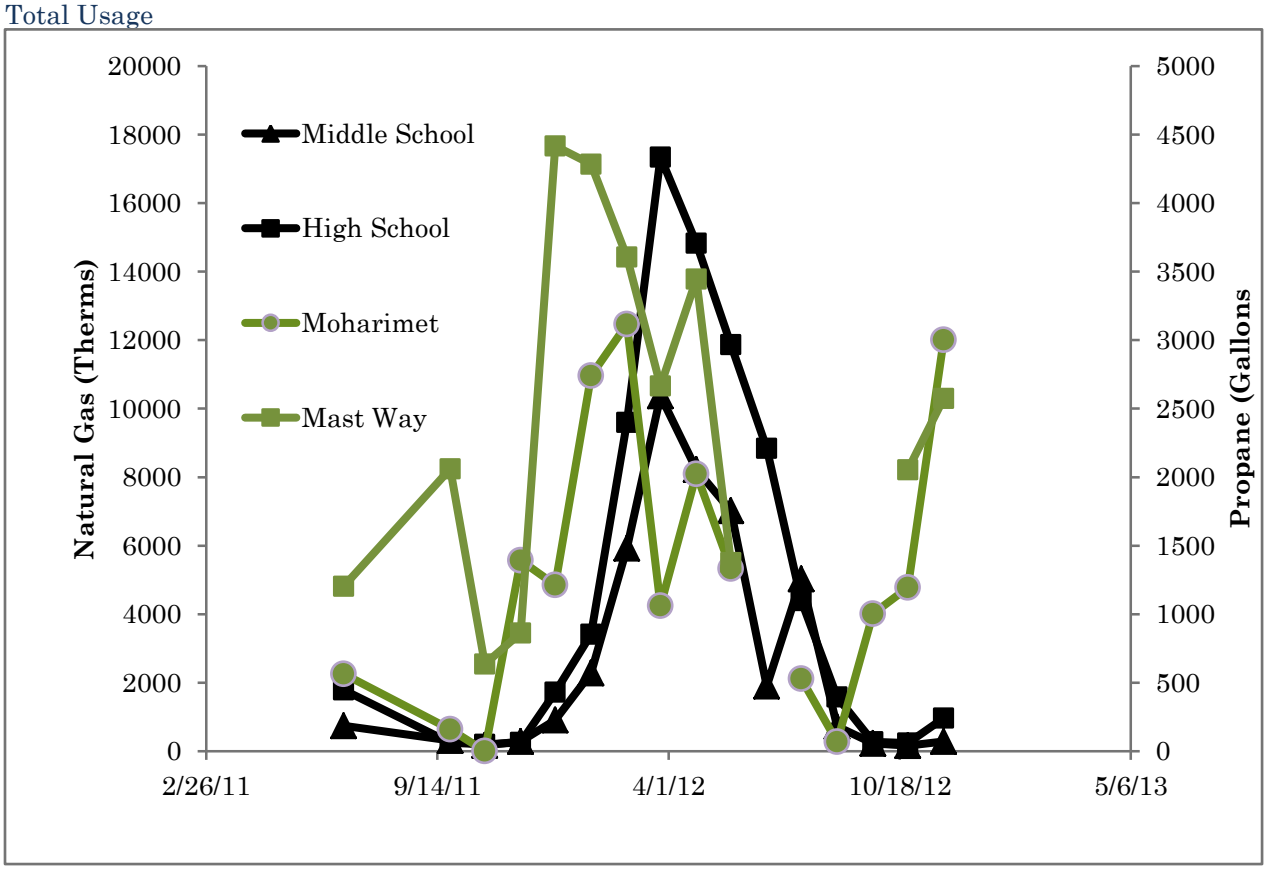
Total Cost

School	Energy Type	Total	Cost	$MTCO_2E$
Mast Way	Propane (Gallons)	24,562	$43,562.17	187.19
Moharimet	Propane (Gallons)	13,602.60	$23,410.52	90.43
Middle School	Natural Gas (Therms)	43,154.49	$55,930.57	216
High School	Natural Gas (Therms)	74,327.29	$106,407.35	972
Total		112,491	$173,380.04	1,465.62

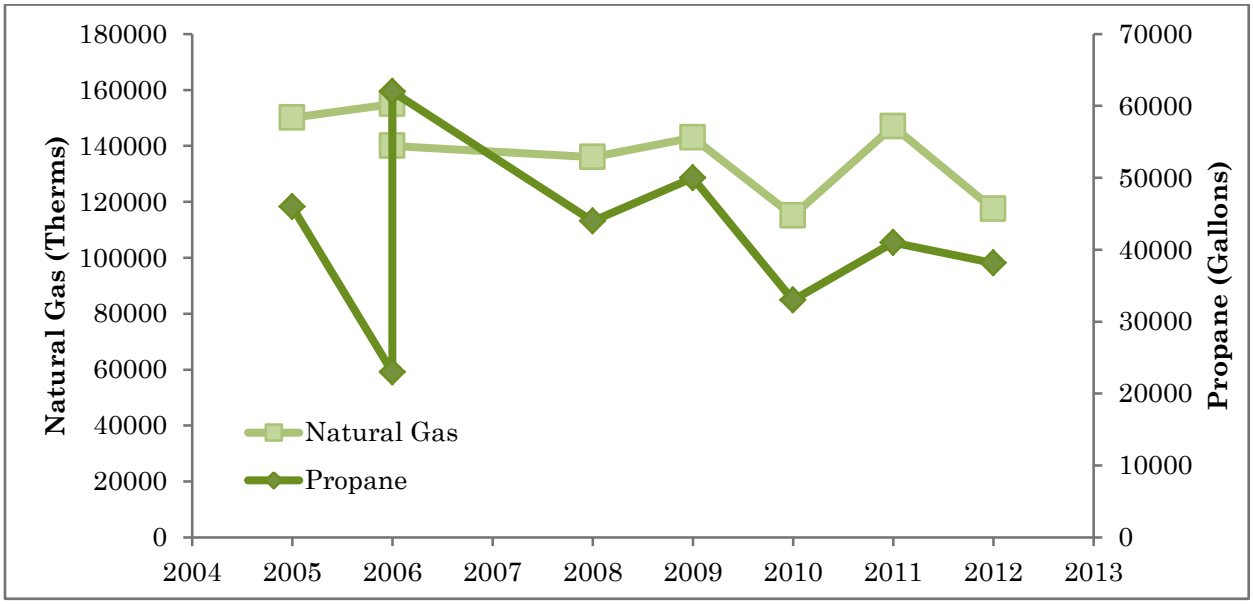
Breakdown of Costs Per Student by School



Total Usage



Annual Comparison of Usage

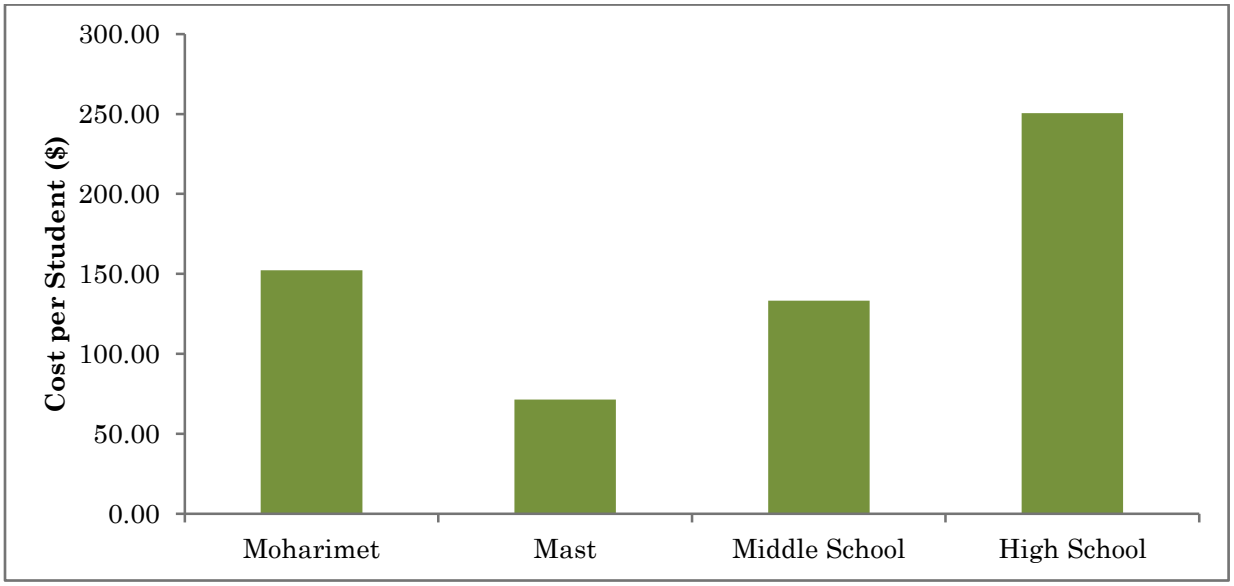


Electricity

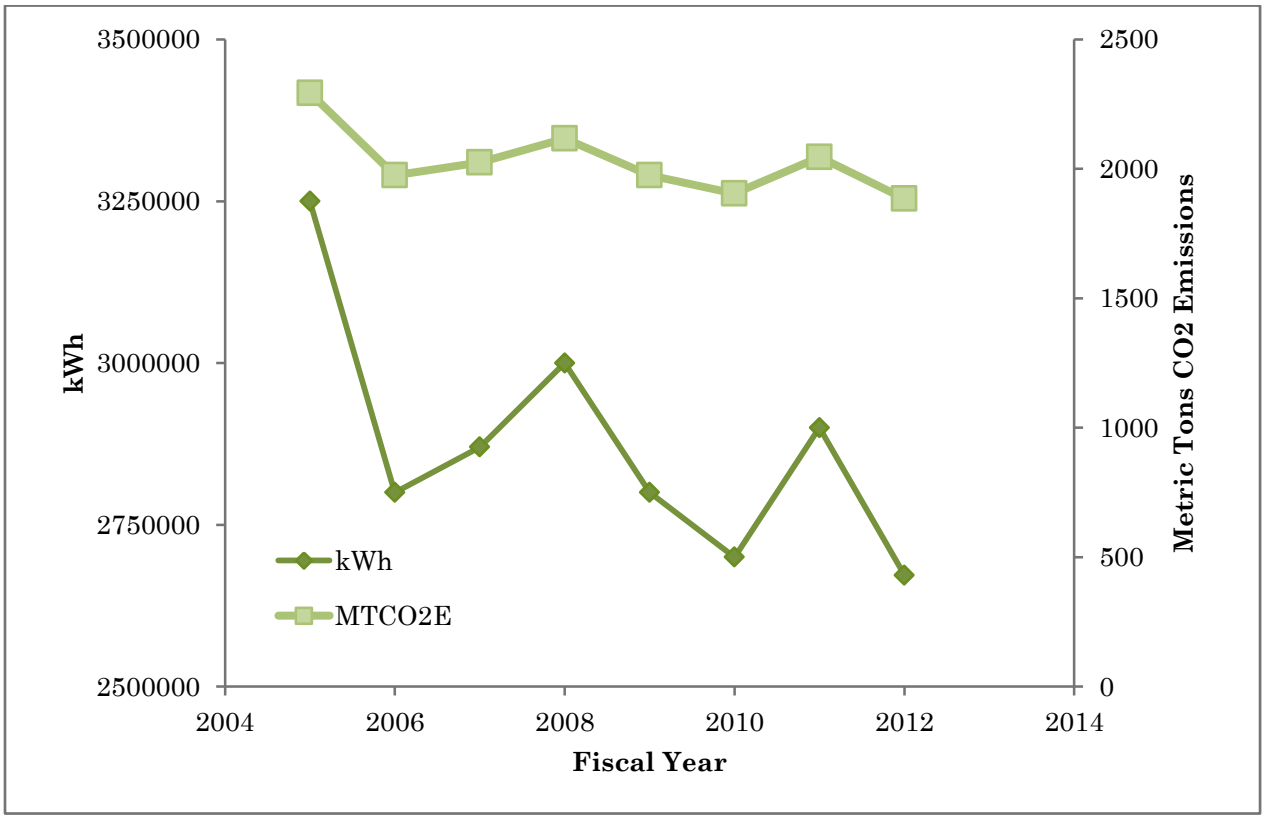
Total Costs and Usage

School	Cost	kWh	MTCO2E
High School	$21,434.26	1,568,121	1,106
Middle School	$25,697.00	631,200	445
Mast Way	$45,697.00	245,360	173
Moharimet	$200,359.71	227,368	160
All Schools	$293,187.97	2,672,049	1,885

Breakdown of Costs Per Student by School



Annual Comparison of Use



Paper Consumption

Overall paper consumption within the district is difficult to track as the following figures do not include amounts used by students or any amount used in classrooms that the district does not purchase. For the purpose of the Report and for comparison in future years, paper amounts purchased by the district will serve as a proxy for overall paper consumption in all schools. The following chart displays paper purchases (reams) for the district in FY 2011-2012.

	White	Colored	Total/Period
July-September	1,300	250	1,550
September-November	1,000	200	1,200
December-March	2,410	420	2,830
April-June	1,390	140	1,530
Total	6,100	1,010	7,110

Cost Differences	Reams	Price	Total Cost
Recycled White Paper	6,100	$4.40	$26,840.00
Non-Recycled White Paper	6,100	$2.52	$15,372.00

Added cost of switching to recycled paper in the district would be $11,468.00/year.

PART II: INDIVIDUAL SCHOOL ASSESSMENTS

Mast Way Elementary

Solid Waste and Recycling

Cost	Percent Change from Previous Year
$6,321.11	11.9%

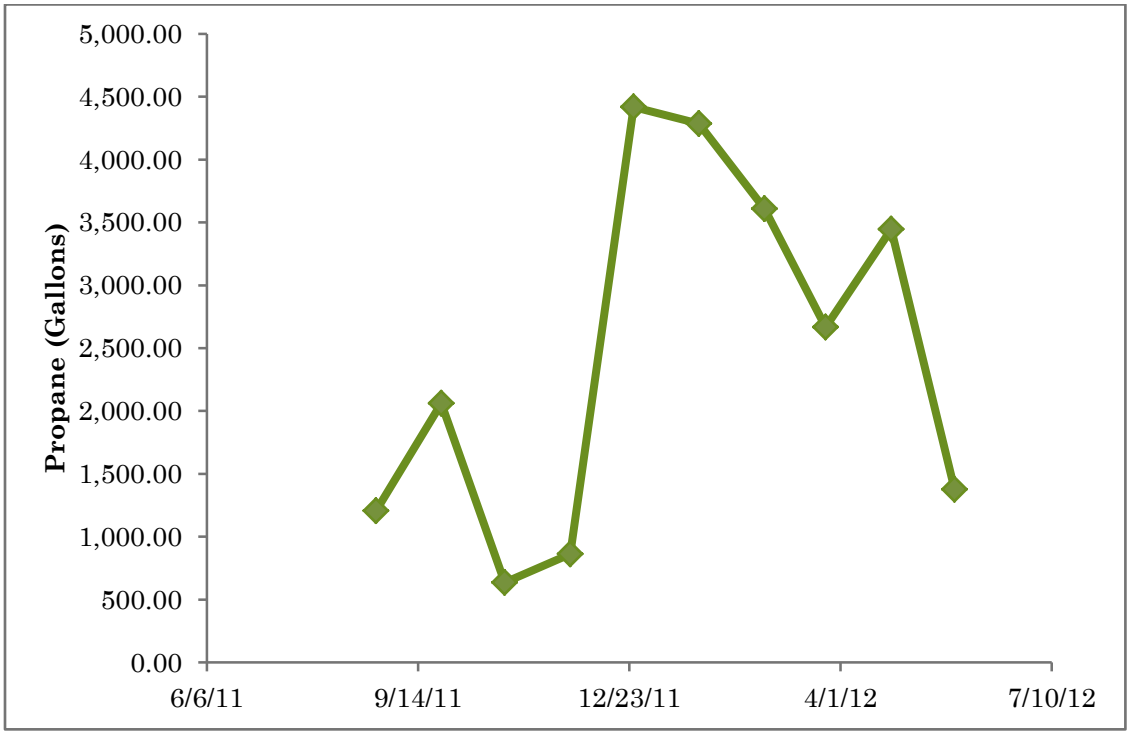
Water Consumption

Due to the fact that Mast Way Elementary's water is extracted from a well, its averages and patterns of consumption are not included in this report.

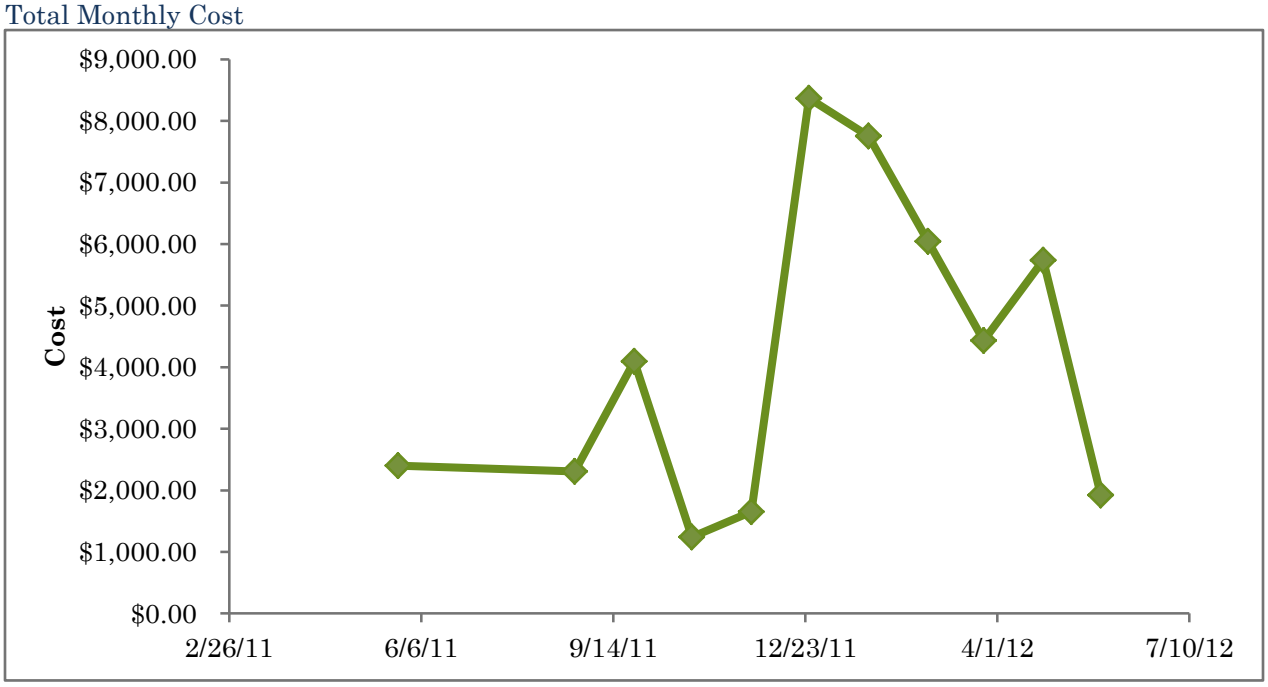
Energy

Utility Data: Mast Way	
Propane: Gallons	24,561.50
Cost	$43,562.17

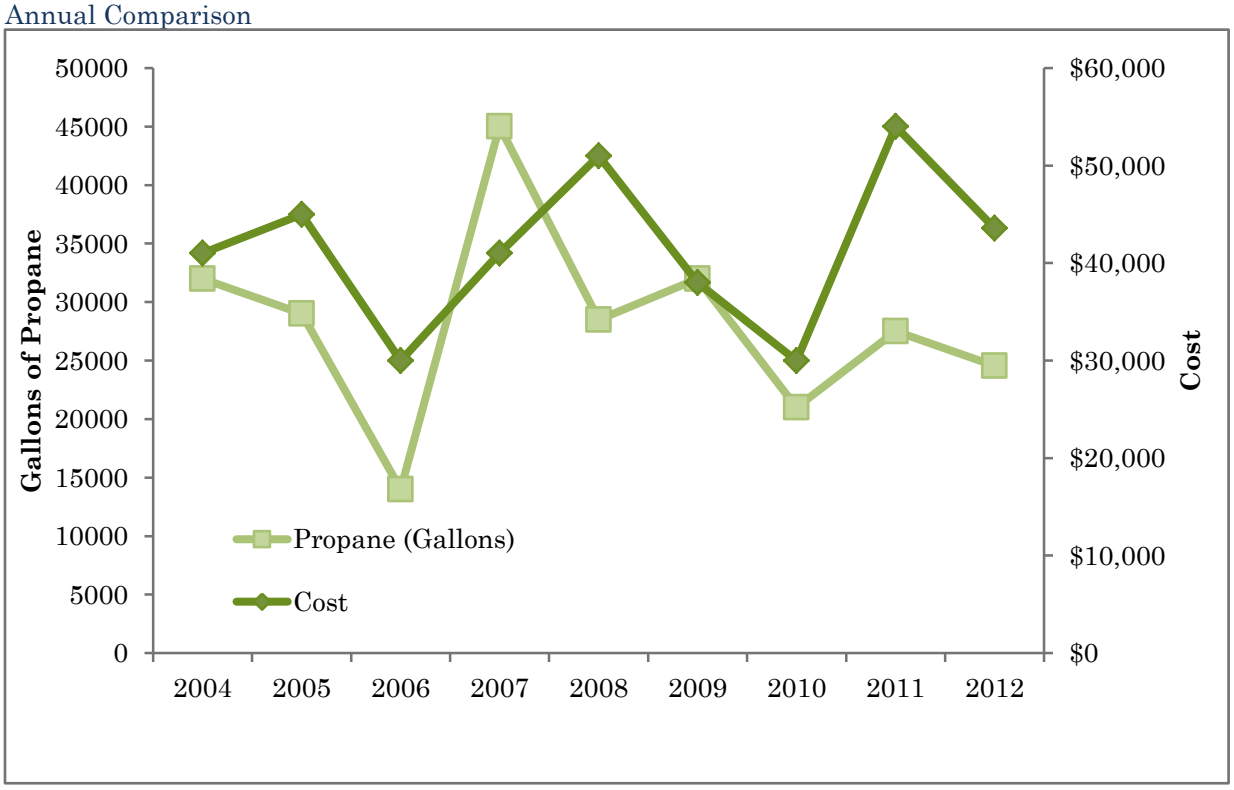
Total Monthly Usage



Total Monthly Cost



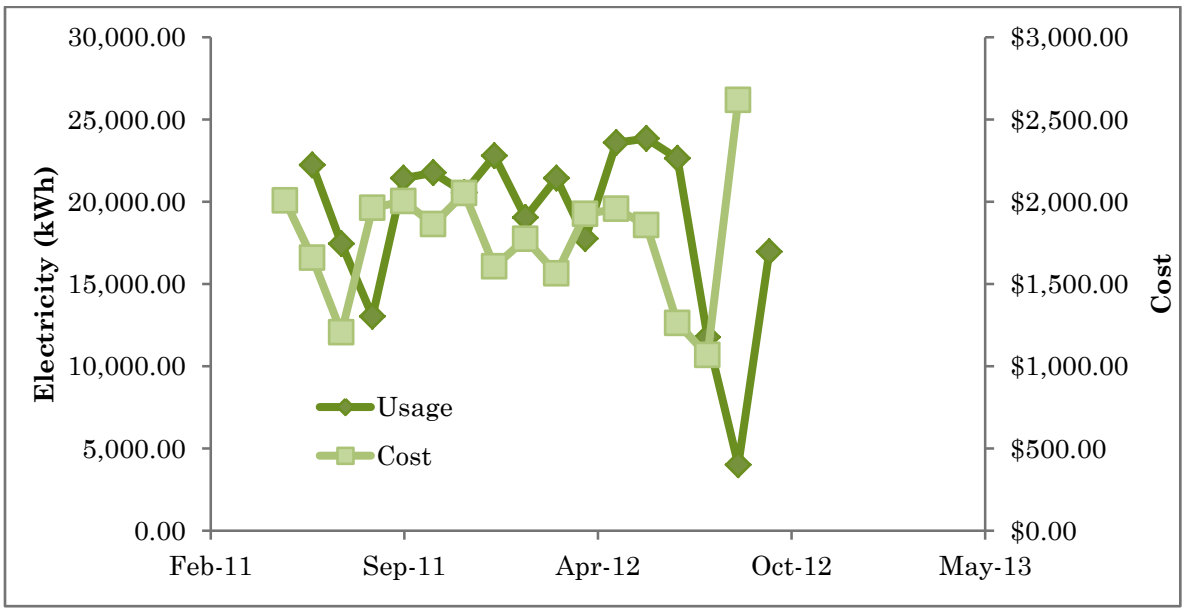
Annual Comparison



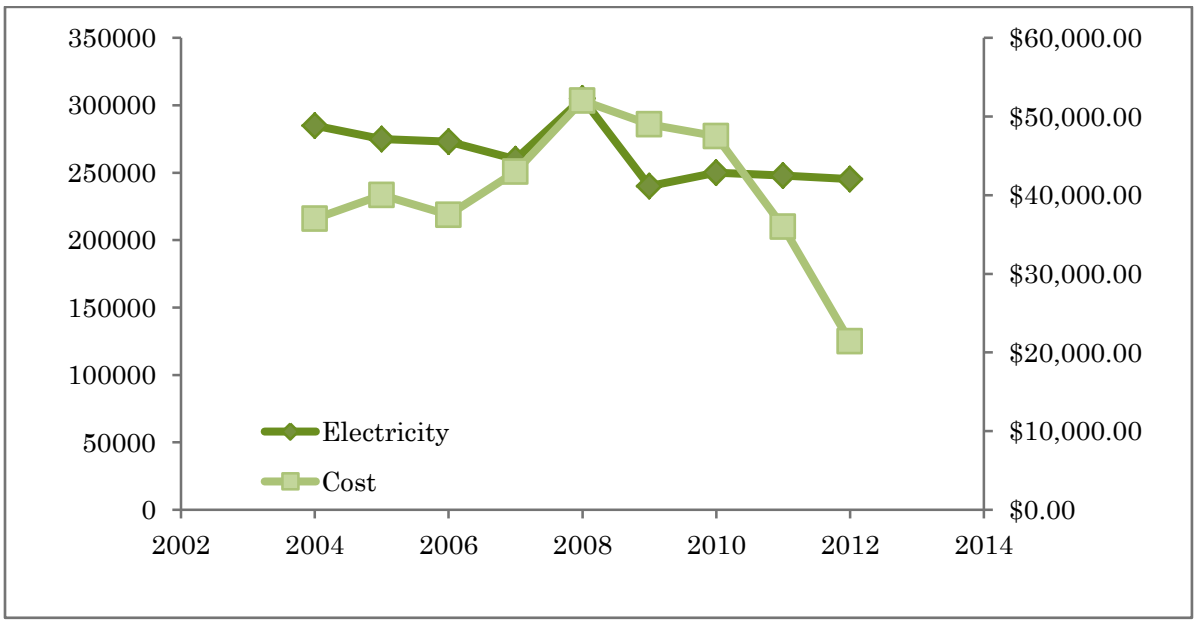
Electricity

Electricity: Mast Way	
Usage (kWh)	245,360
Cost	$21,434.26

Total Monthly Use and Cost



Annual Comparison



Moharimet Elementary

Solid Waste and Recycling

Cost	Percent Change from Previous Year
$6,409.84	(79.7%)

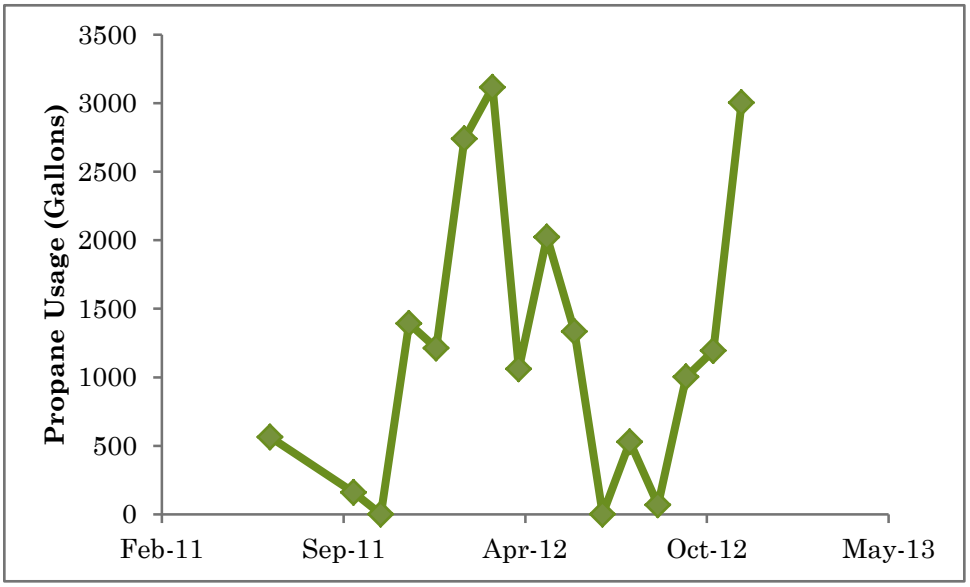
Water Consumption

Due to the fact that Mast Way Elementary's water is extracted from a well, its averages and patterns of consumption are not included in this report.

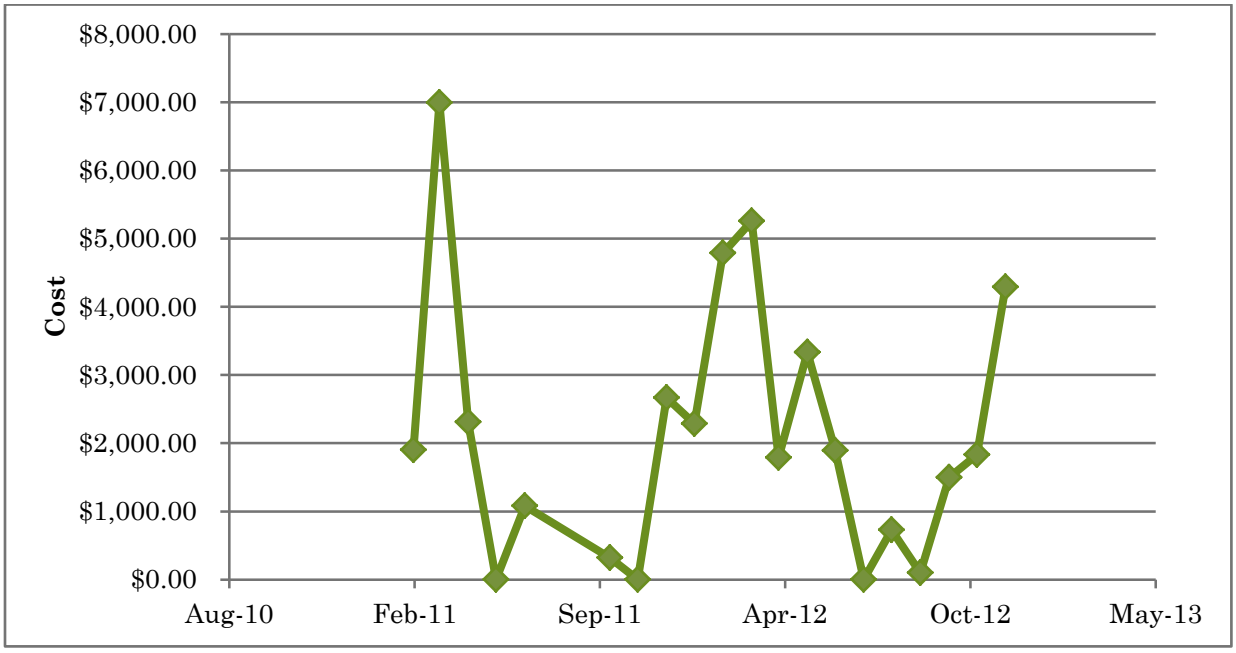
Energy

Utility Data: Mast Way	
Propane: Gallons	14,131.40
Cost	$24,137.57

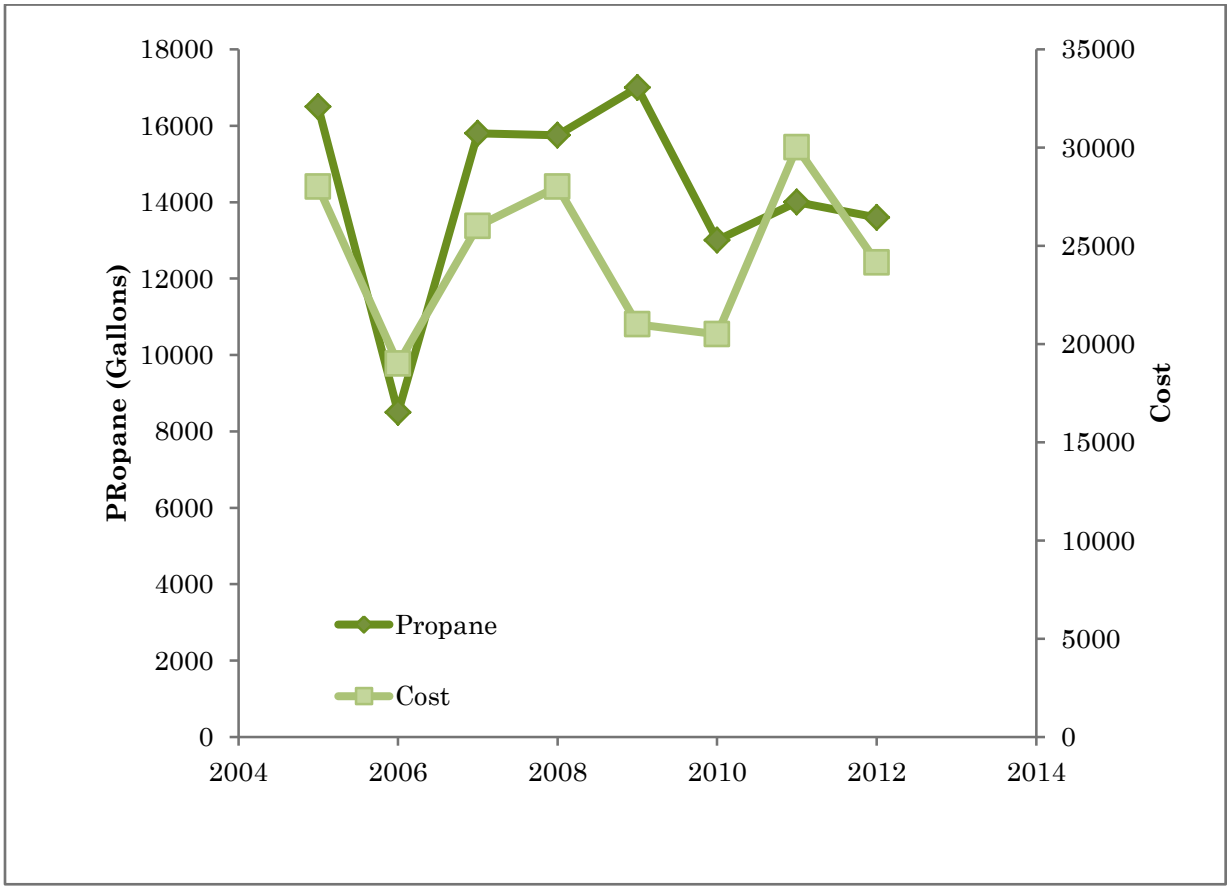
Total Monthly Use



Total Monthly Cost



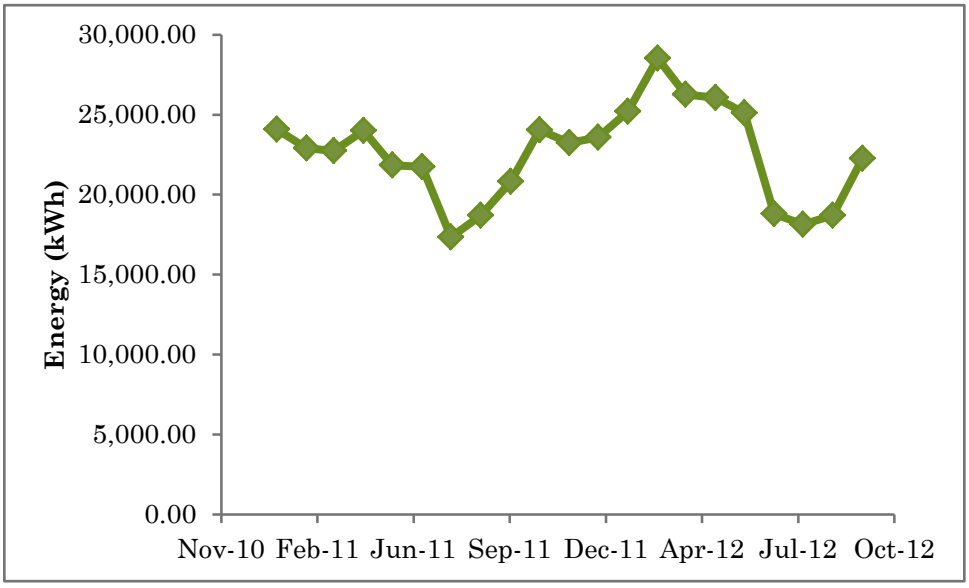
Annual Comparison



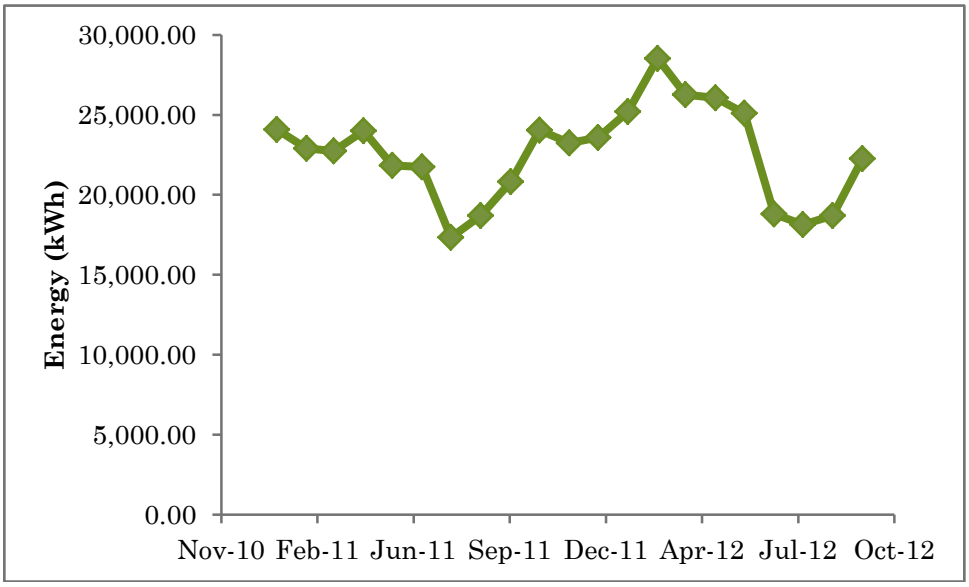
Electricity

Electricity: Moharimet Elementary	
Usage (kWh)	277,630
Cost	$45,697

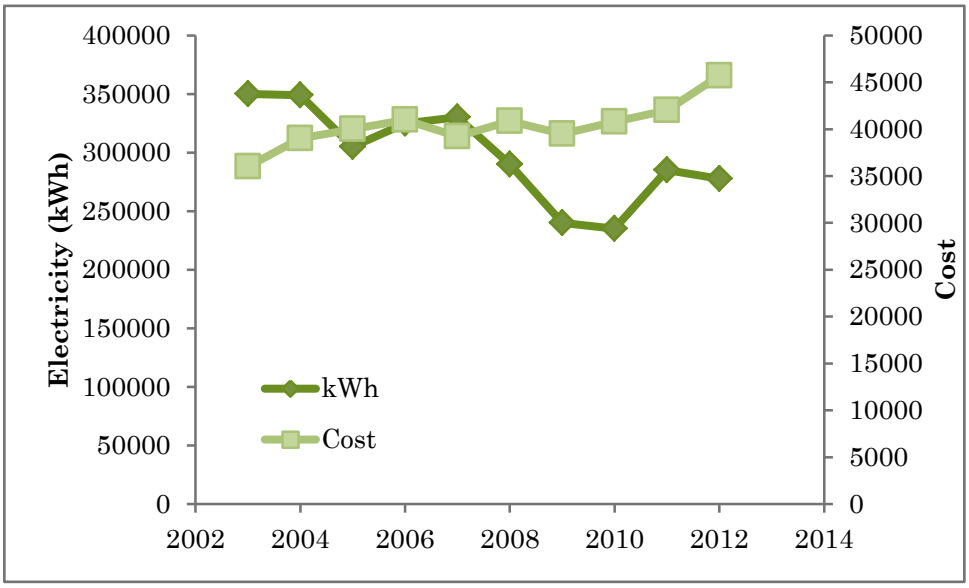
Total Monthly Usage



Total Monthly Cost



Annual Comparison



Oyster River Middle School

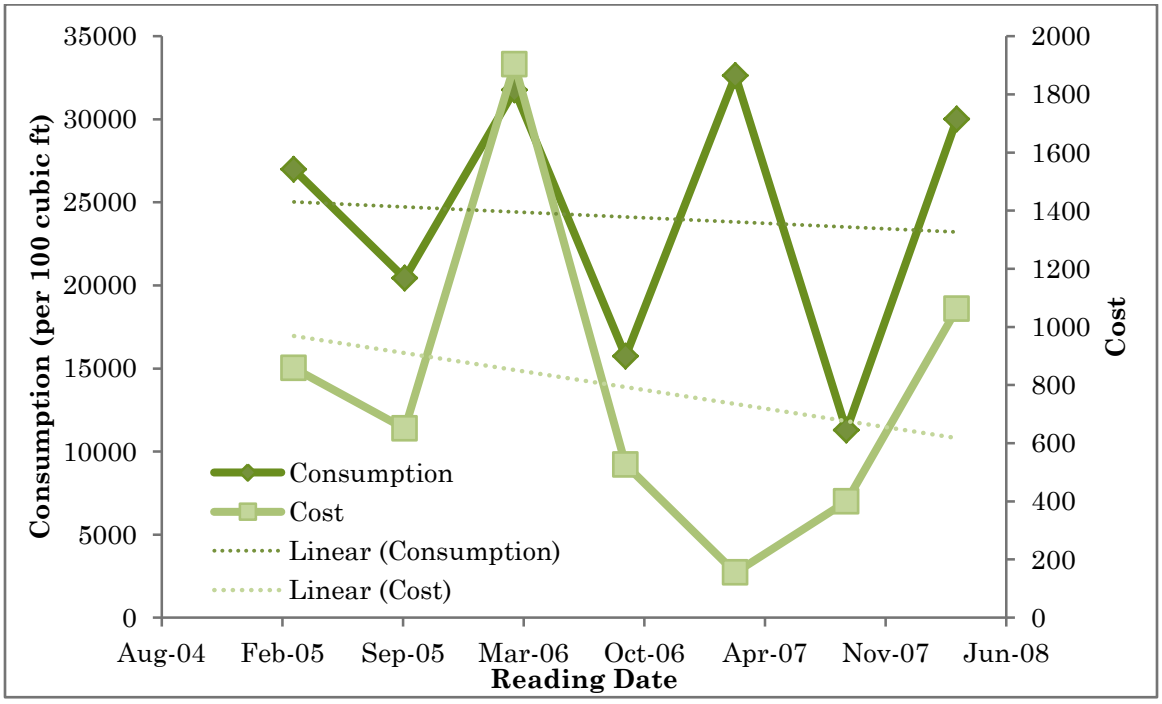
Solid Waste and Recycling

Cost	Percent Change from Previous Year
$5,424.14	44.3%

Water Consumption

Annual Water Consumption: Middle School	
Usage (per 100 cubic feet)	91,000
Cost	$3,221.40

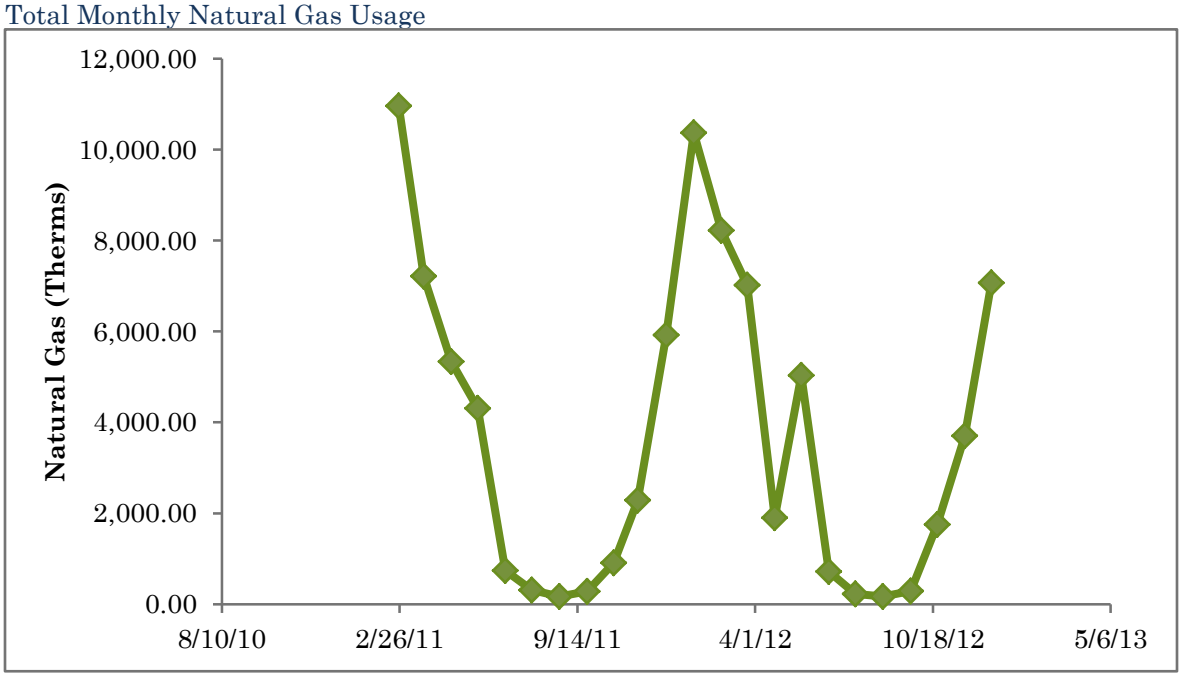
Total Monthly Water Consumption and Cost



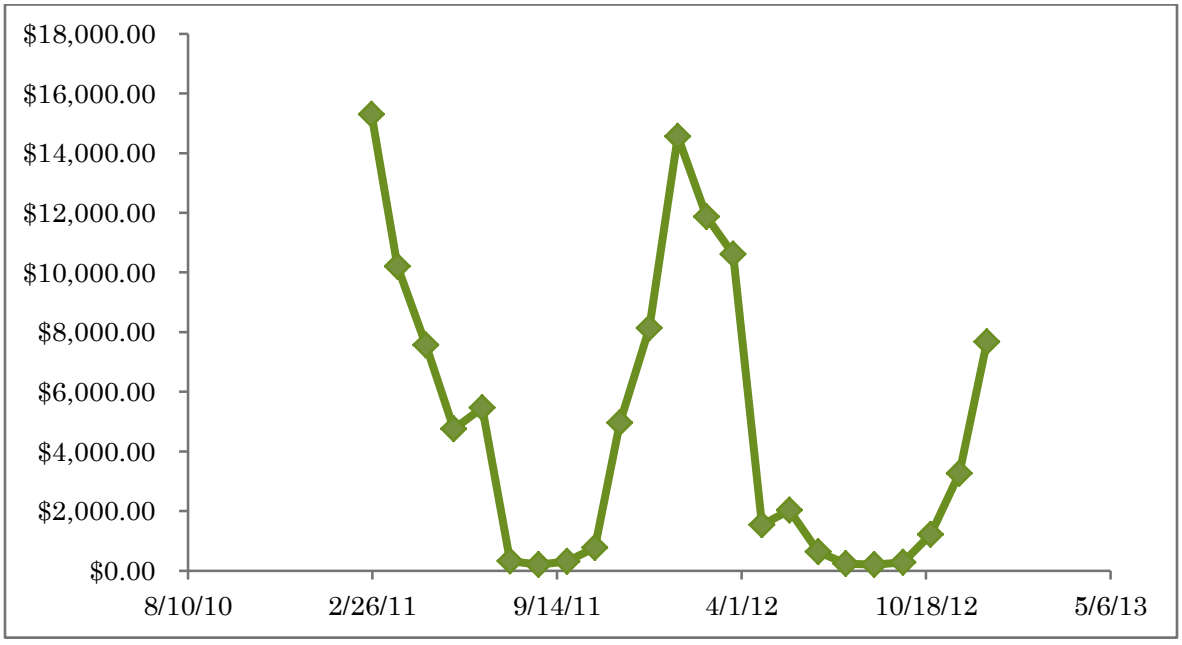
Energy

Energy: Middle School	
Natural Gas (Therms)	43,154
Cost	$61,389

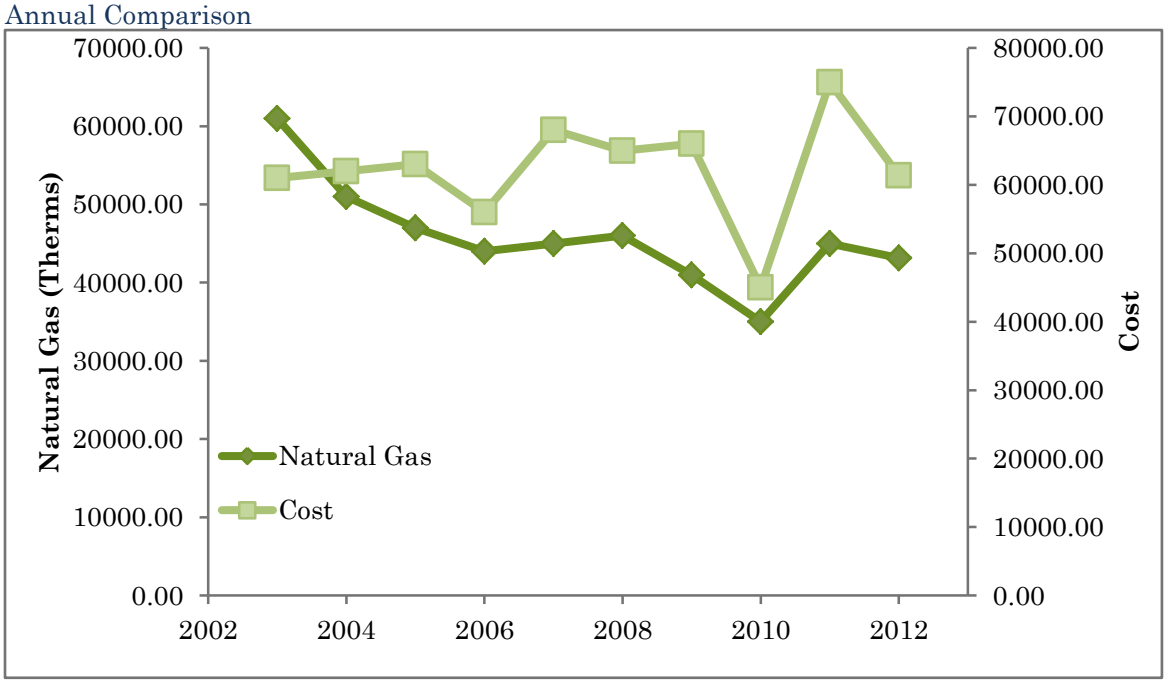
Total Monthly Natural Gas Usage



Total Monthly Cost



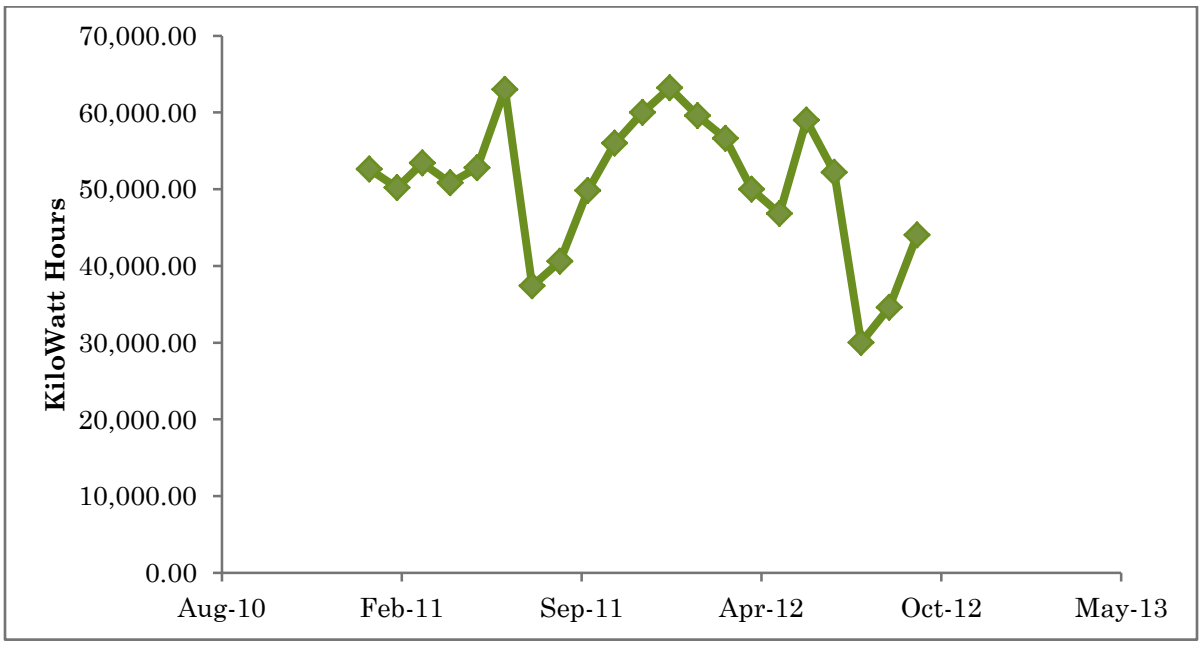
Annual Comparison



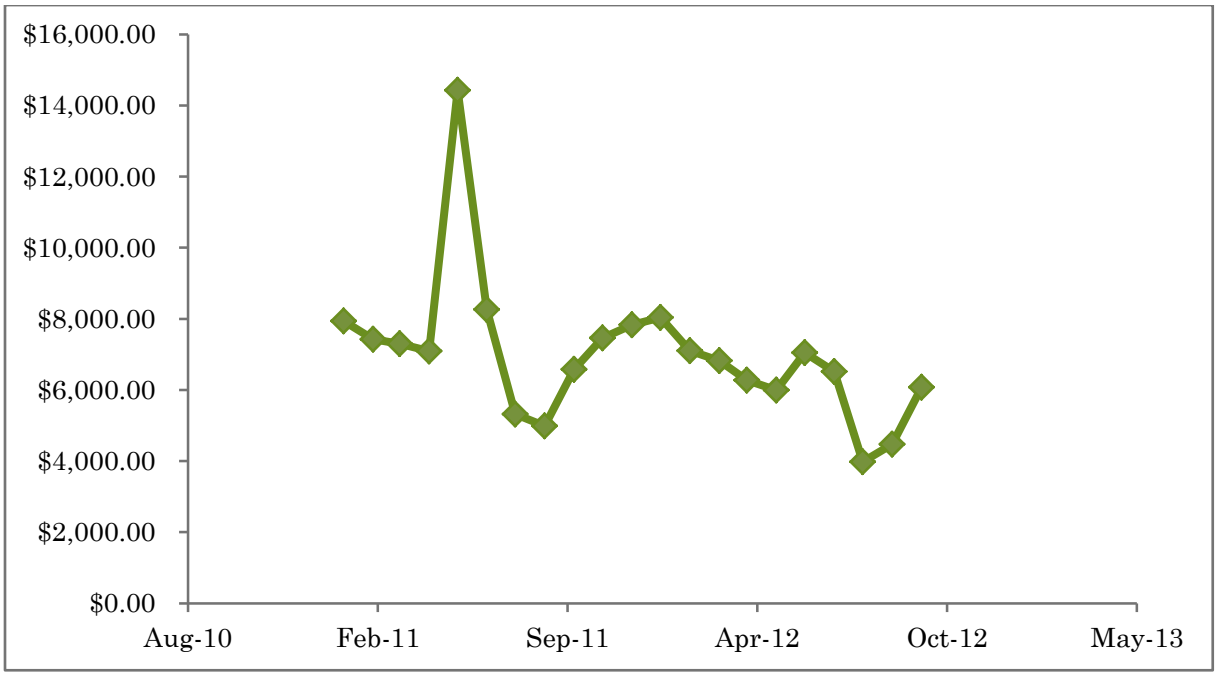
Electricity

Electricity: Middle School	
Usage (kWh)	631,200
Cost	$79,961.38

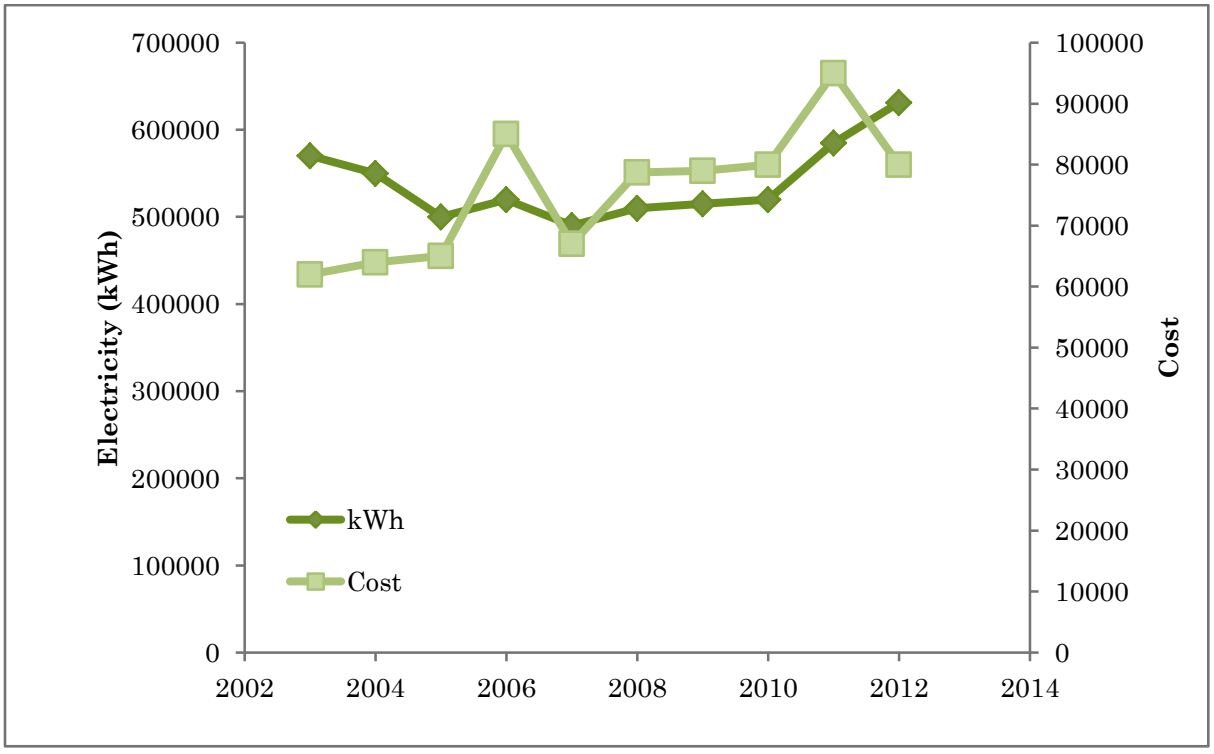
Total Monthly Electricity Usage



Total Monthly Electricity Cost



Annual Comparison



Oyster River High School

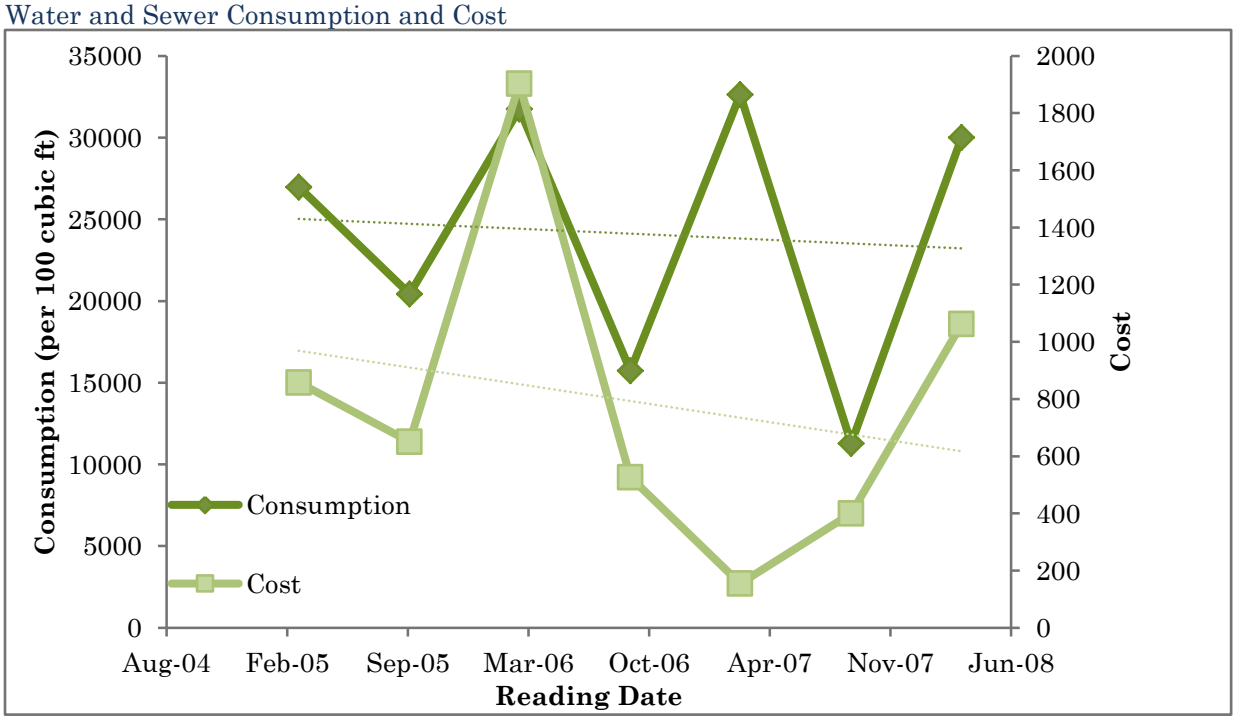
Solid Waste and Recycling

Cost	Percent Change from Previous Year
$7,484.66	19.6%

Water Consumption

Annual Water Consumption: High School	
Usage (per 100 cubic feet)	104,232.80
Cost	$3,638.00

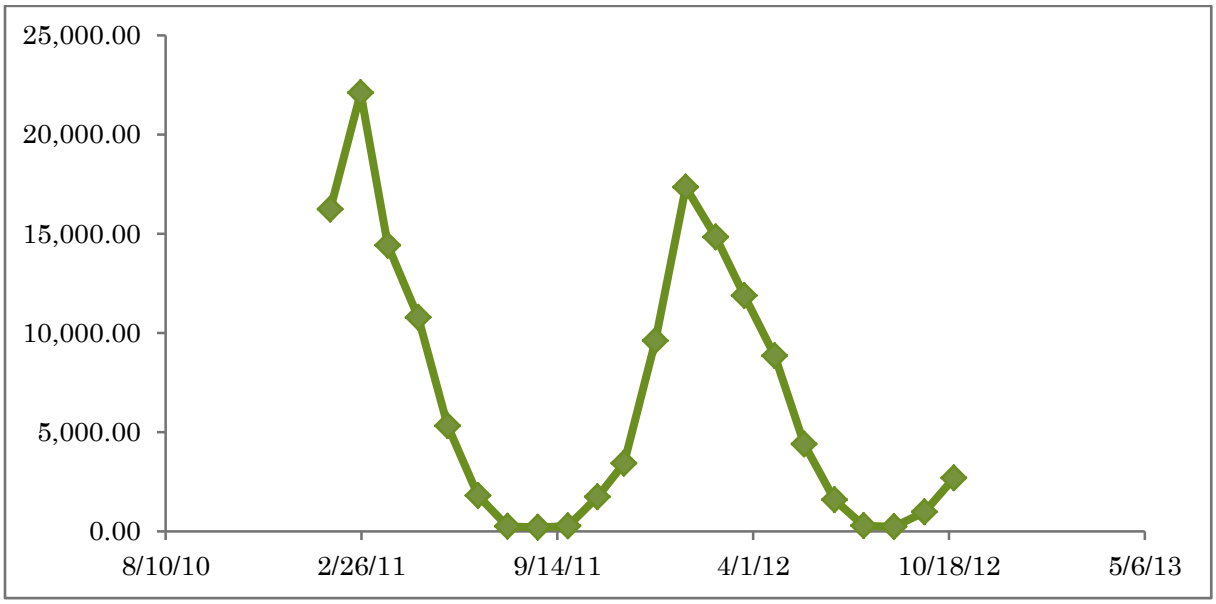
Water and Sewer Consumption and Cost



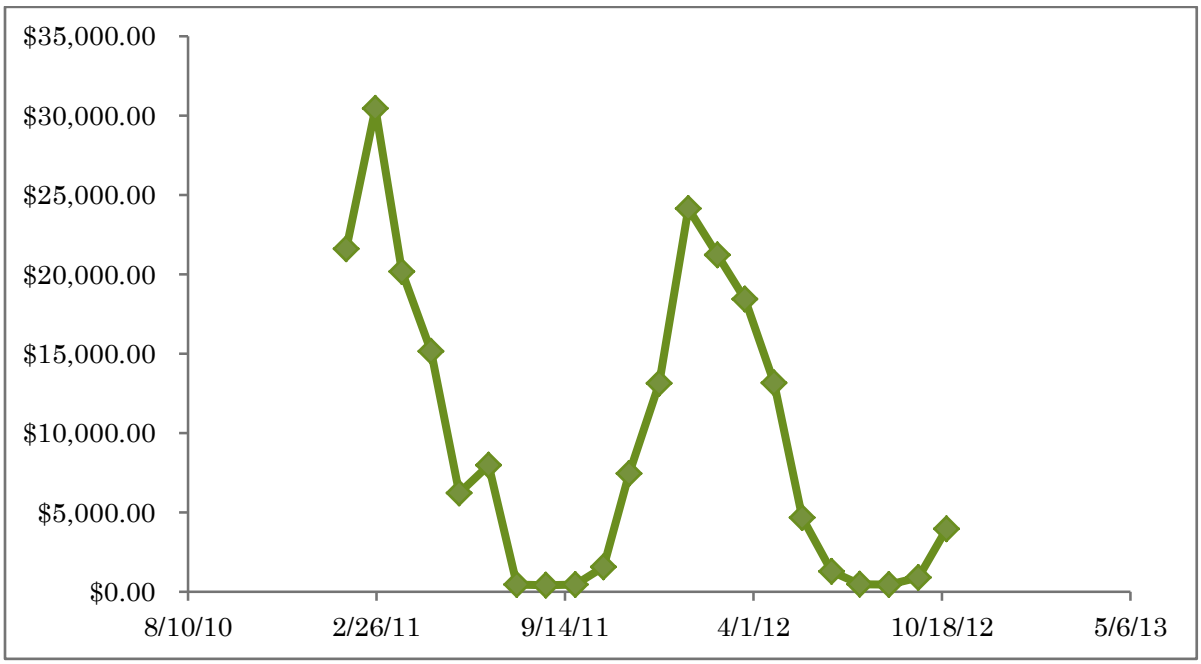
Energy

Energy: High School	
Natural Gas (Therms)	74,327.29
Cost	$106,407.35

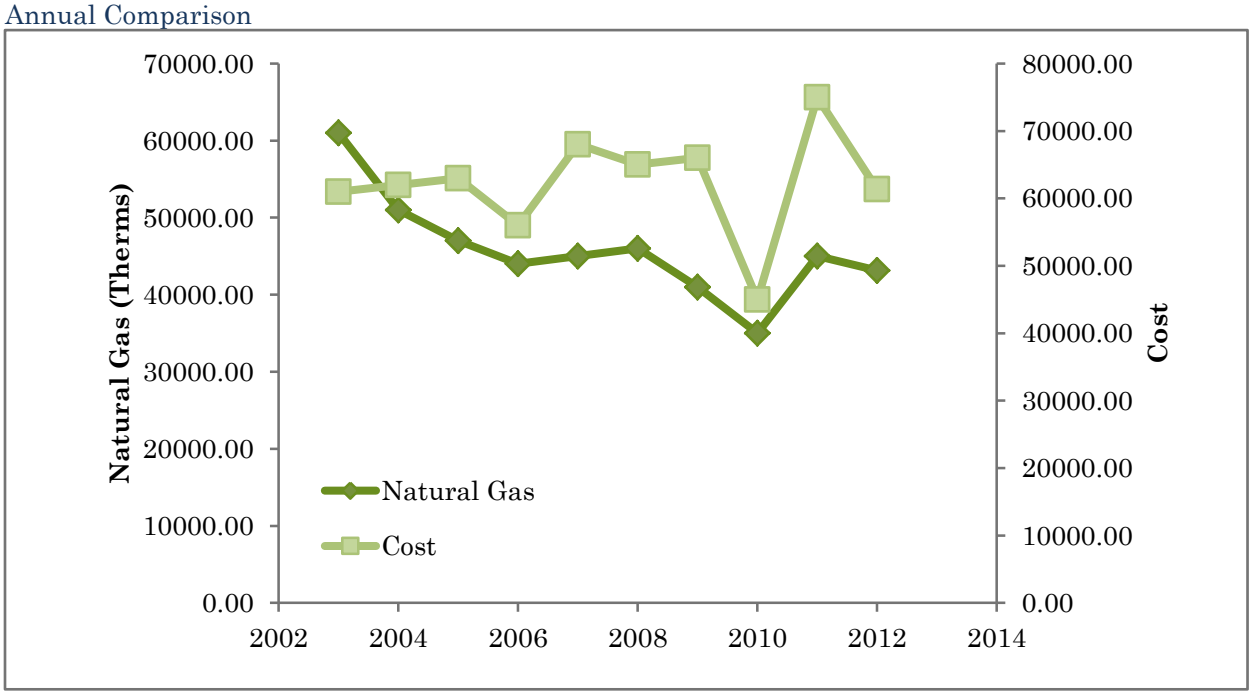
Total Monthly Natural Gas Consumption



Total Monthly Natural Gas Cost



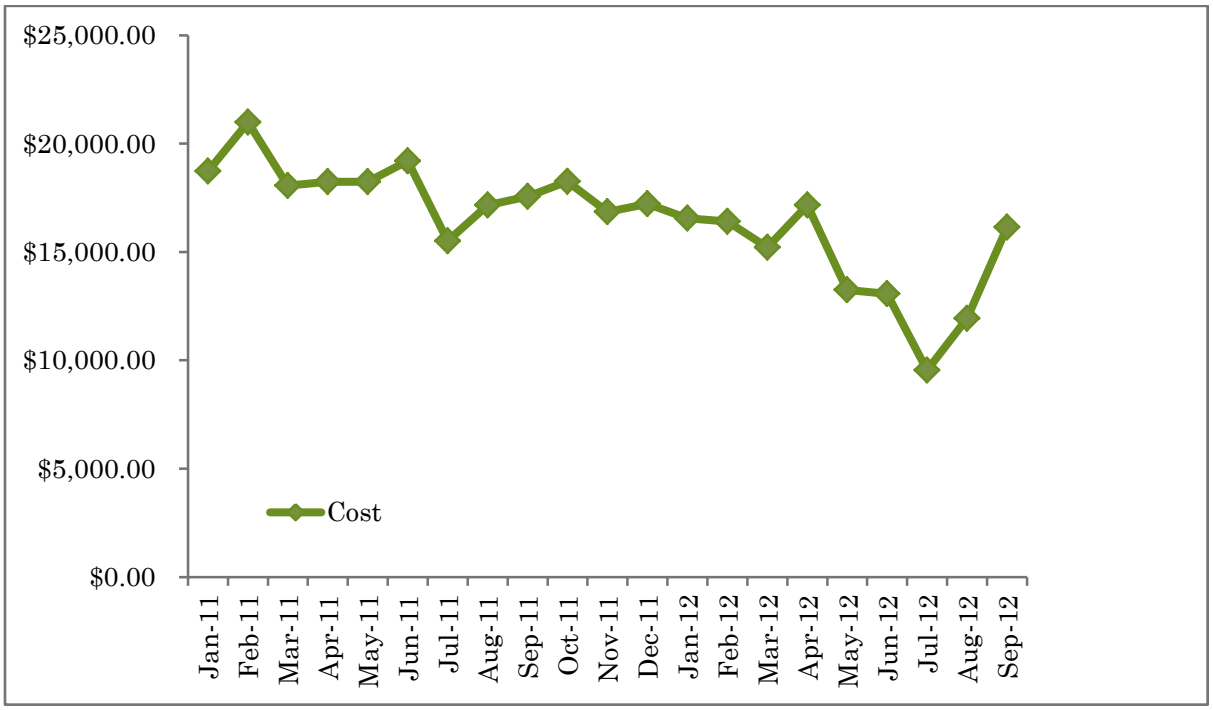
Annual Comparison



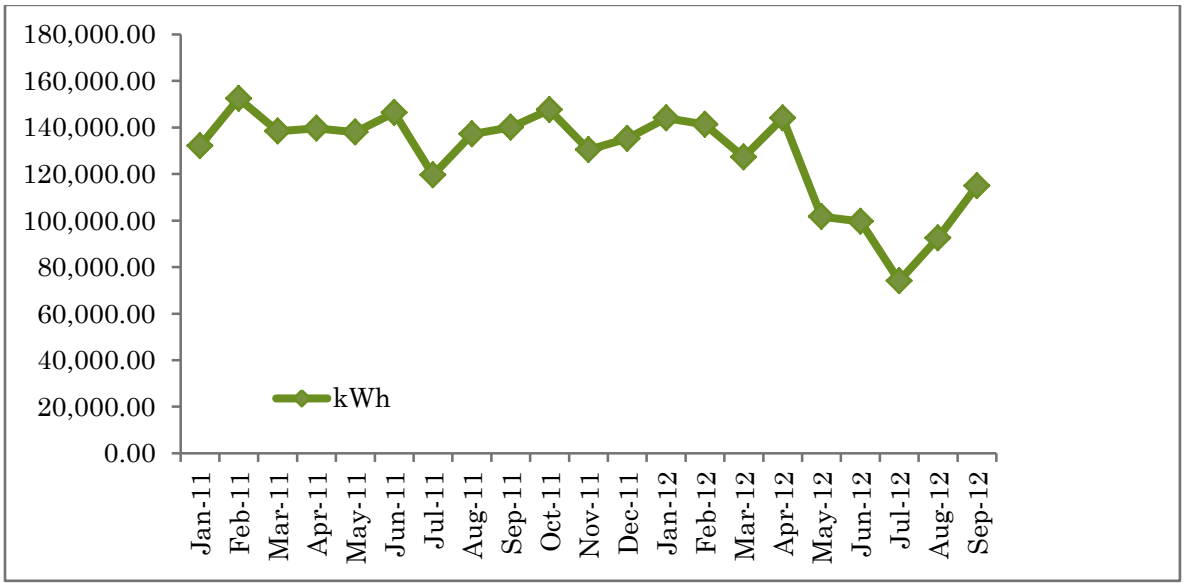
Electricity

Electricity: High School	
Usage (kWh)	1,614,400.40
Cost	$200,359.71

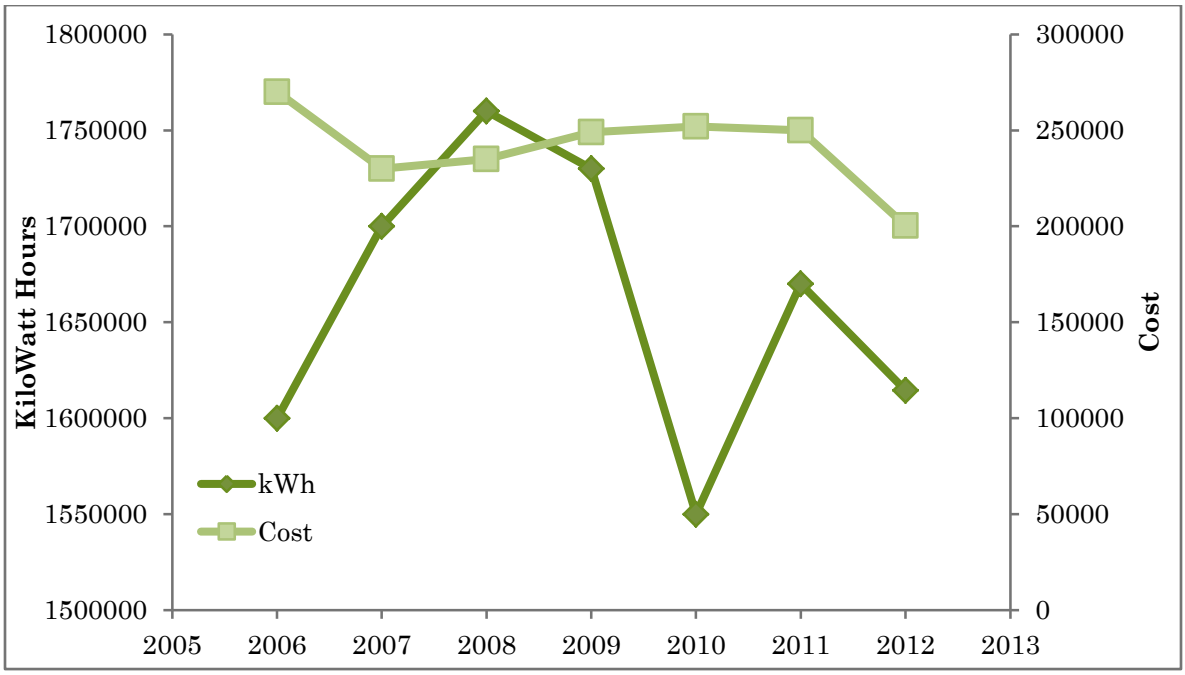
Total Monthly Electricity Cost



Total Monthly Electricity Consumption



Annual Comparison



Part III. Noted Improvements, Recommendations, Appendices

Noted Improvements

Overall, since FY 2010-2011, the entire district has reduced its carbon footprint by 5%. Although in some areas (waste and water) there were increases in operating costs and consumption, in general there were huge improvements in operations within the district. Compared to FY 2010-2011, electricity costs in the district were reduced by 35%. The Middle School saw the largest drop costs, by 50%, closely followed by Moharimet (49% reduction) and Mast Way (38% Reduction). Even the lowest reduction in electricity costs was large, 20%, in the High School. Both gas and propane costs were reduced as well. Natural gas costs dropped by 16% in the Middle School and 14% in the High School. As for propane, costs dropped by 17% in both elementary schools. Fleet upkeep costs dropped by 10% in the entire district.

The drop in carbon emissions is equivalent to the amount sequestered by 181 acres of forest!

Recommendations for ORCSD

Utilize the FY2011-2012 Ecological Footprint as a tool to identify strengths, weaknesses and opportunities within the water, electricity, transportation, energy, paper, and solid waste sectors within the district. Suggested areas of focus include:

1. Given that the cost of solid waste and recycling disposal increased so significantly from FY 2010-2011, the new waste disposal system for FY 2012-2013 should be monitored closely for cost and effectiveness.
2. The cost of water and sewage in the Middle School is significantly higher per pupil than in the High School. The causes behind this discrepancy should be investigated further in order to determine where changes should be made.
3. Identify additional key points that hydration stations may be successful in. So far the installed ones have saved over 86,200 bottles from landfills (and counting!) – and from our waste expenditures. Additions may lead to exponential growth in water bottle savings and trash/recycling reduction.

Recommendations for Further Reports

1. Record missing data measurements: solid waste and recycling tonnage, sustainability initiative investment costs and repayment periods.
2. Determine more effective ways of monitoring and documenting paper usage in district.
3. Document local food purchases.

Appendix A: Calculations and Sources

The following measurements were used for the calculations in this report as cited by the Environmental Protection Agency's (EPA) Greenhouse Gas Equivalencies Calculator (found at: http://www.epa.gov/cleanenergy/energy-resources/calculator.html):

- Electricity: KiloWatt Hours (kWh):

6.8956 x 10^{-4} metric tons CO_2 / kWh

- Transportation Fleet: Gallons of Gasoline

0.125 mmbtu/gallon * 71.35 kg CO_2/mmbtu * 1 metric ton/1,000 kg = $8.92*10^{-3}$ metric tons CO_2/gallon of gasoline

- Energy
  - Natural Gas (Therms)

    0.1 mmbtu/1 therm * 14.47 kg C/mmbtu * 44 g CO_2/12 g C * 1 metric ton/1000 kg = 0.005 metric tons CO_2/therm

  - Propane (Gallons)

    12.8 pounds CO_2/Gallon propane * 2204.62 pounds CO_2/ MTCO2E

Appendix B: Final Ecological Footprint Scorecard

Categories		Description	Measurement	2011-2012
Waste and Recycling		Price: based on tonnage collected	Cost	$25,640.75
Transportation Fleet		Total buses: 40	Gallons (gasoline)	
			Maintenance Costs	$182,084.90
			$MTCO_2E$	533
Water Consumption		Recorded twice each year (omitting Mast Way and Moharimet Elementary well systems)	per 100 cubic feet	132296
			Cost	$7,382.00
Electricity		All schools & facilities	kWh	
			Cost	$293,187.97
			$MTCO_2E$	1,885
Energy	**Natural Gas**	High School Middle School	Therms (per consumption)	117481.29
			Cost	$167,796.40
			$MTCO_2E$	1,188
	Propane	Mast Way Elementary Moharimet Elementary	Gallons (on demand)	38692.9
			Cost	67,699.74
			$MTCO_2E$	247.62
Total Metric Tons of CO2 Equivalent (Energy & Electricity)		All schools	$MTCO_2E$	3,853.62
Total Costs		All sectors (variables included are not consistent with every fiscal school year)	Cost ($)	$743,792