

Acadia Park/Agronomy Building: Water Consumption Data Analysis

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PLAN 597

October 10, 2014

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PLAN 597: Planning for Water Resource Management
Assignment 1
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1) Background

The data is for a piece of the Acadia Park Residences located on Agronomy Road, however, Powerhouse staff did not know which exactly which building. Acadia Park includes one bedroom high-rise apartment residences, two and three bedroom apartments, row houses, and one to four bedroom townhouses. Acadia Park is a year-round student family residence. It is reserved for couples and adults with one or more dependent children 18 years of age or younger.

2) Data Collection

55 data points were obtained from the Powerhouse for the Acadia Park/Agronomy Residence (Customer #403). The data had to be re-inputted into columns in order to be analyzed. The data is quarterly data, from 2001-2014, consisting of high/peak flows and low flows in cubic meters, and water consumption calculated in cubic feet. The data is for March, June, September and December from 2001-2005, and in March, May, September and December from 2006-2014.

It was unknown which year renovations were done in. What was known was that most renovations are done over the summer months, May to September, as they have the least impact on residents. Acadia Park's water consumption is on-going as it is a year-round residence setting.

Calculations: Values for water consumption had already been calculated. However, when I carried out my own calculations, to verify, using the formula below, some of the results I obtained were different (see numbers highlighted in red, 29088 vs. 56574, and 15302 vs. 16103). Thus, there are some inaccuracies in the data obtained. However, I chose to use the consumption values contained in the original excel file received from Powerhouse staff, rather than my own calculations.

$$\text{Consumption} = (\text{Current High Flow Meter Reading} - \text{Previous High Flow Meter Reading}) + (\text{Current Low Flow Meter Reading} - \text{Previous Low Flow Meter Reading}) \times * 35.314475 \text{ (Conversion Rate)}$$

*The Conversion Rate is applied because the water usage for the buildings is measured in cubic meters while the charges are applied in cubic feet.

Sample Data, Showing Inaccuracies:

Date	High Flow (ft ³)	Low Flow (ft ³)	Consumption (ft ³)	Verification Calculation (ft ³)
23-09-2005	80	16284	42519	42519
08-12-2005	80	17119	29488	29488
21-03-2006	80	18058	33160	33160
19-05-2006	80	18397	11972	11972
21-09-2006	881	19198	56574	29088
13-12-2006	80	19654	16103	15302
26-03-2007	80	21076	50217	50217

A second example of a problem area is that the high flow for 21-09-2006 was recorded as 881, but it should be close to 80. All problem figures have been highlighted in red (see Appendix).

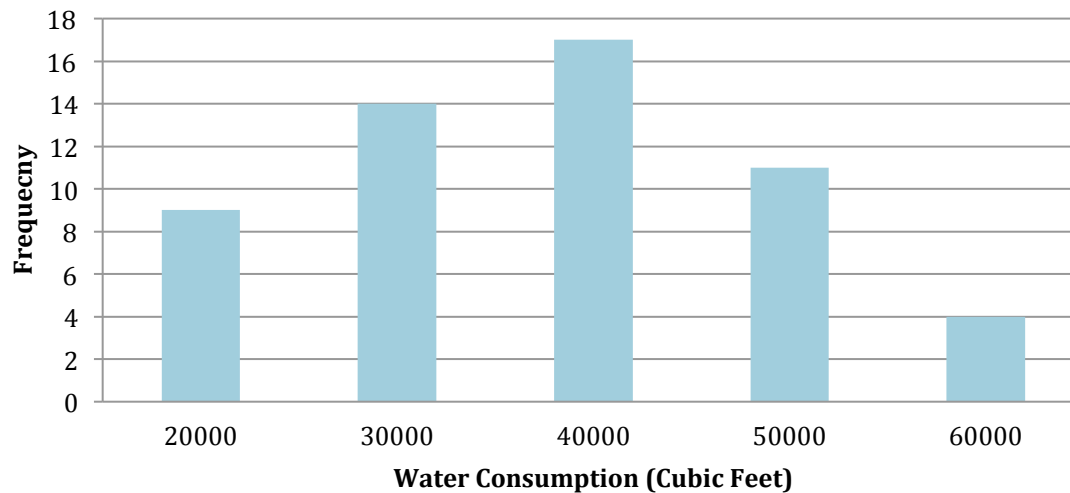
3) Data Analysis

Summary Statistics:

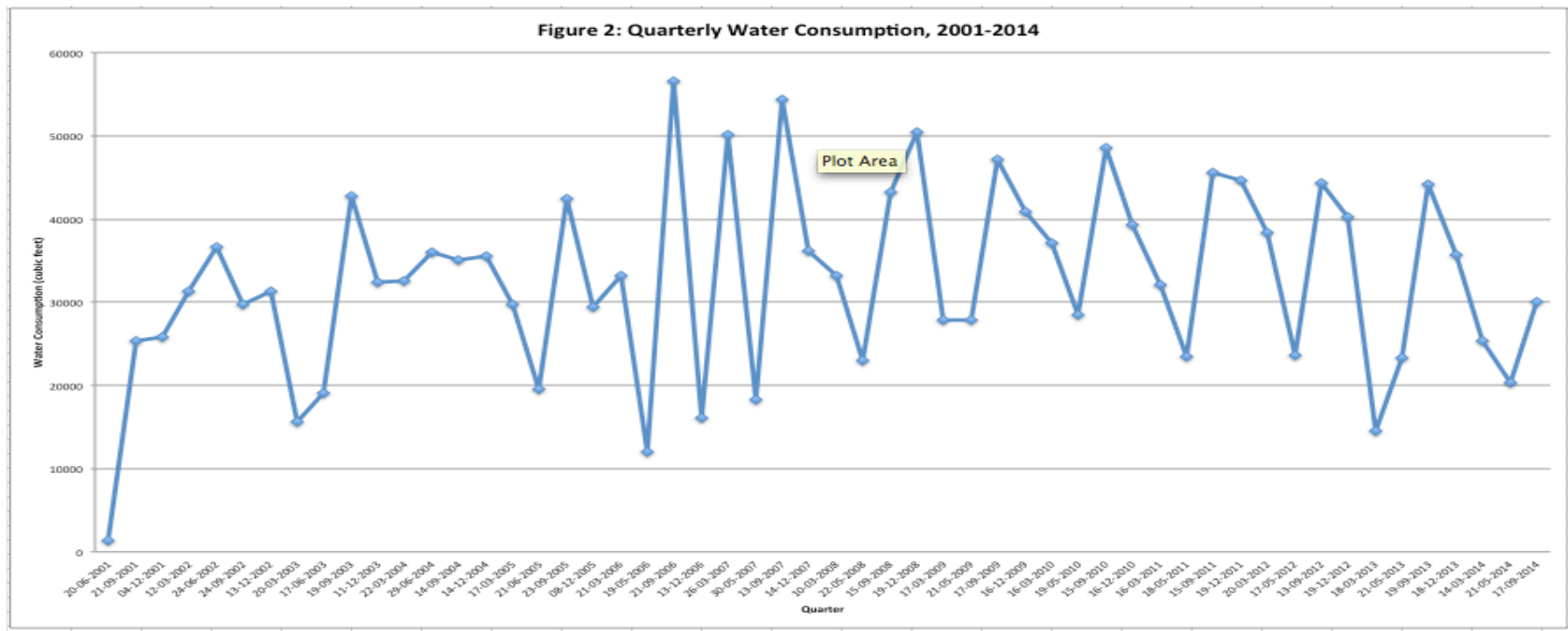
Median	32560
Mean	32633
Variance*	11437

*Variance is calculated as sample standard deviation.

Figure 1: Distribution for Quarterly Water Consumption, from 2001-2014



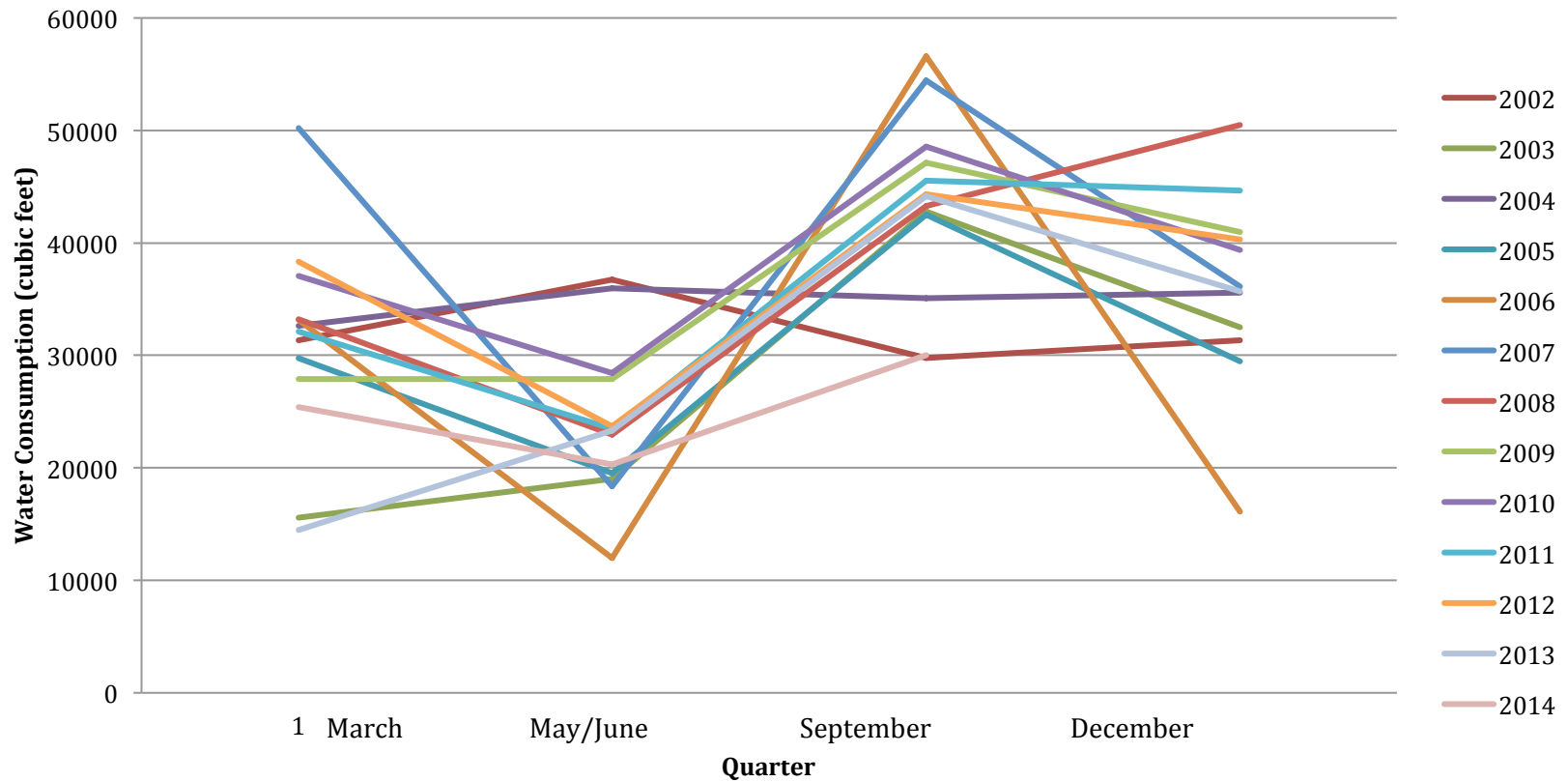
The data distribution can be described as bell-shaped, slightly skewed right, suggesting a fairly normal distribution. The highest frequency of water consumption is for 30001-40000 cubic feet, which is close to the mean of 32633. The lowest water consumption is for 50001-60000 cubic feet. This suggests that there is a limit on high water consumption; this limit could be the price paid for water usage. It could also indicate that it is unusual to consume an extremely high volume of water.



From this figure, there is seasonal variation in water consumption. Generally, peak water consumption is measured in September. This accounts for the summer months of June, July, August. The lowest water consumption is measured in March or May, which accounts for the winter months of December, January and February.

The limitation in reading this pattern is that the quarterly data was collected in March, June, September and December from 2001-2005, and in March, May, September and December from 2006-2014. Thus, while June is considered a summer month, May is not, so it may not be appropriate to compare June and May. What is missing is the dates when renovations occurred.

Figure 3: Seasonal Water Consumption, 2001-2014, Acadia/ Agronomy Building



4) Findings

The data does not show any clear difference or patterns around how the renovations impacted water consumption. Further analysis that looks at monthly data could help look at more fine-grained differences in water consumption. All that can be inferred from this data is that there are seasonal patterns in water usage. Since the dates of renovations were unknown, pre-renovation and post-renovation water consumption could not be compared

APPENDIX

Date	High/Peak Flows (cubic meters)	Low (cubic meters)	Consumption	Verfication Calculation
20-06-2001	60	1543	1342	
21-09-2001	60	2260	25320	25320
04-12-2001	60	2992	25850	25850
12-03-2002	60	3880	31359	31359
24-06-2002	60	4920	36727	36727
24-09-2002	60	5763	29770	29770
13-12-2002	60	6650	31324	31324
20-03-2003	80	7071	15574	14887
17-06-2003	80	7610	19035	19035
19-09-2003	80	8821	42766	42766
11-12-2003	80	9741	32489	32489
22-03-2004	80	10665	32631	32631
29-06-2004	80	11683	35950	35950
14-09-2004	80	12677	35103	35103
14-12-2004	80	13684	35562	35562
17-03-2005	80	14527	29770	29770
21-06-2005	80	15080	19529	19529
23-09-2005	80	16284	42519	42519
08-12-2005	80	17119	29488	29488
21-03-2006	80	18058	33160	33160
19-05-2006	80	18397	11972	11972
21-09-2006	881	19198	56574	29088
13-12-2006	80	19654	16103	15302
26-03-2007	80	21076	50217	50217
30-05-2007	80	21596	18364	18364
13-09-2007	80	23137	54420	54420
14-12-2007	50	24190	36127	37156
10-03-2008	10	25170	33196	34568

22-05-2008	10	25820	22954	22954
15-09-2008	10	27045	43260	43260
19-12-2008	10	28475	50500	50500
17-03-2009	10	29265	27898	27898
21-05-2009	10	30055	27898	27898
17-09-2009	10	31390	47145	47145
16-12-2009	10	32550	40965	40965
16-03-2010	10	33600	37080	37080
19-05-2010	10	34405	28428	28428
15-09-2010	10	35780	48557	48557
16-12-2010	10	36895	39376	39376
16-03-2011	10	37805	32136	32136
18-05-2011	10	38470	23484	23484
15-09-2011	10	39760	45556	45556
19-12-2011	10	41025	44673	44673
20-03-2012	10	42110	38316	38316
17-05-2012	16	42775	23696	23490
13-09-2012	10	44030	44320	44314
19-12-2012	10	45172	40329	40329
18-03-2013	0	410	14479	-1580757
21-05-2013	0	1070	23308	23308
19-09-2013	0	2320	44143	44143
18-12-2013	0	3330	35668	35668
14-03-2014	0	4050	25426	25426
21-05-2014	5	4620	20306	20134
17-09-2014	5	5470	30017	30017