Water Consumption Assessment - Walter Gage South Tower (170)

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PLAN 597

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1. Summary

The following report provides the analysis of the monthly water consumption data acquired from Erin Kastner in the Utilities department at UBC. To note about the building of study:

- The Walter Gage Tower (South) is a campus residence that is home to a maximum of 449 students.
- 100% of the toilets and sinks were replaced with low-flow versions in the summer of 2014.
- The meter is read monthly. Data is available January 2010 to September 2014.
- Of the period of study (56 months), data for only 3 months was unavailable.
- The building is, and has been, completely full during the Winter and Spring terms during the period of study.
- It was not always full during the Summer terms. However, detailed vacancy information was not available
- There is only one water meter at this building. UBC is billed quarterly.

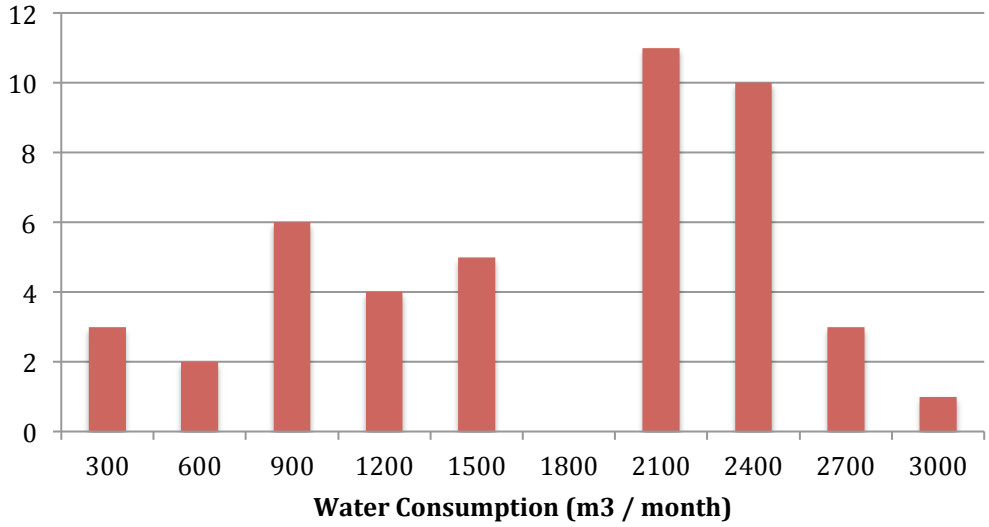
2. Data Analysis

Table 1 shows the statistical summary of the monthly usage, and Figure 1 is a histogram that summarizes the monthly data. Refer to Appendix A for the raw meter data as well as the incremental monthly usage.

Table 1. Statistical Summary of Monthly Usage

	m^3 water / month
Mean (Average)	1561
Median	1858
Standard Deviation	756
Minimum	1
Maximum	2761

Figure 1. Histogram of Water Consumption

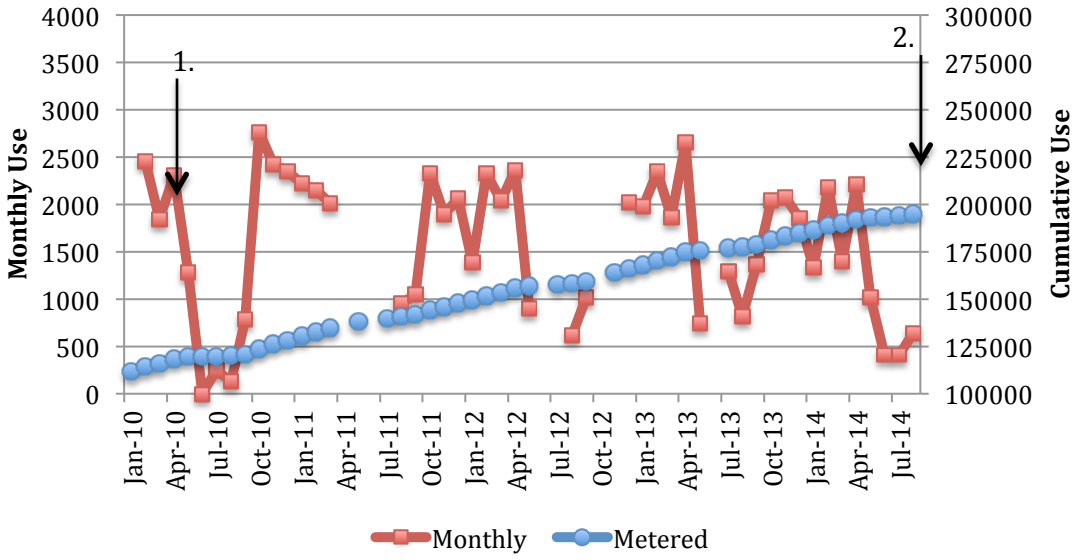


The histogram highlights a typical monthly water usage of between 2100 and 2400 m^3 water / month at the Walter Gage residence. When comparing with the raw data, it appears the group of high values is from Winter and Spring terms (when the residence is full) and the second group of low values on the left side of the histogram represents mainly the summer months. This explains an average usage of only 1561 m^3 / month.

Note that data was not recorded on the same day every month. The recorded date varied between the 13th and the 17th of each month. The average day for recording was the 15th with a variance of 2.6, resulting in an error of ±2.6 days and ±8% water usage.

Figure 2 shows both the cumulative water meter reading and the monthly water usage.

Figure 2. Water Consumption over time (m3/mth)



1. Summer terms (May to August) consistently show low data or no recorded data.
2. Renovations were done during the Summer 2014 term.

The metered data shows a relatively consistent usage over the time period, with a slight tapering towards the end in mid-2014. The monthly usage data shows a general cyclical trend with higher usage during the winter and spring terms (as expected) when the building is full. Oddly, missing data appears to be more common in the summer months, possibly as the usage during this time is negligible compared to during the busy months.

Unfortunately, there is only one data point when the residence is full after the renovations were completed (Sept. 2014). It would be highly beneficial to allow for at least 6 more months of data collection to have reasonable data to compare the before-and-after-renovations water consumption.

Table 2 shows the September water consumption for 2010 to 2014, to see if the number reduces after renovations. Keep in mind the number of residents is constant for all these vales at 449 students. The table takes into account the error that data was not read on the same day each month, resulting in an error of 8%

Table 2. September Water Usage	
	m^3 water / month
September 2010	780 ± 62
September 2011	1044 ± 84
September 2012	1020 ± 82
September 2013	1364 ±109
September 2014	836 ± 67

The water usage for September 2014 is **approximately 20% less** than the average of the previous 4 years. Though it can't be said as a certainty due to lack of data after the renovations, it appears there is a noticeable improvement for the first month of Winter Term 2014, even including error due to reading dates.

Comparing the overall data mean before the renovations, 1577 m^3 / month, and the one data point after the renovations, 836 m^3 / month, the **after-renovations use is approximately 50% of before-renovations** use. This is a promising result, and it would be very interesting to see future data to confirm the substantial impact the renovations had on water consumption.

3. Conclusion

Since the renovations (100% low-flush and efficient fixtures) were completed only in the summer 2014, it is difficult to provide a comprehensive analysis of before-and-after renovations. However, in comparing the September usage for the past 5 years, the September 2014 usage is approximately 20% less than previous September water usages. Also, the September 2014 water usage is half of the average usage before renovations.

Regardless of the results, the installation of efficient plumbing is guaranteed to result in significant savings as these water fixtures are essential to every day activities. This can be combined with raising student awareness in the residences that water is a precious resource and excessive usage should be avoided where possible. These renovations are a great step in UBC's superb conservation goals.

Appendix A – Raw Data and Monthly Usage

Table 2 – Meter Data from UBC Utilities Building

Month	Raw data (m^3/month)	Monthly (m^3/month)		Month	Raw data (m^3/month)	Monthly (m^3/month)
Jan-10	111854			Jun-12		
Feb-10	114316	2462		Jul-12	157770	
Mar-10	116160	1844		Aug-12	158388	618
Apr-10	118470	2310		Sep-12	159408	1020
May-10	138160	1281		Oct-12	144101	
Jun-10	119752	1		Nov-12	164066	
Jul-10	120001	249		Dec-12	166095	2029
Aug-10	120130	129		Jan-13	168075	1980
Sep-10	120910	780		Feb-13	170420	2345
Oct-10	123671	2761		Mar-13	172281	1861
Nov-10	126096	2425		Apr-13	174934	2653
Dec-10	128438	2342		May-13	175678	744
Jan-11	130657	2219		Jun-13		
Feb-11	132808	2151		Jul-13	176973	1295
Mar-11	134818	2010		Aug-13	177786	813
Apr-11				Sep-13	179150	1364
May-11	138160			Oct-13	181187	2037
Jun-11				Nov-13	183262	2075
Jul-11	139775			Dec-13	185117	1855
Aug-11	140726	951		Jan-14	186444	1327
Sep-11	141770	1044		Feb-14	188624	2180
Oct-11	144101	2331		Mar-14	190022	1398
Nov-11	145997	1896		Apr-14	192230	2208
Dec-11	148058	2061		May-14	193251	1021
Jan-12	149440	1382		Jun-14	193662	411
Feb-12	151764	2324		Jul-14	194070	408
Mar-12	153805	2041		Aug-14	194710	640
Apr-12	156170	2365		Sep-14	195546	836
May-12	157067	897				