SAMPLE SUSTAINABILITY PLAN

SAMPLE SCHOOL

JANUARY 2012

WATER AUDIT

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SUSTAINABILITY PLAN REPORT: WATER AUDIT

WATER AUDITING

INTRODUCTION AND DRIVING QUESTION

Water is essential to life. In particular, fresh water is an extremely valuable resource as we rely on it for drinking water, cooking, and so many other applications. Of all of the water on Earth, only 3% of it is available as fresh water. While fresh water is considered to be a renewable resource, in many areas of the world the demand for fresh water greatly exceeds its availability.

Fortunately, Canada has had access to abundant fresh water resources, and this is no exception in New Brunswick. However, this availability of clean fresh water will not always be the case. Water scarcity is one of the most pressing global issues.

Our school currently does not monitor how much water is consumed, and whether water is wasted. This observation led to this study's driving question: how can the school manage its water needs while reducing consumption to 2015?

To answer this driving question, areas of water consumption in the school were identified, water consumption in these areas was measured, and methods to reduce consumption suitable to our school were examined.

This remainder of this document outlines the procedures, inventories, recommendations and suggestions for future work resulting from a water audit at our school.

AREAS OF FOCUS

The major areas of water consumption identified in the school were:

- Washrooms: toilets, urinals, sinks
- Locker rooms: showers, sinks
- Classrooms: industrial and lab sinks, dishwashers
- Hallways: drinking fountains
- Cafeteria: dishwashers, sinks
- Custodial uses

We measured water consumption in all of these categories except custodial uses due to time constraints.

PROCESS

WASHROOMS

TOILETS

Equipment Required

- 1L beaker
- Pedometer
- Xplorer GLX datalogger
- PASPORT Fast Response Temperature Probes
- Solar battery
- Inverter
- 40W solar photovoltaic panel
- Timer

Water Consumption Per Use: Litres Per Flush (LPF)

To determine how many litres per flush (LPF) toilets consumed, a ruler was used to measure and mark the water fill level in the toilet tank. The toilet was then flushed and once the water level went to zero, the tank float was lifted so that water could not re-enter the tank. A 1L beaker was used to refill the tank, and the number of litres required to return the water level to the marked 'fill' level was recorded.

Frequency of Use

To estimate the frequency of toilet use, the first method attempted was to attach a pedometer to the inside of the flush handle to measure how many times the handle was pressed, however it was found that this method was not reliable.

After some discussion, it was realized that the water in the toilet tank will be at a detectable temperature difference than the air surrounding it. This led to estimating frequency of use by recording the change in temperature inside the toilet. To do this, a PASPORT Fast Response Temperature Probe was attached to an Xplorer GLX datalogger. A solar battery that had been charged by a 40W solar photovoltaic (PV) panel was used to ensure continuous data collection by ensuring battery life, and the battery was attached to an inverter to convert direct (produced by the solar PV panel) to alternating current used by the GLX datalogger. The GLX datalogger was plugged into the inverter and placed inside of each washroom for a 24-hour period with the Fast Response Temperature Probe submerged in the water in the toilet tank collecting a sample once every 30 seconds. This was repeated for every washroom in the school.

To verify the temperature data, frequency of use counts were done manually by standing in a washroom and counting the number of times a washroom stall was entered (each entrance counted as one use). This was done once for each washroom for each of the following time periods:

- 45 minutes before the morning bell,
- during each class period of the day,
- during each break including lunch,
- 15 minutes after the dismissal bell.

These frequency-of-use measurements from each of these two methods were averaged to obtain an estimate for each toilet in the school.

URINALS

Equipment Required

- Bucket
- 1L beaker
- Straight-edge funnel
- Timer

Water Consumption Per Use: Litres Per Flush

All urinals were manual flush. To measure the litres per flush, the urinal was flushed and a straight-edged funnel placed underneath the water source that fed into a bucket and the number of litres per flush measured.

Frequency of Use

Manual counts were done by standing near the door of the washroom and counting the number of urinals flushes by the sound of the flush.

WASHROOM SINKS

Two types of sinks can be found at the school: press-down taps that stay on for a determined period of time and dispense a determined amount of water, and those with manual handles where the amount of water dispensed depends on how long the taps are left open.

Equipment Required

- 1L beaker
- Timer

Flow Rate (L/s)

At each press-down tap sink, a beaker was placed underneath of the tap, the tap was pressed, and it was timed how long it dispensed water for. The amount of dispensed water was also recorded. For each manual tap, the taps were turned on and it was recorded how much water was dispensed in 30 seconds.

All sinks were examined for leakage. If leakage was observed, the flow rate for the leak was calculated.

Usage Time

To estimate how long sinks were used, we observed how long people used each type of sink. For the press-down taps, it was recorded how many times a user pressed the tap. For the manual taps, it was recorded how long the user left the taps open dispensing water.

This was done once for each washroom for each of the following time periods:

- 45 minutes before the morning bell,
- during each class period of the day,
- during each break including lunch,
- 15 minutes after the dismissal bell.

LOCKER ROOMS

SHOWERS

Equipment Required

- Container of known volume
- 100mL graduated cylinder
- Timer
- Shower Usage Survey

Flow Rate (L/s)

Showers were turned on and the time taken to fill a 1L beaker was recorded.

At the same time, each shower was examined for leakage. If leakage was observed, flow rate was calculated by leaving a container of known volume under the leak for a known period of time.

Usage Time

A three-question survey (Appendix A – Shower Usage Survey) was administered to students using the locker rooms during each period for one typical day, as well as after school sporting activities to estimate how frequently the showers were used and the duration of showers. Data was collected separately for male and female locker room showers.

SINKS

All sinks in the locker rooms had manual taps. The same methods were used on the sinks in the locker rooms as for the washroom sinks with manual taps.

CLASSROOMS AND CAFETERIA

SINKS: INDUSTRIAL, LABS AND CAFETERIA

Equipment Required

- 1L beaker
- Timer
- Classroom sink survey

Flow Rate (L/s)

All of the taps in the industrial and lab sinks, as well as the cafeteria, were manual turn taps. The flow rate was measured at half and full intensity by measuring how water was dispensed during 1 minute; these flow rates were averaged to determine an average flow rate.

All sinks were examined for leakage. If leakage was observed, flow rate was calculated.

Usage Time

A survey was developed (Appendix A –Sink Survey) to determine how often the sinks were used and for how long during a typical day. This was given to teachers using classrooms either in the industrial or science wing that had sinks, as well as the cafeteria staff.

Manual counts of frequency and duration of sink usage were done by observing sinks in each classroom for one typical day. These counts were done: during each class period of the day, and during each break including lunch. Before and after school were not examined because teachers reported in the survey results that the sinks were not used except during class time.

DISHWASHERS

For each dishwasher, the water per use was found by researching the model number and assuming the water per use was the same as listed by the manufacturer. To determine how often both the dishwasher in the cafeteria, as well as the dishwasher in the culinary arts room, were used, a sheet was left by the dishwasher for 2 weeks and all users were instructed to place a checkmark each time the dishwasher was turned on for a cycle.

HALLWAYS

DRINKING FOUNTAINS

Equipment Required

- 1L beaker
- Timer

Flow Rate (L/s)

The flow rate for drinking fountains was determined by measuring how much water was dispensed when the button or dial was turned/pressed all the way on for 1 minute. This was repeated three times for each fountain, and these numbers were used to find the average flow rate.

Usage Time

To estimate the frequency and duration of use, we observed each use during a typical 24-hour period. This was done once for each washroom for each of the following time periods:

- 45 minutes before the morning bell,
- during each class period of the day,
- during each break including lunch,
- 15 minutes after the dismissal bell.

RESULTING INVENTORY

Water consumption per year has been calculated using 198 school days, except in cases where there is a leak that would constantly consume water. In these cases, a full calendar year of 365 days was used to estimate annual water consumption.

WASHROOMS

Toilets and Urinals

The method developed to estimate frequency of toilet use by detecting changes in tank temperature was effective (Figure 1). Each rise in temperature represents one flush. The data collected by this method was supported by the manual counts, and was averaged to determine frequency of use for all toilets in the school.

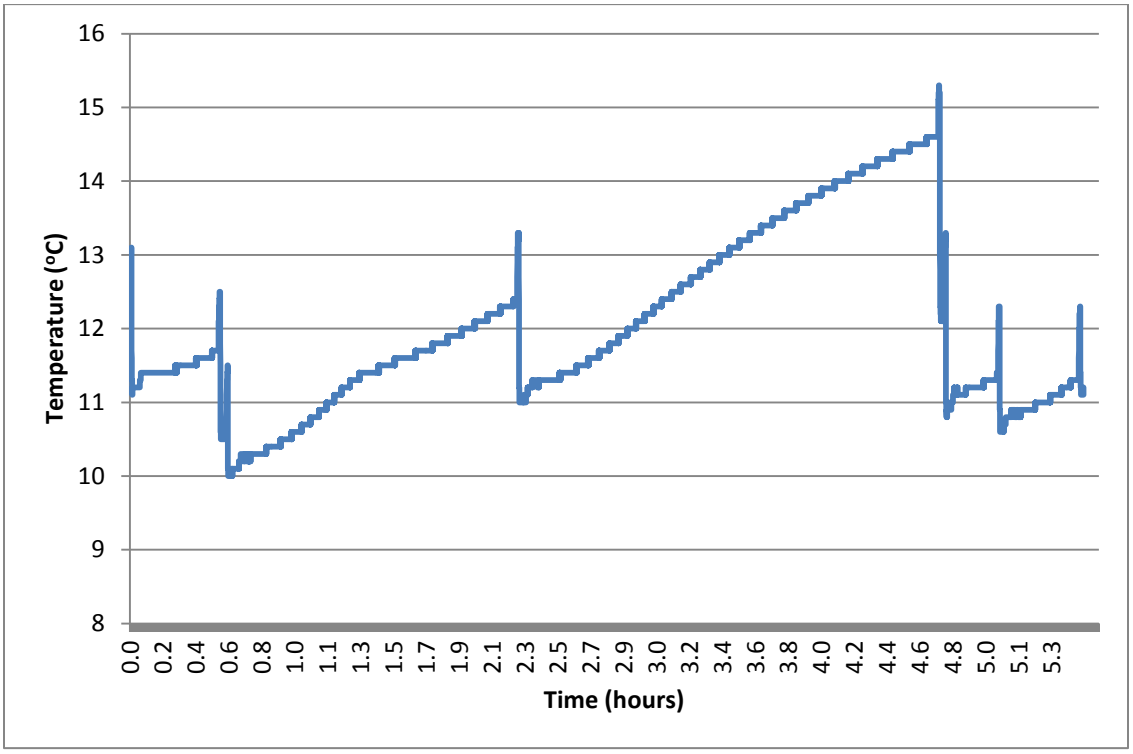

Figure 1. Temperature data indicating frequency of use (number of flushes) in a toilet.

A summary of water consumption per day and per year can be found in Table 1. A summary of water consumption per device in the washrooms can be found in Appendix B (female toilets – Table 1, male toilets and urinals – Table 2, sinks in male washrooms – Table 3, sinks in female washrooms – Table 4).

Washrooms	Per Day	Per Year[1]
Male Toilets	1,700	320,000
Female Toilets	8,100	1,500,000
Urinals	3,500	660,000
Sinks - Male	140	29,000
Sinks - Female	400	78,000
Estimated Total	**13,840**	**2,587,000**

Table 1. Estimated total water consumption per device in washrooms.

DRINKING FOUNTAINS

Water consumption by drinking fountains is summarized in Table 2. A summary of water consumption per drinking fountain can be found in Table 5 of Appendix B.

[1] Based on an estimate of 188 student school days.

Drinking Fountains	Per Day	Per Year
Fountains	140	1,900,000[2]
Leaks[3]	86	16,200
Estimated Total	**5340**	**1,920,000**

Table 2. Estimated total water consumption in fountains and leaking fountain.

SHOWERS

Total water consumption in showers and leaking showers is summarized in Table 3. A summary of water consumption per shower can be found in Table 6 of Appendix B.

Showers	Per Day	Per Year
Male and Female Showers	30,000	7,100,000[2]
Leaks[3]	3,100	1,100,000
Estimated Total	**33,100**	**8,200,000**

Table 3. Estimated total water consumption in showers and leaking showers.

NON-WASHROOM SINKS AND DISHWASHERS

Total water consumption in non-washroom sinks (classrooms: industrial and labs, cafeteria) is summarized in Table 4. A summary of water consumption per non-washroom sink and dishwasher can be found in Table 7 in Appendix B.

Classrooms and Cafeteria	Per Day	Per Year[2]
Industrial and Lab Sinks	2,300	430,000
Cafeteria Sinks	3,400	630,000
Dishwasher - Cafeteria	45	8,500
Dishwasher - Culinary Room	20	3,800
Estimated Total	**5,765**	**1,100,000**

Table 4. Estimated total water consumption by non-washroom sinks and dishwashers

[2] Estimate based on 188 student school days

[3] The drinking fountain in the language arts was found to be leaking. The per year estimate of water consumption is based on 365 days, assuming that the leak was not repaired.

TOTALS

Total water consumption by all measured devices at the school is summarized in Table 5.

Device	Water per Day (L)	Water per Year (L)
Female Toilets	8100	1500000
Male Toilets and Urinals	5200	320000
Female Washroom Sinks	400	78000
Male Washroom Sinks	140	29000
Drinking Fountains	5000	1920000
Male & Female Showers	30000	8200000
Industrial and Lab Sinks	2300	430000
Cafeteria Sinks	3400	630000
Dishwashers	65	12300
	54605	**13119300**
Estimated total	**55,000**	**13,000,000**

Table 5. Estimated total water consumption at school

RECOMMENDATIONS AND MEASURING SUCCESS

The school currently pays a flat rate for water, which is not dependent on the amount used. This means that there is currently little economic incentive to better manage water consumption. However, there are areas in the school where water is currently being wasted or can easily be reduced.

Fix Leaks

The first and potentially easiest recommendation proposed is to fix the leak in the drinking fountain in the language arts wing and the shower in the female locker room (Table 6).

Location	Device	Water Used per Day Before (L)[4]	Water Used per Day After (L)	Percentage Reduction
Female Locker Room	Shower	3,100	0	100%
Language Arts Wing	Fountain	5,200	0	100%
Total		8,300	0	100%

Table 6. Estimated water savings repairing identified leaks.

[4] Estimate based on 365 days.

Fixing these two leaks could save 8,300 L of water per day, which translated to 3 million litres of water per year – that's enough to fill an Olympic size swimming pool (2.5 million litres). The only costs associated with this recommendation are the labour costs to ensure that they are fixed properly.

Measuring Success: Fixed Leaks

As a direct result of developing this sustainability plan, the leaking shower in the female locker room and the leaking drinking fountain in the language arts wing were fixed.

Replacing/Adjusting Toilets

Many of the toilets were found to have higher than 6 L per flush – the industry standard at the time of this report. This sustainability plan identified that the toilets in the female washrooms are used more frequently than those in the male washrooms and it is therefore recommended that replacements be first targeted to the toilets in the female washrooms and to those with the highest litres per flush.

It was discovered that there is a knob on the float of the toilet that controls the height of the arm. If this knob is turned, it bends the float arm lower and therefore less water will flow into the tank after every flush. Since it will likely not be possible to replace all toilets at the school to low-flow toilets in one year, we recommend adjusting the knob on each toilet to its lowest point where the toilet still functions regularly.

Currently, there are 28 toilets in female washrooms at the school and 17 in male washrooms. Table 7 summarizes the water savings that could be realized if all of the toilets in the schools were replaced or adjusted to be 6 LPFs. Potential water savings per day separated by individual male and female washrooms are summarized in Table 1 of Appendix C.

Location	Device	Water Used per Day Before (L)	Water Used per Day After (L)	Percentage Reduction
Female Washroom	Toilet	8,100	3,400	58%
Male Washroom	Toilet	5,200	800	85%
Total		13,300	4,200	68%

Table 7. Estimated theoretical reduction in water consumption if all toilets at the school were changed to 6 LPFs.

Measuring Success: Adjusted Toilet Tanks

Recognizing that it will likely not be possible to replace all toilets at the school with lower water consumption models due to the upfront cost, the floats behind the toilets were all adjusted to bring down the fill level in the toilets. This was done in the all of the male and female washrooms and the LPF was measured after this change using the same method described before the change was made - this

action has reduced water consumption by all toilets by 52% (Table 8). A summary of the actualized water savings by adjusting toilet tanks can be found in Table 3 of Appendix C.

Adjusting Toilets	Savings per day	Savings per year	Percentage Improvement
Theoretical - all toilets to 6 LPF	9,100	1,700,000	68%
Actualized improvements	6,900	1,300,000	52%
Estimated Total	**16,000**	**3,100,000**	**-**

Table 8. Estimated and actualized water savings by adjusting toilet tanks in both male and female washrooms.

As a direct result of this work, approximately **15,000 L per day** are being saved at the school.

Waterless Urinals

While the male toilets were used infrequently compared to those in the female washrooms, the urinals were used regularly.

We recommend that subsequent urinal replacements focus on waterless urinals. Waterless urinals are currently used in a couple of high schools around New Brunswick with success. They are easy to clean and odor-free, and do not use water to flush.

If all of the urinals (19) at the school were replaced with waterless urinals, a 100% reduction in urinals could be realized. Water savings are summarized in Table 9.

	Current	Waterless Urinals
Per day	3,400	0
Per year	660,000	0

Table 9. Estimated potential water savings by installing waterless urinals

The cost associated with buying and installing a waterless urinal is approximately $600 when considering the cost of the unit as well as the cost of installation and replacement cartridges. While there is a significant cost to installing these units (~$11,400), this report recommends looking at replacing existing urinals with waterless ones at the rate of 3-5 urinals every year.

Flow Restrictors: Sinks and Showers

We recommend installing low-flow aerators in all of the sinks, especially in all of the washrooms. The Plumpshop Ultra Low Flow Aerator from the Canadian Tire website (product #63-4122-6) lists its flow rate at 5 gallons per minute (GPM) and sells for $10.99. The water savings to install these on every sink (male and female washrooms, industrial and lab sinks) are summarized in Table 10**.** Installing these on each of the 47 sinks in the male and female washrooms (minus the 3 in the male washroom in the science wing as aerators are already installed) at $10.99 an aerator, would **cost approximately $585**. .

Implementing this recommendation would realize an **88% reduction** in the amount of water used by sinks at the school.

Location	Device	Water Used per Day Before (L)	Water Used per Day After (L)	Percentage Reduction
Female Washrooms	Sinks	400	140	65%
Male Washrooms	Sinks	140	50	64%
Industrial and Labs	Sinks	2,300	160	93%
Total		2,840	350	88%

Table 10. Estimated theoretical reduction in water consumption by installing low-flow aerators in all sinks.

We also recommend installing shower head flow restrictors, or low flow shower heads. In searching through various websites such as Canadian Tire, Kent and Home Depot, it was difficult to find shower heads listing the flow rate. One was found at Canadian Tire: the Waterpik® Ecorain Total Body Shower Head (Product # 63-0291-6) for $39.99, which lists its flow rate at 2 GPM. Estimated water savings are summarized in Table 11**.** This would save enough water to fill an Olympic size swimming pool, and would decrease water usage by showers at the school by 41%. For 10 showers, this would **cost approximately $450**.

Location	Device	Water Used per Day Before (L)	Water Used per Day After (L)	Percentage Reduction
Female Locker Room	Shower	21,000	12,000	43%
Male Locker Room	Shower	9,300	5,800	38%
Total		30,300	17,800	41%

Table 11. Estimated theoretical reduction in water consumption in locker room showers.

Cafeteria and Dishwashers

Since the cafeteria is run by an organization external to the school, we recommend setting up a meeting with officials from the company to discuss monitoring water usage both by the sinks and dishwasher in more detail.

The dishwasher in the culinary lab is run relatively infrequently and does not use as much water as other sources around the school, therefore this report recommends focusing water reduction efforts elsewhere. However, if the monetary resources are available to replace the dishwasher, this report recommends the purchase of an energy and water saving model.

Totals

If the school were to implement the following recommendations:

- replace all toilets with 6 LPF models
- install low-flow shower heads
- install low-flow aerators on all sinks
- replace current urinals with waterless models
- fix leaks in shower and drinking fountain

a total of **34,000 L of water could be saved every day.** That translates to **6.7 million litres of water per year**, or enough to water to fill two and a half Olympic size swimming pools. Implementing all of these recommendations would reduce water consumption at the school by 60% (Table 12).

Location	Device	Water Used per Day Before (L)	Water Used per Day After (L)	Percentage Reduction
Female Washroom – 6 LPF	Toilet	8,100	3,400	58%
Male Washroom – 6 LPF	Toilet	5,200	800	85%
Female Locker Room	Shower	21,000	12,000	43%
Male Locker Room	Shower	9,300	5,800	38%
Female Washrooms	Sinks	400	140	65%
Male Washrooms	Sinks	140	50	64%
Industrial and Labs	Sinks	2,300	160	93%
Female Locker Room	Shower	3,100	0	100%
Language Arts Wing	Fountain	5,200	0	100%
Male Washrooms	Urinals	1,700	0	100%
Total		56,440	22,350	60%

Table 12. Summary of potential water savings per day at the school.

FUTURE WORK

This report has been compiled as part of a multi-year sustainability plan. This water audit helped develop a baseline inventory for water consumption at the school. As the school modernizes and replaces old equipment like toilets and showers, or installs low-flow aerators, we recommend making these replacements public knowledge by hosting this sustainability plan report and all of its data on a website alongside these replacements so that future students can track improvements.

Due to time constraints, this water audit could not measure all of the water consumed at the school. In future years, we recommend also examining custodial uses of water.

An additional point of interest arose from this study. It was observed that while the drinking fountains at the school were used regularly, there wasn't enough recorded uses to account for everyone at the

school. It would be interesting to compare the litres of water consumed at the school via the drinking fountains to the litres of water consumed via purchased water bottles at the school.

This sustainability plan report examined water consumption at the school. In subsequent years, this report recommends studying energy (heating, lighting, plug-in loads), waste, and transportation, as well as the sustainability of food products at the school.

APPENDIX A

CLASSROOM SINK USAGE

1. What is the number of your classroom? _____

2. How many sinks are there in your classroom? _____

3. How often are the sinks in your classroom used?

   _____ Every day

   _____ Couple of times per week

   _____ Once a week

   _____ Couple of times per month

   _____ A few times per semester

   _____ Never

4. Estimate how long each of the sinks in your classroom are used for every day (use only as many lines as there are sinks in your classroom).

   Sink 1 _____ minutes

   Sink 2 _____ minutes

   Sink 3 _____ minutes

   Sink 4 _____ minutes

LOCKER ROOM SHOWER USAGE SURVEY

1. Do you use the showers in the locker rooms? YES NO

2. Which locker room are you using? MALE FEMALE

3. If yes, how often? Place a check by the most appropriate response for you.

   _____ Daily

   _____ Couple of times per week

   _____ Once a week

   _____ Couple of times per month

   _____ A few times per semester

   _____ Never

4. If you answered yes to question 1, estimate how long you are in the shower:

   _____ minutes

LOCKER ROOM SHOWER USAGE SURVEY

1. Do you use the showers in the locker rooms? YES NO

2. Which locker room are you using? MALE FEMALE

3. If yes, how often? Place a check by the most appropriate response for you.

   _____ Daily

   _____ Couple of times per week

   _____ Once a week

   _____ Couple of times per month

   _____ A few times per semester

   _____ Never

4. If you answered yes to question 1, estimate how long you are in the shower:

   _____ minutes

APPENDIX B: BASELINE INVENTORY

Table 1. Estimated water consumption by toilets in female washrooms.

Location	User	Number	Amount per Use (L)	Number of Flushes per Day	Water Used per Day (L)	Water per year (L)
Science Wing	Toilets	2	9	21	378	71064
Arts Wing	Toilets	4	14	19	1064	200032
Culinary Wing	Toilets	4	14	8	448	84224
Language Arts Wing	Toilets	1	14	3	42	7896
History Wing	Toilets	1	12	3	36	6768
Industrial Wing	Toilets	1	12	3	36	6768
Gym	Toilets	2	12	4	96	18048
Guidance Room	Toilets	3	16	5	240	45120
Stone Corridor	Toilets	1	16	3	48	9024
Main Lobby	Toilets	6	15	61	5490	1032120
Office	Toilets	2	16	4	128	24064
Staffroom	Toilets	1	16	3	48	9024
					8054	**1514152**
Estimated Total					**8100**	**1500000**

Table 2. Estimated water consumption by toilets and urinals in male washrooms

Location	User	Number	Amount per Use (L)	Number of Flushes per Day	Water Used per Day (L)	Water per year (L)
Science Wing	Toilets	2	13.6	14	380.8	71590.4
	Urinals	4	1.5	121	726	136488
Arts Wing	Toilets	1	13.6	8	108.8	20454.4
	Urinals	4	1.5	110	660	124080
Culinary Wing	Toilets	2	14.4	4	115.2	21657.6
	Urinals	1	1.5	125	187.5	35250
Language Arts Wing	Toilets	2	13.2	3	79.2	14889.6
	Urinals	1	1.5	132	198	37224
History Wing	Toilets	3	9	5	135	25380
	Urinals	4	1.5	115	690	129720
Industrial Wing	Toilets	1	12.4	3	37.2	6993.6
	Urinals	3	1.5	132	594	111672
Gym	Toilets	2	8	4	64	12032
	Urinals	2	1.5	143	429	80652
Guidance Room	Toilets	1	12.8	5	64	12032
Stone Corridor	Toilets	1	14	12	168	31584
Main Lobby	Toilets	1	13.7	35	479.5	90146
Staffroom	Toilets	1	12.6	7	88.2	16581.6
					5204.4	**978427.2**
Estimated Total					**5200**	**980,000**

Table 3. Estimated water consumption by sinks in female washrooms

Location	User	Number	Amount per Use (L)	Rate of Use (L/s)	Average Time of Use (s)	Number of Uses per Day	Water Used per Day (L)	Water Used per Year (L)2
Science Wing	Sinks	2	0.98	0.1	9.8	20	39.2	7369.6
Arts Wing	Sinks	3	1.001	0.13	7.7	18	54.054	10162.152
Culinary Wing	Sinks	2	0.996	0.12	8.3	9	8.964	1774.872
Language Arts Wing	Sinks	1	1.04	0.13	8	2	2.08	411.84
History Wing	Sinks	2	0.957	0.11	8.7	4	3.828	757.944
Industrial Wing	Sinks	2	1.023	0.11	9.3	2	4.092	810.216
Gym	Sinks	2	0.988	0.13	7.6	6	11.856	2347.488
Guidance Room	Sinks	4	1.008	0.12	8.4	6	24.192	4790.016
Stone Corridor	Sinks	2	1.001	0.11	9.1	2	4.004	792.792
Main Lobby	Sinks	4	0.968	0.08	12.1	60	232.32	45999.36
Office	Sinks	2	1.02	0.12	8.5	4	8.16	1615.68
Staffroom	Sinks	2	0.996	0.12	8.3	3	2.988	591.624
							395.738	**77423.584**
Estimated Total							**400**	**77000**

Table 4. Estimated water consumption by sinks in male washrooms

Location	User	Number	Amount per Use (L)	Rate of Use (L/s)	Average Time of Use (s)	Number of Uses per Day	Water Used per Day (L)	Water Used per Year (L)2
Science Wing	Sinks	3	0.244	0.04	6.1	20	14.64	2752.32
Arts Wing	Sinks	2	0.864	0.12	7.2	18	31.104	5847.552
Culinary Wing	Sinks	2	0.75	0.1	7.5	9	6.75	1269
Language Arts Wing	Sinks	3	0.672	0.08	8.4	2	4.032	758.016
History Wing	Sinks	4	1.157	0.13	8.9	4	4.628	870.064
Industrial Wing	Sinks	2	0.756	0.12	6.3	2	3.024	568.512
Gym	Sinks	2	0.804	0.12	6.7	6	9.648	1813.824
Guidance Room	Sinks	1	1.11	0.15	7.4	6	6.66	1252.08
Stone Corridor	Sinks	1	1.068	0.12	8.9	2	2.136	401.568
Main Lobby	Sinks	1	0.99	0.11	9	60	59.4	11167.2
Staffroom	Sinks	1	0.75	0.1	7.5	3	2.25	423
							144.272	**27123.136**
Estimated Total							**140**	**27000**

Table 5. Estimated water consumption by all drinking fountains

Location	User	Amount per Use (L)	Rate of Use (L/s)	Average Time of Use (s)	Number of Uses per Day	Water Used per Day (L)	Water Used per Year (L)2
Science Wing	Fountain	0.282	0.047	6	43	12.126	2279.688
Arts Wing	Fountain	0.308	0.028	11	51	15.708	2953.104
Culinary Wing	Fountain	0.182	0.026	7	32	5.824	1094.912
Language Arts Wing	Fountain	0.184	0.023	8	46	8.464	1591.232
Language Arts Wing	Leak	0.001	0.001	1	86400	86.4	16243.2
Industrial Wing	Fountain	0.371	0.053	7	39	14.469	2720.172
Cafeteria	Fountain	0.516	0.043	12	91	46.956	8827.728
Gym	Fountain	0.378	0.027	14	87	32.886	6182.568
Gym 2	Fountain	0.564	0.047	12	12	6.768	1272.384
						229.601	**43164.988**
Estimated Total						**5300**	**43,000**

Table 6. Estimated water consumption by showers in male and female locker rooms

Location	User	Number	Amount per Use (L)	Rate of Use (L/s)	Average Time of Use (s)	Number of Uses per Day	Water Used per Day (L)	Water Used per Year (L)2
Female Locker Room	Shower	5	79.2	0.22	360	52	20592	3871296
	Leak	1	3110.4	0.0006	5184000	1	3110	1135150
Male Locker Room	Shower	5	50.4	0.21	240	37	9324	1752912
							33026	**6759358**
Estimated Total							**33000**	**6700000**

Table 7. Estimated water consumption by non-washroom sinks and dishwashers

Location	User	Number	Amount per Use (L)	Rate of Use (L/s)	Average Time of Use (s)	Number of Uses per Day	Water Used per Day (L)	Water Used per Year (L)2
Industrial Wing	Sink - Mr. C	1	180	0.6	300	4	720	135360
	Sink - Mr. R	1	39	0.65	60	3	117	21996
	Sink - Mr. W	1	15	0.5	30	4	60	11280
	Sink - Mrs. H	1	26	0.4	65	2	52	9776
Labs	Sink - Mrs. P	2	34	0.34	100	4	272	51136
	Sink - Mr. S	4	64.5	0.43	150	2	516	97008
	Sink - Mr. B	2	90	0.45	200	3	540	101520
Cafeteria	Sink	2	840	0.7	1200	2	3360	631680
	Dishwasher	1	3	-	-	15	45	8460
Culinary	Dishwasher	1	20	-	-	1	20	3760
							5702	**1059756**
Estimated Total							**5700**	**1100000**

APPENDIX C: RECOMMENDATIONS

Table 1. Estimated water consumption after adjusting toilet tank float in female washrooms

Location	User	Number	Amount per Use (L)	Number of Flushes per Day	Water Used per Day (L)	Water per year (L)
Science Wing	Toilets	2	7	21	294	55272
Arts Wing	Toilets	4	10	19	760	142880
Culinary Wing	Toilets	4	10	8	320	60160
Language Arts Wing	Toilets	1	10	3	30	5640
History Wing	Toilets	1	9	3	27	5076
Industrial Wing	Toilets	1	9	3	27	5076
Gym	Toilets	2	9	4	72	13536
Guidance Room	Toilets	3	11	5	165	31020
Stone Corridor	Toilets	1	10	3	30	5640
Main Lobby	Toilets	6	9	61	3294	619272
Office	Toilets	2	10	4	80	15040
Staffroom	Toilets	1	10	3	30	5640
					5129	**964252**
Estimated Total					**5100**	**1000000**

Table 2. Estimated water consumption after adjusting toilet tank float in male washrooms

Location	User	Number	Amount per Use (L)	Number of Flushes per Day	Water Used per Day (L)	Water per year (L)
Science Wing	Toilets	2	10	14	280	52640
Arts Wing	Toilets	1	10	8	80	15040
Culinary Wing	Toilets	2	11	4	88	16544
Language Arts Wing	Toilets	2	10	3	60	11280
History Wing	Toilets	3	7	5	105	19740
Industrial Wing	Toilets	1	9	3	27	5076
Gym	Toilets	2	6	4	48	9024
Guidance Room	Toilets	1	9	5	45	8460
Stone Corridor	Toilets	1	11	12	132	24816
Main Lobby	Toilets	1	10	35	350	65800
Staffroom	Toilets	1	9	7	63	11844
					1278	**240264**
Estimated Total					**1300**	**240000**

Table 3. Estimated actualized reduction in water consumption by adjusting toilet tank float in toilets.

Location	Device	Water Used per Day Before (L)	Water Used per Day After (L)	Percentage Reduction
Female Washroom	Toilet	8,100	5,100	37%
Male Washroom	Toilet	5,200	1,300	75%
Total		13,300	6,400	52%