

**Low - Flow Showerhead, Phase 2**

**Joshua Baker, Oliver Liu, Steven Nowikci, Waimond Fung**

**University of British Columbia**

**APSC 261**

**November 28, 2014**

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UBC Social Ecological Economic Development Studies (SEEDS) Student Report

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Waimond Fung, Steven Nowicki, Oliver Liu, Joshua Baker

University of British Columbia

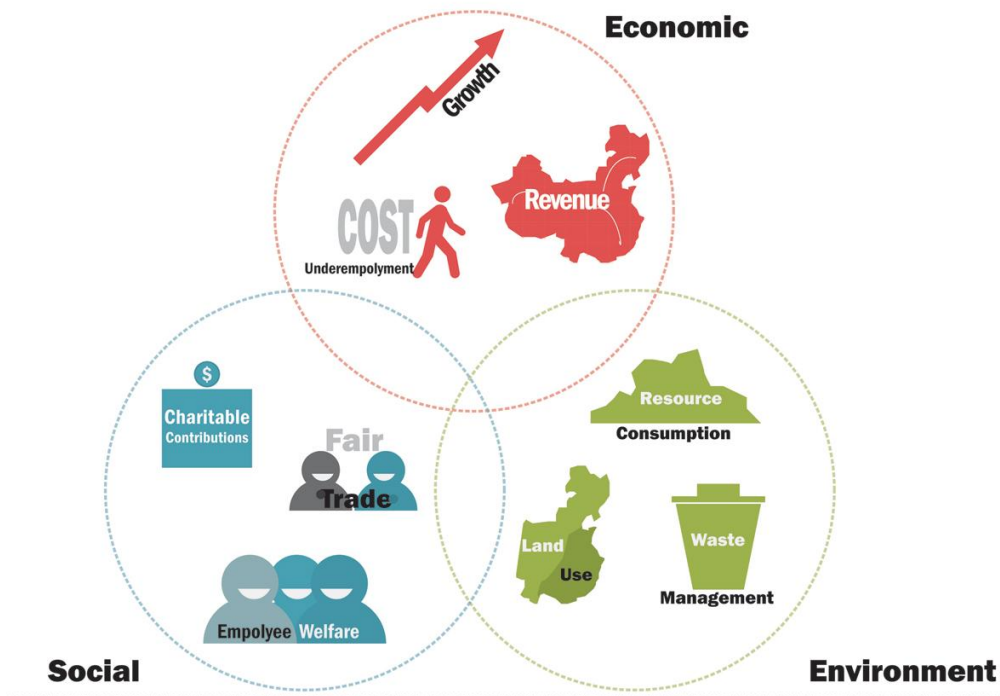
APSC 261 Technology and Society

November 28, 2014

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## Triple Bottom Line Assessment on Low - Flow Shower Heads

**APSC 262 SUSTAINABILITY PROJECT REPORT**



Submitted On: December 2nd, 2014

Instructor: Carla Paterson

Prepared By:

Waimond Fung  
Steven Nowicki  
Joshua Baker  
Oliver Liu

## EXECUTIVE SUMMARY

The purpose of this report is to review the phase 1 report's findings, and expand on their results and methodologies. The report determines user satisfaction from the assigned residence (Marine Drive Residence), and determines a suitable low-flow showerhead replacement based on price point, previous studies, technical specifications, and a triple bottom line (TBL) assessment.

Based on the phase 1 report, the recommended showerheads did not satisfy the price point of \$35. Unfortunately, this meant that their decision had to be disregarded in our research. Our team chose two shower heads: **WaterPik ETC-411** and **Pfister 015-LC0C**. The WaterPik, priced at \$15.77 during the time of this report, has a Watersense certification, a gallon per minute (GPM) of 1.6, four spray patterns, a swivel feature, and a limited lifetime warranty. The Pfister has a GPM of 1.5, three spray patterns, a self cleaning nozzle, and a lifetime warranty. The showerhead is priced at \$28.06 during the writing of this report.

During the shower head selection process, our TBL assessment was incomplete due to the fact that the social aspect of the assessment requires a user satisfaction survey. The phase 1 report had their showerheads tested out in fraternities. Our team believed that the results were heavily biased towards the male population, and could affect the overall results. Our test locations were chosen at the sites where they will be installed in the future. We were assigned to the Marine Drive residence with four test locations. During the installation of the showerhead, the technicians reported the WaterPik to have the best build quality, the best spray pattern, and an install time of seven minutes. The Pfister was reported to have bad build quality, fear of cracking during adjustment, installation, and a install time of five minutes.

Each showerhead was given approximately seven days for the users to try. Afterwards, surveys were administered to the users. The users at the Marine Drive residence did not like the original showerhead. The main concerns were adjustability and pressure. The results concluded that the WaterPik netted the highest user satisfaction even though it netted a score of 3 out of 5 from the spray pattern and water pressure satisfaction. The Pfister was not well received even though the price of the showerhead is almost twice of the WaterPik, and performed even worse than the original showerhead.

Model	User Satisfaction	Spray pattern Satisfaction	Water Pressure Satisfaction	Actual Water Pressure (gpm)
Original Shower Head	2.25	2.25	1.5	N/A
WaterPik	5	3	3	1.6
Pfister	1.5	2.17	1.17	1.5

\*Higher score is better

Table 1. Survey Results (Average Scores, out of 5)

Based on our TBL assessment, we recommend the WaterPik ETC-411. It is an exceptional shower head with a very low cost. The Watersense certification allows us and the users to be confident that it really is eco-friendly. The build quality reported by the installation technicians lends confidence to the fact that it will have a long lifecycle. Most importantly, it achieved a perfect score for user satisfaction in our survey. It achieves a better spray and water pressure score than the original shower head despite having a very low GPM. The showerhead also has adjustable options such as angle of the nozzle head and 4 spray patterns. In our surveys, we also determined that the average user spends 55 minutes in the showers per week. This means only 88 gallons of water is used instead of the minimum 137 gallons that would be used on a non-low-flow showerhead, which equates to about 35% water savings. To take an extra step in conserving water, our group suggests users are educated on how to use the showerhead efficiently (setting the spray patterns, adjusting the nozzle angle). The stakeholders can also educate the tenants on the benefits of saving water, and install a water usage meter to inform users how much water they are using each shower session.

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## Glossary

- *Low Flow Shower Head*: A shower head with a flow rate of < 2.5 gallons per minute.
- *Triple Bottom Line*: A metric intended to advance the goal of sustainability in business practices by taking into account environmental and social impacts as well as economic ones.
- *WaterSense Certification*: A watersense certification is a conformance test that ensures the following properties are kept:
  - Promote the value of water efficiency.
  - Provide consumers with easy ways to save water, as both a label for products and an information resource to help people use water more efficiently.
  - Encourage innovation in manufacturing.
  - Decrease water use and reduce strain on water resources and infrastructure.
- *CalGreen* : A compliance which indicated at least 20% of water is saved.

## List of Abbreviations

*GPM*: Gallons Per Minute. Used to measure flow rate of a shower head.

*TBL*: Triple Bottom Line

## 1.0 Introduction

The phase 1 low flow shower head provided much groundwork on the benefits of water conservation and the many options available in the market. This report aims to refine their report and provide a more in-depth survey for the actual students who will be using the shower heads. Currently, showerheads account for 17% of the water used at the university. With the switch to low flow shower heads, the university can lower that number to 12%. Based on the previous report, we initially chose the original WaterPik showerhead based on the recommendation. However, the showerhead is now priced at \$50 dollars, which is above the \$35 dollar price point requirement. We decided to research and test new showerheads.

There are many shower heads in the market that suit our water conservation needs. Our main priority is to increase user satisfaction. Our TBL assessment is heavily based on the social aspect. The reason that we chose to more heavily weight the social aspect is due to the fixed price of installing a shower head (therefore making a price difference of \$10 a relatively minor concern), and the fact that positive environmental effects are inherent when installing low-flow showerheads. Therefore, only the social aspect is highly variable. We proceeded to investigate and select two showerheads that had to be: locally available, under \$35 dollars, low-flow, and preferably with good user reviews.

Our decision came down to two shower heads: WaterPik ETC-441, and the Pfister 015-L0C. Each shower head was given a week for the users to test, and surveys were completed at the end of each test run. Recommendations were then made based on the results.

## 2.0 Methodology

Using the triple bottom line assessment, we endeavoured to find the overall best showerhead. We didn't have existing user satisfaction data for low-flow showerheads; therefore, primary research was conducted on shower head options. This involved extensive investigation into many types of low flow showerheads. Past studies of viable showerhead options were researched. We were able to find two options that fit the requirements provided by the Student Housing and Hospitality Service representatives. Table 2 shows the low flow showerhead model and flow rate that were tested on the Marine Drive residences participating in the study.

<b>Low Flow Showerhead Model</b>	<b>Flow Rate (GPM)</b>
<b>WaterPik ETC-411</b>	1.6
<b>Pfister 015-LC0C</b>	1.5

Table 2. Model and flow rate (gallons per minute) of low flow showerheads tested in the study

Each showerhead model was installed for seven days into two apartments at the Marine Drive residence. Eight anonymous participants between the ages of 18-24 tested each showerhead. They completed a satisfaction survey for each showerhead, which asked them to rate spray pattern, water pressure and overall satisfaction. The results from this survey were the primary source of information for the social aspect of the triple bottom line assessment.

The User Satisfaction Survey was put together by the four groups doing the Sustainable Showerhead project in APSC 261. The survey comprised of questions specific to the user (i.e. age, gender, ethnicity) to see if a correlation between these variables and properties of the showerhead were present. That is, a person with longer hair may require higher-pressure showerhead than a person with short hair. The survey also included questions related to the showerhead experience; as mentioned previously this included spray pattern satisfaction, water pressure satisfaction and overall satisfaction.

The final social aspect that was considered was satisfaction from the maintenance staff. The maintenance staff is required to change the showerhead and apply a removable nozzle with each new residence. The durability of the showerhead and the ease to change was considered for the triple bottom line assessment.

### 3.0 Technical Specifications of Shower Head

#### 1. WaterPik ETC-411



Figure 1. WaterPik ETC-441

Component	Plastic
Diameter	3.25 inches
Flow Rate	1.6 GPM
Number of Settings	4 spray pattern
Weight	0.52 LBs
Warranty	Limited Lifetime
Eco Certification	WaterSense

Table 3. WaterPik Technical Specifications

WaterPik is a renowned brand known for their oral care and shower heads. Their shower heads have innovative technologies such as their patented OptiFlow. Their OptiFlow technology guarantees exceptional pressure even with a low flow rate.

2. Pfister 015-LC0C



Figure 2. Pfister 015-LC0C

Component	Plastic/Rubber
Diameter	3.37 inches
Flow Rate	1.5 GPM
Number of Settings	3 spray pattern
Weight	0.29 LBs
Warranty	Limited Lifetime
Eco Certification	Cal Green

#### Table 4. Pfister Technical Specifications

The Pfister was specifically produced with green in mind. With an astounding flow rate of 1.5 GPM, it is one of the best low flow showerhead in the market. It is reasonably priced at \$26.77. It has 3 spray pattern, self cleaning nozzle, but no nozzle angle adjustment.

## 4.0 Survey Results

The survey from the Marine Drive residents returned a unanimous love of the Waterpik showerhead. Despite having a lower flow rate than the original shower head, it was rated higher in user satisfaction with regards to the flow rate. Further, although it had a lower cost than the Pfister shower head, it rated higher in terms of build quality and again, user satisfaction.

The Waterpik showerhead received by far the most praise, with one user commenting that "This was the best shower head ever. "Truly Fantastic.". The Marine Drive residents were so vehement in their desire for the Waterpik showerhead that many left additional comments about the Waterpik in the place of the additional comments for the other showerheads. As an example, when asked for additional comments regarding the Pfister shower head, a respondent declared "The 2nd [Waterpik] showerhead was by far the best one and should be installed again and stay forever!".

The overall assessment of the Pfister shower head was that it was difficult to adjust and there was very little pressure. According to one user, there is "not very much pressure at all. The aim is weird and basically hits you in the face and you can't change it". One user even reported that in the span of a week the head fell off when trying to change the pressure.

The original showerhead faced similar reviews to the Pfister shower head, with users stating that there is not much pressure and it doesn't swivel, with one user saying "You can't really change the angle so the water just hits me in the face".

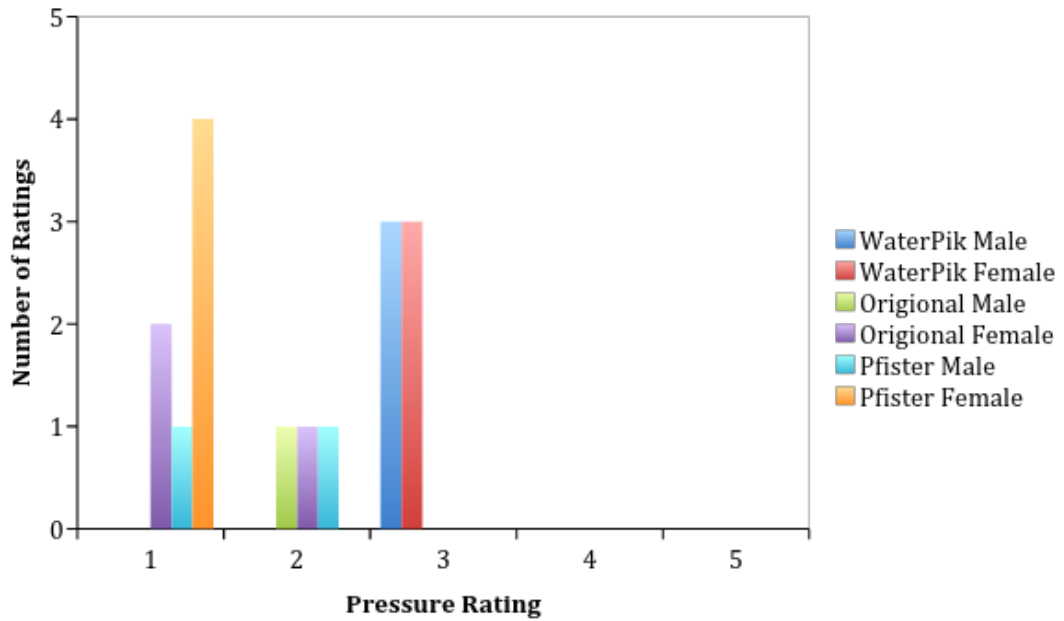


Figure 3. Number of pressure ratings from survey results given to Marine Drive residences

Rating	Original		Waterpik		Pfister	
	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
1		2			1	4
2	1	1			1	
3			3	3		
4						
5						

Table 5. Pressure rating results from survey given to Marine Drive residences



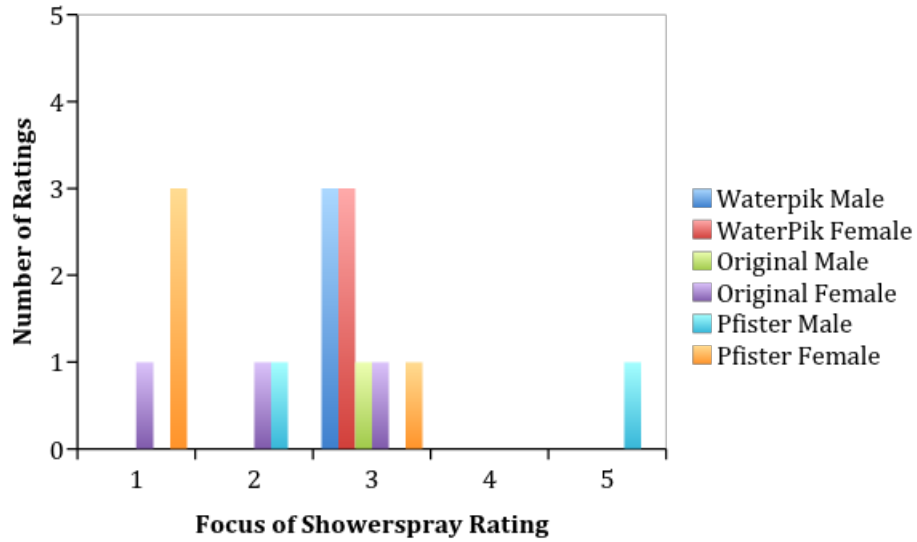


Figure 4: Number of focus of shower spray ratings from survey results given to Marine Drive residences

Rating	Original		Waterpik		Pfister	
	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
1		1				3
2		1			1	
3	1	1	3	3		1
4						
5					1	

Table 6. Focus of showerhead spray rating results from survey given to Marine Drive residences

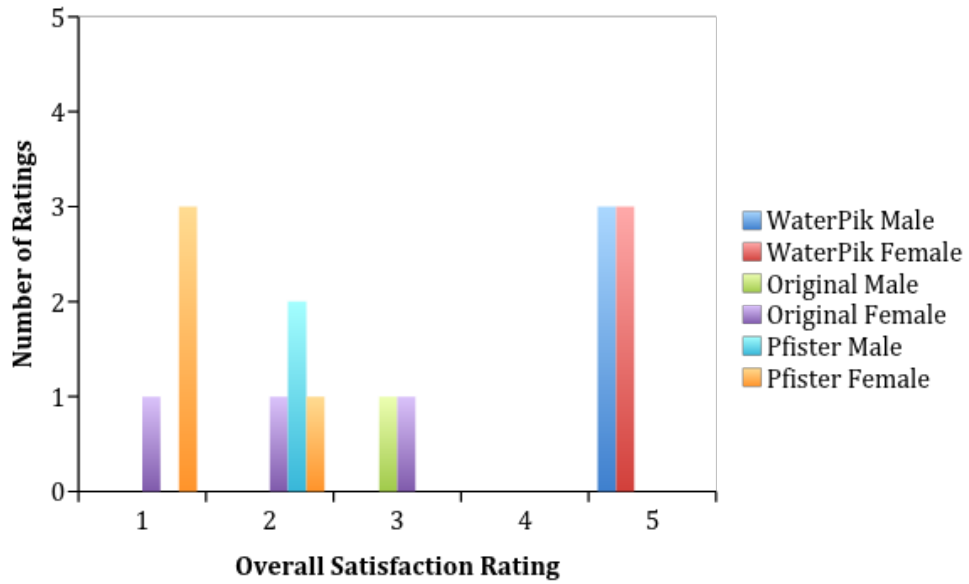


Figure 5: Number of overall satisfaction ratings from survey results given to Marine Drive residences

Rating	Original		Waterpik		Pfister	
	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
1		1				3
2		1			2	1
3	1	1				
4						
5			3	3		

Table 7. Focus of showerhead spray rating results from survey given to Marine Drive residences

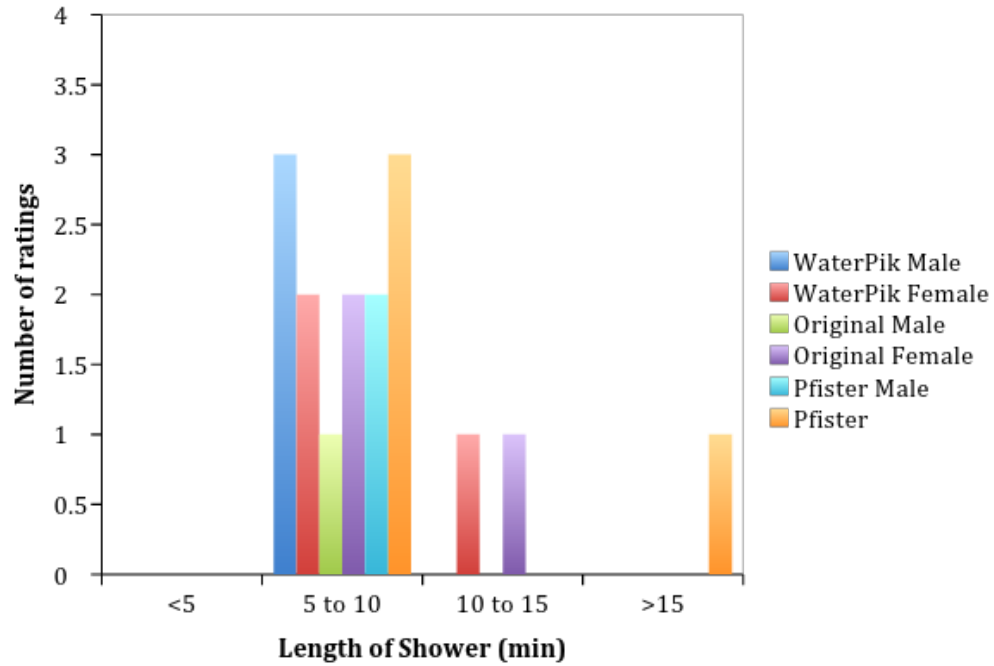


Figure 6: Length of shower results from survey given to Marine Drive residences

Length of Shower (min)	Original		Waterpik		Pfister	
	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>	<i>M</i>	<i>F</i>
<5						
5 to 10	3	2	1	2	2	3
10-15		1		1		
>15						1

Table 8. Length of shower results from survey given to Marine Drive residences

## 5.0 Triple Bottom Line Assessment

In our TBL assessment, we had to take into account the three pillars of any good business decision: the economic, social and environmental impacts of a choice. These factors were measured based on current showerhead market prices, user satisfaction feedback, and estimated water consumption respectively. Based on the results of our analysis, the Waterpik appears to be the favoured option out of the two with lower overhead costs, greater user popularity, but a slightly higher water consumption. The following paragraphs will expand upon our results and their significance to the triple bottom line in greater detail.

### 5.1 Economic Assessment

The economic impact is clearly measurable and primarily dictated by the capital cost of the showerhead. Since both products are sold with limited lifetime warranties, the expected replacement costs of both showerheads are considered negligible and will not tip the scales in either’s favour. Based on feedback received from residential staff, the maintenance costs for the two showerheads are assumed to be similar as we have received no feedback that would indicate a significant difference in the amount of time or effort required to maintain either of the two showerheads. On average, it takes 7 minutes to install the Waterpik and 5 minutes to install the Pfister. With 3 high-rise towers and 2 low-rise buildings, Marine Drive has a capacity of 1600 residents and approximately 617 apartment suites. Assuming an hourly wage of \$40 per hour for UBC Building Operation, the total cost of installation for replacing all current showerheads with either showerheads are as illustrated in the table below

<b>Showerhead</b>	<b>Cost per showerhead</b>	<b>Total cost</b>	<b>Total time required</b>	<b>Cost of installation</b>	<b>Total costs</b>
Waterpik	\$15.70	\$9,686.90	72 hours	\$2,880	\$12,566.90
Pfister	\$28.06	\$17,313.02	51.5 hours	\$2,060	\$19,373.02

The capital costs of the Waterpik and Pfister shower heads were acquired from Rona and Home Depot websites respectively. The Waterpik showerhead was favoured in this respect at the price of \$15.7, approximately \$13 cheaper than the \$ 28.06 Pfister showerhead. Both showerheads are well beneath the \$35 price limit with the Waterpik as the most economic showerhead option.

## 5.2 Environmental Assessment

The environmental impact of each showerhead can be measured by the volume of water used by a typical resident per shower with either showerhead. The amount of water consumed per shower can be estimated by multiplying the flow of the showerhead in gpm with the amount of time spent showering. Analysis of the survey results indicate that most residents surveyed spend approximately 5 to 10 minutes in the shower with either showerhead, thus an average shower time of 10 minutes will be used as a conservative estimate. At 1.6 gpm, the Waterpik has a slightly higher flow rate than the Pfister which has a flow rate of 1.5gpm. Assuming a daily shower, the table below illustrates the amount of water consumed by a typical resident per week with the Waterpik and Pfister.

<b>Showerhead</b>	<b>Gallons per minute</b>	<b>Water consumed</b>
Waterpik	1.6gpm	112 gallons
Pfister	1.5gpm	105 gallons

From the results we can see that over the period of a week there emerges a small but noticeable difference in the amount of water consumed. However due to the limited sample size of our survey results, the significance of this difference will require further investigation. The Pfister was found to be more environmentally friendly and would reduce the water consumption in the long run.

## 5.3 Social Assessment

The social impact was assessed through a user survey conducted at the residence of interest, Marine Drive. The survey measured user satisfaction which was covered in detail in section 4.0. In summary, overwhelming support was found amongst the residents surveyed for the Waterpik which consistently scored higher than the Pfister in metrics related to user satisfaction. From the survey results, we can see that both the users and the maintenance staff believed the Waterpik was of higher quality in terms of water pressure, settings, and build quality.

While the Pfister has a slightly lower flow rate than the Waterpik (0.1 GPM less) we believe this is within an acceptable range of difference considering the overwhelmingly more positive reviews of the Waterpik showerhead. Further, since the cost of the Waterpik is significantly less than the Pfister, our TBL assessment lends us in favor of the Waterpik.

## 6.0 Conclusion and Recommendation

Based on the results of our triple bottom line assessment, we have arrived at the conclusion that the Waterpik ETC-411 is the superior showerhead out of the two tested. Despite being the cheaper option out of the two, it scored higher on user satisfaction metrics across the board with UBC residents, and was praised by UBC technicians as having superior build quality to its competitors. Due to the limited sample size of the residents surveyed in this study, we would recommend conducting further studies with a greater scope of audience and larger sample size of residents surveyed in order to gain a more accurate perspective of user opinion of the Waterpik showerhead. In the event that the suggested studies are not feasible, a gradual, multi-phased approach should be taken to installing the Waterpik showerhead in the Marine Drive residence. The residence should be invited to provide feedback on the new showerhead and in the absence of consistent negative feedback, proceed with the installation.

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Appendix A - Student Survey

Showerhead Survey Questions

This survey will help Student Housing and Hospitality Services (SHHS) determine residents' satisfaction with showerheads, and to test out alternatives. By participating in this anonymous survey you will contribute to SHHS's procurement decisions. However, you can refrain from answering any of the following questions, or to abstain from the survey for whatever reason. If you have any questions, please contact your residence life manager.

If you choose to participate, **please fill out one survey for the showerhead currently in use in your residence, and one survey for each alternative model tested in your residence.**

1) Please circle your gender: Male Female Other

2) Which residence do you live in? \_\_\_\_\_

3) Based on these images of showerheads, please identify the showerhead that you are using. For the following questions, please answer based on your opinion of that showerhead.

Original Showerhead	First Alternative	Second
Alternative		

4) How long do you spend in the shower with the water flowing, on average? Please note that this is for the showerhead at your residence, not at home. Please circle from the following options:

Less than 3 minutes	3-6 minutes	7-11 minutes	12-15 minutes
More than 15			

5) How often do you shower at your residence every week? \_\_\_\_\_

6) On a scale from 1 to 5, is the pressure from the showerhead sufficient for your needs? (1 meaning there is not enough pressure, and 5 meaning there is too much pressure)

1	2	3	4
5			
Not enough pressure	Good amount of pressure		Too
much pressure			

7) Is the spread on the showerhead to your preference? (1 meaning "it can be more focused", 5 meaning "it can be wider"). If not applicable, please indicate why (e.g. adjustable): \_\_\_\_\_

1	2	3	4
5			

Not focused enough  
focused

Good

Too

8) Please rate your overall satisfaction with the showerhead:

5	1	2	3	4	
Very dissatisfied			Neither Satisfied	not Dissatisfied	Very
Satisfied					

9) How important would you say conserving water is to you?

5	1	2	3	4	
Not at all important			Somewhat Important		Very
Important					

Please indicate any additional comments as to why you like or dislike your showerhead, and any recommendations you may have (you may continue on the back of page):

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**Thank you!**