Filtered Water Stations on Western Michigan University's Campus:

A Sustainable Alternative to Bottled Water

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I. Summary

There are significant upstream and downstream consequences from the production, transportation, and disposal of bottled water. Because healthy and safe alternatives exist, that result in fewer green house gas emissions and lower cost, we believe more effort should be put into creating sustainable alternatives on campus. Rather than terminating our contract with Coca-Cola, we suggest for there to be free filtered water available to students, faculty, and staff. We believe that by doing so this will make WMU stand out in its efforts to act as a sustainability leader. Reducing our consumption of plastic together as a campus community, would help the university reduce our green house gas emissions (GHG) as well as provide a wide range of economic and social benefits.

Packaging is a crucial component of bottled water. Bottles provide contextual suggestions about the product and are marketed to attract buyers. It is something in which consumers can identify and relate to. In addition to its packaging, the water source that is labeled on the bottle may influence choice of consumption. Many corporations may use pictures of pristine mountains and water sources on the labels. According to the National Resource Defense Council, both Coca-Cola's Dasani and Pepsi's Aquafina, two of the biggest brands in the world, originate not from mountain springs or arctic glaciers, but from public drinking water facilities. Both companies point out on their bottles by labeling it "purified drinking water," but all regulated drinking water is purified.

Bottled water is far more expensive than water provided by our municipal sources. Little to no evidence exists suggesting that bottled water is cleaner than tap water. Bottled water is regulated by the federal government as a food product by the Food and Drug Administration (FDA); whereas, the EPA routinely regulates municipal water.

A growing number of Higher Education Institutions have already begun to eliminate the sale of bottled water. According to AASHE, six universities have been successful in campus-wide bottled water bans. Although we are not suggesting banning them altogether, we are however, proposing alternative course of actions which support our objectives to reduce our GHG emissions on campus. AASHE also provides universities with various bottled water policies such as, student campaigns to encourage and reduce bottled water consumption, as well as campaigns to ban bottled water in specific areas like university events, meetings, and commencement ceremonies, to name a few. They are doing so based on studies that suggest bottled water has negative social and environmental impacts and furthermore, that bottled water is produced under lower health and safety standards than public or tap water.

Students in particular, embrace various reasons for choosing to drink bottled water instead of tap water. Many of which take personal satisfaction in believing that water sold in a plastic container is somehow better for you. In general, society has deemed tap water to be the villain. The wide acceptance of bottled water has absorbed as a part of our culture today. If we look at our local activities and day to day

encounters, we can all witness the prevalence of this detrimental commodity.

Truthfully, we ought to be more concerned about corporations such as Nestle, Pepsi, and Coke, which are among many that are privatizing fresh water supplies (Elizabeth Royte, Bottlemania). Bear in mind that these corporations are earning a huge profit from selling water as a commodity. In addition, these bottled water manufacturers continue to add an extensive amount of greenhouse gases in their production and distribution processes.

Drawing from results of our survey with studies on understanding consumers' preferences, the reasons for bottled water consumption seemed to be varied. The main conclusion is that people generally value "good quality water" and many are prepared to spend up to 10,000 times more for it because they perceive to be a "purer" or "healthier" product. If filtered water is what students prefer, then we would like to recommend that WMU should make alternative options available in a more sustainable manner.

We recommend for a filtered water station at a key, well traded location, such as the Bernhard Center. Given the high capital costs that an organized plan may require, it is essential to know what strategies will work before a plan can be scaled up. The Sustainability Fund is a great opportunity for this project to launch on campus and to continue its life cycle of fine-tuning. Conducting a pilot will be the most crucial step for WMU in order to evaluate whether or not it's likely to be effective. Our project proposal sets the foundation for students to continue making improvements as the university itself makes incremental strides as a leader in sustainability.

II. Introduction

How did bottled water become so popular in first place? What does it mean that we are abandoning our municipal supplies? To answer the first question, bottled water started out as a niche market twenty years ago, marketed towards the wealthy demographic. They have become so ubiquitous now that we involve them in our everyday routines.

The tremendous amount of waste that goes into the production, distribution, and disposal of the onetime usage of plastic water bottles bring forth a significant matter of concern. As the plastic industry continues to grow, and corporations continue to contend that they are allowed to privatize water, there has been a correlating increase in toxic pollution (both to the environment and to humans). According to a study conducted by the Pacific Institute, bottled water raises serious concerns about the energy and water resources required to produce bottles and deliver them to consumers. The process of bottling water produces more than 2.5 million tons of carbon dioxide in a year, and it takes 3 liters of water to produce 1 liter of bottled water. Transporting bottled water also requires millions in barrels of oil (Pacific Institute).

Take a look around you, most of what we eat, drink, or use comes prepackaged in petroleum-based plastic, a material designed to last forever, yet used for products

that we then throw away. Plastic water bottles are rarely recycled in a closed loop. Rather than being recycled, 86 percent of water bottles are thrown away.

Plastic is a major contributor of pollution; it gathers in the earth's dynamic water systems which threatens aquatic ecosystems. Scientists have found significant amounts of plastic particles in the stomachs of marine animals. You might ask, "What is the significance of this?" Humans who consume fish might be concerned because it could have an effect on their health as well. So you see, there are upstream and downstream costs.

Most plastic cannot be recycled in a closed loop because the plastic material lowers significantly in the recycling process. For the last two decades, The American Plastics Council (APC) has promoted plastic recycling as being easy, economical, and successful while simultaneously encouraging the use of more and more plastic. According to the Environmental Defense Fund, during the APC's eight month advertising campaign to "Take Another Look at Plastics," 15 billion pounds of plastic were produced in the meantime and only 1 billion were taken back and recycled. The growth of new plastic products continues to outpace the growth of plastic product recycling by a factor of 14 to 1. (Environmental Defense Fund, "Something to hide: The sorry state of plastics recycling," October 21, 1997).

We are faced with the matter that bottled water is widely accepted and perceived to be "better" than tap water. From our survey, we believe bottled water acts as a pure, tasty, convenient alternative for students rather than making use of the campus tap and drinking fountains. Our survey also suggests two main contributing factors: convenience and taste. Furthermore, we believe a wide range of negative perceptions of the campus drinking fountains exist, which serve to uphold their behavioral and social reasoning to come to a decision to dispense $1.25 for water. From an objective perspective, bottled water is not necessarily "better" or "worse" than tap water.

Not surprisingly, bottled water consumption is sometimes higher in communities that have serious problems with their tap water. Water scarcity is a critical issue in many less developed and a few developed parts of the world. More than 2.5 billion people lack access to clean drinking water because they do not have the necessary infrastructure to filter contaminated water (Active Water, 2010). In America, we are fortunate enough to have drinking water that is regulated by the EPA to ensure it is safe to drink. Likewise, there are health risks related to drinking bottled water. Similar cases have occurred where bottled water have been contaminated with carcinogens. In a more recent case, Coca-Cola decided to remove Dasani from the UK market, after finding out that the levels of bromate, a potential carcinogen, exceeded legal standards.

A growing number of Higher Education Institutions are increasing their efforts to reduce privatization of bottled water on campus. For a social strategy warranting change to be effective, we must sort through competing systems and discover the barriers that inhibit students from engaging in the alternative activity we aim to foster. We followed a series of steps to begin revealing some of the barriers we set out to identify. It would be appropriate to uncover the self benefits students believe are

associated with engaging this alternative movement.

We need to determine and overcome the barriers to tap water and fountain use at WMU in order to reduce consumption of bottled water. From our survey, we studied the social aspects that students have on bottled water.

The steps we took to reveal the constraining barriers were: 1) Conduct a survey with a random sample of students. The survey supplied data for the types of barriers we aimed to discover. 2) Conduct another study using our own criteria for judging the conditions of the drinking fountains on campus. To do this, we made a columned chart that first named the locations we visited, followed by an exterior audit and its state of working order (Appendix V). 3) The information was then gathered and compared from our two surveys and presented to make our case.

Our ultimate purpose of this project is to make filtered water available on campus for free. WMU has the opportunity to substitute an energy intensive behavior for one that achieves a greater sustainable objective; one that aims to reduce unnecessary wastes and energy consumption associated with the life cycle in the production, transportation, and distribution of plastic. It is important to consider the many impacts that have a bearing on the environment.

If people have access to good quality tap water, they should use it. On the contrary, what we've gathered from our sample survey is that the condition of fountain tap water influences his or her decision to drink from them. We have developed a proposal which aims to provide an optimal solution for the university as well as make high quality drinking water available to the campus community. Together, it will be paired with a program to encourage the use of reusable containers. Our goals will be to reduce the use of plastic bottles, decrease the barriers that students are faced with concerning campus drinking water options, and support the prime selected reusable containers from Klean Kanteen.

To put filtered drinking stations into effect would serve as an action item in our promotion to decrease the amount of waste we produce together as a campus. Manufacturing is only the first step in an energy intensive process of consuming water in plastic water bottles. In contrast to tap water, the transporting bottled water involves burning massive quantities of fossil fuels. Roughly 80-86 percent of plastic water bottles end up as garbage and the only material that can be recycled is the material known as PET. If the manufacturer uses PET for their bottling practices, they are required to name it on the bottle, which is usually located on the bottom.

WMU is challenged to expand its existing sustainability efforts and commitments by underlining the stories of successful models of sustainability functions and activities. As identified in the ACUPCC Strategic Sustainability Initiatives Report, "we need to create and institutionalize processes for: 1) developing open, collaborative sustainability strategic planning; 2) identifying and allocating the necessary resources to successfully implement our plans; and 3) setting both achievable goals and targets and measuring and tracking our success to stimulate improvement." (ACUPCC)

III. Methodology and Data

Since there is no past project which relates to filtered water stations being installed on campus, our primary mission was to develop a student survey to see how if there was student support in making filtered water available at no cost to them. Another key point we hunted to investigate were the purchasing habits of students of bottled water. For example, we asked “Where your primary source of drinking comes from”, “At what quantity do you purchase”, and general reasons for drinking bottled water versus other sources. We expected a higher percentage of students to purchase bottled water. Our results however, were the opposite. This could partly be due to the design of some of the questions.

In addition to seeking student’s perceptions of the fountains, we examined the conditions ourselves. In our evaluation we included to what extent the individual fountains operated as well as the smell, taste, and appearance of them. The results from testing revealed a new light; suddenly, our general perceptions of the fountains were not as terrible as we initially predicted them to be. On average, most were satisfactory with a few exceptions.

We wanted to begin groundwork for introducing a high quality stainless steel water bottle, available at WMU bookstore. We searched for companies whose foundations are dedicated to sustainable manufacturing. We then focused a question on the survey of whether or not students would purchase a high quality water bottle. When it came to the water bottles, a lot of past research was already complete on the Eco Mug, such as if the company manufactures its products based on sound practices. The group of students who have worked on the Eco Mug in the past also conducted a series of tests to decide the product’s durability. This work helped us decide which companies to purchase samples from. We decided to gather samples from two companies, The Express Line and Klean Kanteen.

After looking at the many water bottle options offered in the campus bookstores, starting from an array of plastic to aluminum, we realized a good quality bottle made from stainless steel is not available to purchase. That is the reasoning for searching for something that is of higher quality for students. Once we found the two companies we desired for the test, we distributed some samples to the students in our class. Their homework was to test the water bottles in every way possible that would reveal its durability and overall likeness. (See Appendix IV)

IV. Examples of Best Practice on Campus

While some creation of footing was started by a research undergraduate, we are essentially embarking upon a fresh, new initiative. Chris, the research undergraduate, explored valuable information comparing the costs associated with some of the different options of filtration machines. Chris also conducted a blind taste test that

offered two types of water: Reverse Osmosis and Filtered water. The results from the small testing revealed that overall it was an evenly divided preference.

Perhaps the most valuable piece of data came from a resource (Thomas Reich) that performed water quality tests at five different locations on campus (See Appendix VI). His samplings indicated that the water quality is indeed safe. If this is true, then there must be a reason why students still prefer bottled water over tap water. As we initially predicted about the water's quality, there were sizeable amounts of Iron. Iron is significant because it has an effect on the water's taste and appearance. We have identified taste to be the single most contributing factor to why students are motivated to drink bottled water instead of tap water. The evidence is there, and that shows that the water is adequate; however, it does not deny the fact that the taste of the water is not desirable. In order to find out why, we used our survey to correlate students' opinions and perceptions of the drinking fountain conditions with our own findings from examining the fountains.

Moreover, even though we are presented with evidence that our water quality on campus is below the level of concern, these tests should be used as a basis for further investigation by extending to perform more tests.

V. Examples of Best Practice on Other Campuses

In particular, Colorado at Boulder was a leading model in our initiative. Our premise is that successful positive changes have occurred at universities when students, with the support of faculty, develop innovative projects and solutions to address our past and present unsustainable behaviors. Colleges are magnets for resources and interesting people, ideas, and projects that can have significant impact on their community's sustainable development efforts.

In an effort to protect the environment, universities are becoming leaders in eco cultural sustainability by considering alternative options that will provide filtered water stations instead of bottled water. Below are the major universities that have influenced us on the path for our proposal. Our biggest influences were CU at Boulder and Kalamazoo College. Although we did not have the extended amount of time or financial resources available to us at the time to execute our proposal for a pilot, we mirrored some of their steps because they were successful in implementing sustainable water practices on their campuses.

University of Boulder at Colorado

The practices at this university were the most influential to us because the students who worked on it clearly defined their place and goals in its mission to changing attitudes and influencing sustainable behaviors. Students, faculty, and staff at

University of Boulder at Colorado started out by recognizing current unsound activities on campus; which is what we have set forth to expose.

In the last decade, student body support at Boulder Colorado has blossomed since it began its early stages of transformation as a university leader in shifting toward a minimal impact lifestyle. Boulder's life cycle began in 2008, when Dining Services first launched filtered water stations as a pilot in dining halls. Subsequent to the installation, their next step was to increase the popularity by using incentives and other public awareness tools. With the help of dedicated members who first launched a bottled water team and with the support of Dining Services, Coordinator of Nutrition and Sales, Coordinator for Facilities, and Coordinator for Procurement, this hard working team was able to successfully outline problems on campus.

According to Dining Services, the presence of the filtered water stations had made little or no impact on the large amount of bottle waste. We further investigate this low usage rate and to provide suggestions for improvements, which was paired with the request to encourage the use of reusable mugs. Our own mission was similar to theirs, with the exception that WMU does not already own filtered stations and we set out to encourage reusable water bottles instead of mugs. A key action plan for CU at Boulder involved designing creative signs that together promote and help educate students about the use of filtered water stations as a healthy alternative.

Like WMU, bottled water on Boulder's campus is produced by the Coca-Cola Corporation along with a few others. They took it a step further and calculated the approximate health and ecological footprints concerning the manufacturing of the various types of plastic bottles. This model would be very important to WMU in the future and would serve as a huge leverage for initiating a change. Although past students have developed a formula to summarize the school's greenhouse gas emissions, not all activities have been measured. Calculating the energy use, would assist student environmental researchers to gather more quantitative data and calculate results into the previous work.

The students put up signs above the water filtration stations. Without explaining what it is and the reason for it being there, students would have little idea and would easily pass it by. We decided that it would be a great idea to put up our murals and posters to catch the attention of passing students.

Their survey observations offered perception about the high rate of bottled water use.

Kalamazoo College

In the 2007-2008 school year, the environmental organization at K College initiated a campaign to spread awareness about the impacts of unsustainable behaviors on freshwater supplies. K College's action plan began with a three part campaign that is a part of the College's climate commitment plan and effort to reduce the consumption of bottled water on campus. The environmental organization first directed their effort towards making a visual illustration of empty water bottles and hung them on campus.

The next step was to set up a table in the cafeteria to sell reusable water bottles and also to encourage students to sign pledges to reduce or eliminate bottled water consumption. Their campaign was part of the Think Outside the Bottle Campaign. “This is a campaign to promote, protect, and ensure public funding for our water systems” (thinkoutsidethebottle.org)

Portland State University

Portland’s Environmental Club initiated a public campaign called “Take Back the Tap,” an organized campaign to reduce the use of plastic bottles on PSU’s campus.

Their efforts of leadership were published in The Portland Tribune. In doing so, their awareness reached even more individuals which encouraged participation and support in their striving actions toward eco cultural sustainability. Again, this stresses the importance of public awareness programs as a tool for changing social behavior.

Grand Valley State University

Student on Tap is a committee at Grand Valley State University. Josh Lycka stated that the committee’s main area of focus is directly rooted in education. This group of students strongly believe educating the public about the actual upstream and downstream costs of bottled water is what fuels support for their initiative.

Students on Tap is just getting the campaign started, but already they have schemed possible alternatives for students should the campaign be successful. Some of those alternatives include: reverse osmosis water stations, getting reusable water bottles out to students, and having a check-out system for students where they can rent or borrow a reusable bottle in the event they do not carry their own. This last idea presents obvious potential health issues, as well as taking inconvenience into consideration, which is why we chose not to incorporate it.

VI. Discussion

Analysis of Drinking Fountains and Survey Results

Our findings of some of the campus drinking fountains were for the most part, fairly similar. When we first started our project, our initial perceptions of the drinking fountains were very poor; we expected them to be dirty and undesirable to drink from.

However, we found surprising opposing results once we evaluated them.

To summarize our results, we found that corroded residue tended to accumulate on many of the fountain's spout. This characteristic, which remained consistent as we examined several fountains, consisted of a combination of white, blue-green crud. Although this appears to be displeasing for users, it doesn't change the fact that the water coming out from the fountain is just as sufficient, or even more so, than the water that is pumped from a far away source by bottle water corporations.

From the results of our survey, there were 71.6 percent of the responses which stated that the condition of the campus drinking fountains affects their decision to use them. Furthermore, 63.3 percent of the respondents stated that lack of cleanliness is what disappoints them about the drinking fountains. Other determining characteristics worth mentioning are malfunctions of the machine (i.e. water shoots out too softly, or too rapidly), 51.4 percent and taste of the water, 66.1 percent. Together, these numbers provide evidence that the appearance of the fountain as the user approaches it for a drink will greatly direct his or her decision to drink from it. If this is indeed true, we need to examine an action plan to adjust users' behavior to take advantage of the water that is supplied by our local water systems instead of supporting the privatization of water that is bought and sold by corporate companies. By switching from bottled water to a source that is treated locally and provided at a much lower cost to the community, we would be supporting further investment toward future improvements of the city's municipal system.

If filtered water systems were installed on campus, 86.2 percent of students would be likely to use them. This number, although taken from a small population sample, may provide enough evidence that would suggest a larger sample would likewise counter the same answer.

The location of a pilot is obviously one of the most important factors in its success, so we set out to ask students what would be a desirable location to fill up their reusable water containers. 84.2 percent of students that participated in our survey said that they would use the filtered water stations if they were located in the Bernhard Center. We gave them an option to also suggest their own location idea. Among them were: the Residence Halls, Sangren, Sprau Tower, and Parkview. To set up a filtration machine this would call for an expensive upfront cost. Nevertheless, the university is responsible for the removal of its litter and recycled products; and by reducing our consumption of merely non reusable plastic water bottles, would alone save a great deal of money.

Our first and only scenario would be for the pilot machine to be installed inside the Bernhard Center. We chose not to explore other locations because we wanted to focus mainly on a practical location on campus to conduct a trial.

One of options of a machine we found was the "Elkay EXH20 Bottle Filling Station." We have also come up with other filtration machines (See Appendix VII).

Our most limiting factor was time, especially since there was not a lot of groundwork to assist in the beginning phases of our proposal. We initially had so many aspirations of what we had hoped to accomplish, but simply did not have the amount of time it would require.

Analysis of Water Bottles

We decided that the re-reusable water bottles that we provide should be stainless steel. Our decision was based upon that there is no current evidence that stainless steel water bottles leach harmful chemicals and do not retain flavors. More importantly, stainless steel is much more durable than plastic, lasts longer, and is BPA free. Since stainless steel is already a safe alternative to aluminum and plastics, it does not need to be lined for protection. Liners in reusable water bottles usually contain BPA, a harmful substance that has been connected to numerous illnesses. The stainless steel water bottles do not take on other flavors due to the lack of a liner. Other benefits to stainless steel water bottles include the durability associated with using a combination of chromium and nickel. Used together, the resistance to stains and rust is increased. Also, stainless steel provides an easy to clean surface that allows for a more sanitary water bottle. The health benefits associated with stainless steel are reason enough to prefer a stainless steel water bottle, the rest are just added benefits.

VII. Limitations of Analysis & Future Work

Limitations

One of the major problems we encountered was getting our survey sent out to students' e-mails. We spent two days at the flagpoles to both educate students about our initiative and surveying them. During those two days, we collected approximately 70 to 85 responses and the rest were collected from online responses. We believe surveying at the flagpoles was a successful leverage, though it didn't reach as many students as we had hoped for. We e-mailed several advisors, department chairs, and professors to see if they would distribute our survey to their list server of students. We found that indeed, the most challenging part was getting the approval that was needed from the HSIRB. Time was the factor in this matter because it would take months for them to approve that it.

Our survey was the first of its kind at WMU, therefore, there is a lot to learn from it. We realized that some of the questions may need to be more direct or rephrased.

The Physical Plant would be most resistant to installing and maintaining water stations because of the extra labor and costs it would require.

Future Work

- Since the manufactures, Earth to Earth, are willing to work with WMU to

improve the stainless steel water bottles that we tested, future work is required so that WMU will be able to offer a high quality stainless steel water bottle at the campus bookstores.

- Education outreach campaign to bring awareness of green house gas emissions associated with the production, transportation, etc.

- Further testing on many other drinking fountains (Thomas Reich).

- Continue to try and access Coca-cola contract.

- Pilot of filtered water machine (see Appendix VII).

VIII. Conclusion/Recommendations

Concerning the survey, we felt it did not reach the population desired. At first we didn't believe the survey was going to be a key stepping point. On the other hand, we concluded that it was far more important as part of our course of action. We realized through the survey that student support was critical and hearing how the students really feel was significant because ultimately, if students don't care, why should the university find it necessary to install expensive machines?

After reviewing the survey, we thought it would be helpful to add the following question "Do you purchase bottled water," in a yes or no format. It would have been a lot more direct and we would have obtained a sample statistic that supports their reason why they chose to drink bottled water. In addition, it could also present supporting data towards the striking number of plastic waste on Western Michigan University's campus.

After further refining our proposal initiative, we aim for it to be reviewed and accepted by the Sustainable Fund Board. The fund can provide sufficient funding that is need for this project. A major drawback is the initial capital costs related to the machines. For instance, it would require an extensive amount of additional labor to install and continually maintain the machines to make sure they are in proper working status. In order for the university to find it practical to invest in this project, it must be considerably inexpensive. We provide a cost comparison of some of the elevated possibilities of machine options (Appendix VII).

We didn't follow the exact manner of procedures that the successful universities in our best practice models carried out mainly because our school's circumstances are slightly different. For example, at CU at Boulder, their filtered water stations were implemented into dining halls, which they placed on countertops that became part of

their cafeteria operation. In our given case, the test pilot located anywhere on campus would need to be a something students can identify easily so they will make use of it. The Bernhard Center is an ideal place to pilot a filtration machine. One of the ways to determine whether it's being used by the students is to document the number of times the machine has been used in a given day, week, and/or month. A possible way of achieving this would be to install a system to swipe a student's Bronco ID card. The swiping system would also tell us who's using it and among the students who are, how often and at what given times it is being used.

A high priority recommendation for the next group of students who carry on with this project, we would strongly suggest to combine two forms of qualitative research that would be useful to identify barriers and benefits: observational studies and a large focus group survey study.

Suggested observational studies of this project involve watching students carry out a chosen behavior in a direct manner. It would be ideal to observe first hand student behaviors in connection to the drinking fountains, such as recording their actions and usage. Furthermore, a plan once a pilot is installed at the Bernhard would be to observe and record students' behavior to determine if there is a social change. Direct observations would be a very valuable technique because it would bypass limitations of exaggerated responses when asking students to self report about their personal behaviors by survey.

After execution of our survey, we realized that not only was the participating sampling class undersized but also, it did not operate to concentrate on any specific focus group. For example, we could have geared the questioning toward freshman students, and spent time in the residence halls surveying them. With the obtained data, we might have been able to make a leveraging case for installing filtered water machines in residence halls, if the results deemed significant.

Just as Kalamazoo College has the Outside the Bottle Pledge as a part of their campaign, we would like to see that same pledge brought to WMU. We could also make the pledge available for students to sign on campus, for example, the dining halls would be a great location to raise awareness and gain support.

Further suggestions include showing the film *Tapped* on campus. It would be a part of our raising awareness campaign. We have not seen the film yet, but we have read and heard positive reviews on it. The film exposes the dangers of the bottled drinking water industry, of which many people are not aware of. Moreover, this film is about the "behind the scenes look into the unregulated and unseen world of an industry that aims to privatize and sell back the one resource that ought never to become a commodity-water." (*Tapped*-Review from Film.com)

We can use the success and failures experienced by Kalamazoo College as an advantage and use them as leverage points for our initiative strategies. We would like to implement an educational awareness campaign to provide insightful and effective facts relating to the upstream and downstream costs associated with bottled water to students.

Our ultimate goal for the future is to cut down on bottled water in the following areas:

1) New Student Orientation
2) Commencement
3) Student Events
4) Sporting Events
5) Vending Machines
6) Residence Halls
7) Campus Cafés

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X. Appendices

Appendix I: Author Contacts

Name	Phone Number	Email
Kimberly Shafer	(269) 449-4463	kimberly.j.shafer@wmich.edu
Alexandra Secrest	(815) 342-1327	alexandra.m.secrest@wmich.edu

Appendix II: Contact List and E-mail Communication Log

Name	**Title**	**Email**	**Phone Number**
Don Penskar	Director, Logistical Services	donald.penskar@wmich.edu	269.387.8804
Chris Chaprara	Undergrad Researcher	christopher.b.chaprara@wmich.edu	269. 350.7711
Baiba Stepe	Director of Auxilary Enterprise Office	baiba.stepe@wmich.edu	269.387.3362
Tom Duisterhof	Gordon Water Rep.	tomd@gordonwater.com	616.262.5188
Thomas Reich	Tested water from the fountains	thomas.j.reich@wmich.edu	n/a
Matthew Hollander	Postgraduate Sustainability Researcher	m4hollan@wmich.edu	269. 352.5093

From	Betsy Drummer <betsy.drummer@wmich.edu>
Sent	Thursday, April 8, 2010 8:14 am
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Subject	Re: A student survey

Dear Betsy,

I am a business student. I am currently working on a sustainbility project proposal for a class, in which to to implement free filtered water stations throughout WMU's campus. I would greatly appreciate your help in distributin this e-mail below to your server list of students. The url contains a short survey for students, faculty, staff, etc. I would so greatly appreciate your help by sending the following message out containing the url. In advance, thank you for your time and help.

http://www.surveymonkey.com/s/wmuwater

Thank you,

Kim Shafer

Hi Kim,

We do not have a list serv in which I can do this. Sorry! When we send out mass emails, it's from the direction of the faculty and the office coordinators can get a class list from the professor. The best person to maybe contact would be someone in charge of communication for the college of business. Valorie Juergens is our communication coordinator for the college of business. She works out of the deans office, you may try to contact her about a list serv or some other means of getting this out for you. Here is the web site to our communications department:
http://www.wmich.edu/business/communications/

Hope this helps!
Betsy

Betsy Drummer
Office of Advising and Admissions
Haworth College of Business
Western Michigan University
Phone: (269) 387-5089 Fax: 269-387-5710
betsy.drummer@wmich.edu

From	Valorie Juergens <valorie.juergens@wmich.edu>
Sent	Thursday, April 8, 2010 9:54 am
To	thom.myers@wmich.edu
Cc	Betsy Drummer <betsy.drummer@wmich.edu> , kimberly.j.shafer@wmich.edu
Subject	Fwd: A student survey. (HCOB)

Dear Valorie,

I am a business student and I am currently working on a sustainbility project proposal for a class, in which to to implement free filtered water stations throughout WMU's campus. I contacted Betsy Drummer, in the office of advising and admission of business, she suggested to e-mail our communications coordinator since she did not have a list serv. I would greatly appreciate your help in distributing this e-mail below to your server list of students. The url contains a short survey for students, faculty, staff, etc. I would so greatly appreciate your help by sending the following message out containing the url. In advance, thank you for your time and help.

http://www.surveymonkey.com/s/wmuwater

Thank you,

Kim Shafer

From	Thom Myers <thom.myers@wmich.edu>
Sent	Thursday, April 8, 2010 11:15 am
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Cc	Valorie Juergens <valorie.juergens@wmich.edu> , Betsy Drummer <betsy.drummer@wmich.edu> , Jim Gilchrist <james.gilchrist@wmich.edu>
Subject	Re: A student survey. (HCOB)

Hi Kim,

A survey of students requires approval of the Human Subjects Institutional Review Board and approval of the University's chief information officer, Dr. James Gilchrist.

We do not use WMU e-mail to distribute invitations to take student-conducted surveys. We will publish invitations through a targeted announcement in GoWMU, but only if the survey is part of doctoral dissertation. We established these limits, because otherwise, we would all be buried in survey requests. If you want to appeal, you

should write to Dr. Gilchrist at james.gilchrist@wmich.edu.

It would be more productive, however, to think of other ways to get the word out. For example, you have 446 Facebook friends. You could select the ones at WMU or Haworth College of Business and send them an invitation through FB.

Regards, Thom

Thom Myers
Director of Electronic Communication
Office of University Relations
Western Michigan University
Kalamazoo MI 49008-5433
office (269) 387-8710 or 387-8400
mobile (269) 720-4713
thom.myers@wmich.edu

From	Matthew Hollander <m4hollan@gmail.com>	
Sent	Wednesday, April 7, 2010 7:27 pm	
To	Kimberly Shafer Joy <kimberly.j.shafer@wmich.edu>	
Cc	Glasser Harold <harold.glasser@wmich.edu>	
Subject	Water samples	
Attachments	Water around campus.xlsx	38K

Dear Kim,

Here is Thomas Reich's data. Now that I look at it he only tested five sources. If you recommend that more sources are tested at least we know that Dr. Koretsky's lab has the capabilities (if not the time, money, or desire) to do them. His email is thomas.j.reich@wmich.edu and he is a cool guy.

Cheers,
Matt

From	Donald Penskar <donald.penskar@wmich.edu>
Sent	Monday, April 12, 2010 12:45 pm
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Subject	Re: Numbers on Coca-Cola purchasing

Mr. Penskar,
My name is Kim, I'm a student working on a semester long project for one of my classes. In short, the project is a proposal to help ignite a sustainable change on campus, as Pres. Dunn has recently identified to become integrated into the institution. One of the last pieces of data that would be desirable to include would be any information on purchasing orders for Coca-Cola. In particular, I am looking at the trend of bottled water, so an approximate number of how many WMU purchases would be extremely supportive. If you have any time to meet with me this week, instead of through e-mail, it would be most helpful and appreciated.
I thank you for your time and help.
Sincerely,
Kim Shafer

Kim,

Thanks for your note....I am not sure that I have the specific information you need on this.....but please give me a call at 269-387-8804 and I think I can point you in the right direction.

Don

Don Penskar
Director, Logistical Services
Western Michigan University
Kalamazoo, MI 49008
Phone - 269-387-8804
Fax - 269-387-8824
E-Mail - donald.penskar@wmich.edu

From	Donald Penskar <donald.penskar@wmich.edu>
Sent	Tuesday, April 13, 2010 12:42 pm
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Subject	Re: Numbers on Coca-Cola purchasing

Kim,

Is there a number I can reach you? Or if you prefer, please let me know a time you would like to call and I will make sure I am here....you can also try my cell at 269-217-4238.

Thanks,

Don

Mr. Penskar,

Thank you for responding so quickly. I tried calling your office number yesterday, but unfortunately was not able reach you. Is there a better time to try? To make a clearer picture of what I am searching for, is any related information on Coca-Cola purchasing. This project, called Water Filtration on Campus, is for Dr. Glasser's class.

Thank you,

Kim Shafer

From	Baiba Stepe <baiba.stepe@wmich.edu>
Sent	Friday, April 16, 2010 1:34 pm
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Subject	Re: Coca-Cola inquiry

Hi Kim and Alex,

We, WMU Vending, do not purchase Coca-Cola products. Coke supplies
the vending machines and product to fill them. They bear the entire cost. Product is purchased by Dining for the dining rooms and Cafes. That contact person is Judy Gipper. Coke product supplied to Athletics is handled by a third party. Let me know if you have any additional questions. Vending machines are serviced 2 to 3 days a week.

Till later,
Baiba

From	ServiceMagic Customer Service <customerservice@mp.servicemagic.com>
Sent	Sunday, April 18, 2010 8:03 pm
To	kimberly.j.shafer@wmich.edu
Subject	Your service request for Gordon Water Systems, Inc.

Dear Kim,

Thank you for your request to be matched with Gordon Water Systems, Inc. for your Install or Replace a Water Treatment & Purification System need. We are currently reviewing your request and would like to confirm that you are interested in pursuing this project.

We are glad that you are part of the ServiceMagic community of homeowners and prescreened, customer-rated home service professionals. We hope you'll come back soon.

By using ServiceMagic's services, you agree to the ServiceMagic Terms & Conditions

Customer Regards,
Service Team
ServiceMagic, Inc.
Toll Free: (866) 888 - MAGIC (6244)
CustomerService@ServiceMagic.com

From	Tom Duisterhof <tomd@gordonwater.com>
Sent	Monday, April 19, 2010 10:06 am
To	kimberly.j.shafer@wmich.edu
Subject	Drinking Water

Kim, I am responding to your interest in a drinking water solution.

How can we help you today?? I will call you shortly.

Best Regards,

Tom Duisterhof
tomd@gordonwater.com
www.gordonwater.com
800.Water.68 (800.928.3768),
Mobile 616.262.5188

On Apr 19, 2010, at 11:39 AM, Kimberly Joy Shafer wrote:

Tom,
I am a student at Western Michigan University. I have been working on a semester long project proposal in a class for introducing filtered water stations on campus. Our aim is to provide free filtered water to all individuals of the campus community, in an effort to help WMU's journey towards a more sustainable university by reducing greenhouse gas wastes associated with the production, distribution, and disposal of bottled water. Our school has a long standing contract with Coca-Cola, so we have some barriers there. But included in my project proposal, are some water equipment options that are feasible for WMU. I came across your website, and noticed you are local, which is great! WMU is likely to give a pilot test of the machine that is chosen. Do you have a commercial size filtration (machine, fountain, etc.)?

Thank you Tom for your interest and help!

Sincerely,
Kim

From	Tom Duisterhof <tomd@gordonwater.com>
Sent	Monday, April 19, 2010 2:27 pm
To	Kimberly Joy Shafer <kimberly.j.shafer@wmich.edu>
Subject	Re: Drinking Water

Kim - Thank you for contacting us. Yes, we too have been working with persons at WMU to propose drinking water solutions. We have worked with two other students, the latest being Christopher Caprara. They have been part of the Physical Plant and reporting to Anand Sankey. Are you involved at the physical plant? Do you know either Chris or Anand?

We do offer a very nice solution that can provide a very good, 3rd party tested/verified, drinking water solution. The filtration technology can be coupled with a bottle-less cooler or directly to a faucet for dispensing.

Let me know what your thoughts or needs are moving forward.

Best Regards,

Tom Duisterhof

Appendix III: Survey Questions & Results

Water Filtration Station(s) on Campus

1.

Do you drink water?

- [ ] Yes
- [ ] No

What is your primary source of drinking water?

- [ ] a. The tap/at home filter system (ex. Brita)
- [ ] b. Bottled water
- [ ] c. Drinking fountains
- [ ] d. Campus tap

Do the conditions of the campus drinking fountains affect your decision to use them?

- [ ] Yes
- [ ] No

What disappoints you about campus drinking fountains?
***Check all that apply**

- [ ] Lack of cleanliness
- [ ] Malfunction i.e. water shoots out too softly or too rapidly
- [ ] Water temperature
- [ ] How well they work
- [ ] Taste
- [ ] Smell
- [ ] Contaminants
- [ ] Other (please specify)

If some campus water fountains were improved and equipped with a filtration system, would you be likely to use these more frequently?

- [ ] Yes
- [ ] No
- [ ] Not sure

Water Filtration Station(s) on Campus

Would you use the filtered water stations if they were located conveniently? (such as in the Bernhard Center)

- [ ] Yes
- [ ] No
- [ ] Maybe
- [ ] Other (please specify other location)

Do you own a re-usable water bottle?

- [ ] Yes
- [ ] No

If a high quality water bottle was available at the bookstore, I would be willing to pay...

- [ ] I would not buy one
- [ ] $4-6
- [ ] $7-9
- [ ] $10-12
- [ ] $13-15

If you purchase bottled water, at what quantity do you purchase?

- [ ] Individual sale from a vending machine or other store
- [ ] Multipack
- [ ] I do not purchase bottled water

How much bottled water, by volume, do you purchase weekly (in individual container or in bulk)?

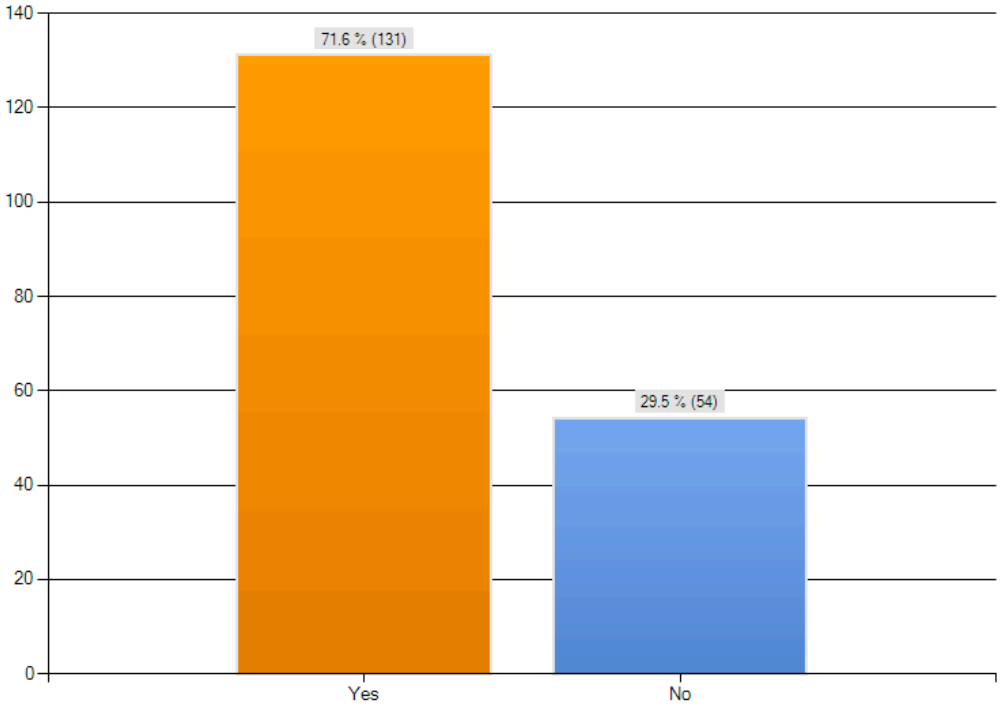
- [ ] One quart (1/4 gallon) or less
- [ ] One quart to one gallon
- [ ] More than one gallon
- [ ] Do not purchase bottled water

Water Filtration Station(s) on Campus

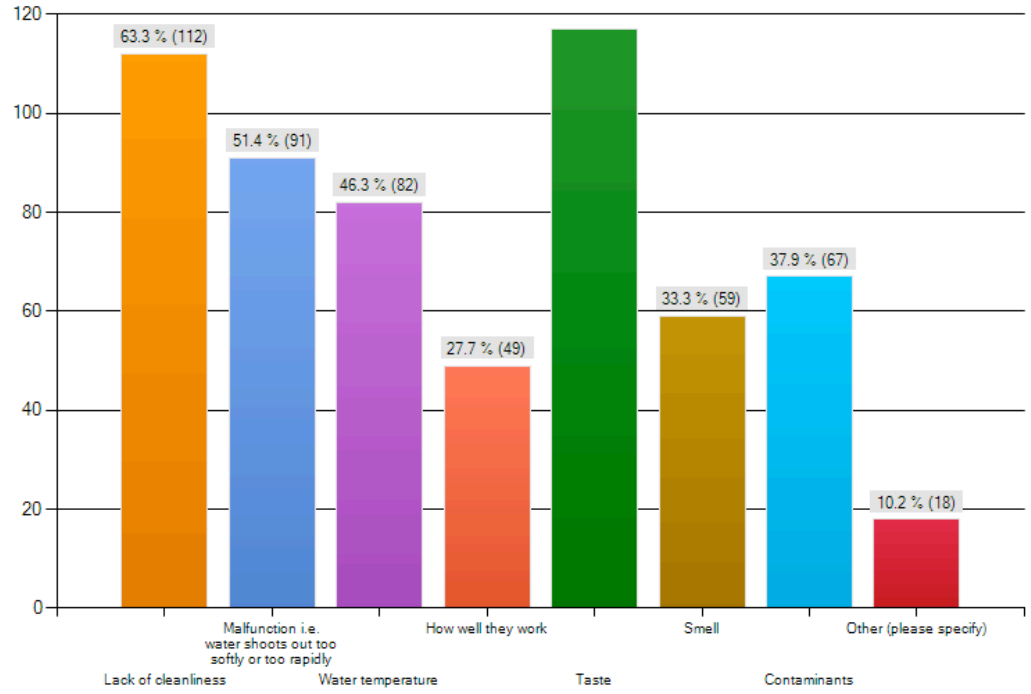
If you drink bottled water, what is your primary reason for doing so?

- [ ] Taste
- [ ] convenience
- [ ] Other (such as drinking fountain conditions)
- [ ] Do not drink bottled water

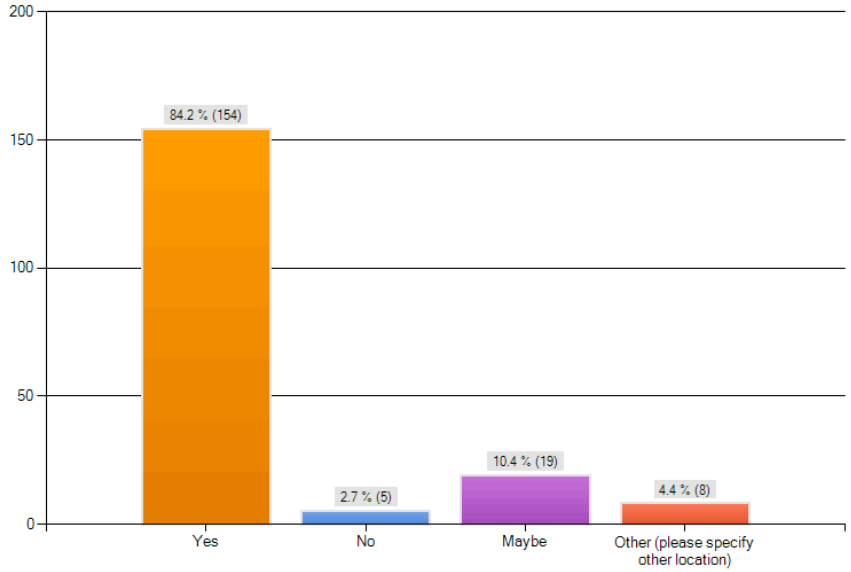
Do the conditions of the campus drinking fountains affect your decision to use them?



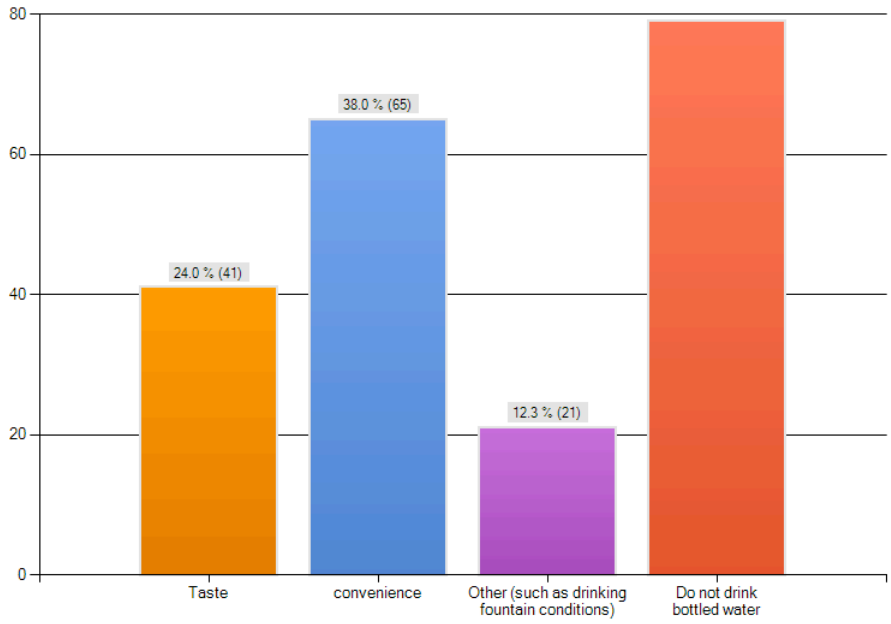
What disappoints you about campus drinking fountains? *Check all that apply



Would you use the filtered water stations if they were located conveniently? (such as in the Bernhard Center)



If you drink bottled water, what is your primary reason for doing so?



Appendix IV: Students' Bottle Evaluation

Bottle #6061

Durability:

In almost every attempt to see the bottle's ability to remain closed when dropped, the cap flew off. It leaked constantly and the thread to hold the cap on stripped out. It is obviously not meant for hot drinks. That I'm sure of. It didn't keep cold drinks cold either. It dented easily. It tasted like drinking out of an aluminum can. Cheap and simple with a little bit of aesthetics taken into account. Out of 5, I'd give it a 1.

Design:

It's too big and has no features. It is basically what you think it is at first glance, a metal container. No surprises. I didn't get to try and cook with it, but I'm sure you could because there is no logo and it is 100% steel. The mouth was ridiculous. I spilled a lot (i.e. too large). The odor was minimal and the cap was a terrible design.

Functionality of Lid:

As mentioned previously, the lid was junk. It stripped, it had no features (hole to sip or an attachment for carrying), and, even knowing I tried, I'm almost certain the plastic would break.

Bottle #4161

Durability:

I was overly clumsy with the water bottles; dropping it on different surfaces when full and when empty.

- Easy to dent when water is in them
- Paint stays on the outside well even when washed.
- I drink more water now that I carry this around with me

Design:

- The size was a good size, didn't feel it was too large or too small.
- Feels light which is a good thing.
- No taste differences. Water still tasted fine even after I left it in there for 1 or 2 days.

Functionality of Lid:

- The lid did not leak or crack even after much abuse. It is kind of a pain to unscrew it every time and screw it back on but I would take that over a leaky water canteen.
- Just a general note for stainless steel water bottles in general. Extra lids should be made easily available or should be attached to the actual bottle because they become very useless if the lid is lost. And I've almost lost mine a couple times. If people lose the lid they will most likely just buy another whole water bottle which is terribly counter-productive to the problem this program would like to solve.
- I only put water in the canteen now that I think of it. Don't know if I would put much else in there but it would be nice to know that no flavor is left from the past liquid.

Bottle #6061 – 24oz wide mouth (has Gazelle Sports printed on it)

Durability:

- I didn't drop my bottle because I know you guys aren't going to use this size, and I like this water bottle too much to deform it (even in the name of science!). But I've had no problems with it; it seems quite durable as long as you're not dropping it for science.
- The picture on the bottle is neat. It's a Gazelle Sports logo, and doesn't scratch off at all.

Design:

- Overall design is perfect for me. I drink a lot of water so I like the 24oz bottle size. It would fit great in my water bottle holder on my bike, but it's metal so it makes a lot of noise when I ride.
- The mouth is bigger than my last metal water bottle, and it took some getting used to, but I really like it now. You can actually fit ice cubes in it, and it's easier to drink out of.
- There was an odor in the bottle when I first got it, but I washed it out with soap and that went away, so no problem. No funny tastes, and I make sure to dry it out every night so it doesn't get moldy or something.
- I don't seem to have as much of a problem with the bottle sweating as I had with previous water bottles. Definitely a plus.

Functionality of Lid:

- The lid works a lot better than I expected. The thread pattern is short – only one or two turns to tighten – but it holds really well and hasn't leaked at all. There is a gasket between the lid and bottle which helps seal it. The handle on top is well sized and sturdy.

Appendix V: Campus Drinking Fountain Evaluations

Location	Temperature	Taste	Cleanliness	Working conditions
Rood	Cool	Metal	Good	Inconsistent buttons
Rood	Cool	Metal	Good	Water splatters, button difficult to push
Rood	Warm	Metal	Good/Old	Flow of water good
Rood	Cool	Metal	Brown Spotting	Water flow poor, not enough to fill water bottle. Button difficult to push
Rood	Cool	Metal	Stainless Steel tarnished	Flow is poor
Rood	Cool	Metal	Good	Flow is poor
Rood	Cool	Metal	Good	Flow is poor, hard to maintain water pressure
Rood	Warm	Metal	Good	Flow is adequate to fill bottle
Lee Honors College	Cool	Metal	Good. Plastic spouts keeps coroded residue to a minimum	Good
Chemistry	Cool	Metal	Spout dirty	Flow is adequate to fill bottle
Chemistry	Cool	Metal	Spout dirty. Drain dirty	Flow is adequate to fill bottle
Chemistry	Cool	Metal	Good	Flow is too far and spills on to the floor
Chemistry	Cool	Metal	Good	Flow is too far and spills on to the floor
Chemistry	Cool	Metal	Good	Flow is too far and spills on to the floor
Chemistry	Cool	Metal	Good	Flow is too far and spills on to the floor
Knaus	Cool	Metal	Dirty/Old.	Splatters water everywhere.
Knaus	Warm	Metal	Dirty/Old	Flow is poor/short
Knaus	Cool	Metal	Good/Old	Flow is adequate
Dunbar	Cool	Metal	Good	Flow is adequate
Dunbar	Cool	Metal	Good	Flow is adequate

Dunbar	Cool	Metal	Good	Splatter water and face gets wet
Dunbar	Cool	Metal	Spout dirty. Drain dirty	Flow is poor
Dunbar	Cool	Metal	Good	Flow is poor and inconsistent
Dunbar	Cool	Metal	Spout dirty	Good
Dunbar	Cool	Metal	Good	Good
Dunbar	Cool	Metal	Good	Splatters water everywhere.
Dunbar	Cool	Metal	Good	Splatters water everywhere. Push button is difficult
Dunbar	Cool	Metal	Good	Splatters water everywhere.

Appendix VI: Thomas Reich's Testing of Water Fountains

Building	Flouride (ppm)	Chloride (ppm)	Nitrate (ppm)	Phosphate (ppm)	Sulfate (ppm)	Cd (ppb)	Fe (ppb)	Ni (ppb)	Pb (ppb)
Chem	0.9774	52.08	0	0	34	3.278	208	1.863	32.32
Hadley Rm 316	0.8884	78.995	0	0.735	37.17	3.337	66.26	6.277	41.82
Fountain in Haenicki	0.9659	68.82	0	0	36.53	3.346	138.7	4.161	26.71
Rood Hall	0.9328	77.9	0	0.6961	37.63	3.119	225.3	1.98	31.8
Sangran	0.941	80.71	0	0	37.14	3.274	163	1	31.31

Appendix VII: Cost Comparison of Filtration Machines

Elkay EZH2O:

Product Features:

- attaches to most 115V/60 Hz EZ pushbar activated fountains
- sanitary, no-touch, sensor activation with automatic 30 second shut off timer.
- 3,000 gallon filter
- silver ion anti-microbial protection
- quick fill
- minimal splash
- real drain system eliminates standing water
- visual interface display includes: 1) Filter monitor indicating when replacement is necessary. 2) Green ticker counting the quantity of 16 oz. bottles saved from the landfill for non-refrigerated units and 12 oz. bottles for refrigerated units.
- estimated single filter replacement: $103

Estimated Cost: $ 1,631.19

Canney's Aquabar:

General Specifications w/ Everpure Filtration:

- free standing unit
- 3 temperatures
- 5 year limited warranty
- 3/8" water line
- 120 VAC connection for chiller
- filter changed every 1,000 gallon
- 6 months preventative maintenance schedule
- 80$ per filter
- Taste, odor and chlorine reduction
- 99.2% reduction of particles 0.5 and larger

Cost

Equipment	$788	
Delivery/Setup		$125
Shipping		$120
Filters/Labor		$810
Total		**$1,843**

Gordon's Oasis:

Available with drinking fountain and bottle filler, or stand alone bottle filler

- Recessed wall mounted unit
- Stainless steel
- Optional ultraviolet light
- Optional green filter
- 8 or 12 gallon/hour capacity
- High installation cost
- Replace filter every 1,000 gallons ($120-$140/filter)

Cost

Bottle filler	**$2,000-$2,800**
Bottle filler & fountain	**$4,000-$4,400**