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Evaluation of household water treatment systems in terms of physicochemical and microbiological parameters, Adana Province (Turkey) example

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ABSTRACT

Access to safe drinking water is very important in order to protect human health. Although extensive monitoring and controlling of tap water, people state that they do not consume tap water in Turkey. Realization of minor changes in parameters such as odour, colour and taste or misdirected news on the visual media led public to use either bottled water or household water filtration systems. The aim of the present study was to reveal the present situation of contamination in the waters obtained from residential water filtration device by analyzing physical, organoleptic, some chemical and microbiological parameters. Physicochemical properties of taste, colour, odour, turbidity, pH, temperature, conductivity, total hardness, iron, aluminum and nitrate values of 300 samples (inlet and outlet of water) were evaluated. Within the scope of microbiological analysis of *Clostridium perfringens*, *Pseudomonas aeruginosa*, coliform, *Escherichia coli*, colony counting at 22°C and 37°C were examined. The results of the physicochemical analysis showed that tested values stated in the regulation. Microbiological results of samples did not comply with required standards. In particular, *E. coli* outbreaks showed that water contamination and disinfection procedure were inadequate. According to the paired *t* test results, we found that *E. coli*, colonic counts at 22°C and 37°C were statistically significant ($p < 0.05$). As a conclusion, household water filtration devices cannot demonstrate the performance that they show for chemical pollution when it comes to microbiological contamination.

Keywords: Household water treatment systems; Microbiological and physicochemical parameters; *E. coli*; Public health; Safe drinking water

1. Introduction

Water, the indispensable part of life, sustains all biological life and human activities, from the smallest living organism to the largest living thing. Because of the constant water resources despite the rapid growth of the world population, the need of man for clean and reliable water is increasing day by day [1]. Sustainability of accessible water resources around the world forms the basis of many events such as reaching safe food, economic growth and the fight against escalating climate change [2].

As water can be a cause of disease on its own, it can also prepare the ground for diseases or make it easier for some diseases to occur. Hence, access to safe and healthy water is of great importance for the protection of human health [1]. The inadequacy of water and its pollution due to various factors bring many health problems with it. Statistics carried out show that almost half of all the diseases in the world are related to water [3]. Preventing these problems will be possible by increasing the quality of usable waters and improving health conditions. It is the duty of local governments to deliver healthy and safe drinking water to the society in our country and monitoring the quality of the water is the task of the Ministry of Health. The quality standards of drinking waters have been prepared to determine the quality standards of the water, in line with the EU directive, and determined in the

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"Regulation on Waters Intended for Human Consumption Purposes", which was put into force on 17/2/2005 [4].

Despite extensive monitoring and controls of drinking waters, most citizens state that they do not drink tap water [5]. Individuals' realisation of changes of odour, colour and taste, other parameters in the nature of tap waters, evaluations made in the media, biased advertisements and similar reasons direct people to bottled waters and to household water treatment devices with the thought that it would be economical because of the large number of households [6]. Water treatment devices are, with the shortest definition, the appliances that provide drinking water by separating foreign and harmful substances in the water. Often, reverse osmosis systems are used in the household water treatment devices, which are frequently preferred nowadays. Filters in the reverse osmosis system vary from brand to brand but they usually have six stages. The first filter stage is the sediment filter. This filter separates large particles, which are not soluble in water, such as sand and other particles. The second stage is the carbon filtration. This filter functions to filter chlorine, odour and volatile organic compounds to absorb harmful organic chemicals in the water. The third stage is the membrane filtration. Membrane filters filter heavy pollutants such as heavy metals, microorganisms and harmful organic chemicals in the water. The fourth stage is the final carbon filtration. The odoriferous substances are filtered and the process of improving the taste of the water is carried out at this stage. The fifth stage is the fine filtration. This filter stage is intended to filter the fine dust particles in the water and other impurities. The sixth stage is the antibacterial filtration. This is the phase to prevent microorganisms from multiplying and increase water hygiene.

According to the producers of water filtration devices, water filtration systems improve the quality of the city water. Nonetheless, maintenance of the systems is one of the important issues. Although it improves water quality, not changing the filters in time means that the treatment device is not working effectively. This situation also brings the danger that the users may face from the water with it. It was proven that maintenance service of water filtration devices enhanced the performance of the systems [7].

Adana is one of the major provinces in Turkey that has a population of almost 2 million making it in the first five ranks in Turkey. Seyhan is the oldest and most crowded district in Adana. Cukurova district has a large community of people from all over Turkey who mostly have higher life standards [8].

The aim of this study was to reveal the present situation of pollution in the waters obtained from household treatment devices which are frequently used in everyday life, by inspecting physical, organoleptic, indicator, chemical and microbiological parameters which were taken from inhabitants of Seyhan and Cukurova districts.

2. Materials and methods

2.1. Selection of samples

As a result of the survey study conducted within the scope of this research [5], a total of 300 samples of drinking waters including inlet (tap water) and outlet (purified water) were collected from the households that accepted to give samples among the houses which have a household treatment device, and some physical and organoleptic, indicator, chemical and microbiological parameters were examined. Water samples were obtained with the help of special sampling containers and taken to the Adana Public Health Laboratory, which is an authorized and accredited institution in the analysis of drinking waters, on the same day by the cold chain, and analyzed as specified in the Regulation on Waters Intended for Human Consumption Purposes (17.02.2005/25730) for taste, odour, turbidity and colour from physical and organoleptic parameters; pH, conductivity (at 20°C), iron and aluminium from indicator parameters; nitrate from chemical parameters and *Clostridium perfringens* (including spores), *Pseudomonas aeruginosa*, *Escherichia coli*, colony counting at 37°C and colony counting at 22°C.

2.2. Physical and organoleptic parameters

The taste, colour, odour and turbidity from the physicochemical properties of the water samples (tap water and treatment water) taken from 150 households as specified in the related regulation were examined and the analysis results were evaluated as specified in the Regulation on Waters Intended for Human Consumption Purposes (17.02.2005/25730).

2.3. Indicator parameters and chemical parameters

The values of pH, temperature, conductivity, total hardness, iron and aluminium from physicochemical properties were examined in the water samples taken from 150 houses as specified in the related regulation. Only the nitrate value was determined from the chemical parameters and the analysis results were interpreted according to the values indicated in the legislative limits specified in the Regulation on Waters Intended for Human Consumption Purposes (17.02.2005/25730). Parameters including taste, odour, turbidity and colour were analyzed by organoleptic method in the Adana Public Health Laboratory. Aluminium and iron analysis of waters were carried out with ICP-MS (7500-CX, Agilent, CA, USA) and nitrate was studied with ion chromatography (Dionex 3000, DC, USA). Aluminium and iron were analyzed according to ISO 17294-2 methods [8]. TS EN ISO 10523 method [9] was used for pH analysis and TS 9748 EN 27888 method [10] was used for electrical conductivity.

2.4. Microbiological analysis

For the bacteriological analysis, the water samples were taken with the help of special sampling containers as specified in the regulation and taken to the Adana Public Health Laboratory by the cold chain on the same day and analyzed. Within the scope of bacteriological analysis, *Clostridium perfringens* (including spores), *P. aeruginosa*, total coliform, *Escherichia coli* existence, colony counts at 37°C and colony counts at 22°C in 72 h were examined. *Escherichia coli* and total coliform bacteria analysis were carried out according to the TS EN ISO 9308-1 method. The method of analysis proposed in this standard is based on the inoculation in a selective medium and the counting of target microorganisms in the sample after membrane filtration. Two repeats of each of the samples were studied and 100 mL samples were taken, filtered through a 0.45 µm porosity sterile membrane and placed in CCA (Chromogenic) Agar (Merck, Darmstadt, Germany) medium. The medium was incubated at 36°C ± 2°C for 24 h. Purple-coloured colonies seen on the plates at the end of 24 h were accepted as *E. coli*. The pink-coloured colonies were confirmed with oxidase (Merck, Darmstadt, Germany). The sum of these two different coloured colonies gave the total number of coliform bacteria. Colony counting at 37°C and 22°C was carried out in the Adana Public Health Laboratory by using the TS EN ISO 6222 method. Accordingly, samples were plated by using the general producer medium (Plate Count Agar) and incubated at 36°C ± 2°C for 44 ± 4 h. After incubation, all kinds of colonies formed on the medium for each 1 mL sample were counted. For *Clostridium perfringens* analysis, 100 mL of water samples were taken and subjected to membrane filtration and *m*-CP agar implantation and subjected to incubation at 44°C ± 1°C for 21 ± 1 h in anaerobic medium. The opaque yellow colonies turning into pink or red after being exposed to the ammonium hydroxide vapour for 20–30 s after incubation are counted. Each of the samples for *P. aeruginosa* were studied two times repetitively and 100 mL samples were taken, filtered through a 0.45 µm porosity sterile membrane filter, and the membrane filter was placed on CN Agar (Merck, Darmstadt, Germany) medium without any air bubbles at the bottom. Petri dishes are incubated at 36°C ± 2°C for 44 ± 4 h. Petri dishes are examined for colony development after 22 ± 2 h and 44 ± 4 h. All the colonies with blue-green pigmentation (pyocyanin) are marked as possible *P. aeruginosa*. Petri dishes are examined under long wavelength (~366 nm) UV lamps for verification. Pyocyanine-free and fluorescence forming colonies were also marked as possible *P. aeruginosa*. Verification was made by using acetamide broth, and all other colonies with brown/red pigmentation and forming no fluorescence were also marked as possible *P. aeruginosa* and confirmed by using the oxidase test, Acetamide broth and King B agar media tests.

2.5. Statistical analysis

Data were analyzed using SPSS 11.5 (SPSS Inc, Chicago, USA) statistical software package. Longitudinal changes in continuous variables were assessed by paired *t* test. In the end, $P < 0.05$ was taken as indicating statistically significant differences.

3. Results

3.1. Analysis of indicator parameters and chemical parameters

Analysis of turbidity, colour, odour and taste of the waters were conducted organoleptically. It was observed that all the waters analyzed as a result of physical analysis were colourless, odourless, at normal taste and not blurry. The results of analysis of taste, colour, odour and turbidity of the analyzed water samples both in the inlet water samples and the outlet water samples were found to be appropriate according to the Regulation on the Waters for Human Consumption (17 February 2005/25730) and the results are given in Table S1. When the pH levels in the inlet water samples were examined, the value of the tap water was measured between 6.95 and 8.78 and the average value was 7.62 (Table S1). It was observed that the value of the outlet water samples from only two houses were higher than the water regulations pH value range (≥6.5 and ≤9.5). The pH values of the water samples measured after household treatment devices in these two houses were 9.83 and 10.04. It was found that the conductivities of the inlet and outlet samples examined vary between 9.53–12.03 and 4.91–4.20, respectively. In other words, from the parameters tested, pH and conductivity values were found within the appropriate limits. The findings from the tested samples are given in Table S1. They were evaluated according to the criteria specified in the "Regulation on Waters Intended for Human Consumption".

It was measured that the total hardness of the input samples examined had an average French hardness rating of 20.41 in the French hardness range of 19–21.5. In the examined output samples, it was determined that the samples with a significant decrease in total hardness as a result of sampling after the treatment device had a maximum degree of French hardness of 10. The total hardness values of the output samples are in soft water hardness values and it is comfortable drinking water. Iron was not detected in 57% of the input samples. The iron level in the remaining 43% of the input water samples was measured to be in the range of 1.92–169 and 29.08 µg L^{-1} on average (Table S1). Iron level of the tap water complies with the Regulation on Waters Intended for Human Consumption (max 200 µg L^{-1}). On the other hand, only 5% of the samples of the outlet water examined contained iron metal. The level of iron metal detected was found to be very low, 37 µg on average L^{-1} (12.9–133.4 µg L^{-1} range). The absence of iron metal in the 53% of the inlet water is an indication that the tap water is of good quality in terms of iron. Aluminium was not detected in 73% of the input samples examined. The remaining 27% of the input water samples had an aluminium level of 1–163.6 µg L^{-1} range and 14.89 µg L^{-1}on average (Table S1). Aluminium level of the tap water is suitable according to the Regulation on Waters Intended for Human Consumption (maximum 200 µg L^{-1}). The aluminium levels in the output water samples examined were in the range of 1.01–22.6 and 3.81 µg L^{-1} on average.

No nitrate was found in the input water samples examined except for one. The determined nitrate value was measured at a range of 0.6–133.2 and 4.22 mg L^{-1} on average (Table S1). The amount of nitrate in the inlet water samples taken from three houses were 133.2, 109.9 and 59.3 mg L^{-1}, respectively. The presence of this level of nitrate in the tap water does not comply with the Regulation on Waters Intended for Human Consumption (max 50 mg L^{-1}). No nitrate was found in 28% of the samples examined. The amount of nitrate in the remaining samples was measured as in the range of 0.5–36.8 and 1.57 mg L^{-1} on average.

3.2. Results of microbiological analysis

As a result of the analysis, *C. perfringens* was detected in only two houses' inlet water (tap water; Table S2). As a result of the analysis we conducted, *P. aeruginosa* were detected in a total of 16 houses, 10 of them were found in the household treatment device waters and 6 of them were found in the tap waters (Table S2). According to the results of the analysis, coliform bacteria were detected in both the tap waters and the treatment device waters of four houses (Table S2) In addition to these, the results of coliform bacteria were found to be inconsistent in only the tap water of 12 houses and in only the treatment water of 11 houses. In the *E. coli* screening carried out, these bacteria were detected in 72 of the total samples (Table S2). While these bacteria were detected in both the inlet and outlet waters of 19 of these 72 inconsistent houses, irregularity was detected in 29 treatment waters and in 5 tap waters. While both the inlet and outlet waters of the 3 houses were found to be inappropriate in the colony count at 37°C, irregularity was detected only in the treatment waters of 37 houses and only in tap waters of 5 houses (Table S2). As a result of colony count analysis at 22°C in 72 h, irregularity was detected in the treatment waters of nine houses (Table S2).

3.3. Results of statistical analysis

According to the paired *t* test that we assessed for 150 samples, we found that *E. coli*, Colonic counts at 22°C and 37°C were statistically significant ($p < 0.05$) (Table 1).

4. Discussion

This study shows the importance of maintenance of water filtration systems and also makes a comparison between the city and filtered water. From the source to the arrival point, water is the most easily contaminated material. The most important factors in the emergence of infectious diseases and epidemics arise from microbiological and chemical contamination of waters [11–13]. The results of the physicochemical analysis of 300 water samples examined in our study, except for a few of the tap water samples, were within the values stated in the "Regulation on Waters Intended for Human Consumption". These results are an indication of the good performance of the drinking water treatment facility in Adana province. However, we have also encountered several inappropriate results of inlet water that suggest that the importance of the distribution of inlet drinking water network systems and the in-building drinking water systems, and their frequent controls (Table S1 and S2). The necessity of performing regional controls after giving the city water to the distribution system also arises in our study.

In the water samples obtained from the treatment of the tap water, which we refer to as output water in our study; it has been found that iron, aluminium metals and/or nitrate (trace amounts) are treated by the devices in a performance manner compared with the inlet water. This is an expected result for treatment devices using reverse osmosis membrane systems. This detail, which is not important as long as there is no negative effect on the tap water, is of importance if the tap water is polluted as a natural phenomenon such as flood or spate from rusty pipes or industrially. When we looked the other studies, researchers examined the balance chlorine, conductivity, turbidity, taste, smell, colour and ammonium values in the villages and towns, especially in Bozkır city centre, Konya province [14]. Only three of the samples examined have exceeded the ammonium (NH_4^+) legislative limits. While the presence of NH_3 and NH_4^+ in drinking waters often points to a faecal contamination, the presence of NO_3^- indicates the presence of a pre-existing pollutant in drinking water [14–16]. The use of these waters can cause serious health problems in individuals. In addition to these, water with high nitrate content causes a serious health problem due to enzyme deficiency in infants. There were studies that the consumption of water with high nitrate ratio causes stillbirths, postpartum complications, goitre and diabetes and many other diseases [13,16]. Luckily, we did not observe any of these problems in our water samples.

Table 1
Paired *t* test results

Indicator microorganisms	Total observation numbers	*P* value
Clostridium perfringens	300	0.226
Pseudomonas aeruginosa	300	0.924
Escherichia coli	300	0.011
Coliform	300	0.462
Colonic counts at 22°C	300	0.000
Colonic counts at 37°C	300	0.01

pH value is at the head of parameters first examined in the water quality. Low pH is at the beginning of the factors causing corrosion in the water distribution pipelines. In our study, it was determined that pH values in output water samples were in contrary to the legislative limits only in two places. One of the reasons for the excessive alkalinity of the output water in the samples maybe the possibility of the presence putrefaction in the water or the freshly modified and/or newly installed alkaline filter with calcite and coresex minerals in the water treatment devices. Today, in developing countries, outbreaks of diarrhoea caused by infected waters are at the forefront [1–3]. As stated in the Regulation, there must not be faecal coliform, *E. coli*, physicochemical analysis of 300 water samples examined in our study, except for a few of the tap water samples, were within the values stated in the "Regulation on Waters Intended for Human Consumption". These results are an indication of the good performance of the drinking water treatment facility in Adana province. However, we have also encountered several inappropriate results of inlet water that suggest that the importance of the distribution of inlet drinking water network systems and the in-building drinking water systems, and their frequent controls (Tables S1 and S2). The necessity of performing regional controls after giving the city water to the distribution system also arises in our study.

Enterococcus sp., *P. aeruginosa* and parasites in the 100 mL of drinking waters and in the 250 mL of spring waters. When the studies conducted in our country in the recent years are examined; 7.1% of the drinking waters in Manisa city centre, 21.6% in Bursa, 12.7% of the drinking waters in Tokat and 12.24% of the drinking waters in Ankara, 16.48% in Konya, 8% and 30.2% of the waters in Bitlis and Malatya, respectively, were exposed to coliform and *E. coli* pollution [17–22]. In the study conducted in Sivas province by Alim [23], 16.9%–39.5% of total coliforms were found in tap and spring waters. Nearly 60% of the samples analyzed were considered to be clean. They have taken samples from a total of 30 different places such as wells, distribution places, water depots, houses, work places and street fountains in the study carried out in 2001 in Afyon city center [24]. Coliform bacteria were detected in 23.3% of the samples. Alişarlı et al. [25]

found that enterococci rate was 43% in depot waters and 3%–49% in tap waters. Köksal et al. [26] investigated the existence of *E. coli*, coliform, *Salmonella*, *Shigella*, *Vibrio cholerae*, *Yersinia enterocolitica*, *Campylobacter*, *Aeromonas*, *Pseudomonas* and *Plesiomonas* in the waters. As a result of the study, it was observed that 95% of the tap water samples were suitable for TS 266, national drinking water standard. In another study, a total of 188 water samples were taken for the detection of faecal indicator bacteria in the drinking waters of Konya, Bozkir area [13]. Also inconsistencies have been detected locally. Researchers carried out a study to investigate physicochemical and microbiological quality of the water storage tanks in Adana [27]. They analyzed 159 water samples, collected from the inlet, outlet of water storage tank and from the first floor. The inlet of the analysis showed 0.63% total coliform bacteria, 1.89% total colonic counts while the outlet tanks analysis indicated 0.63% enterococci, 14.5% total colonic counts, 5% total coliform bacteria [27]. When we look at examples abroad, Researchers took water from four different sources in their study, they carried out at a dormitory in Nigeria, and studied the physicochemical and bacterial loads of the waters [28]. As a result of the analysis performed, total colony counts were found 28, 65, 90, and 126 cfu mL^{-1}, respectively, while coliform bacteria were not found in the waters. Parameters such as temperature, pH, turbidity, dissolved oxygen concentration, and conductivity were also examined and waters were reported to be acidic according to the WHO standards and nickel and alumina were detected [28]. Ahsan et al. [29] found inconsistencies in all samples in *E. coli* and total coliform counts in samples taken from many points (spring, treatment plant, fountain and water depots) in the study they conducted to determine water quality in Bangladesh. Although a decrease in the number of colonies is observed at the treatment outlet, it was seen that this number increased again in the fountain and water depots, and the lack of maintenance in the distribution system was pointed out as the cause of pollution. In addition to this, it has been shown that one of the physicochemical properties, pH, meets the WHO standards by an average value of 7.79; on the other hand, the turbidity and residual chlorine parameters cannot meet the standards at some points. Researchers identified 29% total coliforms and 23% faecal coliform incompatibilities in 80 samples taken from 16 sources in the study they carried out in Iran [30]. Ahsan et al. [30] pointed out in their study they found inconsistencies of 100% of the total colony counts and 55.2% of the total coliform counts in the samples taken from the tap waters. In another study, measuring water quality and the determination of bacterial contamination, impropriety was detected in 16% of the samples taken from the water treatment plant, and this figure was determined to be more than half of the water samples taken from the fountains [31]. In this study, it was concluded that the water was contaminated during the passage through the distribution pipelines [31]. Masoumi et al. [32] have investigated the contamination of commercial water filters used to remove the mentioned impurities. As a result of the study, they have found that *Pseudomonas aeruginosa* contamination was 3.70% in the tap waters and 20.37% in the filter waters. The coliform count at 37°C and 22°C was found to be 16.66% and 3.70%, respectively. In addition to this, the residual chlorine measurement was 0.229 mg L^{-1} in the tap waters, but the amount was nil in the filter waters [32]. In another study, it was reported that bacterial counts went up to 6,000 cfu mL^{-1} in 24 out of 34 samples using water filtration. Six of the filters in the study were investigated and 4 of them were found to have a higher ratio of bacterial colonies comparing with the water sample taken from fresh filtrate fountain, and it was suggested that biofilm formation occurred on the filter and increased the number of bacteria in the water [33]. A similar result was also reported by Szymanska, it was observed that 105 cfu *P. aeruginosa* was found in 100 mL of sample in the outlet water although the presence was not found in the inlet water [34] As a result, within the scope of our research, it has been found that household treatment devices do not provide 100% assurance about microbiological pollution and additionally households that do not change their filters consume unhealthy water from microbiological aspect. It is observed that there are also problems in the in-building water constructions and/or distribution systems in the houses where waters found to be inconsistent according to the samples analyzed. In particular, inconsistency of *E. coli* water samples being higher ($p < 0.05$) than the other parameters (inlet + outlet, inlet, outlet waters) examined suggests faecal contamination in waters and inadequate disinfection procedures. The reason for the increase in the treatment waters at 22°C and 37°C ($p < 0.05$) is that the filters or treatment devices do not work at full efficiency from the microbiological aspect. The use of old and corroded pipes and/or reduced chlorine activity in the water distribution pipelines due to time and the neglected and dirty depots from in-building water systems can expose drinking waters to microbiological and chemical pollution factors. It is believed that the reason for the contamination in the treatment waters is caused by filters that are forgotten to be changed and/or not cleaned. One of the most important causes of pollution in the tap waters is considered to be water depots of whose maintenance and disinfection are not carried out. The great majority of waterborne pathogens that cause microbiological pollution in the waters are contamination of human or animal faeces to the waters directly or indirectly. The sudden increases in colony counts may be the first warning of a serious contamination and stress that further researches should be carried out.

When marketing these devices, microbiological purification, which is an issue that people do not pay attention to, is actually one of the most important parameters that should come first when we mention healthy water-quality that affects our health. That some local companies as well as consumers do not have any idea about the subject of microbiological purification can also be seen in demonstrations when devices are sold. Especially during the sale, firms should explain to the consumer the exchange of the filter is a part of the treatment device purchasing process and should be continuous; it is an economic burden to change the filter but if these filters are not changed, they may face great health problems due to the treatment device which does not work efficiently. It is necessary to prevent people from being directed by wrong people about a subject of a vital importance and all companies that sell household treatment devices should not share information that have no scientific basis and cannot prove to be accurate with the local people for commercial purposes and be controlled by authorized institutions.

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Supporting Information

Supporting Information is available from the Wiley Online Library or from the author.

Table S1
Results of indicator and chemical parameters

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
1	Outlet	AC[a]	AC	AC	AC	7.87	420	25.6	1.04	2.21
1	Inlet	AC	AC	AC	AC	7.83	419	ND	1.17	2.3
2	Outlet	AC	AC	AC	AC	8.4	71.8	ND	ND	0.62
2	Inlet	AC	AC	AC	AC	8.3	408	11.9	3.64	2.37
3	Outlet	AC	AC	AC	AC	7.86	49.3	ND	ND	0.87
3	Inlet	AC	AC	AC	AC	7.64	411	14.4	ND	2.68
4	Outlet	AC	AC	AC	AC	7.91	57.9	ND	1.36	0.75
4	Inlet	AC	AC	AC	AC	7.5	412	ND	ND	2.61
5	Outlet	AC	AC	AC	AC	8.38	407	ND	1.78	2.21
5	Inlet	AC	AC	AC	AC	8.2	681	30.6	1.38	2.14
6	Outlet	AC	AC	AC	AC	8.23	37.6	ND	ND	0.5
6	Inlet	AC	AC	AC	AC	7.47	413	11.5	ND	2.84
7	Outlet	AC	AC	AC	AC	8.3	412	14	2.21	2.08
7	Inlet	AC	AC	AC	AC	8.46	413	32.6	80.6	1.96
8	Outlet	AC	AC	AC	AC	9.83	61.5	ND	ND	ND
8	Inlet	AC	AC	AC	AC	8.26	415	11.9	1.8	2.13
9	Outlet	AC	AC	AC	AC	8.15	37.5	ND	ND	0.55
9	Inlet	AC	AC	AC	AC	7.58	413	34.4	ND	2.31
10	Outlet	AC	AC	AC	AC	8.34	18.47	ND	ND	ND
10	Inlet	AC	AC	AC	AC	7.51	413	ND	ND	2.39
11	Outlet	AC	AC	AC	AC	8.07	29.6	ND	3.11	0.74
11	Inlet	AC	AC	AC	AC	7.46	410	15.3	ND	2.32
12	Outlet	AC	AC	AC	AC	7.5	389	19.9	1.05	1.99
12	Inlet	AC	AC	AC	AC	7.78	81.4	ND	1.4	0.86
13	Outlet	AC	AC	AC	AC	8.77	21.11	ND	ND	ND
13	Inlet	AC	AC	AC	AC	8.13	411	19.4	ND	2.33
14	Outlet	AC	AC	AC	AC	8.41	48.7	ND	ND	0.81
14	Inlet	AC	AC	AC	AC	8	412	ND	ND	1.99
15	Outlet	AC	AC	AC	AC	9.03	56.3	ND	ND	0.71
15	Inlet	AC	AC	AC	AC	8.36	412	53.8	ND	2.21
16	Outlet	AC	AC	AC	AC	8.41	51.3	ND	ND	0.8
16	Inlet	AC	AC	AC	AC	7.97	411	10.1	ND	2.55
17	Outlet	AC	AC	AC	AC	8.54	26.1	ND	ND	0.76
17	Inlet	AC	AC	AC	AC	7.92	411	ND	ND	2.77
18	Outlet	AC	AC	AC	AC	8.47	20.49	ND	ND	ND
18	Inlet	AC	AC	AC	AC	7.81	410	ND	ND	2.03
19	Outlet	AC	AC	AC	AC	8.83	36.5	ND	ND	ND
19	Inlet	AC	AC	AC	AC	8.49	410	ND	ND	2.1
20	Outlet	AC	AC	AC	AC	7.66	26.7	ND	11	0.65
20	Inlet	AC	AC	AC	AC	7.02	383	20.5	56.1	2.18
21	Outlet	AC	AC	AC	AC	7.98	31.9	ND	1.73	0.82
21	Inlet	AC	AC	AC	AC	7.53	411	ND	33.9	2.25
22	Outlet	AC	AC	AC	AC	7.91	78.7	ND	1.03	1.14
22	Inlet	AC	AC	AC	AC	7.55	408	11.5	ND	2.62
23	Outlet	AC	AC	AC	AC	7.7	254	ND	6.35	2.12
23	Inlet	AC	AC	AC	AC	7.72	408	14.1	19.7	2.26
24	Outlet	AC	AC	AC	AC	8.11	38.6	ND	ND	0.64
24	Inlet	AC	AC	AC	AC	7.73	413	14.8	ND	2.17

(Table S1 Continued)

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
25	Outlet	AC	AC	AC	AC	7.78	27.1	ND	ND	0.61
25	Inlet	AC	AC	AC	AC	7.59	412	123	ND	2.2
26	Outlet	AC	AC	AC	AC	8.46	29.4	ND	ND	ND
26	Inlet	AC	AC	AC	AC	7.65	4136	10.9	ND	2.16
27	Outlet	AC	AC	AC	AC	7.33	99.2	ND	ND	1.43
27	Inlet	AC	AC	AC	AC	7.06	409	121.9	ND	2.21
28	Outlet	AC	AC	AC	AC	8.81	38.9	ND	ND	0.66
28	Inlet	AC	AC	AC	AC	7.65	407	ND	ND	2.29
29	Outlet	AC	AC	AC	AC	8.02	40	32.1	ND	ND
29	Inlet	AC	AC	AC	AC	7.42	409	40.3	ND	2.25
30	Outlet	AC	AC	AC	AC	8.06	45.2	ND	ND	0.87
30	Inlet	AC	AC	AC	AC	7.51	407	ND	ND	2.26
31	Outlet	AC	AC	AC	AC	8.18	8.1	ND	ND	ND
31	Inlet	AC	AC	AC	AC	7.39	403	14.6	ND	2.63
32	Outlet	AC	AC	AC	AC	8.09	33.6	ND	ND	0.56
32	Inlet	AC	AC	AC	AC	7.58	388	63.1	3.58	2.29
33	Outlet	AC	AC	AC	AC	7.2	113.8	ND	1.86	1.47
33	Inlet	AC	AC	AC	AC	7.17	408	ND	6.91	2.1
34	Outlet	AC	AC	AC	AC	8.12	63.7	ND	1.18	1.17
34	Inlet	AC	AC	AC	AC	7.64	311	11.5	ND	2.49
35	Outlet	AC	AC	AC	AC	7.93	79.1	ND	7.12	1.76
35	Inlet	AC	AC	AC	AC	7.99	413	14.9	ND	2.7
36	Outlet	AC	AC	AC	AC	7.44	97.1	ND	4.9	0.98
36	Inlet	AC	AC	AC	AC	7.31	412	14	ND	2.55
37	Outlet	AC	AC	AC	AC	7.44	405	ND	ND	1.37
37	Inlet	AC	AC	AC	AC	7.44	405	30.6	ND	2.33
38	Outlet	AC	AC	AC	AC	7.44	412	ND	1.09	2.63
38	Inlet	AC	AC	AC	AC	8.35	9.53	ND	1.13	0.61
39	Outlet	AC	AC	AC	AC	8.27	61.8	ND	ND	1.45
39	Inlet	AC	AC	AC	AC	8.22	411	11.9	ND	2.29
40	Outlet	AC	AC	AC	AC	7.49	71.7	ND	ND	1.45
40	Inlet	AC	AC	AC	AC	7.13	408	10.2	ND	2.3
41	Outlet	AC	AC	AC	AC	7.04	404	39.8	2.27	2.32
41	Inlet	AC	AC	AC	AC	8.39	66.7	ND	ND	0.6
42	Outlet	AC	AC	AC	AC	7.69	47	ND	4.74	ND
42	Inlet	AC	AC	AC	AC	7.12	409	10.3	ND	2.12
43	Outlet	AC	AC	AC	AC	7.56	57.5	ND	ND	0.5
43	Inlet	AC	AC	AC	AC	7.1	407	16.7	ND	2.07
44	Outlet	AC	AC	AC	AC	7.83	25.7	ND	1.89	ND
44	Inlet	AC	AC	AC	AC	7.1	408	ND	ND	2.06
45	Outlet	AC	AC	AC	AC	7.24	174.5	ND	ND	1.96
45	Inlet	AC	AC	AC	AC	7.07	409	ND	ND	2.39
46	Outlet	AC	AC	AC	AC	7.62	53.1	ND	ND	0.73
46	Inlet	AC	AC	AC	AC	7.09	408	21.4	ND	2.26
47	Outlet	AC	AC	AC	AC	8.14	75.7	ND	ND	0.96
47	Inlet	AC	AC	AC	AC	8.1	407	14.5	ND	2.36
48	Outlet	AC	AC	AC	AC	8.4	25.3	ND	ND	ND
48	Inlet	AC	AC	AC	AC	7.8	405	31.6	1.45	1.99
49	Outlet	AC	AC	AC	AC	7.8	403	18.5	5.14	2.02
49	Inlet	AC	AC	AC	AC	7.7	405	31.3	1.14	ND
50	Outlet	AC	AC	AC	AC	8.39	17.54	ND	ND	ND

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
50	Inlet	AC	AC	AC	AC	7.72	402	ND	ND	2.12
51	Outlet	AC	AC	AC	AC	8.45	4.91	133.4	ND	ND
51	Inlet	AC	AC	AC	AC	7.45	406	ND	ND	2.1
52	Outlet	AC	AC	AC	AC	8.3	46.5	ND	ND	0.98
52	Inlet	AC	AC	AC	AC	7.81	405	15	ND	2.08
53	Outlet	AC	AC	AC	AC	8.44	27.1	ND	ND	0.53
53	Inlet	AC	AC	AC	AC	7.91	407	ND	ND	2.13
54	Outlet	AC	AC	AC	AC	8.4	17.37	ND	ND	ND
54	Inlet	AC	AC	AC	AC	7.72	407	ND	ND	2.18
55	Outlet	AC	AC	AC	AC	8.04	34.6	ND	4.55	ND
55	Inlet	AC	AC	AC	AC	7.64	408	ND	ND	2.03
56	Outlet	AC	AC	AC	AC	8.16	23.2	ND	ND	ND
56	Inlet	AC	AC	AC	AC	7.42	406	ND	ND	2.12
57	Outlet	AC	AC	AC	AC	8.25	26.1	ND	ND	ND
57	Inlet	AC	AC	AC	AC	7.84	410	37.3	5.25	2.32
58	Outlet	AC	AC	AC	AC	8.22	30.4	ND	1.19	0.73
58	Inlet	AC	AC	AC	AC	7.66	410	ND	ND	2.37
59	Outlet	AC	AC	AC	AC	7.8	36.5	ND	ND	0.81
59	Inlet	AC	AC	AC	AC	8.16	34.4	ND	ND	2.56
60	Outlet	AC	AC	AC	AC	7.42	47.9	ND	ND	3.3
60	Inlet	AC	AC	AC	AC	7.13	407	11.3	ND	2.37
61	Outlet	AC	AC	AC	AC	8.12	19.59	ND	1.54	ND
61	Inlet	AC	AC	AC	AC	7.69	408	ND	ND	2.14
62	Outlet	AC	AC	AC	AC	10.04	97	ND	ND	ND
62	Inlet	AC	AC	AC	AC	7.43	410	ND	ND	2.23
63	Outlet	AC	AC	AC	AC	8.33	22.1	ND	ND	ND
63	Inlet	AC	AC	AC	AC	7.71	551	ND	ND	3.01
64	Outlet	AC	AC	AC	AC	9	39.9	ND	ND	1.29
64	Inlet	AC	AC	AC	AC	8.71	406	ND	ND	2.15
65	Outlet	AC	AC	AC	AC	7.96	46.4	ND	ND	ND
65	Inlet	AC	AC	AC	AC	7.43	407	60.6	3.91	2.51
66	Outlet	AC	AC	AC	AC	7.85	408	ND	2.27	2.81
66	Inlet	AC	AC	AC	AC	7.47	408	ND	1.46	2.3
67	Outlet	AC	AC	AC	AC	7.82	152	ND	2.22	1.67
67	Inlet	AC	AC	AC	AC	7.84	403	58	ND	2.61
68	Outlet	AC	AC	AC	AC	8.08	32.3	ND	ND	0.6
68	Inlet	AC	AC	AC	AC	7.56	408	ND	ND	2.36
69	Outlet	AC	AC	AC	AC	7.44	116.1	ND	4.53	1.63
69	Inlet	AC	AC	AC	AC	7	405	ND	ND	2.21
70	Outlet	AC	AC	AC	AC	8.6	29.8	ND	1.11	ND
70	Inlet	AC	AC	AC	AC	8.46	405	26.4	ND	2.3
71	Outlet	AC	AC	AC	AC	8.5	10.32	ND	ND	ND
71	Inlet	AC	AC	AC	AC	7.99	408	13.6	ND	2.49
72	Outlet	AC	AC	AC	AC	7.68	172.5	ND	7.6	1.11
72	Inlet	AC	AC	AC	AC	7.61	406	21.5	1	2.29
73	Outlet	AC	AC	AC	AC	8.08	52.5	ND	1.72	0.71
73	Inlet	AC	AC	AC	AC	7.96	405	ND	ND	3.54
74	Outlet	AC	AC	AC	AC	8.25	38.7	ND	ND	1.22
74	Inlet	AC	AC	AC	AC	7.7	404	ND	ND	1.87
75	Outlet	AC	AC	AC	AC	8.03	66.1	ND	1.79	1.03
75	Inlet	AC	AC	AC	AC	7.67	404	ND	ND	2.19

(Table S1 Continued)

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
76	Outlet	AC	AC	AC	AC	8.14	39.2	ND	ND	1.15
76	Inlet	AC	AC	AC	AC	7.63	401	77.5	1.72	2.43
77	Outlet	AC	AC	AC	AC	9.5	277	ND	17.5	ND
77	Inlet	AC	AC	AC	AC	8.45	402	ND	ND	2.57
78	Outlet	AC	AC	AC	AC	9.1	30.8	ND	1.28	ND
78	Inlet	AC	AC	AC	AC	8.78	405	ND	ND	2.3
79	Outlet	AC	AC	AC	AC	8.79	42	ND	1.56	0.66
79	Inlet	AC	AC	AC	AC	8.41	404	ND	ND	2.21
80	Outlet	AC	AC	AC	AC	8.7	19.48	ND	ND	ND
80	Inlet	AC	AC	AC	AC	8.22	405	ND	ND	2.46
81	Outlet	AC	AC	AC	AC	8.5	22.7	ND	ND	ND
81	Inlet	AC	AC	AC	AC	7.88	404	ND	ND	2.66
82	Outlet	AC	AC	AC	AC	8.52	24.8	ND	ND	0.59
82	Inlet	AC	AC	AC	AC	7.86	404	11.9	1.01	2.19
83	Outlet	AC	AC	AC	AC	8.29	39.3	ND	1.41	0.58
83	Inlet	AC	AC	AC	AC	7.7	406	ND	ND	2.19
84	Outlet	AC	AC	AC	AC	8.24	46.9	ND	1.32	0.62
84	Inlet	AC	AC	AC	AC	7.7	404	16.1	1.03	2.08
85	Outlet	AC	AC	AC	AC	8.23	29.9	ND	3.04	ND
85	Inlet	AC	AC	AC	AC	7.67	406	ND	ND	2.37
86	Outlet	AC	AC	AC	AC	8.24	32.6	ND	1.64	ND
86	Inlet	AC	AC	AC	AC	7.64	407	ND	ND	1.43
87	Outlet	AC	AC	AC	AC	8.29	32.6	ND	8.18	0.95
87	Inlet	AC	AC	AC	AC	7.91	406	ND	2.23	2.23
88	Outlet	AC	AC	AC	AC	8.41	38.8	ND	1.8	0.54
88	Inlet	AC	AC	AC	AC	7.68	406	ND	1.29	2.24
89	Outlet	AC	AC	AC	AC	7.74	57.4	ND	ND	ND
89	Inlet	AC	AC	AC	AC	7.43	407	ND	1.07	2.2
90	Outlet	AC	AC	AC	AC	7.95	50.1	ND	ND	ND
90	Inlet	AC	AC	AC	AC	7.46	404	ND	ND	2.22
91	Outlet	AC	AC	AC	AC	7.74	27.8	ND	ND	0.62
91	Inlet	AC	AC	AC	AC	7.33	406	ND	3.32	2.26
92	Outlet	AC	AC	AC	AC	7.84	31.9	ND	ND	0.57
92	Inlet	AC	AC	AC	AC	7.26	409	ND	1.29	2.24
93	Outlet	AC	AC	AC	AC	8.1	26.2	ND	5.19	ND
93	Inlet	AC	AC	AC	AC	7.32	402	137.9	ND	2.27
94	Outlet	AC	AC	AC	AC	7.85	391	12.9	22.6	2.48
94	Inlet	AC	AC	AC	AC	7.91	69.9	ND	ND	0.78
95	Outlet	AC	AC	AC	AC	8.43	29.4	ND	ND	0.6
95	Inlet	AC	AC	AC	AC	7.94	401	16.1	ND	2.22
96	Outlet	AC	AC	AC	AC	7.59	14.16	ND	ND	ND
96	Inlet	AC	AC	AC	AC	6.95	404	ND	ND	2.59
97	Outlet	AC	AC	AC	AC	8.08	35.6	ND	ND	0.57
97	Inlet	AC	AC	AC	AC	7.73	406	1.92	157.9	2.24
98	Outlet	AC	AC	AC	AC	8.09	21.5	ND	ND	0.67
98	Inlet	AC	AC	AC	AC	7.34	381	ND	ND	2.37
99	Outlet	AC	AC	AC	AC	7.99	24.8	ND	3.72	ND
99	Inlet	AC	AC	AC	AC	7.39	408	ND	1.58	2.17
100	Outlet	AC	AC	AC	AC	7.75	32.9	ND	2.91	0.75
100	Inlet	AC	AC	AC	AC	7.42	407	ND	1.25	2.28

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
101	Outlet	AC	AC	AC	AC	7.77	28.2	ND	1.04	0.63
101	Inlet	AC	AC	AC	AC	7.19	406	ND	ND	2.23
102	Outlet	AC	AC	AC	AC	7.79	38.3	ND	1.2	0.71
102	Inlet	AC	AC	AC	AC	7.76	406	ND	ND	2.26
103	Outlet	AC	AC	AC	AC	7.44	35.8	ND	ND	1.25
103	Inlet	AC	AC	AC	AC	6.99	403	ND	ND	2.25
104	Outlet	AC	AC	AC	AC	7.34	32.8	ND	ND	0.86
104	Inlet	AC	AC	AC	AC	7.47	402	ND	ND	2.29
105	Outlet	AC	AC	AC	AC	7.45	24.7	ND	ND	0.69
105	Inlet	AC	AC	AC	AC	7.05	401	ND	3.81	2.27
106	Outlet	AC	AC	AC	AC	7.38	136.3	ND	ND	36.8
106	Inlet	AC	AC	AC	AC	7.5	983	ND	ND	133.2
107	Outlet	AC	AC	AC	AC	8.54	17.01	ND	ND	ND
107	Inlet	AC	AC	AC	AC	8.39	405	ND	ND	2.21
108	Outlet	AC	AC	AC	AC	8.68	24.8	ND	ND	0.82
108	Inlet	AC	AC	AC	AC	8.09	404	ND	1.76	2.59
109	Outlet	AC	AC	AC	AC	7.95	22.8	ND	6.85	ND
109	Inlet	AC	AC	AC	AC	7.8	405	ND	6.59	2.3
110	Outlet	AC	AC	AC	AC	7.78	80.2	ND	2.46	13.7
110	Inlet	AC	AC	AC	AC	7.26	835	ND	2.29	109.9
111	Outlet	AC	AC	AC	AC	7.83	17.18	ND	2.34	0.69
111	Inlet	AC	AC	AC	AC	8.27	406	ND	1.32	2.35
112	Outlet	AC	AC	AC	AC	7.75	21.4	ND	1.73	ND
112	Inlet	AC	AC	AC	AC	7.44	408	ND	ND	2.252
113	Outlet	AC	AC	AC	AC	7.68	36.7	ND	ND	0.52
113	Inlet	AC	AC	AC	AC	7.25	406	58.3	ND	2.22
114	Outlet	AC	AC	AC	AC	7.7	22.9	ND	ND	0.67
114	Inlet	AC	AC	AC	AC	7.18	406	14.1	ND	2.31
115	Outlet	AC	AC	AC	AC	8.35	46.1	ND	1.79	0.92
115	Inlet	AC	AC	AC	AC	8.08	406	ND	ND	2.27
116	Outlet	AC	AC	AC	AC	8.25	20.17	ND	ND	ND
116	Inlet	AC	AC	AC	AC	7.95	405	17	ND	2.65
117	Outlet	AC	AC	AC	AC	7.78	25.5	ND	ND	0.6
117	Inlet	AC	AC	AC	AC	7.8	405	ND	ND	2.24
118	Outlet	AC	AC	AC	AC	7.78	31.1	ND	ND	4.98
118	Inlet	AC	AC	AC	AC	7.06	596	ND	ND	32.5
119	Outlet	AC	AC	AC	AC	7.96	13.7	ND	ND	ND
119	Inlet	AC	AC	AC	AC	7.11	400	ND	ND	2.34
120	Outlet	AC	AC	AC	AC	7.65	33.6	ND	ND	0.99
120	Inlet	AC	AC	AC	AC	7.47	402	12.6	ND	2.62
121	Outlet	AC	AC	AC	AC	7.71	22.9	ND	ND	1.03
121	Inlet	AC	AC	AC	AC	7.5	402	ND	ND	2.46
122	Outlet	AC	AC	AC	AC	7.74	32.8	ND	ND	1.07
122	Inlet	AC	AC	AC	AC	7.28	402	ND	ND	2.38
123	Outlet	AC	AC	AC	AC	8.02	25.7	ND	ND	0.62
123	Inlet	AC	AC	AC	AC	7.18	401	17.6	ND	2.7
124	Outlet	AC	AC	AC	AC	7.94	35.1	ND	ND	1.09
124	Inlet	AC	AC	AC	AC	7.28	402	ND	1.04	2.34
125	Outlet	AC	AC	AC	AC	8.03	31.9	ND	ND	1.63
125	Inlet	AC	AC	AC	AC	7.28	402	ND	ND	2.26

(Table S1 Continued)

Number		Taste	Odour	Turbidity	Colour	pH	Conductivities	Iron	Aluminium	Nitrate
126	Outlet	AC	AC	AC	AC	8.17	20.1	ND	1.01	0.72
126	Inlet	AC	AC	AC	AC	7.2	401	ND	ND	2.46
127	Outlet	AC	AC	AC	AC	8.26	408	ND	ND	1.08
127	Inlet	AC	AC	AC	AC	7.26	401	ND	1.99	2.38
128	Outlet	AC	AC	AC	AC	8.2	23.2	ND	ND	0.64
128	Inlet	AC	AC	AC	AC	7.42	401	10.3	ND	2.48
129	Outlet	AC	AC	AC	AC	8.26	23.2	ND	ND	ND
129	Inlet	AC	AC	AC	AC	7.42	400	ND	ND	2.2
130	Outlet	AC	AC	AC	AC	7.9	86.9	ND	1.65	1.26
130	Inlet	AC	AC	AC	AC	7.47	400	14.8	ND	2.31
131	Outlet	AC	AC	AC	AC	7.71	84.1	ND	ND	1.51
131	Inlet	AC	AC	AC	AC	7.48	399	169	ND	2.44
132	Outlet	AC	AC	AC	AC	8.21	23	ND	ND	1.38
132	Inlet	AC	AC	AC	AC	7.53	401	ND	ND	2.44
133	Outlet	AC	AC	AC	AC	8.23	24.2	ND	ND	0.93
133	Inlet	AC	AC	AC	AC	7.56	399	37.3	ND	2.26
134	Outlet	AC	AC	AC	AC	8.07	31	ND	ND	0.7
134	Inlet	AC	AC	AC	AC	7.51	401	ND	ND	2.3
135	Outlet	AC	AC	AC	AC	8.19	10.95	ND	ND	ND
135	Inlet	AC	AC	AC	AC	7.56	401	21.5	ND	2.27
136	Outlet	AC	AC	AC	AC	7.85	48.6	ND	ND	1.31
136	Inlet	AC	AC	AC	AC	7.48	400	ND	ND	2.43
137	Outlet	AC	AC	AC	AC	8.19	26.7	ND	2.75	1.69
137	Inlet	AC	AC	AC	AC	7.81	241	3.46	163.6	2.53
138	Outlet	AC	AC	AC	AC	7.92	35.4	ND	ND	3.72
138	Inlet	AC	AC	AC	AC	7.15	1203	ND	ND	59.3
139	Outlet	AC	AC	AC	AC	7.99	22.5	ND	ND	0.69
139	Inlet	AC	AC	AC	AC	7.29	400	ND	ND	2.39
140	Outlet	AC	AC	AC	AC	8.03	20.68	ND	ND	1.06
140	Inlet	AC	AC	AC	AC	7.26	400	ND	ND	2.25
141	Outlet	AC	AC	AC	AC	7.76	31.8	ND	6.81	0.69
141	Inlet	AC	AC	AC	AC	7.38	401	ND	ND	2.28
142	Outlet	AC	AC	AC	AC	7.83	24.5	ND	ND	0.65
142	Inlet	AC	AC	AC	AC	7.36	400	27.1	ND	2.28
143	Outlet	AC	AC	AC	AC	7.94	28.4	ND	ND	0.74
143	Inlet	AC	AC	AC	AC	7.31	401	22.6	1.03	2.48
144	Outlet	AC	AC	AC	AC	7.84	39.9	ND	1.52	0.96
144	Inlet	AC	AC	AC	AC	7.36	401	10.2	ND	2.39
145	Outlet	AC	AC	AC	AC	7.91	26.7	ND	ND	0.76
145	Inlet	AC	AC	AC	AC	7.19	402	15.4	8.74	2.73
146	Outlet	AC	AC	AC	AC	8.13	12.72	ND	16.9	0.57
146	Inlet	AC	AC	AC	AC	7.07	401	ND	ND	2.67
147	Outlet	AC	AC	AC	AC	8.12	22.2	ND	ND	0.84
147	Inlet	AC	AC	AC	AC	7.49	402	12.9	4.35	2.52
148	Outlet	AC	AC	AC	AC	7.54	32.9	ND	ND	0.77
148	Inlet	AC	AC	AC	AC	7.41	400	10.03	ND	2.92
149	Outlet	AC	AC	AC	AC	8.03	27.4	ND	ND	1.37
149	Inlet	AC	AC	AC	AC	7.16	398	ND	ND	2.48
150	Outlet	AC	AC	AC	AC	7.74	19.34	ND	ND	ND
150	Inlet	AC	AC	AC	AC	7.19	404	11.4	ND	2.21

ND: not detected.

[a] Acceptable to consumers and without any abnormal changes.

Table S2
Results of microbiological analysis

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72*h*
1	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
1	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
2	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
2	Outlet	Acceptable	AAL	Acceptable	Acceptable	AAL	Acceptable
3	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
3	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
4	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
5	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
5	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
6	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
7	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
7	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
8	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
8	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
9	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
9	Outlet	Acceptable	AAL	Acceptable	AAL	Acceptable	Acceptable
10	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
10	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
11	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
11	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
12	Inlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
12	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
13	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
13	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
14	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
14	Outlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
15	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
15	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
16	Inlet	Acceptable	AAL	AAL	Acceptable	AAL	Acceptable
16	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
17	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
17	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
18	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
18	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
19	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
19	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
20	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
20	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
21	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
21	Outlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
22	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
22	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
23	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
23	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
24	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

(Table S2 Continued)

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72*h*
24	Outlet	Acceptable	AAL	AAL	AAL	Acceptable	Acceptable
25	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
25	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
26	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
26	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
27	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
27	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
28	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
28	Outlet	Acceptable	AAL	AAL	Acceptable	AAL	Acceptable
29	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
29	Outlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
30	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
30	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
31	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
31	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
32	Inlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
32	Outlet	Acceptable	AAL	AAL	Acceptable	Acceptable	Acceptable
33	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
33	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
34	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
34	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
35	Inlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
35	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
36	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
36	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
37	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
37	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
38	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
38	Outlet	Acceptable	AAL	AAL	AAL	Acceptable	Acceptable
39	Inlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
39	Outlet	Acceptable	AAL	AAL	AAL	AAL	Acceptable
40	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
40	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
41	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
41	Outlet	Acceptable	AAL	AAL	Acceptable	Acceptable	Acceptable
42	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
42	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
43	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
43	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
44	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
44	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
45	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
45	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
46	Inlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
46	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
47	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
47	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
48	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
48	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72 h
49	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
49	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
50	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
50	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
51	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
51	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
52	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
52	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
53	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
53	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
54	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
54	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
55	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
55	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
56	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
56	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
57	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
57	Outlet	Acceptable	AAL	AAL	Acceptable	AAL	Acceptable
58	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
58	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
59	Inlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
59	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
60	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
60	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
61	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
61	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
62	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
62	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
63	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
63	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
64	Inlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
64	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
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65	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
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67	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
67	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
68	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
68	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
69	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
69	Outlet	Acceptable	Acceptable	Acceptable	AAL	AAL	AAL
70	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
70	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
71	Inlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
71	Outlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
72	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
72	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
73	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

(Table S2 Continued)

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72 h
73	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
74	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
74	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
75	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
75	Outlet	Acceptable	AAL	AAL	Acceptable	Acceptable	Acceptable
76	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
76	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
77	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
77	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
78	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
78	Outlet	Acceptable	Acceptable	AAL	AAL	AAL	Acceptable
79	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
79	Outlet	Acceptable	Acceptable	AAL	Acceptable	AAL	Acceptable
80	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
80	Outlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
81	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
81	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
82	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
82	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
83	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
83	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
84	Inlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
84	Outlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
85	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
85	Outlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
86	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
86	Outlet	Acceptable	Acceptable	AAL	AAL	Acceptable	Acceptable
87	Inlet	Acceptable	Acceptable	AAL	Acceptable	Acceptable	Acceptable
87	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
88	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
88	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
89	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
89	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
90	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
90	Outlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
91	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
91	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
92	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
92	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
93	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
93	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
94	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
94	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
95	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
95	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
96	Inlet	Acceptable	AAL	Acceptable	Acceptable	Acceptable	Acceptable
96	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
97	Inlet	Acceptable	Acceptable	Acceptable	AAL	AAL	Acceptable
97	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72 h
98	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
98	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
99	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
99	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
100	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
100	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
101	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
101	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
102	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
102	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
103	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
103	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
104	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
104	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
105	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
105	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
106	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
106	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
107	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
107	Outlet	Acceptable	Acceptable	Acceptable	AAL	Acceptable	Acceptable
108	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
108	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
109	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
109	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
110	Inlet	AAL	AAL	AAL	AAL	Acceptable	Acceptable
110	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
111	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
111	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
112	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
112	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	Acceptable
113	Inlet	Acceptable	AAL	Acceptable	Acceptable	Acceptable	Acceptable
113	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
114	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
114	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
115	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
115	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
116	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
116	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
117	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
117	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	AAL	AAL
118	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
118	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
119	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
119	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
120	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
120	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
121	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
121	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
122	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

(Table S2 Continued)

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72 h
122	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
123	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
123	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
124	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
124	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
125	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
125	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
126	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
126	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
127	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
127	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
128	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
128	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
129	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
129	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
130	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
130	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
131	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
131	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
132	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
132	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
133	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
133	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
134	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
134	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
135	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
135	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
136	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
136	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
137	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
137	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
138	Inlet	AAL	AAL	AAL	AAL	Acceptable	Acceptable
138	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
139	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
139	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
140	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
140	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
141	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
141	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
142	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
142	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
143	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
143	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
144	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
144	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
145	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
145	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
146	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
146	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

Number		*Clostridium perfringens*	*Pseudomonas aeruginosa*	*Escherichia coli*	Coliform	Colony counts at 37°C	Colony counts at 22°C–72 h
147	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
147	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
148	Inlet	Acceptable	AAL	Acceptable	Acceptable	Acceptable	Acceptable
148	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
149	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
149	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
150	Inlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
150	Outlet	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable

AAL: Above the acceptable limit.