LifeStraw®

MAX

Performance & Test Reports

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LifeStraw products have a history of use in some of the harshest conditions around the world, from refugee camps to natural disasters to extreme back-country, our products have to work because lives depend on them. Our testing and transparency is unparalleled, as is our commitment to social impact and environmental sustainability.

WHAT SETS LIFESTRAW APART

1. Tough and Minimalist: Our products are made with minimal spare parts and are used in the toughest conditions around the world.

2. LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory

3. 4-step quality control including microbiological testing over every single batch of filters.

4. We give back: We provide a year of safe water to a child in need for every LifeStraw product sold.

5. Transparent testing: We share all internal and external lab reports publicly, on our website.

6. Optimal flow rates: Optimized to operate off of human sucking & last longer in sandy & silty conditions.

7. Sustainable packaging: All packaging is free of plastic and is fully recyclable or compostable

8. It's all about the 9s: We report log removal (99.999999%) data for all of our microbiological claims.

HOW WE TEST OUR PRODUCTS

LifeStraw's testing and transparency is unparalleled and we use the most trusted performance criteria based on protocols established by the World Health Organization, the US EPA, NSF International and the Water Quality Association.

ALL LIFESTRAW PRODUCTS REMOVE:

- LOG 8 (99.999999%) for Bacteria
- LOG 5 (99.999%) for parasites/amoebas/cysts
- LOG 5 (99.999%) for microplastics
- BPA FREE
- FDA Food Grade Materials

4 STEP QUALITY CONTROL

LifeStraw puts 100% of its filters through a rigorous quality control process.

STEP 1: Resistance test at high pressure.
STEP 2: Bubble test to confirm pore size.
STEP 3: Particle test to ensure nothing the size of bacteria or larger can pass through the filters.
STEP 4: We send a sample from every batch for full Bacteria and Protozoa log removal tests.

MICROBIOLOGICAL TESTING – HOW ITS DONE

The only accepted scientific evaluation of microbiological filtration performance is log values (the number of 9s in 99.999999%). PERIOD. All internationally accepted protocols from ANSI, WQA, NSF International, the US EPA, and the World Health Organization evaluate performance through log removal testing. None of these bodies will certify anyone based on pore size; it is ACTUAL PERFORMANCE that matters. LifeStraw products exceed all log-based performance standards.

LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory capable of performing cutting age tests on microbiological performance longevity, turbidity and other performance indicators. LifeStraw also tests all products through external internationally recognized labs.

MAX
PERFORMANCE DATA

INDEPENDENTLY TESTED

LifeStraw water purifiers are rigorously tested by independent labs and our own ISO certified lab to meet protocols established by the US Environmental Protection Agency (EPA) and NSF International/ANSI.

- Membrane Ultrafilter pore size – 0.02 micron
- Meets NSF/ANSI P231 standard for reduction of viruses, bacteria and parasites
- Included advanced carbon filter reduces lead, chlorine, asbestos, and organic chemical matter. Lasts up to 4,000 gal | 15,000 L

MEMBRANE ULTRAFILTER LASTS UP TO 26,500 GAL (100,000 L)

REMOVES 99.99% OF VIRUSES

Adenoviridae
Astroviridae
Calicivirus
Enterovirus
Hepatovirus A (Hepatitis A)
Influenzavirus
Norovirus
Human parainfluenza viruses (HPIVs)
Paramyxovirus
Human parvovirus B19
Rhinovirus
Rotavirus
Alphavirus
Rubivirus (Rubella)

REMOVES 99.999% OF PARASITES

Ascaris lumbricoides
Cryptosporidium spp.
Entamoeba histolytica
Giardia intestinalis
Naegleria gruberi
Schistosoma mansoni
Taenia saginata

REMOVES 99.999999% OF BACTERIA

Brucella melitensis
Campylobacter jejuni
Francisella tularensis
Pseudomonas aeruginosa
Shigella
Staphylococcus aureus
Vibrio cholerae (Cholera)
Vibrio parahaemolyticus
Yersinia enterocolitica
Yersinia pestis
Enteropathogenic Escherichia coli (E. coli)
Haemophilus influenzae
Klebsiella pneumoniae
Legionella pneumophila
Mycobacterium tuberculosis
Mycoplasma pneumoniae
Burkholderia pseudomallei
Salmonella enterica
Salmonella typhi (Typhoid)
Streptococcus pneumoniae
Streptococcus pyogenes
Leptospira

REMOVES 99.999% OF MICROPLASTICS

REDUCES LEAD, ASBESTOS, CHLORINE, AND ORGANIC CHEMICAL MATTER

REDUCES TURBIDITY (SILT, SAND, CLOUDINESS)

The above is not an exhaustive list of all bacteria, parasites, and other contaminants removed by LifeStraw filters but rather the main waterborne disease-causing contaminants. If you have additional questions about a specific contaminant not included on the list, please email us at info@lifestraw.com.

Study Report

PHÒNG THÍ NGHIỆM NƯỚC
Water Laboratory

Performance of LifeStraw Max on longevity, microbial and chemical removal

Study Number: LSF.18.1002.1

Attention to: Jean Luc Madier	Date of issuance: 22 July 2020
Issued by: Chung Nguyen	Approved by: Le Cao

Summary

In this study, the LifeStraw Max samples were tested to evaluate the lifetime according to NSF P231 standard and evaluate the performance of carbon filter according to NSF/ANSI 42 and 53.

The test result showed that LS Max samples could filtrate 300NTU water well till 200,000L volume with filtration rate of higher than 4L/min. Turbidity of filtrated water met the requirement of NSF/ANSI 53/2019 for drinking water – lower than 0.5NTU.

LS Max samples could remove bacteria (E. Coli) at minimum 8log reduction, remove virus (MS2 virus) at minimum 5log reduction and remove Cyst at minimum 5log reduction along the tested 200,000L volume. These results exceeded the requirement for water treatment products of WHO and NSF P231 standards.

LS Max samples could remove Lead according to NSF/ANSI 53/2019 till 30,000L and remove Chlorine according to NSF/ANSI 42/2019 till more than 15,000L of the claimed lifetime of the carbon filter.

Purposes

Evaluate performance of the LS Max product in term of:

- The lifetime of product based on the filtration rate (flowrate) and microbial removal efficacy.
- Lifetime of carbon filter in term of Lead and Chlorine removal efficacy.

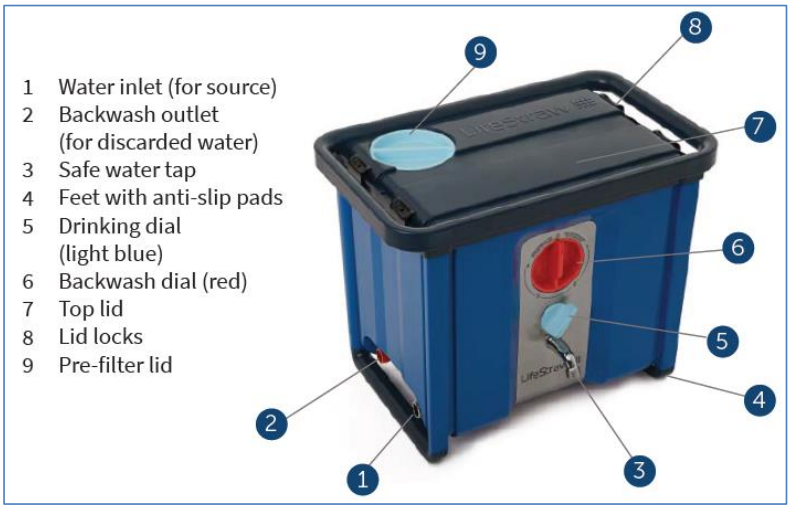
Samples and Materials

Samples with below codes were tested:

- LS.19.226.2 and LS.19.259.3: samples for longevity test
- LS.19.542.1-10: samples for Lead removal test
- LS.542.11-16: samples for Chlorine removal test

VILAS 751

VESTERGAARD® IMPACTING PEOPLE



Picture 1: LS Max product

Procedure/ Testing methods

- Type of testing water: accelerated aging water (AAP) with high turbidity of 300NTU.
- Pressure: 1bar.
- Microbiological removal efficacy test: every 20,000L during the longevity test, following the NSF P231 standard.
- Lead removal test: according to the NSF/ANSI 53/ 2019.
- Chlorine removal test: according to NSF/ANSI 42/ 2019.

Results and discussions

1. **Filtration rate and longevity data**

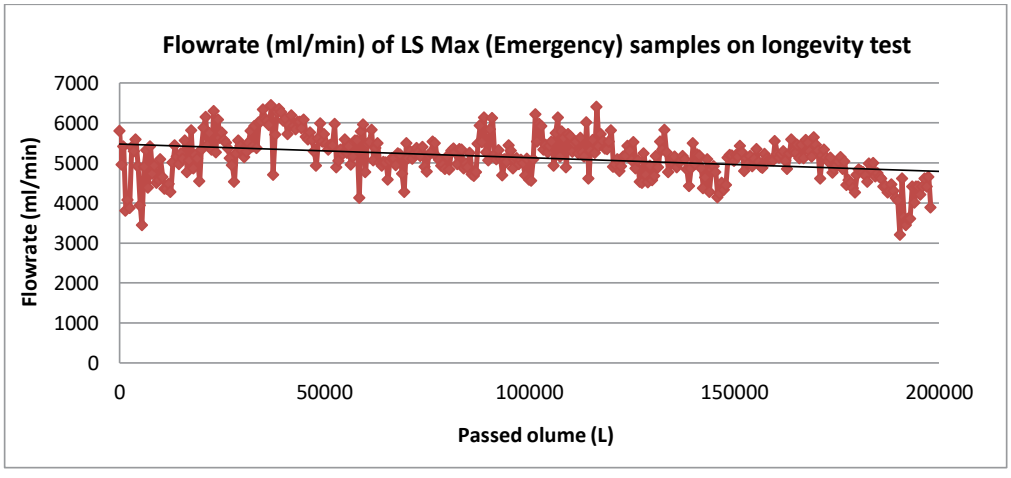


Fig 1: average flowrate of the samples tested with AAP water at 1bar

Table 1: data summary of the LS Max longevity test

Sample	Initial data		Longevity data					
	Max initial flowrate		Average flowrate (ml/min)		Average normalized flowrate	Aging duration (hours)	Average turbidity of effluent water (NUT)	Volume reached (L)
	ml/min	L/h	ml/min	L/h				
LS.19.226.2	7840	470	5074	304	0.65	651	0.12	198,134
LS.19.259.3	7400	444	5166	310	0.70	613	0.11	190,090
Average	**7620**	**457**	**5120**	**307**	**0.67**	**632**	**0.12**	**194,112**

- The samples were tested with AAP water - 300NTU turbidity as mimic of emergency conditions (flood or similar).
- The samples run well along 200,000L volume with slowly down-trend of flowrate. Till 200,000L point, flowrate was as high as around 4L/min. Maximum flowrate of the samples during the longevity test was higher than 6L/min.
- Turbidity of effluent water was maintained lower than 0.5NTU along the test at all sampling points with average value of 0.12NTU. This result met the requirement of NSF/ANSI 53/2019 for drinking water.

2. Microbial removal data

Table 3: summary of Microbial testing data during longevity test of LS Max samples

Sample	Microbial log reduction at challenging points																					
	Beginning		20,000L		40,000L		60,000L		80,000L		100,000L		120,000L		140,000L		160,000L		180,000L		200,000L		
	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	E.coli	MS2	Spheres
LS.19.226.2	8.7	6.2	8.3	6.9	8.2	6.7	-	5.4	8.5	6.4	8.6	6.7	8.6	5.9	8.0	6.5	8.4	6.2	8.3	6.0	8.3	6.0	5.2
LS.19.259.3	8.7	6.8	8.3	6.9	8.2	6.7	8.4	6.6	8.5	6.4	8.6	6.7	8.4	5.6	-	6.1	8.5	6.5	8.5	6.8	8.5	6.8	-
Average	**8.7**	**6.7**	**8.3**	**6.9**	**8.3**	**6.8**	**8.1**	**6.2**	**8.5**	**6.2**	**8.5**	**6.7**	**8.5**	**6.1**	**8.0**	**6.5**	**8.4**	**6.3**	**8.3**	**6.4**	**8.4**	**6.4**	**5.2**

- The tested samples passed NSF P231 along their 200,000L volume in which:
  - Log reduction of E.coli bacteria: ≥ 8.0log
  - Log reduction of MS2 virus: ≥ 5.4log
  - Log reduction of cyst (as 3 micron microspheres): 5.2log.
- This result exceeded the requirement of WHO for highly protective product (4 log of bacteria removal, 5 log of virus removal and 4 log of Cyst removal) and NSF P231 (6 log of bacteria removal, 4 log of virus removal and 4log of Cyst removal).

3. Chemicals removal

- Lead concentration in effluent water of the LS Max samples at both pH 8.5 and 6.5 according to NSF/ANSI 53/2019 was lower than 0.005mg/L (5µg/L) at all sampling points along its 30,000L. This result exceeded the requirement of NSF for drinking water treatment product – lead in effluent water must lower than 0.005mg/L (Fig. 2).

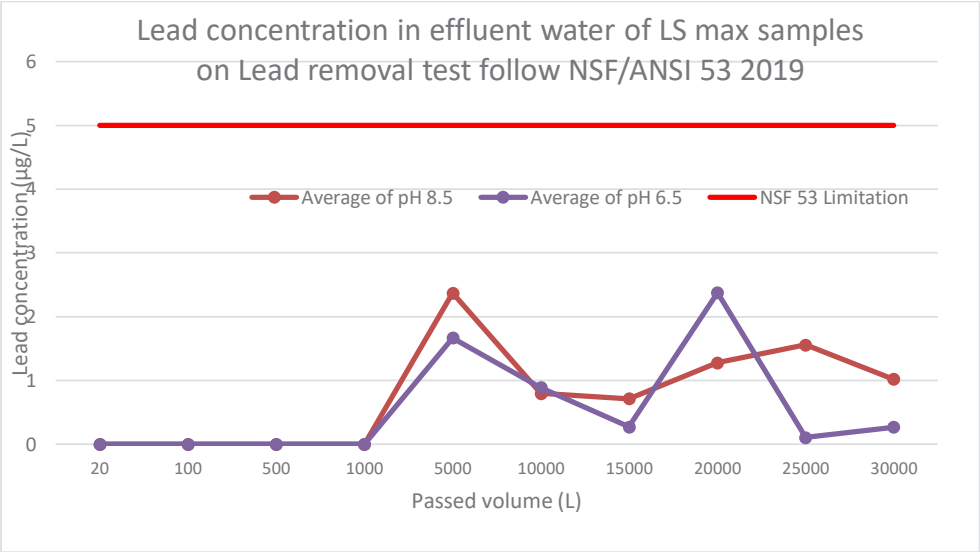


Fig. 2: lead concentration in effluent water of the samples on lead removal test

- The result of chlorine removal of all samples was very good : at all sampling points of all samples along its 20,000L volume, chlorine in influent water was not detected and thus removal percentage was 100%. This result exceeded the requirement of NSF for percentage of chlorine removal (higher than 50%) and exceeded the claimed lifetime of the carbon filter (15,000L) (Fig. 3).

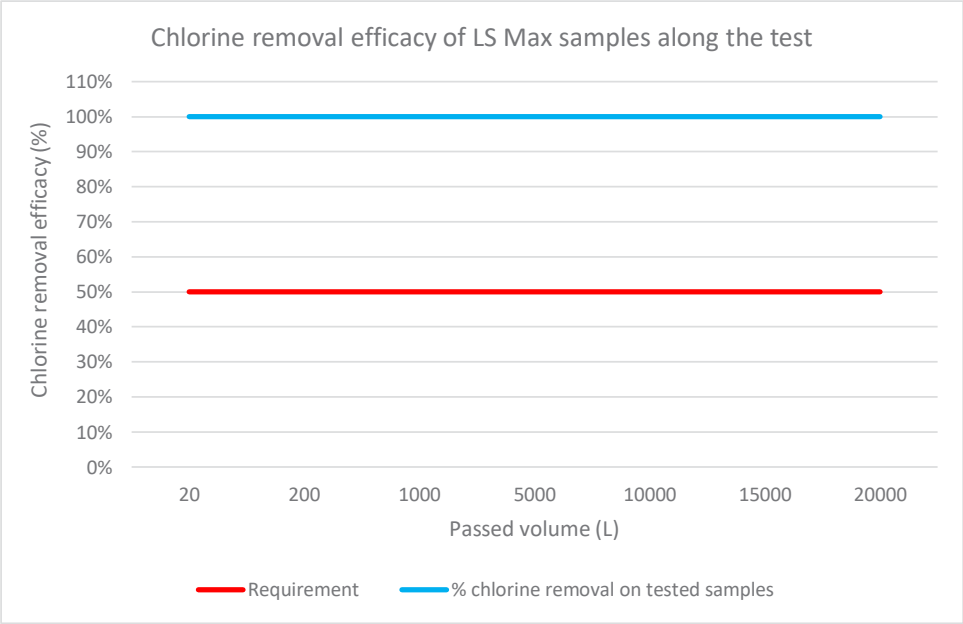


Fig. 3: chlorine concentration in effluent water of the samples on chlorine removal test

Conclusions

- The test result showed that LS Max samples could filtrate highly turbid water (300NTU water) well till 200,000L with filtration rate of higher than 4L/min. Turbidity of filtration water met the requirement of the NSF/ANSI 53/2019 standard for drinking water – lower than 0.5NTU.
- LS Max samples could remove bacteria (E.coli) at minimum 8log reduction, remove virus (MS2 virus) at minimum 5log reduction and remove Cyst at minimum 5log reduction along the tested 200,000L volume. These results exceeded the requirements for water treatment products of WHO and NSF P231 standards.
- LS Max samples could remove Lead according to NSF/ANSI 53/2019 till 30,000L and remove Chlorine according to NSF/ANSI 42/2019 till more than 15,000L of the claimed lifetime of the carbon filter.

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TEST REPORT

Report No: IAPMOILAB/PRTR/ 18808 /21-22 **Date: 14.09.2021**

CUSTOMER DETAILS	SAMPLE DETAILS	TEST DETAILS
Name & Address Kind Attn: Ms. Le Thu Cao Vestergaard Frandsen Inc 333, W Ostend St. Suite 300 Baltimore, MD 21230, USA	Sample received: 31.08.2021	Method: Microplastic reduction (as 1 micron plastic spheres) – black dyed microspheres.
	Sample code no: AWRTCL/18808/21-22	
	Sample Description : Lifestraw Max	
	Sample Quantity for Testing: 1 No	
	Submitted by: Vestergaard Frandsen Inc – USA	
	Date of Analysis started: 08.09.2021	
	Date of Analysis Completed: 09.09.2021	
	Subcontract: Not Applicable	
	Sample condition when received : Intact	

EXECUTIVE SUMMARY:

One unit of Lifestraw Max was evaluated at a flow rate of 4.4 LPM for its performance in reducing microplastics as 1 micron microspheres after a filtration of 15L volume. The tested unit was found to reduce well the microplastics (as 1 micron poly styrene black dyed microspheres) with a reduction per cent higher than 99.9998 (>5.83 log).

TEST DATA: 1 Micron Microsphere reduction by LS Max @ 4.4 LPM flow rate

#	Influent water 1 micron microsphere counts	Effluent water 1 micron microsphere count	% Reduction
1	1.074 x 10^8 spheres/L ($8.03 \log_{10}$)	<160 spheres/L ($2.2 \log_{10}$)	>99.99985 > 5.83 log)

<160 spheres/L = below detection limit. Sampling was done after 15L filtration.

TEST CONDITIONS:

Flow rate: 4.4 LPM

Input Water Pressure: 60 PSI

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TEST REPORT

Influent Test water: Challenge Test Water

S.No	Test water Characteristics	Concentration maintained by the Laboratory	Analysis
1	pH	9.1	APHA 23rd edn 4500 H+B
2	TDS mg/L	1580	Calibrated TDS meter
3	Turbidity NTU	30	APHA 23rd edn 2130B
4	TOC mg/L	10	HACH DR 2800 Spectrophotometer
5	Temperature ^{0}C	4	Calibrated thermometer
6	Microspheres	X 10^8/L	Light Microscope coupled with Haemocytometer

PICTURE OF TEST PRODUCT

Dr S.MURALIDHARA RAO
Director of Laboratory

00--------End of the Test Report 00

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We under take analytical job for water, food, biocidal resins, detergents & sanitizers and soil. We carry out performance evaluation of drinking water treatment units as per NSF/ANSI specifications. Based on performance we can arrange for certification from IAPMO – USA

Note:
1. The results pertain only to the tested samples and applicable parameters.
2. Samples will be disposed after 15 days from the issue of test certificate unless otherwise specified, in case of bacteriological tests, the samples will be disposed after 7 days itself from the date of issuing the certificate.
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GSTIN: 29AAHCAO185G1ZP

TEST REPORT

Report No: AWRTCL/PRTR/17346 / 20-21 **Date:05.05.2020**

CUSTOMER DETAILS	SAMPLE DETAILS	TEST METHOD
Name & Address: **Kind Attn:** **Ms. Le Thu Cao** **Vestergaard Frandsen Inc** **1920 19th Street NW** **Suite 875** **Washington D.C. 20036, USA**	**Sample received: 28.04.2020** **Sample code no: AWRTCL/17346/20 - 21** **Sample Description: LifeStraw Max** **Sample Quantity for Testing: 1No** **Submitted by : Vestergaard Frandsen Inc – USA** **Date of Analysis started: 04.05.2020** **Date of Analysis Completed:05.05.2020** **Subcontract : Not Applicable** **Sample condition when received : Intact**	**NSF P 231 protocol and NSF/ANSI 53 standard**

EXECUTIVE SUMMARY: One unit of Life straw Max was evaluated at a flow rate ≈5.4 Lit/min for its performance in reducing microbial contaminants at exaggerated levels from the input water as per NSF P231 protocol for Bacteria, Virus and Cyst reduction after a filtration of 50L volume. The tested unit was found to be very effective in reducing E.coli MTCC 68 bacterial species to ≥99.999999% (8.74 log), MS2 phage ATCC 15597B1 surrogate virus to≥99.9999% (5.77 log) and 3 micron microspheres (artificial cysts) to ≥99.9999% (5.03 log). The performance was exceeding the NSF requirements of minimum 99.9999% reduction (6 log) for bacteria and 99.99% (4 log) reduction for Virus and 99.9% reduction for cysts (artificial cyst) as per NSF P231 protocol. As well Turbidity reduction was very effective reducing from 10NTU to <0.1 NTU thus exceeding the performance requirement of NSF/ANSI 53 standard i.e from 11±1NTU to ≤0.5NTU.

TEST PRODUCT PICTURE

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GSTIN: 29AAHCAO185G1ZP

TEST CONDITIONS:

Influent water Pressure:60 PSI
Sampling filtration Volume :50L
Test Water: GTW#1 as per NSF P 231 protocol
Flow rate attained at 60 PSI: 5.40Lit/min
Running cycle: Continuous
Test Protocol: NSFP231

Table – 1 TEST DATA: MICROBIAL REDUCTION

BACTERIAL REDUCTION E. coli MTCC 68			VIRUS REDUCTION MS2 phage ATCC15597B1			CYST REDUCTION 3-micron polystyrene black dyed Microspheres		
Influent water E. coli MTCC 68 counts	Effluent Water E. coli MTCC68 counts	% Reduction & Log reduction	Influent water MS2 phage ATCC15597B1 counts	Effluent Water MS2 phage ATCC15597B1 counts	% Reduction & Log reduction	Influent water 3-micron Polystyrene black dyed Micro-spheres	Effluent water 3-micron Polystyrene black dyed Micro-spheres	% Reduction & Log reduction
6.0X 10 ^{6} cfu/ml	NVC/ 100 ml	>99.999999	6.0X 10 ^{5} pfu/ml	NPFU/1ml	>99.9999	1.73 x 10 ^{7} cells//Lit	<160 spheres/Lit	≥99.999
5.0X 10 ^{6} fu/ml	NVC/ 100 ml	&	6.0X 10 ^{5} pfu/ml	NPFU/1ml	&			
Average 5.5X 10 ^{6} fu/ml	Average NVC/ 100 ml	8.74	Average 6.0X 10 ^{5} pfu/ml	Average NPFU/1ml	5.77	7.23	2.2	5.03
8.74 log	0 log		5.77 log	0 log				

Cfu: Colony forming units, pfu: Plaque forming units, NVC: No viable colonies, NPFU: No plaque forming units.
<160 is Below detection Limit
Note: For calculating log10 values in case of bacteria colony forming units per 100 ml quantities are considered for both influent and effluent water samples. In case of Virus plaque forming units per 1 ml are considered.

Table – 2 TEST WATER COMPOSITION FOR MICROBIAL REDUCTION

Test water Characteristic	Recommended concentration for Bacteria, Virus and cyst reduction NSF P231 protocol	Tank 1	Tank 2
pH	6.5 – 8.5	7.51	7.49
TDS mg/L	50 – 500	259	265
TOC mg/L	0.1 – 5.0	1.0	---
Turbidity NTU	0.1 – 5.0	1.2	0.8
Temperature ^{0}C	20 ± 3	23	23

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Table – 3 TEST DATA : TURBIDITY REDUCTION @ 5.1Litmin Flow rate

Volume of Filtration	Influent water Turbidity NTU	Effluent Water Turbidity NTU
10L	10.6 NTU	<0.1NTU
50L	10.4 NTU	<0.1NTU

<0.1 NTU: Below detection Limit

Table – 4 TEST WATER COMPOSITION FOR TURBIDITY REDUCTION

Test water Characteristic	Recommended concentration as per NSF/ANSI 53 standard	Tank 1
pH	7.5 ±0.5	7.48
TDS mg/L	200 – 500	252
Turbidity NTU	11 ±1	10.6
Temperature ^{0}C	20 ± 2.5	23

Table – 5 ANALYSIS METHODS

Test Parameter	Method
TDS mg/L	Calibrated TDS meter
pH	APHA 23rd edn 4500 H+B
Temperature ^{0}C	Calibrated Thermometer
TOC mg/L	HACH DR 2800 Spectrophotometer
3 micron microspheres	Haemocytometer coupled with Light Microscope
Turbidity NTU	APHA 23rd edn 2130B
E.coli and MS2 phage	USEPA / APHA methods

Dr S. MURALIDHARA RAO
Head – Laboratory

Report No: AWRTCL/PRTR/17346 / 20-21, Date:05.05.2020, Page 3 of 3
00---End of the Test Report ---00

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GSTIN: 29AAHCAO185G1ZP

TEST REPORT

Report No: AWRTCL/PRTR/ 17346 &17346C/20-21 **Date:11.06.2020**

CUSTOMER DETAILS	SAMPLE DETAILS	TEST DETAILS
Name &Address: **Ms. Le Thu Cao** **Vestergaard Frandsen Inc** **1920 19th Street NW** **Suite 875** **Washington D.C. 20036** **USA**	**Sample received: 28.04.2020** **Sample code no: AWRTCL/17346 & 17346C/20-21** **Sample Description: Life straw Max** **Sample Quantity for Testing: 2 Nos** **Submitted by: Vestergaard Frandsen Inc** **Date of Analysis started: 07.05.2020** **Date of Analysis Completed: 08.06.2020** **Subcontract : Not Applicable** **Sample condition when received: Intact**	**Protocol** **NSF/ANSI 42 Drinking Water Treatment Units – Aesthetic Effects 2019**

TEST DATA: AWRTCL-17346 & 17346 C Lifestraw Max Flow through water Filter Chlorine Reduction

Volume of Filtration Liters	Influent water Chlorine concentration mg/L	Effluent water Chlorine concentration mg/L	% Reduction	Flow rate Lit/min	Influent water Chlorine concentration mg/L	Effluent water Chlorine concentration mg/L	% Reduction	Flow rate Lit/min
	AWRTCL/17346/20-21 Unit #1				AWRTCL/17346C /20-21 Unit # 2			
10L initial	2.2	0.05	97.72	5.34	2.2	0.05	97.72	5.04
1500L(10%)	2.1	0.05	97.62	5.28	2.1	0.05	97.62	5.28
3000L(20%)	2.1	0.05	97.62	5.58	2.1	0.05	97.62	5.4
4500L(30%)	2.1	0.05	97.62	5.10	2.1	0.05	97.62	4.8
6000L(40%)	2.05	0.05	97.56	4.74	2.05	0.05	97.56	4.62
7500L(50%)	2.1	0.05	97.62	4.50	2.1	0.05	97.62	4.86
9000L(60%)	2.2	0.1	95.45	5.22	2.2	0.1	95.45	5.22
10500L(70%)	2.2	0.1	95.45	5.46	2.2	0.1	95.45	5.4
12000L(80%)	2.2	0.1	95.45	5.28	2.2	0.1	95.45	5.28
13500L(90%)	2.2	0.1	95.45	5.46	2.2	0.1	95.45	5.4
15000L(100%)	2.3	0.1	95.65	5.28	2.3	0.1	95.65	5.16
18000L(120%)	2.2	0.1	95.45	5.46	2.2	0.1	95.45	5.46
NSF/ANSI requirement	1.8 to 2.2	Acceptable Limit: At least 50% reduction in the product water at all sampling points. Tested Lifestraw Max units exceed the performance requirement of NSF/ANSI 42 standard up to the tested volume of 18,000L. Hence the Products are **PASSED.**						

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GSTIN: 29AAHCAO185G1ZP

TEST CONDITIONS:

Running cycle: 10 min ON/ 10 min OFF
Input water Pressure: 60 ± 3PSI
Daily Filtration : 600L approx.
Flow rate: Whatever maximum flow rate achieved at 60 PSI

TEST WATER COMPOSITION: At the time of sampling

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory					
			Tank1 10L	Tank2 1500L	Tank3	Tank4	Tank5	Tank6
1	pH	7.5±0.5	7.61	7.59	7.62	7.42	7.49	7.61
2	TDS mg/L	200 - 500	320	350	311	290	361	326
3	TOC mg/L	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0
4	Total Free available Chlorine mg/L	2.0±0.20	2.2	2.1	2.1	2.1	2.05	2.1
5	Turbidity NTU	<1	<1	<1				
6	Temperature ^{0}C	20±3	23	23	23	23	22	23

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory					
			Tank7 7	Tank8 1500L	Tank9	Tank10	Tank11	Tank12
1	pH	7.5±0.5	7.59	7.86	7.66	7.79	7.69	7.59
2	TDS mg/L	200 - 500	311	320	309	329	316	306
3	TOC mg/L	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0	≥1.0
4	Total Free available Chlorine mg/L	2.0±0.20	2.2	2.2	2.2	2.2	2.3	2.2
5	Turbidity NTU	<1	<1	<1				
6	Temperature ^{0}C	20±3	22	22	22	22	22	22

Report No: AWRTCL/PRTR/ 17346 &17346C/20-21,Date:11.06.2020, Page 2of 3

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PICTURE OF THE TEST SETUP

ANALYSIS

S.No	Test Water Characteristic	Test Method
1	pH	APHA 23rd edn 4500 H+B
2	TDS mg/L	Calibrated TDS meter
3	Total Free available Chlorine mg/L	APHA 23rd edn 4500 Cl F
4	Temperature ^{0}C	Calibrated thermometer
5	TOC mg/L	HACH DR 2800 Spectrophotometer
6	Turbidity NTU	APHA 23rd edn 2130 B

Dr S.MURALIDHARA RAO
Head – Laboratory

Report No: AWRTCL/PRTR/ 17346 &17346C/20-21,Date:11.06.2020, Page 3of 3
00*--------End of the Test Report --------*00

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TEST REPORT

Report No: AWRTCL/PRTR/ 17346A -17346B/20-21 **Date:30.07.2020**

CUSTOMER DETAILS	SAMPLE DETAILS	TEST DETAILS
Name &Address: **Ms. Le Thu Cao** **Vestergaard Frandsen Inc** **1920, 19th Street** **NW Suite 875** **Washington D.C.20036** **USA**	**Sample received: 13.02.2020**	**Protocol** **NSF/ANSI 53 Drinking Water Treatment Units – Health Effects 2019**
	Sample code no: AWRTCL/17346A – 17346B/20-21	
	Sample Description: Life straw Max	
	Sample Quantity for Testing: 2 Nos	
	Submitted by: Vestergaard Frandsen Inc	
	Date of Analysis started: 04.05.2020	
	Date of Analysis Completed: 28.07.2020	
	Subcontract : Not Applicable	
	Sample condition when received: Intact	

EXECUTIVE SUMMARY

Two units of LS Max were tested for Lead reduction capability at pH 8.5 for a volume of 30,000L which is 200% of the estimated capacity of 15000L. Flow rate was maintained at 4.86L/min and 4.80L/min (average), respectively, for these units. Throughout the tested volume, the units were able to reduce Lead from an influent water concentration of 150µg/L±10% to < 5.0µg/L which is in compliance with NSF/ANSI 53 – 2019 requirement. Hence the test is PASSED. The Lead reduction may be claimed for 15,000L.

TEST CONDITIONS:

Running cycle: 10 min ON/ 10 min OFF
Input water Pressure: 60 ± 3PSI
Daily Filtration: 600L approx.

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TEST REPORT

TEST DATA OF LEAD REDUCTION AT pH 8.5

Sample No: AWRTCL-17346A Life straw Max Unit #1

Volume of Filtration Litres	Total Lead µg/L	Lead after 1.2µ filtration	Lead after 0.1µ filtration	% Particulates	% Fines	Effluent water Lead µg/L	Flow rate LPM
10L (initial)	165.03	129.73	97.09	41.16	48.04	<5.0	5.52
750L (5% Volume)	164.42	133.04	98.79	39.91	52.19	<5.0	5.10
3750L (25% Volume)	153.54	127.33	99.30	35.31	51.65	<5.0	5.16
7500L (50%Volume)	155.57	125.45	103.31	33.59	42.37	<5.0	5.28
11250L (75%Volume)	156.60	130.62	107.81	31.15	46.75	<5.0	4.98
15000L (100% Volume)	152.03	126.19	101.23	33.42	49.13	<5.0	4.80
18750L (125%Volume)	155.66	124.53	106.64	31.48	36.51	<5.0	4.56
22500L (150% Volume)	148.96	123.47	97.15	34.78	50.80	<5.0	4.50
27000L (180% Volume)	159.35	131.01	105.40	33.85	47.47	<5.0	4.38
30000L (200%Volume)	152.95	131.96	112.58	26.3	48.0	<5.0	4.32
Average Values	156.41	--	--	34.09	47.29	<5.0	4.86
NSF/ANSI53 requirement	135-165 µg/L	--	--	20-40%	≥ 20	Maximum allowable limit : 5.0 µg/L	

Report No: AWRTCL/PRTR/ 17346A -17346B/20-21, Date:30.07.2020, Page 2 of 5

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TEST REPORT

TEST DATA OF LEAD REDUCTION AT pH 8.5

Sample No: AWRTCL-17346A Life straw Max Unit #1

Volume of Filtration Litres	Total Lead µg/L	Lead after 1.2µ filtration	Lead after 0.1µ filtration	% Particulates	% Fines	Effluent water Lead µg/L	Flow rate LPM
10L (initial)	165.03	129.73	97.09	41.16	48.04	<5.0	5.52
750L (5% Volume)	164.42	133.04	98.79	39.91	52.19	<5.0	5.10
3750L (25% Volume)	153.54	127.33	99.30	35.31	51.65	<5.0	5.16
7500L (50%Volume)	155.57	125.45	103.31	33.59	42.37	<5.0	5.28
11250L (75%Volume)	156.60	130.62	107.81	31.15	46.75	<5.0	4.98
15000L (100% Volume)	152.03	126.19	101.23	33.42	49.13	<5.0	4.80
18750L (125%Volume)	155.66	124.53	106.64	31.48	36.51	<5.0	4.56
22500L (150% Volume)	148.96	123.47	97.15	34.78	50.80	<5.0	4.50
27000L (180% Volume)	159.35	131.01	105.40	33.85	47.47	<5.0	4.38
30000L (200%Volume)	152.95	131.96	112.58	26.3	48.0	<5.0	4.32
Average Values	156.41	--	--	34.09	47.29	<5.0	4.86
NSF/ANSI53 requirement	135-165 µg/L	--	--	20-40%	≥ 20	Maximum allowable limit : 5.0 µg/L	

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TEST REPORT

TEST DATA OF LEAD REDUCTION AT pH 8.5
Sample No: AWRTCL-17346A Life straw Max Unit #1

volume	Volume of Filtration Litres	Total Lead µg/L	Lead after 1.2µ filtration	Lead after 0.1µ filtration	% Particulates	% Fines	Flow Rate LPM
10L (initial)	163.93	131.10	98.97	39.62	49.46	<5.0	4.80
750L (5% Volume)	162.54	134.00	107.87	33.63	47.79	<5.0	5.04
3750L (25% Volume)	151.62	126.07	101.28	33.20	49.23	<5.0	5.04
7500L (50%Volume)	157.30	126.77	101.57	35.43	45.21	<5.0	5.10
11250L (75%Volume)	154.14	129.64	108.27	29.76	46.58	<5.0	5.04
15000L (100% Volume)	150.00	130.22	103.90	30.73	57.09	<5.0	4.98
18750L (125%Volume)	158.95	135.91	105.07	33.90	57.23	<5.0	4.50
22500L (150% Volume)	151.97	124.97	103.07	32.18	44.79	<5.0	4.62
27000L (180% Volume)	165.21	129.46	104.20	36.93	41.40	<5.0	4.26
30000L (200%Volume)	155.58	128.24	118.19	24.03	26.86	<5.0	4.62
Average Values	157.12	--	--	32.94	46.56	<5.0	4.80
NSF/ANSI 53 requirement	135-165 µg/L	--	--	20-40%	≥ 20	Maximum allowable limit : 5.0 µg/L	

Report No: AWRTCL/PRTR/ 17346A -17346B/20-21, Date:30.07.2020, Page 3 of 5

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TEST REPORT

TEST WATER COMPOSITION: At the time of sampling pH 8.5

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank1 10L	Tank2 750L	Tank3 3750L	Tank4 7500L	Tank5 11250L
1	pH	8.5±0.25	8.54	8.46	8.47	8.49	8.62
2	Hardness as CaCO3 mg/L	100 ± 10%	96.07	115.29	96.07	105.68	115.29
3	Alkalinity as CacO3 mg/L	100 ± 10%	104.15	104.15	93.73	93.73	104.15
4	Total Free available Chlorine mg/L	0.5±0.25	0.40	0.55	0.50	0.60	0.60
5	Temperature ^{0}C	20±2.5	21	21	21	21	21

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank6 15000L	Tank 7 18750L	Tank8 22500L	Tank9 27000L	Tank10 30000L
1	pH	8.5±0.25	8.69	8.55	8.61	8.31	8.42
2	Hardness as CaCO3 mg/L	100 ± 10%	105.68	115.29	105.68	96.07	96.07
3	Alkalinity as CacO3 mg/L	100 ± 10%	114.56	93.73	104.15	93.73	93.73
4	Total Free available Chlorine mg/L	0.5±0.25	0.60	0.60	0.50	0.50	0.60
5	Temperature ^{0}C	20±2.5	21	21	21	21	21

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TEST REPORT

ANALYSIS

S.No	Test Water Characteristic	Test Method
1	pH	APHA 23rd edn 4500 H+B
2	Hardness as CaCO3 mg/L	APHA 23rd edn 2340C
3	Alkalinity as CacO3 mg/L	APHA 23rd edn 2320B
4	Total Free available Chlorine mg/L	APHA 23rd edn 4500 Cl F
5	Temperature ^{0}C	Calibrated thermometer

PICTURE OF THE TEST UNITS

Dr S.MURALIDHARA RAO
Head – Laboratory

Report No: AWRTCL/PRTR/ 17346A -17346B/20-21, Date:30.07.2020, Page 5 of 5

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TEST REPORT

TEST DATA OF LEAD REDUCTION AT pH 6.5

Sample No: AWRTCL-17346D- 17346E/ 20-21 Life straw Max Unit #1 & Unit # 2

Volume of Filtration Litres	AWRTCL/17346 /20-21			AWRTCL/17346 /20-21		
	Influent water Lead µg/L	Effluent water Lead µg/L	Flow rate LPM	Influent water Lead µg/L	Effluent water Lead µg/L	Flow rate LPM
	Filter #1			Filter # 2		
10L (initial)	153.32	<5.0	5.58	151.73	<5.0	5.52
750L (5% Volume)	152.01	<5.0	5.22	157.51	<5.0	5.04
3750L (25% Volume)	157.46	<5.0	5.22	156.82	<5.0	5.22
7500L (50%Volume)	158.39	<5.0	4.50	159.38	<5.0	4.92
11250L (75%Volume)	159.84	<5.0	4.62	150.17	<5.0	4.44
15000L (100% Volume)	156.96	<5.0	4.80	146.70	<5.0	4.50
18750L (125%Volume)	160.53	<5.0	4.92	155.64	<5.0	4.44
22500L (150% Volume)	159.47	<5.0	4.92	164.25	<5.0	4.80
27000L (180% Volume)	152.55	<5.0	4.98	160.20	<5.0	4.92
30000L (200%Volume)	160.13	<5.0	4.80	158.69	<5.0	4.62
Average Values	157.06	<5.0	4.96	156.11	<5.0	4.84
NSF/ANSI53 requirement	135-165 µg/L	Maximum allowable limit : 5.0 µg/L			STATUS : PASS	

Report No: AWRTCL/PRTR/ 17346D -17346E/20-21,Date:23.09.2020, Page 2 of 4

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TEST REPORT

TEST WATER COMPOSITION: At the time of sampling pH 8.5

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank1 10L	Tank2 750L	Tank3 3750L	Tank4 7500L	Tank5 11250L
1	pH	8.5±0.25	8.54	8.46	8.47	8.49	8.62
2	Hardness as CaCO3 mg/L	100 ± 10%	96.07	115.29	96.07	105.68	115.29
3	Alkalinity as CacO3 mg/L	100 ± 10%	104.15	104.15	93.73	93.73	104.15
4	Total Free available Chlorine mg/L	0.5±0.25	0.40	0.55	0.50	0.60	0.60
5	Temperature ^{0}C	20±2.5	21	21	21	21	21

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank6 15000L	Tank 7 18750L	Tank8 22500L	Tank9 27000L	Tank10 30000L
1	pH	8.5±0.25	8.69	8.55	8.61	8.31	8.42
2	Hardness as CaCO3 mg/L	100 ± 10%	105.68	115.29	105.68	96.07	96.07
3	Alkalinity as CacO3 mg/L	100 ± 10%	114.56	93.73	104.15	93.73	93.73
4	Total Free available Chlorine mg/L	0.5±0.25	0.60	0.60	0.50	0.50	0.60
5	Temperature ^{0}C	20±2.5	21	21	21	21	21

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Note:
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AQUADIAGNOSTICS WATER RESEARCH & TECHNOLOGY CENTRE LIMITED
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GSTIN: 29AAHCAO185G1ZP

TEST REPORT

TEST WATER COMPOSITION: At the time of sampling pH 6.5

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank1 10L	Tank2 750L	Tank3 3750L	Tank4 7500L	Tank5 11250L
1	pH	6.5±0.25	6.39	6.56	6.69	6.71	6.42
2	Hardness as CaCO3 mg/L	10 – 30	20.01	20.01	20.01	20.01	10.0
3	Alkalinity as CacO3 mg/L	10 – 30	10.0	20.0	20.0	20.0	10.0
4	Poly phosphate as P mg/L	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1
5	TDS mg/L	<100	51	62	66	71	56
6	Turbidity NTU	<1.0	<1	<1	<1	<1	<1
7	Temperature ^{0}C	20±2.5	20	20	20	20	20

S.No	Test Water Characteristic	Recommended Concentration	Quality of Water Maintained by the Laboratory				
			Tank6 15000L	Tank7 18750L	Tank8 22500L	Tank9 27000L	Tank10 30000L
0	pH	6.5±0.25	6.38	6.51	6.49	6.62	6.46
2	Hardness as CaCO3 mg/L	10 – 30	20.0	20.01	10.0	20.01	20.01
3	Alkalinity as CacO3 mg/L	10 – 30	10.0	20.0	20.0	20.0	10.0
4	Poly phosphate as P mg/L	<.5	<0.1	<0.1	<0.1	<0.1	<0.1
5	TDS mg/L	<100	53	55	52	56	58
6	Turbidity NTU	<1.0	<1	<1	<1	<1	<1
7	Temperature ^{0}C	20±2.5	20	20	20	20	20

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AQUADIAGNOSTICS
Water Research & Technology Centre
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TEST REPORT

ANALYSIS

S.No	Test Water Characteristic	Test Method
1	pH	APHA 23rd edn 4500 H+B
2	TDS mg/L	Calibrated TDS meter
3	Turbidity NTU	APHA 23rd edn
4	Hardness as CaCO3 mg/L	APHA 23rd edn 2340C
5	Alkalinity as CacO3 mg/L	APHA 23rd edn 2320B
6	Poly Phosphate as P mg/L	USEPA 365.3
7	Temperature ^{0}C	Calibrated thermometer

PICTURE OF THE TEST UNITS

Dr S.MURALIDHARA RAO
Head – Laboratory

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00--------End of the Test Report --------00

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TEST REPORT

Report Number: **2585-21003** **Project No.:** 37135

Report Issued: November 5, 2021

Report To: Vestergaard Frandsen Inc

Source of Samples: Tested by QFT Laboratory Inc. Williamstown NJ

Location of Testing: 1041 Glassboro Rd. Suite D-1 Williamstown NJ 08094

Dates of Evaluation: October 21, 2021

Product Description: LifeStraw Max – Plumbed in with Reservoir

Reference Standard: NSF/ANSI 53-2020

Scope of Evaluation: Qualification of the sample for Asbestos Reduction per NSF/ANSI 53-2020.

Conclusion: **The samples described in the "Product Description" were evaluated according to the referenced standard, results are below.**

Report Status: **IN COMPLIANCE**

Reviewed By,

Sal Aridi, Director

Requirements for Compliance:
The system shall reduce the influent asbestos fiber concentration in the range of 10^7 to 10^8 fibers per liter by at least 99%

Table One: Specifications of testing

Number of Units	One
Conditioning	Run for 2 minutes
Sampling	Per NSF 53
Flow Rate	1.5 GPM
Filter Capacity	50 L
Unit Volume	1 L
Cycle	Continuous
PID	None
Prefilter Required	Yes
Deviations from Standard	none

Influent water characteristics:

Sample Point	pH (7.5±0.5)	Temperature (20±2.5°C)	TDS (200 to 500 mg/L)	Hardness (<170 mg/L)	Turbidity: Test Water (<1NTU)	TOC (>1 mg/L)	Turbidity: Dust Loading Water (>10NTU)
50 L	7.45	20.5	260	109	0.45	1.2	11.5
Average	**7.45**	**20.5**	**260**	**109**	**0.45**	**1.2**	**11.5**

Filter #1 Data Summary Table

Sample Point	Influent 1 (fibers/L)	Effluent 1 Concentration (fibers/L)	% Reduction
50 L	3.5452×10^7	60	99.99998%

Asbestos Reporting Limit: 10 fibers/L

Figure 1- Filter System Tested

Figure 2- Filter System Tested

Figure 3- Filter System Tested

LifeStraw®