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January 7, 2005

VIA HAND DELIVERY

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Blanca S. Bayo, Director  
Division of the Commission Clerk  
and Administrative Services  
Florida Public Service Commission  
2540 Shumard Oak Boulevard  
Tallahassee, Florida 32399-0850

Re: Aloha Utilities, Inc.; PSC Docket No. 010503-WU - Water Rate Case  
Our File No. 26038.35

Dear Ms. Bayo:

Attached in accordance with the requirements of the Commission's Prehearing Procedure Order in regard to the above-referenced docket are 15 copies of the testimonies of Dr. Audrey D. Levine, PhD and David Porter, P.E. filed on behalf of Aloha Utilities, Inc.

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It is my understanding that as a result of the termination of the proceedings under Commission's Docket No. 020896-WS at the agenda conference last Tuesday, that the proceeding in Docket No. 010503-WU which had been consolidated with the 2002 Docket above will go on separately, under the same general timetables. The only testimony that was submitted exclusively in the 010503-WU Docket is that of Dr. V. Abraham Kurien that specifically references that docket alone. None of the other testimonies submitted in the combined dockets addressed any of the issues in this proceeding and as such, those have not been responded to. It is my understanding that all parties agree that only Dr. Kurien's 20 page testimony remains as the testimony of the petitioner in this case. To the extent that any party takes the position at some future time that any of the other direct testimonies on behalf of petitioners are to be considered in this proceeding, the Utility will have to be given an opportunity to respond to those as well.

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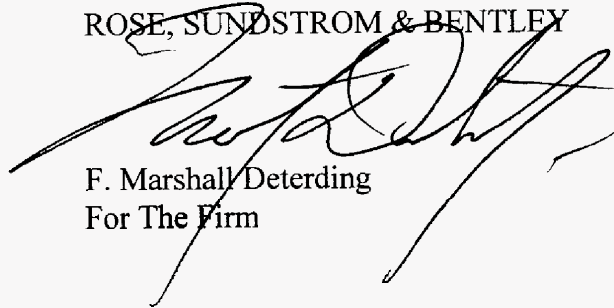
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Blanca S. Bayo, Director  
January 7, 2005  
Page 2

If you have any questions in this regard or if my understanding of the agreement of the parties concerning the only testimony of petitioners to be considered in this docket is incorrect, please let me know immediately.

Sincerely,

ROSE, SUNDBSTROM & BENTLEY

A handwritten signature in black ink, appearing to read 'F. Marshall Deterding', is written over the typed name and firm name.

F. Marshall Deterding  
For The Firm

FMD/tms

cc: Ralph Jaeger, Esquire  
Edward Wood  
Harry Hawcroft  
Honorable Mike Fasano  
Charles Beck, Esq.  
Margaret Lytle  
V. Abraham Kurien, M.D.  
Stephen Watford  
David Porter  
Robert Nixon

1 BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

2 ALOHA UTILITIES, INC.

3 DOCKET NO. 010503-WU

4 TESTIMONY OF DR. AUDREY D. LEVINE, PHD

5 Q. Please provide a brief resume of your training and experience as it relates to this  
6 proceeding.

7 A. I am an environmental engineer with extensive experience in water quality and  
8 potable water systems. I hold a Ph.D. in Civil and Environmental Engineering from  
9 the University of California at Davis, an M.S. degree in public health from Tulane  
10 University, and an undergraduate degree from Bates College in Biological Sciences.  
11 I have been teaching and conducting applied research at the University level for over  
12 twenty years and have worked on a wide variety of water quality related issues  
13 throughout the U.S. My resume is attached to this document.

14 Q. Do you consider yourself an expert in water chemistry and water treatment  
15 engineering?

16 A. Yes.

17 Q. What do you think about setting a hydrogen sulfide MCL as mentioned by Dr. Kurien  
18 in his testimony?

19 A. The concept of developing a method to validate the effectiveness of hydrogen sulfide  
20 treatment is good, however, the currently available technology for monitoring  
21 hydrogen sulfide lacks accuracy and reproducibility. If hydrogen sulfide exists in  
22 water, it can volatilize to the atmosphere generating odors. It is difficult to measure  
23 the concentration accurately due to the potential for volatilization. To develop an  
24 enforceable standard, a reliable measurement method is needed.

25 Q. What do you think about the Hydrogen Sulfide Goal that is used by Tampa Bay

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Water?

A. The Tampa Bay Water goal for hydrogen sulfide has been accepted by all of Tampa Bay Water member governments. This goal provides a reasonable target level for hydrogen sulfide of 0.1 mg/L for water quality entering the retail distribution system. It should be noted that the detection limit for accurate measurement of hydrogen sulfide is 0.1 mg/L.

Q. Do you think the hydrogen sulfide monitoring approach that has been proposed by Aloha Utilities differs significantly from the Tampa Bay Water monitoring approach?

A. No, it is similar to the approach implemented by Tampa Bay Water. Aloha Utilities has proposed monitoring hydrogen sulfide at the outlet from their treatment plants. This approach can provide direct feedback that can be used for process control. Because Aloha Utilities derives its water from several sources including Pasco County, monitoring in the distribution system will not provide any direct information on the effectiveness of the treatment system.

Q. Are there any USEPA or FDEP standards that require water systems to meet a H<sub>2</sub>S concentration goal or MCL at a customer's meter?

A. I am not aware of any enforceable standards for hydrogen sulfide that must be met at a customer's meter.

Q. In your study of the Seven Springs system, did you detect sulfide re-formation within the transmission system as suggested by Dr Kurien in his testimony?

A. My studies detected no sulfide in the finished water or the transmission or distribution system. Even if I had detected sulfide in the distribution or transmission system, it would be impossible to tell if it was the result of re-formation, nor was that the intent of the study. Detection of sulfide re-formation would require a very sophisticated sampling and analysis procedure. The Aloha Water System delivers

1 several million gallons of water per day. If sulfide is detected in the distribution  
2 system, it is not possible to determine if it was in the water originally or if it resulted  
3 from "re-formation" without conducting concurrent tracer studies and possibly stable  
4 isotope analysis. In my study we were trying to evaluate the entire system and  
5 identify potential problems with hydrogen sulfide. The only location in which  
6 detectable hydrogen sulfide was observed was at the inflow to the ground storage  
7 tank which is not in the transmission or distribution system. This sample site was  
8 resampled several times in succession and did not have detectable hydrogen sulfide  
9 upon resampling. Currently, the water at the entry to the ground storage tank is  
10 chlorinated prior to entering the distribution system, thus would not be considered  
11 to be finished drinking water until it exits the ground storage tanks.

12 Q. Dr. Kurien, states that he believes that turbidity in Aloha's finished water causes a  
13 reduction in the effectiveness of the chlorine disinfection system resulting in  
14 hydrogen sulfide generation taking place in the distribution system? Would you care  
15 to comment?

16 A. Turbidity is not routinely monitored in groundwater systems because monitoring is  
17 not required under the Safe Drinking Water Act. During my study I conducted  
18 suspended solids tests to assess the quantity of suspended material in the Aloha  
19 Distribution system, and all of the samples from the distribution system were below  
20 detection limits for suspended solids. Aloha routinely monitors the bacteriological  
21 quality of the water in the Seven Springs System. To date there have been no  
22 violations of the bacteriological standard (total coliform) within the Seven Springs  
23 System, suggesting that the disinfection process as currently practiced is adequate.  
24 While the data on turbidity is limited, the wealth of data on microbiological quality  
25 suggests that the disinfection process is functioning effectively.

1 Q. What is your opinion of Dr. Kurien's testimony that there is "significant consumption  
2 of free chlorine residual within the transmission and distribution system" at Aloha?

3 A. Chlorine decays within distribution systems due to a variety of reactions and the  
4 decay rate is influenced by temperature and other factors. The testing of chlorine  
5 residuals that is routinely conducted in the Seven Springs system is intended to  
6 ensure that there is an adequate chlorine residual throughout the distribution system  
7 and to identify potential problem areas such as dead-ends that might require flushing.  
8 The use of chlorine monitoring data to evaluate chlorine demand within the  
9 distribution system is inappropriate.

10 Q. On pages 12 through 14 of his testimony, Dr. Kurien discusses his evaluation of the  
11 potential merits of two hydrogen sulfide treatment technologies – conversion  
12 utilizing oxidation (with hydrogen peroxide) and removal utilizing aeration or the  
13 MIEX process. Do you have any comments about this testimony?

14 A. Yes. First, I believe that Dr. Kurien's testimony here is not since this topic (choice  
15 of treatment technology to meet the specified goal) is not one of the matters at issue  
16 according to the Commission's Consummating Order. There are several approaches  
17 that are effective for treatment of hydrogen sulfide from groundwater. Selection of  
18 the most appropriate method requires significant testing and evaluation. It is  
19 inappropriate to judge the efficacy of a process without supporting information and  
20 data.

21 Q. In his testimony, Dr. Kurien suggested that limitations on the concentration of  
22 elemental sulfur should be imposed in addition to the 0.1 mg/L sulfide limits already  
23 approved by the Commission. What is your opinion of the elemental sulfur limits?

24 A. Monitoring of elemental sulfur is not practiced in the drinking water industry due to  
25 the lack of reliable test methods. Because of the measurement difficulties, it is also

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not currently feasible to determine what an “appropriate” limit would be. During my study of the Seven Springs System, I evaluated the characteristics of particles isolated from the system. In general the particle concentration was quite low and the elemental composition of the particles was highly variable.

Q. Do you have anything further to offer?

A. No.

## **AUDREY D. LEVINE, Ph.D., P.E.**

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University of South Florida;  
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Tampa, Florida 33620-5350  
813-974-5846 (VOICE) levine@eng.usf.edu (e-mail)

### **EDUCATION**

- Ph.D. Civil Engineering, September 1985  
University of California at Davis  
Major: Environmental Engineering  
Minors: Water Chemistry and Public Health  
Dissertation Topic: Particle Size Characterization of  
Organic Contaminants in Wastewater
- M.S. Public Health and Environmental Health Science, December 1980  
Tulane University School of Public Health  
New Orleans, Louisiana  
Thesis Topic: Environmental Impact Assessment of a Portion  
of the Louisiana Hurricane Protection Project
- B.A. Biological Sciences, June 1975  
Bates College, Lewiston, Maine

### **AWARDS AND FELLOWSHIPS**

2003 European Science Foundation Symposium Participant  
1998 U.S. Army Summer Faculty Research Program  
Summer Faculty Research Program: Air Force Office of Scientific Research, 1996  
American Society of Civil Engineers, New Jersey Section 1993 Educator of the Year  
E.N.E.A. Research Fellowship September 1989-August 1990  
Outstanding Women of America, 1987  
Chi Epsilon: Civil Engineering Honor Society  
University of California Graduate Opportunity Fellowship, 1981-1983  
Tulane University, Environmental Health Award for Most Outstanding  
Student Working at the Master's Level, 1981  
U.S. Public Health Service Traineeship, September 1979-December 1980  
Benjamin Bates Scholarship, September 1972-June 1975

### **REGISTRATION AND PROFESSIONAL ORGANIZATIONS**

Professional Engineer, State of New Jersey (#GE37307)  
Air and Waste Management Association  
American Chemical Society  
American Water Works Association: USF Student Chapter Advisor  
International Association of Water Quality  
National Groundwater Association  
Water Environment Federation: USF Student Chapter Advisor



AUDREY D. LEVINE

Page two

## PROFESSIONAL EXPERIENCE

**Associate Professor**, Civil and Environmental Engineering;  
University of South Florida; *September 1998-present*

**Summer Faculty Research Associate**

U.S. Army Corps of Engineers; Waterways Experiment Station;  
Vicksburg, MS; *Summer 1998*

U.S. Air Force Research Program; Tyndall Air Force Base; Florida; *Summer 1996*

**Associate Professor**, Civil and Environmental Engineering;  
Utah State University, Logan, Utah; *August 1994-September 1998*

**Associate Professor**, Civil and Environmental Engineering,  
New Jersey Institute of Technology, Newark, New Jersey;  
*January 1992-August 1994*

**Associate Professor**, Civil Engineering, Iowa State University, Ames, Iowa,  
*April - December 1991*; Assistant Professor *August 1985 - April 1991*

**Research Engineer**; E.N.E.A. , Bologna, Italy; *September 1989 - August 1990*

**Post Graduate Research Engineer**, University of California at Davis  
*June 1984 - August 1985*

**Research Assistant**, University of California at Davis  
*October 1981- August 1985*

**Environmental Scientist**, Burk and Associates, New Orleans, Louisiana  
*November 1980 to July 1981*

**Research Associate**; Department of Environmental Health Science,  
Tulane University, New Orleans; *September 1979 to December 1980*

**Research Associate**; Boston University Medical Center, Boston, Massachusetts  
*February 1976 to August 1979*

AUDREY D. LEVINE

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- A.D. Levine, P. Cheng, B.A. Bolto “Reactions of polyelectrolytes with other water treatment chemicals” submitted to *Journal American Water Works Association*, 2005.
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- A.D. Levine, S. Shehane, and J.B. Rose (2004) Speciation of coliform bacteria in water distribution systems: Implications for water quality reliability” submitted to *ASCE Journal of Environmental Engineering*, 2005
- A.D. Levine, M. T. Meyer, and G. Kish “Evaluation of the Persistence of Pharmaceuticals, Hormones, Household and Industrial Chemicals through Pure-Oxygen Activated Sludge Nitrification-Denitrification”, submitted to *Water Environment Federation Research Journal*, 2004.
- V.J. Harwood, A.D. Levine, T.M. Scott, V. Chivukula, J. Lukasik and J.B. Rose “Validity of the Indicator Organism Paradigm: Pathogen Reduction and Public Health Protection in Reclaimed Water” in press *Applied and Environmental Microbiology*, 2005.
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- A. D. Levine, B.J. Raymer, and J. Jahn “Hydrogen Sulfide and Turbidity Control using Catalyzed Oxidation coupled with Filtration for Groundwater Treatment” *Journal of Water Supply: Research and Technology—AQUA*, vol.53, no.5, 325-337, 2004
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- T. Asano and A.D. Levine "Water Reclamation, Recycling and Reuse: Past, Present, and Future" *Water Science and Technology*, vol.33, no.10-11, pp. 1-14, 1996.
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- U.E. Ndon, A.D. Levine, and B.S. Bradley "Evaluation of Biodegradability of Starch-based Plastics" *Water Science and Technology*, vol. 25, No. 9-11, pp. 2089-2092, 1992.
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- A.D. Levine, G. Tchobanoglous, and T. Asano "Size Distributions of Particulate Contaminants in Wastewater and their Impact on Treatability , *Water Research*, 25(8), 911-922, 1991.
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A.D. Levine, and L.R. Kroemer. "A Critical Look at the Use of TOC and TOX as Indicator Parameters for Organic Contaminants in Landfill Leachates" *Waste Management and Research*, 7, 337-349, 1989.

G.A. Norton, and A.D. Levine "Co-combustion of Refuse Derived Fuel and Coal: A Review of Selected Emissions", *Environmental Science and Technology*, 23(7), 774-783, July 1989.

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A.D. Levine, G. Tchobanoglous, and T. Asano "Characterization of the Size Distribution of Contaminants in Wastewater: Treatment and Reuse Implications" *Journal Water Pollution Control Federation*, 57(7), 805-816, July 1985.

A.D. Levine, "Water Characteristics" Annual Literature Review, *Journal Water Pollution Control Federation*, 60(6), 796-799, 1988; 61(6), 779-782, 1989, *Research Journal Water Pollution Control Federation* 62(4), 384-386, 1990, 63(4), 361-363, 1991, and 64(4), 333-335, 1992.

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Page six

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- A. D. Levine, V.J. Harwood, T.M. Scott, and J.B. Rose "Effectiveness of Secondary Effluent Filtration for Removal of Bacteria, Enteroviruses, and Protozoan Pathogens in Wastewater Reclamation Facilities" Session 12, WEFTEC 2004.
- D.P. Smith, A.D. Levine, A.Mody, B. MacLeod, M. Simpson, "Factors Influencing Selection of Nanofiltration Membranes For Removal of Organics from Surface Water" *2003 Water Quality Technology Conference*, Session W-4-High Pressure Membrane Systems, Philadelphia, PA.
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- A. D. Levine, V. J. Harwood, T. M. Scott, and J. B. Rose; "Evaluation of variables that influence the effectiveness of wastewater filtration for removal of pathogens" *2003 Florida Water Resources Conference*, May 2003.
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- A.D. Levine, J. B. Rose, M. R. McLaughlin, V. Chivukula, T. M. Scott, and V. J. Harwood "The Water Environment Research Foundation Study: A Status Report" *2002 Florida Water Resources Conference*, April 2002.
- A.D. Levine, M.R. McLaughlin, J.B. Rose, V. Chivukula, and V.J. Harwood "Factors Influencing Pathogen Removal in Wastewater Reclamation and Reuse Facilities" *Disinfection 2002*; Water Environment Federation, Specialty Conference Series, February 2002.
- A.D. Levine, J. Viciere, T. Xu, M. Sallam, and W.F. Echelberger "Coagulant Chemical Interactions During Drinking Water Treatment", *Proceedings of the 75<sup>th</sup> Annual Florida Water Resources Conference*, pp. 393-400, 2000.
- A.D. Levine, " Characterization of Residual Organics in Reclaimed Water", *Proceedings of the 75<sup>th</sup> Annual Florida Water Resources Conference* pp. 551-560, 2000.
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- D.P. Smith, A.D. Levine, and M. P. Campbell "Biological Treatment of Hazardous Waste Landfill Leachate in Fixed Film Reactors" *Proceedings of the 26th Mid-Atlantic Industrial Waste Conference*, pp. 141-150, August 1994.
- A.D. Levine and M. Rachkornkij, "Effects of Chemicals on Microorganisms" 1993 Annual Literature Review *Research Journal Water Environment Federation*, June
- Seagren, E., A.D. Levine, and R.R. Dague "High pH Effects in Anaerobic Treatment of Liquid Industrial Byproducts, *Proceedings of the 45th Purdue Industrial Waste Conference*, pp.377-386, Lewis Publishers, 1991.
- G.A. Norton, and A. D. Levine "Effect of Co-combusting Refuse-Derived Fuel and Coal on Emissions of SO<sub>x</sub>, NO<sub>x</sub>, and Ash from Coal-fired Boilers" *Proceedings of the Thirteenth Energy from Biomass and Waste Conference*, pp. 513-527, edited by D.L. Klass, Institute of Gas Technology, Chicago, 1990.
- A.D. Levine, M.E. Bain, and K. D. Bienlien "Characterization and Extraction of Metals from Waste Residues" *Proceedings of the 44th Purdue Industrial Waste Conference*, pp. 591-602, Lewis Publishers, 1990.

AUDREY D. LEVINE

Page eight

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- A. J. Cardoso; L. R. Rhea, B. Nayak, A.D. Levine, and V. J. Harwood, "Relationship of Waste Characteristics to the Formation of Mineral Deposits in Landfill Leachate Drainage Systems" *2004 Annual Conference of Florida Air & Waste Management Association*, October, 2004.

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