JOINT EXPERT REPORT

(Preliminary)

PREPARED BY

PROFESSOR JOHN FAWELL &
PROFESSOR JOSEPH HUN-WEI LEE

Expert Witnesses appointed by the Commission of Inquiry into Excess Lead Found in Drinking Water

12 November 2015

The Terms of Reference of the Commission are as follows:

(a) to ascertain the causes of excess lead found in drinking water in public rental housing developments;

(b) to review and evaluate the adequacy of the present regulatory and monitoring system in respect of drinking water in Hong Kong;

(c) make recommendations with regard to the safety of drinking water in Hong Kong

Professor John Fawell

Biologist/Toxicologist

(Consultant on drinking water and environment)

Specialist Field	:	Assessment and management of risks from drinking water contaminants
Appointed on behalf of	:	The Commission of Inquiry into Excess Lead Found in Drinking Water (the "**Commission**")
Prepared for	:	The Commission
On instructions of	:	Messrs. Lo & Lo, Solicitors for the Commission ("**Lo & Lo**")
Subject matter / Scope of engagement:	:	To assist the Commission in discharging its duties under the Terms of Reference and by acting as an expert witness in the inquiry hearings
Curriculum Vitae		**Appendix I**

Instructions to Professor Fawell

I have been instructed to give my opinion on the matters under the Terms of Reference.

In providing my opinion, I have also been instructed to consider the following areas and undertake the following tasks:

(a) review and verify the findings of the Interim and Final Reports of the Task Force led by the Water Supplies Department (WSD) in respect of the Waterworks system and the Inside Service system in public rental housing developments, including the overall methodology adopted in the investigation;

(b) identify and explain the international standards (particularly those laid down by the World Health Organisation (WHO)) in respect of the following matters for the purpose of ensuring safety and quality of drinking water in Hong Kong :

(i) hazards and hazardous events;

(ii) risk assessment, prioritization and management;

(iii) control measures;

(iv) construction and maintenance;

(v) inspection and monitoring;

(vi) management procedures;

(vii) rectification;

(viii) the supply and use of plumbing materials; and

(ix) the procedures and protocols regarding the use and installation of plumbing materials;

(c) in the context of the international standards in (a) –

(i) review and evaluate the adequacy of the existing Water Safety Plans of the WSD;

(ii) review and evaluate the existing regulatory and monitoring regimes (both prior and subsequent to the excess lead in drinking water incidents as a result of which new measures have been put in place by public authorities) on quality of drinking water :

(1) at the pre-construct stage;

(2) at the construction stage;

(3) at the completion of construction (before the WSD issues the certificate for water supply connection); and

(4) at the maintenance stage;

(iii) opine on whether any further metal(s), chemical(s) and/or microorganism(s) should be included as parameter(s) in addition to those set out in the WSD Circular Letter No. 1/2015 for testing of water samples, and if so, the thresholds, benchmarks and/or the acceptance criteria to be set for them; and

(iv) the effectiveness of the recommendations made by the Review Committee;

(d) opine on how the inadequacies (if any) identified for the matters above may be rectified or improved and to make recommendations with regard to the safety of drinking water in Hong Kong; and

(e) state, provide advice and recommendations on other areas of concern (if any).

Professor Joseph Lee

Chair Professor, Department of Civil and Environmental Engineering
Vice-President for Research & Graduate Studies
Hong Kong University of Science and Technology

Specialist Field	:	Environmental engineering: environmental hydraulics & water resources Environmental hydraulics/fluid mechanics; water quality modelling
Appointed on behalf of	:	The Commission
Prepared for	:	The Commission
On instructions of	:	Lo & Lo
Subject matter / Scope of engagement:	:	To assist the Commission in discharging its duties under the Terms of Reference and by acting as an expert witness in the inquiry hearings
Curriculum Vitae		**Appendix I**

Instructions to Professor Lee

I have been instructed to give my opinion on the matters under paragraph (a) of the Terms of Reference. In providing my opinion, I have also been instructed to consider the following areas and undertake the following tasks:

(a) to ascertain the factual source(s) of excess lead found in drinking water in public rental housing and to advise on what work and tests are to be performed;

(b) to evaluate the methodologies and to review and verify the findings of the WSD Task Force's Interim and Final Reports in respect of the Waterworks system and the Inside Service system in public rental housing developments, from the perspective of a civil engineer; and

(c) to conduct, if necessary, independent investigation on behalf of the Commission into the above systems in order to ascertain the factual source(s) of excess lead found in drinking water.

Preliminary Joint Opinion

The sampling protocol to identify whether lead is present in the pipework or fittings of drinking water systems in buildings is important in assessing the risks of lead contamination in drinking water. The contact time with lead-containing components such as soldered joints or fittings is a key factor in determining lead concentrations in drinking water. Indeed, a number of authorities suggest fixed stagnation periods before withdrawing samples while others propose first draw samples.

The International Standards Organization Standard (ISO-5667-5) on sampling techniques of drinking water from treatment works and pipe distribution systems states that "If the effects of materials on water quality are being investigated, then the initial draw off should be sampled. Samples may also be taken after a specified period of stagnation to provide information on the rate at which materials affect quality or the maximum likely effect." For example, in the UK (England and Wales) standards for drinking water quality, the sampling requirement is to take the first litre of water drawn from the tap without flushing. The USEPA also requires that one-litre first draw samples are taken to indicate the level of exposure to lead and copper. In Japan the requirement is to first flush for five minutes and then take a sample for analysis after 15 minutes stagnation.

Fully flushed samples on their own may serve the purpose of assessing the general quality of a drinking water as supplied, but will not give a representative assessment of the concentration of lead or other metals from the internal distribution system to which the consumer is exposed.

Based on the above, data from fully flushed samples are not likely to be representative of the extent of lead exposure.

Expert's Declaration

I, PROFESSOR JOHN FAWELL DECLARE THAT:

1. I declare and confirm that I have read the Code of Conduct for Expert Witnesses as set out in Appendix D to the Rules of High Court, Cap. 4A and agree to be bound by it. I understand that my duty in providing this written report and giving evidence is to assist the Commission. I confirm that I have complied and will continue to comply with my duty.

2. I know of no conflict of interests of any kind, other than any which I have disclosed in my report.

3. I do not consider that any interest which I have disclosed affects my suitability as an expert witness on any issues on which I have given evidence.

4. I will advise the Commission if, between the date of my report and the hearing of the Commission, there is any change in circumstances which affect my opinion above.

5. I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.

6. I have endeavoured to include in my report those matters, of which I have knowledge or of which I have been made aware, that might adversely affect the validity of my opinion. I have clearly stated any qualifications to my opinion.

7. I have not, without forming an independent view, included or excluded anything which has been suggested to me by others, including my instructing solicitors.

8. I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.

9. I understand that:

(a) my report will form the evidence to be given under oath or affirmation;

(b) questions may be put to me in writing for the purposes of clarifying my report and that my answers shall be treated as part of my report and covered by my statement of truth;

(c) the Commission may at any stage direct a discussion to take place between the experts for the purpose of identifying and discussing the issues to be investigated under the Terms of Reference, where possible reaching an agreed opinion on those issues and identifying what action, if any, may be taken to resolve any of the outstanding issues between the parties;

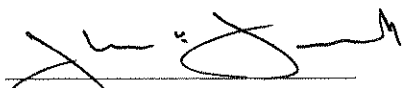
(d) the Commission may direct that following a discussion between the experts that a statement should be prepared showing those issues which are agreed, and those issues which are not agreed, together with a summary of the reasons for disagreeing;

(e) I may be required to attend the hearing of the Commission to be cross-examined on my report by Counsel of other party/parties;

(f) I am likely to be the subject of public adverse criticism by the Chairman and Commissioners of the Commission if the Commission concludes that I have not taken reasonable care in trying to meet the standards set out above.

Statement of Truth

I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. I believe that the opinions expressed in this report are honestly held.



Professor John Fawell

12 November 2015

Expert's Declaration

I, PROFESSOR JOSEPH LEE DECLARE THAT:

1. I declare and confirm that I have read the Code of Conduct for Expert Witnesses as set out in Appendix D to the Rules of High Court, Cap. 4A and agree to be bound by it. I understand that my duty in providing this written report and giving evidence is to assist the Commission. I confirm that I have complied and will continue to comply with my duty.

2. I know of no conflict of interests of any kind, other than any which I have disclosed in my report.

3. I do not consider that any interest which I have disclosed affects my suitability as an expert witness on any issues on which I have given evidence.

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Professor Joseph Lee
12 November 2015

APPENDIX I

CURRICULUM VITAE OF PROFESSOR JOHN FAWELL

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CURRICULUM VITAE OF PROFESSOR JOSEPH LEE

CURRICULUM VITAE

NAME:	**Professor JOHN FAWELL**
PROFESSION:	**Consultant on drinking water and environment.**
PROFESSIONAL BACKGROUND:	Biologist/Toxicologist
PRIMARY SPECIALISATION:	Assessment and management of risks from drinking water contaminants and from re-use of wastewater
YEAR OF BIRTH;	1945
NATIONALITY:	British
HONOURS:	MBE He received the International Society of Regulatory Toxicology and Pharmacology 2013 International Achievement Award
QUALIFICATIONS:	BSc Applied Biology University of Bath 1969 MI Biol C Biol 1972 (now C Biol MSB) M CIWEM 1983 (resigned 2010) Diploma in Toxicology, Royal College of Pathologists 1986
PROFESSIONAL AFFILIATIONS:	Society of Biology British Toxicology Society American Water Works Association Scientific Fellow, of the Zoological Society of London International Water Association Appointed visiting professor at Cranfield University May 2011.
WORKING LANGUAGE:	English

EXPERIENCE

Prof Fawell has worked on the implications of contaminants in the environment for human health and aquatic life since 1979 and is actively involved at both a national and international level.

Key areas included:

- Closely involved in the WHO Guidelines for Drinking Water Quality as a member of the co-ordinating team since 1988. For the 1993 revision he was co-ordinator for

inorganics and substances which affect acceptability to consumers, rapporteur for organics, pesticides and disinfection by-products and organiser of working group meetings on radioactivity and treatment and analysis. Prepared background documents on the toxicology and health risks of a wide range of substances, with proposed guideline values, for 1993 revision and the 1998 addendum. He was coordinator for naturally occurring substances and substances from agriculture, industry and human settlements for the preparation of the third edition of the Guidelines in 2003 for which he also prepared several revised background documents. Actively involved in the rolling revision of the Guidelines he was Chairman of the 1998 Medmenham meeting on Aspects of Protection and Control and of Microbiological Quality. Subsequently he has continued as Co-ordinator for naturally occurring substances and substances from agriculture, industry and human settlements but has added pesticides for use in controlling Denghe fever vectors in drinking water containers. He has continued in that role for the fourth edition of the Guidelines published in July 2011. He was part of the WHO expert group establishing guidelines for the supply of safe drinking water by desalination and a member of the expert group considering the significance of beneficial minerals in drinking water. He was one of the three co-ordinators and one of the authors of the WHO publication "Chemical safety of drinking-water: assessing priorities for risk management". He is coordinator for most of the chemical parameters for the preparation of the fourth edition of the Guidelines and has been closely involved with the preparation of most of the other sections. He is a member of the WHO expert group on pharmaceuticals in drinking water.

- Works closely with WHO regional offices, including liaison between the European Commission and the European Regional Office on water and between WHO HQ and the Commission on re-use of wastewater.
- Member of several IPCS expert groups and author of working documents on chemical contamination for the WHO working group on bathing water quality. He has served on JECFA for substances in which drinking water is a key source of exposure and is a member of the panel of experts.
- Has led programmes of research on the toxicology and health implications of by-products of disinfection for government and water suppliers since 1982. Has acted as external supervisor for two PhD students on the epidemiology of disinfection by-products and adverse reproductive outcomes. He has also carried out research on the risks to health and risk assessments of blue-green algal toxins, polycyclic aromatic hydrocarbons and a wide range of other environmental contaminants.
- Previously chief scientist in the team which provides advice to UK water undertakers and regulators on the risk assessment of contaminants in the environment, particularly for human health, through drinking water, including a 24 hour service for incidents involving drinking water and the aquatic environment. He is currently contracted to provide toxicological and risk assessment advice to the Drinking Water Inspectorate.
- Provided independent advice and reviews on chemicals, which are used in drinking water or which may reach the environment, for chemical companies and groups of chemical companies and provided advice on water contaminants and disinfection processes to the food industry. He has been involved in preparing an ILSI Europe document on the use of water and its treatments in the food industry and this includes food processing. Provides advice on monitoring and assuring water quality for water used in beverage and food manufacturing.
- Prof Fawell provides advice on water contaminants and their management for a number of public drinking water suppliers, including acting as an independent reviewer of water quality of both raw and treated water.

- Has provided advice on the significance and nature of contaminants to large producers of bottled and natural mineral waters. These include both naturally occurring inorganic contaminants/constituents and anthropogenic contaminants from a number of sources, including microbiological contaminants. He has also been involved in the assessment of remineralisation needs for demineralised water processes for desalinated waters.
- Has been a member of committees advising government and regulatory bodies such as the Sub-Committee on Pesticides, The Environment Agency National Advisory Group for Determining Substances for the EC Groundwater Directive and subsequently technical advisor to the Joint Agency Groundwater Directive Advisory Group, The Toxic Algae Task Group and the Steering Group for the Revision of the UK National Environmental Health Action Plan. He was invited to give evidence to the Royal Commission on Environmental Pollution at the beginning of their study on environmental regulations. He has worked closely with the International Life Sciences Institute (ILSI) in the USA and Europe and was previously chairman of the ILSI Europe Task Force on Environment and Health.

- Provides independent advice on regulatory and environmental issues to the drinking water inspectorate in the UK and a variety of industries and government departments, including governments outside the UK. He has provided an independent opinion on the work of the Irish drinking water regulator and the value for money that it provides.

- Closely involved in the development and implementation of water safety plans and their incorporation into regulation both in the UK and in a number of regions of the world, including involvement in advising the Romanian government on establishing drinking water regulations to meet the provisions of the drinking water directive. He has also been closely involved in a WHO initiative to develop advice for member states on developing regulations based on the Guidelines.

- One of the lead members of a team commissioned to prepare proposals for revising the chemicals section of the European Drinking Water Directive taking into account the introduction of water safety plans.

Prof Fawell has been recently involved in research on a number of priority contaminants in the environment and drinking water including endocrine disrupters, disinfection by-products and pharmaceuticals. In this respect he has close ties with The Department of Epidemiology at Imperial College and the Small Area Health Statistics Unit in particular. He has a particular interest in and is actively working in the field of risk assessment of chemicals and microorganisms in the environment. This includes the development of strategies to manage risks and perceived risks in the managed water cycle by early intervention through developments in wastewater and drinking water treatment. He was part of the team, with WCA Environment and Cranfield University, which carried out an assessment of the significance of pharmaceutical residues for drinking water for DWI and is part of a WHO/USEPA joint initiative on pharmaceutical residues.

He worked with CREH Analytical to develop a framework for managing microbial and chemical risks in drinking water (Water safety Plans) and with CREH Analytical and Owen Hydes to develop a framework for developing criteria for the safe reuse of wastewater. He also acts as consultant on projects for reuse of wastewater and the safe implementation of desalination as a drinking water source. In some cases these two are combined. He has also worked with the Spanish consultancy Eptisa in Romania to assist the Ministry of Health in meeting the requirements of the EU drinking water and bathing water directives, including introducing water safety plans in Romania. He and Owen Hydes have assisted water companies in developing and implementing their strategy for

the introduction of drinking water safety plans and he was a consultant to IWA for their outreach programme to water suppliers on drinking water safety plans, including activities in Brazil, India and the Far East.

Prof Fawell has an international reputation and is involved in a number of international forums in addition to WHO, and has close contacts with regulators, industry and researchers in many parts of the world including North America and Japan. In 1998 he carried out a WHO mission to Kuwait to advise on environmental and environmental health issues. He was chairman of the Expert Committee on Health Aspects of Water Supply for KIWA in the Netherlands. He has acted as a consultant on drinking water standards and drinking water related materials to the Canadian Government and has close links with the USEPA Office of Water. He has assisted the USEPA and Health Canada on research requirements for the assessment of disinfection by-products in drinking water.

Prof Fawell is interested in the public perception of risk and the communication of risks to the public. He has acted as a PhD examiner on this subject and has made numerous radio and television appearances to discuss risks of a wide range of environmental contaminants and issues surrounding environmental contamination.

Prof Fawell is an author of over 90 publications in the open literature and is author of many project and other reports found in the grey literature.

Following a period of 20 years with WRc, he joined Warren Associates (Pipelines) Ltd as a Director of the Environmental Division in January 2000 and transferred to an equivalent position in the Infrastructure and Environment Management Division of FaberMaunsell when Warren Associates (Pipelines) Ltd was acquired by AECOM. He now works independently.

He was non-executive chairman of the board of WCA Environment, stepping down to non-executive board member in 2011 and retiring from the board in January 2013. He was appointed visiting professor in the Water Science Institute at Cranfield University in the UK in May 2011.

EMPLOYMENT EXPERIENCE

December 2002-	**Independent consultant**
April 2001 – December 2002	**Technical Director, Environmental Management Division, Metcalf and Eddy Ltd. Group Leader for Drinking Water and Environmental Toxicology.**
Jan 2000 – April 2001	**Director, Environmental Division, Warren Associates**
May - Dec 1999	**WRc-NSF Ltd - Chief Scientist**
1979 - April 1999	**WRc plc**
1988 - 1999	**Principal Toxicologist and Chief Scientist of the National Centre for Environmental Toxicology (1995)** Principal Scientist for toxicology, advising on the implications and significance of contaminants in drinking water and the aquatic environment. Responsible for the scientific quality of the work of the National Centre for Environmental Toxicology.
1981 - 1988	**Head, Toxicology Section** Leading a team investigating the significance of organic and inorganic pollutants in drinking water. Investigation of mutagens in drinking water and mutagens formed in drinking water treatment and their significance.
1979 - 1981	**Toxicologist, Water Quality and Health Group** Primarily assessing the implications for health of organic pollutants in drinking water.
1977 - 1979	**RHM Research Ltd Scientist i/c Pathology, Nutrition and Toxicology Department** Experimental pathology of novel foods. The effects of nutritional imbalance on kidney pathology .
1972 - 1977	**Inveresk Research International, Section Manager, Quantitative Histology and Histochemistry, Pathology Division** Experimental pathology of tobacco smoke on respiratory structure and function and of drugs on GI tract, heart and liver. Short term bioassays for predicting carcinogenic potential.
1970 - 1972	**Huntingdon Research Centre, Research Officer, Pathology Department** Experimental Pathology. Quantification of Experimental Emphysema and Bronchitis in rodents and primates.
1969 - 1970	**Lake Mweru Research Unit, Zambia** **Scientific Officer** - Limnology and fish stock assessment.

Selected Publicly Available Contract Reports

C. Jorgensen, H. Buchardt Boyd, DHI. J. Fawell, O.D. Hydes. Independent Consultants. September 2008. Final report on establishment of a list of chemical parameters for the revision of the Drinking Water Directive. European Commission. ENV.D.2/ETU/2007/0077r

Dawn Maycock, John Fawell, Graham Merrington and Chris Watts March 2008. Review of England and Wales Monitoring Data for Which a National or International Standard Has Been Set (Defra Project Code: CEER 0703 DWI 70/2/215 WT1207)

John Fawell et al. April 2008 Considering water quality for use in the food industry. ILSI Europe Report Series.

Chris Watts, Dawn Maycock, Mark Crane and John Fawell; Watts and Crane Associates Emma Goslan; Cranfield University. November 2007. Desk based review of current knowledge on pharmaceuticals in drinking water and estimation of potential levels (Defra Project Code: CSA 7184/WT02046/DWI70/2/213)DWI Pharmaceuticals.

David Kay and John Fawell. December 2007. Standards for recreational water quality. An FWR Guide. FR/G0005. Foundation for Water Research.

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Chris Watts and John Fawell; Watts and Crane Associates, David Sartory; SWM Consulting, John Leaman and Adam Tuffin; Ipsos MORI. July 2006. Evaluation of the Drinking Water Quality and Health (DWQH) Research Programme (1996-2004) for Defra. (Defra Project Code: DWI 70/2/188)

John Fawell, John Watkins, Owen Hydes, Lorna Fewtrell and Peter Wynn-Jones. 2005. Framework for Developing Water Reuse Criteria with Reference to Drinking Water Supplies UKWIR/AwwaRF/WateReuse Foundation (05/WR/29/1)

J Fawell, J Littlejohn, J Watkins 2005 Development of Drinking Water Safety Plans in Scotland. Scottish Executive Project No: ENV3/04/03

John Fawell and John Watkins 2003. Managing Microbial and Chemical Risks from Source to Tap: Report and Toolbox UKWIR (03/DW/02/31)

J Fawell, L Fewtrell, J Watkins, O Hydes January 2002. Future regulatory Parameters: Implications for the UK Final Report for Phase 1. DWI 70/2/145

John K Fawell 2002 Asbestos cement drinking water pipes and Possible health risks. A review for DWI. Report for Contract 70/2/135

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2. Fawell JK. (2014) Drinking water quality and health. Chapter 3 in: Pollution: Causes, Effects and Control. Fifth Edition. Ed RM Harrison. The Royal Society of Chemistry.

3. Fawell J. (2012) Chemicals in the water environment. Where do the real threats lie? *Ann Ist Super Sanita* 48(4):347-353.

4. Fawell J. and Ong CN. (2012) Emerging contaminants and the implications for drinking water. *International Journal of Water Resources Development*. 28(2): 247-263.

5. Bull, R.J., Cotruvo J.A., Fawell, J. and Hrudey, S.E. (2012) Re: Chowdhury et al. 2011. J. Hazard. Mater. Disinfection byproducts in Canadian provinces: Associated cancer risks and associated medical expenses. 187: 574-584. J. Hazard. Mater.237-238:384-385.

6. Hrudey, S.E., B. Conant, I.P. Douglas, J. Fawell, T. Gillespie, D. Hill, W. Leiss, J.B. Rose & M. Sinclair. (2011). Managing uncertainty in the provision of safe drinking water. *Water Sci. Technol.: Water Supply*. 11(6): 675-681.

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16. Thompson T. Fawell J. Kunikane S. Jackson D. Appleyard S. Callan P. Bartram J. Kingston P. (2007) Chemical safety of drinking-water: Assessing priorities for risk management. World Health Organization, Geneva.

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20. Fawell J. and Walker M. (2006) Approaches to determining regulatory values for carcinogens with particular reference to bromate. Toxicology Vol. 221, Iss 2-3, pp 149-153.

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22. Toledano M.B., Nieuwenhuijsen M.J., Best N., Whitaker H., Hambly P., de Hoogh C., Fawell J., Jarup L. and Elliott P. (2005) Relation of trihalomethane concentrations in public water supplies to still birth and birth weight in three water regions in England. Environmental Health Perspectives. 113, (2), http://www.ehponline.org/members/2004/7111/7111.html

23. Whitaker H., Best N., Nieuwenhuijsen M.J., Wakefield J., Fawell J. and Elliott P. (2004) Modelling exposure to disinfection by-products in drinking water for an epidemiological study of adverse birth outcomes. J Expo Anal Environ Epidemiol. May.

24. Fawell J. and Nieuwenhuijsen M.J. Contaminants in drinking water. In: Impact of environmental pollution on health. Balancing risks, Elliott P and Briggs D (eds). British Medical Bulletin 2003, volume 67.

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37. FAWELL, J.K. and YOUNG, W.F. (2000) Hormonally active chemicals in water. Proceedings of the Conference on Research Needs on Water, Environment and Health in Europe. http://www.who.it/docs/Water/Procresonwat/procresonwat.htm

38. FAWELL, J.K. and GOWERS, A.M. (2000) Chlorinated solvents in groundwater. Proceedings of the Conference on Research Needs on Water, Environment and Health in Europe. http://www.who.it/docs/Water/Procresonwat/procresonwat.htm

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42. FAWELL, J.K., MITCHELL, R.E., HILL, R.E. and EVERETT, D.J. (1999) The toxicity of cyanobacterial toxins in the mouse: II Anatoxin a. *Human and Experimental Toxicology* 18, 168-173.

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48. FAWELL, J.K. (1996) Allotropes versus polymorphisms. Comment on the paper 'A unique metabolism of inorganic arsenic in native Andean women' by Vahter *et al*. *Human and Experimental Toxicology* 15, 698-699.

49. FAWELL, J.K. (1995) Physiological factors and environmental carcinogenesis. Comment on the paper 'Multiple risk factors associated with arsenic-induced skin cancer: effects of chronic liver disease and malnutritional status' by Hsueh *et al*. *Human and Experimental Toxicology* 14, 464-465

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52. FAWELL, J.K. (1995) Hazards and benefits of drinking water chlorination. *Proceedings of the Toxicology Forum conference on Chlorinated Organic Chemicals. Their Effect on Human Health and the Environment.* Berlin 1994. The Toxicology Forum, 1995.

53. FAWELL, J.K. (1995) Chemical associated waterborne diseases. *Microbiology Europe* 3, 8-12.

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58. FAWELL, J.K. and WILKINSON, M.J. (1994) Oestrogenic substances in water: a review. *J. Water SRT - Aqua*

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65. FAWELL, J.K. (1992) Carcinogenic Micropollutants in Drinking Water - Risks and Regulation Proceedings of the IAWPRC Conference on Hazard Assessment and Control of Environmental Contaminants in Water, Otsu, Japan. November 1991.*Water Science and Technology* 25 (11). 473-478

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91. FAWELL, J.K. (1976) A histochemical investigation of isoprenaline-induced cardiotoxicity in mice. *Proceedings of the European Society of Toxicology* 17, 241-249.

92. FAWELL, J.K. (1975) The use of image analysis in applied biology and medical research. In: *Quantitative Analysis of Microstructures in Medicine, Biology and Materials Development*. Ed H.E. Exner Dr Reiderer-Verlag GmbH Stuttgart.

93. FAWELL, J.K. (1974) Applications of quantitative morphology in toxicology. *Proceedings of ESSDT* 16, 285-289.

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95. FAWELL,J.K. and NEWMAN, A.J. (1972) Automated method of quantitating experimental pulmonary emphysema. *American Review of Respiratory Disease*, 105 849-851.

96. FAWELL, J.K., THOMSON, C. and COOKE, L. (1972) Respiratory artefact produced by carbon dioxide and pentobarbitone sodium euthenasia in rats. *Laboratory Animals* 6, 321-326.

97. FAWELL, J.K. and LEWIS, D.J. (1971) A simple apparatus for the inflation fixation of lungs at constant pressure. *Laboratory Animals* 5. 267-270.

98. BROWN, V.M., SHURBEN, D.G. and FAWELL, J.K. (1967) The acute toxicity of phenol to Rainbow Trout in saline waters. Water Research 1. 683-685.

JOSEPH HUN-WEI LEE

CURRICULUM VITAE

BORN: 20th October, 1952.

EDUCATION:	Massachusetts Institute of Technology Cambridge, Mass., USA	Ph.D.	Civil Engg.	June 1977
		M.Sc.	Civil Engg.	Sept. 1974
		B.Sc.	Civil Engg.	Feb. 1973

1969-73 MIT Scholarship
1971-72 Winslow Scholar
Chi Epsilon National Civil Engineering Honorary Fraternity
Tau Beta Pi National Engineering Honorary Fraternity

RESEARCH INTERESTS: Environmental hydraulics/fluid mechanics; water quality modelling

EXPERIENCE:

Nov.2010 -	Vice-President for Research & Graduate Studies, Hong Kong University of Science and Technology.
2004-Oct.2010	Pro-Vice-Chancellor, The University of Hong Kong.
2000-2003	Dean of Engineering, The University of Hong Kong (Associate Dean 1999-2000).
Dec 1996-	Redmond Chair of Civil Engineering, Department of Civil Engineering, The University of Hong Kong.
1987-96	Senior Lecturer then Reader (1991), and Chair Professor (1995).
1980-87	Lecturer, Department of Civil Engineering, University of Hong Kong.
1977-80	Assistant Professor, Department of Civil Engineering, University of Delaware, USA.
Courses taught:	Postgraduate: environmental hydraulics; coastal hydraulics and water quality; water quality modelling; urban hydrology and hydraulics. Undergraduate: fluid mechanics; engineering hydraulics, environmental engineering; water quality control; water supply engineering; wastewater engineering.

Honors/Awards/External Appointments (Selected):

2015 Honorary Member, International Association for Hydro-environmental Engineering and Research (IAHR).

2013 Karl Emil Hilgard Hydraulic Prize, American Society of Civil Engineers

2010 China State Scientific and Technological Progress Award (Second class) for the project "Buoyant jets in complex environments: theory, innovative technology and applications" (Principal Investigator)

Guest Professor, Sichuan University, China (2013)

President, Hong Kong Academy of Engineering Sciences (2010-2013)

Honorary Professor, Nankai University, China (2010)

IAHR-APD Distinguished Member Award, IAHR (2010)

Hunter Rouse Hydraulic Engineering Award, American Society of Civil Engineers (2009)

Fellow, Royal Academy of Engineering, UK (2008)

Best paper award, 14th Biennial Congress of the Asia and Pacific Division (APD) of the International Association of Hydraulic Engineering and Research (IAHR), December 15-18, 2004, Hong Kong.

K.C.Wong Educational Foundation Lectureship, Hohai University (Oct. 2004)

Croucher Laboratory of Environmental Hydraulics Award, Croucher Foundation (April 2004)

Outstanding Researcher Award, University of Hong Kong (2004)

Fellow, Hong Kong Academy of Engineering Sciences (2002)

Innovation Award for Construction Industry, The Hong Kong Institution of Engineers (2002)

Universitas 21 Fellowship, McGill University (1999)

The Croucher Award (Senior Research Fellowship of the Croucher Foundation) (1999)

Visiting Erskine Fellowship, University of Canterbury, New Zealand (July-Aug 1998).

Alexander von Humboldt Research Fellow, University of Karlsruhe, Germany (Feb. 1992-Jan. 93)

K.C.Wong Educational Foundation Lectureship, Tongji and Hohai University (1988)

Commonwealth Academic Staff Fellowship Award, Imperial College of Science and Technology, U.K. (Oct. 1985 - Jul. 86).

Editor in Chief, *Journal of Hydro-environment Research*, Elsevier (2007-).

Associate Editor, *Journal of Hydraulic Engineering*, American Society of Civil Engineers (1997-).

Member, International Editorial Board, *Estuarine Coastal and Shelf Science*, Elsevier (2006-).

Member, International Editorial Board, *Environmental Fluid Mechanics*, Springer (2011-2014).

Member, International Editorial Board, *Ecological Informatics*, Elsevier (2006-).

Member, International Editorial Board, *KSCE Journal of Civil Engineering*, Korea Society of Civil Engineers (2006-).

Associate Editor, *Journal of Engineering Mechanics*, American Society of Civil Engineers (2002-2004).

Associate Editor, *China Ocean Engineering*, Chinese Ocean Engineering Society (1999-2004; 2007-).

Associate Editor, *Communications in Nonlinear Science and Numerical Simulation* (June 2000 -)

Member, Chinese People's Political Consultative Conference (CPPCC), Shanghai Committee (2008-)

Overseas Academic Master, 111 Project on Coastal Tidal Flat Resources Development and Safety, Hohai University, Nanjing (2012-)

Member, Advisory Board, Nanyang Environment & Water Research Institute, Nanyang Technological University, Singapore (2011-)

Member, Selection Committee of the International Climate Protection Fellowship, Alexander von Humboldt Foundation, Germany (2009-)

Member, International Advisory Board (IAB), Glasgow Research Partnership in Engineering, Scottish Funding Council (2007-)

Vice-President, International Association of Hydraulic Engineering and Research (IAHR) (2007-2011)

Member, Aviation Development and Three-runway System Advisory Committee, Hong Kong SAR Government (Aug 2015-)

Member, Land and Development Advisory Committee, Hong Kong SAR Government (2009-2015)

Member, Steering Committee for Research Themes under the Research Endowment Fund, University Grants Committee (2009-2015)

Member (Vice-Chair), Assessment Panel, Public Policy Research Funding Scheme, Central Policy Unit, Hong Kong SAR Government (2014-2015)

Member, Construction Industry Council, Hong Kong SAR Government (2010-2012)

Member, Town Planning Board, Hong Kong SAR Government (2010-2012)

Member, Advisory Council on the Environment, Hong Kong SAR Government (2009-2012)

Council Member, Internet Professionals Association (iProA) (2004-2010)

Chairman, Asia and Pacific Division (APD), IAHR (2003-2007)

Chairman, International Audit Committee for the Review of Delft Hydraulics Software Systems, WL Delft Hydraulics, Delft, Netherlands, August 2005.

Chairman, Fluid Mechanics Section, IAHR (1996-2001)

Council member, International Association of Hydraulic Engineering and Research (IAHR) (2001-03; 2005-11)

Chairman, Built Environment Panel, University Grants Committee Research Assessment Exercise (RAE) 1999, Hong Kong.

Member, Engineering Panel, Hong Kong Research Grants Council, (1993-98)

Visiting Professor, East China College of Hydraulic Engineering, Nanjing, China. (Aug. 1981; gave a one-month course in Environmental Hydraulics)

Advisory Professor, Hohai University, China. (1986-)

Visiting Associate Professor, School of Civil & Environmental Engineering, Cornell University, USA. (Aug.-Sept. 1986)

Technical Consultant, Environmental Sciences Research Center, Zhongshan University, Guangzhou (1986)

Consulting Professor, Tongji University, Shanghai (Apr. 1997 -)

Member, Advisory Council, International Research and Training Centre on Erosion and Sedimentation (IRTCES), Beijing (Oct. 1997 - 2000)

Member, Environmental Impact Assessment Ordinance Appeal Board, Hong Kong Government (1998-2007).

Member, Red Tide Experts Advisory Group, Agriculture, Fisheries and Conservation Department, Hong Kong Government (1998-2014).

Member, International Expert Advisory Panel, European Union Harmful Algal Blooms Expert System (HABES) group research project (2001-2004).

Member, Drainage Appeal Board Panel, HKSAR Government (2001-2007).

Member, Advisory Group on Waste Management Facilities, Environment, Transport and Works Bureau (ETWB), HKSAR Government (Chairman of Technology Sub-group, 2002-2005).

Member of 3-person Tribunal for the Environmental Impact Assessment (EIA) Appeal Case for the KCRC Sheung Shui - Lok Ma Chau Spur Line ('Long Valley' case), 2000-2001.

Member, Working Group on the Review of the Academic Structure for Senior Secondary Education and Interface with Higher Education, Education Commission, Hong Kong Government (2000-2003).

External assessor for Chair Professorship/senior promotion, and External Examiner for MPhil/PhD theses for many universities in Hong Kong and overseas (e.g. Imperial College London, University of Liverpool, University of British Columbia, Delft University of Technology, University of Manchester, University of Alberta, University of Canterbury, US Environmental Protection Agency, HKUST, City University of Hong Kong, Nanyang Technological University). (1996-2015)

External Examiner, M.Sc. Course in Civil Engineering, Hong Kong Polytechnic, 1990-1994.

Consultancy Appointments

Served as consultant/advisor on over 30 environmental hydraulic projects to international consulting engineers (including UK Water Research Centre, Binnie, Black and Veatch, Montgomery Watson, Ove Arup and Partners, Maunsell Consultants Asia, Walter Vivendi Joint Venture Australia, AeCOM) and Water Supplies Department, Drainage Services Department and Environmental Protection Department of Hong Kong Government. Representative projects include the Initial Dilution study for the UK Water Research Centre, River Indus Hydraulic Model Study, Sydney Deepwater Outfall post-operation monitoring, EIA study of the Hong Kong Strategic Sewage Disposal Scheme, Review of Deep Bay Water Quality Regional Control Strategy, Yuen Long Bypass Floodway, Tai Hang Tung Storage Scheme, Lai Chi Kok Transfer Scheme, and Hong Kong Harbour Area Treatment Scheme.

Professional Societies/Activities (Selected):

- Fellow, American Society of Civil Engineers.
- Fellow, The Hong Kong Institution of Engineers.
- Member, The Chartered Institution of Water and Environmental Management (IWEM), U.K.
- Chairman, Sub-Committee on Turbulence, Engineering Mechanics Division, American Society of Civil Engineers (2002-04).
- Vice-Chairman, Executive Committee, International Association for Hydraulic Research (Asia and Pacific Division), (2000-2002)
- Member, Fluid Mechanics Section, International Association for Hydraulic Research (1990-1995).
- Reviewer for Journal of Hydraulic Engineering, Journal of Environmental Engineering, Journal of Engineering Mechanics (ASCE), Journal of Hydraulic Research, Journal of Fluid Mechanics, International Journal for Numerical Methods in Fluids, Journal of Hydrology, Water Research, Limnology and Oceanography, Journal of Marine Systems, Environmental Fluid Mechanics, Proceedings of Institution of Civil Engineers (ICE), Applied Mathematical Modelling, Science in China, Marine and Freshwater Research, Ecological Modelling, Coastal Engineering, Estuarine Coastal

and Shelf Science, Marine Pollution Bulletin, US National Science Foundation, Swiss National Science Foundation, Hong Kong Research Grants Council, Hong Kong Innovation and Technology Fund.

- Member, Technical Standards Committee: Water Pollution Control (Amendment) Bill 1990, Hong Kong Government Secretariat, 1990.
- Member, Construction and Other Technologies Panel, Hong Kong University Grants Committee (UGC) Research Assessment Exercise, 1994 and 1996.
- Founding Chairman, The Hong Kong Chapter of the International Association for Hydraulic Research, April 1997.
- Member, Working Group on Upgrading of Water Quality and Hydraulic Mathematical Models, Civil Engineering Department, Hong Kong Government, 1997-98.
- Chairman, Organizing Committee, The 7th International Symposium on River Sedimentation and 2nd Int. Symposium on Environmental Hydraulics, December 16-18, 1998, Hong Kong.
- Chairman, Organising Committee, Second HKIE Symposium on the Sustainable Development of Guangdong, Hong Kong, and Macau, 8-10 April 2003, Hong Kong.
- Chairman, Organising Committee, The 14th IAHR Asia-Pacific Congress and 4th International Symposium on Environmental Hydraulics, December 15-18, 2004, Hong Kong.
- Chairman, Organising Committee, Symposium for the 10th Anniversary of IAHR-HK: "Hydrology and Water Resources with a focus upon Hong Kong and the Yangtze River, China", The University of Hong Kong, March 25-26th, 2008.
- Co-Chairman, International Scientific Committee and Chairman of Best Paper Selection Panel, 16th IAHR Asia-Pacific Congress, October 20-23, 2008, Nanjing.
- Chairman, Local Organising Committee, 6th International Conference on Asian and Pacific Coasts (APAC2011), December 14-16, 2011, Hong Kong.
- Executive Chairman, Local Organising Committee, 35th IAHR Congress, September 8-13, 2013, Chengdu, China.
- Member, Grand Judging Panel of the Hong Kong ICT Awards 2013; Chairman, Final Judging Panel of Best Collaboration Award.

Hobbies/Passion: Study Ballet; tennis; music; competitive Table Tennis.

EXTERNAL RESEARCH GRANT AWARDS

(as sole or principal investigator (PI) unless otherwise indicated)

1. *Multiport Thermal Diffusers as Line Momentum Sources in Shallow Water*, U.S. Engineering Foundation US$12,000, 1980-82.

2. *Mathematical Modelling of Marine Water Quality and Eutrophication Dynamics*, Croucher Foundation, HK$530,000, 1986-89 (Co-PI).

3. *Hydraulic and water quality modelling of Victoria Harbour, Hong Kong*, UPGC Research Grant, HK$450,000, 1989-92 (Co-PI)

4. *Mixing of Submerged Buoyant Jets in a Current*, Croucher Foundation, HK$743,240, 1991-94.

5. *Sea Water Intrusion into Tunnelled Outfalls*, Hong Kong Research Grants Council (RGC), HK$459,000, 1994-97.

6. *Hydraulics of Sediment Oxygen Demand (SOD) Chambers*, Hong Kong Research Grants Council (RGC), HK$836,000, 1995-98.

7. *Hydraulics of Duckbill Valve Jets*, Hong Kong Research Grants Council (RGC), HK$990,000, 1998-2001

8. *Environmental Management of Mariculture in Hong Kong*, Environment and Conservation Fund, HK$1,388,000, 1998-2001.

9. *Dynamics of Algal Blooms and Red Tides in Sub-Tropical Coastal Waters: Monitoring, Modelling and Prediction*, Hong Kong Research Grants Council (RGC)/Central Allocation (1998-99) (Group Research Project), HK$4,300,000, 1999-2002 (PI)

10. *Sediment-Water-Pollutant Interactions in Estuarine and Coastal Waters - with Particular Reference to Bohai Bay and Deep Bay*, Natural Science Foundation of China (NSFC)/Hong Kong Research Grants Council (RGC) Joint Research Scheme, HK$700,000, 1999-2002 (Hong Kong PI)

11. *Innovative Modelling and Visualization Technology for Environmental Assessment and Education*, Hong Kong Innovation and Technology Fund (ITF), HK$5,500,000, 2001-2003.

12. Croucher Advanced Study Institute on *Recent Developments in Coastal Eutrophication Research*, Croucher Foundation, HK$632,000, 2001.

13. *3D Modelling of Coastal Outfall Discharge in Random Wave Environment*, Hong Kong Research Grants Council, HK$610,000, 2001-2003 (Co-I).

14. *Mixing of Submerged Multiple Jet Group in Crossflow*, Hong Kong Research Grants Council (RGC), HK$480,000, 2002-2004

15. *Dynamics of Algal Blooms and Red Tides in Sub-Tropical Coastal Water*, Hong Kong Research Grants Council (RGC)/Central Allocation (Group Research Project Renewal), HK$1,500,000, 2003-04 (PI)

16. *Mixing of Rosette Jet Group from Ocean Outfalls*, Hong Kong Research Grants Council (RGC), HK$569,200, 2003-04

17. *Experimental Investigation on the Zone of Flow Establishment in a Submerged Round Jet in a Current*, Hong Kong Research Grants Council (RGC), HK$569,220, 2003-04 (Co-I)

18. *UGC Area of Excellence on Marine Environmental Research and Innovative Technology (MERIT)*, HK$45 M, 2004-2009 (Co-I)

19. *Croucher Laboratory of Environmental Hydraulics*, Croucher Foundation, HK$2 M (2004)

20. *Integrated Physical and Ecological Management of Rivers - with Particular Reference to the East River*, National Natural Science Foundation of China/Hong Kong Research Grants Council (NSFC/RGC), HK$572,800, 2004-06 (PI, Hong Kong)

21. *Data Assimilation for Forecasting of Coastal Water Quality*, Hong Kong Research Grants Council (RGC), HK$496,691, 2004-2006

22. *Investigation of Island Wake Hydraulics*, Hong Kong Research Grants Council (RGC), HK$686,715, 2004-2006 (Co-I)

23. *Hydraulics of Bottom Rack Intakes for Supercritical Storm Flow Diversion*, Hong Kong Research Grants Council (RGC), HK$436,000, 2006-2008

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