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出席人士：石永泰資深大律師、許偉強大律師及鄭欣琪大律師，為外聘律師，代表食水含鉛超標調查委員會

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王鳴峰資深大律師、陳樂信大律師及羅頌明大律師，由律政司延聘，代表水務署署長

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李柱銘資深大律師及譚俊傑大律師，由何謝韋、李偉業律師事務所延聘，代表啟晴邨及葵聯二邨公屋居民代表 Lee Pui Yi、Chong So Nga 及 Lui Hui Ping

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何沛謙資深大律師及殷志明大律師，由羅夏信律師事務所延聘，代表香港房屋委員會

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Mr Ian Pennicott 資深大律師及林定韻大律師，由孖士打律師行延聘，代表中國建築工程（香港）有限公司

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許佐賓大律師，由的近律師行延聘，代表保華建築營造有限公司

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孖士打律師行陳韻華律師，代表瑞安承建有限公司

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陳樂信先生：主席，早晨。

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水務署第二證人：陳健民（水務署（總水務化驗師））宣誓繼續作供
陳樂信先生繼續主問

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SECOND WITNESS STATEMENT OF CHAN KIN MAN

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I will skip the first part.

1. I am the Chief Waterworks Chemist of WSD. My duties include, amongst other thing, overseeing the quality and treatment of water resources, the control of pollution in gathering grounds and the ecology of impounded waters and to ensure that the potable supplies conform to satisfactory and internationally recognized standards of quality in Hong Kong; supervising the management and operation of laboratories and radiation screening centres; and monitoring the implementation and maintenance of quality assurance systems of the Water Science Division of WSD.

2. I am the same person who made the Witness Statement of CHAN Kin Man dated 26 October 2015. I make this 2nd Witness Statement pursuant to the request of the Commission of Inquiry into Excess Lead Found in Drinking Water ("**the Commission**"), conveyed in a letter from Messrs. Lo & Lo to the Department of Justice dated 27 October 2015 ("**the 27 October Letter**"). Save where otherwise appears, the facts deposed hereto are within my personal knowledge or arc derived from office files and records and sources to which I have access and are true to the best of my knowledge, information and belief. Save as otherwise se specified, this Statement adopts the same abbreviations an d nomenclature as in the 27 October Letter.

3. This Witness Statement addresses the second paragraph of the 27 October Letter:-

"Mr CHAN Kin-man (the Chief Waterworks Chemist) to describe and explain the related isotopic analysis."

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Principle and methodology

8. Isotopic analysis has been adopted by the WSD Task Force to provide a preliminary deduction of the source of lead in water by comparing the lead isotopic ratio of the water sample with those of the copper alloy component and leaded solder joints. An isotopic analysis was carried out for each of the three water supply chains of Kai Ching Estate (KCE) and Kwai Luen Estate Phase 2 (KLE2) by using a copper alloy valve and a leaded solder joint in the water supply chain with water sample taken from the respective housing block of the water supply chain.

9. The Hong Kong Polytechnic University was engaged by the Task Force to carry out isotopic analysis by using an Inductively-coupled Plasma-Mass Spectrometry ("**ICP-MS**") for measuring isotopic abundance of Pb-206, Pb-207 and Pb-208. In simple terms, ICP-MS atomises and ionizes lead in the sample to lead ion in the plasma which are collected and separated by the mass spectrometer according to their mass, with the lead ions of different isotopes converted to electronic signals for detection of abundance.

10. The isotopic ratios obtained from ICP-MS measurements were then analysed by Linear Discriminant Analysis ("**LDA**"). LDA is a statistical classification method used to distinguish two classes of objects. LDA was carried out to determine the clustering of the 20 lead isotopic ratios of each sample to see if the clusters of the copper alloy valve and the lead solder joint are significantly different from each other. A Division Line between the data clusters of the copper alloy valve and the leaded solder joint was then established to determine if the data cluster of the water sample resembled that of the copper alloy valve or leaded solder joint.

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THIRD WITNESS STATEMENT OF CHAN KIN MAN

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2. I am the same person who made the Witness Statement of CHAN Kin Man dated 26 October 2015 and the 2nd Witness Statement of CHAN Kin Man dated 10 November 2015. I make this 3rd Witness Statement to further assist the Commission of Inquiry into Excess Lead Found in Drinking Water ("**the Commission**") by:

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(a) Part 1 : Providing an overview of WSDs monitoring and control of water quality at waterworks¹:

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¹This covers, with necessary elaborations, Chapter 3 of the August Statement as requested at paragraph i.1 of the 12 October Letter, as well as responses to paragraph i.2 and 3 of the 12 October Letter insofar as water quality in waterworks is concerned.

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(b) Part 2: Explaining the water sampling and testing by WSD in respect of inside service (from the perspective of WHO guidelines / chemical aspects); and

(c) Part 3: Explaining the rationales for testing eight parameters for connection of newly constructed inside service to the Government supply and testing seven parameters for "Quality Water Supply Scheme for Buildings - Fresh Water".

3. Save where otherwise appears, the facts deposed hereto are within my personal knowledge or are derived from office files and records and sources to which I have access, and are true to the best of my knowledge, information and belief.

Part I : An overview of WSD's monitoring and control of water quality at waterworks²

² That is, the monitoring and control of water quality from source, at treatment works and up to connection points.

WSD's pledge

4. Safe drinking water is essential to the protection of public health. WSD has all along taken the production of quality water very seriously and striving to undertake it in a most professional and stringent manner.

5. Under the existing statutory regime, neither the Waterworks Ordinance, Cap.102 ("WVO") [Bundle C2, No. 10, A1.1, Pages 1145 - 1155] nor the Waterworks Regulation, Cap.102A ("WWR") [Bundle C2, No. 11, A1.2, Pages 1156 - 1177] specifies any standard or requirement in relation to water quality. Notwithstanding that, in respect of water quality in the waterworks, WSD has pledged to comply with the

"Guidelines for Drinking-water Quality"³ ("Guidelines") of the World Health Organization ("WHO"). The WSD has indeed successfully done so as detailed below.

³ WHO gives recommendations on managing the quality of drinking water in the form of guidelines titled "Guidelines for Drinking-Water Quality", the latest edition of which was published in 2011.

It's available online.

6. Specifically, in 1994-95, WSD pledged in its Controlling Officer's Report to supply water in full compliance with the Guidelines up to the connection points, i.e. the points between government mains and the inside service...

This relates to the early statement that WSD has successfully complied with the WHO guidelines.

...Based on monitoring results, WSD has achieved this pledge since 1994. This pledge has been made practicable as WSD has full control over its waterworks as empowered under the WWO. On the other hand, as stipulated in the WWO, consumers and agents are responsible for the custody, maintenance and cleaning of the inside service within the lot boundary.

WHO Guidelines

7. Many developed countries worldwide make reference to the Guidelines to monitor and control the quality of treated water. The Guidelines provide recommendations for managing risk from hazards that may compromise the safety of drinking water for the protection of public health. Among other things, the Guidelines stipulate "guideline values" ("GV") and "provisional guideline values"⁴ ("PGV") for certain constituents of water.

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D 4 The "guideline values" represent the concentration of constituents in
E drinking water that will result in any significant health risk to a consumer
F weighing 60 kg over a lifetime consumption of 2 litres per day for 70 years.
G (See part 8.2 of the Guidelines.) "Provisional guidelines values" are
H established based on, inter alia, the practical level of treatment
I performance or analytical achievability. They are not meant to be
J mandatory limits. In order to define national standards, it is necessary
K to consider the context of local or national environmental, social, economic
L and cultural conditions. For lead, the provisional guideline value of WHO
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R 9. The WHO published its first edition of the Guidelines
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T revisions to its detailed content, with a sharp
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Parameter	WHO 1984	WHO 1993	WHO 2004	WHO 2004 1 st Addend um (WHO 2006)	WHO 2004 2 nd Addend um (WHO 2008)	WHO 2011 (Current)
Bacteriological	1	1	1	1	1	1
Chemical	27	94	93	92	94	89
Radiological	2	2	2	2	2	2

10. Currently, WSD monitors the quality of drinking water supply in the waterworks with reference to the latest (4th) edition of Guidelines published in 2011 ("**the 2011 Guidelines**") [Bundle C2, No. 18, Bl.2, Pages 1244 - 1525]. The 2011 Guidelines contain a total of 92 monitoring parameters including 1 bacteriological parameter, 89 health-related chemical parameters (such as heavy metals, pesticides, disinfection by-products, organic chemicals) and 2 parameters for radiological screening of water. The WHO parameters currently adopted by WSD for monitoring drinking water quality in waterworks and the reasons/criteria for adoption are given in **Annex 1** to this Statement. In addition, WSD also monitors drinking water quality in respect of a number of parameters beyond those set out in the Guidelines. The reasons/criteria for adoption are given in **Annex 2** to this Statement.

Water Safety Plans

11. In its 2004 edition of the Guidelines, besides updating its monitoring parameters, the WHO first introduced

the concept of Water Safety Plans ("WSPs"). WSPs adopts a risk-based and multi-barrier approach to assure the safety of water supply from source, through water treatment to distribution system. This remains the approach currently advocated by the WHO in its 2011 Guidelines [B2, No.18, Pages 1266-1267]. A WSP holistically identifies the actual and potential hazards in the water supply system, assesses the risk of each hazard and devises control measures. In this regard, the WHO recommended operational monitoring, operational /critical limits and corrective actions for identified hazards as well as the verification of water quality as a final check on the effectiveness of WSPs.

12. With reference to the WHO's WSPs, WSD has developed its own WSPs for use in the Hong Kong context covering the waterworks from source through treatment to connection points. WSD started implementing its WSPs in 2007 to provide an effective and proactive mechanism for ensuring the safety of drinking water for the protection of public health. The WSPs for WSD consists of a 3-tier structure. The first tier is the General WSP [Bundle C1 No. 5(1), Pages 47 - 101], which lays down the broad policies, principles and practices for safeguarding the quality of drinking water supply in the waterworks. At the second tier, the Regional/Divisional WSPs [Bundle C1 No. 5(2)-(6), Pages 102 - 280] cover the procedures and practices for regional/divisional operation and monitoring. At the third tier are the WSP for Resources Protection [Bundle C2, No. 5(28), Pages 1068 - 1102] and the WSPs for individual Water Treatment Works [Bundle C1, No. 5(7)-(20), Pages 281 - 812 and Bundle C2, No. 5(21)-(26), Pages 813 - 1044] and Tai Lam Chung Chlorination Station [Bundle C2, No. 5(27), Pages 1045 - 1067], prepared in respect of specific treatment processes and operational requirements.

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Surveillance on drinking water quality under WSPs is supported by the Department of Health ("DH") through regular review of test results, communications and task group meetings.

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13. The primary objectives of the WSPs for WSD are to (i) prevent contamination at sources; (ii) remove contamination through water treatment process to meet water quality targets; and (iii) prevent contamination during storage and distribution. The following major aspects are covered under the WSPs for WSD:

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- protection of valuable water resources;
- maintaining close liaison with relevant main land authorities for monitoring of Dongjiang water quality;
- operational monitoring and control of treatment processes, storage and distribution;
- verifying water quality;
- setting up contingency plans; and
- surveillance on treated water quality with support from DIL

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14. Although compliance with the Guidelines is not a statutory requirement under WWO and WWR, the WA has nevertheless set up its WSP based on the risk management framework as advocated under the Guidelines to safeguard the quality of drinking water supply from source through treatment to distribution. The DH and the WSD have agreed to adopt a set of guideline values for chemical and bacteriological parameters based on the WHO's recommendations as the health-based targets for the drinking water supply in Hong Kong.

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15. In developing the WSPs for WSD, the water supply system has been systematically assessed with an aim to identifying actual and potential hazards/hazardous

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events, and conducting risk assessment for each hazard/hazardous event.

16. Each stage (from source, water treatment works, distribution network to connection points) would have its own characteristics in terms of the probability of occurrence and the consequences and severity of occurrence of different hazardous events. Appropriate control measures are identified and implemented at source through water treatment works to distribution to prevent, reduce or eliminate the occurrence of the identified hazards/hazardous events and to ensure that drinking water consistently meets the health-based targets.

17. Operational monitoring against established operational/critical limits is also in place to provide timely indication of the effectiveness of the control measures and to allow for rapid response and corrective actions if deviations are detected. Corrective actions are also pre-determined for application when irregularities are detected from the operational monitoring.

18. For final verification of the overall effectiveness of the WSPs for WSD, treated water samples are taken regularly from water treatment works to distribution system for compliance monitoring and verification with the Guidelines. Surveillance arrangement has been made with the support of DH to oversee the safety and acceptability of the drinking water supply for assessment through regular review of test results, communications and task group meetings.

19. The related management, communication and operational procedures are documented in the WSP (General Plan) for WSD, Regional and Divisional WSPs, and WSPs for resources protection, individual treatment works and Tai Lam Chung Chlorination Station referred to at

paragraph 12 above.

20. With regard to the water quality beyond the connection points (i.e. within communal service and inside service), WWO stipulates that the custody and maintenance responsibility of communal and insider service rests with the agent and consumer. As noted in the General Plan for WSP⁵, the Customer Services Branch of WSD generally plays a regulatory role.

⁵According to the 2011 Guidelines, that roles and responsibilities of different stakeholders relating to the safe management of drinking water systems within buildings can be influenced by a number of factors including ownership of assets and rights of access. WSPs established for management of public water supplies are not typically extended to buildings, although the water supplier WSP may include a number of initiatives to ensure that backflow prevention is in place or to provide information to consumers on protecting their own water quality.

These matters are implemented through enforcement of the WWO and WWR. Mr. Lam Ching Man, Assistant Director/Customer Services will provide details on the monitoring and control of water quality at inside service in Part (1) of his Witness Statement.

21. WSD has developed a comprehensive and extensive water quality monitoring regime through a series of physical, chemical, bacteriological, biological and radiological examinations covering WHO and other non-WHO parameters for operational monitoring and water quality surveillance. Water samples are taken regularly throughout the water supply system from source, through water treatment works to distribution system and consumer taps for various analyses to safeguard the quality of the drinking water supply in conformance with the Guidelines. Every year, more than 160,000 samples are collected throughout the entire water supply system for operational monitoring, control and verification of water quality to ensure

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that the WSPs for WSD are working properly. Based on risk assessment of potential exposure and historic record of monitoring result the priority and frequency of monitoring for different chemical parameters will vary for water quality monitoring or verification.

22. The measures which WSD has put in place (a) to monitor and control water quality at source, (b) to monitor and control water quality at water treatment works, and (c) to monitor and control water quality in the distribution system up to the connection points are explained below.

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Monitoring and control of water quality at source

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23. According to the 2011 Guidelines [Bundle C2, No. 18, Pages 1261 & 1281-1282] (para. 1.2.4 and 4.1.3), resource and source protection is an integral part of preventive management of drinking-water quality. Prevention of microbial and chemical contamination of source water is the first barrier in protection of drinking water quality.

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24. Hong Kong has two sources of raw water: local yield collected from various gathering grounds and imported Dongjiang water. To protect the local raw water source at the gathering grounds, WSD has been controlling development and activities within gathering grounds and conducting regular patrols with a view to guarding against pollution. Legislation is in place to protect water sources in Hong Kong against pollution of water forming part of the waterworks: see section 30 of the WWO. The Environmental Protection Department also controls the pollution of the waters of Hong Kong under the Water Pollution Control Ordinance, Cap. 358.

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25. With regard to Dongjiang water imported from Guangdong Province, WSD has stipulated in the water supply

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agreement with the Government of Guangdong Province the quality standard of Dongjiang water which is the national standard "Environmental Quality Standards for Surface Water GB3838-2002" [Bundle C2, No. 5(29), Pages 1103 - 1114] Type II standard. This is the highest national standard for surface water applicable for the abstraction for human consumption under GB3838-2002.

26. To protect the quality of Dongjiang water, the Guangdong Province has enforced legislation and implemented a number of pollution prevention and control measures and projects including commissioning a dedicated aqueduct in June 2003 to convey Dongjiang water direct from the abstraction point at Taiyuan Pumping Station to the Shenzhen Reservoir. Dongjiang water entering Shenzhen Reservoir will undergo a nitrification process at the bin-nitrification plant in Shenzhen Reservoir to remove ammoniacal nitrogen and organic matters before supplying to Hong Kong through Muk Wu Pumping Stations.

27. To provide early warning of any anomalies in water quality notwithstanding the above protective measures, WSD has closely monitored the quality of Dongjiang water supply received at Muk Wu Pumping Stations through on-line water quality monitoring systems 24-hours each day. Regular samples are also taken for detailed analyses. There are also well established mechanism and channels for the Guangdong side to alert WSD of any significant variation in the quality of imported water so that WSD can take prompt and control measures to suitably mitigate the impact to safeguard the quality of treated water.

28. On-line water quality monitoring systems are also installed at selected impounding reservoirs for continuous monitoring of the stored water quality. The real-time water quality monitoring data can

provide valuable information and alarm signals for laboratories and water treatment works operators to respond promptly to changes in water quality.

29. WSD has implemented a comprehensive programme to closely monitor the quality of source water by taking water samples at strategic locations with in gathering grounds for different tests. Regular limnological surveys are al so carried out at major impounding reservoirs to monitor impounded water quality. Aeration systems are operated in the vicinity of the draw-off tower in Plover Cove and Tai Lam Chung Reservoirs to prevent thermal stratification. Biological surveys are also conducted regularly to assess the ecological status of major reservoirs. Regular fish stocking is also conducted to maintain ecological balance in selected reservoirs.

30. Apart from on-line water quality monitoring and regular sampling and testing, WSD has developed a Biosensing Alert System using zebrafish and a light-emitting bacterium to detect any abnormalities of raw water quality. The systems are currently installed at the Sheung Shui and Tai Po Water Treatment Works for monitoring of incoming raw water consisting mainly of Dongjiang water.

Monitoring and control of water quality at water treatment works

31. After source water protection, the next barriers against contamination of the drinking water system are those of water treatment processes. All raw water including Dongjiang water imported from Guangdong Province and local yield undergoes stringent water treatment processes and disinfection at water treatment works before supply to consumers.

32. The water treatment works ("**WTW**") are important

facilities where WSD generally treats raw water of varying quality to ensure treated water quality complies with the Guidelines.

33. In response to any variations in raw water quality as indicated from the monitoring results, chemists are required to optimize the treatment process and the dosage of various treatment chemicals for removal of impurities and disinfection. They will closely monitor each stage of the treatment process comprising coagulation, clarification, filtration and disinfection; and specific treatment technologies to ensure that the treated water is clear, wholesome and free from pathogenic bacteria.

34. The water quality monitoring programme in a water treatment works consists of three tiers. The on-line water quality monitoring system is the first tier providing continuous monitoring of key operational parameters such as turbidity, pH and residual free chlorine to allow rapid responses of works operators to variation of water quality. The second tier is primary control tests of key parameters such as pH, turbidity, fluoride, ammonia etc. carried out regularly by works operators to monitor the treatment processes and adjustment of chemical dosages by jar test according to established guidelines. The third tier is regular sampling from different stages of treatment at designated sampling and testing schedule to ensure that the treatment process operation is optimized and to verify the treated water quality is in compliance with WSD's final treated water quality targets and Guidelines.

35. Before leaving the WTW, the treated water is dosed with post-treatment chemicals such as chlorine for disinfection and maintaining a residual free chlorine of about 1 mg/L to prevent bacterial re-growth in the distribution networks; fluoride for dental protection;

hydrated lime for pH adjustment to about 8.2-8.8 to reduce corrosivity of treated water supply and protection of water mains.

36. Apart from conventional water treatment technology, WSD has also strived to introduce updated treatment technologies and facilities (e.g. ozonation at Ngau Tam Mei WTW, and dissolved air flotation and biological filtration at Tai Po WTW) to enhance the treatment capabilities.

Monitoring and control of water quality in the distribution system up to the connection points

37. Water treatment should be optimised to prevent microbial growth, corrosion of pipe materials and the formation of deposits. After leaving the treatment works, treated water is delivered to the connection points through an enclosed system of service reservoirs and the distribution water main network. To maintain the quality of treated water, all pipes and fittings used for waterworks shall comply with relevant British Standards. Newly laid water mains are cleansed and disinfected; and water samples are tested⁶ to confirm the quality before they are connected to the distribution system.

⁶ Test parameters include Colour (by visual comparison method); pH (by electrometric method); Turbidity (by nephelometric method); Conductivity (by conductivity meter); Free residual chlorine (by colorimetric method); Total coliforms, E. Coli (by membrane filtration method); Heterotrophic plate counts (by pour plate method) before July 2015; and 4 additional metals including Lead, Cadmium, Chromium and Nickel (by inductively coupled plasma mass spectrometry)

WSD carries out regular cleansing to the service reservoirs and flushing of the water mains at dead ends in order to maintain the water quality in distribution systems. Mr. Leung Wing Lim, Assistant Director/New

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Works will provide details on the design, construction and maintenance of the waterworks in Part (2) of his Witness Statement.

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38. WSD also carries out extensive monitoring on the quality of treated water throughout the distribution system.

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39. Based on the recommendation of the 2011 Guidelines [Bundle C2, No. 18, Pages 1287-1288] (para. 4.3.1, Table 4.4), a minimum of 2,280 samples are required for faecal indicator testing 111 the distribution system for a population of 7 million in Hong Kong. In view of the tropical climate, high population density and prevalence of high rise buildings as well as the potential consequence of a large outbreak of waterborne diseases in Hong Kong, it is of paramount importance and a top priority for the densely populated urban context of Hong Kong that an adequate number of treated fresh water samples are taken from the distribution system for bacteriological testing for public health protection.

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40. Since 2006, about 26,000 treated fresh water samples have been taken annually for bacteriological testing including E. coli, total coliforms and heterotrophic plate counts from water treatment works, service reservoirs, accessible connection points and random sampling points at consumer taps selected from the database of the Laboratory Information Management System of the Water Science Division under WSD (see paragraph 45 below for details).

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41. In addition, treated water samples are taken at scheduled frequencies from 40 strategic fixed points including a combination of 10 service reservoirs, 3 cross harbour mains, 9 accessible connection points and 18 fixed consumer taps in the corresponding supply zones of major water treatment works for verification

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of chemical quality of treated water supply in compliance with the 2011 Guidelines through distribution network to consumer taps. In 2014/15, more than 250 pairs of treated water samples were taken from water treatment works on a monthly basis as well as at the above-mentioned 40 strategic fixed points on a half yearly basis for testing of 12 metals (Antimony, Arsenic, Barium, Boron, Cadmium, Copper, Chromium, Lead, Nickel, Selenium, Uranium and Mercury) as recommended in the 2011 Guidelines (Table A3.3, page 472-472) [Bundle C2, No. 18, B1.2, Pages 1244-1525].

42. Since the implementation of the second and third-tier WSD's WSPs in 2007, there has not been any incident of significant magnitude that has compromised the safety of the drinking water supply up to the connection points to trigger a material uplift of the current level of activities of the corresponding WSPs. As part of the second and third-tier WSPs, the regular water quality monitoring from source to the connection points throughout the years has also shown that these WSPs are being implemented effectively to achieve the performance required. This reflects the adequacy of the current level of activities implemented by these WSPs in safeguarding the water quality, but the WSPs will be kept under review by WSD. Arising from the excess lead found in drinking water incident in the inside service, among other things, WSD has stepped up lead testing at consumer taps as detailed in paragraph 48 of this Statement.

Part 2: Water sampling and testing by WSD in respect of inside service (From perspective of WHO guidelines/chemical aspects)

43. Paragraph i.8 of the 12 October Letter requests the following information:

"8. paragraph 48 of the August Statement describes the

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power and procedures of the WSD to investigate complaints on water quality in the inside service:

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(a) please explain whether the WSD has the power (and/or practice) to conduct periodic tests and inspections (whether on an annual or more regular bases) on the plumbing system of the inside service and to take water samples to ensure the safety and quality of drinking water;

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(b) if the answer (a) is affirmative, please state the reasons for the determined frequency and the contents of such tests and inspections;

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(c) if the answer to (a) is negative, please comment on the feasibility and effectiveness of carrying out such inspections and tests in order to ensure the safety and quality of drinking water."

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44. In response to the said request, this part of my Statement explains the routine water sampling and testing by WSD in respect of inside service (from perspective of the WHO guidelines/chemical aspects).⁷

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⁷ To put the matter in context, the water sampling and tests involving WSD in relation to inside service are as follows:

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(1) As a routine procedure, samples are taken for testing from consumer taps on random basis for checking microbial safety and general chemical quality, and consumer taps at fixed strategic locations to verify the chemical quality of treated water in compliance with the Guidelines including lead and other heavy metals; After discovery of excess lead in water incident, random samples are taken from consumer taps for lead testing. (See paragraphs 40, 41 and 48 and Part 2 of this statement)

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(2) For newly constructed inside service:

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(a) (before 2012) water samples were taken for testing near connection point (8 parameters) as a prerequisite for effecting

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water supply;

(b) (from 2012 to 2015) water samples were taken for testing near connection point (8 parameters) as a prerequisite for effecting water supply; after effecting water supply, water samples were taken from inside service within building (8 parameter as a recommendation to LP/AP) for checking the effectiveness of cleansing and disinfection;

(c) (after discovery of the excess lead in water incident in 2015) water samples have been taken for testing both near connection point and from the inside service within building (12 parameters) as a prerequisite for effecting water supply; (See the Witness Statement of Lam Ching Man and Part 3 of my present Statement)

(3) As far as public rental housing (PRH) estates are concerned, WSH has been assisting HD in taking samples from PRH estates including Affected Estates for lead testing

45. As earlier mentioned, notwithstanding that the WSD's pledge is to supply water in full compliance with the Guidelines up to the connection points. WSD still implements water quality monitoring at consumers taps according to the risk based approach of WHO. To this end, WSD takes random water samples at consumer taps routinely to check the microbial and general chemical quality of water, The sampling locations generally cover direct and indirect supply systems in shopping centres, clinics, community facilities, sports grounds, markets, government offices, estate management offices, etc. which can be accessible for sampling with the consent of premises holders if necessary. Direct supply means water is conveyed directly from the government water mains to the point of usage without any transit water storage tanks. Indirect supply means water is conveyed from the government water mains to the point of usage through a transit water storage tank. As connection points

at lot boundary of buildings are generally located underground, there is only a very limited number of connection points accessible for sampling. Samples taken at consumer taps from direct and indirect supply can serve as a surrogate for treated water quality at connection points as well as an indication of the cleanliness of the inside service of consumers premises.

46. According to the WHO Guidelines published in 2011 [Bundle C2, No.18, Page 1269] (para.2.5.2), the most common and widespread health risk associated with drinking water is microbial contamination, the consequence of which means that the control of such contamination must always be of paramount importance and deserving of priority in terms of the use of WSD finite resources. Microbial contamination of a major urban system such as that in Hong Kong has the potential to cause widespread outbreaks of waterborne disease affecting a large number of persons. In view of the recommendation of WHO, the local tropical climate, high population density, prevalence of high rise buildings in Hong Kong, about 16,000 pairs of water samples are taken at consumer taps annually from locations randomly selected from the database of the Laboratory Information Management System of the Water Science Division under WSD for testing. One sample of each pair is tested for E.coli, total coliforms and heterotrophic plate counts for microbial quality while the other sample is for testing of turbidity, conductivity, free residual chlorine and fluoride (selected samples) which are associated parameters for microbial quality and general chemical quality of treated water. The number of bacteriological samples taken in Hong Kong with a population of 7 million is significantly more than the minimum number of 2,280 samples recommended to be taken from the distribution system for faecal indicator testing recommended by the

Guidelines [Bundle C2, No. 18., Pages 1287, 1288] (para. 4.3.1 Table 4.4).

47. In addition, in order to verify the chemical quality of treated water to be in compliance with the Guidelines through distribution network to consumer taps as well as to characterize the water quality for trend monitoring and temporal change, about 1,600 samples were also taken annually at strategic fixed consumer taps in corresponding water supply zones of major water treatment works for testing of chemical constituents including trace inorganics, metals, trace organics, pesticides and disinfection by products, etc. specified in the Guidelines and radiological parameters at varying frequency based on risk assessment. The monitoring results indicated that there has been no significant spatial and temporal variation in the content of heavy metals in fixed consumer taps in different water supply zones. The concentrations of 12 metals including lead were in full compliance with the Guidelines.

48. In view of the recent lead in water incident and the emerged risk of lead in tap water, additional consumer tap samples are now collected randomly for lead testing for public reassurance on the quality of tap water. As at 23 October 2015. WA has tested 597 random consumer samples for lead. All samples except one (taken from the management office of Wing Cheong Estate, which is one of the declared Affected Estates) complied with the provisional guideline value of 10 ug/L for lead set out in the 2011 Guidelines [Bundle C2, No. 18, Page 1446]. In this connection, I should mention that these random tests were conducted separately from those at the 18 fixed consumer taps referred to earlier in this statement, and I have not yet exhibited the results of these random tests. I now attach at **Annex 3** herewith a summary of those test results, with information as to the locations where the samples were

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taken. As can be seen from **Annex 3**, the further random consumer samples tested so far (as at 23 October 2015) all except one did not contain excess lead.

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49. The test results of consumer tap samples are reviewed and evaluated for compliance with WHO Guidelines. In the event of a particular parameter in a consumer tap sample exceeding the WHO Guidelines, the consumer will be notified for follow up action.

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Part 3: Rationales for testing eight parameters for connection of newly constructed inside service to the Government supply and testing seven parameters for "Quality Water Supply Scheme for Buildings - Fresh Water"

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Test parameters for connection of newly constructed inside service to the Government supply

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49. To guard against contamination to the government water supply by any newly constructed inside service, the WA requires a water sample to be taken near each connection point from newly constructed inside service before effecting water supply.

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50. Prior to July 2015, the water samples were tested for 8 parameters to indicate the cleanliness, effectiveness of disinfection, the microbial safety as well as the acceptability of the water. These parameters are pH (at 25°C), turbidity, colour, conductivity (at 25°C), residual free chlorine, Escherichia coli (E.coli), total coliforms, heterotrophic plate counts. The rationale for each test parameter is as follows:

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- (i) pH - The test parameter is to ensure that the inside service has been thoroughly flushed and that there are no excess disinfectants present in the inside service which will render the water highly alkaline and affect

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the acceptability of water.

(ii) Turbidity - The test parameter is a measure of suspended or colloidal particles in water. High turbidity can provide protection for microorganisms against the effect of disinfectant and affects the efficacy of disinfection. The clarity of water can also affect acceptability of water.

(iii) Colour - The test parameter is a measure of the presence of coloured substances in water which will affect the acceptability of water. This can also serve as a screening parameter for the presence of iron and other metals. If high level of colour is detected, further analysis of iron and other metals may be required to investigate the source of colour.

(iv) Conductivity - The test parameter is a measure of ions in water which can be used to characterise the source of water in the inside service and check if there is cross connection between fresh water and salt water supply system.

(v) Residual free chlorine - The test parameter is an indicator of effectiveness of disinfection. Excessive level of residual chlorine in water will cause taste and odour problem.

(vi) E.coli - The test parameter is the bacterial indicator of faecal contamination. The positive detection of E. coli will indicate the potential presence of faecal pathogens.

(vii) Total coliforms - The test parameter is to indicate the cleanliness and integrity of the

system and the potential presence of biofilms.

(viii) Heterotrophic plate counts - The test parameter is to indicate the cleanliness and integrity of inside service and the presence of biofilms in the system. The test can also detect a wider range of microorganisms including chlorine resistant bacteria and organisms that proliferate rapidly in the absence of residual chlorine.

51. Amongst others, the testing of residual free chlorine near the connection point of the inside service is an indicator of the effectiveness of disinfection of the inside service. However, it cannot replace the need for bacteriological testing as particulates in water can shield the microorganisms against the action of disinfectant. The bacteriological tests for E.coli, total coliforms and heterotrophic plate counts are required to confirm the absence or otherwise of pathogenic and heterotrophic/opportunistic microorganisms through standard culturing methods, thereby confirming positively microbial safety to prevent contamination of the Government supply when effecting supply.

52. Furthermore, as explained in paragraph 50(i) above, the measurement of pH in water sample taken from inside service is to ensure that the inside service has been thoroughly flushed; and its primary purpose is to check against excessive disinfectants left in the inside service which would affect acceptability of water. WSD's recommendation for a test of pH as one of the eight parameters is not intended to serve as a surrogate test for leaching of heavy metals (including lead). Incidentally, an appropriate pH level has the further benefit of reducing plumbosolvency. As Hong Kong's water is soft and low in minerals, the pH of

treated water leaving water treatment works is adjusted to about 8.2 to 8.8 to reduce its corrosivity to minimize the corrosion of pipe materials, which is in line with the optimum pH of about 8.0 to 8.5 has recommended by WHO to reduce plumbosolvency (Guidelines. page 502) [Bundle C2, No. 18, B1.2, Pages 1244-1525]. Thus, if the materials used in the inside service are in compliance with BS specifications, it is expected that the risk of heavy metals (including lead) leaching from the materials into the treated water (with the said set pH value) should be low and should pose minimal threat to water quality. According to Section 3|3|2 of WHO's publication "Chemical Safety of Drinking-water: Assessing Priorities for Risk Management", it suggests that, unless there is strong evidence, inclusion of those chemicals in drinking-water monitoring programmes is not justified. There is now produced and shown to me marked as "**Annex 4**" a copy of the said publication. In any event, The document [C3, No. 18, Pages 1346-1349] (para.8.5.4) advocates, *inter alia*, that the approach to monitoring and management is preferably through control of materials. Contamination caused by poor quality materials is best controlled through applying specifications governing the composition of the materials; direct regulations and exercise of control on the quality of pipes are the most effective means of avoiding possible contamination of water by leachable materials. See also the Chemical Fact Sheet as regards lead in Chapter 12 of the Guidelines [C3, No. 18, pages 1446-1447], which illustrates the importance of preventing or detecting lead contamination before the construction of pipes is complete, since otherwise the remedy "consists principally of removing plumbing and fitting containing lead, which involves much time and money". Mr. Leung Wing Lim, Assistant Director/New Works will in Part (1) of his Witness Statement provide details

on the prohibition of lead in plumbing materials and the stakeholder approach to explain the control of the materials.

Test parameters for "Quality Water Supply Scheme for Buildings Fresh Water"

53. To encourage agents and consumers to properly discharge their maintenance responsibility of inside service, the WA has launched the "Quality Water Supply Scheme for Buildings - Fresh Water" ("**the Scheme**") since July 2002. Amongst other maintenance requirements, the Scheme requires testing of water samples for 7 parameters to indicate the general cleanliness and maintenance conditions of the inside service. These parameters are pH (at 25° C), turbidity, colour, conductivity (at 25°C), iron, E.coli and total coliforms. The rationales behind each of these parameters are basically similar to those set out in paragraph 50 above. The additional testing of iron is to check positively the state of the maintenance of inside service and the scale of rusting problem in the pipework of inside service. High concentration will affect the acceptability of water and cause staining of laundry. As regards testing of iron, it is unlikely that newly constructed inside service will have rusting problem⁹;...

⁹Before 1995, galvanized steel pipes (G.I. Pipes) were commonly used in Hong Kong because of their comparatively low cost and ease...

主席：Footnote 唔使讀。

陳樂信先生：唔使。

...and thus iron testing is not considered necessary

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as colour test can serve as a screening parameter.

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54. I confirm the contents of this Witness Statement to be true to the best of my knowledge, information and belief.

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Dated this 11th day of November 2015

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FOURTH WITNESS STATEMENT OF CHAN KIN MAN

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2. I am the same person who made the Witness Statement of CHAN Kin Man dated 26 October 2015, the 2nd Witness Statement of CHAN Kin Man dated 10 November 2015 and the 3rd Witness Statement of CHAN Kin Man dated 11 November 2015. I make this 4th Witness Statement in light of the Joint Expert Report (Preliminary) by Professor John Fawell and Professor Joseph Hung-wei Lee dated 12 November 2015 to further assist the Commission of Inquiry into Excess Lead Found in Drinking Water ("**the Commission**"), by explaining the way in which WSD employs different water sampling methods for different purposes.

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Overview of water sampling purposes

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According to the IS05667-5:2006 (COI ref C2, No.19 B1.3 Pages 1526-1549), an inventory of different sampling procedures is adopted, as appropriate, to meet specific sampling purposes. Some examples of such purposes are as follows:

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- (i) checking of the quality of drinking water to ensure compliance with the World Health Organization's "Guidelines for Drinking-water

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Quality" (**"WHO Guidelines"**);

(ii) determination of the efficiency of various water treatment processes (e.g. disinfection);

(iii) quality monitoring of the water leaving the treatment plant;

(iv) quality monitoring of the water within the distribution system;

(v) search for the cause of contamination of the distribution system (e.g. in response to customer complaints);

(vi) assessment of the effects of materials in contact with water on the water quality (chemical and biological).

4. In Hong Kong, WSD establishes its sampling procedures as set out in the Sampling Manual (COI ref C2, No. 22, Bl.6, Pages 1635-1754) with reference to the ISO 5667-5:2006. According to the Sampling Manual, the sampling procedures adopted by WSD to meet the different purposes are set out as follows.

5. For the purposes of checking the quality of drinking water to ensure compliance with the **WHO Guidelines**, and quality monitoring of the water within the distribution system, **flushed samples** are taken by WSD from sampling taps. Before the sample is taken, all tap fittings or filters are removed and the pipe is flushed for 2-5 minutes or longer if necessary at a uniform rate before samples are collected. The flushed sample taken by WSD is not a "fully flushed

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sample". A fully flushed sample is defined as a sample taken after prolonged flushing of the tap in a premise. In practice, a fully flushed sample is one taken after flushing at least three plumbing volumes. See the Joint Research Centre of European Commission Scientific and Technical Reports, "Guidance on sampling and monitoring for lead in drinking water" (page 11, Section 3) a copy of which is now produced and shown to me and marked as "**Annex 1**".

6. For the purpose of quality monitoring of each stage of the water treatment processes and water leaving the treatment plant, sampling work is achieved by taking continuously flowing sample by WSD.

7. For the purpose of determining the cause of contamination of the distribution system or handling customer complaints, for example on discoloration of water quality, both unflushed and flushed samples before the water meter or at consumer taps will be taken by WSD for investigation to identify the source of the water quality problem.

8. For the purpose of assessing the effects of materials in contact with water on the water quality (chemical and biological), according to ISO5667-5:2006 section 6.4.1, if the effects of materials on water quality are being investigated, 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 water quality or the maximum likely effect. This sampling methodology is not routinely used by WSD given the specific nature of the purpose as the occasion arises. It is more commonly used in overseas countries, in the context and for the purposes addressed in paragraphs 19 to 33 of this witness statement.

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Checking of the quality of drinking water to ensure compliance with WHO Guidelines

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be mandatory limits. In order to define national standards, it is necessary to consider the context of local or national environmental, social, economic and cultural conditions. For lead, the provisional guideline value of WHO in its 2011 Guidelines was 10µg/litre.

12. Water sampling after flushing is the methodology commonly used for assessing compliance with health-based water quality targets which are normally based on chronic effects and apply to average concentrations in water consumed for extended periods.

13. On the other hand, test results from samples taken before flushing are only indicative of the quality of water upon standing in the water pipes or faucets for a period of time. They are not representative of the quality of water to be consumed by an individual on a routine or long term average basis. Samples taken after stagnation are not representative of the quality of water typically consumed by an individual and should not be used in reference to the WHO Guidelines. They rather represent the maximum concentrations to which the user can be exposed in the absence of any other water usage. The first draw sample after a long stagnation reflects the contribution of the faucet and immediate connecting piping which may not be the maximum concentration in the premise plumbing. Concentrations in the first draw can be very high if lead containing materials are present in the faucet and connecting piping. Results of first draw samples after extended stagnation cannot be considered representative of the average concentration of lead at the tap to which the consumer is exposed on a routine basis. (Please see paragraph 34-36 below for detailed illustration).

14. After the discovery of excess lead in drinking water, in order to address residents' health concerns, WSD has assisted the Housing Department ("HD") in relation to conducting water sampling tests for all public rental housing estates, to determine whether the lead content in drinking water complied with the WHO Guidelines¹.

¹ See the Press Releases dated 2 and 25 September 2015 and 18 November 2015 at Annex 2.

Given the purpose of the water sampling and testing in this context, WSD has followed ISO 5667-5:2006 to test for lead in flushed samples and compare the test results directly with WHO PGV for lead. Such flushed samples are the most consistent and representative reflections of the average quality of the water to be consumed on a routine basis. If first draw samples are taken, the test results will not be representative of the average quality of water routinely consumed for comparison against the WHO PGV for lead².

² A maximum allowable concentration of 0.1 mg/L (i.e. 100...

主席：Footnote 唔使讀，footnote 唔使讀。

陳樂信先生：好。

I'll omit footnote 2 in the statement.

15. For completeness,...

Continue on paragraph 15.

...it should be noted that the above water sampling and testing was distinct from the investigative work

of the WSD Task Force on Investigation of Excessive Lead Content in Drinking Water (see the Witness Statement of Mr WONG Chung-leung dated 26 October 2015), which purpose falls within (v) and (vi) as defined in paragraph 3 of this statement. The Task Force conducted a comprehensive investigation on the **cause of contamination (excess lead) of the distribution system and the effects of plumbing materials on drinking water quality**. The work of the Task Force was mainly based on sampling and testing of plumbing materials taken from the relevant estates instead of water sampling data.

Water sampling for lead testing in overseas countries

16. Currently, there is no single, universal or standard practice for taking water samples for lead testing throughout the world. Different countries adopt their own sampling procedures or practice in accordance with their specific objectives and regulatory contexts.

17. The collection of first draw samples from taps is usually practised in countries for lead testing in drinking water where lead pipes are present and are considered to be a primary source of exposure to lead at the tap. In general, these protocols are applied to single households with a lead service line. Such water sampling and testing usually serve specific purposes such as operational monitoring of the effectiveness of treatment and corrosion control of the lead plumbing systems e.g. orthophosphate dosing. However, the use of lead pipes has been banned in Hong Kong since 1938. As lead pipes are not in use in Hong Kong, these sampling protocols may not be best adapted to estimate representative concentrations of lead at the tap in large buildings in Hong Kong.

18. For reference, the sampling practices adopted in UK, USA, Canada, Japan, Australia and New Zealand are briefly outlined as follows.

United Kingdom

19. In the U.K. (England and Wales), where lead pipes had been in use until the 1970s, drinking water quality is regulated by the Water Supply (Water Quality) Regulations 2000. The Drinking Water Inspectorate ("DWI") states in its Guidance on the Implementation of the Water Supply (Water Quality) Regulations 2000 (as amended) in England that, for monitoring of copper, lead and nickel, "Samples for these parameters must always be taken at consumers' taps. The sampling point should be selected from the random sampling programme and the sample should be the first one litre of water drawn from the tap without flushing." (Annex 3).

20. According to the information provided by the United Kingdom DWI (Annex 4), there is no harmonisation with regard to sampling technique for lead across European Union member states. In the UK, regulatory compliance sampling of public supplies is carried out by the water companies. Samples are taken at consumers' properties, selected at random. Samples for lead must be first draw samples, that is, the sample comprises the first litre of water drawn from the tap before the tap is flushed in preparation for further samples to be taken.

21. If the first draw sample result exceeds 10µg/L, the water company should return to the property and take further samples, which would normally include a fully flushed sample and sometimes a 30-minute stagnation sample, to ascertain whether flushing the tap for two minutes or so reduces the lead level to below the limit. The company should also investigate the consumer's

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systems must follow to ensure control of lead through control of corrosivity of water (Annex 5). Under LCR, water samples are required to be collected from designated sites in water systems for lead testing. A one-litre "first draw" sample is collected for lead testing from a frequently used cold water tap with at least six hours' standing time without any water usage (see the "Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems" at Annex 6). The USEPA sets an action level of 0.015 mg/L (15 µg/L) for lead to assess whether further actions are required. This action level is considered by the USEPA as the lowest level to which water systems can reasonably be required to control lead in drinking water at customers' home taps given the technology and resources available. (Annex 7) Under the LCR, if more than 10% of tap samples exceeds the action level (i.e. if the 90th percentile level is greater than the action level), actions including optimizing the corrosion control programme, education of consumers etc. will be taken (Annex 5).

25. It is worth emphasising that the sampling method and corresponding action level of LCR are designed for the purpose of assessing the effectiveness of corrosion control in reducing lead in water, in a context where old lead pipes remain prevalent. It is not for the specific purpose of monitoring water quality for general compliance with WHO Guidelines, which is WSD's purpose (i) mentioned above.

Canada

26. The difference in sampling methodologies between compliance monitoring and corrosion control is helpfully illustrated by the sampling practice in Canada.

27. Lead monitoring in Canada varies across provinces that determine and enforce drinking water quality regulations. Health Canada issues non-binding general guidelines on lead monitoring. Significant differences exist in sampling methodologies prescribed by the provinces to determine compliance to the lead limit of 0.010 mg/L. Depending on the sampling protocol and corresponding action levels, additional investigative sampling and corrective actions are prescribed. The province of Québec has adopted a fully flushed (> 5 minutes) sampling protocol. Any sample exceeding 0.010 mg/L must be investigated. The province of Ontario has implemented the use of the first draw (2L) after 30 minutes stagnation with a compliance set on less than 10% of samples >0.010 mg/L. Health Canada has established a health-based maximum acceptable concentration ("**MAC**") of 0.010 mg/L (10 µg/L) for lead in its Guidelines for Canadian Drinking Water Quality. The Guidelines provide that "Because MAC for lead in drinking water is intended to apply to **average concentrations in distributed water**, sampling should be carried out on **flushed samples** at the point of consumption." (Annex 8)

28. According to the "Guidance on Controlling Corrosion in Drinking Water Distribution Systems" published by Health Canada, the tiered approach sampling protocol **for corrosion control** requires that "[a] **first-draw** 1-L sample is taken at the consumer's cold drinking water tap (without removing the aerator or screen) after the water has been stagnant for a minimum of 6h under Tier I sampling protocol." (Annex 9) When more than 10% of the sites have a lead concentration greater than 0.015 mg/L (lead action level) further actions including public education program(s) to encourage consumers to flush the water after a period

of stagnation and additional sampling in accordance with Tier 2 sampling protocol are required.

Japan

29. According to our understanding, the sampling protocol in Japan comprises the following steps: flushing for 5 minutes with flow rate of 5 litre/minute, then standing in pipes for 15 minutes, then flushing for undefined period of time before collecting a well mixed sample from the 5 litre sample with flow rate of 5 litre/minute for lead testing. A pictorial diagram is attached for reference at Annex 10.

Australia

30. The Australian Drinking Water Guidelines, 2011 ("ADWG") are primarily based on the WHO Guidelines. According to our understanding, lead service pipes are rarely used in Australian distribution systems and consumer premises. Sampling for compliance with ADWG is routinely undertaken within distribution systems. This can include collection of samples at property boundaries but generally does not include sampling within buildings. The sampling frequency varies depending on the size and complexity of drinking water systems. The major water utility in South Australia monitors lead on a quarterly basis by taking flushed sample as part of routine monitoring. Taps are normally flushed before collection of samples unless one is specifically looking for worst case results. Worst case results are only looked for during specific investigations and are not normally part of the process for monitoring of general health effects.

New Zealand

31. Lead service pipes are not commonly in use in New Zealand. According to the Guidelines for Drinking-water Quality Management for New Zealand 2013, elevated concentrations of metals of health concern caused by poor grade domestic plumbing, fittings or faulty installation are not covered in the Drinking-water Standards for New Zealand 2008 ("DWSNZ").

32. Because the softness of most New Zealand waters is associated with the leaching of metals such as lead from plumbing fittings, all drinking water supplies are assumed to be plumbosolvent. Plumbosolvent water is known to contain metals of health concern (e.g. lead, nickel, cadmium or antimony) in the first portion of water collected from the tap but occur at a much lower concentration after flushing the tap. For this reason, water designated as plumbosolvent do not have to be monitored for heavy metals. However, to reduce the intake of heavy metals by consumers, the DWSNZ require consumers receiving plumbosolvent water to be warned at least annually of this fact and advised to flush about 500 mL of water (about two standard glasses) from the tap each morning before drawing water for drinking.

33. According to our understanding, if a consumer tap water were to be tested for drinking water compliance, it would be collected after flushing, in order to eliminate confounding issues. If water samples are collected as part of a pipe/fitting investigation, such as the one conducted by the WSD Task Force, the samples would be both "first flush" and "post flush".

Limitations of first draw sample for representation of overall water quality

34. According to the Joint Research Centre ("JRC") of European Commission report (Annex 1), first draw

sample is defined as a sample that is taken first in the morning before the tap in the premise has been used for other purposes. During the stagnation period, no water should be drawn from any outlet within the property including toilet flushing. **If any water is drawn during the stagnation period, the test result of the samples will be invalid.**

35. There is also an alternative practice of taking random daytime ("RDT") sample in some countries including the UK and the Netherlands. As defined by the JRC report, RDT sample is a sample taken at a random time of a working day directly from the tap in a property without previous flushing. As the stagnation of water influences the concentration of lead and the length of stagnation period prior to sample collection is not specified, the test results of RDT sample may depend on randomness of sampling time and locations. The test results of RDT samples can be considered to provide results for statutory monitoring purposes at the system level if sufficient samples are taken. However, RDT sampling results are not adequate to evaluate the efficacy of treatment through repeated monitoring.

36. It must further be noted that first draw sampling has its limitations, even where the objective is to determine the "worst case" concentration. The following diagrams serve to show the salient difference of first draw sample and flushed sample. Within Hong Kong's unusually dense urban context, public rental housing estates consist of multi-storey buildings with different pipe configuration and long branch pipes. In this context, the one-litre first draw sample can represent only the quality of water in a section of about 3 metre pipe length. It does not represent the quality of water in the entire length of the water pipe and the worst water quality may exist in other parts of the plumbing system which cannot

be detected. To overcome the limitation of first draw sample, sequential or consecutive to establish a profile of lead contributions from the plumbing system such as the Tier 2 sampling protocol in Canada. On the other hand, flowing water taken in a flushed sample can have a certain degree of mixing in passing through the pipe, which can provide an average quality of water passing through the pipe for sampling at consumer taps.

There then follows two diagrams, one being a static first -draw sample from tap and then a flushed sample from tap.

37. According to "Water Distribution System Monitoring: A Practical Approach for Evaluating Drinking Water Quality" (2009, CRC Press) (an extract is at Annex 11), there are practical and scientific problems associated with first draw 1 litre sample as follows:

(i) The one litre water sample is intended to represent water in contact with a whole plumbing system. However, in regard to the typical pipe configurations of Hong Kong public rental housing, the first one litre from a kitchen faucet (i.e. stagnant part), may however not be representative of typical concentrations correspond to the worst water quality in the plumbing system.

(ii) The USEPA Lead and Copper Rule sampling protocol and control remedies (which recommends the one-litre first drawn sample method) focuses on uniform corrosion where lead and copper are assumed to be present in the water solely by reason of uniform corrosion. This is not a safe assumption where there multiple potential sources for the release of metal into water (i.e. sources other than uniform corrosion) have been

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identified in the water distribution system.

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38. In premise plumbing without a lead service line, the concentration of lead in first draw sample after extended stagnation usually does not persist throughout the volume of water and drop off very quickly. Thus, the test results of first draw sample are not considered representative of average water quality routinely consumed for compliance checking with WHO's provisional guideline value for lead.

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39. I confirm the contents of this Witness Statement to be true to the best of my knowledge, information and belief.

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Dated this 4th day of December 2015

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Mr Chan, you have been taken through these four document, four witness statements.

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答：我想話畀調查委員會聽，我現時已經係退咗休嘅總化驗師嚟嘅。咁我而家即係嗰個職務嗰度，我個 statement 個職務就同而家可能有啲唔同。

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陳樂信先生： Mr Chairman, I believe there are a small number of questions in-chief. What we were discussing between us, subject of course to Mr Chairman's directions, is that it may be more efficient if Mr Wong's asks about the statements because he will ask them directly in Chinese, and that will save a bit of time. If that's acceptable, can we proceed that way?

主席：Yes, that's fine.

王先生主問

問：好，早晨，陳先生。你可唔可以首先同委員會講講你個教育背景，即係你個 education background？

答：我嘅教育背景係喺 1979 年喺香港大學就擺咗 BSc 嘅學位嘅，係 major in Chemistry 嘅。喺 1992 年，我就再擺多個 Master in Science Environmental Management。我亦都有參加一啲專業嘅團體，例如係英國嘅 Royal Society of Chemistry，我係 member of Royal Society of Chemistry，係 Chartered Chemist。我亦都有喺 1991 年參加嗰個 Chartered Institution of Water--嗰個我哋叫 "CIWEM"，Chartered Institution of Water Manage--Water Management，我係 member，直至到我 2014 年 12 月 31 號，因為我準備退休，所以就再有參加呢個 CIWEM 嘅 member。仲有我就亦都有幫我哋嗰個 HOKLAS (Hong Kong of Laboratory Accreditation Scheme) 做一啲 part-time assessor，我做咗十幾年，exact 嘅 day 我就有喺手嘅。

問：好，唔該。你可唔可以同委員會解釋下關於你喺做 water sampling，即係水樣辦抽驗個經驗？

答：我喺水務署三十四年至三十五年嘅，咁我嘅工作主要係 waterworks chemist 所做嘅工作。Waterworks chemist 嘅工作係主要係同水質監控，同抽水辦都係有不可分割嘅連繫，所以我可以亦都話我有三十幾年抽水辦嘅--即係關於抽水辦嘅方法嘅經驗。

問：好，唔該。你同呢個 Water Science--即係喺你退休之前，同 Water Science Division 個關係係咩嘢？

答：我喺退休前係 Water Science Division 嘅總化驗師。

問：好。你可唔可以同我哋簡介下嗰個 Water Science Division 有幾多個員工，同埋有幾多人係負責個 R&D 嘅，同埋 R&D 個性質係乜嘢？

答：我哋 Water Science Division 就由一個 chief waterworks chemist 統領。我之下有五位嘅高級化驗師就協助我即係執行工作，咁呢五位化驗師，高級化驗師之下亦都二十個化驗師做唔同嘅工作。當中有九位就負責水質處理；就有三位負責水源管理；有一啲就負責世衛嗰啲咁嘅微量分析，或者係幅射監測；有一啲亦都係負責嗰啲即係水安全嘅計劃同埋嗰啲 planning 嘅工作。咁至於 technical staff 就有大概六十幾人，support staff 有四十幾人，總共人數大概係一百三十人嘅。

問：好，唔該你。跟住我就想向你請教下，關於嗰個世衛嗰個 10 微克個標準，我呢度就有兩個 specific 嘅問題，因為我就唔識，所以要請教你。第一，關於嗰個世衛嗰個 10 微克嘅標準，假設如果我朝頭早飲一啖水，第一個水係 25 個微克，中午嘅時候飲嗰個水係 5 微克，下午飲係 5 微克，夜晚飲都係 5 微克，咁嗰個平均值，嗰日飲嘅水，我可唔--即係我咁樣理解啱唔啱，就 10 微克，咁如果我從符合世衛飲用水安全嘅角度嚟講，如果我用平均數當日飲用嘅水，用我咁 layman 嘅睇法，是否符合世衛嘅標準？

答：如果你當日係咁樣飲法，計出嚟嘅話，你係應該符合標準嘅。但係我亦都想提醒世衛嗰個標準係基於一個而家已經係被撤回嘅 PTWI (Provisional Tolerable Weekly Intake)，呢一個係 25 微克，每公斤嘅人嘅 body weight。咁世衛呢個標準係基於呢一個 PTWI，就 with 50 個 per cent allocation to drinking water。咁 and then 係佢利用一個我哋叫做嬰兒，5 公斤嘅嬰兒，佢每日飲水 0.75 毫克--公升而計出嚟嘅每公升 10 個微克。所以如果你一個禮拜內用你嘅 body weight 去計，你每公斤 25 微克，如果我假定仍然嗰個 PTWI 即係係嗰個原本世衛嗰個準則值係基於呢一個方法定嘅，你係應該唔會超標。

問：好，唔該。我哋就有一個問題，就即係關於呢個世衛標準嗰個 application。有啲講法就我朝頭早起身嘅習慣就係先煲咗水，先飲咗水先嘅；有啲人可能係先刷牙洗面先，咁嗰個人嘅生活習慣對於呢個世衛呢個標準嘅食用性個影響係邊度，或者有冇影響？

答：據我所知，即係每一個人都有唔同嘅生活習慣或者用水習慣，咁好似你講話係咪有啲人係起身就即刻開水即刻飲，或者係咪有啲係即係走去沖涼或者刷牙洗面先，呢一個我就根據我哋而家水務署做緊一個全面水資源策略嘅顧問研究，其中有一項嘅住戶調查，就嗰個顧問公司就會隨機揀一千戶出嚟，就了解佢哋日常用水嘅習慣同埋態度，以及同埋對節約用水嘅意見嘅。咁直至到 2016 年 1 月 3 號，我哋同事就話畀我聽，就佢哋已經訪問咗大概三百四十八個用戶，咁接近九成半嘅人，受訪嘅住戶都係起身先用水洗面、洗手、刷牙或者沖涼先嘅，係極少數係即刻起身，就即刻煲水嘅。

問：好，唔該。我哋另外一個範圍就想問你嗰個--因為我哋好關於--市民都好關於嗰個 test，即係究竟係用頭啖水嚟做 test，抑或係做嗰個 flush to 3 minutes 嚟做 test。咁其中我哋一個好 legitimate 嘅關注點，就係話你 flush 咗 2 to 3 minutes 之後，你應唔應該行多一步，就係 after 你做咗世衛個 compliance 嗰個 flushing 之後，為咗香港市民用水嘅安心，再做多步，再擺嗰個 first draw 驗多一次。咁我就想請問你，從一個呢一方面嘅專家嚟講，如果已經做咗嗰個 flush for 2 to 3 minutes 之後，從科學上再多一次嗰個 first draw 個 sample，嗰個作用、功能係邊度？

答：或者我哋呢度同調查委員會介紹少少，喺抽水辦作為測試鉛嘅方法有幾種，唔係單一種嘅。第一種，我哋叫做 composite proportional sample，或者係叫做 proportional sampling；第二種--或者我介紹 proportional sampling 點解，就係喺嗰個住戶嘅屋企個水龍頭裝一啲特別嘅儀器，咁佢每一次用水攞嚟飲，佢嗰個水嗰個 water tap 出嚟嘅時候，佢會 teed 一部分出去嗰個 proportional sampler 嗰度，然後就 over 一個禮拜，然後攞嗰個 sample 走去驗，然後去決定佢係嗰個禮拜究竟有冇超過即係我哋 say 每公升 10 微克嘅標準嘅，呢一個係一個比較科學化，而好多時係作為 research 嘅安排，先至會用到呢個方法，因為佢要等一個禮拜，然後先攞去驗。

咁另外一種方法，就係我哋叫 fully flushed, fully flushed 嘅方法，就係嗰個水辦 after prolonged sampling for at least 三個 plumbing volume，你先攞嗰個水辦去驗嘅，呢個就係 fully flushed 嘅方法。

有另外一個方法，就係個 RDT 嘅方法，random daytime sampling，咁呢個 random daytime sampling 就係喺工作嘅日子、工作嘅時間，嗰個 water sampler 走去一個 property 嗰度攞

個水辦，佢就唔預先 flush，就即刻開水喉就攞，呢個就係叫做 random daytime sample。

咁仲有一種就叫做 fixed stagnation sample，咁 fixed stagnation sample 佢就係先 flush 咗個 system，即係 prolonged flushing 咗個 system，跟住就讓啲水停留喺啲個供水系統，say for 一個 certain period of time，例如係六個鐘頭，之後，佢先至去攞辦，呢一個叫做 fixed stagnation sample。

另外，最後呢種就好似你講，係 first-draw sample，呢個 sample 就係朝頭早乜都唔做之前，就攞嘅水辦嚟嘅，就佢完全喺中間係唔可以--即係譬如你去完洗手間洗手，開過個水喉都唔得嘅，呢個就係叫 first-draw sample，佢就係早晨第一件事要做嘅嘢，就係 first-draw sample。

咁我亦都想同委員會解釋，就係你啲個水喉出嚟嘅水嘅含鉛量，其實係好 variable 嘅，係好 depends on 一啲 factor，例如就係你係咩嘢物料，即係啲個 plumbing material。跟住就係你啲個 water composition，你個水啲個水質係乜嘢 composition，make in 個 pH、hardness，或者入面有冇啲 orthophosphate 啲啲咁嘅東西喺入面，啲個 water composition。

仲有一樣就係好緊要下嘅，就係啲個 consumer behaviour，啲個用戶究竟係幾經常用水，同埋用水係咪開盡水喉，即係佢啲個 flow rate，攞幾多水，呢啲咁嘅因素都會影響到啲個水辦，啲個食水含鉛量嘅。

所以如果我哋攞 first-draw sample，除非你個個人都係同時係即係攞 first-draw sample，即係咁多個單位一齊攞個 first-draw sample，先至可以有比較性，同埋可以 consistent，otherwise，你啲啲 result 根本唔可以好 objectively 咁樣 interpret 到究竟呢一個水辦係咪代表真係啲個供水系統裏面嘅含鉛量。所以我哋點解要攞一個 flush sample，我要 make sure 佢啲個水流過啲個 inside service 嘅時候，如果入面有啲乜嘢 confounding 嘅 factors，譬如佢入面可能有一啲 particulate 或者有啲污糟嘅嘢，佢都會帶咗出嚟，喺我哋啲個水辦裏面反映出嚟，咁我哋就當即係呢個水辦就係代表啲個用戶日常飲用嘅水質嘅。

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咁而你話如果我哋攞咗個 flush sample 之後，再去攞一個 first-draw sample，其實我覺得意義係不大嘅，因為亦都似乎唔係好合邏輯。即係譬如我話嗰個 flush sample 已經係合格，你走番去攞一個 first-draw sample，我當唔合格或者高過 10，跟住我又攞一個 flush sample，佢仍然係合格，呢個咁嘅動作，其實係唔會 change 到嗰個 conclusion of 嗰個嘅 testing，即係呢個係我嘅意見。

問：好。我最後一個問題想問你，你係負責幫水務署制訂個 WSP，係咪？

答：係。

問：所有分區嗰啲 WSP 就全部 report to 你，係咪？即係...

答：我要分清楚，WSP 係分咗三層嘅，最高嗰一層就係署長負責簽署，即係佢睇完之後，覺得呢個政策，呢個 practice 係 okay，咁署長負責 authorise 嘅。我哋呢啲總工程師或者係我哋總化驗師，即係只係負責嗰個第二層嘅，regional 嘅 WSP，同埋嗰個我哋叫做 divisional 嘅 WSP。第三層嗰啲就可能係嗰啲區嗰啲同事，即係個別單位嘅主管負責。我哋嗰個 WSP，其實係有即係制訂嘅時候，我哋係有一個 working group，即係因為要集思廣益，我唔能知道晒每一區，佢每一區個供水系統裏面有啲咩 hazards，呢個 risk 有幾大，所以我哋係需要有個即係集體嘅即係 contribution。

問：明白。我想問你，我哋知道個 WSP 就淨係去到 connection point，...

答：係。

問：...咁我想你，你當時喺制訂呢個 WSP 去到 connection point 嘅時候，有冇諗過將個 WSP 推到去 consumer...

主席：WSP 唔係淨係去到 connection point 嘅，因為你尋日--亦都睇過你個 general plan 嗰度係 goes beyond 你個 connection point 嘅。

王先生：嗰個係 by monitoring，嗰個係 by...

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主席：咁係咪 WSP，嗰個係咩嘢？

王先生：係，係。

主席：係囉。

問：我想問，即係我哋知道而家即係對 individual buildings 係冇具體制訂，或者有一個講法，就係話要水務署帶頭推動各個 building 自己製造或者係訂立一個 WSP，當時有冇考慮呢一個方向，同埋...

答：或者我講少少即係 WSP 嘅背景。即係嗰陣時喺 2003 年，我就代表水務署去參加世界衛生組織西太平洋地區嘅一個會議。咁呢個會議係計劃係推出呢個第三版嘅嗰每世界衛生組織《飲用水水質準則》，咁當中佢係首次引入嗰個 WSP 嘅 concept。就當中有好多國家嘅嗰啲代表都喺嗰度嘅，我就即係代表香港去參加呢個咁嘅會議，咁我問過嗰度當時嗰個 WHO 啲 consultant 嘅，咁我話「喂，點樣制訂 WSP？我哋完全冇經驗嘅。」佢嗰陣時就話「欸，你唔使驚，只要你而家日常做開嘅嘢，將啲 good practice 寫番出嚟，然後將佢即係制度化咗，同埋 document 咗，跟住你推行咁就得喇嘞，其實。」咁我後來亦都有參考過外國嘅 WSP...

主席：不如你直接答佢個問題，WSP building，佢實際上想問。

答：唔係，我都有關嘅，呢一個問題。我就睇過澳洲佢嗰個叫 framework for drinking water management，同埋紐西蘭嗰個我哋叫做--佢叫做 risk management plan，即係 in away 佢都係 WSP。仲有我睇過日本，最近日本嘅 WSP，佢哋嘅所有嘅 WSP 都係只係去到嗰個 distribution system，係唔會入去嗰個 consumer tap 裏面，因為佢嗰個 consumer tap 裏面嗰個即係 WSP，其實喺世衛 paragraph 6.9--或者 section 6.9 嗰度，佢講過就係嗰個 WSP typically 就係 outside 即係嗰個 water supplier 嗰個 role，water supplier 嗰個 WSP normally 係唔會 extend 去嗰個 building 嘅 WSP。

咁我亦都有睇過世衛嗰個即係建議，佢話對於譬如一啲大嘅 building，譬如 office、shopping mall，或者一啲特別嘅

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healthcare centre、醫院，佢哋建議佢呢啲係希望最好有 WSP。因為佢哋喺入面住嘅人、探訪嘅人，佢哋都有唔同嘅即係嗰個 vulnerabilities to 嗰個 water safety。咁譬如可能醫院，佢需要即係做 infection control，佢啲水可能話即係再處理，佢先至可以用得，因為我哋供應畀佢嘅水只係符合世衛嗰個《飲用水水質準則》。如果你要高啲要求嘅水，佢要另外再處理，咁佢先至再用，譬如醫院佢要愛嚟寫儀器或者內規鏡，佢用嗰啲佢要再 sterilise 啲水，佢先可以用。

另外一方面，嗰啲病房嗰啲可能...

主席：唔係，唔好，唔使講嗰啲。但係而家世衛 WSP 係有一個--有一份嘢叫做 WSP for Buildings 㗎嘛？

答：係，冇錯。

主席：係囉。

答：嗰個係 Water Safety in Buildings，嗰度有介紹...

主席：係囉，Water Safety in Buildings。

答：...嗰個即係唔同嘅 facilities，嗰啲 WSP 應該點樣做。

主席：唔係，不如你答咗佢個問題先。

答：唔。

主席：你仲未答嘅。

問：或者我再問多次，即係當年喺制訂個 WSP plan 嘅時候，你哋有冇考慮過由水務署牽頭要其他 buildings，都樓宇、醫院嗰啲推動、帶動佢哋走呢個 WSP？

答：我哋係有考慮過，但係我哋就會用一啲 supporting programme，好似世衛講 supporting programme 去幫嗰啲 buildings maintain 個 safety of 嗰個 drinking water。

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王先生：主席，我有其他問題。

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主席：唔該。不用我哋 take 個 break 先，好唔好？唔該。

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上午 11 時 13 分聆訊押後

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上午 11 時 39 分恢復聆訊

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出席人士如前。

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水務署第二證人：陳健民（水務署（總水務化驗師））宣誓繼續作供
石先生盤問

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問：陳先生，早晨，咁我代表委員會，我有啲問題想請教下嘅。首先，我想問一問你，就係有關水務署，你哋有個我叫做 connection point 嗰個 theory，因為水務署唔同嘅證人，包括閣下，喺你嘅證人供證裏面都多番強調，就係水務署嗰個 pledge 去符合世衛標準，就 up to connection point。

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答：係。

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問：咁水務署其中一個理由，就係 up to connection point，水務署就有全權控制到 up to connection point 嗰個系統，對嘛？

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答：對。

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問：Connection point 之後，就係嗰個 consumer 或者係個 agent 嘅責任。我想提一提醒你，你睇一睇你嘅證人供證第 6 段，第三份證人供詞第 6 段，10500 頁。C19.1，10500。你嗰度就係講到水務署 94、95 年就一個承諾，就係符合世衛標準，“up to the connection points”，“This pledge has been made practicable as WSD has full control over its waterworks as empowered under the WWO. On the other hand, as stipulated in the WWO, consumers and agents are responsible for the custody, maintenance and cleaning of the inside service within the lot boundary.” 你見到嘅？

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A 答：唔。

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D 問：好嘞，我想順帶我想你睇一睇，就係林正文先生，佢就係水務署--Mr
E Lam Ching Man，佢係水務署 Customer Services 嗰面嘅同事，
F 對嘛？我想你睇一睇佢嘅證人供詞，C19.5，13486 頁。C19.5，
G 13486，第 41 段。呢度 41 段，佢係講到水務署喺接駁--將水務署
H 嗰個 system 接駁到一個新建成嘅單位，或者新建成嘅大廈之前，驗
I 水嗰八個參數嗰個驗水，佢裏面就有一句就係話“The purpose of
the testing of water samples near the connection point
at this juncture was not for identifying the presence
of non-compliant materials in inside service as an end
product test but more to guard against contamination
to the government water supply by the inside service.”
你見到？

J 答：唔。

K 問：咁所以水務署喺發生呢個鉛水事件之前嘅取態，就係佢所緊張嘅，即
L 係用一個比較籠統啲講法，比較著緊嘅，就係喺佢自己嘅供水系統裏
M 面係咪可以符合到世衛嘅標準；第二，就係佢驗水都唔係為咗驗
N inside service 裏面有冇一啲唔合規格嘅物料，而係為咗保護番
O 水務署自己嘅系統，可唔可以咁講？

P 答：我要澄清一樣嘢，就係水務署除咗係保護自己個系統，亦都係保護緊
Q 市民嘅公共健康嘅，因為如果你嗰個新建成嗰個系統，如果你唔清洗
R 乾淨、消毒好，你有機會係會污染到嗰個成個 government system，
S 而令到好多人會即係受到嗰個 waterborne diseases 嘅影響，呢
T 個係一個最大嘅 public health risk from water supply point
U of view 嚟睇。

V 問：我明，我明。即係我唔係話你保護自己，就唔益人，即係保護到自己，
就直情影響到整體嘅即係其他受到水務署系統供水嘅單位。但係我嘅
問題嘅焦點，就係水務署呢一個取態，關於驗水，驗嗰八個參數，或
者頭先我所睇你嘅證人供詞裏面，所講話水務署嘅職權淨係包到 up
to connection point，即係整個取態其實就係 inside service
裏面嘅物料合規與否，唔係水務署一啲 test 或者工作嘅焦點，對嘛？

答：我哋水務署對於物料嘅監控，佢有一套佢嘅 regulatory mechanism
嘅，係通過水務條例去控制物料嘅使用嘅，係咪？

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問：唔。

答：所以我哋驗水嗰個目的，其實係想確保嗰啲新建成嘅內部供水系統係徹底咁樣清楚同埋消毒，呢個係我哋最主要嘅目的，我哋至於你話物料係咪符合嗰個要求，我哋係有水務條例同埋《水務設施條例》去管制嘅，呢個係 material control 嗰方面嘅工作。

問：好嘞，我而家同你睇 material control。水務條例底下，就有要求，我哋亦都睇過好多百次。

答：唔。

問：就係有關於要符合 British Standards 呢一個嘅要求，所用嘅物料，你記得，我唔使 show 嗰條條例畀你睇，waterworks regulations 嗰度。

答：對唔住，你嗰個 BS standards 唔係我嘅工作範圍之內嘅，係我另外一啲客戶服務嘅同事負責嘅。

問：我明白，所以我唔會叫你睇嗰個 actual standard，但係你都知道係有呢樣嘢嘅？

答：我知道有咁嘅條例，但係我唔知內容。

問：係，係，我唔會問你內容。但係你都籠統地係知道，就係相關嘅英國標準有關於焊料，佢會要求用一個級別叫做 lead-free 嘅 solder，你知道嘅？

答：係。

問：係咪呀？即係我哋唔使翻箱倒篋睇番嗰個 footnote 或者邊個表，你都知道有呢一個籠統嘅要求，對嘛？

答：係。

問：係。咁水務署就係去 administer 水務條例最終嘅公共嘅部門，對嘛？

答：我相信係。

問：係。咁當然可以係自己做，或者透過發牌畀 licensed plumber 去做，但係最終監管嘅機構都係 WSD，對嘛？

B

B

C

答：我諗執行水務條例，應該係水務署嘅責任嚟嘅。

C

D

問：係，好。水務署--水務條例底下就好多 form 嘅，好多文件嘅，你知道嘛？

D

E

答：唔知道。

E

F

問：WWO046 嗰啲咁嘅 form 嘅？

F

G

答：呢個唔係我嘅工作範圍之內。

G

H

問：Okay。即係你係比較叫做係科學性、技術性啲嗰一方面嘅，係咪呀？

H

I

答：係。

I

J

問：Okay。咁但係籠統地講，其實你知唔知道就係水務署喺今次嘅調查委員會嘅聆訊裏面提出咗有一個叫 stakeholder approach，你有聽過嘛？

J

K

答：我有聽過。

K

L

問：你有聽過。即係...

L

M

答：不過詳情我就唔係好清楚。

M

N

問：...亦都係唔係你嘅...

N

O

主席：唔係，對唔住，我想問一問，因為你係水質科學部嘅最頭頭，係咪？

O

P

答：係。

P

Q

主席：咁你就--即係我想 follow up 石大狀嘅問題，咁你就話你對 BS 嗰啲嘢--你知道有佢嘅存在，不過就唔係你嘅工作範圍，所以就基本上就唔知嘞，嗰啲嘢？

Q

R

R

S

答：係。

S

T

主席：如果係咁樣嘅話，因為我哋知道水務規例又好，水務條例又好，賦予呢個水務署都幾多權力係可以去檢查一啲用嘅物料嘅，換句話嚟

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講，呢啲檢查物料嘅，如果水務署真係要檢查物料嘅話，就完全係唔關你事嘅？

C

D

答：係我哋客戶服務部嗰啲同事會做嘅，呢樣嘢。

D

E

主席：唔係，你客戶服務部，譬如好簡單，佢去做，譬如佢去擺啲--譬如佢認為有個客戶服務部 consumer，「啊，你用嗰啲料，我懷疑係完全唔啱嘅，我而家要擺番去水務署驗。」就完全係唔關你事嘅？

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答：我哋目前係冇一啲測試嘅程序可以做到呢樣嘢嘅。

G

H

主席：得--唔係，即係係唔關你事嘅？

H

I

答：可以咁講。

I

J

主席：亦都有另外一個--水務署裏面有另外一個測試嘅部門嘅？

J

K

答：冇，冇。

K

L

主席：即係你個部門就純粹就驗水質嘅啫？

L

M

答：係嘞，水質監控。

M

N

主席：如果咁講，你喺水務署做咗三十幾年，咁過往嗰三十幾年都冇一個咁嘅部門個啫？

N

O

答：係呀，我哋未試過係驗，即係拆咗啲咁嘅部件返嚟話驗一啲咁嘅嘢嘅。

O

P

主席：係囉。咁即係如果咁講，你都未見過，係咪？

P

Q

答：可以咁講。

Q

R

主席：係囉，得。

R

S

問：係，因為我就係正想即係了解一下你嗰個職權，因為你係叫 chief chemist？

S

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答：係。

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問：即係 chemist 可以包括好多樣嘢，水質固然係包括--即係水質固然就係一個 chemist 要有興趣了解嘅嘢，水裏面有啲咩嘢化學物質。咁但係用料裏面有咩嘢化學物質，即係純粹我哋街外人望，就會唔會都係 chemist 要了解嘅呢咁，就你話畀我哋聽，根據水務署裏面嘅分工去了解或者研究或者去制訂，關於物料裏面所需要有一啲乜嘢即係唔准超過幾多 per cent 乜乜嘅化學物品，呢啲就唔係你嘅職權範圍裏面嘅，對嘛？

答：冇錯，係，對。

問：但係制訂或者決定要驗邊幾個參數，就係你有份參與制訂，對嘛？

答：係，嘅。

問：因為呢個係同水質有關，對嘛？

答：冇錯。

問：咁所以即係我確保我有啲問題可以攞咁唔問，或者有啲問題要跟進，所以我要 make sure 我明白你嘅職權包括乜嘢，唔包括乜嘢。剛才主席就問過你，就係唔單只係你本人，甚至乎水務署裏面係有一個分別嘅部門，或者有一個既定嘅程序係會有人去負責去抽樣去驗，無論係施工期間或者施工之後，用嘅物料有冇包含過量嘅某種化學物料，呢樣嘢係--唔好淨係講鉛，即係乜嘢都有嘅？

答：我哋冇做一啲 material testing 嘅，我哋主要係水質管制啲嘢。

問：唔。所以雖然喺水務條例裏面係有要求到符合英國標準，而英國標準裏面係有一啲嘅要求係包括某一啲化學物料唔能夠超越某種嘅極限，就水務署裏面係有一個程序係去 monitor，或者佢自己去了解，或者去即係令自己安心嘅一啲科技嘅 testing 係冇嘅？

答：我哋嘅工作冇包呢啲嘢。

問：冇嘅。咁所以關於去所謂嘅源頭，因為我睇番你遲啲有講，就係操控水裏面應唔應該有某種超標嘅物料，有陣時我睇番你--一陣間我都會問你，就係唔好用 water sampling 嘅辦法，喺源頭嗰度做就比較好啲，咁呢個係你曾經講過㗎嘛？

答：係。

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問：係。好嘞，源頭做，即係基本上就係用條例或者用標準去確保唔好喺一開始用咗啲錯嘅物料，好過你事後要走去抽水驗，...

答：係。

問：...呢個就係嗰個取態咁嘛。係，但係源頭嗰度，水務署就係冇一啲嘅 test 去 test 源頭嘅物料嘅，對嘛？

答：我就知道佢有個 regulatory mechanism 嘅，但係至於...

問：就係靠 LP，係咪呀？

答：係，LP、AP，即係我聽番嚟嘅呢個，唔係我 personal knowledge 嚟嘅。

問：係。

答：咁同埋佢哋有一啲物料要引入嘅時候，佢會拎去--即係要求嗰個申請者拎去出面嗰啲 laboratory 做我哋叫做 type testing 嗰啲咁嘅嘢，然後將嗰啲 certificate 畀番水務署嚟審批嘅。

問：一啲物料嘅引入，即係話舉個例，你如果唔熟行，或者唔係你個範疇話畀我聽，我問第二個。

答：Okay，嘎。

問：即係你話有啲物料要引入，你就會要求佢 show 一啲嘅 testing 嘅文件畀你，嘅意思係咪--即係舉個例，如果佢哋喺施工前，佢哋要 submit 一啲施工所用嘅物料有個清單，咁如果佢引入一啲之前水務署可能未曾 approve 過嘅一啲新牌子或者新嘅品種，佢就要說服水務署呢樣料係 okay 嘅，咁佢就要畀啲即係化學嘅證明文件畀水務署睇，係咪籠統係咁樣呢？

答：我諗籠統可以咁講，但係我唔可以--即係我唔知道嗰個 details 嘅。

問：唔係你嘅範疇，唔緊要，唔緊要，得，好。總之就係即係物料係唔關你事嘅？

答：係。

問：好。咁即係話關於啲 form，WVO046、1005，呢啲冧巴亦都唔係你

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嘅工作嘅範疇裏面嘅？

答：係，係。

問：好，我即係咁可以減省咗好多工夫。我想睇一睇--我想請你睇一睇有一份文件，就係 C4，tab 41，3256 頁。3256，解釋下畀你聽先，呢個就係水務署佢嘅--一個大廈通知水務署話「我完工嘞，你嚟驗下我哋個供水系統係咪符合一啲嘅要求。」咁嘅時候，就會一啲咁樣嘅 checklist 去剔嘅，呢一個就係 Mr Lam Ching Man 佢嘅個證人供詞裏面就列舉過出嚟，即係一個證物嚟嘅。我想問一問你，就係呢一個亦都唔係你嘅即係工作嘅範圍裏面會見到嘅嘢，係咪呀？

答：係。

問：Okay，我諗即係話我應該係問佢。因為點解呢，我哋見到喺 3257 裏面，第 8 項，佢嗰度寫住 “Partially Completed Works - Materials of Pipe and Pipe Jointing”，咁佢就即係似乎嗰個 inspection 就包括埋嗰個 jointing 嘅物料，咁所以我想就係了解下，即係所謂佢呢個清單嘅意義，嗰個 materials of pipe jointing，咁實際上係驗乜嘢嘅呢，咁呢個亦都唔係你嘅職權？

答：唔係我，嘎。

問：好，得，咁我亦都都可以攞番埋先。咁我而家就想問一問你，就係關於你嘅證人供詞裏面係關於一啲 sampling，抽水辦去驗嘅一啲即係例子嘅。我想你睇睇第 21 頁，你嘅證人供詞，第三份證人供詞，第 21 頁。你裏面就講到，就係水務署有一個即係好 extensive 嘅水質控制嘅系統，咁就有好多唔同嘅一啲即係化學或者生物、細菌上，或者呢個放射性嘅一啲測試嘅。

答：唔。

問：你裏面有提到，就係每年係驗有超過十六萬個 sample，係 “throughout the entire water supply system”，okay？呢個十六萬呢個數目字，就我睇番啲即係聆訊嘅謄本，就係林署長我哋之前都有問過佢，呢十六萬就係平均一個數值嚟嘅，係咪呀？會係 every year，咁係大約嘅？

答：係，呢個約莫嘅數值。

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問：約莫嘅數值。咁呢個十六萬就係包括咗邊啲地方裏面所驗嘅水辦嚟嘅呢？

答：呢十六萬嘅樣辦係由成個供水系統入面抽取嘅，咁成個供水系統就包括咗水源、食水處理過程、分配系統，同埋 consumer test，即係呢幾部分組成嘅，十六萬個樣辦。當中譬如話水源嗰面，我哋有水塘、閘水區同埋有嗰個東江水嘅供應嗰個水樣辦嘅。

問：唔。

答：咁就食水處理過程，我哋...

問：停一停先。

答：唔。

問：停一停先。我知道就係即係參觀濾水廠或者即係我哋睇證人供詞，就會知道就係有一啲水質嘅監控嘅步驟，就係唔 involve 抽一個樣辦出嚟嘅？

答：係。

問：譬如話我記得就係有啲用條魚，zebrafish 嗰 part，咁嗰 part 就唔係要抽個辦出嚟，嗰 part 就直情係啲魚喺一個塘裏面，如果佢有啲咩嘢特殊嘅反應就知道有事，咁樣嗰個就唔關事，因為嗰啲係 constant monitoring，嗰啲就唔係抽水辦嘅事情嚟嘅，對嘛？

答：係，嗰啲我哋叫做 continuous online monitoring 嘅，嗰啲係唔計落嗰個...

問：係嘞，嗰啲 continuous online monitoring 就唔算數嘅，...

答：唔算數。

問：...因為你唔係抽咗個辦出嚟嘅？

答：同意。

問：咁所以一年十六萬呢個就係由東江水可能係抽一、兩個出嚟，就驗一啲特定嘅 parameter，咁跟住到到你可能喺個水塘裏面臨到離開 treatment plant，咁就可能又抽一、兩個辦出嚟，又驗另外一啲

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parameter，係唔同喺 stages，喺唔同階段都會抽出嚟，係咪咁嘅意思？

答：係，嘅。

問：呢個就係包含 before connecting point 同埋 after connecting point 嘅，對嘛？

答：係。

問：但係我想知道，就係你話包括埋會喺個水喉嗰度，咁呢啲就係 random 抽嘅，係咪全部都會係？

答：係，冇錯。

問：Random 嘅。你睇番第 41 段，“treated water samples are taken at scheduled frequencies from 40 strategic fixed points including a combination of 10 service reservoirs, 3 cross harbor mains, 9 accessible connection points and 18 fixed consumer taps”諸如此類，呢一啲咁樣嘅 treated water samples 擺嚟試，都係包含咗喺你嗰十六萬裏面嘅，係咪呀？

答：冇錯。

問：你 2014 至 2015，你話“more than 250 pairs of treated water samples were taken from water treatment works on the monthly basis”，點解係用一啤一啤嚟到去計嘍，250 pairs？

答：因為係有啲測試重金屬，我哋有十一個重金屬係要用一個水辦，另外水銀就需要因為用唔同嘅方法，就要用另外一個水辦，所以我哋係做重金屬係一啤啤咁擺嘅。

問：你有十二種金屬要 test，係咪？

答：冇錯。

問：呢個如果我有理解錯誤，或者我有記錯，就係可能喺個濾水廠裏面就經過晒啲濾水過程，可能就會 random 咁樣去抽一啲嘅水辦出嚟，就睇下有冇即係唔同嘅重金屬，嗰十二種裏面，咁走去測試，對嘛？

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答：我呢個 treated water，即係話離開水廠嗰陣時，即係已經處理好晒。

問：係囉，係囉，經歷晒啲啲即係過濾嘅階段嘞？

答：即係我哋嘅 end product。

問：係，嘎，嘎，嘎。咁就喺裏面就 random 咁樣抽一啲辦出嚟...

答：唔係 random，應該係 fixed point 嘅，呢啲即係離開水廠，即係出水嗰個點。

問：係，我明。Random 嘅意思係時間上嘅 random？

答：時間上我哋有 scheduled frequencies。

問：有 schedule 嘅？

答：嘎。

問：Okay，得。

答：譬如好似重金屬，我哋係一個月做一次嘅，嗰個濾水廠啲啲。

問：得。就會有驗包括鉛嘅？

答：冇錯。

問：咁就你頭先講話有一啤一啤，但係即係我想你再--呢個未必係好緊要，但係我即係都係想了解一下，點解係一啤一啤呢？因為你話有十二種，有十一種就係一種驗法，水銀 (mercury) 就係另外一種驗法？

答：係，冇錯。

問：咁我每種 sample 擺一種咪得囉，咁點解要擺一啤？

答：唔係，我哋擺一樽水辦，嗰度已經可以驗晒十一種嘅重金屬，我諗你都參觀過我哋嗰個 ICPMS 嗰度，一個 scan 已經做晒嗰十二個...

問：哦，我明，擺一啤嘅意思係因為其中一樽就係要嚟做十一種，另外嗰樽可能要嚟做水銀，係咪你嘅意思？

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答：冇錯，係。

問：得，我明白，唔該。亦都係有關於即係化學嘅一個問題，就係不過我聽你講你嘅職權範圍都未必關你事，但係我想確保即係我有理解錯誤，就係你知道--頭先我亦都問過，就係水務條例裏面有講一啲關於建築物料裏面用英國標準嘅要求。咁你個人嘅認知，你知唔知道喺2001、2002年左近，房署佢哋係有一啲研究，好似有一啲 session 有啲討論，就係關於公營嘅房屋，佢哋係將水喉用嘅物料係嘗試去探討係容許去用銅喉，咁引申出一啲嘅技術嘅討論，譬如話要 revise 一啲 specification 咁樣，亦都可能會有 consult 過，或者 involve 過水務署嘅同事去參加討論或者去 comment 下，如果轉咗銅喉，有啲乜嘢嘅意見咁樣。呢一 part 你有冇個人嘅認知，或者有冇參與？

答：我哋 Water Science Division 係有參與呢啲工作。

問：我都理解，因為如果聽個名就係 Water Science 純粹即係水嘅啫，好。End product 頭先你所講，就會去驗一啲重金屬嘅 presence，包括鉛？

答：係。

問：咁我想知道嘅就係點解要驗鉛呢？

答：因為我哋要 verify 嗰個 treated water 係 in complies with WHO 嗰個 2011 嘅 Guidelines for Drinking-water Quality。

問：唔。

答：如果你唔驗嘅話，你點可以話你自己 compliant？

問：咁但係你驗完，我哋唔好講其他嘅物料，我哋講鉛，鉛其實我哋都知道喺食水系統裏面--如果你想睇詳細嘅資料，我可以同你去睇。喺食水系統裏面，鉛最大可能出現嘅地方，就係嗰啲 plumbing system，你理解嘛？

答：我亦都要解釋一下，就係如果即係嗰個鉛水收集嘅地方，嗰度附近有一啲 mining 嘅 activities，亦都有機會有鉛釋出嘅，所以我哋要成個供水系統即係睇，嗰個鉛究竟即係個 source water 有冇，treatment process 可唔可以 remove 鉛，treated water 有冇

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鉛，係咪符合世衛嘅標準，係整體嚟睇，而唔係 single out 即係一啲--某啲 sample，淨係睇嗰度得嘞，唔睇前面。

問：唔。即係話你哋水務署喺 end product 嗰度決定抽驗邊幾種金屬，就唔係話基於一個所謂 metal-by-metal 嘅風險分析，就話鉛我哋考慮過，其實一般嚟講多數係 plumbing system 裏面有，所以未必需要喺個 treatment plant 裏面驗，咁就唔係基於一個咁樣嘅 metal-by-metal 嘅分析，對嘛？

答：我或者要解釋一下，我哋 treated water 嘅 analysis 嘅目的，係一個 verification monitoring in complies with 嗰個 WHO 嘅 guidelines 嘅。

問：唔。

答：所以 WHO 有啲乜嘢嘢，我哋就全部會 check 晒，...

問：我明。

答：...so that 你係即係 ensure 嗰個 Water Safety Plan 係 working properly，同埋所有 risk 係 under control 嘅。

問：唔。即係唔係 tailor-made for 某種嘅金屬，...

答：唔係。

問：...呢種金屬特別要留意咁做，而係因為總之世衛嗰個標準裏面有一排咁樣嘅金屬嘅清單，咁所以你就做咗去咁解嘅啫？

答：係，嘅。

問：好。咁我哋而家就講到嗰八個參數，嗰八個參數，即係話驗水嘅時候嗰八個參數，呢八個參數就 tailor-made，對嘛？就唔係因為基於世衛有啲咩嘢，...

答：係。

問：...因為呢八個參數就係我哋都了解，就係喺個供水點嗰度，就係即係我哋叫做以防倒流，而 devise 出嚟嘅一套參數嘅 test，呢個就同世衛有關嘅，對嘛？

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答：係。

問：好。我哋睇番你嘅證人供詞第 49 段，第三份證人供詞。你嘅第三份證人供詞，第 49 段，你嗰度就可能要更改下，因為你嘅第三份證人供詞係有兩個 49 段嘅。我係講第二個 49 段，你裏面就解釋咗就係八個參數，同埋解釋點解係嗰八個參數，亦都解釋點解有鉛。我想睇睇第 52 段。第 52 段嗰度，你就有解釋過，就係 pH 嗰個問題，你就講就係香港嘅水係 soft water？

答：係。

問：咁你就提到，就係香港嘅水嗰個酸鹼度係調校到 8.2 至 8.8，就偏向鹼性，對嘛？以我有限嘅化學知識。

答：唔。

問：偏向鹼性。要嚟 reduce corrosivity，就係確保佢冇咁大嘅侵蝕性，因為如果有酸性，我嘅理解就會同金屬就會有化學作用。其實鹼性都會有嘅，係咪呀？

答：鹼性嘅機會係細啲嘅。

問：細啲，好。酸性就會有，以我嘅即係記憶就會。

答：因為好多 solubility 係 depend of 嗰啲咁嘅 chemical compound，depends on pH。

問：咁所以你呢個 52 段所講，就係以香港嘅水質喺濾水廠裏面出嚟，就已經係偏向鹼性，個目的就係令到就算喺輸水系統裏面出咗街之後，有啲唔應該存在嘅金屬，例如鉛都好，由於水嘅酸鹼度係偏向鹼性，咁侵蝕或者係同嗰啲唔應該存在嘅金屬發生作用，令到佢釋出嘅機會就會細啲，對嘛？

答：係。我哋將個 pH 調教到 8.2 至 8.8，目的除咗保護我哋自己嘅供水系統，亦都保護即係客戶嗰個供水系統。

問：就係 in case 其中一個客戶嘅供水系統裏面有一啲唔應該存在嘅金屬，譬如話鉛，咁由於你酸鹼度係偏向鹼性，產生化學作用，令到鉛釋出，進入食水嘅機會相對會減少咗，對嘛？

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答：我諗應該係話我哋即係嗰個酸鹼度係會令到嗰啲重金屬冇咁--或者係可以 leachable 出嚟嘅嘢，冇咁容易 leach 出嚟。

問：就叫做 reduced plumbosolvency，係咪呀？即係令到佢--即係總之啲鉛...

答：係。

問：...冇咁容易與啲水發生化學作用，就 dissolve in 啲水，對嘛？

答：係，係。

問：得。咁但係我哋而家就知道，即係發生咗咁多事之後，我哋就知道就係原來係用咗一啲含鉛嘅焊料喺啲喉管度，就結果都有鉛釋出咗，進入咗食水，咁係咪表示其實用咗相對偏向鹼性嘅水分，其實都未必真係可以完全杜絕喉管裏面如果係有重金屬嘅話，釋出呢個可能？

答：我或者要解釋少少，如果我哋嘅 pH，呢啲水係我哋叫做微酸性，就譬如 pH 係...

問：即係低過 7。

答：...係 6.5，佢嗰個譬如 lead 嘅 compound 嘅 solubility，可能佢去到 100 個 micrograms per litre。如果我哋將嗰啲水嘅 pH 調校到 say 8.5，佢嘅嗰個 solubility 已經係可以減低十倍，去到 10 個 micrograms per litre。所以我哋調節嗰個食水嘅酸鹼度，目的係減少佢嘅腐蝕性，令到 leach 出嚟嘅嘢係 minimum。

問：而唔係令到佢完全唔 leach？

答：我諗冇乜可能應該係。

問：冇乜可能你覺得。即係所以其實你講就係話如果個 pH 係低番少少嘅話，鉛水事件所釋出嘅鉛係可能仲多？

答：仲多，係。

問：係咁解，得。你嘅第 52 段下面，你就有講到就係“if the materials used in the inside service are in compliance with BS specifications, it is expected that the risk of heavy

metals (including lead) leaching from the materials into the treated water (with the said set pH value) should be low and should pose minimal threat to water quality. According to 3/3/2 of WHO's publication 'Chemical Safety of Drinking-water: Assessing Priorities for Risk Management', it suggests that, unless there is strong evidence, inclusion of those chemicals in drinking-water monitoring programmes is not justified." 跟住你就喺附件 4 就提供咗嗰份嘅文件。

跟住你就話 "In any event, the document ... advocates, that the approach to monitoring and management is preferably through control of materials. Contamination caused by poor quality materials is best controlled through applying specifications governing the composition of the materials ..." 我哋停一停先。呢度就係我頭先同你探討過，就係即係水務署嗰個哲學就係喺個根源嗰度著手，就係透過去控制供水系統嘅物質，就覺得係好過喺最後嗰度嗰啲水辦嗰度抽驗，嚟到去即係睇下水裏面有冇啲唔應該存在嘅重金屬，係咪？呢個就係水務署嗰個哲學，嗰個 philosophy，對嘛？

好嘞，我想同你去睇一睇，就你引用嗰個世衛嗰個 "Chemical safety of drinking-water" 嗰個文件。你睇一睇 C19.1，第 10581 頁。

你睇睇首先就係 10581，2.4.4，嗰度就係講鉛。 "The presence of lead in drinking-water can cause server health effects and is primarily consequence of the use of lead plumbing and lead-containing metal fittings in buildings. Although lead may be present in source waters, this is unusual except in some mining areas. Generally, lead is not a high priority for routine monitoring programmes because of the variability from building to building, but possible risks posed by lead in drinking-water should be assessed in localities where lead has been extensively used in plumbing materials, particularly if the water supplied is corrosive or is likely to dissolve lead."

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咁呢一個係你有考慮過嘅其中一點嚟，係咪？關於呢一點，呢一度講過有關鉛嗰個特性，同埋佢呢度有提過就係 not a high priority，你係咪即係倚賴呢一點嚟到或者係即係 rely on 呢一點作為你其中一個理據？

答：我哋唔係完全 rely on 呢一點，我哋亦都係 base on 我哋嘅過去嘅 monitoring data，同埋我哋有一個 regulatory mechanism in place，所以我哋覺得呢個風險係會係較低嘅呢個，所以我哋係唔會--即係喺鉛水事件發生之前，喺嗰個八個參數，係並冇加入呢啲重金屬。

問：我明，即係我對你公道，所以我睇勻咗呢一份嘢，有關講 lead 嘅，我都 extract 咗出嚟，即係我梗係唔係話你純粹淨係一句嘢。

答：係。

問：就頭先嗰度有講過鉛，咁佢有講過唔係一個 high priority，...

答：係。

問：...咁你會都認為呢一個係與水務署嗰個理解係相符，對嘛？

答：呢個係佢建議我哋亦都--即係唔係話一定認同，但係我哋有我哋嘅 monitoring strategy 其實。

問：好。好嘞，...

答：我...

問：...sorry，你繼續講。

答：即係唔係話我哋 base on 呢句嘢，我哋就唔做任何嘢。

問：得。你睇睇 3.3.2。3.3.2，係 10589 頁，呢度就係你嘅證人供詞裏面所直接引述嗰 part 嚟嘅，3.3.2。即係呢個係你個詞人供詞裏面直接有引述。

答：係。

問：呢一 part 喇，呢一 part 就唔係淨係講鉛，呢一 part 就係即係籠統嚟講，籠統嚟講，呢一 part 3.3.2，你睇番喺中間嗰度，啱啱喺

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3.3.3 頂個度，佢就話“Unless there is strong evidence that particular chemicals are currently found or will be found in the near future, at levels that may compromise the health of a significant proportion of the population, the inclusion of those chemicals in drinking-water monitoring programmes is not justified, particularly where resources are limited. It is often more effective to maintain an ongoing programme of pollution control and risk assessment in the catchment.” 呢度就係你所講嘅 3.3.2 個個哲學，...

答：係。

問：...對嘛？好，我想再同你睇睇 10642。10642 頁，中間個度，“Lead can also be present if lead solder is used in the installation of copper piping. A control measure in this case would normally be to avoid the use of lead solders for applications involving drinking-water.” 你見到，係咪？見唔見到 10642？

答：係，見到。

問：喺 8.5 對上兩段咁樣，你見到嘛？

答：係，見到。

問：“Lead can also be present”你見到喇？

答：唔。

問：咁所以你繼續睇落去，就係 PVC plastic pipe is also widely used in distribution systems. Lead has been used as a stabilizer in unplasticized PVC pipe”諸如此類。咁就喺 PVC pipe 呢一個 content，呢一段最尾就有一句，就係“chemical monitoring of drinking-water is not normally considered to be appropriate and the most suitable method of management is by product specification, as indicated above for other materials.”雖然呢一度就係喺講 PVC pipe 嘅 context 講，咁但係呢一段佢所強調嘅都係唔提議係用水嘅--即係抽水去 monitor，而係喺個源頭個度控制用嘅物料，

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係咪呀，你見到嘛？

答：見到。

問：最後我想你睇睇 698, 10698。最底嗰度“Lead”，“Lead is widely dispersed in the environment, occurring in a variety of sedimentary rocks, and in felsic igneous and metamorphic rocks”諸如此類。跟住最底嗰度，“When found in drinking-water, lead usually arises from lead pipes and lead solder, mostly from plumbing in buildings. Monitoring is quite difficult and requires samples to be taken at the tap. Assessing the presence of lead pipes, or the ability of the water to dissolve lead, are the most appropriate management approaches. Monitoring is only considered if significant resources are available.” 咁你見到呢一段？

答：係，見到。

問：你係咪認為剛才我讀畀你嗰啲段落，其實都係與水務署嘅哲學係符合嘅呢？

答：基本上係即係同我哋嘅說法係一致，咁我亦都想石大狀睇睇嗰個 bundle 嗰個 WHO 嗰個 C2/1347。

問：呢個係世衛嗰個 guideline，係咪？

答：世衛 WHO 2011。

問：係，得，係。

答：你頭先講嗰本，呢本嘢係一啲 supporting document 嚟嘅。

問：係，得，搵到，係。

答：咁個世衛 8.5.4 嗰度，“Chemicals used in water treatment or from materials in contact with drinking-water...”

問：1347，係咪你講？

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答：1347。

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問：係，係，請講。

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答：咁有一度佢提到，“Other chemicals”喺中間度。

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問：係，我見到，“such as lead or copper”，係。

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問：係。

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答：咁就一路講，再隔一段，即係唔睇中間嗰個“Some chemicals used in water treatment (e.g. aluminium)”嗰度唔睇。“Many of these additives, both direct and indirect or unintentional, are components of processes for producing safe drinking-water. The approach to monitoring and management is preferably through control of the material or chemical.” 咁呢度亦都係即係話畀調查委員會聽，即係點解我哋係 rely on material control rather than on 一個 end product testing。

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問：但係凡此種種都係基於一個假設，就係 material control 呢一個做法係有效，對嘛？

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答：我哋要相信呢個制度。

N

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問：係嘞，即係如果呢個假設，即係話如果 material control，即係基本上嘅諗法就係喺個水喉嗰度抽水去 monitor，就可能係資源上有問題，同埋即係 resource 嘅問題可能，係咪呢個係一個考慮？

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答：我哋要 balance 嗰個 cost 同 benefit。你可以抽好多水辦驗好多嘢，但係你係咪攤到嗰個 proportional 嘅 benefit，我哋要考慮呢樣嘢，資源唔係無限嘅因為，所以我哋喺設計我哋嘅 water sampling 同埋 testing，係要考慮呢個實際嘅問題。

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問：其中一個要考慮嘅，就係嗰個 alternative，嗰個另外嗰個監控，即係話喺個源頭嗰度控制所用嘅物料，係咪一個有效嘅監控？

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答：呢個我唔能夠答到你係咪有效，我相信係有效。

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問：我明，你相信有效，但係即係我想--我明白，因為物料監控嗰 part 就唔係你負責，因為你淨係負責個水嘅樣辦。咁但係即係整個理論就係如果喺個物料監控嗰度 break down 左嘅話，咁你個假設就唔成立，對嘛？

答：係，直至到今次鉛水事件出現，我哋原來知道呢個制度會有甩轆。

問：係，即係甩轆又好，認知不足又好，或者之前即係種種--我哋唔好用咩嘢形容詞，總之就係如果呢個假設，即係話你物料監控嗰度，你以為佢監控到，但係原來係冇人監控嘅話，咁就會引致到而家即係出現左個問題。因為之前就冇人監控，後面又冇人把關，咁就係...

答：我諗唔能夠話冇人監控，因為你始終有一個 LP 同 AP 嘅制度喺度，...

問：監控失衡，我咁講。

答：...咁你...

問：係，我哋叫做監控失衡，好唔好？

答：係嘞，我哋要相信有 LP 同 AP 啲人係會睇住呢個咁嘅物料使用嗰啲咁嘅嘢，我哋唔能夠話唔信嗰啲專業人士喺度睇緊呢啲嘢，而我哋要做多一層，我哋又要即係再 super in post on 佢哋個 operation 其實。

問：但係如果假設你信錯咗佢，或者原來佢反而信番你，總之凡此種種嘅原因，呢個假設係失效嘅話，咁就你唔用呢個所謂後來用抽水辦嘅呢一個 approach，亦都我可以咁講，叫做 invalidated 咗，同唔同意？

答：係，而家我哋喺鉛水事件之後，我哋而家加入咗四種重金屬已經。因為我哋知道個 risk 已經唔係好似我哋以前諗，即係咁低而家。

問：你喺鉛水事件之後，你就話驗多咗四種重金屬，咁呢一個就係喺你嘅詞人供詞裏面都有講過，2015 年之後就係驗多四種，就係 connecting point 同埋 inside service 都有驗，對嘛？

答：係。

問：好嘞，我一陣間會同你睇一睇即係而家新驗之後嘅情況，但係你等等

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先。但係我哋講番之前，即係話鉛水事件發生之前，我哋淨係驗嗰八個參數，就因為我想知道中間嗰個，頭先你用「甩轆」呢個詞語，咁或者我想知道其實中間有啲咩嘢做咗會冇事呢咁樣？之前我哋喺 connecting point，就應該喺地底，即係你未封蓋之前，我哋叫做，就會喺嗰度就抽一個水辦出嚟，就驗八個參數，對嘛？

答：係，係。

問：即係籠統啲咁講。

答：嘎，嘎。

問：因為個 connecting point 喺地底，對嘛？

答：係，啱。

問：咁就有個蓋咁扭住，咁於是就你會係嗰度有個打開個蓋，就喺嗰度下面個管抽...

答：唔係蓋，應該係佢未壅泥之前，佢喺...

問：係，我明，我明。

答：...個地下。

問：喺地下。即係我用蓋嘅意思，我唔係話一個 manhole 咁樣，即係總之你未扭，未封頂之前，就喺嗰度就最近 connecting point 嘅地方，就抽一個水辦出嚟，就驗八個參數？

答：啱。

問：咁所以嗰度其實係驗唔到 inside service 裏面嘅水質，對嘛？

答：嗰度唔係諗住驗 inside service。

問：我明，我明。因為我哋之前睇過啲圖，但係我諗都唔使圖，因為你喺地底，然後就泵咗上去...

答：Roof tank。

問：Roof tank，即係你直上 roof tank，roof tank 就再向下落，

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vertically 向下落，跟住就會打橫一支支咁樣，喺每一層就出去，對嘛？

答：對。

問：我哋而家就發現出問題嘅就唔係上去嗰程，對嘛？你知唔知道即係而家用咗含鉛焊料嘅唔係泵上去嗰一條喉管？

答：根據我哋喺房屋署做嗰啲水辦，咁我見到嗰個 roof tank 係搵唔到鉛，同埋佢 sump tank 亦都搵唔到鉛。

問：係。咁所以用含鉛焊料嘅過錯，可以咁講，就唔在於泵上去嗰條 up-link 嗰條喉，可唔可以咁講？

答：據我自己個人嘅了解，就用水喉，佢多數唔會用銅喉或者咩嘢，佢多數用一啲我哋叫做 ductile iron。

問：ductile iron，DI pipe。咁所以就即係用咗含鉛焊料係唔關上去嗰程事？

答：佢應該唔需要用含鉛焊料去燒焊。

問：係嘞，係嘞，冇錯。咁所以就可唔可以咁講，就係用番之前水務署驗水嗰個哲學，即係淨係驗 connecting point 嗰度，就算嗰下驗埋鉛係冇用，係 detect 唔到我哋而家發現原來鉛水事件嗰啲含鉛嘅部件，同唔同意？

答：我而家睇番我哋嗰個...

問：當日，當日就算你唔係驗八個參數，因為我哋而家好多時候都係話「啊，我哋驗八個參數，係咪應該驗多啲？」但係當日就算你驗埋鉛，而家睇番轉頭，都係會驗唔到鉛出嚟？

答：我諗我唔可以同意你呢個講法，因為我接過一個 case，我唔可以講個地點，係驗到鉛出嚟，係肥晒。

問：即係喺個 connecting point 嗰度驗，都驗到有鉛？

答：喺 connecting--唔係喺 connecting point，係喺 inside service。

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問：哦，我唔係講 inside service，我係講緊鉛水事件發生前。

答：如果有...

問：鉛水事件發生前，水務署咪淨係驗 connecting point，對嘛？

答：如果我有記錯，應該 connection point 應該係冇事，係過咗嗰個 connection point 之後。

問：係。所以我哋逐步嚟，我哋逐步嚟。鉛水事件發生前，水務署嘅 approach 淨係驗 connecting point，作為一個 precondition for 去供水？

答：唔係。喺 2002 年至到 2012 年，嗰陣時係淨係驗 connection point，2012 年...

問：係。退伍軍人症事件出現之前，即係 2012 年暑假之前，...

答：係嘞，冇錯。

問：...就係 connection point 驗八種 parameters？

答：係。

問：2012 年暑假，由於政府總部出現退伍軍人症嘅發現，咁所以就改變咗個做法，但係仍然都係淨係驗八種 parameters 作為一個先決條件，對嘛？

答：再加埋 inside service，都係喺八種 parameters。

問：係。就提議做 inside service，係咪呀？唔係一個 precondition？

答：唔係，執行。

問：執行？

答：係。

問：作為一個 precondition？

答：係，我相信係嘅，呢個，因為如果詳細，我諗要搵番我啲 CS 嘅同事。

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問：好，好，好。即係話退伍軍人症事件發生之後，就驗埋 inside service？

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答：嘅。

D

E

問：係。淨係驗 down-link，定係驗埋打橫入屋嗰啲銅喉？

E

F

答：我諗應該係驗嗰個 consumer taps 嘅應該就。

F

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問：Consumer taps？

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答：嘅。

H

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問：即係話退伍軍人症事件發生前，如果你喺個 connection point 嗰度，就算你驗埋鉛，都 detect 唔到用戶嗰 part 係含鉛嘅，對嘛？

I

J

答：可以咁講，我...

J

K

問：因為如果個問題係出在 down-link 或者係打橫入屋嗰啲喉裏面用咗含鉛嘅焊料，你淨係喺 connection point 嗰度驗，係驗唔到，對嘛？同意嘛？

K

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答：係。

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問：2012 年之後，如果係有驗埋 inside service，如果有驗埋入屋嗰喉，如果嗰陣時有驗埋鉛，就會發現到，如果係有用到含鉛部件嘅話，同意嘛？

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答：係，呢個...

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問：同意？

P

Q

答：...有機會。

Q

R

問：有機會？

R

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答：嘅。

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T

問：即係你 random 當然，即係你--如果係有含鉛部件嘅話，你喺 2012 年之後，由於驗埋 inside service，所以就有機會會驗到，對嘛？

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答：可以咁講。

問：好。我想你睇睇你嘅證人供詞 10516。你嘅詞人供詞 10516 頁，footnote 7，你嘅註腳嗰度，個 footnote，見到嘛？10516 頁，footnote，見到嘛？

答：係。

問：好嘞，你嗰度就話“To put the matter in context, the water sampling and tests involving WSD in relation to inside service are as follows: ...” 咁你睇番(2)嗰度，“For newly constructed inside service: (a) (before 2012) water samples were taken for testing near connection point as a prerequisite for effecting water supply”，即係話 2012 年之前，就喺 connection point 嗰度驗八種參數，淨係驗嗰八種。

“(b) (from 2012 to 2015) water samples were taken for testing near connection point (8 parameters) as a prerequisite for effecting water supply; ...”，即係話 precondition 都係喺 connection point 驗八種，只不過就係跟住話 “...after effecting water supply, water samples were taken from inside service within building (8 parameters as a recommendation to LP/AP) for checking the effectiveness of cleansing and disinfection.”

所以驗 inside service，八個 parameters 唔係一個先決條件嚟個啲，放水，同唔同意？你講嘅。

答：唔係，嗰個--即係你一定要畀咗水佢，佢入咗嗰個 inside service，你先可以擺到辦驗。

問：係，對，咁先至可以喺個 tap 度開到水驗？

答：係。

問：咁但係你都係 recommend 佢之後去擺去驗，係咪呀？即係佢...

答：我諗如果係睇番呢度，應該係。

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問：即係佢唔擺去驗，咁你都有咩嘢 sanctions，你都畀咗水佢，你有一個可以 cut 番佢，係咪？

答：唔係，我諗如果真係--我唔知呀，呢個真係要問我啲 CS 嘅同事，佢哋...

問：即係林先生可能會比較了解啲，係咪？

答：係嘞，冇錯。

問：係。因為林先生嘅供詞--係囉，因為林先生佢就話其實呢一啲 recommended 嘅 sample from inside service 就唔係一個先決條件嚟嘅，不過你覺得呢啲應該係問佢...

答：比較清楚。

問：...會比較清楚啲，係咪呀？

答：係。

問：好。所以我哋講番--呢個我哋假設林先生所講係啱，即係話 inside service 走去驗呢八個參數，其實都係 recommend 嘅啫，唔係強制。咁亦即係話其實水務署一路嘅做法都係唯一強制，就喺個 connecting point 嗰度去驗嗰八個參數。如果係咁嘅話，可唔可以咁講，就係喺鉛水事件發生之前，之所以點解水務署有驗水辦作為一個強制性--即係放水前強制驗水辦，我知道有啲 random sampling 嗰度咁嘅嘢，我哋唔好講嗰啲，我哋講強制要驗水辦先至可以放水呢一 part，個問題所在就唔係淨係因為有驗到鉛，而係因為水務署淨係驗 connection point，可唔可以咁講？

答：我唔係好清楚你個問題。

問：我個問題就係，好多時候好多人就話「點解你一開始就唔驗埋鉛呢，喺 connection point 嗰度？」頭先我哋就已經係講咗，就係話就算你 connection point 嗰度驗埋有冇鉛係冇意思，我哋而家知道，對嘛？

答：我諗要睇下你用咩嘢物料，你唔可以咁樣有個可能性，...

問：唔係，我哋而家今次事件知道原來嗰個成因係因為喺啲鉛喉嗰度用咗

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含鉛嘅焊料，睇番轉頭，我哋就知道原來當日，好多人而家喺度嘈，就係點解淨係驗八種。但係講番轉頭，就係話就算當日你唔係淨係驗八種，你喺個 connection point 地底驗埋有冇鉛，都驗唔到有用㗎--喺鉛喉度用咗含鉛嘅焊料嘛，同意嘅？

答：同意。

問：係咪呀？

答：同意。

問：個原因就係唔係淨係因為驗八種，而係因為你驗八種，加上同埋你仲要喺個 connect--淨係驗 connection point，對嘛？

答：咁個八種嘢係 apply to 嗰個 connection point 嗰個嗰度。

問：係。但係我哋而家就知道原來新建嘅公屋或者新建嘅樓宇，水務署係絕對可以喺入伙前係驗埋 inside service，原來係有呢個能力，對嘛？未入伙，我講。

答：我諗呢個問題要搵 CS 啲同事答。

問：得，好。

答：呢個係屬於佢哋係咪法定權力，我唔係好清楚。

問：好，okay，得，我又係淨--咁即係話，okay，亦都淨係問你水質嘅問題？

答：係。

問：好，okay。我哋而家就問你關於第四份證人供詞，關於水質，...

答：係。

問：... sampling probable 嗰度。我想你睇一睇世衛嘅標準，2011嘅標準，你喺第四份證人供詞嘅第11段裏面都有提過。我哋先睇2011嗰份嘅世衛文件，bundle C2，tab 17，1258。你睇睇一二--你嘅詞人供詞裏面，就曾經提過就係世衛裏面嗰啲 guidance value，即係幾多個毫克 per litre，其實係建基於一啲嘅 assumption，係一啲假設，對嘛？我想你睇一睇嗰個 actual 嗰個假設，actual

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嗰個假設嗰個字眼，其實就喺 1337 頁。1337 頁，你嗰度見到就有個叫做“Default assumptions”，見唔見到？

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答：係。

D

E

問：你喺證人供詞裏面所講，嗰啲 guidance values 所建基嗰個 assumption 就係喺呢一度攤出嚟，對嘛？

E

F

答：係。

F

G

問：嗰個叫做“Default assumptions”。佢話“*There is variation in both the volume of water consumed daily and the body weight of consumer.*” 因為即係個個人體質唔同，飲水嘅成分又唔同，咁所以呢一個數值，所謂十毫克 per litre 就建基於假設一個 hypothetical person，對嘛？

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答：唔係。

J

K

問：噃？

K

L

答：我諗你嘅理解錯咗。

L

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問：係。

M

N

答：嗰個--你講鉛，係咪呀？講鉛十...

N

O

問：我唔係講鉛，我慢慢同你講鉛。

O

P

答：Okay。

P

Q

問：我而家係講 general。

Q

R

答：General 嘅 guideline value？

R

S

問：鉛我哋遲啲慢慢同你講，...

S

T

答：Guideline value，係。

T

U

問：...我有做功課。

U

V

答：係。

V

B

B

C

問：Guideline 呢度就係有個 default assumption。

C

D

答：冇錯。

D

E

問：就係假設一個成年人，佢每日飲兩 litre 嘅水，而你假設呢一個成年人嘅體重係 60 個 kilograms，就嗰啲 guidance value，係幾多個毫克 per litre 嘅水就安全嘞咁樣，就係建基於呢一個 default assumption？

E

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G

答：同埋要飲七十年。

G

H

問：飲七十年？

H

I

答：嘎。

I

J

問：對。咁亦即係話，如果我五十歲，今年嘅話，就係其實我日日飲超標嘅水都應該係唔會死，因為我都活唔到一百二十歲，係咪呀？對嘛？

J

K

答：咁我...

K

L

問：講 blunt 少少，講得涼薄少少，係咪呀？

L

M

答：我諗你可以咁講。

M

N

問：不過我唔會咁做。

N

O

答：因為世衛嗰個係 lifetime，由你出世 day zero 去到七十歲嘅可以。

O

P

問：係，好。好嘞，跟住你睇番，咁呢個當然係一個所謂 default assumption？

P

Q

答：係。

Q

R

問：任何嘢如果喺一個 default assumption 嘅話，就一定係有啲 case by case 你要去 adjust，對嘛？你會視乎每一種唔同金屬睇下，我哋係 apply 呢個所謂 default 嘅 assumption，定係我哋睇下呢一種物料，喂，原來佢有啲咩嘢特性，我哋未必係要 apply 呢個 default 嘅 assumption 啲，對嘛？

R

T

答：係，呢個 default assumption，或者我講世衛呢一個 WHO Guidelines，其實係一個 scientific point of departure，

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你可以因應你自己...

問：出發點，出發點。

答：係。因應你自己國家嘅情況，你可能你國家啲人個個平均都有 60 公斤嘅，或者係個個都超過 70 公斤，...

問：有七十歲命嘅或者。

答：...咁你可以應用--即係你可以改嘅 default assumption 而去修正你個 guideline value。

問：係。或者舉個例，如果嗰隻特別嘅金屬，佢哋係對某一種 category 嘅人係特別 risky 嘅，咁可能我哋個 default assumption，你睇落去，係嘞，“In some cases, the guideline value is based on children...”，見到嘛？

答：係。

問：“... where they are considered to be particularly vulnerable to a particular substance.” 係咪？

答：對。

問：“In this event, a default intake of 1 litre ...”呢個就 1，唔係 2，因為細路仔飲少啲水。

答：係，啱。

問：“... is assumed for a body weight of 10 kilograms ...”又輕啲，“... where the most vulnerable group is considered to be bottle-fed infants, an intake of 0.75 litre is assumed for a body weight of 5 kilograms.”

答：係。

問：對嘛？

答：對。

問：咁所以就其實你用邊個 default assumption，其實都之前有一個

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前設嘅分析，就係話你嗰種物料嗰個 risky category of people 係乜嘢先，如果係特別對細路仔係一個 risky group 嘅話，咁你嘅假設就係話你假設一個細路仔佢 10 個 kg，即係嗰個 value 個 derived 出嚟，就係 base on 一個 10 kg 重嘅細路仔，每日飲幾多個 litre 咁計出嚟，對嘛？

答：因為你要計一個--即係要 derived 一個 guideline value，你一定要有個 basis，你 base on 乜嘢去 derived 呢個 guideline value。呢個 default assumption 就話畀我哋聽，佢呢個 guideline values 有邊啲 chemical 係有啲--即係某啲 vulnerable groups，我哋唔叫 risky groups。

問：Vulnerable groups，係。

答：Vulnerable groups。咁就需要用嗰個 default assumption 去 derived 嘅。

問：係。咁所以其實你望見某種物料，叫做物料 X 咁先算，咁你想知道呢個物料 X 佢嗰個 guideline value 係點 derived 出嚟，你未必一定係 apply 成年人嗰個 default assumption，你要睇下究竟呢個物料嗰個 vulnerable group 係乜嘢，你再有個分析，再去考慮，對嘛？

答：係。但係你亦都要睇下你嗰啲 scientific data 係嚟自乜嘢，究竟係嚟自一啲 human study、animal study，然後你先至要做一個即係所謂嘅 derivation 個 process。

問：明白。咁亦即係話唔可以攞住 10 micrograms，就一刀切，就話我哋係--或者攞住任何一個數值，就話呢個數值係金科玉律，因為學你話齋，你要考慮下佢嗰個 vulnerable group 係邊個，或者你要考慮下佢嗰個數值。甚至你頭先話齋，呢個係一個 point of departure，你要考慮嗰個地方嘅風土、人情、習慣，對嘛？

答：對。

問：好。你睇睇 1447 頁。1447 頁，同埋一個-- 1447 頁。1447 頁裏面--應該睇 1446，對唔住，1446。係，1446 頁先真。1446 頁中間嗰度，你就見到有“Lead”，見到嘛？

答：係。

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問：佢係一個 provisional guideline value, "Provisional guideline value"就係 0.01 milligrams per litre, 即係變咗 10 micrograms per litre, 見到?

答：係。

問："The guideline value is provisional on the basis of treatment performance and analytical achievability." okay。我遲啲會慢慢同你講, 但係我而家開宗明義同你講的話, 呢個 10 micrograms per litre, 就唔係一個用所謂健康或者以衛生嘅角度計出嚟嘅一個數值。

答：唔同意。

問：唔同意?

答：嘅。

問：Okay。即係你覺得呢個係用一個健康嘅數值計出嚟?

答：因為我要講番個歷史, 佢點解係喺 2011 年, WHO 2011 年將佢變咗做 provisional, 喺 2004 年嘅 WHO Guidelines for Drinking-water Quality, 佢嗰個仍然係用緊 10 個 micrograms per litre, 呢個 10 個 micrograms per litre 點樣 derived 出嚟, 就係 base on 好似頭先你講嘅 default assumption。就係一個 5 公斤嘅 infant, 每一日 consume 0.75 公升嘅水, 再加埋一個當時個世衛聯合國嗰個糧油組織, 有個 provisional tolerable weekly intake, 嗰 25 個 micrograms per kilograms body weight 嗰度, 再加埋 50 個 per cent 嘅 allocation to drinking-water 咁樣去計出嚟, 佢嗰個 GV-- 當時嘅 GV 係等如 TDI, tolerable daily intake 乘個 body weight 乘嗰個我哋叫做 allocation, 即係 allocation to drinking-water derived ...

問：50 per cent, 50 per cent。

答：... by 嗰個 volume of water consumed, and then 佢計出嚟, 我自己都計過, 大概係 11, 但係佢 rounded down 就係 to 一個 significant figures, 唔係, to 兩個 significant figures 就 10, 係咁樣出嚟。呢一個咁嘅 pro -- 即係之前先身係 guideline

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value, 世衛就認為呢個 guideline value 係 applicable and equally protective for all age groups of the population, equally protective。咁點解佢喺 2011 年冇咗呢個 -- 即係將呢個 guideline value 轉咗做 provisional guideline value, 就因為 FAO 嗰個糧油組織認為嗰個 PTWI is no longer protective, 咁就抽起咗 25 個 micrograms per litre。

And then 世衛 designated 佢 as 一個 provisional guideline value, 就係因為你就算 treatment 做得幾好, 你都好難 achieve 到一個 lead 嘅 level 低過 10。同埋另外一方面, 就 laboratory 個 capabilities, 唔係個個 lab 係有 ICP-MS, 咁佢未必能夠達到呢一個咁嘅 10 micrograms per litre 嗰個 analytical requirement。所以點解佢由 GV 轉咗做 PGV, 但係佢嘅 basis of derivation 係冇變嘅之前。

問：你覺得都係從一個健康或者衛生嘅角度計出嚟係，因為水務署嘅大律師經常強調，就係 10 micrograms 係健康上係會安全，即係唔超過，即係你覺得呢一個 10 micrograms 計出嚟係從健康為本嘅分析，分析出嚟，你嘅理解？

答：喺 2011 年之前，lead 係仍然係一個叫做 threshold chemical, 佢有一個我哋叫做 -- 我唔知中文點講，thres ...

問：個極限，一個極限。

答：咁就而家佢 lead 就變咗做一個 ...

問：有 threshold?

答：... non-threshold 嘅 chemical。

問：係。

答：即係話有一個 safe limit, 總之係愈低愈好。但係佢自己本身呢個 PGV 其實都係 health-based。

問：我想同你睇睇真嗰個 -- 而家好多時都加個「真」字喺前面，真版本，C21, 18938 頁，18938。呢個就睇番 1993 年，呢個係世衛 1993 嘅文件，你見到 18938 嘛，見到？

B

B

C

答：係，見到。

C

D

問：呢個 18938，如果你掀多兩頁，你見到 18940。你以你嘅記憶，1983 係多咗好多個 chemical 要驗，係咪呀，即係之前都有一個早啲嘅版本，但係嗰個少啲嘅？

D

E

答：係。

E

F

問：1983--唔係，1993 年嗰個版本係多咗好多，係咪？

F

G

答：係。

G

H

問：以你嘅記憶，對嘛？好，我哋睇番 18940，“Lead”，你見到呀？

H

I

答：1894...

I

J

問：18940，C21 頁。

J

K

答：係。

K

L

問：18940，18940，你見到？

L

M

答：Okay。

M

N

問：中間係“Lead”，你見到嘛？

N

O

答：見到。

O

P

問：咁就講咗好多有關 lead 嘅嘢，你睇番跟住 18941 頁，中間嗰度，就 “In 1986, JECFA ...”，JECFA 就係世衛裏面一個叫 Joint Expert Committee on Food Additives and Contaminants，你知道呢個組織嘛？即係呢個 Committee，總之世衛裏面一個委員會。

P

Q

答：嘎。

Q

R

R

S

問：“... established a provisional tolerable weekly intake (PTWI) for lead of 25 micrograms per kilogram of body weight (equivalent to 3.5 micrograms per kilogram of body weight per day) for infants and children on the basis that lead is a cumulative poison and that there

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should be no accumulation of body burden of lead. ...”
跟住就計數。“Assuming a 50 per cent allocation to
drinking-water for a 5-kg bottle-fed infant consuming
0.75 litres of drinking-water per day, the
health-based guideline value is 0.01 milligrams per
litre (rounded figure).” 就變咗 10 micrograms per
litre，你見到嘛？

答：唔。

問：“As infants are considered to be the most sensitive
subgroup, this guideline value will also be protective
for other age groups.” 你見到嘛？

答：見到。

問：好。跟住“Lead is exceptional in that most lead in
drinking-water arises from plumbing in buildings and
the remedy consists principally of removing plumbing
and fittings containing lead. This requires much time
and money, and it is recognized that not all water will
meet the guideline immediately. Meanwhile, all other
practical measures to reduce total exposure to lead,
including corrosion control, should be implemented.”
你見到，係咪？

答：見到。

問：好。呢度就係你頭先所講嗰個始祖，...

答：係。

問：...嗰個 10 micrograms 係點嚟嘅。其實你嘅詞人供詞第 14521
頁嘅 footnote 2 都有講到。你嘅詞人供詞 C19.6，14521 頁，
footnote 2。見到嘛？

答：見到。

問：嗰度你都有提過“The GV was tightened to 10 micrograms per
litre in the 2nd edition of Guidelines published in

B

B

C

1993”，你見到嘛？

C

D

答：係。

D

E

問：即係其實你嗰度講嘅就係呢一個，係咪呀？

E

F

答：嘎。

F

G

問：咁我哋個 starting point 就搵到，就係 1993 年，10。好嘞，我哋跟住就再睇睇 2011 年嗰份世衛嘅文件，1447 頁，C2。你見到 1447 頁--我哋睇番 1446 應該係。1446，呢個“Lead”，你見到？

G

H

答：唔。

H

I

問：“Basis of guideline value derivation”，你見唔見到？

I

J

答：見到。

J

K

問：“The guideline value was previously based on a JECFA PTWI, which has since been withdrawn, ...”，你見到嘛？

K

L

答：見到。

L

M

問：係。“...and no new PTWI has been established, ...”見到嘛？

M

N

答：見到。

N

O

問：“... on the basis that there does not appear to be a threshold for the key effects of lead. However, substantial efforts have been made to reduce lead exposure from a range of sources, including drinking-water. Because it is extremely difficult to achieve a lower concentration by central conditioning, such as phosphate dosing, the guideline value is maintained at 10 micrograms per litre but is designated as provisional on the basis of treatment performance and analytical achievability.” 見到嘛？

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答：見到。

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問：好。你睇番後面嘅個 text，嗰個解釋嗰 part，1447，“Bases on the dose-response analysis, JECFA estimated that the previously established PTWI of 25 µg/kg body weight is associated with a decrease of at least 3 IQ points in children and an increase in systolic blood pressure of approximately 3 mmHg in adults. These changes are important when viewed as a shift in the distribution of IQ or blood pressure within a population. JECFA therefore concluded that PTWI could no longer be considered health protective, and it was withdrawn.”

呢個就係解釋點解之前 JECFA 所出嗰個 PTWI 25 micrograms per kilogram，即係後來轉型成咗--即係 translate 成為 10 microgram per litre 呢個 start off 呢個數值，係 no longer considered health protective。即係話之前如果以為 10 micrograms per litre 就係嗰個所謂健康保障嗰個一個 threshold 嘅話，就唔啱。之前以為一日飲 10 micrograms per litre 冇事，但係而家發覺唔係，所以就 withdraw 咗，呢個係咁講，對嘛？

答：我諗唔可以咁講，因為你--佢 withdraw 咗呢一個咁嘅 PTWI，唔係表--即係如果你話你--新嘅 PTWI 佢係根本做唔到出嚟，因為佢覺得可能係 0 係最好，但係如果你...

問：美國係話 0，我一陣問畀你睇。

答：0 可能係最好，咁但係你如果係 translate to 嗰個--即係我哋話叫做 health-based 嘅 guideline values，你根本就唔可以--唔可能 achievable。

問：視乎你係邊部，係咪呀，視乎你嗰個地方嗰個歷史，不嬲用開乜嘢嘢，同唔同意？

答：我諗如果你用緊鉛喉，even though 你而家加咗啲 orthophosphates 喺英國咁，佢都唔係 hundred per cent ...

問：對嘛，...

答：... achieve 到 10，achieve 到 10。

B

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C

問：都可能係要請小鳳姐熱烈地彈琴，如果 achieve 到 10，喺嗰一啲咁樣嘅地方，對嘛？係咪呀？

C

D

答：係。

D

E

問：有啲地方如果用開鉛喉，做到 10 已經要開派對，對嘛？

E

F

答：可以咁講。

F

G

問：係咪呀？但係如果香港 start off 唔係用緊鉛喉，可能有 9 都唔應該有派對，對嘛？

G

H

答：咁要視乎你咩嘢情況。

H

I

問：同埋我哋午飯後再繼續，好唔好呀？

I

J

答：Okay。

J

K

K

主席：好，我哋午飯後再繼續。

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L

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M

下午 1 時正聆訊押後

N

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下午 2 時 29 分恢復聆訊

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出席人士如前。

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Q

水務署第二證人：陳健民（水務署（總水務化驗師））宣誓繼續作供
石先生繼續盤問

R

R

問：陳先生，我哋食晏之前就喺度睇緊世衛嗰份 2011 年嘅文件，世衛 2001 年嘅文件，我哋睇番 C2 嘅 1447 頁，我哋頭先就講到就係關於嗰個 JECFA 之前嗰個 PTWI 就喺 2011 年嗰份世衛嘅文件裏面，佢就叫做 withdraw 咗，withdraw 咗，就係你睇番嗰份文件嘅 1447 頁中間嗰度，就係因為佢之前嗰個 PTWI，25 microgram per kilogram body weight，就發現原來喺智能上同埋喺一啲健康上都仍然有啲

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問題，佢就 withdraw 㗎。

你睇番跟住嗰段，佢就話 “Because the dose-response analyses do not provide any indication of a threshold for the key effects of lead, JECFA concluded that it was not possible to establish a new PTWI that would be considered to be health protective. JECFA reaffirmed that because of the neurodevelopmental effects, foetuses, infants and children are the subgroups that are most sensitive to lead.”。

呢一段你都明白佢講乜嘢，就係話純粹講邊一個組別嘅人叫做係 vulnerable 或者係 most vulnerable，JECFA 仍然都係覺得係兒童同埋嬰孩係屬於 vulnerable 同埋最 vulnerable 個極嘅，你同唔同意？

答：唔係，Joint Expert Committee on Food Additives，嗰個係冇考慮邊個 vulnerable，呢個只不過佢 base on 佢哋嘅 studies，就 propose 㗎一個我哋叫做 PTWI 出嚟，佢係冇幫世衛 identify 邊一個 group 係 vulnerable 或者係 sensitive 嘅。

問：佢話 “reaffirmed that because of the neurodevelopmental effects, foetuses, infants and children are the subgroups that are most sensitive to lead.”。

答：世衛就 take 呢一個咁嘅即係佢嗰個 finding，就搵到細路同埋或者係孕婦或者乜嘢係屬於 sensitive group 嘅。

問：即係唔好用 “vulnerable” 呢個字，即係佢係用 “most sensitive to lead”。

答：Sensitive，係。

問：Okay，佢跟住就話 “It needs to be recognized that lead is exceptional compared with other chemical hazards, in that most lead in drinking-water arises from plumbing in buildings, and the remedy consists principally of removing plumbing and fittings containing lead, which requires much time and money. It is therefore emphasized that all other practical measures to reduce

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total exposure to lead, including corrosion control, should be implemented.”。

呢一度我有幾點就想向你提出，睇下你同唔同意嘅，就係喺 2011 年嘅呢一個世衛嘅文件就可以睇出，之前嗰個 10 microgram per litre 呢個數值就係基於嗰個 25 microgram per kilogram body weight 呢一個，就追到去 1993 年，我哋之前睇嗰個，就呢一個所謂基於嗰陣時健康嘅考慮，計出嚟嘅呢一個值就 PTCFA 係 withdraw 咗嘅，同意喇？

答：唔。

問：同意。亦即係話，佢亦都話係冇辦法搵到一個同健康或者係衛生有關嘅 threshold，搵唔到一個新嘅 threshold 出嚟，對嘛？

答：係。

問：同意。所以就算佢用番一個叫做 provisional，一個臨時或者暫時嘅一個 GV, guidance value, 呢個 guidance value 佢已經唔可以再將佢當成為一個以健康考慮為準嘅一個界限，呢個只不過係一個權宜之計，就係因為用盡一啲實際嘅辦法都唔能夠將一啲本身含鉛量好高嘅供水系統降到 10 microgram per litre 以下，所以講得俗啲，就係焗住冇辦法就用住 10 microgram per litre 呢一個數值做一個臨時嘅 guidance value, 係與健康有關嘅，你同唔同意呢個說法呢？

答：唔同意。

問：點解呢？

答：因為你要睇番佢嗰個 history of derivations, 佢係 base on 嗰個 JEFCA --即係 JECFA 嗰個數值，雖然佢家係冇咗，係抽走咗，唔係表示佢呢一個咁嘅數值唔係 health-based, 只不過呢個 health-based 嘅數值而家係 carry certain degree of health risk, carry certain degree of health risk。

問：邊度搵出嚟嘍，“carry certain degree of health risk”？

答：呢一個係...

問：佢搵唔到 threshold 喇嘛已經，佢已經搵唔到一個代替話「我哋不如 5 microgram 就安全啲喇。」佢唔係㗎嘛？

答：我諗冇人可以喺呢個 stage 話佢嘅 safe threshold 係幾多，或者我帶你去睇下世界其他地方，EC Drinking Water Directive 仍然係用緊 10 個 microgram per litre，最近澳洲，drinking water quality guidelines 亦都 reaffirm 係用 10 個 microgram per litre，呢一份係 2015 年出嘅，New Zealand drinking water quality standard 仍然係用緊 10 個 microgram per litre，至於日本、中國都係 10 個 microgram per litre。

至於你就話有 threshold 嘅 chemical，in practical context，我就會應用 radiological protection 嘅 principle，佢個度就話雖然你係有一個我哋叫做 threshold，即係類似喺幅射防護個個原則，就係有兩種原則嘅，一種我哋叫做 non-stochastic effect，或者我哋叫做 deterministic effect，呢一個係有 threshold 嘅。

呢個 threshold 即係話譬如你 expose to 一啲幅射，某一個劑量嘅幅射，你係會出現甩頭髮、嘔吐或者血嗰個紅血球出現變化，呢個係 deterministic 嘅 effect。

另外一種就好似頭先你講，dose-response 嘅，嗰個就叫做 stochastic effect，一啲隨機嘅效應嘅，即係話你嘅劑量越低就越好，越高嘅時候，你個 probability of getting cancer 嗰個 probability 增加咗嘅。

所以喺呢一個咁嘅即係譬如 no safe threshold 之下，我會 interpret 係 in practical context，係 as low as reasonably achievable 或者 as low as reasonably practicable，就唔係好話零呢個根本冇可能嘅，因為喺世上，我哋嘅 daily living 都係 full of risk 嘅。

所以你嗰個咁嘅比如而家用 10，我覺得佢仍然係 health-risk base 嘅--咩嘢 health-based 嘅，只不過而家呢個 health-based 係出現一啲--會 carry 一個 certain degree of health risk。

我或者 for 你 information，世衛嗰啲 guideline values，

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佢個個 reference risk level 係一般嚟講都係 10 個負 6 DALY, disability adjusted life years, 呢個係一個 reference 我哋叫做 risk level, 呢一個 reference risk level, 即係 10 嘅負 6, 或者 in practical terms, 佢可以 interpret as 即係話每十萬人之中有一個人會 get 到 excess cancer, because of 即係飲呢一樣嘢飲七十年或者乜嘢, 呢個係個個 excess risk, 大概係十萬人一個人可能有事, 唔係一定有事, 可能有事。

所以可能你個個 risk level 本來係 10 嘅負 6 嘅, 係 10 個個 health-base 嘅時候係 10 嘅負 6, 但係而家你因為有咗個 threshold, 你可能唔係 10 嘅負 6, 可能係 10 嘅負 5, 或者係 5 乘 10 嘅負 5, 呢個我相信就而家冇人可以說得準究竟個 risk -- 個個 public health risk 係幾大, 係咪 acceptable。

問：但係我想返番轉頭先, 就係有咗個 threshold, 有咗個個 threshold, 我想同你探討嘅, 就係如果你睇番個個 derivation, lead 個個 derivation, 就係 1446 個度, "is designated as provisional on the basis of treatment, performance and analytical achievability."。

呢個就係講番我哋今朝早食晏之前, 我哋都提過就係因為世衛呢啲標準, 佢開宗明義就講到明就係唔係一個強制嘅標準, 冇法例嘅地位, 對嘛?

答：係, 佢係一個 recommendation。

問：係喇, 亦都當然要係就住每地嘅風土人情、習慣或者歷史背景, 用開咩嘢物料而要有所調整, 對嘛?

答：我唔明你嘅意思, 用開咩嘢物料...

問：我舉個例子, 就係如果你係住喺一個譬如話英國咁樣, 或者有一啲地方一路係用鉛造嘅水喉, 用到七十年代、八十年代嘅, 啲啲地方有辦法, 因為用鉛嘅水喉係遠在--大家知道原來鉛嘅水喉係會釋出鉛份, 影響身體, 冇辦法喇, 歷史遺留落嚟嘅問題, 就焗住要用鉛嘅水喉, 因為要 replace, 好大成本同埋好麻煩, 係咪? 我哋都曾經見到啲啲文件裏面咁寫, 係咪? 可能會好麻煩, 係咪呀?

答：(沒有可聽到的回答)

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問：所以有一啲嘅地方，甚至係幾大嘅區域都係用緊呢一啲嘅水喉，所以如果呢一啲嘅地方佢哋嘅 remedial measure 可能就係唔能夠完全變成零，對嘛？除非你換晒嘅啫，否則，你唔會變成零嘅，你會用一啲嘅化學嘅辦法減低，對嘛？

答：係。

問：用一啲嘅化學嘅物料放入去，就可以將啲鉛嘅成分減少，或者我哋將水嘅 plumbosolvency 減低，即係將鉛溶喺水裏面嘅 rate 減低或者減少啲 solubility，可以咁講，對嘛？

答：係。

問：用呢啲辦法嚟到補救，但係就惟有就係呢個我哋叫做 bring down 或者 reduce 水裏面含鉛嘅數量，對嘛？對嘛？

答：係，係。

問：喺呢啲嘅地方，佢哋就會 talk about bring down 啲個 lead level in water，所以先至會出現到，就係話 achieve 到 10 microgram per litre 係唯一可以權宜之計，practicable 做到嘅，喺呢啲地方，對嘛？即係佢其中一個考慮就係咁樣？

答：我諗唔可以一概而論，因為有啲地方唔係用 10 嘅，譬如美國，佢係用 15，佢 15 亦都唔係一個 health-based 嘅 limit，佢係一個 action limit，佢即係超過呢個數有 10 個 per cent 嘅 sample，佢先至要 initiate 一啲 corrective action。

問：係，佢哋有啲地方用 10，有啲地方用 15，即係我哋知道就係話只要你唔係 health-based，因為你計唔到一個 threshold 出嚟，所以你用 10 或者 15 可能係唔同區域之間有判斷嘅分別，但係無論你用 10 好或者 15 都好，啲個背景其實都係你要 bring down 到一係 10，一係 15，對嘛？

答：我諗...

問：相比香港，香港應該係零嘍嘛，即係唔係絕對零，香港嘅水務署三十年代開始唔用鉛喉，對嘛？

答：係。

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問：亦都好自豪地講話我哋禁晒所有嘢，所以理論上我哋個 starting point 已經唔同，同唔同意？

答：（沒有可聽到的回答）

問：第二啲地方嘅 starting point 係已經係充滿鉛嘅--用鉛造嘅水喉，你要 bring down 香港，你理論上，如果監管得咁好嘅話，starting point 應該唔係要 bring down，對嘛？同唔同意呀？

答：我可以話畀你聽鉛嘅源頭有好多嘅，除咗係嗰啲物料之外，空氣或者係泥土其他都有鉛存在嘅，所以我諗唔可以話冇用鉛喉，你就冇鉛嘅，呢個...

問：我明，但係以香港嚟講，如果你嘅水喉裏面係冇鉛或者冇咗呢個又含鉛嘅焊料，其實即係好 blunt 咁講，你空氣裏面有鉛，或者一啲水源裏面源頭，可能條河或者水塘附近有啲含鉛嘅一啲自然嘅物件滲咗落水裏面，其實嗰啲係 minimal 嘅，ignorable 嘅，對嘛？

答：Depends 喇，呢個。

主席：你又唔可以話 ignorable 嘅，不過我哋睇--不過回應番石大律師講，即係其實我哋譬如睇你好多做 test 嗰啲 unaffected 嘅 estates，你驗番出嚟嗰啲含鉛--即係嗰啲其實係低過 0.001，即係基本上係去到你嗰個 machine 嗰個 sensitive 個 limit，即係換句話嚟講，我哋差唔多可以當佢等如零喇。

答：係，係 less than 嗰個 1 又或者 detection limit。

主席：係囉，exactly。

問：我唔好話 ignorable，即係接近 undetectable，可以話個 limit？

答：大部分，如果冇嘅，應該 undetectable。

主席：係囉，trace 喇，係好。

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石先生：係。

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問：所以喺香港，喺香港，我哋唔好講第二度，因為第二度要將佢充滿住用鉛造嘅水喉拉到落去 10，用番我頭先食飯之前嘅例子，如果用開用鉛造嘅水喉，能夠用種種嘅化學嘅技巧將佢 bring down 到 10 以下，已經係一個好折衷嘅辦法，但係喺香港，個 starting point 唔係一條用鉛造嘅水喉，所以香港嘅考慮唔係要 bring down，同唔同意？

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答：點解唔會考慮 bring down 呢？我哋應該係 keep 佢 as low as practicable 㗎喎。

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問：我明，bring down 嘅意思即係唔係好似外國咁樣，唔係要採取一啲措施去將一條 otherwise 充滿住鉛水嘅水喉裏面嘅水減低到成為 10 microgram 以下，而係香港嘅 starting point 就係根本你條喉唔係用鉛嘅，你亦都有啲用鉛嘅焊料，你唯一有可能嘅就係你個 surrounding 裏面有啲好微細嘅鉛，所以你如果香港搵到就算 9 都好，唔係一件好值得自豪嘅事嚟嘅，同唔同意？

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答：我...

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問：如果有啲外面嘅人知道原來香港嘅系統係 pride itself on 一早禁咗用鉛嘅水喉，亦都唔畀用含鉛嘅焊料，你走去賣國際廣告話香港所有嘅水都係 9.9 microgram per litre，你唔會喺國際上咁講嘅，係咪呀？

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答：我諗...

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問：呢個唔係值得自豪嘅事情嚟嘅，係咪呀？

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答：我諗我哋只能夠話我哋啲水係 comply with WHO 嘅啫，我哋唔能夠話 9.9 我就好自滿，我哋係 no room for complacency 嘅其實。

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問：但係你唔會話 9.9 就安全㗎嘛，對嘛？

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答：如果喺科學嘅角度嚟睇，9.9 仍然係安全嘅。

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問：我...

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答：因為你...

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問：好。

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答：你 9.9 就算係你 round up to 10，你 10 仍然係達標㗎嘛，喺嗰個 PGV 嚟講，係達標，你只能夠話「總之你唔超過 10，我都認為係 okay 嘅」。

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問：我畀你睇一睇 v 59 頁，v 59 頁，呢個就係委員會喺醫學上嘅專家 Prof Bellinger 嘅專家報告，你睇番呢一頁嘅頂個度，或者你睇番之前個頁，58。

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"At the present time, the World Health Organization identifies a blood lead level of 10 µg/dL as the upper limit of the acceptable range. A WHO committee is currently reviewing the guidelines for the diagnosis and treatment of lead poisoning, however. As noted, in its most recent evaluation of lead, the FAO/WHO JECFA withdrew the PTWI, of 25 µg/Pb/kg body weight/week, which had been established in 1993. The rationale was that the absence of a threshold for lead toxicity means that no level of exposure is safe (thus 'tolerable'). Moreover, it was not possible to" identify "a new PTWI that would be considered to be health protective."

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你對 Prof Bellinger 嘅講法，有咩嘢意見呢？

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答：你指係即係講--呢啲係 factual 嘅嘢嚟嘅咋啲呢個。

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問：係，你同唔同意佢講嘅嘢？

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答：呢個？我同意，呢個因為亦都係嗰個 FAO/WHO withdraw 咗個 PTWI，到而家為止，亦都有一個新嘅 PTWI，但係我就唔係好明白嗰個 blood level 嗰個 10 個 microgram per decilitre as the upper limit of the acceptable range，因為我唔係醫學嘅專家，我就唔知呢個有啲咩嘢 implications 嘅其實。

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問：好喇，你睇番再底少少，再落少少，佢有一句就係"The current consensus is that there is no 'safe' blood

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concentration below which adverse effects do not occur.”，你見到呢句喇，係咪呀？

答：（沒有可聽到的回答）

問：你會唔會有異議呢？

答：我唔能夠 comment，因為我唔係 medical professional。

問：好，明白。但係我想同你 tackle 嘅一點就係，我明白水務署嗰個 pledge 就係會符合世衛嘅標準，但係當我哋而家了解到原來--世衛標準，唔同金屬有唔同標準，對嘛？

答：唔。

問：唔同金屬佢裏面嗰個 derivation 嗰個 basis 都會唔同，對嘛？

答：係。

問：我哋而家就淨係睇鉛個 derivation，原來就係經過咁樣嘅演變，對嘛？93年可能係 health-based 嘅，跟住 withdraw 咗嗰個源頭嗰個 25 microgram 嗰個原先嗰個 value，就而家就話嗰個 threshold 其實係有嘅，有 threshold，我想向你提議或者指出嘅一點，頭先我都問過，不過我想擺一個比較確切嘅一個答案，就係 achieve 到世衛 10 microgram per litre 呢一個標準係唔適用於喺香港呢一種情況，因為香港我哋唔係話用一啲用鉛造嘅水喉，我哋嘅 starting point 就係用無鉛嘅水喉同用無鉛嘅焊料，所以我哋嘅出發點應該係 as low as possible，唔應該係滿足於淨係 meet 到世衛嗰個 10 microgram per litre？

答：我相信世衛呢個標準，係香港飲用水水質嗰個 target 嚟嘅，一個 health-based 嘅 target 嚟嘅，咁...

主席：係一個咩嘢？Health-based 嘅 target？

答：係，係。即係當然我哋--根據世衛嘅精神，就唔會話因為你嘅嗰個水質標準係定咗係咁，而我哋專登令到個水嘅 quality degrade 到去個咁嘅 level，而我哋係 always 係要 maintain 啲水 at highest

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possible level 嘅。

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問：You mean 嘅水含量...

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答：水嘅 quality，應該。

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問：Quality，係。但係當我哋--即係你仍然係堅持呢個 10 microgram per litre 呢一個係叫做係 health-based 嘅？

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答：係。

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問：我哋頭先就講過嗰個所謂 assumption，嗰個 assumption 就係如果係成年人，你就假設佢飲七十年，係咪呀？

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答：（沒有可聽到的回答）

J

J

問：但係如果個 assumption 係 infant 嗰個 assumption，你假設佢飲幾多年？

K

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答：我諗呢一個咁嘅 guideline value，世衛亦都講得好清楚，係 protective for all age group of the population 嘅，嗰個細路其實可以飲到七十歲，佢飲呢個 10，佢應該都有問題。

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問：但係佢唔會七十歲都係細路㗎嘛。

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答：所以呢一個咁嘅 guideline values 其實係 conservative 嘅，for 嗰啲細路，conservative。

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主席：Conservative？

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答：Conservative。

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主席：但係我哋...

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答：因為如果你照--如果你用番嗰個...

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主席：唔係，唔係，唔係，對唔住先，對唔住先，因為我哋實際上又真係

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有啲--即係你哋--即係我都係返番去尋日，我哋有啲 data，你哋擺
咗啲 data，知道譬如啟晴邨、葵聯邨啲啲細路，首先啟晴、葵聯啲
啲水超標，當然有啲多啲，有啲少啲，不過都唔係犀利啫，係咪？十
零諸如此類啫，啲啲小朋友都係飲咗充其量兩、三年呢啲咁樣樣嘅
水，但係我哋已經見到佢個血係超標囉嗱，咁再飲多七十年，咁點算
呀？

答：唔係，我諗有個我哋叫做 confounding 嘅 factors 嘅，嗰個佢血
源其實除咗嚟自水，會唔會仲有嚟自其他 sources 呢？

主席：唔，所以 Bellinger 亦都睇埋，當佢哋一有 interruption 嘅時
候，佢哋啲啲血就即刻跌啲啲鉛，所以佢亦都有個 conclusion，就
係係，就係因為水裏面啲啲含鉛而引致嘅。即係如果陳先生你咁講，
咁唔得掂㗎囉。

答：唔係，我講嗰個 conservative，就唔係話...

主席：Conservative...

答：唔係，即係唔係...

主席：...即係可以飲一百四十年呀？

答：唔係，唔係，唔係淨係 apply to 細路，因為呢個咁嘅標準，係 for
細路，好似石大狀講，就佢唔會長年都係細路嚟㗎嘛，佢一路會 grow
嘅時候，其實...

主席：Lead 係 accumulative 㗎嗱，只會越嚟越多嘅咋嗱。

答：但係佢身體會--我唔知吖，呢個要問 health 嘅 expert，睇下...

主席：唔係，唔係，所以就--即係我而家咪話埋畀你聽，所以你呢個嘅
assumption 會唔會出咗啲問題呢？

答：（沒有可聽到的回答）

主席：當然我 accept 你唔係一個醫學嘅專家，不過我哋知道，係，個細
路仔會大，係咪先？不過 assume 佢繼續飲呢啲咁嘅--佢可能大個
咗，強壯咗，但係並不--佢強壯咗啫，並不表示呢個 lead 對佢嘅影
響係減低咗，因為 lead 影響細路仔就係最重要，係咪先？

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答：係。

主席：只不過 accumulate 咗喺裏面之嘛，你唔可以--即係我唔係好明白你嗰個「呢個係一個 conservative 嘅 figure, therefore 其實就好 safe 嘅。」即係根本好似唔係好 make sense 㗎。

答：因為我哋嘅睇法就係呢一個 apply to 細路仔嘅 guideline values, 如果你 apply to 所有 age group of the population, 其實就係 safe 嘅其實。

問：即係如果對細路都 safe, 對大人都應該 safe?

答：係，冇錯。

問：你嘅意思就係咁。

主席：理論上就係咁樣樣，係咪咁嘅意思？

答：係，係。

主席：即係如果個細路係可以飲七十年嘅話，如果個大人係有一百四十歲嘅話，佢可以飲一百四十年？

答：係。

主席：得，明白。

問：我擺埋世衛嗰個標準嘅演繹先，因為啲字就喺度，咁樣即係我哋大家都冇眼睇。但係我哋就想同你講講就係抽驗水辦嗰個方法，我哋一路聽見就係抽頭浸水㗎，定係沖完之後先至驗咁樣。

你嘅證人供詞第四份裏面嘅第 13 段就係講到就係頭浸水，“before flushing”就“are not representative of the quality of water to be consumed by an individual on a routine or long term average basis.”，你咁講。

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我首先就想同你講清楚，就係其實係冇一個嘅標準，無論世衛又好，ISO 又好，去教你話如果你要攞到一個所謂 representative sample of the quality of drinking water consumed on a routine basis，你係要 flush 佢 for 幾耐，係冇一個標準咁寫出嚟，對嘛？

答：係。

問：冇嘅，所以呢一個所謂去搵出呢個究竟邊一個時候抽嘅水辦先至會係 representative of the quality of drinking water consumed on a routine basis，呢個就係水務署自己研究嘅一個判斷嚟嘅，對嘛？

答：我...

問：即係唔係基於話世衛第幾份文件嘅 3.2 就係教我哋係--我知道你講 ISO 裏面有講唔同嘅 purpose，就點樣點樣，但係我想講嘅就係，聽清楚，representative of the quality of drinking water consumed on a routine basis 唔係一個 define concept，而係一個 stipulated number of minutes 走去 flushing 就得出嘅，係咪呀？冇一個地方寫咗出嚟，對嘛？

答：你如果要攞一個水辦，同世衛嗰個 GV 又好，PGV 又好，去 compare，你係一定要攞一個有代表性嘅樣辦，呢個代表性嘅樣辦係代表你嘅 average quality of water consumed on routine basis 或者 overnight time 喇或者，你就唔能夠攞一個最高嗰個--即係或者係嗰個最 worst scenario 嘅水辦，攞去 compare with 一個 standard，呢個 standard 係 base on average quality 嘅，而國際上亦都冇一個 standard 係去 cater for 一啲咁 extreme 或者係 worst scenario 嘅 water quality 嘅。

問：所以你嘅答案就係，其實呢一個概念叫做 quality of drinking water consumed on a routine basis，就係你想搵到嗰樣嘢，但係就冇一條嘅條文就係話 flush 三分鐘之後就會得到，或者唔 flush 就會得到，因為呢一樣嘢其實都好視乎用家嗰個用水習慣嘅，對嘛？

答：係，不過我哋始終有個 basis for reference，就係大家都知道嘅 ISO 5667-5 2006 年嗰個--即係嗰個 basic principles 都

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係嗰度 follows 嘅，如果你想 check 嗰個 water quality at tap，你係需要 flush 兩至三分鐘 or longer if necessary，如果你想 investigate 個 effect of 嗰個即係 pipe material 嘅-- maximum likely effect of 嗰個 pipe material on water quality，你嘅抽樣方法又唔同咗嘅。

問：我哋睇世衛--或者唔係，我哋睇 ISO，睇 ISO 嗰個，嗰個唔係世衛，嗰個 ISO 嗰個有幾個唔同嘅 scenario，就用唔同嘅方法，我哋其實--一陣間我會同你慢慢逐條條文去睇。但係你都會同意嘅，就係我哋唔係淨係要睇個條文本個字眼，我哋要睇埋條文本後面個精神嘅，任何嘢都係㗎喇，對嘛？

答：除咗睇字眼，我哋亦都要 interpret 佢嘅。

問：係，interpret 就梗係有陣時你要了解佢背後想達到嘅真正嘅目的係乜嘢，係咪呀？

答：Okay。

問：對嘛？同意嘛？

答：係。

問：好喇，水務署嘅理解，我哋唔好講 ISO，因為 ISO 好多嘢我可以同你講，但係水務署嘅理解就係你 flush 咗大約兩至三分鐘，係咪呀？你哋嘅做法係？

答：我哋而家幫房署係兩至五分鐘。

問：兩至五分鐘。

答：兩分鐘就係 for 嗰啲經常有人住，嗰個水喉經常用嘅，五分鐘就係 for 一啲空置嘅單位嘅。

問：兩至五分鐘，其實有數可以計嘅，但係即係如果兩至五分鐘，我哋假設個水喉，打橫嗰槓，即係入屋，由嗰個 down pipe 打橫入去走廊，跟住入屋去到水喉頭嗰槓，我哋假設佢大約 20 metre 嘅，假設，如果你 run 大約二至五分鐘，其實都已經係叫做 run 咗好多轉㗎喇，係咪呀？啲水喺嗰裏面，可以話係？

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答：我諗唔可以咁講，要 depends on 你嘅 flow rate 係幾多。

問：我畀個假設嘅 flow rate 你，你等等。如果假設個 flow rate 係 0.26 metre per second。

答：即係幾多...

問：如果假設。

答：Per minute?

問：Per second，你要 per minute，乘 60，有冇計數機計？冇。唔緊要，簡單咁講，你 rinse 二至五分鐘嘅話，其實個實際嘅功用就係其實將個供水系統裏面--打橫個槓，即係你明我講乜呀？打橫個槓，因為我哋而家經過抽絲剝繭之後，我哋都了解到，就係垂直 vertical 個槓嘅喉管係可以話係有 contribute 到 lead 嘅，我哋而家驗到有鉛 solder 嘅喉管都係 horizontal，即係打橫喺走廊入屋個 part 嘅，你知唔知道？

答：我諗 depends on 你個 location，如果係嗰個 copper pipe 嗰個 size，好似如果我有記錯，...

主席：點六。

答：...大過 76，760 mm 嗰啲，佢係會用 silver brazing，可能一路細嗰陣時候，下面嗰啲喉管就有機會用嗰啲 lead solder，鉛焊或者乜嘢嘅。

問：我計咗數出嚟，頭先我想畀你嗰個 flow rate 15.6 litre per minute 嘅係。

答：15.6 litre per minute?

問：即係呢個係 flow rate，15.6 litre per minute。

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主席：15.6，係，乘 60。

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石先生：15，吓？

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主席：係，0.26 乘 60。

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石先生：係，15.6 litre per minute 嘅。

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問：即係如果你 assume 呢個 flow rate 嘅話。所以如果你假設條喉管係 20 metre，假設，所有嘢都係假設嘅啫，你 run 五分鐘嘅話，其實就即係好 blunt 咁講一句，就係已經將供水系統，即係相關打橫入屋嗰一截係洗到乾乾淨淨㗎喇，即係將任何如果係從喉管裏面有含鉛嘅物質，掂到有鉛嘅話，已經係沖洗乾淨㗎喇。

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答：我諗你呢個 flow rate，我就唔知我哋同事擺辦嗰時係咪真係呢個 flow rate，因為佢哋通常嚟講，就開盡水喉，我聽前線嘅同事報告，就有啲水喉就好慢，有啲水喉就快啲嘅，我就好難想像佢會達到十五點...

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主席：唔係，你 assume。

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問：Assume。

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主席：你 make 啲 assumption 喇。

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問：Assume。

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主席：我哋唔係講...

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答：如果你話 15.6，你好似我嗰個 statement 嗰度曾經提過，如果用 5 個 litre per minute，就大概你係會擺到 2.6 metre 嘅嗰個水喉，如果你 15 個 litre per minute，即係...

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主席：三倍你嗰個喇。

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答：三倍，係，三倍即係大概係七點幾 metre of 嗰個 pipe length。

主席：Depends on 究竟你係講緊直嘅抑或係彎嘅，我哋當直嘅，唔好講彎嘅咁複雜先。

問：但係我哋唔好講計數，我哋講番嗰個水務署嗰個 Task Force，嗰個 Task Force 即係有個結論，我一陣間可以畀個實際嗰個頁數你，不過你係有份參與呢個 Task Force 嘅討論嘅。

答：係。

問：你都知道即係 rinse 兩分鐘，如果你--就算你 stagnation 四十八小時之後，你 flush 兩分鐘就已經係將裏面可能含鉛量係減咗九成㗎喇，你記得有一個咁嘅數據？

答：係，冇錯。

問：即係常理都係，如果你隔夜浸咗喺度，即係好多鉛釋出咗，你開水喉開兩分鐘，你有啲新鮮未污染嘅水嚟到沖走咗本身滷咗一晚嘅水，你出嚟嘅水都應該係冇乜鉛或者鉛係減少咗，呢個常理嘅啫，會唔會係減到零就另外一回事，但係都會大量減少，對嘛？同意嘛？

答：所以 that's why 我哋話你 first draw sample，你呢個 transient concentration 或者我哋叫做 instantaneous maximum concentration 唔會 last for the whole day 嘅，你亦都唔可以用 first draw sample 呢一個咁嘅 maximum concentration 就去 compare with WHO 嗰個 guideline value。

問：但係你視乎啲人攞乜嘢水嚟煲嘅啫，同意嘛？

答：同意。

問：同意。

答：如果你話日日咁樣你飲頭啖水嘅，呢個我就唔知，有啲人有啲咁嘅 habit，但係我建議啲市民為健康著想，就最好唔好用頭啖水。

問：市民決定佢哋嘅生活習慣係點，呢個係另外一回事，但係有啲市民覺

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得「做乜我要睇水呢？」呢個你冇得控制佢㗎，但係即係...

答：其實唔睇水㗎㗎。

問：你可以用嚟做第二啲嘢咩。

答：係。

問：我明白。但係習慣嘅嘢有陣時我哋唔好同啲市民爭拗，每人生活嘅方式都唔同。你頭先就有提到，就係話你喺同事之中就口耳相傳，就話有個做緊嘅調查，就話唔知有九十幾 per cent 嘅受訪者話佢哋起身開水喉，第一件事就係刷牙洗面啫，唔係要嚟煲水飲嘅。

答：係。

問：呢個係未成事，未完成嘅一個報告嚟嘅，係咪呀？

答：係，仲進行緊嘅，我相信。

問：Okay，所以有關嘅 methodology，有關嘅嗰個背後嗰啲假設同埋嗰個做法係問卷定係真係擺個嘢喺度，真係有 physical 嘅 sample 擺去--唔係，即係 test 住嗰個幾時開水喉，呢個係未知，未有一份文件可以睇到嘅，係咪呀？

答：我相信係 interview 嚟嘅，應該係。

問：Interview，okay。因為我哋就有一份文件，就係聽到你講之後，我哋即刻抄到嘅，就係而家我哋入咗我哋個 bundle 裏面㗎喇，未必係太過關事，因為呢啲係冇科學對錯嘅，幾多 per cent 嘅人用咩嘢水，但係你睇番呢份文件，我擺住嗰份係未有 page number 嘅，我想知道 officially 係 bundle A4 第 2745 頁，bundle A4 第 2745 頁，你見到喇？

答：（沒有可聽到的回答）

問：呢個就係一份 1986 年嘅文件嚟嘅，就可能舊咗少少，你可以話人嘅生活習慣都唔同嘅，但係呢一份係 1986 年喺英國嘅一份文件嚟嘅，就係 Water Research Centre，有冇聽過呢一個機構？

答：我喺度受訓過嘅。

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問：有受訓過，86年受訓咗未呀？

答：我喺1990年喺嗰度受訓。

問：Okay，佢86年就做咗呢一個嘅調查，就叫做“Domestic Water Use Patterns”，你見到喇？

答：係。

問：你睇番，攞一頁，攞一頁就係2747頁，“Domestic Water Use Patterns”，佢就開宗明義，就話“The concentration in drinking water”，你見到嘛？

答：（沒有可聽到的回答）

問：“The concentration in drinking water of a contaminant such as lead, that is derived from the household piping, is partly dependent on the length of time that the water has stood in the pipes before use.”，呢一句你同意㗎？

答：係。

問：即係你停得越耐，啲鉛份釋出就越多，呢個係常理啫。

答：係，contact time 越長。

問：“A survey of patterns of water-use was therefore undertaken to provide better information about such times of stagnation. The survey also enabled the consumption of water for drinking and cooking to be estimated separately from total demand.”，呢個就係嗰個調查嘅目的，你見到喇？

答：（沒有可聽到的回答）

問：你睇番嗰個 summary，攞一頁，佢就將佢嗰個 methodology 講咗出嚟，2749頁，2749，你見到喇？

答：唔。

問：2749頁，summary，佢就講佢嗰個方法，“Patterns of domestic

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water use were measured in a survey covering some 100 households in 22 districts in England, Scotland and Wales. Automatic monitoring and recording equipment was installed in each house to register the volume and time of day of each individual flow of water through the service connection for a period of two weeks.”，佢就唔係淨係靠 interview，佢直情係擺咗個 meter 喺嗰度，一個 meter，一個 recording device，就度住，就比較準確，對嘛？

答：唔。

問：就知道幾點鐘開水喉，就唔係淨係靠 word of mouth。“Distributions were obtained of the stagnation times between uses”，“and of the volumes of water drawn. Consumers operated a button to identify water used for drinking and cooking (potable uses) so these could be dealt with separately in the data analysis.”，即係話如果你開水刷牙嘅，同埋你開水要嚟煲或者要嚟煮餸嘅，佢就會分開處理，因為有個掣可以幫助佢分開。

跟住就話“The effect of household characteristics, such as number of occupants, socioeconomic status and geographical region, on the average daily consumption of water, on the mean and median inter-use times, and on the frequency of uses was investigated. Separate results are given for first draw uses. The average pattern of diurnal variation in water demand was also estimated.

The report concludes that, as expected, the number of persons in the household is the main factor influencing the consumption of water for non-potable purposes. However, the consumption of water for potable purposes appeared to be independent of household size. The mean inter-use time was dependent on household size, the main difference being between single person and multi-person households.”，呢個就係嗰個撮要。

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我想你睇嘅就係 internal page 33 頁，internal 33 頁就係大嘅頁數 2784，2784 頁，你睇下佢嗰個 conclusion，佢嗰個總結嘅第(7)，當然我知道呢個係 1986 年，呢個係英國，但係佢嘅總結就係係英國，“About 25 per cent of the first draws are used for potable purposes.”，即係用佢呢一個 methodology 做出嚟嘅報告，睇出嚟嗰個 pattern，就有百分之二十五咁多，一早起身第一件事開喉就係要嚟飲用嘅。

呢個係即係起碼我哋叫做白紙黑字有得睇嘅一啲報告，就見到英國就 25 per cent。你剛才冇提過你同事就係做緊--唔係做完，做緊，你同事做緊嗰個調查其實個目的係咩嘢嚟？

答：睇下佢嗰個用水習慣同埋對於節約用水嗰個態度、意見嗰啲咁嘅嘢。

問：用英文講，係 prompted by 呢個鉛水事件，係呢個鉛水事件引致到有呢個調查，定係根本不關--你哋不關 plan 緊做嘅嘢都包括咗呢樣嘢其實？

答：因為而家佢哋做緊嗰個，我哋叫 Total Water Management 2.0 一個咁嘅 consultancy study 嘅其實，即係我哋喺一九...

問：2.0 即係進階版咩嘛，叫做係？

答：係，冇錯。喺 2008 年我哋推出第一版就...

問：1.0。

答：係，第一版嘅 Total Water Quality Management，經過咁多年之後，我哋想睇下個成效同埋有啲咩嘢 improvement 嘅嘢可以再進一步嘅。

問：所以呢一個唔係因為鉛水事件引致話「不如我哋調查下喇。」而係 as part of 一個大啲嘅 project 咁嚟，對嘛？即係叫做呢個進...

答：我唔知會唔會因為鉛水事件，佢順便加咗啲 questions，睇下一啲人嗰個 water use 嘅 habit 即係香港係會係點，呢個我就唔係好清楚，因為唔係我負責呢個 project 嘅。

問：好喇，我哋講番先，就係呢個 project 未做完，結果係點都未知嚟？

B

B

C

答：未知。

C

D

問：我哋亦都係冇一啲 publish 咗嘅資料知道呢個 project 個 methodology 係點樣？

D

E

答：係。

E

F

問：但係所以水務署喺所謂決定佢個 sampling method 嘅時候，就唔係基於任何嘅一啲 statistical analysis，有關用者個用水習慣嘅，對嘛？

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答：係，係。

H

I

問：你就話用頭啖水，first draw 就淨係反映到可能，可能，你話未必，可能個 worst case scenario，滙咗一晚之後未必反映到一個人平均每日飲嘅水嘅數量。

I

J

答：係。

J

K

問：你嘅理論就係 flush 兩至五分鐘出到嚟就更加能夠反映，okay，但係我想 put 畀你嘅一個提議就係其實呢一個真係視乎個 household 佢哋個用水習慣，你同唔同意？

K

L

L

M

答：同意。

M

N

問：同意。

N

O

答：因為一個 household 嘅 size 同埋有幾多人 sharing the tap 係會影響到個個 water quality 嘅。

O

P

問：同埋有陣時可能就係我哋知道就係公共屋邨啲水喉入屋，因為香港--我聽我哋嘅專家講，香港啲水喉入屋兜啲啲--兜兜轉轉，其實就有啲就係先入屋就去咗廚房，有啲先入屋就去咗廁所嘅，即係五花百門嘅，你知道㗎嘛，係咪？

P

Q

Q

R

答：我嗰次跟李教授去睇過，就...

R

S

問：你都見到五花百門嘅？

S

T

答：有啲會出咗去，然後再返番入嚟。

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問：入番去咁嘅，即係條路都有排咁樣兜嘅，入咗之後先去邊度又唔同嘅，係咪呀？嗰個位。

答：係。

問：入咗去之後出番嚟，行咗幾遠再入番去又唔同，會有啲咁樣，好多 variation 嘅，對嘛？

答：係。

問：每家每戶用水嘅習慣都會唔同，你就會同意？

答：係。

問：你會同意就係有人真係起身就開水煲水，跟住煲咗水之後，個壺飲用水就係要嚟我哋叫做 last through whole day 㗎喇？

答：呢個我好難 comment，因為呢個...

問：我話畀你聽，我係咁，不過每人都可以講唔同嘅習慣喇？

答：係，冇錯。

問：你同意喇？

答：係。

問：即係我唔想好攞斷、好武斷咁樣去 generalise，有啲人好日都唔喺屋企飲水嘅，有啲人飲尾浸水嘅，你唔會抹殺排除有啲人係一早起身就阿媽或者工人喺廚房第一件事開水喉，倒咗尋晚個浸隔夜水，即係飲用水，因為隔咗夜，就開水喉，廚房就會煲壺新水，有人係咁做㗎，即係就算你本身唔係，你都會接受有人會咁做，對嘛？

答：係。

問：你都會接受，就係成年人日頭好多時候會出街，比較少喺日頭飲屋企水，成年人？

答：係。

問：但係 BB 就唔同，BB 全日都喺屋企，對嘛？

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答：（沒有可聽到的回答）

問：所以 BB 飲屋企水嘅機會會大過成年人飲屋企水，對嘛？

答：所以點解佢係 most sensitive group。

問：係喇，most sensitive，就係話一早起身，又係個個人唔同，我有朋友佢直情有個分別嘅水壺，喺 BB 個間房嗰度，沖奶就喺嗰度倒啲熱水出嚟開奶粉嘅咁樣，你都會接受有啲人係咁樣嘅，係咪呀？

答：係。

問：我想帶出嘅，就係既然家家嘅習慣都唔同，而係冇一個所謂科學嘅方法可以話到畀你聽呢一種 flush 法就 deem to be 代表所有人飲水嘅方法，一個負責任嘅所謂想去了解市民飲咗啲水裏面含幾多鉛嘅一個測試嘅方法，係咪應該兼顧唔同飲水 pattern，用水嘅規律嘅人嘅習慣，而諗一個方案出嚟，而唔係純粹機械性地覺得「我要 average，purpose number one: average，只得一個方法嘅啫，就係 flush 你三分鐘。」你明唔明我問你嘅問題？

答：我諗如果我哋唔係攞一個 flushed sample，你攞出嚟嘅 result 根本就 inconsistent，同埋唔可以 interpret 嘅。

問：Inconsistent with 乜嘢呢？

答：你唔知道佢呢個水喉之前有冇用過水，或者係佢一早，或者係幾日都有開過水喉，或者係點，你攞一個水辦，你攞個 test result 之後，你點樣 interpret 呢一個--即係當你 first draw，你有一個 equal basis，我 flush 佢兩分鐘，就 make sure 嗰啲 result 係 consistent 同埋 reproducible，呢個係一個科學化嘅 approach 嚟嘅，就唔係話我要諗下你幾時有冇開過個水喉，然後攞一個水辦，呢個水辦我攞咗返嚟之後，test 到個 result 出嚟，我點 interpret 呢？

問：我明你講乜，你嘅意思即係話我哋唔好講究竟頭浸水係咪所謂 representative of 某一種社群嘅飲水習慣，你頭先所講嘅就係一個實際嘅問題，就係你用 flushed sample，起碼水務署入到去，「我控制到，我知道你係 flush 咗兩個鐘嘅，我知道呢個一定係 flush 咗喇。」whereas 如果你係要用頭浸水嘅話，我一早去到--我要信你嗰個住戶話畀我聽你尋半夜去廁所，冇洗到手，係咪呀？

B

B

C

答：係。

C

D

問：即係要講個信字，對嘛？

D

E

答：係。

E

F

問：係咪咁講？

F

G

答：係。

G

H

問：所以你哋就覺得你係用一種自己控制到晒嘅辦法，就自己最信任，係咪呀？

H

I

答：係。

I

J

問：但係而家就係非常時期，咁就用非常手段嚟喇，而家係發現咗有呢個問題，而家唔係你 randomly 走去話要 test 下你 generally 啲水靚唔靚，而家係有人話咗畀你聽係有食水含鉛嘅問題，同意嘛？

J

K

答：同意。

K

L

問：而家我哋唔係--而家我哋面對住一個--我唔會話係一個 crisis，crisis 好似即係--不過對一啲住戶，佢哋會覺得係好嚴重嘅問題，但係係一個特殊嘅情況，對嘛？

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答：唔。

N

O

問：唔係一個 routine 話我哋不如得閒去抽個水辦望下，唔係呢啲咁樣嘅 standard 嘅一個 operating procedure，你同意嘛？

O

P

答：係。

P

Q

問：同意。首先就係你睇番 1986 年英國嗰個做法都係，其實你要真係好可靠地知道嗰家人對上一次夜晚黑最後一次用水同埋早上第一次開水喉，你想唔靠講個信字，係有 meter 可以整到嚟嘛，對嘛？

Q

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S

答：係。

S

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問：即係呢啲係好常見嘅嘢嚟嘅啫。

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答：不過正如你所講，喺一個非常時期，我哋需要係有一個好 efficient

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同埋好 reliable 嘅 sampling method, so that 我所有嘅 test result 可以好 confidently 去 compare with 一個世衛嘅標準嘅。

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D

問：世衛佢係叫你講就係話搵一個 representative 嘅 sample, 但係 representative 嘅 sample, 既然我哋都講過, 就係話你--其實有一個人叫 representative 嘅人, 對嘛?

D

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F

答：係。

F

G

問：你搵唔到一個 representative 嘅人出嚟㗎嘛, 有啲人係早上, 有啲人係夜晚, 所以你只能夠 representative of 早上飲水嘅人同埋晚上飲水嘅人嘅啫, 每一個時段飲水嘅人都有個 representative sample 嘅, 同唔同意?

G

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答：如果你真係要話搵一個 representative sample, 就好似我今朝講, 你要做一個 proportional sampling, 你要嗰個人一開水喉, 咁就嗰面 key 咗出嚟, 裝幾多, 然後你去做一個 testing, 你攞一個 flush 嘅 sample, 兩分鐘, 再 compare with 嗰個 proportional sample, 究竟大家嘅 difference 有幾多, 你先至可以話你呢個 sample 係咪 representative。因為你呢個中間仲有一個我哋叫做 mean inter-use 嘅 stagnation, 即係你開完水喉, 攞完啲水飲或者用完之後...

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問：三十分鐘可能係, 唔係漏夜。

N

N

答：係, 你可能隔一個時間之後又再開水喉, 佢未必一定攞嚟飲㗎嗰個又, 係咪先?

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問：係, 我睇啲文憲都係㗎, 有啲人有四種方法, 有啲就係 stagnate 一輪, 有啲就漏夜, 一係就 random, 一係就 flush, 好多種嘅, 但係而家就係喇, 非常時期, 同埋有居民想要, 佢話「我要安心。」因為你話畀我聽 flush 咗一輪之後, 但係我基於種種理由, 我想--起碼我知道我之前飲落啲有冇事, 當然, 政治上或者政策上你願唔願意 appease 或者去 pacify 呢一啲居民另外一個問題, 但係有居民要做呢樣嘢, 想攞個安心, 但係實際上唔係做唔到嘅, 對嘛?

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答：我哋攞個 flushed sample, 其實已經一步到位, 就話咗畀你聽如果你個屋企嘅水辦, 我係用我嘅抽樣方法係安全定唔安全, 你已經可以畀到一個 assurance 嗰啲居民, 嗰個 about their safety of 嗰個 water quality, 其實。

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問：但係如果你抽咗個水辦出嚟係 8 microgram per litre 嘅，叫做 borderline 嘅，叫做達咗標，但係佢哋就會心諗，「嘩，如果你 flush 咗兩分鐘或者五分鐘，都係 8 個 microgram，如果唔 flush，我開頭飲頭浸水，飲咗兩年，咁咪好大件事？」佢哋係會咁諗嘅，你又唔做個 unflush 嘅 sample 畀佢，佢哋咪吊吊擰囉，喺半空，佢哋個心情。

答：我亦都要提，如果你攞個 unflush 嘅 sample，攞咗一個數，呢個數係代表乜嘢呢其實？你係咪話畀我聽你一個咁嘅 concentration of 個 lead in water 係你全日都係飲呢個嘅，或許你根本你個個 instantaneous，你一開水喉，好似 Task Force 做出嚟，已經即刻跌咗 90 個 per cent，你中間所--即係或者 inter-use 嘅 stagnation，你都唔會去番呢一個 transient concentration 㗎喇嘛？

問：你咪畀個用者去判斷，你咪話畀佢聽「你搵一個人」，我相信李大律師佢代表好多居民，而家唔係話你強逼啲人，而家係啲人要，如果啲人要到嘅話，你叫佢做乜，佢都會配合嘅，你同佢講「我攞個 meter 喺你個度，我同你話到明你夜晚去廁所唔好洗手，或者你用濕紙巾，okay。」，你滷六個鐘頭得出嚟嘅結果，你可以公告，就話「我得出嚟嘅結果，flush 咗之後就係咁，唔 flush 就係咁樣，你哋自己走去判斷，你如果係唔飲頭浸水嘅，你安心，因為 flush 完 okay，但係你係飲頭浸水，嚟，原來結果係咁，你 beware 喇。」點解唔可以咁做呢？

答：我或者講一講 DWI 嘅做法，佢係攞頭啖水，佢英國嘅法例亦都要求佢攞頭啖水，test for 個個 lead、nickel、copper。

問：係，我知。

答：攞完頭啖水如果超過嗰個 10 嗰個 limit 之後，佢要再返去攞嗰個即係我哋叫做 flushed sample 或者係有時攞 stagnation sample，然後去再決定嗰個 flushed sample 究竟係唔係 flush 完之後，可以符合佢個 10 嗰個咁嘅 limit，如果得嘅話，佢就會畀 advice 嗰個 consumer，「你 flush 完，就 okay 㗎喇。」如果唔係嘅話，佢就建議嗰個 consumer，就換呢啲喉，但係而家我哋因為...

問：即係可能佢唔願意改變習慣，咁就話「你換咗佢喇」？

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答：換喉，係。但係喺香港嘅情況，我哋係要喺一個最短嘅時間之內畀啲啲市民有個安心，我哋就要 adopt 一個 efficient 嘅方法，而 objectively 咁樣可以 assess 到嗰個 water 嘅 safety，而唔係擺個頭啖水，擺咗出嚟，可能高，可能低，但係你又有一個標準去 benchmark 佢幾多為之係安全、幾多唔安全，即係話好似你講話「我好鍾意飲頭啖水嘅。」飲頭啖水喺邊個水平先安全呢？我哋有一個標準，全世界亦都有一個標準係邊一個係安全水平，嗰個 first draw。

我亦都曾經吵過，美國疾控中心 CDC 有一個我哋叫做 oral 嘅 lethal dose，oral lethal dose for lead，佢係講緊係 450 個 milligram per kilogram body weight，即係呢一個係 lethal。

問：Oral 即係 O-R-A-L？

答：係，oral。

問：即係你食咗咁樣嘅 concentration 就死得嚟喇？

答：係，冇錯，而呢一個咁嘅 oral lethal dose 係 derive from 一個 worker 70 公斤重，喺一個工作環境就有 21,000 個 milligram 嘅 lead per cubic metre 嘅空氣，and then 佢嘅 breathing rate 就係 50 個 litre per minute，去 derive 出嚟嘅，...

問：計出嚟㗎嘛？

答：計出嚟。

問：唔係搵個真人試。

答：但係全世界係有一個 parametric unit for 一個 first draw sample 應該用咩嘢標準為之安全嘅。

問：但係世界都有一個 parametric unit 係話一個 flushed sample 係安全嘅，其實。

答：有。

問：你所講嘅就係嗰個...

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答：WHO。

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問：我明，你所講就係嗰個 average consumption 啫？

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答：係。

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問：但係 average consumption -- 我哋頭先所講，average consumption 就視乎你個人嗰個習慣嘅之嘛，如果我嘅習慣係日日都飲頭啖水嘅，我嘅 average consumption 就係 calculated by reference to unflushed sample 㗎喇，對唔對？

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答：係，我覺得呢個就係 extreme case，個 WHO，我諗全世界嘅 standard，正如我講，就冇一個 standard 可以去 cater for 一啲 worst 嘅 scenario 或者係 extreme 嘅 case 嘅。

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問：但係點解係一個 extreme case 呢？即係如果有人嘅習慣真係飲頭啖水嘅話。

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答：但係呢個係咪一個 generic habit 呢？

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問：唔係，呢個係人見人殊㗎嘛，係咪呀？

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答：係，所以...

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主席：唔係，你英國似乎係，有好多人係喇。

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問：我畀你嗰個 e-mail exchange，你其實你問過 DWI，我知道你嘅證物 4，C19.6 14575。

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主席：唔係，我唔係想 challenge 任何人，其實好似我問署長咁啫，當然你做你嗰個 average 嗰個，我覺得冇問題，一個數據畀啲市民參考，不過做多個都唔係好難啫，即係我嘅意思，行多一步，worst scenario 就係咁樣樣，average 就係咁樣樣，或者甚至你可以做個最好嘅就係咁樣樣，沖夠二十分鐘就係咁樣樣。最好、average、最衰，話咗畀人哋聽，佢決定囉，你明我意思咩嘛？

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答：我明。

問：因為即係 before 我睇嗰啲 e-mail，因為其實呢度係你嘅證物，你都好開誠布公擺出你曾經 consult 過英國嘅 DWI，但係行多一步，其實畀個用家多一個嘅選擇，多一重資料係咪好過你強制就話「我覺得呢一種就係對你最好，你無需要知其他嘢」？

答：我或者解釋少少，即係擺一個 first draw sample，同時擺一個 flushed sample 就唔係困難嘅，但係有個問題就係嗰個跟進嗰個 analytical 嘅工作，擺一個 unflushed 嘅 sample，好多時候佢嘅 treat --即係嗰個 analytical treatment 係唔同一個 flush 嘅 sample 嘅，因為佢嗰個--譬如擺一個 flushed sample，佢嘅 turbidity 好多時可能會--即係你漚咗一段時間，你會高咗嘅。

如果根據我哋 US EPA 200.8 嗰個方法，如果個 turbidity 高過 1 嘅時候，我哋要將嗰個 sample 要做 acid digestion，要做 acid digestion，嗰個時間就變咗耐咗好多㗎喇已經係，就唔係好似我哋擺個 flushed sample，一驗到佢嗰個 turbidity 低過 1，我哋就即刻上機，就好快有 result。

通常嚟講，我哋喺幫公共屋邨做嗰個水樣本嘅時候，我哋擺咗個樣本之後就二十四個小時之內，我哋就要公布嗰個 result 㗎喇，我哋就唔可能又擺個 flush 個 sample，然後做一輪嗰個我哋叫 acid digestion，然後先至再做。變咗喺呢一方面，嗰個時間同埋個 efficiency 都會受到影響嘅其實。

問：你話要二十四小時內公布，呢個係咩嘢規定？

答：呢個係我哋--政府希望我哋...

問：一個 performance pledge 咁上下？

答：唔好話 performance pledge，係我哋係希望能夠儘快有個結果，令到市民安心，令到居民安心，所以我哋會儘快出咗 result 嘅，我亦都試過我哋嗰啲 sample 擺咗返去之後，我哋同事係做到夜晚三點幾，我四點幾出 result。

問：我明。

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答：我哋目的就係想儘快有 result，讓啲啲市民安心嘅，其實就。

問：Task Force 都係抽 first draw 同埋 flush，係咪？

答：佢個係 investigation。

問：但係我哋--你又好執著有陣時話 investigation 定係 general quality，但係我哋而家係有件事發生咗，你係針對性地搵 lead 咁嘛，而家係，點解唔係一個 investigation？

答：我哋而家係搵個 water quality 係咪符合世衛標準，唔係搵 the presence of lead。

問：但係我哋而家知道咗有一個 lead 嘅問題，我哋想知道究竟某個屋邨嘅某一浸嘅住戶佢哋嘅用水會唔會有 risk of contaminated, not generally，但係 by lead 咁嘛而家係？

答：如果你係用呢一個咁嘅目的，你係做緊我叫做 inventory monitoring 嘅工作，inventory monitoring 好多時你就要擺 first draw 或者係我哋叫 RDT 又好，然後利用呢個 inventory monitoring 去 establish 個 scale of the problem, the presence of lead in 呢個咁嘅 system，而家我哋係做緊一個我哋叫做 compliance monitoring，我哋擺個水質係咪符合世衛標準，大家嘅 purpose 係唔同嘅。

問：但係我又想問你，個 purpose 係你定嘅啫，因為譬如話而家發生咗事情，房委會或者各大嘅 stakeholder，佢哋走嚟搵你，佢唔會 specify 你，「唔該你做個 test for purpose A」咁啲嘛，即係好似啲人搵律師咁樣，佢唔會走嚟整個 problem 畀你話「我想你答呢個問題。」佢走嚟搵你，就係話「我而家有一撻嘢喺度，唔該你幫我諗最靚最好嘅辦法解決到一個問題。」所以 set 個個 purpose 都係由你 set 啲嘛應該？

答：唔係，今次公共屋邨個個就由房委會主席佢喺 7 月 24 號就話要喺兩個月之內，為香港所有嘅即係 2005 年之後建嘅公共屋邨完成抽水驗水嘅工作，佢目的係要 determine 個個 lead content 係咪 comply with WHO，佢個 press release 有講呢樣嘢。

問：我同你睇番個 e-mail，就係頭先我所講 C19.6, 14575，你見到呢個係你嘅證物第 4。

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答：係。

主席：14575？

石先生：14575。

主席：唔該。

問：呢個係覆陳先生個 e-mail 嚟嘅，陳先生 send 出去問嗰個 e-mail 就喺 14576 嘅底嗰度，你見到，係咪？

答：係。

問：你嘅問題就係 "In Hong Kong, there has recently been the lead in water incident in the new public housing estates. The method of taking water sample from tap after 2-3 minutes flushing practised by my Department has been a matter of considerable debate by the community and subjected to challenge. Currently, we are following the provisional guideline value of lead 10 µg/L for compliance checking of drinking water quality for lifetime consumption.

At present, I am not aware that there is a harmonised approach in taking water sample for lead testing in EU. In this regard, I write to enquire about the sampling procedure for lead testing in drinking water at consumer taps in UK for assessing the compliance with the parametric concentration of 10 µg/L as specified in the Water Quality Regulation of UK and EC Directive for drinking water standard. If stagnation sample, say overnight or several hours is taken for lead testing, what is the standard/reference value for compliance assessment."，呢個就係你嘅問題。

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答：係。

問：跟住答案就係 14575，佢開頭就係“You are correct to say that there is no harmonisation with regard to sampling technique for lead across EU member states. I believe that at one time the intention was to agree a common approach but this has not happened.

In the UK, regulatory compliance sampling of public supplies is carried out by the water companies. Samples are taken at consumers' properties, selected at random. Samples for lead must be 'first draw' samples, that is, the sample comprises the first litre of water drawn from the tap before the tap is flushed in preparation for further samples to be taken. If the sample result exceeds the limit of 10 µg/L”，呢個其實亦都係香港嗰個世衛嘅標準，不過佢哋有法例嘅規定。

答：呢個 limit 我曾經問過佢，佢又話唔係一個 health-based 嘅 limit。

問：Okay，但係佢哋總之有個 limit 喇？

答：有個 limit，我就問過佢，佢就話呢個 limit 點定，佢就話係相當困難嘅，佢話裏面有好多 debate 究竟係定一個咩嘢 limit。

問：總之佢哋就係用 first draw 嚟睇下係咪 reach 到有個佢哋定咗嘅 limit？

答：係，冇錯。

問：就咁啱亦都係 10 micrograms per litre？

答：係，係。

問：“the water company should return to the property and take further samples, which would normally include a fully flushed sample and sometimes a 30-minute stagnation sample”，呢個就即係唔同嘅 sampling，overnight 嘅可能其實即係叫做 6-hour stagnation，可能大約，係咪呀？差

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唔多喇？

答：係。

問：呢度有個 30-minute stagnation sample, "to ascertain whether flushing the tap for two minutes or so reduces the lead level to below the limit. The company should also investigate the consumer's service pipe and internal plumbing system to establish the presence of lead pipework, and investigate the company's own communication pipe", "If the company's communication pipe is made of lead the company must replace it. The company must also give the consumer written advice on actions they can take to reduce the risk from lead in their water supply, which might include flushing the tap before using the water for drinking or cooking, and replacing any private lead pipework.

Over-night stagnation sampling is not carried out very widely, because it would normally be dependent upon the consumer to take the sample first thing in the morning, and companies prefer to take their own samples. Water companies have the power to enforce prevention of contamination caused by consumer's private plumbing systems. If the consumer's premises is a place where tap water is made available to the public, for example a restaurant, then the water company must use its legal powers to ensure that any private lead pipework is replaced.

In the UK the use of lead solder in new plumbing systems has been banned for some time, but we have found that brass fittings can also be a source of lead in tap water, which the Inspectorate has carried out some research into. These days, however, most new water meters include very little brass, so this problem should reduce over time."

呢度你就係見到英國你向佢哋即係請教，佢就指出咗佢哋嘅做

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法，佢話一定要係--第一個應該係--佢哋嘅做法，就係一定係 first draw sample，搵到超咗佢哋嘅標，就會採取一連串嘅跟進嘅工作。

答：係。

問：你嘅理解，佢哋用 first draw 嘅理念係咩嘢呢？

答：佢嘅 first draw 嘅理念除咗係睇下究竟 flush 嘅 sample 係咪可以達標之外，佢仲有一個--即係因為英國而家好多水廠都係落緊啲嘅 orthophosphate 嘅，佢要睇下究竟...

問：Orthophosphate 就係去減低個 plumbosolvency，係咪呀？

答：冇錯，係，係一個 plumbosolvency control，佢想攞咗啲...

問：停一停先，係因為佢哋歷史嘅問題，佢哋用鉛造嘅水喉管，冇辦法，所以佢哋惟有靠外力攞啲化學物質落去減低啲個可溶性，對嘛？

答：冇錯，係，因為佢仲有一個最大嘅原因就係英國或者係歐盟啲個鉛啲個標準，佢原本由 50 去到 25，25 之後就喺 2013 年 12 月，好似唔知係咪 25 號定係 23 號，再進一步降到 10 嘅，佢英國係要被逼要採取一個好 aggressive 嘅我哋叫 corrosion control 嘅 programme，佢就要喺啲啲咁嘅--你冇可能一次過換晒所有啲啲 lead pipes 嘅，佢就惟有好似你講，就加一啲 chemical 落喺個 water treatment work，就加啲 orthophosphate，and then 就利用 orthophosphate 入咗啲個供水系統之後，同啲啲 lead pipe form 咗一啲叫 lead orthophosphate，一啲 protective layer，就防止啲啲 lead 喺啲鉛喉裏面滲出水嘅。

佢呢一個咁嘅 first draw 其實亦都 in a way，佢要睇下佢啲個 corrosion control 係咪 effective，係咪需要有地方佢仲要 optimise 啲個 corrosion control 嘅 programme，因為我睇過一啲文憲，佢 optimise 一個 corrosion control 嘅 programme，即係落 orthophosphate，啲個 dosing 係要慢慢 optimise 去 tune 到佢能夠 achieve 到一個高 percentage 嘅 compliance with 啲個 10 microgram per litre 嘅 limit 嘅，所以點解佢一定要攞 first draw，就係其中有個原因，就 optimisation of 個 corrosion control programme。

問：你講其中一個原因，有其他原因喇？

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答：係。

問：其他原因係咩嘢？

答：其他原因就係睇...

問：你話呢個都係 health-based 㗎嘛，係咪？你嘅理解。

答：唔係，呢個 10 唔係 health-based 嘅。

問：唔係 health-based，sorry。但係佢跟住，你話佢會向啲消費者去
作出一啲意見，係咪？如果發現咗嘅話。

答：係，冇錯。

問：即係佢都覺得呢一個係一個頭浸水 show 咗出嚟嘅問題係值得佢哋要
去 take action，叫消費者改變下佢哋嘅生活模式諸如此類，係咪
呀？

答：如果你話好似有一啲 public outlet，好似餐廳咁，佢係要強制佢
換啲水喉嘅。

問：但係就算私人，佢又要畀意見咁諸如此類喇？

答：係，你可以唔換。

問：即係你私人，你選擇飲鉛水就你選擇喇？

答：冇錯，係。

主席：唔係，我想問，因為你之前嗰個 e-mail 冇--即係你問佢--因為我
睇番你之前嗰個 e-mail，你問佢 overnight、several hour，
“what is the standard/reference values for compliance
assessment”，你呢個係你個問題㗎嘛，你呢個係個問題，佢咁樣
樣答你，完全唔係話因為其他嘅原因，即係佢冇講話「因為我哋有個
咁樣嘅 programme，我哋又要試下我哋啲 orthophosphate 夠唔
夠」...

答：唔係，呢個我係睇我哋...

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主席：呢個你自己嘅--即係你加咗好多你嘅見解落去，即係我...

答：唔係，因為有其他嘅文憲係講呢樣嘢。

主席：跟住人哋就咁答吓嘛。

答：係。

主席：係囉，佢咁答，佢就話「我哋係咁樣樣㗎。」咪係囉。

答：其實佢仲有一度答我，佢哋擺個頭啖水，佢係屬於我哋叫做 audit monitoring 嘅，即係喺嗰個 EC 嗰個 EC Drinking Water Directive，佢擺頭啖水係 for 一個我哋叫做 audit monitoring，佢另外一啲 e-mail 答過我嘅。

主席：唔係，呢啲我明，佢哋英國有佢哋好多啲規矩，係咪先？不過呢個佢係好 specific 咁樣樣答你，有關於你問佢「我哋香港究竟應該點做？」咁樣樣，用邊種方法，你問完，佢畀咗呢個答案你，但係你就決定唔需要跟佢？

答：唔。

問：但係你純粹睇字面呢度，我又係問番，即係我不斷都會返嚟問番你，就係佢哋都係先用咗 first draw，發現到有一個問題，就有一啲跟進嘅工作，可能係再抽 flushed sample 或者要畀呢個消費者一個意見，唔似係純粹就係睇下嗰個 corrosive control 做得靚唔靚咁樣，因為如果純粹係知道 corrosive control 做得靚唔靚，咁咪自己心知咪得囉，點解又要牽涉到要同個消費者去講呢，如果係超過咗 10 嘅話，佢哋覺得就要同消費者講？

答：其實頭先我嗰啲 information 係睇一啲嗰啲 paper, technical paper, 都係 DWI 入面有一啲人喺我哋叫做 IWA 嗰啲 journal 嗰度 publish 嘅，其實就。

問：即係剛才你所講話英國就因為歐盟喺 2013 年嘅時候改咗例，英國焗住要要做一啲 aggressive 啲嘅 corrosion control，所以引致好多好多嘢，所以佢先至要做呢啲嘢，呢啲就係你喺呢個 e-mail 以外自己做咗啲 research？

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答：係，冇錯。

問：跟住就所謂你係 put 2 and 2 together 咁樣話畀我哋聽，係咪呀？

答：係。

問：但係嗰啲文憲你有擺到出嚟嘅？

答：冇，你想要，我都可以供應嘅。

問：可唔可以睇一睇，如果係？唔係而家喇梗係，即係你而家--即係我諗你要畀一畀我哋嘅委員會嘅律師或者秘書處。

答：唔，okay。

問：因為我哋都好有興趣去睇到嘅。

答：Okay。

主席：因為我哋見到 Scotland 嗰個都係--我哋嗰日已經 go through 過，都係擺 stagnation 㗎嘛，即係 2002 Scotland。

問：我畀你睇一睇，A1 tab 12，你睇一睇個 bundle tab 12，蘇格蘭。不如直情睇 15，因為 12 嗰個係 interim，15 嗰個就係-- tab 15，tab 15 就係 page 2，tab 15，你睇一睇第 248 頁，長話短說，就蘇格蘭又出現咗鉛水風波嘅，佢哋都，亦都係發現原來就係用咗啲含鉛嘅焊料嘅，請你睇睇 248 頁“Methods”。

話“Two objective tests were used to confirm the presence of leaded solder. Firstly, a colorimetric chemical indicator test was used to detect the presence of lead on surfaces such as pipework. Secondly, an isotopic analysis”

“Stage 2 testing was confined to kitchen cold water tap samples. This was to allow an assessment of the potential quantity of lead consumed by house occupants

as a result of drinking tap water at home. Different sample types were collected to obtain data on the different possible concentrations of lead associated with normal variation in the contact time between water and the internal pipework.

Flushed water samples provided the background lead level associated with water from the mains supply. Overnight samples provided data on the lead levels associated with the maximum normal likely duration of contact between water and internal pipework."

呢個就係所謂頭浸水，係咪呀？Overnight 呢個。

答：（沒有可聽到的回答）

問： "Stagnation samples provided a standardised measurement of the change in lead concentration over a fixed time period."，佢哋用三十分鐘，你見到。

跟住，"Random samples were taken to provide data on the typical lead concentration likely to be encountered during normal use of a kitchen tap."。

即係蘇格蘭佢哋做就係頭先我同你都曾經講過，佢哋用四種，random、first draw、flush 同埋 stagnation for 少過通宵，三十分鐘，佢個度就。

答：唔。

問：即係你有一個 range of data，你點樣去演繹、點樣去解讀，係咪呀？點都全面過淨係抽一個，你同唔同意？

答：我知道佢哋呢個係做一個 survey 嚟嘅，佢個 survey 就好多時間可以慢慢點樣攞辦或者係攞唔同種類嘅辦，然後再做一個 interpretation 嘅，但係相比起香港而家我哋個 case，就唔係做一個 survey，我哋而家係做一個 compliance monitoring，所以佢呢個抽辦方法，我係同意佢可以做 investigation 可以咁做，但係同我哋嘅 purpose 其實係唔相同嘅。

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問：好多時候我覺得你嘅答案都係叫做係受到你一個既定嘅 purpose 去限制㗎，但係中國人有句說話，就叫事在人為，或者叫「非不能也，就實不為也」，你如果將你嘅--而家我哋叫做發現㗎有十一條屋邨係叫做 affected estates，有可能有第二啲邨，而家好多邨民都喺度擔心緊，就係「會唔會其實驗水方法唔妥當，其實我哋啲啲都係中招嘅，只不過你係用咗第二啲方法，所以係驗出嚟叫做 unaffected」。

你自己局限咗自己一個 particular purpose，就係都話「我淨係可以用 flushed sample」，但係你睇下人哋，人哋 define a purpose differently，佢就用咗四種嘅方法，你都有異議到話你 define 個 purpose differently，你都唔反對抽幾種辦㗎，...

答：所...

問：... 點解你唔去諗下就係話「我唔 define 個 purpose as 一個 general compliance。」點解一定要焗住自己係 general compliance 呢？你自己 set 畀自己嘅，呢個框框係。

答：呢個唔係我哋自己 set 畀自己，因為我哋水務署係協助房屋署去抽水辦去決定鉛嘅含量係咪符合世衛標準，呢個已經係一個好明確嘅 purpose 嘅，係咪？我哋唔可以自己話「我鍾意又抽呢樣，又抽啲樣，然後做一個 survey，然後就將啲 data，我就唔知點樣處理。」就如果你咁就咁，咁就咁，即係呢一個我覺得啲個訊息畀居民更加混亂嘅會。

問：即係你 draw 一個 difference 嘅 distinction 就係你 proactively 地去諗一樣嘢出嚟，你就覺得比較難，因為你要自己諗個 purpose，又要諗下點樣教啲人去演繹，但係你 respond to 人哋走嚟求救，你就照人哋求救乜嘢，你就執個乜嘢藥畀人哋，呢個就係水務署啲個取態，係咪呀？

答：係，啱。

主席：唔係，我睇番即係可能 Mr Ho 都提過，9951，9951 19.1 嗰個...

石先生：19.1 9951？

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主席：係呀。就係你個 purpose 㗎嘛，你個 purpose 當時就係 A，就係 “in order to identify which” particular “rental housing estates/developments are affected”，呢個係你個 mandate 㗎嘛？

答：係。

主席：冇話一定要 general compliance of 呢個 WHO guidelines 呀。

答：我哋去即係話嗰個 identify 邊個屋邨嗰個 rental housing 係咪 affected，我哋都有嗰個 basis，就係去決定佢嗰個食水嘅鉛含量係咪符合嗰個世衛標準，其實如果唔係嘅話，我哋根本就唔知道點樣去 identify 邊一啲屋邨係受影響或者冇受影響，係咪？

主席：你 identify，咁梗係要 determine 埋佢個 extend of 嗰個 effect 㗎喇。

答：我哋嗰陣時嗰個定義就呢一樣嘢就唔係屬於 compliance -- 佢係唔屬於 inventory monitoring，係屬於 compliance monitoring。

問：唔係，但係呢一啲種種嘅字眼其實係你哋內部有陣時個區分出嚟，但係街外人，我真係唔會理你內部係叫做 compliance monitoring 定係 inventory monitoring，街外人好多時候--就好多時候啲人就係話「Give me the worst-case scenario, give me the best-case scenario, okay, there are the best of time and the worst of time, okay, 你畀我自己去揀。」點解你唔可以靈活啲做嘢呢你哋？

答：唔係，但係我哋唔可以 deviate from 我哋嗰個 purpose 㗎嘛，其實。

主席：唔係，你可以話畀房署聽「我哋可以咁做、咁做、咁做，你想我點做？」你可以㗎嘛，佢唔識㗎嘛？

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答：唔係，我哋正正係咁，即係房署又因為好似你主席講話「我哋唔識㗎，你話畀我聽點樣做」...

主席：你可以話畀佢聽「我哋其實有一個既定嘅方法，睇勻全世界都，有咁多種方法，噏，咁樣樣就有咁樣樣嘅結果，咁樣樣就會睇多啲，咁就睇少啲，我建議你咁咁咁，你同唔同意？」咁㗎嘛可以。

石先生：做律師都係咁嘅啫，其實即係。

主席：係呀，認罪就咁，唔認罪就咁，係咪？呢個官，死梗㗎喇你。

答：唔係，我哋可能 taken 佢個 mandate，就係話「你同我 check 下啲水係咪符合世衛標準。」我哋自然就用番個 flushed sample 去做呢一個咁嘅驗水工作。

問：唔係，但係我哋又返番嚟嗰度，就係話呢個就係假設 flushed sample 係代表性嘅，睇到我哋都 go through 過呢樣嘢，就係飲 flushed sample 水嘅人係一橛人，另外一橛人會係飲頭浸水，你頭先就話嗰啲係 worst case scenario，但係 public health estate，梗係要作最差打算㗎喇，好多時候係，同唔同意？Public health 有關嘅嘢。

答：但係 public health，我諗你 toxicology 嘅 approach，我唔係好清楚，係咪佢一定要用嗰個 worst scenario 去 estimate 個 exposure 或者乜嘢，但係 from water quality management point of view，我哋係擺一個係 average 嘅 quality，就唔係擺一個 worst 嘅 scenario 去 compare with 一個 guideline values，佢係 represent 一個 average quality for lifetime 嘅 consumption，所以我哋有一個 practice 係用一個 worst scenario 去 compare with 一個 average quality 嘅 guideline values 嘅。

問：香港都未試過有鉛水呢種危機出現過啫，呢個都係第一次啫，對嘛？

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答：亦都唔希望有第二次。

問：但係你有第一次，即係唯一一次喇我哋希望係，但係呢個唔係所謂你哋 run-of-the-mill 做開嘅嘢嚟㗎嘛，對嘛？

答：我可以話係 run-of-the-mill，我哋係攞 flush 嘅 sample 去做 compliance monitoring，亦都係符合其他國家，譬如澳洲、紐西蘭，佢哋都係攞 flushed sample 做 compliance monitoring，其實我哋係 in line with 一個 international practice 嘅其實。

問：但係我又喺度兜個圈，頭先我哋睇個係英國，係咪呀？UK、蘇格蘭，佢哋都係用 first draw 㗎咁樣，所以 international practice，即係你好似講到就話「我跟走 international practice，我有好多掣肘，唔畀我做 first draw。」好多人就用 flush，但係好多人亦都做埋 first draw，而家 international 冇人話唔好做 first draw 㗎嘢？

答：因為人哋有鉛喉，所以佢一定要攞 first draw 嘅，去睇下個 scale of the problem，我...

問：但係我哋而家係有 potentially 知道有含鉛嘅 solder，我哋知道有邊啲屋邨係被呢啲 potentially 含鉛嘅 solder 影響，都係知道有個 potential 嘅源頭，想搵下嗰個源頭有冇影響之嘛，對嘛？

答：唔係，如果你想搵源頭，我哋其實攞咗 flushed sample，我哋跟進嘅工作，如果佢超標，我就已經用一個 XRF 嘅 technique 去搵嗰個 possible source of 嗰個 lead 㗎喇嘛已經，同埋亦都有一個 elemental analysis，即係其實我哋 instead of 話驗完水之後就--超標之後就唔係做任何嘢，我哋都會去搵佢嗰個 possible source of 嗰個 lead 㗎喇嘛。

問：係，base on flushed sample 超咗標。

答：係。

問：Flushed sample 冇超標，你就唔會去搵㗎喇，因為在你哋眼中就 close file，...

答：正常情況係。

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問：...因為叫做正常？

答：係。

問：雖然 flushed sample 冇超標嗰啲屋邨用 first draw 可能係超標
㗎。

答：超標，我諗呢個係一個假設性嘅問題㗎，呢個應該就，即係...

問：我哋未必需要畀你睇啲實際嘅屋邨，你都知道有啲 unaffected
estate 其實係 borderline 嘅，有好多單位，你知嘅，係咪呀？

答：唔可以話 borderline，因為我哋做...

問：高過 5 喇，高過 5，少過 10 喇。

答：可以話高過 5，少過 10，我哋唔可以話佢...

問：有，你知道有呢啲情況嘅，係咪呀？

答：有，有，但係唔多數目。

問：唔好理多少，有喇？

答：係。

問：即係如果我要畀你睇啲實際嘅嘢，我可以畀你睇下嘅，就係 A3，A3 嘅 tab
43 2391 頁，2391，呢個就係 unaffected estate，2005 年或
之前建成，右手面黃色嗰棟就係叫做 borderline，borderline 嘅
定義係咩嘢呢？就係高過 5 microgram，少過 10，即係 5 至 10
microgram，就定義為 borderline，即係 for 呢個 purpose，黃
色嗰棟，你見唔見到？右手...

答：唔係我哋定嘅，呢個 borderline。

問：唔係，我明，即係我咪話畀你聽呢個係製造呢個表嘅人，因為
borderline 都有世界定義，你可以話要 9.5 先係 borderline，
但係呢度話畀你聽 5 至 10，就覺得叫做係 borderline，如果用呢
一個定義嘅話，就都有一拈嘅，你見到，呢個係 2005 或以後建成嘅
屋邨，你右手面見到有啲係 7，有啲 6、6、7，有啲 8，你見到喇，
有啲 9 咁嘅，你睇下 2393 嗰度，有一個係 9 嘅。

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所以你話唔多，呢個係一啲 random sample 嚟嘅，呢啲係，你一路揸，其實都唔能夠話--即係都唔係零星落索，其實都有一拵咁樣，都叫做係 5 至 10 嘅。如果有一啲屋邨係 flush 咗，都有 5 至 9，唔 flush，常理推論，就應該係過咗 10 嘍喇，即係常理，我梗係唔係要你計條實際嘅數畀我喇。但係常理，就 unflush 就會過咗嘍喇，就係有啲住戶佢嘅習慣真係飲好多頭啖水嘅話，佢哋就會覺得話「我唔理你心目中嗰個 hypothetical average person 佢飲幾多，但係我如果係飲頭浸水嘅 family，我就會好擔心喇。」即係有冇考慮過呢個情況？

答：我哋擺嗰個水辦個目的其實係做一個 body check 咁，如果你嗰個 flushed sample 係低過 10 嘅話，我哋就覺得佢係符合咗世衛標準，就係 no cause for concern 嘅應該。

問：而家我唔同你拗 10 係咪應該 apply，應唔應該 apply 10，我哋之前講咗，但係就算我當你 10，而家嗰個爭拗點就係你用乜嘢 sample 嚟 test against 呢個 10，我就係問番你，就係話如果係呢一拵嘅 unaffected estate 裏面住嘅居民，佢嗰個 test 出嚟，flushed sample 係 9 嘅，真係爭啲嘅啫，係真係爭個馬鼻嘅咋嘢可能，你轉第二朝去，可能已經係 10 嘍囉嘢，仲要係一個 flushed sample，佢 unflush，佢就實過添喇，你同意？

答：（沒有可聽到的回答）

問：點解呢一啲屋邨嘅居民，成條邨影響嚟嘅，呢個會係，即係咁啱嗰條邨嗰個 sample 抽出嚟，由於佢係冇超到標，你就將成條劃走咗嘍喇嘛，就叫做 unaffected estate 嘍喇嘛，但係你唔覺得有呢一啲邨裏面係有例子，flush 咗嘅 sample 係 8 嘅、9 嘅，亦即係表示唔 flush 就會超標嘍喇，即係你覺得呢一啲屋邨裏面嘅居民飲頭浸水習慣嘅居民佢哋嘅憂慮係唔需要處理嘅？

答：唔係，喺咁嘅情況之下，其實係咪應該要畀一啲 advice 嗰啲居民去 flush 嗰啲咁嘅 sample before consumption 呢？Rather than 你就話「你可能好唔安全，你飲頭啖水，你死梗呀。」係咪？

問：當然，任何政府部門要處理一個咁樣嘅危機都要好 sensitive，即係話畀人聽死梗就可能有 scaremongering，但係亦都唔係話要--即係呢個係一個 extreme，話畀人聽死梗，但係亦都唔需要用另外一個 extreme，就好似就係話「我用個中位數，我唔話畀你聽嗰個 worst

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case scenario，你又好快樂地就覺得『我有事喇』咁樣。」而實際上係會有人係飲頭浸水㗎嘛，你都接受係有人會飲頭浸水㗎嘛？

答：但係我相信唔係大多數，同埋我諗飲唔飲頭啖水呢樣嘢，我諗要教育市民，要教佢「你個系統如果有鉛嘅時候，你係應要 flush 咗個 tap，你先至攞嚟飲用㗎嘛，應該」。

問：我明白就係實際上可能個 difference 未必咁大，因為好多人話「我使千幾釵買個濾水機就有問題。」或者話「我真係 flush 咗佢，我唔睇水喇。」咁樣，但係居民都有權去知道㗎嘛其實，即係 worst case scenario，我諗我問多最後一次，就係好多時候危機嘅管理或者要知道一件事去到盡係點樣，做生意或者盛，你都會畀個 worst case scenario 我，未必發生，但係起碼我知道 -- 我可以知道個 magnitude of the problem，叫做係，政策上嚟講？

答：但係我嘅睇法就係如果 even though 你係畀咗個 worst case scenario 佢，你係咪能夠 allay 到佢嘅 anxiety 同埋 worry 呢其實，佢可能仲更加驚㗎。

主席：你畀個知情權我㗎，你明唔明呀？

答：但係我哋唔係話唔畀知情權，而係我係即係...

主席：唔係，你話畀我聽，譬如好簡單，可能我大人嘅，我有所謂，不過我有個細路仔，你話聲畀我聽，等我知點做㗎嘛。

問：我請你睇多一個蘇格蘭嗰份文件，262 頁，呢個係呼應番頭先主席問你嗰個問題。“Water Sample Collection”，呢個又係蘇格蘭嗰份文件，A1 tap 12 -- tap 15，sorry，A1 tap 15，262 頁，呢個又係蘇格蘭嗰份文件，“Water Sample Collection”。

“In stage 1 of the survey, only random water samples were obtained from participating houses for reasons of convenience and practicality. It was appreciated at the time that this might result in not identifying some houses which had elevated lead levels

associated with the use of lead solder, due to the variability in stagnation time for a random sample. Stage 2 of the survey was therefore designed to explore the extent to which the sample type used influenced the probability of detecting elevated lead levels in the water supply within the house. Four sample types were therefore obtained; an overnight sample representing the maximum probable period of stagnation, a stagnation sample drawn after a standard 30 minute period of stagnation, a random sample collected when the sampler first arrived and a flushed sample taken after the supply was run for long enough to ensure that the water was from the mains supply only and had minimal contact time with the internal pipework. The aim of the flushed sample was to determine the background lead level associated with the mains supply."

呢度講蘇格蘭個例子，佢就講到明佢哋 flush 個個目的其實唔係要嚟話咩嘢達致到一個咩嘢 representative sample of 一個 average daily consumption，佢沖洗乾淨就係去知道由--所謂好似香港用--與香港 equivalent，就係水務署出啲水正唔正，你 internal system flush 幾轉，你就整走晒你個 system 裏面啲污糟嘢，就可以 test 到水務署出嚟啲水靚唔靚，但係你知道水務署啲水好靚係冇用㗎嘛，因為我哋而家唔係話水務署出嚟啲靚唔靚，你 flush 咗之後，你證明到一樣大家冇異議嘅嘢有咩嘢用？

答：或者我諗你要明白下香港個大廈，一啲高層大廈啲 plumbing system，同蘇格蘭佢係屬於一啲 individual house，佢個 individual house，佢個個 main supply 同佢個個 house 個個 water tap 係距離好近嘅，所以你 flush 一個短時間之後，佢都可以攞到個個 main water 個個 sample，and then 就係代表佢個個 main water supply 有冇問題嘅。

但係喺香港，我哋係要經過個 roof tank，然後再經過 down pipe，經過啲 branch pipe，所以佢呢一個係攞個 background water quality，同香港個情況有啲唔同，如果我哋 flush 完之後，淨係攞到我哋水務署 supply 啲靚水，根本就唔會有樣辦超標，係咪先？點解我哋仲會攞到九十一個樣辦係超標，就因為呢個 flush 嘅 sample，一個 flowing water sample 經過個個 inside service

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system 之後，入面嗰啲 contaminants 會 release 番出嚟去嗰個水體裏面嘅，所以 that's why 點解我哋仍然都係攞到嗰辦會超標。

就唔係好似佢個情況，佢 flush 完之後攞嗰辦係正嘅，因為佢嗰個 distance between 嗰個 individual house 同埋個 mains 根本就好短，你 flush 完之後，你根本就可能攞緊佢嗰條喉嗰啲水。

就唔係話好似我哋嘅情況，我哋嗰個 water supply system 係比較 complex, and then 嗰啲水係要經過一啲 branch pipe 或者係嗰啲 internal 嘅 pumping system, 我哋先至攞到個水辦，而佢經過嘅時候，佢會 pick up 或者係有一啲 contaminants, 或者 lead particularly 會 release 出去個水入面，所以 that's why 我哋點解就算係 flushed sample, 佢仍然都係有水辦係超標。

問：呢個係程度嘅分別啫，如果 flush 完之後仲超標，即係表示原先嗰個打橫嗰截，即係入屋嗰截其實係超勁喇根本就係？

答：可以--我呢個可以 common sense 都話 stagnation sample 嗰個 lead content 應該係高過嗰個 flushed sample。

問：係喇，flush 兩分鐘，drop 九成嘍嘛會，所以如果你 flush 咗之後都有超標嘅話，你可以想像 unflush 係幾咁嚴重，但係如果你開頭嘅時候可能係得個 10 或者 12 嘅話，你 flush 咗兩分鐘之後，可能係剩番 1 或者係少過 1 嘍囉啱大約，同唔同意？

答：我講就係嗰個即係你 stagnation 之後嗰個 lead content 其實係一個 transient 嘅 concentration 嚟嘅，你 over 呢段時間，你 accumulate 咗咁多 lead 喺嗰個水入面，你一開水喉，你其實已經係即刻跌喇已經係。

問：我想你睇一睇 ISO 嗰個驗水嗰個程序，因為你之前都有提過。

主席：或者我哋 take 個 10 minutes 嘅 break, 好唔好呀？

石先生：好。

主席：我哋 break 一 break 先。

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下午 4 時 13 分聆訊押後

下午 4 時 27 分恢復聆訊

出席人士如前。

水務署第二證人：陳健民（水務署（總水務化驗師））宣誓繼續作供
石先生繼續盤問

問：陳先生，我想同你睇一睇 ISO 嗰個關於驗水嘅程序，C2 tab 19 1539 頁，你見到“Faucets”嗰度，6.4。

答：係。

問：6.4，你見到中間嗰度，“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 water quality or the maximum likely effect.”，你見到喇，呢個就係 for 呢啲目的就用 first draw。

答：係。

問：跟住嗰句，“If the quality of the water as supplied to premises is to be checked, then the faucets should be cleaned and flushed at a uniform rate for 2 minutes to 3 minutes or longer if necessary to achieve constant temperature before samples are collected.”。

佢呢度嗰兩至三分鐘 flushing，佢嘅目的就係為咗要 check 嗰個 quality of the water as supplied to premises，但係其實佢嘅意思係咪就係話你外面街外條喉嚟到你個 premises，你如果想知道嗰啲水嘅水質，你就先喺你內部系統 flush 兩至三分鐘，將內部系統有可能整污糟嘅嘢 flush 走咗佢，你 eliminate 咗內部系統嘅 potential 嘅潛在嘅污染物之後，你就會知道街外條喉嚟到

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你個 premises 嘅水嘅水質，佢嘅意思係咁咩呢度，係咪呀？

答：我...

問：係唔關你個咩嘢 general average quality 事嘅，對嘛？

答：我哋嘅理解，就係你個 flushing 其實係 remove 個啲 standing water, and then 你個啲水由個個 tap 出嚟就經過晒你個個 inside service、個 plumbing system，就攞個個水辦作為一個測試去 check 個個 water quality as supplied to the tap。

問：唔係 to the tap, to the premises 啲。

答：To the premises，都可以咁，或者 to a tap，都係。

問：唔係有個分別嘅咩就係？我將你內部系統清洗乾淨之後，將佢原先可能沉積咗嘅污穢嘅嘢或者一啲 contaminant flush 走咗，跟住入到嚟嘅水雖然佢都會有經過內部個啲嘢，但係都唔會逗留得好耐，都係動態咁樣出嚟，所以你出嚟嘅水辦其實就係代表你由外面 supply 去 premises 個度嘅水嘅水質。

答：但係亦都係經過個個內部系統，雖然你講話個個 contact time 唔係咁長，因為呢個 contact time 喺 lead pipe 嚟講，係相當之重要嘅，因為 lead pipe 佢個個面頭，佢 lead 同 carbonate form 咗一層個個 lead carbonate 喺度，佢如果個 contact time 短嘅時候，個 solubility of 個個 lead into water 就係短嘅，而我哋呢度就係 find out 究竟呢個 flowing water passing through 呢個 inside service system 佢會喺個 system 裏面 pick up 啲乜嘢 contaminants 又好，particulates 又好，咁會喺個個水喉出嚟，我哋就 take 呢個 sample as representative as the average quality of the water supplied to the premises。

問：好喇，我哋睇番之前個頁 1539 -- sorry, 1538，對唔住。6.1 "General" 個度，"Cleaning, disinfection and flushing prior to sample collection depend on specific objectives of the monitoring programme."，你見到喇？

答：係。

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問：“In general, sampling to ascertain the quality of the water delivered to a building”，呢度清楚啲，即係入到個 building，你想知道 quality of water delivered to a building，“or to ascertain whether the quality of water delivered within a building is possibly altered by the service network within the building, should not be carried out without thorough cleaning and flushing of the sampling points. Investigation of water quality as delivered from a faucet might require that samples be collected before cleaning and flushing, or samples might be required both before and after cleaning and flushing.”。

我簡單嘅理解，就係你如果想知道外面供水去一棟大廈嗰度，因為佢講 a building，去到棟 building 嗰度，即係唔係講係入面個 network，去到棟 building，你想知道去到嗰棟 building 嘅水嘅水質嘅話，你就要 flush 乾淨你內部嗰個 system，你如果係 flush 乾淨咗內部嘅 system，你喺水喉度抽出嚟嘅水就會係代表你由外面嘅水源送到去嗰個 building 嗰度嘅水質，因為你內部嘅 potential 存在嘅污染物已經 flush 走咗，我嘅理解就係咁樣。

答：我哋嘅一般嘅理解就係你個 flushing 係 remove 啲 standing water，係用...

問：Standing water 裏面就沉積咗一啲嘅 contaminant。

答：唔知係乜嘢，可能係有好多好似你講有啲污染物或者其他啲嘢，lead 又好，bacteria 又好，我哋要 make sure，好似呢度咁講，你係想 “ascertain whether the quality of the water delivered within a building is possibly altered by the service network within the building, should not be carried out without thorough cleaning and flushing of the sampling points.”，所以你一定要 flush 完之後，你先至可以擺到個辦，ascertain 嗰個 quality of water delivered to the building 有冇畀呢個 inside service alter 咗佢嘅 water quality。

問：我用咩嘢嚟比較？

答：呢個，而家你就 take 呢一個 sample 就係代表呢個 representative 嘅 average quality of water，因為你 passing through 呢個 service network，喺嗰個水喉出左嚟，攞咗個水辦之後，你就 analyse 咗，就 compare with 一個譬如 PGV 又好，或者係其他 WHO 嘅 guideline 又好。而你後面嗰句 investigation 就需要攞嗰個辦就係 before cleaning and flushing 嘅，即係如果你係做 investigation，就係要咁做嘅。

問：係咪 investigation，我哋之前都講咗好耐，但係你頭先嗰度，你話“to ascertain whether the quality of water delivered within a building is possibly altered by the service network”，你就話 flush 咗之後，但係我 flush 完之後得出嚟嗰個結果就係你清走晒嗰啲沉積嘅水，你外面嚟嘅新鮮水 go through 咗個 system 一次，就攞咗個水辦出嚟。

呢個水辦就係新鮮嘅水經過咗個 system 一次攞出嚟嘅水辦，你都要有一啲嘢比較，譬如話攞出嚟嘅水辦裏面嘅化學成分係每種金屬有 x、y、z 咁，你都唔知道究竟呢啲化學成分係來自原先嘅水源定係來自你個 system，你都要有個 control sample，你個 control sample，我嘅理解，就會唔會係其實你清洗晒裏面之後，清洗晒裏面之後攞出嚟嗰個 sample 就係所謂外面嚟 as supplied to the building 嘅 sample？Stagnant 咗一輪之後，就可以知道其實你嗰個 internal system contribute 咗啲乜嘢額外嘅物質入去，係咪可以咁睇呢？

答：我哋喺嗰個 sampling 嘅 exercise 裏面，個 control sample 其實就係嗰個 sump tank 同埋個 roof tank，呢兩個就係嗰個 control sample，嗰個 tap sample 就係 compare with 呢兩個 control sample。即係譬如好似你個 tap 攞出嚟係 0.3 嘅，如果你嗰個 roof tank 係 less than 0.1，即係證明經過呢個 pipework 之後出嚟嗰個水係 pick up 咗，即係多咗 0.2 或者係一個 level 嘅 contaminant 或者係 lead 喺入面嘅，你個 control sample 其實就係 sump tank 同埋 roof tank，所以點解我哋攞辦一定要攞 sump tank、roof tank，然後嗰啲逐個住--即係一啲住戶裏面，要攞佢個 consumer tap，so that 我哋有個 basis 去 compare，究竟呢個辦嗰啲咁嘅 contaminants 係嚟自我哋咩，定係嚟自呢個 service pipework。

問：即係你嘅解讀就係 control sample 就係攞 sump tank 或者 roof

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答：係。

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問：呢個就係代表正嘅水辦，然後你 flush 完之後，清洗晒裏面所有啲雜物之後再 run 一次，就睇下 run 嘅水 pick up 到啲乜嘢嘢裏面嘅嘢？

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答：係。

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問：呢個就係叫做搵到個 system contribute 啲嘢落去？

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答：係。

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問：但係呢個就同我哋而家 specific 呢個 task，即係亦都我頭先同你講嘅嘢，就係頭浸水嗰個爭論就未必有直接嘅關係，因為頭浸水就唔係 run 緊嘅水，頭浸水係 stagnant 咗一輪㗎嘛。

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答：係。

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問：我哋就啱啱就搵到就另--不過呢個可能係而家未必整到住，就係我哋搵到一份較新嘅一個水嘅 pattern of water use 嘅報告，我哋未印晒成份嘅，但係我哋係印咗裏面嘅第 5 個 chapter 出嚟，我哋遲啲會 paginate 埋，擺番落去個 bundle 裏面。

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你睇下，呢個係--我哋睇番嗰個風險，就係 patterns of water，呢度就唔係全英國嘅，呢度係 southern England，你睇番嗰個 "Acknowledgement" 嗰度，你搵大約係兩頁嘅，你就見到就係話 "This research report is the result of two interconnected research projects, the EPSRC", EPSRC 係一個簡稱，Engineering and Physical Sciences Research Council, funded ARCC-Water project, 總之係一啲研究嘅報告。

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你睇番個 executive summary 嗰度，就話 "This report contains the findings of survey research on the patterns of water using practices in households across the South and South East of England."。

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你睇番就係第 3 點嗰度，"The research involved an 1,800

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respondent survey, conducted in the south and south east of England in the summer of 2011.”，呢個似乎就係靠係問問題嘅。

佢話“The survey included questions to probe the ‘materials, meanings and skills’ of everyday practice associated with water, such as an audit of water consuming technologies in the home and garden, detailed questions on routines and performances or practice, and collected other data such as socio-demographics, presence of meter, and a suite of questions exploring other environmental habits.”

跟住下面就有講到有啲咩嘢分析，譬如話“descriptive statistics and cluster analysis techniques”咁諸如此類。

我想你睇番就係第 100 裏面第 5.4，under “Kitchen use” 嗰度，“Summary of kitchen practices”，第三個點嗰度，佢就話“Nearly half of households consume water in the home in addition to or instead of unprocessed tap water, most commonly bottled, but also filtered tap water. Younger people, and those living in the London region, are particularly more likely to drink such alternatives to tap water. 50% of households also run the kitchen tap before drawing water from it for use, for various reasons, most commonly to get it to the right temperature.”。

你跟住就睇番第 104 頁，有個表嘅，呢個就係去 summarise 嗰啲問卷嗰啲答案，“Do you ever run the cold water for a period of time before you take water from the tap for drinking or cooking?”，有接近一半係 no 嘅，其他嗰啲就有啲係 yes 嘅。

yes 就講埋理由嘅，有啲“Yes, because you have lead pipes”，呢啲有人係 rinse 咗，run 咗，因為有鉛喉，okay，有人係聽呢個用途。但係其他人，有一個就話“yes, because you do not want to use the water that has been sitting in the tap.”，即係種種原因，唔鍾意用啲滷咗好耐嘅水，有啲就係可能佢

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個水溫唔啱，呢個係種種嘅理由。

呢個就唔係 tailor-made for 我哋呢一個調查，亦都係用問卷，可能問卷中間統計上可能亦都有好多嘅要 adjust 嘅地方。

呢個亦都係另外一啲嘅證據，雖然都係英國，即係人飲用水嘅 pattern 就係--即係飲頭浸水呢樣唔係一啲--即係起碼我哋見到起碼某一啲嘅文化裏面，唔係話真係一啲好刁鑽嘅習慣嚟嘅，真係需要去考慮同埋正視嘅，啲人係明知道有鉛喉呢個問題嘅，有啲人真係 flush 咗嘅，嗰度你見到喇，但係有五成人都係唔去咁做。

你同唔同意就係其實飲頭浸水呢一個現象唔係一個可以就咁撥埋咗一面，就話「你教下佢喇」或者「其實唔係好多人嘅啫」咁嘅現象？

答：我淨係睇到呢一份咁 brief 嘅 survey report，就話大概 50 個 per cent 嘅人都唔會 flush before you take water from the tap for drinking or cooking，但係我唔知個問題有冇問佢「你屋企有冇用鉛喉？」呢 50 個 per cent 嘅人屋企究竟係用緊咩嘢水喉。

問：唔係，我明，即係係有 constraint 嘅，因為呢一個係問卷問嘅得到嘅結果，但係籠統嘅問題就係你會唔會同意就係生活習慣當中係唔 rinse 第一浸水嘅人係唔係話可以就咁我哋撥埋一面話唔需要理會佢哋嘅呢？

答：我相信...

主席：即係唔好理佢用咩嘢喉，你唔好理佢用咩嘢喉先喇呢度。

答：唔係，我相信係一定有一啲人會係好似就咁飲頭啖水嘅，呢個係咪大多數定係少數，喺香港，我哋就真係冇咩嘢數據喺度，其實。

問：可能係視乎教育，可能係視乎你點問佢，...

答：係，習慣。

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問：...習慣，好多唔同嘅嘢。但係我就想知道水務署喺佢 devise 種種嘅策略或者 test 嘅 method 嘅時候，純粹就係睇番頭先你所講，係 audit sampling 定係 compliance sampling，定係點樣，而唔會考慮埋用水習慣呢一個因素？

答：我哋通常嚟講，係 devise 嗰個 sampling programme 係唔會考慮嗰個 consumer behaviour 嘅。

問：點解呢？

答：因為 consumer behaviour 個個都唔同嘅，你點樣 devise 一個 sampling protocol 可以 suit every single consumer 佢嗰個 water usage habit 或者 water consumption behaviour 呢？

主席：唔係，我同意當然係有可能完全知道，不過有陣時做呢啲 survey，你可以 set 一啲 parameters，譬如你可以 set 一啲 parameters，例如呢個屋企係成人嘅，呢個屋企係有 BB 嘅，佢哋點樣樣用水，你明唔明呀？即係你唔需要--當然，我哋大家，譬如你話五十歲嘅人，呢度咁多個，個個都可以唔同，係咪？但係譬如你啲 typical household，譬如--我唔知，啟晴邨可能係新落成嘅居屋，可能係比較一啲後生啲嘅家庭，佢哋有小朋友，你都可以嚟嘛，係咪？睇下你想點做嘅啫，唔係話一定唔得嘅，係咪？

答：主席，我同...

主席：你咪知道佢哋個 pattern 囉。

答：主席，我同意嘅，如果你做 survey，你會係有唔同嘅 sampling protocol 嘅，亦都會要 devise 得嗰個 sampling protocol 係可以攞一個 reliable 嘅...

主席：即係你要攞到啲 meaningful 嘅 result，你就要...

答：係，如果你做 survey，係。

主席：...就要做小心啲，即係佢石大狀頭先嘅意思都係咁上下，即係你其實係可以嘅，不過個問題就係當時有冇究竟諗過呢個問題，又另外

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一件事，係咪？

問：我嘅感覺就係閣下當然喺化學或者喺技術上就鑽研咗好耐，但係會唔會係太過熟悉水務署內部嘅一啲既定嘅一啲 test type，compliance monitoring 或者 audit monitoring，就有陣時公事公辦之餘，就忽略咗原來有啲嘢可以叫特事特辦，就係發現咗而家有鉛水呢個事情，我哋唔係要 generally walk around 搵下係咪有問題，我哋知道有一個潛在嘅問題，有啲人係真係有個習慣用咗含鉛嘅焊料，我哋要針對性地去搵下，有冇邊啲嘅屋邨喺落嚟嗰段 down pipe 或者入屋打橫嗰段喉裏面用咗含鉛嘅焊料，而 tailor-made 去諗一套 testing 嘅 protocol 出嚟，我同你--即係你撇除咗，或者你攞咗，當係你有聽過 audit monitoring 或者 compliance monitoring，你重新諗過，其實點解係唔可以跟隨譬如話蘇格蘭頭先我哋見到嘅做法或者英國嗰個做法呢？

答：如果你諗住有個 survey，有個 objective 嘅，你個 survey methodology 當然可以同而家我哋所做嘅方法唔同嘅，但係我哋而家目的其實學你話頭，我哋亦都係有情況係特事特辦嘅，譬如有啲投訴，我哋唔會話淨係攞嗰個 flushed sample 嘅，我哋亦都會攞一個 unflushed sample 去 determine 佢個 source of 嗰個 problem 喺邊度嘅，我哋唔會話一本通書睇到老嘅。

但係喺今次個 exercise 我哋 given 嗰個 objective 就係想 determine whether the lead content is complying with the WHO PGV，所以 that's why 點解我哋要 devise 一個 sampling programme 係 meet 到呢個 objective。當然如果你--好似主席講，如果我哋真係要做一個 comprehensive survey，我哋嘅 methodology 可以完全唔同晒。

問：但係另外一樣嘢，...

主席：我唔係講緊...

問：...我畀另外一個例子你，就係...

主席：繼續。

問：我畀另外一個例子你，就係你都知道--一早我今朝問你，就係水務署其中一個法例嘅要求就係焊料裏面係應該用無鉛級別嘅焊料，你唔係負責嗰方面嘅，但係你都知有呢個認知喇？

答：係。

問：你都知道就係話如果你用咗無鉛級別嘅焊料，你就算--無鉛級別就唔真係無鉛嘅，可能係 minimal 嘅鉛，好少。你用咗無鉛級別嘅焊料，你理論上釋出嘅鉛就應該接近 undetectable 或者好少、好少，對嘛？

答：應該可以話符合標準。

問：符合標準，超級符合添喇，即係好坦白咁講，講得掘啲，就係如果你用一個 unflushed sample，驗出嚟係 9 嘅，我當你唔超標都好，驗出嚟係 9 嘅，你就擘大眼都會知道肯定係裏面有唔妥，因為就算我當你符合世衛標準個 10 都好，你 unflush，走出個 9 出嚟，就即係裏面有啲人用咗啲唔符合標準嘅嘢，因為用咗，有可能走到 9 咁多，同唔同意？

答：呢個我相信係可能有一啲 lead present 咗喺入面，但係係咪純粹嚟自焊料或者其他嘅 brass fitting，呢個就我哋就唔可以 ascertain。

問：你起碼收窄範圍，即係而家發現原來--而家 identify 咗個問題，我唔理你焊料定係部件都好，問題就無窮無盡嘅，聽日可能有第二啲問題，不過未必關你個部門，但係起碼我哋而家知道就係原來係有啲含鉛部件會釋出啲鉛份嘅，唔好理咩嘢世衛什麼，你發現有冇人違咗規先，呢樣嘢都係一個 objective 嚟㗎，理論上，對唔對？

答：但係我哋驗水，又只係睇下個水質係咪符合標準，就唔會話去搵究竟呢個咁嘅鉛嘅來源喺邊度，係部件吖，定係嗰個 lead solder，呢個就係另外一個--即係對我哋嚟講，係另外一個 issue 嚟嘅已經係。

問：我明，你係負責淨係水質，但係未必係你個部門去管理添，但係宏觀嚟講，當你撇除世衛，你 first draw sample 驗咗，原來係 overnight 嘅水原來係積咗有 9 microgram 嘅鉛嘅，舉個例，唔

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超喇啱，唔超世衛喇，okay，但係有 9 microgram 咁多嘅鉛，就肯定裏面無論 fitting 又好，喉頭又好，定係 solder 又好，就肯定有幾樣嘢可以鎖定咗，就係呢個單位嘅水經過嘅地方係有人用咗啲唔合規嘅嘢，對唔對？

答：呢個我諗除非我哋再 carry out 一啲 further investigation。

問：啱，但係起碼可以 one thing lead to another，對嘛？如果你收到--驗到佢話原來 1326 號室嘅廚房個喉驗出嚟係 9 microgram 嘅，合咗世衛嘅標準，但係有 9 microgram 嘅鉛，你同有關部門嘅同事講一聲，佢哋可能彈起，「嘩，咪住，你提醒咗我，呢個單位去佢途中嗰個 route 嘅喉裏面一定係有問題出咗。」係咪呀？佢可以擺個嘢去“beep”下又盛，我哋知道而家好多啲咁樣嘅 meter，好多啲咁嘅 device，係咪呀？

答：係。

問：其實原則上可以做到呢樣嘢，係咪呢？

答：係。

問：係可以做到嘅，尤其是，你話無端端我哋唔知道有鉛水事件，大家可能係快樂地假設大家都合咗規，原來而家發現咁多認知不足嘅，enforcement 都要㗎，係咪呢其實？同唔同意？

答：呢個 enforcement，睇下係邊一個 authority 嗰度負責喇，呢個就。

問：你梗係要郁 LP㗎，水務署裏面係 LP 預飛㗎嘛，覺得，同唔同意？

答：喺我方面，我就唔係好熟悉，我知道係 LP 係負責呢樣嘢，但係嗰個 enforcement action 就由客戶服務部嗰啲同事去做嘅呢個。

問：Okay，我哋頭先都見到，嗰啲所謂 unaffected estate 因為冇超到標，但係都搵出可能係 8 嘅，flush 咗都 8 嘅，唔超標，算，但係就--頭先我都話齋，就係正路就係推論到有人用咗啲含鉛嘅焊料或者係部件，以你所知，有冇水務署內部係採取一啲跟進嘅方法，就係話衛生健康除外，有冇人違反咗水務條例，用咗啲唔係含鉛級別嘅部件？

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答：或者容許我講一講，如果你話你成個大廈二十--譬如通常嚟講，有二十或者至到二十二個水樣本，其中一個係 8 嘅時候，我哋唔會覺得佢係特別有問題 as compare with others，譬如佢其他都係譬如 less than 5 或者係乜嘢，我哋唔會特別 single out 呢個 8，就要 take further action 嘅，因為你唔可以用一個...

問：我明，我明，我明。

答：...一個 single result，...

問：我明。

答：...就 generalise 呢一個...

問：可能係一個 quirky 嘅一個 isolated case，但係當你有足夠嘅 pattern，係咪呀？

答：係。

問：可能大家都係 8，大家都唔超標，但係咁啱個個都係 8 嘅，係咪呀？同意嘛？

答：呢個我...

問：即係可以係推論到肯定喺用料度有啲問題？

答：你可以咁樣推論。

問：但係以你嘅認知，水務署有冇人係跟進呢樣嘢或者研究緊呢樣嘢？衛生以外，唔好講衛生。

答：我諗呢個我就答唔到你，呢個真係。

問：Okay，邊個會知呢，其實？

答：我諗會唔會係林正文先生會比較熟悉。

問：好，留番畀佢，好。最後--唔係最後，我想再同你睇一睇就係 Task Force 嘅一啲會議紀錄，我想你睇一睇第一個會議，19.6 13898 頁，呢個就係水務署嗰個 Task Force，見到喇，係咪呀？Minutes，第一次會議，tab -- 132 頁，見到嘛？

答：見到。

問：13896 就係嗰個出席人士，你見到你係有份出席嘅，見到嘛？

答：係。

問：第 4.4 段，13898 4.4，“Members expressed that the procedures to collect water samples would affect the testing results of lead content.”，呢個係肯定，我哋大家都知道。

“Flushing tests and stagnation tests are to be conducted at different time intervals so as to address the controversy over the procedures of taking water samples.”，其實喺呢個 Task Force 嘅時候，其實大家都知道有一個所謂潛在嘅 controversy，就係有關究竟用頭浸水定係唔用頭浸水。

我明白你頭先所講話個 objective 又唔同諸如此類，呢個頭先我哋都討論過，其實我就同你提出過，就係話視乎你點 set 個 purpose 嘅，但係呢個我哋擺埋一面先。

你頭先另外一個理由講話 first draw 未必 reliable，就係因為你點知佢 stagnant 咗幾耐，點知佢會唔會半夜起身去廁所洗過，你自己控制唔到，但係呢個似乎呢個考慮冇阻礙到呢個 Task Force 佢去用 first draw 作為一個 sample，即係佢哋唔覺得頭先你所講嗰個憂慮話「攞 first draw，我點知你係咪真係 first draw 㗎，我點知你半夜點㗎，我控制唔到。」呢啲考慮佢哋冇擔心過似乎，做到㗎嗎？

答：嗰陣時我記得嗰個 controversy 就係講嗰個 sampling 嘅 procedure 應該係點樣做，即係究竟係用 flushed sample 或者係其他種類嘅 sampling protocol，大家有唔同嘅意見嘅。

我哋嗰陣時喺嗰個會嗰度就解釋咗，呢個 Task Force 亦都會 conduct 一啲我哋叫 investigation 嘅 sampling protocol 去 address 一啲唔同嘅 controversy 嘅，所以 that's why 你 even 都唔好話我哋自己嗰個 task group 裏面嘅 meeting 有一個 controversy about 個 sampling procedures。

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我哋初初鉛水事件發生之後，社會上都有一個 comments，啲 media 有 comments 話我哋--譬如好似藥劑師協會都提過話要擺頭啖水嘅其實。嗰陣時開始其實個社會都有討論呢樣嘢，members 喺呢個 task group 亦都有提出呢個問題，我哋亦都向佢解釋咗大家嘅 sampling 嗰個 objective 唔同，所以嗰個 sampling protocol 亦都會唔同嘅，但係 to address 佢哋嘅 concern，個 task group 亦都會 conduct 一啲 stagnation test 去擺出一啲咁嘅 result 去 address 呢個咁嘅 problems 嘅。

問：冇錯喇，我哋睇番第五個會議，第五個會議，我想你睇一睇就係 14057，14057 就係第五次會議嘅 minutes，你都在座嘅，你見到喇？

答：係。

問：嗰個內容，我就想你睇 14061，14061，你見到 3.2 就有所謂“The Secretary presented the paper titled ‘Proposed mitigation of lead contamination in tap water’ prepared by the Advisory Committee on Water Resources” 諸如此類，你見到喇？見唔見到？

答：見到。

問：你等等。佢裏面 refer 咗 to 嗰個 paper，你可以喺後面搵到嘅，就係 14111，佢嗰度就 refer to 左右--右上角，你見到喇，“para 3.2 of minutes of 5”，第五個會議，有人手寫咗，見唔見到？

答：唔。

問：呢一個文件就係應該就係嗰個叫做“Proposed mitigation of lead contamination in tap water”，呢個就係嗰份文件，如果你睇番 14117 頁，“Recommendations”嗰度，第 3 段，“WSD should standardize and educate the public on the proper sampling methods and protocols for drinking water and the analytical method in order that the water quality results by WSD and outside parties are comparable. At present, the practice of WSD is to flush the pipe leading to the kitchen tap for”三至五分鐘，“before sampling for 250 ml of water for analysis. However,

as shown in Appendix 1, other countries and places have adopted different protocols.”，跟住就有一啲外國嘅例子，例如 Lead and Copper Rule，喺美國嗰個。

最底，“We recommend that both pre-flush, i.e. allowing water to stand in pipework for at least 6 hours and post flushed samples, i.e. after flushing for 2 minutes, should be drawn from the kitchen taps and that ICPMS should be used for analysis in a HOKLAS accredited laboratory.”。

呢個會裏面係 table 咗呢一個嘅文件，而呢個文件係 recommend --就係考慮過唔同地方嘅唔同做法，佢 recommend 水務署係應該係提議係驗兩浸水嘅，一個係 stagnant 咗六個鐘頭嘅水，另外一個就係 flush 過嘅水，你記唔記得呢個討論？

答：我有印象我哋討論過呢一個 paragraph，即係話 recommend both pre-flush 同埋嗰個 post flush 嘅 sample，我記得係我哋有討論如果要呢啲 test result comparable，大家嘅 test 個 sampling procedure 同埋個 test method 最好能夠大家 standardise 咗佢，otherwise，出面民間有民間驗，我哋有我哋驗，大家根本就唔知道嗰啲 result 大家可唔可以 comparable 嘅。

問：民間就用頭浸水驗，就好多更多超咗標，但係水務署就用 flush 咗，就話冇超標，咁就拗喇。

答：係。

問：但係呢度我哋見到就係呢一個係 ACRWQS，呢個成立咗好耐呢個委員會，佢就有個 paper，就真係 recommend 水務署要 standardise 嗰個做法，亦都 recommend 兩個 sample，你有記憶討論過呢份文件嘅內容，因為佢嘅會議紀錄 14061，佢都淨係叫做話 present 咗，就可能有陣時啲會議紀錄 present 咗出嚟，就冇人睇，瞓眼瞓嘅可能，係咪呀？淨係擺咗喺檯面，table 咗就算喇，個意思係，係咪呀？

答：我有印象睇過呢一份 paper，proposed mitigation。

問：但係你印象中，通常呢啲 paper table 咗，會點呀？即係大家睇完就算，定係真係會逐段咁樣去 go through，定係點嘅呢？

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答：通常我哋喺 task group meeting table 嗰啲 paper 多數係啲 test results，譬如佢做一啲 analysis of 嗰啲 testing result，譬如我哋 leaching test 嘅 result，stagnation sample 嗰啲 result，呢一份 paper，我有印象佢係喺嗰個 task group meeting 討論過。

問：我哋話個 minute speaks for itself，即係佢真係有 table 過出嚟。

答：係。

問：實際上喺個會議裏面有冇人真係話“Let’s go through it”，話「我哋逐段睇喇。」你就冇呢個記憶？

答：係。

問：但係而家總之你當時有冇真係逐版逐版睇過，或者有人真係叫做 draw your attention to 呢份嘢都好，你而家就見到，呢個就係嗰個水質嗰個委員會嘅一個建議嚟嘅，你點睇呢？我啱啱讀畀你嗰段，14117。

答：我就唔係好清楚佢 make 呢個 recommendation 嗰個 rationale 係乜嘢其實，因為如果你想做一個 pre-flush 嘅 sample，okay，你係可以做嘅，但係你要 put it in perspective，究竟擺咗啲 result，你係諗住點樣用，我嘅睇法就係有冇咁嘅必要，除非你嘅 purpose 係做 investigation，你真係要擺 pre-flush，同埋擺一個 post flush，去 prove 你個 effectiveness of 嗰個 flushing，你就可以擺一個 pre-flush、一個 post flush，但係呢度佢有特別提到佢個 rationale，點解要擺一個 pre-flush、一個 post flush。

主席：照計，你應該知㗎喎。

答：唔係，我知就係如果你擺嚟做 comparison，即係...

主席：唔係，我嘅意思即係你有份坐㗎嘛，呢啲 meetings。

答：係，但係我有印象有 discuss 過呢份 paper。

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主席：呢啲 minutes 通常開完會，下一次又要 confirm 番上一次啲 minutes，唔會就咁話開完就算，你要 confirm、通過㗎嘛，政府啲啲係咁㗎喇，係咪？

石先生：係，in fairness，呢份嘢就係一個啲個水質啲個委員會，可能佢哋都分別自己考慮過，就提供咗一份 recommendation，就係 Task Force 嘅秘書就 table 嘅。

問：你就同我哋講你係冇記憶當時真係 table 過，返番去正話先，有陣時或者啲嘢，開會，大家都知道，尤其是臨近到開會尾聲，啲人就話呢份嘢 table，大家返去慢慢睇，我叫做 table 咗，咁就算數嘅，你記唔記得有呢個動作，直情係，定係冇呢？

答：我真係記唔番即係...

石先生：或者主席...

主席：都好新嘅咋喎，2015 年嘅咋喎，2015 年嘅事嚟之嘛，係咪呀？

石先生：好新，係。

主席：咪係囉。

石先生：係。或者主席，而家都差唔多 5 點鐘，我大約係問完，但係我諗如果個證人需要再諗一諗，睇下佢回復下記憶，我又可能聽朝。

主席：或者聽日先，橫掂都未完。

石先生：但係我應該我都大致係問完嘅。

主席：好呀。

陳先生，可以離開㗎喇。

B

B

C

答：係。

C

D

D

主席：首先就有幾樣事，第一，就係聽日交 expert report。

E

E

王先生：係，可以。

F

F

主席：聽日可以喇嘛？

G

G

王先生：係，可以。

H

H

主席：第二，就係聽日就星期五，我哋個午膳時間就稍作更改，就由十二點半去到兩點半，十二點半去到兩點半，午膳時間，即係長咗半個鐘頭，基本上就係下個禮拜，星期四、星期五休庭，各位都知道，農曆新年。

I

I

J

J

另外剛才講及呢個律師向客人畀啲建議，純粹就係建基於律師嘅 false impression 嘅啫，法官個個都係公正嘅，明白嘛？

K

K

講者（不能辨別）：哦，哦，哦。

L

L

M

M

2016年2月4日

N

N

下午5時09分聆訊押後

O

O

P

P

Q

Q

R

R

S

S

T

T

U

U

V

V

A *Annex: Realtime English Transcription based on floor / Simultaneous Interpretation* A

B Commission of Inquiry into Excess Lead Found in Drinking Water Day 52 B

C Thursday, 4 February 2016 C

D (9.32 am)

E (Transcript of simultaneous interpretation D

F except where otherwise specified) E

G MR CHAN KIN MAN (on former affirmation)

H Examination-in-chief by MR A CHAN (continued) F

I (Mr A Chan spoke English except where otherwise specified) G

J MR A CHAN: (Via interpreter) Good morning, Chairman. H

K "Second witness statement of Chan Kin Man." H

L I will skip the first part. I

M (2nd statement read in English) J

N "Third witness statement of Chan Kin Man". J

O If I may, I will skip the first paragraph. K

P (Paragraphs 1 to 2 of 3rd statement read in English) L

Q Footnote 1: L

R (Footnote 1 read in English) M

S (Paragraphs 2 to 3 read in English) N

T Part 1: An overview of WSD's monitoring and control O

U of water quality at waterworks. O

V (Footnote 2 read in English) P

(Paragraphs 4 to 5 read in English) Q

The footnote to this states: Q

(Footnote 3 read in English) R

(Paragraphs 5 to 7 read in English) S

Pausing here, the footnote to the PGV states: T

- 1 - U

Transcript by DTI Corporation Asia, Limited V

A *Annex: Realtime English Transcription based on floor / Simultaneous Interpretation* A

B Commission of Inquiry into Excess Lead Found in Drinking Water Day 52 B

C (Footnote 4 read in English) C

C (Paragraphs 8 to 9 read in English)

D The table has a column of parameters across, with D

E different versions. E

F Version WHO 1984, for bacteriological parameters, F

F there was one parameter; likewise for 1993. 2004 WHO, F

G there was one bacterial parameter; 2004 1st addendum, G

G one bacteriological parameter; and likewise for the 2004 G

H 2nd addendum; and the 2011 version, which is current. H

H

I For chemical parameters, the changes are as follows: I

I WHO 1984, 27 parameters; 1993, 94 parameters; 2004, I

J 93 parameters; 2004 1st addendum (WHO 2006), J

J 92 parameters chemical; 94 chemical parameters for J

K 2nd addendum (WHO 2008); and for the current 2011 K

K version there are 89 chemical parameters. K

L

L

M For radiological parameters, there are two for each M

M of the versions previously mentioned. M

N

N

O (Paragraphs 10 to 20 read in English) O

O The footnote that accompanies this sentence says: O

P (Footnote 5 read in English) P

P

Q (Paragraphs 20 to 37 read in English) Q

Q

R There's a footnote in respect of water sample R

R testing which states: R

S (Footnote 6 read in English) S

S

T End of footnote. T

T

U

U

V

A *Annex: Realtime English Transcription based on floor / Simultaneous Interpretation* A

B Commission of Inquiry into Excess Lead Found in Drinking Water Day 52 B

C (Paragraphs 37 to 44 read in English) C

D The accompanying footnote reads: D

E (Footnote 7 read in English) E

F That's the end of that footnote. F

G (Paragraphs 44 to 53 read in English) G

H (Footnote 8 read in English) H

I (Paragraph 53 read in English) I

J "Footnote 9: Before 1995, galvanised steel pipes J

K were commonly used in Hong Kong because of their K

L comparatively low cost and ease of" -- L

M CHAIRMAN: (Chinese spoken). M

N MR A CHAN: Exactly. N

O (Paragraphs 53 to 54 read in English) O

P Dated 11 November 2015. P

Q (4th witness statement read in English) Q

R (Paragraphs 1 to 14 read in English) R

S (Footnote 1 read in English) S

T (Paragraph 14 read in English) T

U "A maximum allowable concentration of 0.1 mg/L (ie U

V 100" -- V

CHAIRMAN: You don't need to read the footnote.

MR A CHAN: I'll omit footnote 2 in the statement.

Continuing on, paragraph 15:

(Paragraphs 15 to 36 read in English)

There then follows two diagrams, one being a static

- 3 -

Transcript by DTI Corporation Asia, Limited

first-draw sample from tap and then a flushed sample
from tap.

(Paragraphs 37 to 39 read in English)

Dated 4 December 2015, "Chan Kin Man".

Mr Chan, you have been taken through these four
document, four witness statements.

A. (In English) I want to make --

Q. Before you do that, can you just confirm that indeed
this is part of the evidence you intend to provide to
this Commission of Inquiry?

A. Yes.

Q. Sorry, you were about to say something. Please
continue.

A. I would like to tell the Commission that I'm a retired
chemist, and my job duties in the statement, they might
be different from what I'm doing now.

MR A CHAN: Mr Chairman, I believe there are a small number
of questions in-chief. What we were discussing between
us, subject of course to Mr Chairman's directions, is
that it may be more efficient if Mr Wong's asks about
the statements because he will ask them directly in
Chinese, and that will save a bit of time. If that's
acceptable, can we proceed that way?

CHAIRMAN: Yes, that's fine.

Examination-in-chief by DR WONG

DR WONG: First of all, can you tell us your educational background?

A. In 1979, Hong Kong University, I received my BSc degree and I majored in chemistry. In 1992, I received my MSc in environmental management, and I also joined some professional bodies, for example, The Royal Society of Chemistry in the UK. I'm a member of The Royal Society of Chemistry; I'm a chartered chemist. In 1991, I joined the Chartered Institute of Water Management, and I was a member until 2014, 31 December, because I was going to retire, so I did not renew my subscription.

I also -- Hong Kong accreditation scheme, I did some -- I worked as a part-time assessor, I served as a part-time assessor for more than ten years.

Q. Could you explain to us, when you do water sampling, your experience doing water sampling?

A. Well, in the Water Science Division, I have been working there 34-35 years, and my work is as a waterworks chemist.

The job duties of a waterworks chemist -- have to monitor water quality and we also take water samples. So you can say I have 30-plus years of water sampling experience.

Q. Before you retired, what was your relationship with the

Water Science Division?

A. Before my retirement, I was the principal chemist for the Water Science Division.

Q. Can you tell us how many staff are there in the Water Science Division? How many people are responsible for R&D and what's the job nature of R&D?

A. The Water Science Division, we have a chief waterworks chemist lead the team, and under myself I have five senior chemists assisting me, doing my work. These senior chemists, under them there are some 20 chemists doing other work, and nine of them are responsible for water quality. Three are responsible for water source management. We also have some doing radioactive analysis and trace elements analysis. We also have people working on the Water Safety Plan.

Regarding technical staff, we have some 60-plus and 40-plus support staff. So we have a total of 130-plus staff.

Q. Thank you. Then I would like to ask you about the 10 micrograms WHO standard. I have two specific questions for you.

The 10 micrograms WHO standard -- let's say in the morning I have a glass of water, it has 25 micrograms, and in the afternoon I have 5 micrograms, and there's also 5 micrograms at night, so the average -- is my

understanding correct, so is the average 10 micrograms?

So if you are looking at the WHO perspective, if we look at the average, my consumption in one day, is that in compliance with WHO standards?

A. If you drink in such quantities, then you should be in compliance with the standard. But I would also like to remind you that the WHO standard is based on a withdrawn PTWI, "(In English) provisional tolerable weekly intake". It's for each kilogram, 25 micrograms body weight. The WHO is based on the PTWI, 50 per cent allocation is to drinking water.

Then we have a 5-kilogram baby -- if they consume 0.7 micrograms, so they calculate 10 micrograms per litre, so within a week, using your body weight to calculate 25 micrograms per kilogram, and the PTWI being the original standard, that's how they set the standard, then you shouldn't have exceeded the limit.

Q. I also have another question regarding the WHO standard application. Some people say that in the morning they will boil water for daily consumption. Some people might brush their teeth first. So a person's habits, how do the WHO standards apply to different habits?

A. As far as I know, everyone has different habits, habits of consuming water. As you said, some people might consume water right away after they wake up and some

people might brush and wash up first. This is covered in part of our water resource study done by the WSD, and 1,000 random households would be identified, and their water consumption habits would be analysed.

As of 3 January this year, my colleagues told me that they have surveyed about 348 users, and about 95 per cent of the surveyed users would first use water to wash up or brush, the first thing in the morning, and they seldom boil water first thing in the morning for consumption.

Q. The public is quite concerned about the sampling method, whether the first draw or the flushed sample after two or three minutes is used, and we have a legitimate concern.

Two or three minutes after flushing -- well, after you satisfy the WHO standard, in order to reassure the public of Hong Kong, would you go one step further and test the first-draw samples? So from an expert's perspective, after performing the two to three-minute flush, what's the significance of taking first-draw samples?

A. Let me try to explain this to the Commission. There are several methods of taking water samples to test for lead. The first method is called composite proportional sample, or proportional sampling.

Perhaps I will help you understand what proportional sampling means. At the user's water tap, a special device is installed. Every time the tap is opened, part of the water would be teed to the proportional sampler, and over the course of one week the sample would be tested.

Then they can determine whether the standard of 10 micrograms per litre would be exceeded for that week. This is a scientific approach, and this method is usually used in researches, because you have to wait one week before testing the sample.

Now, an alternative approach is fully flushed samples, or fully flushed sampling. After prolonged sampling for at least three plumbing volumes, samples would be taken. Now, this is the fully flushed approach.

We have another approach called RDT or random daytime sampling method, so during working hours the water sampler would visit the properties to take water samples. No prior flushing would be done; they would take the immediate water samples. So this is the random daytime sampling.

We have another approach, called fixed stagnation sampling. The system would be first flushed. It would undergo prolonged flushing. The water would be allowed

to stagnate in the water supply system for, let's say, six hours before samples are taken. This is the fixed stagnation sampling method.

We have another method called first-draw sampling. The first thing in the morning, water samples would be taken. The water tap cannot be turned on for any purposes prior to that. Samples are taken first thing in the morning.

Now I would like to explain to the Commission that the lead content coming out of the water in the tap depends on a lot of factors. It's highly variable. It depends on plumbing materials. It also depends on water composition, for instance, pH, hardness, and whether any phosphates are contained, and so on. Consumer behaviour is also very important; in other words, how often does the user use the tap. It also depends on the flow rate of the tap, volume, and so on. All these factors would affect the lead content in the water samples.

So if we take first-draw samples, unless first-draw samples are taken across all the flats, otherwise there's no consistency or comparability. Otherwise, you cannot objectively interpret the results to see if the water samples represent the lead content in the supply system.

So, when we take samples, we have to consider the

flow rate to see if there are any confounding factors in the supply system. For example, if it contains any particulates or pollutants, they will show up in our water samples. And this water sample would represent the water used by the average user. So I think it is not very meaningful to take first-draw samples after that and it's not very logical.

If the flush sample is satisfactory, then if you go back and take a first-draw sample, which might be not compliant, so to speak, and sometimes the first-draw sample might be compliant, and this act of taking a first-draw sample would not change the conclusion of the testing.

That's my opinion.

Q. I have one last question for you. You are responsible for establishing the WSP for the Water Supplies Department; right? So all regional or district WSPs would be accountable for you; right?

A. There are three tiers for WSP. The highest tier would be signed by the director. He would look at the policy and plan and he would authorise if he finds everything okay. Our chief engineer or chief chemist would only be responsible for the second tier, the regional WSP and divisional WSP. The third tier would be supervisors of specific area units. When establishing our WSPs, we

have a working group, in order to solicit opinion from everyone. I cannot possibly know the hazards and risks of all supply systems. So everyone needed to contribute.

Q. All right. We know that the WSPs only reached till the connection points, so when these WSPs were established --

CHAIRMAN: The WSPs don't just reach the connection points. According to the general plan -- the plan goes beyond the connection points. That's the WSP; right?

DR WONG: Okay.

In individual buildings, there's no specific provision for the Water Supplies Department for each building to establish their own WSP. Did you consider that at that time?

A. Perhaps I will give some background for the WSP. In 2003 I attended a WHO West Pacific conference on behalf of the WSD, and the conference wanted to publish the third edition of the WHO drinking water quality guidelines, and the WSP concept was introduced and a lot of delegations of different countries attended.

I attended the conference on behalf of Hong Kong, and I talked with the WHO consultants at that time. I asked them how the WSP could be established, because we don't have the experience, and the answer was we

don't have to worry; we simply have to spell out the good practice we have always been practising and make it more systematic and we can implement it, and that would suffice.

I looked at WSPs of other countries afterwards.

CHAIRMAN: Can you answer the question directly? He wants to know about WSPs in buildings.

A. I looked at the framework for drinking water management in Australia, and the risk management plan in New Zealand. In other words, it's a WSP. And recently I looked at Japan's WSP as well.

All these WSPs only reached the distribution system; they won't cover the consumer taps. The WSP and consumer taps -- well, according to the WHO section 6.9, the WSP is typically outside of the role of the water supplier. The Water Supplies WSP would not extend to the building, normally.

I also looked at the WHO's recommendations and they said, for big buildings, like healthcare centres, malls and hospitals, they recommend a WSP.

The reason is that the people inside or visitors have different vulnerabilities. So for hospitals, they might have to carry out infection control; they might have to process or reprocess the water before they can use it. The water supply merely complies with the WHO

drinking water standards. If there are higher requirements, then they have to process them further.

For instance, hospitals might have to clean their equipment, so they might need to sterilise their water before it can be used.

CHAIRMAN: Perhaps don't go into those things. The WHO has a document called the WSP for Buildings.

A. Yes. That's Water Safety for Buildings. The WSPs for different facilities have been covered.

CHAIRMAN: Can you answer his question first.

DR WONG: Let me repeat. When establishing the WSP, did the WSP consider taking the lead in promoting the establishment of WSP for major buildings?

A. No, we didn't consider that. But we would use supporting programmes as suggested by the WHO, to help buildings maintain the safety of their drinking water.

DR WONG: I have no further questions.

CHAIRMAN: All right. Let's take a break.

(11.14 am)

(A short adjournment)

(11.39 am)

Cross-examination by MR SHIEH

MR SHIEH: Good morning, Mr Chan. I have some questions for you on behalf of the Commission.

At the WSD, you have a theory on connection points.

Different WSD witnesses, including yourself, have said in the witness statements repeatedly that the WSD's pledge to comply with the WHO standards only applies to the area until the connecting points. The reason given by the WSD is that the WSD has full control over the areas up until the connecting points, and beyond the connecting points it would be the responsibility of the consumers or agents.

I would like you to look at your 3rd witness statement, paragraph 6 on page 10500, C19.1. It says there's a pledge from the WSD since 1994 to comply with WHO standards.

"(In English) This pledge has been made practicable as WSD has full control over its waterworks as empowered under the WWO. On the other hand, as stipulated in the WWO, consumers and agents are responsible for the custody, maintenance and cleaning of the inside service within the lot boundary."

Do you see that?

A. Yes.

Q. I would like you to look at Mr Lam Ching Man who is responsible for Customer Services at the WSD. I would like you to look at C19.5, page 13486, paragraph 41.

Here, the paragraph mentioned the connection of the water system by the WSD to a new building, and before

that, eight parameters would be tested. It says:

"(In English) The purpose of testing of water samples near the connection point at this juncture was not for identifying the presence of non-compliant materials in inside service as an end product test but more to guard against contamination to the government water supply by the inside service."

Do you see that?

A. Yes.

Q. So before the lead in water incident, the WSD's stance -- well, perhaps I would say they were more concerned about whether their own inside service complies with WHO standards. And secondly, the testing of water was not to test for non-compliant materials in the inside service, but it was to safeguard the integrity of WSD's own system. Is that correct?

A. I would like to clarify one point. Apart from preserving the integrity of its own system, the WSD is also safeguarding public health. For new system, if it's not clean and disinfected properly, it might contaminate the entire government system, which would put many people at risk for waterborne diseases. That's the biggest risk.

Q. I understand. I am not saying you are only safeguarding yourself. You would in turn affect all units connected

to your supply system.

But the focus of my question is that in the testing of eight parameters or according to your witness statement, the WSD's scope of work only lasts until the connecting points. So is the stance such that the compliance of the materials are not the most important?

A. We have a regulatory mechanism for plumbing materials, and this is governed by the Waterworks Ordinance. So the purpose of testing the water samples is to ensure that the new water supply systems are thoroughly cleaned and disinfected. That's our primary goal.

Whether or not the materials comply with the requirements, they are governed by WWO and WWR.

Q. Now let's look at material control. Under the Waterworks Ordinance -- as we have seen many times, the materials must comply with British Standards. Do you remember that?

A. The BS standards are not within my scope of work. That's the work of our Customer Services staff.

Q. So I won't have you read the standards, but you are aware of that?

A. Yes, I'm aware of that.

Q. I won't ask you about the content, but you are aware in general that the relevant British Standards regarding solder material, they have a requirement to use

A	<i>Annex: Realtime English Transcription based on floor / Simultaneous Interpretation</i>	A
B	Commission of Inquiry into Excess Lead Found in Drinking Water	B
	Day 52	
C	lead-free solder?	C
	A. Yes.	
D	Q. We don't need to go through the footnotes or the table.	D
	You know of this general requirement?	
E	A. Yes.	E
F	Q. The Waterworks Department, they administer the	F
G	Waterworks Ordinance. It's a public department that	G
	oversees that?	
H	A. Yes, I believe so.	H
I	Q. Of course, they can do it themselves or they could issue	I
	a licence to LPs?	
J	A. Well, enforcement of the Waterworks Ordinance is the	J
K	WSD's responsibility.	K
L	Q. Under the Waterworks Ordinance, there are a lot of	L
	forms; are you aware?	
M	A. No.	M
N	Q. WWO46?	N
	A. No. That's not my work responsibility.	
O	Q. So you are a scientific, technical officer; is that	O
P	right?	P
	A. Yes.	
Q	Q. But in general, are you aware that the Waterworks	Q
R	Department in this Commission of Inquiry have put	R
S	forward a stakeholder approach; you have heard of that?	S
	A. Yes, but I am not familiar with the details.	
T		T
U		U
	- 18 -	
V	Transcript by DTI Corporation Asia, Limited	V

CHAIRMAN: Wait a second. I would like to ask -- you are
the Water Science Division head; right?

A. Yes.

CHAIRMAN: I would like to follow up on Mr Paul Shieh's
question. So you are aware of the existence of British
Standards, but that's not your work responsibility, so
you are not familiar with those subjects.

A. (Nodded head).

CHAIRMAN: If that is the case, we are aware whether it's
the Waterworks Ordinance, it gives the WSD a lot of
powers to inspect materials. So, in other words, the
inspection of material, if the Waterworks Department
does such inspection, that's not your responsibility?

A. It's Customer Services Division. They do that.

CHAIRMAN: So customer service, put simply, if the Customer
Services Division have a customer who says, "The
materials are not appropriate, I want to have it
inspected by WSD", it's not your responsibility?

A. Currently, we don't have testing procedures to do that.

CHAIRMAN: So it's not your responsibility?

A. Yes, you can say so.

CHAIRMAN: And there is no other testing division that
handles that?

A. No.

CHAIRMAN: So your department just tests water quality?

A. Monitoring water quality.

CHAIRMAN: You have spent 30-plus years in the WSD, so in the past 30-odd years there has been no such division?

A. No. We have never dismantled components and tested for such.

CHAIRMAN: So, in other words, you have never seen that stuff?

A. Yes, yes, you can say so.

CHAIRMAN: Okay.

MR SHIEH: I would like to understand -- you are the chief chemist, so the chemist, that could include a lot of things. Water quality is something a chemist would be interested in. But what chemical properties are there in components, is that something a chemist should look into? You are saying according to the division of labour within the Water Supplies Department, to study or formulate a component requirement or a certain percentage threshold for chemicals, that's not your work responsibility?

A. That is correct, yes.

Q. But deciding which parameters to inspect, you participate in that?

A. Yes.

Q. Because it's related to water quality?

A. Yes.

Q. I just want to clarify which questions I need to ask.

That's why I have to understand your job nature.

So just now the chairman asked you, not just you personally, even within the Water Supplies Department, there is no separate division or existing procedure where somebody inspects random samples during construction, after construction. They won't inspect construction materials and whether it has excessive chemicals, not just lead?

A. No, we don't do material testing. We just monitor water quality.

Q. So even though, under the Waterworks Ordinance, it requires compliance with British Standards, and British Standards have some requirements, including chemicals that have a threshold, but the WSD doesn't have a procedure to monitor or take initiative -- they don't have this kind of scientific testing?

A. No, our work doesn't include that.

Q. So, regarding the source, because you mentioned whether certain chemicals -- whether they exceed standards. So aside from water sampling at the tap, you should also check at the source. That's what you said.

A. Yes.

Q. So we can rely on legislation. We shouldn't use inappropriate material, rather than taking water

samples; that's your position?

A. Yes.

Q. But at source the WSD doesn't have any tests, to test source material; is that correct?

A. I know they have a regulatory mechanism. The LP, AP -- this is just hearsay, it's not my personal knowledge -- they also have -- when they introduce materials, they require the applicant to do type testing at third-party laboratories, and the certificate has to be submitted to the WSD.

Q. When you say introduce materials -- if it's not your expertise, you should notify. You say the WSD requires them to do testing. So, to give you an example, if prior to works they will submit construction material checklist and if they introduce something that the WSD has not approved, a new brand or new product, they need to persuade the WSD that the material is okay, they need to provide chemical testing. Is that the general case?

A. I think generally that would be -- but I'm not aware of the details.

Q. So you are not responsible for materials. In other words, regarding WWO46 and 1005, this is also not part of your work responsibility?

A. Yes.

Q. That saves a lot of questions.

I would like to direct you to a document.

Bundle C4, page 3256.

Let me explain. When a building declares that works are complete, they ask the WSD to check the water supply, whether it conforms to specifications, they have a checklist. So this is Mr Lam Ching Man; he provided this exhibit.

I would like to ask you -- this is also not part of your work responsibility; right?

A. That is correct.

Q. Then I should ask him, because at page 3257, item 8, it says:

"(In English) Partially completed works -- materials of pipe and pipe jointing."

So it seems the inspection includes jointing material, so I wanted to -- I was going to explore what the inspection of pipe jointing was.

A. It's not my work responsibility.

Q. Okay. I can set that aside as well.

Then I would like to ask you -- your witness statement, some water samples. Page 21, your 3rd statement. You say the WSD has an extensive water quality system. There are chemical, microbial tests, and you mention that every year, 160,000 samples throughout the water supply system are taken. So the

160,000 -- Mr Lam, we asked him about that -- this
160,000, it's an average figure; right? Every year?

A. Yes, it's an approximate figure.

Q. So 160,000, what does it include?

A. Well, the 160,000 samples are taken from the whole water
supply system. That includes the source, water
treatment, water distribution, and consumer taps. It's
made up of these different parts.

For example, at source, we have reservoirs, water
catchment areas, we have the Dongjiang water sample, and
in what --

Q. Hang on. I'm aware that water filtration system -- we
read from the witness statement that some procedures do
not involve test sampling.

A. Yes.

Q. I remember we also have -- where fish are introduced in
the reservoir, if there's a special reaction, we know
that there's a problem. That's constant monitoring.
That's not a water sample.

A. We call that continuous online monitoring.

Q. So continuous online doesn't involve sampling. So
160,000, they might take one or two samples from
Dongjiang supply, check one or two parameters, and in
the reservoir, before it reaches treatment, they might
take one or two samples. So at different stages, you

will take samples?

A. Yes.

Q. That includes before and after the connecting points?

A. Yes.

Q. I would like to ask -- you say you also include testing from taps. These are conducted at random.

Now let's look at paragraph 41. It says:

"(In English) ... treated water samples are taken at scheduled frequencies from 40 strategic fixed points including a combination of 10 service reservoirs, 3 cross harbour mains, 9 accessible connection points and 18 fixed consumer taps ...", and so on.

All these treated water samples are included in the 160,000; right?

A. Yes.

Q. "(Partially in English) In 2014/2015, more than 250 pairs of treated water samples were taken from water treatment works on a monthly basis ..."

Why were pairs taken?

A. For some heavy metal tests, we had 11 heavy metal tests that use a single water sample, and for mercury another water sample was required. So for heavy metal test we took pairs of water samples.

Q. You have to test for 12 types of heavy metals; right?

A. Correct.

Q. So if I understand correctly, the samples would pass through the filtration procedures at the water treatment works, and random samples would be taken and tested for heavy metals, or one of the 12 heavy metals?

A. After leaving, these treated water samples have passed --

Q. Through the water treatment works.

A. Those are end products.

Q. (Chinese spoken).

A. Fixed point samples would be taken.

Q. (Chinese spoken).

A. In terms of time we take them at regular frequencies.

For heavy metals, we would take samples once every minute.

Q. And lead would be tested; right?

A. Yes.

Q. You talked about pairs of water samples. I just want to find out why pairs have to be taken. You have to test for 12 metals, and for 11 metals you have a method, and for mercury you have another approach.

A. We only have to take a bottle of water sample and we can test all 12 metals. So we just have to perform one scan and we can test all 12 metals.

Q. So you would take one jar of water to test the 11 metals and another jar for testing mercury?

A. Yes.

Q. Now I have another question on the chemistry. This might not fall under your ambit of work, but I just want you to confirm whether I am right.

Just now, I said that under the WWO, there are requirements on the compliance of certain materials with British Standards. So, in around 2001 to 2012, the Housing Department had some discussions on public rental estates, and they looked at allowing the use of copper pipes in the plumbing systems. There were technical considerations -- for example, revising certain specifications -- and the WSD might have been consulted to take part in the discussion or provide consultation on the switch to copper pipes.

So are you aware of that or were you personally involved?

A. The Water Science Division was not involved.

Q. All right. You said that the samples would be tested for the presence of heavy metals, including lead. So what was the reason to test for lead?

A. We needed to verify that the treated water complies with the 2011 WHO Guidelines for Drinking-water Quality. If you don't test it, how can you say you are compliant?

Q. Let's just focus on lead. I can look at the details with you, if you want. But in a water supply system,

lead is most likely to appear in plumbing systems.

A. If the water collection point is located close to mining activities, there might be leaching of lead, so we have to look at the entire project. We have to see if lead is present in the source water, and we have to see if it's present in treated water, and whether it complies with the WHO standards. We have to look at the whole picture. We cannot just single out specific samples without considering others.

Q. That means the WSD would look at the end product and decide which metals to test for? So you are not conducting a metal-by-metal risk analysis, and you are not saying that lead might appear in plumbing systems, so there's no need to test for it in the supply system. So you are not conducting any metal-by-metal analysis?

A. We want to make sure that the metal content complies with WHO standards. So we would test everything against the WHO standards, to ensure that the Water Safety Plans are working properly and that all risks are under control.

Q. So you are not tailoring the tests for any specific metal? You are doing it because the WHO provides a list of metal contents; that's why you conduct the tests, right?

A. Yes.

Q. Now let's look at the eight parameters for water testing. These eight parameters are tailor-made; right? They are not based on the WHO standards?

A. Right.

Q. These parameters for testing were derived to avoid backflow at the point of supply, and this has nothing to do with the WHO standards.

A. Right.

Q. Now let's look at paragraph 49 of your 3rd witness statement. You have two paragraphs 49. I am referring to the second paragraph 49. You explain the eight parameters and why the eight parameters were used, and you explain why lead was not included.

Now let's look at paragraph 52. In this paragraph, you explain the issue of pH. You said the water in Hong Kong is soft, and you said the pH of water in Hong Kong is adjusted to about 8.2 to 8.8, which is slightly alkaline, in order to reduce its corrosivity. If it's acidic, then the water might react with metals. What about if the water is alkaline?

A. Well, the chances will be lower, but if water is acidic, it will react with compounds. Sometimes, the reactions with metallic compounds depends on the pH.

Q. So the water leaving water treatment works is already slightly alkaline, and some metals which should not

exist, such as lead, since the water is slightly alkaline, the corrosivity or chances of reacting with metals that should not exist would be low; right?

A. The purpose of adjusting the water pH to 8.2 to 8.8 is to safeguard our own system as well as the customers' water supply systems.

Q. If the water supply system of a customer contains metals which should not exist, such as lead, by adjusting the water to be slightly alkaline, the chances of chemical reactions would be minimised?

A. We shall say that the pH of our water would minimise the chances of metal leaching into the water.

Q. In other words, reducing the plumbosolvency, and lead would be less likely to react with the water, and they would more likely dissolve in the water?

A. Yes.

Q. By now, we know that if we use leaded materials for plumbing, lead still leached into the water. Does it mean that even if the water is slightly alkaline, metals might still leach into the pipes, if present?

A. If our pH level is slightly lower than 7, for example 6.5, the compound solubility might reach 100 micrograms per litre. If we adjust the pH of the water to 8.5, the solubility would be reduced by 10 times to 10 micrograms per litre.

So the purpose of adjusting the pH is to reduce
corrosivity of the water and minimise metal leaching.

Q. So this is not to completely eliminate metal leaching.

A. I don't think that's possible.

Q. You mean if the pH is slightly lower, then more lead
might be leached out into the water?

A. Yes.

Q. In paragraph 52, towards the bottom, you said:

"(In English) ... if the materials used in the
inside service are in compliance with BS specifications,
it is expected that the risk of heavy metals (including
lead) leaching from the materials into the treated water
(with the said set pH value) should be low and should
pose minimal threat to water quality. According to
section 3.3.2 of WHO's publication 'Chemical safety of
drinking water: assessing priorities for risk
management', it suggests that, unless there is strong
evidence, inclusion of those chemicals in drinking water
monitoring programmes is not justified."

Then in annex 4 you provide a copy of this
publication. You continue by saying:

"(In English) In any event, the document advocates,
inter alia, that the approach to monitoring and
management is preferably through control of materials.
Contamination caused by poor quality materials is best

controlled through applying specifications governing the composition of the materials ..."

Let's pause here.

So the WSD's philosophy is to look at the source, through controlling or managing the materials of the plumbing system or water supply system. That's more effective than taking water samples eventually to test for lead. So that's the philosophy of the WSD; right?

A. (Nodded head).

Q. Now let's look at the document, "Chemical safety of drinking water of the WHO", you quoted. C18.1, page 10581.

Let's look at page 10581. 2.4.4, "Lead":

"(In English) The presence of lead in drinking water can cause severe health effects and is primarily a consequence of the use of lead plumbing and lead-containing metal fittings in buildings. Although lead may be present in source waters, this is unusual except in some mining areas. Generally, lead is not a high priority for routine monitoring programmes because of the variability from building to building, but possible risks posed by lead in drinking water should be assessed in localities where lead has been extensively used in plumbing materials, particularly if the water supplied is corrosive or is likely to dissolve

lead."

So this is one factor you considered, regarding the characteristics of lead, and it's not a high priority, and you have relied on this?

A. Well, we don't totally rely on this point. It's based on the monitoring data, and we have a regulatory mechanism in place. So we feel that that risk would be lower.

So, prior to the excessive lead in water, we did not add heavy metals into our eight parameters.

Q. I am being fair to you. I have extracted this, and I'm not saying that you only rely on this. Just now, we talked about lead wasn't a high priority, and you would also feel it was in line with the WSD understanding.

A. That was their recommendation. We don't necessarily agree. We have our own monitoring strategies. So it's not based on this and therefore we don't do anything.

Q. Page 10589, this is the part where you quoted. You quoted this directly. In this part, it's not just about lead in general -- 3.3.2, in the middle, it says:

"(In English) Unless there is strong evidence that particular chemicals are currently found or will be found in the near future, at levels that may compromise the health of a significant proportion of the population, the inclusion of those chemicals in drinking

water monitoring programmes is not justified,
particularly where resources are limited. It is often
more effective to maintain an ongoing programme of
pollution control and risk assessment in the catchment."

So that is 3.3.2.

I would like to go through page 10642 with you. In
the middle:

"(In English) Lead can also be present if lead
solder is used in the installation of copper piping.
A control measure in this case would normally be to
avoid the use of lead solders for applications involving
drinking water."

You see that?

A. Yes.

Q. Two paragraphs above 8.5, "Lead can also be present",
and if you read along:

"(In English) [PVC] plastic pipe is also widely used
in distribution systems. Lead has been used as a
stabiliser in unplasticised PVC pipe ..."

PVC pipes -- the last sentence says:

"(In English) ... chemical monitoring of drinking
water is not normally considered to be appropriate and
the most suitable method of management is by product
specification, as indicated above for other materials."

So, even though this talks about PVC pipes, but they

emphasise here -- they do not suggest doing water sampling for monitoring but rather manage the materials at source.

Lastly, I would like to direct you to page 10698.

"Lead":

"(In English) Lead is widely dispersed in the environment, occurring in a variety of sedimentary rocks, and in felsic igneous and metamorphic rocks ..."

At the bottom:

"(In English) When found in drinking water, lead usually arises from lead pipes and lead solder, mostly from plumbing in buildings. Monitoring is quite difficult and requires samples to be taken at the tap. Assessing the presence of lead pipes, or the ability of the water to dissolve lead, are the most appropriate management approaches. Monitoring is only considered if significant resources are available."

Do you see that paragraph?

A. Yes.

Q. So do you think what I read just now is not in line with WSD philosophy?

A. Well, basically, our thinking is in alignment. I would also like Mr Paul Shieh to look at the bundle, WHO, C2/1347.

Q. That's the WHO 2011.

A	<i>Annex: Realtime English Transcription based on floor / Simultaneous Interpretation</i>	A
B	Commission of Inquiry into Excess Lead Found in Drinking Water	B
	Day 52	
C	A. These are supporting documents.	C
	Q. Yes.	
D	A. The WHO, in 8.14:	D
E	"(In English) ... chemicals used in water treatment	E
F	... or from materials in contact with drinking	F
	water ..."	
G	Q. Are you referring to 1347?	G
H	A. Yes.	H
	Q. Yes.	
I	A. It mentions, "(In English) Other chemicals".	I
J	Q. "(In English) ... such as lead or copper ..."	J
K	A. It reads along, and then the next paragraph, if we skip	K
	the middle, "Some chemicals":	
L	"(In English) Many of these additives, both direct	L
M	and indirect or unintentional, are components of	M
N	processes for producing safe drinking water. The	N
O	approach to monitoring and management is preferably	O
	through control of the material or chemical."	
P	So this also tells the Commission why we rely on	P
	material control rather than in product testing.	
Q	Q. But given that it's based on an assumption that material	Q
	control is effective; am I correct?	
R	A. You have to believe in the system.	R
S	Q. It's that assumption, that is material controls, their	S
T	thinking is, taking water samples from pipes, there	T
U		U
V	Transcript by DTI Corporation Asia, Limited	V

might be resource difficulties?

A. Well, we have to balance the cost and benefits. You can take a lot of samples, test for a lot of compounds, but can you get the proportional benefits? We don't have infinite resources.

So, in designing our water sampling and testing, we have to consider the reality.

Q. Well, one consideration would be the alternative. That is, monitoring at source, the materials at source. Is that effective?

A. I cannot answer you whether it's effective or not. I think it's effective.

Q. I understand. You are not responsible for material control. You are only responsible for water sampling. But the theory is that in material control, if you break it down, then your assumption doesn't hold?

A. Well, ever since the incident of excess lead in water, we are aware that there are loopholes in the system.

Q. Whether it's lack of knowledge or loopholes, at any rate, the assumption was that you thought you could control materials, but then no one was monitoring it, and that led to the problem. There was nobody monitoring and no goalkeeper.

A. You can't say that there's no person monitoring. There's an LP. We have to believe that the LP and AP

will look at these materials. We cannot say we don't place our faith in these professionals and we need to compound their work and add another layer of work imposed on them.

Q. But let's say you place your trust in them, or they place their trust in you. For whatever reason, if this assumption breaks down, and you don't take water samples, I can say it's invalidated.

A. After the incident of excess lead in water, we have now included four heavy metals. We now know the risk is not like what we assumed; it's not as low as we thought.

Q. So after the excess lead in water incident, you are testing four more heavy metals. So, in your witness statement, after 2015, you would test inside service and connection points for four heavy metals. So I will look at this scenario, the latest scenario. Wait a second.

Let's talk about the past. Before the excessive lead in water, we only looked at eight parameters. I would like to know -- you said there were some loopholes -- so what was done? We know at the connecting point, at the end of our level, you will take a water sample to test the eight parameters in general, because the connection point is underground, so there's a manhole cover, so --

A. It's not a cover. Before they seal it off -- it's

underground.

Q. I'm not referring to a manhole cover. So before you have covered it up, you take a water sample from the closest connecting point for the eight parameters. But that cannot test the water quality of the inside service.

A. We are not testing the inside service.

Q. We have looked at diagrams, and it's underground, and then you pull it up to the roof tank, and then it flows down vertically and then it travels horizontally to each storey.

A. Yes.

Q. So now we have identified the problem doesn't occur going up; are you aware? The solder material is not used -- it doesn't occur going up.

A. According to the WSD samples, we see that the roof tank doesn't contain lead. There's no lead in the sump tank.

Q. So the lead doesn't exist in the up-link?

A. Well, according to my personal understanding, they don't use copper tubes. They use ductile iron GI pipes for water going up. So they don't need solder.

Q. So can we say that using the WSD water sampling facilities, where they test the connecting points, so even if you test for lead there, it won't detect lead? It won't find the leaded components; is that correct?

- A. If you look at --
- Q. Even if you didn't examine, test the eight parameters -- we now say we talk about eight parameters, we should test for more. But looking in hindsight, you still wouldn't detect lead?
- A. I can't agree with what you are saying, because I have received a case -- I can't disclose the location -- we did detect lead. It had failed all tests.
- Q. At the connecting point you detected lead?
- A. Not at the connecting point. It was the inside service.
- Q. I'm not talking about inside service. I'm talking, before the excessive lead in water incident, before the incident, the WSD only checked connection points.
- A. The connection points were problem-free. The problem only exists beyond the connection points.
- Q. Let's take it one by one. Before the lead in water incident, the WSD's approach was only to test the connecting points, as a precondition for water supply?
- A. From 2002 to 2012, only connecting points were tested.
- Q. Before the incidence of Legionnaires' disease, only the connection points were tested, and eight parameters were tested. After the summer of 2012, since there were incidences of Legionnaires' disease at the government headquarters, you adopted a different approach, but still the eight parameters were retained?

A. Yes, plus the inside service. Yes, the eight parameters were kept.

Q. The inside service was tested as a precondition?

A. I believe that's true. For details, you might have to ask our Customer Services staff.

Q. So after the incidence of Legionnaires' disease, inside service was tested. Did you only test the down-link or did you only test pipes that entered the building?

A. Only consumer taps were tested.

Q. So before the Legionnaires' disease incidences appeared, even if you tested for lead, you could not detect if lead was present on the customer's side or part?

A. Yes, you can put it this way.

Q. If the down-link or horizontal pipes into the buildings were the issue, you could not detect the presence of lead just by testing the connecting points. And after 2012, if inside service and inside pipes were tested for lead, then you would have detected them, if leaded parts were used?

A. Yes, possibly.

Q. If there were leaded components, since 2012, since inside service was also tested, you might be able to detect them; right?

A. Yes, you can put it that way.

Q. Please look at page 10516 of your witness statement.

Footnote 7. Please look at the footnote, on page 10516.

Do you see that?

A. Yes.

Q. "(In English) To put the matter in context, the water sampling and tests involving WSD in relation to inside service are as follows".

Now, for (2):

"(Partially in English) For newly constructed inside service:

(a) (before 2012) water samples were taken for testing near connection point ... as a prerequisite for effecting water supply".

So before 2012, you would test the eight parameters at the connection points.

"(Partially in English) (b) (from 2012 to 2015) water samples were taken for testing near connection points ... as a prerequisite for effecting water supply ..."

So the precondition depends on after the eight parameters at the connection point.

Then it says:

"(Partially in English) ... after effecting water supply, water samples were taken from inside service within building (8 parameters as a reconnection to LP/AP) for checking the effectiveness of cleansing and

disinfection".

So the eight parameters were not a precondition for approving water supply?

A. The water supply must be connected before you can take water samples.

Q. So you are just recommending a test afterwards?

A. Yes.

Q. You won't impose any sanctions even if they don't test the water, because the supplier has been granted already?

A. I'm not sure. I have to ask my Customer Services staff.

Q. So perhaps Mr Lam might be more familiar with that?

A. Right.

Q. In Mr Lam's witness statement, he said these recommended samples for inside service were not preconditions, but you feel that he might be more familiar with these issues; right?

A. Yes.

Q. Assuming what Mr Lam said was right, that is the eight parameters were only recommended for inside service, they were not mandatory, so the WSD's approach is that the only mandatory tests were at the connection points.

So before the lead in water incident, the WSD conducted mandatory water tests -- well, let's not talk about random sampling. Let's talk about the mandatory

water sampling required for water connection.

The problem was not that lead wasn't tested. It was that the WSD only tested the connection points. Can you put it that way?

A. I'm not really sure what you mean.

Q. My question is this. Some people asked why you don't test for lead at the connection points. As we said, even if you test for lead at the connecting points, it's meaningless, as we know; right?

A. I think it depends on the materials used.

Q. From this incident, we know that the cause was the use of leaded soldering material at the copper pipes. Some people complained why only eight parameters were tested, but retrospectively, even if you tested for lead at the connection points, you couldn't detect the leaded solder in the copper pipes. The reason was not that only eight parameters were tested; the problem was you only tested the connection points. Do you agree?

A. The eight parameters applied to the connection points.

Q. But by now we know that for new buildings, the WSD can certainly test the inside service, before moving in.

A. I think our CSD staff can better answer this question.

I'm not sure that this falls under their statutory powers.

Q. In other words, I will only ask you questions about

water quality.

A. Correct.

Q. I would like to look at your 4th witness statement, on water quality, paragraph 11.

Please look at the WHO standards in 2011. Let's look at the 2011 WHO document: bundle C2, tab 17, page 1258.

In your witness statement, you mentioned the guidance values of the WHO are based on some assumptions.

A. Right.

Q. I would like you to look at the actual assumptions. Let's look at page 1337. On this page, you can see the heading, "(In English) Default assumptions"; do you see that? The guidance values mentioned in your evidence are based on these assumptions.

You see the heading, "(In English) Default assumptions" -- it says:

"(In English) There is variation in both the volume of water consumed daily and the body weight of consumers."

So the bodies of each person are different, and water consumption is different, so the level of 10 micrograms per litre is based on such assumption?

A. No. I think your understanding is wrong. Are you

referring to lead?

Q. I am not referring to lead. I'm just talking about something in general. In the guidelines, there are default assumptions, and the assumption is that the average adult will consume 2 litres of water per day, and you assume that the body weight is 60 kilograms. The guidance value is based on such default assumptions.

A. Yes.

Q. And the consumption period is 70 years. So if I'm 50, then even if I would not die -- because I cannot live until 120, to put it in a blunt way?

A. Yes, you can put it that way.

Q. But I won't try that, for sure.

A. The WHO standards start from day zero to 70.

Q. So these are default assumptions. So, if we have default assumptions, you have to make adjustments from case to case. You have to see whether you should apply default assumptions for specific materials, or you would look at the characteristics of the material and say, "I might not apply these default assumptions"?

A. So, in the WHO Guidelines, this is a scientific point of departure. You can adjust it to suit your country's needs. For instance, if the average weight of your people is less than 60 kilograms, then you can change the default assumptions and revise your guideline

values.

Q. If a specific metal is especially risky for a specific vulnerable group, then -- well, further down, it says:

"(In English) In some cases, the guideline value is based on children ..."

Do you see that part?

A. Yes.

Q. "(In English) ... where they are considered to be particularly vulnerable to a particular substance. In this event, a default intake of 1 litre ..."

Now, this is 1 litre, not 2.

"(In English) ... is assumed for a body weight of 10 kilograms ..."

So it's lighter.

"(In English) ... where the most vulnerable group is considered to be bottle-fed infants, an intake of 0.75 litre is assumed for a body weight of 5 kilograms."

A. Yes.

Q. So, no matter what your default assumptions are, there's a precondition. You need to identify the risky category of people for different materials. If children are particularly at risk, you would consider the body weight of an average child, and the derived values would be based on the body weight of 10 kilograms and his daily consumption?

A. If you are to derive a guideline value, you must have a basis. Now, these default assumptions tell us, or identify vulnerable groups towards certain materials, and this is how the assumptions are derived.

Q. For example, for a substance X, if you want to know the guideline value for substance X, how would you derive it? You might not apply default assumptions for adults; you have to identify the vulnerable groups for this material before conducting analysis?

A. Correct. But you have to look at the source of your scientific data as well, whether they are from human studies or animal studies, and then you would begin the process of derivation.

Q. So you cannot have a clear-cut, you know, boundary at 10 micrograms, or you cannot -- there's no universal reference value. You have to identify the vulnerable groups and consider the corresponding values. You even said there might be a point of departure, where you consider the local culture and habits, and so on?

A. Yes.

Q. Please look at page 1446. In the middle, do you see "Lead"?

A. Yes.

Q. This is a provisional guideline, "(In English) Provisional guideline value". It says 0.01 micrograms

per litre.

"(In English) The guideline value is provisional on the basis of treatment performance and analytical achievability."

So I will ask you, but let me tell you right now, this 10 micrograms per litre, it's not based on a health perspective.

A. I disagree.

Q. You think this is based on a healthy human being?

A. I have to tell you the history, why in 2011 it became a provisional guideline.

In 2004, the WHO Guidelines were still using 10 micrograms per litre. The 10 micrograms per litre, how was it derived? Well, as you said, it was based on a default assumption. That is a 5-kilo infant would consume 0.75 litres of water. At that time, the UN and WHO, the agricultural committee, they had a provisional intake of 25 micrograms per kilogram body weight, and 50 per cent allocation to drinking water. That's how they calculated it.

The GV at that time was equal to TDI, tolerable daily intake, multiplied by body weight, multiplied by allocation to drinking water, and it was divided by volume of water consumed. I had calculated that it was roughly 11, and they rounded it down to two significant

figures. That is 10. That's how it was calculated.

That was the previous guideline value. The WHO felt that this was applicable and equally protective for all age groups of the population; equally protective. So why, in 2011, did they take the guideline value and change it to a provisional value? Because the FAO felt that the PTWI was not protective, and they converted it to 25 micrograms per litre. The WHO designated it as a provisional guideline value because no matter how good your treatment is, it's hard to achieve a lead level lower than 10, and on the other hand the laboratory capabilities, not all labs have ICP-MS. They cannot achieve 10 micrograms per litre analytical requirement.

So that's why, from GV, it was converted to PGV, but there was no change in the basis.

Q. So you are saying it's still from a health perspective, that's how it was calculated? Because the Water Authority counsel says that 10 micrograms is safe. So you are saying that's based on health benefit analysis?

A. Before 2011, lead was a threshold chemical. So lead is now a non-threshold chemical. There's no safe limit; the lower the better. But the PGV is health-based.

Q. I would like to refer you to the authentic version. C21, page 18938. This dates back to 1993. It's the WHO 1993 document. If you go forward two pages.

So, in your recollection, in 1993 they had included a lot more chemicals, but there were less chemicals before, in the previous version. The 1993 version had a lot more chemicals; is that correct?

A. Yes.

Q. Let's take a look at C21, page 18940, "Lead". It talks about lead.

Then the next page, 18941, in the middle:

"(Partially in English) In 1986, JECFA [The Joint Expert Committee on Food Additives; it's a committee under the WHO] established a provisional tolerable weekly intake (PTWI) for lead of 25 micrograms per kilogram of body weight (equivalent to 3.5 micrograms per kilogram of body weight per day) for infants and children on the basis that lead is a cumulative poison and that there should be no accumulation of body burden of lead."

Then they do the calculation.

"(Partially in English) Assuming a 50 per cent allocation to drinking water for a 5-kg bottle-fed infant consuming 0.75 litres of drinking water per day, the health-based guideline value is 0.01 milligrams per litre (rounded figure). As infants are considered to be the most sensitive subgroup of the population, this guideline value will also be protective for other age

groups.

Lead is exceptional in that most lead in drinking water arises from plumbing in buildings and the remedy consists principally of removing plumbing and fittings containing lead. This requires much time and money, and it is recognised that not all water will meet the guideline immediately. Meanwhile, all other practical measures to reduce total exposure to lead, including corrosion control, should be implemented."

You see that?

A. Yes.

Q. So that is the original 10 micrograms reason.

Actually, at page 14521 of your witness statement, in bundle C19.6, footnote 2.

A. Yes.

Q. You see:

"(Partially in English) The GV was tightened to 10 micrograms per litre in the 2nd edition of Guidelines ..."

So you are referring to this, and we found the 1993 version.

Then let's take a look at the 2011 WHO document. Page 1447, bundle C2.

Look at page 1446. This is "Lead"; do you see that?

A. Yes.

Q. "(In English) Basis of guideline value derivation"; do you see that?

A. Yes.

Q. "(In English) The guideline value was previously based on a JECFA PTWI which has since been withdrawn ..."

Do you see that?

A. Yes.

Q. "(In English) ... and no new PTWI has been established ..."

Do you see that?

A. Yes.

Q. "(In English) ... on the basis that there does not appear to be a threshold for the key effects of lead. However, substantial efforts have been made to reduce lead exposure from a range of sources, including drinking water. Because it is extremely difficult to achieve a lower concentration by central conditioning, such as phosphate dosing, the guideline value is maintained at 10 micrograms per litre but is designated as provisional on the basis of treatment performance and analytical achievability."

Do you see that?

A. Yes.

Q. Take a look at the explanation. Page 1447:

"(Partially in English) Based on the dose-response

analysis, JECFA estimated that the previously established PTWI of 25 micrograms per kg body weight is associated with a decrease of least 3 [IQ] points in children and an increase in systolic blood pressure of approximately 3 mmHg in adults. These changes are important when viewed as a shift in the distribution of IQ or blood pressure within a population. JECFA therefore concluded that the PTWI could no longer be considered health protective, and it was withdrawn."

So that explains why the JECFA, the PTWI of 25 micrograms per kilogram and how it was calculated at 10 micrograms per litre, why it was no longer considered health protective.

That is previously, if we thought 10 micrograms per litre was the so-called safe -- the health threshold, that's incorrect.

Previously, we thought a consumption of 10 micrograms per litre was safe, but now we have found out that's not safe, that's why it was withdrawn?

A. I don't think you can put it that way. When they withdrew that PTWI, it doesn't mean -- because the new PTWI is not achievable. They must feel that zero would be best.

Q. Well, the US says zero.

A. Zero might be the best, but if you translate it into

health-based guideline values, it is not achievable.

Q. It depends where you are. It depends on the history,
the material used. Do you agree?

A. Well, if you were using lead pipes and even if you have
orthophosphates, it's not 100 per cent where they can
achieve 10 micrograms.

Q. In those areas, you might still have to expend a lot of
effort. If you are using lead pipes, if you could
achieve 10 micrograms, it was cause for celebration.

But Hong Kong wasn't using leaded pipes, so 9 micrograms
might be achievable?

A. It depends on the circumstances.

MR SHIEH: Let's continue after lunch.

CHAIRMAN: Okay. We will continue after lunch.

(1.01 pm)

(The luncheon adjournment)

(2.29 pm)

MR SHIEH: Mr Chan, this morning we were looking at the 2011
WHO document. Now let's look at bundle C2, page 1447.

Just now, we talked about the PTWI before JECFA, and
these were in the 2011 WHO document, and these were
withdrawn.

Now let's look at page 1447. In the middle of the
page, for PTWI, 25 micrograms per kilogram of body
weight, they found that there were still problems with

the mental health and wellbeing, so it was withdrawn.

It says:

"(In English) Because the dose-response analyses do not provide any indication of a threshold for the key effects of lead, JECFA concluded that it was not possible to establish a new PTWI that would be considered to be health protective. JECFA reaffirmed that because of the neurodevelopmental effects, foetuses, infants and children are the subgroups that are most sensitive to lead."

Now I guess you understand what this means. So it defines the vulnerable or most vulnerable groups. JECFA feels that children and infants are vulnerable and the most vulnerable.

A. No, it's not like that. The JECFA did not consider which groups were vulnerable. They are merely proposing a new PTWI based on their studies. They did not identify for WHO which groups are sensitive or vulnerable.

Q. But it says:

"(In English) ... reaffirmed that because of the neurodevelopmental effects, foetuses, infants and children are the subgroups that are most sensitive to lead."

A. The WHO adopted their findings and found that children

and pregnant women are sensitive groups.

Q. Let's not use the word "vulnerable". They are most sensitive to lead.

"(In English) It needs to be recognised that lead is exceptional compared with other chemical hazards, in that most lead in drinking water arises from plumbing in buildings, and the remedy consists principally of removing plumbing and fittings containing lead, which requires much time and money. It is therefore emphasised that all other practical measures to reduce total exposure to lead, including corrosion control, should be implemented."

Now, I have a few points I want to put to you.

In the 2011 WHO document, the standard of 10 micrograms per litre was based on the 25 micrograms per kilogram of body weight. It was dated to 1993. So the value was derived from this assumption, and JECFA withdrew this standard. They could not identify a threshold, a new threshold, with regards to health.

Do you agree?

A. Yes.

Q. Therefore, even if a provisional GV was adopted, the guidance value could not be taken as a health-based threshold. It existed merely because the lead content in the pipes could not be reduced to under 10 micrograms

per litre, and as such the level of 10 micrograms per litre was only a provisional GV based on a lack of alternatives. Do you agree?

A. No, I do not agree.

Q. Why?

A. When you look at the history of derivations, they were based on JECFA value, even though it has been withdrawn. It doesn't mean that this value was not health-based. It merely meant that the health-based reference value carried a certain degree of health risk.

Q. Where does it say here? The threshold could not be identified, so a specific level could not be determined.

A. No one can give a safety threshold at this stage.

Now I would like to take you to what other countries are doing. EC Drinking Water Directive, the levels are still 10 micrograms per litre. In the drinking water guidelines of Australia, it reaffirmed that the reference value is 10 micrograms per litre. It was published in 2013. In New Zealand, in the Drinking-water Standards, again 10 micrograms per litre was used. In Japan and China, again, it's 10.

You said there are no threshold chemicals, but in practical terms, a radiation threshold would be used. There are two radiation principles. One is called non-stochastic effect or deterministic effect. There's

a threshold for that. If you are exposed to a certain dosage of radiation, you will experience hair loss, nausea, changes to red blood cells. This is a deterministic effect. Alternatively, it might be a dose-response or what we call stochastic effect or random effect. The lower the dosage, the better. The higher the dosage, the probability of contracting cancer also increases.

So, under the situation of no safe threshold, in practical context, I would say it's as low as reasonably achievable or as low as reasonably practicable. It's not zero, as you suggested, because it's not possible. In our daily living, there are certain risks. Now the level is 10. I still feel that the reference value is health-based. Just that this still carries an extent of health risk.

Now, the reference risk levels of the WHO generally -- to the degree of -- 10 to the degree of minus 6, and this is minus -- to the degree of 10 to minus 6, and in practical terms, for every 100,000 people, one person will contract cancer, contract excess cancer. So it's around 1 in 100,000. So that person might have an issue.

So the original risk might be 10 to the power of minus 6, but now it might be 10 to the power of minus 5.

No one can say for certain whether the level of public health risk is acceptable.

Q. Now, without the threshold, when you look at the derivation of lead, on page 1446, "(In English) is designated as provisional on the basis of treatment, performance and analytical achievability."

Before lunch, we talked about the WHO standards. They said very clearly that they were not mandatory standards; they had no legal basis, right?

A. Yes.

Q. And they had to be adjusted based on the history, culture, habits, materials, and so on?

A. I don't understand what you mean by materials.

Q. For example, if you live in the UK, or somewhere where copper pipes are still used -- now, in those countries, since copper pipes were first used far before everyone was aware of the harmful effects of lead -- for historical reasons, it might be expensive or troublesome to replace the pipes. So in some countries or areas, these pipes are still being used.

So, in these places, their remedial measures cannot be completely eliminated, unless there's a complete replacement. You try to reduce the risk by chemicals, and the chemicals can reduce the content of lead. Alternatively, we can reduce the plumbosolvency of

water. We can reduce the solubility, and these might be remedies. This is something we can do to bring down or reduce the lead content in water; right?

A. Yes.

Q. So, in these countries, they would talk about bringing down the lead level in water, and reducing the level to under 10 micrograms per litre is a practical approach and achievable; right?

A. It's hard to say. First of all, some countries don't adopt 10. The US adopts 15, and it's not a health-based limit; it's simply an action limit. If 10 per cent of the sample exceeds this level, they would take corrective action.

Q. Some countries use 10 and some use 15. But as long as it's not health-based, since you cannot calculate a threshold -- there might be a difference in judgment between 10 and 15. Whether you adopt 10 or 15, the premise is that you have to bring it down to either 10 or 15; right? In Hong Kong, it should be zero. It's not an absolute zero. Since the 1930s, the WSD stopped using lead pipes and they stopped everything.

A. Right.

Q. So the starting point was already different. But in some places, it might be full of copper pipes, and in Hong Kong, since monitoring is in place, our starting

point should not be to bring down lead content.

A. There are a lot of sources of lead apart from the materials. For air and soil, they might contain lead as well. So we cannot say that there is no lead because lead pipes are not used in Hong Kong.

Q. If your pipes don't contain lead or if you use unleaded material, the source of the water might be from objects in the streams or rivers. Those are minimal. Those can be ignored; right?

CHAIRMAN: Well, you cannot just say -- you can't just ignore them. But in response to Mr Shieh -- for the unaffected estates, the lead content was actually under 0.01 per cent. Basically, it's already at the sensitivity limit of a machine; you can take it to be zero.

A. It's less than the detection limit.

CHAIRMAN: Exactly.

MR SHIEH: You can't say you can ignore it but it's close to undetectable, the limit?

A. For the unaffected estates, it's undetectable, only at trace levels.

Q. So in Hong Kong -- in other jurisdictions, to bring the lead levels down, as in the example I quoted, if they were using leaded pipes, they had to rely on chemical methods to get it down below 10 micrograms, that would

be a compromise. But in Hong Kong, the starting point -- we are not using leaded pipes, so Hong Kong's consideration should not be to bring it down; would you agree?

A. Why would you consider bringing it -- we should try to keep it as low as practicable.

Q. When I say "bring down", we are not like in overseas, where we have an otherwise -- pipe full of lead and bring it down to less than 10 micrograms. Hong Kong's starting point was we weren't even using leaded pipes, we didn't have leaded solder. The only probability was that we have trace elements of lead in the surroundings. So in Hong Kong, even if we have levels of 9 micrograms, it should not be a matter of pride. If people overseas knew that Hong Kong prides itself on not having a source that contains lead and we didn't use leaded solder, this is not something you would be proud of?

A. All I can say is that our water complies with the WHO. I cannot say how many micrograms is a matter of pride. No, there's no room for complacency.

Q. Would you say 9.9 a safe level?

A. From a scientific point of view, 9.9 is still safe. If you round it up to 10, you are still within the standard. As long as you don't exceed 10, it's still okay.

Q. Let's take a look at bundle V, page 59.

This is our medical expert, Prof Bellinger, his report.

If you refer to the top of the page, or the previous page:

"(Partially in English) At the present time, the World Health Organization identifies a blood lead level of 10 micrograms per decilitre as the upper limit of the acceptable range. A WHO committee is currently reviewing the guidelines for the diagnosis and treatment of lead poisoning, however. As noted, in its most recent evaluation of lead, the FAO/WHO JECFA withdrew the PTWI, of 25 micrograms of lead per kilogram of body weight per week, which had been established in 1993. The rationale was that the absence of a threshold for lead toxicity means that no level of exposure is safe (thus 'tolerable'). Moreover, it was not possible to establish a new PTWI that would be considered to be health protective."

So how would you respond to Prof Bellinger's view?

A. Are you referring to --

Q. This is a factual statement. Do you agree with that?

A. I agree. That is the FAO/WHO, they withdrew the PTWI, and up till now there is still no new PTWI. But I don't understand the blood level 10 micrograms per decilitre

upper limit of the acceptable range -- well, I'm not a medical expert, so I don't know what implications that would have.

Q. Looking further down:

"(In English) The current consensus is that there is no 'safe' blood concentration below which adverse effects do not occur."

You see that sentence. Would you disagree?

A. I cannot comment because I'm not a medical professional.

Q. I understand. But one point I would like to tackle with you. I understand the WSD pledge is that they would conform with WHO standards. But when we understand -- well, we understand that the WHO has different standards for different metals. So the derivation basis would be different for different metals.

A. Yes.

Q. We are just looking at lead now. We went through that background change, in 1993 it was health-based, the 25-microgram value was withdrawn, and now the threshold -- we don't have a threshold now.

So I want to suggest to you or point out to you -- I have asked that before but I would like a firm answer now -- to achieve the WHO 10 micrograms per litre, this standard, it is not applicable to Hong Kong, because in Hong Kong we don't have leaded pipes. Our starting

point was lead-free pipes and lead-free solder. So our starting point should be as low as possible. We shouldn't be satisfied with just meeting the WHO 10 micrograms per litre standard.

A. I think the WHO standard for drinking water quality in Hong Kong, it's a health-based target.

CHAIRMAN: It's a health-based target.

A. Yes. Of course, according to the WHO spirit, you shouldn't have a fixed water standard and we shouldn't degrade it to that level. We should always maintain the water quality at the highest possible level, the water quality.

MR SHIEH: So you still insist that 10 micrograms per litre is a health-based standard?

A. Yes.

Q. The assumption we looked at just now, the assumption was that for adults, you assume they consume the water for 70 years, but for the infant assumption, what would be the assumption?

A. This guideline, the WHO made it clear, it's protective for all age groups of the population. So the infant could drink it to 70 years old.

Q. But they wouldn't be an infant at 70 years of age.

A. So the guideline, it's conservative.

CHAIRMAN: It's conservative?

A. It's conservative because --

CHAIRMAN: Wait a second. As a matter of fact, returning to yesterday's evidence, we know that in Kai Ching and Kwai Luen Estates, the infants there, in Kai Ching and Kwai Luen, there was excessive lead of varying amounts. It wasn't excessive. It was in the teens. And the kids have been consuming it for two or three years. But we see their blood lead levels are excessive. If they consume it another 70 years --

A. Well, we have some confounding factors. The blood lead levels -- aside from water, we have other sources.

CHAIRMAN: That's correct. That's why Bellinger looked at, when there's an interruption, their blood lead levels drop. So the conclusion was, yes, it was because of excessive lead in water.

So, Mr Chan, as you said --

A. Well, I said it's conservative.

CHAIRMAN: So you are saying we can consume it for 140 years?

A. It doesn't only apply to kids. This standard, as Mr Paul Shieh says, they won't be kids forever, as they grow.

CHAIRMAN: But lead is accumulative, so you only have more and more lead in the body.

A. I don't know. You will have to ask a health expert.

CHAIRMAN: So I'm telling you, that assumption, are there problems with that?

I accept you are not a medical expert, but we know the kids grows up, but we assume, if they continue to assume the water, they might be stronger as they get older, but it doesn't mean that the lead impact has diminished, because lead has the most significant effect on kids and it accumulates. I don't understand why you say it's a conservative figure and therefore it's safe. It doesn't make sense.

A. Our view is that when we apply the values to kids, and if you apply it to all age groups of the population, then it's actually safe.

MR SHIEH: So you are saying, if it's safe to kids, then it's safe to adults; is that what you are saying?

A. Yes.

CHAIRMAN: So if the kid can consume it for 70 years, and if the adult would live to 140 years, they could drink it to 140 years?

A. Okay.

MR SHIEH: So if you include the WHO interpretation -- well, since it's written there, so we don't need to go through it.

I would like to move on to water sampling. We talked about first-draw, flushing, and so on. In your

4th witness statement, paragraph 13, you talk about first-draw before flushing "are not representative of the quality of water to be consumed by an individual on a routine or long term average basis."

That's what you said.

First of all, I would like to clarify with you -- there is no standard, whether it's ISO or WHO, that tells you, if you want to get a representative sample of quality of water to be consumed on a routine basis, you need to flush for such and such a period. There's no such standard?

A. Yes, you are correct.

Q. So when should water samples be taken, when would that be representative of the quality to be consumed on a routine basis -- so that is a judgment -- it's a research of the WSD. So we are not saying the WHO Guidelines, 3.2 -- I know ISO has different purposes, and so on -- but I want to say "(In English) representative of the quality of drinking water to be consumed on a routine basis" -- it's not a defined concept. There is no stipulated number of flushing minutes stated.

A. If you want to take a water sample and you want to compare it to GVs or PGVs, you need to get a representative sample. That representative sample

represents the average quality of water consumed on a routine basis over the lifetime.

So you cannot take the highest -- you cannot take the worst scenario and compare it to a standard. The standard is based on average quality, and internationally we don't have a standard that caters to extreme or worst-case scenarios.

Q. Okay. So your answer is that the concept, quality of drinking water consumed on a routine basis, we don't say that that can be achieved after flushing for three minutes, because it depends on the user's consumption habits?

A. As said, we still have a basis for reference.

ISO 5667-5 2006 edition. So we follow their basic principles.

If you want to check the water quality in a tap, you have to flush it for two or three minutes, or longer if necessary. If you want to investigate the effect of the pipe materials on water quality, then you would use a different sampling method.

Q. Let's look at the ISO standards. There are a few scenarios that warrant different methods. I will look at those provisions one by one in a moment, but would you agree that apart from the actual provisions and the wording, we should consider the wording of it; right?

A. Apart from the wording, we have to interpret it.

Q. By interpreting, you have to first understand the real objectives; do you agree?

A. Yes.

Q. According to the WSD's understanding -- let's not look at ISO for the time being -- you would flush it and then wait two or three minutes; is that your practice?

A. We would use two to five minutes. If the tap is often used, then we would use two minutes; for empty or vacant units, five minutes would be used.

Q. Now, for two to five minutes, let's assume that the horizontal part of the pipe entering the building, for that part, let's assume that it's about 20 metres. Now, if you run the tap for two to five minute, then the water would have cycled for quite a few times; right?

A. You cannot put it this way. It depends on the flow rate.

Q. Now let me just cite the flow rate.

Assume the flow rate was 2.6 litres per second.

A. Per minute?

Q. Per second. For the per-minute rate, you have to multiply it by 60.

Do we have a calculator?

A. No.

Q. That's all right.

Simply speaking, if you rinse it for two to five minutes, the actual effect -- on the horizontal section of the supply system -- I guess you know what I mean.

By now we know that the vertical part of the pipe does not contribute to the presence of lead. We only detected the presence of lead in the horizontal part of the pipe, the part entering the unit.

A. I think it depends on the location. For copper pipes with diameters exceeding 76 millimetres, silver brazing would be used. For smaller pipes, lead solder might be used.

Q. Now, the flow rate is 15.6 litres per minute.

A. 15.6 litres per minute.

CHAIRMAN: 0.26 times 60.

MR SHIEH: Now, assuming that this is the flow rate, assuming the pipe is 20 metres long, over the course of five minutes -- to put it bluntly, the horizontal part or the horizontal pipe of the water supply system would have been very clean, and all presence of lead would be washed away?

A. I don't know if that was the flow rate. When our colleagues collected water samples, usually they would turn on the tap to the fullest, and -- according to their reports, some taps are very slow and some are faster. Let's assume -- this is only an assumption --

if it's 15.6, in my statement, I said at a rate of 5 litres per minute, and if the pipe is 2.6 metres -- if the flow rate is 15.6 litres per minute, it will be about three times, around 7 metres or so. It will be about 7 metres of the pipe length.

CHAIRMAN: It depends on whether you are talking about the curved part or the vertical, or the straight part. Let's not talk about the curved part.

MR SHIEH: Let's not look at the method for the time being.

Let's look at the WSD Task Force. They had a conclusion. I will point you to the right page. You were involved in the discussions of this task force; right? Even if you leave it stagnated for 48 minutes, after flushing for two minutes, the lead content will be reduced by 90 per cent. So by common sense, if you -- first thing in the morning, after you turn on the tap for a few minutes, then the water should be free of lead or mostly free of lead. Whether it's zero is another question, but the level should be substantially decreased?

A. That's why I said for the first draw, for the transient concentration or instantaneous maximum concentration, it would not last the whole day. So you cannot use the maximum concentration of the first-draw method and compare it with the WHO Guidelines.

Q. So that depends on the type of water people use for boiling; do you agree?

A. Yes.

If you drink the first draw from the tap every night -- well, I'm not so sure, but I suggest the public not to use the first draw, for the sake of health.

Q. The residents can form their own habits, but some residents might not want to waste water. But we cannot argue habits. Everyone has different habits.

You said there was a survey done by your colleagues that more than 90 per cent of people would use water for washing up and brushing the first thing in the morning.

A. Yes.

Q. This report, the study is still ongoing?

A. Yes.

Q. As for the methodology assumptions and actual method, whether it's done by souvenir or actual test, it's unknown; right? We have no documentation yet.

A. I believe it's an interview.

Q. Let's look at one of the documents in our bundles. It might not be very relevant, because there's no absolute answer. Bundle A4, page 2745. Do you see this? This is a document from the 1980s. It is rather dated. It is a document from 1, published in the UK. It's done by the Water Research Centre. Have you heard of this

organisation?

A. I was trained there. I was trained in 1990.

Q. This research was done in 1986. It's called "Domestic water use patterns".

On the next page, 2747, "Domestic water use patterns", and it mentions concentration. It says:

"(In English) The concentration in drinking water of a contaminant such as lead, that is derived from the household piping, is partly dependent on the length of time that the water has stood in the pipes before use."

Do you agree with this statement?

A. Yes.

Q. So the longer you wait, the lead content would be higher.

"(In English) A survey of patterns of water-use was therefore undertaken to provide better information about such times of stagnation. The survey also enabled the consumption of water for drinking and cooking to be estimated separately from total demand."

That's the objective of the study; you see that, right?

The next page, that's the summary, on page 2749. The methodology was given. It says:

"(In English) Patterns of domestic water use were measured in a survey covering some 100 households in

22 districts in England, Scotland and Wales. Automatic monitoring and recording equipment was installed in each house to register the volume and time of day of each individual flow of water through the service connection for a period of two weeks."

So they didn't just rely on interviews; they placed a meter or recording device there, which was a more accurate approach. So they didn't just rely on word of mouth.

"(In English) Distributions were obtained of the stagnation times between uses (inter-use times), and of the volumes of water drawn. Consumers operated a button to identify water used for drinking and cooking (potable uses) so these could be dealt with separately in the data analysis."

So if you turn on the tap to brush or for boiling or cooking, then they are separate, but there's a button to identify water use:

"(In English) The effect of household characteristics, such as number of occupants, socioeconomic status and geographical region, on the average daily consumption of water, on the mean and median inter-use times, and on the frequency of uses was investigated. Separate results are given for first draw uses. The average pattern of diurnal variation in water

demand was also estimated.

The report concludes that, as expected, the number of persons in the household is the main factor influencing the consumption of water for non-potable purposes. However, the consumption of water for potable purposes appeared to be independent of household size. The mean inter-use time was dependent on household size, the main difference being between single person and multi-person households."

So that's the summary.

Now let's look at internal page 33, page 2784.

You can look at the conclusion, point (7). This was dated 1986 in the UK. The conclusion was that, in the UK:

"(In English) About 25 per cent of the first draws are used for potable purposes."

So, based on this methodology, based on the results, about 25 per cent of first draws were used for drinking. This is something in black and white from the UK. The percentage was 25 per cent. You said that your colleagues are conducting a study. So what's the purpose of this study?

A. It's to find out about the habits of using water and their attitude towards water conservation.

Q. So was it prompted by the lead in water incident or was

it planned all along?

A. They are carrying out Total Water Management 2.0

consultancy study. So version 2.0, that means

an advanced version, and the first edition was launched

in 2008, the first edition of Total Water Management,

and after the use we want to see how it progresses and

how improvements can be made.

Q. So that did not arise out of the excessive lead in water incident; it's part of a larger project?

A. Well, I'm not sure -- I'm not sure if they added some other questions in light of the excessive lead in water incident. I'm not very sure of that because I'm not responsible for the project.

Q. Okay. This project is ongoing. We don't know what the results are, and we don't have published data on the project methodology.

A. Correct.

Q. So the WSD, in determining the sampling method -- so it's not based on statistical analysis regarding users' consumption habits?

A. Correct.

Q. You are saying using first draw only reflects, maybe, a worst-case scenario, because the water had stood overnight, it might not reflect the average water quality. So your theory is that flushing two to five

minutes, that would better reflect the actual situation.

So I would like to put to you -- well, that really depends on the household habits; would you agree?

A. Yes, because the household size and how many people are using the tap, that affects the water quality.

Q. We know that PRH -- and we will be hearing from our experts -- the pipes, when they enter the unit, they take twists and turns. Some go to the kitchen first, some go to the washroom first. You are aware of that?

A. Yes. I visited -- had a visit with Prof Lee.

Q. So the pipes enter at different locations. We don't know how many twists and turns there are. There are many variations.

So each household's habits are different; you would agree?

A. Yes.

Q. Would you also agree that people get up, turn on the tap, they boil water, and after boiling water, that water would last through the whole day?

A. It's hard to comment.

Q. I can tell you that's the way I do it.

A. Right.

Q. I don't want to draw conclusions. Some people hardly drink any water at home. Some people -- you wouldn't rule out that some people get up -- it could be the

domestic helper or your mum -- they would discard stale water, they would boil a fresh pot of water. Some people do that. You might not, but you would agree some people would do that?

A. Yes.

Q. You would also agree that adults don't consume too much water at home, because they are out during the day, but babies are at home all day, so the chances of babies consuming water at home is much higher?

A. That's why they are the most sensitive group.

Q. That's because -- well, of course, it differs. I have a friend who has a separate facility for his baby at home. But I want to point out that each household is different and there's no scientific method that can tell you this flushing can represent all people's habits.

So a responsible party that wants to understand drinking habits, shouldn't it cater to different water consumption patterns, and shouldn't they come up with a method that could cater that all these habits, rather than looking at mechanical averages, where there's only one methodology, that is flushing for three minutes?

Do you understand what I am driving at?

A. Well, if we don't take a flushed sample, the results would be inconsistent and you cannot interpret.

Q. Inconsistent with what?

A. Well, you don't know, have they drawn water from it previously, had the tap not been used for days, and when you test in a water sample, how would you interpret, assuming it's the first draw? There's no equal basis. If I flush it for two minutes, I want the results to be consistent and reproducible. That's a scientific approach. It's not because I have to consider when you turn on the tap and take a sample, this sample, I have to test the results. How would I interpret it?

Q. I understand what you are saying. You are saying we should not consider whether the first draw is representative of a certain group. You are talking about a practical issue. Using a flushed sample, at least the WSD can control -- we know they flushed it for two minutes, it's definitely flushed, whereas if you use first draw, I go there, I have to trust that the household didn't go to the washroom, they didn't use the facilities. Is that correct?

A. Yes.

Q. So you feel, using something that you can control, that produces the most credible results.

A. Right.

Q. Well, we are now in a crisis. We have identified a problem. It is not a random sampling. We now have people telling you that there's excessive lead in water.

We are now -- well, I shouldn't say "crisis" -- but for some tenants it's a serious issue. It's a special situation. It's not a routine operation. It's not a standard operating procedure. Do you agree?

A. Yes.

Q. First of all, looking at the 1986 UK approach, you want to accurately know when the household -- when was the last time they used the water and when was the first draw in the morning. If you don't want to take their word, then -- this is very commonplace.

A. As you said, during a special situation, we need an efficient and reliable sampling method. All my test results, we can confidently compare these with WHO standards.

Q. The WHO standards, you should get a representative sample, but a representative sample, since we said -- there's no representative person. You don't have such a person. Some people stay up late at night, some people get up early in the morning. So we should have a representative sample of people who consume water at every hour of the day.

A. Well, if you want a representative sample, as I said this morning, you need to do proportionate sampling. The person turns on a tap, we have to input the data, how much they consume, we do testing, we flush for two

or three minutes and compare it to the proportionate sample, then see what the difference is. Then you can say whether that sample is representative or not, because in the middle we have the mean inter-use stagnation. So that means, after you draw the tap -- so there might be a interval before you turn on the tap again. So they may not use it for consumption, for drinking.

Q. There are four methods. Some people have stagnated, they have random or they flush it. We are now in a special situation. You are telling me that I should flush it, and for different reasons I want to know whether the water has excessive lead. Of course, politically or policy-wise, whether you want to pacify, you said that's a separate issue. But some tenants want to rest assured. It is feasible; right?

A. We take a flushed sample, it achieves our purposes in one go. We are saying, using our sampling methodology, whether it's safe or not. We can already give assurance to the tenants about the safety of water quality.

Q. But if the water sample you get is 8 micrograms, it's borderline. But they would say, if you flush for two or five minutes and it's still 8 micrograms, if I didn't flush it and I drank from the first draw for two years, I would be in serious trouble; that's what they would

think, right? You didn't do an unflushed sample, then they wouldn't rest easy?

A. If you take an unflushed sample, what does the data represent? Are you saying this concentration of lead in water -- are you consuming that lead throughout the day? If it was instantaneous, the task force got 95 per cent, then you don't look at the inter-use stagnation, you don't look at the transient concentration.

Q. Then you let the user decide. I think Mr Martin Lee represents a lot of tenants. It's what they want. They will co-operate with you. You could install a meter, you tell them not to go to the washroom at night, then let it stagnate for six hours. Then you can say, after flushing, these are the results, and if you don't flush, you have this. You can decide for yourself. If you don't drink the first draw, you can be certain, but if you take the first draw, you have to be careful. Why don't you do that?

A. Let me talk about the PTWI. The requirement is that they have to take the first draw and that's what the legislation requires. They also test for lead, nickel and copper. If it exceeds the limit of 10 micrograms, they have to go back and get the flushed sample. Sometimes they have to get the stagnation sample, and then decide whether the flushed sample could comply with

the 10 micrograms limit. If it was okay, they would give the consumer advice that after flushing it's okay. Otherwise, they would suggest to the consumer that they should change the pipes, or they might --

Q. Because they are not willing to change their habits.

A. But the situation in Hong Kong, in a short period of time we need to assure tenants. We need an efficient method to objectively assess the water safety. We are not taking the first flush. It might be high, it might be low. But there's no standard to benchmark that, whether it's safe or not.

As you said, you like to drink the first draw. What level would be safe? There's no standard. There's no standard throughout the world.

I have also looked at the US CDC. They have an oral lethal dose for lead, and it is 450 milligrams per kilogram body weight.

Q. That is lethal, orally, when you consume that amount of lead?

A. That oral lethal dose is derived from a 70-kilo worker in a working environment, where they have 21,000 milligrams per cubic metre of air and the breathe-in rate is 50 litres per minute. That's how they derived it.

But throughout the world, there is no parametric

limit for the first-draw limit, what is safe.

Q. But there's no parametric unit that says what is a safe flushed sample. You are saying that's just average consumption, but as I said just now the average consumption depends on your personal habits. If my habit is to drink the first draw every day, then you can calculate my consumption level.

A. I think that would be the extreme case. I think, as I said just now, there is no standard that caters to worst-case scenarios or extreme cases.

Q. Why is it an extreme case if someone is used to drinking first draws?

A. But is this a generic habit?

Q. Everyone has different habits.

CHAIRMAN: Apparently that's the case in the UK, a lot of people would drink first draws.

MR SHIEH: Let me show you an email exchange. Exhibit 4, page 14575.

CHAIRMAN: I don't want to challenge everyone, but just like when I questioned the director, it's all right to give generic figures, so it shouldn't be too hard to go one step further; right?

This is the worst-case scenario and this is the average scenario, or you can even come up with a best scenario. Now, you just have to tell people the best

scenario and the worst scenario and the rest is up to others.

MR SHIEH: Before we look at the emails -- well, this is one of your exhibits, and this is something you disclosed. Now, by going one step further, you can provide for information to the user. Would that be better than just trying to, you know, hide or ignore that information?

A. Let me try to elaborate. It's not hard for our colleagues to collect first-draw samples. The problem lies with the analytical work. For the unflushed samples, the analytical treatment is often different from a flushed sample. In a flushed sample, the turbidity might be higher.

According to the JECFA, if the turbidity is more than 1, then we have to conduct an acid digestion, and the time taken would be much longer. This is different from the treatment of flushed samples. If the turbidity is less than 1, then we would see a result very soon.

When taking water samples in public estates, once we obtain the sample, we have to announce the result within 24 hours. We cannot obtain a flushed sample and conduct acid digestion before we proceed. Then the time taken and the efficiency would be affected.

Q. You said the results must be announced within 24 hours.

A. Well, this is an internal hope. We want results to be

available as soon as possible, in order to reassure the public, so we will announce the results as soon as possible. After obtaining the samples, our colleagues wait until 3 am and 4 am and the results are announced at around 4 am. Our goal is to have the results available as soon as possible, to reassure the public.

Q. I understand. The task force would draw the first draw.

A. Right, but their purpose is on investigation.

Q. Now, you seem to be very insistent on general quality against water quality.

A. We are trying to determine the water quality to see if it fulfils WHO standards. We are not trying to test for the presence of lead.

Q. Now we understand there's an issue of lead. We want to know that in a specific housing estate, whether the drinking water might be contaminated by lead.

A. If this is your objective, you are conducting what I call inventory monitoring, and in inventory monitoring you would often take first draws or RDT, and based on the inventory monitoring you would establish the scale of the problem or the presence of lead in the system.

Now we are doing what we call compliance monitoring. We are trying to test if the water quality complies with the WHO standards. The purposes are different.

Q. You are the one who determined the objective or purpose.

Now, after the incident, the Housing Authority or other stakeholders would approach you and they would not specify the objective; it's not like approaching a lawyer. Now they would approach you and ask you for the best solution. So you should be the one establishing the standard or objective; right?

A. Well, this time, the chairman of the Housing Authority said that water sampling and testing must be conducted for housing estates completed after 2005. The goal was to check whether they complied with the WHO standards. It was mentioned in a press release.

Q. Now let's look at the email. C19.6, page 14575. This is exhibit 4, page 14575. This is your reply to Mr Chan. Mr Chan's email is on page 14576, towards the bottom of the page.

Your question was:

"(In English) In Hong Kong, there has recently been the lead in water incident in the new public housing estates. The method of taking water sample from tap after 2-3 minutes flushing practised by my Department has been a matter of considerable debate by the community and subjected to challenge. Currently, we are following the provisional guideline value of lead 10 micrograms per litre for compliance checking of drinking water quality for lifetime consumption.

At present, I am not aware that there is a harmonised approach in taking water sample for lead testing in EU. In this regard, I write to enquire about the sampling procedure for lead testing in drinking water at consumer taps in UK for assessing the compliance with the parametric concentration of 10 micrograms per litre as specified in the Water Quality Regulation of UK and EC Directive for drinking water standard. If stagnation sample, say overnight or several hours is taken for lead testing, what is the standard/reference value for compliance assessment."

So that was your question.

The answer is at page 14575:

"(In English) You are correct to say that there is no harmonisation with regard to sampling technique for lead across EU member states. I believe that at one time the intention was to agree a common approach but this has not happened.

In the UK, regulatory compliance sampling of public supplies is carried out by the water companies. Samples are taken at consumers' properties, selected at random. Samples for lead must be 'first draw' samples, that is, the sample comprises the first litre of water drawn from the tap before the tap is flushed in preparation for further samples to be taken.

If the sample result exceeds the limit of
10 micrograms per litre ..."

Well, this actually exceeds the WHO standard.

A. I asked him about such limit and they said it is not
a health-based limit, or there is a limit. I asked
them how they came up with this limit, and they said it
was very difficult. There were a lot of debates on the
limit.

Q. So, in other words, they would use first draw, and
coincidentally it was also 10 micrograms per litre. It
said:

"(In English) ... the water company should return to
the property and take further samples, which would
normally include a fully flushed sample and sometimes
a 30-minute stagnation sample ..."

So different sampling was adopted.

So a 30-minute stagnation period was allowed for
overnight samples. Then it continues:

"(In English) ... to ascertain whether flushing the
tap for two minutes or so reduces the lead level to
below the limit. The company should also investigate
the consumer's service pipe and internal plumbing system
to establish the presence of lead pipework, and
investigate the company's own communication pipe ... If
the company's communication pipe is made of lead the

company must replace it. The company must also give the consumer written advice on actions they can take to reduce the risk from lead in their water supply, which might include flushing the tap before using the water for drinking or cooking, and replacing any private lead pipework.

Overnight stagnation sampling is not carried out very widely, because it would normally be dependent upon the consumer to take the sample first thing in the morning, and companies prefer to take their own samples.

Water companies have the power to enforce prevention of contamination caused by consumer's private plumbing systems. If the consumer's premises is a place where tap water is made available to the public, for example a restaurant, then the water company must use its legal powers to ensure that any private lead pipework is replaced.

In the UK the use of lead solder in new plumbing systems has been banned for some time, but we have found that brass fittings can also be a source of lead in tap water, which the Inspectorate has carried out some research into. These days, however, most new water meters include very little brass, so this problem should reduce over time."

Here, you asked questions of the UK authority, and

you pointed out their practice. First of all, they would certainly take first-draw samples, and if the level is excessive, they would have a series of follow-up work.

So, as you understand, why do they take first-draw samples?

A. Apart from checking flushed samples to see if they are compliant, a lot of water companies in the UK add orthophosphates.

Q. And the purpose is to reduce plumbosolvency?

A. Yes, that's a plumbosolvency control.

Q. Let's pause for a minute. Was it based on historical reasons? Is it because they used copper pipes and they had to introduce an external chemical to reduce plumbosolvency?

A. Yes. The UK or EU lead standards, originally it was 10 and then 25, and in December 2013, it was further reduced to 10. So the UK was forced to adopt an aggressive control programme. It's impossible to replace all lead pipes in one go, so they had to introduce chemicals to the water treatment works, orthophosphate. After the orthophosphate entered the water system, they would form lead phosphates, which is a protective layer, to avoid water seepage from pipes.

So, in a way, it depends on whether corrosion

control is effective and whether anything needs to be optimised in the corrosion control programme.

I read some documents. The dosing of orthophosphate must be gradually optimised, in order to achieve high compliance with the 10 micrograms per litre limit. So that's why they had to take first-draw samples. One reason was to optimise the corrosion control programme.

Q. You said this was one of the reasons, so there were other reasons. What were the other reasons? Are they health-based?

A. The level of 10 is not health-based.

Q. You said they would then offer advice to consumers. So they feel that if problems arising from the first draw are worth knowing for the consumers, then they should change their habits and so on?

A. For public outlets, like restaurants, they have to replace their pipes.

Q. For private units, you can choose not to replace the pipes.

CHAIRMAN: I have a question. For the previous email -- I looked at their previous email -- you asked about "(In English) overnight or several hours", and you mentioned "what is the standard/reference values for compliance assessment". So that was your question; right? So that was your question, and they offered

an answer.

A. (Nodded head).

CHAIRMAN: They didn't mention their programme, and they didn't mention about the orthophosphate. That's a lot of personal interpretation from you.

A. Well, there's a lot of literature on that.

CHAIRMAN: That's what they answered?

A. They also told me that the first draw was for audit monitoring. Under the EC Drinking Water Directive, the first draw was for audit monitoring purpose.

CHAIRMAN: I understand. There are a lot of rules in the UK. But this is a specific answer to your question. You assume what we should do in Hong Kong and what methods we should adopt. So they give you that response, and you decided that you did not need to comply with them.

MR SHIEH: If you just look at the wording -- I will keep visiting this -- they used first draw. They have identified a problem. There was some follow-up work. They took a flushed sample for the consumer and gave the consumer some advice. So it doesn't seem like, whether corrosive control was effective -- why would they have to notify the consumer, if it exceeded 10 micrograms?

A. Just now, the information was derived from technical papers. It was DWI. I call them IWA Journal; it was

published there.

Q. So you were referring to the UK, in 2013, the EU changed some regulations, and they had to do corrosion control. That led to a lot of incidents. That's the research you did outside of this email, and you put 2 and 2 together and that's what you are telling us. But you did not submit these documents.

A. If you want, I can supply them to you.

Q. Not now. I think you can submit it to our Commission lawyers. We are interested.

CHAIRMAN: We see the Scotland report. They take a stagnation sample, at 2002.

MR SHIEH: A1, tab 12.

Let's go directly to tab 15, page 248. To put it simply, Scotland also had an excessive lead in water incident, and they found that lead solder was used.

Page 248, "Methods":

"(In English) Two objective tests were used to confirm the presence of leaded solder. Firstly, a colorimetric chemical indicator test was used to detect the presence of lead on surfaces such as pipework. Secondly, an isotopic analysis of lead ...

Stage 2 testing was confined to kitchen cold water tap samples. This was to allow an assessment of the potential quantity of lead consumed by house occupants

as a result of drinking tap water at home. Different sample types were collected to obtain data on the different possible concentrations of lead associated with normal variation in the contact time between water and the internal pipework.

Flushed water samples provided the background lead level associated with water from the mains supply. Overnight samples provided data on the lead levels associated with the maximum normal likely duration of contact between water and internal pipework."

So that is the so-called first draw.

"(In English) Stagnation samples provided a standardised measurement of the change in lead concentration over a fixed time period."

You can see they use 30 minutes.

"(In English) Random samples were taken to provide data on the typical lead concentration likely to be encountered during normal use of a kitchen tap."

So, in Scotland, they have four tests: random, first-draw, flushed, and stagnation, for 30 minutes here. So there is a range of data. Would you say that's more comprehensive than taking one sample?

A. I know this is a survey. In the survey, they have a lot of time to take samples, or even take different types of samples, and come up with an interpretation.

Compared to Hong Kong, in our case, it's not a survey. We are now doing compliance monitoring.

So I agree they can conduct the investigation but, for our purposes, it's not the same.

Q. A lot of times, I think in your responses you are affected by purpose. But there's a Chinese saying, "Where there's a will, there's a way". So we now have 11 estates, affected estates, and there might be other estates where tenants are worried whether the sampling is inappropriate, or "We might have been affected, it's just that you are using different methodology and it's not showing up; the results say that we are unaffected."

So you have committed yourself to a particular purpose. You insist on using a flushed sample. But if you look at other people, they define the purpose differently and they use four methods. You have not considered that you have defined your purpose differently. So why don't you consider that, "If I don't define the purpose as general compliance, why do I have to confine myself to compliance testing?"

A. We didn't impose a limit on ourselves. The WSD assists the HA in taking samples to decide whether the lead in water conforms to the WHO standards. That's a defined purpose. We cannot take samples hotchpotch and haphazardly. The message would be even more chaotic to

the tenants.

Q. So the distinction you are drawing is that you are proactively thinking of something, you are coming up with your own purpose, and when you respond to pleas for help, so you will just respond with what people ask you? That's the WSD response?

CHAIRMAN: I think Mr Ho might have meant page 9951, C19.1. That is the purpose. That is the purpose. The purpose was:

"(In English) (a) ... in order to identify which rental housing estates/developments are affected".

That is your mandate. It doesn't say that it has to generally comply with WHO Guidelines.

A. We have to identify which public rental housing estate was affected. There is a basis to determine whether lead levels were in compliance with WHO standards, otherwise we wouldn't be able to identify which estates were affected or not affected.

CHAIRMAN: Well, you identified the estates, then you would have to determine the extent of effect.

A. Our definition at the time was that that wasn't part of the inventory monitoring. It's compliance monitoring.

MR SHIEH: But all this terminology is a distinction within your department. But for the layperson, they don't care whether it's inventory monitoring or compliance

monitoring. The layperson will just say, "Give me the worst-case scenario or best-case scenario, and let me choose." So why can't you be more flexible?

A. But we cannot deviate from our purpose.

CHAIRMAN: No. You can tell the Housing Department, "You can do it such and such a way. How do you want me to do it?" You can. They are not the professionals.

A. It's exactly because the HD, as the chairman says -- well, we are not professionals, you tell us.

CHAIRMAN: You can tell them, "We don't have a standard approach. There are so many approaches. We can have different consequences with different approaches, and I would suggest you do so and so; do you agree?" That's the way you could do it.

MR SHIEH: It's the same with lawyering.

CHAIRMAN: If you plead guilty, then this; if you plead not guilty, then that. The judge is going to send you to the gallows.

A. The mandate might have been, "Test that water, see if it complies with the WHO standards", and then we will use a flushed sample to do the water inspection.

MR SHIEH: That come back to the question. This assumes the flushed sample -- and we went through that just now -- people consuming flushed sample, they are one group, and some people would consume first draw. But for PRH, you

- have to assume the worst case, regarding public health?
- A. Well, if you take a toxicology approach, I'm not sure whether they would use the worst-case scenario or what. But from a water quality management point of view, we take the average quality, not the worst-case scenario, and compare that with guideline values, because they want an average quality for lifetime consumption. We don't have a practice that uses worst-case scenario that compares with an average guideline value.
- Q. So Hong Kong never had excessive lead in water? This is the first? We also don't want a second, so let's hope this is the first and only instance. It's not a run-of-the-mill operation.
- A. Well, I can say it's run-of-the-mill, where we take flushed samples for compliance monitoring. It also complies with Australia, New Zealand; they also take flushed samples for compliance monitoring. We are in line with international practice.
- Q. We saw in the UK, in Scotland, they also use first draw. It sounds like you are complying with international practice, you cannot use first draw, but a lot of people do take first-draw samples.
- A. That's because the other people have lead pipes, so they have to take the first draw, to determine the scale of the problem.

Q. But now we have pipes that potentially have solder, and estates that potentially are affected by leaded solder, so we want to identify the source.

A. If you want to identify the source, then taking a first-draw sample, if they exceed the levels, we can use XRF technique to identify the source of lead. We also have elemental analysis. So, instead of not doing anything after water testing, we are also looking for the initial source of lead.

Q. Based on flushed samples being excessive. If it's not excessive, you won't continue; you will close the file because it's normal?

A. Yes.

Q. Even though flushed samples weren't excessive, but they might be excessive on first draw?

A. That's a hypothetical question.

Q. Well, we don't need to show you actual estate results. We have some unaffected estates, they were borderline; were you aware of that?

A. Well, you cannot say it's borderline.

Q. It's more than 5, less than 10. You are aware of these circumstances?

A. Yes, but there weren't a lot of them.

Q. Regardless of the number, they did exist.

I will show you some examples. A3, tab 43,

page 2391:

"Unaffected estates (completed in or after 2005)."

The column in yellow, borderline estates, and the definition is that the lead content is between 5 to 10 micrograms per litre, for the purpose. Do you see the column in yellow?

A. We didn't define the borderline.

Q. It was defined by whoever drew up this table. There is no international standard for borderline cases. But under this definition, 5 to 10 micrograms per litre constitutes borderline cases, and we have quite a few estates. These are estates completed in or after 2005. You can see some 6s, 7s and 8s or even 9s. On page 2393, the level is 9 for one estate. These are random samples.

Now, the next three pages, we can see we have a number of such cases. If the level is 5 to 9 for some estates even after flushing, if no flushing is done the level should be over 10, right, by common sense? But if some households tend to drink first-draw samples, they won't have to consider the average consumption of the other person. If a person always drinks first draws, then he should be worried. Have you considered this possibility?

A. The purpose of water sampling is like a health check.

If the level is less than 10 in the flushed sample, then we feel that it's compliant with WHO standards and there is no cause for concern.

Q. I don't want to argue whether the level of 10 should apply. We talked about it already. Let's assume the level is 10. The focus is: with what standards would you test against this level of 10? If the flushed sample is 9, it's only just short of the standard, and if you use a different approach, it would be 10 or over, and we are talking about a flushed sample. For the unflushed samples, they must be higher.

If the tested unit from one estate is all right, you would cross out that entire estate and then you would categorise it as an unaffected estate. But in the flushed sample, let's say if the level is 8 or 9, so it would be substandard if you test an unflushed sample.

So do you feel that the worries of residents who drink from first draws are irrelevant?

A. We won't say that if you drink from the first draws, you would be dead, it's very unsafe; we would not do that.

Q. Any government department has to remain sensitive when dealing with such issues. It cannot tell people that you would be dead if you drink from these first draws. But that's one extreme.

If you just give the middle ground -- but you have

to accept that some people do drink from first draws?

A. I believe that won't be the majority. I think we should educate the public that if your system contains lead, you should flush the tap before you drink from it.

Q. I understand that the actual difference might not be that much. Some people might use water filters, and some people don't want to flush because they don't want to waste water.

But residents have the right to know the worst-case scenario. So, in terms of crisis management, even if you do business, you have to offer the worst-case scenario, so that you can imagine the magnitude of the problem, policy-wise?

A. My view is, even if you offer the worst-case scenario, can you allay their anxieties and worries? They might feel even more worried.

CHAIRMAN: At least I can know. Do you understand?

A. I'm not saying you should not know.

CHAIRMAN: I'm an adult, so I'm okay with that, but I have a kid, so you should inform me, so I know what to do.

MR SHIEH: Now I would like to point you to page 262, the document of the Scotland case, in response to the question by the chairman. "(In English) Water Sample Collection". This is from the Scotland document. A1, tab 15, page 262. This is the document from Scotland.

C "(In English) Water Sample Collection": C

D "(In English) In stage 1 of the survey, only random D
water samples were obtained from participating houses
E for reasons of convenience and practicality. It was E
appreciated at the time that this might result in not
F identifying some houses which had elevated lead levels F
G associated with the use of lead solder, due to the G
variability in stagnation time for a random sample.
H Stage 2 of the survey was therefore designed to explore H
I the extent to which the sample type used influenced the I
J probability of detecting elevated lead levels in the J
water supply within the house. Four sample types were
K therefore obtained; an overnight sample representing the K
L maximum probable period of stagnation, a stagnation L
M sample drawn after a standard 30 minute period of M
N stagnation, a random sample collected when the sampler N
O first arrived and a flushed sample taken after the O
P supply was run for long enough to ensure that the water P
Q was from the mains supply only and had minimal contact Q
R time with the internal pipework. The aim of the flushed R
S sample was to determine the background lead level S
T associated with the mains supply." T

U Here, the case in Scotland, they said that the U
V purpose of flushing is not to achieve a representative V
sample of the average daily consumption. The purpose of

flushing was -- if you flush it several times in the internal system, after all the contaminants are gone, you can test -- it's just like in Hong Kong, you can see whether the water from WSD is of high quality. So after flushing, well, if you prove something, everyone knows it's meaningless.

A. I think you have to understand, the plumbing systems in high-rise buildings in Hong Kong -- in Scotland, they have individual houses. The distance from water taps would be longer. So, after a short period, they can obtain water samples from the mains, to show whether the water supply is all right. But in Hong Kong, the water has to go through the roof tanks, down pipes and branch pipes. So here they test the background water quality.

The situation is different for Hong Kong. After flushing, we can only determine the quality of water from the WSD, and there wouldn't be any non-compliance. But in a flowing water sample, after passing through the inside service system, the contaminants inside would be released into the water body. That's why our samples are substandard.

Now, this is different from the document. The distance between individual houses and the mains is very short. Soon after flushing, you are basically testing water in the pipe. The situation is different from

ours. Our water supply system is more complex and the water has to pass through branch pipes and internal plumbing system before you can obtain the samples.

After water passes through those parts, they would pick up contaminants or lead particulates.

So that's why, even for flushed samples, there are still such substandard samples.

Q. That's just a question of extent. If there's still non-compliance after flushing, it means that the horizontal part is in great excess?

A. By common sense, yes, it's higher.

Q. So, for flushed sample, the lead content would decrease by 90 per cent of the two minutes. So, if the flushed sample is substandard, you can imagine how bad it is for the unflushed sample.

Now, if the original is 2, then after flushing the level would drop to 1 or less than 1; would you agree?

A. The content after stagnation is actually transient.

After some time, there is a lot of lead in the water.

When you turn on the tap, the level would drop sharply.

Q. Please look at the ISO water testing procedures.

CHAIRMAN: Let's take a ten-minute break.

(4.13 pm)

(A short adjournment)

(4.28 pm)

MR SHIEH: Mr Chan, I would like to direct you to ISO water sampling procedures. C2, tab 19, page 1539.

You can see, in 6.4, "Faucets". In the middle:

"(In English) 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 water quality or the maximum likely effect."

So, for these purposes, they take the first draw.

"(In English) If the quality of the water as supplied to premises is to be checked, then the faucets should be cleaned and flushed at a uniform rate for 2 minutes to 3 minutes or longer if necessary to achieve constant temperature before samples are collected."

So the two to three minutes of flushing, the purpose is to check the quality of the water as supplied to the premises. But do they mean the external pipe water that comes to your premises, you want to check that water quality, so you therefore need to flush out the internal water, where it might have been contaminated and you want to flush that away, so you eliminate the potential contaminants in the internal system? Then you know what the water quality of the external is when it comes into your premises?

Does it have anything to do with the general water quality you mentioned?

A. As we know, the flushing removes standing water, and water coming out of the tap would pass in the inside service to the plumbing system, and the water samples would be taken to check for water quality as supplied.

Q. It's not to the tap, it's to the premises.

A. It's the same.

Q. Isn't there a difference, after cleaning the inside service, the residual contaminants or pollutants would be flushed away, and the water that comes in thereafter would still pass by the inside pipes but they won't stay there for a long time, so the resultant water samples would represent the quality of water supplied?

A. They would pass by the internal service. Even though the time of contact might not be very long, for lead pipes the contact time period is very important. For lead pipes, the lead and carbonate would form a layer of lead and carbonate. If the contact time is short, the solubility of lead into water would be short.

We want to find out that when the flowing water passes through the inside system, whether it would pick up any contaminants or particulates and come out through the tap. So we would take this sample as representative of the average quality of water supplied to the

premises.

Q. Now let's go back one page. Page 1538. 6.1, "General":

"(In English) Cleaning, disinfection and flushing prior to sample collection depend on specific objectives of the monitoring programme."

Do you see that part?

A. Right.

Q. "(In English) In general, sampling to ascertain the quality of the water delivered to a building ..."

Now, this is more specific. For a building, if you want to know the quality of water delivered to a building:

"(In English) ... or to ascertain whether the quality of water delivered within a building is possibly altered by the service network within the building, should not be carried out without thorough cleaning and flushing of the sampling points. Investigation of water quality as delivered from a faucet might require that samples be collected before cleaning and flushing, or samples might be required both before and after cleaning and flushing."

My understanding is that if -- for water supplied to a building, we are not talking about the internal network, we are talking about supply to a building. If you want to know -- if you want to find out about the

water quality, you have to first flush the internal system, and after that, the water drawn from the tap would represent the quality of water delivered to the building from an external source, because all external contaminants have been flushed away. That's my understanding.

A. We generally understand that flushing removes standing water, and in the standing water there are residual contaminants. I don't know what they are. They might be pollutants or other substances. They might be lead or bacteria.

As it says here, you want to "(In English) ascertain whether the quality of the water delivered within a building is possibly altered by the service network within the building, should not be carried out without thorough cleaning and flushing of the sampling points."

So, after flushing, you can obtain water samples and ascertain the quality of water delivered to a building, and then you can see whether the quality is altered.

Q. So what's the basis of comparison?

A. The sample taken would be representative of the average quality of water passing through the service network. After taking water samples, you would analyse them and compare them against PGV and other WHO Guidelines. And the subsequent line of investigation, you have to obtain

water samples before cleaning and flushing, if your objective is investigation.

Q. Well, we talked about objective. It says "(In English) to ascertain whether the quality of water delivered within a building is possibly altered by the service network" and you said flushing is required. The result of the flushing is to clear all standing water, and the fresh water would pass through the system once and the sample would be taken. Now, the sample is taken after fresh water passes through the building.

You would compare the chemical components of -- for example, the metallic elements in the sample, you wouldn't know whether these chemicals come from the water source or the internal system; you must have a control sample.

After internal flushing or cleaning, the sample obtained will be a sample as supplied to the building, and after a while you can find out how much is contributed by your system.

A. In the sampling exercise, our control system is the sump tank and the roof tank. These two are control samples. For the test sample, it's compared against these two control samples. If the level is 0.3 coming out of your tap, it shows that after passing through the pipeworks the water picked up an extra 0.2 in contaminants or

lead, so your control sample are the sump tank and the roof tank, so when we take samples we have to take the sump tank and roof tanks, and we have to obtain samples from consumer taps so we have a basis for comparison, to see where the contaminants of the water sample comes from, whether it comes from ourselves or from the pipeworks.

Q. So for the control sample you would obtain samples from the tanks, and after flushing, after cleansing, you would run the tap again, and you would see what the water picks up, and this is to determine the contribution from the system.

Now I told you about the first draw, and that might not have anything to do with the first draw. The first draw might be standing water instead of running water.

We found a relatively new report on the pattern of water use. We have not printed the entire report. We printed chapter 5. (Handed).

We will paginate it and include it in the bundle later on.

Let's look at the cover. It says "Patterns of water". This does not apply to the whole of the UK. It only applies to southern England. Under "Acknowledgments", around two pages on, it says:

"(In English) This research report is the result of

C two interconnected research projects, the EPSRC ..."

D The EPSRC is the acronym for Engineering and
Physical Sciences Research Council.

E "(In English) ... funded ARCC-Water project ..."

F So it's a research report.

F You can look at the executive summary:

G "(In English) This report contains the findings of
H survey research on the patterns of water using practices
H in households across the south and southeast of
I England."

J In point 3, you can see it says:

K "(In English) The research involved an 1,800
K respondent survey, conducted in the south and southeast
L of England in the summer of 2011."

M Apparently, some questions were asked.

N "(In English) The survey included questions to probe
N the 'materials, meanings and skills' of everyday
O practice associated with water, such as an audit of
O water consuming technologies in the home and garden,
P detailed questions on routines and performances or
P practice, and collected other data such as
Q sociodemographics, presence of meter, and a suite of
R questions exploring other environmental habits."

S Below that, there is some analysis such as
T techniques and so on.

C I want you to look at 5.4, under "Kitchen use". C

"(In English) Summary of kitchen practices".

D Under the third point it says: D

E "(In English) Nearly half of households consume E
F water in the home in addition to or instead of F
G unprocessed tap water, most commonly bottled, but also G
H filtered tap water. Younger people, and those living in H
I the London region, are particularly more likely to drink I
J such alternatives to tap water. 50 per cent of J
K households also run the kitchen tap before drawing water K
L from it for use, for various reasons, most commonly to L
M get it to the right temperature." M

N Now please look at page 104. There's a table that N
O summarises the answers to the survey. "Do you ever run O
P the cold water for a period of time before you take P
Q water from the tap for drinking or cooking?" Around Q
R half said no, and for the rest, they answered yes, and R
S the reason given in the answer was yes, was it because S
T you are using lead pipes? So some people raised this T
U issue and others -- one said yes, because you don't want U
V to use the water standing in the tap. So there are V
different reasons. Some were due to wrong water
temperatures. So there are various reasons. This was
not tailor-made for our investigation and it was
a questionnaire. So, statistically, a lot of

adjustments are needed.

So these are other forms of evidence from the UK on the consumption habits of water.

As we can see, in some cultures, drinking from first draw are not rare habits, so you have to realise and understand this factor. Some people are aware of the problem with lead pipes and around 50 per cent would flush out the first draw.

Do you agree that drinking from the first draw is a factor that can be ignored?

A. This is a very brief survey report and it says around 50 per cent of the respondents would not flush before they take water from the tap for drinking or cooking. I'm not sure if it was a question of whether lead pipes were used, what kind of pipes were used in this 50 per cent.

Q. I understand there were constraints, because it was a questionnaire. But for the big questions, do you agree that you cannot just ignore people who use the first draw?

CHAIRMAN: So, regardless of the type of pipe, so just don't think about the type of pipe.

A. I'm sure some people would drink from the first draw. Whether this is a majority or minority in Hong Kong, we really have no such figures.

MR SHIEH: It depends on education, on how you ask the question, on habit, and so on; there are a lot of factors.

A. Right.

Q. So the WSD, in advising strategy or testing, referring to what you just said, whether it's audit sampling, compliance sampling, you won't consider water consumption habits?

A. Usually, the sampling programme does not consider consumer behaviour.

Q. Why?

A. Because consumer behaviour varies. How do you devise a sampling protocol that suits every single consumer? How do you fit their water consumption habits or behaviour?

CHAIRMAN: I agree that it's impossible to be aware of these habits. But you can set some parameters. You can say this household is made of adults, this household has babies; how do they use water? Do you understand?

For a 50-year-old -- we are all different, but for a typical household, let's say in Kai Ching, it could be a new HOS flat, they might have a young family, they have kids. It depends how you want to devise the sampling. It's not impossible. Then you can identify their patterns.

A. I agree, Chairman. If you conduct a survey, there are different sampling protocols. The sampling protocol has to produce reliable data.

CHAIRMAN: You need meaningful results, then you have to be careful in your approach. That's what Mr Paul Shieh was driving at. It's possible, but did you consider these issues? That's a separate matter.

MR SHIEH: My impression is -- you are the expert in chemistry and technical issues, but would you be too committed to test types or audit monitoring? Aside from your daily business practice, you generally walk around -- you are inflexible to special circumstances. We really have some people who have used leaded solder. We need to identify which estates that have used water contaminated by solder, leaded solder. Do we need to devise a testing protocol for them?

So let's rule out audit monitoring, compliance monitoring. If you were to start from scratch, why can't you adopt the Scottish or the UK model?

A. If you want to have a survey objective, your survey methodology, of course it can differ from our approach. But our purpose, as you said, we do respond to special circumstances. We are not just looking at the first flush. We will also look at unflushed samples, to determine the source of the problem.

So we are not applying the same yardstick to all scenarios. Our objective is to determine whether the lead content is compliant with WHO's standards. That's why we need to have a protocol that meets those objectives. Of course, as chairman said, if we were to do a comprehensive survey, our methodology could be totally different.

MR SHIEH: Hang on --

CHAIRMAN: Please continue.

MR SHIEH: I will give you an example. This morning I asked you, one of the WSD legislative requirements is that they should use lead-free solder. You are not responsible for that area but you have that knowledge. So you know, if you use lead-free solder -- when you call it lead-free, it has minimal levels of lead. So theoretically, the leached lead should be close to undetectable?

A. Yes. It complies with standards.

Q. It's super-compliant if you use an unflushed sample and if you get a reading of 9, so even if you don't exceed the level, so you know that there's something wrong. So if you comply with -- even if you get a reading of 10 and if you get a 9 for unflushed samples, that means people have used inappropriate material, otherwise you wouldn't have such a high reading?

A. I believe there's lead present, but whether it comes solely from solder, could it be other brass fittings --

Q. Well, we can narrow it down. We have identified the problem. I don't care whether it's solder or components. There are an infinite number of problems but it might not relate to your department.

We now know that some leaded components will leach lead. Set aside the WHO. When you first identify somebody has breached the rules, that's what you'd identify it; right?

A. We just look at the water quality, whether it's compliant. It's not where the source of lead was found, was it components or lead solder. That is for me a separate issue.

Q. I understand. You are only responsible for water quality. Your department is not responsible. But broadly speaking, in the first-draw sample, whether it's overnight sample, we have 9 micrograms of lead, for example. It doesn't exceed the WHO standard. But having 9 micrograms, that means whether it's fittings, the copper, whether it's solder, we can narrow down that this unit, the water has flowed through these pipes, somebody has used inappropriate material.

A. Unless we carry out further tests.

Q. Yes, so one thing leads to another. If you identified

unit 1326 kitchen sinks have 9 micrograms of lead, it's within WHO standards but there's 9 micrograms of lead, then you and your colleagues would say, "Wait a second, that reminds me, this unit -- en route to that unit, there must be a problem with the pipes, and they can use their meters and equipment, their devices. So in principle you can do that; right?"

A. Yes.

Q. So before the excessive lead in water incident, we were blissfully ignorant, and now we have identified the problem we need enforcement; right?

A. Well, the enforcement, it depends on which authority is responsible.

Q. Of course, the LPs -- so the LPs are responsible?

A. I am not familiar. I know LPs are responsible for this area, but the enforcement action, the Customer Services Division will deal with that.

Q. Just now, we saw the unaffected estates, they had a reading of 8, even if it's flushed. So they haven't exceeded the standards, but as I said, we can deduce somebody had used leaded components. So, as far as you know, internally, did the WSD follow up? Aside from health issues, did anyone contravene the Waterworks Ordinance and use leaded components?

A. Allow me to explain that in the whole building, let's

say there are 20 to 22 water samples, if one of them has a reading of 8, we will not think that there is a problem compared to others. Let's say the others are less than 5 or whatever; we won't single out that 8 reading and take further action, because you cannot use a single result and generalise from that.

Q. It could be a quirky isolated case, and you need a pattern, a bunch of 8s for action? So you can deduce that there was a problem in the materials?

A. Well, you can make that deduction.

Q. But as far as you know, did anyone in the WSD follow up, aside from health issues?

A. I cannot answer that.

Q. Who would know?

A. Mr Lam Ching Man.

Q. Let's save him that question.

I would like to investigate with you the task force minutes of meetings. C19.6, page 13898. This is the WSD Task Force, the first meeting minutes, tab 132.

A. Yes.

Q. Page 13896 are the people in attendance. You were present.

Paragraph 4.4:

"(In English) Members expressed that the procedures to collect water samples would affect the testing

results of lead content."

So everybody knows that.

"(In English) Flushing tests and stagnation tests are to be conducted at different time intervals so as to address the controversy over the procedures of taking water samples."

Actually, you were aware of a potential controversy over the stagnation and flushing tests. I understand you said there were different objectives, and so on -- we had discussed that -- and I said it depends on how you define your purposes. Put that aside. You also said that first draw may not be reliable, because you don't know how long it has been stagnant, whether the tenant had got up in the middle of the night to use the washroom. It seems that this consideration did not hinder the task force in using first draw as a sample. They weren't worried about whether that was really a first draw, whether the tenant had got up in the middle of the night and used the water.

A. I remember at the time the controversy was whether sampling procedure -- how should it be done? Should it be a flushed sample or other types of sampling protocol. There were different views. During the meeting, we had explained that the task force would conduct investigations and sampling protocols to address these

different controversies.

So the controversy wasn't just related to our task force. When the excessive lead in water incident was exposed, there were comments. Even the Pharmacists Association, they called for first-draw sampling. There was a discussion in society, and the members of the task force had also raised this question, and we explained the sampling objectives were different, so the sampling protocol would be different.

But to address their concerns, the task force would also conduct stagnation tests and address these problems.

Q. Okay. Let's look at meeting number 5. I would like you to read page 14057. That was the 5th meeting. You were present.

A. Yes.

Q. I would like you to turn to page 14061. In paragraph 3.2:

"(In English) The Secretary presented the paper titled 'Proposed mitigation of lead contamination in tap water' prepared by the Advisory Committee on Water Resources ..."

Do you see that?

A. Yes.

Q. It refers to a paper, and you can find that at

page 14111.

It refers to paragraph 3.2, the 5th meeting. It's handwritten. So we have "(In English) Proposed mitigation of lead contamination in tap water".

If you look at page 14117, "Recommendations".

Paragraph 3:

"(Partially in English) WSD should standardise and educate the public on the proper sampling methods and protocols for drinking water and the analytical method in order that the water quality results by WSD and outside parties are comparable. At present, the practice of WSD is to flush the pipe leading to the kitchen tap for 3-5 minutes before sampling for 250 millilitres of water for analysis. However, as shown in appendix 1, other countries and places have adopted different protocols."

Then some overseas samples were quoted. For example, the copper in the US. At the bottom of the page:

"(Partially in English) We recommend that both pre-flush, ie allowing water to stand in pipework for at least 6 hours and post-flush samples, ie after flushing for 2 minutes, should be drawn from the kitchen taps and that ICP-MS should be used for analysis in a HOKLAS accredited laboratory."

In this meeting, this document was tabled.

This report recommended that the WSD should suggest testing the water samples twice, one on stagnant water and the other on flushed samples. Do you recall this discussion?

A. I have no recollection that we discussed this paragraph on the pre-flush and post-flush samples. I remember that we did discuss that if the test results are to be comparable, the sampling procedures and methods should be standardised. Otherwise, if tests are done separately, we might not be able to compare the results.

Q. But for private labs, they found even more cases of excessive lead.

For the ACRQWS, the committee was set up for a long time, and they had a paper that recommended the WSD to standardise the procedures, and they also recommended taking two samples. You have no recollection of any discussions on this paper.

In the meeting minutes on page 14061, it was presented, and the minutes were -- the document was simply tabled but no one read it. Is that what it means?

A. I have no recollection of this paper, of the proposed mitigation.

Q. So, as far as you remember, once the paper is tabled,

what usually would happen?

A. Usually, in task force meetings, we usually tabled test results and analysis of the results. For example, the results of stagnation samples and so on. I have no recollection that this paper was discussed at the task force meetings.

Q. Well, the minutes speak for themselves. So it was tabled. So, during the meeting, did anyone propose to go through it paragraph by paragraph? You said you had no recollection.

A. (Nodded head).

Q. So did you actually go through it page by page?

Regardless of that, now it's in front of you, it was a recommendation from the ACRQWS, so what's your view on this page, 14117?

A. I'm not sure the purpose of making such recommendations. If you want to take pre-flush samples, it's possible. But you have to put it in perspective, how you are going to use the results.

In my opinion, unless your purpose is investigation, then you need pre-flush and post-flush samples to prove the effectiveness of the flush, and in that case we can obtain pre-flush and post-flush samples.

But here, the rationale wasn't given why pre-flush and post-flush samples were obtained.

CHAIRMAN: Well, you should have known. You were involved.

A. But I have no recollection that these items were discussed.

CHAIRMAN: Usually minutes have to be confirmed every meeting. The minutes have to be confirmed after the meeting. That's how the government works.

MR SHIEH: In fairness, perhaps the committee considered the matter and came up with recommendations and the Secretariat of the task force came up with the minutes. You said you have no recollection that it was tabled.

Let's go back a little bit. Now, near the end of the meeting, usually some documents were circulated, and it might have been ignored. So do you have any recollection of that?

A. I cannot remember.

CHAIRMAN: It was very recent, just 2015. It's a very recent document.

MR SHIEH: Now it's around 5.00. Basically I'm done. Maybe the witness can think about it. Let's continue tomorrow, but basically my questions have been covered.

CHAIRMAN: Mr Chan, you may leave.

Now a few matters we have to cover. The expert report has to be submitted tomorrow. Is it possible?

DR WONG: Yes.

CHAIRMAN: Secondly, tomorrow is Friday. The lunch hours

will be amended. It will be from 12.30 to 2.30. That's the lunch break. So the lunch break will be extended by half an hour. We have no meetings next Thursday and Friday because of Lunar New Year.

As for the argument I made about the advice given from counsel to their clients, based on -- it's just an impression. The judges are perfectly impartial. Understand?

(5.10 pm)

(The hearing adjourned until 9.30 am the following day)

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