2016 年 2 月 15 日

上午 9 時 33 分恢復聆訊

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

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

李柱銘資深大律師及吳思諾大律師，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

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

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

李頌然大律師，由顧增海律師行延聘，代表有利建築有限公司、明合有限公司及伍克明

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

孖士打律師行陳宇文律師，代表瑞安承建有限公司

石先生：主席，我哋今朝傳召就係委員會嘅第一位專家證人李行偉教授。

主席：好呀。

食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授、香港科技大學副校長（研發及研究生教育））以本地話宣誓作供
石先生主問

問：早晨，李教授。

答：係。

問：你就應該係為咗今次嘅調查查委員會係準備咗兩份嘅專家報告，一份就係一個 Joint Preliminary Report，係同 Professor Fawell 準備嘅；另外一個就係你個人嘅嗰個，你記得嘛？

答：係。

問：記得。麻煩你睇睇你面前嘅一個 bundle，叫做 V1 嘅，見唔見到？V1 bundle，你睇佢左手面...

答：V1，係，V1。

問：...黐咗嗰度寫住"V1"。

答：係，V1。

問：個 bundle 裏面就有一個呢啲咁嘅 divider 嘅。第一個 divider 你睇睇，呢個就係你同 Professor John Fawell 喺去年嘅 11 月 12 號做嘅一份 joint expert report，係一個初步嘅專家報告，你見到喇，第一版。見到嘛？

答：係，係。

問：Joint Expert Report (Preliminary)。

答：係。

問：今朝我--另外一份就係你睇下，你面前嘅 V1，tab number 4，第四個 divider。

答：係。

問：呢一份就係你個人嘅專家報告，expert report，就係十二--就係今年嘅 2 月 5 號，你見到？

答：係。

問：今朝我打算就係我會將你嘅專家報告係讀出嚟，咁讀出嚟嘅期間，因為你係用英文寫，我用英文讀出嚟，咁就即係等大家有機會可以即係聽到即係個內容。一路讀嘅時候，如果有邊一度或者我覺有需要邀請你可能係即係稍為解釋，稍為發揮一下嘅話，我會停一停，咁我會即

係可能係問你一啲比較針對性啲嘅問題，關於其中一啲嘅概念，或者一啲嘅圖表咁樣。我讀會用英文讀，但係我問到譬如話某一段裏面嘅一啲嘢，我想你詳細啲解釋，我哋用番中文，咁呢個你明白我今朝...

答：明白。

問：...打算所用嘅一個即係程序？

答：係，明白。

問：Okay。我麻煩你睇番 V1 嘅 joint expert report，你睇下第 5 頁。

答：第 5 頁，係。

問：係，因為之前嗰一、兩頁就係畀 Professor Fawell 嘅一個 instruction。第 5 頁就係畀你嘅 instruction，你見到喇？

答：係。

問：“**<u>Professor Joseph Lee</u>**”，見到嘛？

答：係。

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

Specialist Field	：Environmental engineering：environmental hydraulics & water resources Environmental hydraulics / fluid mecha nics; water quality modelling
Appointed on behalf of	：The Commission
Prepared for	：The Commission
On instructions of	：Lo & Lo

Subject matter/Scope of : To assist the Commission in discharging its duties under the Terms of Reference and by acting as an expert witness in the inquiry hearings

Curriculum Vitae **Appendix I**"

我請你睇睇 Appendix I，就係喺第 27 頁，呢個 bundle--Appendix I 係第 13 頁開始，咁就一係我哋睇第 13 頁先。就第 14 頁--sorry，第 14 頁係 Professor Fawell。Sorry，你嘅 curriculum vitae，冇錯，係第 27 頁。

答：唔。

問："JOSEPH HUN-WEI LEE"，"CURRICULUM VITAE"。

詳細嘅我就唔會再即係仔細咁讀出嚟，就簡括來說，就係你在七十年代，就係喺美國麻省劍橋市嘅麻省理工學院得到科學學士、科學碩士同埋博士嘅學位，對嘛？

答：係。

問：係。然之後，就你得到即係 awarded 嘅榮譽同埋獎學金。你研究嘅即係專長，呢度寫住就係"Envioronmental hydraulics / fluid mechanics; water quality modelling"。即係你覺得就係你嘅研究專長係適用於你今次被委任去回答一啲問題嘅，你係自己覺得？

答：係，係。

問：係。簡單嚟講講，你嘅研究嘅範疇係包括啲咩嘢嘢嘅呢？

答：簡單嚟講，就即係包括所有同環境有關嘅水利問題，譬如話香港嘅海港淨化計劃嘅設計，或者任何同污染有關嘅水力學都會係涉及。

問：簡單嚟講，就係研究一啲污染物如何可以喺水裏面，由於一啲物理嘅 rules 嘅規條，...

答：係，係。

問：...如果去擴散，如何去控制，係咪即係呢一類嘅問題，對嘛？

答：係，呢類嘅，可以。

問：咁你嘅經驗有好多，應該就係 courses taught 就有一拃嘅科目，你喺美國嘅 University of Delaware 做過 Assistant Professor。跟住就回到香港，喺香港大學就任教，就 2000 至 2003 年就係工程學院嘅院長，Dean of Engineering？

答：係，唔。

問：2004 至 2010 年就係 Pro-Vice Chancellor，呢個就係所謂嘅副校長？

答：嗄，嗄。

問：你嘅副校長任命就 2010 年，就應該嗰陣時都大--我睇番啲報紙報導，就係科大跟住就邀請咗你過檔，就去咗科大做副校長？

答：係，係，啱啱有個機會，係嗰個又。

問：係。咁港大你個副校長嗰個位置就懸空咗，跟住？

答：嗄，嗄。

問：懸空到而家仲懸空緊，填唔到，係咪？

答：誒...

問：就係填唔到嗰個位，係咪呀？

答：好似最近填咗，我消息好似係。

問：係咩？你嗰個--你負責係邊個範疇，副校，喺港大嘅時候？

答：喺港大就係人事嘅，staffing。

問：去到科大就係叫做...

答：研究。

問：...Research & Graduate Studies，...

答：嗄，研究。

問：...研究同埋畢業生嘅...

答：就係研究生教育。

問：...--即係研究生嘅，係。

答：係。

問：好。跟住就你見到第 27 頁下面打後就有一連串嘅一啲嘅功績，或者係從事過啲乜嘢嘅有關嘅研究，即係一啲委員會裏面嘅一啲成員，即係你從事過一啲嘅工作。

答：係。

問：我就唔再係喺度即係深究，我亦都唔認為會有即係好嚴重嘅爭議，對你嘅即係專家嘅資歷。咁我想睇睇，就係你嘅嗰個 Preliminary Joint Opinion 嘅內容，就係第 6 頁--唔係，我哋睇番第 5 頁，你個 instruction 先，第 5 頁。

"**<u>Instructions to Professor Lee</u>**

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

(a) to ascertain the factual source(s) of excess lead found in drinking water in public rental housing and to advise on what work and tests are to be performed;
(b) to evaluate the methodologies and to review and verify the findings of the WSD Task Force's Interim and Final Reports in respect of the Waterworks system and the Inside Service system in public rental housing developments, from the perspective of a civil engineer; and
(c) to conduct, if necessary, independent investigation on behalf of the Commission into the

above systems in order to ascertain the factual source(s) of excess lead found in drinking water."

跟住第 6 頁。

"**Preliminary Joint Opinion**

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

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

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

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

喺呢度停一停先。我想你睇睇趷二嗰一段，就係：

“Fully flushed samples on their own may serve the purpose of assessing the general quality of a drinking water as supplied”.

我想你解釋一下，即係呢個所謂嘅“general quality of a drinking water as supplied”係指乜嘢呢？

答：即係指供水嘅源頭，即係譬如嚟到個大廈嗰個水源，即係話喺個 lot boundary，即係或者成個水源嘅質量，就會--fully flushed 就會係足夠嘅，...

問：唔，okay。

答：...咁嘅意思，係。

問：咁你指係個水源就去到個 lot boundary，點解 fully flushed 未必一定係可以反映到過咗嗰個 lot boundary 之後嘅水質呢？

答：因為即係無論係以前啲事件或者今次我哋嘅調查都顯示，即係話好多時喺大廈，尤其是香港咁特別嘅情形，即係咁高樓大廈，嗰個鉛嘅--有鉛嘅原因呢，因為 plumbing，因為嗰啲水喉、水喉配件含鉛，通常即係係--就即係話喺嗰個 inside service，即係喺嗰個 lot boundary 之後，個 inside service 喺個 building 入面個源頭，即係個鉛嘅 source，鉛嘅--水嘅源頭通常係一個 plumbing service，因為各個國家都有報導嘅，就係文憲。

問：唔。

答：所以如果你淨係睇一個總體嘅水源嚟衡量居民對於含鉛嘅風險，即係飲--食水含鉛嘅風險呢，即係就覺得唔係咁足夠，即係 oflead exposure。

問：好，唔該。我想你跟住就睇睇你個人準備嘅一份專家報告，就係第 127 頁，tab number 4，呢個就係你 2 月 5 日準備嘅專家報告。個內容就係 128 頁，128 頁就係一啲即係背景嘅資料，即係關於邊個 instruct 你，邊個委任你，呢個我唔再重複。129 頁，你裏面有講到好多 sampling protocol、sampling method 嗰啲嘢，其實嗰啲我一陣間我會讀到你實際上有關嘅段落嘅時候，我會同你睇嗰啲 appendix 裏面嘅一啲圖，或者一啲詳細啲嘅資料嘅。

跟住你就講到，就係"Date of Inspection"，就喺 129 頁，右手面。"Date of Inspection of some of the involved estates"。

停一停先。即係你係為咗準備你嘅專家報告，你係曾經去參觀過幾所即係特定嘅一啲屋邨，對嘛？

答：係。

問：你睇睇就係：

"1) **10 November 2015** (Kwai Luen Estate Phase – Luen Yat House; Kai Ching Estate – Hong Ching House; Tak Long Estate – Tak Long House);

2) **27 November 2015** (Vacant flat in Un Chau Estate);

3) **12 December 2015** (Vacant flats in Un Chau Estate;Kwai Luen Estate);

4) Field sampling visits to all 'affected estates' and selected 'unaffected estates'"

停一停先。就係頭嗰三個日子嘅 visit，即係 11 月 10 日、11 月 27 日，同埋 12 月 12 日，呢一啲就係去參觀就係作為一般去了解即係我哋叫做望下，或者係即係問下問下，呢一種形式嘅探訪，對嘛？

答：係，係。

問：跟住第 4 嗰度寫住"Field sampling visits to all 'affected estates' and selected 'unaffected estates'"嗰度，就係因為我了解一陣報告都會講過，就係你與你科大嘅一啲研究團隊，

就係之前嗰三次叫做望完之後，就實際真係落手落腳要去做嗰啲水質嘅測試，...

答：係。

問：...就有一連串嘅探訪，就係去一啲指定嘅一啲特定嘅單位，就係去抽水去驗嘅，呢個就係所謂嘅 field sampling visits，對嘛？

答：係。

問：係，好。呢一啲 field sampling visits，就係我嘅理解就係你有一班研究嘅團隊去做，你個人有冇去起碼會有一、兩次去睇過佢哋去做？

答：啲 vacant flats 有，即係嗰啲即係需要詳細啲嘅...

問：有三個，我了解就係？

答：嗄，有三個 vacant...

問：有三個空置嘅單位，就係比較做咗詳細嘅測試嘅？

答：係，係。

問：咁嗰三個空置單位嘅測試，你有個人去觀察？

答：有。

問：好。跟住129頁下面，就係"Site visits"，就係屋邨以外嘅一啲嘅探訪。

"1) **9 November 2015** - Shatin Water Treatment Works Government Laboratory

2) **12 November 2015** - Ngau Tam Water Treatment Works；..."

即係喺牛潭尾，係咪呢個應該？

答：係，牛潭尾，係，牛潭尾，...

問：牛潭尾。

答：...係一個。

問："3) **7 December 2015** - Training Centre of the Construction Industry Council".

跟住第 130 頁，就係列出--呢一頁就係即係 formal 啲一個部分，就係列舉出委員嘅職權範圍，同埋你嘅 instructions。你嘅 instructions 就係頭先我之前讀過出嚟，咁我唔再重複。

131 頁。

"I, Professor Joseph Hun-wei Lee of the Hong Kong Special Administrative Region of China, have been appointed as the Commission's expert to assist the Commission in determining the matters under the Terms of Reference. The opinions and conclusions in this Report are based on: (i) a review of key documents and information supplied to me by **Lo & Lo**; (ii) analysis of lead concentration data collected by the Water Supplies Department (WSD) and Housing Department (HD) prior to the end of November 2015; (iii) independent sampling of all buildings in the 'affected estates' and selected buildings in the 'unaffected estates'; and (iv) analysis and interpretation of lead concentration data using a computational fluid dynamics (CFD) model of a representative household water supply system. Site visits were made to selected housing estates and the chemical laboratories in the water treatment works in Shatin and Nga Tam Mei. Discussions with W8D and HD were also held during the site visits.

<u>Background of the Incident</u>

2. During July - September 2015, following queries from the public, the Water Supplies Department and the Housing Department collected a number of drinking water samples in the Public Rental Housing (PRH)

Estates of Hong Kong. The lead concentrations of 106 samples in 11 estates were found to exceed the WHO provisional guideline value of 10 micrograms per liter (µg/L). The WSD 'Task Force on Investigation of Excessive Lead Content in Drinking Water' also conducted an investigation on the causes of excess lead. The Task Force Report (October 2015) concluded that the main cause of the excess lead was due to the use of lead solder in the construction of the fresh water supply plumbing system. While the main cause of the lead contamination was being reviewed independently, WSD also provided interim alternative drinking water supply to selected estates and recommended precautionary measures of water usage at the consumer tap (e.g. flushing for one to two minutes each morning before taking any water for drinking or cooking) to reduce possible health risks.

3. Hong Kong has traditionally not monitored lead concentrations in residential flats. There were no drinking water quality standards with respect to lead prior to this excess lead incident, although new parameters for testing of water samples with respect to lead, cadmium, chromium and nickel were introduced as a result of WSD Circular Letter No. 1/2015 since 13 July 2015.

4. According to the test results of water samples provided by the WSD and the Government Laboratory], lead concentration was measured on 1,325 samples in the 11 'affected estates' (36 buildings; a typical building has around 40 floors and 800 flats). Excess lead (≥10 \µg/L) is found in 8.0 percent of the samples with 14.6 percent in the range of 5·9 µg/L. In addition to the 'affected estates', lead measurements were also made for 3,806 samples in 45 estates (163 buildings) completed in or after 2005 (the 'unaffected estates'). Based on the data, it seems the measurements were made at different times during office hours, with no

apparent planned schedule."

你呢一段就講緊嘅，我想確定先，第 4 段裏面講緊嘅一啲 sample，一啲嘅測試唔係講緊科大，即係你嘅團隊去抽嗰個 independent field sampling，對嘛？呢個係講緊水務署喺事情發生之後，佢自己走去測試水質嘅一啲工作，對嘛？

答：對。

問：係。咁我哋睇睇，我--你就講過，就係水務署就驗出嚟嘅結果，就喺十一條屋邨度就發現裏面有一啲嘅食水嘅含鉛，你就講到係 Appendix III，Table 1，我哋睇睇第 158 頁。158 頁，呢個就係 Table 1，就係"List of 'affected estates' sampled by Water Supplies Department during July - September"，咁呢度就係列舉出你見到(a)嗰度，就有屋邨嘅名，左手面就"Estate"，咁就係葵聯邨二期一路直落。

咁你見到就係"Year of completion"，落成嘅年份就由 2008 年至到 2014 年都有。跟住就最右嗰棟就係有幾多個樣本係含鉛，同埋係抽驗咗出嚟嘅樣本相比嘅百分比，咁總體嚟講，就一三二五個樣本裏面係有一零六個樣本係超咗標，即係超過咗 10 個 microgram 嗰個標，就佔即係抽咗出嚟嘅樣本百分之八。你個第 4 段裏面所指嘅百分之八，即係 8 per cent of the samples 就係計出嚟，對嘛？

答：係，係，對。

問：好。跟住下面嗰度，第二部分呢個表，就係列舉出整體嚟講，嗰一千三百二十五個樣本裏面，唔同含鉛度嘅分布，你就可以見到就係細過 1 microgram 嘅，譬如話就有百分之三十點四；1 至到 4 個 microgram 嘅，會有百分之四十七，咁就如此類推咁樣睇落去。所以如果你睇 5 至 9 microgram 嘅，就有一百九十三個樣本，就係佔一三二五個樣本嘅百分之十四點六。你嘅第 4 段裏面嘅百分之十四點六就係咁樣得到出嚟，對嘛？

答：係，對。

問：咁你之所以要即係 highlight，即係好多人可能諗住話超咗就超咗，你淨係需要睇過咗 10 嗰啲。咁點解你要零零舍舍特別提出，就話 5 至 9 呢一個界別都要即係攞出嚟，即係特別提一提，即係 5 至 9 microgram per litre 有咩嘢咁特別？佢冇超到，即係一般嘅人

眼中。

答：因為呢啲數目，譬如 10 個 microgram per litre，都係一種叫做 provisional guideline value，即係話係一個 guideline，即係唔係一個好 absolute 嘅嘢，咁第一；第二，亦都睇啲文憲，有關嘅含鉛--食水含鉛嘅影響，亦都唔同嘅年紀嘅居民亦都會有唔同嘅影響，譬如細路仔當然敏感啲。所以亦都有啲文憲話譬如你 5 個 microgram per litre，其實就開始應該關注。

問：唔。

答：咁所以純粹冇乜--即係純粹因為即係我哋想全面睇一個食水含鉛嘅範圍，即係影響嘅範圍，咁覺得就需要有一個對個分布，即係濃度嘅分布有一個比較好嘅認知同埋了解，就基於呢個原因，就即係比較微細啲咁樣。

問：好。跟住我哋睇番繼續就係第 5 段。

"There has been great concern among the residents and the public on the safety of drinking water in PRH estates since the incident broke out in July 2015. Effective corrective measures must be based on an adequate understanding of the causes of the lead contamination in the 'affected estates'.

6. The lead concentration of drinking water at the consumer tap in a PRH estate building depends on a complex myriad of factors including: the time of consumption and prior use, the sources of lead in the water supply system, the pipe material and chemical properties of the water, detailed plumbing arrangements, and the age of the building. Different methods of sampling the same household supply will also give different results. There is currently no universal accepted method for sampling lead in drinking water; the appropriate method depends on the particular purpose for which sampling is carried out.

7. As this review progressed, it became clear that an independent field sampling of drinking water at the

affected PRH estates would be necessary. The lead concentration measured on the 1,325 drinking water samples in the 11 'affected estates' are all based on 'fully flushed samples' (i.e. for each flat a 250 mL sample was taken after flushing the tap for 2-5 minutes). While this sampling method provides a measure of water quality of the bulk water supply, it does not reflect the actual and sometimes high lead concentrations to which the residents are exposed. Such data does not provide an estimate of the mean lead concentration used for drinking and cooking, nor an adequate basis for assessment of health risks. This concern on the inadequacy of the sampling method adopted by the Water Supplies Department was expressed in the Joint Expert Report (Preliminary) by Fawell and Lee." 呢一個就係我哋頭先睇過嗰個 preliminary report。

好，跟住 paragraph 8。

"Unlike other countries where lead contamination has been investigated, lead pipes are not used in the water supply system of Hong Kong. On the other hand, the deposition, release and transport of any lead introduced into the highly compact labyrinth of water supply system in a PRH estate building is a unique feature that has previously not been studied. In view of the enormous scale of the problem and the paucity of data, resort has also to be made to the use of a computational fluid dynamics (CFD) model to assist with the data interpretation. Great effort has also been made by Lo & Lo to examine, retrieve, collate and analyse all the lead concentration data collected, measured and tracked by different parties (WSD, HD, and the Government Laboratory)**[A.3/43-45]**."

呢度就係羅文錦律師行就基於水務署同埋政府化驗所，佢哋即係調查期間做出嘅好多驗水嘅報告，好多嘅資料，就做咗好多個表咁樣嘅。

答：冇錯，冇錯。

問：咁就我嘅理解就係你遲啲一陣間到到你嘅即係報告嘅內容嘅時候，你都會即係 refer 番去佢哋做出嚟嘅圖表，...

答：係，係。

問：...咁一陣間我會即係睇一、兩個例子嘅。

"**<u>Technical Investigation</u>**

<u>Sampling of drinking water at PRH estates</u>

9. A field sampling program was designed and implemented during 2 - 22 December 2015. The aim was to provide an independent data set for identification of the causes of lead contamination and to provide a basis for health risk assessment. The sampling covered 36 buildings in the 11 'affected estates' and 7 buildings in 6 selected 'unaffected estates'. In each building, 3 flats at upper, middle and lower levels were randomly selected by the Housing Department. In total, 129 flats were sampled."

呢一個就其實係即係簡單嘅算術，就係喺嗰啲受影響屋邨裏面，受影響屋邨裏面就搵咗三十六棟，就基本上係涵蓋晒全部十一座屋邨嘅...

答：每一座樓都有。

問：每一座，係，冇錯。"and 7 buildings in 6 selected 'unaffected estates'，咁所以三十六加七，就得出四十三，即係以棟數嚟講，...

答：係，係。

問：...就有四十三棟樓，四十三棟樓，而每棟樓就隨機地就抽咗三個單位，最頂嗰浸、中間嗰浸，同埋最底嗰浸，所以四十三乘三，就得出一二九，即係有一百二十九個單位就係抽咗水嚟驗，就係咁得出嚟。

答：係，係。

問："The field sampling"--跟住睇番 160 頁--sorry，159，

159。第 159 頁呢個 Table 2，就係列舉出你哋嗰個科大嘅團隊自己走去做嘅 independent field sampling 裏面嘅大廈嘅座數，邊日去探訪咗邊啲單位，就喺呢度睇出？

答：唔。

問：好。跟住第 10 段，睇番 133 頁。

"The field sampling was carried out by trained researchers (six teams, each of two members) from the Hong Kong University of Science and Technology (HKUST). For each flat, a total of 5 samples were taken from the kitchen tap with the water continuously flowing: a 'first draw' sample and 4 subsequent samples at 20 second intervals. ..."

停一停，咁即係話一開水喉嗰度係 first draw，咁呢個 first draw 就遲啲你會有個 sampling protocol，即係講就係話呢個 first draw 係早上嘅 first draw，咁之前嗰晚要做啲咩嘢準備工夫，你會有一個 sampling protocol 就去即係向啲住戶講解咗嘅，對嘛？

答：係。

問：係。咁就係 first draw 係當零秒？

答：係。

問：跟住就開咗水喉，零秒就出，咁就攞 250 個 millilitres？

答：係，millilitre。

問：Millilitre，即係我哋俗稱嘅 cc，係咪？

答：係。

問：即係 25(250?)個 cc，就係第一頭浸水開咗，咁就攞 250 cc；咁跟住佢繼續 run 住開住，等到二十秒，就擺個容器落去，今次就攞 50；四十秒又係擺個嘢喺度攞 50；六十秒又攞 50；八十秒又攞 50，係咪？

答：對。

問：所以呢五個樣本夾埋就會攞咗係 450 cc？

答：係。

問：250 加四乘 50，咁就係 450。

"... The sampling was carried out in the early morning (between 6:30 - 9:00 am); the resident was informed by HD staff to flush the kitchen and wash basin taps the night before the sampling for 5 minutes before going to bed, and not to use the kitchen tap afterwards before the sampling. The tap flow rate was also measured. The sampling protocol is illustrated in **Figure 1 in Appendix II.**"

你睇睇第 149 頁，Figure 1。

答：唔。

問：就係頭先我哋即係口頭形容嗰個步驟，首先就係你睇最左嗰度，就係之前嗰晚就開水喉沖五分鐘，跟住就成晚通宵唔用廚房嘅水喉，跟住第一次攞水就 250，跟住每一次就攞 50，就係個程序就係咁樣，對嘛？

答：係，唔。

問：藍色嗰度就係講啲水一路咁樣流住，對嘛？

答：係。

問：係，好。你度出嚟有個 flow rate measurement，個 flow rate measurement 基本上就係一路度下，睇下你過咗一段時間之後，總共有幾多水流咗出嚟，跟住就除番用咗嘅時間，咁就叫做 flow rate measurement，係咪？

答：係，流量。

問：咁嗰個平均嘅水流嘅速度，喺你呢個實驗裏面，當然即係水流快定慢就視乎你開大定開細，即係總之你哋今次嘅實驗裏面，你哋得到出嚟嗰個水流嘅速度，就一般都係 0.26 litre per second？

答：平均，呢個平均值。

問：平均嘅，呢個係平均值嚟嘅，係。因為你每一個單位，你開都唔可能確保到每一個一模一樣，但係總之你平均咗個數值就係 0.26 litre per second？

答：per second，係。

問：好。跟住睇番第 11 段。

“The samples were preserved and logged in by the Health, Safety & Environment Office (HSEO) Laboratory of HKUST and sent to the Government Laboratory (GL) for analysis of lead concentrations. HSEO also carried out lead concentration measurements as a cross-reference and supplement, and for targeted purposes. The HSEO of HKUST is an accredited laboratory under the HOKLAS scheme. In total 645 samples were collected;...”

呢個六百四十五個樣本，其實就係一百二十九個單位乘五，就得出嚟六四五，因為一百二十九個單，每個單位抽五個樣辦，咁你係六四五。

“...290 and 269 samples were analysed by GL and HSEO respectively; cross-checking confirmed the reliability of the measurements. Details of the sampling protocol can be found in **Appendix IV.**”

用番即係一般嘅算術，六四五個樣本抽咗，但係你呢度跟住就講“290 and 269 samples were analysed by GL and HSEO respectively”，如果我哋就咁加埋二九零同二六九，就得出嚟就係五五九嘅，得出嚟係五五九嘅？

答：係。

問：但係你抽咗出嚟嘅樣辦就有六四五？

答：係。

問：但係我嘅理解，就係二九零同二六九呢兩個數值，就其實唔係就咁加埋佢，因為中間有一啲係重複咗，就係要嚟大家做 cross-checking 嘅，可唔可以即係簡單咁樣--我嘅理解係有十八個樣本其實係兩家都有做到，即係 GL 同埋 HSEO 大家都有做嘅，就有十八個水辦，就大家都做，咁呢個就係作為嗰個 cross-checking。但係跟住都有一拃係未化驗到，...

答：未化驗到。

問： ...冇化驗到嘅，咁請你解釋下呢一度點解呢個數目字，抽咗六四五，咁有一橛就畀佢兩個化驗所化驗，點解有一橛又未做，可唔可以解釋下？

答：因為呢個調查都有啲時間嘅緊迫性，咁所以開頭其實我哋攞就攞五個樣本，但係原本就準備其實就驗兩個樣本嘅，即係原本嘅計劃。

問：驗兩個樣本？

答：兩個樣本。但係因為...

問：即係每層--每個 unit 抽出嚟嘅五個辦，...

答：就係原本嘅計劃...

問：...會係選擇性地抽五個樣辦裏面嘅兩個樣辦？

答：嗄，嗄，就係零同埋四十嘅，即係零同埋四十，原本嘅計劃。但係因為我哋一路做，一路發覺個變化同我哋想像即係好複雜，咁所以我哋就越嚟越覺得需要度晒五個，所以就結果你睇就好多日，我哋就度晒五個樣本，就嚟比較好嘅了解佢嘅變化，因為有好多嘅含意，唔同嘅變化。咁當然即係因為資源限制，同埋仲有八十六個係未分析。至於話嗰個 cross-checking 嗰度，就喺第 166 頁，即係我哋響十八個樣本，其實就所謂 cross-checking，就係同一個水辦，166 頁，166 頁，係。

問：165，係咪你--166，係，166 就係嗰個 cross-checking，係。

答：Cross-checking，係，166。因為 166 就話個 cross-checking 嘅意思，就係我哋有啲樣本，即係唔同嘅樣本，同一個水辦我哋就攞兩個 sample，一部分就一個 GL 嚟分析，一部分就我哋分析，咁主要就有一個 cross-checking，即係話大家--咁樣大家都睇到即係好脗合嘅，咁個目

的就係有種大家都有一個 reference point，咁雖然大家都係 accredited lab，但係我哋覺得即係需要做，所以就十八個樣本就係--即係有十八個 sample 就係 cross-checking。

問：係。

答：即係唔係 distinct--即係話十八個樣本就唔係嗰個 distinct sample，即係其實都係同一個 flat 有兩個樣本。

問：即係你抽完出嚟之後，將佢分成兩...

答：同一個辦，就兩...

問：...個容器，一樜就畀咗 GL，另外一樜就畀咗科大嗰個去做咁解？

答：係，係。

問：嗰十八個樣本，呢個數目字就喺 165 嗰度見到嘅？

答：係。

問：165 嗰度中間，你就見到？

答：係，係。

問：就係：

"A total of 645 samples (excluding vacant flat and control flat samples) were collected; 290 samples were analyzed by GL and 269 samples by HSEO Lab. The unanalyzed samples were stored in HSEO Lab's calibrated refrigerator for future analysis. Results of analyses by GL were sent back to HKUST once available. Eighteen samples analyzed by both GL and HSEO Lab of HKUST were used for cross checking."

即係簡單嘅算術，咁樣即係話其實真係實際上驗咗嘅水嘅樣本，就唔係純粹係二九零加二六九，因為要減番十八？

答：係。

問：所以就二九零加二六九，就五五九，減番十八，就其實實際上驗咗嘅，

就應該就係五四一嘅，五四一？

答：唔，唔，係。

問：六四五減番五四一，即係其實係有一百零四個樣辦就係未驗嘅？

答：係。

問：就處理咗？

答：係。

問：係，好。你頭先講過就係開頭嘅時候，你哋打算就唔會話真係五個水辦，即係零、二十、四十、六十、八十都驗晒，你就原先打算係針對係咪人零同埋四十？

答：係。

問：點解揀--零我明白，因為叫做頭浸水，咁點解揀四十，唔揀八十呢？

答：因為都想即係我哋呢個都--個目的其實都想睇嗰個鉛嘅，即係食水含鉛嗰個 maximum exposure，即係傾向。咁你譬如開水喉，你都要有一段時間，譬如你開第一個水辦，你都需要時候。所以其實實際情況下，二十個 second 都好儆，即係零、二十，咁我哋想等耐少少，即係比較一個係頭啖水入面嘅相對平均嘅，我淨係只可以取兩個樣本，如果你譬如一分鐘可能冇晒，咁我哋覺得就四十個 second 就仍然係幾穩陣，因為你太長，你可以乜都度唔到。

問：係。

答：咁即係咁嘅意思。

問：太長都預咗係冇晒，咁你想知道...

答：即係會--即係我哋就咁睇數據，因為一路做一路都睇，我哋都。

問：係，得，明白。跟住第12段。

"More detailed sampling was also carried out in 3 vacant flats of 3 estates (Un Chau Estate, Kwai Luen Estate and Kai Ching Estate) **[see Appendix III, Table 7]. ...**"

我哋睇睇 Appendix III 嘅 Table 7，就係第162頁。你呢度有個表。

答：係。

問：你見到162就即係附表7，你見到？

答：係，係。

問：你將隻手指擺喺162先，跟住我哋就睇番134，因為我要你揭嚟揭去嘅，跟住。

答：係。

問：呢三個空置單位，就係之前嗰一百二十九個單位以外嘅，對嘛？

答：係。

問：“...The aim was to study how lead concentration at the kitchen tap varied with time in relation to water stagnation (out of use) in the water supply chain of the individual flat. This provided a systematic data set for comparison of different sampling methods, for assessment of health risks, and for calibration and validation of the CFD model. For these flats, two additional sampling taps were installed with the assistance of WSD and HD: one at the water meter position for the flat (in the meter room), and one at the entry location to the flat (which may be the kitchen or washroom depending on the design of the flat). The kitchen and wash basin taps were flushed by HD staff the night before; samples were taken at the kitchen tap as well as the two special sampling taps. A longer sampling period of 5 minutes was used. The configuration of the water supply chain pipe of each flat (location and arrangement of meter room; number, type and location of pipe joints, pipe lengths) of each flat was also measured on site. Details of the sampling protocol can be found in

Appendix V.″

我哋睇睇 162 頁先，呢度就係--首先我哋見到就係三個屋邨、三棟樓裏面就有三個空置單位，嗰個單位冧巴寫咗喺度，咁就有寫低就係即係幾時去探訪抽樣辦。今次呢三個單位裏面，抽水嘅時間就唔同，同埋又...

答：係，嗄，嗄，就係呢啲。

問：...零、三十、六十、一二零、一八零，同埋三百。

答：係。

問：跟住就我哋見到就有多兩個 measurement，一個就係 Meter，一個就係叫做 Entry？

答：係。

問：Meter 就即係水錶房？

答：係。

問：每層樓有一個？

答：係每層樓有一個。

問：每層樓有一個水錶房，就...

答：嗄，嗄，即係每一個單位--係每層、每一個單位嘅水錶...

問：每層樓有一個水錶房，水錶房裏面就有一大拃嘅水錶？

答：唔，唔，嗄，有幾個水錶房好似係，因為我了解就係...

問：好似係，其實...

答：...四、五個單位--五、六個嗄就有一個錶房。

問：係，係。咁就裏--每個錶房裏面都有一大拃嘅水錶。就即係簡略咁樣講一講，就係我哋知道公營嘅屋邨就由天台--我哋簡化啲講，天台嘅水箱就落去下面每一層樓，嗰個叫做 down pipe，就係典型嘅一個屋--嘅大廈，就係粗啲嘅，...

答：粗啲嘅。

問：...要 76 millimetres 嘅直徑，對嘛？

答：係，係。

問：研究就話畀我哋聽，76 個 millimetres 嘅直徑就--首先我哋講番轉頭先，就係之前嘅一啲嘅研究或者係實驗，就係已經知道直至到上到天台水箱都係冇事嘅，唔含鉛嘅，...

答：冇事嘅。

問：...所以個問題就係睇下佢落嚟 down pipe，跟住入屋，咁就個問題會出在邊度。落嚟嘅 down pipe 就係用 76 millimetres 嘅喉管，以你嘅理解，呢一啲 down pipe 嘅喉管唔係用所謂 solder，唔係用呢啲焊料去接駁，對嘛？即係唔係用我哋而家呢啲所謂「錫焊」叫做去接駁嘅，你知唔知？

答：我嘅理解就係呢啲 down pipe 就即係度唔到鉛，度唔到鉛，係。

問：度唔到鉛，係，okay，得。所以而家就即係逐樣排除，即係可以叫做係。

答：唔，唔。

問：上去天台排除咗，因為驗咗上到去天台水箱都係冇鉛。咁你知道落嚟嘅 down pipe，落嚟都冇含到鉛，所以就個問題就係即係又係我哋用個腦去描繪番個圖畫出嚟，就係落嚟嗰概冇鉛，即係起碼係打橫開始入每一層樓開始起你要測試，究竟啲鉛喺邊度嚟，所以你就要喺入--喺錶房嗰度開多個 tap。因為你落樓嘅時候，down pipe 就係用 76 millimetre 直徑，係咪一打橫開始入每一層樓，就唔再用 76，以你嘅了解？

答：即係細啲嘅。

問：22，係咪？我嘅理解。

答：嗄，嗄，用一啲 36 嗰啲嘢，總之細啲。

問：總之唔再係 76，就會細啲，一開始打橫我哋叫 horizontal，就細啲？

答：係，係。

問：咁就打橫入咗嗰層樓之後，首先就會去咗錶房，喺個錶房裏面就去到個水錶，跟住由水錶就會再出嚟，就經過好多轉轉彎彎，兜兜轉轉就會去到各自嘅單位，對嘛？

答：嗄，嗄，去到天花板。

問：係。

答：即係走廊嘅天花板。

問：就入屋嘞，跟住？

答：係，然後沿住個天花板，就...

問：係，入去各自嘅單位？

答：係嘞。

問：係。首先你就係喺個錶房裏面就開咗個 tap，咁呢度就叫做係即係搵出咗入錶房嘅時候嘅水質，係咪如果喺嗰個 tap 嗰度開出去？

答：嗄，嗄，即係喺個水錶咪嗰度，水錶。

問：喺個水錶前定係水錶後裝呢個 tap 冇乜分別，係咪？

答：冇嘅。

問：冇分別？

答：就喺水錶個位。

問：水錶個位直情？

答：嗄。

問：Okay，好。所以你呢度就係見到 meter 同埋 entry 嗰度，所以呢度係總共，如果你睇番就係 meter、entry 加六個，即係你會總共係有八個辦嘅其實，對嘛？呢個 vacant flat 呢度。

答：係，對。

問：跟住你睇番就係右手面，Appendix IV--sorry，睇番 Appendix V，就係你嗰個 sampling protocol，167 頁。167 頁，呢個就係嗰個 sampling protocol for 嗰三個空置嘅單位，你見到嘛？

答：係。

問：就係：

“Special sampling surveys were also conducted in 3 vacant flats of three estates. Two sampling taps were installed: (i) at the water meter position inside the meter room; and (ii) at the location of pipe entry inside the flat. The kitchen and wash basin taps were flushed by HD staff for 5 min the day before. Samples were taken at the sampling and kitchen taps (Figure "V-1). The vacant flat sampling...”

Figure IV-1 你見到就 169 頁嘅，169 頁。

答：唔。

問：左上角就見到就係喺個錶位嗰度就裝多咗個喉，就喺嗰度而家就係抽緊水，對嘛？

答：係。

問：嗰張相，嗰度下面嗰個係樽嚟，嗰個人隻手揸住下面係一個水樽，裝緊水？

答：係，係。

問：係。“(b) tap at the water supply pipe entry to flat”，咁你見到就係即係嗰個人企到好高，就應該係喺個天花板嗰度，即係高高地個位置就喺外面走廊入屋嗰個位，呢個就係喺個室內嗰度攞嘅？

答：室內，室內。

問：室內攞嘅？

答：室內，室內。

問：咁跟住就最下低嗰幅相就係 kitchen tap。好，我哋睇番 167 頁。

“...The vacant flat sampling was carried out by one sampling team. The pipe configuration of each flat was also measured on site for further analysis.” 咁你見到跟住就 Vacant flats 寫咗出嚟嗰啲單位號碼。

最底。

“Sampling procedures：

1) One 250 mL sample was collected at the meter room tap.

2) One 250 mL sample was collected at the tap at the entry of the water supply pipe to the flat.”

我想問一問你，呢兩個即係叫做額外加嘅 tap 放出嚟嘅水係頭浸水嚟嘅？

答：頭浸水，即係我哋做咗兩次，即係第一個就係喺個 meter position，係頭浸水，可以咁講頭浸水。

問：因為你後來有一次就係 after t 等如三百，再抽多次，抽咗兩次，但係起碼你有一次係頭浸水？

答：頭浸水，

問：到到抽晒五分鐘之後，你再抽多咗一次，呢個我知道，但係起碼 meter 位同埋入屋位係抽咗頭浸水？

答：頭浸水。

問：跟住水喉嗰度就開始零，跟住就三十、六十咁樣去，okay。跟住就“One 250 mL sample was collected at the tap at the entry of the water supply pipe to the flat.” 睇番 167 頁，167 頁。

答：唔。

問：“3) The first sample (250 mL) at the kitchen tap was collected when the tap was opened. The tap remained fully open throughout the sampling.

4) The second, third, fourth, fifth and sixth samples (50 mL each) were collected at t = 30, 60, 120, 180 and 300 seconds at the kitchen tap.

5) The kitchen tap flow rate was measured using 1L bottle and measuring cylinder.

168頁。

"6) After the flow rate measurement (which took around 5 minutes), one 250 mL sample was collected again at the meter room tap.

7) One 250 mL sample was again collected at the tap at the pipe entry to the flat."

呢個就係頭嗰浸攞完 meter 同埋 entry，抽晒之後，又攞多兩個 250 嘅。

"8) After around 3 hours, the vacant flat was revisited and steps 1-7 were carried out again to collect one more set of samples (except for the second day of sampling for Un Chau Estate and Kwai Luen Estate vacant flats)."

呢個就係頭嗰浸攞完 meter 同埋 entry，抽晒之後，又攞多兩個 250 嘅？

答：係，係。

問："After around 3 hours, the vacant flat was revisited and steps 1 - 7 were carried out again to collect one more set of samples. --After the sampling, the samples were transported back to HKUST. All apparatus and log sheets were returned. All samples were preserved and logged in by HSEO Lab and then selected samples sent to the GL for analysis. A total of 80 samples were collected for vacant flats; 40 samples were analyzed by HSEO Lab and 40 by GL."

你睇下第 8 度，“After around 3 hours, the vacant flat was revisited and steps 1 - 7 were carried out”，呢個重複多一次，不過就唔係隔夜，而係隔三個鐘頭，呢個亦都係其實為咗要測試下，就係如果唔隔夜，只不過係 stagnation for 一個短啲嘅時間，個結果會係點--個目的係咪咁？

答：係，係，對。

問：等八個鐘，可能某種嘅含鉛量；等三個鐘短啲，可能係反映某種人嘅用水嘅習慣，就三個鐘。其實任你 design 嘅，可以四，可以六，可以八，不過點都要揀個數值，咁樣用咗三咁解，對嘛？

答：係。

問：好。第 134 頁，最底嗰度。

<u>“Computational fluid dynamics modelling of water supply chain</u>

13. Any sources of lead introduced into the drinking water supply system will affect the lead concentration at the consumer tap. As the WSD measurements indicate absence of lead contamination in the supply line to each building, roof tank, and down pipe (the central water supply line from the roof tank to the individual households), the focus is on the release, accumulation, and transport of the lead in the branch water supply chain from the down pipe to the individual flats on each floor.

14. Lead can accumulate in the water supply chain and be transported to the consumer tap of a particular flat as follows. An individual parcel of water flows from the down pipe to the meter room and passes a labyrinth of piping to a pipe along the ceiling of the corridor before entry into the flat (either the kitchen or wash room). The water parcel passes through a number of fixtures and joints along the flow path - Tee joints, elbows, water meters and valves. Figures 2 and 3 in Appendix II depict a typical arrangement of a water

supply chain for a PRH estate flat."

我哋而家睇一睇啲圖，149 頁。149 頁下半部，每一個單位都可能唔同，嗰個--嗰啲喉嘅走法，咁但係呢個係一個即係簡化咗，一個典型嘅單位嘅嗰啲喉嘅走法，對嘛？

答：係，對。

問：我哋睇睇中間最粗落嚟，藍色嗰條就係我哋叫做 down pipe，76 mm。

答：係。

問：你見到嗰度一路落，落到去中間你會見到有個方格，就叫做 Meter room，見到嘛？

答：係。

問：Meter room，你跟住睇一睇右上角，右上角嗰度有個係即係放大版嘅 meter room，對嘛？

答：係。

問：嗰度就係落到去之後，就有一條喉係打橫係入咗個 meter room，跟住就轉咗啲彎咁樣，就入 meter valve。跟住下面有度就叫做 to other rooms 咁樣，"to other rooms"嘅意思係乜嘢？咩嘢 rooms，其實嗰啲係？

答：即係其他啲 flats，即係佢譬如一個錶房就可能就五、六個單位，咁變咗就即係我哋就淨係做即係一個 flat。

問：得，得。你見到入咗個錶房之後，其實你每一支出嚟嗰啲，其實就係代表一個 meter，對嘛？

答：係。

問：係。咁有啲 37 mm 我哋見到，即係去個水錶嘅時候，可能係 37 mm？

答：係。

問：去完個水錶，水錶出嚟就變咗 22 mm，呢個係一個典型嘅一個例子。

答：嗄，嗄，大約嘅，大約。

問：咁入咗錶房，去咗個--過咗個錶，經過咗個錶出到嚟，就用咗另外一種嘅喉管。咁跟住你見到就出到嚟，就有個幼啲管，就有寫住"Corridor"，咁你見到，corridor，睇番中間嗰度，corridor。咁你嗰啲 2.15 m、3.9 m 呢啲，基本上，就係嗰條喉管嘅長度，對嘛？

答：對，對。

問：所以離開咗錶房之後，出嚟咁可能有幾截，離開咗個錶出到嚟會係 0.75，就轉咗一彎就係 0.7，跟住加 1.1，跟住就 2.15，咁幾截嘅喉管咁駁咗之後加埋。咁去到走廊可能 3.9，咁就 0.5。跟住就落到下面，你見到就係去到 flat 嗰度，flat 嗰度你打橫就係即係有個放大咗版嘅 flat。

答：唔。

問：呢一個 flat，你入咗個 flat 之後，第一個分岔出嚟就去洗衣機？

答：係。

問：咁啲水繼續行，去到第二個，就係去咗廚房？

答：係。

問：跟住第三，就係去洗手間？

答：係。

問：嗰度寫住"(no flow)"，係咩嘢意思呢？

答：No flow 即係喺呢個情形下，我哋就唔--即係做到嗰度就停，即係我哋主要嘅目的係做去到廚房個 tap，即係喺...

問：「做」嘅意思係咩嘢？

答：即係我哋計數，計數。

問：係，得。即係 for the purpose of 你嘅...

答：For the purpose of，係，即係譬如...

問：...嗰個 computational model？

答：嗄，嗄。

問：跟住睇番後面--跟住我想--我哋講講啲名詞，因為喺你嘅報告裏面，我哋都有好多唔同嘅名稱，關於嗰啲即係水喉嗰啲名。

答：係。

問：我哋見到有啲叫做 tee joint 嘅嘢，tee joint 嘅嘢就好明顯就係可能係一支喉，佢會分岔咗做左右，咁就好似個"T"字咁樣，咁叫做 tee joint。Elbow 就好似個"L"字型咁樣，就咁轉一個彎，咁就叫做 elbow，對嘛？

答：係。

問：Okay。我哋再睇一睇就啲相，就係 150 頁。150 頁就係實際嘅照片。左--你睇番最頂嗰度張相，corridor，就係喺街外，外牆入咗個走廊，跟住就會上到走廊嘅 roof 嗰度，喺個走廊嘅 roof 嗰度行嘅應該？

答：係，唔。

問：喺個 roof 嗰度行。咁跟住行到去某個單位，就喺個 roof 嗰度入咗嗰個單位入面，入咗去之後，可能落番去個--再行落去咁嘞要，係。

答：係。

問：咁跟住我哋下面嗰兩張相，就係見到左手面嗰張相就係個錶房裏面嘅情況？

答：係，係。

問：右面嗰張相就係廚房？

答：係。

問：好嘞，咁我哋睇番 135 頁。135 頁，第 15 段。

"When the water tap is not in use, say overnight, the water in the supply chain of a particular flat is stagnant. Any lead deposits will be released into the water through chemical reaction and molecular diffusion; the lead concentration in the system will increase with time. When the water tap is turned on, say the next morning, the accumulated lead in the system will be transported in the turbulent pipe flow and the lead concentration at the consumer tap depends on the accumulated lead during the stagnation period and the mixing and transport in the system. The distribution of the dissolved lead along the supply chain both during stagnation and after opening the tap can be obtained through computational fluid dynamics (CFD) modelling.

16. CFD modelling is a tool to determine the changes in lead concentration along the supply chain and with time. The supply system is discretized or divided into a large number of cells (finite volumes), and the lead distribution is determined by numerical solution of governing equations based on mass and momentum conservation. The input to the model is the pipe configuration, the pipe flow rate, and the assumed stagnation equilibrium lead concentrations and lead leaching rates at the joints and pipes based on the WSD laboratory data."

我哋停一停先，就呢一個係一個 model。我就睇過你有一大堆嘅即係嗰個 model 裏面嘅一啲嘅 equations，咁就我哋唔使去深究嗰啲 differential equations 咁樣嘅樣。但係其實呢個係一個即係--點講呢？可以話係一個即係理論嘅 model，就係即係你 input 一啲嘢落去，你就計，你去 predict，就話如果你嘅某啲嘅速度係咁樣，理論上出到嚟，就應該嗰個結果會係咁樣嘅，呢個係一個理論嘅一個計算嚟嘅，對嘛？

答：即係一個工具，即係一個手段，一個--但係呢個手段同工具，就喺而家嘅工程學嘅科技就即係喺好多領域都驗證，即係大量驗證過，所以係一個理論嘅手段，但係--計算嘅手段。

問：但係你即係基本上，你係嚟對照實際結果得出嚟，睇下大家個分別大唔大，就係知道即係會唔會其中一方係離晒譜，咁樣係叫做係，對唔對？

答：係，係，係。即係模型嘅物理過程。

問：係。

答：模型嘅物理過程。

問：咁你 input--即係你有啲乜嘢嘅元素你係即係放入去呢一個 model 裏面呢，第一就係 pipe configuration，即係條管點行法，隔咗幾耐之後轉一個咩嘢嘅彎。因為即係我諗常理嚟講，就係你啲水去到撞到乜嘢，轉一個咩嘢彎，可能會影響嗰啲粒子嗰個移動嗰個方向，或者嗰個 concentration，就係受嗰個水流嗰個形狀影響，呢個就係 pipe configuration。

答：係，係。

問：跟住就係 pipe flow rate，就係行得幾快喇，啲水。跟住“...assumed stagnation equilibrium lead concentrations and lead leaching rates at the joints and pipes based on the WSD laboratory data.”

呢個 WSD Laboratory data 係乜嘢情況之下得到嘅 data 嚟喋？

答：呢個 WSD data 就係喺個 WSD 嘅 task force 嗰個入面個報告入面，即係佢寫牛潭尾就嗰個 treatment plan 入面就做個大量嘅有關唔同配件嘅鉛嘅釋放嘅情況，就包括 leaching rate，即係鉛嘅--即係將個配件用啲同樣嘅水浸咗佢二十四個鐘頭，之後你就度佢一路個濃度咪越來越高，即係顯示。咁佢廿四小時後，就度個濃度，即係呢個就 maximum concentration，亦都我哋而家當佢係 equilibrium concentration。

另外一個就釋放率，即係嗰個 leaching rate。所以呢啲都係個水務署就係通過好多嘅配件嘅化學分析嚟做，我哋就用嗰啲資料嚟做一個 input。

問：即係話呢，呢度我哋講緊兩樣嘢，一種就叫做 stagnation equilibrium--pipe configuration 個形狀就係即係你親眼就知道點轉彎，嗰啲係科大嘅團隊自己見到喋喇。pipe flow rates 都係用番科大自己度出嚟嘅 pipe flow rates。“assumed stagnation equilibrium lead concentration”即係基本上就係啲鉛喺啲水度不斷咁樣釋出，就溶到某個階段就唔會再不斷咁樣溶出嚟，有限嘅科學知識，即係差唔多好似飽和咗咁上下，因為即係

冇可能不斷放啲鉛出嚟，如果唔係成嚿鉛就喺個水嗰度浮浮下，唔會㗎嘛。所以即係溶到某個地步，溶得太多，就唔會再溶，咁就一個 equilibrium 嘅狀態。咁就係即係幾時會達到呢個 equilibrium 嘅狀態，呢一個就唔係科大嘅團隊度嘅，呢個你就係依靠水務署嗰個 task force，嗰個自己調查嗰個小組，因為佢哋就--我嘅理解呢，佢哋個報告都有講嘅，就唔係純粹度水質。佢哋係切咗唔同部位嘅喉管嘅 joint，就做咗一啲實際嘅量度，係咪，你嘅理解就係咁樣？

答：係，係。

問：你去都見過嗰啲一條條嘅管切咗出嚟係咩嘢樣嘅，參觀...

答：參觀過，睇過晒。

問：你參觀應該係化驗所嘅--政府 chemist 嘅時候，係咪？

答：唔係，呢個喺牛潭尾，牛潭尾又有 treatment plan，就佢哋因為擠晒喺嗰度嘅，就喺嗰度化驗。

問：係，因為嗰度要研究嗰啲 leaching rate。另外一個就係嘞，呢個就係 equilibrium 嗰度，即係睇下放到幾多嘅時候，就會到達到一個叫 equilibrium。另外，leaching rate 又係頭先你所講，就係亦都係依靠水務署嗰個調查嗰個過程裏面得出嚟嘅一啲資料。呢個--即係呢兩個 input 就唔係 UST 嗰個團隊度嘅，呢個你就係信納咗水務署嗰個畀你哋嘅一啲 data，對嘛？

答：係，係。

問：好。咁就你 input 咗落去呢個 model 裏面，我嘅理解就係你都係想知道條喉點樣走法，理論上佢走出嚟，應該係--如果有鉛嘅話會係含幾多呢咁樣。其中一個即係常人諗法需要知道嘅，就係其實你嗰啲部件裏面嚿鉛有幾大嚿，或者有幾大嚿 mass 啫。

我睇你呢個 input 裏面，就冇包括到即係譬如話個 amount of lead in 個 system。但係其實係咪已經包含咗喺個 leaching rate 裏面，呢一個係...

答：係，即係包含咗，應該包含咗。因為佢個--即係當然你有鉛喺個--deposit 喺個喉管嘅表面，或者配件嘅表面，可以釋放嘅情形梗係好複雜，即係呢啲需要--亦都好多即係需要一個化學 chemist 去真係睇呢個問題。

但係我哋就 take 一個 engineer approach，我就基於呢個數據，因為數據最準㗎嘛，即係你釋出嚟幾多。我哋基本上就話將--喺呢個供水鏈嗰度，我哋唔同嘅地方，我哋就知道唔同嘅釋放率。咁點解要咁做呢，其實主要就話你有一個比較科學嘅方法，將呢啲釋放率同埋含鉛嘅濃度轉到 water tap concentration，即係去真係用嘅時候係咩嘢鉛呢。譬如我哋計出嚟，如果完全唔啱嘅，可能佢度有問題。但係而家似乎就幾一致嘅，咁呢樣其中一個目的。

問：唔，好。

答：唔。

問：跟住"The output of the model..."睇番第16段，135頁。

"The output of the model is lead concentration in each grid cell. Details of the CFD modelling are given in **Appendix VI. Figure 4...**"

In Appendix VI 就係170頁，170頁就係 Appendix VI，係有一連串嘅算式。我唔打算喺度即係詳細咁樣去探索，其他嘅律師如果想探索，可能佢哋會--"**Figure 4 in Appendix II** shows the computational grid for a representative vacant plat."

Figure 4 in Appendix II 就係151頁。呢度其實係咪每一個細嘅四方格都係一個 grid，151頁？

答：係，係，嗱--係。

問：我哋見到好多個細嘅四方格。

答：係，係。即係佢呢度睇唔到入面嗰啲，...

問：係，當然，當然。

答：...即係呢個就喺表面，係可以咁講，係一個就一個 pipe lead volume。

問：即係其實以 sight--以三維空間，three dimensional 睇就係好多粒，好細嘅 cube 咁組成嘅，一個 grid 可能係一個好細嘅 cube 咁樣，對嘛？一個四方體，一個立方體咁樣，對嘛？

答：對，對，對。

問：係，好。好，跟住我哋就再睇番，就係 135 頁第 16 段下面呀。

"**Figure 5 in Appendix II** shows a typical lead distribution in a pipe joint at different times after stagnation."...

152 頁就係 Figure 5 in Appendix II。呢個"typical lead distribution in a pipe joint at different times after stagnation."你見到三個鐘、六個鐘、九個鐘同十二個鐘。其實就係大意代表就係你啲水喺裏面積得越耐，你嗰個含鉛嗰個濃度就越來越高咁解，即係個顏色越深就表示個含量越來越高，對嘛？

答：對，對。

問：睇番 135 頁。

..."The model has been calibrated and validated against data obtained from the vacant flat tests by both WSH and the independent experiments of this study. The aim of the computer modelling is to provide an indirect check on the measured lead leaching rates, and to gain more insights into the causes and possible mitigation measured against risks of drinking lead-contaminated water in PRH estate flats in Hong Kong.

OPINION & FINDINGS

(i) **Analysis of Lead Concentration Data**

17. The WSD data for the "unaffected estates" provided guidance for the targeted field sampling in December 2015 [Table 3, Appendix III]."

160 頁我哋頭先都睇過嘅--未，160 頁，睇睇 160 頁。160 頁呢個呢，Table 3，Table 3 同埋 Table 4 其實都係代表住水務署佢話不受影響屋邨嘅一啲結果，即係我話「水務署話」--一陣間我哋會知道點解我哋話「水務署話」，水務署話 Table 3 同 Table 4 所代表嘅一啲屋邨就係不受影響嘅。Table 3 同 Table 4 個分界點就係

咩嘢呢，Table 3 裏面就係講 2005 年後落成嘅屋邨；Table 4 就係 2005 年前落成嘅屋邨。

跟住你嘅第 17 段，第二行，就係：

"For these 45 estates (163 buildings) completed in or after 2005 excess lead was found in 11 samples (out of 3806 samples taken). It is notable that 86.3% of the samples had lead concentrations below 1μg/L (below detection), and 98.1% below 5 μg/L. Lead contamination risks for these estates appear to be very low. The 11 excess lead samples were derived from 5 estates (namely, Shui Chuen O Estate, Yee Ming Estate, Tin Ching Estate, Choi Tak Estate and Kwai Chung Estate) that were labelled "unaffected" probably due to different methods of interpretation."

呢度可能就要即係落少--花多少少嘅時候去解釋，因為就我哋都注意到就係即係好多報導都係相關於話呢--即係點解話有啲 unaffected estate 裏面都有啲樣辦係超咗標呢咁樣，點解呢，咩嘢叫做"different methods of interpretation"呢咁樣。

我哋睇睇 160 頁，160 頁裏面呢個表呢，就有四十五條邨，我哋見到，45 estates，四十五條邨。即係話水務署歸納為不受影響嘅屋邨 2005 年後落成嘅，就係四十五座，總共一百六十三棟樓。佢哋抽過出嚟驗嘅水辦有三千八百零六個，當中含鉛量嘅分佈就一個 microgram 以下嘅佔好大部分，3284；跟住 1 至 4、5 至 9 算低；10 或以上就有十一個水辦，佔百分之零點三，咁呢度你見到，11，見到喇，係咪？

答：係。

問：咁呢個表就係嗰個結果，就即係好多朋友都係針對於就係呢 11。我想--又係嘞，呢一個表裏面嗰啲抽水水辦嗰啲，就唔係科大團隊做嘅，呢個係你睇番，即係我哋調查委員會去問應該係水務署攞到，佢哋一啲原始驗水報告出嚟嘅結果，就歸納成呢個表，對嘛？

答：對，對，對。

問：所以即係其實基本上就係呢，睇番水務署喺--唔係講緊 task force，

我哋而家係講緊，即係事情爆咗出嚟之後，水務署即刻好多驗水。但哋驗水裏面嘅辦，有啲係超過咗 10 microgram 嘅。你留意到呢樣嘢，但係你亦都留意咗，但係雖然有啲單位係超過咗 10 microgram，但係水務署仍然將呢一啲單位列為不受影響嘅屋邨。你就提出咗，就可能個原因係因為大家對某一個驗水嘅結果，大家有不同嘅演繹或者解釋嘅方法咁樣。

我就想同你睇睇嗰十一個樣辦來自邊度，同埋有啲乜嘢可能嘅解釋。嗰十一個水辦就來自好多個唔同嘅邨嘅，見到有五個。首先我想你睇一睇，就係有個好大嘅表嘅，就係 A3，麻煩我哋睇一睇 A3，Tab 43，第 2391 頁，2391 頁。呢一個表就唔係我哋所謂嘅原始資料嚟嘅。原始資料其實如果你要即係所謂尋根究底，我哋可以睇番水務署真係內部抽咗水出嚟，submit 去畀化驗所驗嗰啲紙仔嘅，但係我哋唔使睇嗰啲住，因為呢個表應該係即係羅文錦律師行做嘅，應該係即係都幾準--都好準備地反映咗嗰啲原始資料嘅。

你睇睇呢度呢，“Unaffected Estates (Completed in or after 2005)”，你睇下左手面嗰度就 Number 咁樣 4 嗰度，因為呢度應該就係每個邨就有個即係自己一個 number。第 1--頭嗰三個樣本就係來自呢個 Cheung Lung Wai Estate；Number 2 就係有一拃嘅，就係來自 Hung Fuk Estate；睇下 number 4，水泉澳邨，你見到嘛？

答：唔。

問：Number 4，Shui Chuen O Estate。

答：唔。

問：你見到右手面呢，就你見到應該係有啲顏色，嗰啲 column，你見到嘛？

答：係，係，係，係。

問：有一欄係紅色咗嘅，紅色咗嘅，就係水泉澳嗰個單位，就 S37，37 對--嗰個 37 其實就係即係個樣本秝把，即係抽水即係喺水務署內部 submit 上去嗰啲水辦，佢哋自己內部嘅一個記認，就叫做 S37，就 0.014。因為 0.01 milligram 就係 10 microgram，所以 0.014 milligram 即係 14 個 microgram，咪超咗標。

答：係。

問：如果我哋睇番呢度係邊度嚟嘅呢，其實就係廚房嚟嘅。你睇番--我哋就對要番就係 D1，我哋睇番 D1，第 145 頁。

答：145 頁，係。

問：D1，145。

答：係，呢度廚房，係。

問：你如果睇番裏面相對嘅 S37 呢，一路 move down，一路 move down，S37，S37 就 kitchen tap，佢嗰度有埋“Before/After Flushing”，你見到，見到嘛？

答：係，係。

問：就全部都係 A 嘅，因為即係我哋知道水務署抽水、驗水，佢哋嗰個 potable 就係全部係 flush 咗之後先至驗，所以你見到佢哋全部都係 after flush。37 就係 kitchen tap，如果我哋想睇埋個結果，就係 D2 嘅第 785 頁。我唔會每一個樣辦都咁睇，因為呢一個只不過係示範我哋呢個表，即係羅文錦律師行做嗰個表裏面嗰啲係點樣 divide 出嚟，我哋首先就見到就係一路而家追番，D2 785 頁，Sample 37，你見到右面 Lead 就係幾多個 microgram per liter，0.014，見到喇？

答：唔。

問：就係咁樣即係 divide 出嚟嘅，所以水泉澳邨呢個廚房喉就見到有超咗標嘅，如果純粹睇數字，因為佢係 14 microgram per liter。但係雖然水泉澳邨呢一個單位呢個樣辦有一個即係超咗標嘅情況出現，但係水務署或者即係當局都將呢一個水泉澳邨列為不受影響嘅屋邨。

　　你嘅報告裏面，就即係提議，suggest 即係呢個就話「啊，可能係因為有呢個 different methods 或者叫 different methods of interpretation。」咁你能夠諗到會係啲乜嘢即係唔同嘅演繹或者解釋方法會係話「咦，呢個係超咗，但係都係覺得係水務署會將佢歸納成為 unaffected estate 呢？」

答：一個就即係譬如如果個 sample 受污染過，即係未度之前，你攞咗個 sample contaminated，或者任何 whatever reason，即係--即係樣本 handle 嘅時候，譬如有污染，通常呢個一個可能。

另外亦都可能如果你要裝嗰啲 fitting，自己嘅，咁因為 fitting 你 depend on 點用，都可能唔同程度嘅污染，亦都可以 interpret to--即係唔代表...

問：Invalidate 咗呢一個水辦可以話？

答：嗄，即係覺得係一個唔代表性，即係。

問：得。但係呢一啲嘅資料，就係睇呢啲數目字係睇唔出㗎。

答：睇唔到，睇唔到，睇唔到。

問：即係你作為演繹呢啲數目字嘅人，你就係望到，啊，有個冧把喺度。每個冧把背後，可能有各自一啲外在嘅因素，每個冧把背後都有個故事，但係呢啲可能就係要水務署嗰方面，佢哋基於乜嘢額外嘅理由 rule out 咗呢一個水辦，invalidate 咗佢呢，呢一個就即係你個人冇認知，你只能夠即係估計可能係有一啲佢知、你唔知嘅嘢，對嘛？

答：係，係，係，係。

問：好。我哋而家逐個睇，另外一個--呢十一個水辦，就係另外一個就喺怡明邨，我哋睇睇，就係 Tab 43，我哋睇番頭先我哋嘅 Tab 43，又係 2391，就係其實係第 6 號，你見到"Yee Ming Estate"，見到嘛？

答：睇到。

問：2391 頁，Yee Ming Estate (Yee Yan Hse)，你見到又係紅色嗰棟係有嘅，"NTE106"，呢個就 0.015，呢個係 0.015。呢個係一個--我唔會同你真係睇番實際嗰啲驗水嗰啲紙仔嗰啲，因為就會要跳嚟跳去。我可以話畀你聽，呢一個其實就係一個空置單位，嗰個係一個廚房喉嚟嘅。即係以你嘅理解，會有啲乜嘢 different methods of interpretation，如果係一個空置咗嘅單位，同埋係一個廚房喉？

答：即係如果空置咗，就即係可以話即係嗰啲水喉可能--亦都有可能失修呀，或者即係好--聚積好耐，即係如果--就唔係一個代表性，好似平時即係啲居民成日用嘅，又會有分別。即係你成日用嘅時候，都有唔同程度嘅流動㗎嘛，水。咁就即係呢個可以話即係唔夠代表性，即係居民嘅--反映居民嘅飲用水，呢個都可以理解。

問：跟住就天晴邨，另外一個單位就喺天晴邨嘅，Tab 43，A3 Tab 43，2393 頁，2393 頁。第 26 號，你見到嗰度寫住"Tin Ching Amenity and Community"，你見到嘛？嗰度就有一度度出嚟 0.046，即係成 46 microgram，超咗好多嘅。

答：係，係，唔，係。

問：但係呢，睇番--如果我哋追睇番，其實驗水紙裏面出嚟喺邊度呢，其實佢係一個即係嗰啲社區會堂，amenity and community building 裏面三樓嘅一個女廁。

答：係。

問：呢一度如果有個咁樣嘅即係 sample，如果話埋畀你聽，原來係一個三樓嘅女廁嚟，一個社區中心裏面嘅女廁咁樣，即係你會點樣去即係演繹，或者解釋呢一個樣辦？

答：一般人就唔會用嚟飲用㗎嘛，即係都係一個理由嘅，即係所以話唔同嘅 interpretation，即係你唔會飲用，即係飲用嘅--即係用廁所水例如飲嘅，或者煲水機會係好細。

問：係，好。另外一個 Choi Tak Estate，2393--唔係，天晴邨另外有一個嘅--啊，唔係，天晴邨完嘞。跟住 Choi Tak Estate 就係同一版，2393 睇落少少，呢個 item 28，你見到佢就有兩個 sample 都係超咗標嘅，一個 0.019、一個 0.030，你見到喇？

答：唔。

問：紅色嗰個 column。呢個係一個 kitchen tap，呢個係一個 kitchen tap，咁冇話係空置嘅，應該，冇話係空置嘅。呢個 kitchen tap 咁即係呢個可能用番你頭先嘅解釋，就係即係佢有啲嘢佢知、你唔知，因為你純粹...

答：冇--我哋就咁睇嘅資料，就似乎係超標。

問：唔。跟住 item 28，Choi Tak--係，呢度有兩個 sample 都有。好，跟住就到葵涌邨，Kwai Chung Estate，呢度係有包咗兩個單位嘅，呢度係 Choi Tak Estate，呢一度係因為有兩個 house 嘅，Choi Shing Hse 同埋 Choi Shun Hse 喇。

咁跟住我哋睇第六個叫做超標嘅樣本，就係喺葵涌 Estate，葵

涌邨，就係 A3 Tab 43 嘅 2398 頁。2398 頁你見到，56 號嗰度，就 Kwai Chung Estate。你見到嗰度就係 Hop Kwai Hse、Pak Kwai Hse 嗰度，你見到有個 0.012 嘅，見到嘛？

答：係。

問：0.012。咁呢一個就我嘅理解，睇番啲文件係 kitchen tap，廚房，咁你都係會用番同一個即係解釋，就係可能有啲關於呢一個廚房喉嘅嘢，可能水務署方知道咗啲額外嘅資料，就 rule out 咗佢。

答：係，係，係。

問：跟住同樣，item 56，你睇番下一個，Kwai Chung Estate （Pak Kwai Hse，Hop Kwai Hse）嗰度，你見到有一大堆嘅樣辦。

答：唔嗯。

問：065 嗰個，我嘅理解就係一個錶位嚟，我理解係個錶位，我--或者我哋係睇睇，065 呢個我哋睇一睇就係 D1 嘅 Tab 460 頁。D1，460。

答：係，喺邊度？

問：個 sample reference 就係 51500103S03 嗰個，S03 嗰個。係，103，係，03 呢個，係 after flushing，但係佢喺 meter position，呢個係錶位嚟嘅。

答：錶位，係。

問：呢個係錶位嚟。如果話畀你聽呢個係錶位，咁會有啲咩嘢影響，對你對呢一個數值嘅演繹？

答：即係錶位就當然唔係喺個 kitchen tap 度，即係有個分別。但係即係譬如頭先我哋睇到就因為錶位都--通過錶位之後先入屋，即係錶位如果--譬如如果含鉛，亦都表示跟住啲水亦都有可能含鉛，係咪超標要度過先知。

問：所以即係純粹因為呢一個樣本係喺個錶位度度嘅，就唔等如你因此可以 ignore 咗佢嘅，你嘅意思，係咪？

答：誒...

問：因為錶位有鉛，亦都可能有個風險，入屋都係有鉛，係咪咁意思？

答：即係我會咁理解。

問：係，即係呢個你要有待即係水務署可能畀多啲資料你去解釋，對嘛，要？

答：係。

問：好。我哋跟住再睇睇，又係葵涌 Estate，仍然都係 2398 頁，因為嗰度有一大堆嘅。你見到有一個係 0.15 嘅，你見到嘛，紅色嗰啲，0.065 嗰個下面有個係 0.15。

答：係。

問：0.15 嗰個就超得好緊要，係咪？

答：係，係好犀利，係，150，係。

問：150 microgram 嚟嘅，150 microgram 嚟嘅，但係嗰個一個錶位嚟嘅，嗰個係一個錶位嚟嘅。因為睇番 D1 嘅話，462，睇番 D1 462，嗰度就係樣本 number 係 S01 嘅。

答：唔，係。

問：S01，你見到呢一個就係一個錶位。

答：錶位，係。

問：個保良局 Centre 嘅錶位，應該係一個嗰啲 community amenities 嘅一個錶位。呢個就係兩個額外嘅因素，錶位，加上你係一個--你見到係"Po Leung Kok Centre"，個保良局嘅一個--應該係一啲社區會堂，或者社區嘅設施嚟嘅。如果加埋咗呢兩個資料畀你，你會有咩嘢嘅演繹？

答：即係呢啲要睇佢--佢真係即係錶位之後，去--即係去邊度呢，即係你可以好多個可能㗎嘛，可以去個 water fountain，又可能--又可以去就咁一個 toilet 都有可能，即係唔知，嗄，唔知。

問：得。

答：但係即係會有唔同嘅可能性㗎嘛。

問：唔，好。我哋跟住睇番 2398 頁，A3 2398 頁，我哋睇番紅色嗰度，

再落一個，呢個仍然都係睇緊葵涌 Estate 喎。我哋睇完 0.15 嗰度 sample，我哋落一個，即係 51500103S06 嗰個，0.11 嗰個，呢個 Hop Kwai Hse 嘅，0.11，咁都係成百幾個 microgram，你見到。

答：係。

問：呢一個個資料話畀我哋聽，呢一個係一個 meter position 嚟嘅，一個 meter position 嚟。咁我哋睇睇就係 D1 嘅 462 頁，D1 462。

答：係。

問：S01 462，S01，係--啊，sorry，sorry，講錯，06 呀，S06，sorry。

答：06 呀。

問：S06，呢個係 462 嘅 S06，係。係，呢個係一個 meter position，一個錶位嚟嘅，咁你亦都係即係同上嘅一個演繹本身唔代表你要將佢 invalidate，因為亦都係視乎錶位之後去邊度，你都要驗下錶位之後去到個水喉，同唔同意？即係唔可以因為話錶位，就 invalidate 咗佢？

答：係，係。

問：Okay。係，跟住我哋就--仍然都係葵涌 Estate，仍然都係呢個 item，就落睇到一個係 0.051，你見唔見？S07 嗰度，0.051。

答：係。

問：呢個係一個廚房喉，463 頁，D1 463 頁。

答：463 頁，呢個廚房。

問：D1 463，呢個就係樣辦 S07。係，kitchen tap 嚟嘅，呢個係。

答：唔。

問：Okay，即係 on the face of it，去睇表面就係廚房喉，呢個你亦都會話即係有待水務署嘅解釋嘅要，對嘛？

答：係。

問：即係可能佢會知道有啲即係污染咗，或者一啲換過喉，或者其他嘅嘢，

係咪，對嘛？

答：對，對，對。

問：好。跟住亦都係葵涌 Estate，就係 0.072 嗰個 entry，0.072 個 entry，呢個係 S04 嘅 sample，我哋睇番 D1，464。D1 464。

答：係。

問：S04 嘅 sample，呢個就係 meter 嚟嘅，呢個係 meter 嚟嘅。

答：係。

問：咁我哋即係睇過呢十一個水辦，佢哋來自唔同嘅地方，佢哋可能有啲係有啲特別嘅地方嘅，譬如話有個係一個社區中心嘅女廁咁，咁你可以理解。但係有啲係 meter 位，但係 meter 位你嘅頭先發表過嘅意見，就係 meter 位有，即係表示繼續下流落去到個水喉都可能會有，咁都應該--即係唔應該純粹因為係 meter 位，就...

答：係。

問：...廢咗呢一個 sample。

答：係，除非有第二啲原因。

問：除非或者第二啲原因係可以足夠廢咗呢一個 sample，其他有一啲水喉位亦都係，除非水務署有一啲嘅解釋，點解佢哋即係有額外嘅理由，係因為佢哋知道住戶改動過，或者有--佢哋知道有污染--第二啲污染嘅源頭，覺得呢一個樣本唔可靠，所以就先至要撥走。

呢個就係你所謂嘅 possibly due to different methods of interpretation 就係咁解，可能佢哋知道有啲額外嘅嘢，對嘛？

答：係，係。

問：好。我哋睇完呢十一個樣辦之後，我哋而家就回歸到你嘅第 17 段，V1，136 頁，第 17 段，「For the purpose of independent lead sampling, a total of 6 "unaffected" estates （水泉澳、怡明、Choi Tak、葵涌、元州 and 秀茂坪） were selected」

亦即係話，受影響嘅屋邨其實全部驗晒，而喺水務署歸納為 unaffected 嘅屋邨裏面，你就抽樣就抽咗六個嚟到去做科大嘅

independent sampling。我就睇過，嗰六個 unaffected estate，即係科大做 independent sampling 嗰六個 independent estate 裏面，就包含咗四個我哋剛才睇過話即係含有超標樣辦嘅屋邨嘅。譬如話水泉澳、怡明、Choi Tak 同埋葵涌嘅，呢四個。其他元州（Phase 5）同埋秀茂坪（南）就唔係歸納喺頭先我哋見到嗰十一個超咗標嘅樣辦裏面嘅屋邨嘅。

即係你抽出嚟睇六個--你用乜嘢嘅方法去抽呢六個 unaffected estate 出嚟去驗？純粹 random，定係你係諗住嗰陣時話「我哋抽呢六個，不如就抽一橛係都含有啲超標樣辦嘅，又抽啲係冇嘅」咁樣，定係點嘅呢？係點樣去決定，點樣抽呢六個？

答：即係首先，就係正如你所講，就係有個十一個樣本，即係咁樣--即係可--我哋都即係會咁諗，就係話可能有 different methods of interpretation，但係始終都係應該睇一睇，即係呢個。亦都係個量好犀利，即係我哋個主要嘅目的都係個三十六個 affected estate 嘅 building，咁加--譬如五、六個 building，我哋--基於我哋分析嘅水務署嘅數據，覺得嗰六個屋邨就比較值得探討，亦都包含個十一個 sample 入面嗰啲屋邨喇。

問：嘅某幾個喇，即係其實入...

答：亦都有啲你話冇事，都有一個 control 嘅一個控制即係一個--應該冇事嘅，應該冇事嘅。即係我諗我哋目的原本就話即係你哋--我哋三個 random upper--即係高層、中層、低層咁隨機咁去抽樣，如果全部都冇事，照計嚟講--照到--我哋頭啖水，照計嚟講就個風險係低，即係咁諗嘅。咁亦都係，如果我話冇事，都需要確定係冇事。即係係基於呢個理念，咁去設計呢個獨立嘅調查。

問：好。我哋睇番第 18 段，第 18 段。

"Lead concentrations were also measured on a total of 2,639 samples collected from 138 estates (308 buildings) completed before 2005. No excess lead is found in any of the samples. It seems that any lead introduced into the water supply system would have been substantially leached over the 10 year period."

Table 4，Appendix III 就喺 160 頁嘅，呢個就係下面嗰個表。

答：係，係。

問：頭先我哋講過，Table 3 上面嗰個表，Table 3、4 都係水務署話 unaffected，上面就係新啲嘅，2005 之後嘅，下面就係舊啲嘅，2005 年之前嘅。

答：唔，唔。

問：呢個就係冇超標嘅，完全。咁你嘅意思就係“...any lead introduced into the water supply system would have been substantially leached over the 10 year period.”呢個係一個可能喇。

答：係。因為主要呢個係基於水務署喺啲供水鏈度，佢就度到啲 deposit--啲鉛嘅 deposit 啲重量吖嘛，我哋亦都知個 leaching rate㗎嘛。當然即係個化學作用好複雜，但係你起碼一個粗略嘅睇法，即係就算你最理想嘅化學嘅適當嘅情形咁，即係似乎到五到十年，應該--即係基於嗰啲量。所以亦都--Table 4 亦都反映呢個觀點，基於各樣考慮。

問：得，得。你呢度就“...any lead introduced into the water supply system...”，即係如果有鉛都應該沖晒嘞咁樣。但係當然，即係之前係咪有鉛呢一個，就你唔知道。

答：唔知。

問：因為其實即係我哋之前聽過啲證供，就係話其實公屋裏面，房署係喺 2001--2002 年左右開始，就研究過就係即係容許用銅喉，因為之前係用一啲 lined 嘅叫 GI pipe 嘅。

答：係，係，係。

問：Lined 嘅 GI pipe 就用啲唔同嘅接嘅方法，就唔包括用焊料去接嘅。呢個都探討過，係咪？

答：係，冇錯。

問：用咗銅喉，要用焊料，就引致到可能先至有鉛。所以 2005 之前落成嘅公屋單位，你嗰度提出過，就係話可能就算有鉛，都已經沖晒嘞。當然，另外一個--即係如果我而家話畀你聽，原來 2005 年之前嘅起--落成嘅公屋單位，根本好多可能係唔係用銅喉，用焊料接嘅。呢個

會唔會都係可以解釋到...

答：係，啱，對，對，對，係。

問：可以嘅？

答：可以，可以。

問：可以。跟住，呢個第 18 段裏面嗰啲 sample，亦都係水務署喺調查期間抽出嚟嘅 sample 嚟嘅，呢個唔係科大自己抽出嚟嘅 sample，對嘛？

答：對，對。

問：就係你係睇留科大抽出嚟--唔係，你係睇番水務署抽出嚟嘅 sample，跟住就作出你嘅一啲演繹，同埋一個意見，對嘛？

答：係，係，唔。

問：好。第 19 段。

"The independent and planned sampling of every building with suspected lead contamination (in the "11 + 6" estates)...", Eleven，11，就 affected；six 就 unaffected。

"...provides independent data for general risk assessment and as a basis for assessment of health risk and sampling protocol, and possible advice to residents."

就 20 段。

"Different sampling methods lead to different lead concentrations. The independent sampling reveals that 47.2% of the 'first draw' samples have excess lead - as compared with 8.0% of the fully flushed samples..."

跟住就你有一個表嘅，"**[Table 5，Appendix III]**"，第 161 頁，161。呢個 Table 5 呢，我哋而家係有一個 renew 咗嘅版本嘅。

我哋不如睇最 up to date 嗰個 Table 5，第 173.17，173.17。呢個 173.17 嗰個 Table 5，同你原先 161 嗰個 Table 5 相比呢，就係多咗個 column，就叫“No. of flats with excess lead”，呢個一陣間我哋會解釋多咗呢一個係點解喇。但係你睇番就係呢一個 Table 5 呢，“Comparison of excess lead data of WSD and HKUST - “fully flushed” vs first draw samples and flat concentrations”呢，你就會見到，有一戙係叫做“WSD/HD”嘅，你見到嘛？

答：唔，係。

問：呢一個就係水務署同埋房署佢哋喺即係事件又係爆發之後，佢哋自己做嘅一連串嘅驗嘅工作。你就--我哋知道佢哋即係水務署驗水嘅 protocol 係 flush 咗先至驗嘅，所以出到嚟就係百分之八，8 per cent 嘅 sample 係有超咗標。但係你睇番隔籬，under HKUST 嗰度，under HKUST，the “No. of first draw samples should excess lead”就係百分之四十七點二 per cent--係百分之四十七點二。

呢一度嘅對照，其實即係話畀我哋聽，即係同一個屋邨，同一拃嘅屋邨，你未必係驗同一個單位，當然，係咪？

答：係。

問：但係同一個屋邨，水務署佢哋用 flush 咗之後先至驗，得出嚟嘅百分比係有 8 per cent 嘅單位，即係 8 per cent 嘅 sample 係超標；相比，科大用頭浸水嚟到驗，就有百分之四十七點二。呢一個你就係帶出呢個對比，即係頭浸水同埋 flush 咗之後係會有咁大嘅分別。

答：係，係。

問：你跟住就話。

“The independent sampling data is also consistent with the information from the Coalition of the Victims of Contaminated Drinking Water, although details of the sampling protocol for this set of data are unknown.”

即係受影響嘅即係居民嘅代表，佢哋都有一啲資料提供到，不過即係可能即係作為科學精神，就係即係你--你會覺得就係話，即係你

要知道佢點樣抽，佢用咩嘢 protocol，你先至可以知道點樣去演繹。因為你要所謂"compare like with like"㗎嘛，好多時候，你唔知道個 protocol 係點樣，有陣時你未必即係可以放好重嘅即係比重落去。但係雖然你嘅意見，就係都係即係籠統嚟講，都係 consistent 嘅。

答：Consistent。

問：即係 stagnate 咗好耐，或者頭浸水出到嚟含鉛嘅機會就會大啲，即係含鉛超標機會又會大啲，對嘛？

答：嗄。

問：係，好。跟住，我哋睇番第 21 段...

主席：或者我哋 take 個 break 先，好嘛？

石先生：好。

主席：我哋 take 個 20 minutes 嘅 break。

答：Okay。

<u>上午 11 時 26 分聆訊押後</u>

<u>上午 11 時 51 分恢復聆訊</u>

出席人士如前。

<u>食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授、香港科技大學副校長（研發及研究生教育））宣誓繼續作供</u>
<u>石先生繼續主問</u>

問：李教授，我哋而家就返番去睇你嘅報告，V1 第 137 頁，第 21 段。

答：係。

問："The complex variation of lead concentration with time is captured by our sampling. Two characteristic patterns of lead concentration variation with time were observed. In about 37% of the cases in which lead was detected, the maximum concentration is observed in the first draw sample, followed by a monotonic decrease in the subsequent samples (at t=20, 40, 60, 80 sec)."

停一停先，咩嘢叫"monotonic decrease"？

答：即係唔會話有升有降，即係一個方向。

問：Okay，得。

"In other cases (around 63%), the maximum concentration is detected in the second sample at t=20 sec, followed by a sharp decrease."

跟住你就引用咗 Figure 6，Appendix II，153 頁。

答：係。

問：即係基本上，你將嗰啲大廈就分做--即係呢度，即係籠統地就可以即係將佢哋歸納做兩種，一種就係第頭浸水，就係濃度最高嘅；另外一批就係第二浸，即係 20 秒嘅時候，就濃度較高嘅，佢哋就係即係 63 與 37 之比。

跟住你喺第 21 段，就繼續。

"This second pattern is mostly found in flats completed in or after 2010. The delayed peak concentration is usually found in flats with higher lead contamination, and probably reflects the relative location of the lead sources from the kitchen tap (whether the significant lead sources are in the meter room, corridor, or inside the flat)."

即係其實簡單地講，就係如果嗰個污染，或者嗰個鉛嘅源頭係距離個水喉遠啲，可能喺個錶位，或者甚至更遠嘅，基本上啲約--啲水隔咗一夜之後，頭浸都污染嗰 part 水都未去到水喉，你要等廿秒，嗰啲水先至可以游到去個水喉嗰度，所以即係十--反而就係廿秒嗰浸，就會係多啲。就另外嗰啲如果第一浸已經好多鉛嘅，可能喺嗰啲單位出事嘅鉛嘅來源可能係近啲單位嗰度嘅一個 solder joint 都未定，係咪？

答：係，係。

問：即係基本上係咁樣，視乎你嗰個鉛嗰個來源喺邊度，係咪咁樣即係理解？

答：係，可以咁理解，嗄，係。

問：好。第 22 段。

> "While general patterns can be discerned, the sampling also indicates occasional samples that would not follow any general trend. For example, the lead concentration of four samples (t=0, 20, 40, 80 sec) can be below detection, with the sample (t=60 sec) giving unexpectedly high concentration that may reveal the picking up of a lead particle in the system. Such outliers are rare but reflect the complexity of the problem once lead sources are introduced into the water supply chain."

你嗰度就列舉咗個可能，就係點解又話有陣時會有啲情況，就係頭浸 20、40 秒，就算最尾嗰浸 80 秒都冇事，中間零零舍舍係有一個好高嘅樣本，咁你就話可能係行行下，突然間中間有個 pick up 咗一個 lead particle in the system。但係，即係又係嘞，用番即係常人嘅諗法，如果嗰個 lead particle 一個 system 嗰度，咁你啲水過嚟都會掂到㗎喇。你 60 秒嗰個 sample pick up 咗，咁 80 秒個 sample 你應該 pick up 到㗎，係咪呢？點解零零舍舍一個--係零零舍舍得一個位 peak 咗，其他嗰啲又冇呢，會，如果咁樣嘅即係可能性嘅話？

主席：我諗佢--Professor 你嘅意思，即係有啲 particle，即係嗰啲 lead carbonate，或者嗰個 lead hydroxide 就係沖咗出嚟，就啱啱喺嗰個--嗰一個 partial 嘅水裏面，whereas 其他 partial 嘅水就冇，係咪咁嘅意思，抑或你嘅意思係點樣樣，exactly？

答：係，因為喺個--即係喺個水喉入面，就係我哋叫「湍流」，湍流即係話 turbulence，turbulent flow。「湍流」嘅意思，就係一種隨機性嘅，即係你每一個時刻，都唔係 exactly 一樣嘅，有個隨機性。即係亦都話，有個可能就話，喺某一個時刻，即係如果一個假設就喺啲鉛嘅 particle，鉛嘅粒子，就 carbonate 好，hydroxides 好，就喺呢個表面。咁亦都有化學作用，佢可能平時唔會 pick up，即係個 particle，但係某一個時刻，可能佢--你係一個彎位又好，乜嘢都好，有湍流嘅作用，亦都係唔穩、唔恆定嘅。

問：呢個我明白。

答：咁就 pick up 咗個 particle。

問：得。咁呢個就唔關係釋出，慢慢釋出定係成粒 carry 咗佢，所以就係咁啱喺六十秒嗰浸水包咗一粒好大嘅 particle，...

答：係，係。

問：...而係後面嗰啲冇？

答：嗄，嗄，後面冇。

問：Okay，得，明白。跟住第 23 段，"Since multiple sample were taken in each flat,..."，multiple sample 就係零、二十、四十、六十、八十，呢個就係你所指嘅 multiple samples，係咪呀？

答：係，係。

問："... a measure of the lead determination risk can be given by a mass integrated average lead concentration of the 5 samples taken - the 'flat concentration' is the concentration measured by the total mass divided by the total volume collected ..."，呢度背後嘅理念就即係其實都好簡單，我相信就係即係如果你要知道平均嗰個風險係幾多，你攞八十，flush 晒之後，好低，係一個極端，你攞頭浸，可能

係最差嘅一個情況，咁所以你就不如攞總共咁多個樣本裏面，得到嘅鉛嘅含量加埋晒佢，...

答：係。

問：...就over所有水，450，我哋知道嘅含量，咁你就得到個所謂平均嘅鉛嘅含量，對嘛？

答：係，係，對。

問：咁呢個概念，呢個 flat concentration 係即係你係特登係 for 今次呢一個 study 諗出嚟，定係其實喺其他嘅一啲 study 嗰度，係一個常用嘅一個 technique 嚟？

答：係for呢個study嘅，係for呢個study嘅，即係...

問："Based on the flat concentration, 53.2 per cent and 58.2 per cent of the samples have excess lead (depending on 2 or 5 samples respectively) as compared to the 8 per cent for the individual flushed sample." 呢個我哋睇番 table 5，新嗰個。

答：係，係。

問：新嗰個，173.17。因為舊嗰個 161 嗰個 table 5 就冇咗最右面嗰個 column，係講 flat concentration 嗰個。我哋睇番 173.17 先，173.17，呢個就係即係 revised 咗嘅 table 5，就最右面嗰棟係叫做"No. of flat with excess lead"，呢個 excess lead，你睇番下面嗰個 asterisk，就係"Based on flat concentration"，即係呢個 number of flat with excess lead 嘅意思，基本上就係有幾多個單位，佢嘅 flat concentration 係多過10？

答：係。

問：係。你嘅 asterisk 嗰度就話"Based on flat concentration computed from 5 samples"，就係零、二十、四十、六十同八十？

答：唔。

問："For Un Chau Estate Phase 2 and 4 and Lower Ngau Tak

Kok ... the flat concentration is obtained from the 2 samples for which lead concentrations are measured."
呢個就係零同埋四十？

答：係，唔。

問："If all flat concentrations are computed from 2 samples, the number of flats with excess lead"就會係 52.5？

答：係。

問：即係話你如果鍾意嘅話，就喺右手面嗰個 column 嗰度，58.3 per cent 隔籬，你可以寫 52.8 per cent bracket using two samples？

答：係。

問：全部用兩個 sample 就 52.8 per cent？

答：係，係。

問：平均含鉛量超標？

答：係。

問：如果全部用五個 sample，除咗元洲同埋牛頭角下用兩個 sample 之外，就會係 58.3 per cent 平均 flat concentration 超標？

答：係，係。

問：點解你會喺--即係會有零零舍舍用五個 sample 嗰個數值裏面，零零舍舍係元洲 Phase 2 and 4 同埋牛頭角下邨會係用咗兩個 sample？

答：主要冇乜嘢特別嘅原因，主要係嗰陣時因為時間嘅限制，而 Government Lab 同我哋本身個科大個實驗室都有個資源嘅限制，即係譬如嗰陣時係每個星期只可以度四十個 sample，咁就即係--咁我哋可以取捨，即係有啲...

問：得，明白。

答：...priority。

問：得。即係唔係因為呢兩個屋邨有咩嘢特別？

答：唔。

問：只不過係因為純粹資源上？

答：資源，資源上。

問：咁樣純粹可以抽到兩個 sample 睇？

答：係，係。

問：但係嗰個 range 都係五十幾 per cent，呢個係？

答：係，係。

問：咁相比--即係無論你用頭浸水嚟比，或者你用平均嗰個 flat concentration，即係平均值咁樣嚟比，相比即係水務署嗰個 methodology，即係 flush 咗之後比，都係相差，你都係覺得係好遠。水務署嗰個係 8 per cent，如果係 flush 咗之後，科大嗰個 methodology 就係一係就四十幾 per cent，如果淨係睇頭浸水嘅 sample 超標，或者如果係睇即係 number of flat 嘅 flat concentration 超標，佔所有嘅 flat being sample 嚟到比，就有五十幾個 per cent。即係都係--你都覺得係一個幾 significant，即係幾大嘅差別嚟，係咪呀，百分比嚟講？

答：係，即係簡單嚟講，我諗即係--因為我哋有一個呢個 investigation，其實就即係咁嘅 sampling 可以反映到個 maximum lead exposure，即係 maximum lead exposure。我諗個 full flushed sample 就可以話係偏低嘅 exposure，咁當然即係嗰個影響就會係一個...(聽不清) in between，即係個 mean 嘅 exposure 先最緊要，即係個 mean exposure。但係我哋即係因為要睇--主要個目的就係想睇個食水含鉛個--即係嗰個影--個範圍，個 extent of contamination，咁我哋呢個就係所以就 focus 喺 maximum，頭浸水個頭一分鐘到八十個 second，一、二分鐘咁樣，嗰個就會反映個 maximum lead exposure 咁嘅意思。

問：好。跟住第 24 段，"The average of the flat concentrations of randomly selected upper, middle and lower floors gives a 'building concentration'."呢個係另外一個概念。

答：係。

問：就係你每一棟大廈就有三個單位抽咗嚟驗咁樣？

答：係。

問：咁即係話你每個單位本身有個 flat concentration，嗰個 flat concentration 已經係一個平均值嚟？

答：係。

問：而你將一棟大廈嘅上、中、下嗰三個單位嘅平均值再平均多一次佢，咁就得咗一個叫做 building concentration，...

答：Building，係，係，building，係。

問：...即係就反映到就係話，你唔好話可能係某一個高度嘅單位特別衰啲，唔緊要，我哋拉番勻佢嚟睇，咁就知道即係整體成棟大廈嗰個 exposure 個風險有幾大，對嘛？

答：唔，對。

問："The lead contamination of a building can be classified as follows: Class 1 --the building concentration and all sample concentrations are less than 10 micrograms per litre ..."即係 class 1 就風險嚟講，係叫做最低，因為 flat concentration 又冇超標，你加晒又冇超標？

答：係，係，係，即係所有都冇超標，冇一個 sample，你，即係十五個 sample 都達標。

問：咁其實如果所有嘅 flat concentration 都唔超標嘅話，咁順理成章就連個 building concentration 都唔會超標，對嘛？

答：係嘞，exactly 係即係咁嘅意思。

問：係，好。Class 2 就係"the building concentration is less than 10 micrograms per litre but with at least one sample greater than 10 micrograms per litre ..."呢個就即係中度，就係話可能有--嗰三個樣本裏面有一個超咗標或者有兩個超咗標，但係第三個就應該可能係冇超標，如果三個都超晒嘅話，

就 building concentration 有超標？

答：係，係。

問：可能係有一個超咗標或者兩個超咗標，但係第三個唔超，平均咗之後，可能唔超嗰個叫做救咗成棟大廈，嗰個好低，咁就拉低咗，就係所以個 building concentration 就會係低過 10 micrograms，呢個就叫做第二級嘅風險上嚟講？

答：係，係，係。

問："Class 3 -- the building concentration is greater than 10 micrograms per litre"，呢個 building concentration is greater than 10 microgram per litre 其實都有好多個可能性，可能係三--可能係上、中、下都超標，咁如果上、中、下嘅 sample 都超標，咁 building 一定超標。但係可能係其中一個 sample，可能係最頂或者中間或者最底，有一個 sample 超級大嘅超咗標，但係其他嗰兩個可能冇事，咁但係由於其中一個係超級超咗標，就會嗤到成棟大廈都會個 concentration 都超咗標，你同唔同意會有呢個可能？

答：第三個比較細，比較細，呢個可能比較細。即係正如你講第二個情況，即係話 class 2 嗰個就會有咁嘅情況，但係 class 3 一般都係比較嚴--比較 lead contaminated，係。

問：Class 3 會比較--即係一般嚟講，就多數會係三個，即係上、中、下都會係超晒標，先至影響到成棟大廈？

答：一般都係比較多，比較多。

問：Okay。我哋睇一睇嗰啲實際嗰啲數字，你有個 table 6，appendix III，就係 161 頁。呢個睇番 161 頁，呢個 table 6 就係用科大嗰啲 sample 得出嚟嘅結果。咁你見到就係有一大拃嘅屋邨就係冇 class 3 building，譬如話 Choi Tak、秀茂坪、水泉澳嗰啲，...

答：彩德嗰啲。

問：...水泉澳有一個 class 1 building，即係如果你係好微細地睇，但有一棟大廈裏面係有啲單位係超咗標。但係你拉勻嚟講，即係你就覺得如果純粹係睇番有冇影響到全棟大廈，就相對比冇，因為你用你 class 2、class 3 嘅 classification 嚟睇。咁所以水泉澳你會

見到就係有class 1嘅building，但係就冇class 2，亦都冇class 3。

答：係，係。

問：咁就一路睇落去，你最底嗰度你會見到，相比之下，我哋 contrast，你望下最底嗰度，葵聯、石硤尾、東匯、榮昌、元洲二、四期同埋啟晴，呢六個邨你就用灰色 shaded 咗佢。

答：Shaded 咗佢。

問：呢六個邨亦都係水務署歸類咗成為受影響屋邨嘅，okay。

答：係，係。

問：呢六個邨點解你要直情係--即係呢六個邨係冇 class 1、冇 class 2，咁但係唔係話好好，因為去晒 class 3 嗰度，即係話抽親嗰啲大廈全部都係 class 3 嚟。即係佢中就唔係即係偶然地中，而係全部，即係抽樣得出嚟嘅大廈都叫做中招。

答：係，係。

問：咁你點解--即係你灰色咗佢係咩嘢意思？

答：即係我哋呢個獨立嘅調查就似乎即係同水務署都好一致，即係呢個--肯定呢六個屋邨就係有 lead contamination，就好 significantly lead contamination，咁呢個...

問：就係葵聯、石硤尾、東匯、榮昌、元洲...

答：即係就係--係嘞，係嘞，就係葵聯、石硤尾、東匯、榮昌、元洲...

問：榮昌、元洲二、四。

答：...二期、四期、啟晴。基於呢個，你無論邊個角度睇，都似乎係有啲問題，即係你呢個好簡單，就好明顯嘅咁樣囉。

問：好。跟住你睇番，因為如果有 class 3 building，咁即係話成棟大廈嘅平均值都超咗標咁，咁叫做好似好嚴重。因為你睇番葵聯嗰啲全部都係有 class 3 building，冇 class 1、冇 class 2。你睇番怡明第 11 項，即係葵聯上面嗰個 Yee Ming。

答：係。

問：佢都係，佢有一個 class 3 building，佢冇 class 1、冇 class 2，咁佢都係有 class 3，咁但係點解你又冇灰色到佢？

答：因為怡明嗰個情況就好特別嘅，怡明我哋就即係好似咁樣抽樣，即係去做個調查。咁就十五個樣本，有十四個樣本都係度唔到嘢，都係 below detection。但係唯一就有一個樣本喺六十秒就超標，同埋就超標都幾-- 150 micrograms per litre，即係超標得幾厲害。就好似話頭先我哋講嘅情形，就係似乎咁樣唔係好合常理，即係突然喺六十秒就有一個好--比較高嘅超標。咁因為一個數就影響到嗰個 flat concentration 就超標，呢一個--呢個 flat concentration 就 17，即係有一個--某一個單位，喺三個單位，某一個單位。

問：你指 building concentration 超標？

答：Flat concentration。

問：Okay，okay。

答：Flat concentration，flat concentration，所以佢係第--即係我哋係得一個，一個 number of concentration 咁樣。咁亦都即係變咗就呢個就係--即係呢個就有一個好特別嘅情況，我諗係需要再調查，但係即係總體嚟講，怡明就即係正如我所講，就十五個樣本，其實十四都度 below detection。即係就係--所以呢個就亦都說明嗰個情況，有陣時幾複雜，即係呢個可能需要再睇一睇。

問：好，好。

答：但係總體嚟講，就似乎就係即係個風險唔係話好似一個樣本所表示嘅風險。

問：我就想你睇一睇嗰個原始嗰個資料，你睇睇你而家面前 V1，第 173.4 頁。

答：173？

問：173.4 頁。

答：係，係。

問：你見到頂嗰度就係怡明，就有兩粒星，即係特別啲嘅個怡明。

答：係，係。

問：你就話，最底嗰度"All 14 samples in 3 flats of the building are below detection ..."，315，你嗰棟大廈上、中、下三個單位，每個單位就抽五個，咁就總共有十五個樣本。

答：係。

問：十五個樣本你就話有十四個樣本都係 below？

答：係，係，係。

問：就話有一個 sample at t=六十秒 at high concentration，咁你見到，嗰個 Yee Yan House 嗰度，就係你見到就係零零舍舍全部都好低，零零舍舍係某個 unit 佢裏面嘅六十秒就係跳，跳咗上去 0.1，係咪呢度呀，見到？

答：係，係，係，就係呢度，係，係，係。

問：紅色咗嗰度，0.15 嘅。

答：係，係，係。

問：咁呢度就基本上你嘅意見，頭先所講就係--就你頭先係講咗幾樣嘢，就係一到六十秒嘅時候，突然間好高？

答：係，係。

問：咁呢一個--由於呢一個，所以你覺得即係影響不大，就係因為呢樣嘢，就拖高咗整棟大廈嘅個 building concentration？

答：係，係，係。

問：咁所以就係因為呢樣嘢，即係所以你唔係淨係睇數值嘅，你要睇埋個數值點樣 derive 出嚟？

答：係，係。

問：咁雖然你話怡明係 100 per cent class 3 building，但係呢個 class 3 building 原來喺呢個特別嘅情況之下，搞到變咗 class 3

嘅，你可以話？

答：係，係，係。

問：其他全部都唔係 class --即係冇事？

答：其他都唔係，即係佢係一個好特別，因為佢特別高，特別高。

問：係一個單位裏面嘅一個 measurement 特別高？

答：嗄，嗄。

問：咁就即係你覺得呢個可能係一個獨立嘅一個...

答：獨立嘅考慮。

問：事件，一個考慮，唔知點解。

答：係。

問：一個--可以話係一個 singularity，或者一個比較嘅 quirky 一個 occurrence，係咪呀？

答：係，係，係。

問：所以係因為咁，所以就算你話怡明計出嚟，數目字上係 class 3 有一棟都好，即係你都唔覺得怡明係即係總體作為一個屋邨，即係有呢個相對地大嘅風險？

答：係，唔覺得，係，即係個風險相對嚟講都係低。

問：好。咁你跟住睇番，就係紅磡同埋牛頭角下邨，紅磡同埋牛頭角下邨，其實呢兩個邨都有 class 3 building 嘅存在？

答：係。

問：因為我想比較下，就係你下面 shaded 咗嗰拃話有 class 3，係咪有 class 3 就一定係叫做係好危險、有事呢咁。咁佢上面，怡明你解咗，就係因為有嗰個零零舍舍一個 measurement 拖高晒，但係紅磡同埋牛頭角下邨有兩棟同埋三棟嘅 class 3 嘅 building。

答：好。

問：咁點解你又唔去將呢兩個屋邨 shaded 咗佢，colour 咗佢，話即係相對地你覺得係受污染？

答：因為譬如你睇牛頭角下邨，其實佢有啲--個別有啲 building，譬如 Kwai Yuet，咁佢係相對嚟講，即係啲數據顯示個風險係比較相對細。即係佢唔係個個 building 個風險一樣。譬如紅磡，咁你兩個 class 3，一個 class 2 building，咁譬如話牛頭角下邨就 2 同 3，即係兩個--都有兩個 building class 2。咁即係話佢有--即係就唔係成個屋邨可以一概而論，即係就算同一個屋邨，都會有啲 building 可能就相對嚟講，就個風險比較細，即係就咁睇啲數據。所以我哋就唔分去最--即係唔歸納佢係個 group，即係頭先嗰六個屋邨入面，即係相對嚟講，佢係即係個別嘅 house 就風險都係比較低，即係咁嘅理念，咁樣去睇。

問：可唔可以咁講，就係因為即係灰色咗嗰拃，葵聯、石硤尾嗰度，純粹以即係或然率嚟講，即係你抽兩個，譬如葵聯咁樣，啟晴喇，啟晴你抽六棟嚟睇，六棟都係 class 3 咗，即係個命中率就好高，即係差唔多驗親都中，嗰啲大廈係。

答：好高。

問：即係以棟大廈嚟講？

答：係。

問：但係即係譬如話相對紅磡同埋牛頭角下邨，係冇錯，係有啲大廈係個 building concentration 係超咗標，但係有啲大廈又唔係喎，所以你成個邨嚟睇，就唔係話--即係你抽嚟睇嘅時候，就唔係叫做棟棟都中，即係講得即係...（聽不清）少少，可唔可以咁講？

答：係，係，可以咁講。

問：另外有一度我係想你解釋一下，就係你睇番 173.3、173.2、173.1，呢度呢一拃嘅表，咁你就-- Q，中間有一棟寫住〝Q〞嘅。

答：係。

問：譬如 173.1，有個係 Q，Q 嗰個係 flow rate。

答：係。

問：因為睇個單位都知係 flow rate，millilitres per second，呢個係個 flow rate。

答：係。

問：咁跟住 t=0、t=20，跟住到到 t=80，嗰度就係度出嚟嘅含鉛量，對嘛？

答：係，係。

問：Concentration。跟住"Flat concentration"就係 average 咗佢，唔係 average of 嗰拃含鉛量，而係即係 mass over volume。跟住"First draw 1 litre"嘅 concentration，"First draw 1 litre concentration"即係咩嘢嗰度？

答："First draw 1 litre"，因為好多啲 sampling 啲標準，都講"First draw 1 litre"，譬如即係 EU 嗰個 guideline 或者--即係你唔同嘅 stagnation 時間後，好多都係 first-draw 1 litre，即係呢個似乎係一個。咁我哋做 sampling 嘅時候，因為條件限制就--同埋種種原因，就即係唔可能做每個 sample first-draw 1 litre，咁所以我第...

問：即係 first-draw 1 litre 你唔知道佢係二十秒嘅時候定係四十秒嘅時候，幾時會 1 litre？

答：你唔知，你唔知，係。

問：咁你點樣搵出嚟呢個 first draw 1 litre？

答：呢個就純粹由我哋 t=0 同埋 t=20 嗰個度出嚟嘅含鉛量，再加上我哋嘅流量嘅--直接度出嚟嘅流量咁嚟估計出嚟嘅。因為嚴格嚟講，我哋可以估計乜嘢時候就即係開大水喉，你乜嘢時候--因為我哋有一個流量，我哋就知道咩嘢時候就 fill 1 litre。咁因為知道個時間，我哋就知道 t=0 同 t=20，我就可以估計，base on 兩個 point，因為通常都係二十秒之前，即係就 fill 1 litre。咁所以即係換句話講，呢個 first-draw 1 litre 嗰陣時個意思就係話 what if we had --即係如果我哋假設我哋當時真係 collect 咗 1 litre，咁個濃度會係點，咁就由呢個--我哋而家個數據就可以都幾可靠咁估計出嚟，即係咁嘅意思。

問：即係呢個唔係一個 measurement，呢個係一個推論，一個推論？

答：唔係一個 direct measurement，但係由兩個 direct measurement 嘅 interpretation。

問：係，明白，明白。即係你由流--你由個 flow rate 就可以知道流幾耐，流滿 1 litre，呢個係計出嚟嘅啫？

答：係，係。

問：咁至於呢 1 litre 水裏面，理論上你--你 extrapolate 裏面有幾多鉛，咁呢個你就係 base on at two point in lead concentration？

答：係，係。

問：咁可能你畫直線定係--總之你用嗰啲方程式就可以校番出嚟，就可以估計到...

答：Interpret -- linear interpretation。

問：係，直線，係咪呀，你講？

答：直線，直線。

問：直線，好，得。好嘞，咁即係最右嗰欄，有個"infant weekly intake (micrograms per week)"，咁呢個係點整出嚟嘅呢？

答：呢個就係基於嗰個--即係我睇啲資料，就話假設啲--譬如你每日譬如話 take 0.75 個 litre of water，而假設--即係假設，呢個最--我哋話即係最 maximum exposure，咁就你 first-draw 1 litre，即係咁嘅情形，咁呢 0.75 個 litre 就係由呢個 first-draw 1 litre 度嚟嘅，咁就可以估計佢每日幾多鉛，係咪呀，可以去估計，因為我哋知道呢個 first-draw 1 litre concentration。

咁即係話假設個 BB 就係由呢個 1 litre consume，即係用 0.75 個 litre，咁咪我哋知道個有幾多鉛。咁你七--一個禮拜又乘七，咁就變咗--即係一個基於呢個 first-draw 1 litre 嘅 concentration 就可以估計個 BB 每個禮拜嘅 intake。咁點解咁做，因為所有啲 guideline 出嚟，我哋都睇，都係 guideline，provisional guideline value，都係有一個標準就係基於一個 BB 一個禮拜嘅可以容許嘅即係含鉛嘅 intake。

所以即係我哋覺得呢個係一個比較直接嘅比較，就即係相對於譬如 flat concentration，就 flat concentration 係一個比較宏觀嘅比較，呢個就直接可以同佢--即係啲 guideline 你--即係呢個比較，即係一個其實概念上嘅比較嚟。即係--即係話咁究竟係點先，即係譬如你喺呢個情形下，即係嗰個含義係乜嘢，即係我哋--咁我主要就係可以比較清楚咁有一個 reference point，有一個基準點嚟比較。

問：得，我明白。即係其實簡單地講，就係因為世衞嗰啲所謂幾多個 micrograms per litre，其實都係計一輪先計出嚟，佢個 starting point 都係你假設有一個 BB，佢每飲幾多先至假設佢會有事，咁就計下計下就計出嚟，10 micrograms per litre 咁樣？

答：係，係，係。

問：咁你睇番佢原本點 derive 出嚟，就係你假設一個 BB，如果佢一個禮拜飲幾多，最多可以飲幾多就先至叫做安全，或者先至叫做冇危險咁樣，咁所以你就將嗰啲 flat concentration 呢啲，你轉化番同樣嘅可以比較到嘅數字，咁就可以比較到？

答：係，係。

問：而你呢個 infant weekly intake 基於嘅假設，就係呢個 BB 每日飲嘅水都係來自 first draw？

答：係，係，即係一個假設。

問：呢個假設就係假設佢來自 first draw，係咪呀？

答：係，係。

問：我想你睇一睇世衞嗰個文件，請等等，麻煩你睇一睇--或者我繼續問咗你先，我遲啲搵番個 reference 出嚟。24 段，137 頁，"Out of the 43 buildings sampled, 18 buildings are of class 2 or above, while 9 buildings are considered class 1. The remaining 25 buildings are considered significantly lead contaminated."呢個就係頭先嗰個表最底嗰度灰色咗嗰拃大廈，即係葵聯尾嗰拃。

答：係，係。

問：138頁。

“(ii) Cause of excess lead”，“The detailed data for the three representative vacant flats to the sources of lead in the water supply chain of the flats. The sampling shows significant lead concentrations measured at the water position as well as at the location of first entry to the flat. This means most of the lead contamination comes in the pipe network in the meter room, and along the corridor leading to the flat.”

即係簡單講，就係如果你個咪錶房裏面已經度到有好高嘅鉛，咁即係起碼入到去咪錶房嗰橛嘅喉就包含咗一啲含鉛嘅即係部分，或者係焊料或者部件。跟住如果繼續到到入屋嗰個喉，度到亦都係有好多含鉛，咁即係沿住公共走廊入屋嗰一橛嘅喉管，亦都裏面有啲高含鉛量嘅嘢，呢個就係嗰兩個新加嘅--即係額外加嘅喉，話到畀你嘅事情，係咪呀？

答：係。

問：係。佢有個“Table 7, Appendix III”，咁呢度應該係啲數據嚟，“Table 7 Appendix III”，就係162頁，就係頭先我哋睇過嘅。

答：係，係。

問：係，我開咗先。好嘞，咁跟住我哋繼續睇番你嘅報告，“This is consistent ...” --第25段。

“This is consistent with the significant measured lead deposits and leaching rates found in the meters, valves, elbows and pipe joints reported by the WSD task force.”

呢個就係你引用就係水務署嗰個特別嗰個自己調查嗰個報告？

答：係，係。

問：嗰個報告裏面，呢度你講緊嘅就唔係真係純粹驗水質，呢個就真係切咗嗰啲部件出嚟就擠上去，即係驗佢嘅--首先佢鉛嘅含量同埋釋出嗰個濃度？

答：係，係。

問：“Figure 7 in Appendix II shows the measured lead deposits in the water supply chain of Luen Yat House. While it is difficult to extrapolate the lead deposits measured on pipe sections of 0.2 m length, it is clear that the elbows and joints contribute significantly to the lead contamination. Flow recirculation patterns around a 90 degree pipe bend will also favour lead accumulation in isolated pockets.”

Figure 7 就喺 154 頁，154 頁。呢度就係--因為呢個係一個例子嚟嘅應該係，呢個係喺即係葵聯邨裏面某一橛，某一個 segment 裏面攞咗出嚟。

答：係，攞出嚟。

問：咁呢個甚至乎就唔係話 unit-specific，呢個係直情係譬如話一層樓，佢由入到咪錶房，咪錶房出到嚟，到到唔同--去到走廊，轉咗啲彎，跟住去咗唔同嘅單位，咁每一個轉接嘅位，佢都喺嗰度抽咗個樣本出嚟，跟住就度到佢釋出鉛分嗰個 rate，係咪咁樣做，以你嘅理解？

答：係，係，係。但係喺個單位嘅，即係佢係有一個...

問：佢下面有個單位？

答：...--有一個單位。

問：一個單位嚟，okay，係，冇錯。因為下面嗰度係 flat 裏面，okay，okay。

答：係。

問：但係即係基本上，佢就係針對住某一個單位，咁佢哋就睇番由水源，佢個水源當係 meter 開始，一路行到去呢個單位，中間經歷過好多唔同嘅轉彎位，所有 potentially 含鉛嘅位，佢都走去度過？

答：係，係。

問：咁佢係得出咗就係唔同嘅位釋出嘅鉛都有唔同嘅 concentration，

咁所以你見到右面嗰個圓形，就發覺即係最多係鉛 deposit 出嚟，佢就見到度出嚟就係 elbow。

答：係，elbow。

問：呢個就係 mass deposit，呢個係度出嚟，呢個唔係睇水出嚟，呢個就純粹係即係...

答：度出嚟。

問：度出嚟嘅，因為用一啲儀器去度下，實際上佢係含咗幾多鉛？

答：係，係。

問：咁跟住嗰啲數字，就係講水裏面釋出咗嘅...

答：係，釋出，係。

問：...鉛，係咪呀？

答：係，係。

問：咁其實基本上就係相比番就係用水裏面搵到嘅鉛相對番實際上唔同部件，唔同轉彎位度出嚟嘅鉛，大家之間相互嘅關係，係咪呀？

答：嗄。其實主要就係話說明就係喺個供水鏈度，即係佢呢個 flat 嘅 supply chain 度，就即係個直接佢哋劏開呢啲配件嚟度，就啲鉛嘅 deposit 就係大部分都係嗰啲 joints 度，即係主要佢哋說明呢樣嘢，大部分都係 joint。

就喺個 piping 度，就佢度咗幾個 section，但係都係--因為咁長嗰條管，你唔係--咁咪即係代表性，0.2 個 metres，幾個 section 度，咁嗰啲就要係 extrapolation，嗰啲就冇咁準。咁但係其他啲係直接度，就說明--首先說明個 elbow，即係嗰啲彎位，就我哋去牛潭尾嘅時候都睇到好多，亦都喺個 report 度有好多呢啲，彎位就好多鉛。

咁就亦都幾個原因，一個即係焊嘅時候，即係可以話用得太多鉛，或者個 workmanship。第二，亦都係因為佢個水流嘅情況下，就會 favours 啲 accumulation，呢啲彎位。所以即係呢個合理，因為主要說明呢個--即係由呢個 data，即係由呢個數據嚟睇，就係即係

似乎啲 joints，即係啲 elbow、啲 tee 嗰啲，就係一個好多鉛嘅，佢哋好多鉛。

咁亦都間接我哋喺啲 vacant flat 啲 sample 亦都睇到，由個 meter room 去到未入屋之前都好犀利。咁即係最主要就我諗說明即係話個一致性，即係譬如我哋度到呢啲嘢，似乎同表明上同佢呢個數據係起碼合理，咁另外我哋嗰個計數又亦都另外一方面，即係間接有一個 check 咁樣。

問：好。另外有一度，即係 as a matter of interest，熱水嘅喉管同埋凍水嘅喉管喺含鉛嘅風險上有嘅分別係在於咩嘢？

答：啲熱水--因為熱水會溶，咁所以熱水嘅風險係大好多。

問：係，因為佢會傾向於容易啲令到啲鉛...

答：鉛溶，溶。

問：...會溶，釋出。

答：釋出。所以呢度我哋就冇，我哋主要係--即係啲凍水。

問：凍水？

答：嗄。

問：第 26 段。

“Based on the measured leaching rate and maximum stagnation concentrations reported ...”

呢啲 maximum stagnation concentration 同埋 measured leaching rate 就係個 task force 度出嚟？

答：係，係，係。

問：“... the lead concentration at the kitchen tap both during stagnation and after the tap is turned on can be estimated by the CFD model.”

呢個就係頭先我哋睇第 15 段同埋第 16 段，即係第 135 頁裏面所講嘅 CFD model，就係你 input 一拃嘢入去，configuration、 flow rate，同埋就係頭先我哋所講嘅 leaching rate 同埋嗰個 equilibrium 嗰個 concentration input 咗落去，就可以計到或者預測到嗰個 lead concentration 出嚟。

“Both during stagnation and after turned on”，跟住睇番第26段第四行，“Considering the limited data and complexity of the problem, the predictions of the calibrated model are in reasonable agreement with the WSD data. This provides an indirect confirmation of the detailed stagnation lead concentration and leaching rate measurement made by WSD.”

你嗰度就有個 reference，就係 appendix II 嘅 figure 8，咁我就麻煩你睇一睇 appendix II 嘅 figure 8，就係第155頁，155。呢度就有兩個表，上面嗰個就係 stagnation test，即係 stagnation 之後嘅估計，或者實際上量度出嚟嘅資料，下面就係 flushing test。上面 stagnation 即係 stagnation 之後嘅結果，下面 flushing 就係 flush 咗之後嘅結果。實線就係代表用數計出嚟嗰個 prediction，即係你入晒啲資料落去，計條數出嚟就應該係咁，嗰個理解就係你 stagnation 得愈耐，嗰個含鉛量就會愈高。黃色嗰啲點點就係實際上量度出嚟嘅結果，係咪呀？

答：係。

問：咁你就會點樣去演繹或者去解釋，即係嗰個實線，即係 prediction 同埋一點點，嗰啲黃色一點嘅關係？

答：首先，即係我哋而家就話用呢個 stagnation test 嚟做校準，即係所謂 calibration，咁 calibration 即係話我哋啲 model 啲參數都要做啲調整，因為你每一個--即係情況幾複雜，咁你啲配件都係有限嘅配件。咁所以校準咗之後，大家睇到嗰個 stagnation test，即係話喺唔同嘅時間，即係你個水唔郁，譬如二十個鐘頭、三十個鐘頭、十個鐘頭，即係你閂咗個水喉唔郁，咁就即係 stagnation，成個水體唔郁。咁唔郁就即係話喺個供水鏈入面啲鉛就會慢慢釋放，咁即係話亦都話個濃度不斷更加，咁即係變咗你睇呢個就睇到嗰個 prediction，即係佢 CFD 個模型計出嚟同佢度出嚟就相當一致。

咁當然你睇佢度都其實都有啲 scatter 我哋叫做，即係都有啲參差，因為都幾--每一個單位都唔同，都幾複雜。咁所以就即係我哋覺得呢個就係一個幾有代表性嘅校準。咁 calibrate，即係校準咗之

後，我哋嘅 test 就其實個 flushing，咁就下面幅圖就我校準咗個模型，我就去試呢個 flushing，咁就睇到呢個 flushing，當然即係佢度就係每一分鐘度一個，我冇記錯，每一分鐘要度一個水辦，咁但係你睇嗰個，其實個變化幾快，咁但係起碼就即係個 trend，即係大家去度出嚟同我哋計出嚟嘅 trend，即係譬如話一分鐘已經跌到好低，咁似乎一致。

咁即係換句話嚟講，我哋基於佢嗰啲物料，即係度出嚟，物料啲釋放--鉛釋放率同埋啲 equilibrium concentration 就校準咗之後，我哋計出嚟嘅 flushing test 就同佢數據都幾吻合，咁即係基本上就即係做到呢樣嘢。咁呢個唔單只係葵聯，即係我哋因為用--葵聯因為唔係我哋自己啲數據，但係用自己啲數據，figure 9 都即係講同一樣嘢，咁基本上就係咁嘅意思。

問：我嘅理解就係 figure 8 就係葵聯邨裏面呢個聯逸樓裏面，係搵咗一個空置嘅單位，呢個就係個 task force 做嘅一個測試？

答：係，係，係。

問：因為你見到佢 stagnation 成幾廿個鐘頭，就肯定係冇人住嘅單位，先至可以 stagnation 到幾廿個鐘頭，呢個就係個 task force 去測試嘅時候，就用咗呢一個作為一個--用咗呢個嚟測試，咁就所以就你哋嘅 CFD model 就係用咗呢一個單位就作為一個對比。

答：試點，一個試點。

問：一個試點，係嘞，冇錯。咁跟住你到到 figure 9，後面嗰頁，就都係做緊類似嘅嘢，就不過就唔係用水務署 task force 走去抽出嚟嘅一個空置單位，就唔係用一個水務署提供畀你，即係唔係用一個水務署 task force 提供畀你嘅資料，呢個就係用科大自己抽嘅一個unit？

答：係，係個 vacant flat。

問：都係一個 vacant flat？

答：Vacant flat。

問：即係其實 8 同埋 9 都係基於喺一個 vacant flat 裏面抽出嚟嘅水辦量度出嚟嘅嘢做出嚟，不過 8 就係 task force 用嘅一個 vacant flat？

答：係。

問：Figure 9 就係科大另外搵嘅一個 vacant flat？

答：係。

問：好。跟住我哋睇番就係第 27 段。

"By adopting lead source strengths within the range of the WSD measurements, the CFD simulation of lead concentrations at the kitchen tap are consistent with our own measurements. ..."

Our own measurement 就係頭先我睇嗰個 figure 9，呢個就係用番科大自己喺個空置單位裏面抽出嚟嘅水辦，亦都係同 CFD predict 出嚟嗰啲數值係吻合？

答：係。

問："...For the vacant flats, it seems that for both 4-hour and 18-hour stagnation periods the lead concentration drops to below 10 micrograms per litre levels in about 30 seconds. As noted above, in lead contaminated flats, occasional outliers of lead concentration are still possible.

28. Based on a holistic assessment of the collective WSD and HKUST data, and the CFD modelling, it seems that the main cause of the excess lead found in drinking water of PRH estates is due to the leaching of significant lead deposits in the pipe joints and fittings. From the soldering demonstration by a plumbing expert of the Construction Industry Council and the WSD data, it is clear that lead soldering material can be introduced into the pipe joints due to over use of lead solder and/or poor workmanship. Whether the lead deposits are greater along the pipe length (due to shearing off and sedimentation of lead solder deposits and/or electrochemical reactions of copper alloys with the water) or at the pipe joints

is of secondary importance. In any case, the measured leaching rates are consistent with the lead concentration measured at the tap."

(iii) Review of Findings of the WSD Task Force Reports

29. Overall the Water Supplies Department and the Government Laboratory have carried out a thorough and substantial investigation within the time and other constraints. In particular, the dismantling and chemical analysis of the key components of the water supply chains of three representative flats was a sensible and practical step. Although only three representative flats were selected, the examination of the 134 pipe components and fittings yielded very useful information.

30. The direct measurements on the lead content and leaching rate of pipe sections, joints (elbows, sockets, tees) and fittings (meter, valves, tapes) provided valuable data to unravel the causes of excess lead. There is great variability (one to two orders of magnitude) in the measured leached lead mass from the pipe and joints and fittings. The total leached mass from the fittings are similar for the three locations. Given the mass of lead deposited in the components of the water supply chain it can be roughly estimated that it could take as long as 5-10 years for most of the lead mass to be leached into the water, especially for the pipe joints. This is consistent with the present finding that the estates completed in or before 2010 have generally a lower lead concentration."

呢度有講到就係關於 great variability in the measured leach lead mass from the pipes and joints and the fittings。呢度我係想你睇一睇一啲嘅數據，麻煩你睇一睇 C19.1，C19.1，tab 104，第 9889 頁，9889 頁。

答：得，唔該。

問：你呢度就係見到就係 sum --呢個係--講一講先，呢個就係 summary of lead leaching tests，你睇一睇落少少，落少少。你見到嗰啲相就係話畀你聽係度緊邊個部件咁樣。

答：係。

問：跟住你見到下面用紅筆圈咗，有好多個數值，有啲係 0 至到 16，有啲就係 copper alloy 10.3，人哋嗰啲就 3.7，有啲 0 至 13.7，可唔可以解釋一下呢一啲，solder joint 係 1.4 至到 639.8，個 range 好似好大。你可唔可以講一講即係呢一個係咩嘢嘅文件，同埋呢啲數據話畀你聽咩嘢？

答：係，即係呢個係 leaching test，即係佢係 leach ...

問：呢個係邊個做嘅 leaching test 嚟，以你嘅理解？

答：呢個係水務署，水務署。

問：個 Task Force 做嘅？

答：Task Force。

問：係，Task Force 做，係。

答：係。即係呢個 lead leaching micrograms 就係二十四個鐘頭內 leach 出嚟嘅鉛嘅質量，個 mass。咁所以即係大家睇到，即係嗰個就話個 solder joint，其實嗰個--即係個 variability 好大，你由 1、2 去到六百幾，咁即係兩個數量級，我哋嘅意思就係咁。咁即係個 variability 好大，咁亦...

問：一個位就係一個 order of magnitude？

答：嗄，嗄，即係 10、100。

問：所以 1.4 至到 639.8 就係睁咗兩個 order？

答：兩個數量級，兩個數量級。

問：咁呢個就係即係 demonstrate 咗你喺第 30 段嗰個 point，就係 “There is great variability in the measured leached lead mass from the pipe and joints and fittings.” Fitting 就 one order of magnitude？

答：係，係嘞。

問：你睇番頭先嗰版，睇番頭先嗰版。個 fitting 嗰個 one order of magnitude 喺邊度見到，sorry？

答：即係...

問：睇番 9889 嗰頁。

答：係。

問：9889 嗰頁，係嘞。

答：九...

問：“For one order of magnitude”係喺？

答：就係 for one order of magnitude，總言之 fitting 就係譬如啲水錶、啲 valves、啲閥門、啲 tap，咁譬如你睇呢三樣嘢，就譬如由 0 或者 3.7 去到十幾、二十。

問：3.7 嗰個得一個，得一個嘢 sampled 咗，咁嗰個講緊 variation，即係嗰個...

答：嗄，嗄，即係個 fitting，因為 fitting 就通常指就係水錶、水喉、閥門咁樣。

問：即係譬如話 0 至 13.7 嗰度，就係相隔--相差一個 order？

答：一個 order of magnitude。

問：一個位到兩個位，係咪呀？

答：一個位。

問：但係 194 就係一個位到三個位？

答：係，係。

問：就睜咗兩個 order of magnitude，係咁樣嘅演繹，係咪嚟嘅？

答：係，咁嘅意思，係。

問：Okay，得。另外一個就係麻煩我哋睇睇水務署-- sorry，Task Force 嘅報告，裏面嘅"Annex 2.5"，水務署 Task Force 嘅報告。我哋睇睇水務署嘅 Task Force 嘅報告，A1 650，佢嘅"Annex 2.5"，758，758。譬如睇 757、758 咁樣，呢個"Annex 2.5"，見到嘛？

答：係，2.5，係。

問：係，2.5。咁呢度就係即係列舉咗，就係你見到 H2、H3、H4 咁樣，咁係有一大堆嘅 elbow 咁樣，你會見到 0.15，有啲又三十幾。咁呢一拃嘅數值，即係話到--即係可以顯示到啲咩嘢？

答：呢拃數值就顯示到即係話，第一，又係嗰個 variability，即係嗰個可以--同一樣嘢可以--即係個 deposit 可以差--即係有一段距離，譬如係啲 copper --譬如舉例，譬如 elbow，例如 elbow，我諗幾樣嘢，第一，就相對嚟講，大嘅直徑啲就冇乜嘢 deposit 嘅，譬如你一百--譬如你 Y4A、Y5，咁好細嘅啲 deposit，基本上就即係 0.01 咁。

問：係。你講緊 758 頁，係咪，而家係？

答：係，758，係，758。即係你 758 嗰個表。

問：係。

答：咁譬如你頭兩個 row，譬如你 159、159、100，咁都係零點--即係零點--啲 elbow，即係 0.01、0.01 咁樣，好細嗰啲。咁一路去到 22，就去到 22，即係一路細，你去到 22 個 metre，即係 22 個 millimetres 嗰啲直徑嘅，即係去到入到個供水鏈，即係個 flat 嘅供水鏈入面，你譬如去到廚房個 tee，咁你可以去到 23.2，即係去到你即係 2.72。譬如你係 Y20A，咁你 22 個 millimetres diameter elbow，咁就 2.72 個 milligram，佢係 milligram。咁跟住去到 tee 就 23.2 個 milligram，咁跟住去到 elbow Y34，個 cold water，咁都係 2.1 個。即係所以呢個 milligram，咁你係好犀利嘅呢個 deposit。咁即係主要就我諗係講，就話一路睇住個供水鏈，咁佢大直徑啲，就相對嚟講就即係除非你係啲膠嗰啲，咁係相對嚟講係細啲嘅，咁然後入到去 22、15，你一路--即係睇到個 variability，亦都睇到 variability，同埋亦都係反映頭先講嗰樣嘢，就係個 elbow，喺個 elbow 度啲 deposit，即係嗰啲鉛就好犀利，即係主要嗰樣嘢。

問：即係你用大直徑同細直徑去比，又可能唔係 compare like-for-like，但係你就算你係頭先你所講，就係我哋淨係睇 22 mm 嘅管，你都可以見到好大嘅 variability？

答：係。

問：就係咁意思？

答：係，係。

問：譬如話個 tee at kitchen 係 23.2，個 elbow 嗰度就 2.72，但係相比其他嘢都係 22--即係都係 22 mm 嘅地方，係即係比較高啲 concentration 會係？

答：係。

問：明白。當然有啲例外，你會見到，譬如話你會見到即係呢個就 35 mm 嗰個 gate valve 會跳咗去 5.83 咁。

答：係，係。

問：但係即係籠統嚟講，就係即係多數係 22--即係 22-millimetre 嘅 pipe 嘅部件有鉛，但係 even within 22-millimetre 嘅部件，佢嗰個含鉛量都 vary？

答：係，vary 嘅。

問：好。第 31 段。

"Based on by visit to the Ngau Tam Mei treatment works to see the dismantled 'components' and the chemical tests employed, it is clear that the dismantling and transport of the pipe components and the chemical analysis have been carefully conducted. As the CFD model [calculation] are based on the measured leaching rates, the credibility of the WSD measurements is also supported by the congruence of the predictions of lead concentrations with data. In the view of the variability and randomness of the lead sources within a branch water supply system leading to a flat, it was judged that independent laboratory tests of the lead content of pipe joints and fittings would not have added much value. Rather the effort was directed towards the development of the CFD model."

你意思就係話即係科大冇打算自己走去獨立地走去再驗多一次即係水務署 Task Force 切咗出嚟嗰啲部件？

答：係呀，因為第一，即係我個人去參觀過啲實驗室同埋成個程序，即係佢哋講解，就覺得就好徹底同埋好小心，即係成個 test。咁第二，因為大家見到嗰個--即係嗰個 variability，即係咁犀利，咁你其實就算我哋去做，你切某一個單位，咁唔代表乜嘢，即係個 added value 就好細，所以我哋就唔覺得有需要去做呢樣嘢嚟驗證。咁反而我哋就係頭先講，就話即係個 CFD model 嘅好處就係話，即係可以睇到佢譬如話度到嗰啲 leaching rate、釋放量、釋放率係咪合理，因為最終都係我哋感興趣都係個 water tap concentration，咁就個 model 就係做到呢樣嘢，即係我哋只係做呢樣。

如果我哋去度，咁第一，即係要好--個時間同埋你度到幾多，即係我諗係你哋先至 mind，即係咁會係--即係我哋比較嗰個 benefit-to-cost，就唔覺得值得做，即係我哋反而係覺得我哋選擇做個 model 反而緊要好多。因為我哋亦都想睇下即係嗰個，究竟個 drop，即係你頭啖水嗰個變化係幾多，你話係半秒、一秒、二秒，即係或者一分鐘、半分鐘，咁嗰個就反而對我哋嚟講又覺得緊要啲，因為你可以解釋到唔同嘅資料。咁所以即係我諗係一個取捨，亦都我哋唔覺得我哋會做得好過佢 government lab 嘅 chemist。

問：所以你就冇自己話我就走去切啲自己鍾意嘅部件，就自己驗嗰個就冇嘞？

答：冇，冇，冇，係呀，冇，冇，即係...

問：呢個就係即係所謂權衡利害之下嘅一個折衷嘅辦法？

答：係呀，權衡利害，係，係。

問：係。跟住我要--你嘅 32 段，其實就我有一連串嘅問題要問你。

石先生：但係主席先生，我諗不如我哋食完飯之後，我會返嚟繼續。

主席：晏晝食完飯先至再繼續，好唔好呀？

答：好，好。

主席：咁我哋兩點半再繼續，唔該晒。

下午12時58分聆訊押後

下午2時31分恢復聆訊

出席人士如前。

食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授及香港科技大學副校長（研發及研究生教育））宣誓繼續作供
石先生繼續主問

問：李教授，我哋午飯之前，我就讀到第 31 段，我而家就同你睇睇你嘅第 32 段，係 E1 嘅 140 頁，就係：

"The independent sampling and measurements by two accredited laboratories demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

呢一句就即係我想你睇一睇有冇需要澄清，首先，你講 independent sampling，你就係講緊科大進行嘅嗰個即係獨立嘅抽樣嗰個步驟喇？

答：係，係，係。

問：你唔係講緊水務署佢本身一路做開嗰種--嗰個調查，亦都唔係講緊 Task Force，你個 independent sampling 你就係講緊 UST 自己做嗰個喇？

答：係，係。

問："And measurements by two accredited laboratories"，你呢度嗰個所謂"measurements by two accredited laboratories"係邊兩個 accredited laboratories？

答：係指 Government Lab 同埋科大個實驗室。

問：Okay，你即係話科大佢嗰個抽樣嘅呢個程序，抽完啲 sample 出嚟，就十一個受影響屋邨加六個非受影響屋邨，就每棟樓就--即係每棟大廈三個樣辦，即係呢一個咁嘅步驟，就我哋都知道就係話你就將佢哋出嚟嗰啲水辦分批，有啲畀咗科大嘅，你就係指呢一個"by two accredited laboratories"，呢個其實？

答：係，係，係。

問："Demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

呢度就係有少少嘅疑問，呢度你有冇啲嘢需要澄清嘅，呢一度？

答：即係或者我哋直情刪去"by the Government Laboratory"，即係其實就主要就話兩個 accredited lab，我哋經過 cross-checking，都 confirm 咗個準確度，所以就可以其實就刄咗"by the Government Laboratory"呢幾個字。

問：Okay，okay，即係基本上你就係講番就係科大抽出嚟嘅水辦就之後係經過兩個 accredited laboratories 各自去驗？

答：係。

問：加上，我諗你嘅意思就係亦都有十八個樣本係大家有 cross-check。呢一個就係即係確保咗科大抽水呢個程序嗰個 robustness 同埋個準確性，係咪呀？

答：係，係，係。

問：跟住"Based on the average kitchen tap flow rate of 0.26 L/s, turning on the tap for 2-5 minutes (say 3 min) would cover a supply chain pipe length of over 100 m.

Assuming a typical pipe length of around 20 m, this would translate to more than '5 plumbing volumes'."

呢個"supply chain pipe length of over 100 m"係由邊度度起？

答：呢個由個 tap，由個 tap。

問：由 tap 度到邊度？

答：即係話我哋睇--或者睇 appendix II，Figure 1。

問：Appendix II...

答：II。

問：...Figure 1 即係 149 頁？

答：係，149 頁，係，即係...

問：Figure 2，係咪呀？你意思係？

答：Figure 1。

問：Figure 係上面，okay。

答：係，Figure 1，即係個意思就係 Figure 1，我哋就話我哋去到八十秒就大約 50 個 metre 嘍，55 個 metre 嘍，即係會...

問：哦，係，okay。

答：...correspondingly 抽。咁所以呢度個意思就係話如果我 flush 譬如三分鐘咁，咁就即係三分鐘，180，即係差唔多 100 米嘅，即係如果你延伸，就 100 米嘅 supply chain，咁即係話其實就由個 down pipe 去到 tap 嗰截其實就清晒，就即係咁嘅意思。

問：Down pipe 即係你梗係唔係由水箱度起喇？

答：唔係。

問：即係由打橫開始入嗰層樓開始？

答：係。

問：你如果係 run 得...

答：三分鐘，三分鐘、五分鐘，係。

問：...三分鐘，就打橫嗰條 pipe 已經清洗過大約有五轉？

答：清晒，應該清晒。

問：Okay，得。

"Hence the government sampling method was essentially a 'fully flushed' sample..."

"The government sampling method"，你嘅意思係，唔係講緊 Task Force，你係講緊水務署即係一路嚟做緊調查水質嗰個抽水嘅步驟，即係以你所知道，譬如話水務署你都知道佢哋嘅證人都講過，佢哋調查嘅時候--唔係 Task Force，水務署自己調查，...

答：係，水務署，水務署。

問：...係 flush 過嘅，你嘅意思即係話根據水務署嘅形容，佢哋嗰種驗法，就其實都係根據你嘅理解，就係叫做一個 fully flushed sample喋喇？

答：係，係。

問：Okay。

"...the government sampling method was essentially a 'fully flushed' sample according to generally accepted definitions (time taken to flush 3-5 plumbing volumes). The WSD sampling would not give the maximum or average lead exposure levels of the consumer. Nevertheless, the collective WSD data was very useful in guiding the independent sampling, and also as a basis for assessing the general lead contamination risk among the PRH estates."

你嘅意思即係話雖然水務署佢哋調查嘅時候所做出嘅，即係量度

出嚟就唔係真係叫做代表到最高嗰個濃度，但係佢都可以畀到一啲指示你哋，即係譬如話可--即係應該係咪咁講呢？就係佢量度到起碼有十一個受影響屋邨，你就起碼用嗰個作為一個 starting point，其他嗰啲非受影響屋邨，你哋就可以基於呢一個作為一個指引，就話「非受影響嘅，我就喺裏面抽樣出嚟得喇。」十一個佢哋話受影響嘅，你哋就會驗晒，係咪咁樣嘅意思呢，...

答：係，係，係咁嘅意思。

問：...你話嗰個叫做“in guiding the independent sampling”？

答：係，係，可以咁講，可以咁講。

問：Okay，得。其實睇番第 32 段，你其實呢個可能係即係律師睇嘢，好多時候睇番啲 heading，第 32 段其實你唔係真係叫做 reveal 緊個 WSD 嘅 Task Force 嘅 report 嘅，對嘛？

答：（沒有可聽到的回答）

問：你呢一段其實係講緊 WSD 佢自己驗水嘅步驟，係咪呀？呢一段其實唔係真係叫做 commenting on 個 Task Force，呢一段係 commenting on WSD，作為水務署自己做嘢嘅方法，係咪呀？

答：係，可以咁講，可以咁講。

問：Okay，好。因為我哋知道水務署自己一路調查同埋 Task Force 係兩樣嘢嚟嘅，我哋要明白。

答：係，係，可以咁講。

問：Okay，得。33 段：

“The tap water concentrations measured in this study...”

“this study”嘅意思就係 UST 嗰個 independent sampling 嘅 study，對嘛？

答：係。

問：“...are consistent with the significant lead content of the solder measured (between 27 per cent and 42 per cent, page 21 of task force report). The use of the isotopic analysis to ascertain the correlation between lead in water and the lead in the solder joints is judged to be reasonable and valid."

呢度你講到嗰個 isotopic analysis，即係嗰個同位素嘅測試，我哋長話短說，我哋知道就係話因為我哋知道潛在地可能含鉛嘅唔係淨係有焊料，好多部件都潛在地會含鉛，而亦都曾經測試到，就係有一啲嘅部件其實都含有一定嘅含鉛係超越咗相關嘅英國標準嘅，咁所以曾經有過一個疑慮，就係其實水裏面嘅含嘅鉛會唔會唔係焊料度嚟嘅呢，會唔會係嗰啲配件嗰度嚟嘅呢咁，而我哋知道就係用咗一個--即係 Task Force 用咗一個叫同位素嘅測試，因為唔同嘅鉛嘅來源，佢哋釋出嚟嘅鉛嗰個原子裏面嗰個成分都唔同嘅，因為鉛有唔同嘅同位素，就基於呢一種偵測，佢哋就知道水裏面含嘅鉛嘅同位素，其實搵番個源頭，就大部分都唔係來自配件嘅，而係來自焊料嘅？

答：焊料，係。

問：你睇番 Task Force 呢一個 approach，你就係針對呢樣嘢，你就話佢"judged to be reasonable and valid"，係咪呀？

答：係，係，係。

問：第 34 段：

"Measurements on pipe joints in the flat Hung Hei House Hong Fuk Estate (HFE) - where stainless steel pipes with mechanical joints and copper pipes with lead-free solder joints are used - show the absence of lead (Annex 2.7 of WSD Report)[A1/19/772]. The pipe points and fittings in these flats are otherwise similar to flats in the affected estates. This control experiment provides solid evidence that the leaded solder joints should be the main cause excess lead in drinking water and the relative insignificant lead contribution of copper alloy fittings. Tak Long House of Tak Long Estate that we visited is a similar building that uses stainless steel pipes and mechanical joints. The tap-water lead concentration in one flat of Tak Long

House (not included in this report) also indicated below detection levels."

呢個就係一個好基本嘅科學實驗嘅方法，就係你搵一個叫做 control sample，就係冇咗你懷疑出事嗰部分嘅嘢，我哋呢個 case 就係冇咗含鉛嘅部件，譬如話佢係用 mechanical joint 嘅，根本冇焊料嘅，你去除咗呢樣嘢，就驗出嚟，真係水裏面冇鉛，從此，你就可以作為一個支持嘅論據，就係罪魁禍首喇可以話，主要嘅來源就係含鉛嘅焊料，係咪咁樣嘅理論？

答：係咁嘅意思。

問：第 35 段。

"The mathematical model adopted in the WSD report is essentially a mass balance assuming fully mixed conditions. Consistent with the present review, the results generally indicate the significance of the contributions of the lead solders (or the lead deposits along the pipes derived from the lead solder). However, it is highly questionable whether the lead sources in the copper pipes (e.g. p.30 of WSD Report) **[A1/19/681]** can be estimated by linear extrapolation of the measurements on short lengths (0.2 m) of copper pipes containing lead deposits. There is also no data to test the scenarios depicted. The estimates of lead mass leached from the pipes for the Kai Ching Estate are hence prone to significant uncertainties. This uncertainty will affect the relative contribution of lead deposits on pipes, joints, and fittings to the water tap lead contamination. Additional tests similar to the vacant flat experiments will help to further resolve this issue."

呢一度，似乎你係針對緊嗰個 Task Force 嘅報告裏面其中一項，你就有少少嘅問題提出，我想確保大家聽見呢度，了解其實你所提出嘅疑問係關於乜嘢，因為裏面好多好技術性嘅語言，你可唔可以簡單咁樣解一解，其實你針對評論緊嘅係嗰個 Task Force 報告裏面乜嘢嘅部分？同埋呢個 Task Force 報告嘅呢個部分雖然係你形容係有個 questionable 嘅部分，但係影唔影響整體佢嘅結論？

答：係，即係佢主要結論就即係話 leaded solder 係主要嘅來源，即係鉛嘅來源，所以呢個結論就唔會有影響嘅。

問：唔受你呢個質疑影響嘅？

答：唔受呢個影響嘅。

問：呢個質疑係關於咩嘢呢？

答：咁就但係因為基本上喺個報告入面，就係三樣嘢嘅含鉛嘅來源都有一個估計嘅，就啲 joints，即係好似啲 elbow 嗰啲 joints 就有啲數據，即係有啲直接度出嚟嘅數據，啲 fittings 亦都有啲直接度出嚟嘅數據，即係話啲 leaching rate，即係啲釋放量嗰啲咁。

問：Joints 就係要駁埋，中間用焊料嗰啲就係 joints 喇？

答：係，係，係。

問：Fittings 就係指嗰啲 meter、...

答：係喇，啱。

問：...嗰啲 valve，嗰啲即係閥或者嗰個--嗰啲閥門，嗰啲叫做，或者係個水喉本身，呢啲即係嗰啲部件，呢啲就係嗰啲 fittings 叫做？

答：係，fittings，係。然後水管入面亦都有啲估計嘅，但係我呢段嘢講，就話覺得嗰個不定因素，即係呢啲咁嘅估計，最不定嘅因素就係喺啲喉入面嗰啲含鉛量，即係喺嗰啲喉嘅 pipe wall，啲牆，啲管嘅牆嗰啲含鉛嘅 deposit，嗰啲估計係最 uncertain，最不定，因為佢基本上成個供水鏈，可能 20 咪長嘅，可能你其實度咗，就一、兩、三橛，0.2 咪嘅，即係剷出嚟度，咁 base on 0.2 咪嘅度出嚟，就要有一個 extrapolation，呢個就其實就真係好大 uncertainty，因為咁複雜，即係喺個水流咗咁多--即係咁長嘅時候，你究竟喺沿住條管每一截有幾多沉澱，有幾多同啲 carbonate 同 hydroxide 有反應，而沉澱喺嗰個管道入面，其實就唔知嘅，亦都冇可能係逐個去度。

所以呢個係一個--我諗當喺有限數據一種 extrapolation，但係相對嚟講，呢個係最 uncertain，譬如配件，你有個範圍，你而家連範圍都唔係咁知，即係都唔係咁知，其實。

問：可唔可以咁講，就係 Task Force 嗰個報告入面，佢就用好多嘅唔同嘅方法或者技巧，達至到一個結論，就係個原兇，就係 solder，呢個焊料裏面用咗啲含鉛嘅焊料，譬如話，而你亦都見到係有--譬如話係有個 control experiment 諸如此類咁樣，好多唔同嘅結果都支持呢一個結論，但係呢個 Task Force report 裏面，佢就企圖用一個數學嘅估計嘅方式就去支持或者係達到同一個結論，就係去即係話同你頭先所講，就係唔同嘅可能嘅源頭，條管本身、組件同埋 solder，用一啲 extrapolation，好多嘅假設，就試下計條數出嚟，睇下 as between 呢種種唔同嘅喉裏面嘅嘢，究竟邊一種先至似係原兇呢，佢就希望用一個數學嘅方式計出嚟。你嘅意思就係話就用呢一種企圖用數學嘅方式計出嚟，裏面就牽涉咗好多 uncertainty 嘅嘢，咁所以就--如果想達至嗰個結論，支持嗰個結論，呢一種嘅方式就未必係真係一個可信納或者可靠嘅方式，係咪呀？

答：即係...

問：或者需要再做更多嘅測試，先至可以支持到？

答：做更多嘅測試，就即係嗰個部分，嗰部分。

問：但係就算你唔用呢一種嘅計法，你亦都本身已經你都滿意，就係其實其他嘅方面嘅測試都已經支持到嗰個結論，就係其實嗰個主要嘅來由就係嗰個 leaded solder？

答：係，leaded solder。

問：即係含鉛嘅焊料，係咪？

答：係。

問：如果想用數學方式計，得，可以慢慢計，做更多嘅測試？

答：係，係。

問：冇咗佢都唔緊要嘅？

答：係，係，可以咁講。

問：好，唔該。跟住到到"Summary and Conclusions".

"Independent planned sampling and analysis of lead contamination of 43 buildings in 17 PRH estates have confirmed the main WSD findings. Regardless of the method of sampling, the 'affected estates' and the 'unaffected estates' are largely confirmed."

呢度你係講緊其實就係嗰個 Table 6 嗰度嗰個結論，係咪呀？

答：係，係。

問：即係灰色嗰拃就係根本係 affected estates 裏面嘅核心，你可以話？

答：係，係。

問：有十一個水務署覺得係 affected 嘅，你嗰度灰色咗嗰拃就係嗰十一個裏面，你就 highlight 咗有六個，就係好灰嘅？

答：係，係，可以咁講。

問：其他，當然，我哋會見到有一啲係怡明咁樣，嗰啲就我哋都見到雖然佢有啲 class 3 buildings，但係你都係基於頭先你所講過嘅理由，就係覺得佢哋係比較個風險係次要啲嘅？

答：係，可以咁講。

問："The more detailed sampling results in a more accurate assessment of the extent of lead contamination in the different estates and buildings."

即係 UST 嗰個係 more detailed sampling，所以你就覺得呢個 more detail 嘅 sampling 就更加準確，得出嚟嘅結果？

答：係，係，係。

問："The average lead concentration of about 50 per cent of the samples in the 'affected estates' exceeded the WHO provisional guideline value of 10 micrograms per litre.

Lead contamination in the densely populated PRH estates seems to be dominated by lead solder deposits in the numerous joints of the water supply chain from the down pipe to the individual flats. The lead concentration at the kitchen tap varies with time in a complex manner possibly due to the random nature of the lead deposits in the system. First draw samples may or may not contain the highest concentration. In general, more sporadic variations and higher concentrations are found in the estates completed in or after 2010.

The detailed sampling provides data for health risk assessment. Both the data and CFD results indicate that lead concentration in most cases drop rapidly within 30 - 60 seconds. A flushing time in the order of 0.5 - 1 minute appears to be adequate for guarding against risks of lead contamination.”

李教授，有一點我想同你返番轉頭睇一睇嘅，就係我想你先攞番剛才我哋睇過有幾個大表，就係 173.1 開始，剛才你講過，就係右手面嗰個 column “infant weekly intake (μg/wk)”，嗰度你就話你係將嗰啲含鉛量，將佢 translate 成為 micrograms per week，就方便去對比。

答：係。

問：我想你睇一睇世衛嗰個準則，我想你睇睇 C21 tab 175，呢個就係世衛1993年嗰個準則，你睇18941頁，呢份文件嘅起頭就係喺18938嘅，你見到就係“Guidelines for Drinking-Water Quality”，1993，你見到喇？

答：係。

問：你睇到裏面講鉛嗰部分就 18941，中間嗰度：

“In 1986, JECFA established a provisional tolerable weekly intake (PTWI) for lead of 25 μg/kg of body weight (equivalent to 3.5 μg/kg of body weight ...)”。

麻煩你可唔可以簡單咁樣同我哋--跟住佢繼續講，就係：

“...(equivalent to 3.5 μg/kg 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. Assuming a 50 % 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 mg/litre ...”

即係10 micrograms per litre。

我粗略嘅理解，你點解喺嗰度整個“infant weekly intake”，跟住micrograms per week，即係correct me if I’m wrong，就係嗰個tolerable weekly intake，PTWI，就係25 micrograms per kilogram of body weight，由於嗰個假設係一個bottle-fed infant佢係5個kilogram重嘅，所以你就25個micrograms乘5，因為25乘5等於125？

答：係。

問：所以首先你就25個micrograms per kilogram，即係125 micrograms per 5 kilogram，而呢125 micrograms per 5 kilogram，你當佢有一半係來自食水，...

答：係，係。

問：...所以就個估計其實就係每周一個5個kg重嘅infant，佢飲嘅水嗰個limit就應該係62.5 micrograms，係咪呀？

答：係，係。

問：25乘5，跟住乘50 per cent？

答：係。

問：就係咁derive出嚟？

答：係。

問：所以其實如果你睇嗰個infant weekly intake，你用micrograms per week嚟到去計嘅話，62.5或以上就見紅㗎喇，即係紅色，應該alert㗎喇，對嘛？

答：係。

問：所以如果你睇下呢個"infant weekly intake (μg/wk)"，右手面呢個 column，你會一路睇，睇到就係，就算你係十幾、二十幾、三十幾，仍然都係黑色，冇事嘅？

答：係。

問：直至到你去到譬如話 173.3，你見到 92.8，就紅咗喇？

答：係，係。

問：因為佢係超過咗 62.5。

答：係。

問：所以你如果用 infant weekly intake，micrograms per week，assuming 5 kilogram weight 嘅話，嗰個 limit，呢度睇，per week 計，就係 62.5 microgram，對嘛？

答：係，係。

問：即係要睇右手面就用 62.5 microgram 作為基準，對嘛？

答：係。

問：得，okay。好，唔該晒。我冇其他嘅問題，但係其他嘅--即係代表其他當事人嘅大律師，佢哋仲會有啲問題問你，跟進嘅。

答：係。

石先生：我冇其他問題。

主席：唔該。

<u>王先生盤問</u>

問：李教授，我係代表水務署嘅，有幾個問題，我想同你澄清下。首先就

睇你個證人口供嘅第 36 段，第 36 段。

答：36 段？

問：係。

答：係。

問：因為我哋而家社會上就有個--甚至喺呢個委員會度都有一個好大嘅爭議，就係究竟用頭啖水嚟做水樣辦吖，抑或用我哋水務署用個 flushed 2 to 5 minutes 嗰個嚟做抽水樣辦，兩分鐘就係有人住嘅，五分鐘就冇人住。但係你第 36 段，你就 confirm 咗，“Regardless of the method of sampling, the ‘affected estates’ and the ‘unaffected estates’ are largely confirmed.”。

即係無論係用水務署嗰個 flush 嘅 method，抑或用李教授你嗰個比較複雜嘅方法，其實呢個方法就五啖水嚟嘅，頭啖水，隔二十秒之後攞第二啖水，再隔二十秒之後再攞第三啖水，再隔二十秒之後再攞第四啖水，隔二十秒之後再攞第五啖水，所以其實你嗰個係一個五啖水嘅一個平均值嚟嘅，個 total mass 除個 total volume，係咪？

答：係。

問：我一陣間會同你探討下你嗰個 model。但係無論係邊個 model 都好，其實嗰個 unaffected estate 同 affected estate 都係 largely confirmed？

答：係。

問：呢樣嘢就點解我要同你 confirm 呢，因為你出咗呢份報告之後，就有報紙就賣話出咗新嘅五條屋邨就係有受影響，其實我想澄清就係冇呢件事嘅，好喇，怡明邨...

主席：冇咩嘢？冇邊一件事？

王先生：即係冇五條新嘅屋邨喺嗰個--或者我咁講，係冇五條新嘅屋邨個 building concentration，根據 Prof Lee 嘅計算，係高過佢嗰

個標準。

問：係咪？

答：係，即係簡單嚟講，就彩德、水泉澳、葵涌同埋怡明都 okay 嘅，即係你睇番我哋 independent sampling 總體嗰個，你睇到就係都係喺上面，即係個意思就係話--即係我哋點解喺呢啲 unaffected estate，就正話講過，因為十一個樣辦，我哋覺得需要重視，咁就所以呢個係完全 random 呢個 sampling。

問：明白，明白。

答：呢個 random sampling 出嚟嘅結果就喺呢個表度。

問：明白。

答：即係總體嚟講，就譬如彩德咁係好 okay 嘅。

問：明白。

答：所以呢個係你講得啱，呢個喺呢點度啱，即係。

問：明白。好喇，就有一點即係 out of abundance of caution，我想同你 clarify，係關於怡明邨嘅，怡明邨，如果你去睇你個報告嘅 Table 6，Table 6，即係 161 頁嗰度，頭先委員會嘅大律師都帶你睇過，怡明邨嗰度就話有一個就話係 class 3 building 嘅，個"1"字嗰度，係咪？

答：係，係。

問：我就想睇下呢度有冇出錯啫，我哋睇下你嗰個新嘅數據係 173.4，173.4，173.4，第 173.4，上面關於怡明邨嗰度，就有一系列嘅數據嘅，就怡明邨嗰啲數據好靚嘅，好多個 0 嘅，除咗 1124 嗰度，喺"T=60"秒嘅時候就 0.15，係咪？

答：係。

問：所以由於佢有一個 T 等如 0.15，所以佢個 flat concentration 就變咗 0.017。

答：係，係。

問：如果我冇理解錯誤，李教授你嗰個 building concentration 其實就係好簡單嘅啫，就係三個 flat concentration 加埋除 3？

答：係。

問：所以如果你個 building concentration 喺怡明邨嚟計，其實照計，就唔應該係屬於 class 3 building，如果你除 0.017 除 3 之後，應該就係 0.051 度，啱唔啱？

答：係，係，即係呢個就正話即係都約略提過下，就呢個係一個--即係我哋講咗係一個 singular case，其實我哋都考慮咗要唔要再翻度，經過好多考慮嘅,但係我哋覺得點解 highlight 佢,即係 quote and quote 3 呢，就即係覺得值得注意，值得注意，因為我哋解釋唔到點解個 sample 咁高，我哋其實同兩個實驗室話「你有冇可能你度個時候有少少偏差？」...

問：出錯。

答：...佢哋好堅強咁就話一定啱，即係啲數據，即係佢哋 accredited lab 有一個 QC、QA，所以呢個就係一個對我哋嚟講，一個 singularity，嗰個即係 quote and quote 3，就呢個係有一個特別嘅意思，...

問：我明白。

答:...就唔係照嗰個 normal definition,你講得啱,如果照個 normal definition，可以根本唔理佢，都唔當佢 3 都得，但係呢個即係好特別，即係咁高嘅。

問：即係如果根據你個 definition，其實個"1"字其實應該移過 class 2 building 嗰度，啱唔啱？

答：係，係，係。

問：好喇，第二，亦都係如果你睇怡明邨嗰度，佢喺 T 40 秒嘅時候係 0 嘅。

答：係。

問：T 80 秒嘅時候都係 0 嘅，零零舍舍佢喺 T 60 秒嘅時候就 0.15，都幾高嘅，0.15。

答：好高，150 係好高。

問：咁有冇可能好似你今朝咁講，其實係有一個 possibility of contamination 呢？即係有污染，譬如話一滴塵跌咗落去，所以令到佢呢個數字咁高，有冇呢個可能性？即係 sampling 嘅過程入面。

答:即係污染,照計我哋啲 sample 都係咁 handle,一路都係咁 handle,我哋冇理由去懷疑，因為成個程序都幾照足嘅，亦都正話都講，我哋都反覆其實都探討過，因為呢個數據，我哋亦都同啲 chemist，同啲同事，同啲同事都考慮過呢個問題，最終嘅結論就話似乎唔係個 measure，...

問：唔係 measure。

答:...似乎真係,所以因為真係你有一個--譬如一個 random particle pick up 咁，雖然你一個 sample，但係亦都代表可能 system 即係有 particle，即係有嘢，所以一個--所以我哋覺得係需要再睇呢個，...

問：係，再睇。

答：...再做，即係再 confirm。

問:你都同意,即係如果有個 outliner,好似而家咁樣,周圍都係 0 嘅,突然之間一個高咗，你話要再睇，其實就係喺個 sampling 過程入面，都要有個可重複性，係咪？

答：係。

問：即係佢可以 repeat，即係譬如話我再做多次，如果佢喺 T 60 秒嘅時候都係出現咗呢一個數嘅，咁嗰個數值就有--個價值就高啲喇，因為佢重複咗？

答：係。

問：但係如果你再做多次，去到 T 等如 60 嘅時候，冇咗，係咪？就冇再重複，所以呢一個數字嘅價值或者科學性就可能要再 verify，啱唔啱？

答：我唔會話呢個數字嘅科學性，而係個隨機性。

問：隨機性。

答：佢可能唔係 T 60，可能下一次 T 係 20 高，即係因為成個過程其實都有啲隨機性嘅，成個，因為你日日都唔同嘅人用，即係你點都有少少隨機性，所以我唔會話--即係我唔會 expect 我下次再攞，個 T 係 60 會係 exactly the same，it won't，it won't，it just --即係唔會嘅，因為佢成件--成個現象係一啲隨機性。咁所以但係我同意，即係呢個一種--即係成個整體個 building 同埋個屋邨就應該就一致性嘅，所以亦都係我哋呢個 statement 話大致上 confirm，就係因為我哋似乎做出嚟嘅比較嚴重有 lead contamination 嘅屋邨就同水務署嗰個就幾一致。

問：一致嘅？

答：一致，但係一致唔表示 identical，即係唔一...

問：係，我知，因為你用個 method...

答：即係嗰六個屋邨就一致，一致。

問：因為你用個 method 唔同，所以嗰個 lead concentration 嗰個 level 都唔同，係咪？

答：係，係，係。

問：好喇，第二個問題就係你嘅第 37 段，第 37 段嗰度你有一句...

答：30，係。

問：37 段。

答：Okay。

問：141 嗰度，你嗰度有一句話"First draw samples may or may not contain the highest concentration."，李教授，其實經過你啲數字，我都睇過 173 嗰幾版嘅數字，我一陣間會同你詳細睇嗰啲數字嘅，就百分之六十三，好似你咁講，百分之六十三嘅 highest concentration 其實都唔係 first draw？

答：係，都唔係 first draw。

問：都唔係 first draw？

答：係。

問：所以如果有一個--我哋有一個概念，就話攞 first draw 就可以攞到 highest concentration，即係我哋一路都咁嘅概念，其實你呢個 experiment 或者你呢個 exercise 就 confirm 咗嗰個 first draw 未必 carry 個 highest concentration 嘅，啱唔啱？

答：因為一般睇你點睇，即係一般 first draw 就 first-drawn 1 litre，我哋呢個係 first-drawn 250 millilitre，所以有少少唔同，所以我哋點解有五個 sample 呢？基本上喺我哋呢五個 sample 嘅涵蓋就有 first-drawn 1 litre 嘅入面喺度㗎喇，所以你如果話因為我呢個數據而 first draw 唔係，咁就我諗如果 first-drawn 1 litre 就未必係，因為响其實呢個表個 lead intake 就...

問：我知道，我一陣間會同你計一計個 sample volume 個問題。

答：所以總嚟講，係同一般嘅諗法，第一，頭啖水最高，就有少少出入，有少少出入。

問：有少少出入？

答：係，少少出入。

問：好，我想帶你去睇一睇 Prof Fawell 有一段喺 V bundle，90 頁，Prof Fawell 嘅 expert statement paragraph 2，paragraph 2，就係 second last sentence 嗰度，佢就咁講嘅，佢話 "Typically first draw water will have a much higher concentration of lead but this may not reflect the concentrations of lead in water ingested in normal use."。

似乎 Prof Fawell 都同意，即係如果我哋係講緊個 normal use，即係話如果我哋係要反映嗰個 concentration of lead in normal use 嘅時候，個 first draw 就未必係好適合，呢個你同唔同意？

答：呢個唔係好同意，點解呢？即係佢話 "Typically first draw water will have a much higher concentration"，喺香港

情形，都大家睇到未必，睇你點 interpret，未必係。

問：哦，即係第一句你都唔同意喇？

答：未必係。

問：好喇，第二句，佢就話如果我哋係想睇下嗰個 normal use，即係話 represent 一個正常，日常咁用水嗰個 pattern 嘅，淨係攞第一啖水，佢都當其時話呢個都唔係好適合，“may not reflect the concentration of lead in water ingested in normal use”，呢一句你又同唔同意？

答：我就會 qualify 少少，我就會調轉嚟寫，我就會係“may or may not reflect”。

問：“May or may not reflect”？

答：“May or may not reflect”。

問：好喇，李教授，我想睇你第 7 段，第 7 段，132 嗰度，你就提出咗一個 concept，叫做“estimate of the mean lead concentration used for drinking and cooking”，係咪？

答：係。

問：如果我哋要搵出呢個 mean lead concentration used for drinking and cooking，其實頭啖水都唔適合，因為頭啖水就唔會反映個 mean concentration，佢會咁反映，可能反映，may or may not 反映個 maximum，即係高啲嘅 concentration，但係如果你要搵出個 mean，即係日常飲用個 mean，頭啖水就唔係好適合，呢個你覺得我咁樣講法係唔係公平呢？

答：唔公平嘅，點解呢？因為頭先我哋睇到，主要睇個 user，主要睇個 user，譬如如果你睇 infant，譬如如果你假設最一句，極端，即係唔係某一種情形，譬如話你係有一部分嘅 population 係用頭啖水做 drinking and cooking 嘅，一部分人啫，英國就做過 study，好詳細，就係百分之四十五人，百分之十四嘅用量，first draw 嘅用量係 cooking and drinking，呢部分嘅人，譬如舉例，佢如果就將呢啲水煲咗，咁成日啲 BB 就用呢啲水嘅，咁對呢拃嘅 user 嚟講，佢係 reflect 個 mean 個 B 咋喎，但係譬如對個 adult，譬如如果我 adult，譬如話你一半，百分之十四嘅用水先係 drinking and cooking 嘅，我就 probability，咁咪 0.14，即係嗰個 risk，所以我嘅回答就話會係 depends on，決定於嗰個 user，就唔可以...

問：即係唔可以一概而論？

答：唔可以一概而論。

問：就係要 depends on 個 user 嘅 habit？

答：User，係。

問：個 consumption habit？即係究竟佢攞第一啖水係...

答：Habit，但係 habit 就似乎你乜嘢數據都會有人用，即係 habit，即係我意思你無論英國嘅數據或者我哋嘅理解就都會有人用頭啖水嘅，所以你除非話某一類 user 可以 take 多啲 risk，即係我意思你點睇都好，都會有咁嘅 user，你話 user 嘅風險大抑或幾大，呢個稍為另外一回事。所以我唔係完全同意你講法，因為我明你嘅意思，但係因為你香港嘅情形就係咁，你煲咗水就用，如果你完全--即係係喇，即係某一個類型嘅 user，譬如呢個 case，infant，對佢嚟講，就唔一定係真係 mean 嘅，係咪呀？

問：唔。

答：咁亦都睇，有啲好低嘅，mean 好低，係咪呀？即係就算我啲數據太低，咁有高有低。

問：明白，明白，多謝你，李教授。我係同意你嘅，即係如果有人係--或者有一個特別嘅群組，佢哋真係朝頭早，或者細路仔或者係其他人朝頭早起身，第一啖水就愛嚟煲水嘅，當然嗰個第一啖水對佢嘅影響就都好大？

答：係。

問：個影響會大啲，呢個無可厚非。但係照計，就有人會淨飲--即係淨係每一日都係飲第一啖水㗎，即係佢都可能會出面飲水，佢嗰個飲水嘅 pattern 都唔會話淨係飲第一啖水，因為 by definition，第一啖水即係第一啖，係咪？所以你唔會每一日淨係飲第一啖水㗎嘛？

答：但係即係就正話我講，就係 depends --即係決定於個 user，個用嘅人，譬如一般就會係煲，一般就煲一壺水，一壺水煲咗之後成日用，

呢類咁嘅 user 就會反映個 mean，但係如果我就咁一起身，我水喉--通常而家都好少人飲水喉水嘅，或者都要飲 boiling water，因為我淨係 boil water，你 boil 唔會淨係 boil 一杯，你 boil 成個 kettle。所以我諗喺個--如果你話我一起身就出街，咩嘢，食早餐咁，咁就唔會。

問：或者喺...

答：所以我諗係決定於個 user，律師。

問：或者起身先刷牙、洗面先，係咪呀？都有可能㗎嘛？

答：係，都有可能，都有可能，都有可能。

問：Okay，李教授，我唔知有冇人同你講過水務署嗰面就曾經做過一個香港嘅 survey，就係關於香港嗰啲人嗰啲 use of 水嗰個 pattern，因為 part and parcel of 一個 total water management 嘅 programme，就我哋就有個 partial 嘅 report 出咗，就話大概有九成嗄香港人起身第一件事就先刷牙、洗面嘅，如果用--我哋而家淨係攞咗五百--大概五百個嗰個調查結果，因為我哋原本目標係一千個嘅，所以 interim report 就睇到大概五百個 response 返嚟，九成香港嘅居民起身都係先刷牙、洗面多過先煲一壺水喺度，然後全日愛嚟飲。

如果嗰個假定，即係可能 depends on 點樣 interpret 個 result 或者係嗰啲 question，暫時假定如果 90 個 per cent 以上嘅人都係先刷牙、洗面先嘅，其實用頭啖水就唔係咁能夠反映出嗰個 mean consumption of lead during the day，咁樣講法，你會唔會認同呢？即係如果九成以上嘅人係先刷牙、洗面 instead of 攞頭啖水愛嚟煲水。

答：呢個我就睇過--我琴日就睇過呢個報告嘅，即係呢個 preliminary 啲 results，我就咁睇，第一，呢個報告嘅對象就唔係純粹屋邨嘅，即係佢係一個 total volume 咩嘢，所以即係話--因為我哋集中就係屋邨啲居民，即係屋邨個 social class，social economic class，所以你一個好 broad 嘅--即係一個成個 population，同呢個--第一點，我想講就係會有啲出入，個 population，因為譬如我即係講番以前，譬如英國做個 study 就好詳細，即係 make sure 嗰個受訪者係好代表性，in fact，佢哋直情 hire 一個 market research 去指定 interview 咩嘢人，因為好專業，因為你要唔同

嘅好代表性嘅 social class，咁就一個。

第二個，我個印象就係你呢個係加咗三條問題，喺個原本嘅 questionnaire 加咗三條問題，嗰三條問題即係個準--即係 the way you question it 就係定性嘅，我就咁睇，就係你每一個 household 搵一個代表，你就搵一個代表問，你問幾個問題咁樣，第一，就唔係定量嘅，亦都唔知佢--即係同一個所謂你真係要搵個--即係真係要搵呢個資料，就需要科學化啲，我覺得。

舉個例，譬如 Water Research Centre，好 way back，1986 做，就真係 automatic samplers，所以你每一個人用、幾時用、用幾多量都知嘅，唔係話譬如你一個家庭，有阿婆喺度，或者一個--譬如十五歲以上，或者你一個人，咁佢未必知佢個仔點做，佢以為佢知啫，未必真係知，即係你以為你知，譬如你一個人，五個人咁，你未必你嘅姐姐做乜嚟嘛。

即係我個意思就話呢個係一個--即係都有一個代表性，但係呢個代表性就係比較係一個主觀嘅 impression，impression，即係話大約會點做，但係大約會點做同我哋而家要嘅嘢就似乎--即係可能需要比較定量啲，唔係好難嘅，其實。

另外一樣，佢話 according to 你呢個 14C，就話‶about 6.5 per cent of households use the first-drawn water for drinking and cooking purposed in the morning.″6.5 個 per cent，6.5 個 per cent，你睇你個 base，都唔少人，6.5 per cent，...

問：6.5，係。

答：...如果我 schedule 你--你而家成百幾條屋邨，即係你好多人，如果 6.5 per cent。因為我即係咁講，我都唔係好知個 details，但係我就因為見過譬如英國點做呢，就覺得就係要好客觀同埋真係要幾 detail 做，就唔係一個好似 social science 一個 survey 可以解決個問題。

問：明白，明白，okay，好。同埋我亦都想澄清一點，其實李教授你而家呢個 modelling -- sorry，呢個 sampling，其實 modelling 同 sampling 係唔同嘅。

答：係，唔同，唔同，唔同。

問：因為你 sampling protocol 去攞水辦，同埋你個 computational fluid dynamic -- dynamic fluid 嗰個 model 係完全兩回事嚟嘅。

答：完全兩回事。

問：兩回事嚟嘅。

答：完全兩回事，但係亦都相連嘅，因為譬如我哋 vacant flat 嘅 sampling 嘅設計，就係因為我哋做一個呢個 model 先乜嘢，唔好意思就真。

問：唔該，唔該。其實你呢個 sampling protocol，我叫五啖水，上中下，因為你每一個 unit 攞五啖水，然後每一個 building 上中下，高層、中層、低層，你 random sampling 攞一個 flat，你呢一個 sampling protocol，其實如果--我想你睇番你嘅 Figure 1，有張表，其實你呢度去到如果用--因為你--我一陣間先至再同你講你個 plumbing volume 嘅問題。

因為你個 definition of 個 plumbing volume 就 20 米，係咪？嗰個打橫個水管，就 20 米流一次，你就為之一個 plumbing volume，啱唔啱？

答：（沒有可聽到的回答）

問：其實如果你去到 T 等如 20 秒嘅時候，就大概十幾米嘢，係咪？

答：係。

問：但係如果去到第二啖，當--唔好，第三啖，去到第三啖水嘅時候，根據你嘅計算，其實都已經係--嗰 20 米都已經 flush 咗，啱唔啱？

答：可以，可以咁講。

問：可以咁講？

答：可以咁講。

問：所以你攞第三啖水嘅時候，其實嗰第三啖水，根據你哋嘅 definition，都係一個 flushed sample，啱唔啱？即係都係沖過水，第三啖水已經係一個 flushed sample？

答：就係，因為呢個係一個平均嘅流量，但係因為每一個 flat 其實都唔同嘅。

問：每一個 flat 都唔同嘅。

答：即係一個 rate。

問：因為我知道嗰個--你而家用 26 -- 0.26 個 litre per second？

答：係。

問：但係其實我哋睇過個表，其實 variant 好大嘅，即係唔係--即係嗰個變化其實可以好大？

答：係，係。

問：我一陣間帶你去睇一睇嗰個流量個變化？

答：係，係，係。

問：我哋暫定如果係用平均值，0.26 個 litre per second 咁嚟計，第三啖水就已經係一個 flushed sample，第四啖水都係 flushed sample，第五啖水亦都係一個 flushed sample 嚟嘅，係咪？

答：可以--即係粗略，可以咁講，因為佢係一個 indicative，可以咁講。

問：所以你個 model 其實係一個混合嘅 model，即係你又攞第一啖水，你又攞到啲 flushed sample，然後你又將呢一堆嘢加埋，個 total mass divided by 個 total volume，就計出個數值出嚟，啱唔啱？即係一個咁樣嘅混合式，一個 hybrid 嘅 model，又唔係 first draw，又唔係 flush，而係一個 first draw 加 flush 嘅，然後一個計算出嚟嘅一個值，咁樣講法，公唔公平？

答：如果你想咁講，都可以嘅，都可以。

問：Okay，好，唔該你。好喇，我就想帶你去睇一睇你嘅第 38 段，你嘅第 38 段，你就話"Both the data and CFD results indicate that lead concentration in most cases drop rapidly within 30 - 60 seconds. A flushing time in the order of 0.5 - 1 minute appears to be adequate for guarding against risks of lead contamination."。

你話根據你嘅計法，就係其實三十秒到六十秒都夠㗎喇，即係沖水，即係如果係我哋都關心市民個健康，飲用水嘅健康，你嘅計法就係三十秒到六十秒都已經夠㗎喇，啱唔啱？

答：即係大部分，我要 qualify 一下，呢啲就指唔係--即係你譬如有啲好--即係嗰六個就好 seriously 即係 significant lead contaminated 嘅，就未必完全 apply，但係一般--即係我哋意思就話你有一個 significant drop within thirty --即係喺三十秒到六十秒有一個顯著嘅衰減個強--鉛嘅含量有一個好顯著嘅衰減，呢個係嘅。

問：你知道，都係喺你嘅 paragraph 2 嗰度亦都 record 咗水務署其實 advise 香港市民就 flush 1 to 2 minutes 嘅，即係一至兩分鐘，你覺得呢個一至兩分鐘呢個 advice 適唔適合--適唔適當？

答：你越長--即係你一個越長嘅，梗係你嗰個有乜嘢鉛喺度嗰個沖走嘅機會梗係越大，但係我個人嘅睇法就係你一至兩分鐘其實就好長嘅，好少人真係開，你又要儲存啲水又盛，因為我覺得就基於今次嘅實驗同埋我哋嘅計數，就係 for 譬如你嗰三個 group 啲 estate，就除咗嗰啲好 significant contaminate 除外，就似乎，似乎即係我哋目前有一個數據做咩嘢，就係 0.5 至一分鐘就 okay。

問：Okay，好。

答：一至兩分鐘當然保險啲。

問：保險啲。

答：當然保險啲，其實三分鐘仲保險。

問：明白，明白，兩至三分鐘仲保險。

答：係。

問：明白。好喇，跟住我就想同你研究下你嗰個 sampling protocol。

答：好。

問：就唔係你個 CFD model，淨係個 protocol 啫。你頭先提到關於個 first draw，有啲文憲係講話用攞 1 個 litre 嘅，記唔記得？

答：係，啱，啱。

問：我記得你今朝早個證據就問過你點解你嘅 first draw 嘅時候係決定攞 250 個 ml，即係毫升，cc，你嘅答案就話--我嘅 record 就係話有啲 constraints 同埋有啲理由，reasons，就"we cannot always obtain the first draw first litre concentration"。我第一件事，我就想帶你去睇下啲文憲，就講點解攞 first draw 嘅時候，一般都係要攞 1 個 litre。我想同你講番點解 1 個 litre 係咁緊要。因為你喺計算個 flat concentration 嘅時候，即係用你呢個 model，你計算個 flat concentration 嘅時候，你係用個 total volume，係咪？

答：（沒有可聽到的回答）

問：所以你個 first draw 究竟係攞 1 個 litre 抑或攞 250 個 ml 就會直接影響到個 flat concentration 個數據嘅，啱唔啱？

答：係，係。

問：好喇，而嗰個 flat concentration 嘅數據亦都會直接影響到個 building concentration 嘅數據，啱唔啱？

答：（沒有可聽到的回答）

問：好喇，所以我就帶你睇下嗰個 first draw 嗰啲 sampling protocol，第一，我想帶你睇下 19.1。

答：十九...

問：19.1。

答：19.1 喺度。

問：14620，你睇 14618 先。

答：14618，唔好意思。係，係。

問：呢個就係水務署個總化驗師嗰個第四個 witness statement 嗰個 annex 嚟嘅，annex 11，19.6，I'm sorry，唔該 19.6。

答：十九點--係。

問：19.6，14618。

答：係。得。

問：如果你攞去 14619，1.4.1，就係個"LEAD AND COPPER RULE SAMPLING"，見到嘛？

答：係。

問：你都熟悉呢個文件，係咪？你睇過㗎喇之前，係咪呀？

答：睇過，睇過。

問：睇過，okay。我哋睇下 14620，first full paragraph 就係咁講嘅：

"Water samples are obtained after the water at the building has stagnated for at least six hours."

呢度就係講緊個 first draw。

"This no-flow period allows time for uniform corrosion processes to occur and for metals to, theoretically, reach peak concentrations in the water. After the stagnation, a 'first-draw' sample is taken from an interior faucet (kitchen or bathroom) in a one liter bottle. A one liter bottle is used to try to capture the largest practical volume representative of contact of the water with the plumbing system."。

呢度似乎都嗰個 lead and copper rule on sampling 都講到好清楚，即係話如果你係目的係要攞 first draw 嘅，嗰個 sampling volume 都好似應該係 1 個 litre，呢個你同意？

答：呢個係，呢個即係係可以--即係我哋係知道呢個 guideline 嘅，亦都唔係淨係 lead and copper rule，EU 都係咁嘅，first-drawn 1 litre，所以呢個 first-drawn 1 litre 我哋係知道嘅。

問：Okay，我帶你去睇埋一個，跟住我就會問你點解要 depart from 呢個 rule，你一定有理由㗎嘛，係咪？

答：係。

問：好喇，我再帶你睇睇嗰個 14587，14587，G 嗰度就係“How Do I Collect Lead and Copper Tap Water Samples?”，佢下面有個 bullet point 嘅，佢就話“Always collect a 1-litre sample in one container only (e.g., do not split the sample between two containers)”。

下面嗰度就話：

“Always collect a first-draw sample from a tap where the water has stood in the pipes for at least six hours (e.g., no flushing, showering, et cetera). However, make sure it is a tap that is used regularly, and not an abandoned or infrequently used tap.”。

呢度亦都講得好清楚，似乎就係話如果你想個目的係要攞 first draw 嘅，咁就係要攞 1 litre，我想問你，李教授，有冇啲文憲講話其實攞 first draw 嘅時候，攞 250 個 ml 都夠嘅呢？

答：首先，夠唔夠其實取決於幾樣嘢，第一，你唔可以攞得太細，因為太細，你唔代表盛吖，第二，亦都取決佢 instrument 個 measurement，即係你需要幾多 volume，有陣時你需要個 minimum volume，所以我哋嘅理解就 250 ml，譬如我哋 50 ml 都，即係 as far as the --即係由個測量嘅角度，就算 50 個 ml 都 okay 嘅，但係當然我哋--好似你講，個 first draw 係想佢比較大啲嘅 volume，比較代表性，即係唔會有啲太細嘅 sample，但係正如我今早講過，我哋亦都進行呢個 independent sampling，亦都有時間同資源嘅限制，亦都要喺一個有限嘅時間，我哋要好有效率咁做完呢件事，即係 sampling。我哋就權衡咗好多利害，就設計咗呢個五個 sample 嘅嘢。

因為開頭嘅時候，香港根本冇人知究竟個 variation 係乜，即係當我哋開始嘅時候，11 月我哋有一個爭論，即係話頭啖水咩嘢吖，抑或係即係 first draw 係代表性吖，抑或係 fully flushed，都冇數據--任何數據顯示，冇任何數據顯示，所以我覺得第一步就係話需要有一個足夠嘅資料，就佢同時間點變化，你先可以--譬如如果佢時間變化得好極端嘅，我哋可以即刻變化，可以 adapt，因為你最終都係想搞清楚件事啫，即係咁樣嘅意思。

所以我哋就係基於權衡利害，權衡資源、時間嘅限制，就結果我哋就話以五個 sample，呢個亦都同 Prof Fawell 都知嘅，即係幾個人都傾過，佢都好熟呢啲，佢都覺得 okay，有冇--因為我哋反而係覺得就話我哋要設計到唔好 miss 咗啲高 concentration，譬如初初我哋其實三分鐘嘅，base on 啲--以前都係三分鐘，如果我哋三分鐘，就--譬如我五個 sample，三分鐘就唔會 miss 咗好多。

因為我想講，就係話嗰陣時點解設計五個 sample 呢？其實好大嘅原因就係想 capture 嗰個--想捕捉個鉛水個含鉛量同時間嘅變化，因為嗰個你唔知呢，其實就好多都無從講起嘅，所以一個首先，即係唔理想，呢個當然如果有 1 litre，我冇好多人--當然係最理想。

問：最理想 1 litre？

答：1 litre，但係，但係我哋覺得喺呢五個 sample 呢個設計下面仍然係可以--仍然係可以，就如今日我個 table 講，仍然可以估計嗰個 first-drawn 1 litre concentration，即係話...

問：但係你推算出嚟，嗰個係，嗰個係推算出嚟？

答：但係其--推算，可以話推算，但係你由任何科學嘅層面去講，都講得通，即係話假如，譬如我啲條件唔容許我做呢個 1 litre，呢個就 probably they comes very close to 一個幾 scientifically credible 嘅 estimate，即係我只可以咁講，我同意，如果 1 litre 就--即係樣樣都 1 litre 最好，但係你有好多其他考慮，好多其他考慮。所以只可以咁樣回答個問題，即係咁樣回答你嘅問題。

問：唔該李教授。李教授，你頭先講話就係話有好多限制，就時間限制，資源限制，各方面，所以就決定唔用 1 litre，用 250 個 ml，我想請你睇 169 頁，V 169。

答：第

問：V 169，有啲相喺度嘅。

答：啲相，喺邊？哦，得，okay，169。

問：如果我哋睇(c)嗰張圖，李教授，呢度有啲 containers 嘅，近住嗰個 kitchen sink 嗰度，大啲啲個 container 就係 250 個 ml 嘅 container 嚟，啱唔啱？

答：係，係。

問:好喇,入面藍色 cap 住嗰啲,有個蓋嗰啲就係 50 個 ml 嘅 container,啱唔啱？

答：係，係，係。

問：其實我就係想了解，如果你想要攞 1 個 litre 嘅水，其實好簡單咋喎，你咪換咗啲 container，攞個 1 個 litre 嘅 container，喺水龍頭攞水囉，點解會有時間、資源嘅問題？

答：因為都--係喋，因為我哋即係組織呢個 sampling team 嘅時候，我哋同一時間六隊嘅，六隊出去嘅，即係要做呢樣嘢，而我哋亦都有--即係 readily available，因為你又要消毒好多嘢，好多細節要注意,亦都有成個 protocol,亦都我哋覺得呢個係 investigation,呢個唔係--呢個 purpose 可以達到，我哋覺得可以達到，所以就我哋就 take the most --即係最有效率嘅方向咁樣做，所以冇乜--即係我哋唔覺得呢個 litre，當然 1 litre 佢有佢嘅背景，因為佢即係 standardisation，即係佢呢啲 rule，但係我哋呢個係 investigation，一個初步嘅 investigation，喺一個有資源限制、時間，就係一個初步嘅，我哋覺得係達到個目的。

所以即係--你講得啱，即係話好似我一噍一啲錢，就可以六個 1-litre bottle，但係你個個就--五次就五個 1-litre bottle，然後再--即係好多呢啲咁嘅，而 1 litre，你亦係用少嘅即係咩嘢，所以我哋傾落嚟，就覺得呢個--即係總括嚟講，就話唔係照足個 guideline，即係 1 litre，但係我哋覺得就係完全可以符合我哋呢個 investigation 嘅目的，即係只可以簡單係咁講，即係呢個觀點角度問題。

問:Okay,得,我知道你嘅答案,唔該。你都同意,如果我哋係用 1 litre 嘅話，嗰個分母，即係你計 flat concentration 嗰個分母就會增加，啱唔啱？

答：（沒有可聽到的回答）

問：我畀個例子你，因為你個表好好嘅，173.1，咁先算，...

答：係邊個 17...

問：173.1，V 173.1。

答：係。

問：因為你又推--即係其實你就推算「如果我攞 1 litre 嘅 first draw，嗰個結果係會點樣樣」。

答：係，係。

問：譬如以清河為例，清河，最後屘嗰個 entry，就成頁紙最下低有個 entry，0.011 嗰個，你 T 喺 0 秒嘅時候，攞 250 個 ml，就 0.011，啱唔啱？

答：係。

問：0.011，好喇，你推算如果--即係呢個唔係真係攞 1 litre 嘅，你推算出嚟之後，係 0.010，就係如果你攞 1 個 litre，嗰個含量就跌咗少少嘅，啱唔啱？

答：係，啱。

問：好喇，如果你用呢個數據再係攞 1 litre 嘅，去計算你嗰個 formula，你嗰個 protocol 嘅 formula，咁對於個 flat concentration 其實會有好大影響，啱唔啱？因為你個分母大咗喇嘛。

答：但係呢個影響可以係加，可以係加抑或減，可以加，亦可以減。

問：可以係加，可以減，我知，我知，我即係講呢個--呢個只係我想講一個例子啫，所以我就係話如果你係用 1 litre 嘅話，係會影響到個 flat concentration 嘅結果。

主席：影響到個咩嘢？個 flat 嘅 concentration？

王先生：Flat，flat concentration。

答：係，影響到 flat concentration，但係因為個定義有少少唔同，定義有少少唔同，即係其實我哋點解定義呢？就係其實想有一個指標嚟睇某一個 building，邊個 building 係相對嚟講嗰個 lead contamination 嘅程度，基本上係咁。所以你唔同嘅 sample 當然會有稍為唔同嘅結論，但係我諗總體嚟講，就應該個總體嘅結論應該

唔會有好大出入。

問：Okay，得。

主席：我想問一問，呢度，譬如呢個你哋攞 sample，T 係 0 second 嗰陣時候，我明，你一開就裝 250 ml 嘅水，裝完呢 250 ml 我唔知要幾多時間，係咪即係你哋有個秒錶喺度，0 就係裝 250 ml，可能譬如用咗五秒鐘，跟住就再加多十五秒，就去到第 20 秒嗰陣時就再裝，抑或隔二十秒呢？

答：主席，就直情照足，譬如 0，就撳鐘，即係撳錶，0，咁就 0 就裝滿，就裝滿咗，然後到 20，一路就開住。

主席：一路開住嘅？

答：開住嘅，然後到 20，又再第二樽咁樣。

主席：係，唔該。

王先生：唔該。

問：李教授，我哋都查過，其實係冇任何文憲去支持頭啖水係 250 個 ml 嘅，咁講，你同唔同意？

主席：冇文憲？

王先生：係。

主席：冇人用過咁嘅方法做？

王先生：係，冇人咁方法做，係。

主席：第一次你用 250...

王先生：第一次，第一次。

問：如果獨立要攞頭啖水，用 250 個 ml。

答：我其實唔可以確定，in fact，我諗你哋文憲就會有嘅，但係呢個我諗唔係咁 relevant，但係我哋呢個係一個調查嚟㗎嘛，即係我呢個係調查嚟，我唔需要照--我覺得做到我哋嘅目的就亦都--我唔係即係唔係咩嘢，亦都 Prof Fawell 又一齊傾過，咁似乎可行，只可以咁講，係咪文憲呢？我相信有㗎喎，250 ml 嘅嘢，應該唔同嘅情形下會有...

問：如果一個 combination，for example，flush，攞 first draw，再加攞 flushed sample，再加攞 stagnation，再加攞其他，譬如一個 basket of factors，我同意你係有用 250 個 ml 嘅，但係如果攞 first draw 愛嚟做呢一個 test 嘅話，係好少單獨會用 250 個 ml 嘅，你同唔同意？

主席：又冇 set --冇一個 set rule㗎嘛，做實驗有嘅咩？

答：係，係，係，即係...

主席：除非你有個乜嘢 standard 定咗出嚟，話一定要咁樣樣跟就係咁樣樣跟嘅啫，如果唔係嘅話，你設計任何一個 experiment，都係基於你嘅需要同埋基於你嘅時間、基於你嘅金錢、好多樣嘢去設計唔同嘅 protocol，一定係咁㗎喇，做實驗，係咪呀？

王先生：明白。

主席：創新科技吖嘛。

王先生：明白。

主席：繼續。

王先生：好。

問：李教授，如果我哋講緊250個ml嘅，呢一個咁樣嘅量其實係攞緊嗰個水管頭一截，係咪？

答：係，係。

問：即係好近水龍頭嘅，係咪？

答：係。

問：所以呢一個first draw嗰個result係會好影響by水龍頭附近嗰一截嘅水質，啱唔啱？250個ml。

答：即係係，我哋--唔好意思。即係如果我哋睇appendix II Figure 1，可以咁講，頭5個metre，5個metre嘜，5個至10個metre嘜嘅--即係喺個供水鏈度頭一橛。

問：我哋而家知道嗰個喉管入面嗰個lead contamination其實就唔係homogeneous嘅，係咪？

答：係。

問：所以如果你淨係攞頭嗰250個ml，其實你哋好難反映到個sporadic嘅contamination喺個喉...

主席：咩嘢話？再講多次。

問：即係你係好難反映到個 sporadic 個 contamination in 嗰個water pipe嘅，淨係攞250個ml嗰度。

答：係，即係我哋都講，每一個單位都有啲唔同，每一個單位都有啲sporadic，random嘅element，但係我估就我哋--你睇到就係個80個second應該就成個sample，所以亦都話你係first draw，即係呢個 first draw 就係 stagnation 之後個引起嘅頭啖水嘅總體個總含鉛量應該就捕捉到，即係個設計係咁。

至於話係咪完全捕捉到呢？因為我哋只有五個 sample，但係我

哋覺得就好大程度上就捕捉到嘅，因為你點睇，橫睇掂睇都幾吻合嘅，亦都同水務署嘅數據大體上吻合，但係有啲 fundamental 嘅唔同，但係大體嘅吻合。所以我哋睇就話係有美--即係當然唔係 perfect，但係 again，對我哋個目標嚟講，似乎就都係達到，只可以咁講。

問：或者我喺呢個題目最後問一個，就係話你頭啖水攞 1 升吖，抑或攞 250 個 ml，呢一個 sample volume，喺科學上，對於嗰個攞出嚟嘅 sample 入面嗰個含個 mass 係會有影響，唔會冇影響。

主席：含鉛個咩嘢話？

王先生：Mass，即係嗰個含鉛量，係會有影響。

主席：佢攞多啲，個 mass 就梗係唔同喇。

答：會有影響，即係你唔同嘅，會有影響，係，會有影響，係，係。

問：好，得，好。我跟住又想問你，你第一啖水就決定咗用 250 個 ml，你第二啖水攞嘅時候，就係 50 個 ml 嘅，即係隔兩分鐘，由個水喉 -- sorry，二十秒，個水喉流咗二十秒之後就攞第二啖水，第二啖水就攞 50 個 ml，係咪？

答：係，係，係。

問：我想問攞 50 個 ml 呢一個數量個理據喺邊度？點解要攞 50 個 ml，而唔係攞 250 個 ml？

答：主要都係資源同--因為我哋嗰個實驗室係用開 50 嘅，譬如個個實驗室都有啲唔同嘅習慣，唔同嘅取向，我哋嘅實驗室就係覺得 50 就已經好足夠，而亦都我哋覺得 50 都唔係話太細，即係攞呢個 volume，所以就咁，因為你取材吖嘛，即係就地取材，就地取材，就係覺得滿足到個目標，即係我哋有一拃，因為講得好多量嘅，我哋一百二十九個 flat，同埋一百二十九個--係喇，一百二十--係咪呀？大家睇一睇嗰個總數，係即係好--個量幾--六百幾個 sample，即係始終係有一個資源嘅問題，即係你六百...

問：資源問題？

答：係，資源同埋時間同埋效率，即係好多嘢考慮。

問：明白，好。中間分開，相隔二十秒，點解設計二十秒呢？有冇啲咩嘢思考喺背後呢？點解係二十秒呢？個理據係咩嘢？

答：其實原本我哋係三分鐘嘅，基於以前啲數據，係三分鐘嘅。

問：三分鐘嘅，係。

答：咁好彩就冇走去攞三分鐘嘅，因為攞三分鐘就會完全捕捉唔到個高濃度，褸尾就同啲 chemist、我哋嘅啲同事咁樣就傾過，就覺得你三分鐘唔會或者--即係三分鐘，我哋總共就話五個 sample，你嘅 end point 喺邊？End point 喺三分鐘，你第一個 sample 都已經成好耐喇嘛，所以就未必可以捕捉到嗰個比較高個頭啖水個含鉛量喎，所以褸尾諗諗下，都係不如--點解二十個 second，因為你其實係開水喉，攞咗 250 ml，差唔多搞得嚟都二十個 second，即係有好多實際嘅考慮嘅，但係似乎覺得八十個 second 係合理，同埋睇啲數據，都似乎捕捉到，咁就咁定。

即係原本我頭--今早都講，原本係其實攞兩個 sample，因為原本都每個實驗室都有其他嘢做，即係都有一個時間、資源嘅限制，但係褸尾睇睇下，就似乎覺得要攞晒五個 sample，所以而家基本上大部分都有五個 sample。所以二十個 second 係冇嘅，即係一個--你可以講一個經驗，一個 iteration，就達到呢個 protocol，結果就行呢個 protocol。

結果褸尾去到 vacant flat，我哋覺得就因為已經有個經驗，就想度長啲，就度長啲，咁咪多啲 sample，度長啲，呢啲 vacant flat，我直情十個 sample，但係嗰陣時做唔到你每個 flat 十個 sample，即係其實好 labour intensive 嘅。

所以二十個 second 就係咁嚟喫喇，即係話要捕捉到比較真係頭啖水啲濃度，而亦都可以測量到個變化，尤其是我哋好 interest 就係佢 drop。所以達到呢兩個目的，權衡就覺得八十個 second 似乎--試下喇，咁試下就似乎 okay，即係咁嘅原因。

問：Okay，李教授，你就頭先同我哋講呢一個 sampling protocol 就係你為咗今次呢個 exercise design 出嚟嘅，即係創新科技，新創嘅呢一個 sampling protocol，全新嘅。

主席：設計出嚟嘅？

問：設計出嚟？

答：設計，係，係可以咁講，我冇乜諗過係全新，即係要達到個目的係得--唔係好多嘅 choice。

問：你講好似好達到目的，你要達到個目的就係搵最高嘅 lead concentration，嗰個就係你目的，係咪呀？即係呢啲--呢個...

答：同埋個變化，同埋個變化。

問：同埋個變化。其實你呢個設計呢一個 sampling 嗰個目的就唔係去搵嗰個平均，即係 average 嗰個正常，日常飲用個 average 嗰個值，而係去搵一個 maximum 同埋個變化，呢個就係你個 sampling protocol 嘅目標，啱唔啱？

答：但係即係咁講，你唔知個最大值，就冇可能知道平均，所以我哋係集中係頭啖水嗰個比較高嘅含鉛量，由呢個其實就可以估計，可以估計嗰個平均值嘅，即係因為你有個基礎嚟估計個平均值，可以咁講。

問：但係你設計呢個 model，呢個 sampling -- sorry，protocol，唔係 model，sampling protocol，個目的係去攞咗嗰個 maximum 嘅，然後另外一個方法就係估個 average，啱唔啱？就你呢個唔可以愛嚟估個 average。

主席：你再講多次你個問題，唔係好明你想問乜。

王先生：Okay。

問：你設計呢一個 sampling protocol 嘅目的就係想攞 maximum，capture 個 maximum，係咪？

答：（沒有可聽到的回答）

問：當然我同意你咁講法，即係話 unless 你攞到 maximum，你亦都唔知道 average 係乜嘢，但係你呢個 sampling protocol，嗰個 sampling method 嗰個目的，從你呢個 sampling method，我哋係搵唔到個 average 出嚟，啱唔啱？

答：唔係完全同意，我覺得由我哋呢個就可以估計，可以估計嗰個 average，如果我知道 consumption pattern，可以估計，可以估計，即係一個 educated 嘅 estimation。真係要知全日你真係嘅 consumption，就要一個幾詳細嘅，好幾 elaborate，幾仔細嘅 household 嘅 automated 嘅 monitoring 先得，只可以咁講。

問：Okay，得，我想返番去講嗰 50 個 ml 個問題，你攞咗一罌 50 ml 之後，你今朝講有十八個辦係兩個 lab 都做嘅，係咪？

答：係。

問：有冇一啲係 50 個 ml，喺十八個辦入面，應該有，係咪？

答：通常我哋咁嘅，j 攞咗返嚟，就 200 嗰就畀 Government Lab 嘅，即係畀 Government Lab，我哋自己就 50，我哋自己做 50 嘅咋，即係夠㗎喇已經。

問：Okay，嗰個係 first draw 喇？

答：First draw，係。

問：如果係攞 50 ml 嘅，就冇可能畀 50 畀呢個 Government Lab，係咪？

答：但係我哋有一個 QA，我哋係每一個 building 最後個 sample 係攞 250 嘅，我哋有一個 QA procedure，即係有一個 internal 嘅 QA，即係每一個 building 嘅十五個--即係佢一般嘅啲 lab 都有呢個程序，有個 QC，internal QC 嘅程序嘅，就每唔知二十個嗰，就會有一個大啲嘅 sample，你可以抽嚟檢驗。我哋通常就係用嗰啲大--稍為知道要同佢 cross-check，就攞一個 250 咁樣。

問：即係話而家你 T 20 或者 T 40、T 60 嗰啲，其實都有一個愛嚟做 control 嘅，嗰個就係 250 嘅？嗰個攞 250？

答：通常係 T 最後嘅，通常係最後。

問：T 80。

答：如果我冇記錯，應該最後，80 呀咁樣嘅，通常最後嘅 sample，有一個 internal control。係，可以咁講，應該係 T 等如 80，即係我哋 internally，我即係想講，就話 internally 就有一個 QA 嘅過程，就係每一個 building 最後一個 sample 就分兩個水去 check 嘅，就有一個咁嘅。

應該係咁嘅，應該係--即係我呢個--我可以再書面再回答你呢個問題嘅，但係會係呢個十八個樣本，就係應該係除咗頭啖，仲有其他嗰啲嘅，我冇記錯，應該有其他嗰啲嘅。但係好多都應該係頭啖，我要啲番個數據，或者可唔可以容許我書面再答呢個問題？

問：好，好。

答：呢個可以好詳細答嘅，但係我嗰陣時--我記得，就應該係除咗頭啖，仲有其他啲 sample。

石先生：164 頁，唔好意思，因為其實呢一點其實未必要書面，因為其實已經有。164 頁嘅 point number 3。

答：係，係。

問：好，我想問你，如果 in respect of other than 第五啖水之外，如果你要做 quality control 同埋 quality assurance，即係 QC、QA，你頭先講，係咪？如果你淨係攞 50 個 ml，譬如第二、第三、第四啖水，你淨係攞 50 個 ml，我想問個 quality control 同埋 quality assurance 點做法呢，以你嘅認知？

答：咪就係 quality control 就話你分開兩個，即係將 250 再 split 開兩個 sample 度，然後 cross 比較。

問：我知，如果你有 250，你可以 split，我明白，所以第一個 first draw，我明白你可以做 QA、QC，第五個 draw，我都明白你可以做 QA、QC，但係第二、第三、第四啖，如果你淨係攞 50 個 ml，你點樣做 QA、QC？

主席：有冇做先？

答：唔係，因為呢個，就頭啖當然有，我就係話喺呢個 cross-check，因為呢啲係全部 accredited lab 嚟嘅，即係呢個係全部...(聽不清) as accredited，所以佢哋就即係 take it --即係佢哋直情 sacred 嘅，即係你話佢 question 啲 measurement，所以即係你睇--大家可以睇睇 166 頁，個 cross-check 係--即係兩個完全唔同嘅實驗室度嘅都好一致，所以當你 accredit 咗個 measurement，我冇理由去每一個 sample 都做 QA，即係 QA 係一個--譬如我有一個儀器，我做咗某一種 QA，我照度嚟喇嘛，100，因為我唔會抽樣再 check，所以你個問題話 50 點做 QA，我就會話你成個度嘅過程其實本身有一個 QA、QC，即係我唔會話中間，我 50 個 ml，再做 QA、QC，我唔知可唔可以咁樣理解。

問：好。

答：因為個實驗室就佢自己本身要攞到呢個 accreditation，佢要好多 QA、QC，即係我個理解，因為我都知道少少，即係咁。所以 Government Lab 就唔好講喇，因為佢係 authority，我哋即係咁樣理解。

問：唔該。李教授，我咁樣向你指出，就係我嘅理解，就係話如果你要做 QA、QC，你淨係攞 50 個 ml 係唔足夠嘅，你起碼要攞 100，你先至可以做到 QA、QC？

答：係，係，係。

主席：攞乜嘢話？

王先生：攞 100。

問：即係如果你攞 50 上個機嗰度，個 50 就會用晒嚟喇，所以如果你要做嗰個 QA、QC，你係要攞起碼 100 個 ml 嘅，呢個你知唔知？

答：係，所以你睇呢個，就係我哋166頁，就即係我哋嚟講，除咗個lab本身嘅QA、QC之外，我哋兩個lab之間嘅，我哋所謂cross-checking，就做咗，十八，呢個十八，你睇嗰個range，由我哋最關心嘅0.01，就最關心嗰度就兩邊都好夾嘅，即係within...

主席：我諗Government Lab會識啩，呢啲嘢。

答：係，係。

主席：Government Lab唔識呀？

王先生：我唔係講Government Lab唔識，我只係想澄清提問啫。

主席：唔係，我哋個Government Lab好先進㗎喎。

王先生：我唔爭議呢個point。

主席：咪係囉，即係如果你attack我哋個Government Lab嗰啲QC standard，你咪又attack埋你自己攞番嚟嗰啲水辦嗰啲standard。

王先生：唔係，我...

主席：咁咪即係搵自己笨？

王先生：唔係，我唔係attack Government嗰個Laboratory嗰個，我只係想知道，即係攞個fact啫，就係話如果QA、QC嘅話，其實第二、第三、第四啖水應該就...

主席：佢話冇做囉，唔做囉。

王先生：冇做。

主席：因為一頭一尾已經有QC、QA喇嘛。

答：冇做，但係唔需要。

王先生：即係我淨係想 clarify 呢個 fact 啫。

主席：係喇，係喇，得。

答：係，係。

問：好，首先我想--跟住想同你睇--帶你去你個證人口供入面個 Table 7。

答：Table 7。

問：喺 V 162 頁嘅。

答：係。

問：呢個就係喺三個 vacant flat 嗰度做嘅一個實驗嚟嘅，就係你後尾返去做 vacant flat，你自己有 visit 過呢三個 flat 嘅，啱唔啱？

答：係，係。

問：我哋睇一睇，譬如第一個圓周咁樣，如果你睇 entry，喺朝頭早，攞第一啖水嘅時候就有 0.017 嘅，啱唔啱？T 等如 0 second 嘅時候，0.017，啱唔啱？

答：係。

問：好喇，三十秒之後，0.010，啱唔啱？

答：係。

問：好喇，六十秒之後就係已經細過 0.0025。

答：係。

問：好喇，跟住一路都係細過 0.0025 嘅，啱唔啱？

答：係，係。

問：好喇，去到下晝嘅--同一日下晝兩點鐘，係咪？

答：係。

問：Entry 就一開始都係 0.0025，係咪呀？

答：係，係，係。

問：即係全日都係低過 0.0025 嘅，係咪呀？

答：係。

問：即係話你其實如果咁睇，其實你 flush 咗頭三十秒之後，嗰...

主席：Entry 係即係入屋之前？

王先生：屋...

主席：入屋之前抑或入屋之後？

答：啱啱入屋之後。

主席：入屋之後？

答：係喺個 flat 入面。

問：之後，入屋之後，我哋 for consistency，我淨係講入屋之後，如果你講 meter position 都可以嘅，因為你之前嗰個就係個 column 就係 meter，跟住有一個就係 entry？

答：唔。

問：用邊個數值都得嘅，不過我而家就 for convenience sake，我就係用 entry，即係入屋之後嗰個數值。

答：係。

問：如果你睇呢一日，12 月 12 號 15 年，呢個單位，如果你嗰日係 flush 咗三十秒之後，其實全日嗰個去到下晝兩點鐘再去攞水嘅時候，嗰個水辦都係低過 0.0025 嘅，啱唔啱？

答：係，係，係，啱，啱。

問：好喇，我哋再睇 17 號，五日之後，五日之後，你又再返去攞，T 等如 0 second 就 0.002，跟住就細過 0.002，跟住去番 0.004，跟住又一路都係細過 0.002 嘅。

答：係。

問：Professor，呢個係一 vacant flat 嚟嘅，即係全日冇乜人用嘅，如果 flush 咗三十分鐘之後，後面嗰啲水，你睇嗰個水...

主席：Flush 咗三十分鐘？

王先生：三十秒，三十個 second，sorry，唔好意思，我講錯咗。

問：三十個 second 之後，嗰個水嗰個含鉛量都係好低，係咪？

答：係。

問：所以如果我哋個目的係要攞一個有代表性嘅，即係日常飲用嘅水，其實攞個 flushed sample，就更加 representative 喇。

主席：唔係，呢個我哋已經討論過好多次，呢個問題，係咪呀？我哋需唔需要又要--底下有好多原因，睇下你嘅飲水嘅習慣，係咪呀？你個 average --冇 average 㗎嘛，如果你 flush 好耐嘅，其實同你喺個 boundary point 攞冇分別㗎，啱唔啱先呀？

王先生：唔。

主席：咁你咪 as well 去個 boundary point 嗰度攞，啱唔啱？如果你成日成嚿大廈開晒所有啲水龍頭，係咁沖嘅，冇分別㗎，你唔使去嗰個大廈攞添，你直情去個 boundary point，你個 boundary point

嗰度有鉛就有鉛，冇鉛就冇鉛，就 full stop，完全都唔使 test。

王先生：呢個或者我可以一步一步...

主席：你明唔明我嘅意思？

王先生：主席，我明你嘅意思，我係充分地理解主席你嘅意思。

主席：你去到個 meter 嗰度就即係去到個--經過個 down-feed 去到個 meters 嗰度，你就經過一啲比較粗啲嘅水管，你入咗個--由個 meter 去到個 entry 嗰度就經過咗個 meter room，嗰度我嘅理解就係最多 joints and tees and elbows，去到個 entries 嗰度，你就喺個 entries 嗰度攞，基本上你就可以 test 到由個 down-feed，最粗嗰條水喉去到嗰個入屋，經過嗰個 meter room，最多 tees and joints 嗰度嘅 contaminations，跟住入咗屋之後，跟住嗰啲--入咗屋之後，基本上就少好多 joints and tees。

所以 Prof Lee 個 recommendations，第一，就係你沖水，0.5 至一分鐘，就已經 significantly 可以 reduce 咗呢個 lead，如果可以--即係如果你話「我唔想咁快騷擾啲民居嘅裝修，入屋拆人哋嗰啲水喉」諸如此類，其實你拆咗個水錶房，就已經又可以大量咁樣樣減低呢一個鉛嘅 concentration。

唔係，我想知道我哋要問咁多呢啲問題，其實都已經寫晒喺個報告度喇。

王先生：明白，主席，或者我想澄清，我想問 Professor 講嘅就係話--因為我知道，我唔想我哋講緊南轅北轍，完全唔同嘅嘢，因為 Prof Lee 佢而家嗰個 model 嘅 design 似乎係去攞個 maximum lead concentration。

主席：呢個 Prof Lee 一早都講咗，係攞個頭啖水，跟住睇個 variations，time 同埋個 concentration 呢個 variation 點樣樣變，呢一個呢啲--呢三個 flat，呢三個 apartments 就係睇呢個 computational fluid dynamics，跟住睇下究竟係唔係嗰啲 leaching rate，究竟係咪喺嗰啲 joints and tees 嗰度走出嚟，呢個就係個 purpose 就係咁樣樣用，咁仲有啲咩嘢問題呢？我都唔係好明。

王先生：主席，我想嘗試去帶出嚟，就係話如果我哋睇呢三個 vacant flat，係 flush 咗三十秒或者至到六十秒之後，再攞水之後，嗰個

水質其實就係好代表性，就係每一日嗰個 average 嘅 consumption 嗰個 metal...

主席：我哋唔好理佢 con 唔 consumption，總之呢個就係呢啲 figures 就係咁樣樣嘅 figures，呢啲 figures 就係 measure 到出嚟嘅 figures，你點樣樣 interpret 佢就係閣下嘅事，啱唔啱先？係咪一個 average 嘅 consumption concentration，depends，譬如你又睇下究竟你嗰啲 users 究竟係朝頭早鍾意飲水吖，抑或唔鍾意飲水，係咪呀？呢啲好難講喇，呢啲就好難講喇，冇一個叫做 average，每一個 household 都唔同。

王先生：Okay，主席，或者我咁講喇...

主席：如果你話晏晝，你 flush 晒之後，晏晝嗰個 concentration 係 significantly reduced 嘅，我 accept 呀。

王先生：得。

主席：係咪？咁你唔使問咁多，即係我唔係唔畀你問，不過其實好多嘢已經係 self-explanatory，就唔需要問。

王先生：明白，主席。

問：Prof Lee，我想同你請教嘅，就係你嗰五啖水係第一啖就 250，係咪？第二啖就係 50，第三啖 50，第四啖 50，第五啖 50，然後就係 total mass divided by total volume，係咪？Total mass divided by total volume，係咪？

答：（沒有可聽到的回答）

問：我想講嘅就係話個 weight，嗰個 weight，喺計個 average 個 flat concentration 嘅時候，後面嗰五啖，後面嗰四啖水嘅 weight 就係細過第一啖水，啱唔啱？

答：係，你可以咁講，係，可以咁講，可以咁講。

問：但係如果個 consumption pattern，即係如果你沖咗三十秒或者六十秒之後，其實嗰個水嘅含量係低啲，如果你要搵--如果你個 protocol 係要搵一個 average 嘅 consumption 嘅話，其實個

weight 就應該後面反而應該多啲。

主席：呢個返番去頭先個老問題，下一個問題，唔該。

王先生：Okay，得。

主席：不如咁，我哋休息十分鐘先。

王先生：好。

主席：你諗下啲新問題先。

王先生：好。

下午 4 時 09 分聆訊押後

下午 4 時 24 分恢復聆訊

出席人士如前。

王先生：主席，就 Table 7，我都仲有一、兩個問題要問，然後我就會 move 到另外一個題目。

主席：好呀。

食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授、香港科技大學副校長（研發及研究生教育））宣誓繼續作供
王先生繼續盤問

問：李教授，我頭先同你睇緊 Table 7。Table 7 正正反映咗就唔關嗰啲人嘅 drinking habit 事嘅，因為 Table 7 係 vacant 嘅，即係冇人用過呢個水喉嘅，係咪？

答：係。

問：但係 Table 7 就可以反映到其實嗰第一啖水嗰個 transient effect 係對影響呢一個水質嗰個影響係好細，你同唔同意？

答：（沒有可聽到的回答）

問：即係都係得三十秒啫，呢個冇人用嘅，vacant flat 嚟嘅，係咪？

答：係，係。

問：好喇，如果我哋將呢個 match 落你嗰個 sample，即係你嗰個 sampling protocol 度，250 ml 就係 first draw，另外嗰四個 50 個 ml，其實你呢個 model 反映出嚟就係 250 ml 嗰個影響性，第一，first draw 影響個 flat concentration 最大。

答：係，啱，啱。

問：啱。

答：即係嗰個比重係。

問：比重係最大嘅？

答：係。

問：啱啱同呢一個 Table 7 嗰個 observation 係有矛盾嘅，你同唔同意？

答：因為個 vacant flat，我哋做就因為比較詳細咁去睇個時間變化，就裏面冇人住，即係你做嘢方便，所以就 not so much 去睇，因為冇人住呢度，所以--我明你想講乜，即係你嘅意思就話應該嗰 millilitre 嗰啲都比重一樣，咁就即係--你係咪想講就話就會係代表性啲，係咪咁嘅意思？

問：係，係，係，冇錯，呢點你同唔同意？

答：但係我哋因為冇個--即係代表性某一個程度，因為我哋正話講咗，即係我哋覺得就呢五個 sample，因為呢個 sample 嘅資料就可以估計個 first-drawn 1 litre，所以即係我哋嚟講，就即係所以最好都係你度咗佢，但係 scientifically，我覺得--我個人覺得就 okay 嘅，即係可以相當可靠咁 estimate 個 first-drawn 1 litre。

至於你話呢八十個 second，你呢個我哋咁樣呢五個 sample 嘅 average concentration 係咪可以唔同嘅比重呢？咁係可以唔同嘅比重嘅，但係因為我哋點解咁做，因為我哋 total mass 除 total volume，呢個係最 direct 嘅 measure，我唔需要假設，因為我可以話譬如 50 再--即係 assume 咁你--即係變咗你要好多假設，所以嗰個 flat concentration 就係 base on direct measurement，咁係其中一個 measure 嚟嘅啫，即係唔係一個絕對嘅，因為喺呢個因應我哋嘅 sampling protocol，一個 average 嘅 flat concentration，即係只可以咁講。

我明你所講，如果你嘅意思就因為如果譬如我唔係咁做，我係 250、100、100、100，或者 250、200，咁做出嚟嘅 flat concentration 就可能唔同，咁同意，同意，所以呢個完全冇唔同意，冇，完全冇唔同意。

問：亦都冇乜特別理由係要唔可以 250、250、250 或者 250、100、100、100 咁，冇乜特別...

主席：咁永遠都唔可以 please 所有嘅人，啱唔啱先？我今日做 250，聽日你話唔准，要做 500，後日你話要做 750，咁幾時先至完呀？

王先生：主席，我唔係咁嘅意思，我唔係想...

主席：Exactly，...

王先生：唔係...

主席：...如果唔係咁嘅意思，唔好嘥時間喇，係咪？咁你係咩嘢意思呢？

王先生：主席，我嘅意思...

主席：即係你今日做一個 250，梗係喇，我聽日可以做 260嚟，後日可做 250嚟，我要做幾多先至滿足到你哋各位律師嘅心願呢？

王先生：或者我咁講，主席，其實我係想講，我唔係特登想刁難或者浪費時間，主席，我係想講李教授...

問：或者我想同你講，我係想講如果嗰個比重係可以反映到嗰個水質嗰個 transient value，即係話嗰啲咩嘢時，譬如三十秒就係嗰個 first draw 嘅影響，and then 之後嗰個 flush 嘅影響多啲，如果你係想 capture 嗰個水嘅 average 或者個 mean lead concentration，喺個 weight 個 adjustment 嗰方面其實都應該係落啲工夫，如果就咁用 average 嘅話，未必係咁準確，我就係想帶出咁樣嘅道理。

答：係。

主席：呢個你唔使問佢，睇下你點樣樣 take 個 average 之嘛。

答：即係同意嘅，同意嘅，同意嘅，係，同意。

主席：你鍾意 T，第二個係一分鐘嘅，第三個係兩分鐘嘅，個 average 又唔同晒喇已經。

王先生：主席，其實同個分鐘冇關係嘅。

主席：你 measure 出嚟嗰個 concentration 已經唔同咗喇。

王先生：係，concentration 唔同咗。

主席：你個 concentration 唔同咗，跟住你 average 就已經唔同晒喇，係咪？

王先生：係。唔係，主席，我係想講話唔係嗰個時間問題，而係...

主席：唔係，我知，但係個問題就係因為而家李教授就係想 capture 嗰個重複嘅，個 concentration 同個 time 個 difference --即係個 relationship，所以佢咪設計到個 gap 盡可能係細啲，你咪可以 capture 到多啲數據，睇到個 variation 係點樣樣變囉，係咪？

王先生：唔。

主席：就係咁簡單之嘛，你取決於 resources 嘅之嘛，你如果人多嘅，你可以十秒鐘攞一個都得㗎，係咪？你個 lab 大把空間做嘅，你咪做多啲囉，你嗰個準啲，你 plot 出嚟個 graph 咪靚啲囉，一樣之嘛，同我哋考試，O level、A level 一樣之嘛，你鍾意做幾多個

integral 吖嘛，你 plot 條 graph 出嚟靚唔靚，smooth 唔 smooth，就係咁之嘛。

王先生：啱，明白。主席，或者我已經 explore 咗呢個 point，其實我係想講個 weight 嘅問題，不過李教授已經答咗。

主席：我絕對明白你，即係你取決於好多，你個 sampling protocol、你個 experiment、你個 methods 點樣樣，你出嚟嘅嘢，你有好多唔同嘅...

石先生：同埋亦都係視乎你嘅假設，因為我諗王大律師佢有一個好嚴重嘅假設，我諗就係 guided by 水務署最新攞出嚟嗰個所謂 interim report，就係冇乜人係用頭嗰浸嘅，所以佢哋可能有一方係要堅持就係話就比重應該係擺重後面嗰啲，但係始終呢個就係習慣嘅問題。

主席：第一就係習慣嘅問題，第二就係究竟你想做乜嘢嘢，個 objective 係做咩嘢，最重要係，係咪？

王先生：係。

主席：我話如果你話「我要一個 general」--個問題你要一個--你話「我要一個好 general 嘅究竟 water quality，一個 general pictures。」嘅話，你咪 flush 囉，係咪？甚至你喺個 entry point，lot boundaries 嗰度攞，跟住你入咗去，你話「原來我呢度成蕸屋邨呢蕸人係好得意嘅，個個都唔會朝頭早一起身就係攞啲水煲水，擺落去個暖水壺嗰度今日用㗎喇，佢哋個個都係刷牙、洗面、沖涼。」嘅，跟住你攞頭啖水，咁梗係唔代表呢一座大廈啲居民嘅用水嘅方法，亦都唔代表佢哋 average 飲水裏面究竟有冇鉛幾多喇。

呢個一定係咁樣嘅，不過我哋冇可能㗎嘛，因為全香港咁多居民，係咪？我哋一定要搵一啲 method 出嚟，我哋認為都 generally 係可以係一個 representative 嘅 pictures 可以塑造到出嚟，我哋咪-- Prof Lee 認為呢一個係可以做到嘅，佢咪做囉。聽日你可以一個呀，啱唔啱呀？

王先生：唔係，...

主席：不過你水務署用嘅方法就係連時間又冇，總之一去到，得閒去到嗰度就抽一個出嚟，總之就 flush 兩至五分鐘，係咪？你就話呢個就係個 general quality of water，如果你話呢一個唔 scientific 嘅話，你哋嗰個更加唔 scientific 添。

王先生：主席，我一陣間會講一講我哋嗰個 method 嘅，或者我想澄清一點，所以即係大家唔好誤會，第一，我嗰個 assumption 唔係建基於人嘅 habit 嘅，因為 exactly Table 7 就唔關 habit 事嘅，Table 7 係一 vacant flat 嚟嘅，所以個 habit 就唔 into 個 picture，所以朝早起身先煲水吖，抑或先刷牙、洗面呢，喺呢一個 vacant flat 就...

主席：唔係，我明嘅，你唔使問呢啲問題㗎喇，你明唔明呀？

王先生：係。

主席：我完全明白晒個報告講乜嘢嘢，你想問問題嘅目的係咩嘢，不如你--如果你有你嗰啲專家話咁樣樣係錯嘅，咁樣樣先至係啱嘅，你咪 as well 直接問 Prof Lee「我哋個專家話咁樣樣先至係啱嘅。」聽 Prof Lee 個 comment 囉。

王先生：好，或者我直接問。

主席：係。

問：Prof Lee，如果我哋想係攞一個--個目的如果係想攞一個 representative sample 嘅，即係 represent the general quality of the water 嘅，個目的係咁樣樣嘅話，咁 looking at Table 7，個 transient value of 嗰個第一啖水嘅話，如果個目的係咁嘅話，個 model --即係嗰個 protocol，個 weight to attach to 個頭啖水其實就唔應該係大嘅，應該係細嘅，調番轉嘅，呢個你同唔同意？

答：譬如我哋睇葵聯，睇葵聯，譬如你葵聯，佢頭啖水就係 12 月 12 號，頭啖水係 26，跟住 30 個 second 就係 7 吖嘛，30，7 咁，跟住就好細，跟住去到最後突然又有 0.011，所以我哋咪睇到--即係我冇，主要係睇個變化，我哋而家做係睇個變化，就如果你話好似個--我而家當然呢個 vacant time 唔係我哋嗰五個 sample 嗰個 typical 嘅 sampling，但係如果--譬如我哋要 sample 呢個，咁你都超--即係你都會個--就咁嗰個 flat concentration 都會--即係 borderline 咁樣，即係會 borderline 咁樣，你意思就話應該後面啲比重多啲，係咪？比重多啲？

問：係，冇錯，呢個就係我個意思。

答：但係我諗就會--如果係 for 成年人，我諗就可能就你--即係我會同意你嘅，即係會有另外啲 measure 可以 possible，我個意思就可以有第二啲 measure，但係正話我哋講過個 first-drawn 1 litre 同埋個 weekly lead intake 一樣嘅咋喎，即係唔會點受呢啲影響，如果你睇今日嘅表，個 weekly lead intake，infant weekly intake 基本上取決於頭兩個數，基本上，如果你 first-drawn 1 litre，我覺得對呢啲 user 就冇咩嘢影響。

如果譬如你話成年人，成年人，如果我哋話百分之十四先用個頭啖水嚟做 drinking potable 嘅，咁就即係就--咁一樣喇，呢個都係--我覺得一樣會係 first-drawn 1 litre 就代表到，因為你去到--如果你睇我哋嘅 Figure 1，你睇番我哋嘅 Figure 1，你去到 80、100 秒，其實你已經好--嗰個好犀利，20 個 litre喫喇，即係你去到 80 second，即係已經好龐大嘅數字呀嗰個。

簡單嚟講，就話你話要代表性，就 first-drawn 1 litre 係一個代表性，你話成日嘅代表性係 average lead concentration，就視乎個 consumption pattern，譬如我用個數據嚟講，譬如話英國數據，因為香港未必準，譬如話你成年人就百分之十四，就用 first draw 啲水，用嚟飲用，0.14，即係個 risk 係 0.14，對我嚟講，0.14 乘呢個 intake，that would be my estimate of the expected lead intake of an adult，即係好--呢個當然即係好多假設，即係假設英國嗰個就--但係英國起碼就好 scientific 嘅，唔係你口講，真係度，度咗兩個禮拜，每一個--一百個 household，每一個 household 度咗兩個禮拜足足。

咁所以即係就會咁睇，就會唔係咁決定呢五個 sample 嘅 details，係咪呀？即係...

問：得，我問完喫喇，呢個 topic，我 move on喫喇。

答：Okay，唔該。

問：Prof Lee，我哋下一個 topic 想問你個 sample size。你有個新嘅 Table 5 嘅。

答：Table 5。

問：喺 17.3.17 -- 173.17，173.17。

答：Table 5。呢度，okay。

問：Okay，你呢個表嗰個 comparison，"WSD/HD"就係水務署嗰個 sample 個 size，根據你呢個表，個 number of sample 就 1325，係咪？

答：（沒有可聽到的回答）

問："No. of samples with excess lead"就係 106，8 個 per cent，好喇，科大嗰個，即係你個 research team 嗰個，"No. of samples (flats)"就係 108，108，啱唔啱？

答：係。

問："No. of first draw samples with excess lead"就係 51，啱唔啱？

答：係。

問：跟住你又有"No. of flats with excess lead"，呢個就係個 flat concentration 喇？

答：係，係，差唔多。

問：差唔多，你 number of first draw 就係淨係用頭嗰 250 個 ml 愛嚟做比較喇？

答：係，係。

問：好喇，我想問你，你認為--當然我哋知道有資源、有時間限制，呢樣嘢水務署係相當了解嘅。你認為 compare 108 個 sample 同 1325 個 sample，兩者我哋做比較，達出一個 comparative 嘅 result，呢一個唔同 sample size 會唔會唔係好 accurate 呢？

答：首先，就算水務署本身嘅 sample，都係--如果我冇記錯，就所有嘅 lead 嘅百分之四嘅咋，只可以 sample 到。

問：係，係，係，當然，當然，當然，係。

答：所以即係就算你...

問：雖然係千幾，嗰個都係百分之四，係。

答：個 sample 就好細嘅，同埋嗰個 sample 就唔係一個有計劃嘅

sample，即係話你晏晝 3 點鐘又度啲，然後 fully flushed，所以係冇一個 target 嘅 purpose 嘅，我哋--當然呢個係 general 嘅一個 quality 係--即係我哋都講過呢個問題--即係唔係問題，即係講咗呢個取決，但係我哋嘅 sampling 就目標就好明確嘅，就想搵個 maximum lead exposure 可能係點，即係可能係點。咁所以我覺得我哋--而亦都係當然有限資源，但係我覺得個特點即係咩嘢呢？就係每一個 building 去做，每一個 building 去做，而每一個 building 上、中、下。

我哋亦都有啲原因點解上、中、下，即係上層、中層、下層，randomly，即係好 random，呢個唔係我哋抽嘅 random，呢個係房屋署抽嘅，呢個 random sample，如果咁嘅情況下，譬如話成個屋邨都冇事，咁真係我覺得幾有代表性，對我嚟講，within 個 framework。所以呢個亦都同--即係有喺 within 個 resources，喺有限資源下，我覺得呢個係就可以畀到我哋好多訊息，一個 general 嘅 sampling 畀唔到。

問：好，我想...

答：我只可以咁，你話係咪代表性，我只可以話就係佢嘅結果就同我哋成個理解就相當吻合嘅，亦都同啲咩嘢 concerned owners 嗰啲，我呢度冇講，但係即係其實譬如佢哋度到啲係有事嘅，我哋都係，即係一致嘅，咁所以只可以話所有嘅跡象就係雖然係有限嘅數據，但係我哋覺得係有一定嘅代表性，即係初步嘅代表性，因為個個 building 都有 sample，個個 building 都有 sample。

問：Prof Lee，我想問你一粒數，彩福邨，你睇呢個表，彩福邨嗰粒數，彩福邨，即係最後尾嗰個 entry，“No. of buildings”係 3，“No. of samples” taken by WSD 就 92，“No. of samples with excess lead”就 13，就 14.1 個 per cent，呢個就係水務署調查嘅結果。

答：係。

問：UST 個 team，“No. of samples” 係 9，“No. of first draw samples”係 0，“No. of flats with excess lead”係 0，你可唔可以解釋到點解會係咁嘅現象？

答：呢個就--呢個我就會係調轉嚟講反而，我就覺得--我有好幾個亦都--即係有啲原因嘅，我哋覺得呢個彩福就--我有啲 comment 嘅，你

等等先。即係我順帶講一講，即係意思就話其實--如果你就算你全部譬如 fully flushed 咁做，其實得出嚟結果個相對性，我覺得就冇我哋呢個 sampling 咁好,點解呢？譬如彩德就 14.1 個 per cent，東匯 7.7 個 per cent，所以你從 flushed 嘅 sample 嚟睇，就彩福就嚴重過--即係似乎多啲超標過東匯嘅，但係如果我哋由真係頭啖水嘅嚟睇，就東匯就即係真係好顯明，就係 83 對 0 嘅，即係好顯明嘅呢個。

至於點解有咁嘅對比呢？即係因為好多原因，你嗰個譬如視乎嗰陣時做，譬如夏天嘅氣溫可能又有啲唔同，有好多原因，但係我覺得會有好多原因，我覺得 temperature to be one factor。但係亦都有可能個--即係你意思--當然你--如果你 fully flushed，都有十三個辦，當然即係都 indicate 有個問題，係，有個問題。

呢個我就冇--等我睇下先，彩福。多謝你嘅問題，我哋一齊睇一睇彩福，彩福，我哋--譬如我哋睇彩福，我哋啲 data 真係冇乜--呢度全部 random，嗰九個 sample，冇乜...

黎先生：教授，可唔可以咁睇呢？實際上，我哋而家講緊做 sampling，抽樣，除非你係每一個單位都走去做嗰陣時，就梗係知道晒嗰個結果，我哋而家講緊係做 sampling，我嘅睇法就咩嘢呢？梗係一定會有啲有，有啲冇，因為事實上，而家睇落去，亦都唔係全部係所有嘅焊接都係用有鉛嘅焊料，即係梗會有啲嘅情形出現，係有啲係有鉛喺入面，有啲係冇鉛喺入面，而係冇可能，除非你做得到，想話知道晒嗰陣時，就全部單位都做晒，梗係最清楚喇。

但係另一方面好清楚睇得到，如果係冇鉛嗰啲，我哋都做咗好多嗰啲嘅測試，喺以前，譬如話接駁方法唔同，嗰啲係冇鉛，就真係冇鉛，無論你任何時候開個水喉都係無鉛嘅，嗰啲係好清晰嘅，而呢一啲嗰陣時，做嗰陣時好明顯有一啲我哋因為唔知道究竟邊一個單位接駁嗰陣時係用咗啲有鉛嘅焊料，咁梗有啲情況之下，有啲驗出嚟有，有啲係冇，而因為基於你係咩嘢呢？係去 random 嚟到去揀呢啲單位出嚟嚟到去測試嗰陣時，梗一定會有呢啲咁嘅 result 出現㗎喇，有啲你驗到出嚟多啲，有啲驗到出嚟少啲，但係最重要就係咩嘢呢？如果你係有鉛嘅話嗰陣時，有可能出現咗就係咩嘢呢？你係唔同嘅方法驗，無論你係水務署嘅方法或者係教授嗰啲方法都可能會驗到有鉛，如果真係冇，就係冇㗎喇，有嘅話，唔同方法可能驗到，有一啲佢嘅方法可能驗到出嚟冇嘅，好似咩嘢呢？彩福係冇，一啲都唔出奇。其

他有陣時，如果係有嘅話，證明一定係有，不過你唔同嘅方法都驗到出嚟咁解嘅啫。

而我而家啲睇法就係咩嘢呢？最重要就係咩嘢呢？我哋嗰個大家嗰個嘅用水嘅習慣係好唔同，問題就係我哋係咪接受水務署嗰啲嘅解釋，我哋係開咗水喉，flush 咗啲水一陣，然後先至飲嗰啲水，係咪唯一呢個咁嘅方法呢？定係話係市民嘅期望係話「我任何時候我開個水喉，啲水都係符合標準，係可以飲用。」嘅方式呢？點解有啲人住喺啲屋邨，就話「你住喺呢度，你就要開水喉 around 兩至五分鐘，你先好飲呀。」咁，點解住喺其他啲屋邨「我任何時候開咗個水喉都冇事。」呢？我哋要接受係我哋要接受邊一種嘅標準咁解嘅啫，所以呢一個係我哋一啲嘅諗法。

所以變咗係呢啲嘅 sampling，我覺得出嚟 result 大家唔可能係一樣嘅，如果你話做一千三百二十五，係咪 Water Supply 嗰個嘅抽樣先至合格呢？而係做一百零八十唔合格呢？我又唔係咁睇，因為我覺得譬如一百零八，你純粹只不過我哋係 check 下 Water Supply 佢哋做過一啲嘅抽樣嘅調查，嗰個結果係點，然後用一啲另外嘅方法嚟到再 check 下有冇咁嘅同樣嘅情況出現咁解嘅啫。我覺得唔通我又要求李教授做一千三百二十五佢先合格呢？係咪咁樣樣呢？唔係㗎嘛，係咪呀？

我哋啲睇法就係有少少，我哋應該要值得大家去深思一下個問題喺邊度，定係純粹喺度糾纏一啲嘅呢啲嘅 sampling 嘅方法或者係嗰啲的結果，係咪呀？唔知李教授同唔同意？

答：多謝委員。唔係，我仲想補充下，其實我哋再睇彩福，彩福有十三個超標嘅，呢十三個超標，其實有十一個就係 10 同 19 之間嘅，即係呢個表係我自己嘅，即係我唔知有冇...

問：唔緊要，唔緊要，你講。

答：10 即係--然後有兩個就大過 30，即係兩個好高㗎喇，呢個即係唔知邊度，但係就喺 10 至 19，即係 20 至 29 就冇嘅，所以呢十三個其實有十一個就係啱啱超標，如果你用美國嘅標準，15 添，即係啱啱超標嗰個範圍，咁即係係有個隨機性。

問：明白。

答：我諗只可以咁講，多謝你指出呢樣嘢。

問：唔係，我只係想提出一個可能性，多謝黎專員頭先提出嗰個思考，我只係想話提出一個睇法，就係話會唔會個 sample size 會影響到個結果啫。因為九吖嘛，呢個呢個淨係攞九，相對九十二，即係用 sampling 嘅角度去睇，即係會唔會係因為個 sample size 細咗，就有個 capture 唔到，有冇呢個可能性？

黎先生：就算去到九十二，都未必嗰個 result 同你嗰個九十二一樣㗎喎。

王先生：唔係，我唔係話一樣。

黎先生：係咪呀？

王先生：不過因為就隨機性，我明白，攞 sampling。

黎先生：咪係囉。

問：會唔會係個冧巴太細呢，九？會唔會有問題？

答：正如我哋講，即係都係有一個資源同時間同其他考慮個平衡，當然我係每個大廈，即係每個 house 我攞唔係三個 flat，六個 flat，但係你一個 house，八百個 flat，即係香港嘅情形就係一座樓有八百個 flat，你點為之夠呢？呢個就其實你話就算五個、十個，你係咪夠，都咩嘢？咁所以我明嗰個你嘅顧慮，但係只可以講，似乎啲結果都幾一致，我只可以咁講，即係結果，我睇唔到有咩嘢--即係都幾合理，只可以話。亦都其實同--就算你--譬如你由基於呢個調查之後，個 lead intake 同所有啲--甚至乎水務署啲都吻合㗎，即係個大體，...

問：我哋冇話唔吻合，我哋冇話唔吻合。

答：大體吻合，okay。

問：好，我而家去第二個題目。我想問一問你關於 plumbing volume 嘅問題。Plumbing volume，你就用 20 米作為一個 plumbing volume，大約 20 米作為一個--即係個水流 20 米作為一個

plumbing volume。

答：即係呢一個大約嘅...

問：32 段，你嘅 32 段。

答：即係二十、三十咁，即係當係一個 plumbing volume。

問：Plumbing volume，李教授，我哋今次就知道 it so happen，因為水務署已經做咗啲 research，就知道喺嗰個 roof tank 同埋 sump tank 入面嗰個水質係冇超標嘅。

答：係，係冇超標。

問：所以嗰個 research 個重點就係去 find out 既然嗰個 roof tank 同埋個 sump tank 都冇被污染到，你就攞個 branch pipe 嗰段，係咪？

答：係，係，係。

問：但係正常如果我哋冇--即係淨係假設我哋唔知道呢樣嘢，我哋想測試下嗰個內部供水系統，啲水喺 connection point 嗰度，如果我哋想知道嗰啲水係咪合標，我哋唔使 flush through 嗰個 inside service，我哋可以直接喺 connection point 嗰度攞水，喺大喉或者攞水，就咁可以驗到水務署供應個水質喇，係咪？好喇，如果我哋係想攞啲水，嗰啲水係 run through 嗰個 internal plumbing system，一般嚟講，我哋係抽嗰個 plumbing volume，係咪應該係攞嗰個水，唔係淨係嗰個 horizontal pipe，應該係攞晒成個 plumbing intern --即係水 run through 個 plumbing system，然後先至可以搵到佢有冇事嘅。你明白我講咩嘢？

答：係，但係即係...

問：因為呢個 case 好 special，因為我哋已經知道咗個原因，然後我哋先至攞呢一截水，就根據你嘅講法，就話 define 呢一橛做 plumbing volume，但係如果我唔知嘅，譬如可能唔只含鉛，可能有其他嘅 hazard 喺入面嘅，我想知，我淨係想知道喺個 internal plumbing system 入面有冇其他污染物，如果我想攞一個 plumbing volume of 個 internal system，我可以攞嘅其實就唔係淨係嗰條 horizontal pipe，啱唔啱？我要攞嘅就係由 connection point 一路 pump 到上天台，跟住再落番嚟，然後流番入去每間住戶嗰度，

呢一個個水 run 一次，咁就叫一個 plumbing volume，你同唔同意？

答：呢個就唔一定嘅，呢個唔一定，因為 plumbing volume 嘅定義就係 the volume for which stagnation ceases to have an effect，即係意思你擺喺度隔夜都唔會有影響嘅，呢個叫 plumbing volume。所以你如果話好 formally，你表面上按文即係嚼字咁嚟，就會係好似你講，即係成個 system 睇晒，照晒咁成個。

問：全身檢查。

答：全身檢查。但係喺我呢個 context，就符合 plumbing volume 嘅定義嘅照計，因為成個 system 冇事，你係得由個 down pipe 入嚟有事，所以即係話你三個呢個 volume 之後，你係咪 stagnation 都冇影響嘅，如果我理解，就 plumbing volume 係咁定義嘅。

但係因為你一般嘅--尤其是第二啲國家啲 system 就會好大，一般，即係我哋呢個情形就有少少唔同嘅，所以我諗係有啲取捨，睇你點 interpret 一般嘅 guideline，我哋就 interpret 就係--即係其實就照正，個 interpretation is the volume for which stagnation ceases to have an effect，呢個就係某一個程度上基於水務署嘅數據，...

問：嘅數據。

答：...即係話 roof tank 同咩嘢都，但係似乎都合理喇，似乎。

問：但係如果冇咗水務署嘅數據，要你 design 一個 plumbing volume 嘅時候，你就唔會淨係攞 horizontal 嗰槪，啱唔啱？

答：比較難講啲，比較難講啲，即係譬如如果你成個 down pipe 都係好污染嘅，咁即係就會唔同。

問：咁你攞埋喇，係咪？

答：即係會 vary。

問：好，仲有一樣嘢我想問，如果用嗰個 0.26 per litre per second -- 0.26 個 litre per second 呢一個 flow rate，喺你做過個 research，關於呢個 public housing estate，如果我要攞水，係攞到-- from 個 connection point，即係我要攞一個 plumbing --即係我所謂叫 plumbing volume，即係成個水務系統，即係成個

internal service，要抽水抽到係喺嗰個供應點嗰度嘅，兩至三分鐘絕對唔夠嘅，你同唔同意？

答：係，唔夠，唔夠，唔夠，係。

問：你認為要幾耐？

答：呢個我哋就未--因為睇你點睇嘅，因為...

問：即係攞到去...

答：...如果你由個 lot boundary 開始--呢個都睇你個定義喎，因為你由個 lot boundary 入去個泵房，泵房好大喎，泵房，咁你泵房--即係如果你想估計泵房入面嘅水嘅 residence time 就即係我諗你要睇個 flow rate，睇成個泵房嘅容量，係咪呀？

問：唔。

答：然後你再上去 roof tank，又要睇 roof tank 嘅容量，係咪呀？

問：啱。

答：所以都會 probably in the matter of hour，right？

問：Hours。

答：Yes, probably。

問：因為同我哋嘅...

答：冇，即係其實不過--即係如果你成個系統睇，就 probably in the matter of hours，order of hour。

問：係喇，即係話如果你想攞個水箱，係攞咁喺 connection point 嗰個，你要 flush，要 flush hours 嘅，唔係 minutes 嘅，啱唔啱？

答：唔一定 hours，係咪 hours，唔知，order of an hour，即係唔係 minutes，probably。

王先生：主席，我 move 會第二個 topic，可唔可以聽朝繼續？

主席：可以。聽朝九點半再繼續。我想問一問你，水務署，你哋係咪有專家㗎？

王先生：我哋有。

主席：你個專家報告幾時 file？

王先生：我哋嘅 understanding，就係委員會想呢個禮拜完成晒所有專家嘅證人，我哋而家爭取緊，希望儘快或者何建宗教授或者佢就咁喺 witness box 度 comment，其中一個 option 快啲，就係何建宗教授喺 witness box 度 comment 兩個專家...

主席：我哋要睇你個 report。

王先生：因為我哋何...

主席：如果係咁，我唔批准你。

王先生：主席，或者咁樣樣，我聽朝答你，好唔好呀？個時間。

主席：唔係，因為我--老老實實，你嗰個 preliminary report 幾時 file，我唔記得咗，放假之前？

王先生：放假之前，咁點解而家咁耐都仲未有？

主席：因為我哋其實係放假之前 file 咗，跟住何建宗教授放假，所以就--放咗農曆假，所以...

李教授，你可以離開㗎喇。

答：Okay，得，得，得，好，得。

王先生：其實我哋何建宗教授同一日嘅，都係禮拜五，同 Prof Lee 嘅 report 同一日交嘅。

主席：收咗喇。

黎先生：何建宗嗰個。

主席：Preliminary 嗰個。

黎先生：何教授嗰個。

王先生：係，preliminary report 同一日 file。

主席：我知，你得一個之嘛？

王先生：係，係。

主席：我唔係要嗰個，我要你個 final report，你幾時 file 你個 final report 呀，打算？

王先生：我聽朝話你知咁，可唔可以？

主席：唔得，你聽日 file，一係就。我哋呢一個研訊嘅其中一個問題就係個個人都係等到人哋 file 晒所有嘅 report，先至 file，全部就係 reactive 嘅啲 report，睇住人哋點樣樣寫，我就寫嘅。

王先生：我哋盡量...

主席：你一早都知道有啲乜嘢 issue 㗎喇，你個 preliminary report，恕我直言，得嗰幾段，係冇 substance 嘅幾段。

王先生：主席，因為--或者咁，我聽到主席嘅意見，我盡力爭取聽日。

主席：我老老實實話畀你聽，如果你聽日唔 file 嘅話，我唔會畀你 file 嘅，我亦都唔會畀你 call expert witness，你如果 file 嘅話，你聽日 5 點鐘之前 file。

王先生：好，可以。

主席：唔該。

2016 年 2 月 15 日

下午 5 時 01 分聆訊押後

下午 2 時 31 分恢復聆訊

出席人士如前。

<u>食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授及香港科技大學副校長（研發及研究生教育））宣誓繼續作供</u>
<u>石先生繼續主問</u>

問：李教授，我哋午飯之前，我就讀到第 31 段，我而家就同你睇睇你嘅第 32 段，係 E1 嘅 140 頁，就係：

"The independent sampling and measurements by two accredited laboratories demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

呢一句就即係我想你睇一睇有冇需要澄清，首先，你講 independent sampling，你就係講緊科大進行嘅嗰個即係獨立嘅抽樣嗰個步驟喇？

答：係，係，係。

問：你唔係講緊水務署佢本身一路做開嗰種--嗰個調查，亦都唔係講緊 Task Force，你個 independent sampling 你就係講緊 UST 自己做嗰個喇？

答：係，係。

問："And measurements by two accredited laboratories"，你呢度嗰個所謂"measurements by two accredited laboratories"係邊兩個 accredited laboratories？

答：係指 Government Lab 同埋科大個實驗室。

問：Okay，你即係話科大佢嗰個抽樣嘅呢個程序，抽完啲 sample 出嚟，就十一個受影響屋邨加六個非受影響屋邨，就每棟樓就--即係每棟大廈三個樣辦，即係呢一個咁嘅步驟，就我哋都知道就係話你就將佢哋出嚟嗰啲水辦分批，有啲畀咗科大嘅，你就係指呢一個"by two accredited laboratories"，呢個其實？

答：係，係，係。

問："Demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

呢度就係有少少嘅疑問，呢度你有冇啲嘢需要澄清嘅，呢一度？

答：即係或者我哋直情刪去"by the Government Laboratory"，即係其實就主要就話兩個 accredited lab，我哋經過 cross-checking，都 confirm 咗個準確度，所以就可以其實就扠咗"by the Government Laboratory"呢幾個字。

問：Okay，okay，即係基本上你就係講番就係科大抽出嚟嘅水辦就之後係經過兩個 accredited laboratories 各自去驗？

答：係。

問：加上，我諗你嘅意思就係亦都有十八個樣本係大家有 cross-check。呢一個就係即係確保咗科大抽水呢個程序嗰個 robustness 同埋個準確性，係咪呀？

答：係，係，係。

問：跟住"Based on the average kitchen tap flow rate of 0.26 L/s, turning on the tap for 2-5 minutes (say 3 min) would cover a supply chain pipe length of over 100 m. Assuming a typical pipe length of around 20 m, this would translate to more than '5 plumbing volumes'."

呢個"supply chain pipe length of over 100 m"係由邊度度起？

答：呢個由個 tap，由個 tap。

問：由 tap 度到邊度？

答：即係話我哋睇--或者睇 appendix II，Figure 1。

問：Appendix II...

答：II。

問：...Figure 1 即係 149 頁？

答：係，149 頁，係，即係...

問：Figure 2，係咪呀？你意思係？

答：Figure 1。

問：Figure 係上面，okay。

答：係，Figure 1，即係個意思就係 Figure 1，我哋就話我哋去到八十秒就大約 50 個 metre 嘜，55 個 metre 嘜，即係會...

問：哦，係，okay。

答：...correspondingly 抽。咁所以呢度個意思就係話如果我 flush 譬如三分鐘咁，咁就即係三分鐘，180，即係差唔多 100 咪嘅，即係如果你延伸，就 100 咪嘅 supply chain，咁即係話其實就由個 down pipe 去到 tap 嗰截其實就清晒，就即係咁嘅意思。

問：Down pipe 即係你梗係唔係由水箱度起喇？

答：唔係。

問：即係由打橫開始入嗰層樓開始？

答：係。

問：你如果係 run 得...

答：三分鐘，三分鐘、五分鐘，係。

問：...三分鐘，就打橫嗰條 pipe 已經清洗過大約有五轉？

答：清晒，應該清晒。

問：Okay，得。

"Hence the government sampling method was essentially a 'fully flushed' sample..."

"The government sampling method"，你嘅意思係，唔係

講緊 Task Force，你係講緊水務署即係一路嚟做緊調查水質嗰個抽水嘅步驟，即係以你所知道，譬如話水務署你都知道佢哋嘅證人都講過，佢哋調查嘅時候--唔係 Task Force，水務署自己調查，...

答：係，水務署，水務署。

問：...係 flush 過嘅，你嘅意思即係話根據水務署嘅形容，佢哋嗰種驗法，就其實都係根據你嘅理解，就係叫做一個 fully flushed sample嚟喇？

答：係，係。

問：Okay。

"...the government sampling method was essentially a 'fully flushed' sample according to generally accepted definitions (time taken to flush 3-5 plumbing volumes). The WSD sampling would not give the maximum or average lead exposure levels of the consumer. Nevertheless, the collective WSD data was very useful in guiding the independent sampling, and also as a basis for assessing the general lead contamination risk among the PRH estates."

你嘅意思即係話雖然水務署佢哋調查嘅時候所做出嘅，即係量度出嚟就唔係真係叫做代表到最高嗰個濃度，但係佢都可以畀到一啲指示你哋，即係譬如話可--即係應該係咪咁講呢？就係佢量度到起碼有十一個受影響屋邨，你就起碼用嗰個作為一個 starting point，其他嗰啲非受影響屋邨，你哋就可以基於呢一個作為一個指引，就話「非受影響嘅，我就喺裏面抽樣出嚟得喇。」十一個佢哋話受影響嘅，你哋就會驗晒，係咪咁樣嘅意思呢，...

答：係，係，係咁嘅意思。

問：...你話嗰個叫做"in guiding the independent sampling"？

答：係，係，可以咁講，可以咁講。

問：Okay，得。其實睇番第 32 段，你其實呢個可能係即係律師睇嘢，好多時候睇番啲 heading，第 32 段其實你唔係真係叫做 reveal 緊個 WSD 嘅 Task Force 嘅 report 嘅，對嘛？

答：（沒有可聽到的回答）

問：你呢一段其實係講緊 WSD 佢自己驗水嘅步驟，係咪呀？呢一段其實唔係真係叫做 commenting on 個 Task Force，呢一段係 commenting on WSD，作為水務署自己做嘢嘅方法，係咪呀？

答：係，可以咁講，可以咁講。

問：Okay，好。因為我哋知道水務署自己一路調查同埋 Task Force 係兩樣嘢嚟嘅，我哋要明白。

答：係，係，可以咁講。

問：Okay，得。33 段：

"The tap water concentrations measured in this study..."

"this study"嘅意思就係 UST 嗰個 independent sampling 嘅 study，對嘛？

答：係。

問："...are consistent with the significant lead content of the solder measured (between 27 per cent and 42 per cent, page 21 of task force report). The use of the isotopic analysis to ascertain the correlation between lead in water and the lead in the solder joints is judged to be reasonable and valid."

呢度你講到嗰個 isotopic analysis，即係嗰個同位素嘅測試，我哋長話短說，我哋知道就係話因為我哋知道潛在地可能含鉛嘅唔係淨係有焊料，好多部件都潛在地會含鉛，而亦都曾經測試到，就係有一啲嘅部件其實都含有一定嘅含鉛係超越咗相關嘅英國標準嘅，咁所以曾經有過一個疑慮，就係其實水裏面嘅含嘅鉛會唔會唔係焊料度嚟嘅呢，會唔會係嗰啲配件嗰度嚟嘅呢咁，而我哋知道就係用咗一個--即係 Task Force 用咗一個叫同位素嘅測試，因為唔同嘅鉛嘅來源，佢哋釋出嚟嘅鉛嗰個原子裏面嗰個成分都唔同嘅，因為鉛有唔同嘅同位素，就基於呢一種偵測，佢哋就知道水裏面含嘅鉛嘅同位素，其實搵番個源頭，就大部分都唔係來自配件嘅，而係來自焊料嘅？

答：焊料，係。

問：你睇番 Task Force 呢一個 approach，你就係針對呢樣嘢，你就話佢"judged to be reasonable and valid"，係咪呀？

答：係，係，係。

問：第 34 段：

"Measurements on pipe joints in the flat Hung Hei House Hong Fuk Estate (HFE) - where stainless steel pipes with mechanical joints and copper pipes with lead-free solder joints are used - show the absence of lead (Annex 2.7 of WSD Report)[A1/19/772]. The pipe points and fittings in these flats are otherwise similar to flats in the affected estates. This control experiment provides solid evidence that the leaded solder joints should be the main cause excess lead in drinking water and the relative insignificant lead contribution of copper alloy fittings. Tak Long House of Tak Long Estate that we visited is a similar building that uses stainless steel pipes and mechanical joints. The tap-water lead concentration in one flat of Tak Long House (not included in this report) also indicated below detection levels."

呢個就係一個好基本嘅科學實驗嘅方法，就係你搵一個叫做 control sample，就係冇咗你懷疑出事嗰部分嘅嘢，我哋呢個 case 就係冇咗含鉛嘅部件，譬如話佢係用 mechanical joint 嘅，根本冇焊料嘅，你去除咗呢樣嘢，就驗出嚟，真係水裏面冇鉛，從此，你就可以作為一個支持嘅論據，就係罪魁禍首喇可以話，主要嘅來源就係含鉛嘅焊料，係咪咁樣嘅理論？

答：係咁嘅意思。

問：第 35 段。

"The mathematical model adopted in the WSD report is essentially a mass balance assuming fully mixed conditions. Consistent with the present review, the results generally indicate the significance of the contributions of the lead solders (or the lead deposits along the pipes derived from the lead solder). However, it is highly questionable whether the lead sources in the copper pipes (e.g. p.30 of WSD Report) **[A1/19/681]** can be estimated by linear extrapolation of the measurements on short lengths (0.2 m) of copper pipes containing lead deposits. There is also no data to test the scenarios depicted. The estimates of lead mass leached from the pipes for the Kai Ching Estate are hence prone to significant uncertainties. This uncertainty will affect the relative contribution of lead deposits on pipes, joints, and fittings to the water tap lead contamination. Additional tests similar to the vacant flat experiments will help to further resolve this issue."

呢一度，似乎你係針對緊嗰個 Task Force 嘅報告裏面其中一項，你就有少少嘅問題提出，我想確保大家聽見呢度，了解其實你所提出嘅疑問係關於乜嘢，因為裏面好多好技術性嘅語言，你可唔可以簡單咁樣解一解，其實你針對評論緊嘅係嗰個 Task Force 報告裏面乜嘢嘅部分？同埋呢個 Task Force 報告嘅呢個部分雖然係你形容係有個 questionable 嘅部分，但係影唔影響整體佢嘅結論？

答：係，即係佢主要結論就即係話 leaded solder 係主要嘅來源，即係鉛嘅來源，所以呢個結論就唔會有影響嘅。

問：唔受你呢個質疑影響嘅？

答：唔受呢個影響嘅。

問：呢個質疑係關於咩嘢呢？

答：咁就但係因為基本上喺個報告入面，就係三樣嘢嘅含鉛嘅來源都有一個估計嘅，就啲 joints，即係好似啲 elbow 嗰啲 joints 就有啲數據，即係有啲直接度出嚟嘅數據，啲 fittings 亦都有啲直接度出嚟嘅數據，即係話啲 leaching rate，即係啲釋放量嗰啲咁。

問：Joints 就係要駁埋，中間用焊料嗰啲就係 joints 喇？

答：係，係，係。

問：Fittings 就係指嗰啲 meter、...

答：係喇，啱。

問：...嗰啲 valve，嗰啲即係閥或者嗰個--嗰啲閥門，嗰啲叫做，或者係個水喉本身，呢啲即係嗰啲部件，呢啲就係嗰啲 fittings 叫做？

答：係，fittings，係。然後水管入面亦都有啲估計嘅，但係我呢段嘢講，就話覺得嗰個不定因素，即係呢啲咁嘅估計，最不定嘅因素就係喺啲喉入面嗰啲含鉛量，即係喺嗰啲喉嘅 pipe wall，啲牆，啲管嘅牆嗰啲含鉛嘅 deposit，嗰啲估計係最 uncertain，最不定，因為佢基本上成個供水鏈，可能 20 咪長嘅，可能你其實度咗，就一、兩、三橛，0.2 咪嘅，即係劏出嚟度，咁 base on 0.2 咪嘅度出嚟，就要有一個 extrapolation，呢個就其實就真係好大 uncertainty，因為咁複雜，即係喺個水流咗咁多--即係咁長嘅時候，你究竟喺沿住條管每一截有幾多沉澱，有幾多同啲 carbonate 同 hydroxide 有反應，而沉澱喺嗰個管道入面，其實就唔知嘅，亦都冇可能係逐個去度。

所以呢個係一個--我諗當喺有限數據一種 extrapolation，但係相對嚟講，呢個係最 uncertain，譬如配件，你有個範圍，你而家連範圍都唔係咁知，即係都唔係咁知，其實。

問：可唔可以咁講，就係 Task Force 嗰個報告入面，佢就用好多嘅唔同嘅方法或者技巧，達至到一個結論，就係個原兇，就係 solder，呢個焊料裏面用咗啲含鉛嘅焊料，譬如話，而你亦都見到係有--譬如話係有個 control experiment 諸如此類咁樣，好多唔同嘅結果都支持呢一個結論，但係呢個 Task Force report 裏面，佢就企圖用一個數學嘅估計嘅方式就去支持或者係達到同一個結論，就係去即係話同你頭先所講，就係唔同嘅可能嘅源頭，條管本身、組件同埋 solder，用一啲 extrapolation，好多嘅假設，就試下計條數出嚟，睇下 as between 呢種種唔同嘅喉裏面嘅嘢，究竟邊一種先至似係原兇呢，佢就希望用一個數學嘅方式計出嚟。你嘅意思就係話就用呢一種企圖用數學嘅方式計出嚟，裏面就牽涉咗好多 uncertainty 嘅嘢，咁所以就--如果想達至嗰個結論，支持嗰個結論，呢一種嘅方式就未必係真係一個可信納或者可靠嘅方式，係咪呀？

答：即係...

問：或者需要再做更多嘅測試，先至可以支持到？

答：做更多嘅測試，就即係嗰個部分，嗰部分。

問：但係就算你唔用呢一種嘅計法，你亦都本身已經你都滿意，就係其實其他嘅方面嘅測試都已經支持到嗰個結論，就係其實嗰個主要嘅來由就係嗰個 leaded solder？

答：係，leaded solder。

問：即係含鉛嘅焊料，係咪？

答：係。

問：如果想用數學方式計，得，可以慢慢計，做更多嘅測試？

答：係，係。

問：冇咗佢都唔緊要嘅？

答：係，係，可以咁講。

問：好，唔該。跟住到到"Summary and Conclusions".

"Independent planned sampling and analysis of lead contamination of 43 buildings in 17 PRH estates have confirmed the main WSD findings. Regardless of the method of sampling, the 'affected estates' and the 'unaffected estates' are largely confirmed."

呢度你係講緊其實就係嗰個 Table 6 嗰度嗰個結論，係咪呀？

答：係，係。

問：即係灰色嗰拃就係根本係 affected estates 裏面嘅核心，你可以話？

答：係，係。

問：有十一個水務署覺得係 affected 嘅，你嗰度灰色咗嗰拃就係嗰十一個裏面，你就 highlight 咗有六個，就係好灰嘅？

答：係，係，可以咁講。

問：其他，當然，我哋會見到有一啲係怡明咁樣，嗰啲就我哋都見到雖然佢有啲 class 3 buildings，但係你都係基於頭先你所講過嘅理由，就係覺得佢哋係比較個風險係次要啲嘅？

答：係，可以咁講。

問："The more detailed sampling results in a more accurate assessment of the extent of lead contamination in the different estates and buildings."

即係 UST 嗰個係 more detailed sampling，所以你就覺得呢個 more detail 嘅 sampling 就更加準確，得出嚟嘅結果？

答：係，係，係。

問："The average lead concentration of about 50 per cent of the samples in the 'affected estates' exceeded the WHO provisional guideline value of 10 micrograms per litre.

Lead contamination in the densely populated PRH estates seems to be dominated by lead solder deposits in the numerous joints of the water supply chain from the down pipe to the individual flats. The lead concentration at the kitchen tap varies with time in a complex manner possibly due to the random nature of the lead deposits in the system. First draw samples may or may not contain the highest concentration. In general, more sporadic variations and higher concentrations are found in the estates completed in or after 2010.

The detailed sampling provides data for health risk assessment. Both the data and CFD results indicate that lead concentration in most cases drop rapidly within 30 - 60 seconds. A flushing time in the order of 0.5 - 1 minute appears to be adequate for guarding against risks of lead contamination."

李教授，有一點我想同你返番轉頭睇一睇嘅，就係我想你先擺番剛才我哋睇過有幾個大表，就係 173.1 開始，剛才你講過，就係右手面嗰個 column “infant weekly intake (μg/wk)”，嗰度你就話你係將嗰啲含鉛量，將佢 translate 成為 micrograms per week，就方便去對比。

答：係。

問：我想你睇一睇世衛嗰個準則，我想你睇睇 C21 tab 175，呢個就係世衛1993年嗰個準則,你睇18941頁,呢份文件嘅起頭就係喺18938嘅，你見到就係“Guidelines for Drinking-Water Quality”，1993，你見到喇？

答：係。

問：你睇到裏面講鉛嗰部分就 18941，中間嗰度：

“In 1986, JECFA established a provisional tolerable weekly intake (PTWI) for lead of 25 μg/kg of body weight (equivalent to 3.5 μg/kg of body weight ...)”。

麻煩你可唔可以簡單咁樣同我哋--跟住佢繼續講，就係：

“...(equivalent to 3.5 μg/kg 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. Assuming a 50 % 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 mg/litre ...”

即係 10 micrograms per litre。

我粗略嘅理解，你點解喺嗰度整個“infant weekly intake”，跟住 micrograms per week，即係 correct me if I’m wrong，就係嗰個 tolerable weekly intake，PTWI，就係 25 micrograms per kilogram of body weight，由於嗰個假設係一個 bottle-fed infant 佢係 5 個 kilogram 重嘅，所以你就 25 個 micrograms 乘 5，因為 25 乘 5 等於 125？

答：係。

問：所以首先你就 25 個 micrograms per kilogram，即係 125 micrograms per 5 kilogram，而呢 125 micrograms per 5 kilogram，你當佢有一半係來自食水，...

答：係，係。

問：...所以就個估計其實就係每周一個 5 個 kg 重嘅 infant，佢飲嘅水嗰個 limit 就應該係 62.5 micrograms，係咪呀？

答：係，係。

問：25 乘 5，跟住乘 50 per cent？

答：係。

問：就係咁 derive 出嚟？

答：係。

問：所以其實如果你睇嗰個 infant weekly intake，你用 micrograms per week 嚟到去計嘅話，62.5 或以上就見紅㗎喇，即係紅色，應該 alert㗎喇，對嘛？

答：係。

問：所以如果你睇下呢個"infant weekly intake (µg/wk)"，右手面呢個 column，你會一路睇，睇到就係，就算你係十幾、二十幾、三十幾，仍然都係黑色，冇事嘅？

答：係。

問：直至到你去到譬如話 173.3，你見到 92.8，就紅咗喇？

答：係，係。

問：因為佢係超過咗 62.5。

答：係。

問：所以你如果用 infant weekly intake，micrograms per week，assuming 5 kilogram weight 嘅話，嗰個 limit，呢度睇，per week 計，就係 62.5 microgram，對嘛？

答：係，係。

問：即係要睇右手面就用 62.5 microgram 作為基準，對嘛？

答：係。

問：得，okay。好，唔該晒。我冇其他嘅問題，但係其他嘅--即係代表其他當事人嘅大律師，佢哋仲會有啲問題問你，跟進嘅。

答：係。

石先生：我冇其他問題。

主席：唔該。

王先生盤問

問：李教授，我係代表水務署嘅，有幾個問題，我想同你澄清下。首先就睇你個證人口供嘅第 36 段，第 36 段。

答：36 段？

問：係。

答：係。

問：因為我哋而家社會上就有個--甚至喺呢個委員會度都有一個好大嘅爭議，就係究竟用頭啖水嚟做水樣辦吖，抑或用我哋水務署用個 flushed 2 to 5 minutes 嗰個嚟做抽水樣辦，兩分鐘就係有人住嘅，五分鐘就冇人住。但係你第 36 段，你就 confirm 咗，"Regardless of the method of sampling, the 'affected estates' and the 'unaffected estates' are largely confirmed."。

即係無論係用水務署嗰個 flush 嘅 method，抑或用李教授你嗰個比較複雜嘅方法，其實呢個方法就五啖水嚟嘅，頭啖水，隔二十秒之後攞第二啖水，再隔二十秒之後再攞第三啖水，再隔二十秒之後再攞第四啖水，隔二十秒之後再攞第五啖水，所以其實你嗰個係一個五

啖水嘅一個平均值嚟嘅，個 total mass 除個 total volume，係咪？

答：係。

問：我一陣間會同你探討下你嗰個 model。但係無論係邊個 model 都好，其實嗰個 unaffected estate 同 affected estate 都係 largely confirmed？

答：係。

問：呢樣嘢就點解我要同你 confirm 呢，因為你出咗呢份報告之後，就有報紙就賣話出咗新嘅五條屋邨就係有受影響，其實我想澄清就係冇呢件事嘅，好喇，怡明邨...

主席：冇咩嘢？冇邊一件事？

王先生：即係冇五條新嘅屋邨喺嗰個--或者我咁講，係冇五條新嘅屋邨個 building concentration，根據 Prof Lee 嘅計算，係高過佢嗰個標準。

問：係咪？

答：係，即係簡單嚟講，就彩德、水泉澳、葵涌同埋怡明都 okay 嘅，即係你睇番我哋 independent sampling 總體嗰個，你睇到就係都係喺上面，即係個意思就係話--即係我哋點解喺呢啲 unaffected estate，就正話講過，因為十一個樣辦，我哋覺得需要重視，咁就所以呢個係完全 random 呢個 sampling。

問：明白，明白。

答：呢個 random sampling 出嚟嘅結果就喺呢個表度。

問：明白。

答：即係總體嚟講，就譬如彩德咁係好 okay 嘅。

問：明白。

答：所以呢個係你講得啱，呢個喺呢點度啱，即係。

問：明白。好喇，就有一點即係 out of abundance of caution，我想同你 clarify，係關於怡明邨嘅，怡明邨，如果你去睇你個報告嘅 Table 6，Table 6，即係 161 頁嗰度，頭先委員會嘅大律師都帶你睇過，怡明邨嗰度就話有一個就話係 class 3 building 嘅，個 "1"字嗰度，係咪？

答：係，係。

問：我就想睇下呢度有冇出錯啫，我哋睇下你嗰個新嘅數據係 173.4，173.4，173.4，第 173.4，上面關於怡明邨嗰度，就有一系列嘅數據嘅，就怡明邨嗰啲數據好靚嘅，好多個 0 嘅，除咗 1124 嗰度，喺 "T=60"秒嘅時候就 0.15，係咪？

答：係。

問：所以由於佢有一個 T 等如 0.15，所以佢個 flat concentration 就變咗 0.017。

答：係，係。

問：如果我冇理解錯誤，李教授你嗰個 building concentration 其實就係好簡單嘅啫，就係三個 flat concentration 加埋除 3？

答：係。

問：所以如果你個 building concentration 喺怡明邨嚟計，其實照計，就唔應該係屬於 class 3 building，如果你除 0.017 除 3 之後，應該就係 0.051 嘜，啱唔啱？

答：係，係，即係呢個就正話即係都約略提過下，就呢個係一個--即係我哋講咗係一個 singular case，其實我哋都考慮咗要唔要再翻度，經過好多考慮嘅，但係我哋覺得點解 highlight 佢，即係 quote and quote 3 呢，就即係覺得值得注意，值得注意，因為我哋解釋唔到點解個 sample 咁高，我哋其實同兩個實驗室話「你有冇可能你度個時候有少少偏差？」...

問：出錯。

答：...佢哋好堅強咁就話一定啱，即係啲數據，即係佢哋 accredited

lab 有一個 QC、QA，所以呢個就係一個對我哋嚟講，一個 singularity，嗰個即係 quote and quote 3，就呢個係有一個特別嘅意思，...

問：我明白。

答：...就唔係照嗰個 normal definition，你講得啱，如果照個 normal definition，可以根本唔理佢，都唔當佢 3 都得，但係呢個即係好特別，即係咁高嘅。

問：即係如果根據你個 definition，其實個"1"字其實應該移過 class 2 building 嗰度，啱唔啱？

答：係，係，係。

問：好喇，第二，亦都係如果你睇怡明邨嗰度，佢喺 T 40 秒嘅時候係 0 嘅。

答：係。

問：T 80 秒嘅時候都係 0 嘅，零零舍舍佢喺 T 60 秒嘅時候就 0.15，都幾高嘅，0.15。

答：好高，150 係好高。

問：咁有冇可能好似你今朝咁講，其實係有一個 possibility of contamination 呢？即係有污染，譬如話一滴塵跌咗落去，所以令到佢呢個數字咁高，有冇呢個可能性？即係 sampling 嘅過程入面。

答：即係污染，照計我哋啲 sample 都係咁 handle，一路都係咁 handle，我哋冇理由去懷疑，因為成個程序都幾照足嘅，亦都正話都講，我哋都反覆其實都探討過，因為呢個數據，我哋亦都同啲 chemist，同啲同事，同啲同事都考慮過呢個問題，最終嘅結論就話似乎唔係個 measure，...

問：唔係 measure。

答：...似乎真係，所以因為真係你有一個--譬如一個 random particle pick up 咁，雖然你一個 sample，但係亦都代表可能 system 即係有 particle，即係有嘢，所以一個--所以我哋覺得係需要再睇呢個，...

問：係，再睇。

答：...再做，即係再 confirm。

問：你都同意，即係如果有個 outliner，好似而家咁樣，周圍都係 0 嘅，突然之間一個高咗，你話要再睇，其實就係喺個 sampling 過程入面，都要有個可重複性，係咪？

答：係。

問：即係佢可以 repeat，即係譬如話我再做多次，如果佢喺 T 60 秒嘅時候都係出現咗呢一個數嘅，咁嗰個數值就有--個價值就高啲喇，因為佢重複咗？

答：係。

問：但係如果你再做多次，去到 T 等如 60 嘅時候，冇咗，係咪？就冇再重複，所以呢一個數字嘅價值或者科學性就可能要再 verify，啱唔啱？

答：我唔會話呢個數字嘅科學性，而係個隨機性。

問：隨機性。

答：佢可能唔係 T 60，可能下一次 T 係 20 高，即係因為成個過程其實都有啲隨機性嘅，成個，因為你日日都唔同嘅人用，即係你點都有少少隨機性，所以我唔會話--即係我唔會 expect 我下次再攞，個 T 係 60 會係 exactly the same，it won't，it won't，it just --即係唔會嘅，因為佢成件--成個現象係一啲隨機性。咁所以但係我同意，即係呢個一種--即係成個整體個 building 同埋個屋邨就應該就一致性嘅，所以亦都係我哋呢個 statement 話大致上 confirm，就係因為我哋似乎做出嚟嘅比較嚴重有 lead contamination 嘅屋邨就同水務署嗰個就幾一致。

問：一致嘅？

答：一致，但係一致唔表示 identical，即係唔一...

問：係，我知，因為你用個 method...

答：即係嗰六個屋邨就一致，一致。

問：因為你用個 method 唔同，所以嗰個 lead concentration 嗰個 level 都唔同，係咪？

答：係，係，係。

問：好喇，第二個問題就係你嘅第 37 段，第 37 段嗰度你有一句...

答：30，係。

問：37 段。

答：Okay。

問：141 嗰度，你嗰度有一句話"First draw samples may or may not contain the highest concentration."，李教授，其實經過你啲數字，我都睇過 173 嗰幾版嘅數字，我一陣間會同你詳細睇嗰啲數字嘅，就百分之六十三，好似你咁講，百分之六十三嘅 highest concentration 其實都唔係 first draw？

答：係，都唔係 first draw。

問：都唔係 first draw？

答：係。

問：所以如果有一個--我哋有一個概念，就話攞 first draw 就可以攞到 highest concentration，即係我哋一路都咁嘅概念，其實你呢個 experiment 或者你呢個 exercise 就 confirm 咗嗰個 first draw 未必 carry 個 highest concentration 嘅，啱唔啱？

答：因為一般睇你點睇，即係一般 first draw 就 first-drawn 1 litre，我哋呢個係 first-drawn 250 millilitre，所以有少少唔同，所以我哋點解有五個 sample 呢？基本上喺我哋呢五個 sample 嘅涵蓋就有 first-drawn 1 litre 嘅入面喺度㗎喇，所以你如果話因為我呢個數據而 first draw 唔係，咁就我諗如果 first-drawn 1 litre 就未必係，因為响其實呢個表個 lead intake 就...

問：我知道，我一陣間會同你計一計個 sample volume 個問題。

答：所以總嚟講，係同一般嘅諗法，第一，頭啖水最高，就有少少出入，

有少少出入。

問：有少少出入？

答：係，少少出入。

問：好，我想帶你去睇一睇 Prof Fawell 有一段喺 V bundle，90 頁，Prof Fawell 嘅 expert statement paragraph 2，paragraph 2，就係 second last sentence 嗰度，佢就咁講嘅，佢話 "Typically first draw water will have a much higher concentration of lead but this may not reflect the concentrations of lead in water ingested in normal use."。

似乎 Prof Fawell 都同意，即係如果我哋係講緊個 normal use，即係話如果我哋係要反映嗰個 concentration of lead in normal use 嘅時候，個 first draw 就未必係好適合，呢個你同唔同意？

答：呢個唔係好同意，點解呢？即係佢話 "Typically first draw water will have a much higher concentration"，喺香港情形，都大家睇到未必，睇你點 interpret，未必係。

問：哦，即係第一句你都唔同意喇？

答：未必係。

問：好喇，第二句，佢就話如果我哋係想睇下嗰個 normal use，即係話 represent 一個正常，日常咁用水嗰個 pattern 嘅，淨係攞第一啖水，佢都當其時話呢個都唔係好適合，"may not reflect the concentration of lead in water ingested in normal use"，呢一句你又同唔同意？

答：我就會 qualify 少少，我就會調轉嚟寫，我就會係"may or may not reflect"。

問："May or may not reflect"？

答："May or may not reflect"。

問：好喇，李教授，我想睇你第 7 段，第 7 段，132 嗰度，你就提出咗一

個 concept，叫做“estimate of the mean lead concentration used for drinking and cooking”，係咪？

答：係。

問：如果我哋要搵出呢個 mean lead concentration used for drinking and cooking，其實頭啖水都唔適合，因為頭啖水就唔會反映個 mean concentration，佢會咁反映，可能反映，may or may not 反映個 maximum，即係高啲嘅 concentration，但係如果你要搵出個 mean，即係日常飲用個 mean，頭啖水就唔係好適合，呢個你覺得我咁樣講法係唔係公平呢？

答：唔公平嘅，點解呢？因為頭先我哋睇到，主要睇個 user，主要睇個 user，譬如如果你睇 infant，譬如如果你假設最一句，極端，即係唔係某一種情形，譬如話你係有一部分嘅 population 係用頭啖水做 drinking and cooking 嘅，一部分人啫，英國就做過 study，好詳細，就係百分之四十五人，百分之十四嘅用量，first draw 嘅用量係 cooking and drinking，呢部分嘅人，譬如舉例，佢如果就將呢啲水煲咗，咁成日啲 BB 就用呢啲水嘅，咁對呢拃嘅 user 嚟講，佢係 reflect 個 mean 個 B 咋喎，但係譬如對個 adult，譬如如果我 adult，譬如話你一半，百分之十四嘅用水先係 drinking and cooking 嘅，我就 probability，咁咪 0.14，即係嗰個 risk，所以我嘅回答就話會係 depends on，決定於嗰個 user，就唔可以...

問：即係唔可以一概而論？

答：唔可以一概而論。

問：就係要 depends on 個 user 嘅 habit？

答：User，係。

問：個 consumption habit？即係究竟佢攞第一啖水係...

答：Habit，但係 habit 就似乎你乜嘢數據都會有人用，即係 habit，即係我意思你無論英國嘅數據或者我哋嘅理解就都會有人用頭啖水嘅，所以你除非話某一類 user 可以 take 多啲 risk，即係我意思你點睇都好，都會有咁嘅 user，你話 user 嘅風險大抑或幾大，呢個稍為另外一回事。所以我唔係完全同意你講法，因為我明你嘅意思，但係因為你香港嘅情形就係咁，你煲咗水就用，如果你完全--即係係喇，即係某一個類型嘅 user，譬如呢個 case，infant，對佢嚟講，

就唔一定係真係 mean 嘅，係咪呀？

問：唔。

答：咁亦都睇，有啲好低嘅，mean 好低，係咪呀？即係就算我啲數據太低，咁有高有低。

問：明白，明白，多謝你，李教授。我係同意你嘅，即係如果有人係--或者有一個特別嘅群組，佢哋真係朝頭早，或者細路仔或者係其他人朝頭早起身，第一啖水就愛嚟煲水嘅，當然嗰個第一啖水對佢嘅影響就都好大？

答：係。

問：個影響會大啲，呢個無可厚非。但係照計，就冇人會淨飲--即係淨係每一日都係飲第一啖水㗎，即係佢都可能會出面飲水，佢嗰個飲水嘅 pattern 都唔會話淨係飲第一啖水，因為 by definition，第一啖水即係第一啖，係咪？所以你唔會每一日淨係飲第一啖水㗎嘛？

答：但係即係就正話我講，就係 depends --即係決定於個 user，個用嘅人，譬如一般就會係煲，一般就煲一壺水，一壺水煲咗之後成日用，呢類咁嘅 user 就會反映個 mean，但係如果我就咁一起身，我水喉--通常而家都好少人飲水喉水嘅，或者都要飲 boiling water，因為我淨係 boil water，你 boil 唔會淨係 boil 一杯，你 boil 成個 kettle。所以我諗喺個--如果你話我一起身就出街，咩嘢，食早餐咁，咁就唔會。

問：或者喺...

答：所以我諗係決定於個 user，律師。

問：或者起身先刷牙、洗面先，係咪呀？都有可能㗎嘛？

答：係，都有可能，都有可能，都有可能。

問：Okay，李教授，我唔知有冇人同你講過水務署嗰面就曾經做過一個香港嘅 survey，就係關於香港嗰啲人嗰啲 use of 水嗰個 pattern，因為 part and parcel of 一個 total water management 嘅 programme，就我哋就有個 partial 嘅 report 出咗，就話大概有九成嘍香港人起身第一件事就先刷牙、洗面嘅，如果用--我哋而家淨係攞咗五百--大概五百個嗰個調查結果，因為我哋原本目標係一千個

嘅，所以 interim report 就睇到大概五百個 response 返嚟，九成香港嘅居民起身都係先刷牙、洗面多過先煲一壼水喺度，然後全日愛嚟飲。

如果嗰個假定，即係可能 depends on 點樣 interpret 個 result 或者係嗰啲 question，暫時假定如果 90 個 per cent 以上嘅人都係先刷牙、洗面先嘅，其實用頭啖水就唔係咁能夠反映出嗰個 mean consumption of lead during the day，咁樣講法，你會唔會認同呢？即係如果九成以上嘅人係先刷牙、洗面 instead of 攞頭啖水愛嚟煲水。

答：呢個我就睇過--我琴日就睇過呢個報告嘅，即係呢個 preliminary 啲 results，我就咁睇，第一，呢個報告嘅對象就唔係純粹屋邨嘅，即係佢係一個 total volume 咩嘢，所以即係話--因為我哋集中就係屋邨啲居民，即係屋邨個 social class，social economic class，所以你一個好 broad 嘅--即係一個成個 population，同呢個--第一點，我想講就係會有啲出入，個 population，因為譬如我即係講番以前，譬如英國做個 study 就好詳細，即係 make sure 嗰個受訪者係好代表性，in fact，佢哋直情 hire 一個 market research 去指定 interview 咩嘢人，因為好專業，因為你要唔同嘅好代表性嘅 social class，咁就一個。

第二個，我個印象就係你呢個係加咗三條問題，喺個原本嘅 questionnaire 加咗三條問題，嗰三條問題即係個準--即係 the way you question it 就係定性嘅，我就咁睇，就係你每一個 household 搵一個代表，你就搵一個代表問，你問幾個問題咁樣，第一，就唔係定量嘅，亦都唔知佢--即係同一個所謂你真係要搵個--即係真係要搵呢個資料，就需要科學化啲，我覺得。

舉個例，譬如 Water Research Centre，好 way back，1986 做，就真係 automatic samplers，所以你每一個人用、幾時用、用幾多量都知嘅，唔係話譬如你一個家庭，有阿婆喺度，或者一個--譬如十五歲以上，或者你一個人，咁佢未必知佢個仔點做，佢以為佢知啫，未必真係知，即係你以為你知，譬如你一個人，五個人咁，你未必你嘅姐姐做乜嘢嘛。

即係我個意思就話呢個係一個--即係都有一個代表性，但係呢個代表性就係比較係一個主觀嘅 impression，impression，即係話大約會點做，但係大約會點做同我哋而家要嘅嘢就似乎--即係可能需要比較定量啲，唔係好難嘅，其實。

另外一樣，佢話 according to 你呢個 14C，就話"about 6.5 per cent of households use the first-drawn water for drinking and cooking purposed in the morning."6.5 個 per cent，6.5 個 per cent，你睇你個 base，都唔少人，6.5 per cent，...

問：6.5，係。

答：...如果我 schedule 你--你而家成百幾條屋邨，即係你好多人，如果 6.5 per cent。因為我即係咁講，我都唔係好知個 details，但係我就因為見過譬如英國點做呢，就覺得就係要好客觀同埋真係要幾 detail 做，就唔係一個好似 social science 一個 survey 可以解決個問題。

問：明白，明白，okay，好。同埋我亦都想澄清一點，其實李教授你而家呢個 modelling -- sorry，呢個 sampling，其實 modelling 同 sampling 係唔同嘅。

答：係，唔同，唔同，唔同。

問：因為你 sampling protocol 去攞水辦，同埋你個 computational fluid dynamic -- dynamic fluid 嗰個 model 係完全兩回事嚟嘅。

答：完全兩回事。

問：兩回事嚟嘅。

答：完全兩回事，但係亦都相連嘅，因為譬如我哋 vacant flat 嘅 sampling 嘅設計，就係因為我哋做一個呢個 model 先乜嘢，唔好意思就真。

問：唔該，唔該。其實你呢個 sampling protocol，我叫五啖水，上中下，因為你每一個 unit 攞五啖水，然後每一個 building 上中下，高層、中層、低層，你 random sampling 攞一個 flat，你呢一個 sampling protocol，其實如果--我想你睇番你嘅 Figure 1，有張表，其實你呢度去到如果用--因為你--我一陣間先至再同你講你個 plumbing volume 嘅問題。

因為你個 definition of 個 plumbing volume 就 20 米，係咪？嗰個打橫個水管，就 20 米流一次，你就為之一個 plumbing volume，啱唔啱？

答：（沒有可聽到的回答）

問：其實如果你去到 T 等如 20 秒嘅時候，就大概十幾米嘜，係咪？

答：係。

問：但係如果去到第二啖，當--唔好，第三啖，去到第三啖水嘅時候，根據你嘅計算，其實都已經係--嗰 20 米都已經 flush 咗，啱唔啱？

答：可以，可以咁講。

問：可以咁講？

答：可以咁講。

問：所以你攞第三啖水嘅時候，其實嗰第三啖水，根據你哋嘅 definition，都係一個 flushed sample，啱唔啱？即係都係沖過水，第三啖水已經係一個 flushed sample？

答：就係，因為呢個係一個平均嘅流量，但係因為每一個 flat 其實都唔同嘅。

問：每一個 flat 都唔同嘅。

答：即係一個 rate。

問：因為我知道嗰個--你而家用 26 -- 0.26 個 litre per second？

答：係。

問：但係其實我哋睇過個表，其實 variant 好大嘅，即係唔係--即係嗰個變化其實可以好大？

答：係，係。

問：我一陣間帶你去睇一睇嗰個流量個變化？

答：係，係，係。

問：我哋暫定如果係用平均值，0.26 個 litre per second 咁嚟計，

第三啖水就已經係一個 flushed sample，第四啖水都係 flushed sample，第五啖水亦都係一個 flushed sample 嚟嘅，係咪？

答：可以--即係粗略，可以咁講，因為佢係一個 indicative，可以咁講。

問：所以你個 model 其實係一個混合嘅 model，即係你又攞第一啖水，你又攞到啲 flushed sample，然後你又將呢一堆嘢加埋，個 total mass divided by 個 total volume，就計出個數值出嚟，啱唔啱？即係一個咁樣嘅混合式，一個 hybrid 嘅 model，又唔係 first draw，又唔係 flush，而係一個 first draw 加 flush 嘅，然後一個計算出嚟嘅一個值，咁樣講法，公唔公平？

答：如果你想咁講，都可以嘅，都可以。

問：Okay，好，唔該你。好喇，我就想帶你去睇一睇你嘅第 38 段，你嘅第 38 段，你就話"Both the data and CFD results indicate that lead concentration in most cases drop rapidly within 30 - 60 seconds. A flushing time in the order of 0.5 - 1 minute appears to be adequate for guarding against risks of lead contamination."。

你話根據你嘅計法，就係其實三十秒到六十秒都夠㗎喇，即係沖水，即係如果係我哋都關心市民個健康，飲用水嘅健康，你嘅計法就係三十秒到六十秒都已經夠㗎喇，啱唔啱？

答：即係大部分，我要 qualify 一下，呢啲就指唔係--即係你譬如有啲好--即係嗰六個就好 seriously 即係 significant lead contaminated 嘅，就未必完全 apply，但係一般--即係我哋意思就話你有一個 significant drop within thirty --即係喺三十秒到六十秒有一個顯著嘅衰減個強--鉛嘅含量有一個好顯著嘅衰減，呢個係嘅。

問：你知道，都係喺你嘅 paragraph 2 嗰度亦都 record 咗水務署其實 advise 香港市民就 flush 1 to 2 minutes 嘅，即係一至兩分鐘，你覺得呢個一至兩分鐘呢個 advice 適唔適合--適唔適當？

答：你越長--即係你一個越長嘅，梗係你嗰個有乜嘢鉛喺度嗰個沖走嘅機會梗係越大，但係我個人嘅睇法就係你一至兩分鐘其實就好長嘅，好少人真係開，你又要儲存啲水又盛，因為我覺得就基於今次嘅實驗同埋我哋嘅計數，就係 for 譬如你嗰三個 group 啲 estate，就除咗

嗰啲好 significant contaminate 除外，就似乎，似乎即係我哋目前有一個數據做咩嘢，就係 0.5 至一分鐘就 okay。

問：Okay，好。

答：一至兩分鐘當然保險啲。

問：保險啲。

答：當然保險啲，其實三分鐘仲保險。

問：明白，明白，兩至三分鐘仲保險。

答：係。

問：明白。好喇，跟住我就想同你研究下你嗰個 sampling protocol。

答：好。

問：就唔係你個 CFD model，淨係個 protocol 啫。你頭先提到關於個 first draw，有啲文憲係講話用攞 1 個 litre 嘅，記唔記得？

答：係，啱，啱。

問：我記得你今朝早個證據就問過你點解你嘅 first draw 嘅時候係決定攞 250 個 ml，即係毫升，cc，你嘅答案就話--我嘅 record 就係話有啲 constraints 同埋有啲理由，reasons，就“we cannot always obtain the first draw first litre concentration”。我第一件事，我就想帶你去睇下啲文憲，就講點解攞 first draw 嘅時候，一般都係要攞 1 個 litre。我想同你講番點解 1 個 litre 係咁緊要。因為你喺計算個 flat concentration 嘅時候，即係用你呢個 model，你計算個 flat concentration 嘅時候，你係用個 total volume，係咪？

答：（沒有可聽到的回答）

問：所以你個 first draw 究竟係攞 1 個 litre 抑或攞 250 個 ml 就會直接影響到個 flat concentration 個數據嘅，啱唔啱？

答：係，係。

問：好喇，而嗰個 flat concentration 嘅數據亦都會直接影響到個

building concentration嘅數據，啱唔啱？

答：（沒有可聽到的回答）

問：好喇，所以我就帶你睇下嗰個 first draw 嗰啲 sampling protocol，第一，我想帶你睇下19.1。

答：十九...

問：19.1。

答：19.1喺度。

問：14620，你睇14618先。

答：14618，唔好意思。係，係。

問：呢個就係水務署個總化驗師嗰個第四個 witness statement 嗰個 annex嚟嘅，annex 11，19.6，I'm sorry，唔該19.6。

答：十九點--係。

問：19.6，14618。

答：係。得。

問：如果你攞去 14619，1.4.1，就係個"LEAD AND COPPER RULE SAMPLING"，見到嘛？

答：係。

問：你都熟悉呢個文件，係咪？你睇過㗎喇之前，係咪呀？

答：睇過，睇過。

問：睇過，okay。我哋睇下 14620，first full paragraph 就係咁講嘅：

"Water samples are obtained after the water at the building has stagnated for at least six hours."

呢度就係講緊個 first draw。

“This no-flow period allows time for uniform corrosion processes to occur and for metals to, theoretically, reach peak concentrations in the water. After the stagnation, a ‘first-draw’ sample is taken from an interior faucet (kitchen or bathroom) in a one liter bottle. A one liter bottle is used to try to capture the largest practical volume representative of contact of the water with the plumbing system.”。

呢度似乎都嗰個 lead and copper rule on sampling 都講到好清楚，即係話如果你係目的係要攞 first draw 嘅，嗰個 sampling volume 都好似應該係 1 個 litre，呢個你同意？

答：呢個係，呢個即係係可以--即係我哋係知道呢個 guideline 嘅，亦都唔係淨係 lead and copper rule，EU 都係咁嘅，first-drawn 1 litre，所以呢個 first-drawn 1 litre 我哋係知道嘅。

問：Okay，我帶你去睇埋一個，跟住我就會問你點解要 depart from 呢個 rule，你一定有理由㗎嘛，係咪？

答：係。

問：好喇，我再帶你睇睇嗰個 14587，14587，G 嗰度就係“How Do I Collect Lead and Copper Tap Water Samples?”，佢下面有個 bullet point 嘅，佢就話“Always collect a 1-litre sample in one container only (e.g., do not split the sample between two containers)”。

下面嗰度就話：

“Always collect a first-draw sample from a tap where the water has stood in the pipes for at least six hours (e.g., no flushing, showering, et cetera). However, make sure it is a tap that is used regularly, and not an abandoned or infrequently used tap.”。

呢度亦都講得好清楚，似乎就係話如果你想個目的係要攞 first draw 嘅，咁就係要攞 1 litre，我想問你，李教授，有冇啲文憲講話其實攞 first draw 嘅時候，攞 250 個 ml 都夠嘅呢？

答：首先，夠唔夠其實取決於幾樣嘢，第一，你唔可以攞得太細，因為太

細，你唔代表盛吖，第二，亦都取決佢 instrument 個 measurement，即係你需要幾多 volume，有陣時你需要個 minimum volume，所以我哋嘅理解就 250 ml，譬如我哋 50 ml 都，即係 as far as the --即係由個測量嘅角度，就算 50 個 ml 都 okay 嘅，但係當然我哋--好似你講，個 first draw 係想佢比較大啲嘅 volume，比較代表性，即係唔會有啲太細嘅 sample，但係正如我今早講過，我哋亦都進行呢個 independent sampling，亦都有時間同資源嘅限制，亦都要喺一個有限嘅時間，我哋要好有效率咁做完呢件事，即係 sampling。我哋就權衡咗好多利害，就設計咗呢個五個 sample 嘅嘢。

因為開頭嘅時候，香港根本冇人知究竟個 variation 係乜，即係當我哋開始嘅時候，11 月我哋有一個爭論，即係話頭啖水咩嘢吖，抑或係即係 first draw 係代表性吖，抑或係 fully flushed，都冇數據--任何數據顯示，冇任何數據顯示，所以我覺得第一步就係話需要有一個足夠嘅資料，就佢同時間點變化，你先可以--譬如如果佢時間變化得好極端嘅，我哋可以即刻變化，可以 adapt，因為你最終都係想搞清楚件事啫，即係咁樣嘅意思。

所以我哋就係基於權衡利害，權衡資源、時間嘅限制，就結果我哋就話以五個 sample，呢個亦都同 Prof Fawell 都知嘅，即係幾個人都傾過，佢都好熟呢啲，佢都覺得 okay，有冇--因為我哋反而係覺得就話我哋要設計到唔好 miss 咗啲高 concentration，譬如初初我哋其實三分鐘嘅，base on 啲--以前都係三分鐘，如果我哋三分鐘，就--譬如我五個 sample，三分鐘就唔會 miss 咗好多。

因為我想講，就係話嗰陣時點解設計五個 sample 呢？其實好大嘅原因就係想 capture 嗰個--想捕捉個鉛水個含鉛量同時間嘅變化，因為嗰個你唔知呢，其實就好多都無從講起嘅，所以一個首先，即係唔理想，呢個當然如果有 1 litre，我有好多人--當然係最理想。

問：最理想 1 litre？

答：1 litre，但係，但係我哋覺得喺呢五個 sample 呢個設計下面仍然係可以--仍然係可以，就如今日我個 table 講，仍然可以估計嗰個 first-drawn 1 litre concentration，即係話...

問：但係你推算出嚟，嗰個係，嗰個係推算出嚟？

答：但係其--推算，可以話推算，但係你由任何科學嘅層面去講，都講得通，即係話假如，譬如我啲條件唔容許我做呢個 1 litre，呢個就 probably they comes very close to 一個幾 scientifically credible 嘅 estimate，即係我只可以咁講，我同意，如果 1 litre 就--即係樣樣都 1 litre 最好，但係你有好多其他考慮，好多其他考慮。所以只可以咁樣回答個問題，即係咁樣回答你嘅問題。

問：唔該李教授。李教授，你頭先講話就係話有好多限制，就時間限制，資源限制，各方面，所以就決定唔用 1 litre，用 250 個 ml，我想請你睇 169 頁，V 169。

答：第

問：V 169，有啲相喺度嘅。

答：啲相，喺邊？哦，得，okay，169。

問：如果我哋睇(c)嗰張圖，李教授，呢度有啲 containers 嘅，近住嗰個 kitchen sink 嗰度，大啲啲個 container 就係 250 個 ml 嘅 container 嚟，啱唔啱？

答：係，係。

問:好喇，入面藍色 cap 住嗰啲，有個蓋嗰啲就係 50 個 ml 嘅 container，啱唔啱？

答：係，係，係。

問：其實我就係想了解，如果你想要攞 1 個 litre 嘅水，其實好簡單咋喎，你咪換咗啲 container，攞個 1 個 litre 嘅 container，喺水龍頭攞水囉，點解會有時間、資源嘅問題？

答：因為都--係喫，因為我哋即係組織呢個 sampling team 嘅時候，我哋同一時間六隊嘅，六隊出去嘅，即係要做呢樣嘢，而我哋亦都有--即係 readily available，因為你又要消毒好多嘢，好多細節要注意，亦都有成個 protocol，亦都我哋覺得呢個係 investigation，呢個唔係--呢個 purpose 可以達到，我哋覺得可以達到，所以就我哋就 take the most --即係最有效率嘅方向咁樣做，所以冇乜--即係我哋唔覺得呢個 litre，當然 1 litre 佢有佢嘅背景，因為佢即係 standardisation，即係佢呢啲 rule，但係我哋呢個係 investigation，一個初步嘅 investigation，喺一個有資源限

制、時間，就係一個初步嘅，我哋覺得係達到個目的。

所以即係--你講得啱，即係話好似我一嚦一啲錢，就可以六個 1-litre bottle，但係你個個就--五次就五個 1-litre bottle，然後再--即係好多呢啲咁嘅，而 1 litre，你亦係用少嘅即係咩嘢，所以我哋傾落嚟，就覺得呢個--即係總括嚟講，就話唔係照足個 guideline，即係 1 litre，但係我哋覺得就係完全可以符合我哋呢個 investigation 嘅目的，即係只可以簡單係咁講，即係呢個觀點角度問題。

問：Okay，得，我知道你嘅答案，唔該。你都同意，如果我哋係用 1 litre 嘅話，嗰個分母，即係你計 flat concentration 嗰個分母就會增加，啱唔啱？

答：（沒有可聽到的回答）

問：我畀個例子你，因為你個表好好嘅，173.1，咁先算，...

答：係邊個 17...

問：173.1，V 173.1。

答：係。

問：因為你又推--即係其實你就推算「如果我攞 1 litre 嘅 first draw，嗰個結果係會點樣樣」。

答：係，係。

問：譬如以清河為例，清河，最後尾嗰個 entry，就成頁紙最下低有個 entry，0.011 嗰個，你 T 喺 0 秒嘅時候，攞 250 個 ml，就 0.011，啱唔啱？

答：係。

問：0.011，好喇，你推算如果--即係呢個唔係真係攞 1 litre 嘅，你推算出嚟之後，係 0.010，就係如果你攞 1 個 litre，嗰個含量就跌咗少少嘅，啱唔啱？

答：係，啱。

問：好喇，如果你用呢個數據再係攞 1 litre 嘅，去計算你嗰個 formula，

你嗰個 protocol 嘅 formula，咁對於個 flat concentration 其實會有好大影響，啱唔啱？因為你個分母大咗喇嘛。

答：但係呢個影響可以係加，可以係加抑或減，可以加，亦可以減。

問：可以係加，可以減，我知，我知，我即係講呢個--呢個只係我想講一個例子啫，所以我就係話如果你係用 1 litre 嘅話，係會影響到個 flat concentration 嘅結果。

主席：影響到個咩嘢？個 flat 嘅 concentration？

王先生：Flat，flat concentration。

答：係，影響到 flat concentration，但係因為個定義有少少唔同，定義有少少唔同，即係其實我哋點解定義呢？就係其實想有一個指標嚟睇某一個 building，邊個 building 係相對嚟講嗰個 lead contamination 嘅程度，基本上係咁。所以你唔同嘅 sample 當然會有稍為唔同嘅結論，但係我諗總體嚟講，就應該個總體嘅結論應該唔會有好大出入。

問：Okay，得。

主席：我想問一問，呢度，譬如呢個你哋攞 sample，T 係 0 second 嗰陣時候，我明，你一開就裝 250 ml 嘅水，裝完呢 250 ml 我唔知要幾多時間，係咪即係你哋有個秒錶喺度，0 就係裝 250 ml，可能譬如用咗五秒鐘，跟住就再加多十五秒，就去到第 20 秒嗰陣時就再裝，抑或隔二十秒呢？

答：主席，就直情照足，譬如 0，就撳鐘，即係撳錶，0，咁就 0 就裝滿，就裝滿咗，然後到 20，一路就開住。

主席：一路開住嘅？

答：開住嘅，然後到 20，又再第二樽咁樣。

主席：係，唔該。

王先生：唔該。

問：李教授，我哋都查過，其實係冇任何文憲去支持頭啖水係 250 個 ml 嘅，咁講，你同唔同意？

主席：冇文憲？

王先生：係。

主席：冇人用過咁嘅方法做？

王先生：係，冇人咁方法做，係。

主席：第一次你用 250...

王先生：第一次，第一次。

問：如果獨立要攞頭啖水，用 250 個 ml。

答：我其實唔可以確定，in fact，我諗你哋文憲就會有嘅，但係呢個我諗唔係咁 relevant，但係我哋呢個係一個調查嚟喋嘛，即係我呢個係調查嚟,我唔需要照--我覺得做到我哋嘅目的就亦都--我唔係即係唔係咩嘢，亦都 Prof Fawell 又一齊傾過，咁似乎可行，只可以咁講，係咪文憲呢？我相信有喋喎，250 ml 嘅嘢，應該唔同嘅情形下會有...

問：如果一個 combination，for example，flush，攞 first draw，再加攞 flushed sample，再加攞 stagnation，再加攞其他，譬如一個 basket of factors，我同意你係有用 250 個 ml 嘅，但係如果攞 first draw 愛嚟做呢一個 test 嘅話，係好少單獨會用 250 個 ml 嘅，你同唔同意？

主席：又冇 set --冇一個 set rule㗎嘛，做實驗有嘅咩？

答：係，係，係，即係...

主席：除非你有個乜嘢 standard 定咗出嚟，話一定要咁樣樣跟就係咁樣樣跟嘅啫，如果唔係嘅話，你設計任何一個 experiment，都係基於你嘅需要同埋基於你嘅時間、基於你嘅金錢、好多樣嘢去設計唔同嘅 protocol，一定係咁㗎喇，做實驗，係咪呀？

王先生：明白。

主席：創新科技吖嘛。

王先生：明白。

主席：繼續。

王先生：好。

問：李教授，如果我哋講緊 250 個 ml 嘅，呢一個咁樣嘅量其實係攞緊嗰個水管頭一截，係咪？

答：係，係。

問：即係好近水龍頭嘅，係咪？

答：係。

問：所以呢一個 first draw 嗰個 result 係會好影響 by 水龍頭附近嗰一截嘅水質，啱唔啱？250 個 ml。

答：即係係，我哋--唔好意思。即係如果我哋睇 appendix II Figure 1，可以咁講，頭 5 個 metre，5 個 metre 度，5 個至 10 個 metre 度嘅--即係喺個供水鏈度頭一橛。

問：我哋而家知道嗰個喉管入面嗰個 lead contamination 其實就唔係 homogeneous 嘅，係咪？

答：係。

問：所以如果你淨係攞頭嗰 250 個 ml，其實你哋好難反映到個 sporadic 嘅 contamination 喺個喉...

主席：咩嘢話？再講多次。

問：即係你係好難反映到個 sporadic 個 contamination in 嗰個 water pipe 嘅，淨係攞 250 個 ml 嗰度。

答：係，即係我哋都講，每一個單位都有啲唔同，每一個單位都有啲 sporadic，random 嘅 element，但係我估就我哋--你睇到就係個 80 個 second 應該就成個 sample，所以亦都話你係 first draw，即係呢個 first draw 就係 stagnation 之後個引起嘅頭啖水嘅總體個總含鉛量應該就捕捉到，即係個設計係咁。

至於話係咪完全捕捉到呢？因為我哋只有五個 sample，但係我哋覺得就好大程度上就捕捉到嘅，因為你點睇，橫睇掂睇都幾吻合嘅，亦都同水務署嘅數據大體上吻合，但係有啲 fundamental 嘅唔同，但係大體嘅吻合。所以我哋睇就話係有美--即係當然唔係 perfect，但係 again，對我哋個目標嚟講，似乎就都係達到，只可以咁講。

問：或者我喺呢個題目最後問一個，就係話你頭啖水攞 1 升吖，抑或攞 250 個 ml，呢一個 sample volume，喺科學上，對於嗰個攞出嚟嘅 sample 入面嗰個含個 mass 係會有影響，唔會冇影響。

主席：含鉛個咩嘢話？

王先生：Mass，即係嗰個含鉛量，係會有影響。

主席：佢攞多啲，個 mass 就梗係唔同喇。

答：會有影響，即係你唔同嘅，會有影響，係，會有影響，係，係。

問：好，得，好。我跟住又想問你，你第一啖水就決定咗用 250 個 ml，你第二啖水攞嘅時候，就係 50 個 ml 嘅，即係隔兩分鐘，由個水喉-- sorry，二十秒，個水喉流咗二十秒之後就攞第二啖水，第二啖水就攞 50 個 ml，係咪？

答：係，係，係。

問：我想問攞 50 個 ml 呢一個數量個理據喺邊度？點解要攞 50 個 ml，而唔係攞 250 個 ml？

答：主要都係資源同--因為我哋嗰個實驗室係用開 50 嘅，譬如個個實驗室都有啲唔同嘅習慣，唔同嘅取向，我哋嘅實驗室就係覺得 50 就已經好足夠，而亦都我哋覺得 50 都唔係話太細，即係攞呢個 volume，所以就咁，因為你取材吖嘛，即係就地取材，就地取材，就係覺得滿足到個目標，即係我哋有一拃，因為講得好多量嘅，我哋一百二十九個 flat，同埋一百二十九個--係喇，一百二十--係咪呀？大家睇一睇嗰個總數，係即係好--個量幾--六百幾個 sample，即係始終係有一個資源嘅問題，即係你六百...

問：資源問題？

答：係，資源同埋時間同埋效率，即係好多嘢考慮。

問：明白，好。中間分開，相隔二十秒，點解設計二十秒呢？有冇啲咩嘢思考喺背後呢？點解係二十秒呢？個理據係咩嘢？

答：其實原本我哋係三分鐘嘅，基於以前啲數據，係三分鐘嘅。

問：三分鐘嘅，係。

答：咁好彩就冇走去攞三分鐘嘅，因為攞三分鐘就會完全捕捉唔到個高濃度，褸屘就同啲 chemist、我哋嘅啲同事咁樣就傾過，就覺得你三分鐘唔會或者--即係三分鐘，我哋總共就話五個 sample，你嘅 end point 喺邊？End point 喺三分鐘，你第一個 sample 都已經成好耐喇嘛，所以就未必可以捕捉到嗰個比較高個頭啖水個含鉛量喎，所以褸屘諗諗下，都係不如--點解二十個 second，因為你其實係開水喉，攞咗 250 ml，差唔多搞得嚟都二十個 second，即係有好多實際嘅考慮嘅，但係似乎覺得八十個 second 係合理，同埋睇啲數據，都似乎捕捉到，咁就咁定。

即係原本我頭--今早都講，原本係其實攞兩個 sample，因為原

本都每個實驗室都有其他嘢做，即係都有一個時間、資源嘅限制，但係褌屘睇睇下，就似乎覺得要攞晒五個 sample，所以而家基本上大部分都有五個 sample。所以二十個 second 係冇嘅，即係一個--你可以講一個經驗，一個 iteration，就達到呢個 protocol，結果就行呢個 protocol。

結果褌屘去到 vacant flat，我哋覺得就因為已經有個經驗，就想度長啲，就度長啲，咁咪多啲 sample，度長啲，呢啲 vacant flat，我直情十個 sample，但係嗰陣時做唔到你每個 flat 十個 sample，即係其實好 labour intensive 嘅。

所以二十個 second 就係咁嚟㗎喇，即係話要捕捉到比較真係頭啖水啲濃度，而亦都可以測量到個變化，尤其是我哋好 interest 就係佢 drop。所以達到呢兩個目的，權衡就覺得八十個 second 似乎--試下喇，咁試下就似乎 okay，即係咁嘅原因。

問：Okay，李教授，你就頭先同我哋講呢一個 sampling protocol 就係你為咗今次呢個 exercise design 出嚟嘅，即係創新科技，新創嘅呢一個 sampling protocol，全新嘅。

主席：設計出嚟嘅？

問：設計出嚟？

答：設計，係，係可以咁講，我冇乜諗過係全新，即係要達到個目的係得--唔係好多嘅 choice。

問：你講好似好達到目的，你要達到個目的就係搵最高嘅 lead concentration，嗰個就係你目的，係咪呀？即係呢啲--呢個...

答：同埋個變化，同埋個變化。

問：同埋個變化。其實你呢個設計呢一個 sampling 嗰個目的就唔係去搵嗰個平均，即係 average 嗰個正常，日常飲用個 average 嗰個值，而係去搵一個 maximum 同埋個變化，呢個就係你個 sampling protocol 嘅目標，啱唔啱？

答：但係即係咁講，你唔知個最大值，就冇可能知道平均，所以我哋係集中係頭啖水嗰個比較高嘅含鉛量，由呢個其實就可以估計，可以估計嗰個平均值嘅，即係因為你有個基礎嚟估計個平均值，可以咁講。

問：但係你設計呢個 model，呢個 sampling -- sorry，protocol，唔係 model，sampling protocol，個目的係去攞咗嗰個 maximum 嘅，然後另外一個方法就係估個 average，啱唔啱？就你呢個唔可以愛嚟估個 average。

主席：你再講多次你個問題，唔係好明你想問乜。

王先生：Okay。

問：你設計呢一個 sampling protocol 嘅目的就係想攞 maximum，capture 個 maximum，係咪？

答：（沒有可聽到的回答）

問：當然我同意你咁講法，即係話 unless 你攞到 maximum，你亦都唔知道 average 係乜嘢，但係你呢個 sampling protocol，嗰個 sampling method 嗰個目的，從你呢個 sampling method，我哋係搵唔到個 average 出嚟，啱唔啱？

答：唔係完全同意，我覺得由我哋呢個就可以估計，可以估計嗰個 average，如果我知道 consumption pattern，可以估計，可以估計，即係一個 educated 嘅 estimation。真係要知全日你真係嘅 consumption，就要一個幾詳細嘅，好幾 elaborate，幾仔細嘅 household 嘅 automated 嘅 monitoring 先得，只可以咁講。

問：Okay，得，我想返番去講嗰 50 個 ml 個問題，你攞咗一罂 50 ml 之後，你今朝講有十八個辦係兩個 lab 都做嘅，係咪？

答：係。

問：有冇一啲係 50 個 ml，喺十八個辦入面，應該有，係咪？

答：通常我哋咁嘅，j 攞咗返嚟，就 200 嘜就畀 Government Lab 嘅，

即係畀 Government Lab，我哋自己就 50，我哋自己做 50 嘅咋，即係夠喫喇已經。

問：Okay，嗰個係 first draw 喇？

答：First draw，係。

問：如果係攞 50 ml 嘅，就冇可能畀 50 畀呢個 Government Lab，係咪？

答：但係我哋有一個 QA，我哋係每一個 building 最後個 sample 係攞 250 嘅，我哋有一個 QA procedure，即係有一個 internal 嘅 QA，即係每一個 building 嘅十五個--即係佢一般嘅啲 lab 都有呢個程序，有個 QC，internal QC 嘅程序嘅，就每唔知二十個嘎，就會有一個大啲嘅 sample，你可以抽嚟檢驗。我哋通常就係用嗰啲大--稍為知道要同佢 cross-check，就攞一個 250 咁樣。

問：即係話而家你 T 20 或者 T 40、T 60 嗰啲，其實都有一個愛嚟做 control 嘅，嗰個就係 250 嘅？嗰個攞 250？

答：通常係 T 最後嘅，通常係最後。

問：T 80。

答：如果我冇記錯，應該最後，80 呀咁樣嘅，通常最後嘅 sample，有一個 internal control。係，可以咁講，應該係 T 等如 80，即係我哋 internally，我即係想講，就話 internally 就有一個 QA 嘅過程，就係每一個 building 最後一個 sample 就分兩個水去 check 嘅，就有一個咁嘅。

應該係咁嘅，應該係--即係我呢個--我可以再書面再回答你呢個問題嘅，但係會係呢個十八個樣本，就係應該係除咗頭啖，仲有其他嗰啲嘅，我冇記錯，應該有其他嗰啲嘅。但係好多都應該係頭啖，我要嘞番個數據，或者可唔可以容許我書面再答呢個問題？

問：好，好。

答：呢個可以好詳細答嘅，但係我嗰陣時--我記得，就應該係除咗頭啖，仲有其他啲 sample。

石先生：164 頁，唔好意思，因為其實呢一點其實未必要書面，因為其實已經有。164 頁嘅 point number 3。

答：係，係。

問：好，我想問你，如果 in respect of other than 第五啖水之外，如果你要做 quality control 同埋 quality assurance，即係 QC、QA，你頭先講，係咪？如果你淨係攞 50 個 ml，譬如第二、第三、第四啖水，你淨係攞 50 個 ml，我想問個 quality control 同埋 quality assurance 點做法呢，以你嘅認知？

答：咪就係 quality control 就話你分開兩個，即係將 250 再 split 開兩個 sample 度，然後 cross 比較。

問：我知，如果你有 250，你可以 split，我明白，所以第一個 first draw，我明白你可以做 QA、QC，第五個 draw，我都明白你可以做 QA、QC，但係第二、第三、第四啖，如果你淨係攞 50 個 ml，你點樣做 QA、QC？

主席：有冇做先？

答：唔係，因為呢個，就頭啖當然有，我就係話喺呢個 cross-check，因為呢啲係全部 accredited lab 嚟嘅，即係呢個係全部...（聽不清）as accredited，所以佢哋就即係 take it --即係佢哋直情 sacred 嘅，即係你話佢 question 啲 measurement，所以即係你睇--大家可以睇睇 166 頁，個 cross-check 係--即係兩個完全唔同嘅實驗室度嘅都好一致，所以當你 accredit 咗個 measurement，我冇理由去每一個 sample 都做 QA，即係 QA 係一個--譬如我有一個儀器，我做咗某一種 QA，我照度㗎喇嘛，100，因為我唔會抽樣再 check，所以你個問題話 50 點做 QA，我就會話你成個度嘅過程其實本身有一個 QA、QC，即係我唔會話中間，我 50 個 ml，再做 QA、QC，我唔知可唔可以咁樣理解。

問：好。

答：因為個實驗室就佢自己本身要攞到呢個 accreditation，佢要好多QA、QC，即係我個理解，因為我都知道少少，即係咁。所以 Government Lab 就唔好講喇，因為佢係 authority，我哋即係咁樣理解。

問：唔該。李教授，我咁樣向你指出，就係我嘅理解，就係話如果你要做QA、QC，你淨係攞 50 個 ml 係唔足夠嘅，你起碼要攞 100，你先至可以做到 QA、QC？

答：係，係，係。

主席：攞乜嘢話？

王先生：攞 100。

問：即係如果你攞 50 上個機嗰度，個 50 就會用晒㗎喇，所以如果你要做嗰個 QA、QC，你係要攞起碼 100 個 ml 嘅，呢個你知唔知？

答：係，所以你睇呢個，就係我哋 166 頁，就即係我哋嚟講，除咗個 lab 本身嘅 QA、QC 之外，我哋兩個 lab 之間嘅，我哋所謂 cross-checking，就做咗，十八，呢個十八，你睇嗰個 range，由我哋最關心嘅 0.01，就最關心嗰度就兩邊都好夾嘅，即係 within...

主席：我諗 Government Lab 會識啩，呢啲嘢。

答：係，係。

主席：Government Lab 唔識呀？

王先生：我唔係講 Government Lab 唔識，我只係想澄清提問啫。

主席：唔係，我哋個 Government Lab 好先進㗎喎。

王先生：我唔爭議呢個 point。

主席：咪係囉，即係如果你 attack 我哋個 Government Lab 嗰啲 QC standard，你咪又 attack 埋你自己攞番嚟嗰啲水辦嗰啲 standard。

王先生：唔係，我...

主席：咁咪即係搵自己笨？

王先生：唔係，我唔係 attack Government 嗰個 Laboratory 嗰個，我只係想知道，即係攞個 fact 啫，就係話如果 QA、QC 嘅話，其實第二、第三、第四啖水應該就...

主席：佢話冇做囉，唔做囉。

王先生：冇做。

主席：因為一頭一尾已經有 QC、QA 喇嘛。

答：冇做，但係唔需要。

王先生：即係我淨係想 clarify 呢個 fact 啫。

主席：係喇，係喇，得。

答：係，係。

問:好,首先我想--跟住想同你睇--帶你去你個證人口供入面個 Table 7。

答：Table 7。

問：喺 V 162 頁嘅。

答：係。

問：呢個就係喺三個 vacant flat 嗰度做嘅一個實驗嚟嘅，就係你後尾返去做 vacant flat,你自己有 visit 過呢三個 flat 嘅,啱唔啱？

答：係，係。

問：我哋睇一睇，譬如第一個圓周咁樣，如果你睇 entry，喺朝頭早，攞第一啖水嘅時候就有 0.017 嘅，啱唔啱？T 等如 0 second 嘅時候，0.017，啱唔啱？

答：係。

問：好喇，三十秒之後，0.010，啱唔啱？

答：係。

問：好喇，六十秒之後就係已經細過 0.0025。

答：係。

問：好喇，跟住一路都係細過 0.0025 嘅，啱唔啱？

答：係，係。

問：好喇，去到下晝嘅--同一日下晝兩點鐘，係咪？

答：係。

問：Entry 就一開始都係 0.0025，係咪呀？

答：係，係，係。

問：即係全日都係低過 0.0025 嘅，係咪呀？

答：係。

問：即係話你其實如果咁睇，其實你 flush 咗頭三十秒之後，嗰...

主席：Entry 係即係入屋之前？

王先生：屋...

主席：入屋之前抑或入屋之後？

答：啱啱入屋之後。

主席：入屋之後？

答：係喺個 flat 入面。

問：之後，入屋之後，我哋 for consistency，我淨係講入屋之後，如果你講 meter position 都可以嘅，因為你之前嗰個就係個 column 就係 meter，跟住有一個就係 entry？

答：唔。

問：用邊個數值都得嘅，不過我而家就 for convenience sake，我就係用 entry，即係入屋之後嗰個數值。

答：係。

問：如果你睇呢一日，12 月 12 號 15 年，呢個單位，如果你嗰日係 flush 咗三十秒之後，其實全日嗰個去到下晝兩點鐘再去攞水嘅時候，嗰個水辦都係低過 0.0025 嘅，啱唔啱？

答：係，係，係，啱，啱。

問：好喇，我哋再睇 17 號，五日之後，五日之後，你又再返去攞，T 等如 0 second 就 0.002，跟住就細過 0.002，跟住去番 0.004，跟住又一路都係細過 0.002 嘅。

答：係。

問：Professor，呢個係一 vacant flat 嚟嘅，即係全日冇乜人用嘅，如果 flush 咗三十分鐘之後，後面嗰啲水，你睇嗰個水...

主席：Flush 咗三十分鐘？

王先生：三十秒，三十個 second，sorry，唔好意思，我講錯咗。

問：三十個 second 之後，嗰個水嗰個含鉛量都係好低，係咪？

答：係。

問：所以如果我哋個目的係要攞一個有代表性嘅，即係日常飲用嘅水，其實攞個 flushed sample，就更加 representative 喇。

主席：唔係，呢個我哋已經討論過好多次，呢個問題，係咪呀？我哋需唔需要又要--底下有好多原因，睇下你嘅飲水嘅習慣，係咪呀？你個 average --冇 average㗎嘛，如果你 flush 好耐嘅，其實同你喺個 boundary point 攞冇分別㗎，啱唔啱先呀？

王先生：唔。

主席：咁你咪 as well 去個 boundary point 嗰度攞，啱唔啱？如果你成日成蔓大廈開晒所有啲水龍頭，係咁沖嘅，冇分別㗎，你唔使去嗰個大廈攞添，你直情去個 boundary point，你個 boundary point 嗰度有鉛就有鉛，冇鉛就冇鉛，就 full stop，完全都唔使 test。

王先生：呢個或者我可以一步一步...

主席：你明唔明我嘅意思？

王先生：主席，我明你嘅意思，我係充分地理解主席你嘅意思。

主席：你去到個 meter 嗰度就即係去到個--經過個 down-feed 去到個 meters 嗰度，你就經過一啲比較粗啲嘅水管，你入咗個--由個 meter 去到個 entry 嗰度就經過咗個 meter room，嗰度我嘅理解就係最多 joints and tees and elbows，去到個 entries 嗰度，你就喺個 entries 嗰度攞，基本上你就可以 test 到由個 down-feed，最粗嗰條水喉去到嗰個入屋，經過嗰個 meter room，最多 tees and joints 嗰度嘅 contaminations，跟住入咗屋之後，跟住嗰啲--入咗屋之後，基本上就少好多 joints and tees。

所以 Prof Lee 個 recommendations，第一，就係你沖水，0.5 至一分鐘，就已經 significantly 可以 reduce 咗呢個 lead，如果可以--即係如果你話「我唔想咁快騷擾啲民居嘅裝修，入屋拆人哋嗰啲水喉」諸如此類，其實你拆咗個水錶房，就已經又可以大量咁樣樣減低呢一個鉛嘅 concentration。

唔係，我想知道我哋要問咁多呢啲問題，其實都已經寫晒喺個報告度喇。

王先生：明白，主席，或者我想澄清，我想問 Professor 講嘅就係話--因為我知道，我唔想我哋講緊南轅北轍，完全唔同嘅嘢，因為 Prof Lee 佢而家嗰個 model 嘅 design 似乎係去攞個 maximum lead concentration。

主席：呢個 Prof Lee 一早都講咗，係攞個頭啖水，跟住睇個 variations，time 同埋個 concentration 呢個 variation 點樣樣變，呢一個呢啲--呢三個 flat，呢三個 apartments 就係睇呢個 computational fluid dynamics，跟住睇下究竟係唔係嗰啲 leaching rate，究竟係咪喺嗰啲 joints and tees 嗰度走出嚟，呢個就係個 purpose 就係咁樣樣用，咁仲有啲咩嘢問題呢？我都唔係好明。

王先生：主席，我想嘗試去帶出嚟，就係話如果我哋睇呢三個 vacant flat，係 flush 咗三十秒或者至到六十秒之後，再攞水之後，嗰個水質其實就係好代表性,就係每一日嗰個 average 嘅 consumption 嗰個 metal...

主席: 我哋唔好理佢 con 唔 consumption,總之呢個就係呢啲 figures 就係咁樣樣嘅 figures，呢啲 figures 就係 measure 到出嚟嘅 figures，你點樣樣 interpret 佢就係閣下嘅事，啱唔啱先？係咪一個 average 嘅 consumption concentration，depends，譬如你又睇下究竟你嗰啲 users 究竟係朝頭早鍾意飲水吖，抑或唔鍾意飲水，係咪呀？呢啲好難講喇，呢啲就好難講喇，冇一個叫做 average，每一個 household 都唔同。

王先生：Okay，主席，或者我咁講喇...

主席：如果你話晏晝，你 flush 晒之後，晏晝嗰個 concentration 係 significantly reduced 嘅，我 accept 呀。

王先生：得。

主席：係咪？咁你唔使問咁多，即係我唔係唔畀你問，不過其實好多嘢已經係 self-explanatory，就唔需要問。

王先生：明白，主席。

問：Prof Lee，我想同你請教嘅，就係你嗰五啖水係第一啖就 250，係咪？第二啖就係 50，第三啖 50，第四啖 50，第五啖 50，然後就係 total mass divided by total volume，係咪？Total mass divided by total volume，係咪？

答：（沒有可聽到的回答）

問：我想講嘅就係話個 weight，嗰個 weight，喺計個 average 個 flat concentration 嘅時候，後面嗰五啖，後面嗰四啖水嘅 weight 就係細過第一啖水，啱唔啱？

答：係，你可以咁講，係，可以咁講，可以咁講。

問：但係如果個 consumption pattern，即係如果你沖咗三十秒或者六十秒之後，其實嗰個水嘅含量係低啲，如果你要搵--如果你個 protocol 係要搵一個 average 嘅 consumption 嘅話，其實個 weight 就應該後面反而應該多啲。

主席：呢個返番去頭先個老問題，下一個問題，唔該。

王先生：Okay，得。

主席：不如咁，我哋休息十分鐘先。

王先生：好。

主席：你諗下啲新問題先。

王先生：好。

下午 4 時 09 分聆訊押後

下午 4 時 24 分恢復聆訊

出席人士如前。

王先生：主席，就 Table 7，我都仲有一、兩個問題要問，然後我就會 move 到另外一個題目。

主席：好呀。

食水含鉛超標調查委員會的專家證人第一證人：李行偉教授（香港科技大學土木及環境工程學系講座教授、香港科技大學副校長（研發及研究生教育））宣誓繼續作供
王先生繼續盤問

問：李教授，我頭先同你睇緊 Table 7。Table 7 正正反映咗就唔關嗰啲人嘅 drinking habit 事嘅，因為 Table 7 係 vacant 嘅，即係冇人用過呢個水喉嘅，係咪？

答：係。

問:但係 Table 7 就可以反映到其實嗰第一啖水嗰個 transient effect 係對影響呢一個水質嗰個影響係好細，你同唔同意？

答：（沒有可聽到的回答）

問：即係都係得三十秒啫，呢個冇人用嘅，vacant flat 嚟嘅，係咪？

答：係，係。

問：好喇，如果我哋將呢個 match 落你嗰個 sample，即係你嗰個 sampling protocol 度，250 ml 就係 first draw，另外嗰四個 50 個 ml，其實你呢個 model 反映出嚟就係 250 ml 嗰個影響性，第一，first draw 影響個 flat concentration 最大。

答：係，啱，啱。

問：啱。

答：即係嗰個比重係。

問：比重係最大嘅？

答：係。

問：啱啱同呢一個 Table 7 嗰個 observation 係有矛盾嘅，你同唔同意？

答：因為個 vacant flat，我哋做就因為比較詳細咁去睇個時間變化，就裏面冇人住，即係你做嘢方便，所以就 not so much 去睇，因為冇人住呢度，所以--我明你想講乜，即係你嘅意思就話應該嗰 millilitre 嗰啲都比重一樣，咁就即係--你係咪想講就話就會係代表性啲，係咪咁嘅意思？

問：係，係，係，冇錯，呢點你同唔同意？

答：但係我哋因為冇個--即係代表性某一個程度，因為我哋正話講咗，即係我哋覺得就呢五個 sample，因為呢個 sample 嘅資料就可以估計個 first-drawn 1 litre，所以即係我哋嚟講，就即係所以最好都係你度咗佢，但係 scientifically，我覺得--我個人覺得就 okay 嘅，即係可以相當可靠咁 estimate 個 first-drawn 1 litre。

至於你話呢八十個 second，你呢個我哋咁樣呢五個 sample 嘅 average concentration 係咪可以唔同嘅比重呢？咁係可以唔同嘅比重嘅，但係因為我哋點解咁做，因為我哋 total mass 除 total volume，呢個係最 direct 嘅 measure，我唔需要假設，因為我可以話譬如 50 再--即係 assume 咁你--即係變咗你要好多假設，所以嗰個 flat concentration 就係 base on direct measurement，咁係其中一個 measure 嚟嘅啫，即係唔係一個絕對嘅，因為喺呢個因應我哋嘅 sampling protocol，一個 average 嘅 flat concentration，即係只可以咁講。

我明你所講，如果你嘅意思就因為如果譬如我唔係咁做，我係 250、100、100、100，或者 250、200，咁做出嚟嘅 flat concentration 就可能唔同，咁同意，同意，所以呢個完全冇唔同意，冇，完全冇唔同意。

問：亦都冇乜特別理由係要唔可以 250、250、250 或者 250、100、100、100 咁，冇乜特別...

主席：咁永遠都唔可以 please 所有嘅人，啱唔啱先？我今日做 250，聽

日你話唔准，要做 500，後日你話要做 750，咁幾時先至完呀？

王先生：主席，我唔係咁嘅意思，我唔係想...

主席：Exactly，...

王先生：唔係...

主席：...如果唔係咁嘅意思，唔好嘥時間喇，係咪？咁你係咩嘢意思呢？

王先生：主席，我嘅意思...

主席：即係你今日做一個 250，梗係喇，我聽日可以做 260㗎，後日可做 250㗎，我要做幾多先至滿足到你哋各位律師嘅心願呢？

王先生：或者我咁講，主席，其實我係想講，我唔係特登想刁難或者浪費時間，主席，我係想講李教授...

問：或者我想同你講，我係想講如果嗰個比重係可以反映到嗰個水質嗰個 transient value，即係話嗰啲咩嘢時，譬如三十秒就係嗰個 first draw 嘅影響，and then 之後嗰個 flush 嘅影響多啲，如果你係想 capture 嗰個水嘅 average 或者個 mean lead concentration，喺個 weight 個 adjustment 嗰方面其實都應該係落啲工夫，如果就咁用 average 嘅話，未必係咁準確，我就係想帶出咁樣嘅道理。

答：係。

主席：呢個你唔使問佢，睇下你點樣樣 take 個 average 之嘛。

答：即係同意嘅，同意嘅，同意嘅，係，同意。

主席：你鍾意 T，第二個係一分鐘嘅，第三個係兩分鐘嘅，個 average 又唔同晒喇已經。

王先生：主席，其實同個分鐘冇關係嘅。

主席：你 measure 出嚟嗰個 concentration 已經唔同咗喇。

王先生：係，concentration 唔同咗。

主席：你個 concentration 唔同咗，跟住你 average 就已經唔同晒喇，係咪？

王先生：係。唔係，主席，我係想講話唔係嗰個時間問題，而係...

主席：唔係，我知，但係個問題就係因為而家李教授就係想 capture 嗰個重複嘅，個 concentration 同個 time 個 difference --即係個 relationship，所以佢咪設計到個 gap 盡可能係細啲，你咪可以 capture 到多啲數據，睇到個 variation 係點樣樣變囉，係咪？

王先生：唔。

主席：就係咁簡單之嘛，你取決於 resources 嘅之嘛，你如果人多嘅，你可以十秒鐘攞一個都得㗎，係咪？你個 lab 大把空間做嘅，你咪做多啲囉，你嗰個準啲，你 plot 出嚟個 graph 咪靚啲囉，一樣之嘛，同我哋考試，O level、A level 一樣之嘛，你鍾意做幾多個 integral 吖嘛，你 plot 條 graph 出嚟靚唔靚，smooth 唔 smooth，就係咁之嘛。

王先生：喏，明白。主席，或者我已經 explore 咗呢個 point，其實我係想講個 weight 嘅問題，不過李教授已經答咗。

主席：我絕對明白你，即係你取決於好多，你個 sampling protocol、你個 experiment、你個 methods 點樣樣，你出嚟嘅嘢，你有好多唔同嘅...

石先生：同埋亦都係視乎你嘅假設，因為我諗王大律師佢有一個好嚴重嘅假設，我諗就係 guided by 水務署最新攞出嚟嗰個所謂 interim report，就係冇乜人係用頭嗰浸嘅，所以佢哋可能有一方係要堅持就係話就比重應該係擺重後面嗰啲，但係始終呢個就係習慣嘅問題。

主席：第一就係習慣嘅問題，第二就係究竟你想做乜嘢嘢，個 objective 係做咩嘢，最重要係，係咪？

王先生：係。

主席：我話如果你話「我要一個 general」--個問題你要一個--你話「我

要一個好 general 嘅究竟 water quality，一個 general pictures。」嘅話，你咪 flush 囉，係咪？甚至你喺個 entry point，lot boundaries 嗰度攞，跟住你入咗去，你話「原來我呢度成蔓屋邨呢蔓人係好得意嘅，個個都唔會朝頭早一起身就係攞啲水煲水，攞落去個暖水壺嗰度今日用㗎喇，佢哋個個都係刷牙、洗面、沖涼。」嘅，跟住你攞頭啖水，咁梗係唔代表呢一座大廈啲居民嘅用水嘅方法，亦都唔代表佢哋 average 飲水裏面究竟有冇鉛幾多喇。

呢個一定係咁樣嘅，不過我哋冇可能㗎嘛，因為全香港咁多居民，係咪？我哋一定要搵一啲 method 出嚟，我哋認為都 generally 係可以係一個 representative 嘅 pictures 可以塑造到出嚟，我哋咪-- Prof Lee 認為呢一個係可以做到嘅，佢咪做囉。聽日你可以一個呀，啱唔啱呀？

王先生：唔係，...

主席：不過你水務署用嘅方法就係連時間又冇，總之一去到，得閒去到嗰度就抽一個出嚟，總之就 flush 兩至五分鐘，係咪？你就話呢個就係個 general quality of water，如果你話呢一個唔 scientific 嘅話，你哋嗰個更加唔 scientific 添。

王先生：主席，我一陣間會講一講我哋嗰個 method 嘅，或者我想澄清一點，所以即係大家唔好誤會，第一，我嗰個 assumption 唔係建基於人嘅 habit 嘅，因為 exactly Table 7 就唔關 habit 事嘅，Table 7 係一 vacant flat 嚟嘅，所以個 habit 就唔 into 個 picture，所以朝早起身先煲水吖，抑或先刷牙、洗面呢，喺呢一個 vacant flat 就...

主席：唔係，我明嘅，你唔使問呢啲問題㗎喇，你明唔明呀？

王先生：係。

主席：我完全明白晒個報告講乜嘢嘢，你想問問題嘅目的係咩嘢，不如你--如果你有你嗰啲專家話咁樣樣係錯嘅，咁樣樣先至係啱嘅，你咪 as well 直接問 Prof Lee「我哋個專家話咁樣樣先至係啱嘅。」聽 Prof Lee 個 comment 囉。

王先生：好，或者我直接問。

主席：係。

問：Prof Lee，如果我哋想係攞一個--個目的如果係想攞一個 representative sample 嘅，即係 represent the general quality of the water 嘅，個目的係咁樣樣嘅話，咁 looking at Table 7，個 transient value of 嗰個第一啖水嘅話，如果個目的係咁嘅話，個 model --即係嗰個 protocol，個 weight to attach to 個頭啖水其實就唔應該係大嘅，應該係細嘅，調番轉嘅，呢個你同唔同意？

答：譬如我哋睇葵聯，睇葵聯，譬如你葵聯，佢頭啖水就係 12 月 12 號，頭啖水係 26，跟住 30 個 second 就係 7 吖嘛，30，7 咁，跟住就好細，跟住去到最後突然又有 0.011，所以我哋咪睇到--即係我冇，主要係睇個變化，我哋而家做係睇個變化，就如果你話好似個--我而家當然呢個 vacant time 唔係我哋嗰五個 sample 嗰個 typical 嘅 sampling，但係如果--譬如我哋要 sample 呢個，咁你都超--即係你都會個--就咁嗰個 flat concentration 都會--即係 borderline 咁樣，即係會 borderline 咁樣，你意思就話應該後面啲比重多啲，係咪？比重多啲？

問：係，冇錯，呢個就係我個意思。

答：但係我諗就會--如果係 for 成年人，我諗就可能就你--即係我會同意你嘅，即係會有另外啲 measure 可以 possible，我個意思就可以有第二啲 measure，但係正話我哋講過個 first-drawn 1 litre 同埋個 weekly lead intake 一樣嘅咋嗝，即係唔會點受呢啲影響，如果你睇今日嘅表，個 weekly lead intake，infant weekly intake 基本上取決於頭兩個數，基本上，如果你 first-drawn 1 litre，我覺得對呢啲 user 就冇咩嘢影響。

如果譬如你話成年人，成年人，如果我哋話百分之十四先用個頭啖水嚟做 drinking potable 嘅，咁就即係就--咁一樣喇，呢個都係--我覺得一樣會係 first-drawn 1 litre 就代表到，因為你去到--如果你睇我哋嘅 Figure 1，你睇番我哋嘅 Figure 1，你去到 80、100 秒，其實你已經好--嗰個好犀利，20 個 litre㗎喇，即係你去到 80 second，即係已經好龐大嘅數字呀嗰個。

簡單嚟講，就話你話要代表性，就 first-drawn 1 litre 係一個代表性，你話成日嘅代表性係 average lead concentration，就視乎個 consumption pattern，譬如我用個數據嚟講，譬如話

英國數據，因為香港未必準，譬如話你成年人就百分之十四，就用 first draw 啲水，用嚟飲用，0.14，即係個 risk 係 0.14，對我嚟講，0.14 乘呢個 intake，that would be my estimate of the expected lead intake of an adult，即係好--呢個當然即係好多假設，即係假設英國嗰個就--但係英國起碼就好 scientific 嘅，唔係你口講，真係度，度咗兩個禮拜，每一個--一百個 household，每一個 household 度咗兩個禮拜足足。

咁所以即係就會咁睇，就會唔係咁決定呢五個 sample 嘅 details，係咪呀？即係...

問：得，我問完喋喇，呢個 topic，我 move on喋喇。

答：Okay，唔該。

問：Prof Lee，我哋下一個 topic 想問你個 sample size。你有個新嘅 Table 5 嘅。

答：Table 5。

問：喺 17.3.17 -- 173.17，173.17。

答：Table 5。呢度，okay。

問：Okay，你呢個表嗰個 comparison，“WSD/HD”就係水務署嗰個 sample 個 size，根據你呢個表，個 number of sample 就 1325，係咪？

答：（沒有可聽到的回答）

問：“No. of samples with excess lead”就係 106，8 個 per cent，好喇，科大嗰個，即係你個 research team 嗰個，“No. of samples (flats)”就係 108，108，啱唔啱？

答：係。

問：“No. of first draw samples with excess lead”就係 51，啱唔啱？

答：係。

問：跟住你又有“No. of flats with excess lead”，呢個就係個

flat concentration 喇？

答：係，係，差唔多。

問：差唔多，你 number of first draw 就係淨係用頭嗰 250 個 ml 愛嚟做比較喇？

答：係，係。

問：好喇，我想問你，你認為--當然我哋知道有資源、有時間限制，呢樣嘢水務署係相當了解嘅。你認為 compare 108 個 sample 同 1325 個 sample，兩者我哋做比較，達出一個 comparative 嘅 result，呢一個唔同 sample size 會唔會唔係好 accurate 呢？

答：首先，就算水務署本身嘅 sample，都係--如果我冇記錯，就所有嘅 lead 嘅百分之四嘅咋，只可以 sample 到。

問：係，係，係，當然，當然，當然，係。

答：所以即係就算你...

問：雖然係千幾，嗰個都係百分之四，係。

答：個 sample 就好細嘅，同埋嗰個 sample 就唔係一個有計劃嘅 sample，即係話你晏晝 3 點鐘又度啲，然後 fully flushed，所以係冇一個 target 嘅 purpose 嘅，我哋--當然呢個係 general 嘅一個 quality 係--即係我哋都講過呢個問題--即係唔係問題，即係講咗呢個取決，但係我哋嘅 sampling 就目標就好明確嘅，就想搵個 maximum lead exposure 可能係點，即係可能係點。咁所以我覺得我哋--而亦都係當然有限資源，但係我覺得個特點即係咩嘢呢？就係每一個 building 去做，每一個 building 去做，而每一個 building 上、中、下。

　　我哋亦都有啲原因點解上、中、下，即係上層、中層、下層，randomly，即係好 random，呢個唔係我哋抽嘅 random，呢個係房屋署抽嘅，呢個 random sample，如果咁嘅情況下，譬如話成個屋邨都冇事，咁真係我覺得幾有代表性，對我嚟講，within 個 framework。所以呢個亦都同--即係有喺 within 個 resources，喺有限資源下，我覺得呢個係就可以畀到我哋好多訊息，一個 general 嘅 sampling 畀唔到。

問：好，我想...

答：我只可以咁，你話係咪代表性，我只可以話就係佢嘅結果就同我哋成個理解就相當吻合嘅，亦都同啲咩嘢 concerned owners 嗰啲，我呢度冇講，但係即係其實譬如佢哋度到啲係有事嘅，我哋都係，即係一致嘅，咁所以只可以話所有嘅跡象就係雖然係有限嘅數據，但係我哋覺得係有一定嘅代表性，即係初步嘅代表性，因為個個 building 都有 sample，個個 building 都有 sample。

問：Prof Lee，我想問你一粒數，彩福邨，你睇呢個表，彩福邨嗰粒數，彩福邨，即係最後嘅嗰個 entry，“No. of buildings”係 3，“No. of samples” taken by WSD 就 92，“No. of samples with excess lead”就 13，就 14.1 個 per cent，呢個就係水務署調查嘅結果。

答：係。

問：UST 個 team，“No. of samples” 係 9，“No. of first draw samples”係 0，“No. of flats with excess lead”係 0，你可唔可以解釋到點解會係咁嘅現象？

答：呢個就--呢個我就會係調轉嚟講反而，我就覺得--我有好幾個亦都--即係有啲原因嘅，我哋覺得呢個彩福就--我有啲 comment 嘅，你等等先。即係我順帶講一講，即係意思就話其實--如果你就算你全部譬如 fully flushed 咁做，其實得出嚟結果個相對性，我覺得就冇我哋呢個 sampling 咁好，點解呢？譬如彩德就 14.1 個 per cent，東匯 7.7 個 per cent，所以你從 flushed 嘅 sample 嚟睇，就彩福就嚴重過--即係似乎多啲超標過東匯嘅，但係如果我哋由真係頭啖水嘅嚟睇，就東匯就即係真係好顯明，就係 83 對 0 嘅，即係好顯明嘅呢個。

至於點解有咁嘅對比呢？即係因為好多原因，你嗰個譬如視乎嗰陣時做，譬如夏天嘅氣溫可能又有啲唔同，有好多原因，但係我覺得會有好多原因，我覺得 temperature to be one factor。但係亦都有可能個--即係你意思--當然你--如果你 fully flushed，都有十三個辦，當然即係都 indicate 有個問題，係，有個問題。

呢個我就冇--等我睇下先，彩福。多謝你嘅問題，我哋一齊睇一睇彩福，彩福，我哋--譬如我哋睇彩福，我哋啲 data 真係冇乜--呢度全部 random，嗰九個 sample，冇乜...

黎先生：教授，可唔可以咁睇呢？實際上，我哋而家講緊做 sampling，抽樣，除非你係每一個單位都走去做嗰陣時，就梗係知道晒嗰個結果，我哋而家講緊係做 sampling，我嘅睇法就咩嘢呢？梗係一定會有啲有，有啲冇，因為事實上，而家睇落去，亦都唔係全部係所有嘅焊接都係用有鉛嘅焊料，即係梗會有啲嘅情形出現，係有啲係有鉛喺入面，有啲係冇鉛喺入面，而係冇可能，除非你做得到，想話知道晒嗰陣時，就全部單位都做晒，梗係最清楚喇。

但係另一方面好清楚睇得到，如果係冇鉛嗰啲，我哋都做咗好多嗰啲嘅測試，喺以前，譬如話接駁方法唔同，嗰啲係冇鉛，就真係冇鉛，無論你任何時候開個水喉都係無鉛嘅，嗰啲係好清晰嘅，而呢一啲嗰陣時，做嗰陣時好明顯有一啲我哋因為唔知道究竟邊一個單位接駁嗰陣時係用咗啲有鉛嘅焊料，咁梗有啲情況之下，有啲驗出嚟有，有啲係冇，而因為基於你係咩嘢呢？係去 random 嚟到去揀呢啲單位出嚟嚟到去測試嗰陣時，梗一定會有呢啲咁嘅 result 出現㗎喇，有啲你驗到出嚟多啲，有啲驗到出嚟少啲，但係最重要就係咩嘢呢？如果你係有鉛嘅話嗰陣時，有可能出現咗就係咩嘢呢？你係唔同嘅方法驗，無論你係水務署嘅方法或者係教授嗰啲方法都可能會驗到有鉛，如果真係冇，就係冇㗎喇，有嘅話，唔同方法可能驗到，有一啲佢嘅方法可能驗到出嚟冇嘅，好似咩嘢呢？彩福係冇，一啲都唔出奇。其他有陣時，如果係有嘅話，證明一定係有，不過你唔同嘅方法都驗到出嚟咁解嘅啫。

而我而家啲睇法就係咩嘢呢？最重要就係咩嘢呢？我哋嗰個大家嗰個嘅用水嘅習慣係好唔同，問題就係我哋係咪接受水務署嗰啲嘅解釋，我哋係開咗水喉，flush 咗啲水一陣，然後先至飲嗰啲水，係咪唯一呢個咁嘅方法呢？定係話係市民嘅期望係話「我任何時候我開個水喉，啲水都係符合標準，係可以飲用。」嘅方式呢？點解有啲人住喺啲屋邨，就話「你住喺呢度，你就要開水喉 around 兩至五分鐘，你先好飲呀。」咁，點解住喺其他啲屋邨「我任何時候開咗個水喉都冇事。」呢？我哋要接受係我哋要接受邊一種嘅標準咁解嘅啫，所以呢一個係我哋一啲嘅諗法。

所以變咗係呢啲嘅 sampling，我覺得出嚟 result 大家唔可能係一樣嘅，如果你話做一千三百二十五，係咪 Water Supply 嗰個嘅抽樣先至合格呢？而係做一百零八十唔合格呢？我又唔係咁睇，因為我覺得譬如一百零八，你純粹只不過我哋係 check 下 Water Supply 佢哋做過一啲嘅抽樣嘅調查，嗰個結果係點，然後用一啲另

外嘅方法嚟到再 check 下有冇咁嘅同樣嘅情況出現咁解嘅啫。我覺得唔通我又要求李教授做一千三百二十五伍先合格呢？係咪咁樣樣呢？唔係㗎嘛，係咪呀？

我哋啲睇法就係有少少，我哋應該要值得大家去深思一下個問題喺邊度，定係純粹喺度糾纏一啲嘅呢啲嘅 sampling 嘅方法或者係嗰啲結果，係咪呀？唔知李教授同唔同意？

答：多謝委員。唔係，我仲想補充下，其實我哋再睇彩福，彩福有十三個超標嘅，呢十三個超標，其實有十一個就係 10 同 19 之間嘅，即係呢個表係我自己嘅，即係我唔知有冇...

問：唔緊要，唔緊要，你講。

答：10 即係--然後有兩個就大過 30，即係兩個好高㗎喇，呢個即係唔知邊度，但係就喺 10 至 19，即係 20 至 29 就冇嘅，所以呢十三個其實有十一個就係啱啱超標，如果你用美國嘅標準，15 添，即係啱啱超標嗰個範圍，咁即係係有個隨機性。

問：明白。

答：我諗只可以咁講，多謝你指出呢樣嘢。

問：唔係，我只係想提出一個可能性，多謝黎專員頭先提出嗰個思考，我只係想話提出一個睇法，就係話會唔會個 sample size 會影響到個結果啫。因為九吖嘛，呢個呢個淨係攞九，相對九十二，即係用 sampling 嘅角度去睇，即係會唔會係因為個 sample size 細咗，就有個 capture 唔到，有冇呢個可能性？

黎先生：就算去到九十二，都未必嗰個 result 同你嗰個九十二一樣㗎喎。

王先生：唔係，我唔係話一樣。

黎先生：係咪呀？

王先生：不過因為就隨機性，我明白，攞 sampling。

黎先生：咪係囉。

問：會唔會係個冧巴太細呢，九？會唔會有問題？

答：正如我哋講，即係都係有一個資源同時間同其他考慮個平衡，當然我係每個大廈，即係每個 house 我攞唔係三個 flat，六個 flat，但係你一個 house，八百個 flat，即係香港嘅情形就係一座樓有八百個 flat，你點為之夠呢？呢個就其實你話就算五個、十個，你係咪夠，都咩嘢？咁所以我明嗰個你嘅顧慮，但係只可以講，似乎啲結果都幾一致，我只可以咁講，即係結果，我睇唔到有咩嘢--即係都幾合理，只可以話。亦都其實同--就算你--譬如你由基於呢個調查之後，個 lead intake 同所有啲--甚至乎水務署啲都吻合㗎，即係個大體，...

問：我哋冇話唔吻合，我哋冇話唔吻合。

答：大體吻合，okay。

問：好，我而家去第二個題目。我想問一問你關於 plumbing volume 嘅問題。Plumbing volume，你就用 20 米作為一個 plumbing volume，大約 20 米作為一個--即係個水流 20 米作為一個 plumbing volume。

答：即係呢一個大約嘅...

問：32 段，你嘅 32 段。

答：即係二十、三十咁，即係當係一個 plumbing volume。

問：Plumbing volume，李教授，我哋今次就知道 it so happen，因為水務署已經做咗啲 research，就知道喺嗰個 roof tank 同埋 sump tank 入面嗰個水質係冇超標嘅。

答：係，係冇超標。

問：所以嗰個 research 個重點就係去 find out 既然嗰個 roof tank 同埋個 sump tank 都冇被污染到，你就攞個 branch pipe 嗰段，係咪？

答：係，係，係。

問：但係正常如果我哋冇--即係淨係假設我哋唔知道呢樣嘢，我哋想測試下嗰個內部供水系統，啲水喺 connection point 嗰度，如果我哋想知道嗰啲水係咪合標，我哋唔使 flush through 嗰個 inside service，我哋可以直接喺 connection point 嗰度攞水，喺大喉或者攞水，就咁可以驗到水務署供應個水質喇，係咪？好喇，如果我哋係想攞啲水，嗰啲水係 run through 嗰個 internal plumbing system，一般嚟講，我哋係抽嗰個 plumbing volume，係咪應該係攞嗰個水，唔係淨係嗰個 horizontal pipe，應該係攞晒成個 plumbing intern --即係水 run through 個 plumbing system，然後先至可以搵到佢有冇事嘅。你明白我講咩嘢？

答：係，但係即係...

問：因為呢個 case 好 special，因為我哋已經知道咗個原因，然後我哋先至攞呢一截水，就根據你嘅講法，就話 define 呢一橛做 plumbing volume，但係如果我唔知嘅，譬如可能唔只含鉛，可能有其他嘅 hazard 喺入面嘅，我想知，我淨係想知道喺個 internal plumbing system 入面有冇其他污染物，如果我想攞一個 plumbing volume of 個 internal system，我可以攞嘅其實就唔係淨係嗰條 horizontal pipe，啱唔啱？我要攞嘅就係由 connection point 一路 pump 到上天台，跟住再落番嚟，然後流番入去每間住戶嗰度，呢一個個水 run 一次，咁就叫一個 plumbing volume，你同唔同意？

答：呢個就唔一定嘅，呢個唔一定，因為 plumbing volume 嘅定義就係 the volume for which stagnation ceases to have an effect，即係意思你擺喺度隔夜都唔會有影響嘅，呢個叫 plumbing volume。所以你如果話好 formally，你表面上按文即係嚼字咁嚟，就會係好似你講，即係成個 system 睇晒，照晒咁成個。

問：全身檢查。

答：全身檢查。但係喺我呢個 context，就符合 plumbing volume 嘅定義嘅照計，因為成個 system 冇事，你係得由個 down pipe 入嚟有事，所以即係話你三個呢個 volume 之後，你係咪 stagnation 都冇影響嘅，如果我理解，就 plumbing volume 係咁定義嘅。

但係因為你一般嘅--尤其是第二啲國家啲 system 就會好大，一般，即係我哋呢個情形就有少少唔同嘅，所以我諗係有啲取捨，睇你點 interpret 一般嘅 guideline，我哋就 interpret 就係--即係其實就照正，個 interpretation is the volume for which stagnation ceases to have an effect，呢個就係某一個程度上基於水務署嘅數據，...

問：嘅數據。

答：...即係話 roof tank 同咩嘢都，但係似乎都合理喇，似乎。

問：但係如果冇咗水務署嘅數據，要你 design 一個 plumbing volume 嘅時候，你就唔會淨係攞 horizontal 嗰樾，啱唔啱？

答：比較難講啲，比較難講啲，即係譬如如果你成個 down pipe 都係好污染嘅，咁即係就會唔同。

問：咁你攞埋喇，係咪？

答：即係會 vary。

問：好，仲有一樣嘢我想問，如果用嗰個 0.26 per litre per second -- 0.26 個 litre per second 呢一個 flow rate，喺你做過個 research，關於呢個 public housing estate，如果我要攞水，係攞到-- from 個 connection point，即係我要攞一個 plumbing --即係我所謂叫 plumbing volume，即係成個水務系統，即係成個 internal service，要抽水抽到係喺嗰個供應點嗰度嘅，兩至三分鐘絕對唔夠嘅，你同唔同意？

答：係，唔夠，唔夠，唔夠，係。

問：你認為要幾耐？

答：呢個我哋就未--因為睇你點睇嘅，因為...

問：即係攞到去...

答：...如果你由個 lot boundary 開始--呢個都睇你個定義喎，因為你由個 lot boundary 入去個泵房，泵房好大喎，泵房，咁你泵房--即係如果你想估計泵房入面嘅水嘅 residence time 就即係我諗你要睇個 flow rate，睇成個泵房嘅容量，係咪呀？

問：唔。

答：然後你再上去 roof tank，又要睇 roof tank 嘅容量，係咪呀？

問：啱。

答：所以都會 probably in the matter of hour，right？

問：Hours。

答：Yes, probably。

問：因為同我哋嘅...

答：冇，即係其實不過--即係如果你成個系統睇，就 probably in the matter of hours，order of hour。

問：係喇，即係話如果你想攞個水箱，係攞咁喺 connection point 嗰個，你要 flush，要 flush hours 嘅，唔係 minutes 嘅，啱唔啱？

答：唔一定 hours，係咪 hours，唔知，order of an hour，即係唔係 minutes，probably。

王先生：主席，我 move 會第二個 topic，可唔可以聽朝繼續？

主席：可以。聽朝九點半再繼續。我想問一問你，水務署，你哋係咪有專家㗎？

王先生：我哋有。

主席：你個專家報告幾時 file？

王先生：我哋嘅 understanding，就係委員會想呢個禮拜完成晒所有專家嘅證人，我哋而家爭取緊，希望儘快或者何建宗教授或者佢就咁喺 witness box 度 comment，其中一個 option 快啲，就係何建宗教授喺 witness box 度 comment 兩個專家...

主席：我哋要睇你個 report。

王先生：因為我哋何...

主席：如果係咁，我唔批准你。

王先生：主席，或者咁樣樣，我聽朝答你，好唔好呀？個時間。

主席：唔係，因為我--老老實實，你嗰個 preliminary report 幾時 file，我唔記得咗，放假之前？

王先生：放假之前，咁點解而家咁耐都仲未有？

主席：因為我哋其實係放假之前 file 咗，跟住何建宗教授放假，所以就--放咗農曆假，所以...

李教授，你可以離開㗎喇。

答：Okay，得，得，得，好，得。

王先生：其實我哋何建宗教授同一日嘅，都係禮拜五，同 Prof Lee 嘅 report 同一日交嘅。

主席：收咗喇。

黎先生：何建宗嗰個。

主席：Preliminary 嗰個。

黎先生：何教授嗰個。

王先生：係，preliminary report 同一日 file。

主席：我知，你得一個之嘛？

王先生：係，係。

主席：我唔係要嗰個，我要你個 final report，你幾時 file 你個 final report 呀，打算？

王先生：我聽朝話你知咁，可唔可以？

主席：唔得，你聽日 file，一係就。我哋呢一個研訊嘅其中一個問題就係個個人都係等到人哋 file 晒所有嘅 report，先至 file，全部就係 reactive 嘅啲 report，睇住人哋點樣樣寫，我就寫嘅。

王先生：我哋盡量...

主席：你一早都知道有啲乜嘢 issue 㗎喇，你個 preliminary report，恕我直言，得嗰幾段，係冇 substance 嘅幾段。

王先生：主席，因為--或者咁，我聽到主席嘅意見，我盡力爭取聽日。

主席：我老老實實話畀你聽，如果你聽日唔 file 嘅話，我唔會畀你 file 嘅，我亦都唔會畀你 call expert witness，你如果 file 嘅話，你聽日 5 點鐘之前 file。

王先生：好，可以。

主席：唔該。

2016年2月15日

下午5時01分聆訊押後

Monday, 15 February 2016

(9.33 am)

(Transcript of simultaneous interpretation
except where otherwise specified)

MR SHIEH: Good morning, Mr Chairman. We are now calling
the first witness for the Commission, Prof Joseph
Hun Wei Lee.
CHAIRMAN: Thank you.

PROF JOSEPH HUN WEI LEE (sworn)

CHAIRMAN: Please be seated.

Examination-in-chief by MR SHIEH

MR SHIEH: Good morning, Prof Lee. For the Commission, you
have prepared two expert reports. First of all, there
was a joint preliminary report prepared together with
Prof John Fawell. Another one was drawn up by you
yourself. Do you recall?
A. Yes.
Q. Please take a look at the bundle in front of you, called
V1. It carries a tab, V1. Within the bundle, we have
a number of dividers.
For the first one, please take a look. There's the
joint expert report, a preliminary one, written by you
and Prof Fawell, on 12 November 2015. Do you see it,
joint preliminary report?
A. Yes.

Q. There's another one. Please take a look at V1, tab 4. That's your own expert report, dated 5 February this year.

This morning, I intend to read out your expert report. You have written it in English, so I am going to read it out in English, so that we have the opportunity to listen to the content of your report. I may have to invite you to elaborate on certain points. So I will pause there and then I will ask you specific questions concerning certain concepts or main points in the report.

I am going to read it out in English. However, when I would like you to invite you to elaborate on certain points, I am going to speak in Cantonese, and I think you have agreed that we should have such an arrangement.

A. Yes.

Q. Thank you. So V1, "(In English) Joint expert report". Please turn to page 5, because the first two pages carry the instructions for Prof Fawell, and then that's followed by the instructions to Prof Lee, "(In English) Professor Joseph Lee".

A. Yes.

Q. "(In English) Chair Professor, Department of Civil and Environmental Engineering ..."

(Page 5 of joint expert report read in English)

"(In English) ... Curriculum Vitae -- Appendix I".

Now I invite you to go to appendix I and you find it in page 27 of the first bundle, starting from page 13. So let's take a look at page 13. Page 14, sorry. For your curriculum vitae -- yes, I'm right, it's on page 27. I'm not going to go into the details. In summary, in the 1970s, at Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, you were awarded a PhD, MSc, and bachelor of science in civil engineering?

A. Right.

Q. Then you were granted a scholarship and the title of scholar. For your expertise, it is written here: environmental hydraulics, fluid mechanics, water quality modelling. So you believe that your research interests are applicable to the area of investigation?

A. Correct.

Q. Briefly speaking, what topics are covered by your research?

A. Briefly speaking, it covers all the hydraulics issues concerning the environment. Say, for example, the heads (?) in Hong Kong and also hydraulics related to pollution.

Q. So, briefly speaking, you talk about how contaminants in water as a result of physical rules may be fields and

you want to know how they can be controlled, and topics like that?
A. Correct.
Q. Your original experience as to the courses taught -- we understand that there are quite a number of them -- you were once the assistant professor at the University of Delaware, and then you came to Hong Kong to teach. Between 2000 and 2003, you were the dean of engineering, and then between 2004 and 2010, you were the vice-chancellor, and then in 2010 you became the vice-president. I read from the newspapers that the Hong Kong University of Science and Technology invited you to go to the HKUST, and then your post as pro vice-chancellor of HKU is still vacant?
A. That's exactly the vacant post. I think I heard that it has just been filled.
Q. When you were with the HKU, what sort of area were you involved in?
A. Staffing.
Q. Then, when you went to HKUST, you were responsible for research and graduate studies?
A. Yes, research and graduate studies.
Q. On page 27, further down, you have got a number of public service posts, as well as the research topics that you have covered, as well as membership of certain

committees.

I don't intend to go into the details and I don't think it is going to be disputed, as to your status as an expert.

Let me turn to your preliminary joint opinion. Please go to page 6 -- no, page 5, where you have your instructions:

(Instructions read in English)

(Pages 5 to 6 of preliminary joint opinion read in English)

Let's pause here. The second-last paragraph:

"(In English) Fully flushed samples on their own may serve the purpose of assessing the general quality of a drinking water as supplied ..."

When you talk about the "(In English) general quality of drinking water as supplied", what do you mean?

A. It means that the source of the water supply reaching the building, that is at the lot boundary -- in other words, the quality of the overall water source, when it is fully flushed, it will be adequate.

Q. So you talk about the water source reaching the boundary. Why are you saying that fully flushed samples may not represent the quality of water passing the lot boundary?

A. This is because whether we are talking about this investigation or previous incidents, it has been shown that given the very unique case in Hong Kong, we have got so many high-rise buildings, the cause of lead in water is due to plumbing; that is, the fittings, the pipework, et cetera, that may contain lead. Oftentimes, beyond the lot boundary, for the inside service, inside the buildings, the source of lead often comes from the plumbing. This has been reported in a lot of international journals and news reports.

So, in terms of the master water source, if you only look at the master water source when you assess the risk of lead in drinking water, it might be inadequate.

Q. Thank you. Now I would like you to look at your own expert report, at page 127, dated 5 February. The report starts from page 128. Here, we have some background information on your appointment as a witness.

Page 129 -- you mention a lot of sampling protocols and methods. Now, we can look at some details and plans when we reach the relevant parts. On page 129, you mention the date of inspection of some of the involved estates.

Let's pause here. So, for the sake of this witness report, you visited certain estates.

A. Yes.

Q. "(In English) 1) 10 November 2015.

(Kwai Luen Estate Phase I -- Luen Yat House; Kai Ching Estate -- Hong Ching House; Tak Long Estate -- Tak Long House).

2) 27 November 2015.

(Vacant flat in Un Chai Estate).

3) 12 December 2015.

(Vacant flats in Un Chau Estate; Kwai Luen Estate).

4) Field sampling visits to all 'affected estates' and selected 'unaffected estates' ..."

Let's pause here. For the visits for the first three days, on the visits on 10 and 27 November and 12 December, your visits served to understand the situation, its investigative nature?

A. Yes.

Q. In number 4, you said:

"(In English) Field sampling visits to all 'affected estates' and selected 'unaffected estates' ..."

As I understand, as your report mentioned, after the first three visits you had to start testing the water quality, so you arranged a string of visits to specific estates and take water samples, and that's what you meant by "(In English) field sampling visits"; right?

A. Yes.

Q. As I understand, your research team was involved in these field sampling visits. Did you personally attend those visits?

A. There were three vacant flats in which detailed investigation was carried out.

Q. And you were personal involved in those visits?

A. Yes.

Q. At the bottom of the page, "(In English) Site visits" -- now, these are visits to non-housing estate premises:

"(In English) 1) 9 November 2015.

Shatin Water Treatment Works.

Government Laboratory.

2) 12 November 2015.

Ngau Tam Water Treatment Works."

So this is located in Ngau Tam Mei?

A. Yes.

Q. "(In English) 7 December 2015.

Training Centre of the Construction Industry Council."

Let's move on to page 130. This is a more formal part that lists out the terms of reference of the Commission and your own instructions. I read them out already.

Let's move on to page 131:

(Paragraphs 1 to 4 were read in English)

So, in this paragraph, I just want to ascertain one point. In paragraph 4, you talked about some water samples. You were not referring to the independent sampling done by your research team at HKUST. Now, these were tests done by the WSD after the lead in water incident?

A. Correct.

Q. You said that in the 11 affected estates tested by WSD, substandard samples of water were found, and this is in appendix I, page 158. This is table 1. We have list of affected estates sampled by Water Supplies Department during July to September 2015.

In (a), you can see names of housing estates -- Kwai Luen Estate Phase 2, and so on. You can see the year of completion, from 2008 to 2014. On the right-most column, you can see the number of samples with excess lead and the number of samples, and the respective percentage.

Overall speaking, out of 1,325 samples, around 106 samples were found to be substandard, and the percentage is 8 per cent.

In paragraph 4, you mention 8 per cent of the samples and that's how you came up with that percentage?

A. Yes, correct.

Q. Now, the second table. This table illustrates out of the 1,325 samples, the distribution of lead concentrations. Now, less than microgram per litre, there were 30.4 per cent; between 1 and 4 micrograms, we have 47 per cent, and so on. 5 to 9 micrograms, we have 193 samples, or 14.6 per cent of the total.

In paragraph 4 of your statement, that's how you came up with the percentage 14.6.

A. Yes.

Q. Now, some people might feel that we only have to look at lead concentrations above 10 micrograms. So why did you have to specifically mention the lead concentration ranged 5 to 9 micrograms? What's the significance?

A. The provisional guideline value is 10 micrograms per litre. It's just a guideline. It's not an absolute standard. According to some academic papers on the impacts of lead in drinking water, the impact would be different on people of different ages, and children are generally more vulnerable. So starting from 5 micrograms per litre we should pay attention. So we want to gain a holistic view on the impacts of lead in drinking water. So we want a better understanding of the ranges of lead concentration.

Q. All right. Let's move on to paragraph 5:

(Paragraphs 5 to 7 were read in English)

Now, this represents -- echoes what you said in the expert report.

(Paragraph 8 was read in English)

So Lo & Lo, on the basis of the WSD and the Government Laboratory's reports and data, they have prepared a number of tables. My understanding is that later on, you would also refer to the diagrams and tables that they have prepared?

A. Yes.

Q. We are going to take one or two examples.

"(In English) Sampling of drinking water at PRH Estates":

(Paragraph 9 was read in English)

In fact, this is simple mathematics. That is, among the affected housing estates, among the affected estates, you selected 36 buildings. Basically, you covered all the 11 affected estates?

A. Yes, each and every building.

Q. "(In English) ... and 7 buildings in 6 selected 'unaffected estates'".

So 43 buildings in total. For each building, randomly you have selected three flats, at upper, middle and lower levels. 43 times 3, that gives us 129 flats. So you got samples from 129 flats. That's how you got the figures.

A. Yes.

Q. Page 160, please. Sorry, it should be page 159.

Table 2. It sets out the dates, the buildings, the

estates visited by the team from the HKUST.

Paragraph 10, paragraph 133:

"(In English) The field sampling was carried out by trained researchers (six teams, each of two members) from the [Hong Kong University of Science and Technology]. For each flat, a total of 5 samples were taken from the kitchen tap with the water continuously flowing: a 'first draw' sample and 4 subsequent samples at 20-second intervals."

Pause here. In other words, you turn on the tap, that's the first draw, and then for the first draw, later on you are going to talk about the sampling protocol, that is the first draw in the morning, and you talked about the preparation work the night before, and you have explained the protocol to the households. So first draw, we assume that's zero seconds, you turn on the tap, so at zero seconds water comes out and you've got 250 millilitres of water, that is 250 cc. So that's the first-draw sample, when you first turn on the tap. Then the water continues to run, you wait for 20 seconds, you place the container there and then you take 50. Then 40 seconds, another 50 mL, and then 60 seconds, once again 50 mL; at 80 seconds, 50 mL. So five samples altogether, they will give you 450 cc, 250 plus -- four times 50.

"(In English) The sampling was carried out ..."

(Paragraph 10 was read in English)

Figure 1 on page 149, that's what we have been describing verbally in relation to the steps. Left-most, the night before, you turn on the tap for five minutes, and then throughout the night, overnight, you don't use the kitchen tap.

Then the first time you get the water, 250 mL followed by 50 mL each. So that's the procedure involved?

A. Yes.

Q. For the part in blue, that means the water is running?

A. Yes.

Q. You have the flow rate measurement. Basically, you are measuring over a period of time how much water has been coming out, and then you measure the volume. So, for the average flow rate for this experiment, it depends on how much you turn on the tap and that will determine the flow rate, and then for the flow rate that you have obtained here, generally speaking it is 0.26 litres per second?

A. That's the average, yes, the average.

Q. This is because for every unit you can't be sure that it would be identical among the units, but then the average is 0.26 litres per second.

A. Yes.

Q. Paragraph 11:

(Paragraph 11 read in English)

"(In English) In total 645 samples ..."

That's from 129 units times five, because for each unit, five samples.

"(In English) ... 290 and 269 samples were analysed by GL and HSEO respectively; cross-checking confirmed the reliability of the measurements. Details of the sampling protocol can be found in appendix IV."

So let's go back to mathematics. You took 645 samples and then you said that 290 and 269 samples were analysed by Government Laboratory and HSEO respectively.

If we simply add 290 and 269, then you will get 559. But then you took 645 samples; right?

A. Yes.

Q. My understanding is that 290 and 269, you don't simply add up the two numbers, because you have some overlapping for the purpose of cross-checking. So my understanding is that 18 samples were analysed by both, that is GL and also HSEO, there were 18 samples analysed by both for the purpose of cross-checking, and then there were a number of them not analysed. So please explain. 645 samples collected for both laboratories, how come some were not analysed?

A. For this investigation, we were sort of limited by time. At first, we took five samples. We intended to analyse two.

Q. You mean two samples for each unit? Five samples collected, and then selectively you would take two samples out of five?

A. Yes, that is zero and 14. That's the original plan. However, when we were working along, we found that the variations were more complicated. Therefore, we believed that we had to measure all five of them. So you can see that for many days, we have been measuring all the five samples, to gain a better understanding in relation to the lead concentration, but then resources were limited, so there were 18-plus not analysed.

For cross-checking, please go to page 166. That is, among the 18 samples, when we talk about cross-checking, it means that for the same sample -- so please go to page 166.

Q. Should it be 165?

A. Yes, you are right. 166 for the cross-checking.

On page 166, when we talking about cross-checking, it means that for the same sample, we have got the GL as well as the HSEO analysing part of it. So that's for the purpose of cross-checking, and the results are found to be compatible.

In other words, we have a reference point, both of us are accredited laboratories, but still we believe we have to do so.

So there were 18 samples subject to cross-checking. In other words, we don't have 18 distinct samples here. For the same flat, we have two samples.

Q. So you have two containers. Part of it goes to the one for GL, the other part will go to the HSEO.

A. Yes.

Q. On page 165, you talk about:

"(In English) A total of 645 samples ... were collected; 290 samples were analysed by [Government Lab] and 269 samples by HSEO Lab. The unanalysed samples were stored in HSEO Lab's calibrated refrigerator for future analysis. Results of analyses by GL were sent back to HKUST once available. Eighteen samples analysed by both GL and HSEO Lab of HKUST were used for cross-checking."

Simple arithmetic. In other words, you didn't analyse 290 plus 269 samples; you have to take out 18. So 559, and you take away 18. In other words, the actual number of samples analysed was 541. 646 minus 541, in other words 104 samples, were not analysed, and they have been sort of kept.

A. Yes.

Q. You have said that in the beginning you did not intend to cover all the five samples; that's 0, 20, 40, 60, 80. The original intention was to focus on 0 and 40?

A. Yes.

Q. Of course I understand zero. That's the first-draw example. Why have you picked 40 and not 80?

A. This is because the purpose was to look at the lead exposure in water. When you turn on the tap, it takes time for you to get the first-draw sample. So, for 20 seconds, it would be quite tight, so we would rather wait a longer time.

Even within the first-draw samples, we wanted to get a better average. So we feel that the time interval is appropriate.

Q. If the period is too long, then everything would be gone; is that what you mean?

A. Yes, according to the data. We have been looking at the data.

Q. All right. Thank you.

Paragraph 12:

"(In English) More detailed sampling was also carried out in 3 vacant flats of 3 estates (Un Chau Estate, Kwai Luen Estate and Kai Ching Estate) [see appendix III, table 7]."

Let's look at table 7 in appendix III, on page 162.

Here we have a table, on page 162. Can you see table 7?

A. Yes.

Q. Let's go back to page 134. We'll flip to and fro between these two pages.

These three estates are outside of the 129 estates?

A. Yes.

Q. "(In English) The aim was to study how lead concentration at the kitchen tap varied with time in relation to water stagnation (out of use) in the water supply chain of the individual flat. This provided a systematic ..."

(Paragraph 12 was read in English)

Now let's look at page 162. We can see the flat numbers of the three vacant flats at the three estates. In these three flats, the sampling times were different, from 0 seconds, 30 seconds, 60, 120, 180 and 300 seconds. We see two extra measurements, a column called "(In English) Meter" and another called "(In English) Entry".

A. Yes.

Q. "(In English) Meter" refers to the water meter room, and there's one at each floor.

A. There's one meter room on each floor.

Q. And there are several?

A. Actually, there are several water meter rooms.

Q. And as I understand, there is one water meter room for every five or six flats, and in each water meter room there are a number of water meters.

A. Yes.

Q. Now, we know that for public rental estates, for the rooftop tank, going downstream, well, that's known as the down pipe. In a typical building, the pipe is thicker and the diameter is 76 millimetres, and according to research -- let's look at some prior research or study. Up until the rooftop tank, the water is still all right and doesn't contain lead.

A. (Nodded head).

Q. What about the down pipe portion? The down pipe portion uses 76-millimetre pipes. So, as far as you know, these pipes were not joined by solder; right? So are you aware whether the pipes are made of lead?

A. As I know, no lead is detected in the down pipes.

Q. So now we can rule out certain possibilities. From the portion to the rooftop tank, it doesn't contain lead, and the down pipe portion also doesn't contain lead either. So if we try to paint a picture of the situation, the down pipe portion doesn't contain lead, so for the horizontal part entering the building, you had to test whether lead is present. So, at the water meter rooms, you have to turn on the taps. The down

pipe works uses 76-millimetre pipes. So, for the horizontal pipes, thinner pipes would be used?
A. Well, we would use 36-millimetre pipes.
Q. So thinner pipes would be used for the horizontal portions.
A. Yes.
Q. After entering the building, the pipes would first pass through the water meter rooms and the pipes would reach the water meters. Subsequently, they would make a lot of twists and turns before they reached the respective flats?
A. They would reach the top of the corridors before they enter the respective flats.
Q. So, first of all, you would turn on the taps in the meter rooms so you can ascertain the quality of water entering the meter rooms.
A. Yes.
Q. Does it make any difference if the tap is installed before or after the water meter?
A. Well, it's installed right after the water tap.
Q. So here you see the columns "(In English) Meter" and "(In English) Entry". You can see a total of eight samples, right, for the vacant flats?
A. Yes.
Q. To the right, let's look at appendix V, the sampling

protocol on page 167. This is the sampling protocol for the three vacant flats; do you see that?

"(In English) Special sampling surveys were also conducted in three vacant flats of three estates. Two sampling taps were installed: (i) at the water meter position inside the metre rooms; and (ii) at the location of pipe entry inside the flat. The kitchen and wash basin taps were flushed by HD staff for 5 [minutes] the day before. Samples were taken at the sampling and kitchen taps (figure V-1)."

You can see the photos on page 169, and in the top-left corner, at the position of the meter, a tap was installed and water sampling was being conducted. You can see the water bottle held by the officer.

Now, (b):

"(In English) Tap at the water supply pipe entry to flat."

You can see the position is rather high. That's the position of the sampling and it's located indoors.

This photo shows the kitchen tap.

Now let's go back to page 167:

"(In English) The vacant flat sampling was carried out by one sampling team. The pipe configuration of each flat was also measured on site for further analysis."

Now you can see the room numbers of the vacant flats.

"(In English) Sampling procedure:

1. One 250 mL sample was collected at the meter room tap.

2. One 250 mL was selected at the tap at the entry of the water supply pipe to the flat."

For these two extra taps, were first-draw samples taken?

A. Yes. We did it twice. First, at the meter position.

Q. Subsequently, you took another sample at 30 seconds. Now, after five minutes, you drew another sample. So you drew samples at the meter room and the entry of the water supply pipe to the flat, and you subsequently took samples at 60 seconds, 90 seconds and so on.

"(In English) 2. One 250 mL was selected at the tap at the entry of the water supply pipe to the flat.

3. The first sample (250 mL) at the kitchen tap was collected when the tap was opened. The tap remained fully open throughout the sampling.

4. The second, third, fourth, fifth and sixth samples (50 mL each) were collected at t = 30, 60 120, 180 and 300 seconds at the kitchen tap.

5. The kitchen tap flow rate was measured using 1-litre bottle and measuring cylinder."

(Chinese spoken).

"(In English) 6. After the flow rate measurement (which took around 5 minutes), one 250 mL sample was collected again at the meter room tap.

7. One 250 mL sample was again collected at the tap at the pipe entry to the flat."

So, after the first draw, two more 250 mL samples were taken.

A. Yes.

Q. "(In English) 8. After around 3 hours, the vacant flat was revisited and steps 1 to 7 were carried out again to collect one more set of samples (except for the second day of sampling for Un Chau Estate and Kwai Luen Estate vacant flats).

After the sampling, the samples were transported back to HKUST. All apparatus and log sheets were returned. All samples were preserved and logged in by HSEO Lab and then selected samples sent to the GL for analysis. A total of 80 samples were collected for vacant flats; 40 samples were analysed by HSEO Lab and 40 by GL."

"(In English) 8. After around 3 hours, the vacant flat was revisited and steps 1 to 7 were carried out ..."

Let's look at step 8. The vacant flat was revisited after around 3 hours, and the purpose was to test the result, to see if it's the same after a period of stagnation.

If a shorter time period is studied, we can explore the habits of the potential users with other habits?

A. This time period or timing interval is actually arbitrary.

Q. At the bottom of page 134, "(In English) Computational fluid dynamics modelling of water supply chain".

(Paragraphs 13 to 14 were read in English)

Let's look at page 149, the bottom half of the page. The layout of pipes might be different in different flats, but this is a simplified diagram in a typical flat, and this shows the alignment of plumbing.

You can see the thickest line in blue, that's the down pipe, the diameter is 76 millimetres.

It goes down, and then in the middle you see a square called "(In English) Meter room"; do you see it?

A. Yes.

Q. "(In English) Meter room" -- the top-right corner is an enlarged meter room?

A. Yes.

Q. It goes down, and then there is a horizontal pipe entering the meter room, and then it turns, and then it goes to the meter valve, and then you have this one called "(In English) to other rooms". What do you mean by "(In English) to other rooms"? What other rooms?

A. That is to other flats. Say, for example, for one meter room, it may serve five or six flats. We have only worked on one flat.

Q. Yes. So, after entering the meter room, for each branch coming out, it represents a meter?

A. Right.

Q. So some 37 mm in diameter, it goes to the meter, it is 37 mm; coming out from the meter, it becomes 22 mm?

A. I think it is a typical layout.

Q. It goes into the meter room, passes the meter, comes out from the meter, and then another diameter -- the pipe is of another diameter. Then we have similar pipes and you see the word "(In English) corridor".

A. (Nodded head).

Q. 2.15 m and 3.9 m, basically, that's about the length of the pipes?

A. Yes.

Q. So after leaving the meter room, there are a number of sections. After leaving the meters, 0.75 and then 1.1, so you have different sections of pipes.

In the corridor, maybe just 3.9 and then 0.5 metres, and then we see "(In English) Flat"; it reaches the flat. Again, we have an enlarged diagram.

After entering the flat, for the first branch, it goes to the washing machine. The water continues to flow. For the second stop, it goes to the kitchen. Thirdly, it goes to the toilet?

A. Yes.

Q. It says "(In English) no flow". What does it mean?

A. It means that we stopped there. So our main purpose was to work on the kitchen tap.

Q. What do you mean by "work on it"?

A. That means we take measurements.

Q. For the purpose of the computational model, let's talk about the terms, because in your report, you have a number of terms concerning plumbing. You have something called "tee joint". Obviously, it refers to a pipe branching out to the left and to the right, like a T. Elbow is like an L, so it turns a corner.

Let's take a look at some of the photographs. Page 150. Top-most, we have "(In English) Corridor", so external wall going into the corridor. Then it goes up to the roof of the corridor.

A. Yes.

Q. It continues, and then it reaches a particular flat. At the roof, it enters the flat, and then it goes downwards.

For the two photographs in the bottom, the one on the left, we have the inside of the meter room?

A. Yes.

Q. On the right-hand side, the kitchen?

A. Yes.

Q. All right. Let's go back to page 135, paragraph 15:

(Paragraphs 15 to 16 were read in English)

"(In English) ... based on the WSD laboratory data."

Let's pause here. So we have a model. I have read a large number of equations in your model. I don't think we need to go into the equations. I think this is a theoretical model. In other words, if you input certain data and then you have some predictions, given a certain flow rate, theoretically speaking, you will anticipate a particular outcome. So it is a theoretical calculation?

A. Yes, it is a tool. It is a means. For this tool and for this means, given the engineering technology nowadays -- well, in fact, it has been verified extensively in many areas.

So yes, you say that it is a computational tool.

Q. You are saying that when compared with the actual data, you are trying to find out whether it is very different, so as to confirm whether it is a huge deviation. Well, for the input, what elements have you fed into the the modelling? First of all, the pipe configuration, that is how the pipes go. Say, after how long -- it will go via a bend, and then, when there's an elbow, the particles' concentration and movement may be affected, so the shape of the flow will have an effect.

Then you have the pipe flow rate, that is how fast the water is travelling. Then:

"(In English) ... assumed stagnation equilibrium lead concentrations and lead leaching rates at the joints and pipes based on the WSD laboratory data".

For the WSD laboratory data, how did you get the data?

A. For the WSD data, the WSD Task Force has a report. In that report, we have the data. Then at the Ngau Tam Mei treatment works, they have looked at the leaching of lead in a large number of components. They covered the leaching rate. Say, for example, immersing the components in water for 20 hours and then the lead concentration will go up. So, after 24 hours, they measure the concentration. That's the maximum concentration. And we will regard it as the equilibrium concentration.

Another one is the leaching rate.

So the WSD has analysed the components and a large number of them. So we have used such data for the purpose of inputs.

Q. You have the stagnation equilibrium lead concentrations. Now, for pipe configuration, it is visible; you can see how the pipes turn and bend, and then pipe flow rates, again, like the one before, they are from the HKUST's team. For the assumed stagnation equilibrium lead concentrations, basically we are talking about the continuous leaching of lead, but then up to a certain level, dissolution will stop.

So, given my limited knowledge, I think it will saturate. I don't think the lead will be seen floating freely in the water. So when dissolution reaches a certain point, there won't be further dissolution, and then it reaches an equilibrium.

As to when the equilibrium will be reached, it wasn't measured by the HKUST's team. You have been relying on the task force of the WSD. My understanding is that, and it has been set out in their report, they don't just measure or test the water quality. They have been dismantling the pipes. And you went there and you looked at the segments of the pipes?

A. Yes.

Q. You had a visit; you visited the Government Laboratory, right?

A. No. At the Ngau Tam Mei treatment plant, they were all kept there.

Q. Yes, they had to analyse the leaching rates. So that's about the equilibrium. They want to know when the equilibrium will be reached. Then you also talked about the lead leaching rates. Again, you rely on the information from the WSD investigation. In other words, they didn't come from the HKUST's team's work, and you have taken the data from the WSD?

A. Correct.

Q. All right. You input the data into the model.
I understand that you want to find out when the pipe goes in this way, in theory, should there be lead, you want to know how much will be there. A layperson will want to know -- we want to know about the mass of the lead there. But you haven't talked about the amount of lead in the system. I want to know whether that would have already been covered in the leaching rate?

A. Yes, included. Of course, when there are lead deposits on the surface of the pipes and the components, leaching of course would be very complicated, and it requires a chemist to look into the matter. But then we have taken an engineering approach, and data is most accurate. So, in the water supply chain, at different points we know about the different leaching rates. We have to find that out. This is because we want to have a scientific way to look at the leaching rates as well as the lead concentration levels, and we want to find out about the water tap lead concentration.

If the figures do not tally, then it means that there are problems with our measurements, so it seems that it is compatible. So that is one of the purposes.

Q. Let's look at paragraph 16:

"(In English) The output of the model is the lead concentration in each grid cell. Details of the CFD modelling are given in appendix VI."

Figure 4, in appendix II, is on page 170.

Appendix VI is at page 170. We have a string of formulas. I won't look into them here with you. If other counsel are interested, they might do themselves.

"(In English) Figure 4 in appendix II shows the computational grid for a representative vacant flat."

Figure 4 in appendix II is at page 151.

Does each box contain one grid?

A. Well, this is the exterior.

Q. So, three-dimensionally, there are a number of small cubes, and they make up the pipes; right?

A. Yes.

Q. Now let's look at page 135, paragraph 16:

"(In English) Figure 5 in appendix II shows a typical lead distribution in a pipe joint at different times after stagnation."

Page 152 contains figure 5 in appendix II, the typical lead distribution after different times. So you can see the time periods: 3, 6, 9 and 12 hours. So in general it shows that the longer the water stays in the pipe, the lead concentration would go up; correct?

A. Yes.

Q. Back to page 135:

"(In English) The model has been calibrated and validated against data ..."

(Paragraph 16 read in English)

"(In English) Opinion & Findings.

(i) Analysis of Lead Concentration Data.

The WSD data for the 'unaffected estates' provided guidance for the targeted field sampling in December 2015 [Table 3, appendix III]."

We looked at page 160 already just now. Page 160. Tables 3 and 4 represent data for the unaffected estates, defined by the WSD. The WSD said the estates in tables 3 and 4 were unaffected. So what's the difference between tables 3 and 4? Table 3 refers to housing estates completed after 2005, and table 4 refers to those completed before 2005?

A. (Nodded head).

Q. The second line of paragraph 17 says, for these 45 estates, in other words, 163 buildings, completed in or after 2005, excess lead was found in 11 samples out of 3,806 samples taken.

(Paragraph 17 read in English)

"(In English) ... probably due to different methods of interpretation."

Here, we might need some elaboration. We noticed that some news reports said that in the unaffected estates, some samples were found to be substandard, and the reason was there were different methods of interpretation.

Now let's look at page 160. Now, in this table, there are 45 estates. These were classified as unaffected, completed before 2005, and that were total of 45, with a total of 163 buildings, and 3,806 samples were taken. The majority, 3,284, had levels under 1 microgram, and 11 samples had lead levels in excess of 10 micrograms per litre, or 0.3 per cent. So a lot of people talked about these 11 substandard samples.

So these water samples were not taken by the HKUST research team; right? These were obtained by the WSD. These were results from their sample tests and as such this table was compiled?

A. Yes.

Q. We are not talking about the task force. After the lead in water incident, the WSD took a lot of water samples and tested them. Some samples were in excess of 10 micrograms per litre, in terms of lead concentration. You are aware of that. Although some flats were substandard, the WSD still classified them as "unaffected". You mentioned that one possible reason is that different people might have different interpretation of the results.

I would like to look at those 11 samples with you. I would like to know where they came from and what possible interpretations were possible.

For these 11 samples, they were from different housing estates, from five estates. I would like you to look at a big table in bundle A3, tab 43, page 2391.

This table does not contain raw data. If you are looking for raw data, you can look at the data submitted to the laboratories by the WSD. You can look at those memos. But there is no need to look at those right now. This table is already rather accurate and it is provided by the solicitors, and it's an accurate representation of the raw data.

The title is, "(In English) Unaffected estates (completed in or after 2005)".

To the left, you can see -- let's look at number 4. At each estate, a number is assigned. The first three samples were from Cheung Lung Wai Estate; number 2 is Hung Fook Estate, number 4 is Shui Chuen O Estate. You can see the words, "Shui Chuen O Estate".

To the right, you can see some columns in colour, and we have a pink column. For the flat in Shui Chuen O Estate, S37, that's the sample number or the sample reference number. That's an internal reference number assigned by the WSD, S37-0.014. 0.01 milligrams is equivalent to 10 micrograms. So 0.014 milligrams is equivalent to 14 micrograms, and as such it's substandard.

Now, where was this sample from? It came from the kitchen.

Let's look at bundle D1, page 145. Let's look at S37. Let's move further down. S37, "(In English) Kitchen tap". There's a column called "(In English) Before/after flushing". You can see a string of As. So as you know, the WSD's protocol is to take water samples after flushing. S37 is from the kitchen tap.

If we want to see the results, you can look at D2, page 785. I won't look at all the samples one by one. We just want to see how data was derived from the table compiled by Lo & Lo Solicitors. Bundle D2, page 785, sample 37. To the right, you can see the lead concentration in milligrams per litre, 0.014. So this is how the figure was derived. So, for the kitchen pipe in Shui Chuen O Estate, the lead concentration was substandard. It's 14 micrograms per litre.

Despite the substandard sample in Shui Chuen O Estate, the WSD or the Administration still classified Shui Chuen O Estate as "unaffected", and in your report, you suggested that this might be due to different methods of interpretation.

So, as you understand, what possible scenarios were possible? Why would the WSD classify it as an unaffected estate?

A. One scenario said the sample might be contaminated before testing, and for whatever reason, when handling the sample, it might be contaminated. So this is one possibility.

The second scenario is that if you install some fittings, depending on the use, there might be contamination as well.

Q. Do you mean it can be invalidated?

A. So it might not be a proper representation.

Q. All right. Now, we cannot tell from these figures, you only see figures, that's it, but beyond these figures there might be external factors and reasons, and this depends on the consideration by the WSD on how they would rule out certain samples, and you have no personal awareness of that; right?

A. That's right.

Q. Let's look at them one by one. Of the 11 samples, we have one from Yee Ming Estate. Tab 423. Again, 2391. Item 6, "Yee Ming Estate"; do you see it?

A. Yes.

Q. Page 2391, Yee Ming Estate, Yee Yan House. Again, in the red column, we have "NTE106". The figure is 0.015.

I won't take you back to the HO testing document; otherwise, we have to flip to and fro. We are talking about a vacant flat and the kitchen tap, so what is your understanding about different methods of interpretation, given that it is a vacant flat and a kitchen tap?

A. In the case of a vacant flat, maybe the pipes are in disrepair and accumulation might have taken place for a long time. So this is different from something being in normal use by the household. So it may be misleading. So it can be called as not representative enough of household use. This is understandable.

Q. Next, Ting Ching estate. A3, tab 43, page 2393. Item 26 -- do you see it? "(In English) Ting Ching Amenity and Community"; do you see it?

A. Yes.

Q. The measurement is 0.046, so the exceedance is quite substantial. Well, it is a community hall. From a female toilet on the 3rd floor, there is this sample. When I tell you that it is from a female toilet on the 3rd floor, from an amenity and community centre, how would you interpret this result?

A. Generally speaking, people don't drink from such a tap, so it could be a reason. So it could be interpreted differently. Getting water from a toilet tap to drink or cook is quite unlikely.

Q. Then we have got, on page 2393, there's another one in Ting Ching Estate. Sorry, it's on the same page, page 2393, if we scroll further down, item 28, two samples of exceedance, 0.019 and 0.030, in the pink column. That's from a kitchen tap.

A. Yes.

Q. It is not put down here as a vacant one. So maybe we can rely on the same explanation that you gave. There may be things that they knew but not available to you, but to us, it's exceedance.

Next, item 28, Choi Tak Estate, two samples.

Next, we go to Kwai Chung Estate. Two flats are involved in relation to Choi Tak Estate. Then we go to the sixth sample of exceedance, and find it in Kwai Chung Estate, page 2398 of tab 43. Page 2398, item 56, Kwai Chung Estate.

A. Yes.

Q. Hop Kwai House and Pak Kwai House, 0.012; do you see it?

A. Yes.

Q. 0.012. I understand from the documents that it came from a kitchen tap, so I suppose you will rely on the same explanation? WSD may have extra information about this kitchen tap and so it has ruled out this sample.

Similarly, the following example, Kwai Chung Estate, Pak Kwai House and Hop Kwai House, you see a number of samples. 0.065, my understanding is that came from a meter. Maybe we can go to that, for the one 0.065. D1, page 460.

The sample reference is 51500103S03. It's from a meter. If I tell you that it is from a meter, how would that affect your interpretation of this figure?

A. Of course the meter means that it is not at the kitchen tap. Just now, after the meter, the water goes into the flat. When lead is found in the meter, it means that the water after the meter will also contain lead and may have exceedance.

Q. Is it simply because the sample -- are you saying that you can't just ignore it just because it is at the meter, because it will still carry a risk?

A. Yes.

Q. So perhaps you need to get more information from the

WSD?

A. Yes.

Q. Again, Kwai Chung Estate, page 2398, we have a large number of them. We have got one sample giving us 0.15, after 0.065. 0.15, that means the exceedance is substantial, 150 micrograms. It is at a meter.

When we go back to D1, page 462, the sample number is S0137. Again, it is at the meter, at the Po Leung Kuk centre. Probably it is an amenity and community facility. There are two extra sorts of factors, a meter, and also it is a Po Leung Kuk centre. So I regard it as a community centre or community facility.

With these two additional factors, what do you say about this?

A. Well, it depends on where the water goes after the meter. There are many possibilities. It may go to a water fountain; it may also just go to a toilet. It is possible. We don't know. There are different possibilities.

Q. All right. Let's go back to page 2398 of A3. Again, we are still on Kwai Chung Estate. We have covered the sample of 0.15. So we go to 0.11. S1500103S06; again, over 100 micrograms. We are told that it is from a meter position. So let's go to page 462 of D1. S01, page 462.

I'm sorry, it should be S06, on page 462. It's from a meter position. So you have the same interpretation; right? And you won't invalidate it? It depends on where the water goes after the meter. So I'm saying we can't invalidate it just because it is from a meter position.

We are still on Kwai Chung Estate. We have one which is of 0.051.

A. Yes.

Q. Kitchen tap. D1, page 463. Sample reference S07. It's from a kitchen tap. So, on the face of it, it is from the kitchen tap, so again you would say that it depends on the WSD's explanation? Maybe they knew about certain contamination or they were aware of re-plumbing.

Again, we are still on Kwai Chung Estate. The entry of 0.072, sample reference S04, D1, page 464. The sample S04. It is from a meter.

We have looked at the 11 samples, and they have come from different locations. Some of them may be special, so one from a community facility, while others have come from meter positions, but you have told us that if lead is found at the meter, water after the meter may also contain lead, so you are saying that we shouldn't invalidate the sample just because it is at a meter.

A. Unless there are other reasons.

Q. So unless there are other justifications. Again, for the other samples from the taps, unless the WSD can justify with extra reasons -- say, for example, other pollutants or there has been re-plumbing by the household -- so that's what is meant by "(In English) probably due to different methods of interpretation" in your report?

A. Yes.

Q. Now we have looked at these 11 affected samples, now let's come back to paragraph 17. V1 page 136, paragraph 17:

"(In English) For the purpose of independent lead sampling, a total of 6 'unaffected' estates ..."

(Chinese spoken).

"(In English) ... were selected."

So, in other words, you conduct tests for all affected estates, and for the estates classified as "unaffected" by the WSD, six were selected for an independent sampling by HKUST. For the six unaffected estates analysed by HKUST, four of the estates were found to contain substandard lead samples. For example, Shui Chuen O Estate, Yee Ming Estate, Choi Tak Estate and Kwai Chung Estate, these four. For the remaining, Un Chau Estate Phase 5 and Sau Mau Ping (South) Estate, they were not among estates with the 11 substandard samples.

So what methodology did you adopt? How did you choose these six unaffected estates? Were they taken or selected at random, or did you try to select some estates with substandard samples and some without?

A. As you said, there were 11 substandard samples. We considered the possible methods of interpretation and we felt it's worth looking at.

Our objective was mainly on the 36 affected estate buildings, together with five or six extra buildings. According to our analysis of the WSD data, we felt that those six estates were worth looking at, and those include some estates with substandard samples.

A control was designated, which was believed to be unaffected. We took samples at upper, middle and lower floors. We sampled them at random. If all of them are okay, then the risk would be lower. That was our thinking. Even if it was claimed to be unaffected, we had to prove it. So that was our thinking in drawing up the independent assessment.

Q. Now on to paragraph 18:

(Paragraph 18 was read in English)

Now, table 4, appendix III. This is about table 4, the table underneath. We talked about table 3. Both tables 3 and 4 contain estates classified as "unaffected" by the WSD. Table 3 refers to those completed before 2005, and table 4 after, and there were no substandard samples. Your conclusion is that "(In English) any lead introduced into the water supply system would have been substantially leached over the 10-year period". So that was one possibility; right?

A. That was based on the measurements of lead deposits by WSD along the water supply chain, and we knew the leaching rate. Of course the chemical reactions are complicated, but generally speaking, even considering the most ideal scenario, the maximum period would be five to ten years. This was echoed in table 4 as well.

Q. You said, "(In English) any lead introduced into the water supply system", so any traces of lead would have been leached. But you didn't know whether it contains lead. According to some witnesses, we heard in around 2001 and 2002 the Housing Department considered using copper pipes, before lined GI pipes were used, and solder was not used. So, subsequently, when copper pipes were adopted, solder had to be used. So for PRH estates completed before 2005, any traces of lead would have been washed away. That's what you said. But for PRH estates completed before 2005, a lot of them weren't using any copper pipes, so would that be one possible explanation?

A. Yes.

Q. Now, the samples mentioned in paragraph 18 were samples taken by WSD over the course of the investigation; right? They were not taken by HKUST?

A. Right.

Q. So you were referring to samples taken by the WSD and you added your own interpretation?

A. Yes.

Q. In paragraph 19:

(Paragraph 19 read partially in English)

Now paragraph 20:

"(In English) Different sampling methods lead to different lead concentrations. The independent sampling reveals that 47.2 per cent of the 'first draw' samples have excess lead -- as compared with 8 per cent of the fully flushed samples ..."

We have a table 5 at appendix III on page 161. We have an updated version of table 5. Let's look at the most up-to-date version, on page 173.17. This table 5 on page 173.17, compared with the original table on page 161, has one extra column called "(In English) No. of flats with excess lead". We will explain the reason in a moment.

In this table, "(In English) Comparison of excess lead data of WSD and HKUST -- 'fully flushed' versus first-draw samples and flat concentrations", you can see the heading called "WSD/HD". After the lead in water incident, WSD and HD did a series of work. We know that WSD's sampling protocol, they take flushed samples, so 8 per cent of the samples were found to have excess lead.

For the heading under HKUST, the number of first-draw samples with excess lead, you can see the percentage is 47.5. So this shows that for the same estates -- you might not test the same flat, of course, but in the same estate, the WSD took flushed samples, and 8 per cent of samples were found to be substandard, and on the other hand the HD took first-draw samples and 47.2 per cent were found to be substandard. So that's the comparison, a substantial difference between first-draw and flushed samples.

You said:

"(In English) The independent sampling data is also consistent with the information from the Coalition of the Victims of Contaminated Drinking Water, although details of the sampling protocol for this set of data are unknown."

So the affected victims or residents provided the data, but from a scientific point of view you feel you have to know the protocols used, because you have to compare likes with likes. You have to know the protocols used. Sometimes you might not give it a heavy weighting, but overall speaking you have to be consistent. For stagnated samples or first-draw samples, the possibility of excess lead would be higher?

A. Right.

Q. Now let's look at paragraph 21.

CHAIRMAN: Let's take a break. Let's take a 20-minute break. Thank you.

(11.27 am)

(A short adjournment)

(11.51 am)

MR SHIEH: Prof Lee, let's come back to V1, page 137, paragraph 21 of your report.

"(In English) The complex variation of lead concentration with time is captured by our sampling. Two characteristic patterns of lead concentration variation with time were observed. In about 37 per cent of the cases in which lead was detected, the maximum concentration is observed in the first draw sample, followed by a monotonic decrease in the subsequent samples (at t = 20, 40, 60, 80 seconds)."

Let's pause here. What do you mean by a monotonic decrease?

A. It will be a unidirectional decrease.

Q. "(In English) In other cases (around 63 per cent), the maximum concentration is detected in the second sample at t = 20 seconds, followed by a sharp decrease ..."

You quoted appendix II, figure 6, on page 153.

Basically, you classified the flats into two types. The first type, maximum concentration is detected in the first-draw samples, and the second type, maximum concentration is detected in the second samples, at 20 seconds.

In the paragraph, you continued:

"(In English) This second pattern is mostly found in flats completed in or after 2010."

(Paragraph 21 read in English)

So, in other words, if the point of contamination is further from the tap -- for example, at the water meter -- so the first-draw portion has not reached the tap yet, so the samples at 20 seconds would have higher concentration, and for samples with high initial lead levels, the source of lead contamination of those flats might be at locations closer to the flat, for example the solder joints. This depends on the source of lead. Is that a correct understanding?

A. Yes.

Q. On to paragraph 22:

(Paragraph 22 read in English)

You said that in some cases, the first draw as well as the 20, 40, 80-second samples were all compliant, but that in one of the samples it gave an especially high concentration, and you said the reason might be that a lead particle in the system was picked up.

So, from a common-sense perspective, if a lead particle was present, then all water samples should contain lead. So you picked it up at the 60-second sample. Why wasn't it picked up in the 80-second samples? So why was only one peak detected?

CHAIRMAN: I think what the professor meant was that there might be a lead particle, like lead carbonates or hydroxides, they might have been flushed away.

MR SHIEH: So it was detected in that partial water sample. Is that what you meant?

A. In the pipes, there might be turbulent flows, and these flows are random in nature. So, at any given time, the flows might not be the same.

One scenario is that a lead particle, whether it's a carbonate or hydroxide, might be stuck to the surface and it undergoes a chemical reaction. The particle might not be normally picked up, but at a particular joint, due to turbulence, due to uncertainty or unpredictability, the particle was picked up.

Q. So it happened that at the 60-second interval a big lead particle was picked up.

Now paragraph 23:

"(In English) Since multiple samples were taken in each flat ..."

So multiple samples referred to 0, 20, 40, 60 and 80-second intervals; that's what you meant?

A. Right.

Q. "(In English) ... a measure of the lead determination risk can be given by a mass integrated average lead concentration of the 5 samples taken -- the 'flat concentration' is the concentration measured by the total mass divided by the total volume collected ..."

If you are to find out the average contamination risk, you can take a flushed sample. If you take the first draw, it might represent the worst-case scenario.

So you should add up the lead concentration levels of all the samples you collected, and you can divide it by the total volume collected and then you can come up with an average lead concentration.

So this concept of flat concentration was specifically drawn up for the sake of this study, or is it a typical technique used?

A. It was drawn up for the sake of this study.

Q. "(In English) Based on the flat concentration, 53.2 per cent and 58.2 per cent of the samples have excess lead (depending on 2 or 5 samples respectively) as compared to the 8 per cent for the individual flushed sample ..."

Now we can look at the new table 5. Page 173.17. The old table 5 does not have a column on the number of flats with excessive lead. Now let's look at the revised table 5. You can look at the column on the right-hand side, "(In English) No. of flats with excess lead". You can refer to the footnote. Beside the asterisk, it says:

"(In English) Based on flat concentration ..."

So this refers to the flat concentration, in which the concentration exceeds 10. You said:

"(Partially in English) Based on flat concentration computed from 5 samples (t = 0, 20, 40, 60 and 80 seconds). For Un Chau Estate Phase 2 and 4 and Lower Ngau Tau Kok ... the flat concentration is obtained from the 2 samples for which lead concentrations are measured."

So the intervals are 40 seconds.

"(In English) If all flat concentrations are computed from 2 samples, the number of flats with excess lead [would be 52.8 per cent]."

So, if you like, for the column on the right, you can write at another percentage, 52.8 per cent, so that's the average figure of all samples.

If you take all five samples, apart from Un Chau Estate and Ngau Tau Kok Lower Estate, the figure would be 58.3 per cent; that would be the average lead concentration.

So why would you use two samples for Un Chau Estate (Phase 2 and 4) and Ngau Tau Kok Estate?

A. There was no specific reason. Due to time constraints, the Government Laboratory and the HKUST lab had resource constraints. We could only test 40 samples each week, so we had to establish priorities.

Q. It was not because of anything special about the two housing estates; it's purely because of the limited resources? The range is still in the 50 per cent plus?

A. Yes.

Q. Whether we talk about the first-draw sample or the average flat concentration value, that is whether we compare the WSD's methodology, that is using the flushed samples, you still believe that for the WSD, after flushed, 8 per cent, for the HKUST sample, 40 -- for the number of flats, the flat concentration, for the number of exceedance vis-a-vis for the total, it's 50 per cent plus -- you still think that there is a significant difference in terms of the percentage?

A. Yes. For an investigation such as sampling, it represents the maximum lead exposure. For the fully flushed samples, they are on the low side. I think the most important is the mean exposure. But then the main purpose is to look at the extent of the contamination by lead in water. Therefore, we have focused on the maximum, the first 80 seconds or the first minute or first two minutes, so as to reflect the maximum level.

Q. "(In English) The average of the flat concentrations of randomly selected upper, middle and lower floors gives a 'building concentration'."

So, for each building, you have selected three flats for testing. In other words, for each flat, there is a flat concentration, and that's already an average figure. Then, for a building, you have got average figures for the upper, middle and lower floor flats, and then you average that as well. You get the building concentration.

So, in other words, you won't say that just because the figure is bad for a particular upper floor, you want to know about the overall risk for the entire building.

"(In English) The lead contamination of a building can be classified as follows: Class 1 -- the building concentration and all sample concentrations are less than 10 micrograms per litre ..."

Lowest risk for class 1, no exceedance for flat concentration. Even when you have added them up, no exceedance.

A. That is correct. No exceedance at all for all the 15 samples.

Q. So if all the flat concentrations do not exceed, then naturally the building concentration would not exceed?

A. Yes, that's what I meant.

Q. "(In English) Class 2 -- the building concentration is less than 10 micrograms per litre but with at least one sample greater than 10 micrograms per litre ..."

So medium. Among the three samples, maybe one or two samples have exceedance, but then for the third one, probably it doesn't exceed, because had that been the case, the building concentration would have exceed the limit. So maybe the third sample doesn't exceed, so averaged out, maybe that figure is particularly low and so it will drag down the average and then the building concentration is less than the limit.

"(In English) Class 3 -- the building concentration is greater than 10 micrograms per litre ..."

Building concentration is greater than 10 micrograms per litre -- there are many different possibilities Maybe for all the figures for the upper, middle and lower samples, they all exceed, and naturally the building concentration exceeds, but it may be that one of the samples from either the upper, the middle or the lower flat floors exceed substantially. The other samples are fine. But then there is a super-exceedance in one sample, and as a result the building concentration will become an excessive concentration. Would you agree?

A. The third possibility is quite slim. As to the second scenario, that is for class 2, this may happen. For class 3, basically, we are talking about more lead contamination.

Q. So for class 3, generally speaking, for all the upper, middle and lower samples, all of them would have exceeded, and therefore the building concentration is being affected.

Let's take a look at the actual figures. You have table 6 in appendix III, and we find it on page 161.

Using the HKUST's samples, you have got quite a large number of housing estates without any class 3 buildings. Say, for example, Choi Tak, Shui Chuen O -- for Shui Chuen O, you have one class 1 building. So if you look at the finer details, some flats in one building have exceedance, but on average, if you only look at the building condition, relatively speaking, no, the building is not affected, because of the classifications of classes 1, 2 and 3. So for

Shui Chuen O, they have a class 1 building but not class 2 or class 3 buildings.

Further down, let's try to contrast. For Kwai Luen, Shek Kip Mei, Tung Wui, Wing Cheong, Un Chau Phase 2 and 4 and Kai Ching -- for the six estates, you have shaded it with grey. Those six estates have been classified by the WSD as "affected estates". Why are you shading them in grey? They have got class 3 buildings only. That is, for the buildings that you have selected, they are all class 3. So it is not random. All those selected are found to have been affected.

Why have you shaded it in grey?

A. This is the independent investigation. It appears that the results are consistent with those from the WSD. That is, it can be confirmed that there has been lead contamination, and significantly.

Q. For Kwai Luen, Shek Kip Mei, Tung Wui --

A. Yes. Kwai Luen, Shek Kip Mei, Tung Wui, Wing Cheong, Un Chau Phase 2 and 4 and Kai Ching.

Q. Yes.

A. So irrespective of the perspective that you adopt, it is simple and obvious that there is a problem here.

Q. When we have got a class 3 building, then in other words, the building concentration exceeds. For Kwai Luen and others, they have only got class 3 buildings but not class 2 buildings. For Yee Ming, the one above Kwai Luen, it has one class 3 building, but no buildings in class 1 or class 2. How come that you haven't shaded it in grey?

A. This is because for Yee Ming, the case is very unique. For Yee Ming, we have been carrying out a random test. 14 out of the 15 samples are below detection, but there is one sample, at 60 seconds, there was exceedance, and it was a matter of 150 micrograms per litre, so quite serious.

As you have mentioned, it appears that it is a departure from the general pattern. We have one single figure resulting in the building concentration exceeding the limit, so one out of the three flats gave this result.

Q. You mean the flat concentration?

A. So there was only one in this classification. So this is a very special case, warranting further investigation. But generally speaking, for Yee Ming, as I have said, there were 15 samples. 14 of them were below detection. It illustrates the complexity of the problem. It may require further investigation. But it appears that the overall risk is not the same as the risk illustrated by that single sample.

Q. Let me show you the raw data. Page 173.4 in the bundle in front of you, V1. At the top, we have Yee Ming, with two asterisks. So it shows that it is a very special case. You have said that:

"(In English) All 14 samples in 3 flats of the building are below detection ..."

3 multiplied by 515, so three flats, 15 samples. You are saying that 14 of them are below detection. One sample, at t = 60 seconds, it yielded high concentration. So all others are at very low levels, but then one stands out and then it's at 60 seconds. Is that the one?

A. Yes.

Q. It's been marked in red. So this is what you have been talking about; right? So you are saying that because of that, it has pushed up the value of the building concentration. So you don't just look at the value itself; you want to find out how the value has been derived.

Now, for Yee Ming, you have 100 per cent class 3 buildings, but you are telling us that this is because of that sample, it has generated a class 3 sample. So in one particular flat there is one single measurement which is exceptionally high, so you are saying that perhaps it is an isolated case, and you don't know why it is a singularity.

A. Yes.
Q. So you are saying that even for Yee Ming, on the face of it, you have one class 3 building, but you don't think that all in all Yee Ming, as a housing estate, has a relatively high risk?
A. No. Relatively speaking, the risk is low.
Q. All right. For Hung Hom and Ngau Tau Kok Lower Estate, for both estates, they have also got class 3 buildings.
A. Yes.
Q. I want to draw a comparison. For those that you have shaded with class 3 buildings, I want to know, whenever there is a class 3 building, it means that the risk is high? For Yee Ming, you have explained the case, that one particular measurement has pushed up the value, but then for Hung Hom and Ngau Tau Kok Lower Estate, we have two and three class 3 buildings respectively. I want to know why you haven't shaded them in another colour. Is it because they have already been contaminated?
A. For Ngau Tau Kok Lower Estate, some buildings -- for example, Kwai Luen -- the risks are relatively low. The risk levels at different buildings are different. For Hung Hom Estate, there are two class 3 buildings and one class 2 building. For Ngau Tau Kok Estate, it's 2 and 3, there are two class 2 buildings. So the risk levels are different across different buildings in the same

estate. For the same estate, some buildings would be less at risk based on the data. So that's why we don't classify these estates among the six identified estates, and the risk levels of certain buildings are relatively low. So that's the thinking.

Q. For the greyed-out boxes at Shek Kip Mei, in terms of probability -- now, for Kai Ching Estate, you selected six buildings, and all of them belong to class 3, so the probability is very high? In other words, for Hung Hom Estate and Ngau Tau Kok Lower Estate, some buildings have very high building concentrations but some do not. In other words, the probability, so to speak, is lower.

A. Yes.

Q. I would like to clarify one more point with you. Please look at page 173.1, 173.2 and 173.3. We have some tables here.

You can see the column "Q". Let's look at 173.1. The Q represents flow rate. When you look at the unit, it's millilitres per second. You can see T at 0 seconds, 20 seconds, right up to 80 seconds. We have different concentrations. Under "(In English) Flat concentration", that's the average figure, not the average lead concentration but the mass over volume. "(In English) First draw 1 litre concentration", what does it mean?

A. "(In English) First draw 1 litre" -- a lot of sampling standards refer to the first-draw concentration. For example, the EU guidelines, different stagnation periods were specified, and first-draw 1 litre concentration was frequently mentioned. So, as we carried out the sampling, due to various constraints and reasons, we could not always obtain the first-draw 1-litre concentration.

Q. So you wouldn't know whether it was taken at 20 seconds or 60 seconds, so how could you calculate the first-draw 1-litre concentration?

A. At 0 seconds and 20 seconds, we mentioned the lead concentrations and we also directly measured the flow rate, and as such we came up with the concentrations. So, at a specific point in time, since we know the flow rate, we know how long it takes to fill up 1 litre.

Now, at 0 seconds and 20 seconds, once we had those concentrations, we could come up with an estimation. Usually 1 litre is filled up before 20 seconds. So the meaning of first-draw 1 litre concentration is that if we collected 1 litre, what would the concentration be. So based on the data we have, we can come up with a reliable prediction. That's not a measurement. It was interpolated from two direct measurements.

Q. So based on the flow rate you can calculate how long it takes to fill 1 litre, and of this 1 litre you can extrapolate the lead concentration based on the concentrations in two separate points in time. So was it a linear extrapolation?

A. Yes. We used linear extrapolation.

Q. On another column we see "(In English) infant weekly intake (micrograms per week)". How did you come up with these figures?

A. We looked at some literature, and we assumed that every infant will take in 0.75 litres of water per day, and assuming maximum lead exposure. Now, the 0.75 litres was derived from the first-draw 1 litre concentration, so we can estimate the weekly intake of lead.

Assuming the infant consumes its 0.75 litres of water, from that 1 litre concentration, so over the course of one week, we would multiply it by seven.

Now, the infant weekly intake is estimated based on the first-draw 1 litre concentration. We looked at all the provisional guideline values and various guidelines, the standard based on the maximum allowable lead intake in a week, so that's why we feel that direct comparisons can be drawn, compared with flat concentration -- well, flat concentration is a more microscopic comparison. This is a conceptual comparison.

Given the circumstances, what's its significance?

We want to provide a clear reference point for comparison.

Q. Yes. All right. So, simply speaking, WHO specified the number of micrograms per litre. They did a lot of calculations, and the starting assumption was based on the estimated intake of water for an infant per week. That's why they came up with the infant weekly intake.

We have to come up with the estimated intake of a baby each week, before we can draw up the maximum intake, and the lead concentrations are converted to more comparable figures. The assumptions of infant weekly intake include that the baby will only drink from first-draw samples?

A. That's an assumption.

Q. I would like you to look at the WHO document. Please wait a second.

Let me continue the question. I will provide the reference later on. Paragraph 24 on page 137:

"(In English) Out of the 43 buildings sampled, 18 buildings are of class 2 or above, while 9 buildings are considered class 1. The remaining 25 buildings are considered significantly lead contaminated."

That refers to the buildings in the table.

Page 138, "(In English) Causes of excess lead":

(Paragraph 25 read in English)

"(In English) ... and along the corridor leading to the flat ..."

So, simply speaking, if you detected high levels of lead in the meter room, then that means the pipes entering the meter rooms would contain leaded parts or fittings.

Now, along the corridor leading to the flat, if high levels of lead are detected, that means that the public plumbing leading to the flat or the building would contain parts that contain high levels of lead. So that's what the data illustrated.

A. Right.

Q. Now we have table 7 in appendix III, which contains some data, on page 162.

Now, let's continue with your report. Paragraph 25:

"(In English) This is consistent with the significant measured lead deposits and leaching rates found in the meters, valves, elbows ... and pipe joints reported by the WSD task force."

This refers to the report. You are not just testing the water quality; you actually tested the contents of lead in the parts and fittings and the relevant leaching rates.

A. Yes.

Q. "(In English) Figure 7 in appendix II shows the measured lead deposits in the water supply chain of ..."

(Paragraph 25 read partially in English)

Figure 7, page 154. This is an example. It represents a segment in Kwai Luen Estate. This is not even unit-specific. For the pipes entering the meter room and coming out of the meter room, passing through the corridor into different flats, at each junction or turn, a sample was taken, and the leaching rates were calculated. That's according to your understanding; right?

A. Yes.

Q. And those are flats actually -- so it is focusing on a particular flat. So, starting from the source of water, take it to be the meter, it travels along the pipework, passing through bends, and then they take measurements. At different points, lead leached would be different in amount, in terms of the concentration levels.

So, from the chart, you can see the elbow leaches the largest amount of lead, so it is by way of measurement, making use of instruments. The figures tell you the lead leached into the water, lead found in the water, and when you try to correlate with the lead found in the different components of the pipework.

A. This shows that in the supply chain, in fact they have dismantled the pipes and fittings. They measure the lead deposits. Most of them were found on the joints. That's the point they want to illustrate.

For the piping, a few sections have been measured, but then the pipes would be long. They have measured pipe sections of 0.2 metres long. So they regard it as extrapolation, not so accurate.

First of all, for the elbows, we understand that there is a lot of lead at the elbows. There are a few reasons. First of all, maybe too much lead has been used at the jointing, and it may also be due to poor workmanship, and also the water flow is in such a way that it favours accumulation. So it is reasonable, from the data, it appears that the joints and the elbows and the tees are places where there is a lot of lead. From the vacant flats, we have got samples. From the meter room to the point before entry to the flat, lead is also significant. This shows the consistency. The measurements that we have obtained show that the data makes sense, and of course we have also carried out the calculations, and indirectly this serves as a check.

Q. Hot water pipes and cold water pipes, what is the difference in terms of the risk?

A. Hot water would dissolve, so the risk is higher.

Q. It means that it's easier for lead to be leached.

A. But here we are mainly talking about cold water.

Q. Paragraph 26:

"(In English) Based on the measured leaching rates and the maximum stagnation concentrations reported ... "

That's measured by the task force.

A. Yes.

Q. "(In English) ... the lead concentration at the kitchen tap both during stagnation and after the tap is turned on can be estimated by the CFD model."

So the CFD model we referred to earlier on, you input a lot of data, the configuration, et cetera, like the leaching rate as well as the equilibrium concentration rate. Then you can estimate, you can project, the lead concentration, "(In English) both during stagnation and after the tap is turned on".

"(In English) Considering the limited data and the complexity of the problem, the predictions of the calibrated model are in reasonable agreement with the WSD data. This provides an indirect confirmation of the detailed stagnation lead concentration and leaching rate measurements made by WSD."

You have a reference here, figure 8, appendix II. May I trouble you with that particular figure, figure 8, appendix II. You find it on page 155. There are two figures here. First of all, the stagnation test, the estimation or the actual measurements after stagnation. The second one, after flushing. So stagnation test and flushing test. The solid line shows the prediction, based on the calculations. In other words, you input all the figures and then you get the result. The understanding is that the longer the stagnation, the higher the concentration of lead.

For the yellow dots, they are the actual measured results. How would you explain the solid line representing the prediction and its relationship with the yellow dots?

A. First of all, we use the stagnation test to calibrate. "Calibrate" means that we need to make adjustments to the reference values in the modelling, because of the complexity. Well, we are talking about a limited number of components. So, upon calibration, you can see that for the stagnation test, over a period of time, and the water remains stagnate 10 hours, 20 hours, 30 hours, and so on and so forth -- in other words, you turn off the tap, the whole water body remains stagnant. In other words, the lead in the water supply chain will be leached slowly. In other words, the concentration will increase.

So you can see the prediction arrived at by the CFD, and you can see that it's consistent between the measurements as well as the prediction.

But then of course there is also some scattering, and this is because of the complexity of the issue. We believe that it is a representative calibration. After calibration, we have the flushing test. So, in the lower figure, we have calibrated, and then we carry out the flushing test. Then we took measurements at one-minute intervals, and you can see that the changes vary significantly. But at least the trend is that after a minute's time it drops significantly. It is consistent.

We have measured the lead leaching rate from the materials, and we have also looked at the equilibrium concentration. Upon calibration, the flushing test gives us consistent data. So we are able to achieve this, and this isn't just the case for Kwai Luen. That's not our data. For our own data, we have figure 9 and it talks about the same thing.

Q. My understanding is that for figure 8, this is about Luen Yat House in Kwai Luen Estate. This was a vacant flat that was carried out by the task force. Stagnation for dozens of hours, it must be a vacant flat with no one living there. So that's done by the task force. They have used this for the purpose of testing.

For your CFD model, you have used this flat for the purpose of reference.

Figure 9, something similar done, but you are not using the data from the WSD's task force. Rather, it was the HKUST that took the data. Again, it is from a vacant flat. So for both figures 8 and 9, the samples came from a vacant flats. For figure 8, that's the vacant flat done by the task force, and figure 9 is done by the HKUST.

All right, let's go back to paragraph 27:

(Paragraph 27 read in English)

"(In English) By adopting lead source strengths within the range of the WSD measurements, the CFD simulation of lead concentrations at the kitchen tap are consistent with our own measurements ..."

So the WSD's measurements are consistent with the predictions of the CFD.

"For the vacant flats, it seems that for both 4-hour and 18-hour stagnation periods the lead concentration drops to below 10 micrograms per litre levels in about 30 seconds. As noted above, in lead contaminated flats, occasional outliers of lead concentration are still possible."

(Paragraphs 28 to 30 read in English)

(Chinese spoken), "(In English) great variability in the measured leached lead mass from the pipe and joints and fittings."

I would like to invite you to look at some data. Please take a look at C19.1, tab 104, page 9889.

This is a summary of lead leaching tests. Further down the page, these photos show the part being tested or measured. You can see the figures circled in red. 0 to 16, you can see some figures, copper alloy, 3.7, and so on. Can you explain these figures? For solder joints, it's 1.4 to 639.8, it's a big range. So what do these figures illustrate?

A. This is a leaching test.

Q. Who did these leaching tests?

A. The WSD did.

Q. The WSD Task Force?

A. Right. So the lead leaching in micrograms represents the mass of lead leached within a 24-hour time frame.

Now, for solder joints, the variability is very big. It's from 1.4 to 600 or so. The variability is huge.

Q. It's to an order of 2, like it's 2 to the power of 2. The range is very wide.

This demonstrates your point on page 130, and the mass of lead leached from fittings and pipes.

Let's look at the previous page. Now let's look at page 9889 again, for one order of magnitude.

A. For fittings, they refer to things like water meters, valves, taps. From 0 to 3.7 --

Q. Well, that's only a single figure of 3.7. There's very little variation.

A. Now, fittings usually refer to taps, valves, and so on.

Q. So, for 3.7, the difference is one order of magnitude, but for 194, the order of magnitude is 3.

Now let's look at the WSD Task Force report. Annex 2.5 of the WSD Task Force report. Let's look at the WSD Task Force report. A1, page 650, "Annex 2.5". Page 758. Now let's look at pages 757 and 758, "Annex 2.5". Do you see that?

A. Yes.

Q. You see H2, H3, H4, there are items like elbows. You can see figures like 0.15 and so on. What do these values represent?

A. These values show the range of variability, the weights in the deposits can vary considerably. For instance, for the elbow, if the diameter is larger, there would be less deposits for Y4A and Y5, the deposits are very little; it's only 0.01.

Q. Are you referring to page 758?

A. Yes. Now, for the first two rows, 159 millimetres, the deposits were only 0.22 and 0.01. So these are very small quantities.

So, for 22-millimetre pipes -- now, in the water supply chain of the flat, at the tees, at the kitchen, the figure has reached 23.2, and we see values like 2.72 for Y28, for the 22-millimetre diameter copper elbow, it's 2.72 milligrams, and for some parts it reached 23 milligrams. For Y34, for the 22-millimetre diameter elbow, cold water, the value is 2.11 milligrams. So it's a considerable quantity for a lead deposit.

So, in the water supply system, for larger diameter pipes, with the exception of valves, deposits -- there would be less deposits. For 22-millimetre pipes, the amounts are more considerable. So you can see the variability.

At the elbows, there are heavy lead deposits.

Q. So you made comparisons between larger and smaller diameter tubes. It may not be a like-for-like comparison. But even if we just look at 22-millimetre pipes, there is still a lot of variability between the pipes and tees. There's a big difference. But for the other parts, for the 22-millimetre diameter pipes, the concentrations are higher.

Of course, we have some exceptions. For instance, for the 35-millimetre gate valve, the figure is 5.83 milligrams, but generally speaking, most lead is detected in the 22-millimetre pipes, but even for other pipes the lead concentrations still vary.

A. Yes.

Q. Paragraph 31:

(Paragraph 13 read partially in English)

So, in other words, your lab does not intend to test the parts dismantled by the WSD?

A. I visited some laboratories and I looked at the entire process, and their work was thorough. That was the impression. Due to the great variability, even if we conduct tests on the specific flat, it has very little representation or added value. So, as such, we didn't feel the need to conduct such tests for verification.

One benefit of the CFD model is that we can detect the leaching rates, the leaching masses, to see if they are reasonable. At the end of the day, we are only interested in the tap water lead concentration, and that can be achieved through this model.

If we do the measurements, it takes a lot of time and we cannot measure a lot of units. So we analysed the benefit-to-cost ratio and we didn't find it worth doing. So it's more important for us to work on the model. We wanted to see the variability in first-draw samples, whether it's half a second, one second or half a minute or one minute. For me, that is more significant, because we would be able to explain more phenomena, so we had to make a decision and we don't feel we could do a better job than the government chemist.

Q. So you did not do tests on the fittings after consideration?

A. Yes.

Q. Paragraph 32.

I have a series of questions for you. Perhaps we would continue after the lunch break.

CHAIRMAN: Yes, let's take a lunch break first. We will continue at 2.30. Thank you.

(12.58 pm)

(The luncheon adjournment)

(2.31 pm)

MR SHIEH: Prof Lee, before lunch, I read your report and I was up to paragraph 31. Now we resume with paragraph 32, page 140:

"The independent sampling and measurements by two accredited laboratories demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

Please tell us whether you would like to clarify this sentence. For independent sampling, you talked about the HKUST work rather than the work carried out by the WSD, and you are not talking about the task force work. When you talk about independent sampling, that's the HKUST's work. The two accredited laboratories, measurements by two accredited laboratories, which two?

A. The government lab, as well as the HKUST's lab.

Q. Okay. So you are saying that the sampling by the HKUST is such that samples have been collected, there were 11 affected estates and six unaffected estates; for each building, there were three samples, and you say that for this procedure, you have told us that they have been classified, so you are referring to those two accredited laboratories.

... "(In English) ... demonstrated the robustness and accuracy of the lead concentration measurements by the Government Laboratory."

I have some doubt here. Would you like to clarify this point?

A. Maybe we can just take out the words "(In English) by the Government Laboratory". In other words, after cross-checking, we are confirmed the accuracy, so we can take out the words "(In English) by the Government Laboratory".

Q. So you are saying that for the samples collected by the HKUST, they have been tested by the two accredited laboratories; moreover, there was cross-checking of 18 samples by both. This is to confirm the robustness of the sampling and accuracy of the measurements of the

HKUST.

"(In English) Based on the average kitchen tap flow rate of 0.26 L/s, turning on the tap for 2-5 minutes (say 3 min) would cover a supply chain pipe length of over 100 m. Assuming a typical pipe length of around 20 m, this would translate to more than '5 plumbing volumes'."

Supply chain pipe length of over 100 metres -- starting from where?

A. From the tap.

Q. Up to where?

A. Maybe we can go to appendix II, figure 1.

Q. Appendix II, figure 1, in other words, page 149?

A. Yes, page 149.

Q. You mean figure 2?

A. No, figure 1.

Q. Figure 1, the one at the top?

A. What I mean is that for figure 1, we are saying that at 80 seconds, we have about 50 to 55 metres. What I mean here is that, say if we flush for three minutes, so three minutes, 180 seconds -- so if you extend it, it means that it involves 100 metres of the supply chain. In other words, from the down pipe to the tap, it has all been cleared.

Q. Of course, by down pipe, you don't mean the roof tank;

you are talking about the horizontal pipe, and after running it for three to five minutes, then the horizontal pipe should have been flushed?

A. Yes.

Q. "(In English) Hence the government sampling method was essentially a 'fully flushed' sample ..."

The government sampling method -- you aren't referring to the government task force method, you are referring to the method adopted by the WSD all the time in relation to water quality.

You have heard the witness from the WSD. I am not talking about the task force. I am talking about the WSD.

A. Okay.

Q. So they have flushed the samples. So according to the WSD's description, their sampling method, according to your understanding, is a fully flushed sampling?

A. Yes.

Q. "(In English) ... a 'fully flushed' sample according to generally accepted definitions (time taken to flush 3-5 plumbing volumes). The WSD sampling would not give the maximum or average lead exposure levels of the consumer. Nevertheless, the collective WSD data was very useful in guiding the independent sampling, and also as a basis for assessing the general lead contamination risk among the PRH estates."

What you mean is that for the data collected by the WSD, it cannot represent the highest concentration level, but still it can give you some guidance? In other words, at least they have identified that 11 estates have been affected, and you would adopt that as the starting point?

A. (Nodded head).

Q. For the unaffected estates, you can use that as a basis, as a guidance. So, for the 11 affected estates, it would cover all of them; is that what you mean when you say that it is useful in guiding independent sampling?

A. Yes.

Q. Paragraph 32. Probably, when lawyers read a paragraph, we will look at the title. You aren't really revealing the task force report of the WSD. Rather, you are talking about the sampling of the WSD. You aren't actually commenting on the WSD Task Force; you are commenting on the work of the WSD itself?

A. Yes, you may say so.

Q. I understand that the WSD has ongoing exercises and it is different from the work of the task force:

"(In English) The tap water concentrations measured in this study ..."

That's an independent study of the HKUST.

A. Yes.

Q. "(In English) ... are consistent with the significant lead content of the solder measured (between 27 per cent and 42 per cent, page 21 of task force report). The use of the isotopic analysis to ascertain the correlation between lead in water and the lead in the solder joints is judged to be reasonable and valid."

You talk about the isotopic analysis. We understand that it is not just the solder joints that may have the potential of having lead. Other components may also have lead. In fact, it has been tested and it has been found that some components may have an excessive lead content, exceeding the relevant British Standards. So once there was this suspicion, that is the lead in the water might not have come from the joints but rather from the components, the task force has adopted the isotopic analysis. This is because lead from different sources will leach lead in such a way that the isotopic characteristics would be different. On the basis of such an analysis, it is found that the isotopic characteristics of lead in water can be traced to its source. Most of it hasn't come from the components; rather, it has come from the soldering materials.

So you have looked at the approach of the task force, and you have said that it is judged to be reasonable and valid?

A. Yes.

Q. Paragraph 34:

(Paragraph 34 read in English)

So there is the lead-free components. They have used mechanical joints. It is lead-free. And you have tested and it has been found that lead is absent. So you regarded it as the supporting evidence and you can say that the main culprit is the solder which contains lead?

A. Yes.

Q. Paragraph 35:

(Paragraph 35 read in English)

So, regarding the task force findings, you have raised one question. I hope we can understand the point that you have raised. Here, you have a lot of technical jargon. Can you tell us what you are targeting at, which part of the task force report you are focusing on?

Now, for the task force report, you have said that there is a part which is questionable, but I want to know whether it affects the overall conclusion?

A. The main conclusion is that the leaded solder is the main source. This conclusion will not be affected.

Q. So it will not be affected by your question here. So what is your query here?

A. Basically, in the report, there is an estimate of the lead from three sources, like the joints and elbows, we have got data, arriving from direct measurements. From the fittings, again, we have got measurements, with the leaching rates, et cetera.

Q. For the joints, we need the solder to connect the points. For fittings, we refer to the meters and valves or the pipes themselves. So they are the components, they are fittings.

A. And then within the pipes we have also got some estimates. What I am saying in this paragraph is that the greatest uncertainty of such estimates is that about the lead on the inside surface of the pipes. That is, the lead deposits there would be most uncertain. Basically, in the whole supply, it's 20 metres long and you have to take estimates from two or three sections. It's 0.2 metres for each section. And based on 0.2 metres estimate, we need to do an extrapolation. This is where the uncertainty lies, because the water has flowed such a long time, so on each section along the pipe, how many deposits, how many carbonates and hydroxides are reacting inside the pipe, we have no idea, and we also cannot estimate each one of them.

So, given limited data, and you do an extrapolation on that, that's where the uncertainty lies. Let's say with a fitting, you have a range, and even then it's not that concrete.

Q. Can we put it this way: the task force report, they use different techniques and methodologies to reach a conclusion that the culprit is solder, that leaded solder was used. You also see there was a control experiment, and so on. There were different results that supported that conclusion. But the task force report, they attempt to use a mathematical modelling to support or reach the same conclusion. That is, as you said, there might be different possible sources: the fittings, the solder, the pipes, and so on. So you did some extrapolation, you made all the assumptions and you tried to calculate which was the culprit and you wanted to do it mathematically.

And you are saying attempting to use a mathematical approach would involve a lot of uncertainties. So, if you wish to reach a conclusion to support that conclusion, then this method might not be a reliable method, or perhaps you need more testing?

A. Yes, we need more testing for that part.

Q. So even if you don't use this calculation, you would be satisfied that other tests can already support the conclusion; that is, the main source would be leaded solder?

A. Yes.

Q. So, if you want to do it mathematically, yes, you can do it, you can do more tests?

A. Yes, you can say so.

Q. Moving on to "Summary and Conclusions":

"Independent planned sampling and analysis of lead contamination of 43 buildings in 17 PRH estates have confirmed the main WSD findings. Regardless of the method of sampling, the 'affected estates' and the 'unaffected estates' are largely confirmed."

This is referring to table 6.

A. Yes.

Q. The grey batch, the core of the affected estates, we have 11 identified by WSD, and you highlighted six of them?

A. Yes, you can say so.

Q. And of course we have other -- even though there are some class 3 buildings, but given your reasoning, they are lesser risk:

"(In English) The more detailed sampling results in a more accurate assessment of the extent of lead contamination in the different estates and buildings."

So the UST was a more detailed sampling and you felt that that was more accurate?

A. Yes.

Q. "(In English) The average lead concentration of about 50 per cent of the samples in the 'affected estates' exceeded the WHO provisional guideline value of 10 micrograms per litre."

(Paragraphs 37 and 38 read in English)

Professor, I would like you to refer to a table, at page 173.1. Just now, you said that the right-hand column, the infant weekly intake, microgram per week -- you say that when you translate the concentration into micrograms per week, it makes it easier for comparison.

I would like to direct you to the WHO Guidelines. C21, tab 175. This is the 1993 WHO Guidelines.

If you turn to page 18941.

A. Yes.

Q. The beginning is page 18938, "Guidelines for Drinking-water Quality, 1993".

If you turn to page 18941, it refers to lead:

"(In English) In 1986, JECFA established a provisional tolerable weekly intake (PTWI) for lead of 25 micrograms per kg of body weight (equivalent to 3.5 micrograms per kilogram of body weight ...)"

Then it goes on to say:

"... (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. Assuming a 50 per cent allocation to drinking water for a 5-kilogram bottle-fed infant consuming 0.75 litres of drinking water per day, the health-based guideline value is 0.01 milligrams per litre ..."

So my rough understanding is why we have this 0.01 microgram per litre figure -- correct me if I'm wrong, if the tolerable weekly intake, the PTWI, is 25 micrograms per kilogram of body weight -- now, this assumption is for a bottle-fed infant that is 5 kilos. So 25 microkilograms, multiplied by 5 -- so, first of all, 25 micrograms per kilogram, so that's 125 micrograms per 5 kilograms, and this 125 micrograms per 5 kilos, you say half of it comes from drinking water. So the estimate is that per week, a 5 kilo infant, the water they consume, the limit should be 62.5 micrograms, that's 125 micrograms multiplied by 50 per cent.

A. Yes.

Q. So if you look at the infant weekly intake and if you look at micrograms per week, 62.5 or above would be the red line.

So if you look at the infant weekly intake, the right-hand side column, you see, even for 10-plus, 20-plus, 30-plus, it's still okay, up till page 173.3, where we are the figures in red, 92.8, assuming 5 kilogram weight. We can see the limit should be 62.5 for 5 kilos. Is that correct?

A. Yes.

MR SHIEH: Okay. Thank you. I have no further questions, but other counsel, representing other parties, will have follow-up questions. I have no further questions.

Cross-examination by DR WONG

DR WONG: Prof Lee, I represent the WSD. I have some questions.

INTERPRETER: The speaker is not speaking directly into the microphone.

DR WONG: Please take a look at paragraph 36 of your witness statement. The Commission and society, they have controversy -- should we use the first-draw sample or should we use the fully flushed five-minute sample? So we have two minutes and five minutes, and in paragraph 36 you confirm:

"(In English) Regardless of the method of sampling, the 'affected estates' and the 'unaffected estates' are largely confirmed."

So, Professor, using your complex method, you use the first-draw, and after 20 seconds you take the second draw, and after another 20 seconds you take another flush, and 20 seconds later you take the fifth sample.

So in fact you have a five-step average, total mass divided by total volume, and I would explore that model with you later.

But regardless of which model, the unaffected estates are largely confirmed. Why do we need to confirm that? It is because after your report was published, it was published in the newspapers, it said that estates were affected --

CHAIRMAN: What was not --

DR WONG: There weren't five more estates that were affected. They did not exceed his calculated standard.

Is that correct?

A. Well, put simply, Shui Chuen O, Kwai Chung, they were okay. If you look at the independent study, you can see. So you are saying why in these unaffected estates we had 11 samples? The sampling was random and the results are in this table. So, overall speaking, it's okay. So, on this point, you are correct.

Q. I want to clarify an issue regarding Yee Ming Estate. If you look at your report, table 6, at page 161 -- just now, Mr Shieh took you through this -- in Yee Ming Estate, there was a class 3 building. I would like to see if there's an error here.

Let's take a look at your new figures. Page 173.4. Page 173.4. Regarding Yee Ming Estate, we have a series of figures. The figures are beautiful, a lot of zeros, except on flat 1124, we have T equals 60 seconds, a figure of 0.15. because of T equals 0.15, the concentration is 0.017. If I understand correctly, the building concentration, it's very simple -- it's three concentrations added together, divided by three. So, if your building concentration in Yee Ming Estate -- it should not be a class 3 building -- if you divide 0.017 by 3, it should be 0.051, roughly?

A. Well, we had mentioned this briefly just now. That was a singular case. We had considered whether we had to re-test. There were a lot of considerations.

Q. But why did you highlight that?

A. It was worth our noticing because we could not explain why the sample figure was so high.

We had two laboratories and we asked them, was it possible that when they took the measurement there was some error, and they were adamant that the figures were correct. They have a QC/QA in the labs.

So, to me, this is a singularity. So you are right: according to the normal definition, it should have been ignored. It should not be regarded as a class 3 case. But then it's very special: it is very high.

Q. So it should have been grouped under class 2 building?

A. Yes.

Q. Then in the case of Yee Ming Estate, for T 40 seconds, it is zero. Even for T equals to 80 seconds, zero. But at T equals to 60 seconds, it is 150; quite high. Yes, quite high. Was it possible that it was contaminated, say by dust, so it has driven up the value? That is, in the course of sampling.

A. Well, we have been handling the samples in the same way all along, so there's no reason to suspect that this has been the case, because we have been following the procedures. As I have said, we have been, in the light of this figure, talking to the chemists as well as the colleagues. We did consider this issue. Ultimately, the finding or our conclusion was that perhaps it was really the case the actual figure -- maybe randomly, a particle has been picked up. Yes, there is a sample, one sample only, but it may represent that particles are there. So we may need to re-test it and reconfirm it.

Q. In this case, this is an outlier, and it is surrounded by the zeros. So you need to see whether it is repeatable. Say if I do it again and if we get the same value, at T 60 seconds, then it is more valuable because it can be repeated. However, if you re-test it at T equals 60 seconds, if it is no longer like this, if it cannot be repeated, then the value of this figure, or whether it is scientific enough, then it has to be verified again?

A. I won't say that this figure is scientific. I am saying it is random. Maybe you get a higher value at T equals to 20 seconds. The whole exercise is random, because every day different people are using it. So I won't expect having exactly the same result at T equals 60 seconds the next time, because the whole phenomenon could be very random.

I agree that for the building as a whole, and for the estate as a whole, I think there is consistency, and that's why we are saying that basically it confirms -- this is because for housing estates with more serious lead contamination, I think it is quite consistent. Consistency doesn't mean identical.

Q. The methods are different, so the lead concentration levels are also different.

A. Yes.

Q. My second question -- please go to paragraph 37, page 141. You have this sentence:

"(In English) First draw samples may or may not contain the highest concentration."

Prof Lee, we read the figures in page 173. In a moment, I am going to look at the figures in detail. As I said, 63 per cent of them have high concentrations and they weren't first-draw samples?

A. No.

Q. Therefore, we have the concept that by using first-draw samples, we will get the highest concentrations. But then from your exercise, from your experiment, it confirms that the first-draw samples may not always contain the highest concentrations?

A. It depends on how you see it. For first draw, you may have first-drawn 1 litre or first-drawn 250 millilitres. So it is different. We have five samples. For the five samples, we have already covered the first-drawn 1 litre. Now, if you say that as a result of my figures, and you say that first draw is not the case, I won't agree with you, for the first-drawn 1 litre.

So, all in all, this is a bit different from the usual concept that the first-drawn sample would yield the highest concentration.

Q. If I may refer you to Prof Fawell's report, paragraph 2. The second-to-last sentence, this is what he says:

"(In English) Typically first draw water will have a much higher concentration of lead but this may not reflect the concentrations of lead in water ingested in normal use."

It appears that Prof Fawell also agreed that when we talk about normal use, that is if we would like to represent the concentration of lead in normal use, first draw may not be appropriate. Do you agree with him?

A. Not quite. Typically, it has a higher concentration. In the case of Hong Kong, you can say that it depends on how you interpret.

Q. So you may not agree even with the first sentence?

For the second sentence, if we want to look at the normal use, that is if we would like to represent the normal use, the daily use pattern, if we use the first-drawn sample, it may not be appropriate. It may not represent the water ingested. Do you agree?

A. I would qualify and I will turn it the other side; may or may not reflect.

Q. Prof Lee, if I may go to paragraph 7 of your report, page 132. You have this concept, estimate of the mean lead concentration used for drinking and cooking. If we want to find out about the mean lead concentration used for drinking and cooking, the first drawn sample would not be appropriate. The first-drawn sample may or may not reflect the maximum. If you want to get the mean of the daily use, then the first-draw sample would not be appropriate. Do you think what I am saying is fair?

A. No, not fair. It depends on the user. For infants, assuming that you are in the extreme case, or say in one particular scenario, part of the population will be using first-draw sample for drinking and cooking, say part of the population will do so. In the UK, 14 per cent of the water used is for cooking and drinking. That's in a detailed report in the UK. If they boiled the water, then throughout the day their babies will be using that water. Then it will not be the mean. But then to an adult, half of the 14 per cent is for drinking and cooking. Then the risk would be different.

So my answer is that it depends on the user.

Q. So you cannot generalise; it depends on the user's habit, the habit of consumption?

A. Well, whether we are talking about UK data or our understanding, there will be the use of the first-draw sample. So unless you are saying that for a particular group of users, you think that they can take a high risk. Irrespective of how you look at it, there would be bound to be this group of users.

As to the magnitude of the risk, it's a separate issue. I do not agree with you entirely. I understand what you are talking about. In Hong Kong, what we do is that we boil the water and we use that boiled water. In the case of infants, say for example, it would be the mean, and even for our figures, the mean could be high or low.

Q. Yes, I agree. There may be a particular group, say for example for children or other people, they wake up and then they use the first-drawn water for boiling, and then the risk and the impact will be greater. This is natural.

However, I don't think there will be people who are drinking first-drawn sample only. By definition, first-drawn is first-drawn. So it won't be just taking the first-drawn water every day. It depends?

A. It depends on the user's pattern. Generally speaking, people will boil the water, you will boil a kettle of water and then you will use that boiled water. For this group of users, then this will reflect the mean. When you wake up, you turn on the tap -- I think people seldom drink directly from the tap; they will use boiled water. You don't boil one cup only at night; you will boil a kettle. Now you may say that as soon as you get up, you will go out to have your breakfast; then of course, that won't be the case. So it all depends on the user.

Q. Or when you wake up, you will brush your teeth, wash your face first?

A. Yes, that's possible.

Q. Prof Lee, I don't know if anybody has told you that the WSD has carried out a territorial survey about the usage pattern being part and parcel of water management. We have a partial report saying that 90 per cent of people in Hong Kong, when they wake up, they will brush their teeth and wash their face first.

We have only got the findings of 500 respondents. We targeted 1,000. Now we have 500 respondents. 90 per cent of them will wash first before -- rather, they will wash their face first, before they will go to boil the water. So it depends on how they interpret such questions.

Now, assuming that 90 per cent of the people will brush their teeth and wash their face first, then using first-draw sample will not actually reflect the mean lead concentration used for consumption during the day, if 90 per cent of them will wash first instead of using the first-drawn sample for boiling.

A. Yesterday, I read this report. I read the preliminary results.

I see it in this way. First of all, they don't just look at the housing estates. It is about Total Water Management. Here, we are focusing on the socioeconomic class of the PRH estates. So, if you have something very broad, targeting at the entire population, then first of all I would like to say that it will be different.

Let me talk about the previous study carried out in the UK. It was very detailed. They made sure that the respondents would be very representative. They hired a market research firm to specify those to be interviewed, because they were interested in a very specific socioeconomic class. Second, my understanding is that they added three questions to the original questions in the survey. So the way you put the questions, it seems that for each household, there was one representative, and that person was asked a few questions. So, first of all, it wasn't a fixed quantity. You need, when you want to identify this data, you have to be scientific. For example, in 1980, there was an automatic sample; they could identify the different factors. For example, a family, there might be a grandparent, they might think they knew how their grandchildren behaved but they didn't. For example, if you're under five, you won't know what your sister is doing.

So what I am saying is we need some representative person but that is a subjective impression. I would think roughly how they would behave, but that seems to be -- we need something more quantifiable and that is very difficult.

According to 14C, about 6.5 per cent of households use first-drawn water for drinking and cooking. That's

6.5 per cent. Well, depending on the size of the base, that's quite a lot of people. We are talking about 100-plus estates. I'm just saying, I'm not aware of the full details. I've seen, for example, what they did in the UK. We need to be objective and very detailed and it cannot be a social science survey.

Q. I just want to clarify one point, Prof Lee. The sampling, the model and sampling are different. So your sampling protocol and your computational model are two different things.

A. But they are related. For the design of the vacant flat sampling, it's because we have this modelling.

Q. Okay. So your sampling protocol, you have five samples, and you take samples from higher storeys and middle lower storeys and the lower storeys. So this sampling protocol, if you look at figure 1 in the table -- I'll deal with the plumbing volume question later, but your definition is 20 metres, the plumbing volume. You define 20 seconds as one pumping volume and when T equals 20 seconds, it's roughly 10-plus metres. So, by the third plumbing volume, according to your calculations, 20 metres has been flushed?

A. You can put it that way.

Q. So, when you take the third sample, according to your definition, that would be a flushed sample? It's been flushed. The third sample would be a flushed sample?

A. That's an average flow, but each flat is different.

Q. I am aware. You are using a calculation of 0.26 litres per second, but the variation is very large. The range can be very large. I will show you a flow range later. But let's assume the average is 0.26 litres per second, so the third sample would be a flushed sample; the fourth would also be a flushed sample. The fifth would also be a flushed sample?

A. Well, roughly, you can put it that way. You can say so.

Q. So if you have a hybrid model, you would take the first draw sample, you have some flushed samples, and you take this and add it up, you divide total mass by total volume and you get a figure. So this is a hybrid model. It's not a first draw and it's not a flushed sample. You have first draw plus flush and you calculate an average. Is that description fair?

A. You can put it that way.

Q. Okay. Thank you.

I would like to direct you to paragraph 38. In your paragraph 38 you say:

"(In English) Both the data and CFD results indicate that lead concentration in most cases drop rapidly within 30-60 seconds. A flushing time in the order of 0.5-1 minute appears to be adequate for guarding against risks of lead contamination."

So you are saying, according to your calculations, 30 seconds to 60 seconds is sufficient, if we are concerned about health. So 30 to 60 seconds is sufficient; is that correct?

A. I need to qualify that. This refers to -- we have six estates with significant lead contamination. That might not apply to them. But generally speaking, you can get a significant drop after flushing 30 to 60 seconds. That is correct.

Q. In paragraph 2 you say that the WSD suggests that there should be a flushing of one to two minutes.

So do you think that this advice applies, by this flushing one or two minutes?

A. Well, the longer you flush, the probability is that whatever lead would be flushed away. But my personal view is that one to two minutes is quite a long time, so I feel, based on the laboratory tests and calculations, for the three estate groups, aside from those with significant contamination, it seems that, given our recent data, half a minute to one minute is sufficient and it would be safer if you flushed for longer than one minute, and three minutes would be even safer.

Q. I would like to take a look at your sampling protocol, just the protocol.

Just now, you mentioned some literature dealing with the first-draw sample. This morning, I recall your evidence, we asked why did you want to take 30 to 60 millilitres in your first-draw sample? Your answer was there were some constraints and reasons; we cannot always get the first draw.

So I would like to direct you to the literature, why we take 1 litre in the first draw, why 1 litre is so important: because when you calculate the flat concentration, you have to use total volume. So in your first draw, should you take 1 litre or 250 cc, that would affect the flat concentration. That would affect the building concentration figures as well.

So I want to take you to the first-draw sampling protocols. Please refer to C19.1, page 14620. Let's look at 14618 first. This is the fourth witness from the WSD, C19.6, page 14618.

If you turn to page 14619, we have -- you have seen this before?

A. Yes.

Q. Let's take a look at page 14620, the first two paragraphs:

"(In English) Water samples are obtained after the water at the building has stagnated for at least six hours."

(Chinese spoken) ... first draw.

"(In English) This no-flow period allows time for uniform corrosion processes to occur and for metals to, theoretically, reach peak concentrations in the water. After the stagnation, a first-draw sample is taken from an interior faucet (kitchen or bathroom) in a one-litre bottle. A one-litre bottle is used to try to capture the largest practical volume representative of contact of the water with the plumbing system."

So this makes it very clear. That is, if the purpose is to get the first draw, the sampling volume should be 1 litre; do you agree?

A. We are aware of this guideline, and it's not just the Lead and Copper Rule. It's the first-draw 1 litre; we are aware of this.

Q. I will take you to another question and ask you why you would depart from this rule. So let's now take a look at page 14587.

In paragraph G, "(In English) How do I collect lead and copper tap water samples?"

"-- Always collect a 1-litre sample in one container only (eg do not split the sample between two containers).

-- Always collect a first-draw sample from a tap where the water has stood in the pipes for at least six hours (eg, no flushing, showering, et cetera). However, make sure it is a tap that is used regularly, and not an abandoned or infrequently used tap."

So that makes it very clear as well that if your purpose is to collect first-draw, then you need to collect 1 litre, so I want to ask you, Prof Lee, do you have any literature where, when you say for the first draw, 250 cc is sufficient?

A. Well, first of all, whether it's sufficient or not depends on a few factors. You cannot take too small a sample. It is not representative. Second, it depends on your measurement instruments, how much volume you need. You need a minimum volume.

So our understanding is that 250 cc, or from a measurement perspective, even 50 millilitres is sufficient. But as you said, the first draw, we want a larger volume, to be more representative. We don't want too small a sample.

But as I said this morning, we have also conducted independent sampling. We have time and resource constraints. We needed to be very efficient and conclude our sampling in a limited time. So we had to balance different factors and we designed the five-sample test, because initially, in Hong Kong, there was nobody in Hong Kong who was aware of these things, and in November, we had a discussion, should it be first draw, would that be representative, or should we take a fully flushed sample? There was no data to indicate either way.

So I felt that the first step was that we needed sufficient data -- if there were extreme changes over time, we needed to adapt because ultimately we wanted to investigate this issue. So we tried to strike a balance. There were many constraints, like time, et cetera. Then we talked to a few persons, including Prof Fawell. He is very familiar with such matters. He also regarded it as okay. We need to design in such a way that we won't be missing out on their high concentrations. At first, we would like to make it three minutes, five samples over three minutes, then we will have missed out a lot.

What I want to say is that we have designed for such samples because we would like to capture the variations of lead concentration with time. We started with nothing. Of course, if we can start with 1 litre, it would be most ideal.

Q. Most ideal with 1 litre?

A. Yes. But for the five samples within the design, we can still, as indicated by the tables here, reflect the 1 litre first-draw sample. So it's sort of, well, you deduct it. It is still scientifically sound. Say the conditions do not allow me to get 1 litre, then what we are doing here comes very close to a scientific estimate. I agree, had it been 1 litre throughout, it would be best, but then there are other things to be considered.

Therefore, I can just give you the reply as I have made.

Q. Thank you, Prof Lee.

Just now, you have said there were constraints -- time constraints, resource constraints -- so you decided against 1 litre and you opted for 250 mL.

Let's go to page 169, or V/169. There are some photographs here. Please take a look at the photograph marked (c), Prof Lee. We see some containers. For the one nearest to the sink, we have the larger one, 250 mL?

A. Correct.

Q. For those with the blue caps, they are 50 mL containers?

A. Yes.

Q. I want to know if you would like to get 1 litre of water, it would have been simple. You just replace the containers by a 1-litre container. How come you are saying there were time constraints and resource constraints?

A. When we organised the sampling team, we were actually sending out six teams at the same time. We need to disinfect a lot of things, so we have the protocol. We also believe that this is an investigation. We believe that we can achieve the purpose; therefore, we take the most efficient method. Of course, for the 1-litre requirement, that's for the purpose of standardisation, but here we are talking about an investigation, a preliminary investigation, limited by resources. I believe that we have already achieved the purpose. Yes, you are right, perhaps we could have wasted a little bit more money and we could have got 1-litre bottles, and then for five samples, five 1-litre bottles. Then, for 1 litre, in fact we will be using little of it.

So, all in all, yes, we haven't fully followed the guideline of using 1 litre, but we believe that we can fully meet the purposes of the investigation.

Q. Yes, all right. We have got an answer from you.

I think you would agree with me that had we used the 1-litre bottle, then the denominator would be larger.

Let me go back to your table. Page 173.1 in bundle V1. If we have 1 litre of the first draw, you try to predict what the results would be like?

A. Yes.

Q. Take Ching Ho as an example. That is the very last entry on this page, with 0.01 being one of the values. 250 mL at T equals to zero, then the value is 0.011; correct?

A. Right.

Q. So you haven't really got 1 litre of water, but you are saying that it would have been 0.010; had you got 1 litre, the concentration would have dropped slightly; correct?

A. Correct.

Q. So, if you rely on this data and if you use 1 litre to input into your formula, then there will be a huge impact on your flat concentration, because the denominator is larger?

A. It could have been larger or smaller. It could have been increasing or decreasing.

Q. Yes. I am just trying to cite an example. In other words, if you are using 1 litre then it will affect the flat concentration?

A. Yes, it will affect the flat concentration. But then the definition is slightly different. We have definitions. This is because we want to have some indicators to tell us which buildings have a different lead concentration, by comparison. Of course, there would have been slightly different conclusions, but I think the general conclusion would not be much different.

DR WONG: All right.

CHAIRMAN: I want to ask a question here. When you took the samples, when T is zero seconds, of course I understand you turn on a tap and you collect 250 mL of water. Then, after collecting the 250 mL of water, how much time did it take? Did you have a stop watch, like you spent five seconds to collect 250 mL, and then another 15 seconds, so when you reach 20 seconds, you have the second sample, or whether it is an interval of 20 seconds?

A. Well, at zero, we press the stop watch. When it is filled, then that's it. So the water tap is on all the time and then when it is 20 seconds, then we fill the second bottle.

DR WONG: Prof Lee, we have tried to look up the literature. There is no literature to support that a first-draw sample should be 250 mL?

CHAIRMAN: You mean, there's no literature?

DR WONG: No one has used this one.

A. It is the first time.

DR WONG: If you want to have first-draw sample, would it be 250 mL?

A. I'm not sure. If you try to look up the literature, you could have found it, but I don't think it is that relevant. We are here talking about an investigation. As long as we can achieve our purpose, Prof Fawell and I can have a word, and it appears that it is feasible. If you talk about whether it can be found anywhere in the literature, I suspect there is, in relation to 250 mL.

Q. First draw flushed samples and then stagnation, a basket of it. Yes, I agree there is 250 mL. But then if you talk about first draw as the basis of tests, seldom would they use 250 mL independently.

CHAIRMAN: But there isn't such a rule. Do we have such rules for experiments? Unless you have already drawn up a standard asking anybody to follow, otherwise you cannot design anything for your experiment and it's based on your needs, the time and money available, and then you will design different protocol. Are you saying it must be the case for any experiments, innovation and technology, right?

Please carry on.

DR WONG: Prof Lee, if we talk about 250 mL, for this volume, we are talking about the first volume of the water pipe. It is very close to the water tap. So, for the first-draw result, it will very much affect the water quality near to the tap?

A. 250, sorry -- maybe we can go to appendix II, figure 1.

Yes, you may say so, for the first 5 metres or first 5 to 10 metres of water within the chain.

Q. We now know that there is lead contamination within the pipework, but it is not homogeneous. So if you only got the first 250 mL, it cannot reflect the sporadic lead contamination?

CHAIRMAN: Say it again?

DR WONG: It is difficult to reflect the sporadic contamination within the water pipe if you only get 250 mL?

A. Yes. We have said that there are sporadic and random elements in all the units. But you can see that at 80 seconds, you have fully sampled it. So, for first draw, it means that that's the first-draw sample after stagnation, that we can capture the overall lead concentration. We only have five samples. We believe that to a very large extent we are able to capture the picture, because however you see it, it is consistent, and it is consistently generally with the WSD data, generally speaking consistent, though there are also some fundamental differences.

Of course, it is not perfect, but again, as far as our objectives are concerned, I believe that we have met our purpose.

Q. On this point, I want to ask my last question. For first draw, whether it is 1 litre or 250 mL, the sample volume will have an impact on the mass of the lead? If you get more, then of course the mass will be different?

A. Yes, it will be affected.

Q. Next, I want to say that for the first draw, you have decided on 250 mL. For the second sample, after 20 seconds, after the water has run for 20 seconds you get the second sample and it is 50 mL.

My question is, 50 mL, why is it? Why not 250 mL?

A. Well, there were resource constraints, and the laboratory used 50 mL bottles, but each laboratory is different. Our lab, we felt 50 millilitres was sufficient, and we felt 50 millilitres wasn't too little. We had to use the resources on hand, and we felt that could satisfy our objective. We are talking about water quantities. There were 129 flats. We had to take -- let's take a look at the "total" figure. There were 600-plus samples. So there were resource constraints, time and resources efficiency; all these factors were in play.

Q. So the interval is 20 seconds. Why did you choose 20-second intervals? Any reason for that?

A. Well, originally it was three minutes. But it was fortunate that we didn't take three-minute intervals because that we didn't take three-minute intervals because we wouldn't be able to capture the high concentration. We subsequently agreed with the chemists and our colleagues. We felt that after discussion, we have a total of five samples and if the end point was at three minutes, that was a very large interval. So that might not be able to capture a concentration of first flush.

So why did we choose 20 seconds? Because when you turn on a tap, it's about 20 seconds by the time you turn it on and collect the sample. But 80 seconds, we felt that that was reasonable, and it seemed to be able to capture the data. As I said this morning, we had wanted to take two samples originally, but each laboratory, they have other work, there were time and resource constraints, so we felt we should take these samples.

So 20 seconds, you can say it was an iteration and we could comply with the protocol, and in vacant flats we had some experience and we wanted to get a more accurate measurement. We could get some ten samples. But we couldn't get ten samples; it was quite labour-intensive.

So that's how we got the 20 seconds. We wanted to capture the first sample concentration, and we also wanted to measure the change. So we had to balance the different factors and then it seemed to work out.

Q. Okay. Prof Lee, you said the sampling protocol was designed for this event and it was an innovative procedure; it was designed from scratch?

A. Yes, you can say so. There weren't too many choices to get this outcome.

Q. So the outcome that you wanted was to capture the highest lead concentration; right?

A. And the change.

Q. So this design, this sample, wasn't to capture the average, the normal, the daily consumption average; you wanted to capture the maximum and the change? That was the objective of your sampling protocol?

A. Well, put it this way. If you don't know the maximum, then you don't know the average. If you just focus on the first sample, with a high concentration, then you can estimate the average. You have a benchmark, a reference value.

Q. So, when you designed this sampling protocol, the purpose was to get the maximum, and you could deduce the average from that?

CHAIRMAN: Could you put your question again? I don't follow your question.

DR WONG: You designed the sampling protocol. The objective was to capture the maximum. And I agree with you, if

you don't get the maximum, you won't know the average.
But this sampling protocol or this sampling method -- we cannot identify the average using this sampling method?

A. I don't fully agree. We can estimate the average if we know the consumption pattern. It's an educated estimation. If you want to know the daily consumption, it would involve an elaborate, detailed household automatic monitoring. I can only put it that way.

Q. I would like to return to the 50-millilitre issue. So, after collecting 50 millilitres, you said this morning 18 samples were tested in the laboratories -- did you test 50-millilitre samples?

A. Well, usually, we collect the 200 samples and we hand it over to the Government Laboratory and we test the 50. That's first draw.

Q. But if you collect 50 millilitres, you won't give them to the government chemist?

A. We have a QA. For every building, our lot sample would be 250 millilitres. The labs have this procedure. They have an internal QC procedure. Every 20 samples, they would have to collect a larger sample where you can do the testing, and usually we would have to cross-check and we would take a larger sample.

Q. So at T 20, 30 or 40, you have a control sample that would be 250 millilitres?

A. Usually, it's less. T 80, the last sample, would be larger. Yes, yes, you can put it that way. So T equals 80 -- so internally, I want to say internally we have a QA process, and the last sample in each building, we would check that, and that's the way it's done.

I can respond in writing. So, out of the 18 samples, aside from the first draw, there were other samples as well. But a lot of them were first draw. Can you give me some time and I can respond in writing. I can give you a detailed answer. I can recall that we did first draw --

MR SHIEH: We might not need a written response. Page 164, point number 3.

DR WONG: I would like to ask, except for the fifth sample, if you wanted to do a QA/QC, if you just take 50 millilitres, for the second, third and fourth sample, how would you exercise quality control and quality assurance?

A. Well, the quality control, you would split the 250 millilitres into two samples.

Q. You can split the 250, I understand you can do that for the first draw, and for the fifth sample you can also do QA/QC. But in the second, third and fourth, if you just take 50 millilitres, how did you exercise QA/QC? Did you do that?

A. Of course we did for the first sample. These are accredited laboratories. You can cross-check. It's almost sacred to them. You can take a look at page 166. We have two different laboratories and their figures match. So, when you accredit the measurement, then you wouldn't do QA for each sample. It's like doing QA for a certain equipment. I need check the sample.

So your question was how do you do QA for a 50-millilitre sample? I would say during the whole process there is a QA/QC. I wouldn't do another QA/QC in the middle. The laboratory may need to be accredited. They have to do a lot of QA/QC. That's my understanding. So, the current lab, they are the authority.

Q. So my understanding is that if you do QA/QC, 50 millilitres is insufficient; you need 100 millilitres. If you take 50 millilitres and use it on a machine, it would use it all up; you need at least 100 millilitres, are you aware of that?

A. Yes. On page 166, aside from the lab QA/QC, we cross-checked between the two labs. When we did 18, if you look at the range, from 0.01 --

CHAIRMAN: I think the government labs would know this stuff.

DR WONG: I just want to clarify --

CHAIRMAN: Our government labs are state-of-the-art. So, if you were attacking the government labs, you would be questioning your own samples.

DR WONG: I am not questioning the government's samples. I'm just asking, if you do QA/QC --

CHAIRMAN: Well, he said that they didn't do it because the government labs already have QA/QC.

DR WONG: I just want to clarify that.

CHAIRMAN: Okay.

DR WONG: I would like to take you to table 7 of your statement, page 162.

This one is a test done on three vacant flats; yes? Let's take a look. Un Chau Estate, in the morning, the entry is T equals 0.017. 30 seconds later, it was 0.01.

A. Yes.

Q. 60 seconds, it was less than 0.0025. Then all the way, it was less than 0.0025. Then, in the afternoon, the same day, at 2 o'clock, entry, it was 0.005. So the whole day it was less than 0.0025.

So after flushing in the first 30 seconds --

CHAIRMAN: So "Entry", was that after you entered the flat?

A. Yes.

DR WONG: So I'm talking about after entering the flat. So we have the column "Meter" and then "Entry". For convenience sake, I will be referring to "Entry". If you look at the date, 12 December 2015, for this flat, if you have flushed for 30 seconds, then throughout the day, up to 2 o'clock in the afternoon, when you get the water samples, it is still below 0.0025; am I right?

A. Yes.

Q. All right. Then let's take a look at five days later, the 17th. Five days later, you went back to get the samples. 0.002, when T is zero, and then less than 0.002, then back to 0.004, and then all the way less than 0.002.

Professor, this is a vacant flat, in other words not much used throughout the day.

CHAIRMAN: After flushing it for 30 minutes?

DR WONG: No, 30 seconds. Sorry, I made a mistake. After flushing for 30 seconds, the lead content in the water is low. So if the purpose is to get a representative sample, that is the water used during daily life, then the flushed sample is more representative?

CHAIRMAN: I think we have discussed this matter for a long time. It depends on your usage pattern. We haven't got an average here. If you flush it for a long time, then it is no different from getting it at the boundary point. Then you may as well get the sample at the boundary point; am I right? Say throughout the day the entire building turns on the tap and flushes it all the time, then there is no difference. Then you don't need to go inside the building; you just go to the boundary point. When there's lead, then there's lead; when there is no lead, there's no lead, full stop. No need for any testing. Do you understand my point?

DR WONG: Yes, Chairman, I understand your point. I fully understand what you mean.

CHAIRMAN: So at the meter, it means it passes the down-feed and it goes to a larger pipe, and from the meter to the entry it has passed the meter room. My understanding is that that's the place where we have the largest number of joints, tees and elbows. Then at the entry you get the sample. Basically, you can find out the contamination from the down pipe through the meter room, where there are so many tees and joints and then up to the entry. Once inside the flat, there are much fewer tees and joints.

So Prof Lee's recommendations are as follows. First of all, flushing for 0.5 to 1 minute, it can significantly reduce the lead. If possible, say for example, if you say that you don't want to be so intrusive, go inside the flats to dismantle so many fittings -- well, what we need to do is to dismantle the meter room. Then we can significantly reduce the lead concentration.

I want to know what's the purpose of asking so many questions. All of them have been written in the report.

DR WONG: Understood. I just want to clarify with the professor. I don't want to be talking about different things. This is because, for the design of the model of the professor -- that's about getting the maximum concentration.

CHAIRMAN: I think from the beginning Prof Lee has made it clear, he would like to get the first-draw sample, and then the variation with time. For the three flats or apartments, we look at the computational fluid dynamics. We want to know about the leaching rates. We want to know whether they come out from the joints and tees. I think it's the purpose. So what else, what other questions do we need?

DR WONG: Mr Chairman, I want to bring out this point. When we look at the three vacant flats after flushing for 30 seconds or 60 seconds, and when we get the sample again, the water quality is indeed very representative of the average daily consumption.

CHAIRMAN: Let's not talk about whether there is consumption or not. The figures are the figures and the figures are the measurements. As to how you interpret the figures, it's your business. Whether it is the average consumption, it depends. It depends on the users, whether the user would like to drink in the morning or not. I think it is difficult to tell. It is very difficult to tell. We haven't got an average. It differs from one household to another.

DR WONG: Mr Chairman, if I may --

CHAIRMAN: Now, if you say that in the afternoon, after it has been fully flushed, if this concentration has been significantly reduced, I accept it. If you want to make this point, then there's no need for you to ask so many questions. I'm not preventing you from asking questions, but a lot of things are self-explanatory and there's no need to ask.

DR WONG: Understood, Mr Chairman.

Prof Lee, for the five samples, for the first one, it is 250 mL; the second one, 50 mL; the third, 50, fourth, 50, fifth, 50, and then the total mass divided by total volume. The total mass divided by total volume; right?

What I want to say is that for the weight, when we arrive at the average flat concentration, for the last four samples, the weight is less than the first one?

A. Yes, you may say so.

Q. However, after you have flushed it for 30 seconds or 60 seconds, then the concentration is lower. If your protocol is to find out about the average consumption, then the weight should be given more to the latter samples?

CHAIRMAN: That goes back to the earlier issue, so please move on to the next question.

DR WONG: Yes.

CHAIRMAN: Why don't we have a ten-minute break. You try to think of new questions.

(4.09 pm)

(A short adjournment)

(4.24 pm)

DR WONG: Chairman, I still have one or two questions regarding table 7.

Prof Lee, just now I directed you to table 7. Table 7 is about vacant flats. It is not related to drinking habits, but in table 7 we can see the first draw, the transient effect, impact on water quality is very minimal. It's only 30 seconds. It's a vacant flat.

A. Yes.

Q. So if we match this with your sampling protocol, 250 millilitres in the first draw, and the other four samples are 50 millilitres, so your model indicates that 250 mL, that impact has a larger impact on flat concentration?

A. Yes, correct, the weight is more.

Q. And there's a contradiction with the data that we can observe in table 7?

A. Well, in the vacant flat, we had a detailed look at the time frame. It was vacant so it was convenient for us to work in. Nobody lived there. I understand what you are driving at. You are saying that the 50-millilitre should carry the same weight, and you are saying that it is more representative.

Q. Yes. Do you agree with that?

A. Well, we discussed just now -- we felt that these samples, from the data that we get from these samples, we can estimate the first draw concentration. I do think we should measure that, but scientifically I personally feel it's okay. It's fairly reasonable. It's fairly accurate. You can estimate the first draw.

Regarding the 80 seconds and you draw five samples and you get an average concentration -- can we assign different weights to it? Yes, we can. But why do we do that? We divide total mass by total volume. That is the direct measurement. We don't need to make assumptions. You would have to make a lot of assumptions. So the flat concentration is based on direct measurement, and this is just one measure. It is not absolute. Because of our sampling protocol, we get an average flat concentration. That's all I can say.

I understand what you are driving at. You are saying if I didn't do that, if I took 250, 100, 100, 100, I might have a different flat concentration. I agree. I agree.

Q. There's no particular reason why it can't be 250, 250, 250 or --

CHAIRMAN: Well, you cannot please everybody. You can do 250, you say it is not accurate, and the next day you would say we should do 500; where does it end?

DR WONG: That's all I mean.

CHAIRMAN: If that's all you mean, then you shouldn't waste time. Then what's the point? So if today you do a 250-mL sample, tomorrow you can do a 260, and the day after you can do a 270, so then when would I satisfy counsel's --

DR WONG: I'm not trying to harass the witness or waste time. I just want to tell Prof Lee that if the weight could reflect the present value of water quality, then 30 seconds could be assigned to the first draw, then further along the line it would reflect a flushed average, so then you should assign different weights. If you just average --

CHAIRMAN: Well, you don't have to ask him. It depends on how you take the average.

A. I agree. I agree.

CHAIRMAN: If you prefer T equals 1 minute and T equals 2 minutes, then the average will be different.

DR WONG: It is not related to the minute.

CHAIRMAN: Well, the concentration you measure is different. So the concentration is different and when you average it, it's different; am I right?

DR WONG: Chairman, I want to say that --

CHAIRMAN: I know. The issue is Prof Lee is trying to capture -- I'm repeating the concentration and the time difference, the relationship. So he designed it such that the gap would be smaller and you would be able to capture more data and you would see how the variation changes. That's it.

So it depends on resources. If you have a lot of manpower, you can take samples every 10 seconds. If you have a lot of resources in your lab, you can do that. Then you get a more accurate figure. Then your graph looks better. It's the same. It's like our O Level and A Level, it's the same. You can do as many integrals as you like. You can smooth out your curve. That's it.

DR WONG: I was trying to focus on weight.

CHAIRMAN: I totally understand. Your sampling protocol, your experiment, your methods -- it also depends on your assumptions.

MR SHIEH: Mr Wong is working under the WSD assumptions, and he needs to insist that the weight should be assigned to the later samples. It's matter of habit.

CHAIRMAN: First of all, it's a matter of habit. Second, it depends on what your objective is. That's most important.

The issue is you say, "I want a general water quality, a general picture", then you flush. You can, at the entry point, take a sample there, and you might say that the whole estate, these people aren't very particular, everybody won't consume water, they won't boil water for the whole day; they all take showers, brush their teeth and wash their faces and taking a first flush, first draw, is not representative of their water consumption habits and also it is not an average of lead levels.

It must be the case, but of course it is impossible for us to do that. There are so many citizens in Hong Kong. We must find method which we think that generally can be a representative picture.

So Prof Lee thinks that this can be done through this method. Tomorrow, you can come up with another one. Am I right?

For the WSD, the method is such that you don't even have a planned schedule. When you are available, you go there, you flush it for between two and five minutes and you come up with the water quality. If you say that this one is not scientific, then yours is even more unscientific.

DR WONG: I will move on to that later, Mr Chairman. I would like to clarify this point. My assumption is not built on individual habits. For table 7, it doesn't follow the habits. It is about vacant flats. So habits do not come into the picture. So whether you boil the water first thing in the morning or whether you brush your teeth first thing in the morning is beside the point.

CHAIRMAN: I understand fully what the report is about and what you want to ask about and the purpose of your questions. If your experts are saying that this is wrong, something else is right, then why don't you put a question directly to Prof Lee, that is tell him what your own experts say should be right and listen to Prof Lee's comments?

DR WONG: Yes, I will.

Prof Lee, if our objective is to get a representative sample, that is about the general quality of the water, and then looking at table 7, the transient value of the first draw sample, then the protocol should be such that the weight attached to the first-draw sample should not be great. On the other hand, it should have been smaller. Do you agree?

A. Take Kwai Luen as an example.

Q. Yes.

A. For Kwai Luen Estate, for the first-draw sample taken on 12 December, it was 0.026, and then after 30 seconds, 0.007, then followed by very small amounts. Then 0.011, at the end.

We are interested in the variation, the change. Of course, this is a vacant flat. It is not the typical sampling of five samples. The flat concentration here would be a borderline case.

I think what you mean is that we should have given more weight to the latter samples.

Q. Yes, indeed. This is what I mean.

A. For adults, I would agree with you, and other measures would have been possible. However, just now, we talk about the first-draw 1 litre, and we talk about the weekly intake, and they would not be affected.

For the weekly lead intake for infants, basically, it will depend on the first two figures. If we talk about the first-draw 1 litre, for such users there won't be a change in the impact. For adults, we are told that 14 per cent of them will use the first draw for drinking and cooking. The first-draw 1 litre will be representative. This is because if you look at figure 1 in our report, by 80 seconds it will be 20 litres, so the amount will be huge.

So if you talk about being representative, you say that first-draw 1 litre is representative. As to the representative average lead concentration, it depends on the consumption pattern.

Take the UK data. In Hong Kong, it may not be accurate. For adults in the UK, 14 per cent of them will use first-draw water for cooking and drinking, so the risk is 0.14 multiplied by intake.

Of course, there will be a lot of assumptions. In the UK, at least they are very scientific. So they measured, for two weeks, 100 households, two full weeks. So it would not be dependent on the details of five samples.

Q. Prof Lee, I would like to talk about the sample size. You have a revised table 5. Page 173.17.

For this table, it is a comparison, "WSD/HD". So the samples from the Water Supplies Department -- the number of samples, 1,325. 8 per cent of them have excess lead, 106. For the HKUST, number of samples, 108; right?

Number of first-draw samples with excess lead, 51; right? And then you have the number of flats with excess lead, that's the flat concentration. So for first-draw, you use the first 250 mL.

My question is, of course we are aware of the time and resource constraints. The WSD is fully aware of this. You are comparing 1,325 samples and 108 samples. The sample size differs. Would you say that the comparison is not accurate?

A. Well, even for the samples of the WSD, if I remember correctly, I think it is only 4 per cent out of the thousand. Then it wasn't a planned sampling. Say maybe at 3 pm they took the samples and then it was fully flushed, so they didn't have a target. Of course, we are talking about the general quality. We have already discussed this aspect. But for us, our target is very clear. We want to get the maximum lead exposure and resources are of course limited. But then the characteristic of our schedule is that we go to each building, and we have upper, medium and lower floors, and there's a special reason. We selected randomly, not selected by the Housing Department for us.

Against this background, if it is found that the housing estate is fine, then to me it will be representative enough. Within the constraints of resources, I think this already gives us a lot of information which a general sampling cannot.

As to whether it is representative, I would say that the findings are consistent with our understanding, and I haven't put it down here but for the concerned owners, for those that have identified exceedances, they are consistent with ours. So even though the data is limited, we believe that it is representative, to a certain extent, because we have got samples from each and every building.

Q. For Choi Fook Estate, for the last entry, number of buildings 3, number of samples taken by WSD, 92; number of samples with excess lead, 13, 14.1 per cent. That's the findings from the WSD.

A. Yes.

Q. HKUST, number of samples, nine. Number of first-draw samples, zero. Number of excess lead, zero. Please explain why this is the case?

A. I will reverse it. There may be a number of reasons. For Choi Fook Estate, I have some comments. Please give me a moment.

In passing, let me say this. Even when it is a matter of fully flushed, the outcome would not be as good as ours. For Choi Tak, 14 per cent; Tung Wui, another figure. From the fully flushed samples for Choi Fook, it's more serious. It appears that they have more cases of exceedance than Tung Wui. However, if we look at the first-draw samples for Tung Wui, it is 83 against zero. It is very obvious.

There are many reasons. In summer, the temperature may be different. There are many reasons. So I would say there would be many reasons. Temperature would be different. I think what you are saying is that even for fully flushed, there are certain samples, it may indicate that there is a problem.

Let me take a look. Choi Fook Estate. Thank you for your question. Let's look at this together. For Choi Fook Estate, we haven't got the data --

COMMISSIONER LAI: Professor, can we see it in this way: when we talk about sampling, unless you cover each and every flat, of course we get the outcome. Whenever we have sampling, then of course you have it present in some and it will be absent in others. Here we can see that not all the soldered joints are leaded, so there is bound to be the result that you find lead in some and you don't find lead in others.

We can also see that if there was no leaded solder, we had done a lot of tests in the past when we had different jointing methods, so at any time when you turn on a tap, there's no lead. That's very clear. And here we have -- we don't know which unit had used leaded solder, so there would be some circumstances where they can identify lead and some don't have lead. That's because you chose these flats at random.

So some will have lead, some won't; some will have more, some will have less. But most important is if you have lead, then using different methodologies, whether you use WSD or the professor's methodology, you would detect lead. If there's no lead, there's no lead. If there is lead present, you would detect it with different methodology. There might be no lead in Choi Fook Estate, and it's just a matter of detecting it through different methodologies.

My view is that our water consumption habits are different. Do we accept WSD's explanation? Do we flush the water first before consuming it? Is that the only method? Or is it the public's expectation that at any time I turn on a tap, the water has to comply with standards, it has to be potable? Why do some people who live in estates say they need to flush two to five minutes before you consume the water, whereas in other estates they can turn on the tap at any time and there's no problem.

So which standard do we accept? This is our thinking. So in this sampling, we cannot get the same results. If you conducted 1,325 samples, is that the pass rate? It doesn't mean that 108 don't live up to standard. It's just the check, to cross-check with the

WSD, and if we use a different methodology, to check again, to see if we have the same scenario. We cannot expect the professor to do 1,325 samples.

So this is something we need to think about. Or should we struggle on sampling methodologies or results? I'm not sure if the professor agrees.

A. I would like to add that if you look at Choi Fook Estate, there were 13 excessive lead cases, and 11 them were between 10 and 19. There were two units that exceeded 30. But between 10 and 19 -- so the 11 out of the 13 had just exceeded the standard. They had just crossed the threshold. So there is some randomness attached to these results.

DR WONG: Thank you for pointing that out. I just want to point out one possibility, as Mr Lai has urged us to consider, would the sample size affect these outcomes? You have only taken nine samples in the UST study. Was it because of sample size, you had a smaller size and you couldn't capture all the --

COMMISSIONER LAI: So, even if they took 92 samples, they wouldn't get the same results?

DR WONG: Would it be for the sample size being too small, just nine samples?

A. As we said, we had time and resource constraints. In each building, I took samples of three or six flats, but in each building there are 800 flats. There are 800 flats, and how many would be sufficient? Even five or ten is not sufficient?

I understand your concern, but I can only say that the outcomes are quite uniform. They are quite reasonable. And even based on this investigation, the lead intake, it matches the WSD results.

Q. It matches.

I would like to ask a question about plumbing volume. Plumbing volume you say -- you use 20 metres as a plumbing volume. Roughly, 20 metres.

A. This is a rough figure. It's 20 or 30 metres, the plumbing volume.

Q. And we know that the WSD has done some research and at the roof tank, the water quality -- the focus of the research was to find out if the roof tank and the sump tank was not contaminated.

If we don't know that, and if we want to test the inside plumbing at the connection points, we don't have to flush through the inside service. We can take a sample at the connection point.

So if we want to take water samples, and the water runs through the internal plumbing system, then in general we take the plumbing volume -- it is not just from the horizontal section. We should take -- it should have run through the whole plumbing system. This is a special case; we already identified the source, and we took a sample from that section, and you define the plumbing volume from that.

But if we didn't know, let's say there were other hazards and I wanted to know, in the internal plumbing system, were there other contaminants, so if I want to take a plumbing volume of an internal system, then I shouldn't just take that one horizontal part; I should take from end to end, from one connection point to the roof and all the way down to the sump tank and through the different households. The water would have to run through the whole system once. Do you agree?

A. Yes. That's definitely the case. The plumbing volume is a volume for which stagnation ceases to have an effect. That means overnight it won't have an impact. That's what the plumbing volume is. And if you want to be comprehensive, then as you say, we have to go through the whole system. But in this context, it complies with the plumbing volume definition, because there's no problem with the whole system. There's just a problem occurring from the down pipe onwards. And there's no impact whether there's stagnation or not.

Now, if my understanding is correct, that's what plumbing volume attempts to do. In other countries, different systems, this wouldn't be very large. It's slightly different.

So I think you need to strike a balance. You need to comply with the guidelines, and it's the volume for which stagnation ceases to have an effect. So that is based on WSD data. But it seems reasonable.

Q. But if we didn't have WSD data, and if you wanted to check plumbing volume, you wouldn't just take that one section?

A. That's hard to say, if your whole system is contaminated.

Q. Okay. If we use the 0.26 litres per second flow, the flow rate, in your research on public rental housing, if we were to take water from the connection point, and I wanted to take plumbing volume for the whole internal service from the connection point, then two or three minutes is definitely not enough?

A. It's not enough.

Q. How long do you think it would take?

A. Well, it depends. If you start from the north boundary -- it also depends on definition. From the north boundary to the pumping room, it's very large. You have to estimate the pump room volume. It would depend on flow rate. It would depend on the volume. Then it has to go up. It has to also depend on the roof tank volume. It would probably take hours, probably. If you want to look at the whole system, it would probably take hours.

Q. So if you want to take a sample from the connection point, you would have to flush for hours?

A. Not necessarily hours. It wouldn't be minutes.

DR WONG: Could I move on to the next topic tomorrow morning?

CHAIRMAN: 9.30 we will continue. So, WSD, do you have experts?

DR WONG: Yes.

CHAIRMAN: When will you issue the expert report?

DR WONG: Our understanding, we would like to complete all expert witnesses this week, and we are striving to -- perhaps Prof Ho Kin Chung could comment in the witness box. So we could have --

CHAIRMAN: But we need to read your report.

In that case, I won't allow it.

DR WONG: Can I answer you tomorrow?

CHAIRMAN: No. Your preliminary report, it was available -- you promised it before the holidays.

DR WONG: Prof Ho was also on vacation.

CHAIRMAN: Prof Lee, you can leave now.

DR WONG: Prof Ho Kin Chung, he took vacation on Friday.

CHAIRMAN: I know. You only have one expert. I want your final report. When will you file your final report?

DR WONG: Can I answer you tomorrow?

CHAIRMAN: No. You need to file it tomorrow. This Inquiry, everybody has been waiting for everybody else to file their reports before they file reports. All of the reports are reactive. You are drafting reports on the basis of what other people have written. You were aware of the issues in advance. Your preliminary report -- allow me to be blunt -- it was only few paragraphs. There was no substance in it.

DR WONG: Well, Chairman, I have heard chairman's opinion.

CHAIRMAN: If you don't file your report tomorrow, I won't allow you to file it, and I also won't allow your witness to stand in the witness box. If you have to file, you have to do to do so before 5 o'clock tomorrow. Thank you.

(5.01 pm)

(The hearing adjourned until 9.30 am the following day)

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