

Advisory Council on the Environment
Open Meeting on the Harbour Area Treatment Scheme (HATS) Stage 2
on 6 September 2004 at 2:30 p.m.

Present

ACE Members

Prof. LAM Kin-che, J.P. (Chairman)
Dr. NG Cho-nam, B.B.S
Mrs. Mei NG, B.B.S
Prof. POON Chi-sun
Mr. Markus SHAW
Ms. Iris TAM, J.P.
Prof. WONG Tze-wai
Prof. WONG Yuk-shan, B.B.S., J.P.
Ms. Jessie WONG (Secretary)

Administration

Dr. Sarah LIAO, J.P.	Secretary for the Environment, Transport and Works
Mr. K K KWOK, J.P.	Permanent Secretary for the Environment, Transport and Works (Environment)
Ms. Doris CHEUNG	Deputy Secretary for the Environment, Transport and Works (Environment)1
Mr. Rob LAW, JP	Director of Environmental Protection
Mr. Raistlin LAU	Principal Assistant Secretary for the Environment, Transport and Works (Environment) 1, ETWB
Mr. Benny WONG	Assistant Director (Waste & Water), Environmental Protection Department
Dr. Samuel CHUI	Assistant Secretary for the Environment, Transport and Works (Environment) 1A
Mr. CHUI Wing-wah	Chief Engineer/Habour Area Treatment Scheme, Drainage Services Department

Participants from academic institutions, concern groups and green groups

Mr. CHAN Bing-woon	Member of the HATS Monitoring Group
Prof. Leonard K H CHENG	Member of the International Review Panel 2000 Professor, Department of Economics, Hong Kong University of Science and Technology
Ms. Lister CHEUNG	Chief Executive, Conservancy Association
Prof. Howard J C HUANG	Independent Checker of the Compact Sewage Treatment Technology Trial

Professor, Civil Engineering Department, Hong Kong University of Science and Technology

Dr. Albert KOENIG

Member of the International Review Panel 2000
Associate Professor, Civil Engineering Department,
University of Hong Kong

Prof. Joseph H W LEE

Professor, Civil Engineering Department, University
of Hong Kong

Prof. Chii SHANG

Assistant Professor, Civil Engineering Department,
Hong Kong University of Science and Technology

Dr. Paul SHIN

Chairman, Marine Biological Association of Hong
Kong

Dr. John WONG

Chairman, Hong Kong Marine Conservation
Society

Prof. Rudolf S S WU

Member of the International Review Panel 2000
Professor, Biology and Chemistry Department, City
University of Hong Kong

Dr. Kedong YIN

Visiting Scholar, Atmospheric, Marine and Coastal
Environment Programme, School of Science, Hong
Kong University of Science and Technology

The Chairman thanked the participants for attending the meeting and explained the run-down of the meeting. He said that the meeting would focus on the following six major issues relating to the Harbour Area Treatment Scheme (HATS) Stage 2-

- the acceptability of chlorination disinfection;
- centralization vs. decentralization;
- phased implementation approach;
- choice of biological treatment technology;
- needs for nutrient removal; and
- sludge handling.

After discussing those major issues, participants would be invited to express views on other issues, if any. In the last session of the meeting, members of the public would be invited to give their views on the proposed scheme.

Acceptability of chlorination disinfection

2. Prof. Rudolf Wu pointed out that some of the by-products of chlorination disinfection were carcinogenic or mutagenic which had half-life ranging from one day to 150 days. The EIA study to be conducted on HATS Stage 2 should

assess very carefully whether such toxic by-products would be accumulated in the environment. Dr. Paul Shin and Dr. John Wong agreed with Prof. Wu. Dr. Shin said that there was not much literature on the effect of chlorination on bio-organisms. Although EPD had conducted a study on chlorination, the study focused on the impact on drinking water and the effect of applying chlorination on effluent was not studied in detail.

3. Mr. Chan Ping-woon said that whether chlorination was acceptable would depend on whether it was the most cost-effective approach to improve the water quality of Victoria Harbour.

4. Dr. John Wong pointed out that seawater had disinfection power and there was no need to add more chemicals into the Harbour. Prof. Wong Tze-wai agreed and said that chlorination could only kill indicator bacteria such as e-coli but harmful virus such as Hepatitis A virus might not be affected. If there were high concentration of organic compounds in the sea, bacteria would grow again after disinfection.

5. Prof. Howard Huang said that according to his 37 years of experience in sewage treatment technology, chlorination was a necessary, feasible and acceptable method for treating sewage in Hong Kong. It had been used for decades in other countries. Sewage in Hong Kong contained 20 ppm of ammonia, and when chlorine was added, monochloroamine would be formed which, despite its lower disinfection power, could kill pathogens and would not result in harmful by-products. Although chlorination was not as commonly used with Chemically Enhanced Primary Treatment (CEPT) as with secondary treatment, the difference between the effluent treated by the two methods was not significant since the effluent of secondary treatment would still contain 12-15 ppm of ammonia nitrogen. Prof. Huang also pointed out that Victoria Harbour had 50 times dilution power and by-products of a general nature would not cause any harm.

6. Prof. Chii Shang said that according to scientific evidence gathered in the past four years, the amount of by-products such as trihalomethane and haloacetic acid to be resulted from chlorination disinfection of sewage in Hong Kong would be small. Having regard to such finding and the lower treatment cost, he considered chlorination disinfection a better method than ozone or ultra-violet disinfection. In view of the use of seawater for flushing and the target to re-open beaches in Tsuen Wan, he considered it necessary to apply disinfection. He added that in North America, disinfection would only be applied in summer when water sport activities would be held.

7. Prof. Rudolf Wu said that in view of the huge amount of effluent to be treated everyday, the absolute amount of chlorination by-products would be significant even though the concentration was low. As some by-products could last

for over 150 days, they could accumulate in the Harbour or even bio-accumulate up the food chain. Indeed, there was recent international concern about the harmful effect of chlorination.

8. Dr. Albert Koenig said that disinfection was seldom used with CEPT, and chlorination disinfection was not effective for primary treatment. If chlorination disinfection were adopted in Hong Kong, a large amount of chlorine would need to be applied and even so it could only lower the number of bacteria and virus temporarily because the concentration of organic matters would still be high. If disinfection were applied for the purpose of improving the water quality of beaches, it should only be applied in swimming seasons. He also pointed out that the poor water quality of beaches in Tsuen Wan might be caused by the lack of sewage treatment in that area rather than the effluent discharged by the Stonecutter Island Sewage Treatment Works. After implementing secondary treatment, the need for disinfection should no longer exist. It would be a waste of public money to acquire the disinfection facility for just a few years.

9. Prof. Wong Tze-wai said that according to studies conducted by EPD in 1980's and mid 1990's, the health risk of swimming in the beaches was low. The relation between infectious disease and poor marine water quality should be investigated before chlorination was adopted. He was of the view that the risk arising from swimming in the beaches and consumption of seafood was very low, and hence chlorination was not necessary. Prof. Rudolf Wu said that although there was statistics on infectious disease arising from consumption of shellfish, there was few statistics on the relationship between seawater quality and infectious disease. One of the main routes for transmission of disease through seawater was the practice of using seawater for keeping seafood. Dr. John Wong added that pathogens of infectious disease such as typhoid and cholera were anaerobic bacteria which were found mainly in the seawater in typhoon shelters but not in Victoria Harbour. Prof. Joseph Lee supplemented that for beach protection and removal of pathogens, the most robust way would be to lengthen the outfall and discharge the effluent in deeper waters.

10. Prof. Howard Huang said that chlorination was not always needed because about 99% of the pathogens would be killed when mixed with seawater for two hours. However, for the improvement of the water quality of beaches, chlorination would still be necessary. He also added that 20 ppm of chlorine might be needed because the contact time for the chemical to work on the effluent was not long enough. The amount of chlorine could be reduced if the contact time could be lengthened.

11. Dr. John Wong pointed out that the practice of using seawater for flushing in Hong Kong was quite unique. Hence, overseas experience in sewage treatment might not be relevant. For instance, the dose of chlorine might need to be

adjusted due to the difference in the salinity of the sewage. In fact, the amount of bacteria in seawater had already been reduced significantly after the implementation of HATS Stage 1. The bacteria would be further reduced in HATS Stage 2 and there would be no need for disinfection.

12. Dr. Sarah Liao said that the Administration would be very careful when considering chlorination disinfection, and a detailed EIA study would be conducted. Chlorination disinfection had long been applied and it was a cost effective method for treating effluent. The Administration had made reference to overseas experience in chlorination disinfection, including over 300 papers and 2,000 abstracts on the technology of chlorination disinfection.

Centralization vs. decentralization

13. Ms. Lister Cheung preferred decentralization of sewage treatment in view of its sustainability and smaller impact on the environment. She also said that the consultation document did not provide any in-depth analysis on the feasibility of decentralization of sewage treatment, leaving no choice but centralization. In addition, in view of the land issue involved, it would be difficult for people to comment on the feasibility of decentralization of sewage treatment.

14. Mr. Chan Bing-woon said that the relevant District Council(s) had to be consulted before setting up a sewage treatment plant. He appreciated the difficulty of such consultation process in view of the “not-in-my-backyard” mode of thinking. The problem would be more acute if the decentralization option was to be adopted.

15. Dr. John Wong supported centralization of sewage treatment in view of the lower treatment cost and the relative ease to conduct environmental monitoring. Decentralization of sewage treatment would affect more areas and more monitoring would be required. In addition, the existing treatment plant on Stonecutters Island could be expanded to accommodate the new facilities which would mean faster implementation of the further stages of HATS. He pointed out that the flushing power of the channel to the east of Tsing Yi was not sufficient. The outfall at the Stonecutters Island should be lengthened to increase the existing dilution factor from 30-40 to 100. Dr. Paul Shin and Prof. Joseph Lee shared his views.

16. Prof. Howard Huang said that the choice of centralization or decentralization of sewage treatment was a matter of optimization. For places where transmission of sewage to one designated place was topologically difficult, decentralization would be better. Centralization of sewage treatment would involve lower unit cost, and the management would be easier. On the other hand, decentralization would involve lower pipeline installation and pumping cost, and allow more points for sewage dilution.

17. Prof. Rudolf Wu preferred centralization of sewage treatment. He said that under the centralization proposal, effluent would be discharged into Victoria Harbour which was not a fishing ground and hence the water quality requirement should not be too high. Decentralization, on the other hand, might lead to water pollution in areas where there was a higher water quality requirement. In addition, centralization of sewage treatment was more cost effective, easier to manage, and the tunnels were mostly in place.

18. Dr. Paul Shin said that decentralization options B, C and D were not very satisfactory because effluent would be discharged near North Point or Lamma Island which were not good locations for effluent discharge, especially for Lamma Island where there were fishery resources.

19. Prof. Leonard Cheng said that reliability and the total cost would be the major concern of Hong Kong people when considering whether centralization or decentralization of sewage treatment should be selected. With modular design, the plants for the centralization option could be highly independent and hence highly reliable. Prof. Cheng stressed that the word “centralization” referred to centralization in the region of Victoria Harbour only. Other areas in the territory such as Shatin and Sai Kung had their own sewage treatment works and therefore Hong Kong’s sewage treatment system was actually decentralized. Since the population along Victoria Harbour was concentrated, he supported centralization of sewage treatment. He also said that if the sewage treatment plant of Stage 2B were to be built underground, space should be reserved for further extension.

20. Dr. Albert Koenig pointed out that the sewage system in Hong Kong was decentralized in nature and HATS covered less than 20% of the area in Hong Kong. He said that in Helsinki and Singapore, one or two centralized plants had been constructed to replace a large number of decentralized plants when it became difficult to manage the latter. He also remarked that most other countries produced much less sewage per capita than Hong Kong. If Hong Kong people could produce less sewage, there would not be the need for so many sewage treatment plants.

21. Mrs. Mei Ng noted that in the consultation document, the score for flexibility for centralization was the lowest. She asked whether that would imply that if centralization were chosen for stage 2A, there would be very low flexibility for adopting decentralization in further stages. In response, Prof. Leonard Cheng said that the score was for comparison only. There would be flexibility if space was reserved in the underground facility on Stonecutters Island.

Phased implementation approach

22. Prof. Rudolf Wu supported the phased implementation approach

because it would avoid delaying the implementation of the scheme, and allow flexibility for uncertainties caused by inaccurate prediction of population growth rate and sewage growth rate. Flexibility was needed because the limiting factor of algal bloom was not very well studied and whether the current standard for ammonia was too stringent or not had yet to be tested. In his view, the water quality should continue to be monitored, and the trigger level for starting Stage 2B should be drawn up.

23. Dr. John Wong also supported the phased implementation approach. He said that according to the consultancy study, there would be improvements in many water quality parameters after implementing Stage 2A. Members of the Hong Kong Marine Conservation Society had observed that the marine environment of the central part of Victoria Harbour as well as the part near Kowloon East had improved significantly after the implementation of HATS Stage 1. He hoped that the Government could conduct biological monitoring after Stage 2A in addition to chemical monitoring to ascertain whether the actual marine environment had improved before deciding on the need for Stage 2B.

24. Prof. Joseph Lee pointed out that the requirement that the minimum dissolved oxygen level had to be satisfied at all time and in all places of the Harbour might be too stringent and unnecessarily severe, as the model calculations showed that the minimum dissolved oxygen standard was violated only in isolated spots. He would feel more at ease if decisions such as the level of treatment were based on certain specified compliance percentages instead. He said that Stage 2A was a reasonable first step, as there would be significant improvements in the three major water quality indicators, namely dissolved oxygen, unionized ammonia, and total inorganic nitrogen after the implementation of Stage 2A. Prof. Rudolf Wu said that the dissolved oxygen level, unlike other parameters, had to be satisfied continuously because a short period of level non-compliance would cause very serious damage. Prof. Lee remarked that it would only be in isolated areas such as Rambler Channel where there were no fishery resources where the minimum dissolved oxygen standard could not be met.

25. Prof. Howard Huang supported the phased implementation approach. He said that after implementing Stage 2A, secondary biological treatment would bring about marginal improvement only. For instance, the level of dissolved oxygen would only increase by 1ppm. He suggested implementing Stage 2A, to be followed by the monitoring of ecological changes in the next 5-10 years. Stage 2B should be implemented only if there was degradation in water quality.

26. Mr. Markus Shaw asked whether the implementation of Stage 2B would be advanced if chlorination disinfection were found to be undesirable. Prof. Howard Huang explained that as far as chlorination disinfection was concerned, the difference between the effluent of primary treatment and secondary treatment was

about one order of magnitude. Chlorination of the effluent of primary treatment would require more chlorine because the effluent contained more organic materials which would also consume chlorine during the chlorination process. In his view, the current problem was that the contact time was too short. If the contact time could be increased, the chlorine dose could be reduced considerably. Prof. Chii Shang commented that if only Stage 2A would be implemented, disinfection would be more important. The CEPT process could only remove around 50% of e-coli. If option A of Stage 2A was chosen, the quantity of sewage would double and so would the number of bacteria, making disinfection essential. The consultant of the Environmental and Engineering Feasibility Study had also compared the effect of different biological treatment processes. A system which was called Membrane Biological Reactor could achieve around 99.9% of bacteria removal.

27. Dr. Albert Koenig said that he had no objection to the phased implementation approach from the engineering angle. However, he objected to the idea that the need for Stage 2B would be re-considered after implementing Stage 2A. He hoped the Government could show stronger commitment to biological secondary treatment, as it was a world trend to upgrade sewage treatment to that level. He also considered that biological monitoring should be conducted in addition to chemical monitoring. Ms. Lister Cheung agreed that strong commitment to Stage 2B was needed. She pointed out that the existence of living organisms was not a sufficient indicator that the water quality had improved, as some organisms could tolerate polluted environment. While supporting the phased implementation approach, Dr. Paul Shin said that chemical monitoring was not adequate, and biological monitoring should be conducted.

28. Prof. Leonard Cheng supported the phased implementation approach from the cost perspective. He said that to show the Government's commitment to Stage 2B, the trigger level should be well defined so that once the level was reached, Stage 2B would be implemented without further delay.

29. Mrs. Mei Ng said that the estimated loss of fishery resources due to algal blooms should be taken into account when examining the cost of sewage treatment. That would make better sewage treatment more important.

30. Dr. Sarah Liao emphasized that the Government was committed to Stage 2B. The phased implementation approach was adopted simply because Stage 2B would involve land issues which would take time to resolve. To avoid any delay of HATS Stage 2, the Government would implement Stage 2A first.

Choice of biological treatment technology

31. Dr. Albert Koenig said that he had no specific preference for the Biological Aerated Filters (BAF) technology. Any biological treatment technology

would be acceptable as long as it could treat the effluent to the required level, fit into small area and its cost was comparable or lower than others.

32. Prof. Howard Huang considered that biological treatment might not be required, and if it were really needed, there should be other suitable technologies. At present, about 80% of the effluent that had undergone secondary biological treatment was treated by the activated sludge process which was stable and non-facility intensive. In addition, there was plenty of actual working experience relating to that technology. Being the independent checker of the pilot scheme that lasted for 14-month, he found that the BAF system was not stable and there were frequent problems arising from mechanical malfunctioning and head-loss.

33. Dr. Albert Koenig was not aware of the instability of the BAF technology. He was of the view that pilot plants tend to have more problems. As far as he was aware, the BAF technology adopted by the tertiary sewage treatment works in Helsinki did not have any stability problem. Their problem mainly arose from the activated sludge plant. He suggested adopting an open mind when selecting the treatment technology for HATS Stage 2. Prof. Howard Huang explained that the major problem of the trials was the stipulated need for achieving a very low ammonia nitrogen level. The target of the trial was 2mg/L of ammonia nitrogen. If the level could be increased to 8mg/L or 10mg/L, the problem would be reduced by 60%-70%. Nonetheless, there were mechanical and head-loss problems that could still be difficult to be removed even if the ammonia nitrogen standards were less stringent.

34. Dr. John Wong said that there was no need to decide on the biological treatment technology for the time being. He supported the use of biological filter which would further improve the water quality.

35. Prof. Chii Shang informed the meeting that there were other compact wastewater treatment technologies. For instance, the Membrane Biological Reactor might be a feasible technology that required a very small area for operation. Prof. Howard Huang supplemented that another promising technology was the Hybrid Biological Reactor which could reduce sludge age from ten days to two days and the unit reactor could handle three to four times more sewage.

Needs for nutrient removal

36. Prof. Joseph Lee pointed out that according to the continuous measurement of algal and nutrient concentrations at Kat O and Lamma Island for four years, nutrients were typically not a critical limiting factor. Very often, light and other hydro-meteorological factors were the limiting factors controlling the onset of algal blooms and red tides. Due to external sources, it might not be possible to reduce the total inorganic nitrogen in the southern waters to lower than 0.2 mg/L.

Such finding was consistent with the modeling result of the Strategic Sewage Disposal Scheme. With 0.2 mg/L of inorganic nitrogen in the water, there were enough nutrients for algal blooms to take off as long as environmental conditions were suitable. In his view, denitrification would not necessarily reduce the occurrence of algal blooms.

37 Dr. Kedong Yin declared that he was one of the consultants of the Environmental and Engineering Feasibility Study of HATS Stage 2. He agreed with Prof. Joseph Lee that nutrient removal might not help reduce the occurrence of algal blooms. After studying the historical data up to 1958, he noted that algal blooms mainly happened in Northeast Hong Kong where the nutrient level was lower than that of Western Hong Kong. He added that in wet seasons, Hong Kong's seawater was greatly affected by the Pearl River Estuary which brought high concentration of nitrogen to Hong Kong waters. As a result, the nitrogen level would be very high in wet seasons. Under such circumstances, he considered that denitrification would have very little environmental benefit. If, however, the Mainland could improve the water quality of the Pearl River Estuary, denitrification could be considered under the phased implementation approach.

38. Prof. Howard Huang agreed that high nitrogen level might not be the reason for algal blooms. For instance, the nitrogen level was high all year round but algal blooms only occurred for one to two weeks. To remove nitrogen from the effluent would increase the cost of sewage treatment by 30% but the effect would be very little. Furthermore, at the bottom of Victoria Harbour there was a layer of sediment of 1.8 m in thickness which could continue to release nitrogen and phosphate. The sediment would not disappear in a few years. Instead of denitrification removal, he supported enhancement of phosphorus removal, which was being used for CEPT. The current phosphorus removal rate was 50-60%. Increasing the dosage of Ferric Chloride could increase the rate to 80-85%, and the enhancement cost would be relatively low.

39. In view of the uncertainty on whether phosphorus and nitrogen removal could help reduce algal blooms, the Chairman enquired about the kind of monitoring work required after Stage 2A for deciding whether and when Stage 2B should commence. In response, Prof. Howard Huang suggested monitoring the levels of nitrogen and phosphorus in seawater as well as studying the pattern of phytoplankton to see if there was any correlation. In addition, more experiments should be done to see whether reducing phosphorus could control the growth of algae.

40. Prof. Rudolf Wu agreed that nitrogen removal might not be useful in reducing the occurrence of algal blooms. The study conducted by Prof. Paul Harrison, who was one of the world's most renowned experts on red tide and phytoplankton, was not very conclusive as to whether nutrient was the limiting factor

for algal blooms in Victoria Harbour. He also suggested monitoring the chlorophyll-A level, phytoplankton composition, and the dissolved oxygen and ammonia levels to see whether algal blooms would occur after implementing Stage 2A.

41. Dr. John Wong said that although the formation of algal blooms might not have a direct relationship with nutrient removal, there was little biological monitoring on the relationship of the two. He hoped that the Government would conduct biological monitoring in future. In addition, he said that if there were enough organisms in the sea, nutrient could be removed naturally. The artificial reefs near Crooked Island attracted organisms and served as biological filters, and helped improve the water quality. Artificial reefs with suitable modification might be a cost-effective method for removing nutrient as well as suspended particulates.

42. Mrs. Mei Ng said that ecological risk assessment should be conducted to establish whether there was any relation between the nutrient level and algal blooms. In addition, more studies should be conducted to find out the cause of algal blooms. In response, Prof. Joseph Lee explained that nutrient was important for the formation of algal blooms. He questioned the need for denitrification because the nutrient base level was already quite high. Algal blooms could start readily at such a level of nutrient. Prof. Rudolf Wu explained that algal blooms should be avoided because dissolved oxygen would be used up by algal blooms, causing serious damage to marine ecology. In his view, Phytoplankton pattern should be monitored to assess if there were any improvements after the implementation of Stage 2A and whether nutrient removal was necessary. In case the occurrence of algal blooms had increased, denitrification could still be applied. The risk of excluding denitrification at the current stage was small.

43. Dr. Albert Koenig informed the meeting that the International Review Panel did not recommend nutrient removal which he agreed might not be required at present. However, a trigger level to decide whether it would be needed in future stages might be required.

44. Ms. Lister Cheung agreed that if there was already a high level of nutrient in the sea, it would be a waste of money to remove the nutrient in the sewage. Instead, resources would be more beneficially used in improving the water quality of Pearl River Estuary which would reduce the base nutrient level in the long run.

45. Prof. Howard Huang explained that nitrogen could exist in water in two different forms, namely ammonia and nitrate, and both forms could support algae growth. However, ammonia was much more toxic than nitrate. The two elements were non-cumulative because ammonia would be oxidized into nitrate and nitrate would be consumed by algae. In fact, a certain level of algae would be beneficial to the environment. It was their uncontrolled growth as algal bloom that was harmful.

Sludge handling

46. Dr. Albert Koenig considered that the Government had overestimated the amount of sludge to be produced by the HATS Stage 2. He also said that the two common methods for treating sludge, namely landfilling and using the sludge for agricultural purpose, were deemed not suitable in Hong Kong. Other treatment methods had to be explored.

47. Prof. Howard Huang said that sludge production was unavoidable in wastewater treatment, and there were three major methods of sludge treatment. One was incineration which could reduce the sludge volume by 90%, and was usually adopted by big cities with limited land supply. The method would be suitable for Hong Kong. Another method was landfilling which might not be suitable for Hong Kong since the existing landfills were being filled up quickly. Normally, sludge in landfills would decompose into methane but around 60% would still remain due to the inorganic materials and organic humus in the sludge. The third method was to collect and treat sludge in the Mainland using the bio-composting method and converting sludge into valuable organic humus. There were a lot of places in the Mainland that were in need of humus.

48. Ms. Lister Cheung cautioned that solutions for water pollution problem should not in turn result in air quality and waste problems. She was doubtful whether it would be a good idea to build an incinerator solely for sludge treatment though she considered that the cost of sludge treatment should be included in the budget for HATS Stage 2.

49. Mrs. Mei Ng sought clarification on the different prediction of sludge production. She said that sludge was currently produced in the Stonecutters Island Sewage Treatment Works, and the figures could be used to predict the future sludge production. She also asked how the existing sludge was treated. In response, Dr. Albert Koenig clarified that there was no disagreement in the predicted amount of sludge from CEPT. The only disagreement was in the amount of sludge produced by biological treatment. The Government had conducted three trials on biological treatment and had used the one with the largest amount of sludge production for the prediction which he thought was too high. In response, Mr. K K Kwok explained that the predicted sludge figure was obtained from HATS Stage 1. The Stonecutters Island Sewage Treatment Works currently handled around 1.40 million m³ of sewage and produced 600 tonnes of sludge per day. With completion of HATS Stage 2A, the ultimate amount of effluent would double and so would the sludge. Stage 2B would involve provision of biological treatment which would remove more pollutants and give rise to more sludge in total. The predicted ultimate amount of sludge would be around 2,300 tonnes per day. At present, sludge would be disposed of in landfills. In 1999, the Government conducted a study on the long term handling of

sludge, and the findings of the study were available on the Bureau's webpage. The study suggested incineration as a suitable treatment method, and further study would be conducted to assess how the technology could be applied in Hong Kong. The study would be completed in end 2005, and more information would be available by then.

50. Prof. Wong Tze-wai objected to the proposed treatment of sludge by incineration because despite the improvement in technology, the air pollution problem would still exist.

Views from members of the public

51. A member of the public, Dr. Guyi Li, submitted a written comment which said "the lower the pollution level in the sewage, the lower would be the treatment efficiency, or the higher would be the treatment cost. If the water quality standards are to be raised in future, the East Lamma discharge option offers more flexibility, or would even be cheaper in the long run". In response, Prof. Leonard Cheng said that the International Review Panel had considered the option of putting the outfall to the southern waters. However, the findings of the consultancy study were that if the outfall were extended southward, it would affect the fishery resources there. If it were put in a less southward location, the dilution effect was not good enough. In his view, to put the outfall in the direction of Lamma Island was not a good choice. Dr. John Wong added that Lamma Island, with its fishery resources and marine ecology, was a sensitive area. Extending the outfall to Ma Wan Channel would be a more suitable option because the flushing power was very high there. The dilution effect of over 100 could be achieved.

52. Another member of the public, Mr. David Wu, said that the Government should show a firm commitment to Stage 2B, as it was a world trend to adopt secondary biological treatment. At present, there was still no timetable for Stage 2B. As far as he was aware, Macau and big cities in the Mainland had begun to adopt secondary biological treatment. He also questioned the need for disinfection since the beaches in Tsuen Wan had very low usage rate. He considered that chlorination was not the only option for disinfection. Apart from the issue of by-products, it would be very difficult to resolve the design problem of fitting the contact tank and automatic dosing system into the small area on Stonecutters Island. As regards centralization vs. decentralization of sewage treatment, he said that the scoring in the consultation document was subjective and only focused on Stage 2A of the project. He considered that the long-term impact should be assessed and more consideration should be given to the dilution effect. In his view, construction of two extra outfalls would increase the dilution effect significantly. As regards the compact treatment technology, he observed that because of the land issue, the facility had to be operated in a small area, and that would involve a high cost. Finally, he suggested taking the advantages of the Closer Economic Partnership Agreement to

export the sludge to the Mainland for treatment.

53. Mr. Allard Nooy, a member of the public, said that in the consultation document, the design-build-operate approach was proposed for the sewage treatment facility, without mentioning the finance issue. In contrast, the International Review Panel had left the option of finance open, to be dealt with at a later stage. He would like to know the direction behind the decision to leave out the option.

54. Another member of the public, Dr. Lai Pong-wai said that dilution was a good approach for making improvements in certain parameters such as dissolved oxygen and ammonia. However, dilution was not a desirable method to address the issue of nutrient because nutrient would accumulate and would not dissipate easily. As far as the issue of nutrient was concerned, the analysis should cover Pearl River Estuary as a whole, as the quality of Hong Kong waters, including the eastern waters, was heavily affected by the water quality of Pearl River. Noting that Macau and other major cities in the Mainland were going to adopt secondary biological treatment, he hoped that the Government would draw up an implementation timetable for Stage 2B. Dr. Kedong Yin pointed out that sewage only contributed to about 10% of the water from Pearl River. Thus, the nitrogen and phosphorus in the water were mainly derived from fertilizer, not human sewage. Mr. K K Kwok explained that the Government had firm commitment to HATS Stage 2B, and the phased implementation approach was primarily adopted to speed up the Stage 2 project. The Government's time table was to implement disinfection around 2008-09, finish Stage 2A around 2013-14, and start the preparation work for Stage 2B during the interim.

55. Mrs. Mei Ng pointed out that in the consultation document, the score on public health was equal for all four options and no score was assigned. She queried the meaning of such scoring.

56. As a member of the HATS monitoring group, Dr. Ng Cho-nam said that he was most supportive of the recommendations of the consultation document. He wish to point out that when selecting the location of the sewage treatment facility, the impacts on the residents and the landscape, in addition to water quality considerations, had to be examined carefully. The options of putting the facility in North Point or Lamma Island were not suitable. He considered that the Stonecutters Island option had the least impact on the environment.

57. The Chairman concluded that good marine water quality was very important for the sustainable development of Hong Kong and the improvement of quality of life. He thanked the participants and the public for their valuable suggestions and views which the Council would consider in detail. Finally, he informed the participants as well as the public that the Government would hold a public hearing on the scheme, and that the consultation period would end on 20

November 2004.

**ACE Secretariat
September 2004**