LegCo EA Panel - Special Meeting on 26 October 1998 to Discuss the SSDS EIA
Discussions with Mainland Side on SSDS

Introduction

In 1994, the Sino-British Joint Liaison Group agreed to establish an Expert Group on Sewage Strategy to discuss and agree on the best way to implement Hong Kong Strategic Sewage Disposal Scheme (SSDS) so as to minimise its impact on the environment. The Expert Group was led by Mr. Chen Zuoer, the Representative of the Sino-British Joint Liaison Group on the Chinese side with members from Hong Kong and Macau Affairs Office, National Environmental Protection Agency, State Oceanic Administration and Guangdong Provincial People's Government. The Hong Kong side was led by Secretary for Works with members from Drainage Services Department, Environmental Protection Department and Constitutional Affairs Branch.

2. A Technical Group on Sewage Disposal was also formed to advise the Expert Group on the water quality objectives, the environmental impact assessment (EIA) study and the convergence of various stages of the project and related issues. The Chinese side was led by Prof. Jing Wenyong of the National Environmental Protection Agency. The Hong Kong side was led by the Director of Drainage Services with members from Planning, Environment and Lands Branch and Environmental Protection Department. The members of the Chinese side of the Sino-British JLG Expert Group and Technical Group are listed out in Annexes 1 and 2, respectively.

Previous Discussions at the Expert Group on Sewage Strategy of the Sino-British Joint Liaison Group

3. The detailed arrangements of the SSDS EIA Study were extensively discussed between both sides during 1995. During the first 3 meetings, the two sides discussed the developments of SSDS and the environmental quality standards. At its Fourth Meeting on 20 December 1995, the Expert Group agreed on the Scope of the SSDS EIA Study and recommended that it should commence as soon as possible. In May 1996, EPD commissioned the SSDS EIA Study which was jointly undertaken by Binhai Wastewater Treatment and Disposal (Hong Kong) Consultants and Montgomery Watson Hong Kong Limited.

4. Between 1996 and 1997, the Technical Group held 3 meetings to discuss the field surveys, option evaluation criteria and methodologies used in the SSDS EIA Study as well as the main working papers submitted by the Consultants listed below.

a)	Inception Report	
b)	Working Paper No.1-	Baseline Survey, Study Plan and Testing Programme
c)	Discussion Note No.1-	Marine Environmental Criteria
d)	Discussion Note No.2-	Onshore Environmental, Engineering and Socio-Economic Criteria
e)	Discussion Note No.3-	Development of Options

f) Technical Note No.3- Assessment and Selection Criteria; Development of Options; and Evaluation Methodology

Apart from these meetings, both sides' convenors of the Technical Group had also maintained close contact to ensure a smooth progression of the Study.

5. In addition, the follow reports were sent separately to the Mainland side as background information:

a)	Working Paper No.3 -	Modelling Approach, Methodology and Computing Requirements
b)	Technical Note No.1 -	Pollution Flows and Loads
c)	Consultation Paper -	Selection Criteria and Shortlist of Options

Recent Discussions with the Mainland Experts after the Return of Sovereignty

6. Following the return of sovereignty in July 1997, discussion of sewage disposal arrangements was dropped from the Sino-British Joint Liaison Group. A new Expert Group on Sewage Disposal was set up in July 1998 to continue the discussions. The Mainland side was led by Mr. Zhang Liangdong of the Hong Kong and Macau Affairs Office with members from the State Environmental Protection Agency (the former NEPA), the State Bureau of Oceanography (the fomer SOA), the Guangdong Provincial People's Government and the Zhuhai Government. The Hong Kong side was led by the Secretary of Planning, Environment and Lands Bureau with members from Drainage Services Department, Environmental Protection Department and Constitutional Affairs Bureau.

7. A Technical Group was also formed to advise the Expert Group on the technical issues and to review the reports submitted by the Consultants. The Mainland side was led by Mr. Qiao Zhiqi of the State Environmental Protection Agency with members from the State Bureau of Oceanography, Guangdong Provincial People's Government and Zhuhai Government. The Hong Kong side was led by the Director of Environmental Protection with members from the Planning. Environment and Lands Bureau and Drainage Services Department. The members of the Mainland side of both the Expert Group and Technical Group on Sewage Disposal are listed in Annexes 3 and 4, respectively.

8. At its first meeting held in August 1998, the Technical Group discussed the findings of the SSDS EIA Study including the modelling results, impacts on water quality and ecosystem and the options identified. At the meeting, the Mainland experts expressed their views on Working Paper No.2-"Option Comparison and Evaluation" and concluded that the working paper has fulfilled the requirements of the SSDS EIA Study. The line of thinking was clear, the methodology adopted was scientific and the work done by the Consultants was comprehensive. In particular,

a) The criteria, data and information adopted were comprehensive and accurate, this includes the reference to international journal and materials, as well as past records and currently collected survey data;

b) The option evaluation criteria adopted in the report, including the environmental, engineering economic and social factors, were complete; and

c) The comparison of options had adopted strict procedures including the near-field and far-field modelling as well as multi-target decision-making methods. This provided a strong technical support in the evaluation and shortlisting of the options in a scientific manner.

9. Apart from the Working Paper No.2, the following reports have also been passed to the Mainland side as background information:

a) Water Quality Modelling Results
b) Working Paper No.5- Existing Environmental Conditions
c) Working Paper No.7- Review of Interim Outfall Discharge
d) Discussion Note No.7- Potential Impacts of SSDS on Cetaceans

10. On the option selection, the Mainland side considered that the option with CEPT plus disinfection and an outfall at East or West Lamma would be preferable. They recommended that the land at Lamma Quarry should be reserved for further upgrading. They also suggested that the Hong Kong Government should carry out additional surveys before the completion of SSDS Stage II to collect more information to aid the consideration of upgrading of treatment levels in future.

Annex 1

中英聯合聯絡小組
Sino-British Joint Liaison Group
香港排污計劃專家組——中方人員名單
JLG Expert Group -- Chinese Side Representatives
(1995)

組長：
Chairman

陳佐洱 Chen Zuoer	中英聯合聯絡小組中方代表 Chinese Representative, Sino-British Joint Liaison Group

專家和工作人員：
Specialists and Members

喬致奇 Qiao Zhiqi	國家環保局開發監督司司長 General Director, Supervision and Management Department, NEPA
鹿守本 Lu Shouben	國家海洋局管理司司長 General Director, Management Department, State Oceanic Administration of China
劉強 Liu Qiang	國務院港澳辦經濟司處長 Division Chief, Department of Hong Kong Economic Affairs, Hong Kong and Macao Affairs Office of the State Council, PRC
魯建華 Lu Jianhua	新華社香港分社經濟部處長 Division Chief, Economic Affairs Department, Xinhua News Agency Hong Kong Branch
黃智民 Huang Zhimin	廣東省環保局處長 Division Chief, Environmental Protection Bureau, Guangdong Province
張清平 Zhang Qingping	廣東省外辦副主任 Division Chief, Foreign Affairs Office, Guangdong Province
張和慶 Zhang Heqing	國家海洋局南海分局副處長 Division Chief, State Oceanic Administration South China Branch
井文涌 Jing Wenyong	清華大學教授 Professor, Tsinghua University
周家義 Zhou Jiayi	國家海洋局教授 Professor, State Oceanic Administration of China
胡平華 Hu Pinghua	外交部港澳辦二秘 Second Secretary, Office of the Chinese Representative Sino-British joint Liaison Group
葉幸平 Ye Xingping	中英聯合聯絡小組中方代表處一秘 First Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group
黃光 Huang Guang	中英聯合聯絡小組中方代表處二秘 Second Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group
趙立平 Zhao Liping	中英聯合聯絡小組中方代表處二秘 Second Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group

Annex 2

中英聯合聯絡小組
Sino-British Joint Liaison Group
香港排污計劃技術小組——中方人員名單
JLG Technical Group -- Chinese Side Representatives
(1995)

組長：
Chairman

井文涌 Jing Wenyong	清華大學教授 Professor, Tsinghua University

專家和工作人員：
Specialists and Members

周家義 Zhou Jiayi	國家海洋局教授 Professor, State Oceanic Administration of China
夏綜萬 Xia Zongwan	國家海洋局南海分局總工程師 Chief Engineer, State Oceanic Administration of China South China Branch
夏青 Xia Qing	中國環境科學研究院副院長 Vice-President of Chinese Research Academy of Environmental Sciences
張忠祥 Zhang Zhongxiang	北京市環境保護科學研究院研究員 Research Professor, Beijing Municipal Research Institute of Environmental Protection
黃宗國 Huan Zongguo	國家海洋局第三海洋研究所高級研究員 Senior Research Scientist, State Oceanic Administration
胡平華 Hu Pinghua	外交部港澳辦一秘 First Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group
任光明 Ren Guangming	中英聯合聯絡小組中方代表處三秘 Third Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group
寧霞 Ning Xia	中英聯合聯絡小組中方代表處三秘 Third Secretary, Office of the Chinese Representative Sino-British Joint Liaison Group

Annex 3

香港排污計劃專家組——內地成員名單

Expert Group on Sewage Disposal -- Mainland Side Membership

(1998)

專家和工作人員：
Specialists and Members

張良棟 Zhang Liangdong	國務院港澳辦香港經濟司司長 Director of Hong Kong Economic Affairs Department, Hong Kong and Macau Affairs Office of the State Council
喬致奇 Qiao Zhiqi	國家環保總局污染控制司司長 Director of Pollution Control Department, State Environmental Protection Agency
鹿守本 Lu Shouben	國家海洋局綜合管理司司長 Director of General Management Department, State Bureau of Oceanography
羅越 Luo Yue	廣東省人民政府副秘書長 Deputy Secretary General, Guangdong Provincial People's Government
劉強 Liu Qiang	國務院港澳辦香港經濟司處長 Division Chief of Hong Kong Economic Affairs Department, Hong Kong and Macao Affairs Office of the State Council
井文涌 Jing Wenyong	國家環保總局顧問、清華大學教授 Consultant of the State Environmental Protection Agency; Professor of Tsinghua University
周家義 Zhou Jiayi	國家海洋局環保所研究員 Research Fellow of Institute of Environmental Protection, State Bureau of Oceanography

Annex 4

香港排污計劃技術小組——內地成員名單

Technical Group on Sewage Disposal -- Mainland Side Membership

(1998)

組長：

Leader

喬致奇	國家環保總局污染控制司司長
Qiao Zhiqi	Director of Pollution Control Department, State Environmental Protection Agency

工作人員：

Members

井文涌	國家環保總局顧問、清華大學教授
Jing Wenyong	Consultant of the State Environmental Protection Agency; Professor of Tsinghua University
周家義	國家海洋局環保所研究員
Zhou Jiayi	Research Fellow of Institute of Environmental Protection, State Bureau of Oceanography
霍兆明	廣東省環境保護局高級工程師
Huo Zhaoming	Senior Engineer of Guangdong Environmental Protection Bureau
林行道	珠海政府副秘書長兼建設委員會主任
Lin Xingdao	Deputy Secretary of Zhuhai Government and Head of Construction Committee

Legislative Council Panel on Environmental Affairs

The Recurrent Cost of Sewage Treatment

This paper sets out for members information the present recurrent costs of treating sewage in Hong Kong, and how these are being met. It also sets out for members guidance the expected future costs of sewage treatment and illustrates the implications of the different ways of meeting these costs.

General Points

The present cost of treating sewage in Hong Kong, together with a projection of the way in which these costs will change over the coming decade is attached as Table 1. This is the table that was given to members at the last meeting of the Environmental Affairs Panel on 5 October 1998. Please note that all the figures are given in constant 1998 prices.

Members will see from the table that the additional costs associated with Stage II of the SSDS will not arise until towards the end of the next decade. Before then, costs will increase as new non-SSDS works are completed, as SSDS Stage I is fully commissioned, and if Stages III & IV are funded.

At present, non-SSDS costs make up 83% of the total sewage collection and treatment costs of $840 million per year.

Assuming that funding is approved for all anticipated sewerage works (both SSDS and non-SSDS), by the end of the next decade non-SSDS costs will comprise about 60% of the total costs of $2916 to $2956 million if we proceed with SSDS Stages III & IV and Option 1 or 2 of Stage II.

If we proceed with Option 3 or 4 for Stage II, non-SSDS costs will comprise about 40% of total costs of $4026 to $4306 million.

How the present costs are met

Of the $840 million cost for treating sewage in 1997/98, $740 million has been paid for by direct charges and $100 million has been met by the taxpayer.

There are now 1,742,000 domestic and 220,000 non-domestic customers paying sewage charges and 13,000 paying the Trade Effluent Surcharge.

The average domestic account sewage charge is $131 per year. The average TES account charge is $1,500 per month.

13% of households are not connected to the public sewerage system, so do not pay any sewage charge. Of the households that are connected:-

14.5% pay nothing because they consume less than 36 cubic metres of water a year (12 cubic metres in each 4 month billing period are ‘free flow allowance’);

38.8% pay between $1 and $112 a year

21.3% pay between $113 and $180 a year

22.5% pay between $181 and $389 a year

2.9% pay over $390 a year.

Future arrangements

With the improvements to the sewage collection system expected over the next decade 95% of all households should be connected to the sewerage system, compared with 87% today. Given the rate at which new households are being formed, due both to population growth and the trend towards smaller family size, it is expected that by the end of the next decade there will be 2,683,000 domestic sewage charge accounts, an increase of 54% over the present number. The number of non-domestic customers is also expected to increase to over 300,000 accounts.

This means that although the costs of treating sewage will increase, those costs will be shared among a much larger number of accounts than at present.

Table 2 illustrates the effects of different ways of meeting the future operating and maintenance costs.

The first example shows what would happen if there is no change in sewage charges. No individual account payer would experience any change, but an extra $1.7 to $3.1 billion a year would have to be set aside from public funds to cover the costs. That is equivalent to between 22 and 41 % of expenditure on subventions under the code of aid to primary schools this year. It is 20% to 120% higher than recurrent expenditure on family and child welfare.

The second example shows what would happen if charges are increased in proportion to the overall increase in costs. If option 1 for Stage II of the SSDS is chosen, the anticipated increase for each account would be 2.2 times the present level. If Option 4 is chosen, the increase would be 3.4 times the present level. The amount that would have to be set aside from public funds would range from $0.3 to $0.5 billion. That is equal to between 30 and 50% of this year’s

provision for programmes for young people, or enough to buy between 3,000 and 5,100 places for the elderly in care and attention homes.

The third example shows what would happen if the charges are increased to recover the total recurrent costs. This would have no implications for taxation or public expenditure. The charges to individual account holders would increase to 2.6 times if option 1 is chosen, and to 3.8 times if option 4 is chosen.

Please note that all these examples have not attempted to calculate the effects of inflation between now and the end of the next decade, nor do they consider the effect of any possible increase in productivity or efficiency. Their use is as a comparative guide to the effects of the different choices we have both for our sewage treatment system and for methods of meeting the recurrent costs.

Capital cost and depreciation

It should be noted that all the figures given in this paper relate to expenditure on the operation and maintenance of the sewerage system. They do not reflect the capital cost or depreciation of the system, which it is assumed will be met through the publicly funded capital works programme. For members reference, the actual and estimated capital expenditure on the SSDS and related sewerage programmes is as follows:

	Estimate	Expenditure to date	Committed but not yet spent
SSDS Stage 1	$8.2b	$4.9b	$3.3b
Other components of HPP	$3.5b	$1.9b	$1.6b
Other Sewerage Works	$13.8b	$4.4b	$9.4b
SSDS III & IV	$6.7b	-	-
SSDS II (1)	$12.0b	-	-
(2)	$13.0b	-	-
(3)	$23.0b	-	-
(4)	$26.0b	-	-

Planning, Environment and Lands Bureau
October 1998

Table 1 : Expected Recurrent Costs

	1997/98 ($ Million)	2000/01 ($ Million)	mid 2000-2010 ($ Million)	late 2000-2010 ($ Million)	end 2010 ($ Million)
SSDS Stage I	**90**	**340**	**529**	**529**	**529**
Preliminary Treatment works	*50*	*50*	*50*	*50*	*50*
Tunnels & pumping stations	*0*	*4*	*4*	*4*	*4*
Treatment	*40*	*286*	*475*	*475*	*475*
SSDS Stages III/IV	**47**	**47**	**102**	**102**	**102**
Preliminary Treatment works	*47*	*47*	*77*	*77*	*77*
Tunnels & pumping stations			25	25	25
SSDS Stage II					
Option 1	0	0	0	**515**	515
Option 2	0	0	0	0	**555**
Option 3	0	0	0	**1625**	1625
Option 4	0	0	0	0	**1905**
TOTALS					
SSDS Only - option 1	**137**	**387**	**631**	**1146**	**1146**
- option 2	137	387	631	631	**1186**
- option 3	137	387	631	**2256**	**2256**
- option 4	137	387	631	631	**2536**
Other Sewerage	**703**	**950**	**1200**	**1550**	**1770**
SSDS and Other systems					
- option 1	**840**	**1337**	**1831**	**2696**	**2916**
- option 2	*840*	*1337*	*1831*	*1837*	**2956**
- option 3	*840*	*1337*	*1831*	**3806**	**4026**
- option 4	*840*	*1337*	*1831*	*1831*	**4306**

Assumes 6.35% per annum growth in Non-SSDS Sewage facilities - in line with 1998 5-year projection
All figures are in 1998 prices. Depreciation is not included
Figures are best available in advance of preparation of PWSC submission

Table 2 : Illustration of Effects of Different Approaches to meeting Sewage Costs

Example 1 : If no increase is made in Sewage Charges

	1997/98	2009/10			
		Option 1	Option 2	Option 3	Option 4
Cost ($ million)	840	2916	2956	4026	4306
Amount paid by charges ($ million)	740	1132	1132	1132	1132*
Amount paid by Taxpayer ($ million)	100	1784	1824	2894	3174
Total number of Accounts	1,962,000	3,000,000	3,000,000	3,000,000	3,000,000
Nominal Cost per Account ($)	377	377	377	377	377

Note :* this increase in cost recovered through charges is because of the increasing number of accounts

Example 2 : If Sewage Charges are raised in line with the increase in costs

	1997/98	2009/10			
		Option 1	Option 2	Option 3	Option 4
Cost ($ million)	840	2916	2956	4026	4306
Amount paid by charges ($ million)	740	2569	2604	3538	3793
Amount paid by Taxpayer ($ million)	100	347	352	488	513
Total number of Accounts	1,962,000	3,000,000	3,000,000	3,000,000	3,000,000
Nominal Cost per Account ($)	377	856	868	1179	1264
Nominal increase (97/98 to 09/10)		2.3 times	2.3 times	3.13 times	3.4 times

Example 3 : If Sewage Charges are raised to cover all recurrent costs

	1997/98	2009/10			
		Option 1	Option 2	Option 3	Option 4
Cost ($ million)	840	2916	2956	4026	4306
Amount paid by charges ($ million)	740	2916	2956	4026	4306
Amount paid by Taxpayer ($ million)	100	0	0	0	0
Total number of Accounts	1,962,000	3,000,000	3,000,000	3,000,000	3,000,000
Nominal Cost per Account ($)	377	972	985	1342	1435
Nominal increase (97/98 to 09/10)		2.6 times	2.6 times	3.6 times	3.8 times

Special Meeting of LegCo EA Panel on 26 October 1998
SSDS EIA - Tunnelling Aspects

Introduction

At the meeting on 5 October 1998, during discussion of the results of the first phase of the SSDS EIA study, Members of the Panel queried the engineering feasibility of constructing and operating the deep tunnels. Members also asked for a detailed analysis of what would be included in the geological surveys for SSDS Stage II. This paper aims at providing Members with further information concerning the construction and operation of the tunnels.

International Experience in Building and Operating Tunnels

2. Tunnels have been used world wide for various purposes including sewage collection, water supply and for public transportation systems. The most famous one is the deep tunnel used for transportation between France and Britain, which is over 50 km long under the English Channel. Some examples of the sewage collection and water transportation tunnels are listed below for reference:

a) **Sweden -** There have been two major tunnelling projects in Stockholm completed successfully through hard granite under the sea and urban areas. The **Saltsjo Tunnel** (7 km long and 3.5 m in diameter) was constructed at about 70 m below sea level in the late 1980s to transfer sewage from an inland sewage treatment plant to the sea for discharge. The **Snake** project, also in Stockholm, is a 2.8 km long 3.5 m diameter storm water storage tunnel, constructed at a depth of 40 m below sea level between 1990 and 1993. This tunnel also passes through predominantly granite.

b) **Australia -** The Sydney Deepwater Outfall Project consists of three outfalls under the same project banner. The three components were outfall tunnels at Malabar, North Head and Bondi. All tunnels were similar in that they were hard rock tunnels commenced onshore and taken to a termination point which had been determined from oceanographic studies and which would provide the desired level of dilution to the sewage as it was discharged. Similar to SSDS, the tunnels were 120 m to 150 m below sea level with bed rock cover about 50m deep and a total tunnel length of 10 km. The excavation of the main submarine tunnels was completed in 1988.

c) **San Diego, California -** The South Bay Ocean outfall was constructed under the Pacific Ocean at San Diego. The geology of the location is soft rock and watercharged sand with large boulders and cobbles throughout. The total length of the tunnel is 6 km, and diameter 5 m. It is 30 m below the seabed.

d) **Los Angeles, California -** Located in the Lake Arrowhead region of California, east of Los Angeles, the Arrowhead East Tunnel is part of a three tunnel project which will convey water into Los Angeles. The geology, depth

and need to control water inflows makes this tunnel very similar to SSDS. The tunnel, having a diameter of 5 m and total length of 3 km, is being constructed in granite at depths between 30 m and 200 m. The area overlying the tunnel route is a groundwater source and a court order dictates that the tunnel should not affect the groundwater level. Consequently, a tight restriction on groundwater inflow applies. The tunnel route is to cross the San Andreas fault which is a large and active fault zone. At this time, one third of the tunnel has been built and work is on schedule.

e) **Boston -** The Boston Harbour project is one of U.S.A.'s largest public works project on wastewater treatment and disposal. This project, serving a total population of 2.5 million, consists of a deep tunnel with a diameter of 7.3 m and a total length of 15 km.

Local Experience in Tunnels

3. Tunnels have also been drilled in Hong Kong for various purposes, such as for water supply, cable routes, vehicle transportation (eg. the Lion Rock Tunnel, Tate's Cairn Tunnel), railway and MTR. Many of these tunnels pass through fault zones either on land or under the sea, as shown in the attached figure (Annex A). Of these systems, the most sophisticated one is possibly the water supply system, which comprises over 170 km of tunnels connecting the water service reservoirs. The development of the new airport at Chek Lap Kok already includes a 6 km water supply tunnel.

4. Although most of the tunnels shown here are on-shore, they faced similar construction problems such as crossing faults and water seepage problems as they are often below the water table. The SSDS Stage I Works is the first deep tunnel sewerage system in Hong Kong. It is unfortunate that the first tunnel contractor unilaterally suspended work. Independent legal and engineering experts advised us that there was no basis for that stoppage, so we took over the works in December 1996. In fact, we do have successful example of constructing deep sea tunnels locally. The Stage I Interim Outfall Tunnel, which is 5 m in diameter; 1.7 km in length; and about 100 m below the Harbour, has already been completed by another contractor.

5. For the six tunnels on which work stopped in 1996, the first of the new contracts was let in July 1997. It covers the two western tunnels. About 75% and 20% respectively of the boring works for the two tunnels have now been completed. The other two contracts for the eastern tunnels were awarded in January this year after additional funding was approved by the Legislative Council. Both contractors have had to replace or refurbish equipment left by the first contractor, but tunnelling works have now restarted.

Additional Surveys Required for SSDS Stage II

6. The geological conditions within Hong Kong's territory are quite well understood. The fault lines, in particular, are shown in Annex A.

7. During the SSDS Site Investigation and Engineering Feasibility Study carried out in 1990 - 1993, we have drilled over 160 boreholes along the tunnel route of SSDS. This

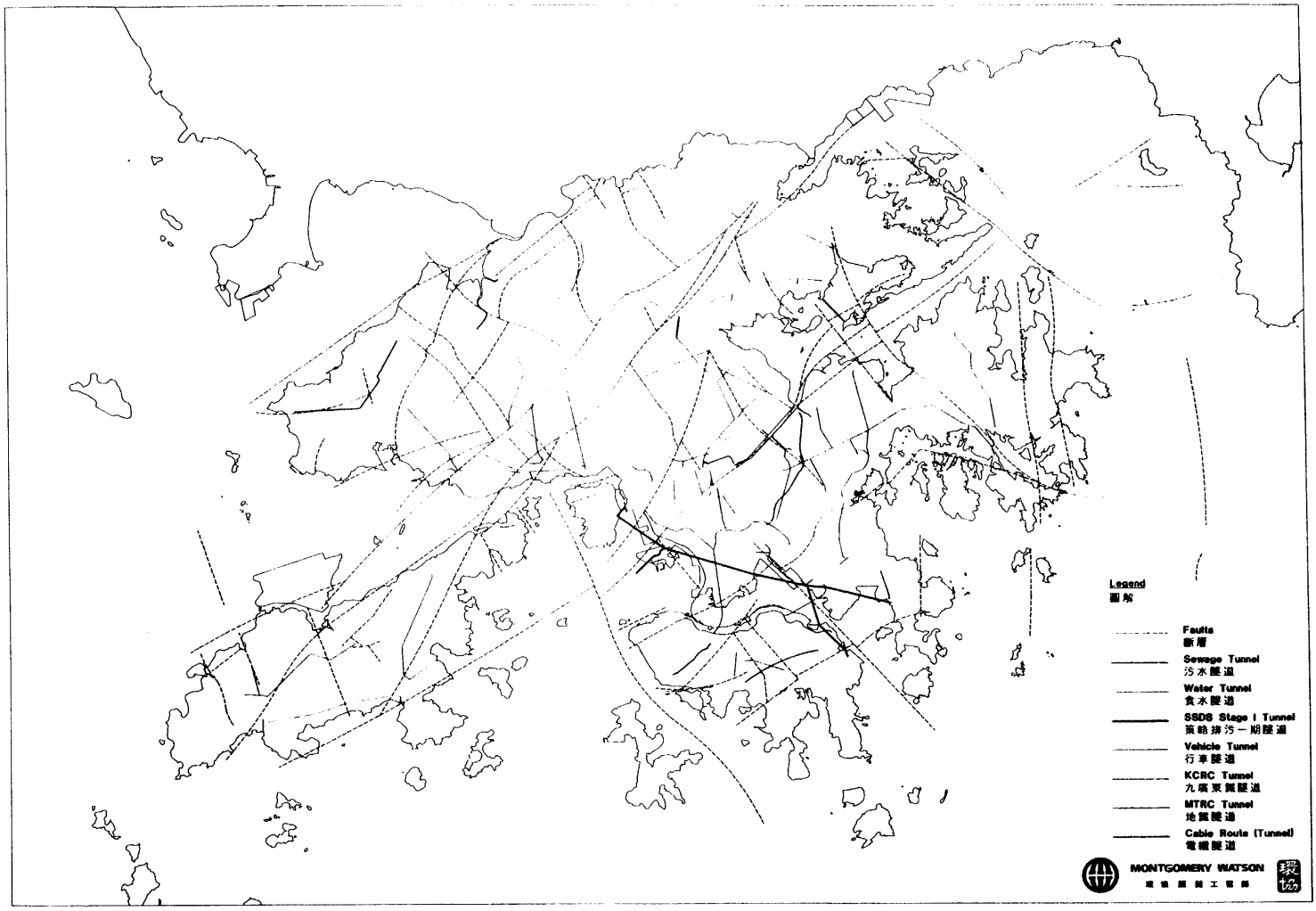
study had not identified any insurmountable problems for the construction and operation of deep tunnels.

8. On the other hand, we have little information concerning the geological conditions in the Lema Channel, which is outside Hong Kong's territory. The only relevant information we have so far is that there are two major parallel, strong to moderately active fault zones running along the southwest - northeast axis through the Dangan Basin, with the comparatively loose Ping Chan Formation sedimentation basin between them (Annex B). These two faults have not been intersected in boreholes and therefore their exact positions are not known accurately. Further site investigations to locate these faults will be needed to determine the optimal location of the outfall, should such an option be pursued.

9. With the experience gained in the SSDS Stage I works, we have decided to carry out further marine investigations, including gravity and magnetic field surveys, in the Preliminary Project Feasibility Study (PPFS) for Stage II, to characterize the major geological features in the area. The cost of these geological surveys (to be completed within a year) is estimated to be $3 - 5 million, depending on the final decision of the option.

10. With this additional information, we will be in a better position to specify appropriate construction equipment in the tender as well as necessary mitigation measures to ensure smooth progress of the work. We will also be able to make minor adjustments to the routing, if necessary. With adequate site investigation, the construction risk can thus be minimized.

11. We have every confidence that the tunnels can be constructed in a timely and cost-effective manner and provide many years of trouble-free service.



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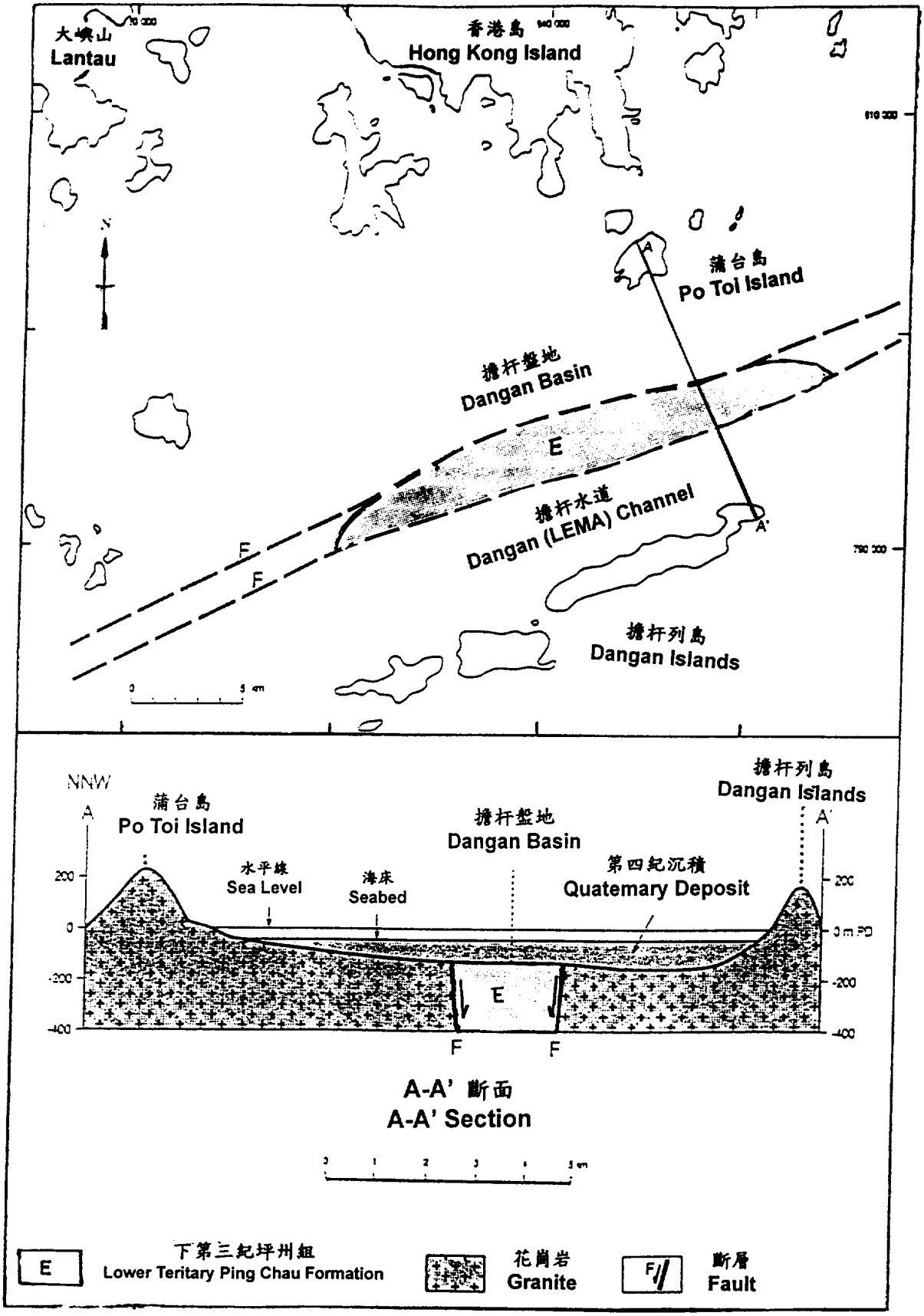

地質地圖及擔杆盤地斷面

Geological Map and Section of the Dangan Basin

Responses to the submissions tabled at the meeting held on 5 October 1998

HKUST

We note the generally positive comments.

2. With regard to the various qualifications expressed we would respond as follows:

Comment	Response
Dispersion at the outfall - have sufficient checks been carried out to satisfy that the DHI model predictions for dispersion at the outfall diffusers are really occurring?	The model used for assessing dispersion at the diffusers is not a DHI model but a near-field dilution model called JETLAG which has been developed by a local expert under local conditions. It is well established and gives reliable results. As the diffusers have not yet been built we cannot yet check whether the predicted dilutions "are really occurring". The far-field dispersion model is a DHI model. The consultants have taken thousands of field measurements for the purposes of calibration and verification. We have every confidence in the model accuracy.
How quickly will the high levels of pollutants be diminished to acceptable levels?	The levels of toxic contaminants in the sewage are relatively low, not high. At the edge of the initial dilution zone, they will all be reduced to levels at which they are not known to be harmful; this is an area along the length of the diffusers which is 2 km long and usually less than 100 m wide.
Concerns over the method of disinfection.	We note and fully understand the concern over the possible impacts of choosing chlorination as a method of disinfection. This will be addressed in the second phase of the study. Our initial preference is to use ultraviolet light, although this

	will be considerably more expensive than chlorination.
Concerns over assessment of the impacts of sludge disposal.	Assessment of the costs and operational impacts of sludge disposal are included in the consultants' brief; costs have been incorporated in the comparison of options; the operational impacts will be addressed in Phase II.
Concerns that worst case scenarios have not been covered.	It is correct that the data presented in the briefing document are time-averaged. This is because the criteria that were agreed upon at a very early stage were generally time-averaged criteria. However this does not mean worst case effects have been ignored. For toxic contaminants, the models predict that even under the worst case of initial dilution the relevant criteria will be met at the edge of the initial dilution zone. For dissolved oxygen, which is also a concern, the models predict that even under the worst conditions the level will not go below 2.8 mg/L.
Regional considerations and Pearl River Estuary Studies.	We entirely agree that regional considerations are of great importance. We hope to pursue regional initiatives through the Hong Kong - Guangdong Environmental Protection Liaison Group and other channels. We would caution though, that the nutrient loads that come down the Pearl River do not just come from sewage, but also from the application of fertiliser to the land. The latter source is likely very important and any decisions about catchment management and allocation of resources need to take it into account. Hopefully HKUST's Pearl River Estuary Pollution Project will help plug this information gap.

The Conservancy Association

The Association's submission can be broadly divided into two parts: the first part makes the case for pursuing Biological Nutrient Removal (BNR). We do not wish to comment on the Association's preference but we would like to make the following points:

(i) no matter which option is selected the mainland WQO for Total Inorganic Nitrogen in the vicinity of the outfall will continue to be complied with;

(ii) it is correct that the WQO for TIN in southern Hong Kong waters of 0.1 mg/L will not be complied with, but the extent to which the TIN level will be raised in southern Hong Kong waters will be only 0.01 to 0.03 mg/L over a relatively small area; it is doubtful that this is ecologically meaningful;

(iii) it is true that there appears to be a trend of increasing nutrients in southern Hong Kong waters; however we should not jump to the conclusion that this is solely due to pollution by sewage; it is likely that run-off of fertiliser from the land in the Pearl River catchment makes a significant contribution also; dealing with this will require a completely different approach and extensive liaison with Guangdong authorities;

(iv) bearing in mind (i) to (iii) above, the community needs to consider whether the investment in BNR would be worthwhile, given that it would unlikely result in an ecologically meaningful change in water quality conditions, and may not even address the primary cause of excessive nutrients in the Pearl River estuary area.

2. The second part of the submission works from the position that only BNR is acceptable and then suggest that this level of treatment would best be provided by a semi-distributed system. Our comments are:

(i) because of the restricted dispersion characteristics of Victoria Harbour, any proposal for a system of distributed discharges in the harbour will necessarily entail a level of treatment equivalent to BNR; this means additional sites will have to be found for large STWs, the cost and land

implications of which have already been set out in our paper to the EA panel;

(ii) it is suggested that there may be new treatment systems on the market which would allow BNR to be delivered in less space and at less cost; some 50 possible treatment systems were considered under the SSDS Options Review in 1994/95, including the SBR process mentioned by the Association; none of the technologies could deliver BNR with significant space savings (apart from those achieved by adopting deeper aeration tanks and double layer sedimentation tanks, which have already been assumed in the SSDS EIA study) and costs were comparable to, or higher than, conventional BNR systems; we have no knowledge of any new advances which have changed that position; it may be that advances are being made on a pilot or research scale but we could not risk adopting such technologies for a scheme as large as SSDS, nor can Victoria Harbour afford to wait while such technologies undergo further development;

(iii) it is suggested that we have adopted inflated land values in providing our estimates of the cost of a distributed system; this is fundamentally untrue; we have not valued the land at commercial prices, we have only estimated the cost of forming new land through reclamation, which would undoubtedly be needed if a semi-distributed system were to be pursued; these costs would be the same whatever the uses proposed;

(iv) it is suggested that we should learn from practice in Japan and develop compact, covered STWs to reduce land-take and avoid the “NIMBY” syndrome; the land requirements identified in paper 3 considered at EA panel on 5 October already assume compact designs; we are also assuming that we will need to cover any new STWs; nevertheless the land requirements are still large and no matter what efforts we make we suspect the NIMBY syndrome will continue to have a powerful effect when trying to locate STWs;

(v) it is suggested that adopting a semi-distributed system would avoid anticipated cost over-runs and delays due to the use of deep tunnels; however it is clear from comments under the heading “Technological changes” that the Association favour a separate treatment works at Green

Island or under Mount Davis; both of these options would still necessitate the use of deep tunnels because there would still be a need to transfer the sewage to Green Island or Mount Davis, so the (perceived) problem would still exist; furthermore the timing of the Green Island reclamation is too uncertain for us to rely on it to provide a speedy means of dealing with Hong Kong's sewage problem, and the Mount Davis site (which would necessitate the construction of a very expensive cavern) is too small to accommodate a BNR works of the necessary size.

Friends of Earth

FoE's submission contains many misgivings about the study. In setting out our comments, we have focussed on those aspects which require clarifications.

Comment	Response
Introduction	
"the sustainability of the scheme is questionable"	We do not understand the comment, and there is no evidence to substantiate it. The criteria established for acceptability of the options are set so as to ensure marine life can be sustained. Since all the identified options meet these criteria it follows that the proposals are environmentally sustainable.
Discontinuity of the Design Concept from Stage I to Stage II	
"the briefing document has clearly pointed out that the quality and quantity of the disposed sewage is far beyond the limits of assimilative power of the sea."	This is untrue. The briefing document does nothing of the sort. The SSDS EIA has taken chemically enhanced primary treatment (CEPT) as the minimum treatment level following the recommendation of an independent panel of experts. The EIA has demonstrated clearly that use of CEPT would allow all but one of the water quality objectives, total inorganic nitrogen (TIN) to be met. The TIN exceedence occurs because of the relatively high background level. The extent of exceedence is small and unlikely to be ecologically meaningful.
"The background nitrogen level contributed by the Pearl River is so high and the dissolved oxygen in the Lema Channel is so low in wet season that lead to the non-compliance of water quality objectives (WQOs) with CEPT effluent discharge."	This is inaccurate and misleading. The total inorganic nitrogen (TIN) levels are indeed elevated as a result of outflows from the Pearl River, but not enormously so. Indeed the TIN WQO in mainland waters will be met in the vicinity of the outfall no matter what level of treatment is provided. The TIN WQO in southern Hong Kong waters will not be met but that is primarily because it is a very stringent requirement that is not met now. In both cases the changes brought about by a CEPT discharge would not be great and would be unlikely to have any ecological meaning. Although the DO level in the Lema Channel in the summer is low (around 4 mg/L) compared with the Mainland WQO (6 mg/L), the effect of the SSDS discharge is minimal, it

	would only reduce the DO in the receiving waters by 0.2 mg/L (~5%). In fact, the DO level in the Lema Channel meets the WQO on an annual basis.
"The background mercury level of southern waters has already exceeded the WQO."	Hong Kong has no WQO for mercury. The mainland Chinese standard is 0.05 μg/L, which is probably one of the most stringent in the world. It is only one tenth of Japan's. As far as we can establish, it is exceeded at a wide range of coastal locations in Guangdong. The SSDS discharge will raise the mercury level by only 1.5% in a very limited area. This is unlikely to be ecologically meaningful.
"The findings clearly indicated that disinfection and higher treatment levels such as biological treatment or biological nutrient removal were necessary"	The study has demonstrated that disinfection is necessary. Biological treatment is not required unless one wishes to reduce the decrease of DO in the receiving waters by 0.1 mg/L and avoid any rise at all in nutrient levels, even though they would have no ecological effects.
<u>Ecotoxicological assessment</u> "the assessment has not taken into account "worst case" conditions. If the sewage discharge will result in period of only one to five hours in which oxygen drops significantly below the "average" conditions described in the model this may be sufficient to eliminate a sensitive species. An example of this occurred in Mirs Bay in 1994 when water with too little oxygen entered the bay for a short period of time killing most of the corals there."	The worst case conditions are experienced in the initial dilution zone in an area within 100m of the outfall diffusers. A combination of modelling and ecotoxicological assessment shows that even under "worst case" tidal conditions with the lowest anticipated dilutions there will be no toxicity at the edge of the dilution zone. As regards dissolved oxygen, model predictions are that at no time, under any tidal condition in any season, will the level outside the initial dilution zone fall below 2.8 mg/L. This should provide sufficient protection for even the most sensitive species. The reference to the deoxygenation event in Mirs Bay is misleading. The event (a very rare natural one) lasted for several days, not a few hours, and oxygen levels dropped well below those predicted in the SSDS EIA work. The scale of this event could never be reproduced by a discharge of treated sewage.

Red tides

"Population growth and the recurrence of red tides have not been fully addressed in this study."	This statement is fundamentally untrue. The projected pollution loads were based on the very latest projected population for the year 2016 which takes into account the latest growth trends. The possibility of increased red tides is catered for in the projections for changes in nutrient levels. Biological nutrient removal is one of the options put forward. Whether it is selected will depend on what weight the community gives to the precautionary approach.
"It is tempting to suggest that the public could vote for a disposal and treatment option for Stage II with built in flexibility to raise the standard of treatment and future expansion allowance. FoE would like to caution against a repeat of the Stage I fait d'accompli which proposed a centralised system limiting alternative distributed treatment system possibilities."	We do not understand this statement. It seems to be implying firstly that there will be no possibility of a future upgrading to the system and secondly that a distributed system would be better. There is absolutely no reason why a further upgrading of treatment should not take place in the future if found necessary. A distributed system would be extremely expensive and would necessitate further reclamation in the harbour, which the community clearly does not want to see, but which would deliver no obvious environmental benefits over a centralised system.

Geotechnics

"The geology of the Lema Channel is not well known that is the critical factor for the workability of the deep tunnel."	Only one option involves a tunnel in the Lema Channel. The geological conditions may be a factor in making the final selection.
"If only one outfall is proposed for discharging all the sewage of SSDS, any delay or failure of the tunnel drilling will jeopardise the whole system."	There is no reason why the tunnels should not be properly constructed. In any event, any delays would not cause anything like the problems for Victoria Harbour that would be caused by pursuing a distributed treatment system involving reclamations, as this would mean much longer delays while more EIAs are done for reclamations, and land is formed.

Modelling

"The document provides no information regarding the development and verification for the accuracy and preciseness of the modelling."	This is a very complex and highly technical area of work which cannot be easily presented in a briefing document. We have used one of the best modelling houses in the world. A detailed report on model calibration and verification is being compiled and will be available for public inspection from 24.10.98.

Waste management

These paragraphs claim that the EIA has not addressed the impacts of sludge disposal and suggest recycling of sludge should be considered.	With the majority of sewage in Hong Kong being treated properly the quantities of sludge being disposed of will increase enormously, no matter which option is chosen. A separate study has therefore been commissioned to review sludge management policy. It is likely the study will recommend incineration. Reuse as soil conditioner is really not feasible because of the high saline content of Hong Kong sewage. Furthermore it is extremely unlikely that any market could be found. Hong Kong currently produces about 70 tonnes of livestock waste each day but outlets can be found for only about 12 tonnes of composted wastes. The projected sludge arisings in the future will be around 2000 tonnes per day.

WWF HK

We are pleased to note that "WWF HK is very pleased to know that Government has planned to clean the harbour by means of the Strategic Sewage Disposal Scheme (SSDS) which aims to collect all the sewage produced to one point and have a centralised treatment system before discharging to the sea". We have no specific comments on the preference expressed (i.e. higher treatment level such as secondary level plus disinfection).

The University of Hong Kong

We find Prof. Lee's submission a balanced assessment of the position in Hong Kong. We are also pleased to note the positive comments that "the approach adopted in the Phase 1 of the EIA Study is acceptable", that "The scheme has built in flexibility ...", and that "the EIA Study applied the best possible methodology and provided a list of viable options for further considerations". We cannot agree more with the views that "the "Do Nothing" approach is not an option" and that "If an option is not decided after rational debate, the water quality in our harbour will deteriorate, and Hong Kong's environment will suffer".

The Hong Kong Marine Conservation Society

We note that the Society considers all the options to be essentially acceptable, and urges for the most cost-effective option. We have no specific comments on the preference expressed (i.e. CEPT + disinfection with S E Lamma outfall).

2. We are pleased to note that the Society is willing to record its view that "Both EPD and the consultants are congratulated for the objective and comprehensive data provided with practical solution suggested to solve our sewage problem."

Letter from the Hon CHOY So-yuk and NG Ching-fai

We have already replied separately to the two Hon Members on 15 October 1998, vide the attached.

香港特別行政區政府
The Government of the Hong Kong Special Administrative Region

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15 October, 1998

(By Fax 2971 0197)

Prof Hon Ng Ching-fai
Member of the LegCo Panel on
Environmental Affairs

Dear Professor Ng,

I refer to your letter of 30.9.98 to the Chairman of the Legislative Council Environmental Affairs Panel, which was tabled at the meeting held on 5 October. I am sorry that you were not able to be present at that meeting.

I do hope that you have had time to look at the papers which we prepared for that meeting, and the letter we sent to the Panel of 29 September.

As that letter said, the EIA study on the SSDS Stage II is being carried out in full compliance with the Environmental Impact Assessment Ordinance. Indeed, we are exceeding the requirements of the Ordinance by taking time out in the middle of the study to brief the Legislative Council, interested parties, and the community about how the study is developing. I entirely share your view that this is a programme with enduring implications for Hong Kong, and needs to be understood and supported by the community.

This understanding and support can only be developed through public information and discussion. This is the reason for putting out the information on the study now, rather than waiting until completion of the study, by which time the administration would have had to have taken decisions about the treatment level and outfall location without you or the community being aware of what the choices are.

May I assure you again that the process of discussion on our sewage treatment system is not confined to Hong Kong. As we have set out clearly in our letter of 29 September, the Expert Group between Hong Kong and the Mainland to discuss the development is an official group, chaired on the Mainland side by the Director of the Economic Affairs Department of the Hong Kong Macau Affairs Office, and including the Director of the Pollution Control Department of the National Environmental Protection Agency, the director of the General Management Department of the State Bureau of Oceanography and the Deputy Secretary General of the Guangdong Provincial People's Government. The Technical Group, officially established under the Expert Group includes members of the Guangdong Environmental Protection Bureau and a Deputy Secretary of the Zhuhai Government.

I am grateful to you for drawing attention to concerns in Zhuhai and Guangdong. We arranged a special briefing session in Zhuhai on 14 October and will continue to keep in close contact with the authorities there. Much of the data that we have collected in the course of the study will be of use to them, and we wish to make clear that we share their concern that nothing we do will add to regional problems.

It is clear from the discussions that I have had with you, the EA panel and many others that a lot of concern has been caused by our constant talk about the "sewage disposal" scheme, with the implication that we are just trying to get rid of the sewage, rather than handling and treating it in an environmentally responsible way. I very much regret that and would welcome your support and assistance in correcting this error.

The points I would like to get across are these:

- Hong Kong is simply disposing of its sewage at the moment, dumping 440 million cubic metres of virtually raw sewage into the harbour each year. This is very bad for us and not good for our neighbours

- Our objective is the proper treatment of all our sewage, so that the treated water can be released into the marine environment without causing damage either to Hong Kong or to our neighbours

- It makes sense to start putting in that treatment system (which can be upgraded later if required) as quickly as we can so as to end the severe degradation of HK waters and the economic losses we are suffering, as well as reducing any impact we may be having on regional water quality.

(Kim Salkeld)
for Secretary
for Planning, Environment and Lands

c.c. Hon Christine Loh - Chairman of the LegCo Panel on
Environmental Affairs
(Fax No. : 2575 8430)

similar letter to Hon Choy So-yuk