

LEGISLATIVE COUNCIL BRIEF

STRATEGIC SEWAGE DISPOSAL SCHEME
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

SELECTION OF OPTIONS

INTRODUCTION

At the meeting of the Executive Council on 5 January 1999, the Council ADVISED and the Chief Executive ORDERED that the Administration should -

- (a) for Stage II of the Strategic Sewage Disposal Scheme (SSDS) and the second phase of the Environmental Impact Assessment study, adopt a configuration which comprises chemical treatment and subsequent disinfection of the sewage followed by discharge via an outfall to the East of Lamma Island in Hong Kong waters;
- (b) retain flexibility by reserving the Lamma Quarry for the upgrading of treatment levels or the development of further outfalls, should this ever be shown to be necessary; and
- (c) continue liaison with the Mainland, through the Expert Group on Sewage Disposal, to discuss the long term planning for sewage treatment and dispersal of treated effluent.

BACKGROUND AND ARGUMENT

General background

2. Throughout the 1970s and early 1980s, the provision of sewerage within Hong Kong failed to keep pace with development. As a result, there was a rapid decline in water quality in the Harbour. In 1987, EPD commissioned a study into the means of providing a comprehensive upgrading to Hong Kong's sewage collection, treatment and disposal infrastructure. For the older urban area around the harbour, the study recommended a system which would collect sewage using deep tunnels, provide primary treatment, and disperse the treated effluent in deep oceanic currents south of Hong Kong. The system was to be constructed in four stages over a ten-year period.

3. There was extensive discussion in the community about these recommendations. In 1994, EPD commissioned an options review study to examine a large number of alternative options. An International Review Panel (IRP) with three experts from the Mainland, Denmark and the USA was appointed to oversee the work of the consultants. The IRP concluded that the original proposals were basically appropriate. They also recommended that -

- (a) chemically enhanced primary treatment (CEPT) should be provided as a minimum, at Stonecutters Island, and all flows should be treated there; and
- (b) since discharge to the Harbour was not a long term solution, an EIA study should be carried out to assess the alternative outfall locations and the level of treatment needed in the long term.

Cross-boundary Liaison

4. The detailed arrangements of the proposed EIA Study were discussed and agreed between both sides under the Sino-British Joint Liaison Group - Expert Group on Sewage Disposal in 1995. Following the commencement of the study in May 1996, both sides continued to discuss the methodology and the reports submitted by the consultants, providing support and advice to the consultants as necessary.

5. After 1 July 1997, a new Expert Group on Sewage Disposal, comprising the Hong Kong and Macau Affairs Office and Planning, Environment and Lands Bureau, was set up in July 1998 to continue the discussions on the sewage disposal arrangements. A Technical Group was also set up under the Expert Group to examine the reports submitted by the consultants. The membership of the two groups are at Annex A.

The Consultants' Recommendations

6. The EIA consultants have completed all the field survey work, including the wet and dry seasons marine water quality and hydrodynamics surveys, the four seasons' ecological surveys, wastewater characterization and whole effluent toxicity testing. A set of environmental, engineering feasibility and socio-economic criteria was also established for the evaluation of options. Based on this set of criteria and the water quality modelling results, four combinations of outfall locations and treatment levels that would be environmentally acceptable were identified, as shown at Annex B and outlined in the table below -

TABLE 1. ENVIRONMENTALLY ACCEPTABLE OPTIONS FOR SSDS STAGE II

| Option Group | Outfall Locations | Treatment Levels |
|--------------|---------------------------------------|---|
| 1 | East or West of Lamma | Chemical with disinfection |
| 2 | Southeast Lamma (in the Lema Channel) | Chemical with disinfection |
| 3 | East or West of Lamma | Biological with disinfection |
| 4 | East or West of Lamma | Biological and Nutrient removal with disinfection |

7. A summary of the cost and land implications of the four options is provided at Annex C. The pros and cons of these options are :

- (a) Option 1 can meet all Hong Kong’s water quality objectives (except the nitrogen objective, due to the high background level) and provide adequate protection to the marine environment. The capital and operational costs are the lowest. It retains the flexibility for further upgrading to biological or biological and nutrient removal treatment, or for the construction of a longer outfall. It is also the quickest to construct.
- (b) Option 2 has marginally less impact on water quality than Option 1 but requires a longer construction time. The uncertainty of the geological conditions in the Lema Channel may increase both the construction time and cost significantly. The longer tunnel would not be justified if it was expected that the treatment level would be upgraded.
- (c) Option 3 has marginally less impact on water quality than Option 2. It has almost double the capital and running costs. It requires around 22 hectares of land at Lamma Island.
- (d) Option 4 has marginally less impact than Option 3. If a regional wide programme to reduce nitrogen loads on Pearl Estuary Waters was introduced, Hong Kong might wish to introduce de-nitrification to contribute to such a programme. Without such a programme, the effect of reducing the nitrogen load from Hong Kong’s effluent would be insignificant. It requires around 28 hectares of land at Lamma Island, which would necessitate some reclamation. This, in turn, would mean a longer construction period and a further EIA on the reclamation proposal. This is the most expensive option in terms of capital and running costs.

PUBLIC CONSULTATION

8. In September and October this year, interested parties were briefed on the outcome of this first phase of the EIA study. Briefings were provided to the Advisory Council on the Environment (ACE), the Legislative Council Panel on Environmental Affairs (the Panel), green groups, tertiary institutions and various professional bodies.

9. In general, the green groups preferred higher levels of treatment whereas the professionals and academics tended to advocate the most cost-effective solution.

10. The ACE was generally satisfied with the environmental assessment work although there were different views on the preferred level of treatment. After much discussion, the ACE advised that chemical treatment plus disinfection should be adopted and the system should be designed with full flexibility for future upgrading or downgrading. To maintain such flexibility, the ACE recommended that sufficient land should be reserved for future upgrading. On the outfall locations, the ACE recommended that the longer outfall southeast of Lamma Island (i.e. Option 2) should be adopted. However, if the longer outfall could not be adopted for any reason, a shorter outfall east or west of Lamma (i.e. Option 1) could be adopted.

11. As for the Panel, there was much debate, in particular, over the issue of whether a distributed network should be pursued, and whether deep tunnels were feasible. The Administration presented the view that a centralised system is more cost effective, both in terms of capital and recurrent costs, that has the least impact on the community and that it requires the least space. In particular, it would not require the harbour reclamation that would, otherwise, be needed for a distributed system. The deep tunnels to collect sewage from Kowloon and part of the Hong Kong Island are already under construction and partially completed at present. Expert evidence was given that similar deep tunnels have been successfully built in North America, Europe and Australia. With the expected completion of this collection system and construction of similar collection tunnels for the remainder of Hong Kong Island, a distributed treatment system would be unnecessary. Apart from the above, Members of the Panel were also concerned about the cost implications of any of these options on sewage charges.

Consultation with the Mainland

12. The Expert Group on Sewage Disposal and its Technical Group have each met twice since July 1998 to consider the consultants' recommendations. At its second meeting held on 30 November, the Expert Group agreed that the four options identified were acceptable and that chemical treatment plus disinfection with a discharge east of Lamma Island should be recommended to the Hong Kong Special Administrative Region Government for consideration. It was further agreed that the selected option should not be seen necessarily as the final arrangement. In the long term, the selected option may need to be further improved or refined, for example, by upgrading the treatment level or constructing a longer outfall.

THE PROPOSAL

13. Of the four options, chemical treatment plus disinfection with a discharge east of Lamma Island is the most cost-effective scheme. It is also the scheme which can be completed within the shortest possible time. Given the severe state of water quality in the harbour, this is a key consideration. This option also provides full flexibility for future modifications, provided land is reserved at Lamma Quarry for further development, if required.

14. The Administration intends to continue to liaise with the Mainland through the Expert Group on Sewage Disposal to consider long term planning of sewage treatment levels and oceanic outfalls. Flexibility will be retained for upgrading of treatment levels or the development of further outfalls, should this ever be shown to be necessary.

FINANCIAL AND STAFFING IMPLICATIONS

15. The EIA study has already been funded and is being conducted. We do not envisage that additional funds would be required for completing the study.

16. Upon the completion of the second phase of the EIA study, a preliminary project feasibility study (PPFS) will be carried out. It is estimated that the PPFS will cost about \$14 million.

17. These studies will be carried out by consultants and there are no additional staffing implications.

18. If Option 1 is to be implemented, the estimated construction cost will be around \$11 billion and the recurrent cost will be about \$0.9 billion per annum. The provision of necessary resources will be subject to the discipline of the annual resource allocation exercises and spending priorities at the time.

ECONOMIC IMPLICATIONS

19. The proposal to carry out the second phase of the EIA study and the PPFS would not have any economic implications.

20. With the implementation of the remaining stages of the SSDS, the costs of operating the whole sewerage system will inevitably increase. Most of these additional costs will not arise and would not be factored into the sewage charge or trade effluent surcharge, however, until late in the next decade. Rough indications of the possible implications of increased operating costs were given in LegCo Paper No. CB(1)354/98-99(01)(B).

ENVIRONMENTAL IMPLICATIONS

21. At present, the Stonecutters Island Sewage Treatment Works is treating 25% of the sewage generated within the SSDS Stage I catchment. With the completion of all the SSDS Stage I projects, 70% of the sewage flows previously entering the Victoria Harbour and the Western Anchorage will receive proper treatment. This will bring substantial interim relief to the Harbour. However, water quality objectives will still not be met as there will be around half a million tonnes of sewage entering the Harbour each day from the north shore of the Hong Kong Island. Deterioration will resume if the population builds up. It is therefore important that the SSDS Stage II (the construction of the oceanic outfall) and Stages III/IV (the collection and treatment of sewage generated from the remaining areas of Hong Kong) should proceed as early as possible so that all sewage in the Victoria Harbour area will be subject to proper treatment and that, as a result, all the established water quality objectives would be met.

22. The first phase of the EIA study has shown that the environmental implications of discharging sewage east of Lamma Island as recommended in Option 1 are minimal.

PUBLICITY

23. A press release will be issued in the afternoon of 5 January 1999.

ENQUIRIES

24. Enquiries could be directed to the following officers:
- Mr. Danny Tsui
Principal Assistant Secretary (Environment)
Planning, Environment and Lands Bureau
- Dr. Malcolm Broom
Principal Environmental Protection Officer
Environmental Protection Department

Planning, Environment and Lands Bureau
January 1999
(File Ref. : PELB(CR) 35/01/05)

**Expert Group on Sewage Disposal
Membership**

(as at July 1998)

Hong Kong Side

| | |
|------------------|--|
| Mr. Bowen Leung | Secretary for Planning, Environment and Lands (Leader) |
| Mr. Rob Law | Director of Environmental Protection |
| Mr. John Collier | Director of Drainage Services |
| Mr. Kim Salkeld | Deputy Secretary for Planning, Environment and Lands (Environment) |
| Mr. Mike Stokoe | Deputy Director of Environmental Protection |
| Dr. Samuel Chui | Senior Environmental Protection Officer, Environmental Protection Department |
| Ms Wendy Cheung | Principal Assistant Secretary, Constitutional Affairs Bureau |
| Mr. Danny Tsui | Principal Assistant Secretary (Environment), Planning, Environment and Lands Bureau |
| Mr. K.M. Cheung | Senior Chinese Language Officer (Putonghua Interpretation) |

Mainland Side

| | |
|---------------------|--|
| Mr. Zhang Liangdong | Director Hong Kong Economic Affairs Department Hong Kong and Macau Affairs Office State Council |
| Mr. Qiao Zhiqi | Director Pollution Control Department National Environmental Protection Agency |
| Mr. Lu Shouben | Director General Management Department State Bureau of Oceanography |
| Mr. Luo Yue | Deputy Secretary General Guangdong Provincial People's Government |
| Mr. Liu Qiang | Division Chief Hong Kong Economic Affairs Department Hong Kong and Macau Affairs Office State Council |
| Prof. Jing Wenyong | Consultant of the National Environmental Protection Agency; Professor of Tsinghua University |
| Prof. Zhou Jiayi | Research Fellow Institute of Environmental Protection State Bureau of Oceanography |

**Technical Group on Sewage Disposal
Membership**

(as at July 1998)

Hong Kong Side

| | |
|-------------------|---|
| Mr. Rob Law | Director of Environmental Protection (Hong Kong Side Leader) |
| Mr. Danny Tsui | Principal Assistant Secretary (Environment), Planning, Environment and Lands Bureau |
| Mr. John Rockey | Assistant Director (Waste & Water), Environmental Protection Department (EPD) |
| Dr. Malcolm Broom | Principal Environmental Protection Officer (Water Policy and Planning), EPD |
| Mr. R.T.K. Cheung | Assistant Director (Sewage Services), Drainage Services Department (DSD) |
| Mr. W.W. Chiu | Senior Engineer (Strategic Sewage Disposal Scheme), DSD |
| Dr. Samuel Chui | Senior Environmental Protection Officer (Water Policy and Planning), EPD (Hong Kong Side Secretary) |

Mainland Side

Mr. Qiao Zhiqi
Director
Pollution Control Department
National Environmental Protection Agency
(Leader)

Prof. Jing Wenyong
Consultant of the National Environmental Protection
Agency;
Professor of Tsinghua University
(Mainland Side Secretary)

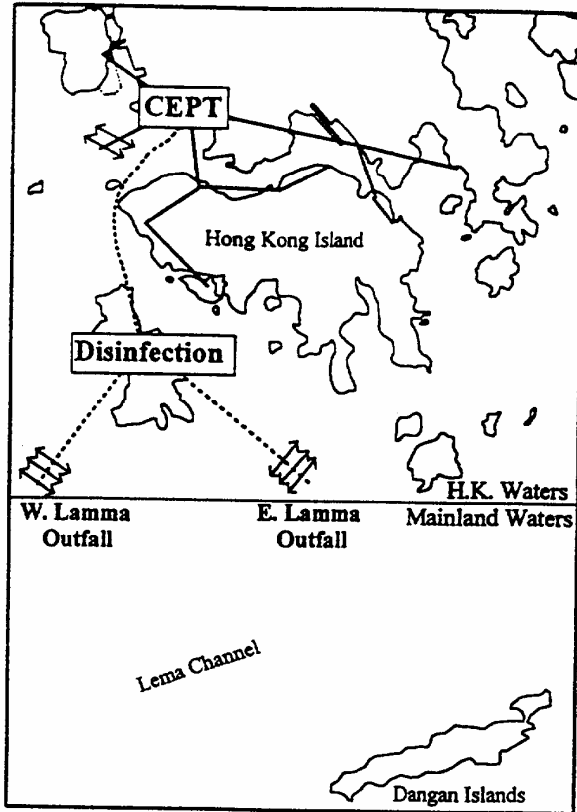
Prof. Zhou Jiayi
Research Fellow
Institute of Environmental Protection
State Bureau of Oceanography

Mr. Huo Zhaoming
Senior Engineer
Guangdong Environmental Protection Bureau

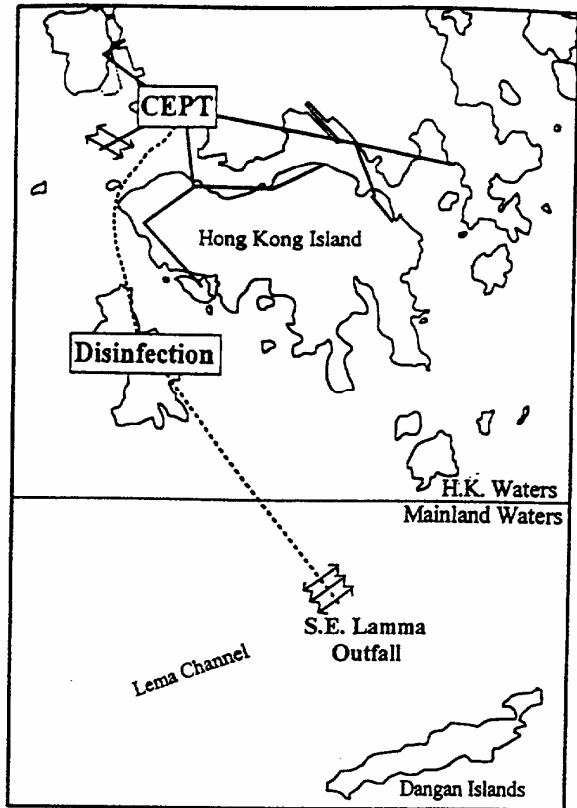
Mr. Lin Xingdao
Deputy Secretary of Zhuhai Government;
Head of Construction Committee

Environmental Acceptable Options for SSDS Stage II

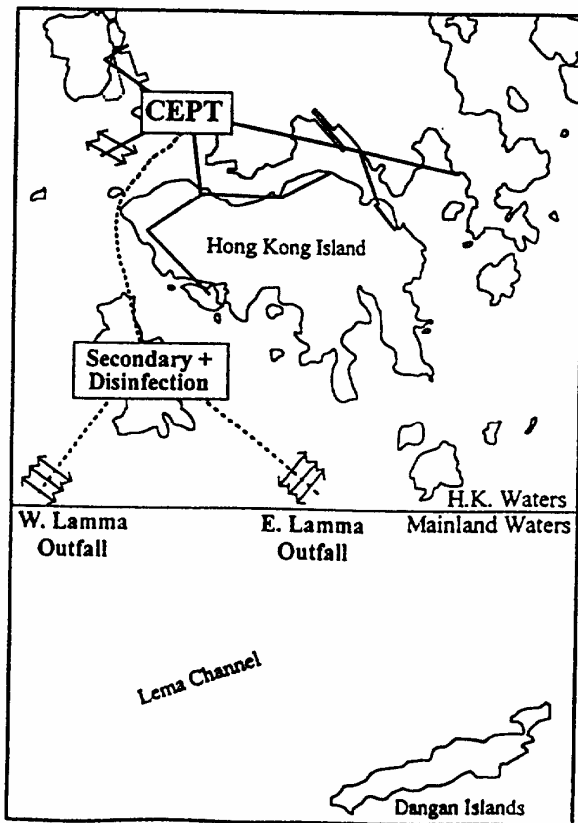
Option 1 : CEPT+Disinfection to E. or W. Lamma Outfall



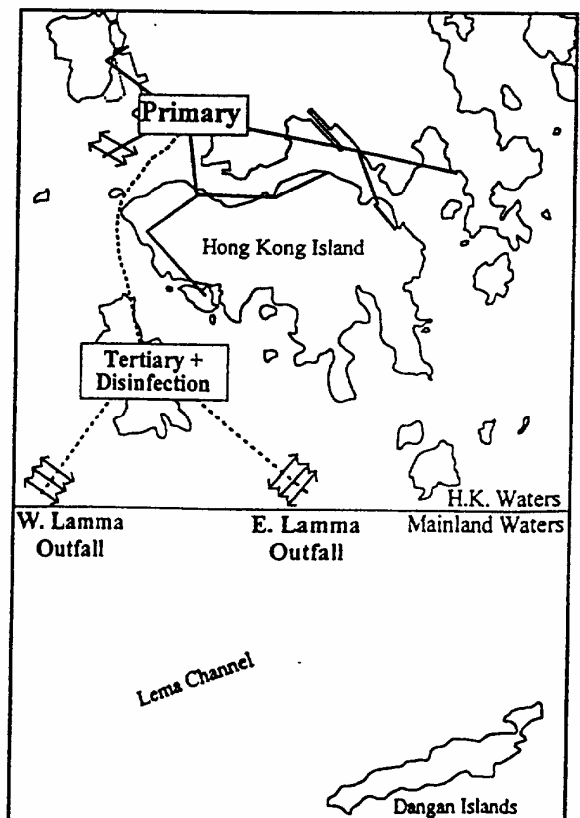
Option 2 : CEPT+Disinfection to S.E. Lamma Outfall



Option 3 : Secondary+Disinfection to E. or W. Lamma Outfall



Option 4 : Tertiary+Disinfection to E. or W. Lamma Outfall



KEY DIFFERENCES BETWEEN THE ACCEPTABLE OPTIONS

| Details and Main Criteria | Group 1 | Group 2 | Group 3 | Group 4 |
|---|---|---|--|---|
| Treatment Levels | CEPT + Disinfection | CEPT + Disinfection | Secondary + Disinfection | Tertiary + Disinfection |
| Outfall Location | E. or W. Lamma | S.E. Lamma (Lema Channel) | E. or W. Lamma | E. or W. Lamma |
| Marine Environment | Achieves all criteria except those where the background levels have already exceeded the WQOs | | | |
| Onshore Environment | Limited impacts | Limited impacts | Moderate | Moderate. Additional impacts from necessary reclamation |
| *Time for Completion (from selection of option to completion of construction) | 7.5-8 years | 8-10 years (depends on the actual geological conditions in Lema Channel) | 7.5-8 years | 9.5-10 years |
| Other Engineering Issues | Further geological survey is needed to determine which outfall is more appropriate | High uncertainties associated with the faults zones in Lema Channel | Further geological survey is needed to determine which outfall is more appropriate | Further geological survey and pilot studies required |
| *Capital Cost (not including Stage I works) | \$11 billion | \$13 billion | \$23 billion | \$26 billion |
| *Recurrent Cost | \$0.9 billion per year | \$0.9 billion per year | \$2.0 billion per year | \$2.3 billion per year |
| Land Requirement | 11 ha of land at Stonecutters Island plus 6 ha of land at Lamma Quarry site | 11 ha of land at Stonecutters Island plus 6 ha of land at Lamma Quarry site | 11 ha of land at Stonecutters Island plus 22 ha of land at Lamma Quarry site | 11 ha of land at Stonecutters Island plus 28 ha of land at Lamma Quarry site; at least 3 ha of land to be formed by reclamation |

*The figures are best estimates at this stage.