



中華人民共和國香港特別行政區
Hong Kong Special Administrative Region of the People's Republic of China

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LEGISLATIVE COUNCIL

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11 November 2004

Secretary for the Environment, Transport and Works
(Attn: Ms Jessie WONG)
Environment, Transport and Works Bureau
10/F., Citibank Tower
3 Garden Road
Central
Hong Kong

Dear Ms WONG,

Panel on Environmental Affairs

Meeting on 18 November 2004

I attach for your consideration and comments a submission from the Hong Kong Institution of Engineers.

With best regards,

Yours sincerely,

(Miss Becky YU)
Clerk to Panel

Encl.

Enclosure**VIEWS AND COMMENTS ON CONSULTATION DOCUMENT FOR THE HARBOUR AREA TREATMENT SCHEME STAGE 2****1. Introduction**

The Harbour Area Treatment Scheme (HATS) is one of the most important sewerage infrastructure undertakings ever pursued by the HKSAR Government. The first stage of the work was commissioned in December 2001. The HKSAR Government is seeking views of the public on the implementation of the Stage 2 works which aim to further improve the water quality in the harbour area. A consultation paper which outlines proposals for HATS Stage 2 was released on 26th August 2004 to seek views from the public on whether they agree with: (a) the preferred option, i.e. Option A, (b) phased implementation of stage 2, and (c) polluter pay principle.

In response to this initiative, the Hong Kong Institution of Engineers (HKIE) in association with the Chartered Institution of Water and Environmental Management Hong Kong (CIWEM) organized a forum on 9th October 2004 to discuss the Consultation Document and to collect members' views on this document for the preparation of this position paper to the government. This paper summarizes the majority views of the HKIE members on the subject, with recommendations for the way forward by the Government.

2. Comments on Consultation Paper

The HKIE is pleased to know that after the commissioning of the HATS Stage 1, the water quality in the Victoria Harbour has been substantially improved. Hong Kong SAR Government should be commended for its commitment and efforts in protecting the waters of Victoria Harbour and the adjacent water control zones in Hong Kong. As the statutory engineering institution in Hong Kong, the HKIE is supportive of this project and wishes to urge the Government to proceed with the project without delay. However, the Institution does have some specific views and comments to express about the Consultation Paper and the Environmental & Engineering Feasibility Assessment Studies (EEFS), which form the technical basis of the paper. These are presented in the Appendix.

3. Recommendations

On the three questions in the Consultation Document, the HKIE's responses are:

3.1 Do you agree with the preferred option, i.e. Option A - centralized treatment at Stonecutters Island (SCI)?

We agree that Option A is an acceptable option, but Option B may be better because under this Option land is readily available for an above ground facility using various proven treatment technologies, and therefore we would be less dependent on the use of compact treatment technology, while the capital and recurrent costs of this Option are only marginally higher than those of Option A. In terms of resilience, Option B

will provide more flexibility for sewage transfer and for future expansion. Also, it will reduce concentrated discharge of effluent, though the higher risk of this Option on ecological resources around the south of Lamma and fisheries resources in southern waters should be duly considered.

3.2 Do you agree that Stage 2 should be implemented in two phases, i.e. HATS Stage 2A: collection of sewage from HK Island, Chemically Enhanced Primary Treatment (CEPT) in SCT + disinfection; and HATS Stage 2B: biological treatment of all sewage at SCT?

YES, but the two phases should be implemented as an integral plan and in two engineering phases for practical reasons. It is essential that a definitive consecutive time frame for the two phases should be specified in the Consultation Paper.

On the use of chlorination for disinfection, the HKIE is of the view that the Government should strike a balance between protection of public health and long-term environmental impact of chlorination. The HKIE concurs in the use of chlorination as an interim measure or as needed during, for example, bathing seasons, pending the implementation of Stage 2B.

3.3 Do you agree that protecting the water quality of Victoria Harbour is essential and that it is worth you paying higher sewage charges in line with the "Polluter Pays Principle"?

- **YES**, it is essential to protect the water quality of Victoria Harbour. The Government has the legal responsibility to protect the water quality of Victoria Harbour, and it must carry out the necessary measures in the most cost-effective manner.
- The HKIE has no consensus view on how to adopt the "Polluter Pays Principle" in this project.

In addition, the HKIE recommends the following for Government consideration:

- **PROPOSE** that a standard be set for effluents discharged into the receiving waters.
- **PROPOSE** to consider shifting the tunnel alignment southward to reduce the risk and cost in tunnelling in the reclaimed area, and to carry out detailed site investigation as soon as possible.

Appendix: Specific Views and Comments

A.1 Water Quality Objectives (WQO) and Effluent Standards/Requirements

The Water Pollution Control Ordinance of 1980 declared 10 Water Control Zones in Hong Kong with 10 different Water Quality Objectives. There are no stated effluent standards for effluent discharges greater than 6000 m³/d. This is contrary to the practice of most Governments in the world, which set effluent standards for all discharges, without any limit on flow rates. The Hong Kong practice allows the Government through Environmental Protection Department (EPD) to set individual effluent requirement for discharges greater than 6000 m³/d, which are usually from government operated sewage treatment plants, case by case. According to EPD, the stated minimum treatment for sewage flows greater than 6000 m³/d is currently CEPT plus disinfection (EPD), but no effluent standards are provided.

The Consultation Document, based on the EEFS, did not recommend an effluent standard to be met by HATS. The HKIE proposes that an effluent standard based on secondary treatment of the wastewater and an initial dilution using a submarine outfall should be set for the future operator in the form of a discharge license.

A.2 Disinfection Requirements

The centralized treatment concept will no doubt bring about local discharge of concentrated wastewater, no matter treated or partially treated. This in turn brings about the increase level of pathogens to the environment, in particular to the nearby beaches. From the protection of public health perspective, there is a need to disinfect the effluent in order to minimize the impact due to the discharge of the pathogens onto both the community and the environment. However, use of some chemicals (e.g. chlorine) may cause formation of undesirable byproducts.

There have been long discussions regarding the need for disinfection in many communities especially when the use of chemicals was involved. The key issue always lies on appropriate balance between protection of public health and long-term environmental impact.

Practically all advanced countries, though with some exceptions, (USA, Canada, European Union, Japan, South Korea, PR China, Macau SAR, etc.) require at least secondary treatment prior to discharge. Hence, it is seldom for chlorination of primary treated (by CEPT or not) effluent, apart from a few cities, such as Boston where chlorination was used as an interim measure during the construction of the secondary treatment system in the Boston Harbour Cleanup project. In Hong Kong, UV disinfection is used for CEPT effluent at Cyberport STW and Sham Tseng STW. If secondary effluent is not able to meet the required ambient water quality, esp. at bathing beaches or in small rivers, then additional disinfection may be necessary. This is usually accomplished by chlorination and more recently by UV infection.

In the USA, disinfection of secondary effluents was practiced since the end of World War II, mostly by chlorination. The main reason was that the receiving waters were

for bathing and recreation. However, this practice was rarely applied in Europe, as secondary treatment was considered sufficient in most cases.

Some problems of chlorinating CEPT effluent in Hong Kong are:

- High chemical consumption (minimum of 10-20 mg/L Cl_2 equivalent + 5 mg/L dechlorination chemical are mentioned in the Excerpt on Chlorination, but could be higher) and hence high operating cost;
- Concern about potential impact on the environment;
- It is not clear whether chlorination will be carried out regularly throughout the whole year or only as emergency measure during the bathing season if the coliform count at the beaches is found too high;
- It is not certain, what proportion of the coliform bacteria at the Tsuen Wan beaches can be attributed solely to the effluent from SCI STW. The high bacterial count there is the cumulative effect from many effluent discharges elsewhere and only in part due to the SCI outfall. Hence measures other than disinfection at SCI must also be considered.

In the view of the HKIE, secondary treatment (though more expensive than chlorination) is still the most suitable treatment method, not only because of its other benefits, namely oxygen demand removal (=stabilization of organic matter) and nitrification, but because of its significant removal of bacteria including *E. Coli* and other pathogens. The Compact Sewage Treatment Technology Pilot Test Trials demonstrated that biological aerated filters (BAF) could reduce coliform bacteria by 2 to 3 orders of magnitude, thus most probably eliminating the need for additional disinfection in the case of SCI STW. Biological treatment can also reduce viruses and protozoa by at least one order of magnitude.

Besides, one may consider the high cost of disinfection versus the economic/environmental losses to close down one bathing beach. That means, is it really worthwhile to keep one bathing beach open for the anticipated cost of a chlorination facility up to ten years? These questions, as well as the proposed method of disinfection, were not addressed in sufficient detail in the Consultation Document.

From the public health perspective, HKIE has no strong objection to *some* disinfection of the CEPT effluent under Phase 2A, but it should only be used as an interim measure, or as needed during, for example, bathing seasons, pending the implementation of Stage 2B.

A.3 Treatment Technology

The Compact Sewage Treatment Technology Pilot Test Trials demonstrated that BAF could meet the specified effluent requirements. BAF was also able to reduce the coliform concentration by almost 3 orders of magnitude (about 99.5%), somewhat higher than in conventional activated sludge systems. While CEPT + BAF probably constitute the most compact available treatment technology, other treatment technologies can also meet the specific effluent requirements given sufficient space. Hence the selection of preferred treatment technology depends on mostly cost and available space.

A.4 Centralization vs Decentralization

While the HKIE supports the Government's proposal for "centralized treatment", and the Option A, the Institution is of the view that Option B may be better because land is readily available for an above ground facility using various proven treatment technologies, and therefore we would be less dependent on the compact treatment technology, while the capital and recurrent costs are only marginally higher than those of Option A. In terms of resilience, Option B will provide more flexibility for sewage transfer and for future expansion. Also, it will reduce concentrated discharge of effluent, though the higher risk of this option on ecological resources around the south of Lamma and fisheries resources in southern waters should be duly considered.

The decision on the final choice will most likely be based on other than technical factors. It has been noted, however, that over the last few years many cities closed down decentralized, smaller STWs and built large, centralized STWs. Examples are Dublin, Hamburg, Helsinki, Singapore, Zurich, etc. Reasons given were usually economy of scale as well as better operational control.

The proposed underground facility for biological treatment near SCI is a welcome solution allowing multiple use of land. Likewise, proposed underground facilities in North Point or Sandy Bay demonstrate the willingness of Government to apply innovative approaches.

No doubt, decentralisation may substantially reduce the need for the expensive and difficult-to-construct deep tunnel sewage collection system, apart from other potential benefits, e.g. resilience and assimilative capacity of the receiving bodies. The EEFS has recommended a cavern in Sandy Bay and a cavern in Braemar Hill for Option C and Option D, respectively. While it is worthwhile exploring further the possibility of utilizing these sites for building regional STWs, the HKIE concurs that Option C and Option D are less favourable, both from the cost and land availability perspective.

A.5 Phased Approach

At present, 25% of untreated sewage from the population around Victoria Harbour is still discharged into the Harbour. This contributes about 60% of current TSS loading and 40% of the current BOD₅ loading to the Harbour, after implementing the HATS Stage 1. There is an urgent need to expedite the completion of the remaining part of the sewage collection system and provide at least interim treatment of CEPT before the final treatment method is implemented. This will represent another major step in removing the waste load discharging into the Harbour.

The HKIE supports that, for practical reasons, the project may be divided into two separate engineering phases in line with Stages 2A and 2B; however, Stage 2 should not be split into 2 independent projects, where the implementation of Stage 2B needs a separate decision based on yet to be defined new criteria. On the other hand, the Government should demonstrate its full commitment to the implementation of secondary treatment by setting a firm time table for the implementation of Stage 2A and Stage 2B. In sum, Stage 2A and Stage 2B should be treated as an integral plan, in the sense that the principles, arguments, and technologies behind Stage 2B will NOT

be debated all over again from scratch in the future. However, the Government should be fully aware of the variables in the project which will continue to be subject to changes, e.g. population, development, pollutant loadings from Pearl River Delta, water demand management, sewage generation, O&M costs, and technology advancement particularly in treatment technology.

Using a timeframe of 10 to 20 years for project implementation (Phases 2A and 2B), the annual capital expenditure amounts to 1 to 2 billion HKD, which should be acceptable for an essential environmental infrastructure project of such magnitude. It should be pointed out that, compared to other secondary STWs operated by the Government, the specific capital cost on a per person or cubic metre basis for HATS is lower. In addition, because of the unusually high BOD₅ removal during CEPT, the percentage of BOD₅ requiring secondary treatment in HATS is lower than in the other Hong Kong STWs and will result in savings of operating cost. Overall, several favorable circumstances in the HATS watershed contribute to low capital and operating cost of the wastewater collection and treatment system, namely low peak factor, few industrial effluents, short sewer length per capita, high efficiency of CEPT, economy of scale, and large well-mixed receiving water body. This should result in highly cost-effective treatment when compared to STWs in other parts of Hong Kong and other large cities in the world.

If implementation of Stage 2B is not recommended, which is possible according to the Consultation Document, Victoria Harbour would be worse off than under the previous Strategic Sewage Disposal Scheme (SSDS). Under that scheme, CEPT effluent was to be discharged into marine waters far to the South of Hong Kong, while under the present proposal CEPT effluent would be discharged right into Victoria Harbour. Undoubtedly, this would raise grave doubts about the sincerity of Government in improving Victoria Harbour.

A.6 Deep Tunneling

HATS Stage 2A comprises mainly the construction of an extensive deep (150m below ground level) tunnel system to transfer sewage from the northern and western parts of the Hong Kong Island to Stonecutter Island. Based on the experience from the HATS Stage I and many other local tunnelling projects, the major hazards associated with deep tunnelling are groundwater ingress and risk of ground settlement. It is anticipated that the risks are still high, but HKIE considers that the risk mitigation or precautionary measures recommended in EEPs are viable and acceptable.

While the proposed deep tunnel alignment of HATS Stage 2A is still open, it is worth exploring the possibility of shifting the tunnel alignment southward to reduce the influence of the tunnel construction in the reclaimed areas, and thus significantly lower the risks and cost. Advance intensive deep ground investigation and further hydrogeological studies, covering both alignments should be made to allow an early decision on the preferred tunnel alignment.

A.7 Procurement Strategy

HATS Stage 2 is a mega-scale project in terms of the works volume and the resources to be spent. A large number of construction contracts will be put on the market and it will create many construction related employment opportunities. The HKIE urges the authorities to consider carefully the abundantly available local construction expertise and resources in the implementation of the HATS Stage 2. As the construction industry in Hong Kong has been dwindling since the economic downturn in 1997/98 and is losing many experienced professional and workforce, who are vital and indispensable for sustaining the development of Hong Kong, the HATS Stage 2 works packages should be derived with this in mind so that it can maximize the use of and retain these local construction expertise and resources.