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**Panel on Environmental Affairs**

**Meeting on 18 November 2004**

**Background brief on the Harbour Area Treatment Scheme**

**Background**

Stage 1 of the Harbour Area Treatment Scheme (formerly known as the Strategic Sewage Disposal Scheme (SSDS)), comprising the Stonecutters Island Sewage Treatment Works (SCISTW) and 23.6 kilometres of deep tunnels, was fully commissioned in late 2001 to bring improvement to the harbour water quality.

Strategic Sewage Disposal Scheme

2. In 1989, the Environmental Protection Department completed the Sewage Strategy Study which recommended, among other things, the implementation of a four-staged SSDS comprising the collection of sewage from the main urban area using deep tunnels, provision of primary treatment at a centralized treatment plant and disposal of treated effluent into oceanic waters through a deep ocean outfall in the south of Hong Kong.

3. There were concerns about the environmental and technical problems associated with the construction of deep tunnels, long-term levels of treatment as well as locations of treatment plant and outfall under SSDS. Since its launch in 1994, SSDS Stage 1 was beset with problems. The unilateral suspension of tunneling works by the contractor in mid-1996 had resulted in the forfeiture of the two original contracts and the re-tendering of three new contracts. As a result, the completion date for SSDS Stage 1 originally scheduled for mid-1997 had been deferred to late 2001.

4. Having regard to the public concern on the delay in SSDS Stage 1 and the continued criticism of the preferred treatment level and of reliance on large treatment plants and discharge arrangements over the years, the Government had finally agreed to appoint a new International Review Panel (IRP) in April 2000 to re-examine subsequent stages of SSDS taking into account the experience gained from SSDS Stage 1. In its report, IRP recommended that Hong Kong should go for a higher

level of wastewater treatment with a short and low dilution outfall, and that Biological Aerated Filters (BAF) treatment should be provided to all SSDS flows. It also proposed four alternative treatment and discharge options<sup>1</sup> which differed in the degree of centralization and the proposed outfall locations. In determining the technical and economic viability of the four options put forward by IRP, the Government had announced in March 2001 that it would undertake trials and studies before drawing conclusion on these options.

5. To ascertain the viability of using BAF technology in Hong Kong, a delegation of the Panel conducted an overseas duty visit to Europe in April 2001 to understand overseas experience in sewage treatment. The delegation concurred in principle with IRP that Hong Kong should go for a higher level of treatment for sewage from an environmental point of view, and that BAF technology was viable for Hong Kong on account of its compactness, small land requirement, high-rate treatment characteristics and flexible operation. However, pilot tests were strongly recommended prior to dimensioning, design and construction of BAF plant in Hong Kong in view of the distinct nature of sewage in Hong Kong, including the high salinity content as a result of the use of seawater for flushing. Water quality analysis should also be conducted to assess the assimilation capacity of the receiving water bodies with a view to determining whether processes such as denitrification and disinfection were required. In view of the small land requirement of treatment plants using BAF, the delegation considered that decentralization was more preferable to allow flexibility for further expansion to treat possible increases in sewage.

6. SSDS was later renamed as the Harbour Area Treatment Scheme (HATS) in March 2001.

### **Programme for the trials and studies**

7. On 25 May 2001, the Finance Committee (FC) approved \$73.6 million for the Administration to conduct a number of trials and studies before a final configuration for the subsequent stages of HATS was selected. The purposes of the trials and studies were to –

- (a) test out BAF technology and, if necessary, other well-proven compact sewage treatment technologies;
- (b) assess the environmental and engineering feasibility of the four options which IRP had recommended for the future development of HATS; and
- (c) develop a contractual framework for option implementation.

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<sup>1</sup> Option A – All sewage treated at SCISTW  
Option B – Treatment at SCISTW and a new plant at Lamma Island  
Option C – Treatment at SCISTW and a new plant in a cavern at Sandy Bay  
Option D – Treatment at SCISTW and new plants in caverns at Sandy Bay and Braemar Hill, North Point

8. In parallel with the trials and studies, the Administration also undertook the following two additional studies using existing resources to evaluate the way forward for HATS -

- (a) HATS Stage 1 flow assessment study to assess performance of the Stage 1 system for future population and development projections under both dry and wet weather conditions; and
- (b) capacity reassessment study for SCISTW to determine the maximum capacity of the Stage 1 Sedimentation Tanks at SCISTW and the effect of increased flow on the pollution removal efficiency.

9. In June 2004, the Administration released the key reports, including the executive summary and the final report of the environmental and engineering studies (EEFS), the Independent Checker's report on the compact sewage treatment technology pilot trials (CSTTT), the interim report of study on procurement options (SPO), the report of Stage I flow assessment and the report of SCISTW capacity reassessment study. In gist, EEFS confirmed that all the four options were environmentally acceptable and technical feasible. In order to provide adequate protection to the harbour water in the long run, biological treatment would be required to remove additional organic pollutants and ammonia from the sewage before discharge. Disinfection would also be required to remove the *E.coli* bacteria in order to reopen the Tsuen Wan beaches. Among the four options, Option A (which involved centralized treatment at SCISTW) was the preferred option as it performed the best overall in terms of cost, environmental and engineering aspects. EEFS also concluded that even if the most compact treatment technology was used in the biological treatment, all the options would require extra land of at least 12 hectares outside the current boundary of SCISTW.

10. CSTTT demonstrated that the two BAF systems tested could perform well under local conditions and meet the prescribed standards. On the other hand, the non-BAF technology could not perform up to the prescribed standard. The trial also revealed that the satisfactory operation of the BAF system would depend heavily on the reliability of the on-line instrumentation and control system as well as the technical knowledge and experience of the operation on the respective designs of BAF technology.

11. SPO identified four main possible procurement options, namely Design-Bid-Build, Design-Build (DB), Design-Build-Operate (DBO) and Build-Operate-Transfer (BOT) for implementing future stages of HATS. It was recommended that a DB approach should be adopted for the sewage conveyance system as the deep underground tunnels would not require much operation and maintenance upon completion. For the construction and upgrading of the sewage treatment works, a DBO approach was recommended if the Government chose to fund the sewage treatment project direct. DBO would maximize the potential benefits of combined project delivery by the private sector on the one hand and minimize interface problems on the other. It also had greater certainty in completion time,

life-cycle cost and design success by utilizing innovative technology available in the wastewater treatment. However, a BOT could be a feasible option if the Government would depart from the traditional funding mechanism for sewerage infrastructure and consider making use of private sector financing.

12. The results of the Stage 1 Flow Assessment Study indicated that the existing deep tunnels could handle all the sewage generated by the projected ultimate population of 5.2 million in the HATS Stage 1 catchment. Meanwhile, the SCISTW Capacity Reassessment Study concluded that the maximum flow that could be handled by the sedimentation tanks would be in line with the maximum design flow.

### **Way forward for HATS Stage 2**

13. In parallel with the findings of the trials and studies, the Administration also released a Consultation Document to gauge public opinions on the preferred option for HATS Stage 2. Under the proposal, the existing sewage treatment works at Stonecutters Island will be expanded and upgraded to provide centralized chemical treatment for sewage from the whole HATS catchment. A new biological treatment plant will be built on a site adjacent to the existing treatment plant to allow for nutrient removal in the long term. The effluent will then be disinfected and discharged into the harbour through the Stonecutters Island outfall.

14. In view of the need to secure land for the biological treatment facilities, the substantial capital and recurrent costs (\$19.1 billion and \$1.2 billion each year respectively) involved and the complexity of building a compact biological treatment system of the scale required, the Administration proposes to implement HATS Stage 2 in two phases –

- (a) Stage 2A – deep tunnels will be constructed for transferring sewage from the remaining parts of Hong Kong Island to Stonecutters Island and the existing SCISTW will be upgraded to provide chemical treatment and disinfection for an ultimate flow of 2.8 million cubic metres per day, which doubles the existing flows being treated at SCISTW;
- (b) Stage 2B – additional biological treatment facilities will be provided to enhance the pollutant removal rate to cater for anticipated population build-up in the HATS catchment. These biological treatment facilities will be constructed underground on a site in the vicinity of SCISTW so that the surface land can be used for other purposes.

15. The Panel held two meetings in June and July 2004 to discuss the findings of the trials and studies relating to HATS Stage 2 and the way forward for HATS Stage 2. Deputations were also invited to express their views at the latter meeting. Questions on the treatment options, sludge management, timeframe for implementing HATS Stage 2B and costs were raised.

16. On treatment options, concern was raised that the problem of thickening of seabed as a result of deposition of coagulants arising from the use of ferric chloride in the chemical treatment at SCISTW would be further aggravated by chlorination in the disinfection process. To this end, the Administration was requested to explore the feasibility of using biofilters which had the effect of cleansing the water by increasing the levels of dissolved oxygen and reducing the level of *E.coli* and suspended solids as evidenced in a study carried by the Agriculture, Fisheries and Conservation Department in 1992 at the fish culture zone in Kau Sai Chau.

17. On sludge management, the Panel noted with concern that the Consultation Document had failed to provide information in this aspect. Given that sea water was used for flushing in Hong Kong, concern was raised about the pollution associated with dioxin generated as a result of incineration of a large amount of sludge with a high chloride content. According to the Administration, a feasibility study would be conducted on sludge management and incineration was one of the options to be actively considered. The public would be further consulted after a long-term strategy on sludge management had been worked out.

18. On costs, concern was raised on possible increase in sewage charge given the high capital and recurrent costs involved in HATS Stage 2. It was therefore necessary for the public to be apprised of the cost implications of the treatment options and the resultant increase in sewage charges which had not been set out in the Consultation Document. The Administration's explanation was that the Government should not be subsidizing polluters in accordance with the polluter-pays principle. Besides, as Stage 2 would take a long time to complete, an increase in sewage charges arising from the construction of Stage 2 would not be an imminent matter for the near future. Notwithstanding, a separate consultation exercise on sewage charges would be carried out in due course.

19. Noting that the original consultation period would expire not long after the commencement of the new legislative term, concern was raised that there would not be ample time for newly elected Members to get familiar with the issue. At the request of the Panel, the Administration agreed to extend the consultation period for HATS Stage 2 by one month from 20 October to 20 November 2004.