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Panel on Environmental Affairs

Meeting on 22 January 2007

Updated background brief on the Harbour Area Treatment Scheme (Position as at 16 January 2007)

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[1] 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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[1] 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.

20. To gauge public views on the way forward for HATS Stage 2, deputations were invited to express their views at the Panel meeting on 18 November 2004. The majority of views were in support of the phased implementation of HATS Stage 2, in particular HATS Stage 2A which was essential to collect and treat the remaining sewage from the northern and western Hong Kong. As a large proportion of pollution was from the Pearl River Delta Region, question was raised on the worthiness of HATS Stage 2B in the long run given the substantial investment involved. There were also concerns on the use of chlorination/dechlorination for disinfection and its impact on the marine ecology. The rise in sewage charge after implementation of HATS Stage 2 was another cause of concern.

Implementation programme for HATS Stage 2

21. Taking into account views collated from the five-month public consultation exercise, the Government announced in April 2005 the implementation programme for HATS Stage 2. In gist, the Government's decisions are –

(a) Through a phased programme, to centralize the treatment of all the harbour sewage at or Stonecutters Island;

(b) To aim to complete the first phase, Stage 2A, in 2013/14. This phase will entail the construction of a tunnel conveyance system to transfer the currently untreated sewage from the northern and western shores of Hong Kong Island to Stonecutters Island, expansion of the chemical treatment and other facilities at the existing SCISTW to cope with the sewage from Hong Kong Island and with projected future increases in sewage flows, and provision of disinfection facilities;

(c) To aim to provide advance disinfection facilities by 2008/09 (the disinfection facilities will be further upgraded as part of the Stage 2A works);

(d) For the second phase, Stage 2B, to construct a biological treatment facility at a site adjacent to SCISTW; and

(e) That construction of Stage 2, including the advance provision of disinfection, should be subject to acceptance by the community that the full recurrent costs of the scheme should be recovered through sewage charges. In the case of Stage 2B, an additional proviso is that the timing would also depend upon a review of trends in sewage flows and in water quality to be conducted in 2010/11.

22. The Panel held two meetings on 25 April and 5 July 2005 to discuss the implementation programme. Deputations were invited to attend the latter meeting to express their views. While supporting the implementation of HATS Stage 2 which would bring the needed improvements to the water quality of the Harbour, concerns were raised on the lack of commitment on the part of the Government to full blown secondary treatment with a clear timeframe and resource allocation. There might be a need to review the capacity of the treatment facilities of 2.8 million cubic metres per day to avoid over-provisioning, particularly when the population growth was expected to contain in the next few years. Query was also raised on the use of chlorination as disinfection agent as this might have a detrimental effect on the marine ecosystem. With the natural biological filtering effect made possible by improvements to the marine ecosystem under HATS Stage 1, coupled with the natural assimilation power of oceanic waters, the use of chlorination for disinfection might not be required. Besides, there were other non-intrusive methods, such as the use of ultraviolet light and ozone, which could be used for disinfection. Consideration could be given to extending the sewage outfall further to Ma Wan Channel for effective dispersion of effluent.

23. According to the Administration, there was a need for long-term planning to cater for future expansion and the ultimate design capacity would not be wasted in view of the anticipated population growth in the long run. On the choice of disinfectants, the Administration's explanation was that ultraviolet light and ozone were not recommended in view of the high cost. Besides, as the effluent had only gone through chemically enhanced primary treatment, the use of ultraviolet light alone might not be very effective for disinfection. The most cost-effective method was chlorination which had been commonly applied in overseas countries for years. The treated effluent would undergo a dechlorination process to neutralize the effects of chlorination before being discharged into the receiving waters. There was also difficulty in identifying potential outfall locations if the sewage outfall was further extended to Ma Wan Channel taking into account the need to avoid fairways, marine barrow areas and anchorage areas.

24. Some members were concerned about the possible increase in the Trade Effluent Surcharge (TES) and the sewage charges (SC) as a result of the increased treatment cost which would inevitably have impact on the trades, in particular the restaurant and textile manufacturing trades. According to the Administration, it was Government's policy to subsidize the capital cost of providing sewage treatment services and to recover the operating cost in accordance with the polluter-pays principle. Assuming that full cost recovery would have to be achieved at the time of commissioning HATS Stage 2 in 2013/14, the average household monthly SC bill would rise from the present $11 to about $26 over the next eight years. The adjustment of slightly over 10% per year would be mild as it would be spread over a period of time. An increase of less than two dollars a month per year for an average household was considered acceptable. Given that the recovery rate for TES was already higher, being 69% (as against 44% for SC) in 2003/04, the proportionate increase required to achieve 100% recovery would not be as large as for SC.

25. There was also concern over the need for the Administration to work out comprehensive water management policies to conserve and recycle water. Consideration might need to be given to setting up a Water Authority to take over the management of water resources, which was now spread over a number of departments, such as the Environmental Protection Department, Drainage Services Department and Water Supplies Department. This would ensure that water resources could be reused and recycled in a more effective manner.

Relevant papers

Information papers provided by the Administration for the EA Panel meetings on 28 June and 7 July 2004

Way Forward for the HATS Stage 2
http://www.legco.gov.hk/yr04-05/english/panels/ea/papers/ea1118cb1-2215-6-e.pdf

Findings of Trials and Studies Relating to the HATS Stage 2
http://www.legco.gov.hk/yr04-05/english/panels/ea/papers/ea1118cb1-2215-7-e.pdf

Consultation document for the HATS Stage 2
http://www.legco.gov.hk/yr03-04/chinese/panels/ea/papers/ea0628cb1-2215-8-ce.pdf

Minutes of the EA Panel meeting on 28 June 2004
http://www.legco.gov.hk/yr03-04/english/panels/ea/minutes/ea040628.pdf

Minutes of the EA Panel meeting on 7 July 2004
http://www.legco.gov.hk/yr03-04/english/panels/ea/minutes/ea040707.pdf

Information papers provided by the Administration for the EA Panel meeting on 18 November 2004
http://www.legco.gov.hk/yr04-05/english/panels/ea/papers/ea1118cb1-225-7-e.pdf

Supplementary technical notes and Consultation document for the HATS Stage 2
http://www.legco.gov.hk/yr04-05/chinese/panels/ea/papers/ea1118cb1-247-3-ce.pdf

Minutes of the EA Panel meeting on 18 November 2004
http://www.legco.gov.hk/yr04-05/english/panels/ea/minutes/ea041118.pdf

LegCo Brief provided by the Administration for the EA Panel meeting on 25 April 2005
http://www.legco.gov.hk/yr04-05/english/panels/ea/papers/ea0425cb1-legcobrief-e.pdf

Minutes of the EA Panel meeting on 25 April 2005
http://www.legco.gov.hk/yr04-05/english/panels/ea/minutes/ea050425.pdf

Information papers provided by the Administration for the EA Panel meeting on 5 July 2005
http://www.legco.gov.hk/yr04-05/english/panels/ea/papers/ea0705cb1-1851-9-e.pdf

Minutes of the EA Panel meeting on 5 July 2005
http://www.legco.gov.hk/yr04-05/english/panels/ea/minutes/ea050705.pdf

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