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**ACE Paper 15/2008**
***For advice***

# Report on the 102nd Environmental Impact Assessment Subcommittee Meeting

## INTRODUCTION

On 17 March 2008, the Environmental Impact Assessment (EIA) Subcommittee considered the EIA report on "South East New Territories (SENT) Landfill Extension" (ACE-EIA Paper 2/2008 refers).

## ADVICE SOUGHT

2. Members are requested to advise whether the EIA report should be endorsed.

## VIEWS OF THE SUBCOMMITTEE

### Need for the Project

3. The three strategic landfills in Hong Kong, i.e. the West New Territories (WENT) Landfill, the North East New Territories (NENT) Landfill and the South East New Territories (SENT) Landfill, are expected to be filled up within the next decade. In December 2005, the Government published the waste management policy document "A Policy Framework for the Management of Municipal Solid Waste (2005-2014)" (the Policy Framework). This document sets out a comprehensive strategy for the management of municipal solid waste in Hong Kong, with clear targets and a ten-year (2005-2014) timetable for action. The strategy adopts the three-tiered waste management hierarchy with avoidance and minimization as top priorities, followed by reuse, recovery and recycling, and with bulk waste reduction

and landfill disposal at the bottom of hierarchy. It is projected that, even with effective reduction and recycling measures as well as modern waste incineration achieving bulk waste reduction as stated in the Policy Framework, extensions to the existing landfills would be required in the early 2010s to mid-2010s.

**Description of the project**

4. The project comprises the development, management, operation, restoration and aftercare of the SENT Landfill Extension. The proposed extension option covers an area of about 50 ha with a filling capacity of about 17 million $m^3$ on the southern side of the existing SENT Landfill, including a temporary encroachment of about 5.1 ha into the Clear Water Bay Country Park (CWBCP). The location of the proposed SENT Landfill Extension site is indicated in **Annex A**. The project covers the following works –

a) site formation and preparation;
b) installation of liner system;
c) installation of leachate collection, treatment and disposal facilities;
d) installation of gas collection and management facilities;
e) utilities provisions and drainage diversion;
f) operation of the landfill;
g) restoration and aftercare;
h) measures to mitigate environmental impacts as well as environmental monitoring and auditing to be implemented; and
i) relocation of existing landfill infrastructures including the leachate treatment plant, landfill gas management plant, power generator, workshops and merging the existing landfill and its extension.

5. The project is classified as a designated project under Item G.1, Schedule 2 of the EIA Ordinance (EIAO), i.e. *"A landfill for waste as defined in the Waste Disposal Ordinance (Cap. 354)"*.

6. The EIA study has considered alternative extension options for developing the preferred option. Priority was given to consider options without the encroachment of CWBCP. However, the EIA found that these options could only provide limited void capacity which would not be able to accommodate the waste generated in the forecast period, even with effective waste reduction and recycling measures as stated in the Policy Framework. Engineering measures have also been

considered to maximize the void space offered by these non-encroachment options. However, the required massive retaining wall/earth bund (in the order of 40 m) would be visually intrusive and technically very challenging. Even so, it would still not increase the void space sufficiently to meet the demand.

7. Hence, the option with a temporary encroachment of about 5.1 ha into the CWBCP (**Annex B**) was proposed which would provide the required void capacity to meet the landfill space demand for two more years to tie in with the succession plan of developing the replacement and infrastructure facilities while minimizing disturbance to natural habitats. The encroached area would be filled to the final formation level and formed part of the restored landfill. The whole restored area would be landscaped and vegetated, and the encroached area after restoration would be returned for country park use.

**Members' views**

8. Members noted that the public inspection period of the EIA report was from 26 February to 26 March 2008. Up to the date of the meeting, the Environmental Protection Department (EPD) received six sets of public comments (two sets were identical in content) which were circulated to Members for reference before the meeting.

9. Members agreed that the discussion should focus on the odour impacts, ecological impacts, traffic impact assessment and efficient use of the Landfill Extension site.

*Odour impacts*

10. On some Members' concern about the odour problem from the existing SENT Landfill as indicated by complaints from the residents in Tseung Kwan O (TKO), the project proponent team explained that they were aware of the concerns of the residents about the odour problem, mainly from residents in the TKO South area. EPD conducted an independent survey on odour intensity during the summer period in 2007. The survey covered 336 observed hours in a two-week period of round-the-clock physical detection of odour intensity by stationing spotters at three residential developments in TKO South area. The result indicated that odour was detected in only 0.2% of the observed hours (about an average of 45 minutes out of

the 336 hours) and the intensity level of the detected odour was relatively low (1 or 2 in the ranking of 1 as the lowest level detectable and 4 as the highest level). The detected odour included that of garbage, sludge, sewage and others. During the survey period, about 80% of the wind direction was from the SENT Landfill. From the experience in handling odour complaints, detection of odour emission depended very much on the prevailing wind direction with time-specific dispersion and thus the origin was very difficult to detect. For the Landfill Extension, there would be additional measures to avoid and further minimize the odour emissions and the Extension site would be even further away from the residential development. Based on the odour impact assessment conducted under the EIA, which was based on mathematical modelling and on-site measurements, there was no exceedance of odour criterion for air sensitive receivers (ASRs) at TKO Town area (including the TKO South area).

11. The project proponent team explained that the Landfill sites in Hong Kong were operating at high international standards in terms of odour control measures. Nonetheless, having regard to the daily handling load of more than 5,000 tonnes of waste in the SENT Landfill, it was inevitable that odour was detected at the active tipping face. The landfill could be one of the odour sources and slight odour might occasionally be detected by the nearby residents located at the downwind side under certain weather conditions. To avoid and minimize any possible impacts, proactive actions were being taken to enhance control over potential sources of odour emission, such as sludge, uncovered areas or passing vehicles.

12. As regards the EIA study, the project proponent team explained that Table 4.7e of the EIA report showed the predicted highest 5-second odour concentration levels at 43 identified representative ASR locations during operation/restoration phase. As shown in the table, only very few ASRs showed exeedance of the 5-second odour criterion (i.e. 5 Odour Unit (OU)). The predicted highest 5-second odour concentration at LOHAS Park, the nearest residential development from the project site, was as low as 0.5 OU. Moreover, the charts in Figures 4.9b-1 and 4.9b-2 showed that the zones of possible impacts due to landfill odour emission would be limited to the area in close proximity to the Extension site boundary.

13. On the possible impacts of seasonal wind direction on the odour concentration, the project proponent team explained that the modelling of EIA had fully taken into account seasonal changes of wind directions with data throughout the year, including changes in wind direction, wind speed, stability class and temperature.

As a mitigation measure to minimize impacts on locations at the downwind side, the waste tipping activities would be rephased, i.e. avoiding waste tipping activities at the northern area of the site in the period between July and November.

14. On the impacts of the odour problem on users of the CWBCP, the project proponent team explained that the Extension site would be further away from the hiking trail of CWBCP and separated from the trail by a mountain ridge, it was unlikely that there would be adverse odour impact on the users. As the Extension might be perceived by users at some parts of the hiking trail, mitigation measures such as tree planting would be taken to screen off the visual impact. This would further minimize potential odour transmission to the country park.

15. On the predicted exceedances of odour concentration at the TVB City, the project proponent team explained that there had been close liaison with the ASRs, including the TVB City. For example, the Landfill operations would be rephased and rescheduled to tie in with important outdoor events at the TVB City. Moreover, under a set of conservative assumptions, the predicted maximum number of potential exceedances from the Extension after the implementation of the recommended mitigation measures was as low as 0.13% (11 events) per annum. The number of potential exceedances was expected to diminish to zero over the 6 years of operation as the separation distances and height differences between the active tipping face and ASRs increased. Regarding possible impacts to TKO Area 137 which was planned for industrial use, under the Hong Kong Planning Standards and Guidelines, a 200 m buffer zone from the landfill boundary was recommended. Based on the result of modelling at a number of locations within TKO Area 137, the highest number of predicted exceedances at the boundary of the buffer zone was two incidences per annum.

16. Members noted that a set of odour management and control measures had been incorporated into the outline design which would be implemented during the operation/restoration phase of the Extension to minimize the potential odour impacts on identified ASRs and there were also some new measures to be implemented. On the details, the project proponent team explained that it was already a site practice that the municipal solid waste (MSW) disposed of at the active tipping face would be covered promptly with construction waste by the use of dozers. On major new control measures, the size of the active tipping face would be minimized as far as possible and would not be greater than the recommended size of 30 m x 40 m. No sewage sludge would be disposed of at the Extension. Deodorizers would be stationed at the waste reception areas and the active tipping face. A comprehensive

landfill gas control system of extraction wells would be installed to control odour and surface emission of landfill gas from the non-active tipping face. The thickness of the daily cover soil for active tipping face would be increased from 150 mm to 300 mm. For interim soil cover, the soil thickness would be increased from 300 mm to 600 mm. There would be day-to-day monitoring of the non-active tipping area which would be covered by impermeable liners. The special waste trench would be covered with a movable cover and the vented air would be scrubbed prior to discharge to the atmosphere. All these control measures would be implemented through contract requirements and contract management.

17. On whether the increased thickness of the cover would reduce the holding capacity of the landfill, the project proponent team explained that the cover was put in the form of additional layering on the waste. With the use of mechanical plants, the daily or interim cover would be pushed away to expose the surface of the waste before stacking up the waste on top. Thus, the use of thicker covers would not reduce the landfilling capacity while it would increase the costs of operation.

18. On the possibility of implementing the proposed new measures at the existing Landfill site to alleviate the current odour concern, the project proponent team explained that control measures which could be advanced and adopted in the existing Landfill were already implemented or being implemented. For example, the provision of impermeable liners covering the non-active tipping area, provision of a movable cover to cover the special waste trench and installation of additional vertical landfill gas extraction wells in the existing Landfill would be completed shortly with rephasing and scheduling of works. However, some new control measures had to be implemented after the relocation of the existing infrastructure facilities, such as covering of the leachate storage and treatment tanks and enclosing the weighbridge area.

19. On the relationship between air temperature and strength of odour emissions as well as the appropriateness of using 30ºC in the modelling, the project proponent team explained that the findings of the sensitivity tests at SENT Landfill concluded that it was difficult to determine an empirical relationship between temperature and strength of odour emissions. Meteorological factors, such as wind speed and wind direction, were found to be the key factors affecting the predicted odour impacts at the ASRs. Details of the analysis of the reasonable worst-case odour scenario were shown in Annex A3 of the EIA report. Table A3.5 of Annex A3 of the EIA report showed that even doubling the odour emission rate for the special waste trench, the predicted odour concentrations at the identified ASRs would not be

appreciably changed. Figure A3.2 of Annex A3 of the EIA report showed the predicted odour impacts at 1.5 m above ground using 30ºC and an emission rate of the special waste trench doubled that for 30ºC. The analysis showed that the odour dispersion characteristics rather than the odour emission rate were more important determining factors. Thus, one of the recommended mitigation measures was moving the active tipping face away from the ASRs as they were usually located at the downwind side during summer months. Moreover, the odour emission rate of the special waste trench adopted in the sensitivity test was very conservative because measurements to establish the odour emission rate were carried out at the existing SENT Landfill which received sewage sludge. As the Extension would not accept sewage sludge, it was anticipated that the odour emission rate would be much lower than the predicted levels.

20. Members noted that one of the mitigation measures would be to cover the leachate storage and treatment tanks, except for the sequential batch reactors (SBR) tanks. The project proponent team explained that a survey had been conducted to find out potential sources of odour emission within and outside the Landfill area. The findings concluded that neither the SBR tanks nor the leachate storage and treatment tanks were found to be significant odour emission sources. Nonetheless, the leachate storage and treatment tanks would still be covered in the Extension to minimize any potential impact. After the ammonia stripping process, most of the ammonia would be driven off and destroyed by the thermal oxidiser and thus the SBR tanks were not found to be the major odour emission source. To avoid overheating of the leachate in the SBR during summer months (which might kill the micro-organisms for the biological treatment process), it was necessary to keep the SBR tanks open during operation.

21. On whether the proposed banning of disposal of sewage sludge at the Extension would be dependent on the development of sludge treatment facilities, the project proponent team explained that sewage sludge was currently disposed of at the three Landfills and a sludge treatment facility using incineration technology would be built by 2012 as a long-term measure for disposal of sewage sludge. On the contingency plan that in case the sludge treatment facility could not be completed timely, the disposal would be diverted to the other two Landfills as an interim measure. Other measures such as pre-treatment processes would also be explored with relevant parties.

22. On the destruction efficiency of the landfill gas flares at the Landfill, the project proponent team advised that the landfill operator had regularly monitored

the performance of the flares and it showed that the specification requirements were met. In the long run, the plan was to utilize all the landfill gas generated and the flare gas system would only be used in case of emergency.

*Ecological impacts*

23. On some Members' concern about the encroachment of the project into the CWBCP, the project proponent team explained that priority was given to consider options without encroachment of CWBCP. However, the EIA found that these options could only provide limited void capacity. The Extension would cover an area of 50 ha and the recommended option would have an encroachment of about 5.1 ha into the CWBCP. The encroachment option would provide the required void capacity to meet the landfill space demand for two more years to tie in with the succession plan of developing the replacement and infrastructure facilities, including the Construction Waste Handling Facility and the South-East Kowloon Material Recovery and Transfer Station. The SENT Landfill was crucial on a regional basis, in particular for disposal of construction waste by private waste collectors. In 2007, more than 70% of the non-inert construction waste generated in Hong Kong was disposed of at the SENT Landfill. Domestic waste was mainly disposed of at the WENT and NENT Landfills. If there was insufficient void space in the SENT Landfill Extension, the waste originally disposed of at SENT Landfill would have to be diverted to the other two Landfills, resulting in increased traffic flows and associated environmental problems such as emission of air pollutants from vehicles and odour.

24. On the engineering difficulties for building a retaining wall around the waste mound to avoid encroachment into the CWBCP, the project proponent team explained that the retaining wall would need to be in the order of 40 m which would be technically very challenging. The standalone feature would be difficult to integrate with the surrounding landscape and visually intrusive. Even so, the void space provided would still be less than the encroachment option and hence could not meet the requirement. Moreover, further utilization of the restored area for public enjoyment would be jeopardized by the retaining wall.

25. Members noted that about 18 ha of area in the CWBCP was affected by the development of SENT Landfill in 1991 and the encroached area had not yet been restored and returned for country park use. The project proponent team explained that the north-east corner of the existing SENT Landfill had encroached into the CWBCP. It was estimated that the site concerned would be filled up in around 2012/2013 and it would take about one to two years for restoration before returning

for country park use. Additional nursery plantation had been planted in order to improve the existing CWBCP area during the operation of SENT Landfill. For the proposed Extension, it would take about six years for operation and another one to two years for restoration before returning for country park use.

26. AFCD advised that mitigation measures on the development of SENT Landfill in 1991 included the diversion of the High Junk Peak Country Trail away from the SENT Landfill site and planting of trees between the boundary of encroachment and High Junk Peak Country Trail to reduce the visual impacts. The restoration plan focused on landscape planting in returning the Landfill site to as natural a form as possible.

27. On the proposed restoration and ecological enhancement plan for the encroached area affected by the Extension, the project proponent team explained that the current proposal was a piggyback option with about 60% of the of the Extension site overlapping with the existing Landfill site. The encroached area of 5.1 ha comprised mainly shrubland and grassland habitats of low to moderate ecological value. The restoration and ecological enhancement plan focused mainly on enhancing the ecological value of the restored Extension site by providing 6 ha of mixed woodland planting on the affected areas and a mosaic of grassland and shrubland (including food plants for butterflies) in the remaining areas of the Extension site to support various wildlife. As for the restoration plan recommended for the existing SENT Landfill, it mainly focused on landscaping by providing plantation with the intention of landscape restoration to return it as natural a form as possible. Thus, the overall ecological value of the current proposed restoration and ecological enhancement plan for the extended Landfill would be better than the restoration plan recommended under for the existing SENT Landfill.

28. On the improvement of the ecological value of the affected area after restoration, the project proponent team explained that the affected area of 5.1 ha comprised about 4.6 ha of shrubland and some small areas of grassland and developed area. The area was previously marine rocky shore coastal areas without rich vegetation. In order to upgrade the ecological value of this part of the CWBCP, it was planned to introduce more mixed woodland habitats species particularly native species to modify the current habitats of shrubland and grassland. A trial nursery for native plant species was recommended to be set up in advance during the construction phase in order to fine tune the planting matrix and management intensity of the recommended indigenous tree species. The goal was to enhance the ecological value by changing the habitats from the existing simple shrubland to a more complex one

for birds and butterflies as well as other wildlife.

29. On the issue of temporarily using a country park site as a landfill site, AFCD advised that the Country Parks Ordinance did not stipulate whether country parks could be used for other purposes such as landfill sites. The issue had been carefully considered by the Country and Marine Parks Board which was empowered to give advice on the management of country parks under the Country Parks Ordinance.

30. Regarding recent major EIA projects involving encroachment into country parks, AFCD advised that the project of improvement to Tung Chung Road had affected about 5.9 ha of land in the proposed Lantau North (Extension) Country Park, Lantau North Country Park and Lantau South County Park. For the Tung Chung Cable Car Project, about 0.9 ha of land in the proposed Lantau North (Extension) Country Park and Lantau North Country Park was affected. The areas disturbed would be reinstated by tree planting.

31. On provisions under the EIAO and Technical Memorandum on the EIA process (TM) which were related to country parks, EPD advised that under Item Q of Schedule 2 of the EIAO, it was stipulated that all projects partly or wholly in an existing or gazetted proposed country park would require an Environmental Permit before commencement of works. The considerations of environmental impacts would include ecological as well as other aspects of impacts. Under Annex 16 of the TM on assessment of ecological impacts, the general policy of mitigating impacts on important habitats and wildlife included, in the order of priority, avoidance of all potential impacts to the maximum extent practicable, minimizing unavoidable impacts by taking appropriate and practicable measures, and compensation for the loss of important species and habitats by providing elsewhere (on-site or off-site). From the perspective of EIA, mitigation or compensation measures would depend on the ecological importance of the site.

32. AFCD advised that the proposed restoration and ecological enhancement plan for the encroached area for the Extension project which focused on the provision of mixed woodland habitats would be a favourable means of mitigation in terms of terrestrial environment for providing diversified habitats.

33. Some Members considered that there was no meaning to request off-site compensation for the affected country park areas for the project. It was more meaningful to provide a coherent restoration and ecological enhancement plan for the

site with a view to upgrading the ecological value of the site.

*Traffic impact assessment*

34. Members noted some concerns about the possible traffic problems caused by increased traffic flow brought about by the Extension project. The project proponent team advised that the number of vehicles going to the extended Landfill site would be similar to the current traffic flow to the existing Landfill site. Thus, no adverse traffic impact was anticipated.

*Efficient use of the Landfill Extension site*

35. On possible ways to reduce MSW and construction waste to be disposed of at landfill sites in order to reduce the space requirement for landfills, the project proponent team explained that the proposed Extension would commence operation in around 2012/2013. After completion of the proposed Integrated Waste Management Facilities in around 2014/2015, the amount of MSW requiring disposal at landfills would be much reduced. The space required for disposal of unavoidable waste such as incinerator ashes would be significantly reduced. For construction waste, close liaison with the construction trades and relevant stakeholders was maintained to ensure that good waste management plans and practices were in place. It was hoped that less construction waste would be generated throughout the design, planning and construction stages, and the lifespan of buildings could be lengthened. The project proponent team noted some Members' suggestion of further increasing the charges for disposal of construction waste which had proved to be effective in reducing the amount of construction waste disposed of at the landfills.

36. On the need for a large area occupied by the leachate storage tanks with a storage capacity of 22,000 $m^3$, the project proponent team explained that large storage capacity was required as a buffer to store heavy leachate flow generated during heavy rainfall periods to avoid possible pollution problems. Moreover, it was necessary to relocate the existing infrastructure facilities of the existing Landfill to the Extension site before operation of the extended Landfill. Thus, the leechate storage requirements would have to take account of the potential leechate flow generated during the last year operation of the existing SENT Landfill. Since the Extension site was too small to accommodate a leachate lagoon to store the leachate temporarily, it would have to depend on the storage tanks. Once the existing Landfill was restored, the average flow would be reduced to about 350 $m^3$. Some of the storage tanks could be decommissioned to release space for other uses.

37. The project proponent team noted some Members' suggestion of using compost, the output of biological treatment plant to be developed, as part of the top soil for the capping system of the restored landfill.

## ADDITIONAL INFORMATION FROM PROJECT PROPONENT

38. The Subcommittee considered that the project proponent should be required to provide the following supplementary information –

(a) confirmation that the resultant odour level during operation/restoration of the SENT Landfill extension would not be worse than the current odour level associated with the existing SENT Landfill site with mitigating measures in place; and

(b) information on the restoration plan committed under the EIA on the existing SENT Landfill project in 1991 and confirmation that the current proposed restoration and ecological enhancement plan in the EIA report on SENT Landfill extension would be better than the plan committed, if any.

39. The supplementary information provided by the project proponent (at **Annex C**) was circulated to the Subcommittee Members after the meeting.

## RECOMMENDATION OF THE SUBCOMMITTEE

40. Having regard to the findings and recommendations of the EIA report and information provided by the project proponent, Members agreed to recommend to the full Council that the EIA report could be endorsed with the following proposed conditions –

a) a community liaison group comprising representatives of potential sensitive receivers should be set up to deal with and manage the potential odour problem;

b) no sewage sludge would be disposed of at the SENT Landfill Extension; and

c) a coherent restoration and ecological enhancement plan for the SENT

Landfill Extension site should be submitted to the AFCD for vetting and endorsement.

The Subcommittee also suggested that a coherent restoration and ecological enhancement plan for the existing SENT Landfill site, which had a temporary encroachment into the CWBCP, be submitted to the AFCD for consideration in conjunction with the restoration and ecological enhancement plan for the Extension site.

41. The Subcommittee agreed that the general issue of encroachment into the country parks, outside the context of the EIA framework, be drawn to the attention of the full Council.

**EIA Subcommittee Secretariat**
**March 2008**