

4. SEA METHODOLOGY

4.1 Outline of the SEA Methodology

4.1.1 The Study Brief states that the consultants should

“carry out strategic environmental assessment for:

- the potential extensions;*
- those sites short-listed for the development of waste disposal facilities.”*

4.1.2 The Consultants’ interpretation of the requirement for SEA is that environmental screening should be used in the decision-making process from the outset of the Study. For this project, this began by identifying the “Areas of Absolute Exclusion” (see *New Sites Studies: Site Selection Exercise (Revised)* – Scott Wilson, September 2000) where landfills would not be permitted. The major areas identified for exclusion included:

- Existing and proposed areas of residential, commercial and industrial use.
- Existing and proposed areas for port and airport use.
- Existing and proposed areas for Government, Institution or Community use.
- Existing and proposed village areas.
- Existing and proposed Country Parks, Marine Parks and Marine Reserves.
- Sites of Special Scientific Interest.
- Ramsar sites.
- Water gathering grounds.
- Major infrastructure areas.
- Fairways and shipping lanes.

4.1.3 Following the elimination of “Areas of Absolute Exclusion”, a long-list of potentially available sites in the SAR of the required size was identified for possible development as landfill sites. The long-listed sites were screened at a broad brush level taking account of a number of criteria (see *Working Paper WP 3.1 (Revised)* – *New Sites Studies : Site Search Short-list* – Scott Wilson, January 2001 and *Short Note – Landfill Extensions Studies : Long-list of Sites* – Scott Wilson, October 2000):

- Planning, lands and social factors.
- Environmental factors (including detailed water quality monitoring, ecological, cultural heritage and landscape & visual impacts).
- Engineering factors (including ground conditions and ease of construction).
- Traffic and access.

4.1.4 The long-listed sites were evaluated against these criteria and a number of extension sites and potential new landfill sites were short-listed.

4.1.5 Following this, further environmental screening is to be applied at a more detailed level to all the sites selected, to ascertain the likely environmental affects – this is documented within this SEA Report.

4.1.6 In effect, progressively finer environmental screening and assessments are used – from the development of a long list of sites, to the drawing up of a short list, to assessing potential impacts of a preferred option. This process is in line with the purposes and meaning of SEA outlined in Section 2 of this SEA Report.

4.1.7 In order to efficiently and effectively carry out the seven requirements of the SEA set out in the Study Brief (outlined in Section 1), an assessment framework for the SEA was agreed with Government. The intention is that the SEA would act as a key decision-making tool in determining the options available for the provision of future waste disposal facilities.

- 4.1.8 The objective of the assessments is to provide a comparative assessment and qualitative evaluation of key environmental issues, which leaves a fully auditable trail so that the decision-making process is fully transparent. In summary, the overall methodology is set out below:
- Agree the SEA evaluation framework.
 - Establish the necessary baseline environmental conditions surrounding the landfills and across the SAR (to identify new sites).
 - Present baseline data, relevant environmental standards and legislation and sensitive receivers.
 - Carry out preliminary environmental (and other) screening in order to short list sites.
 - Apply Framework to screened short-list.
 - Assess new sites / extensions in terms of their environmental performance.
 - Select preferred new site / extension options.
- 4.1.9 It is stressed that the impact assessment has not been carried out to the same level of detail as required by the EIAO, although the evaluation has considered the need to be able to identify whether the landfill new site or extension option is environmentally feasible. The SEA takes into consideration the potential short-term, long-term, residual, cumulative and trans-boundary environmental implications of each landfill new site or extension option.
- 4.1.10 Delft 3D water quality modelling has been carried out to allow a better understanding of the water quality impacts of the proposed landfill site. Simulations were carried out for 15-day spring-neap tidal cycles during the dry and wet seasons. Baseline conditions, and scenarios with the proposed island during both construction phase and operational phase were simulated. The construction phase was further sub-divided into 3 phases to reflect the change in hydrodynamic conditions due to the presence of island and the dredging/dumping rate at different stages. The water quality impact assessments in this SEA were based on the detailed modelling results presented in the Water Quality and Hydrodynamic Assessment Report¹.
- 4.1.11 Strategic environmental conclusions are drawn based on the outcome of the impact evaluations and includes local environmental issues as well as regional issues such as air quality and aquatic environment characteristics and global issues such as greenhouse gas emissions.
- 4.1.12 Where required, specific environmental mitigation measures are identified through which environmental impacts can be controlled to within acceptable levels. This assessment aims to build on the mitigation measures already in place at the strategic landfill sites such as existing landfill and leachate control/treatment systems.
- 4.1.13 In addition, recommendations for a Strategic Environmental Monitoring and Audit (SEM&A) programme are made. The SEM&A is intended to identify major follow-up actions for the subsequent planning, design and operation phases, to identify the parties required to facilitate these actions, and to enable to facilitate auditing of the assumptions made in this SEA. Section 22 provides further discussion of SEM&A.
- 4.1.14 Based upon the strategic environmental assessments highlighted above, specific conclusions are drawn regarding the environmental acceptability of the new sites / extension options – these conclusions facilitate the further assessment in future PPFS, Feasibility Studies and site-specific EIAs.

¹ EML(2002).Water Quality and Hydrodynamic Assessment Report.

4.2 Applying the Environmental Evaluation Framework

4.2.1 Having identified potential new sites and extensions, further environmental screening was carried out of these long-listed sites based on a set of strategic evaluation criteria, documented in the *SEA Methodology Working Paper*. The evaluation criteria set out below follow the basic principles and guidelines of the EIAO and its associated Technical Memorandum, without going into quantitative assessment processes. The purpose of this approach is to facilitate further consideration of the short listed options under the EIAO process as part of further studies emanating from this current Assignment.

4.2.2 The development of the proposed evaluation framework for the SEA has taken into account all existing environmental (and related) legislation. Of particular note, the EIAO (Cap 499, S.16) and its associated Technical Memorandum on the Environmental Impact Assessment Process, and Hong Kong Planning Standards.

4.2.3 The environmental sub-criteria which will be assessed, in terms of this SEA, are:

- Air Quality.
- Noise.
- Water Quality (including freshwater, marine waters & groundwater).
- Waste Management.
- Ecology.
- Fisheries.
- Cultural Heritage.
- Landscape and Visual.
- Landfill Gas Issues.

4.2.4 All sub-criteria are given equal weighting within the environmental evaluation framework, which is common practice in SEA. Instead, focus is giving to identifying the major issues for each of the proposed sites, likely mitigation measures required, and likelihood or difficulty to address the impacts satisfactorily. This would facilitate an informed decision at the early stage.

4.2.5 Within each of the sub-criteria, various influencing factors determine the overall impacts related to that issue. For example, if noise impacts are considered, key influencing factors would be the distance between the landfill and the sensitive receiver, the number of sensitive receivers affected, the topography, etc. For each “influencing factor” a symbol has been applied as follows within the evaluation:

“+ +”	Positive – High
“+”	Positive
“O”	Neutral
“O / -”	Neutral / Negative – Low
“-”	Negative – Low
“- / - -”	Negative – Low / High
“- -”	Negative – High

4.2.6 The evaluation for each site is accompanied by a commentary outlining a description of the scheme and the key environmental issues associated with development at that site. As construction and operation of major strategic landfills happens concurrently, the impacts of construction and / or operation are combined (i.e. assessed together). Thus impacts are assessed for the “construction / operation phase”.

4.2.7 The evaluation of impacts for each sub-criterion has been based on a combination of qualitative judgement and quantitative assessment. Whilst the assessment process presented in Part B uses the score technique for clarity, the final evaluation is based upon professional judgement and it is not the intention that the scores for each site are compared numerically.

4.3 Assumptions

General

Environmental Controls

4.3.1 In addition to the best practice approach to environmental design of landfills described in Section 3.8 it is assumed that standard environmental controls are put in place contractually during construction and operation to minimise noise, dust emissions, polluted runoff, etc. in accordance with the NCO, APCO, WPCO and other relevant legislation. Hence the assessment assumes standard mitigation measures and good site practice are in place for any new site or extension. Such generic measures are outlined in Section 5.

Plant and Operating Methods

4.3.2 Any new site or extension would have approximately the same number and type of plant operating on it. As it is also assumed that all operating procedures would be more or less the same, noise and dust emissions from the site would be more or less equal.

LFG and GHG

4.3.3 Irrespective of location, landfill gas collection and management systems and leachate collection and treatment systems would operate to the same environmental performance criteria, in terms of efficiency and effluent quality, and would therefore have similar impacts on the environment.

4.3.4 For any landfill new site or extension, it is assumed that the same types of waste are received and daily waste inputs (whether by road, rail or marine) would be more or less equal.

4.3.5 It is further assumed that LFG emissions from a new and / or extended landfill would be essentially similar per unit mass of waste delivered and that the LFG would be controlled by similarly efficient gas management systems. This being the case, it is assumed that GHGs would be essentially similar for any landfill development, irrespective of its location, and thus will not be addressed specifically for each site. The underlying assumptions for GHGs are:

- The waste being transported to the individual sites, under any scenario considered for this study, would be landfilled. This study does not compare landfilling against any other waste disposal technologies.
- Waste would be delivered to the landfill site in purpose built containers via truck or waste transport ship, and on site, purpose-built vehicles would handle these containers.
- The landfill gas collected from the landfill would be utilised to generate heat for the leachate treatment process, as well as for electricity generation for on-site uses.
- Any landfill gas not utilised for heat or electricity generation would be destroyed within the landfill gas flaring system.

4.3.6 GHG emissions associated with different transportation modes and routes will, however, be qualitatively considered. Where there is the potential for off-site use of this would also be considered on a site-by-site basis.

Land Contamination

- 4.3.7 Land contamination is not considered a major issue within this assessment as any minor amounts of contamination that may be encountered on the chosen site / sites can be disposed of, or used within the landfill. As this would not be an important, decision-making issue, it is not addressed further within this SEA. Detailed assessment of contamination issues at preferred sites may be made during future more detailed studies. Marine sediment contamination is however an issue that is considered under the water quality section.

Landfill Aftercare and Afteruse

- 4.3.8 It is assumed that any new or extended landfill would have a comprehensive aftercare system put in place contractually that would last for 20-30 years. This being the case, aftercare impacts are assumed to be managed and are thus not a major consideration within this SEA. In addition, potential aftercare impacts would be subject to separate environmental assessment at an appropriate time when the landfill(s) cease to receive waste, and when the afteruse (if any) of the landfill is known.

Balance of Materials

- 4.3.9 Impacts associated with the balance of construction and demolition (C&D) materials (particularly public fill) are likely to vary depending on the nature of the site developed, (i.e., land based or marine based) as well as external factors affecting the supply and demand of public fill across Hong Kong and therefore the opportunities for use of public fill arising from other projects.
- 4.3.10 New sites and extensions can be divided in to those that are land based or marine based. Marine sites are characterised by their need for some form of reclamation and can include:
- Extension sites formed as coastal reclamation (e.g. adjacent to existing shoreline).
 - Extension sites involving a land based filling.
 - New sites formed by land based filling.
 - New sites formed by the reclamation of an artificial island.
- 4.3.11 For both land and marine sites, public fill is a valuable resource for landfill development as it is necessary for engineering fill and daily cover during landfilling operations.
- 4.3.12 In general terms, as a result of excavation to form void space, land based sites result in the generation of public fill that can match the on-site demand for landfill development given sufficient area within the footprint for temporary stockpiling. For marine sites, reclamation to form the site on which the landfill is subsequently developed would require the importation of filling material (assumed to be inert C&D material supplied through the SAR's network of public filling areas/public fill barging points)
- 4.3.13 The EPD "*Study on the Waste Management Plan : Collection and Forecast of Waste Data*", Agreement FP 99-055 DFR July 2000, (C&FWD Study) has identified that the amount of public fill generated in the SAR would continue to increase. Therefore, for the purposes of this SEA it is assumed that:
- A land based site would meet its own requirements for fill materials with no net surplus or deficit.
 - A marine based landfill (i.e. an artificial island) would provide a "sink" for the projected surplus of public fill material arising across Hong Kong. This would reduce the need to stockpile surplus fill within Hong Kong and would indirectly contribute to the reduction of C&D materials public fill being sent to existing landfill sites.

- 4.3.14 At the project level, a *balance* of materials, with no net requirement for either import or export of materials is generally considered the optimal situation in terms of negating environmental impacts. However, as noted above there is a projected surplus of public fill across Hong Kong which would need to be managed. Notwithstanding the potential for secondary environmental impacts, from a strategic perspective, a landfill extension or new site that provides a sink for surplus C&D materials is considered to have greater overall environmental benefits.