

14 Conclusion

This EIA Report has provided an assessment of the potential environmental impacts associated with the construction, operation, restoration and aftercare phases of the Project.

Baseline conditions, sensitive receivers, potential environmental impacts, mitigation measures and EM&A requirements were identified and assessed throughout the course of the EIA study. The recommended mitigation/precautionary measures are summarised in an Implementation Schedule for further enforcement.

14.1 Option Evaluation

Four layout options for the NENT Landfill Extension with different footprints were considered during the option evaluation stage. After detailed evaluation of engineering aspects, environmental issues and community responses, Option 4 for developing the NENT Landfill Extension was adopted.

14.2 Air Quality Impact

The potential air quality impacts during construction, operation, restoration and aftercare phases of the Project have been assessed.

14.2.1 Construction Phase

Construction dust modelling results show that there would be no adverse construction dust impact on the ASRs in the vicinity of the Project site. Good site practices, however, are still recommended throughout the construction period to further eliminate any dust problem. Requirements for regular monitoring of dust concentration are detailed in the EM&A Manual.

14.2.2 Operation Phase

14.2.2.1 Stack Gas Emission

Dispersion modelling results show that gaseous emissions from ammonia stripping plant, LFG power generator and flaring system of the NENT Landfill Extension will have no adverse impact on the ASRs throughout the operational period of the Project. The maximum allowable discharge limits from the above facilities should be specified in contract specifications to control the air emissions. Regular emission monitoring of these facilities is recommended to ensure their proper functioning.

14.2.2.2 Odour

Odour assessment results show that there would be no adverse impact on the ASRs during the operational period of the Project, except the derelict and vacant Tong To Shan Tsuen. Residual impact at Tong To Shan Tsuen is considered to be very scarce and transient in nature and can be mitigated with good site practices (including application of thicker daily cover, progressive restoration for inactive tipping face.), as well as periodic odour patrol should be carried out during active tipping period. In case the weather condition is poor (stable and calm weather), tipping should be arranged at area further away from the ASRs as far as practicable, and/or thicker daily cover / alternative daily cover should be applied subject to EM&A programme.

14.2.3 Restoration and Aftercare Phases

The scale of construction activities during the restoration and aftercare phases of the Project would be smaller when compared with its construction phase. Construction dust is therefore not an issue.

The impact of stack gas emissions from treatment facilities will be much reduced during these phases given the gradual reduction in leachate and LFG generation rates over time. The air quality conditions would not be worse than the operation phase and hence no adverse impact is anticipated.

14.3 Noise Impact

The potential noise impacts during construction, operation, restoration and aftercare phases of the Project have been assessed.

14.3.1 Construction and Restoration Phase

Potential construction noise impacts are likely caused by various construction activities on site, such as, site clearance and formation, soil excavation, installation of lining system, construction of leachate treatment facilities, installation of final capping system, etc.

Construction noise assessment concluded that the construction noise levels at the neighbouring NSRs will comply with the relevant noise criteria even without any mitigation measures in place. No adverse construction noise impact is therefore anticipated during the construction and restoration phases.

14.3.2 Operation Phase

Potential noise impact during the operation phase of the Project include road traffic noise along Wo Keng Shan Road, which is the major access to the NENT Landfill Extension site, and on-site noise from leachate treatment facilities (including aeration lagoon and ammonia stripping plant) and daily landfill operations (e.g. vehicular movements, waste filling, waste compacting, etc.)

Assessment results show that the predicted operational noise levels at the NSRs will be within the relevant noise criteria. No adverse noise impact is anticipated during this phase.

14.3.3 Aftercare Phase

No adverse noise impact is anticipated during the aftercare phase given the minimal amount of site activities involved during this period.

14.4 Water Quality

The potential water quality and hydrological impacts during construction, operation, restoration and aftercare phases of the Project have been assessed. No overflow or discharge of raw leachate, treated leachate and contaminated surface runoff from the tipping face to Ping Yuen River and its tributaries will be allowed under any circumstances.

14.4.1 Construction and Restoration Phases

With proper implementation of construction site runoff control measures, adverse water quality impact during construction and restoration phases is not anticipated.

14.4.2 Operation and Aftercare Phases

Under normal installation and operation conditions, the rate of leachate seepage due to manufacturing defects of geomembrane is assessed to be negligible and would have minimal impact on groundwater quality.

In case of accidental leakage of leachate due to rupture or damage of lining and/or leachate collection system, the impact on surface water and groundwater quality will be limited and temporary with the implementation of remedial measures proposed in the contingency plan.

Assessment results show that the groundwater level underneath the site may potentially drop by 1.5m over the operational lifetime of the NENT Landfill Extension. Groundwater levels at Wo Keng Shan and Ping Yuen could fall by 1m and 0.6m respectively, which are considered to be minimal. The groundwater system will be recharged by adjacent catchments and a number of measures to mitigate the potential loss of groundwater yield have been proposed.

The maximum cumulative amount of leachate generated from both the existing and the extension of NENT Landfill was estimated to be 1,500 m³/day under extreme meteorological conditions. Options for catering the surplus amount of leachate, including building new

storage lagoons and constructing a new leachate treatment facility, have been considered. It should be noted that under normal meteorological conditions the total leachate generation rate from both landfills will be 1,190m³/day, which is still within the allowable capacity of the discharge license. No adverse impact on DSD's sewerage network downstream is anticipated.

14.5 Waste Management

The waste management implications during construction, operation, restoration and aftercare phases of the Project have been assessed.

14.5.1 Construction and Operation Phases

During the construction and operation phases of the Project, a variety of waste including excavated construction materials, chemical waste, general refuse and sludge from leachate treatment facilities will be generated. The quality, quantity and timing of waste arising have been assessed. By adopting a construction material balance approach, and with the implementation of proper management practice, no adverse environmental impact arising from waste management is anticipated.

14.5.2 Restoration and Aftercare Phases

During the 30-year restoration and aftercare period, chemical waste, sludge and general refuse will be the major waste sources anticipated. The quantities of waste arising have been estimated. With the proper handling of waste arising, no adverse environmental impact is anticipated.

14.6 Landfill Gas Hazards

The results of this qualitative risk assessment for LFG hazards associated with the construction, operation, restoration and aftercare phases indicate that the overall risks to the receivers within the NENT Landfill Extension site would be categorised as 'High' and that to the receivers outside the NENT Landfill Extension site would be 'Medium'. The sensitive receivers falling within the newly proposed 250 m consultation zone shall be prone to LFG potential risk and appropriate protective and precautionary measures including engineering design and monitoring programme have been proposed to reduce such risk to acceptable levels. With these measures in place, no adverse impact would be anticipated.

14.7 Landscape and Visual Impact

The Project site of the Landfill Extension is mainly made up largely by the SBA and haul roads of the existing NENT Landfill Site. Furthermore, the existing NENT Landfill Site is located immediately adjoining to the northwest of the proposed extension. It is noted the existing landscape resources and characters of the Project site have already been largely deteriorated by the SBA of the existing landfill site.

In terms of residual landscape impact, it is concluded that with implementation of mitigation measures, the proposed development will have slight impact to the upland landscape at the northwest facing slope of Wo Keng Shan (LCA3C) and moderate impact to rural settlement landscape of Tong To Shan Tsuen & Ngong Tong (LCA2A). Furthermore, it is assessed that there will be slight to moderate residual impact to the woodland (LR1) and slight residual impact to shrubland (LR2) and grassland (LR3) within the Project site. The loss of 1.5 ha of existing woodland and 5.8 ha of shrubland will be compensated by 26.83 ha (about 43% of the Project site area) of woodland mix progressively planted in phases with about 148,100 nos. of tree seedlings/ whips. In addition, 19 ha of shrubland mix planting and 17.55 ha of grassland will be created in the restoration phase.

Due to their proximity, the existing landfill site, its SBA and the proposed extension will affect the similar group of visual sensitive receivers. It is noted that the landscape character of the Project site will be similar to that of the existing landfill site and its associated SBA. In terms of residual visual impact, the proposed development will have slight impact to the majority of the identified visual sensitive receivers. Moderate to significant impact is expected to Hikers at the top of Robin's Nest (VSR 9), whereas moderate impact is expected to visual sensitive receivers at Lin Ma Hang (VSR 2) and to potential future users at the existing NENT Landfill site during its aftercare period. (VSR12).

The proposed landfill extension will be restored and vegetated to match with its surrounding landform and vegetation patterns in the restoration and aftercare phases. In summary, the overall landscape and visual impact of the Project is acceptable with mitigation measures implemented.

14.8 Cultural Heritage Impact

14.8.1 Archaeology

As a result of the findings of the desk-based study and the preliminary site investigation, the Ngong Tong, Shek Tsai Ha and Wo Keng Shan sections of the study area were deemed to have extremely low archaeological potential and would require no mitigation measures. Further testing of the Tong To Shan section was recommended to determine if any sub-surface deposits were associated with the cultural landscape features identified there. The result of the archaeological investigation was that no archaeological material or cultural layers were identified. Thus, no further mitigation measures in the form of archaeological excavation are recommended.

14.8.2 Built Heritage

A number of resources will be directly impacted by the Project; these consist of 13 graves (G2, G4, G5, G6, G7, G8, G14, G15, G25, G26, G27, G29 and G30) and 1 boulder path (BP2). A second boulder path (BP1) will have to be surveyed to determine its exact relationship to the extension area and hence the nature of any impacts. Mitigation in the form of preservation by record for all of the resources will be required. It is the responsibility of the DBO Contractor to ensure that the recording has been carried out by a qualified professional and that a report has been submitted to and approved by AMO prior to the commencement of any excavation works.

14.9 Ecological Impact

14.9.1 Construction and landfill Operation Phase

The construction works of the preferred option would cause a loss of 0.12 ha of abandoned agriculture land, 47.64 ha of grassland with low shrub, 4.01 ha of natural woodland, 4.76 ha of plantation, 6.89 ha of urbanised/disturbed, and 2530 m of stream/channel habitats. In fact, the selected layout enables the NENT Landfill Extension to avoid Lin Ma Hang Stream and its catchment completely. With the implementation of the mitigation measures including compensatory planting, the residual impacts are considered minimal and acceptable.

Potential ecological impacts caused by landfill gas and leachate are ranked as minor. With adoption of the proposed leachate and landfill gas collection facilities and contingency plans, no residual impacts are anticipated.

14.9.2 Restoration Phase

Upon completion of operation, the landfill site would be restored by planting of woodland, shrubland and grassland species, and the surface flow of Ping Yuen River would be

restored to comparable level. No adverse ecological impact to the surrounding terrestrial and aquatic habitats and their associated flora and fauna is anticipated.

14.10 Environmental Monitoring and Audit

Details of the EM&A programme and monitoring requirements are described in the EM&A Manual. The following measurements and activities have been included:

- Baseline monitoring on groundwater, surface water, dust, ambient emissions of odour, VOC and ammonia, and ecology (flora and fauna);
- Impact monitoring on leachate, LFG, groundwater, surface water, dust, ambient emissions of odour, VOC and ammonia, meteorological data, volume and density of waste, settlement, waste type, and ecology (flora and fauna);
- Remedial actions in accordance with the Event and Action Plan within the timeframe in cases the specified criteria in the EM&A Manual are exceeded;
- Logging and keeping records of monitoring results; and
- Preparation and submission of Monthly, Quarterly and Annual EM&A Reports

14.11 3D-EIA Tools

In order to facilitate Continuous Public Involvement (CPI), a web-site www.nent-ext.com has been developed for the presentation of 3-D Environmental Impact Assessment Public Engagement Tools which aims to facilitate awareness of the development proposals and promote greater public participation in the decision making process. All the EIA findings and mitigation measures have been presented in the form of 3D EIA animation.

14.12 Overall Conclusion

An EIA Report has been prepared to satisfy the requirements given in the EIA Study Brief No.: ESB-114/2004 and the TM-EIAO. All the latest design information has been incorporated into the EIA process. Aspects that have been considered in this EIA Report include:

- Layout option evaluation
- Description of construction, operation and aftercare activities
- Air Quality Impact
- Noise Impact
- Water Quality Impact
- Waste Management Implications
- Landfill Gas Hazards
- Landscape and Visual Impact
- Impact on Cultural Heritage
- Ecological Impact
- Environmental Monitoring and Audit
- 3D EIA

Overall, the EIA Report has predicted that the Project would be environmentally acceptable with the implementation of the proposed mitigation measures for construction and operation

phases. An environmental monitoring and audit programme has been recommended to ensure the effectiveness of recommended mitigation measures.