FINAL REPORT

“MENGKAJI KESESUAIAN TAPAK BAGI PEMBINAAN LOJI RAWATAN TERMAL DI KAWASAN TAPAK PELUPUSAN SISA PEPEJAL TAMAN BERINGIN, JINJANG UTARA, KUALA LUMPUR”

Prepared for:-

JABATAN PENGURUSAN SISA PEPEJAL NEGARA (JPSPN)
KEMENTERIAN PERUMAHAN DAN KERAJAAN TEMPATAN
(KPKT)

Submitted by:-

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FEBRUARY 2013
EXECUTIVE SUMMARY

This is the Final report for the “Site feasibility Study for Thermal Treatment Plant at Taman Beringin Landfill” (hereinafter referred to as the “Study”). This report is prepared to present the study of site evaluation throughout the contract period.

Based on the presentation by JPSPN on 20th June 2012, two site options for constructing 1000 tonnes per day (tpd) thermal treatment plants (TTP) had been proposed as follows:

- Site Option A: at the existing landfill site;
- Site Option B: bulky waste facility area (area to the west of transfer station)

The Study team had carried out the following tasks:

a. Literature review of existing TTP
   It is concluded that a minimum of 3 hectares footprint is required to construct a 1000 tpd incinerator.

b. Topographical survey and soil investigation (SI)
   Primary data from survey and SI i.e. available land size, ground profile and other site related information had been collected for both site options.

c. Secondary data
   The secondary data i.e. future land use map, past environmental monitoring data, layout, plan of transfer station, reports, case studies and guidelines had been collected and reviewed to facilitate the site options evaluation.

A few criteria should be considered for the Site Option A as follows:

a. High cost of site preparation
   - Removal of existing waste
     o It is estimated that 8 million tonnes of waste has been accumulated at this landfill
   - Slope stability
     o Cut and fill work is required to obtain a larger and more stable platform (from the height of 84 m RL to 54 m RL) to construct TTP
     o Area of proposed platform with slope embankment is about 5 hectares for 3 hectares footprint of TTP
     o 2 million meter cube of compacted suitable material i.e. imported earth need to be filled up for the waste excavated area to achieve the proposed platform level
b. Soil stability and settlement
   - Bedrock depth is about 72 m from top of landfill
   - More and deeper piling required

c. Landfill gas generation and explosion risk
   - Methane gas measurement is up to 50% at past landfill gas monitoring
   - Piping need to be installed to collect landfill gas
   - HDPE membrane sheets need to be installed to prevent seepage of landfill gas into the building
   - Landfill gas detections and safety systems need to be installed around and at the building for precaution measure

d. Buffer issue
   - Closed to Taman Aman Putra apartment (153 m to the south) and Taman Scri Utara Kipark high end residential area (258 m to the east)

e. Access issue
   - Existing access at the south of landfill need to pass through residential area i.e. Jinjang Utara, Taman Nanyang
   - Limited access from MRR2

Issue with Site Option B as follows:

a. Existing structure
   - Bulky waste facility
   - DBKL nursery
   - Lake (about 2 m depth)

b. Future land use planning
   - Overhead transmission line
   - Future residential area planning

c. Buffer issue
   - Closed to Jinjang Utara (about 100 m to the south) and petrol station (75 m to the west)

From the site options evaluation, Site Option B is more suitable for constructing thermal treatment plant (TTP) due to lower engineering risk and cost.

The study team had recommended a few future actions as follows:

a. Coordination with other government agencies on land use issue
b. Integration of TTP with existing transfer station facility
c. Environmental Impact Assessment (EIA) approval

To facilitate the process of EIA, a Penilaian Awal Tapak (PAT) document for the proposed site for the TTP was prepared and submitted to DOE Kuala Lumpur (KL) on 14th November 2012. By 29th November 2012, DOE KL had reply to the application. A
discussion between the Study team and DOE KL had been organized to further facilitate the PAT process on 29th January 2013 while DOE KL had respond to the discussion by requesting additional information on 8th February 2013.
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1.0 INTRODUCTION

This is the Final Report for the “Site Feasibility Study for Thermal Treatment Plant at Taman Beringin Landfill” (hereinafter referred to as the “Study”). This report is prepared to present the finding throughout the contract period.

2.0 BACKGROUND OF THE PROJECT

There were two proposed site options for the thermal treatment plant (TTP) as presented by JPSPN on 20th June 2012, namely:-

- Site Option A: at the existing landfill site;
- Site Option B: bulky waste facility area (area to the west of transfer station).

Both the proposed site options were located approximately 10 km northeast of Kuala Lumpur in Jinjang Utara as shown in Figure 2-1.

Figure 2-2 showed the location of two proposed site options during the presentation of JPSPN on 20th June 2012. Detailed description of the two proposed site options will be discussed in Section 8.2.4.
Site Feasibility for Thermal Treatment Plant at Taman Beringin Landfill

**Figure 2-1: Location of Taman Beringin Landfill Site in Kuala Lumpur City Map**

*Source: Draft Kuala Lumpur Structure Plan 2020*
Figure 2-2: Location Map of Proposed Site Option A and Site Option B for Thermal Treatment Plant (TTP)
3.0 OBJECTIVES OF STUDY

One of the objectives to be achieved in the study of “Study for landfill rehabilitation and Site feasibility for Thermal Treatment Plant at Taman Beringin Landfill” as per the Request for Proposal (RFP) [Letter ref. No. KPKT/JPSPN(S)/600/1/57(14) dated 14th June 2012] that related to the thermal treatment plant was as follows:-

*Mengkaji kesesuaian bekas Tapak Pelupusan Sisa Pepejal Taman Beringin, Jinjang Utara, Kuala Lumpur untuk dijadikan tapak pembinaan loji rawatan termal.*
4.0 TERMS OF REFERENCE

The TOR for the Project is as per the Request for Proposal (RFP) [Letter ref. No. KPKT/JPSN(S)/600/1/57(14) dated 14th June 2012], which were as follows:-

ii. Kajian Kesesuaian Tapak Untuk Pembinaan Loji Rawatan Termal

a. Mengkaji kesesuaian tapak untuk pembinaan Loji Rawatan Termal (LRT) di atas tapak tersebut. Kajian tersebut hendaklah berasaskan kepada pembinaan sebuah LRT jenis ‘stoker’ berkapasiti 1000 tan sehari bagi merawat sebahagian sisa pepejal sedia ada yang diterima oleh Stesen Pemindahan Taman Beringin. Bagaimanapun, Juruperunding hendaklah juga mencadangkan dalam kajian ini kapasti yang optimum bagi pembinaaan LRT termasuk jenis teknologi lain yang bersesuaian untuk dibangunkan ditapak tersebut sebagai sebahagian daripada laporan kajian secara umum.


c. Mengenal pasti dan mencadangkan jumlah keluasan yang perlu untuk pembinaan loji tersebut.

d. Mencadangkan kawasan yang bersesuaian, jika ada dalam kawasan tapak tersebut untuk pembinaan loji tersebut.

e. Mengkaji dan menganalisa struktur tanah di mana tapak LRT yang dicadangkan berserta mitigasi yang perlu dibuat.


g. Menyediakan anggaran kos tambahan penyediaan tapak yang terlibat sekitanya loji rawatan termal dibina di atas bekas Tapak Pelupusan Sisa Pepejal Taman Beringin. Kos tersebut kemudiannya perlu dibandingkan dengan kos pembinaan LRT di tapak biasa.
h. Mengkaji dan menganalisa maklumat-maklumat tersebut di atas dan seterusnya mencadangkan kepada Kerajaan kesesuaian tapak untuk dijadikan tapak pembinaan LRT.

i. Menyenaraikan isu-isu yang mungkin timbul jika LRT dibina di tapak tersebut berserta cadangan untuk mengatasinya termasuk impak kepada alam sekitar dan penduduk sekitar.

j. Kajian perlu mengambil kira dan memasukkan kriteria yang ditetapkan oleh Jabatan Alam Sekitar (JAS) dalam Penilaian Awal Tapak (PAT) bagi pembinaan LRT sebagai sebahagian daripada skop kajian dan laporan yang akan dikemukakan. Dalam hal ini, Juruperunding hendaklah menasihati JPSPN bagi memastikan bahawa garis panduan yang dikeluarkan oleh JAS dipatuhi sepenuhnya termasuk dalam menyediakan dokumen-dokumen atau borang-borang yang berkaitan dengan perkara tersebut.

k. Laporan mengenai kesesuaian tapak untuk pembinaan loji rawatan termal ini hendaklah disediakan secara bersasingan daripada kajian keseluruhannya. Tempoh kajian mengenai kesesuaian tapak untuk pembinaan loji ini adalah 12 minggu**. Dalam tempoh ini, Juruperunding hendaklah menyediakan 3 peringkat laporan (10 salinan bagi setiap peringkat) iaitu:

   i. Laporan awal:
      • Hendaklah disediakan dalam tempoh 4 minggu dari tarikh Surat Setuju Terima.
      • Laporan awal hendaklah mengandungi ‘preliminary findings’ berkenaan kesesuaian pembinaan LRT di atas tapak pelupusan sedia ada dan/atau alternatif kawasan lain disekitarinya (termasuk kawasan sekitar Steen Pemindahan dan kawasan sisa pukal) yang sesuai untuk dibina LRT.

   ii. Laporan Interim:
      • Status kemajuan kajian dalam tempoh 8 minggu dari Surat Setuju Terima.
iii. Draf Laporan Akhir:

- Hendaklah dihantar dalam tempoh 2 minggu sebelum tarikh tamat tempoh kajian.
- Hendaklah dibentangkan dan dipersetujui oleh JPSPN sebelum Laporan Akhir dicetak.

iv. Laporan akhir:

- Hendaklah disiapkan dan dihantar sebelum tarikh tamat tempoh kajian.

*JPSPN berhak untuk mengarahkan juruperunding untuk membentangkan mana-mana laporan di atas, jika perlu kepada JPSPN dan/atau ahli jawatankuasa yang akan dilantik oleh Ketua Pengarah JPSPN dari semasa ke semasa.

**Tempoh 12 minggu yang dinyatakan di atas adalah anggaran JPSPN bagi kajian ini dan ia tidak menghalang Juruperunding untuk menentukan tempoh kajian yang bersesuaian. Bagaimanapun, Juruperunding hendaklah mengambil maklum bahawa tempoh kajian merupakan salah satu kriteria yang akan diambil kira dalam penilaian Cadangan Teknikal dan Kewangan(CTK).
5.0 KEY TEAM MEMBERS

The key team members of the Study including their expertise area and qualifications were shown in Figure 5-1.
I. STUDY ON LANDFILL REHABILITATION

Secondary Data Collection: Analysis of Existing Landfill Design
Prof. Dr. Mohd Rozainee bin Taib (UTM)
Ir. Yeow Yew Yuen (EEC)

Secondary Data Collection: Establishment of Database on Site & Waste Characteristics including Past Environmental Monitoring Data
Mutahharah binti Mohd Mokhtar (UTM)
Ng Pang Soon (UTM)

Secondary Data Collection: Land Use Survey and Analysis
Dr. Abdullah Hisham bin Omar (GIS Specialist - UTM)

Primary Data Collection: Baseline Environmental Study
Dr. Casey Ngo Saik Peng (Air Quality - ERSB)
Prof. Dr. Mohd Razman bin Salim (Leachate - UTM)
Prof. Dr. Maketab bin Mohamed (Surface Water - UTM)
Ir. Dr. Mokhtar bin Harun (Noise & Vibration - UTM)
Dr. Mohd Badruddin Mohd Yusof (Land Use - UTM)
Assoc. Prof. Dr. Hasni bin Ja’afar (Public Health - UKM)
Zaini bin Sakawi (Socio-economic - UKM)

Study on Existing Design of LTP and Propose Upgrading Measures
Prof. Dr. Mohd Razman bin Salim (Leachate Generation and Characteristics – UTM)
Salmin bin Husin (Design of LTP)

Landfill Gas Generation and Dispersion Modelling Study
Lim Sze Fook (ERSB)
Dr. Casey Ngo Saik Peng (ERSB)

Quantitative Risk Assessment Associated with Landfill Closure
Assoc. Prof. Dr. Mohd Zailani Abu Bakar (USM)

Financial Analysis for Landfill Closure and LTP Upgrading (including CBA)
Soren Beck (EEC)

Study on Infiltration Rates of Rainfall Through Capping Material
Kamarul Azlan (UTM)

Study on Landfill Closure Design
Ir. Yeow Yew Yuen (EEC)

Jabatan Pengurusan Sisa Pepejal Negara (JPSPN) under Kementerian Perumahan dan Kerajaan Tempatan (KPKT)

Project Consultant
Uni-Technologies Sdn. Bhd. (UTSB, UTM)
Engineering and Environmental Consultants Sdn. Bhd. (EEC)
Exxergy Resources Sdn. Bhd. (ERSB)

Project Leader
Prof. Dr. Mohd Rozainee bin Taib (UTM)

Project Manager
Dr. Casey Ngo Saik Peng (ERSB)

Secretariat / Administration
Uni-Technologies Sdn. Bhd. (UTSB, UTM)
Exxergy Resources Sdn. Bhd. (ERSB)
6.0 WORKFLOW

The workflow with task delegations to meet the key targets was as shown in Figure 6-1.
Final Report

Site Feasibility for Thermal Treatment Plant at Taman Beringin Landfill

Figure 6-1: Proposed Workflow for Site Suitability Study for Thermal Treatment Plant

KEY TARGET

SITE SUITABILITY FOR INCINERATOR

SUB-TARGETS

Most Suitable Technology & Optimum Capacity (Environmental, Technical & Economic Aspects)

Most Suitable Site (Physical, Social, Engineering & Technical Aspects)

Techniques to Prepare Sites

Costing Comparisons for Selected Sites

Selected Site (Potential Issues and List of Mitigating Measures)
7.0 DETAILED TECHNICAL WORK PROGRAMME

The technical work programme in breakdown of month was shown in Table 7-1.
Table 7-1: Proposed Technical Work Programme

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<td>2. Collection and analysis of landfill design data (including engineering drawings)</td>
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<td>3. Establishment of database on MSW landfilled at the site (amount, characteristics)</td>
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<td>5. Collection of ambient environmental monitoring data (third party) conducted on the site (air, water, noise, etc.)</td>
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<td>6. Study on the land use status of the surrounding site (current and future) and buffer</td>
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<td>12. Submission of Interim Report #1</td>
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<td>13. Study on the infiltration rate of rainfall through the capping material and to propose measures to minimize the infiltration rates</td>
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<td>15. Risk assessment to establish the pollution level at site and to propose appropriate mitigation measures</td>
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<td>16. To propose corrective measures to contain leachate leakages from capped cells</td>
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<td>17. Study on groundwater flow and potential usage of groundwater surrounding the landfill site</td>
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<td>18. Groundwater flow modelling to determine potential flow of leaked leachate from landfill site</td>
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<td>20. Collection of data on potential routes of leachate entering Sg. Lempoyang through groundwater and to propose the appropriate mitigation measures</td>
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<td>21. Identification of potential surface runoff to the nearest receiving watercourse and the potential stage of the surface water</td>
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<td>22. Study on the design of existing leachate treatment plant at the landfill site and to determine its ability to treat the leachate generated</td>
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<td>23. To propose upgrading of the existing LTP</td>
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<td>24. Estimation of CAPEX and OPEX for proposed LTP upgrading and landfill closure measure, including cost benefit analysis</td>
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<td>25. Study on the composition, amount and rate of landfill gas generation including the dispersion</td>
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<td>27. To present the proposed findings to the QGM for consent and approval</td>
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<td>28. Submission of Final Report</td>
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II. STUDY STAGE – SITE FEASIBILITY FOR SITING OF THERMAL TREATMENT PLANT

- To identify and propose the total land area for development of thermal treatment plant.
- To investigate the suitability of the site for siting of thermal treatment plant of a suitable capacity of 1000 tonnes per day and propose optimum capacity for other suitable technologies.
- To study the feasibility to develop thermal treatment plant at other sites within the boundary of landfill site.
- To propose a suitable site within Taman Beringin Landfill available.
- To study and analyse the oil structure of the site proposed for thermal treatment plant and provide mitigating measures.
- Submission of Inception Report.
8.0 PROGRESS OF STUDY

8.1 Database on Taman Beringin Landfill

8.1.1 Past Environmental Monitoring Data

Environmental monitoring programme has been conducted by Cypark Resources Sdn. Bhd. from January 2008 until December 2009. Landfill gas emission and land settlement have been monitored and reported. The monitoring data was compiled and summarised in Appendix A.

The result of environmental monitoring programme for landfill gas shows that the reading of methane gas measurements is considered high (up to 50%), indicates that the landfill has not yet stabilised at the end of the monitoring period (December 2009). A stable landfill normally has the methane gas measurement of less than 1.0 vol %.

8.1.2 Waste Data

Taman Beringin Landfill served as a waste disposal facility since 1979 and ceased on 15th March 2006. Cypark reported that Taman Beringin Landfill had received domestic, industrial, commercial, construction, mixed and green waste in the past. The amount of waste received at Taman Beringin Landfill has been recorded by Alam Flora Sdn. Bhd. since year 1999 until 2001, as attached in Appendix B. Data shows that Taman Beringin Landfill received about 600,000 tonnes of waste annually. With the long service period, it is estimated that more than 8 million of waste has been disposed in this landfill.

Taman Beringin Transfer Station was in operation since April 2002. All domestic waste from Kuala Lumpur was sent to this transfer station prior to be transferred and disposed at sanitary landfill i.e. Bukit Tagar Sanitary Landfill. Waste data recorded at Taman Beringin Transfer Station from year 2002 to 2012 was obtained and attached in Appendix B. The data shows that total amount of domestic waste received at Taman Beringin Transfer Station in year 2003 was 481,069 tonnes (1,318 tonnes per day). The amount was increased to 779,304 tonnes per year (2,135 tonnes per day) in 2012. This
shows an increase of 63% from year 2003 to 2012.

Taman Beringin Transfer Station also received bulky waste since year 2008. In year 2008, TBTS received 58,826 tonnes of bulky waste. It was increased to 113,730 tonnes per year in 2012, which shows an increase of 93% in 5 years operating time.

8.1.3 Result of Soil Investigation (SI)

Soil investigation (SI) had been carried out to obtain the data as follows:

- Soil characteristic and structure;
- Ground profile;
- Depth of bedrock; and
- Other geotechnical information for engineering evaluation of proposed sites for thermal treatment plant

A total of five (5) boreholes were drilled at landfill closure area and two (2) boreholes were drilled near to existing transfer station and DBKL nursery. Figure 8-1 showed the photograph of the soil investigation drilling works, while Figure 8-2 showed the locations and SI result summary of the total seven (7) boreholes.
Figure 8-1: Photograph of Soil Investigation (SI) Drilling Works
Figure 8-2: Locations and Borehole Summary of Soil Investigation
A summary of the boreholes was shown in Table 8-1 while the detailed SI data log sheet and laboratory analysis were attached in Appendix C. From the soil investigation results, it was noted that the soil layers measured from top of capped landfill were consists of 52 m of rubbish underlain by stiff to very stiff Sandy Silt/Clay with depth approximately 8 m thickness start from depth 34.37 m RL. Medium dense Silty Sand was encountered at depth 27.86 mRL and limestone was found at depth 15.86 mRL, or at depth of 72 m from the top of capped landfill.

### Table 8-1: Borehole Summary

<table>
<thead>
<tr>
<th>Borehole No.</th>
<th>Ground Level / Reduced Level [mRL]</th>
<th>Depth to reach Bedrock [mbgl]</th>
<th>Bedrock Reduced Level [mRL]</th>
<th>Water Level Using Standpipe Piezometer [mRL]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH 1</td>
<td>57.15</td>
<td>8.0</td>
<td>49.15</td>
<td>54.07</td>
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<tr>
<td>BH 2</td>
<td>52.72</td>
<td>14.0</td>
<td>38.72</td>
<td>-</td>
</tr>
<tr>
<td>BH 3</td>
<td>45.32</td>
<td>10.0</td>
<td>35.32</td>
<td>44.02</td>
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<tr>
<td>BH 4</td>
<td>87.86</td>
<td>72.0</td>
<td>15.86</td>
<td>-</td>
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<tr>
<td>BH 5</td>
<td>46.43</td>
<td>29.0</td>
<td>17.43</td>
<td>42.11</td>
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<tr>
<td>BH 6</td>
<td>46.77</td>
<td>-</td>
<td>-</td>
<td>42.18</td>
</tr>
<tr>
<td>BH 7</td>
<td>55.72</td>
<td>-</td>
<td>-</td>
<td>45.37</td>
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</tbody>
</table>

*Note: mgbl is meter below ground level, mRL is meter Reduced Level*

The ground profile of the capped landfill was summarized in Table 8-2, while the ground profile of the bottom of the landfill area and flat area near to the existing transfer station were summarized in Table 8-3. From the bottom of the landfill area and flat area near to the existing transfer station, the top soil stratum generally consists of ex-mining ground where Sandy SILT was encountered approximately 1.5m thickness. Underlying this layer, the soil mainly consists of Loose to Medium Dense Silty Sand underlain by limestone with the various depths. This is due to the extremely various surface of limestone (i.e. overhang, pinnacles, sinkhole, cavities and etc). A comprehensive ground profile of the boreholes was shown in Figure 8-3.
### Table 8-2: Ground Profile for Capped Landfill

<table>
<thead>
<tr>
<th>Layer</th>
<th>Thickness (m)</th>
<th>Material Description</th>
<th>Type of Soil</th>
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<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>Rubbish</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>Stiff to Very Stiff Sandy SILT/CLAY</td>
<td>Ex-Mining Ground</td>
</tr>
<tr>
<td>3</td>
<td>&gt; 3</td>
<td>Medium Dense Silty SAND</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>LIMESTONE</td>
<td>Sedimentary Rock</td>
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### Table 8-3: Ground Profile for the Bottom of the Landfill and Flat Area

<table>
<thead>
<tr>
<th>Layer</th>
<th>Thickness (m)</th>
<th>Material Description</th>
<th>Type of Soil</th>
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<tbody>
<tr>
<td>1</td>
<td>~1.5</td>
<td>Sandy SILT</td>
<td>Ex-Mining Ground</td>
</tr>
<tr>
<td>2</td>
<td>8 to 29</td>
<td>Medium Dense Silty SAND</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>LIMESTONE</td>
<td>Sedimentary Rock</td>
</tr>
</tbody>
</table>
Figure 8-3: Comprehensive Ground Profile of the Boreholes
The landfill site is underlain by Kuala Lumpur Limestone consists of Limestone with minor intercalation of Phyllite. Limestone is a sedimentary rock from biochemical origin. The Bedrock Geology of Kuala Lumpur, published by the Director of National Mapping Malaysia, 1993 showed that the proposed site was formed within the Middle-Upper Silurian. Figure 8-4 showed the Geological Map and the location of proposed site.

<table>
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<th>Legend</th>
<th>Description</th>
<th>Formation</th>
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<tr>
<td></td>
<td>(a) Limestone (marble) with minor intercalation of Phyllite</td>
<td>Kuala Lumpur - Limestone</td>
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<td>(b) Limestone Hill</td>
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Figure 8-4: Geographical Map
8.2 Site Feasibility for Thermal Treatment Plant (TTP)

8.2.1 Capacity Selection

Taman Beringin Transfer Station (TBTS) started to operate since year 2002. It was designed to transfer 1,700 tonnes of municipal solid waste (MSW) per day from Kuala Lumpur to sanitary landfill (i.e. Bukit Tagar Landfill). Waste data from TBTS was collected and attached in Appendix B. In year 2003, total amount of domestic waste received at TBTS was 481,069 tonnes per year (1,318 tonnes per day). The amount was increased to 779,304 tonnes per year (2,135 tonnes per day) in 2012. This shows an increase of 63% from year 2003 to 2012.

TBTS started to receive bulky waste since year 2008. In year 2008, TBTS received 58,826 tonnes of bulky waste per year. It was increased to 113,730 tonnes per year in 2012, which shows an increase of 93% in 5 years operating time.

With the average amount of waste received by TBTS is about 2,500 tonnes per day, it has exceeded the design capacity of TBTS. Further, it is predicted that the waste amount in Kuala Lumpur will reach about 4,200 tonnes per day in year 2020. Therefore, this showed an urgent need to have a 1000 tonnes thermal treatment plant to solve and manage the waste issue at Kuala Lumpur.
8.2.2 Technology Evaluation

Thermal treatment process can be categorised on the basis of air requirement as follows:

a. Combustion (Excess Air Process)
b. Gasification (Starved Air Process)
c. Pyrolysis (Absent Air Process)

Normally, combustion is considered as conventional thermal treatment process because of the direct conversion of fuel to energy. On the other hand, gasification and pyrolysis able to produce syngas or other products which can be further used in the secondary energy recovery stage. Therefore, gasification and pyrolysis also known as advanced thermal treatment process. The detailed description and the comparison of the thermal treatment processes was attached in Appendix D. In general, conventional thermal treatment process is recommended compared to advanced thermal treatment process due to proven operational experience, high scalability and reliability.

There are three types of proven thermal treatment technologies used in the conventional combustion process, namely:-

a. Stoker
b. Fluidised bed
c. Rotary Kiln

Literature shows that more than 1000 stoker facilities were installed globally to treat municipal solid waste (MSW). Further, a unit of stoker can be scaled up to 1,200 tonnes per day compared to fluidised bed (300 tonnes per day) and rotary kiln (250 tonnes per day). Another advantage of stoker technology is the ability to treat different size and composition of MSW.

Fluidised bed is more commonly used in treating homogeneous waste i.e. sludge. One of the largest fluidised bed reactors was reported in Spain, to process debagged and shredded MSW since 2006.
Rotary kiln is primarily used to treat hazardous and clinical waste but less for MSW. Literature shows that rotary kilns only occupy 7% of the market share out of 77 operating waste incineration plants in China.

Detailed comparison of advantages and disadvantages of these thermal treatment technologies was attached in Appendix D.

The MSW generation in Kuala Lumpur is a critical issue due to the increased amount of waste and insufficient waste management facilities. A reliable technology with proven track record is very important to be considered in the technology selection to ensure minimal problems occur during operation. Based on the technology evaluation gathered from literature, it can be concluded that the stoker furnace is more suitable to be proposed in Taman Beringin to process 1,000 tonnes of MSW per day. In terms of proven track record, reliable commercially operation and the ability to treat unprocessed MSW.
8.2.3 Required Area Size / Footprint for Constructing a 1000 tonnes per day Thermal Treatment Plant

In order to determine the minimum required footprint for a thermal treatment plant with the capacity of 1000 tonnes per day, several literatures of the existing thermal treatment plants have been reviewed, such as follows:

a. Keppel Seghers Tuas Waste-To-Energy Plant
   Location : Singapore
   Operation since October 2009
   Capacity: 800 tonnes of wastes per day
   Footprint: 1.6 hectares (one of the most compact incinerator plants in the world)
   Incinerator system: Stoker Furnace

b. Minato Incinerator Plant
   Location : Japan
   Capacity: 900 tonnes of wastes per day
   Footprint: 2.9 hectares
   Incinerator system: Stoker Furnace

c. Shintoko Incinerator Plant
   Location : Japan
   Capacity: 1800 tonnes of wastes per day
   Footprint: 6.1 hectares
   Incinerator system: Stoker Furnace

Therefore, it is expected that a minimum of 3 hectares of footprint is required for a thermal treatment plant with capacity of 1,000 tonnes of wastes per day.
8.2.4 Site Options Description

There are two proposed site options for the thermal treatment plant (TTP) as presented by JPSPN on 20th June 2012, namely:

- Site Option A: at the existing Taman Beringin landfill site;
- Site Option B: bulky waste facility area (area to the west of transfer station).

The location and land use of two proposed site options for the TTP were shown in Figure 8-5 and Figure 8-6. Furthermore, detailed topographical survey on the two proposed site options for the TTP had been carried out and was shown in Appendix E.
(A3 Size)

Figure 8-5: Location Map of Two Proposed Site Options for Thermal Treatment Plant (TTP)
Figure 8-6: Future Land Use Planning at Two Proposed Site Options for TTP
Site Option A

Figure 8-7 showed the survey map of Site Option A. Referring to the survey data in Figure 8-7, it is a hilly area with ground elevation values from 51.0 m RL to 83.67 m RL, occupies an area size of 6.2 hectares. The boundary of the Site Option A mainly involved the slope of landfill. Soil investigation (SI) showed that the depth of the accumulated waste in the landfill is about 52 m from the top of landfill, while the depth to reach bedrock is about 72 m, as discussed in Section 8.1.3.

Site Option B

Figure 8-8 showed the survey map of Site Option B. The area in the project Site Option B is generally in average level with ground elevation at 56.0 m RL to 57.0 m RL. Figure 8-9 showed the location of the components within and surrounding of Site Option B (next to Taman Beringin Landfill), namely: Taman Beringin transfer station, DBKL plant nursery, a lake and bulk waste facility. Taman Beringin transfer station is located at the west of the landfill and occupied a space of about 3.2 hectares. A bulky waste facility with an area size of 0.7 hectares is located at the northwest of the transfer station. Next to the bulk waste facility is the DBKL plant nursery, with an area size of about 5 hectares. The nursery is fenced up with three main gates, one was facing the bulky waste facility, second is located at the south of the nursery which near to the housing area, and the third is facing the petrol station at the west. There are two petrol stations, namely Shell and Petronas with a distance of about 57 m from the fence of nursery. On the other hand, the nearest housing area i.e. Jinjang Utara is about 65 m away from the south border of the nursery. There is a lake (about 1.4 hectares) located within the DBKL plant nursery area. Topographical survey showed that the depth of the lake was about 2 m (level average 52.1 m RL to 53.5 m RL), as attached in Appendix E.

Figure 8-10 to Figure 8-13 showed the building and structure within the transfer station, bulky waste facility, DBKL plant nursery and around the petrol station, respectively.
Figure 8-7: Survey Map of Proposed TTP for Site Option A (At Taman Beringin Ex-Landfill Cell)
Figure 8-8: Survey Map of Proposed TTP for Site Option B (To The West of Taman Beringin Transfer Station)
Figure 8-9: Overall View of the Areas Identified at Taman Beringin
Site Feasibility for Thermal Treatment Plant at Taman Beringin Landfill

Figure 8-10: Buildings and Structure Identified at Transfer Station Area
Figure 8-11: Buildings and Component Identified at Bulky Waste Facility Area
Figure 8-12: Buildings and Structure identified at DBKL Plant Nursery Area
Figure 8-13: Land and Nearby Housing Area Identified near Petrol Station

- Kindergarten
- Temple
- Open Land beside Nursery
- Land Clearing
- Empty Land behind Petrol Station
8.2.5 Site Option A

8.2.5.1 Case Study

There were two (2) case studies found on constructing TTP on ex-landfill site, which are as follows:

(i) Shinkoto Incinerator Plant in Japan
(ii) Mapo Incinerator Plant in Korea

(i) Shinkoto Incinerator Plant in Japan

Shinkoto Incinerator Plant was built in 1988, on a footprint of 6.1 hectares. The capacity of the incinerator plant is 1800 tonnes of wastes per day. It was constructed at the closed off-shore type landfill in Tokyo and now is in operation. The waste buried under the incinerator plant building was first evacuated and the surface soil was then improved by sand compaction pilling. About 5500 sand compaction piles with 15m in depth were installed with 2 m spacing for the purpose of ground improvement, degassing and homogenization of refuse layer. The whole building was on the pile foundation structure, where the number of piles was about 500 with each length of 50 m -55 m. 

Figure 8-14 showed an illustration of the foundation work of the incinerator plant building.

![Figure 8-14: Foundation Work of Shinkoto Incinerator Plant Building](image)
(ii) Mapo Incinerator Plant in Korea

Mapo Incinerator Plant was built on 2005 for the capacity of 750 tonnes of waste per day. Previously, it was a landfill site of around 280 hectares, named as Nanji or Sang Am Landfill, as reported by Halla (2002). The huge area of landfill site was then transformed into a recreational park and golf course. The waste-to-energy (WTE) incinerator was built in between the park and the golf course, as shown in Figure 8-15. Besides that, the residential area and world cup stadium were located within 0.5 – 1.5 km to the WTE incinerator.

Figure 8-15: Location of Mapo Incinerator Plant
The Mapo Incinerator Plant site was prepared as follows:

(i) **Removal of Existing Waste**
   - Wastes that were underground the structure were removed.
   - The removed wastes were then store temporarily on landfill site and treated after the incinerator was completed.

(ii) **Foundation Pilling**
   - Foundation piling was installed into stable soil through waste layer to ensure the soil stability.

(iii) **Landfill Gas Mitigation**
   - As for landfill gas generation issue, the landfill gas was collected by collecting pipe and used as fuel.
   - HDPE membrane sheets were installed under the incinerator building to prevent seepage of landfill gas into the building.
   - Landfill gas detections and safety systems were installed in place around and at the incinerator building as second precaution measure.

**Figure 8-16** showed the description on the construction of Mapo Incinerator Plant Building.

![Figure 8-16: Description on Construction of Mapo Incinerator Plant](image)
8.2.5.2 Issues with Site Option A

Site Option A is located on a part of the landfill area. The boundary of the Site Option A mainly involved on the slope of landfill. A few criteria need to be considered for the Site Option A as follows:

a) High cost of site preparation due to removal of existing waste and slope stability
b) Soil stability and settlement
c) Landfill gas generation and explosion risk
d) Buffer issue
e) Access route

a) High Cost of Site Preparation due to removal of existing waste and slope stability

Waste layers under landfill are not stable for TTP construction as it might encountered for settlement. Based on the case studies discussed previously in Section 8.2.5.1, the wastes need to be removed and the surface of the soil need to be improved by sand compaction pilling, for the purpose of ground improvement, degassing and homogenization of the refuse layer. The amount of waste received at Taman Beringin Landfill had been determined through the waste data record, as discussed in Section 8.1.2. The accumulated amount of waste received at Taman Beringin Landfill was approximately 8 million tonnes. To remove such high amount of waste, the operational cost would be costly. By considering the tipping fee (RM49 per tonne) charged at Bukit Tagar Sanitary Landfill (Berjaya Corporation Berhad, 2012), the total cost for waste disposal at Taman Beringin Landfill will be approximately RM400 million. This amount had not yet included the cost of mining work and logistics to transport the waste. The removed waste will end up sending to Bukit Tagar Sanitary Landfill (BTSL) for proper disposal. If the removed wastes are chosen to be incinerated after the completion of the incinerator, the total waste from Taman Beringin Landfill (approximately 8 million tonnes) with the incinerator capacity of 1000 tpd, a period of 22 years will be required to incinerate the removed wastes.
The plateau of Taman Beringin Landfill consists of an area of 2 hectares, which was insufficient to construct the TTP. Moreover, stability of the design slope for Site Option A must be taken into the consideration due to the existing slopes along the boundary of the proposed location of Site Option A. According to the planning development guideline at hilly area which was published by Jabatan Perancangan Bandar dan Desa Selangor Darul Ehsan in November 1997, no development was allowed at the area which was the existing slope more than or equivalent to 25 deg. From the topography survey in Figure 8-7, it was shown that the slope at existing closure landfill is more than 25 deg. Thus, cut and fill works will be required to create a large area size and more stable platform.

For proposed cut slope, the gradient required was 1: 1.5, whereas for proposed fill slope, the gradient required was 1: 2.0. All cut and fill slopes needed to be designed to achieve the minimum Factor of Safety (FOS) in accordance to JKR requirement for slope i.e. 1.50 against global and local failure. When stability of the slope did not achieve the required FOS, horizontal drains (internal) were to be provided in cut slopes and sand fill drainage blankets in fill slope to control the water levels. Surface drains will also be designed to control infiltration.

The proposed platform level (54 m RL) after cut and fill was shown in Figure 8-17. From the computation by using software MX from Bentley, a total area of 5 hectares including the slope embankment was required for the 3 hectares footprint of TTP. Half of the existing wastes in this landfill (within 5 hectares area of proposed platform) need to be mined or about 2,700,000 m$^3$ of the waste need to be removed. Then, about 2,000,000 m$^3$ of fresh soil needed to fill up the vacant mined waste in order to obtain the proposed platform level.
Figure 8-17: Proposed Elevated Platform (about 54 m RL) for constructing TTP at Site Option A
b) **Soil Stability and Settlement**

The consolidation settlements were expected to occur over the filling area and old rubbish area. Fill area and old rubbish area were expected to settle in different rates of settlement due to the original material of the landfill which is rubbish. The different rates of settlement between cut and fill area will affect the platform level of the TTP. The impact and behaviour of the long term settlement on the project earthworks platform level will need to be analysed and studied in detailed design stage.

For earthwork platform where long term settlements were expected to occur, it was mandatory that the TTP’s building will be founded on piles. The design of the foundation piles must also take into consideration the negative down drag acting on piles due to the settling fill. Besides that, the site is underlain by limestone, hence the recommended foundation for TTP on limestone area is pile foundation. The result of SI showed that the depth of bedrock from the proposed platform level (54 m RL) is about 29 m depth.

c) **Landfill gas generation & explosion risk**

Landfill gas consists of methane gas, which may cause the potential of explosion risk. Public health and safety issues associated with landfill gas arose primarily from its methane content, which at sufficient concentrations could present possible explosion and asphyxiation hazards in structures and confined spaces. Gas samples from active landfills consisted of 45 – 60 vol% (dry) methane and 40 – 60 vol% (dry) carbon dioxide, which was shown in **Table 8-4**. Based on the landfill gas monitoring report prepared by Cypark Sdn Bhd from January 2008 until December 2009, the methane gas measurement was up to 50% at some of the sampling stations. This indicated that the landfill had not stabilised yet at the end on the monitoring period e.g. towards the end of December 2009. A stabilised landfill was characterised by methane concentrations below 1% by volume and carbon dioxide concentration below 1.5% by volume at the probe monitoring locations. The flammability or explosive limit of methane was between 4.4 – 5.0 vol% (lower explosive limit, LEL) and 15 – 17 vol% (upper explosive limit, UEL). If the methane concentrations were within the
range of LEL and UEL, the gas will ignite in the presence of ignition sources.

Table 8-4: Typical Constituents in Landfill Gas

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent (dry volume basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane</td>
<td>45 - 60</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>40 - 60</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>2 - 5.0</td>
</tr>
<tr>
<td>Oxygen</td>
<td>0.1 - 1.0</td>
</tr>
<tr>
<td>Sulphides, Disulphides, Mercaptans, etc</td>
<td>0 - 1.0</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>0 - 0.2</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>0.01 - 0.6</td>
</tr>
</tbody>
</table>

Source: Trace Organic Constituents in Landfill Gas, Department Civil Engineering, University of California, Davis, November, 1987

Referring to a case study of Korea Mapo waste-to-energy incinerator project which was built on an existing landfill site, there (3) important measures were implemented to safeguard against the risk of landfill gas:-

i) Landfill gas collection pipeline should be installed below the plant to channel any accumulated landfill gas out of the plant building.

ii) A High Density Polyethylene (HDPE) membrane sheet should be installed under the building to prevent the seepage of landfill gas into the building. Methane is less dense than air, and pockets of methane contained underground tends to migrate in fissures or permeable zones towards the ground surface. Accumulation of methane in confined spaces such as manholes and chambers as well as poorly ventilated areas of buildings on or adjacent to the site will pose the risk of fire and explosion. The risk of explosion is higher due to the presence of high temperature sources within the plant building i.e. incinerator.
iii) Landfill gas detectors should be installed in the building to monitor the level of landfill gas at the workplace. Regular monitoring shall also be carried whereby portable gas samplers should be used to measure methane and carbon dioxide concentrations in all voids and areas in the basement and/or ground floor and wall cavities of the building. If possible, measurements should be made in each location before allowing ventilation to occur (e.g. measure under a door before opening). If landfill gas is detected, the cause should be remedied as soon as practically possible. Generally, if methane in excess of 10% LEL is detected, gas control measures will be required. If concentrations are found to exceed 1% by volume methane or 1.5% by volume carbon dioxide, the building should be evacuated, all ignition sources (including electricity) switched off, and remedial work carried out as soon as possible under an approved health and safety plan prior to reoccupation. The potential of occurrence of such incidents i.e. evacuation and remedial actions will disrupt the overall operation of the TTP.
d) **Buffer Issue**

Taman Seri Utara Kipark is a residential area consisting 170 units of triple storey terrace house, which is located to the east of Site Option A. The distance between TTP and Taman Seri Utara Kipark is about 260 m. Besides that, there is another residential area namely Taman Aman Putra located to the south of Site Option A. It is 5 blocks of 10 storey apartments with comprising 1000 units. The distance between TTP and Taman Aman Putra is about 150 m. **Figure 8-18** showed the location map of proposed 3 hectares footprint of TTP at Site Option A, and the distance between TTP and nearest residential areas.

e) **Access Route**

Currently, vehicles need to pass through residential areas i.e. Jinjang Utara and Taman Nanyang in order to enter the landfill site (Site Option A) at the south. In future, waste trucks that use this route to transport the waste will cause an issue among the residences. It should be noted that there is limited access route directly from MRR2 to the site.
(A3 Size)

Figure 8-18: Location Map of Proposed 3 Hectares Footprint of TTP at Site Option A
8.2.6 Site Option B

8.2.6.1 Issues with Site Option B

Site Option B consists of Taman Beringin transfer station, DBKL plant nursery, a lake and bulk waste facility, as described previously in Section 8.2.4.

A few criteria need to be considered for the Site Option B as follows:

a) Existing structure
b) Future land use planning
c) Buffer issue

a) Existing Structure

A site visit had been organised on 29th November 2012 to identify the building and other components at the area of this site option. In general, the total land area (about 8.2 hectares) for Site Option B is more than enough for the minimum requirement of 3 hectares. The building and other components identified are discussed previously in Section 8.2.6, which are: Taman Beringin transfer station, DBKL plant nursery, a lake and bulk waste facility. For site preparation, Site Option B needs to take into consideration of the cost of the demolishing the existing structures, such as the existing DBKL nursery and bulky waste facility area. In addition, the relocation of the TNB Substation and realignment of the existing underground service line will need to be carried out. If the TTP footprint extends into the area of lake, additional backfilling works was required to fill up the lake. From the computation by using software MX from Bentley, the filling volume is about 20,000 m³ in order to obtain the proposed platform level of 56.0 m RL.

b) Future Land Use Planning

Based on the draft of Kuala Lumpur City Plan 2020 as shown in Figure 8-19, it can be observed that an overhead transmission line is proposed to be installed, which will overlap with the proposed Site Option B location. Besides that, there is a future planning by DBKL to develop additional residential areas, which also will overlap with the proposed Site Option B as shown in Figure 8-20.
Source: Draft Kuala Lumpur City Plan 2020

Figure 8-19: Location of Overhead Transmission Line on Site Option B
Source: Draft Kuala Lumpur City Plan 2020

Figure 8-20: Future Residential Planning on Site Option B
c) **Buffer Issue**

*Figure 8-21* and *Figure 8-22* showed two proposed alignment of Site Option B, namely Site Option B1 and Site Option B2, with 3 hectares footprint. It can be observed that the distance between the TTP and residential areas i.e. Jinjang Utara is about 100 m. Besides that, there is the presence of petrol pump stations (Shell and Petronas) at western section of Site Option B, with the distance approximately 75 m away.
Figure 8-21: Location Map of Proposed 3 Hectares Footprint of TTP (B1) At Site Option B
Figure 8-22: Location Map of Proposed 3 Hectares Footprint of TTP (B2) Site Option B
8.2.7 Comparison of Both Site Options

The comparison of the issues between Site Option A and Site Option B was summarised in Table 8-5.

For site preparation, Site Option A is required to remove the existing wastes. The amount of wastes that required to be mined is approximately 8 million tonnes. It should be noted that this would increase the construction cost of Site Option A as waste mining operation was costly. Furthermore, the removed waste need to be properly disposed, where tipping fee was charged RM49 per tonne of waste disposed to BTSL. Engineering risk such as slope stability issue need to be considered, where slope stabilization design is required between the existing landfill and the cut and fill area. On the other hand, Site Option B needed to take the surrounding existing structure into account, which is: bulky waste facility, DBKL nursery and lake. The existing lake with the depth of about 2 m is required to be filled for the construction of TTP. However, this would be involved a lower cost, compared to Site Option A.

As for soil stability, Site Option A will need more and deeper pilling as the bedrock level is located 72 m from top of the landfill, whereas Site Option B, the depth of piling required was approximately 14m. This is due to location of Site Option A on the landfill hill, whereas Site Option B is located on the flatland to the west of the Transfer Station.

Besides that, Site Option A need to take into account of landfill gas issue, where a careful control program on landfill gas is required during construction and operation phase to avoid explosion risk. Site Option B could share the existing access of transfer station, whereas access to Site Option A is limited and will need to pass through residential areas i.e., Taman Nanyang and Jinjang Utara.

Both Site Option A and Site Option B shared the same issues such as: buffer issue and incompatible of future land use. For instance, both Site Option A and Site Option B do not have sufficient required minimum buffer distance of 500m away from residential...
areas. Besides that, both site options are near to future planning residential area.

Table 8-5: Comparison of Site Option A and Site Option B

<table>
<thead>
<tr>
<th>Issue</th>
<th>Site Option A (on top of the landfill)</th>
<th>Site Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Preparation</td>
<td>Mining of waste (about 8 million tonnes)</td>
<td>Filling the lake (~ 2m depth)</td>
</tr>
<tr>
<td>Soil Stability</td>
<td>Deeper (bedrock level 72m) and more pilling required</td>
<td>Pilling on about 14m</td>
</tr>
<tr>
<td>Engineering Risk</td>
<td>Slope stability issue</td>
<td>-</td>
</tr>
<tr>
<td>Landfill Gas Issue</td>
<td>- A careful control program required during construction and operation phase</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Explosion Risk</td>
<td></td>
</tr>
<tr>
<td>Buffer Issue</td>
<td>- Insufficient buffer (&lt; 500m)</td>
<td>Insufficient buffer (&lt; 500m)</td>
</tr>
<tr>
<td></td>
<td>- Close to high end residential area (i.e. Taman Kipark)</td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>- Limited access</td>
<td>Existing access (to transfer station) available</td>
</tr>
<tr>
<td></td>
<td>- Will pass through residential area</td>
<td></td>
</tr>
<tr>
<td>Existing Structure</td>
<td>- Bulkly waste facility</td>
<td>- DBKL nursery</td>
</tr>
<tr>
<td></td>
<td>- DBKL nursery</td>
<td>- Lake</td>
</tr>
<tr>
<td>Incompatible of future land use</td>
<td>Near to future planning residential area.</td>
<td>Near to future planning residential area.</td>
</tr>
</tbody>
</table>

**In conclusion, Site Option B was recommended and more suitable to built TTP due to lower engineering risk and cost.**
8.2.8 Recommendations

Recommendations on constructing TTP at Site Option B proposed are as follows:

a) Coordination with other government agencies on land use issue
b) Integration of TTP with existing transfer station facility
c) Submission of PAT
d) EIA approval

8.2.8.1 Coordination with Other Government Agencies

There are existing structures i.e. Taman Beringin transfer station, DBKL nursery, lake and bulky waste facility within Site Option B. These existing structures need to be relocated to utilize the land for TTP construction. Coordination with DBKL is recommended to relocate DBKL nursery. Besides, the bulky waste facility also needs to be relocated to obtain adequate 3 hectares footprint for TTP construction.

Besides that, as discussed in Section 8.2.6.1, future land use planning for overhead transmission line and future residential area within and surrounding the site option B was observed in draft Kuala Lumpur City 2020. A meeting with DBKL is required to discuss and revise the zoning, so that there is sufficient of developing area for TTP without any incompatibility of land utilization.

8.2.8.2 Integration of TTP with Existing Transfer Station Facility

The survey plant layout of Taman Beringin transfer station is shown in Figure 8-23. This facility is located next to the proposed site option B. It is recommended to integrate the physical facility structure and operation of both TTP and the existing transfer station in future. The facilities such as access road, truck parking lot, weighbridge, administrative office, etc can be shared in order optimize the use of space at this area. The integration of both facilities may become an integrated waste treatment complex to process the waste generated from Kuala Lumpur. Besides, the integration of operation of both facilities may not only enhance the efficiency of waste processing operation, it also may improve the management of solid waste.
Figure 8-23: Integration of TTP with Existing Transfer Station
8.2.8.3 Submission of PAT

A systematic approach towards site selection has also been proposed in the EIA Guideline by DOE. This is shown in Figure 8-24.

![Diagram](https://example.com/diagram.png)

**Figure 8-24: Systematic Approach towards Site Selection for Solid Waste Incineration Plant**

*Source: EIA Guidelines for Development of Solid Wastes Incineration Plant, 2013*
The guideline outlines exhaustive site selection criteria which were aimed at assisting project planners to choose the best site option from a list of available options. However, in the case of the proposed TTP at Taman Beringin, the site had been pre-selected. Therefore, the approach used shall be based on determining the fulfillment of the site with respect to a list of criteria (political, technical, environmental, social, and economics). These criteria were based on the Table 5-6: Sample Matrix for Ranking of Pre-Determined Sites for Solid Waste Incineration Plant (Appendix F) in the EIA Guideline. In the context of the proposed TTP in Taman Beringin, the site options shall be evaluated based on selection of the various sub-sites located within the boundary of the closed landfill site and/or transfer station. The EIA Guideline also emphasized that the selected site shall be subjected to PAT prior to being subjected to DEIA study. The submitted PAT document and the corresponding response from DOE KL shall be included as appendix in the DEIA report for reference.

The PAT document for the proposed site for the TTP within the closed landfill was prepared and submitted to DOE KL on 14\textsuperscript{th} November 2012. The submitted PAT document was attached in Appendix G.

By 29\textsuperscript{th} November 2012, DOE KL has reply to the application. In the reply letter, it was mentioned that the outcome of this study will be used as part of the evaluation of PAT application. The reply letter was also attached in Appendix G.

In 29\textsuperscript{th} January 2013, a discussion between the study team and DOE KL has been organized at DOE KL office to further facilitate the process of PAT submission.

By 8\textsuperscript{th} February 2013, DOE KL has replied to that discussion by requesting some further information to proceed the PAT evaluation. The requested information are as follows:

a. Comments from Jabatan Perancang Bandar, Dewan bandaraya Kuala Lumpur
b. Comments from Jabatan Perancangan Bandar dan Desa (JPBD) Kuala Lumpur
c. TTP technology selection
8.2.8.4 EIA Approval

Based on the general site selection criteria for the development of solid wastes incineration plant, the following shall be observed:-

“In general, the minimum buffer distance adopted in Malaysia for solid waste incineration plant is 500 m radius (measured from the boundary of plant). This distance follows the general guideline adopted for heavy industry under DOE’s Guidelines for Siting and Zoning of Industries. However, it shall be noted that with the advancement in technology, the potential impacts could be minimised by applying best available techniques (BATs). Hence, the minimum buffer distance for SWI from any environmentally-sensitive areas (ESAs) such as residential areas or ecologically-sensitive areas should be provided at 500 m (measured from the boundary of the plant) unless it could be proven that the distance could be minimised via scientific data, technology selection e.g. BAT or detailed studies i.e. modelling results for air pollutants dispersion etc. Other applicable guidelines such as Garis Panduan Perancangan Infrastruktur dan Utiliti (GP006-A) (Final Draft, March 2011) by Department of Town and Country Planning shall also be referred to during the determination of buffer zone requirements for proposed SWI projects.

In cases whereby the appropriate buffer distances could not be met and the project is critically required to be sited at the specific location, additional engineering and/or operational controls might be considered acceptable to reduce the zone of impact of potential pollution arising from the project. The reduction in zone of impact enabling the reduction of buffer distance shall be clearly demonstrated in the DEIA study in the form of findings backed up by sound technical justifications. However, this shall be referred to on a case-by-case basis and the onus shall be on the Project Proponent to select a suitable site prior to resorting to a site with insufficient buffer distance.”

Source: Adopted from EIA Guidelines for Development of Solid Wastes Incineration Plant (draft 2012, printing in progress)

Based on the above, the following could be summarised:-

a) Minimum buffer distance required (measured from boundary to boundary) is 500 m;

b) Requirement for buffer distances shall be cross-referenced to Garis Panduan Perancangan Infrastruktur dan Utiliti (GP006-A) (Final Draft, March 2011 or the latest version) by Department of Town and Country Planning (please refer to Section 8: Tapak Loji Rawatan Termal); and
c) In the event whereby the minimum buffer distance of 500 m could not be achieved and the development of the TTP at that specific site is critically-required, additional engineering measures reflecting the Best Available Techniques (BAT) to reduce pollution levels (air, water, noise etc) shall be adopted to justify the reduction in buffer distance. These justifications shall be presented in the DEIA findings to support the selection of the said site.

In the case of the proposed thermal treatment plant at Taman Beringin, it was foreseen the insufficient of buffer distance as stated in the Guideline. Therefore, justifications from the study of environmental impact i.e. air dispersion modelling for chimney emissions and health impact assessment should be prepared to support this proposed site.
9.0 CONCLUSIONS

Based on the presentation by JPSPN on 20th June 2012, two site options for constructing 1000 tonnes per day (tpd) thermal treatment plants (TTP) had been proposed as follows:
- Site Option A: at the existing landfill site;
- Site Option B: bulky waste facility area (area to the west of transfer station)

To evaluate the suitability of both proposed site options, the Study team had carried out the following tasks:
- Literature review of existing TTP
- Topographical survey and soil investigation (SI)
- Secondary data

From that, the Study team had identified a few criteria that need to be considered for Site Option A, which are as follows:
- High cost of site preparation
- Soil stability and settlement
- Landfill gas generation and explosion risk
- Buffer issue
- Access issue

While, for Site Option B, the Study team had identified the criteria that need to be taken into account, which are as follows:
- Existing structure
- Future land use planning
- Buffer issue

Therefore, from the site evaluation, the Study team recommended that Site Option B is more suitable for constructing thermal treatment plant (TTP) due to lower engineering risk and cost. Besides that, the study team had further recommended a few future actions as follows:
a. Coordination with other government agencies on land use issue  
b. Integration of TTP with existing transfer station facility  
c. Environmental Impact Assessment (EIA) approval  

To facilitate the process of EIA, a Penilaian Awal Tapak (PAT) document for the proposed site for the TTP was prepared and submitted to DOE Kuala Lumpur (KL) on 14\textsuperscript{th} November 2012. By 29\textsuperscript{th} November 2012, DOE KL had reply to the application. A discussion between the Study team and DOE KL had been organized to further facilitate the PAT process on 29\textsuperscript{th} January 2013.
LIST OF REFERENCES


Draft Kuala Lumpur City Plan 2020

Draft Kuala Lumpur Structure Plan 2020

EIA Guideline for Development of Solid Waste Incineration Plant (Draft), Department of Environmental


Garis Panduan Perancangan Infrastruktur dan Utiliti (GP006-A), Jabatan Perancangan Bandar dan Desa, March 2011


Restoration Master Plan for Taman Beringin Landfill, volume I to IV, Cypark Sdn Bhd.
LIST OF APPENDICES

Appendix A : Past Environmental Monitoring Data
Appendix B : Waste Record Data
Appendix C : Report of Soil Investigation (SI)
Appendix D : Evaluation of Thermal Treatment Technologies
Appendix E : Topographical Survey Drawing
Appendix F : Table 5-6_Selection Criteria for Pre-Determined Site
Appendix G : Submitted Penilai Awal Tapak (PAT) for Proposed Thermal Treatment Plant (TTP) and Replied Letter