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**RE: Light Horse Business Centre Modifications – Air Quality Assessment**

## 1 INTRODUCTION

The Light Horse Business Centre (LHBC) commissioned an Environmental Assessment (EA) in 2008 for approval to operate a waste processing facility at Eastern Creek landfill site. An Air Quality Impact Assessment (AQIA) formed part of this EA.

The LHBC are now proposing minor modifications to the approval and PAEHolmes has been requested to assess these modifications and their potential impact on air quality predicted in the AQIA (**HAS, 2008**).

## 2 PROPOSED MODIFICATIONS

The proposed modifications to the LHBC waste processing facility are listed below.

- **Modification 1** – The postponement of the construction of certain buildings and parts of buildings.
- **Modification 2** – The construction of a silo/hopper (within MPC building), with electrically powered conveyor (covered) and chute for the conveyance of shredded waste directly from the processing centre to the bottom of the landfill.
- **Modification 3** – Changing one of the internal roads from one-way traffic to two-way.
- **Modification 4** – The construction of concrete bay walls within the area designated for receipt and processing of green waste.
- **Modification 5** – The relocation of the wheel-wash to a position 100 metres further north on Second Avenue.

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### 3 SUMMARY OF AQIA FINDINGS REGARDING DUST

These results relate to the assessment of the proposed LHBC Eastern Creek Landfill Project prior to the proposal of modifications as listed in **Section 2**.

The results from the AQIA (**HAS, 2008**) report were compared with the air quality criteria listed by the NSW Department of Environment, Climate Change and Water (DECCW). These results indicated that there were no anticipated exceedances of the assessment criteria regarding annual average deposited dust levels, total suspended particles (TSP) or particulate matter less than 10 microns (annual average PM<sub>10</sub>) due to the proposed landfill. The AQIA did however indicate that 24-hour average levels of PM<sub>10</sub> may exceed the criterion on occasion.

The assessment criterion for 24-hour average PM<sub>10</sub> relates to the total burden of dust in the air and not just the dust from the project being assessed. In other words, some consideration of background levels needs to be made when using this criterion to assess impacts. The average background level of PM<sub>10</sub> for the LHBC site was determined in the AQIA to be 20 µg/m<sup>3</sup>, however for some 24-hour periods, including during dust storms and bushfire periods, this background level was higher than the DECCW criteria of 50 µg/m<sup>3</sup>. Contributions of PM<sub>10</sub> from the LHBC operations are not considered to cause an exceedance of the goal at these times as the goal was already exceeded due to more regional factors.

Assuming an average background PM<sub>10</sub> level of 20 µg/m<sup>3</sup>, the approximate number of exceedances of the DECCW 24-hour PM<sub>10</sub> criterion was predicted to be around four exceedances per year at the nearest residence (**HAS, 2008**). This is within the DECCW guidelines of five allowable exceedances of 50 µg/m<sup>3</sup> per year.

### 4 IMPACTS OF MODIFICATIONS ON DUST EMISSIONS

#### 4.1 Modification 1

Postponement of the construction of some of the site buildings is not anticipated to significantly affect the conclusions of the AQIA in regard to dust emissions and resultant concentrations predicted at residences. Compared with ongoing sources of dust from landfill operations, construction activities are of a short-term nature and are not considered to be a major source of dust emissions for this project. They do, however, as noted in the AQIA, have the potential to cause nuisance impacts if not properly managed.

The earthworks activities will be completed in accordance with the original timetable, with only the construction of the buildings postponed. Any areas exposed for prolonged periods of time will be either grassed or bitumen capped and as such will not be sources of dust due to wind erosion.

It is desirable that monitoring be carried out during the construction phase of the project (also per the AQMP) to assess compliance with DECCW criteria.

#### 4.2 Modification 2

The use of a conveyor to transport waste to the bottom of the landfill, rather than haulage of waste by truck, will have a significant impact on the conclusions of the AQIA. The haulage of waste by truck to the bottom of the landfill was reported in the AQIA to contribute an anticipated 92 t/y of dust (approximately 47%) to the total emissions from the site in the initial year of operations. This is reduced over the life of the project to approximately 28 t/y of dust in Year 13 and 23 t/y in Year 20, as hauling trip-lengths decrease as the landfill reaches capacity.

These emissions due to haulage would be eliminated by the use of the covered conveyor, reducing the overall emissions from the site to approximately 103 t/y (53% of modelled emissions) in the initial year of operations, as opposed to 195 t/y with haulage. In Years 13 and 20, the dust emission due to haulage is around 20% of the anticipated total emissions reported in the AQIA.

The conveyor is covered and conveying is not therefore anticipated to be a significant source of dust emissions. The conveyor loading point is also enclosed within the MPC building, it is not considered to be a source of dust.

The modelling process used to obtain the results presented in the AQIA involved dividing emissions from the landfill site amongst 18 sources and included the consideration of the particle size characteristics of dust from each source and the interaction of meteorological conditions with activities occurring at different times of the day on different parts of the site. Without repeating this modelling process it is not possible to quantitatively predict the level of dust that might be experienced at nearby residences considering the proposed modification of the landfill. It is however, clear that as total emissions from the site are anticipated to be reduced by almost half, the level of dust at the residences would be expected to be significantly less than that predicted in the AQIA.

Prior to the proposed modifications, it was anticipated that exceedance of the DECCW criteria for 24-hour average PM<sub>10</sub> may occur on around 4 days per year (with background levels at 20 µg/m<sup>3</sup>). It is anticipated that the likelihood of exceedance of this criteria will be significantly reduced by this use of a conveyor to transport waste to the bottom of the landfill.

During periods of increased background PM<sub>10</sub> concentrations, the likelihood of an exceedance of the criteria at residences is also increased. The AQMP details PM<sub>10</sub> monitoring to be carried out for the site along with trigger levels and appropriate actions to ensure that the landfill operation does not cause exceedance of the DECCW criteria at nearby residences.

As noted in **Section 3**, the predicted levels of annual average deposited dust, TSP and PM<sub>10</sub> due to the proposed landfill, prior to the modifications, were within the DECCW criteria. Therefore it can be concluded that the modified landfill, which is anticipated to create significantly less dust, would also meet these criteria.

### **4.3 Modification 3**

The changing of one of the internal roads from one-way traffic to two-way traffic is not anticipated to cause any change in predicted dust emissions from the site or to corresponding dust levels at nearby residences. This road will have a sealed road surface, as indicated in the original development proposal for the landfill.

### **4.4 Modification 4**

The construction of concrete bay walls within the area designated for receipt and processing of green waste will have little effect on the dust emissions from the site or the corresponding dust levels at nearby residences.

### **4.5 Modification 5**

The relocation of the wheel-wash to a position 100 metres further north on Second Avenue is likely to result in a slight reduction in dust emissions from the site. The intention of this modification is to reduce the distance travelled by trucks on the sealed road after visiting the stockpile area before having their wheels washed. In the original design vehicles would need to travel approximately 200m along the internal site road before using the wheel-wash, bringing dust from the stockpile area onto the sealed road.

As was noted in **Section 4.2**, the effect of this modification cannot be quantitatively assessed without further modelling. While the movement of the wheel-wash would be beneficial in reducing the dust emissions from the site, it will be a minor reduction in terms of the overall emissions, and is not likely to be detectable at the nearest residences.

## 5 SUMMARY OF AQIA FINDINGS REGARDING ODOUR

The AQIA concluded that predicted odour levels due to landfill operations would be around 1.1 odour units at the 99<sup>th</sup> percentile. The most stringent DECCW odour criteria, 2 odour units (at the 99<sup>th</sup> percentile), was not predicted to be exceeded at nearby residential areas, indicating that adverse odour impacts due to the project would not occur.

## 6 IMPACTS OF MODIFICATIONS ON ODOUR EMISSIONS

### 6.1 Modification 1

Modification 1 is not relevant to odour and is therefore not anticipated to have any significant effect on odour emissions from the proposed operation.

### 6.2 Modification 2

Modification 2 is not relevant to odour and is therefore not anticipated to have any significant affect on odour emissions from the proposed operation.

### 6.3 Modification 3

Modification 3 is not relevant to odour and is therefore not anticipated to have any significant affect on odour emissions from the proposed operation.

### 6.4 Modification 4

Modification 4, the construction of concrete bay walls within the area designated for receipt and processing of green waste, is likely to have the effect of reducing odour emissions from the site at nearby residences. This is due to the fact that construction of concrete bay walls will allow the green waste composting area to be more easily fitted with equipment to aerate the composting green waste and also to install covers over the green waste.

#### 6.4.1 Modelling of Green Waste Composting in AQIA

Green waste composting odour emissions in the AQIA were modelled as being shredded and stockpiled in uncovered windrows. It was noted in the AQIA, that the green waste to be composted was primarily to be sourced from green waste cleanups and therefore would comprise mostly garden waste.

Up to 20,000 t of green waste may be stockpiled on site at any one time. The water collected from a sump at the green waste stockpiles will be re-circulated by pumping from the sump and allowing it to gently seep out of perforated pipes at several locations across the windrow, to aid in the green waste composting process, with any excess directed to a leachate treatment plant. After a resting period of eight weeks the product will be tested and available for sale or alternatively be blended, tested and available for sale.

Odour emissions from windrows were assumed to be equivalent to measurements on green waste at Australian Native Landscapes operations at Eastern Creek (**HAS, 2003**). It was assumed that the total area of the green waste windrows occupies no more than 5,000 m<sup>2</sup>. Green waste windrows were modelled as area sources using CALPUFF (Version 6.113). Odour emissions in the dispersion

model were multiplied by the recommended near-field peak-to-mean ratios for different source types to predict odour levels for nose response times.

Odour from the green waste windrows was estimated in the AQIA to be a significant proportion (22 percent) of the total odour emissions from the site; with green waste composting contributing approximately 1,200 ou.m<sup>3</sup>/s out of a total 5,907 ou.m<sup>3</sup>/s in neutral conditions and 1,300 ou.m<sup>3</sup>/s out of a total 5,435 ou.m<sup>3</sup>/s in stable conditions. Any improvement in odour emissions from green waste composting will therefore cause a further reduction in the likelihood of any unfavourable odour detections at residences, noting that predicted odour contours in the AQIA were already within DECCW criteria.

In addition, the AQIA reported the proposed use of a product referred to as "BioMagic", which acts as an oxidising agent to speed up the bacteria consumption of waste in order to reduce or eliminate odours although no emission reduction was assumed for the dispersion modelling.

#### 6.4.2 AQMP Recommendations Regarding Green Waste Composting

The AQMP for the proposal (**HAS, 2009**) noted that, to minimise odour, landfill operators should avoid activities that result in peak odour events (such as mixing, turning, aeration, screening, etc) during unfavourable dispersion conditions such as calm/low wind speeds and stable atmospheric conditions.

The AQMP also detailed basic odour monitoring practices that would help ensure that odour levels at the boundary were kept within the DECCW criteria.

As noted in the AQMP, further details on the required process controls, including recommended pH, temperature, C:N ratio, etc, should be obtained from appropriate best practice guidance including:

- AS 4454 – 2003: Composts, Soil Conditioners and Mulches (**Standards Australia 2003**);
- NSW DECCW Environmental Guidelines for Composting & Related Organics Processing Facilities (**DEC, 2004**); and
- General best practice guidelines for composting (**Sustainability Victoria 2009** and **WMAA, 2004**).

It is important that these recommendations in the AQMP are followed, in order to minimise odour emissions from the landfill and maintain compliance with DECCW criteria for odour at residences.

#### 6.4.3 Potential Impacts of Proposed Modification to Modelled Scenario

Without further modelling it is not possible to quantitatively predict the impact at residences from the construction of the concrete bay walls in the green waste area. A summary of available studies undertaken on the effectiveness of aeration and covering, however, has indicated that these controls, if employed, would have the potential to decrease odour emissions from the landfill. The practice of aeration and covering composting green waste is advocated in the relevant best practice standards and guidelines for composting (see **Section 6.4.2**).

##### 6.4.3.1 Aeration of composting green waste

**Sustainability Victoria (2009)** recommends the use of aeration equipment in any composting situation, to prevent formation of anaerobic conditions.

The primary effect of aeration on the formation of odorous compounds is related to its impact on oxygen concentration. Oxygen concentration determines the biochemical process at work

(anaerobic vs aerobic) and the compounds that form as a result. Odorous compounds that are a problem essentially only in anaerobic conditions include hydrogen sulfide and organic sulfides. Without oxygen, odorous compounds form and accumulate more readily and to a greater extent, increasing the intensity, unpleasantness and duration of the odours. Maintaining aerobic conditions can greatly reduce odour emissions (**IWMB, 2007**).

Several studies (within the mushroom industry, cited in **Duns, 2004**) have indicated that forced aeration may have varying degrees of effectiveness (ranging from 75-90%) in reducing odour emissions from composting materials. However, some studies (also cited in **Duns, 2004**) have shown that forced aeration can increase the levels of odorous compounds. It must be noted, however, that if compounds are continually or frequently dispersed at low concentrations, the dispersal may reduce their accumulation and lower the potential for problems when the composting mass is eventually disturbed (**IWMB, 2007**).

#### 6.4.3.2 *Covering of composting green waste*

**Sustainability Victoria (2009)** recommends covers on compost piles to minimise odour. According to the NSW DECCW Environmental Guidelines for Composting & Related Organics Processing Facilities (**DEC, 2004**), rapidly biodegradable organics<sup>a</sup> (including grass clippings) should be covered, and the quantity of such material exposed to the atmosphere should be kept to a minimum. When rapidly biodegradable organics are in an 'active state' during open-air handling and/or processing, they should be covered in order to reduce odour emissions. Material used for covering may be a gore-tex type fabric or simply the previous batch of compost or mulch prepared in the same area. The covering affords other benefits (summarised from **DEC, 2004**):

- Covering prevents the compost from getting too wet in the event of rainfall. When covered, the weather has less influence on the composting process, which means there will be better moisture control (**Beyer, 2008**). This ability to control the moisture content means an aerobic composting environment can be more easily maintained. As well as this, the covers limit run-on and infiltration of water, meaning there is less potential for odorous leachate to be formed as rainfall is kept out of the composting material. Whilst moisture is necessary for active decomposition, if too much moisture is present then water occupies the pore-spaces in the composting material, reducing the ability for oxygen to disperse throughout the compost (**IWMB, 2007**).
- Covering protects the composting organics from losing too much valuable heat and moisture.
- Covering makes it more difficult for vermin and vectors to get to the raw organics.
- Covering reduces fly propagation and rodent attraction.
- Covering controls and minimises the risk of fire.
- Covering minimises emission of biogas.
- Covering also decreases litter generation.

#### 6.4.4 Summary

The main advantage of the concrete bay walls is therefore that it allows for the implementation of such measures as forced aeration and covers for the composting green-waste. Whilst some trial and error appears to be involved in perfecting the composting process with regard to odour, these measures allow more control over the process. It was not anticipated in the AQIA that any adverse odour impacts due to the project would occur at nearby residences. Concrete bay walls themselves would do little to alter odour emissions from the landfill (which have already been predicted to lie

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<sup>a</sup> Rapidly biodegradable organics are defined as biodegradable organics, that are able to be decomposed under favourable conditions by microbial action, in both the presence and the absence of oxygen, to a noticeable extent within 14 days; rapidly biodegradable organics include grass clippings (**DEC 2004**).

within the DECCW criteria), however any subsequent composting controls employed, facilitated by this modification to the proposed landfill, namely aeration and covering of the composting green-waste, would potentially reduce odour levels at residences.

## 6.5 Modification 5

Modification 5 is not relevant to odour and is therefore not anticipated to have any significant affect on odour emissions from the proposed operation.

## 7 CONCLUSIONS

Each of the five proposed modifications to the LHBC landfill approval have been investigated in relation to the effect that they could potentially have on the generation of dust and/or odour at the site. These effects have been compared qualitatively to the results and conclusions in the AQIA (**HAS, 2008**) prepared for the development application in 2008.

The proposed modifications to the LHBC operations have the potential to significantly decrease dust emissions from the operation of the landfill. In particular, Modification 2, the use of a conveyor instead of haulage by truck, is likely to reduce dust emissions by around 47 percent in the initial year of operations. Combined with the measures detailed in the AQMP (**HAS, 2009**), this reduction in potential emissions makes it unlikely that any DECCW criteria for dust would be exceeded due to landfill operations.

The other proposed modifications have a less significant impact on the dust levels anticipated due to the landfill, however they are likely to be beneficial to the overall dust burden due to on-site operations.

With regard to odour, Modification 4, the construction of concrete bay walls in the green-waste composting area, has the potential to reduce odour emissions from the proposed landfill in that it may allow for further controls (aeration and covers) to be used. This will help to maintain optimal composting conditions in terms of odour. Without this modification the proposed landfill is still anticipated to comply with DECCW criteria relating to odour, and none of the other proposed modifications affect odour emissions from the site.

Dust and odour mitigation measures as outlined in the AQIA and the AQMP continue to be necessary in order to ensure that dust and odour emissions from the site are minimised and so that levels at the nearby residences do not exceed the DECCW criteria.

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## 8 REFERENCES

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