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DUNTON BRIDGE STREET NORTH
EMISSIONS TO AIR IMPACT ASSESSMENT

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1. INTRODUCTION

This report has been prepared in support of an application for an Environmental Permit by Dunton Technologies Limited ("Dunton"). Dunton proposes to operate a Hazardous Waste Treatment Facility located at Bridge Street North, Smethwick, UK.

The facility will treat asbestos and hydrocarbon impacted soils in an indoor facility, via physio-chemical treatment and bioremediation. The treatment process will discharge to atmosphere via abatement systems to four release points, A1 to A4.

The assessment has been developed to review the potential environmental impacts of the emissions from the new process.

2. RELEASE POINTS

There will be four emission points from the main processing building. The point source release points to air are defined as:

- A1 – extraction from the asbestos storage bays.
- A2 – extraction from the biopads.
- A3 – extraction from the asbestos hopper.
- A4 – extraction from the asbestos picking cabin.

2.1 A1 Extraction from the Asbestos Storage Bays

Each of the five asbestos storage bays will be located within the main building. In addition, each storage bay will be roofed in order to facilitate effective extraction. The extraction units from each of the five bays will combine to a single release point located above roof height. This release point has been designated as A1.

The extracted air will pass through an abatement unit containing a HEPA filter and carbon filter. HEPA filters will be incorporated to remove potential releases of dust and asbestos fibres. HEPA filters are recognised as being highly efficient at removing dust and particulate matter. A carbon filter has been included on this release point as some of waste will be accepted for asbestos treatment and bioremediation. Where both treatment routes will be used, the waste will first pass through the asbestos picking cabin prior to being moved to a biopad for bioremediation. There is therefore potential for hydrocarbons to be present during the initial storage phase and the carbon filters will be used to prevent potential releases of VOCs and odour.

2.2 A2 Extraction from the Biopads

Bioremediation is undertaken on engineered biopads within the main building. The extraction from the biopads involves a network of perforated aeration pipes that are installed beneath and within the biopiles. The aeration pipes are linked to a high-performance aeration system to allow air to be drawn through the biopile. This allows effective control of the oxygen levels and moisture content in the waste to maintain aerobic conditions.

The exhaust to air extraction system is connected to HEPA filter and then two carbon absorption units fitted in series. The abatement system is designed to capture and treat the degradation products (predominantly VOCs) and reduce particulate and odour emissions. The air extraction system draws air from the biopile where it is subsequently treated in the abatement system prior to release to atmosphere.

2.3 A3 Extraction from the Asbestos Hopper

Materials that are to be passed through the asbestos picking station are transferred from the waste storage bays, into a hopper. From the hopper the materials move via a covered conveyor into the asbestos picking cabin.

The hopper will have a separate extraction that is designated as release point A3. Again, the extracted air will pass through a HEPA and carbon filter arrangement to abate any potential releases of dust and VOCs.

2.4 A4 Extraction from the Asbestos Picking Cabin

Ventilation from the asbestos picking cabin will be extracted to release point A4 via a HEPA and carbon filter arrangement. The release point exit from the roof of the asbestos cabin. Since material for asbestos treatment may also contain hydrocarbons, the carbon filter is installed to prevent potential releases of VOCs.

HEPA filters are installed to abate potential releases of dust and asbestos fibres. However, it is unlikely that asbestos fibres will be released at this point since the pre-acceptance and acceptance procedures require the <0.1% asbestos fibres to be present in the waste materials.

3. EMISSIONS INVENTORY

The facility will process asbestos and hydrocarbon impacted soils. Therefore, the likely emissions from the process are dust, asbestos fibres and VOCs.

3.1 Dust and Asbestos

Operational controls are in place to minimise the emissions of dust and asbestos. Waste pre-acceptance and acceptance procedures are in places that require the asbestos free fibre content to be <0.1%. Waste soils will be kept damp during processing and material transfer to minimise the formation of dust.

Potential releases of dust will be abated using HEPA filters which are effective at capturing 99.95% of all particulates measuring 2 microns in diameter. The emissions of dust are therefore effectively zero due to the particles being too large to pass through the filter. Particulate matter has therefore been excluded from the assessment.

3.2 VOCs

The soils treated at the facility could be impacted by hydrocarbons. Analysis of soil samples has shown that the typical concentration in the soils is 2 ppm. It is not possible to determine the exact hydrocarbon profile of the soils as the types of contamination will vary. Therefore, it has been assumed that the hydrocarbons released from the soils are benzene.

Whilst the soils contain 2 ppm of hydrocarbons, it is not understood what fraction of this is volatile. Therefore, in order to make a conservative assessment, it has been assumed that 2 ppm is the concentration in the stack. Due to the limited data available, the concentration of the release is assumed to be the same for the short term and long term impacts.

The bioremediation process, storage bays and hopper (A1 A2 and A3) extraction systems operate at 2.63 m^3/s (9,360 $m^3/hour$), with a discharge velocity of 16.3 m^3/s.

The asbestos extract ventilation system (A4) operates at 5.85 m^3/s (21,060 $m^3/hour$) and discharges through a high velocity cone at 18.8 m/s.

The site is operation for 8 hours per day and 5 days per week. Therefore, the site is operational approximately 24% of the year. However, for the assessment, it has been assumed to be operational 100% of the year.

Abatement is provided by carbon filters, with the efficiency expected to achieve 90% reduction in concentration.

Table 1: Emission Parameters

Details	**A1, A2, A3**	**A4**
Flow Rate (m^3/s)	2.6	5.85
Flow Rate ($m^3/hour$)	9,360	21,060
Duct Diameter (m)	0.450	0.630
Efflux Velocity (m/s)	16.3	18.8
Actual Stack Height (m)	13.0	13.0
Effective Stack Height (m)	4.98	4.98
Peak Emissions		
Benzene (mg/m^3)	0.639	0.639
Annual Average Emissions		
Benzene (mg/m^3)	0.639	0.639

4. ASSESSMENT METHODOLOGY

This assessment has been prepared using the methodology defined in Environment Agency (EA) guidance: Air Emissions Risk Assessment for your Environmental Permit[1] to undertake the initial screening assessment of potential impacts. This will identify whether the potential for significant pollution exists, which may require more detailed assessment using detailed dispersion modelling. This assessment has used the EA risk assessment tool (also known as the H1 calculation tool) to undertake the required calculations.

According to the EA guidance, it is possible to screen out emissions that result in "insignificant" impacts and those emissions where further assessment is not required, based on the contribution to the appropriate air quality objective for each pollutant. Screening of the emissions is achieved using the simplified dispersion factors contained within the EA guidance. These factors are applied based on the effective stack height of the emissions source and are used to estimate the ground level concentration per release of pollutants.

The degree of dispersion, and hence the likely ground level concentration, arising from an elevated pollutant release is affected by the presence of other buildings or structures in the vicinity of the stack. These structures can cause downwash to occur, which increases the ground level concentration arising from the emissions and in effect reduces the effective height of the release.

The effective stack height is calculated by assessment of the buildings close to the stack, which could affect the dispersion of the release. Effective stack heights have been calculated for the stacks, based on the methodology provided in the EA guidance.

This states that:

- Where the point of discharge is less than 3m above the ground or building on which it is located, or is less than the height of any building within the equivalent of five stack heights,…the effective height of release can be considered to be zero; and
- Where the height of release is greater than 3m above the ground or building on which it is located, but less than 2.5 times the height of the tallest adjacent building, the effective height of release can be estimated as:

  Ueff = 1.66 x H {(Uact /H)-1}

  Where H = height of tallest adjacent building within five stack heights;

  Uact = actual release height; and

  Ueff = effective release height.

The apex of the building is at 10.0 m and the stack heights are 3.0 m above the apex of the building. Therefore, the effective release height is 4.98 m.

The effective stack heights were entered into the EA risk assessment tool.

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Using the EA risk assessment tool, together with the release scenarios and parameters presented in Section 3, it is possible to estimate the worst-case ground level concentrations arising from each source over the short-term and long-term emission scenarios. The predicted Process Contributions (PCs) can then be compared with the appropriate AQS or Critical Level contained in the EA risk assessment tool, in order to determine the "significance" of the pollutant emission. The total pollutant emission is defined as having an "insignificant" impact where:

- PC <= 1% of the AQS or Critical Level for long-term releases; or,
- PC <= 10% of the AQS or Critical Level for short-term releases.

In addition, an estimate of the Predicted Environmental Concentration (PEC) can be made, by adding the PC to an appropriate estimate of the background Ambient Concentration (AC). The PEC can then be compared with the appropriate AQS or Critical Level so as to identify whether detailed modelling of the emissions is necessary.

A pollutant emission is considered to need further modelling where:

- Predicted environmental concentration (PEC) >70% of the AQS or Critical Level for long-term releases; or
- Process contribution (PC) >20% of the difference between short-term AQS or Critical Level and twice the long-term AC; or
- If there are any local receptors that are sensitive to any of the emissions that have not been screened out.

5. RISK ASSESSMENT RESULTS

The emission parameters presented in Section 3 have been assessed using the Environment Agency H1 Assessment Tool. A copy of which is presented in Appendix 1.

5.1 Stage One Screening Assessment

Table 2: Air Impact Screening Stage One – Short Term Impacts

Substance	Short Term Impacts			
	EAL (µg/m³)	**PC (µg/m³)**	**%PC/EAL**	**>10% EAL**
Benzene	195	19.6	10.0	Yes

Table 3: Air Impact Screening Stage One – Long Term Impacts

Substance	Long Term Impacts			
	EAL (µg/m³)	**PC (µg/m³)**	**%PC/EAL**	**>1% EAL**
Benzene	5.0	0.788	15.8	Yes

It can be seen from Table 2 and Table 3 that the process contributions of benzene cannot be screened out as "insignificant" at Stage One of the screening assessment as the process contribution is greater than 10% of the short term EAL and 1% of the long term EAL.

5.2 Stage Two Screening Assessment

Where releases of substances cannot be screened out at Stage One of the assessment, the H1 methodology requires a second stage of screening to assess the predicted environmental concentration (PEC).

To calculate the short term and long term PEC, the process contributions of each substance are combined with the background concentration of the substance.

The background data used for the assessment was taken from 'Background Mapping Data for Local Authorities'[2]. The latest data for benzene was 2001 and the average was 0.455 µg/m³.

In the second stage of screening, releases can be screened out as being insignificant if:

- The short term PC is <20% of the short term environmental standard minus twice the background concentration; and
- The long term PEC is <70% of the long term environmental standard.

The results of the Stage Two assessment are presented in Tables 4 and 5.

[2] https://uk-air.defra.gov.uk/data/laqm-background-home

Table 4: Air Impact Screening Stage Two – Long Term Impacts

Substance	Long Term Impacts				
	PC (µg/m³)	%PC of Headroom (EAL – Bkgnd)	PEC (mg/m³)	%PEC of EAL	% Headroom >70%
Benzene	0.788	17.4	1.25	25	No

Table 5: Air Impact Screening Stage Two – Short Term Impacts

Substance	Short Term Impacts		
	PC (µg/m³)	%PC of Headroom (EAL – Bkgnd)	%PC of Headroom >20%
Benzene	19.6	10.1	No

It can be seen that the risk screening assessment presented in Table 4 and 5 identifies that the potential impacts from the releases of VOCs from the process can be screened out as being insignificant and no further assessment is required.

6. CONCLUSION

The emissions from the proposed waste treatment facility have been assessed using the Environment Agency H1 Methodology. The results demonstrated that the emissions can be screened out as being insignificant and no further assessment of the releases is required.

However, it is noted that the data used for the assessment is based on the best available data and during the construction phase there is potential for changes in the extraction rates to change. Therefore, it is recommended that the H1 assessment be repeated once the site becomes operational and monitoring data is available.

APPENDIX 1
H1 ASSESSMENT TOOL (ELECTRONIC COPY)