Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Daneshill Soils Treatment Facility

FCC Recycling (UK) Limited

Environmental Permit Variation Application

Treatment Process Description & Indicative BAT Review: Establishing BAT conclusions for waste treatment

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1. INTRODUCTION

1.1 Background

1.1.1 This report is an assessment of compliance of the proposed new soils treatment facility at Daneshill Landfill in line with 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU.

1.1.2 A general process description for the treatment activities is provided in section 2 of this report.

1.1.3 Indicative BAT standards are laid out in the BAT Conclusions (updated August 2018) for setting permit conditions for installations covered by Chapter II of Directive 2010/75/EU and their set emissions limit values to ensure that under normal operation conditions, emissions do not exceed emissions levels associated the with best available techniques as laid down by the BAT conclusions.

1.1.4 Therefore, the technical standards for this installation have been outlined in section 3 of this report in tables 2.1 to 2.11 with reference to the BAT conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU.

1.2 Principle of Operation

1.2.1 The facility will be limited to accepting wastes that can be treated so that they are suitable for landfill restoration in accordance with the approved restoration plan.

1.2.2 The proposed bioremediation process will utilise industry standard biopile technology and will operate through the use of biopiles and moisture control; addition of suitable nutrients to the soil and forced air extraction to encourage micro-organism growth leading to the breakdown of hydrocarbons into by products such as carbon dioxide and water vapour. Soils will typically be treated over an 8-16-week period, with the material being turned infrequently, typically once every 4-8 weeks. The bioremediation plant will operate continuously. Please refer to Operating Procedures in Appendix 1.

1.2.3 The biopiles will be placed on water and air extraction pipes connected to a blower that will draw air through the soils where it is then passed through a biofilter before being discharged to air. Excess water draining through the soils will be collected and treated to remove any oils or suspended solids.

1.2.4 Standard NPK fertiliser 25:05:05 ratio, typically added at 1kg/tonne of soil per application. Occasionally, an organic additive such as woodchip is added at ~1-3% to clayey soils to break up the cohesive nature of the soils and aid aeration.

2. PROCESS DESCRIPTION

2.1.1 The Soil Treatment Facility is proposed to accept and process up to 29,999 tonnes per annum of hazardous soils and 20,001 tonnes of non-hazardous soils. The soils treated will be used for the restoration of the wider Daneshill Landfill site. The total storage capacity of the site is 50,000 tonnes. The treatment areas consist of 2 treatment pads measuring at 3450m^2 and 3500m^2 for biotreatment/physical treatment and another 1 x 48800m^2 treatment pad solely for screening/processing. An indicative operational layout of the treatment and processing area and cross section is detailed in drawing refs: 3982-CAU-XX-XX-DR-V-1805 and 3982-CAU-XX-XX-DR-V-1806.

2.2 Pre-Assessment

2.2.1 Pre-acceptance procedures are undertaken to confirm the suitability of materials for treatment to subsequently achieve the reuse criteria. A set of Terms and Conditions for acceptance are sent to the Waste Producer including a clear statement of any waste characterisation samples that are deemed unsuitable for treatment. These are agreed in writing between the Waste Producer and FCC prior to an authorisation number (contract line) being issued by FCC at the weighbridge for deposit at the Soil Treatment Facility. The set of terms and conditions will include the following:

- Maximum soil contaminant concentrations for reuse of material in the restoration area or disposal within the landfill (re-use criteria);
- Limitations on physical and chemical characteristics of the soils (e.g. particle size, pH, moisture content); and,
- Statement from the waste producer confirming that soils containing tars, free oils, invasive species (e.g. Japanese Knotweed) and high moisture content will not be accepted to site.

2.2.2 The pre-assessment testing for asbestos is carried out to confirm the soil matrix and not containing any asbestos fibres above 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos. If any variations or discrepancies should be found regarding the waste producer's waste description, FCC can either reject the waste immediately or attend the site of origin to undertaken further pre-acceptance checks and visual inspections. This will enable the operator to identify any potential issues which could be affecting the conformity of the source materials prior to any further acceptance of waste for treatment.

2.2.3 In the event that moisture content of the waste could result in the material not being self-supporting, then the potential for free water or free oil will be further reviewed. Should FCC determine that there is the high potential for material to contain untreatable materials or properties where the waste materials behave as a liquid or containing free water or oil then, the waste will not be quoted for acceptance and/or will be rejected.

2.2.4 If insufficient information is provided to adequately characterise the waste or determine its suitability for treatment, the Operator will undertake a pre-acceptance testing at the source site to establish an initial waste description. This pre-acceptance will include a

visual inspection. Waste soils will be tested in accordance with a general suite of analysis for soils based on the potential substances present from the site history and any existing chemical data. Sampling of waste soils will be undertaken by a technically competent person, using the sampling frequency utilised at the STF site for soil reception as a minimum. Samples will be clearly identified using labels and recorded on chain of custody forms for transfer to a soils laboratory. All testing and analysis will be undertaken using an UKAS/MCERT accredited laboratory and accredited methods (BAT 9).

2.3 Waste Acceptance

2.3.1 A full waste list is outlined in the Supporting Document reference: 3982-CAU-XX-XX-RP-V-3000.

2.3.2 On arrival to site, lorries entering will be weighed at the weighbridge and all appropriate documentation checked and referenced by the weighbridge clerk. The weighbridge clerk will direct the lorries to the designated soil reception area.

2.3.3 For soils containing asbestos, following satisfactory results from pre-assessment (confirmation of soil matrix and not containing any asbestos fibres above 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos) soils will be directed to the soils asbestos storage area. This is an external storage area with an impermeable base, here these soils will be undergo pre-acceptance testing and will be sheeted. Soils contaminated with hydrocarbons will be subject to pre-acceptance testing and formal acceptance prior to the commencement of biotreatment. Non-hazardous soils will be directed to a designated area for pre-acceptance testing prior to any physical treatment commencing.

2.3.4 If in the circumstance that a load is tipped and upon inspection is identified as non-conforming, (for example deleterious inclusions) the waste materials will be reloaded immediately and rejected. A record of the waste material rejection will be reported to the manager on duty who will record the event. If in the event of a non-conformity that takes place later e.g. chemical data shows inconsistencies against the data originally provided as a waste description by the producer. In this scenario, the waste producer will be contacted and the waste rejection procedure implemented where required.

2.3.5 All wastes received to Daneshill Soil Treatment Facility will be in accordance with general BAT requirements as detailed in BAT 39-44 which at pre-acceptance stage ensures that:

- All assessment of waste is undertaken by a suitability competent person;
- Testing is undertaken at a laboratory with UKAS/MCERTS accreditation All wastes on site is validated through chemical analysis; and visual inspection.
- Checks are undertaken to ensure that the method of treatment will allow reuse on site prior to any acceptance on site.

2.4 On Site Verification

2.4.1 On-site verification procedures will be carried out to ensure soils received at the Soil Treatment Facility (STF) are visually, structurally and chemically similar to those described during the pre-acceptance procedures and confirm compliance with the Environmental Permit and suitability for treatment.

2.4.2 Soil sampling will be performed by the STF technician or project manager in line with composite sampling methods as detailed in the British Standards BS812.

2.4.3 A minimum of at least one composite sample must be taken from each job (unique authorisation code) and in accordance with the sampling frequency highlighted in Table 1 below. Chemical testing is undertaken to ensure that the materials being tipped are consistent with the analysis and description provided by the client at the waste description stage.

2.4.4 Sampling requirements for soil samples are detailed within Table 1 below

Table1: Sampling requirements for Soil Samples

Volume of soil (t)	No. of samples needed (before or during acceptance at STF)
< 100	1
100 - 500	2
500 +	2 + 1 for every 500t

2.4.5 The general suite of analysis for soils shall include:

- pH
- CLEA Metals
- Total TPH
- Total PAHs
- Total Cyanide (where required)
- Phenols (where required)
- SVOCs and VOCs (where required)
- PCBs (where required)
- Asbestos (screen) and quantification
- Moisture content

2.4.6 Soils deemed unsuitable for treatment will be removed from site and either returned to the waste producer or taken to a suitable permitted facility for final treatment/disposal

2.5 Screening/Processing Treatment of Soils

Screening of non-hazardous soils

2.5.1 Following acceptance and valid pre-acceptance testing results to confirm chemical validity, non-hazardous soils will be placed into their respective treatment batches and undergo physical treatment. Non-hazardous soils will be screened to remove oversize inclusions prior to reuse to ensure they are physically suitable.

Temporary storage of asbestos containing soils (prior treatment)

Upon satisfactory pre-acceptance and waste acceptance checks, on arrival to site, the soils will be weighed and directed from the weighbridge to the soils reception area and undergo an inspection and sampling for analytical testing. Soils will be stored on impermeable surfacing provided with bunded edges and sealed drainage. After placement on the storage area, the soils will be sheeted to reduce the potential for air borne emissions. The pre-assessment testing is carried out to confirm the soil matrix and not containing any asbestos fibres above 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos. Until the testing has been completed, the soils will remain sheeted. Following satisfactory results from pre-assessment confirming that the soils are compliant with the acceptance criteria, the soil can be stored externally, un-sheeted and will undergo pre-screening and handpicking for asbestos fragments. Asbestos containing soils with fibres concentrations that has to potential to become airborne at concentrations above the air monitoring detection limit will be rejected from site. Soils that meet all waste acceptance checks will be formally accepted for treatment.

Pre-screening and Handpicking of asbestos containing soils

2.5.2 Following formal acceptance, only hazardous soils containing asbestos will under-go pre-screening and handpicking, where pre-screening will be carried out prior to hand picking. Soils will be screened using a three-way screening (0-15mm, 15-50mm and 50mm+). This is to reduce the potential of damage to the picking station and make hand picking of asbestos debris more effective.

2.5.3 After screening, the picking station will provide an enclosed working area for hand-picking, details and specifications of the station are included in Appendix 3. A conveyor belt will be used on the picking line providing a smoother running line which will aid the hand-picking process. Treatment will only commence when waste acceptance testing has confirmed that the asbestos fibres content in soils is lower than 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos. Handpicking of small asbestos fractions will only be undertaken by suitably trained operatives, with asbestos fractions placed directly in polythene asbestos bags. The bags will be sealed and double bagged and will be placed in a designated sealed and locked asbestos bin.

2.5.1 All stockpiles generated from the screening/hand-picking will be visually inspected for the presence of residual asbestos prior to being samples for further biotreatment or reuse. Following hand-picking, the treated soils are deposited in a stockpile awaiting compliance testing prior to further onward treatment/disposal. Soils with elevated hydrocarbons will be transferred for bioremediation treatment. If the soils meet the 're-use' criteria, they will be retained on site for recovery operations on the Landfill Site.

2.5.2 Dust suppression will be provided for the screener as a preventative measure, in addition, air monitoring will be carried out hourly to assess if there is any detection of asbestos fibres above the method detection limit.

Storage of asbestos after screening/hand-picking

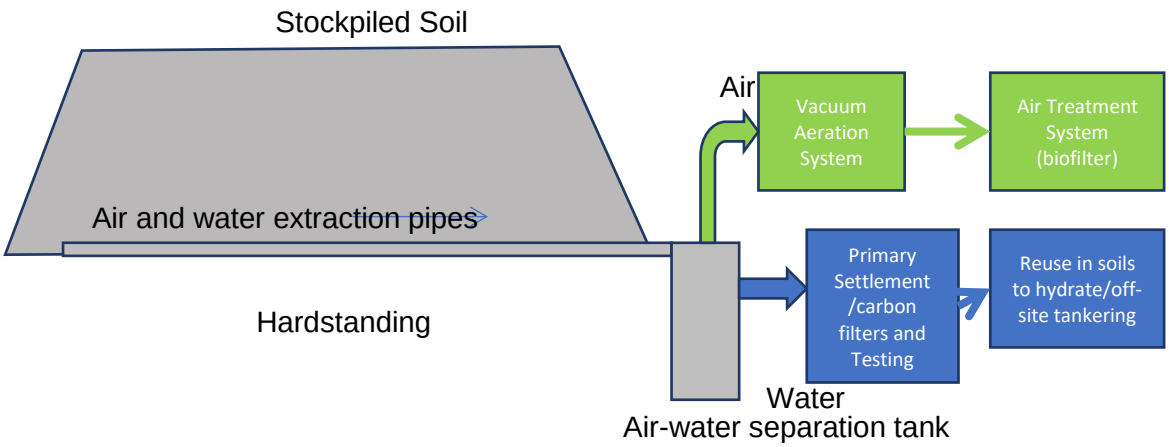
2.5.3 Following the screening and handpicking of asbestos fractions from the soils, the asbestos will be placed will be in bags which will be sealed and double bagged and will be placed in a designated sealed and locked asbestos bin. The locked asbestos bin will be stored on impermeable hardstanding.

2.5.4 Following screening, the soils will be stockpiled for use in recovery at Daneshill Landfill Site, this may also include soils that have undergone bioremediation process to remove oversized materials.

2.6 Bioremediation of Soils

2.6.1 Following screening and hand-picking, soils undergoing biotreatment activities will remove contaminants such as hydrocarbon utilising industry standard biopile technology as shown in Figure 1 below. The process will operate through the use of biopiles and moisture control, addition of suitable nutrients to the soil and forced air extraction to encourage micro-organism growth leading to the breakdown of hydrocarbons into by products such as carbon dioxide and water vapour.

Figure 1: Bioremediation Process



2.6.2 The biological treatment process varies between 8 to 16 weeks, dependent on the contaminants present in the soil.

2.6.3 Bioremediation of soils will be undertaken on a newly constructed GCL lined pad comprising sand blinding, crushed concrete and sealed drainage to allow pumping to holding tanks. The treatment pad has an appropriate fall to allow all process water to be collected in a precast concrete covered gully. As there is no drainage network on site, all process waters will be pumped to on-site holding tanks with any excess water tankered off to an appropriate disposal facility.

2.6.4 Soils accepted at the STF are deposited on the treatment area. The soils are arranged into biopiles using a system of batches which allows the waste to be trackable by age of waste and from the point of origin to its location on the treatment pad.

2.6.5 Bioremediation of soils refers to the biological treatment of contaminated soils by creating optimal conditions for biodegradation of contaminants. To enable biodegradation to occur the following parameters are monitored and manipulated:

- pH
- temperature,
- moisture content,
- oxygen level
- nutrient concentrations

2.6.6 Biodegradation of the organic contaminants is carried out by microorganisms in the soil. This is enhanced by addition of inorganic nutrients such as ammoniacal nitrate and organic material such as woodchip. Management of moisture content is also essential for microbial activity; low moisture content has the potential to inhibit microbial growth, but excessive moisture can restrict airflow. The perforated aeration pipes located beneath the waste will extract air from the biopile to effectively control waste oxygen levels and moisture content to maintain aerobic conditions.

2.6.7 Temperature in the biopiles is maintained between 30 and 40°C to ensure the mesophilic microflora are predominately stimulated, optimising biodegradation.

2.6.8 The stages of the bioremediation process are detailed below:

- Initial Placement: The soil is placed on the treatment pad by a tipper lorry/dump truck where an excavator will form the biopile.
- Addition of Nutrients: Based on the contaminants present within the soil, nutrients are added to facilitate the biological degradation of the hydrocarbon compounds.
- Chemical Analysis – Approximately every 4 weeks the soil is analysed for contaminant concentrations to determine whether the biological treatment of the

soil is adequately reducing the hazardous contaminants to non-hazardous concentrations. Additional nutrients and/or organic inputs may be added to expedite the process

- Nutrients testing – Every 2-4 weeks the soil is analysed for nutrient levels within the soil to ensure that there is sufficient inorganic and organic material to facilitate the biodegradation process.
- De-compaction of the soil – Every 4-8 weeks the biopile will be turned to facilitate aeration of the soil. Reintroduction of treated water into the biopiles if emissions (e.g. dust) is being generated or soils are outside of the optimal moisture content range
- Validation testing: Once the soil treatment is deemed complete it is sampled for laboratory testing to ensure that contaminants meet the landfill re-use criteria.

2.6.9 On receipt of validation testing that confirms the soil meets re-use criteria, it is transferred to the non-hazardous soils storage area, disposed in the adjacent landfill void or reused on site as restoration soils.

2.6.10 There are no direct releases off-site other than via the engineered surface water management system. The site will be engineered so that all collected surface waters and process waters from biopiles will pass into a drain at the lowest points of the treatment pad and transferred into holding tanks. The holding tanks will store all surface and process waters until emptied and disposed of at a suitable facility offsite.

2.6.11 Treatment for soils will include pre-acceptance testing prior to formal acceptance. Non-hazardous soils will undergo pre-screening of oversize inclusions. Soils which are contaminated with asbestos will be hand-picked and the removal of asbestos debris in soils.

2.7 Post Treatment Verification Sampling

2.7.1 This is to ensure soils treated at the Soil Treatment Facility (STF) meet the waste acceptance criteria to enable their use for the restoration of the landfill.

2.7.2 The sampling of soils will be performed by the STF technician or project manager. The procedure uses composite sampling methods as provided in BS812. For batches where treatment has been completed the sampling frequency will be 1/500t of treated soil.

2.7.3 Soils that do not meet the acceptance criteria will be treated further (if deemed viable) or removed from site for treatment/disposal at a suitable permitted facility.

2.8 Transfer – Landfill Restoration or off-site

2.8.1 Treated soils will be transferred onto the landfill for storage prior to spreading in accordance with the approved restoration plan.

3. PLANT & EQUIPMENT

3.1 Mobile Plant

3.1.1 Soils will be handled using tracked 360^{o} excavators from reception through the treatment process. Treated soils will be moved onto the landfill restoration area using dump trucks.

3.1.2 A mechanical screener will be brought in as required to remove oversize material from treated soils prior to reuse on the landfill restoration area. In addition, a mechanical screener and picking station will be provided for the hand-picking removal of asbestos fragments from hazardous soils and screening of non-hazardous soils.

3.2 Fixed Plant

3.2.1 Fixed plant will include the following items

- Weighbridge
- Office
- Bunded process/surface water storage tank
- Air Blower and containerised control panel/transfer pumps
- Biofilter
- Process water treatment vessels
- Storage Container

4. CONTROL OF EMISSIONS

4.1 Biofilter

4.1.1 Air forced down through the biopiles via the extraction pipework system will pass through a biofilter before being discharged to air.

4.1.2 The blower connects to a manifold with several perforated pipes covered in stone above an impermeable surface. Overlying these pipes is oversize compost or woodchip mixture, nutrients and small amount of contaminated soil (<5%) to inoculate the biofilter placed to a height of approximately 1.5m. The compost/nutrient/soil mixture is overlain by an irrigation pipe network on top to maintain the moisture content and covered with a tarpaulin to ensure the biofilter does not dry out. It is then tested every month to ensure the process parameters remain within the optimal range. Olfactory odour checks are also undertaken daily.

4.2 Surface Water drainage from treatment pad

4.2.1 Currently surface water drains to a sump which drains to a tank which is pumped out when required. Details of the site drainage system for leachate in the treatment pad and site design is shown in drawing ref: 3982-CAU-XX-XX-DR-V-1806.

4.2.2 Upon commencement of operations, surface water is collected within the process pipework from where it will be pumped into the small treatment plant prior to disposal off-site via tanker or redirected via a pipeline to humidify the biofilter/biopiles. Valves can be switched to use treated water to irrigate the biofilter/biopiles and then reverse back to collect water for tanker disposal.

4.2.3 The treatment plant comprises:

- 50m^3 settlement tank with transfer pump and level detectors
- Oil Water separator/settlement tank with transfer pump and level detectors
- 5m^3/hr sand filter
- 5m^3/hr granular activated carbon filter

4.2.4 The capacity of the treatment plant is **<50tonnes/day**.

4.2.5 Effluent from the treatment plant will be stored within a tank prior to reuse within the treatment process or removal for further treatment off-site.

4.3 STF Dust Control

4.3.1 Dust suppression is to be undertaken when soil movement is generating excessive dust, this includes traffic movements and soil turnover. The source of dust will be identified and the operation creating a dust presence ceased. Mitigation measures will include the

use of the on-site water bowser with spray rail or equivalent, rain guns and or misting systems will be employed if required.

4.4 Asbestos Fibres

4.4.1 Daneshill Soil Treatment Facility is proposed to accept waste soils containing mixed forms of asbestos with an asbestos fibrous content at concentrations of lower than <0.1% for chrysotile asbestos, and fibre concentration of <0.01% for all other asbestos. These fibre contents will be validated at the pre-acceptance testing stage to remove the potential for airborne emissions of asbestos fibres above the detection limit. Air monitoring for asbestos and particulate testing will be undertaken at 6 locations on site, their locations are detailed within the Dust Management Plan, document ref: 3982-CAU-XX-XX-RP-V-0307 in the dust monitoring plan, drawing ref: 3982-CAU-XX-XX-DR-V-1803.

4.5 Cross-Contamination and clean down procedures

4.5.1 To control and prevent cross-contamination of asbestos fibres, only asbestos soils will undergo physical treatment and hand-picking of asbestos fragments at any one time.

4.5.2 Pre-acceptance testing of asbestos waste prior to screening and hand-picking will validate that soils undergoing this physical process do not contain unacceptable concentrations of asbestos fibres (results detected above those detailed in Section 6.4.1 above will be rejected). Therefore, the accumulation and build-up of asbestos fibres on mobile plant/machinery is not anticipated. Where decontamination procedures are required when mobile equipment/plant is to be removed from site. Cleaning down procedures will be carried out using wet cleaning techniques; any cleaning residues/sludges generated will be placed into one of the storage areas available to accept contaminated soils. In addition, air monitoring will be undertaken to ensure that the concentration of any potential airborne asbestos fibres is below the detection limit of 0.01f/ml.

4.5.3 Any contaminated waters from cleaning will be pumped to the on-site holding tanks which will be tankered off for disposal at a suitable facility. Any PPE/RPE used will be bagged and disposed of with any asbestos wastes and classed as hazardous for disposal at a suitable facility.

5. MONITORING

5.1.1 Visual monitoring of equipment, including plant, and soil biopiles shall be undertaken on a daily basis. Equipment modules will be inspected every morning and evening upon module opening and closing respectively. Noise, vibration and heat observations of equipment shall also be executed at these times. Monitoring of emissions is included in the Emissions Management Plan, under document ref: 3982-CAU-XX-XX-RP-V-0307.

5.1.2 Proposed monitoring is limited to the following:

- Air emissions from the biofilter.
- Material testing of the biofilter matrix.
- Water emissions from the water discharge point at the STF.
- Dust concentrations in air at the STF.
- Airborne asbestos fibre monitoring in air
- PID measurements for VOCs at the STF.
- Noise assessment
- Odour assessment

5.2 Asbestos Baseline Background Monitoring

5.2.1 It is an established procedure to attain pre-operational baseline monitoring for asbestos to form the basis when determining the air quality prior to any treatment activities and the issue of the permit The operator will obtain baseline background monitoring prior to the commencement of operations where 3 rounds of monitoring will be taken at locations shown on drawing ref: 3982-CAU-XX-XX-DR-V-1803.

5.2.2 Following issue of the permit, the operator will be able to compare the monitoring results against reference background levels obtained from baseline monitoring. The background reference levels will be used as an action level should there be any soils with elevated asbestos fibres above the detection limit (0.01f/ml) or reference background level.

5.2.1 Detail of the frequency and thresholds of monitoring are included in the Emissions Management Plant, document ref: 3982-CAU-XX-XX-RP-V-0307.

5.3 Process Emissions

5.3.1 The point emissions from the STF include process water, surface water collection and air emissions from the biofilter as well as dust and odour from general site works. The monitoring for these processes includes:

- Biofilter sampling (from exhaust vents)
- Process water sampling
- Visual and olfactive daily assessment for dust and odour on site.
- Dust monitoring

5.4 Biofilter Monitoring

5.4.1 The biofilter will be regularly checked and maintained to ensure appropriate media particle size, nutrient levels, temperature and moisture content. Equipment will be calibrated in accordance with manufacturer's instructions or as agreed with the Environment Agency. These procedures will maintain an effective air extraction system, reducing odour emissions and identifying any leaks or damage for repair. The frequency for the biofilter sampling is monthly and is scheduled through a nominated UKAS accredited laboratory. The schedule of analysis for the biofilter is as follows:

- Ammonia
- TVOCS
- Hydrogen Sulphide
- VOC's
- Photo-ionisation detector (PID) to quantify gaseous emissions.

5.4.2 Detail of the frequency and thresholds of biofilter monitoring are included in the Emissions Management Plant, document ref: 3982-CAU-XX-XX-RP-V-0307.

5.4.3 The use of a nominated laboratory will permit independent testing of the biofilter air quality for reporting and recording to allow compliance with the permit conditions. The procedure for biofilter monitoring is STF – WI 008. The air sample analysis undertaken before and after the biofilter demonstrates that ~99% of monitored contaminants are continuously removed during the operation of the STF. The biofilter is operational 24 hours per day.

5.5 Process Water Monitoring

5.5.1 The water quality in the water collection tank will be monitored on a monthly basis. A sample will be obtained and analysed for parameters to ensure that they do not exceed limits as stated by the receiving treatment facility. Regular checks will be made to ensure no visible oil or grease is present in the tanks.

5.6 Air Quality Monitoring

5.6.1 If during air quality monitoring, fibre concentrations exceed 0.01f/ml or the agreed background reference value then all work operations will cease to allow for dampening down measures to limit the amount of airborne asbestos fibres. Dust suppression and potentially covering of soils will be carried out.

5.6.2 An exceedance of 0.01f/cm^3 will be followed with an immediate investigation; a sample will be submitted for electron microscopy to confirm the measured concentration of asbestos present. Until results are received, soils will remain covered and untreated. The EA will be notified of any exceedance. It is considered that the likelihood of an exceedance occurring is very low, this is due to the pre-acceptance testing which is carried out on every hazardous soil to confirm the asbestos fibrous content of that sample prior to any processing and screening. No exceedances of detection limits using either Phase Contrast Microscopy (PCM) or Scanning Electron Microscopy (SEM) methodologies have ever occurred in the Operator's experience of undertaking this treatment method on other sites.

5.6.3 Detail of the frequency and thresholds of monitoring are included in the Emissions Management Plant, document ref: 3982-CAU-XX-XX-RP-V-0307.

5.7 STF Dust Monitoring

5.7.1 Visual dust monitoring shall be undertaken on a daily visual basis during periods of dry weather or following a complaint. Monthly onsite monitoring will be carried out using a hand-held dust detector (Dustmate http://dustmonitor.co.uk/ or similar) as well as fixed Frisbee gauges. Details of dust monitoring in included within the Emissions Management Plan, document ref: 3982-CAU-XX-XX-RP-V-0307.

5.8 Photo-Ionisation Detector Measurements

5.8.1 A photo-ionisation detector (PID) shall be used on a bi-monthly basis at around the perimeter and near the biofilter (6) to quantify gaseous emissions. If PID readings for Benzene exceed 1ppm (based on EH40 guidance), then the source shall be identified and assessed by the operator. It will be dealt with, for example, increasing PPE levels on site, a cessation of soil movement or covering of odorous soils with a tarpaulin etc.

5.8.2 If site activity involves the movement of soil that has been identified as containing high concentrations of VOC which may be harmful to personnel working in the vicinity or other off-site receptors, then PID and benzene monitoring shall occur on a daily basis.

5.8.3 Results are recorded in the on-site database system. Detail of the frequency and thresholds of monitoring are included in the Emissions Management Plant, document ref: 3982-CAU-XX-XX-RP-V-0307.

5.9 Noise Measurements

5.9.1 Observations relating to excessive noise incidents shall be recorded in the database system.

5.10 STF Odour Control

5.10.1 Regular daily checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by the operator. It will be dealt with, for example, by a cessation of soil movement if required or covering of odorous soils with a tarpaulin etc. Observations shall be logged in the database system. Details of odour monitoring and procedures are detailed within the Odour Management Plan, document ref: 3982-CAU-XX-XX-RP-V-0308 included within this application.

5.11 Recording of Results

5.11.1 All analytical results and monitoring results shall be stored onto the STF database under the relevant environmental batches location. Any changes made to the type of monitoring or adjustment to the biofilter shall also be recorded on the STF database.

6. ENERGY REQUIREMENTS

6.1.1 The energy requirements of the facility are low with the main energy consumption associated with the treatment processes with the majority of energy use from the air extraction blower.

6.1.2 As the energy requirements of the facility in general are low and no alternatives are available with lower energy use, no improvements are considered necessary. Basic energy saving measures will be adopted and continually reviewed. This includes measures such as: -

- Efficient use of plant and machinery to avoid unnecessary ignition;
- Plant and machinery to be switched off when not in use; and
- Regular maintenance of all plant and machinery.

7. RESOURCE USE - RAW MATERIALS

7.1.1 The activities on site require amounts of resources and raw materials as part of the treatment process.

7.1.2 A water bowser may be used at the site during dry conditions to control the generation of dust. The water will be used only when necessary, and the minimum amount will be used. Water treated in the water treatment plant (detail within drawing ref: 3982-CAU-XX-XX-1806) from surface water run off can be used in place of mains water.

7.1.3 Fuels and chemicals associated with on-site plant will be appropriately stored and bunded; use of diesel will be undertaken in accordance with the site's EMS.

7.1.4 A Standard NPK fertiliser 25:05:05 ratio is used to encourage micro-organism growth. Typical application rates are 1kg/tonne of soil per application equating to a usage of up to 150 tonnes per year if the maximum of 3 applications per batch are used. Bags of the fertilizer will be stored with a waterproof cover.

7.1.5 Organic additive such as woodchip maybe added at ~5% to clayey soils to break up the cohesive nature of the soils and aid aeration. The biodegradation of the organic contaminants can be enhanced by addition of very low concentrations of organic material such as woodchip. Leaf litter within street residues (20 03 03) are received for treatment increases soil temperatures during the colder months. Use of these raw materials replaces virgin materials such as manufactured fertiliser or virgin woodchip and using 'waste raw materials' which would otherwise be landfilled. Approximately 30m^3 of woodchip is stored in an articulated lorry at any one time.

7.1.6 Details of the raw materials proposed are in Table 2 below, it is anticipated that a maximum of up to 2,500 tonnes per annum of woodchip of similar organics from Table 2 will be required.

Table 2: Raw materials to be used in the bioremediation treatment process

Raw Material Description	EWC Specification and use
Wood Off-Specification compost Wood other than those mentioned in 19 12 06	17 02 01 ,19 05 03 & 19 12 07 – wood chips break up cohesive nature of soils, aids aeration and enhances biodegradation Use within biofilter process and occasionally within soil treatment
Street cleaning residues	20 03 03 Leaf litter following removal of residues – improves soil temperatures during winter conditions

7.1.7 Street cleaning residues are usually a combination of organic waste inclusions and soils which is not normally accepted unless it is hazardous (due to the presence of hydrocarbons) and is handpicked by the producer to remove the detritus such as plastics. However, in Autumn and Winter months, leaf litter wastes (following handpicking by the producer to remove rubbish such as crisp packets, bottles and plastics) is accepted at the soil treatment facility. Due to the high leaf litter content within EWC 20 03 03, there is an increased amount of cellulose/lignin which (similar to composting of green wastes) provides an energy source for the thermophilic microflora range present in soil that proliferates at higher temperatures (45-60°C) compared to the mesophilic microflora that are most effective in soil for mineralising hydrocarbons at 25-40°C. The addition of leaf litter in low quantities benefits the biotreatment process as for every 10°C increase in soil temperature, the respiration rate of microflora doubles.

8. EMERGENCY PROCEDURES

8.1.1 FCC operates a Near Miss, Incident and Emergency management systems, specific Emergency procedures for this facility will cover:

- Spillages of waste and/or reagents.
- Fire
- Injury to staff or visitor
- Incident

8.1.2 FCC has ISO14001, 18001 and 45001 accreditation and this will be extended to this facility.

9. REVIEW AGAINST INDICATIVE BAT STANDARD

	Overall Environmental Performance
BAT 1	*In order to improve the overall environmental performance, BAT is to implement and adhere to an environment management system (EMS) that incorporates all of the following features:* *I) Commitment of the management, including senior management;* *II) Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;* *III) Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;* *IV) The implementation of procedures;* *V) Checking performative and taking corrective action;* *VI) Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;* *VII) Following the development of cleaner technologies;* *VIII) Consideration for the environmental impacts from the eventual decommission of the plant at the stage of designing a new plant, and throughout its operating life;* *IX) Application of sectoral benchmarking on a regular basis;* *X) Waste stream management;* *XI) An inventory of waste water and waste gas streams;* *XII) Residues management plan;* *XIII) Accident management plan;* *XIV) Odour management plan;* *XV) Noise and vibration management plan.*
	The company operates under an ISO14001 accredited environmental management system, audits of the performance of key plant, and all maintenance that has been undertaken will be undertaken and reviewed as part of the company's management system. The company management system is audited externally as part of the ISO 9001 and 14001 accreditation. Further information is provided within the management plan summary provided with this application, however in summary the site will have: - • A full maintenance schedule for all machinery and equipment on site;

	• Documented procedures to control all aspects of the operation that may have an impact on the environment, including contingency and operational methods which are to be undertaken in the event that there is a plant breakdown, or activities could lead to an unacceptable emission; • Well documented procedures for monitoring emissions and impacts including the use of a daily site log. All monitoring will occur in accordance with the Environmental Management plans The site will undertake a preventative maintenance programme where site plant, and infrastructure will be inspected on a daily, weekly and monthly basis in accordance with written procedures. Training systems are in place and all employees which will include: - • Relevant treatment activities undertaken on site; • Management techniques to be employed for all aspects of waste treatment which are relevant to their position • Reporting any abnormal events; • Contingency measures in place to prevent breaches of the Environmental Permit in the event of abnormal weather conditions; and ccontingency measures to be taken in the event that accidental emissions are released to the environment. The operator will only appoint suitably qualified contractors, and all purchasing of equipment and materials will be undertaken in accordance with the management system.
BAT 2	*In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques detailed in 'BAT 2 Table 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU' summarised below:* *Pre-acceptance procedures* *Waste Acceptance procedures* *Waste tracking and inventory* *Output quality management system* *Ensure waste segregation* *Waste compatibility prior to mixing or blending of waste* *Sorting of incoming solid waste*

	Pre-acceptance and Waste Acceptance procedures Waste pre-acceptance and Waste acceptance procedures will be in place to ensure that only waste types permitted are accepted for treatment, procedures are outlined in Section 2.2-2.3 and contained within Appendix 1 of this document. No liquid wastes, drummed wastes or laboratory smalls will be accepted. During pre-acceptance checks, the type of contamination of each waste load will be established as will the end use of the waste (after it has been treated. The waste will only be accepted if it is compliant with the permitted waste types and if the site is able to treat the waste. The treatment method is determined prior to the waste being delivered to the facility. In the event of any non-conforming wastes a waste rejection notification will be issued informing that the waste is not suitable for treatment Waste deemed not acceptable will be rejected as per written procedures (see Appendix 1). Rejected wastes will be stored within a designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination. Waste tracking and inventory Waste tracking system will be used as detailed in written procedures contained in Appendix 1. Written records will be maintained which will include information on the waste type, quantity, how the materials were stored and how they were subsequently disposed of. A daily assessment of the current capacity of the site is undertaken and waste is only accepted if there is sufficient capacity. A spreadsheet calculating how much waste is on site will be updated daily to account for waste received on site where waste tonnages have been dedicated (e.g. pre-storage, bioremediation treatment, wastes treated, and wastes removed from site). Asbestos fractions hand-picked and placed in sealed double bags. The number of bags will be recorded and placed in a locked asbestos waste bin (stored on impermeable hardstanding). Written records will be maintained which will include information on the waste type, quantity, how the materials were stored and how they were subsequently disposed of. Output Quality Management System The Operator will have a technically competent manager who is qualified to 'Level 4 in Waste Management Operations – Managing', and 'Treatment of Hazardous Waste (Remediation HROC6 or equivalent)'. The roles of sales and technical staff are clearly defined within the procedures and staff will only undertake activities for which they have received suitable training.

	All staff undertaking waste acceptance procedures will receive suitable training in the waste acceptance procedures, as well as in waste handling and the relevant health and safety and environmental procedures in place. The site will be manned by a minimum of two staff under normal circumstances, during waste reception periods, the operations manager to be qualified to at least HNC Chemistry or equivalent. <u>Ensure waste segregation</u> Segregation of the accepted waste types is not necessary as they are not considered to be reactive. In the event of any non-conforming wastes a waste rejection notification will be issued informing that the waste is not suitable for treatment Waste deemed not acceptable will be rejected as per written procedures (see Appendix 1). Rejected wastes will be stored within a designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination. <u>Waste Compatibility</u> Waste pre-acceptance and Waste acceptance procedures will be in place to ensure that only waste types permitted are accepted for treatment, procedures are outlined in Section 2.2-2.3 and contained within Appendix 1 of this document. Section 2.4 details on-site verification, Reception and Compliance testing will be undertaken in accordance with written procedures (see Appendix 1) Testing will be performed to ensure that the materials accepted are consistent with the analysis and description supplied at the pre-characterisation stage. All external lab analysis will be carried out by MCerts and UKAS-accredited laboratories as detailed within the procedures. Samples shall be retained on site for a minimum of two days following samplings, the accredited laboratory will retain samples for 30 days. <u>Sorting of Incoming waste</u> As per Section 2.5, following acceptance and valid-pre-acceptance testing result (dependant on the waste stream) wastes will undergo the following: Screening of non-hazardous soils

	Temporary storage of asbestos containing soils Pre-screening and handpicking of asbestos containing soils Storage of asbestos after screening/hand-picking
BAT 3	*In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams as part of the environmental management system.*
	Water usage is minimal. Rainfall derived drainage water will be used for moisture control where required. Use of mains water restricted to washing plant etc. The waste discharge areas comprise of impermeable pads which drains to a collection pipework so that any runoff will be contained. There is no drainage to sewer at Daneshill Landfill site, waters will either be used within the process to maintain optimum moisture levels or stored in tanks awaiting collection and disposal to a suitable treatment facility. See Section 5.8 'Photo-ionisation Detector' on quantifying gaseous emissions.
BAT 4	*In order to reduce the environmental risk associated the with storage of waste, BAT is to use all of the techniques given below* *Optimised storage location* *Adequate storage capacity* *Safe storage operations* *Separate area for storage and handling of packaged hazardous waste*
	Waste Acceptance procedures, Waste Rejection Procedures outlined in Section 5.2 of this document and contained within Appendix 1. Waste storage is outlined in Section 3 of this report. A daily assessment of the current capacity of the site is undertaken and waste is only accepted if there is sufficient capacity. The waste storage areas are on impermeable treatment pads with sealed drainage system (detail shown in drawing ref: 3982-CAU-XX-XX-DR-V-1806) any runoff will be treated and then either stored for reuse (within the process to maintain optimum moisture levels) or stored in tanks awaiting collection and disposal to a suitable treatment facility. All areas will be clearly marked using signage. All vehicles delivering waste travel over a calibrated weighbridge and a ticket is printed for a record. The driver is then directed to the designated unloading area by the site operation staff. The site is always manned during operational hours.

	The site layout has been designed to ensure that treatment and storage areas are separate from the rest of the site so as to ensure segregation of activities. Wastes will not be stored in container, the segregation of accepted waste types is not necessary as they are not considered to be reactive. The proposed STF site is in a predominantly agricultural setting, the nearest residential dwellings include a travellers site located 155m SWS from the proposed treatment facility and Loundfield Farm 500m to the east. Materials are stored in such a way as to avoid double handling i.e. wastes are received, stored, treated and moved to the post treatment area. Wastes will only be removed from the storage area if sufficient capacity is available for them to be treated. Waste will be either be treated or stored in stockpiles prior to treatment taking place. All waste that is accepted on site will commence treatment within 10 days of being accepted on site. A spreadsheet calculating how much waste is on site will be updated daily to account for waste received on site where waste tonnages have been dedicated (e.g. pre-storage, bioremediation treatment, wastes treated, and wastes removed from site). Asbestos fractions hand-picked and placed in sealed double bags. The number of bags will be recorded and placed in a locked asbestos waste bin (stored on impermeable hardstanding).
BAT 5	*In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.* *Handling and transfer procedures aim to ensure that wastes are safely handled and transferred to the respective storage or treatment. Including the following elements:* *A) Handling and transfer of waste are carried out by competent staff;* *B) Handling and transfer of waste are duly documented;* *C) Measures are taken to prevent, detect and mitigate spills;* *D) Operation and design precautions are taken when mixing or blending wastes;*
	The Operator will have a technically competent manager who is qualified to 'Level 4 in Waste Management Operations – Managing', and 'Treatment of Hazardous Waste (Remediation HROC6 or equivalent)'. The roles of sales and technical staff are clearly defined within the procedures and staff will only undertake activities for which they have received suitable training. All staff undertaking waste acceptance procedures will receive suitable training in the waste acceptance procedures, as well as in waste handling and the relevant health and safety and environmental procedures in place.

	The site will be manned by a minimum of two staff under normal circumstances, during waste reception periods, the operations manager to be qualified to at least HNC Chemistry or equivalent.
	Monitoring
BAT 6	*For relevant emissions to water as identified by the inventory of waste water stream, BAT is to monitor key process parameters at key locations (e.g. at inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)*
	Monitoring and reporting of emissions currently undertaken as a requirement of the permit.
BAT 7	*BAT is to monitor emissions to water with at least the frequency detailed in BAT 7 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU'*
	Monitoring and reporting of emissions is currently undertaken as a requirement of the permit. There will be no groundwater monitoring required as part of the proposed operations. The waste discharge areas comprise of impermeable pads which drains to a collection pipework so that any runoff will be contained. There is no drainage to sewer at Daneshill Landfill site, waters will either be used within the process to maintain optimum moisture levels or stored in tanks awaiting collection and disposal to a suitable treatment facility. The water quality in the water collection tank will be monitored on a monthly basis. A sample will be obtained and analysed for parameters to ensure that they do not exceed limits as stated by the receiving treatment facility. Regular checks will be made to ensure no visible oil or grease is present in the tanks.
BAT 8	*BAT is to monitor channelled emissions to air with at least the frequency detailed in BAT 8 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU' and in accordance with EN Standards. If EN standard are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.*
	See Section 5 of this document for Monitoring for: • Air emissions from the biofilter. • Material testing of the biofilter matrix. • Water emissions from the water discharge point at the STF. • Dust concentrations in air at the STF. • Airborne asbestos fibre monitoring in air • PID measurements for VOCs at the STF. • Noise assessment • Odour assessment

	Daily visual monitoring to air for dust, litter and olfactory odour monitoring will be carried out on site. Monitoring is undertaken as per the Operating Techniques and requirements of the management system and operational procedures. Given the rural nature of this activity and the existing similar operations on site that have not given rise to complaints, noise modelling is not considered to be required. Noise management has been addressed within the Environmental Risk Assessment. Air forced down through the biopiles via the extraction pipework system will pass through a biofilter before being discharged to air. Emissions to be tested every month to ensure the process parameters are within the optimal range. Olfactory odour checks are also undertaken daily. During soil screening activities, asbestos monitoring around the process area will be carried out every 2 hours as detailed in the monitoring section in the Emissions Management Plan, document ref: 3982-CAU-XX-XX-RP-0307.
BAT 9	*BAT is to monitor diffuse emission or organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPS with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.*
	N/A
BAT 10	*BAT is to periodically monitor odour emissions*
	Monitoring is undertaken as per the Operating Techniques Report (document ref. 3982-CAU-XX-XX-RP-V-0305) and requirements of the management system and operational procedures. The wastes to be accepted are not inherently malodorous although hydrocarbons may produce slight odour - see Amenity and Accidents Risk Assessment (document ref. 3982-CAU-XX-XX-RP-V-0303). As none of the waste is putrescible, odour modelling is not deemed to be required for this installation. The waste types and treatment is not expected to cause odour at levels that will cause a nuisance outside of the permit boundary. The Air Quality Assessment and Environmental Risk Assessment outline the techniques that will be employed to control odour. Given the nature of the activity and the odour control techniques that will be in place, the installation is not expected to generate high levels of odour. A suitability qualified person will do a perimeter walk on a daily basis, if the daily walk identifies high levels of odour at the site boundary, the operator will investigate what activities were occurring on site at the time. If the odour proves to be coming from the site, the operator may investigate further operating techniques to control/diminish the odour levels. See Air Quality Assessment (Appendix 2) & Amenity and Accident Risk Assessment (document ref. 3982-CAU-XX-XX-RP-V-0303).

	Closest residential receptor is approximately 155m from proposed operation. The facility will operate in accordance with the odour management techniques in this document. All abatement equipment will be in place prior to operations commencing. The operator will operate the facility in accordance with BAT for the sector and will review the operating techniques on an annual basis, upon changes to regulations/guidance or after a substantiated complaint as verified by the Environment Agency. All waste will be thoroughly screened through pre-acceptance checks. Any waste which is likely to cause unacceptable odour will be rejected at this stage. If, upon arrival of waste at the site, the visual checks identify the odour content of waste may cause problems at the site, the waste will either be rejected, or if there is sufficient capacity to immediately treat or safely store the waste, the waste may be accepted. There will be no scrubber liquors associated with the site operations, therefore odours and their controls is not applicable. Regular daily checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by the operator. It will be dealt with, for example, by a cessation of soil movement if required or covering of odorous soils with a tarpaulin etc. Observations shall be logged in the database system. Details of odour monitoring and procedures are detailed within the Odour Management Plan, document ref: 3982-CAU-XX-XX-RP-V-0308 included within this application.
BAT 11	*BAT is to monitor the annual consumption of waste, energy and raw materials as well as the annual generation of residue and wastewater, with a frequency of at least once per year.*
	Monitoring is undertaken as per the Activities and Operating Techniques Report (document ref.3982-CAU-XX-XX-RP-V-0305) and requirements of the management system and operational procedures. The annual consumption of waste, energy, raw materials and the generation of waste water will be reported on an annual basis. It is considered however that the energy requirements of the operation are not considered to be significant, Specific Energy Consumption (SEC) information is not applicable to the site operations. The use of Raw Materials is detailed further in Section 7 of this document and specific details are provided in the Operating Techniques. The site will utilise the following raw materials: • Oil and fuels • Standard NPK fertilizer

	• leaves from road sweepings, organic woodchip, Datasheets for the raw materials will be kept on site. A regular review of raw materials will be carried out as per requirements of ISO14001 environmental management system, this will include quality-assurance procedures, waste minimisation and substitutions for less polluting options. Water requirement for the proposed operation are minimal, rainfall derived drainage water will be used for moisture control where required. Use of mains water restricted to washing plant etc. Usage will be reported on a yearly basis within the annual report submitted to the Environment Agency and an audit shall be undertaken within the first two years of operation. Water efficiency objectives will be identified and reported on in an annual basis with an annual report including investigations into water saving technologies. Techniques to minimise water usage will be employed as per requirements of ISO14001 environmental management system.
	Emissions to air
Bat 12	*In order to prevent, or where that is not practicable, to reduce odour emissions, BAT is set up, implement and regularly review an odour management plan, as part of the environmental management system, that includes all of the following elements:* *Protocol for containing actions and timelines;* *Protocol for conducting odour monitoring as set out in BAT 10;* *Protocol for response to identified odour incidents, e.g. complaints* *An odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.*
	See BAT 10 and Odour Management Plan document ref: 3982-CAU-XX-XX-RP-V-0308, Air Quality Impact Assessment (Appendix 2) included within this application
BAT 13	*In order to prevent or, where that it not practicable, to reduce odour emissions, BAT is to use one of more a combination of the following techniques:* *a) minimise residence time* *of potentially odorous waste in storage on in handling systems (e.g., pipe, tank containers) in particular in anaerobic conditions* *b) Using chemical treatment* *c) Optimising aerobic treatment*

	See BAT 10 and Odour Management Plan document ref: 3982-CAU-XX-XX-RP-V-0308, Air Quality Impact Assessment (Appendix 2 included within this application
BAT 14	*In order to prevent or, where that is not practicable, to reduce emissions to air, in particular of dust, organic compounds and odour. BAT is to use an appropriate combination of the techniques given below:* *a) Minimizing the number of potential diffuse emissions sources* *b) Selection and use of high integrity equipment* *c) Corrosion prevention* *d) Containment, collection and treatment of diffuse emissions* *e) Dampening* *f) Maintenance* *g) Cleaning of waste treatment and storage areas* *h) Leaks detection and repair (LDAR) programme*
	Dust management will contain the following measures: - • provision on site of a water bowser equipped with rain gun, misting and adequate year-round water supply and dust suppression by regular spraying in dry conditions; • use of uncontaminated water for dust suppression, to avoid re-circulating fine material; • high standards of housekeeping to minimise track-out and windblown dust; • a preventative maintenance programme, including readily available spares, to ensure the efficient operation of plant and equipment; • minimisation of drop heights during tipping; • clear delineation of stockpiles to deter vehicles from running over edges; and • effective staff training in respect of the causes and prevention of dust. • inspection and maintenance of all trafficked surfaces; • regular compaction, grading and maintenance of haul routes and unsurfaced routes; • setting an appropriate speed limit; • fitting all site vehicles and plant with upswept exhausts and radiator fan shields where practical;

	• even loading of vehicles to avoid spillages; • sheeting of haulage loads; • regular removal of spilled material from site routes. For VOCs, see the Air Quality Impact Assessment (Appendix 2) For fugitive, dust and odour emissions, see the Air Quality Impact Assessment (Appendix 2) Odour Management Plan (document ref. 3982-CAU-XX-XX-RP-V-0308) and Amenity & Accidents Risk Assessment (document ref: 3982-CAU-XX-XX-RP-V-0303. As per the company EMS and detailed in the Amenity & Accidents Risk Assessment, maintenance of mobile plant/equipment will be in line with manufacturers specification. For the pre-screening and hand picking of asbestos containing soils, see Section 2.5 'Screening/Processing Treatment of Soils' of this document. After screening, the picking of asbestos will be carried out in an enclosed working area, details and specifications of the station are included in Appendix 3. A conveyor belt will be used on the picking link providing a smoother running line which will aid the hand-picking process and reduce the potential for agitation. A LDAR programme is not applicable to the proposed operations at Daneshill Landfill Site.
BAT 15	*BAT is to use flaring only for safety reasons or for non-routine operation conditions (e.g. start-ups, shut downs) by using techniques below* *a) correct plant design* *b) Plant management*
	N/A to the proposed operations.
BAT 16	*In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the techniques detailed below:* *a) Correct design of flaring devices* *b) Monitoring and recording as part of flare management*
	N/A to the proposed operations.
	Noise and Vibrations
BAT 17	*In order to prevent, or where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan as part of the environmental management system.*

	Given the rural nature of this activity and the existing similar operations on site that have not given rise to complaints, noise modelling is not considered to be required. Noise management has been addressed within the Noise Management techniques provided with the Amenity and Accident Assessment, document ref: 3982-CAU-XX-XX-RP-V-0303 of this application. • Noise management techniques are employed at the facility as set out in the Environmental Risk Assessment. • In summary the site will employ the following BAT recognized techniques: - • Ensuring site roads and surfaces are kept in good working order; • Acoustic dampening of noise generating equipment; • Low level reversing alarms; • Deliveries and pickups from the site will only take place within the stipulated operational hours; and, • Minimizing drop heights when handling material.
BAT 18	*In order to prevent or where that is not practicable, to reduce noise and vibration emissions, BAT is to use of or a combination of the techniques given below.* *a) Appropriate location of equipment and buildings* *b) Operational measures* *c) Low-noise equipment* *d) Noise and vibration control equipment* *e) Noise Attenuation*
	See Response to BAT 17, Noise Management techniques provided with the Amenity and Accident Risk Assessment, document ref: 3982-CAU-XX-XX-RP-V-0303.
	Emissions to Water
BAT 19	*In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that it not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.*
	There are no emissions to groundwater. The operation will not have a dedicated water supply.

	All offloading is on impermeable bases with sealed drainage. The waste storage areas are on impermeable treatment pads with sealed drainage system (detail shown in drawing ref: 3982-CAU-XX-XX-DR-V-1806) any runoff will be treated and then either stored for reuse (within the process to maintain optimum moisture levels) or stored in tanks awaiting collection and disposal to a suitable treatment facility. The on-site holding tanks are bunded to 110% and its condition will be monitored regularly. The water quality in the water collection tank will be monitored on a monthly basis. A sample will be obtained and analysed for parameters to ensure that they do not exceed limits as stated by the receiving treatment facility. Regular checks will be made to ensure no visible oil or grease is present in the tanks. See Management Procedures in Appendix 1. Further details of the water treatment and discharge are outlined in sections 6 and 7.
BAT 20	*In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of techniques.*
	See response to BAT 19 and details of the water treatment and discharge are outlined in sections 6 and 7. Waste water will not be treated on site.
	Emissions from accidents and incidents
BAT 21	*In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all for the techniques given below, as part of the accident management plan (See BAT 1)* *a) Protection measures* *b) Management of incidental/accidental emissions* *c) Incident/accident registration and assessment system*
	An Accident Management Plan has been submitted with the application, (See Section 8 of this document, 'Emergency Procedures' that identifies: - • The likely causes of accidents; • The consequences of such accidents; • Prevention measures in place to reduce the likelihood of accidents; and • How any accidents that do occur will be managed. The potential for accidents and incidents hazards have been assessed and management techniques put in place as per: • The Activities & Operating Techniques (document ref.3982-CAU-XX-XX-RP-V-0305);

	• BAT assessment (this document); and, • Amenity and Accident Risk Assessment (document ref.3982-CAU-XX-XX-RP-V-0303). These documents have been prepared in support of this application, to ensure that in the unlikeliness of the any accidents or incidents occurring, the operator has sufficient contingency plans and management techniques to ensure they will not lead to an impact on the environment. The company Management system includes written procedures dealing with noncompliance. Any non-compliance will be reported to the site manager or foreman immediately. The site manager or their deputy will determine the course of action to be taken in accordance with the procedure. The company Management system includes written procedures for handling, investigating, communicating and reporting environmental complaints and implementation of appropriate actions. See Management System summary
	Material Efficiency
BAT 22	*In order to use materials efficiently, BAT is to substitute materials with waste*
	The activities on site requires of resources and raw materials as part of the treatment process, See Section 7 'Resources Use – Raw Materials'. Organic additive. Specific details regarding raw materials are provided in the Operating Techniques. The site will utilise the following raw materials: • Oil and fuels • Standard NPK fertilizer • leaves from road sweepings, organic woodchip, Use of the raw materials replaces virgin materials such as manufactured fertiliser or virgin woodchip and using waste raw materials which would otherwise be landfilled. The operator has in place as per requirement of the ISO140001 Environmental Management system: a) Procedures for the regular review of new developments in raw materials and any suitable replacements with an improved profile; b) Quality assurance procedures for controlling the impurity content; and, c) Waste minimization and less polluting options favored.

	Energy Efficiency
BAT 23	*In order to use energy efficiently, BAT is to use both of the techniques given below:* *a) Energy Efficiency plan* *b) Energy balance record*
	Energy requirements of the operation are not considered to be significant and there are no buildings proposed that would require energy-efficient services. The energy efficiency plan relating to techniques relevant to the installation including operating, maintenance and housekeeping measure are in place and covered under an Environmental Management System. Housekeeping measures including maintenance and operational procedures are in place for all areas of the site where the breakdown of machinery could lead to an impact upon the environment or compromise the operator's ability to undertake normal site activities. These measures will be reviewed every year to determine if additional energy savings could be made and will include: - • Switching off equipment when not in use; • Careful operation and maintenance of plant & equipment; • Regular cleaning of plant & equipment.
	General BAT Conclusion for the mechanical treatment of wastes **Emissions to air**
BAT 25	*In order to reduce emissions to air of dust, and of particulate-bound metals*
	N/A
	BAT Conclusions for the mechanical treatment in shredders of metal waste
	BAT Conclusions 26-28
	N/A

	BAT Conclusions for the treatment of WEE containing VFCs and/or VHCs
	BAT Conclusions 29-30
	N/A
	BAT Conclusions for the mechanical treatment of waste with calorific value
	BAT Conclusions 31
	N/A
	BAT Conclusions for the mechanical treatment of WEEE containing mercury
	BAT Conclusions 32
	N/A
	BAT Conclusions for the biological treatment of waste
BAT 33	*In order to reduce odour emissions and to improve the overall performance, NAT is to select the waste input.*
	See BAT 2 regarding the pre-acceptance, acceptance and sorting of waste.
BAT 34	*Emissions to air* *In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below:* *a) Adsorption* *b) Biofilter* *c) Fabric filter* *d) Thermal oxidation* *e) Wet scrubbing*
	See Section 4.1 'Control of emissions- biofilter' and BAT 8 regarding the use of biofilter to reduce emissions to air.
BAT 35	*Emissions to water and water usage* *In order to reduce the generation of waste water and reduce water usage, BAT is required to use all of the techniques given below:* *a) Segregation of water streams*

	b) Water circulation *c) Minimisation of the generation of leachate*
	See BAT 3 and BAT 19 Water usage is minimal. Rainfall derived drainage water will be used for moisture control where required. Use of mains water restricted to washing plant etc. The waste discharge areas comprise of impermeable pads which drains to a collection pipework so that any runoff will be contained. There is no drainage to sewer at Daneshill Landfill site, waters will either be used within the process to maintain optimum moisture levels or stored in tanks awaiting collection and disposal to a suitable treatment facility.
	BAT Conclusions for the aerobic treatment of waste
BAT 36	*In order to reduce emission to air and to improve the overall performance, BAT is to monitor and/or control the key waste and process parameters.*
	See Section 2.6 'Bioremediation of Soil' and BAT 1, BAT 2
BAT 37	*Odour and diffuse emission to air* *In order to reduce the diffuse emissions to air of dust, odour and bioaerosols from open-air treatment steps, BAT is to use or both of the techniques given below:* *a) Use of semipermeable membrane covers* *b) Adaption of operations to the meteorological conditions.*
	See BAT 10 and BAT 15 See Activities and Operating Techniques Report, document ref: 3982-CAU-XX-XX-RP-V-0305. For VOCs, see the Air Quality Impact Assessment (Appendix 2) For fugitive, dust and odour emissions, see the Air Quality Impact Assessment (Appendix 2) Odour Management Plan (document ref. 3982-CAU-XX-XX-RP-V-0308) and Amenity & Accidents Risk Assessment (document ref: 3982-CAU-XX-XX-RP-V-0303.
	BAT Conclusions for the anaerobic treatment of waste
	BAT 38

	N/A
	BAT Conclusions for the mechanical biological treatment (BMT) of waste
	BAT 39
	N/A
	BAT Conclusions for the physico-chemical treatment of solid and/or pasty waste
	BAT 40-41
	N/A
	BAT Conclusions for the re-refining of waste oil
	BAT 42-44
	N/A
	BAT Conclusions for the physico-chemical treatment of waste with a calorific value
	BAT 45-47
	N/A
	BAT Conclusions for the thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil
	BAT 48-49
	N/A
	BAT Conclusions for the water washing of excavated contaminated soil
	BAT 50
	N/A
	BAT Conclusions for the decontamination of equipment containing PCB's
	BAT 51
	N/A
	BAT Conclusions for the treatment of waste-based liquid waste

	BAT 52-53
	N/A

Drawings

NOTES

1. DO NOT SCALE FROM THIS DRAWING, WORK FROM FIGURED DIMENSIONS ONLY. ALL DIMENSIONS ARE IN METRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

LEGEND

- 1 — COMBINED DUST AND ASBESTOS MONITORING POSITIONS
- AREA OF PROPOSED ACTIVITY
- PERMIT BOUNDARY
- BIOTREATMENT SCREENING AND PROCESSING AREA
- SCREENING / PROCESSING AREA

P07	MONITORING POINTS AMENDED TO P04	EJD	KB	AS	18.01.21
P06	ENVIRONMENTAL MONITORING POINTS ADDED	EJD	KB	AS	15.01.21
P05	MONITORING POINTS UPDATED	EJD	KB	AS	26.11.20
P04	LEGEND UPDATED	EJD	KB	AS	24.03.20
P03	MONITORING POINTS UPDATED	EJD	KB	AS	03.02.20
P02	MONITORING POINTS UPDATED	EJD	KB	AS	09.12.19
P01	ISSUED FOR INFORMATION	EJD	KB	AS	05.12.19
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
DUST AND
ASBESTOS MONITORING
PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	EJD	KB	KB

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04.12.2019	1:4000	3982	P07

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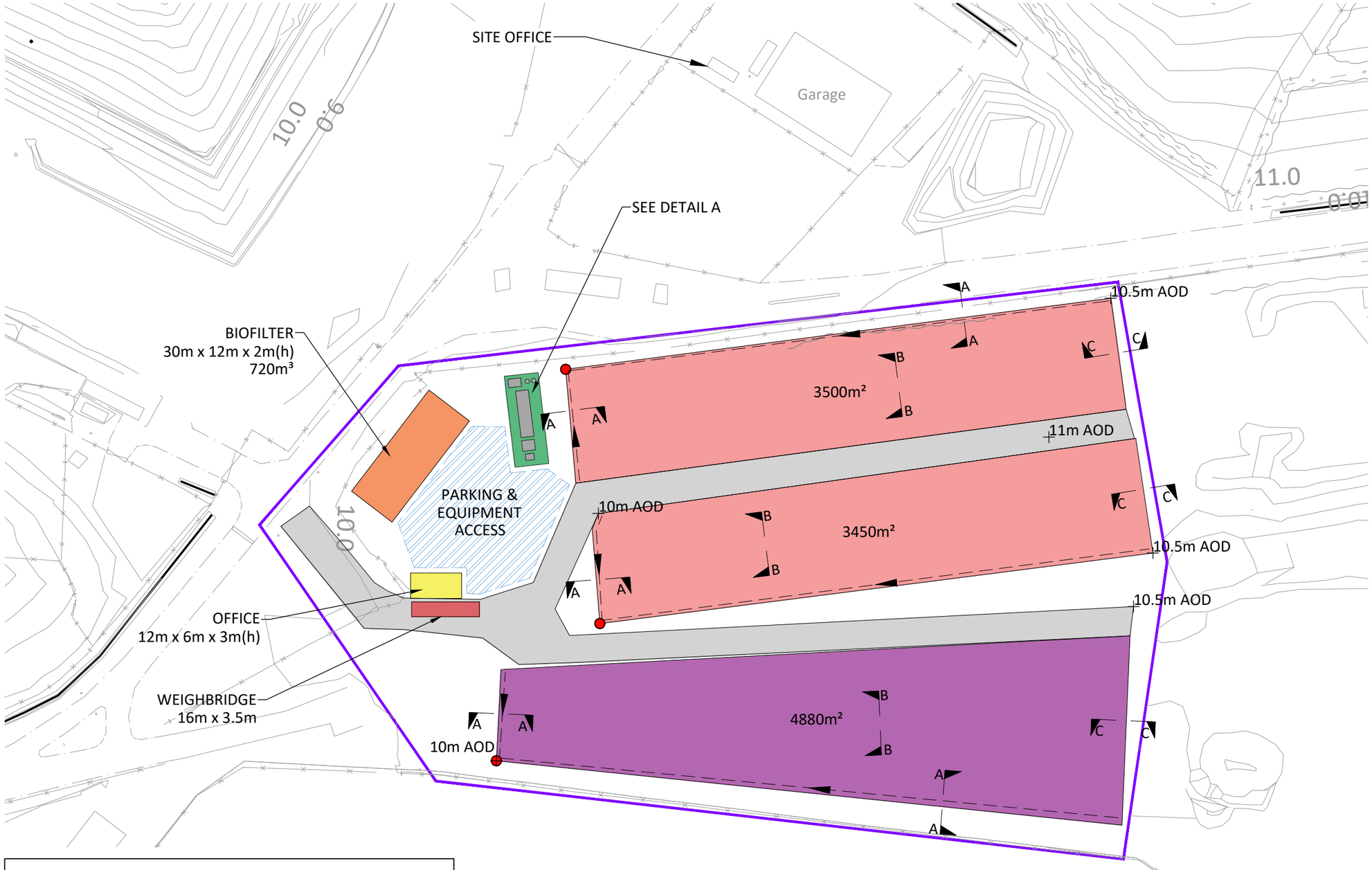

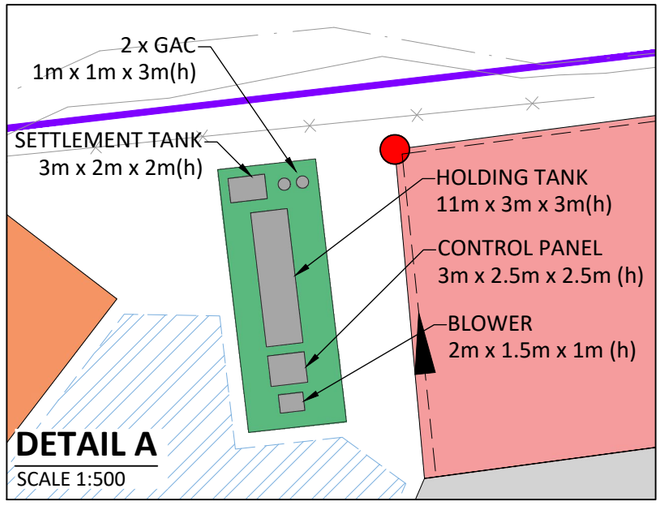

DETAIL A
SCALE 1:500

SITE LAYOUT
SCALE 1:1000

NOTES

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3. DESIGN BASED ON PROVECTUS DRAWING - DANESHILL 1

4. SECTIONS SHOWN ON DRAWING 3982-CAU-XX-XX-DR-C-1806

LEGEND

- AREA OF PROPOSED ACTIVITY
- LEACHATE & DRAINAGE FLOW DIRECTION
- SECTION LINES
- BIOTREATMENT SCREENING AND PROCESSING AREA
- SCREENING / PROCESSING
- ACCESS ROAD
- WATER COLLECTION & PUMPING CHAMBER

REV					
P2	LEGEND UPDATED	EJD	KB	AS	24.03.20
P1	ISSUED FOR INFORMATION	EJD	AS	AS	06.02.20
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
PROPOSED
LAYOUT
PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
JC	EJD	JC	JC
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DRAWING NUMBER
3982-CAU-XX-XX-DR-1805

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NOTES

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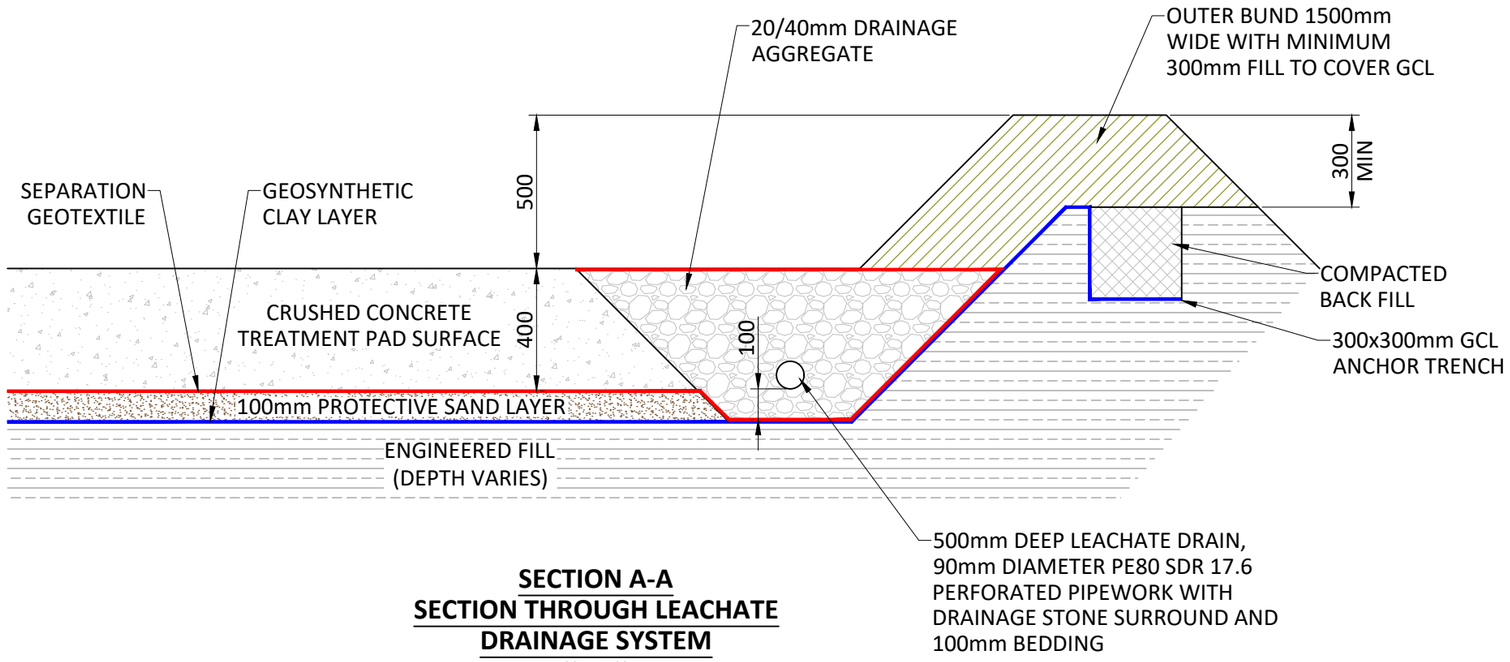
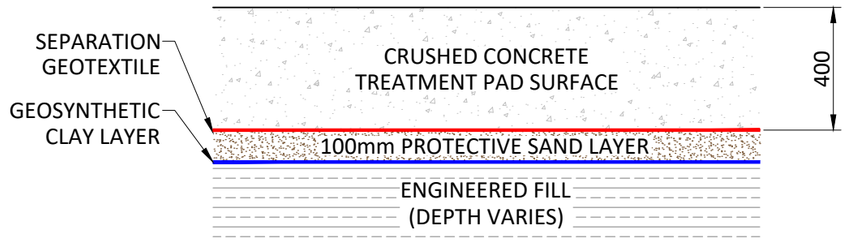
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

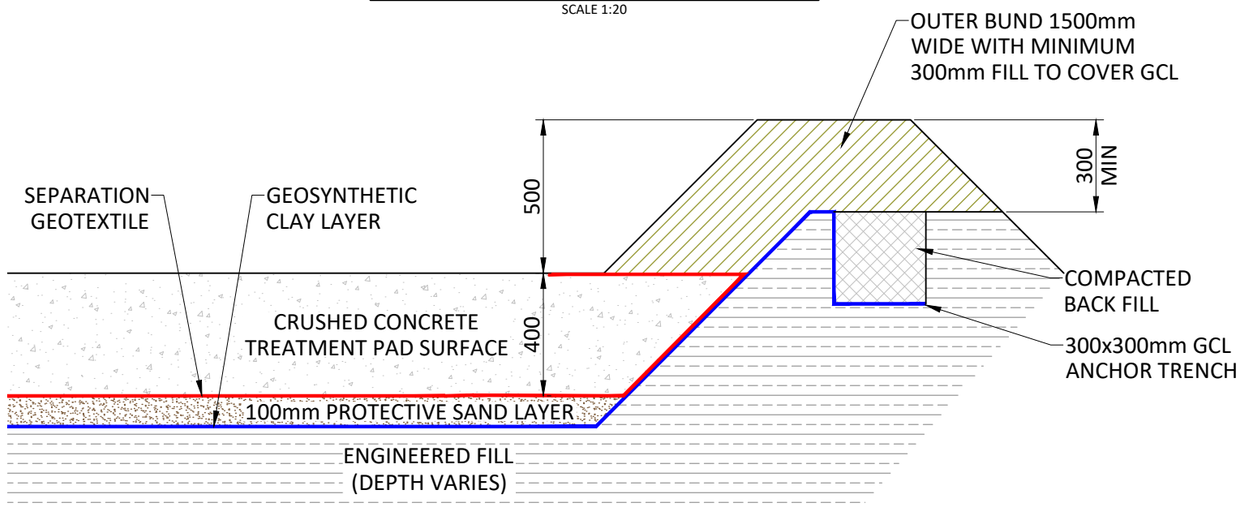
3. SECTIONS POSITIONS SHOWN ON DRAWING 3982-CAU-XX-XX-DR-C-1805



SECTION A-A
SECTION THROUGH LEACHATE DRAINAGE SYSTEM
SCALE 1:20



SECTION B-B
SECTION THROUGH TREATMENT PAD
SCALE 1:20



SECTION C-C
SECTION THROUGH TREATMENT PAD & EDGE BUND
SCALE 1:20

REV					
P1	ISSUED FOR INFORMATION	EJD	AS	AS	06.02.20
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: FCC Environment

PROJECT: DANESHILL SOILS TREATMENT FACILITY

TITLE: SECTIONS DRAWING

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DRAWING NUMBER: 3982-CAU-XX-XX-DR-C-1806

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Appendix 1

Management Procedures

Waste Acceptance Procedure Soil Treatment Centre (STC).

FCC soil treatment centres are limited to accepting wastes which can be treated to a standard that is acceptable beneficial reuse in the adjoining quarry void as general fill. Potential wastes for treatment must be assessed prior to their acceptance to ensure their suitability.

Prior to acceptance at a non-hazardous landfill site the treatment outputs must be assessed and pre-characterised so that its acceptance will not:

- Result in unacceptable emissions to groundwater, surface water or the surrounding environment;
- Jeopardise environment protection systems (such as liners, leachate and gas collection and treatment systems) at the landfill adjacent to the quarry void; or
- Endanger human health

Definitions & Abbreviations

- TM – Technical Manager
- STC – Soil Treatment Centre

Waste Acceptance Procedure STC

1.0	**Waste enquiry receipt, data collection and classification.**	
TM/Site Management	Upon receipt of a new permit or permit variation, all existing wastes should be evaluated in line with the procedures below.	
Sales Team	The initial stage of the STC waste acceptance procedure commences via an enquiry from a potential customer.	
Sales/TM	The Technical Manager (TM) is informed of the nature of the waste and shall carry out a full technical assessment. As a first step toward this aim, the following details shall be gathered: • Source and origin of the waste; • Discussion to be held between the Sales team and treatment subcontractor to establish suitability on the proposed material prior to undertaking the full technical assessment. • Information on the process producing the waste • Appearance of the waste e.g. smell, colour and physical form; • Code in accordance with the European Waste Catalogue or List of Wastes Regulations; • Data on the composition of the waste and the levels of contamination; • Any additional information that may require special precautions to be taken at the STC.	

TM	Waste types acceptable at the STC are limited to those detailed in Appendix C3_1 of the environmental permit variation application If the candidate waste is not classified in one of the categories above, it shall be rejected.	
TM	As part of the classification process described above, the waste will be assessed to determine whether it is hazardous or non-hazardous in accordance with Environment Agency guidance WM3, May 2015.	
TM	The TM will gather all of the above information and pass to the site staff at the treatment centre.	

2.0	**Assessment of Treatment Suitability**	
Treatment Subcontractor	The waste shall be assessed to ensure that it comprises biologically treatable substances. Such substances predominantly comprise of the following, but are not limited to: • A range of petroleum hydrocarbons (petrol, heating fuel, diesel, used oils, crude oil etc) • Polycyclic Aromatic Hydrocarbons (PAHs) • Pentochlorophenols (PCP) • Creosote • Phenols • Volatile Organic Compounds (VOCs) and Solvents • Asbestos screen Unsuitable physical inclusions in the waste that can be treated by physico-chemical treatment processes would be accepted. These inclusions after segregation would either be further treated to allow reuse within the quarry or disposed off-site as appropriate. If the waste contains materials which are untreatable and likely to render the waste unacceptable at the quarry post-treatment, the waste will be rejected.	
Treatment subcontractor	The treatment subcontractor will forward confirmation to the TM that the waste is suitable for treatment together with a statement of any limitations on physical and chemical characteristics (particle size, pH, moisture content etc) which they wish to impose. The treatment subcontractor will at this point advise of the acceptable frequency of incoming loads for treatment. They will also advise with regard to any relevant, additional parameters to be tested for compliance testing and output testing.	

3.0	**Waste stream Approval / Rejection**	
Sales/TM	A Customer Enquiry Form is generated on the computer network at this stage.	
Sales/TM/ Site Manager	All details gathered above will be entered into the waste assessment screens associated with the enquiry. Including the frequency of sampling. Once the assessment is completed and the waste approved for acceptance at the STC, the enquiry is allocated a specific Approval Number and the Customer Enquiry form becomes the Technical Approval. If the waste is rejected the reasons for rejection are keyed onto the Customer Enquiry Form so that a letter of rejection may be generated informing the customer of our decision.	
TM	Following the allocation of an Approval Number to a specific waste all the technical data obtained during and following the appraisal, will be forwarded to the Site Manager and a copy forwarded to the STC Manager.	
Sales / Site Manager	A tipping reference for the waste will created on the Central System and a quotation created and sent to the customer. The tipping reference will require all vehicles to "tare off" following delivery of the waste.	

4.0	**Waste acceptance and booking in.**	
STC Manager	No waste will be accepted unless it has been pre-booked for disposal with the STC manager. Upon booking in, the following information will be required: • Date of proposed deliveries to site • Confirmation of source and approval number (provided on the quotation paperwork) The Sales Team will confer with the Site Manager in relation to the number of the expected loads to the site weighbridge prior to the site opening each day.	
Weighbridge Operator	The weighbridge operator will weigh all incoming loads and assign them to the appropriate tipping reference. If the waste is hazardous the system will demand the entry of the consignment note details. These details should be entered at this point but the paperwork should remain with the driver for completion & signing by the treatment subcontractor staff. The driver should be directed to the STC making them aware of the need to tare off after deposit of the waste.	
Treatment Subcontractor	The treatment subcontractor will inspect any associated hazardous waste consignment notes and sign them prior to deposit of any load. The paperwork will be returned to the delivery driver with an explanation that it must be handed in at the weighbridge. They will direct the deposit of the waste into the suitable treatment lot. During unloading, a visual inspection will be carried out. If the waste appears to be different to that specified in the approval, the material will be quarantined or rejected as appropriate.	

Weighbridge Operator	When the driver returns to tare off the weighbridge operator will collect the signed hazardous waste consignment note (where relevant) and file it securely. The weighbridge ticket will be completed and appropriately signed.	

5.0	**STC Reception - Compliance sampling and testing**	
	All incoming wastes for treatment at the biopile process will be subjected to thorough pre characterisation as described above.	
Treatment Subcontractor	In addition to this, further testing will be performed to ensure that the materials accepted are consistent with the analysis and description supplied at the pre-characterisation stage. This is known as Reception and Compliance testing.	
Treatment Subcontractor	**STC Reception and Compliance Sampling methodology:** As the soil volume and number of lorry movements associated with each clients contract can vary the sampling of incoming soils is adjusted to ensure that representative data is obtained. The table below shows how the number of recovered samples relates to the volume of soil delivered under each contract. **Table 1 – Reception – Sampling Frequency** Volume of soil (m^3) / No. of samples recovered for analysis < 50 / 1 50 - 100 / 2 100 - 200 / 3 200 - 500 / 4 500 – 1,000 / 4 + 1 for every 250m^3 after 1,000m^3 1,000 - 2,000 / 8 + 1 for every 250m^3 after 2000m^3 **Sampling Population:** The sampling exercise is intended to represent the volume of material accepted from each contaminated land site. Its purpose is merely to ensure that the material accepted is that which was described during the pre-characterisation stage and that the material being accepted does not significantly differ either qualitatively or quantitatively in terms of its chemical composition. **Specify detailed sampling location:** Samples to be collected immediately from the discharged waste upon reception at the STC as per the treatment subcontractor Sampling Matrix. **Specify date and time(s) of sampling;** Each consignment of soil delivered to the STC will be sampled once it has been deposited in the STC & prior to being mixed with any existing material. The number of samples taken is dependent on the scale of the delivery (see Table 1 above). **Specify persons to be present:** The sampling of soils during the reception	

process is conducted by the STC Manager or Technician.

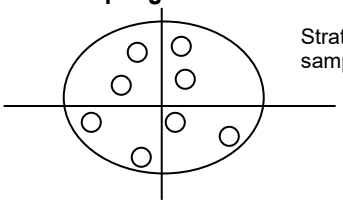
Identify equipment: Stainless Steel trowel, Sample containers (with air tight lids) and a permanent marker pen.

Specify no. of samples to be collected: See Table 1 and associated notes above.

Specify number of increments per sample: 8 (eight)

Specify increment size/sample size: Approximately 200g removed with a trowel.

Description of Sampling event:



The pile of discharged soil is split into quarters (visually) and 2 (two) incremental samples are taken from random locations within each quarter. These incremental samples are placed in plastic containers with air tight lids for subsequent mixing and sub-sampling.

Detail Requirements for on site determinations: No onsite testing is undertaken on these samples

Identify sample-coding methodology: Each sample should be labeled (written in indelible ink) twice. One label on the lid of the container and once on the outer body of the container both should contain identical information including: Contract and Line Number, Approval Number, Time of sample collection, date, signature of sampler.

SUB-SAMPLING

No sub sampling is undertaken with soils recovered at the point of reception. Each sample is considered to fairly represent the quality of the material delivered by the client. The number of samples submitted for external analysis (by an accredited laboratory) from each running contract is outlined in Table 1 and the associated notes above.

PACKAGING, PRESERVATION, STORAGE AND TRANSPORT REQUIREMENTS

Packaging: Samples are packaged into (1 litre) plastic containers, with airtight lids, as supplied by the laboratory. Each container is labelled using the sample coding specified above. These are packed into plastic cool boxes supplied by the laboratory along with a copy of the Chain of Custody documentation, specifying the analysis to be competed.

Preservation: The addition of preservatives is not required.

Storage: All soils awaiting analysis are stored at <4^{o}C in a fridge up to the point of transport to the laboratory

Transport: The samples should be collected and delivered to the laboratory using a propriety courier with proof of collection and delivery confirmed by time, signed and dated receipts.

STC Input Compliance Testing:

The samples collected above should be submitted for the following analytical testing:

- Metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se and Zn)
- pH
- Benzene, Toluene, Ethyl benzene and Xylene
- Volatile Petroleum Hydrocarbons (C5-C10, C10-C12)
- Extractable Petroleum Hydrocarbons (speciated)*
- USEPA priority 16 PAHs+
- Asbestos screen

Any additional parameters suggested by the treatment subcontractor at stage 2.0.

Any material found to be inconsistent with the pre-characterisation description will be quarantined at the waste producers cost, and disposed if untreatable to an appropriately licensed disposal point.

STC Output Sampling methodology:

Scale: A sample is to be collected from each batch of processed soils following treatment to confirm the level of decontamination.
Sampling Population: The sampling exercise is intended to represent the volume of material arising from each batch of soil that has been through the process. **Note -** The size of a typical process batch can vary from as little as 800 tonnes to over 4000 tonnes. Soils that are formed into treatment batches at the start of the treatment contain soils with similar, or compatible, chemical and physical properties. Once treatment begins sampling is based on stratified random sampling at a frequency of one composite sample for every 500 m^3 in process.
Specify detailed sampling location: Samples to be collected from Lots on the basis of a stratified random sampling plan.
Specify date and time(s) of sampling: Each batch will be sampled once it is considered to have completed the treatment process to the required standard. The end point of each treatment is tracked through the collection and analysis of "in-process" soil samples over a period of typically 8 to 16 weeks. This work is conducted by the treatment subcontractor in conjunction with an accredited analytical laboratory.
Specify persons to be present: The sampling of soils during the reception process is conducted by the STC Manager or a technician.

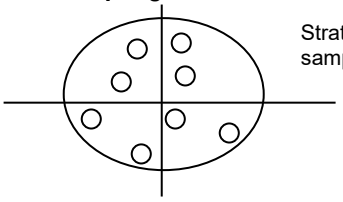
Identify equipment: Stainless Steel trowel, Sample containers (with air tight lids) and a permanent marker pen.

Specify no. of samples to be collected: 1 (one) composite sample from each 500m^3 of soil within the batch (Biopile).

Specify number of increments per sample: 8 (eight)

Specify increment size/sample size: Approx 200g removed with a hand held auger at depths of between 0.5m and 1.5m below the surface.

Description of Sampling event:



The upper surface of the biopile is visually divided into 3 (three) metre wide strips. This equates to the area influenced by a single aeration pipe and contains approximately 400 tonnes of soil. This area is then visually divided once more into 4 (four) equal zones and 2 (two) incremental samples are taken from random locations within each quarter. These incremental samples are placed in a clean 25 litre plastic tub for mixing and sub-sampling.

Detail Requirements for on site determinations: No onsite testing is undertaken on these samples

SUB-SAMPLING

Detailed procedure: Recovered soils from a single batch sampling process are placed in a clean 25 litre plastic container and mixed using a stainless steel hand trowel, for a minimum of two minutes, to generate a uniform sample. Each mixing operation is limited to a maximum of 2kg of soil at any one time. A 1 (one) kg sub sample from each mixing operation is transferred as a the sub-sample to a sample container (1 litre plastic container with air tight lid)

One sub sample is submitted for chemical analysis for every 500m^3 of soil held within the treated batch (Biopile)

PACKAGING, PRESERVATION, STORAGE AND TRANSPORT REQUIREMENTS

Identify sample-coding methodology: Each sample should be labelled (written in indelible ink) twice. Once on the lid of the container and once on the outer body of the container. Both should contain identical information including: Batch identification Number, Time of sample collection, date, signature of sampler.

Sample numbers have the following structure:
STC -1-X-Y
Where X corresponds to batch number and Y corresponds to the nth sample number taken e.g. – if batch 14 underwent three separate sampling events, the samples would be numbered:

	STC -1-14-1 STC -1-14-2, and STC -1-14-3	
	Packaging: Samples are packaged into (1 litre) plastic containers, with air tight lids, as supplied by the laboratory. Each container is labelled using the sample coding specified below. These are packed into plastic cool boxes supplied by the laboratory along with a copy of the Chain of Custody documentation, specifying the analysis to be competed.	
	Preservation: The addition of preservatives is not required. All soils awaiting analysis are stored at <4^{o}C in a fridge up to the point of transport to the laboratory.	
	Storage: Store sample containers in a cool darkened environment (preferably a cold store) until collected.	
	Transport: The samples should be collected and delivered to the laboratory using a propriety courier with proof of collection and delivery confirmed by time, signed and dated receipts.	
	STC Output Testing: The samples collected above should be submitted for the analytical testing as detailed in STC Input Compliance Testing.	

6.0	**Acceptance of treated material at the quarry.**	
TM	Results of STC output testing will be forwarded to the landfill site manager and TM for review. All materials accepted from the STC into the landfill must be subjected to a full technical assessment and approval.	
TM	Material leaving the STC following treatment will be coded under the list of Wastes as either: 19 13 02 An assessment will therefore be required to determine whether the material is hazardous or non-hazardous in accordance with Environment Agency guidance "WM3" using the Approved Supply List (ASL) as the reference source for substance classification, or 19 13 01* Any materials found to be hazardous will not be accepted at the quarry and will remain at the STC to undergo further treatment or off site disposal to a suitably permitted facility.	
TM	Materials which are shown to be non-hazardous and which are shown to display levels of contamination below the soil reuse targets agreed through the completion of a detailed quantitative risk assessment (DQRA) will be permitted for reuse in the quarry as general fill	

STC – FO03 - SOIL CHARACTERISATION PROCEDURE

Document No:	STC - ERQ - FO03	**Issue No:**	2
Author:	Jon Owens	**Approved By:**	Steve Langford
Issue Date:	11/11/16	**Approval Date:**	11/11/16

Introduction

This procedure relates to the measures to be undertaken for the sampling of soils received at the STC. See procedure STC - F002 for background information.

Objectives

The main objective of the operation is to ensure soils received at the Soil Treatment Centre (STC) are visually, structurally and chemically similar to those described during the pre-acceptance procedure, and therefore compliant with the Environmental permit and suitable for treatment. This will allow any non-conforming waste to be rejected. The equipment required will be:

- Gloves
- Clean stainless steel trowel
- Mixing tray
- Soil-sampling plastic pots

Procedure

The sampling of soils will be performed by the STC technician or project manager. The procedure uses composite sampling methods as provided in BS812.

A minimum of at least one composite sample must be taken from each job (unique authorisation code). The PM shall assess which sample will sent to the laboratory for reception compliance testing, based on visual assessment, high risk job, knowledge of the client, material variation etc... Chemical testing is undertaken to ensure that the materials being tipped are consistent with the analysis and description provided by the client at the pre-characterisation stage.

Not all samples may require analysis; these samples shall be stored in an appropriate storage place until the job/batch is disposed of.

Table 1: Requirements for sampling:

Volume of soil (t)	No. of samples needed (before or during acceptance at STC)
< 100	1
100 - 500	2
500 +	2 + 1 for every 500t

The general suite of analysis for soils shall include:

- pH
- CLEA Metals
- Total TPH
- Total PAHs
- Total Cyanide (where required)
- Phenols (where required)
- SVOCs and VOCs (where required)
- PCBs (where required)
- Asbestos (screen) and quantification
- Moisture content

However, these parameters may be adapted by the project manager due to prior knowledge of contaminants derived from client waste description, history and data.

All analysis will be undertaken by a UKAS/MCERTS accredited laboratory using accredited methods.

Once the analysis results are received, they will be assessed by a suitably qualified and experienced STC manager to confirm they meet the requirements for treatment. These results are to be stored electronically onto the CRM database under the specific job number (reception samples) or the specific batch (amendment / in-process / final samples).

Should the results not conform to the requirements for treatment the waste will be rejected following the formal rejection procedure.

STC – WI 010 – PAD MAINTENANCE

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
2	Document format and location change to integrate STC documents into QMS.	05.03.18

Introduction

This procedure relates to the daily operations required to keep the STC fully functional, including maintaining a tidy and safe method of working. This maintenance comes under the remit of Provectus' quality control system. It is also seen as a desirable health and safety practice, since it incorporates measures which control the possibility of equipment, plant and permanent installations presenting dangers to operatives by entering into a state of disrepair and untidiness.

Principle of Operation

The main aim is to ensure that the process performed at the STC is operating at a high level of efficiency; including the reduction of potential infringements. It is undertaken to keep the STC in a clean state of appearance, and to provide a safe working environment for all employees and other operatives in the vicinity of, and within the boundaries of, the treatment pads.

Procedure

There is no specific, set procedure that can be listed to cover general pad maintenance. It comprises of constant visual monitoring of the state of the biopiles, soil treatment pad, and any such areas of operation on the STC. Such things included in this operation are:

- tidy deployment of tools and equipment
- keeping any tarpaulins neatly stored when not in use
- tarpaulins shall not be kept in an untidy manner on the biopile surfaces (tarp use is kept to a minimum)
- any stockpiles of soils, gravels, amendments and materials shall be kept in a safe and organised form
- the on-site office shall be cleaned as required
- the edges of the biopiles shall be kept clean and tidy
- the drains along the edges of the biopiles shall be regularly purged of any debris
- use of a road sweeper and water bowser with spray rail as required

The use of earthworks plant shall often be employed in order to keep the treatment pads and associated areas clean. All of the procedures listed above shall be particularly observed during any operations on the STC, namely soil deliveries and shaping into biopiles, soil removal for subsequent disposal, and turnovers.

As part of a good traffic management system, the regular maintenance of signs shall also be undertaken. The levels on the pad shall be regularly surveyed and visually monitored for differential settlement. Any potholes or deformation of the pad or associated roads will be reported to the PM and the matter resolved within an appropriate timescale.

STC – WI 008 – BIOFILTER OPERATION AND MONITORING

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
2	Document format and location change to integrate STC documents into QMS.	05.03.18

Definitions and Abbreviations

VOC – Volatile Organic Compound
TPH – Total Petroleum Hydrocarbon
PAH – Polycyclic Aromatic Hydrocarbon
BTEX – Benzene, Toluene, Ethyl Benzene, Xylene

Introduction

This procedure relates to the measures to be undertaken for the regular monitoring of the quality and performance of the biofilter located on the STC. The biofilter is a compost mixture, acting as a natural filter medium for exhaust gases from the treatment pads. Its function is to treat exhaust gases, removing VOCs, TPHs, PAHs, and BTEX. To maintain moisture and temperature levels and to maximise process efficiency, the biofilter is normally kept under a tarpaulin cover. Both visual inspections and chemical analyses will constitute the quality control procedure relating to biofilter performance, with electronic data recording and a system for modifications and alterations of the process incorporated into Provectus' quality control system.

Principle of Operation

Air and process water are pumped from the treatment pads, *via* secondary pipes, into a primary pipe. This mixture then enters an air-water separator, where water is separated from the air fraction by gravity. This air fraction is then pumped through a treatment module, and eventually exhausted to the biofilter.

In order to maintain a moisture film on the matrix of the biofilter, re-circulating process water may be pumped periodically (this is controlled and may be altered by the PM in accordance with needs) onto the surface of the biofilter. Used in conjunction with periodic visual inspections, decompaction, re-fertilisation and replacement techniques; this ensures the continuing maintenance of a high-performance biofilter at the STC. The moisture film must be maintained in order to facilitate desorption of organic gases onto the biofilter matrix.

Procedure

As part of the quality control system for the STC, Provectus will replace the biofilter on at least an annual basis. This will involve the removal of an existing biofilter and replacement with a similar material. The biofilter shall be turned, in a similar way to that described for the biopiles on a recommended quarterly period. At this point, if necessary, manual spraying of the biofilter *via* a normal transfer hose assembly from the water collection tank shall be undertaken. Any

such additions of water, turnovers and replacements shall be electronically recorded as part of the quality control system on the STC database. Periodic manual and visual assessments of the moisture content and structure of the biofilter will also be conducted.

On a monthly basis, sampling of the gases directly exhausted from the biofilter will be undertaken by an independent laboratory. The process-specifics are appended and it has been agreed when using Gradko to use a 10 minute exposure period.

Moisture content from the biofilter material will also be tested for monthly, along with quarterly testing of pH, exchangeable ammoniacal nitrogen and phosphorus. Result will be stored onto the STC database.

STC – WI 007 – ENVIRONMENTAL MONITORING

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
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Document Changes

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2	Document format and location change to integrate STC documents into QMS.	05.03.18

Introduction

This procedure relates to the measures to be undertaken for environmental monitoring at the STC, in order that all emission points are regularly monitored to ensure that the operation is compliant with the conditions of the permit. This procedure does not replace any general monitoring of the site undertaken by FCC.

Principle of Operations

The main objective of the operation is to monitor and record the emission points on the STC. These are limited to the following:

- Air emissions from the biofilter.
- Material measurements from the biofilter.
- Water emissions from the water discharge point at the STC.
- Dust concentrations in air at the STC.
- PID measurements for VOCs at the STC.
- Noise assessment
- Odour assessment

Procedure

Site environmental monitoring aims to ensure compliance with the Environmental Permit as well as our internal procedures for PPE and RPE.

Process Emissions

The point emissions from the STC include process water, surface water collection and air emissions from the biofilter as well as dust and odour from general site works. The monitoring for these processes include:

- Biofilter sampling (from exhaust vents only)
- Process water sampling
- Visual and olfactive daily assessment for dust and odour on site.
- Dust monitoring

Biofilter Monitoring

The frequency for the biofilter sampling is monthly and is scheduled through a nominated laboratory. The schedule of analysis for the biofilter is as follows:

- VOCs (including BTEX)
- Speciated PAHs
- TPH

The use of a nominated laboratory will permit independent testing of the biofilter air quality for reporting and recording to allow compliance with the permit conditions. The procedure for biofilter monitoring is STC – WI 008.

Process Water Monitoring

The water quality in the water collection tanks will be monitored on a monthly basis. A sample will be obtained from the point of discharge, and analysed for parameters stated in the discharge consent. Regular checks will be made to ensure no visible oil or grease is present in the tanks, or at the discharge point.

STC Dust Control

Monitoring shall be done on a daily visual basis in addition to independent dust measurement carried out by nominated laboratory/subcontractor. Sampling locations are shown on attached drawing no2.

Dust suppression is to be undertaken when soil movement is generating excessive dust, this includes traffic movements and soil turnover. Measures for this are included within the Site-Specific Working Plan submitted to the Environment Agency. The source of dust will be identified and the operation creating a dust presence ceased. Mitigation measures will include the use of the on-site water bowser with spray rail or equivalent.

PID Measurements

A photo-ionisation detector (PID) shall be used on a bimonthly basis on locations 1 to 5 and near the biofilter (6) to quantify gaseous emissions (see monitoring locations on drawing 1 attached). If PID readings for Benzene exceed 1ppm (based on EH40 guidance), then the source shall be identified and assessed by Provectus. It will be dealt with, for example, increasing PPE levels on site, a cessation of soil movement or covering of odorous soils with a tarpaulin etc.

If site activity involves the movement of soil that has been identified with high level of VOC which may be harmful to personnel working in the vicinity or other off-site receptors, then PID and benzene monitoring shall occur on a daily basis.

Results are recorded in the on-site database system.

Noise Measurements

Observations relating to excessive noise incidents shall be recorded in the database system.

STC Odour Control

Regular daily checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by Provectus. It will be dealt with, for example, a cessation of soil movement if required or covering of odorous soils with a tarpaulin etc. Observations shall be logged in the database system.

Recording of Results

All analytical results and monitoring results shall be stored onto the STC database under the relevant environmental batches location. Any changes made to the type of monitoring or adjustment to the biofilter shall also be recorded on the STC database.

STC – WI 006 - SOIL ANALYSIS

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Introduction

This procedure relates to the measures to be undertaken for the testing of soils treated at the STF. This ensures that soils are suitable when received, are maintained in optimal treatment ranges and are validated in accordance with the permit. Once treatment is complete soils treated at the STC may be reused in two possible ways. Namely, as soil for the quarry access road or as restoration soils for the quarry backfill works.

Principle of Operation

The main objective of the reuse of soils is to ensure, in accordance with the PPC permit, that any material treated by Provectus is reused in a safe and environmentally acceptable manner. Quality control measures are implemented in order to prevent the reuse of soils to destinations either unintended, or unsuitable for the receipt of such soils. This operation is performed in conjunction with FCC, who operate the quarry where the soils shall be reused.

In-treatment batches of soil are monitored periodically, testing for the contaminants of concern and nutrient availability. The location and frequency of this 'in-process' sampling is decided at the discretion of the PM. When a batch of treated soil displays strong chemical evidence of meeting a non-hazardous reuse standard, a 'validation' sample must be taken to generate a data report, this can be sent to FCC for disposal to be formally approved.

Validation sampling should be carried out by the site operator or site manager, using a random stratified sampling plan. As a general rule one composite sample should be taken for every 500t.

The reception and validation samples should be submitted for the following analytical tests –

- Metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se & Zn)
- pH
- Speciated TPH (including BTEX)
- Speciated PAHs
- Phenols
- Total Sulphate
- Elemental sulphur
- Free Cyanide
- Total Cyanide
- Asbestos screen

In process samples should be submitted for the following analytical tests:

- Moisture content
- pH
- Ammoniacal nitrogen
- Nitrate

Contaminants of concern will be added at the request of the PM to supplement the in-process analysis.

Dependent on the contaminants of concern it may be necessary to request further parameters for testing on validation. Leachate analyses are required for reuse of soils in the restoration part of the landfill in accordance with the agreed risk assessment.

Procedure

Once the soil lot has been analysed by an accredited laboratory, and deemed to be suitable for removal from the biopile, the Site Manager shall arrange with FCC, for soil to be removed from the biopiles, and taken to a suitable reuse destination on the landfill.

All information regarding soil volumes, final analysis results, soil origin and ultimate destination shall be recorded on STC database and communicated to both the FCC Waste Assessment team and to FCC Site Manager for approval and arrange plant and personnel required for the transfer of soils.

STC – WI 005 - SOIL TURNOVER

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
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Introduction

This procedure relates to the periodic process referred to as 'turnover', which is an important and necessary undertaking for the treatment of soils at the STC. The process improves air flow through the soil by decompacting it, and soils to be inspected as part of the overall treatment programme. It consists of moving soil sections in a biopile, using an excavator, to an adjacent piping section of the biopile. Occasionally a turnover is conducted *in-situ*, *i.e.* - the soil is moved around within the section it already occupies. This is typically done when there is no spare room on the biopile to relocate the soil. The biopile is also effectively inverted in order to effect a more homogeneous treatment.

Principle of Operation

There is no set pattern of frequency for a turnover, since it is usually dependent upon soil-specific characteristics, and will often follow the receipt of 'in-process' chemical analysis undertaken on soil sampled from the biopile. The programme for the soil turnover events shall be determined by the PM, in conjunction with the SM. A turnover may involve the addition of one or more types of amendments into the soil, and will usually entail movement along the treatment pad to form a new similarly shaped and dimensioned biopile.

Procedure

The operation is carried out by trained excavator drivers, under the supervision of Provectus personnel. Before any soil is moved on to a new secondary pipe, the pipe must be covered with gravel, typically, though not exclusively 20-40mm clean gravel; formed into an apex above the centre line of the secondary pipe, giving a triangular facial profile, and triangular prism shape.

Trenches created during the turnover shall be made safe with a 1 in 1 batter (45^{o} slope) at all times and regular checks will be undertaken by the technician to ensure this is occurring.

During the turnover, underlying secondary pipes may be damaged, when this occurs the area around the damage will be made safe to allow access by Provectus technicians. The damaged section of pipe shall be removed and disposed of, it must NEVER be left in the biopile. Each end of a new pipe section will be secured with the use of a flexible coupler. Gravel will be reinstated on the new pipe section prior to continuing with the soil turnover.

During any pipe repairs the excavator driver shall act as a top man on top of the biopile to ensure no access is permitted to the pipe repair area by unauthorised personnel.

Any operation, turnover or amendment added to the batch shall be recorded electronically onto the STC database, in compliance with Provectus' quality control system.

STC – WI 004 - SOIL TREATMENT AND MONITROING PROCEDURE

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Introduction

This procedure relates to the monitoring of the soil treatment process undertaken and executed by Provectus. The purpose of the treatment is to reduce concentrations of certain contaminants within a soil, prior to reuse within the FCC landfill. This shall form, in conjunction with other routine observations, the monitoring programme for the soil treatment process.

Principle of Operation

Certain process parameters are vital for Provectus' soil treatment system to operate successfully; hence regular and frequent inspection and assessments must be made of these process parameters, in order to monitor the performance efficiency of the soil treatment process, and allow for alterations to be made as required.

Procedure

A weekly equipment follow-up sheet shall be filled in by the Site Manager. This performance record shall be entered in the STC database and compared to previous follow-up sheets, by the site manager, in order to highlight any significant short-term changes in the operational parameters. Additionally, the long-term performance efficiency shall then be monitored. Any necessary advice for re-adjustments can be given by PM, while STC site manager shall act upon this advice/instruction at the earliest possible time.

Soil sampling procedures, in accordance to STC procedure STC WI 003 shall also be undertaken. Soil sampling shall elicit information relating to concentrations of relevant pollutants and amendments made to the soil. From this information, the degradation of contaminants over time may be observed, and any follow up actions decided for the following week *via* a treatment calendar, containing information relating to the history of a 'lot' of soil.

Analysis results shall be entered on to the STC database and thus electronically recorded as part of the quality control procedure.

On a daily basis, visual monitoring of equipment, including plant, and soil biopiles shall be undertaken. Equipment modules will be inspected every morning and evening upon module opening and closing respectively. Noise, vibration and heat observations of equipment shall also be executed at these times.

Daily site walk-overs shall be conducted by the SM in order to monitor leaks in pipe working and water conduits. Regular manual checks of air-flow in secondary pipes for humidity, flow-rates and temperature shall be undertaken by the head technician. Water filters shall be cleaned once weekly, at the time of undertaking the follow-up.

Appendix 2

Air Quality Risk Assessment

The Airshed

Air Quality, Odour and Environmental Noise

Air Quality Impact Assessment for Proposed Soil Vapour Treatment Facility at Daneshill Landfill Lound Retford

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1	18th December 2019	1st draft for internal review
2	8th January 2020	For client review

Executive Summary

FCC Recycling (UK) propose to operate a new soil remediation facility on land at Daneshill Road, Lound, Retford DN22 8RB. The proposed facility is located in a rural area adjacent to a former landfill and current waste treatment facilities. The nearest established residential areas are Ranskill to the northwest, Torworth to the west and Lound to the east. There are isolated houses within 1km of the proposed facility, including the Travellers site at Daneshill Road.

The facility will receive soils that are known to be contaminated with volatile organic compounds (VOCs). Soils to be treated will be graded and screened, and placed in aerated static piles on open ground. Fresh air will be drawn through the static piles to strip the VOCs from the contaminated soils. The VOCs will be drawn through slotted pipes underneath the static piles and ducted to a bio-filter.

Caulmert Ltd, Environmental Consultants, has appointed The Airshed to conduct an air quality impact assessment (AQIA). The scope of this assessment is to consider the potential air quality impacts on human health from the emissions of VOCs. Dust impacts associated with the proposed facility are considered elsewhere.

The nearest sensitive receptors where long-term exposure is relevant is at the Travellers' site on Daneshill Road, ~280m to the south-east.

The airborne concentrations of pollutants have been predicted using ADMS 5.2, a widely used atmospheric dispersion model, using five years of hourly sequential meteorological data from RAF Scampton. The assessment considers the effects of these emissions on sensitive receptors in terms of Environmental Assessment Levels (EALs) for assessing human exposure. A single Scenario has been assessed:

- Scenario 1 considers emissions from the bio-filter assuming the maximum measured concentrations of VOCs reported at a similar site elsewhere.

The predicted concentrations of Benzene, Toluene, Ethylbenzene and Xylene are 0.0% of the relevant long-term and short-term EALs at the nearest sensitive receptors. The predicted air quality impacts from the proposed facility are insignificant.

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Acronyms

AD	Anaerobic Digestion
ADMS 5	Air Dispersion Modelling System Version 5
AERMOD	Preferred dispersion model for USEPA
AOD	Above Ordnance Datum
AQIA	Air Quality Impact Assessment
AQMA	Air Quality Management Area
AQS	Air Quality Standards
As	Arsenic
BAT	Best Available Technique
C_6H_6	Benzene
$C_{20}H_{12}$	Benzo(a)pyrene
Cd	Cadmium
CERC	Cambridge Environmental Research Consultants
CLF	Critical Loads Function
CO	Carbon Monoxide
Co	Cobalt
CHP	Combined Heat and Power
Cr	Chromium
Cr_{VI}	hexavalent Chromium
Cu	Copper
^oC	Degrees Centigrade
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency for England
EAL	Environmental Assessment Level
EIA	Environmental Impact Assessment (a process)
EQS	Environmental Quality Standard
ES	Environmental Statement (a document or series of documents)
FGT	Flue Gas Treatment
g/s	grams per second
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
HHRAP	Human Health Risk Assessment Protocol
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention & Control Directive
K	degrees Kelvin
kW	kiloWatt
LNR	Local Nature Reserve
m/s	metres per second
m^3/s	cubic metres per second
mg/m^3	milligrams per cubic metre(10^{-3})
Mn	Manganese
MSW	Municipal Solid Waste
ng/m^3	nanograms per cubic metre (10^{-9})
NH_3	Ammonia
Ni	Nickel
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_2	Oxygen
OS	Ordnance Survey
Pb	Lead
pg/m^3	pico gram per cubic metre (10^{-12})
PM_{10}	Particles with aerodynamic diameter less than 10 microns
$PM_{2.5}$	Particles with aerodynamic diameter less than 2.5 microns
PC	Process Contribution
PEC	Predicted Environmental Concentration
Sb	Antimony
Sn	Tin
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TEQ	Toxic Equivalent (usually for dioxins and furans)
TG(16)	Technical Guidance Note for Local Air Quality revised in 2018
Tl	Thallium
tpa	tonnes per annum
ug/m^3	micrograms per cubic metre (10^{-6})
U_{10}	wind speed at measurement height – usually 10m above local ground level
USEPA	Environment Protection Agency (for the United States of America)
V	Vanadium
VOCs	Volatile Organic Compounds
WwTP	Wastewater Treatment Plant
WID	Waste Incineration Directive
Zn	Zinc

Prediction is very difficult, especially about the future.
Niels Bohr, Danish physicist (1885 - 1962)

1.0 INTRODUCTION

Background to Report

1.1. FCC Recycling (UK) Ltd who are a wholly owned subsidiary of FCC Environment (UK) Ltd, propose to operate a new soil remediation facility on land at Daneshill Road, Lound, Retford DN22 8RB. The proposed facility is located in a rural area adjacent to a landfill and other waste treatment facilities. The proposed facility is located in a rural area where the nearest established residential areas are Ranskill to the northwest, Torworth to the west and Lound to the east. There are isolated houses within 1km of the proposed facility including the travellers site at Daneshill Road. The site location is shown in Figure 1.

1.2. The facility will receive soils that are known to be contaminated with volatile organic compounds (VOCs). Soils to be treated will be graded and screened, and placed over slotted drainage pipes in aerated linear static piles held under negative pressure. Air will be drawn through the static piles to strip the VOCs from the contaminated soils. The VOCs will be drawn from the soils into the slotted pipes and ducted to a bio-filter. Further details on the project description are presented in Appendix 1.

1.3. Caulmert Ltd, Environmental Consultants, has appointed The Airshed to conduct an air quality impact assessment (AQIA). The scope of this assessment is to consider the potential air quality impacts on human health from the emissions of VOCs. Dust impacts associated with the proposed facility are considered elsewhere.

Table 1.1 – Sensitive Receptors – Human Health (selected)

No.	Location	OS x	OS y	Distance (m)
1	Travellers Site	467595	386491	279
2	Daneshill Cottage	467047	386590	474
3	House to east	468272	386638	788
4	Mattersey Road	468558	386067	1265
5	Lound	468895	386146	1528
6	Lound	469046	386531	1568
7	North View	469083	387159	1641
8	Blaco Hill	469589	388011	2445
9	Lakefield	468917	388519	2270
10	Mattersey Hill	468172	388578	1949
11	Lakeland House	467346	388611	1865
12	Mattersey Road	466777	388399	1797
13	Bridge House	466143	388277	2038
14	Maltkiln Cottage	466239	387768	1614
15	Willow Avenue	466196	387589	1544
16	Lakeside Fishery	466351	387458	1344
17	Underwood Avenue	465818	387047	1701
18	Moat Farm	465851	386645	1645
19	Torworth Grange	465970	386001	1698
20	College Farm	466102	385473	1889

(N.B. distances are from the centre of the biofilter)

1.4. The locations of the sensitive receptors considered in the study are shown in Figure 1 and receptor locations are presented in Table 1.1 above. The nearest receptor location is the Travellers' site 279m to the southeast of the proposed bio-filter.

Scope of Air Quality Impact Assessment

1.5. This assessment considers the potential adverse air quality impacts from the proposed facility on human receptors. The main pollutants of concern are Benzene, Toluene, Ethylbenzene and Xylene. This assessment is based on the assumption that the contaminants in the soils to be used at the facility will be similar in character to those tested at the Edwin Richards Quarry.

1.6. This study is intended to help determine the likely effects of the emissions on adjacent receptors. The dispersion model used in this study, ADMS 5.2, has been widely validated. Experience has shown that the model is conservative, so that it will tend to over-predict, provided the source estimates are accurate.

1.7. The assessment considers the effects of the emissions from the facility in terms of environmental assessment levels (EALs).

Report Structure

1.8. Section 2 discusses relevant air quality standards, and English and European Regulations and Guidance relating to air quality assessment criteria.

1.9. Section 3 describes the pollutant emission rates for the WwTP. The section also discusses the baseline air quality conditions around the installation, taking account of the character of the emissions.

1.10. Section 4 sets out the reasons for the approach to assessment and details the assumptions made in the dispersion model.

1.11. The results from the dispersion modelling are presented in Section 5.

1.12. Proposed mitigation measures are outlined in Section 6.

1.13. The significance of the residual emissions is presented in Section 7.

2.0 RELEVANT LEGISLATION AND STANDARDS

Introduction to Section 2

2.1. This section discusses relevant Guidance relating to the installation.

Environmental Assessment Levels

2.2. The Environment Agency (EA) has published Guidance[1] that proposes a simple screening approach where the predicted process contribution (PC) long-term concentrations of pollution may be regarded as insignificant where the PC <1% of the EAL. PC <10% of the EAL is insignificant for short-term concentrations. The relevant EALs for this assessment are set out in Table 2.1 below. Odour impacts are considered separately.

Table 2.1 – Environmental Assessment Levels (Human Exposure)

Pollutant	Long term	Short term
	ug/m³	ug/m³
Benzene	5	-
Toluene	1,910	8,000
Ethylbenzene	4,410	55,200
Xylene	4,410	66,200

N.B. columns are blank where there is no relevant EAL.

EA Guidance for Odour

2.3. The EA has issued Guidance on odour assessment[2] for processes that are subject to the Environmental Permitting Regulations (H4). The EA's odour criteria are based on the 98%ile of hourly averages in a typical year. This allows for atypical odour emissions or poor dispersion caused by unfavourable weather conditions around 175 hours over a year. According to this Guidance, odour from the most offensive odours, which is likely to include leachates, should be less than 1.5 OU_E/m^3 1 hour 98%ile at sensitive receptors. These criteria are quantified using dynamic olfactometry in accordance with British Standard, BS 13725:2003.

2.4. H4 advises that odours from different processes within the same installation are not necessarily equally offensive and that this should be taken into account. This assessment assumes that an odour benchmark of 1.5 OU_E/m^3 1 hour 98%ile will apply.

BS EN 13725 : 2003

2.5. The use of odour units, based on human response to odour rather than chemical speciation, presumes that human response to odour can be quantified scientifically. The European Standard for measurement of odour concentration, BS EN 13725 : 2003[3] specifies the sampling and analytical procedures for dynamic olfactometry and the quality assurance requirements for repeatability of results. Based on this type of sampling method, the limit of detection for 50% of the test panel is 1 OU_E/m^3. Odour units are not a measurement of concentration, but rather a ratio of

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions
[2] Environment Agency March 2011. H4 Odour Management. How to comply with your permit.
[3] BS EN 13725 : 2003. Air quality. Determination of odour concentration by dynamic olfactometry.

the number of dilutions required to reduce an odour to where it cannot be detected by 50% of the odour test panel.

Where Should EALs and Odour Benchmarks Apply?

2.6. Air quality standards should apply to all locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant objective. Thus short-term standards intended to prevent exposure to toxic air pollutants with acute effects should apply to footpaths at site boundaries and other areas which may be frequented by the public even for a short period of time.

2.7. Longer term exposure and odour benchmarks should only apply at houses and gardens or other locations which the public can be expected to occupy on a continuous basis.

2.8. The receptors used in the modelling assessment are shown in Figure 1. The predicted impacts at these receptor locations are concerned with air quality impacts on human health and amenity.

2.9. This assessment assumes that odour benchmarks around the proposed installation should only apply to residential areas, or other locations which members of the public are likely to occupy over an extended period of time; and that pedestrians on footpaths and people on roads adjacent to the site are not sensitive to odour. All dwellings are considered to be highly sensitive receptors as defined by the IAQM 2014 Odour Guidance[4].

Assessment Framework

2.6. The assessment framework used to assess the significance of air quality impacts is set out in Table 2.2 below. This is based on DEFRA/EA Guidance[5] and the EA's informal pragmatic risk assessment method. These assessment criteria only apply to EALs and do not apply to the assessment of odour.

Table 2.2 - Air Quality Impact Assessment Criteria (Annual Mean at Receptors)

Predicted Impact	Adverse Significance	Justification
Greater than air quality limit value or objective	Major	Exceeding any air quality limit value would be unacceptable in terms of human health, or where the impact would have significant adverse ecological impacts.
Process Contribution >30% of EAL	Moderate	Risk based approach advocated by Environment Agency taking account of model headroom and uncertainty.
Process Contribution <30% of EAL	Minor/Moderate	Risk based approach advocated by Environment Agency taking account of model headroom and uncertainty.
Process Contribution <10% of EAL	Minor	Based on rule of thumb (factor of 10)
Process Contribution <1% of EAL	Insignificant	This is the assessment criteria proposed by EA as a screening method which states that process contributions can be considered insignificant if the long-term process contribution is <1% of the long-term environmental standard.

[4] IAQM 2014. Guidance on the assessment of odour for planning.
[5] Air emissions risk assessment for your environmental permit https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions

3.0 BASELINE AIR QUALITY AND PROCESS EMISSION INVENTORY

Emission Inventory for the AQIA

3.1 The emission estimates for the soil treatment facility assumes that all emissions are released from the surface of the bio-filter and ignores any fugitive emissions from the stockpiles and screening and grading operations.

3.2 Details of the emission rate from the bio-filter are presented in Table 3.1 at the end of the text.

3.3 A single emission Scenario has been considered for the assessment:

- Scenario 1 is based on the maximum measured concentration from a similar installation elsewhere.

Baseline Air Quality

3.4 The only available baseline estimates for Benzene in the study area are from DEFRA modelled projections based on work conducted in 2001. This indicates that the annual mean exposure to Benzene in air within the study area was up to 0.275ug/m^3 for the year 2010.

4.0 DISPERSION MODELLING

Introduction to Section 4

4.1. This Section sets out the reasons for the approach to assessment and details the assumptions made in the dispersion modelling.

Justification for Approach

4.2. The likely impact from process emissions may be estimated using an appropriate atmospheric dispersion model and reliable emission estimates. The emissions from the process for Scenario 1 are based on worst-case emission concentrations measured at a similar facility elsewhere.

4.3. The objective of the dispersion modelling assessment is to predict the likely effect of the prevailing climate, local surface conditions and topography on plume behaviour; and to predict the likely worst case airborne concentrations at sensitive receptors around the facility.

4.4. The pattern of pollutant dispersion may be estimated using several years of historical meteorological data from a representative site. Air quality impacts are assessed against Environmental Assessment Levels.

4.5. The assessment ignores the impacts from fugitive emissions. This is contingent on appropriate measures being adopted at the site to prevent or minimise fugitive releases.

Approach to Modelling Uncertainty

4.6. Environment Agency policy statement[6] refers to the Royal Meteorological Society Guidelines on Dispersion Modelling. According to this Guidance, dispersion modelling studies should include a Sensitivity Analysis for model inputs to provide an estimate of the possible errors in the predictions. The Environment Agency has also published requirements for dispersion modelling.[7] This includes advice on the Agency's requirements for reporting. These Guidance documents have been taken into account in the assessment.

4.7. A widely recognised mathematical model (ADMS 5.2) has been used to predict how emissions will be dispersed taking account of: the source conditions (using emission factors and the flow rate and pollutant concentrations); release conditions (efflux velocity and temperature); meteorological conditions from a representative site (in this case near ground measurements at RAF Scmpton supplied by the Met Office); building effects and surface conditions (surface roughness).

4.8. ADMS 5.2 has been developed specifically for industrial point sources.[8] The model is widely used in the UK for environmental assessment and is

[6]Environment Agency, undated. Policy Statement EAS/2007/1/1

[7]Environment Agency, undated. Air Dispersion Modelling Report Requirements (for detailed dispersion modelling).

[8]CERC 2016. ADMS-5, The Multiple Source Air Dispersion Model. CERC, Cambridge.

generally considered by UK environmental agencies to be suitable for air quality impact assessment subject to its proper use.

4.9. Potential difficulties and limitations in this type of study when applied to air quality impact assessments include:

- Lack of good information about the risk to human health from process emissions. This assessment relies on the Environmental Assessment Levels (EALs) published by the Environment Agency;
- Uncertainties in baseline conditions. The baseline estimates used take account of available background estimates published by DEFRA;
- Errors in source terms used to estimate emissions. Emission rates are based on worst-case measured pollutant concentrations at a similar site elsewhere and air flow estimates provided by the operator;
- Errors inherent in the dispersion model used. The model is considered to be suitable for use in this application and has been validated for area sources; and
- Errors introduced by the model user due to the use of inappropriate or unrepresentative input values such as meteorological data or surface roughness values. A Sensitivity Analysis has been conducted to take these potential errors into account. The significance of these factors is discussed in Section 5. In general the approach used in this assessment has been to include worst case factors where these may otherwise lead to underestimates of worst case conditions.

4.10 This assessment presents a detailed account of the modelling process and considers the model sensitivity to the main user inputs. An inventory of the models run for this project is presented in Table 4.1 at the end of the text.

Dispersion Modelling

4.11 The transport and transformation of a pollutant in the boundary layer,[9] can be predicted with a reasonable degree of confidence using an appropriate mathematical model. The model used for this exercise is ADMS 5.2. This mathematical model enables the calculation of multiple sources and includes an algorithm for assessing flow around buildings that may cause entrainment. The principal factors affecting the concentration of a pollutant are:

- Source characteristics including source strength, height of discharge, density, and temperature of the release;
- Prevailing atmospheric conditions including wind speed, wind direction, cloud cover, precipitation, ambient temperature and the depth of the boundary layer; and

[9]The boundary layer is the layer of the atmosphere near the surface of the Earth that is affected by mechanical turbulence from surface friction and convective turbulence through local surface heating.

- Adjacent topography and local surface conditions.

These factors can be assigned numerical values and the resultant downwind concentrations of pollutants may be predicted.

4.12 The model description is published in the user guide for ADMS 5.2. The model was originally developed as a research project jointly funded by HSE, the Met Office and Her Majesty's Industrial Inspectorate of Pollution. The model is routinely used by UK environment agencies.[10]

Model Parameters

4.13 The temperature and efflux velocity of the stack gases are based on engineering estimates provided by the supplier. The emissions from the process are summarised in Table 4.2 in accordance with the requirements of H1[11] and Environment Agency Guidelines.

Source Condition, Location and Height

4.14 The emissions have been considered as continuous, steady state area source near ground level. The location of the proposed bio-filter is shown in Figure 2. The bio-filter release is assumed to be 1m above local ground level. The flow from the bio-filter has been modelled as a zero volume, zero velocity release.

4.15 The details of the proposed facility were obtained from the site planning drawings and the OS map base at 1:1250 and 1:10,000 scales.

Surface Roughness

4.16 The surface roughness conditions at the site have been assumed to have a surface roughness value of 0.5m as this is considered to represent worst case conditions for dispersion. This value has been used across the domain.

Meteorological Data

4.17 The selection of suitable meteorological data needs to be conducted with care. The main limiting factor for suitable meteorological data is continuous observations of cloud cover, used in the model to determine atmospheric stability.

4.18 Five years of hourly sequential meteorological data from RAF Scampton (2012 - 2016 inclusive) have been used to predict the dispersion around the site. Monks Wood is 34km to the south of the proposed installation and is likely to be reasonably representative of conditions at the study area. The worst case one year in five has been used in the assessment. A summary of the meteorological data is presented in Appendix 2. A model sensitivity analysis has also been conducted using 5 years of hourly sequential meteorological data for Wittering (2014 - 2018), which is

[10] Details of model validation studies are available at http://www.cerc.co.uk/software/publications.htm
[11] Environment Agency December 2011. H1 Risk Assessment Annex F v2.2

~29km to the south-east. Theses data has been used to assess worst case impacts for long-term exposure.

Building Effects

4.19 The release at near ground level so that building effects on dispersion have been discounted.

Terrain Effects

4.20 The land near the proposed installation is relatively level across the site, with only minor variations in ground level across the study area. The local topography is plotted in Figure 3. Terrain effects are unlikely to affect air flow and dispersion. Terrain effects have therefore been taken into account as a precaution.

Time Averaging and Percentiles

4.21 The averaging time for all pollutants is based on a 1 hour average. The 1 hour 100%ile has been calculated for pollutants where appropriate. Odour has been predicted using the 1 hour 98%ile and 100%ile.

Grid Resolution and Receptors

4.22 Predictions have been made at 20 fixed point receptor locations around the site to represent exposure at existing receptors and to assist with the model Sensitivity Analysis. These receptor locations are shown in Figure 1. The predictions have been modelled at a height of 1.5m above ground level.

4.23 Predictions have also been provided over the study area on a grid 43 by 36 at intervals of 100m where x1 = 465000; y1 = 385200; x2 – 469800; and y2 = 388700.

Removal Effects

4.24 Atmospheric chemistry and photo-lytic reactions have been ignored in the dispersion modelling.

Overview of the Modelling Process

4.25 Details of the ADMS dispersion model runs are presented in Table 4.1 at the end of the text.

5.0 IMPACT ASSESSMENT RESULTS

Model Sensitivity Analysis

5.1. It is a requirement of the Royal Meteorological Society Guidelines on Dispersion Modelling[12&13] that studies should include a Sensitivity Analysis for model inputs, to provide an estimate of the possible errors in the predictions. The potential errors in predictions and limits to the dispersion model were outlined in Section 4. The Sensitivity Analysis conducted for this study is based on the findings of the model sensitivity analysis. The results for the model sensitivity analysis are presented in Appendix 3. The model predictions are based on the worst case one year in five, and allow for topography effects and worst case surface roughness conditions.

Results – Human Health

5.2. The predicted contours for airborne Benzene for Scenario 1, excluding background, are plotted in Figure 4. This indicates that the predicted annual mean concentration of Benzene is below the significance threshold of 1% of the EAL for human exposure. The predicted concentrations for all pollutants at sensitive receptors are included within Appendix 3 and summarised in Table 5.1 below.

Table 5.1 - Worst Case Predicted Levels at Sensitive Receptors (Scenario 1)

Pollutant	Long-term	Short-term
	ug/m^3	ug/m^3
Benzene	0.00031	0.0534
Toluene	0.00495	0.8545
Ethylbenzene	0.00046	0.0790
Xylene	0.00124	0.2136

5.3. These predictions are based on worst case dispersion conditions for meteorology and surface roughness. The criteria used to assess the significance of pollutants were presented in Table 2.2. The significance of these predicted concentrations may be determined from Table 5.2 below, where the predicted process contribution is expressed as a percentage of the Environmental Assessment Level. Impacts are insignificant where the process contribution is <1% of the long-term EAL.

Table 5.2 – Significance of Worst Case Predicted Levels at Sensitive Receptors

Pollutant	Long term	Short term
	ug/m^3	ug/m^3
Benzene	0%	-
Toluene	0%	0%
Ethylbenzene	0%	0%
Xylene	0%	0%

N.B. columns are blank where there is no relevant EAL. (Scenario 1)

[12]Royal Meteorological Society May 1995. Policy Statement Atmospheric Dispersion Modelling. Guidelines on the justification of choice and use of models and the communication and reporting of results

[13]ADMLC 2004. Guidelines for the Preparation of Dispersion Modelling Assessments for Compliance with Regulatory Requirements – an Update to the 1995 Royal Meteorological Society Guidance

5.4. This indicates that the process contributions are predicted to be well below the relevant EALs.

Model Headroom

5.5. The Environment Agency's method for assessing model uncertainty[14] indicates that confidence in the model is high for both short and long-term exposure based on Benzene (assuming Scenario 1 emissions).

Results - Odour

5.15. The predicted odour at the nearest sensitive receptors are well below the odour detection threshold for all pollutants.

[14] Ji Ping Shi and Betty Ng; 2004. Risk based pragmatic approach to address model uncertainty. Air Quality Modelling and Assessment Unit The Environment Agency 29 Newport Road Cardiff CF24 0TP. Paper Given At NSCA Seminar.

6.0 PROPOSED MITIGATION MEASURES

Operational Impacts

6.1 The following measures are proposed to prevent or minimise impacts on air pollution:

- The waste acceptance criteria for the proposed facility shall ensure that only suitable materials are deposited within the aerated static piles.
- The air stream into the bio-filter shall be cleaned to prevent dust loading into the filter media.
- The condition of the bio-filter bed shall be tested on a monthly basis to ensure satisfactory performance.
- Supervisory staff shall be trained to ensure that the facility is operated within specification.
- All process operations shall be subject to routine planned preventative maintenance.
- Environmental monitoring shall be conducted to confirm the pollutant concentrations are within the assumed levels and to ensure compliance with Environmental Assessment Levels.

7.0 EVALUATION OF IMPACTS

Human Exposure

7.1 The assessment takes account of the worst case model predictions, the relevant Environmental Assessment Levels (EAL) and the significance criteria set out in Tables 2.1 – 2.2.

7.2 The predicted impacts from the proposed facility are insignificant at all sensitive receptors in terms of the assessment framework set out in Table 2.2, where all pollutants are <1% of the EAL.

7.3 Odour impacts from the proposed facility are predicted to be negligible.

Tables

Item	Description	dimensions [1]	volume of air [2]	pollutant [3]	maximum reported concentration [4]	maximum emission rate [5]	maximum emission rate [5]
		m^2	m3/s		ug/m^3	g/s	$g/m^2/s$
1	bio-filter surface	475	2.778	Benzene	10	2.778E-05	5.848E-08
		475	2.778	Toluene	160	4.444E-04	9.357E-07
		475	2.778	Ethlbenzene	14.8	4.111E-05	8.655E-08
		475	2.778	m/p-Xylene	30	8.333E-05	1.754E-07
		475	2.778	o-Xylene	10	2.778E-05	5.848E-08

Notes

1. from drawing Daneshill No. 1. Provectus FCC Environment Provisional Layout September 2019
2. Email from Jon Owens Provectus to Andy Stocks Caulmert 28th November 2019
3. The species considered in this assessment are based on the available data from measurements at a similar facility elsewhere
4. Based on the maximum reported pollutant concentration at a similar site elsewhere.
5. No correction has been applied for STP or moisture

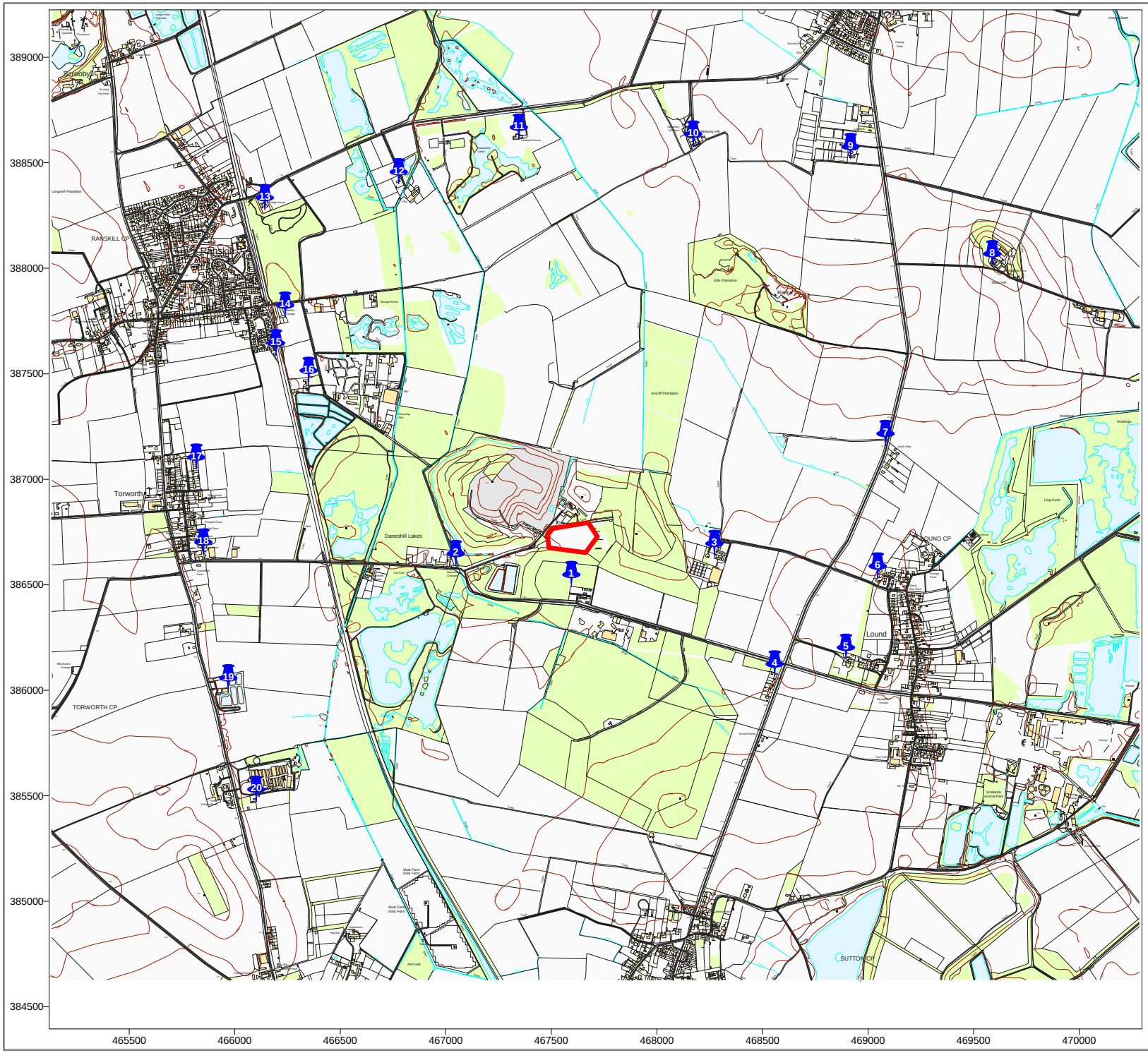
Results from sampling at bio-filter outlet Provectus Remediation Ltd Edwin Richards Quarry April 2018 - October 2019

BTEX	09-Apr-18	12-Mar-18	01-May-18	16-May-18	05-Jul-18	27-Jul-18	03-Sep-18	15-Oct-18	14-Nov-18	14-Nov-18	28-Dec-18	31-Jan-19	27-Feb-19	29-Mar-19	29-Apr-19	10-May-19	10-May-19	10-May-19	10-May-19	28-Jun-19	28-Jun-19	30-Jul-19	30-Aug-19	02-Oct-19	Max	average
Benzene	2.3	1.7	1.7	1.7	1.7	7.9	7.5	3.8	2.3	1.7	10	2	2	2	3	2	2	2	5	2	8	2	2	2	10	3
Toluene	5.3	2	1.7	2	1.7	11.1	9.2	4.9	2	1.7	10	10	20	10	20	3	20	20	30	20	40	30	160	53	160	20
Ethlbenzene	1.7	14.8	1.7	1.7	1.7	3.4	1.8	1.8	1.7	1.7	2	2	6	2	5	2	5	3	5	6	10	6	2	2	14.8	4
m/p-Xylene	1.9	10.9	1.7	1.7	1.7	15.1	8.4	6.7	1.7	1.7	3	6	20	7	10	3	10	6	9	20	30	20	4	4	30	8
o-Xylene	1.7	4	1.7	1.7	1.7	6.5	4.3	2.8	1.7	1.7	2	2	5	3	4	2	4	3	4	7	10	10	2	2	10	4

Model Inventory

Run	Name		Met Data	Surface roughness at site (m)	terrain	objective
1	Scampton 2014	.apl	Scampton 2014	0.3	off	
2	Scampton 2015	.apl	Scampton 2015	0.3	off	
3	Scampton 2016	.apl	Scampton 2016	0.3	off	
4	Scampton 2017	.apl	Scampton 2017	0.3	off	
5	Scampton 2018	.apl	Scampton 2018	0.3	off	to predict deposition for range of met. conditions
6	rough 0.3m	.apl	Scampton 2016	0.3	off	
7	rough 0.5m	.apl	Scampton 2016	0.5	off	
8	rough 1.0m	.apl	Scampton 2016	1.0	off	to assess significance of surface roughness on dispersion
9	terrain	.apl	Scampton 2016	0.3	on	to assess significance of terrain on dispersion
9	Scenario 1	.apl	Scampton 2016	0.3	off	to provide predictions for worst case dispersion conditions

Figures



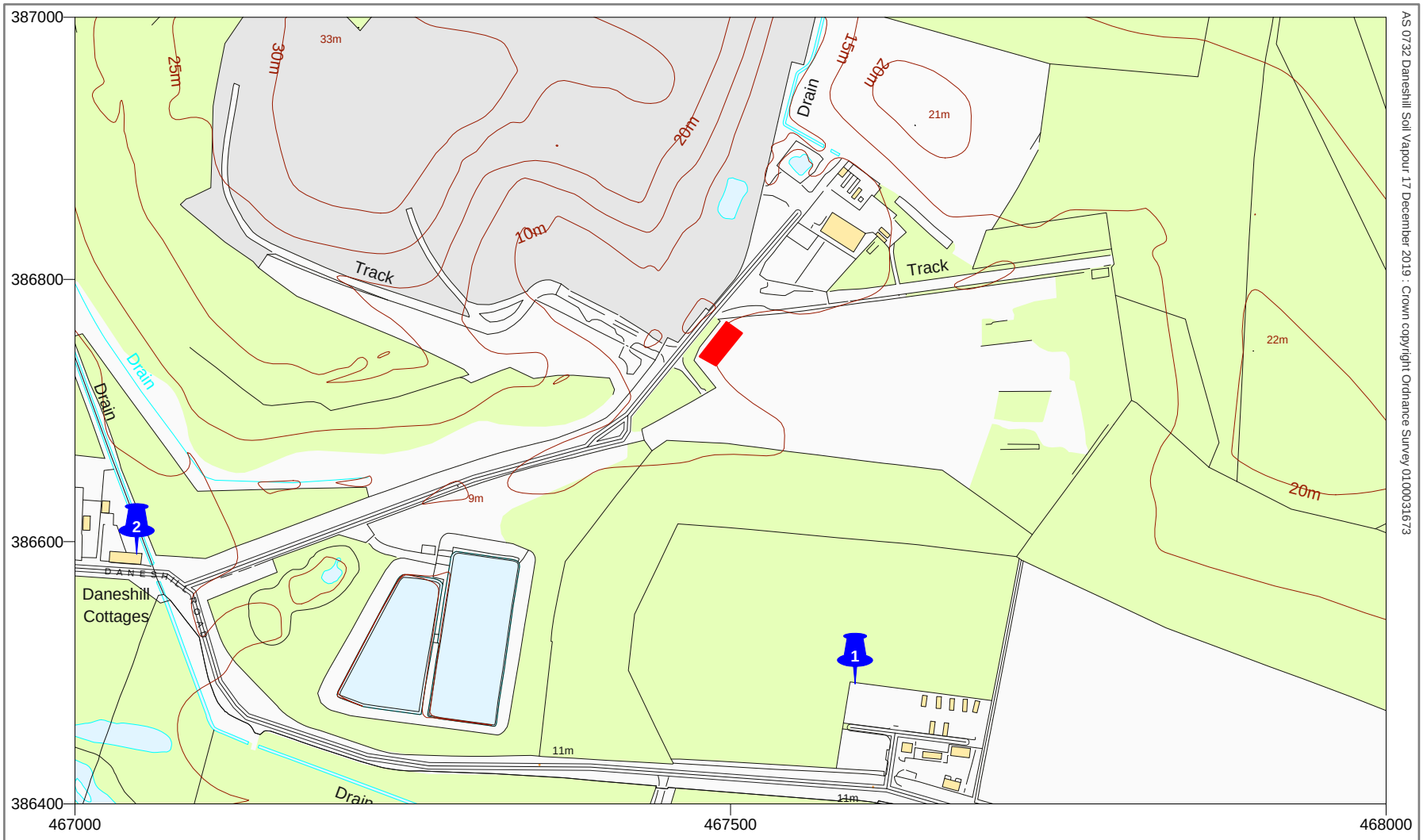
Site Location

indicative site location

sensitive receptor considered in study

Figure 1

The Airshed



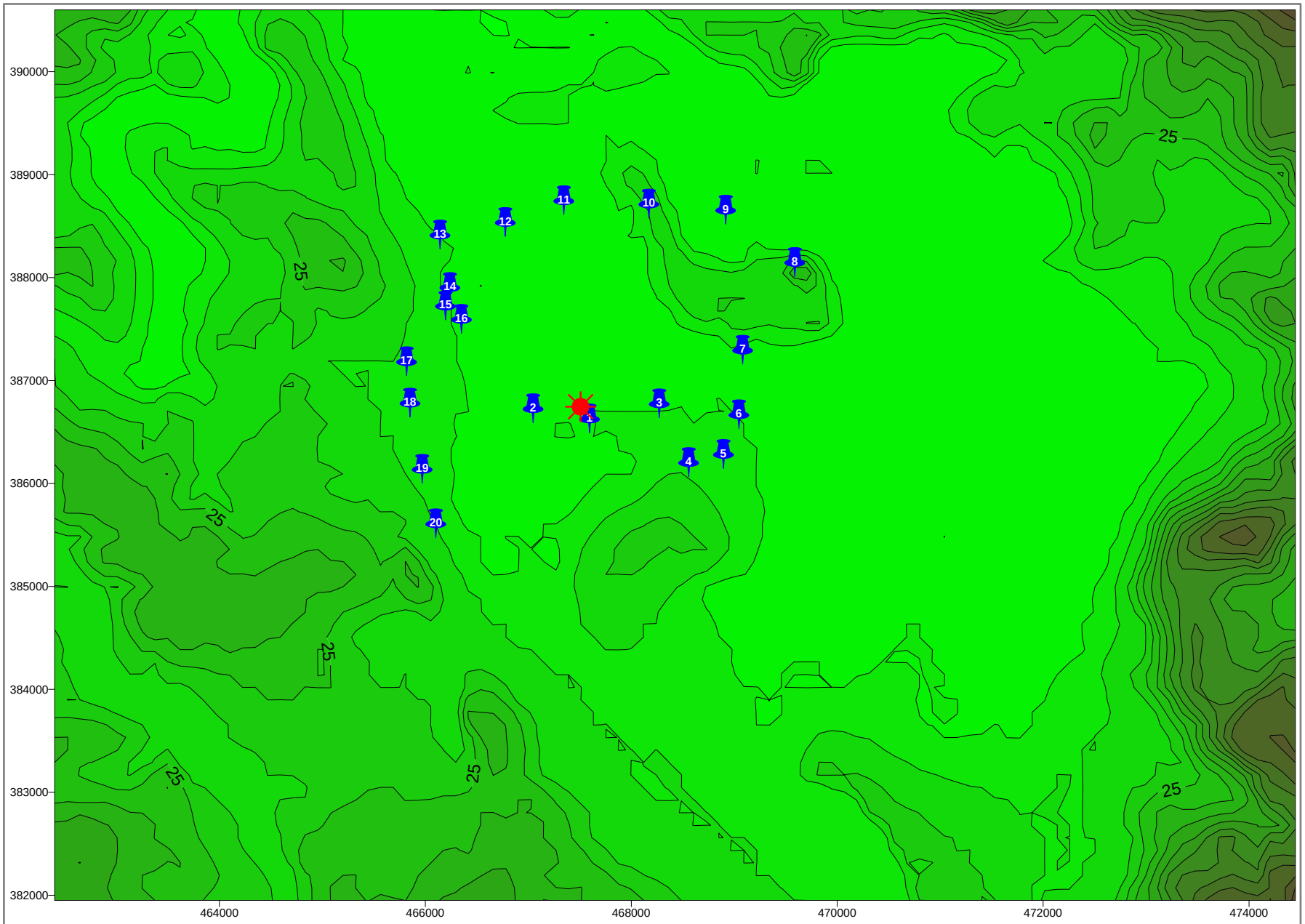
Model Layout

bio-filter

sensitive receptor considered in study

Figure 2

The Airshed



Topography

indicative location of bio-filter

sensitive receptor considered in study

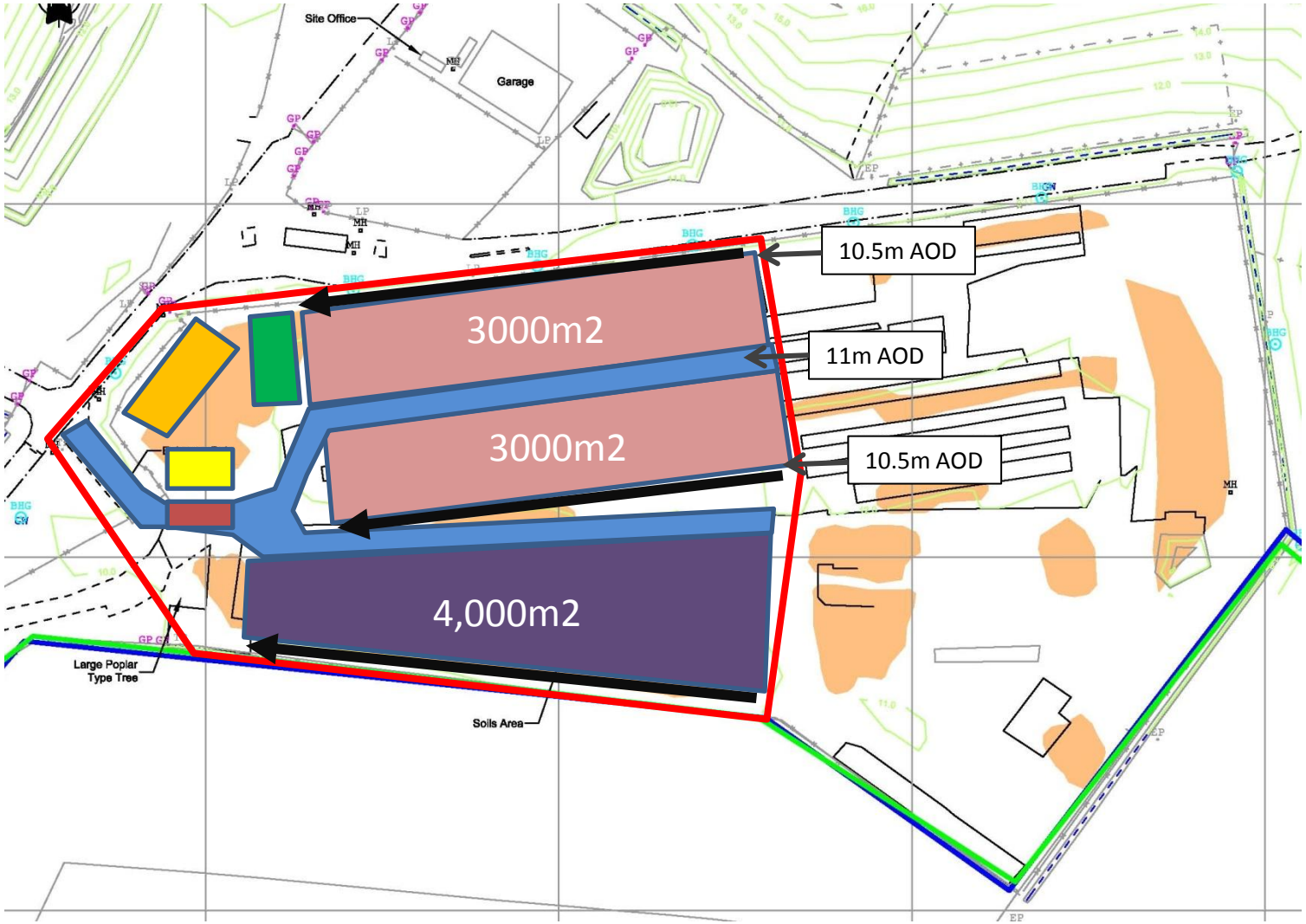
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

OS Landform Panorama mAOD

Figure 3

The Airshed

Appendix 1 – Project Description



- Biofilter (475m2)
- Biotreatment Area
- Screening/Processing
- Soil and Water Treatment Equipment
- Site Office
- Relocated Weighbridge
- Access Roads
- Fall of Drainage

PROVECTUS

Provectus Remediation Ltd
Wyvols Court
Swallowfield
Reading
RG7 1WY

Tel. 0118 988 0218
www.provectusgroup.com

Client: FCC Environment

Project: Daneshill

Job No.: P268

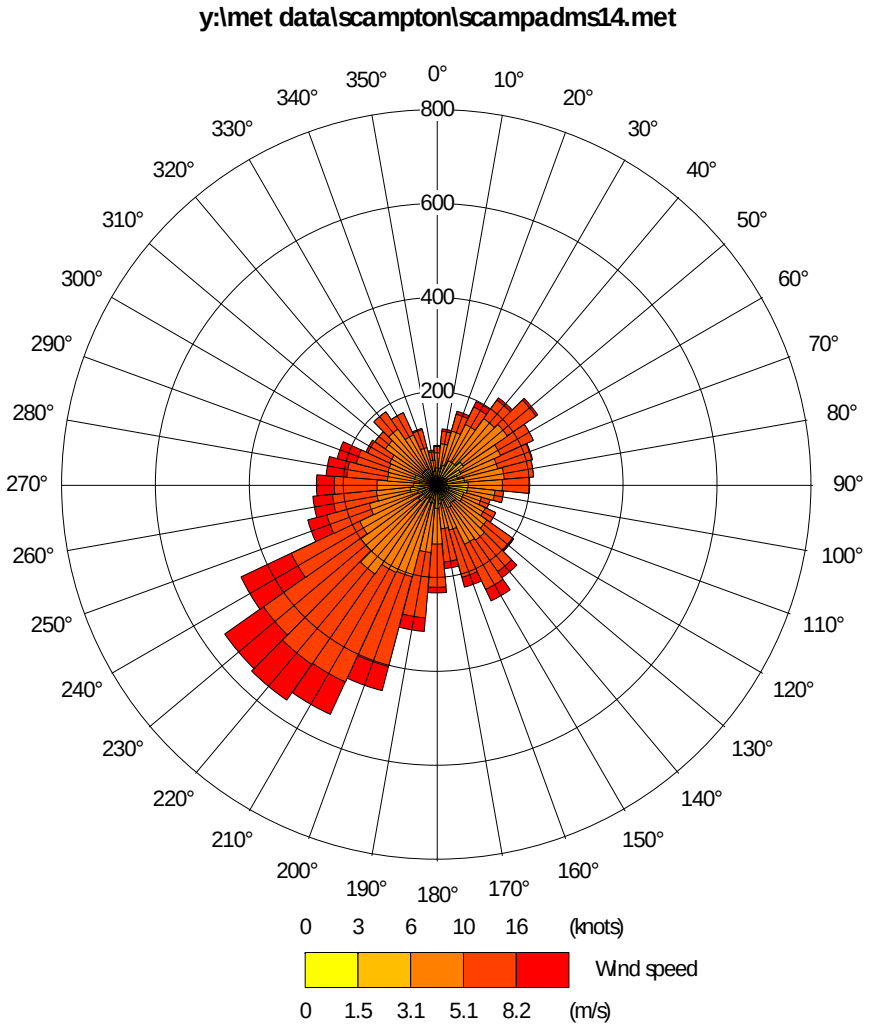
Title: Provisional Layout

Scale: NTS

Date Drawn: September 2019

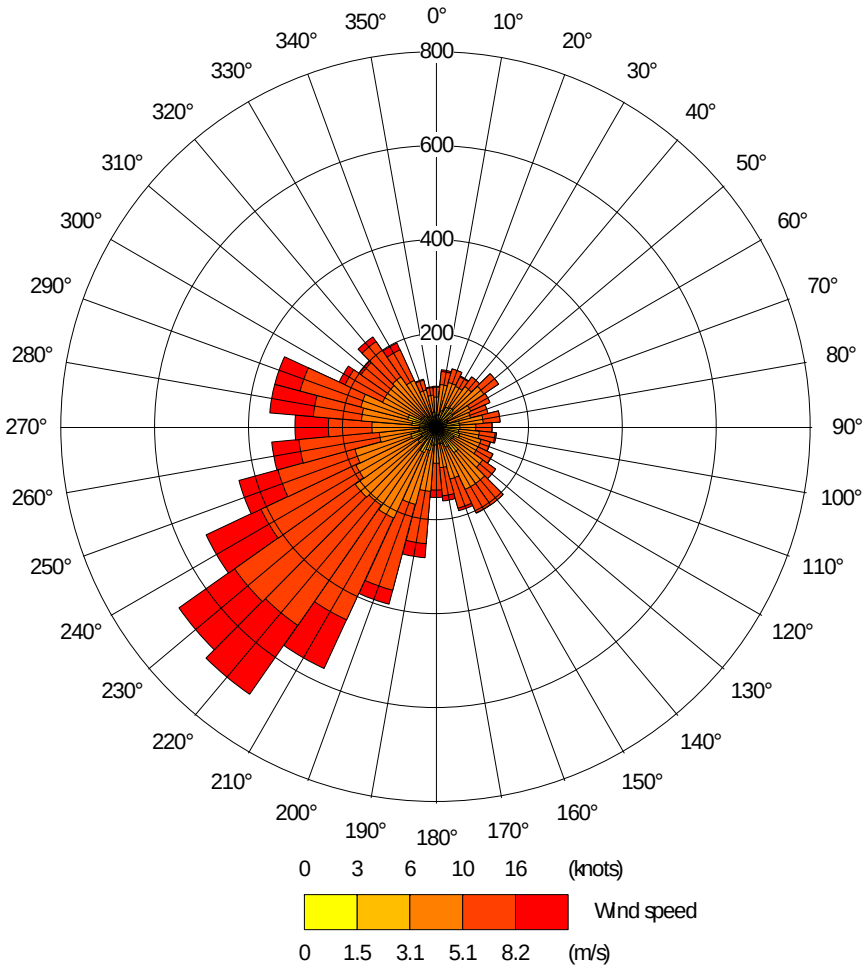
Drawing No.: Daneshill 1

Appendix 2 – Model Inputs



Met Data

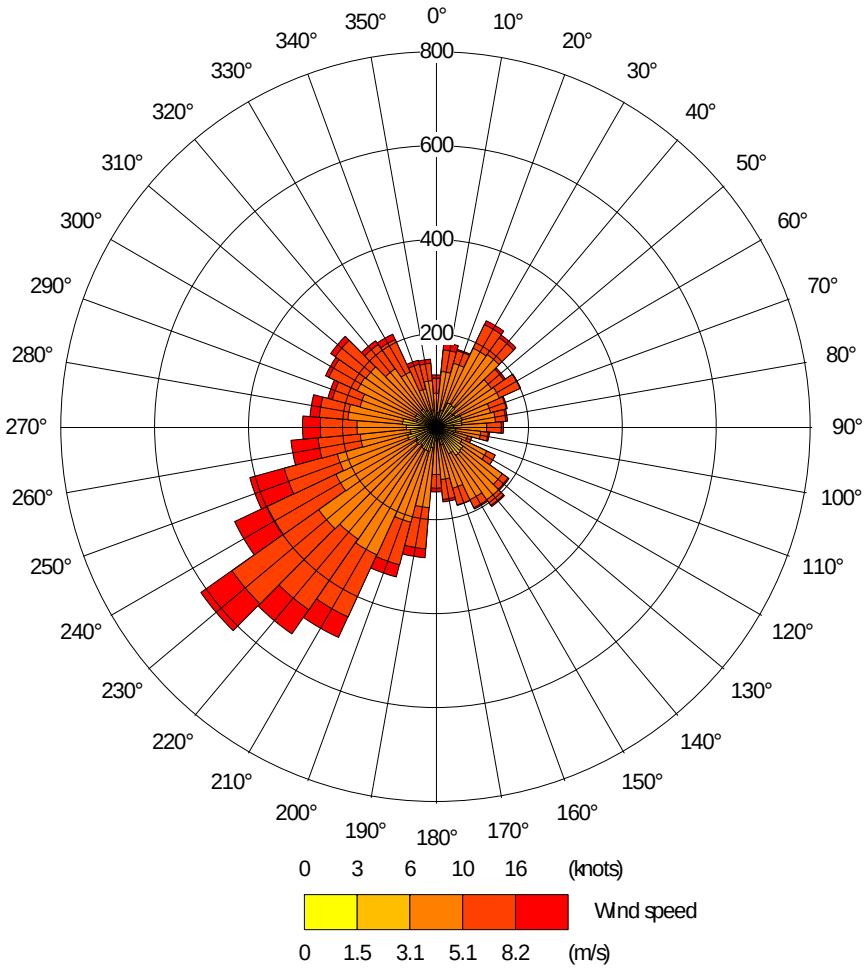
Appendix 2



Met Data

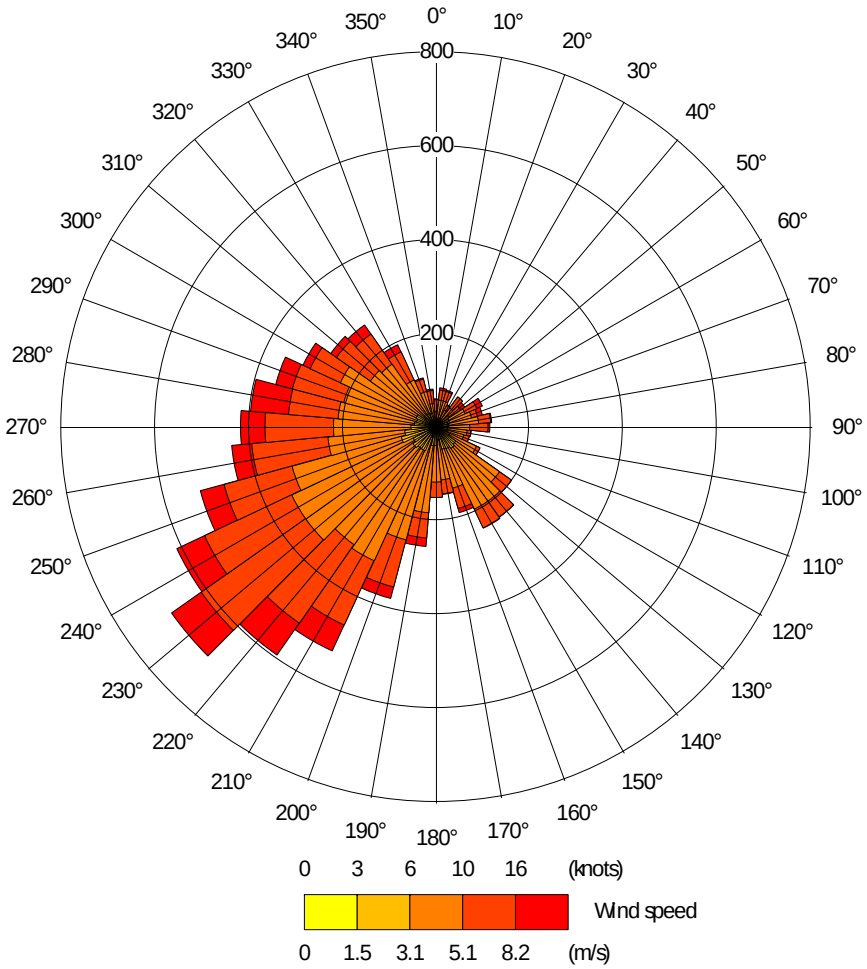
Appendix 2

y:\met data\scampton\scampadms16.met



Met Data

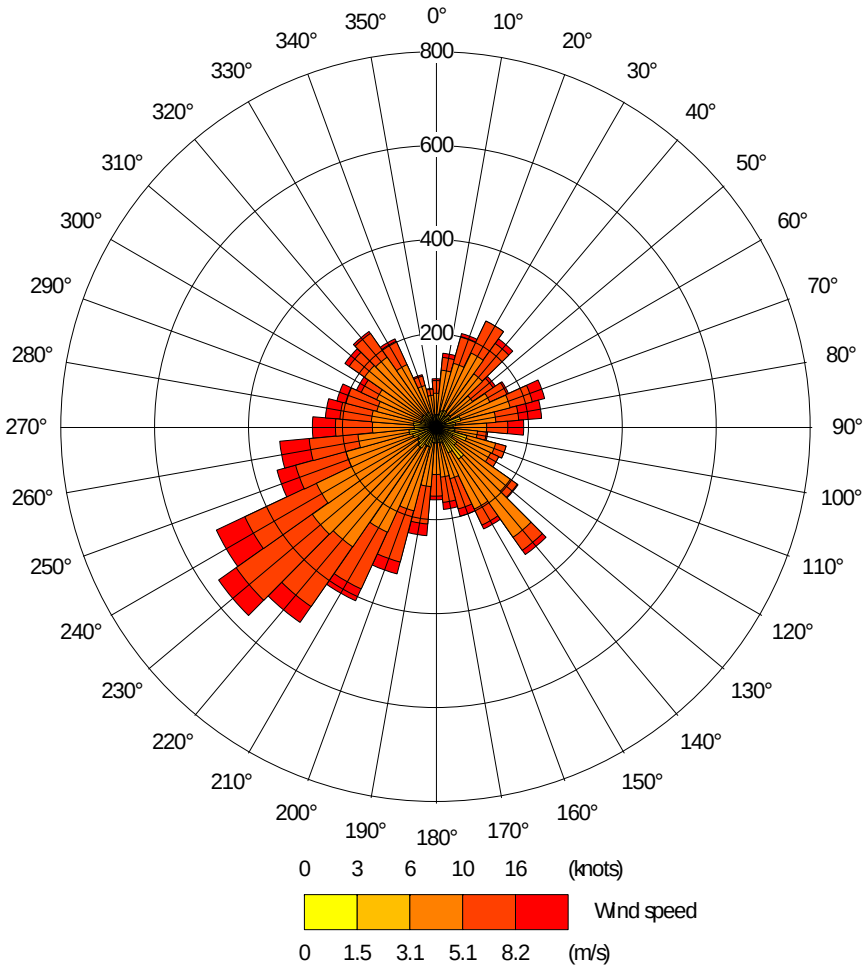
Appendix 2



Met Data

Appendix 2

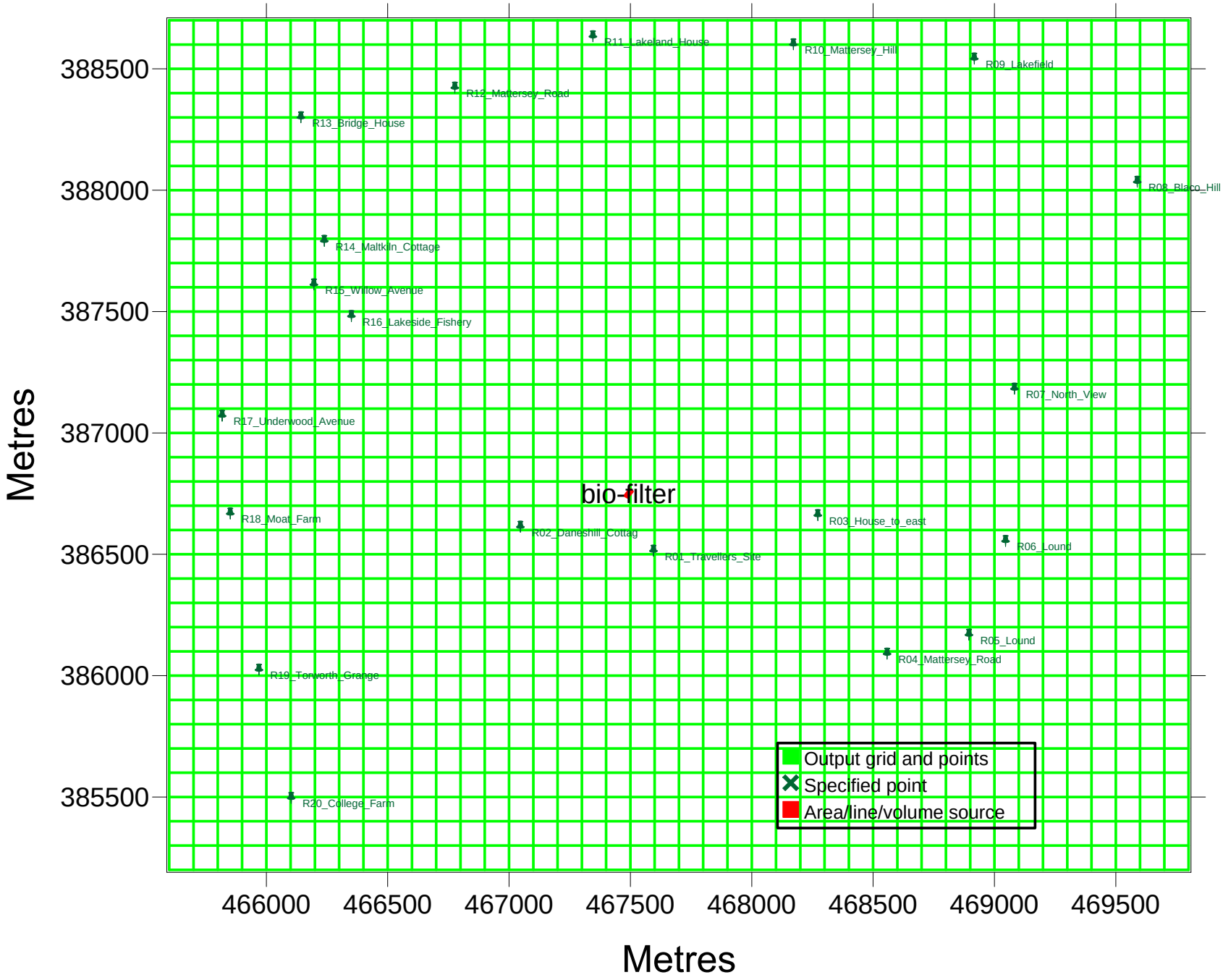
y:\met data\scampton\scampadms18.met



Met Data

Appendix 2

Visualisation of ADMS input
P:\files\AS 0732 Daneshill Soil Vapour\model runs\Scenario 1.APL



Appendix 3 – Model Outputs

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00018	0.02964	0.00188
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00168
3	House to east	468272	386638	0.00005	0.00556	0.00056
4	Mattersey Road	468558	386067	0.00002	0.00256	0.00023
5	Lound	468895	386146	0.00001	0.00193	0.00016
6	Lound	469046	386531	0.00001	0.00180	0.00017
7	North View	469083	387159	0.00002	0.00172	0.00020
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00013
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00017
11	Lakeland House	467346	388611	0.00001	0.00140	0.00014
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00015
14	Maltkiln Cottage	466239	387768	0.00002	0.00170	0.00023
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00024
16	Lakeside Fishery	466351	387458	0.00002	0.00240	0.00031
17	Underwood Avenue	465818	387047	0.00002	0.00161	0.00024
18	Moat Farm	465851	386645	0.00002	0.00171	0.00024
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00018
20	College Farm	466102	385473	0.00001	0.00136	0.00017
Max				0.00018	0.02964	0.00188

model sensitivity analysis
met data variability
Scampton 2014
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00020	0.03068	0.00202
2	Daneshill Cottage	467047	386590	0.00010	0.01306	0.00090
3	House to east	468272	386638	0.00007	0.00575	0.00078
4	Mattersey Road	468558	386067	0.00002	0.00264	0.00025
5	Lound	468895	386146	0.00002	0.00193	0.00021
6	Lound	469046	386531	0.00002	0.00186	0.00024
7	North View	469083	387159	0.00002	0.00172	0.00020
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00013
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00018
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00013
13	Bridge House	466143	388277	0.00001	0.00121	0.00014
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00021
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00022
16	Lakeside Fishery	466351	387458	0.00002	0.00240	0.00029
17	Underwood Avenue	465818	387047	0.00002	0.00161	0.00015
18	Moat Farm	465851	386645	0.00001	0.00171	0.00012
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00010
20	College Farm	466102	385473	0.00001	0.00136	0.00010
Max				0.00020	0.03068	0.00202

model sensitivity analysis
met data variability
Scampton 2015
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00025	0.03068	0.00240
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00166
3	House to east	468272	386638	0.00007	0.00575	0.00093
4	Mattersey Road	468558	386067	0.00003	0.00264	0.00029
5	Lound	468895	386146	0.00002	0.00193	0.00023
6	Lound	469046	386531	0.00002	0.00186	0.00030
7	North View	469083	387159	0.00002	0.00172	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00086	0.00015
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00022
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00019
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00032
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00035
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00009
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00002	0.00161	0.00017
20	College Farm	466102	385473	0.00001	0.00136	0.00015
Max				0.00025	0.03068	0.00240

model sensitivity analysis
met data variability
Scampton 2016
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00016	0.03068	0.00150
2	Daneshill Cottage	467047	386590	0.00008	0.01198	0.00083
3	House to east	468272	386638	0.00007	0.00575	0.00084
4	Mattersey Road	468558	386067	0.00002	0.00256	0.00024
5	Lound	468895	386146	0.00002	0.00193	0.00021
6	Lound	469046	386531	0.00002	0.00186	0.00026
7	North View	469083	387159	0.00003	0.00172	0.00033
8	Blaco Hill	469589	388011	0.00002	0.00090	0.00018
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00019
11	Lakeland House	467346	388611	0.00001	0.00140	0.00013
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00013
13	Bridge House	466143	388277	0.00001	0.00121	0.00016
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00025
15	Willow Avenue	466196	387589	0.00002	0.00176	0.00024
16	Lakeside Fishery	466351	387458	0.00002	0.00229	0.00029
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00008
18	Moat Farm	465851	386645	0.00001	0.00171	0.00008
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00008
20	College Farm	466102	385473	0.00001	0.00136	0.00004
Max				0.00016	0.03068	0.00150

model sensitivity analysis
met data variability
Scampton 2017
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00021	0.03068	0.00218
2	Daneshill Cottage	467047	386590	0.00013	0.01306	0.00128
3	House to east	468272	386638	0.00006	0.00575	0.00062
4	Mattersey Road	468558	386067	0.00002	0.00264	0.00028
5	Lound	468895	386146	0.00002	0.00190	0.00017
6	Lound	469046	386531	0.00002	0.00186	0.00019
7	North View	469083	387159	0.00002	0.00172	0.00022
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00016
11	Lakeland House	467346	388611	0.00001	0.00133	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00012
13	Bridge House	466143	388277	0.00002	0.00121	0.00024
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00036
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00037
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00017
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00016
20	College Farm	466102	385473	0.00001	0.00136	0.00010
Max				0.00021	0.03068	0.00218

model sensitivity analysis
met data variability
Scampton 2018
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00031	0.05341	0.00269
2	Daneshill Cottage	467047	386590	0.00020	0.02288	0.00217
3	House to east	468272	386638	0.00009	0.00928	0.00111
4	Mattersey Road	468558	386067	0.00003	0.00446	0.00032
5	Lound	468895	386146	0.00002	0.00320	0.00026
6	Lound	469046	386531	0.00003	0.00296	0.00034
7	North View	469083	387159	0.00003	0.00234	0.00035
8	Blaco Hill	469589	388011	0.00001	0.00149	0.00017
9	Lakefield	468917	388519	0.00002	0.00168	0.00018
10	Mattersey Hill	468172	388578	0.00002	0.00208	0.00025
11	Lakeland House	467346	388611	0.00002	0.00233	0.00012
12	Mattersey Road	466777	388399	0.00002	0.00250	0.00018
13	Bridge House	466143	388277	0.00002	0.00202	0.00023
14	Maltkiln Cottage	466239	387768	0.00003	0.00296	0.00038
15	Willow Avenue	466196	387589	0.00003	0.00317	0.00037
16	Lakeside Fishery	466351	387458	0.00004	0.00404	0.00044
17	Underwood Avenue	465818	387047	0.00002	0.00274	0.00012
18	Moat Farm	465851	386645	0.00002	0.00289	0.00017
19	Torworth Grange	465970	386001	0.00002	0.00275	0.00021
20	College Farm	466102	385473	0.00002	0.00222	0.00018
Max				0.00031	0.05341	0.00269

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 0.3m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00025	0.03068	0.00240
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00166
3	House to east	468272	386638	0.00007	0.00575	0.00093
4	Mattersey Road	468558	386067	0.00003	0.00264	0.00029
5	Lound	468895	386146	0.00002	0.00193	0.00023
6	Lound	469046	386531	0.00002	0.00186	0.00030
7	North View	469083	387159	0.00002	0.00172	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00086	0.00015
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00022
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00019
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00032
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00035
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00009
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00002	0.00161	0.00017
20	College Farm	466102	385473	0.00001	0.00136	0.00015
Max				0.00025	0.03068	0.00240

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00022	0.01970	0.00226
2	Daneshill Cottage	467047	386590	0.00012	0.00852	0.00158
3	House to east	468272	386638	0.00006	0.00371	0.00087
4	Mattersey Road	468558	386067	0.00002	0.00171	0.00026
5	Lound	468895	386146	0.00002	0.00126	0.00022
6	Lound	469046	386531	0.00002	0.00121	0.00027
7	North View	469083	387159	0.00002	0.00112	0.00028
8	Blaco Hill	469589	388011	0.00001	0.00054	0.00014
9	Lakefield	468917	388519	0.00001	0.00066	0.00015
10	Mattersey Hill	468172	388578	0.00002	0.00085	0.00022
11	Lakeland House	467346	388611	0.00001	0.00091	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00097	0.00013
13	Bridge House	466143	388277	0.00001	0.00078	0.00017
14	Maltkiln Cottage	466239	387768	0.00002	0.00115	0.00028
15	Willow Avenue	466196	387589	0.00002	0.00124	0.00028
16	Lakeside Fishery	466351	387458	0.00002	0.00155	0.00034
17	Underwood Avenue	465818	387047	0.00001	0.00106	0.00010
18	Moat Farm	465851	386645	0.00001	0.00112	0.00014
19	Torworth Grange	465970	386001	0.00001	0.00107	0.00018
20	College Farm	466102	385473	0.00001	0.00089	0.00014
Max				0.00022	0.01970	0.00226

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 1.0m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00023	0.01934	0.00258
2	Daneshill Cottage	467047	386590	0.00012	0.00944	0.00188
3	House to east	468272	386638	0.00007	0.00399	0.00103
4	Mattersey Road	468558	386067	0.00002	0.00171	0.00027
5	Lound	468895	386146	0.00002	0.00125	0.00022
6	Lound	469046	386531	0.00002	0.00122	0.00035
7	North View	469083	387159	0.00002	0.00115	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00056	0.00010
9	Lakefield	468917	388519	0.00001	0.00060	0.00017
10	Mattersey Hill	468172	388578	0.00002	0.00083	0.00023
11	Lakeland House	467346	388611	0.00001	0.00090	0.00012
12	Mattersey Road	466777	388399	0.00001	0.00092	0.00016
13	Bridge House	466143	388277	0.00001	0.00077	0.00022
14	Maltkiln Cottage	466239	387768	0.00002	0.00122	0.00036
15	Willow Avenue	466196	387589	0.00002	0.00127	0.00034
16	Lakeside Fishery	466351	387458	0.00002	0.00163	0.00041
17	Underwood Avenue	465818	387047	0.00001	0.00108	0.00009
18	Moat Farm	465851	386645	0.00001	0.00115	0.00021
19	Torworth Grange	465970	386001	0.00001	0.00106	0.00014
20	College Farm	466102	385473	0.00001	0.00091	0.00014
Max				0.00023	0.01934	0.00258

model sensitivity analysis
terrain effects
Scampton 2016
surface roughness 0.3m
terrain effects on

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00031	0.05341	0.00269
2	Daneshill Cottage	467047	386590	0.00020	0.02288	0.00217
3	House to east	468272	386638	0.00009	0.00928	0.00111
4	Mattersey Road	468558	386067	0.00003	0.00446	0.00032
5	Lound	468895	386146	0.00002	0.00320	0.00026
6	Lound	469046	386531	0.00003	0.00296	0.00034
7	North View	469083	387159	0.00003	0.00234	0.00035
8	Blaco Hill	469589	388011	0.00001	0.00149	0.00017
9	Lakefield	468917	388519	0.00002	0.00168	0.00018
10	Mattersey Hill	468172	388578	0.00002	0.00208	0.00025
11	Lakeland House	467346	388611	0.00002	0.00233	0.00012
12	Mattersey Road	466777	388399	0.00002	0.00250	0.00018
13	Bridge House	466143	388277	0.00002	0.00202	0.00023
14	Maltkiln Cottage	466239	387768	0.00003	0.00296	0.00038
15	Willow Avenue	466196	387589	0.00003	0.00317	0.00037
16	Lakeside Fishery	466351	387458	0.00004	0.00404	0.00044
17	Underwood Avenue	465818	387047	0.00002	0.00274	0.00012
18	Moat Farm	465851	386645	0.00002	0.00289	0.00017
19	Torworth Grange	465970	386001	0.00002	0.00275	0.00021
20	College Farm	466102	385473	0.00002	0.00222	0.00018
Max				0.00031	0.05341	0.00269

Scenario 1
worst-case dispersopm conditons
Scampton 2016
surface roughness 0.3m
terrain effects off

No	Receptor name	X(m)	Y(m)	Benzene	Toluene	Ethylbenzene	Xylene
1	Travellers Site	467595	386491	0.00031	0.00495	0.00046	0.00124
2	Daneshill Cottage	467047	386590	0.00020	0.00322	0.00030	0.00080
3	House to east	468272	386638	0.00009	0.00146	0.00013	0.00036
4	Mattersey Road	468558	386067	0.00003	0.00051	0.00005	0.00013
5	Lound	468895	386146	0.00002	0.00037	0.00003	0.00009
6	Lound	469046	386531	0.00003	0.00045	0.00004	0.00011
7	North View	469083	387159	0.00003	0.00044	0.00004	0.00011
8	Blaco Hill	469589	388011	0.00001	0.00024	0.00002	0.00006
9	Lakefield	468917	388519	0.00002	0.00031	0.00003	0.00008
10	Mattersey Hill	468172	388578	0.00002	0.00040	0.00004	0.00010
11	Lakeland House	467346	388611	0.00002	0.00025	0.00002	0.00006
12	Mattersey Road	466777	388399	0.00002	0.00027	0.00003	0.00007
13	Bridge House	466143	388277	0.00002	0.00030	0.00003	0.00008
14	Maltkiln Cottage	466239	387768	0.00003	0.00048	0.00004	0.00012
15	Willow Avenue	466196	387589	0.00003	0.00050	0.00005	0.00013
16	Lakeside Fishery	466351	387458	0.00004	0.00062	0.00006	0.00016
17	Underwood Avenue	465818	387047	0.00002	0.00027	0.00003	0.00007
18	Moat Farm	465851	386645	0.00002	0.00031	0.00003	0.00008
19	Torworth Grange	465970	386001	0.00002	0.00035	0.00003	0.00009
20	College Farm	466102	385473	0.00002	0.00028	0.00003	0.00007
Max				0.00031	0.00495	0.00046	0.00124

Scenario 1
units = ug/m3

No	Receptor name	X(m)	Y(m)	Benzene	Toluene	Ethylbenzene	Xylene
1	Travellers Site	467595	386491	0.05341	0.85453	0.07904	0.21363
2	Daneshill Cottage	467047	386590	0.02288	0.36608	0.03386	0.09152
3	House to east	468272	386638	0.00928	0.14847	0.01373	0.03712
4	Mattersey Road	468558	386067	0.00446	0.07136	0.00660	0.01784
5	Lound	468895	386146	0.00320	0.05117	0.00473	0.01279
6	Lound	469046	386531	0.00296	0.04734	0.00438	0.01183
7	North View	469083	387159	0.00234	0.03742	0.00346	0.00936
8	Blaco Hill	469589	388011	0.00149	0.02377	0.00220	0.00594
9	Lakefield	468917	388519	0.00168	0.02692	0.00249	0.00673
10	Mattersey Hill	468172	388578	0.00208	0.03332	0.00308	0.00833
11	Lakeland House	467346	388611	0.00233	0.03735	0.00345	0.00934
12	Mattersey Road	466777	388399	0.00250	0.03996	0.00370	0.00999
13	Bridge House	466143	388277	0.00202	0.03234	0.00299	0.00809
14	Maltkiln Cottage	466239	387768	0.00296	0.04741	0.00439	0.01185
15	Willow Avenue	466196	387589	0.00317	0.05066	0.00469	0.01266
16	Lakeside Fishery	466351	387458	0.00404	0.06470	0.00598	0.01617
17	Underwood Avenue	465818	387047	0.00274	0.04385	0.00406	0.01096
18	Moat Farm	465851	386645	0.00289	0.04624	0.00428	0.01156
19	Torworth Grange	465970	386001	0.00275	0.04407	0.00408	0.01102
20	College Farm	466102	385473	0.00222	0.03547	0.00328	0.00887
Max				0.05341	0.85453	0.07904	0.21363

Scenario 1
units = ug/m3

APPENDIX 3

Specification
Ref: CRS-045-SITE MASTER

COMPLETE RECYCLING SYSTEMS

T: +44 (0) 28 8076 0496
E: Marketing@crsni.com
W: www.crsni.com

Office Address: 136 Termon Road, Carrickmore, County Tyrone,
BT79 9HW, N.Ireland

CRS NI LTD

COMPLETE RECYCLING SYSTEMS

SALE OR HIRE

UNPARALLELED PERFORMANCE

NEW SITE MASTER

Designed For Building & Construction Sites To Retrieve Valuable Products From Waste Reducing What Goes Into Your Skip.

Features & Benefits

- Mobile 2 - 4 Man pick
- Designed for Building & Construction Sites
- Retrieve Valuable Products from waste
- Cut Down on what goes into your skip
- Adjustable Height
- Canopy for Weather Protection
- Economical Simple Design
- Electric Drive
- Robust & Heavy Duty Build

CRS NI LTD

COMPLETE RECYCLING SYSTEMS

SALE OR HIRE

UNPARALLELED PERFORMANCE

- Fully Mobile
- Easily Transported Around And Between Sites
- 2 to 4 Man Picking
- Low Cost To Run

- Low Maintenance
- Reduce Skip hire cost

OPTIONS

- Hydraulic Drive
- Air Brakes
- Hard Cover
- Chevron Belt
- Radial Stockpiler

CRS NI LTD

COMPLETE RECYCLING SYSTEMS

Sales: +44 (0) 28 80760 496

E: sales@crsni.com

www.crsni.com

1.0 Conveyor

Feature

- Heavy duty profile steel construction
- Specially designed 8mm and 5mm steel profile to produce high strength section
- Typically 3 times stronger than traditional 6mm channel designs

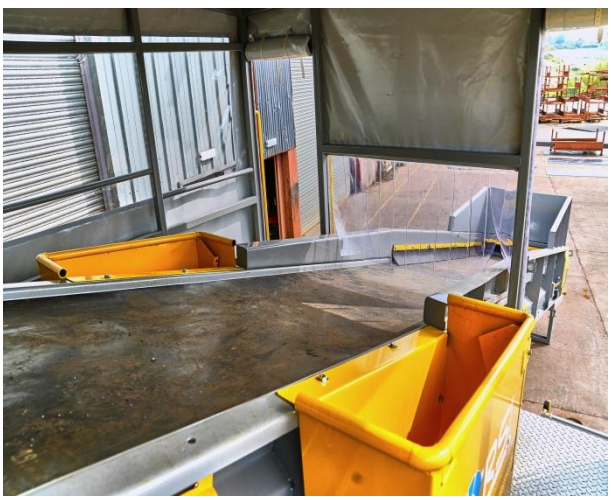
Technical Specification

- 1000mm wide heavy duty rubber belt
- EP500/3ply – 5mm top cover 1.5mm bottom cover
- 8.5m drum centres
- 3.0kW Hi Torque Motovario slip on gear motor drive
- 100mm dia carry rollers placed at 875mm centres
- 100mm dia disc return rollers placed at 2115mm centres
- Head and Tail are fully enclosed to reduce spillage
- High sides incorporated into conveyor with skirting rubber
- Impact bars at infeed boot
- Plough scraper at Tail to reduce material build up
- SKF 50mm bearings (Tail)
- SKF 60mm bearings (Head)
- 288mm dia crowned and lagged drum
- 220mm dia crowned tail drum
- Rosta belt scraper tensioner with polyurethane rubber
- Perspex window at each maintenance point along conveyor
- Dirt chute at tail under plough scraper
- Support legs
- Full guards with emergency stops

2.0 Picking Station

Feature

- 2-4 Man Picking
- 3.5mm Chequered Walkway
- 2 Dropboxes:
  - Width: 900mm
  - Depth: 452mm
  - Height: 989mm
- Access Step Ladders to Picking Station
- Canopy for Weather Protection
- Optional Hard Cover



3.0 Wheel Assembly

Feature

- Adjustable Ram
- Handbrake Lever
- 300x80mm Stud Axle
- Super Single Tyres - 385/65 R22.5

Caulmert
engineering environmental planning

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