South Wales Wood Recycling Ltd
Locks Yard, Heol Llan, Coity, Bridgend, CF35 6BU

Report: **Dust Management and Monitoring Methodology**

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Client: **South Wales Wood Recycling Ltd**

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1 INTRODUCTION

'Dust' is a generic term used to describe particulate matter 1 – 75 µm (micron) in diameter, produced through the crushing and abrasion of materials. Particles greater than 75 µm in diameter are termed grit rather than dust. Dust is often considered in two categories:

a) The size fraction up to 10 µm (often referred to as PM10), which is used as an indicator of local air quality and forms part of National Air Quality Standards. PM10 are measured to agreed standards, and usually expressed as a concentration over time in mg m^{-3} day^{-1}. Wood processing operations such as sawing, sanding and planning typically produce smaller particles (10-30 µm)[1,2] than those produced by large scale wood chipping and it is around these activities where the measurement of PM10s is of particular importance[3] (albeit, PM10s should also be monitored around other wood processing activities from an occupational health perspective)[4].

b) Nuisance dust. There are no standard definitions, or universal monitoring methods, for nuisance dust. It is now becoming accepted that dust above 10 µm may be considered nuisance dust. Nuisance dust can be long-term (or chronic) – such as the long-term soiling of paintwork – or short-term (acute) – such as a short-lived dust cloud. Dust nuisance is the focus of this report.

The effect of dust is a matter of human perception and as a consequence is difficult to quantify. How it is perceived varies according to characteristics of the dust such as its colour, contrast and rate of accumulation, and local factors such as socio-economic conditions and employment.

At waste facilities, the types and amounts of dust generated can be very varied and difficult to predict. Particle behaviour will be highly variable, and there is no simple correlation between particle size and deposition rate.

Dust propagation through air is influenced by many factors including particle size, wind energy and disturbance activities. Large dust particles generally travel shorter distances than small particles and the larger dust particles deposit almost immediately and fairly close to the source, whereas finer particles fall out of the air only after some considerable time and distance[5]. For example, particles with diameters >50 µm tend to be deposited quickly, whereas particles of diameter <10 µm have an extremely small deposition rate in comparison[6]. For the purpose of this assessment the principle that without mitigation particles greater than 30 µm (that comprise the majority of dust particles produced by the wood processing facility) will largely deposit within 100 metres of sources. Those 10 – 30 µm may travel up to 500 metres, however their deposition rates will fall below nuisance thresholds (200 mg m^{-2} day^{-1}) within 250 m. Institute of Air Quality Management (IAQM) guidance[7] has set a cut-off distance for dust soiling effects at construction and demolition sites of 350 m.

How nuisance dust is managed and monitored can be critical to the smooth running of an operation and it is to this end that South Wales Wood Recycling Ltd is proposing the attached methodology for managing and monitoring dust generation at its current and, subject to planning consent, reconfigured site at Coity, Bridgend.

Consistent with the recommendations in guidance from a number of regulatory and industry bodies a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach. The importance of the source, the pathway through the air and the receptor

[1] J. of Ag. Eng. - Riv. di Ing. Agr. (2010),1, 25-31
[2] J. Aerosol. Sci. (1988) 19:1433-35
[3] Woodworking Sheet No 23 (Revision 1), HSE (Nov. 2012)
[4] Occupational Hygiene implications of recycling wood OH/2011/25, HSE (Nov. 2011)
[5] Technical Guidance Note (Monitoring) M17, Environment Agency, Version 2, July 2013.
[6] DoE, The Environmental Effects of Dust from Surface Mineral Workings, Department of the Environment Minerals Division, The Stationary Office, London ISBN 0 117 53186 3 (1995).
[7] IAQM (February 2014) Guidance on the assessment of dust from demolition and construction

sensitivity have been considered in detail below; before being considered together to produce an overall assessment of impact taking professional judgement into account.

Having assessed the likely risk this document goes on to provide detail regarding site mitigation and monitoring measures that will be put in place during future operation.

2 THE STE AND SURROUNDING AREA

2.1 Site Characteristics

2.1.1 Description of the Site

The site comprises the existing South Wales Wood Recycling (SWWR) yard and land adjacent which was the former Bryncethin Nursery. The site is located approximately 3km from the north eastern outskirts of Bridgend between the villages of Bryncethin and Heol-y-Cyw. The local geography is dominated by Hirwaun Common and with the exception of the adjacent Nursery, little development is present in the immediate area.

The wood storage and treatment activity is located at Locks Yard, Heol Llan, Coity, Bridgend, CF35 6BU and it is proposed to use the adjacent nursery for storage of HGVs and containers, maintenance of HGVs, staff and visitor parking and staff welfare. The National Grid Reference for the site (taken at the centre of the recycling area) is SS 93764 1836311. Drawing 10914 - 000 - B shows a location plan for the site.

The Locks Yard site has been used for wood recycling for a number of years and comprises a flat concrete-surfaced yard area approximately 120 m x 120 m with a wood processing/storage building and offices to the north of the site and a centrally located workshop. The site sits at an elevation of around 91m AOD.

A planted bund up to 3m high surrounds the site. The eastern boundary of the site is enclosed by a 2m high palisade fence, with the remaining 3 sides enclosed by a strained wire mesh fence approximately 2.4m high.

HGV access to the recycling facility is from Heol Llan, just off the B4280. The B4280 connects to the M4 at Junction 36 via the B4065, or to Junction 35 via the A473. Access to the site is through palisade gates located at the approximate centre of the eastern boundary.

2.1.2 Current Recycling Operations

The site receives waste wood from a variety of commercial, industrial and municipal customers. This waste can vary from broken pallets, cable drums, manufacturing and timber off-cuts to wood originating from Construction and Demolition sources.

Incoming wood is inspected and based on its source and composition, separated into grades. Each grade of wood is processed separately into woodchips of various size fractions, which are then exported from site to various end user customers. 100% of waste wood inputs are recycled or recovered.

A major proportion of wood chip outputs are currently supplied as raw material for manufacturing panel board products such as new chipboard, fibreboard (e.g. MDF) and Orientated Strand Board (OSB).

At present processing of untreated wood is carried out in the processing/storage building, with processing of treated wood carried out in two areas of the yard to the south east and south west of the site. Un-processed and chip wood is stored in stockpiles located at the south-eastern and southern boundaries of the processing yard and within the processing/storage building.

Drawing 10914 – 000 – D shows the existing layout of the site.

2.1.3 Proposed Recycling Operations

The proposed changes to the site of significance to dust management are:

- Demolition of the existing workshop and its relocation to the former nursery site to provide improved circulation and processing space.
- Side extension of the existing processing/storage building to accommodate the installation of biomass boilers and wood drying floors. The existing storage area would be used to store dry woodchip.
- Construction of an additional storage bay to the rear of the existing processing/storage building.
- Relocation of staff and visitor parking and HGV/container storage to the former nursery site to provide improved circulation and processing space. Designated pedestrian access from the staff car park to the office buildings will be established and clearly marked. Signage and site instructions will indicate that pedestrians should use designated routes.

The proposed changes do not increase the amount of wood being recycled per annum and as a consequence will not result in the intensification of recycling activity at the site. In fact, the installation on-site of wood-fuelled dryers that will use chipped untreated waste wood as fuel and produce heat to dry woodchip will reduce transport movements by around 10 per week (5 HGVs entering and leaving).

The proposed layout is shown schematically in drawing 10914 - 000 – E.

2.2 Wind Direction and Rainfall

Wind frequency data based on 10 years of measurements at St. Athan observation station (at an elevation of 49m ASML) is presented in Figure 2 below. It is evident that winds from the west south west to west north west predominate in the area and winds from the south, north and east tend to be infrequent and typically lower in strength. 33.9% of winds are less than ~3.1m/s (6 knots) and not normally associated with significant transport of particulates.

An additional climatological parameter that is of significance to dust dispersal is rainfall, which results in dust being suppressed during days with higher rainfall. Rainfall data obtained for the St. Athan observation station (1981 – 2010 averages) from the Meteorological Office website[8] indicates that the average number of rainfall days per year is 145.1 (days with rainfall >1mm) i.e. occurring on approximately 40% of days throughout the year. Rainy days were typically around 10-11 per month, with a clearly observable increase between October and January (14-15 days per month).

Rainfall days greater than 0.2mm occur on average between 180 and 200 days each year for the period between 1981 and 2010. It is generally accepted that 0.2 mm of rainfall is considered sufficient to effectively suppress wind-blown dust emissions at mineral sites[9].

On average the site receives 998.9mm of rainfall per annum.

[8] http://www.metoffice.gov.uk/public/weather/climate/gcjv7yd0v

[9] Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England Annex 1: Dust

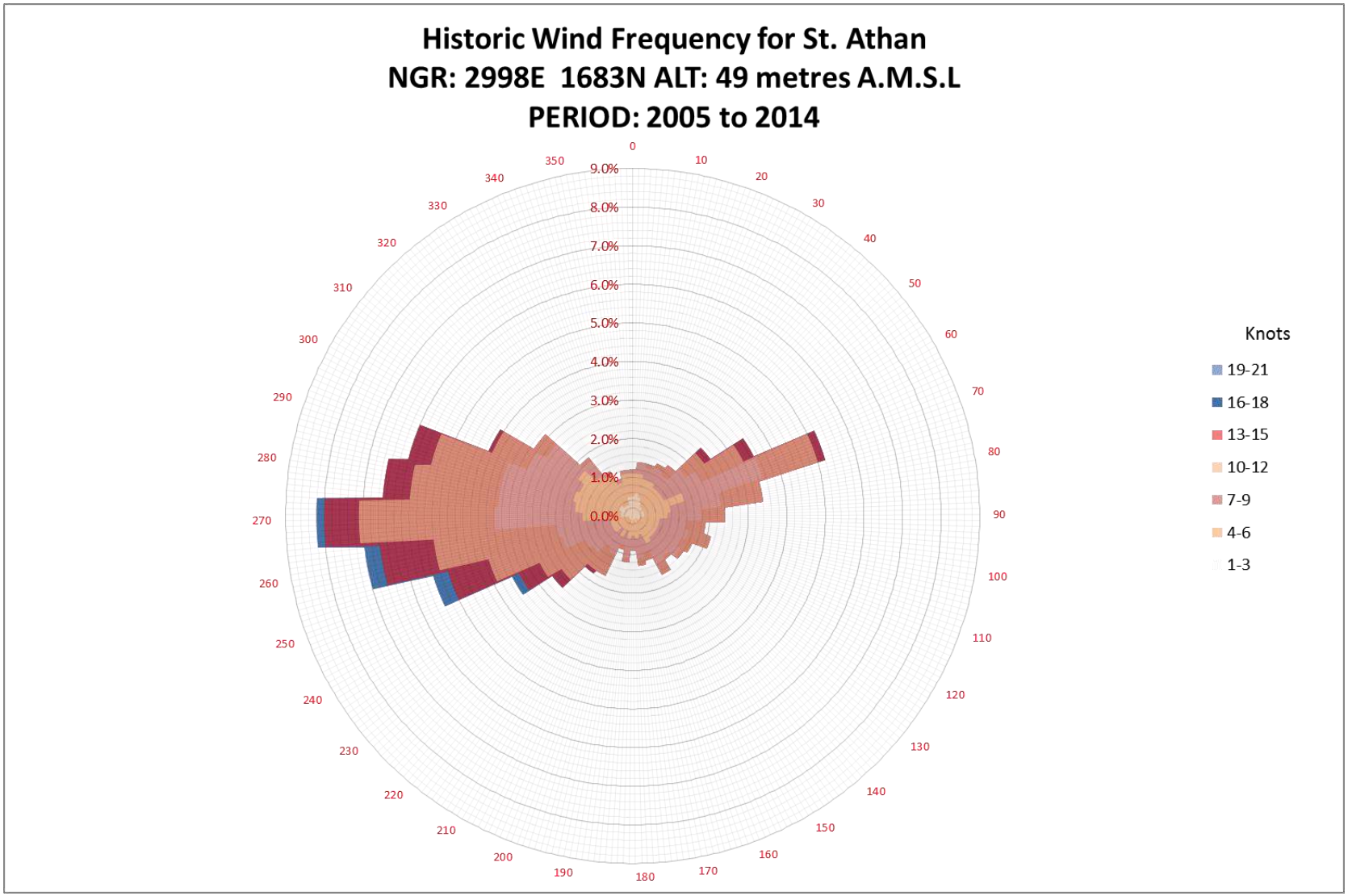


Figure 1. Historic Wind Frequency for St. Athan observation station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	91.9	71.8	68.2	61.5	64.2	60.9	76.4	83.5	82.1	122.4	100.7	115.4	998.9
Days of Rainfall >1mm	14.0	10.9	13.1	11.0	10.1	9.5	10.4	11.3	11.0	14.7	15.1	14.0	145.1

Figure 2. Rainfall data 1981-2010 average for St. Athan observation station

3 RISK ASSESSMENT

3.1 Screening Assessment

The screening assessment is used to determine whether a Detailed Assessment is required.

For the purpose of this assessment it has been determined that a Detailed Assessment will be required where there are:

- human receptors within 500 m of the boundary of the site; or
- ecological receptors within 500 m of the boundary of the site.

Human receptors are defined as people likely to be present within the screening radius for prolonged or frequent periods. This term would therefore apply to dwellings (and amenity areas such as gardens), workplaces where workers would frequently be present, schools and colleges, hotels, etc.. It does not apply to the operators of the wood recycling facility or their staff as their health is covered by Health and Safety legislation. It would not apply for example to public footpaths, bridleways, highways, roads and railway.

Ecological receptors are defined as wildlife and their habitats including designated protection areas including SSSI, SPA, Ramsar, SAC, etc., and locally designated sites including SINC.

The following Receptors were identified within 500 m of the site boundary:

Receptor	Type	Distance from Site Boundary to Boundary/ Amenity Boundary	Direction from site
E1	Cefn Hirgoed SINC	0 m	N, W, S
H1	Residential	212 m	S
H2	Residential	217 m	S
H3	Residential and Kennels	305 m	SE
H4	Residential	273 m	WNW
H5	Residential	309 m	WNW
H6	Residential	350 m	S
H7	Residential	352 m	SSE
H8	Residential	359 m	SSW
H9	Residential	366 m	SSW
H10	Residential	381 m	SSE
H11	Residential	395 m	SSE
H12	Residential Properties and Cattery	402 m	WNW
H13	Residential	394 m	SSE
H14	Multiple Residential (Heol-y-Cyw)	366 m	ENE
H15	Residential	420 m	NNE

Figure 3. Identified Receptors

Receptor locations are shown in Drawing 10914 – 000 – G.

Where there are a large number of receptors of a similar sensitivity grouped closely together, a single receptor has been selected as being representative of the larger number.

The former Bryncethin Nursery is not considered a sensitive receptor as it has been acquired by South Wales Wood Recycling Ltd and the site forms part of the proposed development.

There are no regional or national statutory ecological site designations on or within 500 m of the application site. The former nursery and residential part of the application site lies within the non-statutory Site of Importance for Nature Conservation, Cefn Hirgoed (SBM-1-M) which extends over a large area to the west of the site and abuts the recycling site's northern, eastern and southern boundaries.

A more detailed assessment is required to establish that the level of risk is "negligible", and any effects will be not be significant. This assessment is presented in the following section.

3.2 Risk Assessment

3.2.1 Sources

The identified sources of dust generation at the facility comprise:

- movement of waste to and from the facility;
- storage of waste (under certain conditions) on site;
- the processing of the waste materials, e.g. shredding and screening;
- the handling of woodchip; and
- wind scouring of waste surfaces.

Vehicles driven on and off site can also have an impact on dust generation and transport by:

- re-suspension of deposited particulates on roadways and hard standing; and
- the transport of particles on vehicle bodies, which are subsequently released.

Based on visual assessment of the levels of dust generated by each activity processing of wood, followed by the loading of woodchip into HGVs will, by far, be the greater sources of dust generated compared to other activities. The magnitude of emissions and the duration of processing is such that this activity is likely to generate the vast majority of dust emissions at the site.

For the purpose of this assessment the following source magnitude of emissions categories have been applied.

Activity	Source Magnitude Ranking of Emissions
Processing	High
Handling of woodchip	Medium
Traffic movements	Low
Storage, wind scouring	Negligible

Figure 4. Source magnitude of emissions

Untreated waste wood (Grade A) is processed within a building. Processing is usually carried out without closing the building doors and whilst there will be some reduction in source emission magnitude as a result of the processing being enclosed, for the purposes of this assessment it will be assumed that this processing area emissions magnitude is the same as for processing with no enclosure. The source of emissions for this processing area is defined as the open door. As a result of early feedback from nearby properties regarding the potential for increased noise levels if grade A processing were to be relocated outside, the company has decided to retain the grade A processing activity within the building in order for there to be no increase in noise levels.

B and C Grade wood is processed outside in one of two locations to the south west and south east of the site.

When assessing the distance from a receptor the source closest to that receptor has been used.

A plan showing the location of the sources is shown in Drawing 10914 – 000 – K.

3.2.2 Receptors

3.2.2.1 Human Receptors

The Environment Agency provide guidance[10] that describes a number of categories of receptor and resources for identifying their presence in the vicinity of a site.

Figure 5 shows the DEFRA[11] sensitivity ranking for potential receptors to dust. These rankings have been used to categorise the sensitivity of nearby receptors for the detailed assessment.

Where a receptor is categorized under one or more usages, the higher sensitivity category and ranking has been used.

Common land adjacent to the site that is used for occasional equine grazing/recreation has been excluded from the assessment on the basis of its usage being infrequent.

Ranking	Sensitivity To Dust (General)[12]
High	Hospitals, clinics, hi-tech industry, painting & furnishing, food processing
Medium	Schools, residential areas, food retailers, greenhouses & nursery, horticultural land, offices
Low	Farms, light & heavy industry, outdoor storage

Figure 5. Defra/DoE Receptor Sensitivity Ranking

3.2.2.1.1 Identified Human Receptors

The sensitivity of the human receptors within 500 m of the site is categorised as:

Receptor	Type	Sensitivity
H1	Residential	Medium
H2	Residential	Medium
H3	Residential and Kennels	Medium
H4	Residential	Medium
H5	Residential	Medium
H6	Residential	Medium
H7	Residential	Medium
H8	Residential	Medium
H9	Residential	Medium
H10	Residential	Medium
H11	Residential	Medium
H12	Residential Properties and Cattery	Medium
H13	Residential	Medium
H14	Multiple Residential (Heol-y-Cyw)	Medium
H15	Residential	Medium

Figure 6. Identified receptors within 500 m of the site boundary

[10] Environment Agency 2011. H1 Annex A – Amenity & accident risk from installations and waste activities v 2.1
[11] DEFRA 1999. Waste Management Licensing: Waste Management Licensing. Risk Assessment Inspection Frequencies Operator Pollution Risk Appraisal "OPRA for Waste" A Consultation Paper. Chapter 3.
[12] DoE 1995. Environmental Effects of Dust from Surface Mineral Workings.

3.2.2.2 Ecological Receptors

The focus of this assessment is the direct and indirect effects of nuisance dust on human receptors. However, it is recognised that dust emissions also have the potential to affect ecological receptors and dust can have two types of effects: physical and chemical.

The effects of particulate matter on ecological receptors have not been subject to extensive research and therefore little published guidance is available. A majority of the research undertaken has focused on the chemical effects of alkaline dusts. A summary of a review of available research[13] concluded that: *"The issue of dust on ecological receptors is largely confined to the associated chemical effect of dust, and particularly the effect of acidic or alkaline dust influencing vegetation through soils."*

The IAQM use a sensitivity ranking in their guidance on the assessment of dust from demolition and construction sites[7]. Due to the nature of the dust created at these sites, which can often include the creation of alkali dusts from concrete, the impacts of these dusts on ecological sites (notably those with acidic soil conditions) introduces a further consideration when carrying out assessments of these sites.

The IAQM guidance indicates that:

"Dust from demolition and construction sites deposited on vegetation may create ecological stress within the local plant community. During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions. Rainfall removes the deposited dust from foliage and can rapidly leach chemicals into the soil. Plant communities near short-term works are likely to recover within a year of the dust soiling stress ceasing. However, large scale construction sites may give rise to dust deposition over an extended period of time and adversely affect vascular plants. For example cement dust deposited on leaves can increase the surface alkalinity, which in turn can hydrolyse lipid and wax components, penetrate the cuticle, and denature proteins, finally causing the leaf to wilt.

Limestone dust coating of lichen has been shown to damage its photosynthetic apparatus. These types of damage over a long period have the potential to change plant community structure and function. Noticeable effects include the increase in ruderal and pioneer plant communities."

Environment Agency interim guidance[14] (Environment Agency, 2003) concludes that most relatively insensitive vegetation species will not be significantly affected by smothering at dust deposition levels below about 200 mg m^{-2} day^{-1}; although in habitats in which *Sphagnum* and possibly other mosses are important species within the protected site, effects may be observed at levels above about 70 mg m^{-2} day^{-1}. However the report noted that the uncertainties were considerable and exceedance of these values should not be assumed to demonstrate harm. The report concluded there were insufficient data to derive thresholds for impacts of dust upon invertebrates.

The Design Manual for Roads and Bridges (2007)[15] suggests that only dust deposition levels above 1000 mg m^{-2} day^{-1} are likely to affect sensitive ecological receptors. This level of dust deposition is five times greater than the level of 200 mg m^{-2} day^{-1}, at which dust deposition is generally considered likely to cause complaints of nuisance to humans. It states that most species appear to be unaffected until dust deposition rates are at levels considerably higher than this. It follows, therefore, that by ensuring dust deposition levels are kept below levels likely to cause nuisance to humans, they will be significantly below the level at which ecological receptors can be expected to be affected.

These conclusions, however, only relate to the effects of smothering by inert dust.

The following designations for ecological sites based on those proposed by the IAQM[7] will also be used for this assessment:

[13] DETR (1995). The Environmental Effects of Dust from Surface Mineral Workings – Volume Two.

[14] Environment Agency (2003). Assessment of noise disturbance on birds and dust on vegetation and invertebrate species (authored by WS Atkins)

[15] Design Manual for Roads and Bridges (2007) Volume 11, Section 3, Part 1, HA207/07, Annex F.

Ranking	Sensitivity To Dust
High	Locations with an international or national designation and the designated features may be affected by dust soiling. Locations where there is a community of particularly dust sensitive species including both vascular plants and lower plants (bryophytes, lichens, fungi), some of which may be of particular significance by their designation as species of conservation concern.
Medium	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. Locations with a national designation where the features may be affected by dust deposition.
Low	Locations with a local designation where the features may be affected by dust deposition

Figure 7. Identified receptors within 500 m of the site boundary

3.2.2.2.1 Identified Ecological Receptors

Although there is no land included in any national statutory ecological site designations on or within 500 m of the application site, the assessment of the physical and chemical effects of dust is particularly important as much of the land surrounding the site is designated in the Bridgend Local Development Plan as a Site of Importance for Nature Conservation. Pryce Consultant Ecologists have advised on potential impacts of dust deposition on flora and fauna within the SINC and their observations are presented in the following paragraphs.

The Cefn Hirgoed SINC is an extensive area of unimproved common land and has been given its county-borough designation on the basis of the presence of "*acidic grassland, small areas of wet heath, species rich marshy grassland, bracken, scrub and small areas of woodland and plantation".* Qualifying features are "*Purple moor-grass and rush pasture, Bracken and Acid grassland*" and secondary qualifying features are "*Scrub and Native woodland*". The diversity and large areas of habitats available make this site likely to support many species. Unknown grassland features could include a variety of invertebrates, birds, reptiles and small mammals and the scrub and woodland areas are likely to support other types of birds and small mammals.

Plants cited in the SINC description are common fleabane *Pulicaria dysenterica*, devil's bit scabious *Sucissa pratensis*[16], jointed rush *Juncus articulatus*, gorse *Ulex europaeus*, ling *Calluna vulgaris*, carnation sedge *Carex panicea*, heath bedstraw *Galium saxatile*, glaucous sedge *Carex flacca*, tormentil *Potentilla erecta*, cross leaved heath *Erica tetralix*, lesser spearwort *Ranunculus flammula*, marsh violet *Viola palustris*, marsh pennywort *Hydrocotyle vulgaris*, sphagnum species *Sphagnum* sp, round leaved water crowfoot *Ranunculus omiophyllus*[17], heath speedwell *Veronica officinalis*, heath rush *Juncus squarrosus*, lousewort *Pedicularis sylvatica*, hard rush *Juncus inflexus*, water mint *Mentha aquatica*, greater bird's foot trefoil *Lotus pedunculatus*, marsh bedstraw *Galium palustre*, ragged robin *Lychnis floscuculi*, lady fern *Athyrium filix-femina*, star sedge *Carex echinata*, cotton grass *Eriophorum angustifolium*, bog asphodel *Narthecium ossifragrum*, green ribbed sedge *Carex binervis*, bilberry *Vaccinium myrtillus*, quaking grass *Briza media*, water pepper *Persicaria hydropiper*, water purslane *Lythrum portula*, mat grass *Nardus stricta*, flote grass *Glyceria fluitans*, bog pondweed *Potamogeton polygonifolius*, branched bur-reed *Sparganium erectum*, marsh willowherb *Epilobium paulstre*.

All these species are characteristic of acid soils with pH values of perhaps 4.5 to 5.5, some requiring wet or flushed situations, some dry. The smothering effect of inert wood dust on any of these species or the raising of the soil pH caused by the decomposition of wood dust is likely to be very low.

[16] Devil's-bit Scabious is of concern as it is the larval food-plant of the Marsh Fritillary butterfly, a European Protected Species listed at annex II of the "Habitats Regulations" and known to occur in this area although not included in the SINC description.
[17] Species included on the Countryside Council for Wales List of Globally Threatened Plants category A.

With the exception of round-leaved crowfoot and devil's-bit scabious, none of the plants listed are of high conservation concern, but additional species growing within the SINC but not listed, may have such a status. No assessment appears to have been made of the presence of the extensive wet-heath lower-plant community which includes various *Sphagnum* species (including *S. compactum* which is rare in Glamorgan) and other bryophytes including two species of cruet moss *Splachnum* spp. (both rare in Glamorgan). Some lower plant species are very likely to be sensitive to the anticipated smothering effect of dust deposition and may also be more sensitive than vascular plants to soil-chemistry changes.

Although the proposed facility will only accept grades A, B and C wood and will not accept copper, chrome, arsenic or creosote treated wood, at least some of the wood to be processed will be from demolition sites and potentially will contain or have been treated with a variety of chemicals including preservatives, paints, lacquers and glues. Within distances of 20 m of on-site sources, significant effects from nuisance dust may occur. Beyond this distance only smaller particles are transported and dust deposition will be correspondingly smaller. On this basis the amount of dust that will land in the SINC will be minimal and the amount of chemicals present smaller still.

The presence of species of high conservation concern has led to a sensitivity of HIGH being awarded for the ecological sensitivity of the SINC. Site investigations are not proposed as the presence of unrecorded or additional species to those currently listed would not lead to a higher sensitivity ranking being awarded.

3.2.3 Pathway

The pathway for dust to any receptor is through the air.

As stated earlier, the literature suggests that:

- Without mitigation particles greater than 30 µm (that comprise the majority of dust particles produced by the wood processing facility) will largely deposit within 100 metres of sources; and
- Particles 10 – 30 µm may travel up to 500 metres (The IAQM considers 350 m as a cut-off for dust effects), however their deposition rates will fall below nuisance thresholds within 250 m.

The probability of exposure (and impact of nuisance dust) will be significantly affected by operational, topographical and meteorological factors, as well as physical barriers that impede/increase dispersion. Wind direction in particular has a significant impact on exposure, with receptors in line with the prevailing wind direction more likely to be exposed than those away from the prevailing wind direction. The prevailing wind is from the south west to north south west.

Unlike the screening assessment, this stage of assessment takes into account the location of sources of emission with respect to the receptor.

3.2.3.1 Human Receptors

Within distances of 20 m from sources, significant effects from nuisance dust may occur, regardless of the prevailing wind direction. At greater distances, the wind direction has a greater influence on the impact; consequently, the score allocated to the pathway takes the orientation of the receptor relative to the source into account only for distances beyond 20 m.

As discussed previously, for larger particles, such as those anticipated from wood chipping, it is likely that they will largely deposit within 100 m of the source of emission. It is expected that the source concentration of smaller particles that travel long distances will be lower than the fraction of large particles. Taking these factors into account, for the purpose of this assessment the reference distances of 20 m, 100 m, 250 m and 350 m have been selected as points where the pathway risk transitions to the next level.

In the case where there is a significant natural obstruction between the source of emissions and the receptor, e.g. a large wooded area, large topographical feature, etc. the probability of exposure would be reduced by one classification. No such feature is present between the site and surrounding receptors.

Distance between source* and receptor	Orientation of receptor relative to source*	Probability of Exposure (Pathway Risk)
Less than 20 m	All directions	High
Between 20 m and 100 m	Downwind	High
Between 20 m and 100 m	Upwind	Medium
Between 100 m and 250 m	Downwind	Medium
Between 100 m and 250 m	Upwind	Low
Between 250 m – 350 m	Downwind	Low
Between 250 m – 350 m	Upwind	Negligible
Greater than 350 m	All directions	Negligible

*Taken to be the site boundary where the distance from a source is not known

Figure 8. Assessment matrix for Probability of Exposure for Human Receptors

The identified receptors within 500 m of the site were further characterised and their probability of exposure established (Figure 9):

Receptor	Type	Distance from Source* to Amenity Area Boundary	Direction from site	Probability of Exposure
H1	Residential	245 m	S	Low
H2	Residential	245 m	S	Low
H3	Residential and Kennels	306 m	SE	Negligible
H4	Residential	324 m	WNW	Negligible
H5	Residential	364 m	WNW	Negligible
H6	Residential	378 m	S	Negligible
H7	Residential	385 m	SSE	Negligible
H8	Residential	386 m	SSW	Negligible
H9	Residential	407 m	SSW	Negligible
H10	Residential	413 m	SSE	Negligible
H11	Residential	430 m	SSE	Negligible
H12	Residential Properties and Cattery	452 m	WNW	Negligible
H13	Residential	464 m	SSE	Negligible
H14	Multiple Residential (Heol-y-Cyw)	456 m	ENE	Negligible

*Taken to be the site boundary where the distance from a source is not known

Figure 9. Probability of Exposure for human receptors within 500 m of sources

Both existing and proposed Source configurations yield the same probability of exposure.

3.2.3.2 Ecological Receptors

For the purpose of this assessment the dust created does not have any significant capacity for direct chemical interaction and as a consequence, the direct effects on sensitive ecological receptors will be constrained to smothering effects that could result in reduced photosynthesis, respiration and transpiration.

As with human receptors, for ecological receptors consideration also needs to be given to the distance of the Receptor from the source. As mentioned previously, IAQM[7] guidance on the assessment of dust from demolition and construction is predominantly concerned with dust from construction sites that may be alkali in nature. The guidance would to some extent take into account smothering of ecological receptors by dust which would be independent of chemical composition, although there is no clear indication as to where the distinction lies.

Environment Agency interim guidance[18] concludes that most relatively insensitive vegetation species will not be significantly affected by smothering at dust deposition levels below about 200 mg m^{-2} day^{-1}; although in habitats in which Sphagnum and possibly other mosses are important species within the protected site, effects may be observed at levels above about 70 mg m^{-2} day^{-1}. However the report noted that the uncertainties were considerable and exceedance of these values should not be assumed to demonstrate harm. The report concluded there were insufficient data to derive thresholds for impacts of dust upon invertebrates.

The Design Manual for Roads and Bridges[19] suggests that only dust deposition levels above 1000 mg m^{-2} day^{-1} are likely to affect sensitive ecological receptors. This level of dust deposition is five times greater than the level of 200 mg m^{-2} day^{-1}, at which dust deposition is generally considered likely to cause complaints of nuisance to humans. It states that most species appear to be unaffected until dust deposition rates are at levels considerably higher than this.

With disagreement in the literature a cautious approach has been taken to assessing the probability of exposure for ecological receptors. In the assessment of pathway risk for ecological receptors, larger particles, such as those likely from wood recycling activities were expected to largely deposit within 100 m of the source of emission. Smaller particles will fall below nuisance levels (200 mg m^{-1} day^{-1}) within 250 m.

Distance between source* and receptor	Orientation of receptor relative to source*	Probability of Exposure (Pathway Risk)
Less than 20 m	All directions	High
Between 20 m and 100 m	Downwind	High
Between 20 m and 100 m	Upwind	Medium
Between 100 m and 250 m	Downwind	Medium
Between 100 m and 250 m	Upwind	Low
Between 250 m – 350 m	Downwind	Low
Between 250 m – 350 m	Upwind	Negligible
Greater than 350 m	All directions	Negligible

*Taken to be the site boundary where the distance from a source is not known

Figure 10. Assessment matrix for Probability of Exposure

Within distances of 20 m from sources, significant effects from dust deposition may occur, regardless of the prevailing wind direction. At greater distances, the wind direction has a greater influence on the impact; consequently, the score allocated to the pathway takes the orientation of the receptor relative to the source into account only for distances beyond 20 m. For the purpose of this assessment the reference distances of 100 m and 250 m have been selected as points where the pathway risk transitions

[18] Environment Agency (2003). Assessment of noise disturbance on birds and dust on vegetation and invertebrate species (authored by WS Atkins)
[19] Design Manual for Roads and Bridges (2007) Volume 11, Section 3, Part 1, HA207/07, Annex F.

to the next level. These reference distances and the associated pathway risk are summarised in Figure 10.

In the case where there is a significant natural obstruction between the source of emissions and the receptor, e.g. a large wooded area, large topographical feature, etc. the probability of exposure would be reduced by one classification. No such feature is present between the site and the Cefn Hirgoed SINC.

As indicated by Figure 1, the prevailing wind direction is from the SSW to NNW.

The identified ecological receptors within 500 m of the site were further characterised and their Probability of Exposure established (Figure 11).

Receptor	Type	Distance from Source* to Amenity Area Boundary	Direction from site	Probability of Exposure
E1	Cefn Hirgoed SINC	0 m	NNW (320º) through North to SSW (240º)	Medium

*Taken to be the site boundary where the distance from a source is not known

Figure 11. Probability of Exposure for ecological receptors within 500 m of sources

3.2.4 Risk of Dust Impacts

Each source, pathway and receptor was allocated a score of 0, 1, 3 or 5 depending on whether they were deemed to be negligible, low, medium or high respectively. For each receptor, the scores were multiplied together to give a total dust risk score. A dust risk category of negligible, low, medium or high was allocated according to the score ranges set out in Figure 12.

Dust Risk Score	Dust Risk Category Without Mitigation
45 and above	High
5 - 44	Medium
1 - 4	Low
0*	Negligible

Figure 12. Dust risk category without mitigation

Any receptor identified as having a risk of dust impact greater than negligible without mitigation is taken forward for further assessment (Figure 13).

Where a receptor is affected by multiple sources the highest risk of dust impact has been tabulated.

Receptor	Source	Pathway	Receptor	Total	Risk
H1	5	1	1	5	Medium
H2	5	1	1	5	Medium
E1	5	3	5	75	High

Figure 13. Receptors assessed as having a greater than negligible risk of dust impact without mitigation

3.3 Further Assessment

3.3.1 Pathway Refinements

The Pathway Risk, or Probability of Exposure, is the likelihood of the receptors being exposed to the hazard. In the initial assessment consideration was given to solely to wind direction and the receptor's

location up- or downwind of the prevailing wind direction. This provided an indicative probability of an event occurring. In actuality the probability of exposure is the product of several variables, for example, the fraction of the time that the wind blows towards a receptor, the fraction of time that material is disturbed, rainfall frequency, etc.. The first stage of any further assessment will be to incorporate factors not previously assessed.

Conservative (i.e. "worst case" conditions) probability factors for the occurrence of a release event are described in Figure 14.

Factor	Description	Assumptions and Factors
Frequency of Release Events	Operations resulting in releases of dust	Although the facility currently operates for 5.5 days per week, planning consents allow the facility to operate between 08:00hrs and 18:00hrs 7 days per week. High releases (during processing of wood) are anticipated for 8 hrs/day, 56hrs/week or 2,920 hrs/year (taking into account staff breaks and other operational considerations such as opening hours, maintenance, refuelling and cleaning and excluding shutdowns). Processing activity happens simultaneously with the handling of woodchip. The remaining 5840 hrs/year are characterised as Low or Negligible magnitude release events. High Magnitude operational release therefore occur 33.33% of time averaged over 1 year.
Wind Direction	The proportion of time averaged over 1 year that wind blows towards the receptor	For any receptor >20 m from the source exposure will only occur when the receptor is downwind of the facility. The proportion of time the receptor is downwind of the facility is calculated from the Met Office wind frequency data presented in Figure 1.
Wind Speed	The proportion of time averaged over 1 year that wind blows towards the receptor at wind speeds > 3m/s (6.7 mph) and able to transport particulates	The proportion of time when the wind blows towards the receptor at speeds >3m/s is calculated from the Met Office wind frequency data presented in Figure 1.
Dry days	Number of days averaged over 1 year when rainfall is more than 1 mm and transport of particulate is suppressed.	From data presented in section 2.2 there are 145.1 (days with rainfall >1mm) per year. The number of dry days with rainfall <1mm is therefore 219.9 days/year or 60% of the time averaged over 1 year. It is generally accepted[9] that 0.2 mm of rainfall is considered sufficient to effectively suppress wind-blown dust emissions at mineral sites, so the use of a >1mm threshold is used as a conservative threshold.
Receptor Occupancy	The proportion of time that a receptor is present at the identified location.	Some receptors may only be occupied for a percentage of time, for example workplaces may only be occupied during office hours and the percentage of time a receptor is occupied would be a variable for consideration. For the identified residential and ecological receptors no occupancy reduction has been applied, i.e. the receptor is permanently occupied (or occupancy has no relevance in the case of ecological receptors).

Figure 14. Site Specific Factors Affecting Probability of Exposure

The exposure probability has been calculated by combining the frequency the receptor is present downwind at wind speeds >3m/s, with the frequency of dry days, the frequency a release takes place, the frequency of operational releases and the time an individual receptor is occupied, as follows:

Exposure probability = (% of time the receptor is downwind in wind speeds >3m/s) x (% of dry days with rainfall <1mm) x (% of potential hours of operational release) x (% of time an individual receptor is occupied)

3.3.1.1 Human Receptors

As noted by the Environment Agency[5], the practice guideline of 200 mg m^{-2} day^{-1} (individual monthly-average) as a threshold for "complaints likely" from nuisance dust does not properly reflect the nuisance effects from low density material, such as woodchip. This cannot be wholly resolved by simply adjusting the mass by a correction factor based on the density to enable a comparison with the mass-based 200 mg m^{-2} day^{-1} nuisance benchmark. A better approach is to use a bespoke benchmark limit derived by correlating observed dustfall rates with complaints data or community responses.

For the purposes of this assessment it is proposed to use the duration of exposure as a benchmark, such that it is independent of deposition rate. The proposed limits are presented in Figure 15:

Probability Criteria	Description of Probability Terms
Negligible	Exposure less than 25 hours per year or half hour per week (0.2%of time)
Low	Exposure 25-100 hours per year or up to 2 hours per week (0.2-1% time)
Medium	Exposure 100-250 hours per year or up to 5 hours per week (1-3% time)
High	Exposure more than 250 hours per year or 5 or more hours per week (3% time)

Figure 15. Descriptive Criteria for the Probability of Exposure Occurring

3.3.1.1.1 Receptor H1

In this case, based on wind frequency data it has been calculated that the receptor is downwind in wind speeds >3m/s for 0.3% of the time (0.5 hrs/week).

The probability of exposure is:

0.3% x 60% x 33.33% x 100% = 0.1% = 6 minutes per week.

The exposure probability is assessed as **Negligible**.

3.3.1.1.2 Receptor H2

In this case, based on wind frequency data it has been calculated that the receptor is downwind in wind speeds >3m/s for 0.1% of the time (0.17 hrs/week). The probability of exposure is:

0.1% x 60% x 33.33% x 100% = 0.02% = 2 minutes per week.

The exposure probability is assessed as **Negligible**.

3.3.1.2 Ecological Receptors

In a similar way to human receptors, the probability of exposure for ecological receptors is also a function of the likelihood of the receptors being exposed to the hazard.

Using a similar methodology to that used in 3.3.1.1 the exposure probability has been calculated by combining the frequency the receptor is present downwind at wind speeds >3m/s, with the frequency of dry days, the frequency a release takes place and the frequency of operational releases as follows:

Exposure probability = (% of time the receptor is downwind in wind speeds >3m/s) x (% of dry days with rainfall <1mm) x (% of potential hours of operational release)

The IAQM guidance indicates that:

"During long dry periods dust can coat plant foliage adversely affecting photosynthesis and other biological functions. Rainfall removes the deposited dust from foliage and can rapidly leach chemicals into the soil. Plant communities near short-term works are likely to recover within a year of the dust soiling stress ceasing. However, large scale construction sites may give rise to dust deposition over an extended period of time and adversely affect vascular plants."

There is no indication given by IAQM or within the literature as to what constitutes an extended period of time such that a potentially damaging exposure could be quantified. Rainfall data (2.2) indicates that June is the driest month, typically experiencing 9.5 days with rainfall >1mm. This would equate to rainfall approximately every three days, although clearly, longer periods without rainfall can be experienced. Based on this, an exposure probability of 3 days, or 72 hours (~10% of time), has therefore been selected as a level at which long-term effects from smothering may be anticipated. This would equate to the average, rather than maximum duration without rainfall and in the absence of literature guidance, represents what is considered to be a conservative limit.

The Descriptive Criteria presented in Figure 16 have been used for this assessment.

Probability Criteria	Description of Probability Terms
Negligible	Exposure 0-86.4 hours per year or up to 7.2 hours per month (0 -~1% time)
Low	Exposure 86.4-216 hours per year or up to 18 hours per month (~1-2.5% time)
Medium	Exposure 216-432 hours per year or up to 36 hours per month (~2.5-5% time)
High	Exposure more than 864 hours per year or 72 or more hours per month (~10% time)

Figure 16. Descriptive Criteria for the Probability of Exposure Occurring

Areas of the Cefn Hirgoed SINC will be downwind of the site when the prevailing wind is from 320º (north north west) through to 240º (south south west).

Figure 17 tabulates the probability of exposure as a function of wind direction based on the formula in 3.3.1.2:

Wind Direction	Potential Minutes of Operational Release per Week	Probability of Exposure
10º	6.0	Negligible
20º	8.1	Negligible
30º	10.1	Negligible
40º	14.1	Negligible
50º	32.3	Negligible
60º	52.4	Negligible
70º	76.6	Negligible
80º	48.4	Negligible
90º	30.2	Negligible
100º	24.2	Negligible
110º	28.2	Negligible
120º	20.2	Negligible

130º	18.1	Negligible
140º	14.1	Negligible
150º	18.1	Negligible
160º	14.1	Negligible
170º	14.1	Negligible
180º	8.1	Negligible
190º	12.1	Negligible
200º	10.1	Negligible
210º	22.2	Negligible
220º	28.2	Negligible
230º	40.3	Negligible
240º	58.5	Negligible
250º	N/A	N/A
260º	N/A	N/A
270º	N/A	N/A
280º	N/A	N/A
290º	N/A	N/A
300º	N/A	N/A
310º	N/A	N/A
320º	12.1	Negligible
330º	2.0	Negligible
340º	2.0	Negligible
350º	2.0	Negligible
360º	2.0	Negligible

Figure 17. Probability of Exposure Occurring

The exposure probability is assessed as **Negligible** for all wind directions.

3.3.2 Receptor Refinements

3.3.2.1 Ecological Receptors

The significance of the potential consequences that the identified hazards represent to a receptor are classified depending upon: a) the degree of the impact that the potential risk could have and b) the context in which the risk is being assessed.

Whilst the sensitivity of an ecological receptor may be high, the degree of impact dust may have on the receptor as a whole can be considered as a function of the area affected (Figure 18).

		Ecological Sensitivity			
		Negligible	**Low**	**Medium**	**High**
Area Affected	**High**	Low	Medium	High	High
	Medium	Negligible	Low	Medium	High
	Low	Negligible	Low	Low	Medium
	Negligible	Negligible	Negligible	Negligible	Low

Figure 18. Degree of impact on ecological receptors

This assessment has considered an area of 250 m from on-site sources beyond which deposition rates will fall below nuisance thresholds (200 mg m^{-2} day^{-1}) and has established four categories on the basis of the area of the SINC that may be affected (Figure 19) such that an area of 1% of the SINC being affected would constitute a High impact taking into account the nature of the species present.

Criteria	Area of SINC Affected
Negligible	Less than 0.25% of SINC area affected
Low	Between 0.25% and 0.5% of SINC area affected
Medium	Between 0. 5% and 1.0% of SINC area affected
High	Greater than 1.0% of SINC area affected

Figure 19. Criteria for the Area of SINC affected

Figure 20 calculates the areas of the SINC that lie within the 250 m distance from on-site sources and within which dust may be deposited at rates above nuisance thresholds (in the absence of on-site mitigation) and equates this as a percentage of the total area of the Cefn Hirgoed SINC (227.75ha). Existing developed areas, for example residential properties and gardens, nurseries, arable fields, etc. have been excluded on the basis of any species of interest being likely to be absent.

Wind Direction	Percentage of Total SINC Area	Area Affected
10º	0.24%	Negligible
20º	0.23%	Negligible
30º	0.24%	Negligible
40º	0.22%	Negligible
50º	0.14%	Negligible
60º	0.16%	Negligible
70º	0.18%	Negligible
80º	0.20%	Negligible
90º	0.20%	Negligible
100º	0.18%	Negligible
110º	0.18%	Negligible
120º	0.12%	Negligible
130º	0.16%	Negligible
140º	0.14%	Negligible
150º	0.15%	Negligible
160º	0.18%	Negligible
170º	0.21%	Negligible
180º	0.22%	Negligible
190º	0.22%	Negligible
200º	0.22%	Negligible
210º	0.17%	Negligible
220º	0.13%	Negligible
230º	0.07%	Negligible
240º	0.00%	Negligible
250º	0.00%	Negligible
260º	0.00%	Negligible
270º	0.00%	Negligible
280º	0.00%	Negligible
290º	0.00%	Negligible
300º	0.00%	Negligible
310º	0.00%	Negligible
320º	0.00%	Negligible
330º	0.09%	Negligible
340º	0.19%	Negligible
350º	0.21%	Negligible
360º	0.20%	Negligible

Figure 20. Area of SINC within potential zone of nuisance dust deposition

The maximum area that could be affected by dust deposition at greater than nuisance thresholds of 200 mg m^{-2} day^{-1} would equate to an area of 0.24% of the total SINC area. The Area Affected is ranked as Negligible.

With an Ecological Sensitivity of High (3.2.2.2.1) and an Area Affected of Negligible, the Receptor Sensitivity of the SINC is assessed as **Low**.

3.3.3 Reassessment of Risk of Dust Impacts

Figure 21 recalculates the dust risk in accordance with 3.2.4 using the refined pathway and receptor assessments.

Receptor	Source	Pathway	Receptor	Total	Risk
H1	5	0	1	0	Negligible
H2	5	0	1	0	Negligible
E1	5	0	1	0	Negligible

Figure 21. Risk of dust impact without mitigation

The site dust risk category (Figure 18) is assessed as **Negligible** for both human and ecological receptors. Further assessment and mitigation measures are not necessary.

3.4 Conclusions

An assessment of dust risk has been undertaken for the South Wales Wood Recycling facility based on a Source-Pathway-Receptor model. The assessment takes into account site specific parameters such as location of sources, wind speed, wind direction and rainfall. The assessed risk of dust impact on nearby human and ecological receptors without mitigation is **Negligible**.

This assessment has been undertaken in the absence of quantifiable source emissions rates, measured deposition rates from monitoring locations around the site or agreement in published data relating to deposition rates and durations that can be tolerated by species located within the Cefn Hirgoed SINC. This leads to a degree of uncertainty in the assessment and it is recommended that a programme of monitoring is undertaken on-site to characterise deposition rates at nearby receptors such that this assessment can be refined in light of additional data. Should it not be possible to measure deposition directly at receptors, monitoring should be undertaken at the site boundary and effects extrapolated to nearby receptors.

The assessment demonstrates that only a small area of the SINC may be affected by dust deposition levels that might be significant. In terms of the consequences of smothering, regardless of the species present, the impact is likely to be small. Furthermore, rain would wash off any dust frequently and the risk of significant impact to the SINC and the fauna and flora therein is assessed as Negligible.

Some mitigation is present on-site (planted bunds, dust nets and other structures that will act to reduce dust transport) and water sprays to reduce source emissions. This should be retained and utilised pending the outcome of any monitoring activity to confirm the assumptions used in this assessment.

The following sections describe the existing dust management and mitigation systems at the site, recommendations for monitoring and action levels by which dust control measures should be implemented.

4 DUST MANAGEMENT AND MONITORING METHODOLOGY

4.1 Dust Management

4.1.1 Existing Situation

In April 2014 the company took steps to improve dust management on-site following a series of complaints from the neighbouring Nursery both directly to the company and via Natural Resources Wales. The Nursery site is located directly adjacent to the recycling area and within the 100 m boundary within which larger dust particles are expected to deposit without mitigation measures in place. Following an investigation of the weather and operating conditions at the time it became apparent that dust complaints predominantly arose at mean or peak wind speeds greater than 15 km/hr (8 knots) from the east of the site. Complaints were only received when processing was being carried out within the processing area to the south west of the recycling facility.

The company installed a series of mitigation measures including dust suppression netting and water spray suppression systems along the processing area boundary with the Nursery and the introduction of a slow speed shredder that generates lower levels of dust during processing (as well as reduced noise emissions). Following the installation of this equipment no further complaints were received from the Nursery (or any other nearby receptor) and the measures were considered to be effective in controlling dust at the site.

In the 5 months since submitting application (Ref. P/14/711/FUL) for planning consent to use the adjacent Nursery for HGV/container storage, the erection of a workshop for HGV maintenance, staff/visitor parking and staff welfare and the local profile of the facility being raised, a further four complaints have been made to Natural Resources Wales relating to dust. These complaints were thoroughly investigated in line with the company's complaints procedure. Of the four complaints only one, relating to the transport of dust beyond the southern boundary of the existing recycling site (rather than nuisance dust deposition at the receptor itself) was substantiated. Whilst risks associated with nuisance dust deposition on the adjacent land (the Cefn Hirgoed SINC) have been assessed as Negligible, this report makes recommendations for mitigating against dust transport beyond the boundaries of the site in 4.1.4.

4.1.2 Visual Inspections

4.1.2.1 Continuous Monitoring

During processing operations visual inspections are undertaken to establish whether dust is being transported beyond the boundary of the site. Wind conditions where off-site transport occurs will be logged in the site diary and a weather station will shortly be installed on-site to increase the accuracy of data compared with that currently secured from off-site observation stations.

Section 4.2 describes the actions taken and escalation of action in the event of dust being observed at the boundary of the site.

To complement and reinforce the site inspection data, a series of dust monitoring stations will be installed around the site to measure dust transport outside of the boundary of the site. The nature of the monitoring stations and proposed monitoring regime is detailed in 4.3.1.

4.1.2.2 Off-Site Periodic Monitoring

Twice daily visual inspections are undertaken to establish whether dust arising from site operations has been transported and deposited beyond the boundary of the site.

4.1.3 Physical Mitigation Measures

4.1.3.1 Processing Location

The historic wind frequency data presented in 2.2 indicates that the predominant wind direction is from the south west to west. Processing activities will be located to the south west and south of the site, typically at a distance of 10-15m from the site boundary. The site is surrounded on all sides by a planted bund up to 3m high with deciduous trees around 8 m in height. The bund provides a wind break that will be effective at reducing ground level wind effects across the site. At higher levels, particularly in the winter months, the trees will provide some benefit as a wind break.

To the north of the site is the existing processing building (to be extended if planning consent is obtained) with a ridge height of around 13.35m. This provides a barrier to winds in an arc from north west to north east and reduces off-site dust transport from the process areas to the south of the site. In addition, it provides an effective barrier to off-site transport of dust to the north of the site.

4.1.3.2 Process Equipment

The proposed processing equipment comprises a combination of high speed shredders and screens and a low slow speed shredder without screen. The slow speed shredder produces inherently less dust than high speed shredder variants and does not require a screen to remove process fines. The slow-speed shredder has operated on-site for a number of months and has contributed significantly to a reduction in dust emissions compared with similar high speed shredder usage (and in combination with other mitigation measures).

4.1.3.3 Dust Suppression Netting

Although the accompanying risk assessment concludes that onsite mitigation is not required, the company intends to retain the existing dust suppression netting to minimise the transport of dust into the former Bryncethin Nursery site and its deposition within the proposed staff and visitor parking area and HGV/container storage areas.

The Dust Suppression Netting acts to supress dust transport in two ways:

- For winds from the south west to north west the netting, in combination with the planted screening bund around the site, acts to reduce ground-level wind speed across the site, notably the south western processing area.

- For winds from the north east to south east the netting acts to entrain dust that subsequently falls under gravity to the floor, or impedes its transit such that it can be removed by the water spray dust suppression system (4.1.3.4).

The netting currently in use is a UV stabilised debris netting manufactured from polyethylene monofilaments. It is installed up to a height of 8 m, suspended between steel poles anchored in concrete bases.

4.1.3.4 Water Sprays

4.1.3.4.1 Process Equipment

The shredders and screens are factory-fitted with a dust suppression system that sprays water inwards into the loading hopper and onto the output belt(s). The suppression systems effectively control dust at the point of generation and in certain circumstances is sufficient in itself in controlling dust generation during processing.

4.1.3.4.2 Water Curtain

A water spray dust suppression system is also located above the existing Dust Suppression Netting.

The water spray dust suppression system comprises a string of flat fan extra wide angle nozzles oriented at 90 degrees and spaced 1.5m apart along the netting fence (drawing 10914 - 000 – L). These nozzles produce a droplet size of approximately 200µm in diameter and are effective at removing the larger dust particles that are typical of wood processing operations. The orientation of the nozzles generates a water curtain in front of the dust suppression netting. Particles passing the water curtain are impeded by the netting and will fall under gravity to the floor where they are wetted by the water spray. Details of the nozzles and the associated spray pattern are presented in Appendix 1.

Due to the requirement of output markets for woodchip of low moisture content, the design of spray and water dosing is critical to the suitability of the woodchip for any end use. Excessive water dosing will result in unusable product and use of water sprays is restricted to high wind conditions (when off-site transport of dust is a greater risk) to ensure the highest quality of woodchip is produced.

4.1.3.5 Sheeting of Vehicles

All HGVs will be sheeted when leaving site. An inspection at the weighbridge or loading location will be undertaken prior to dispatch.

4.1.3.6 Internal Movements of Woodchip

Wherever practical the movement of woodchip is not carried out in periods of high wind.

4.1.4 Management of Complaints

People experience nuisance from dustfall in several different ways, sometimes in combination. For example, a person may be annoyed about the sheer prevalence of the dust, or they may be annoyed by the soiling that it causes to their property and belongings such as car paintwork, window sills or laundry.

Complaints relating to dust are immediately investigated by the Site Manager. The nature and details of the complaint will be logged on a complaints form, along with the findings of the investigations and any action required. The Site Manager is responsible for determining the appropriate action to be taken and will communicate the nature of the actions to be taken and timescales with the Complainant.

Not all the airborne or deposited particulate matter at a receptor will be due to the facility itself; a proportion will be, but this process contribution will be superimposed on top of the underlying, ambient background contribution. In agreement with the Complainant the company will install monitoring equipment to confirm the deposition of dust is a direct result of the recycling activity and to identify weather conditions under which the deposition occurs. Soiling Rate Measurement is a simple and effective method used to determine changes in the soiling rates of surface over a period of time and is the most likely technique to be used. The most popular soling rate measurement method is the Sticky Pad system which measures the soiling of a white adhesive surface over a known period and gives a measurement of the deposition (as percentage Effective Area Coverage (%EAC) per day) using a reflectometer.

Although there is currently no CEN, ISO or BS standard method covering this technique, a custom and practice method exists[20].

In the event of a complaint being verified as resulting from the operation of the facility the Site Manager is responsible for identifying short- and long-term mitigation measures to minimise the risk of future incidents. The efficacy of any mitigation measures will be confirmed through further monitoring at the receptor (subject to the Complainants agreement) or at the relevant position along the site boundary.

Complaints logs, in combination with meteorological data and site monitoring information will be used to assess any trends. These will be reported at monthly management meetings and appropriate corrective actions will be tabled.

[20] Bearman & Kingsbury, Assessment of Nuisance from Deposited Particulates Using a Simple and Inexpensive Measuring System, Clean Air, Vol.11, No.2, pp77-81, 1981.

4.2 Action Levels

Figure 22 summarises the proposed dust management measures for the site and action levels

Monitoring Method	Monitoring Frequency	Action Level	Control Measure
Visual	Continuous	Visible dust at site boundary sustained over 15 minutes	Implement dust control measures
		Visible dust at site boundary sustained over 30 minutes	Establish wind direction and undertake an off-site assessment of dust visibility at nearest human receptor.
		Visible dust at nearest human receptor sustained over 60 minutes	Cease operations until wind direction/speed reduces.
	Periodic	Visible dust deposited outside of site boundary	Investigate wind conditions and use of dust suppression systems over monitoring period. Install/ reconfigure boundary particulate monitoring stations to cover area affected Install off-site particulate monitoring station where landowner permission can be obtained Identify and implement additional mitigation measures.
Particulate Monitoring	Periodic	Monitoring threshold (e.g.EAC/AAC) breached.	Investigate wind conditions and use of dust suppression systems over monitoring period. Identify and implement additional mitigation measures. Establish wind direction/ speed parameters to cease operations if mitigation measures cannot be made effective.
Complaint	On receipt	On receipt	Investigate wind conditions and use of dust suppression systems over monitoring period. Install/ reconfigure boundary particulate monitoring stations to cover area affected. Install off-site particulate monitoring station where landowner permission can be obtained. Identify and implement additional mitigation measures if dust complaint verified.

Figure 22. Action levels for dust management

4.3 Recommendations

1) This assessment has concluded through both on-site visual inspections and the risk assessment presented in this report that the majority of dust generated at sources falls to the ground within 20 m of the source. Space restrictions have led to processing equipment being located within 10-15m of the site boundary which results in dust (and incidental light contaminants) being transported beyond the boundary of the site. Relocation of processing equipment >20m from the site boundary will significantly reduce off-site transport.

2) Existing dust suppression netting has been shown to be effective in reducing complaints relating to the off-site transport of dust. Complaints have recently been received with respect to off-site

dust transport to the south of the site. None have been received regarding off-site transport to the north.

Following a short period of background monitoring (in accordance with 4.3.1) in fields adjacent to the site boundary to establish existing background deposition levels (subject to the agreement of the landowner), it is recommended that the company extends the dust suppression netting along the southern and south eastern boundary of the site in order to reduce off-site transport of dust into the SINC, the adjacent fields and the highway. Post-installation monitoring will be used to assess the effectiveness of the netting and where quantifiable benefits are measured, the netting should be retained.

The existing and proposed netting locations are shown schematically in drawing 10914 - 000 – L.

In the event of nuisance dust issues arising from <30μm particles, microporous dust netting, typically effective against particles >10 μm in diameter will be installed as a replacement for debris netting.

4.3.1 Monitoring Stations

Dust flux monitoring is best suited for assessing dust releases across the site boundary, i.e. what is entering and leaving the site. Dust flux is sampled with a collection device positioned in the vertical plane to intercept dust as it travels nominally parallel to the ground.

A series of monitoring stations should be established around the site based on the nature of the dust risk being assessed. Sticky pad samplers are the most likely technique to be used (although BS1747 directional gauges are an alternative) and will be installed based on a site survey and discussions with manufacturers. Sampling periods will typically be for 1-2 weeks duration for sticky pad samplers and 2-4 weeks if BS1747 directional gauges are used.

Monitoring stations should be installed at a height of around 2m above the ground such that they are in a free-flow region of air unaffected by the site fencing and debris netting. Monitoring locations will be selected upwind and downwind of the prevailing wind direction, with additional monitoring locations located where prevailing winds could blow dust towards adjacent properties.

Collected directional data will be compared against known site parameters and a site-specific metric for “no complaints” will be established against which the site can be managed and for the evaluation and improvement of control measures.

The monitoring stations should continue to be used until dust control measures have been demonstrated to be effective.

5 CONCLUSIONS

This report provides a methodology for South Wales Wood Recycling Ltd to control and evaluate the control of dust generation at its facility in Coity.

Surrounding human receptors are predominantly residential in nature and of medium sensitivity to dust generation.

The company has located the wood processing locations in areas that are screened from the predominant prevailing wind and has erected dust suppression netting and water spray dust suppression as mitigation to reduce dust transport off-site. These were considered effective until a resumption in complaints following the submission of a planning application to reconfigure site operations. A change in configuration could result in a change in emissions and the requirement to adapt existing mitigation measures to maintain their effectiveness. A risk assessment has been undertaken to establish the existing situation and evaluate any increased risks from the proposed development.

A risk assessment presented in this report concludes that without mitigation measures in place the current and reconfigured facility has a Negligible risk of creating dust impact at nearby sensitive receptors.

Recommendations have been made to reduce off-site transport of dust which, not appearing to cause a dust nuisance at the assessed receptors exceeding nuisance thresholds of 200 mg m^{-2} day^{-1}, is resulting in an annoyance to residents on the basis of its visibility.

Subject to the implementation of effective management systems and dust suppression measures described in this report, it is considered that dust nuisance at nearby receptors and any impact on the Cefn Hirgoed SINC can be effectively mitigated against and that environmental harm from dust is unlikely.

DRAWINGS

10914 - 000 - B Site and Surrounding Area
10914 - 000 - D Existing Layout
10914 - 000 - E Proposed Layout
10914 - 000 - G Receptor Plan
10914 - 000 - K Sources and Sensitive Receptors
10914 - 000 - L Dust Suppression Measures

LEGEND

PLANNING BOUNDARY

OWNERSHIP BOUNDARY

N

AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY

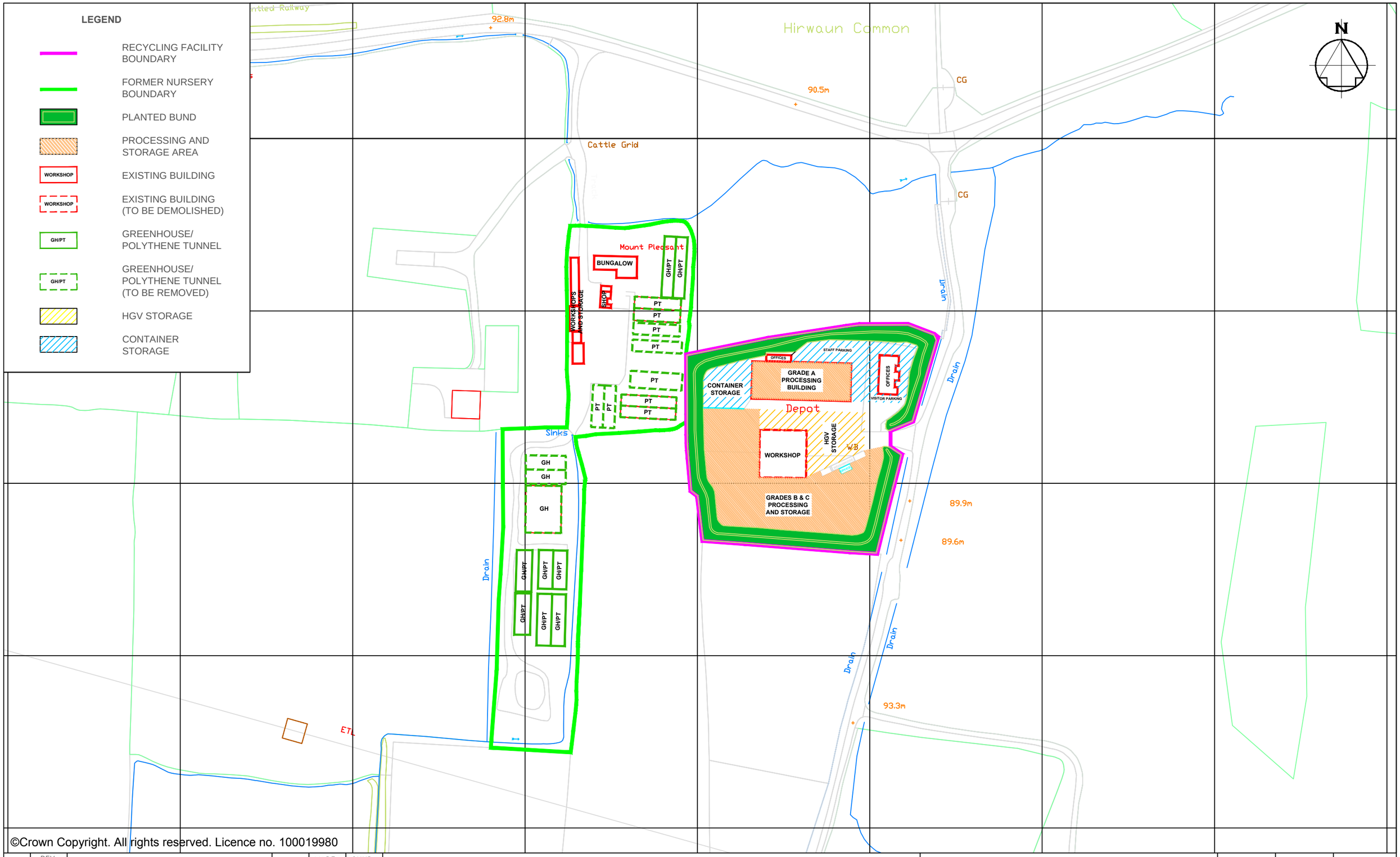
TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

SITE AND SURROUNDING AREA

Drawn	SW	Scale
Ch'kd	GH	1:10,000
Appr'd	KB	@A3
Date	23/10/14	

Job No.	SWWR	Drg No.	10914 - 000 - B



AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

EXISTING SITES AND OPERATIONS

Drawn	SW	Scale	1:2,000
Ch'kd	GH		
Appr'd	KB		@A3
Date	23/10/14		

Job No.	SWWR	Drg No.	10914 - 000 - D

LEGEND

- PLANNING BOUNDARY
- OWNERSHIP BOUNDARY
- PLANTED BUND
- PROCESSING AND STORAGE AREA
- EXISTING BUILDING
- NEW BUILDING
- HGV STORAGE
- CONTAINER STORAGE
- PEDESTRIAN WALKWAY
- BARRIER

N

Mount Pleasant

STAFF AND VISITOR PARKING

CONTAINER STORAGE

HGV PARKING

DRYING

PRODUCT HALL AND GRADE A PROCESSING

STORAGE

OFFICES/ STORES

GRADE A STORAGE

GRADE C PROCESSING AND STORAGE

GRADE B PROCESSING AND STORAGE

WEIGHBRIDGE

OFFICE

WAITING AREA

WORKSHOP

WORKSHOP

CG

Drain

Drain

Drain

Sinks

89.9m

89.6m

AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	REVISE LOCATION – KEEP GRADE A IN BUILDING	15/01/15	SCW	KB

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

PROPOSED LAYOUT (BLOCK PLAN)

Drawn	SW	Scale	1:1,000
Ch'kd	GH		
Appr'd	KB		@A3
Date	23/10/14		

Job No.	SWWR	Drg No.	10914 - 000 - E

LEGEND

- PROCESSING AREA
- DISTANCE FROM SOURCES
- R1/E1+ RECEPTOR
- CEFN HIRGOED SINC

500m

Hirwaun Common

Dismantled Railway

Maes-y-werfa

Cattery

Ty-du

Bron-y-deri

Fant Hirwaun Cottages

Mount Pleasant

Depot

Playing Field

Glyn Tawel

Rose Cottage

Maen Mawr (BS)

Nant Crymlyn

Pleasant View

Waun Davy

Barkers Lodge

Dderwyn Guppa

Pen Bryn

Dderwen Fach

Rhos Wen

Westcott Bungalow

Bryn Fig

Hebol-y-llan

Enclosure

Collects

Drains

Issues

Track

Path

Drain

B4280

94m

93m

91m

98m

87m

83m

111m

H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 E1

AMENDMENTS	REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

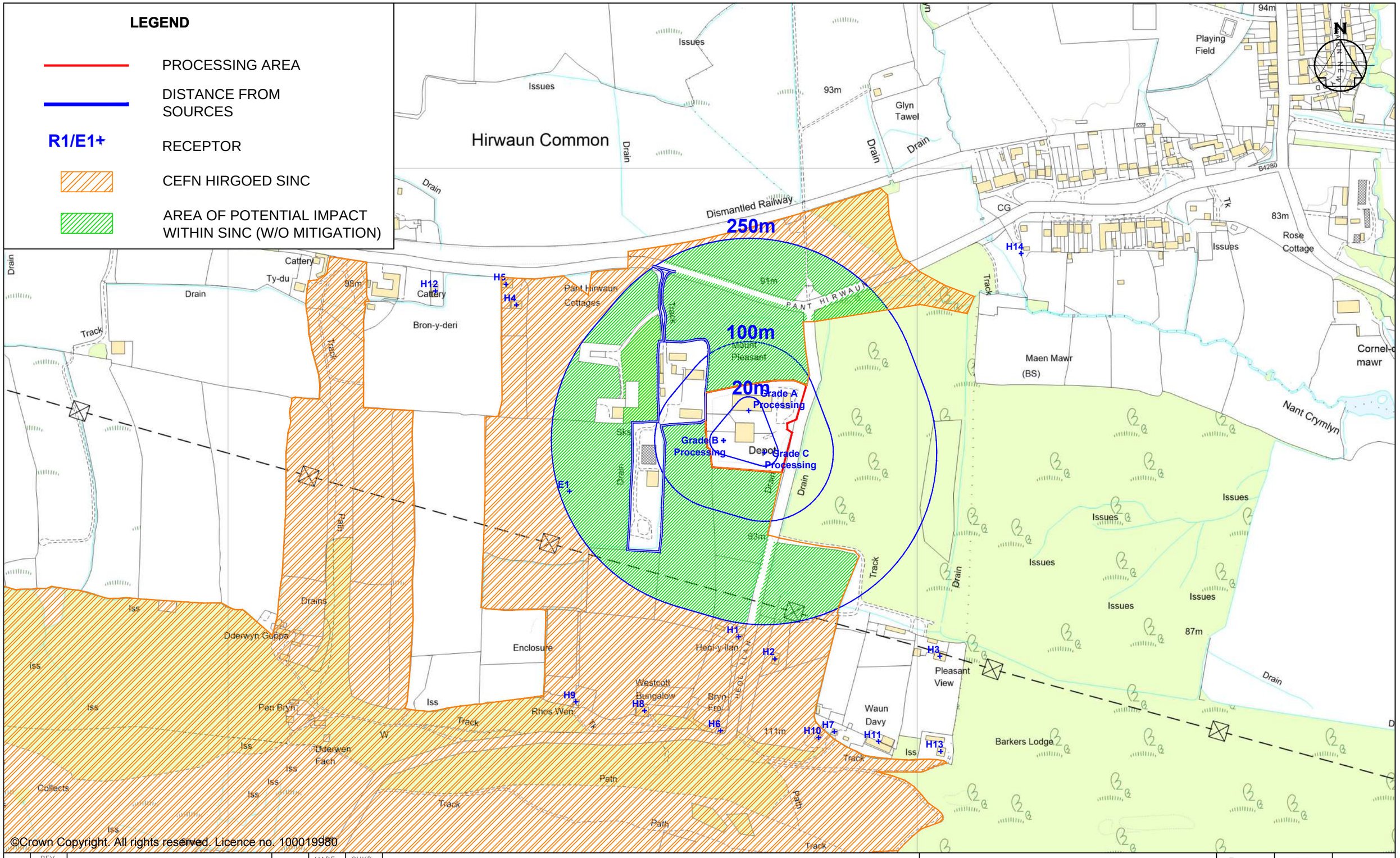
RECEPTOR SCREENING

Drawn	SW	Scale	1:5,000
Ch'kd	GH		
Appr'd	KB		@A3
Date	24/01/15		

Job No.	SWWR	Drg No.	10914 - 000 - G

LEGEND

- PROCESSING AREA
- DISTANCE FROM SOURCES
- R1/E1+ RECEPTOR
- CEFN HIRGOED SINC
- AREA OF POTENTIAL IMPACT WITHIN SINC (W/O MITIGATION)



AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY
A	REVISE LOCATION – KEEP GRADE A IN BUILDING	09/03/15	09/03/15	09/03/15

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

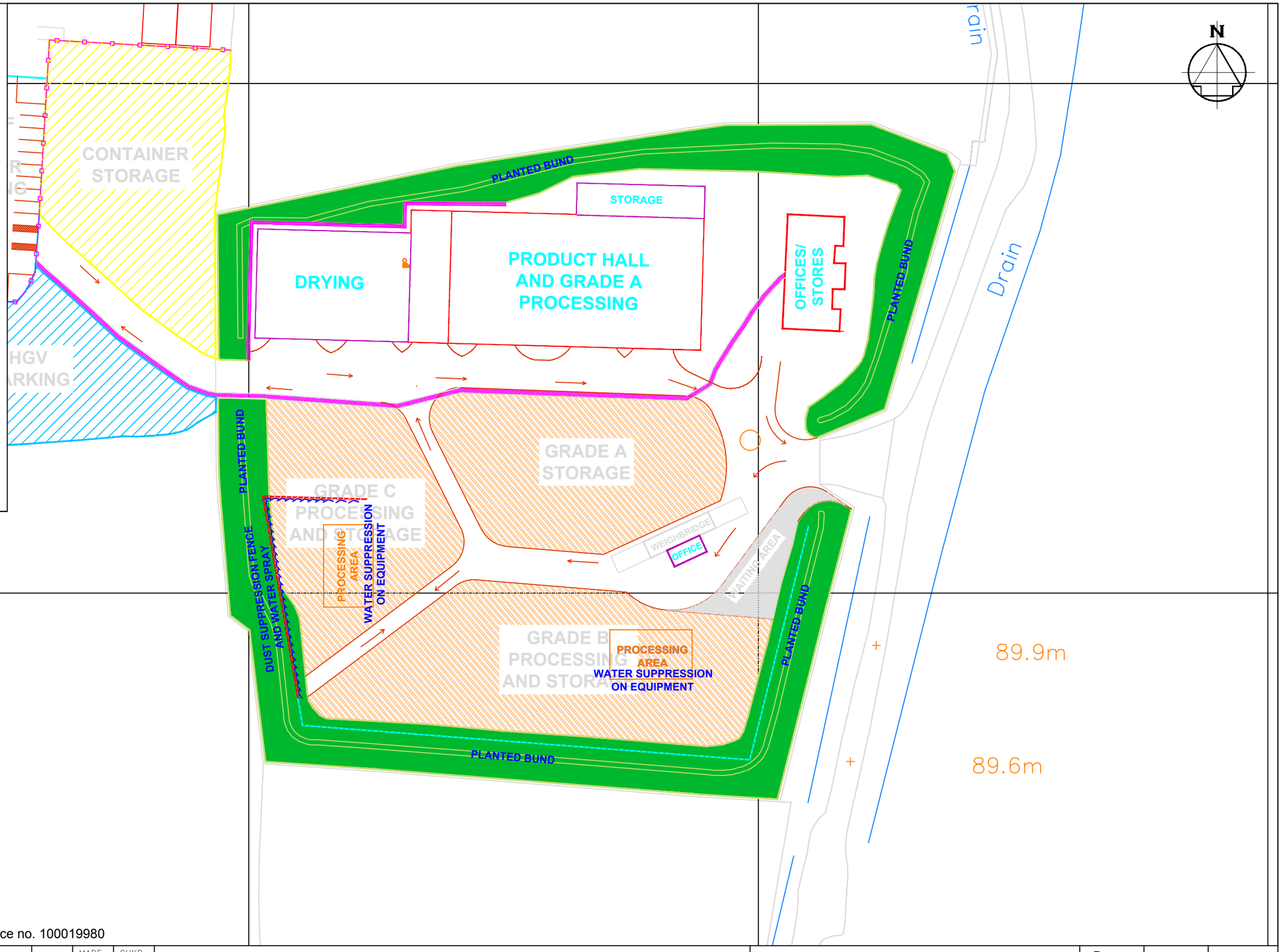
SOURCES AND SENSITIVE RECEPTORS

Drawn	SW	Scale	1:5,000
Ch'kd	GH		
Appr'd	KB		@A3
Date	24/01/15		

Job No.	SWWR	Drg No.	10914 - 000 - K

LEGEND

- PLANNING BOUNDARY
- OWNERSHIP BOUNDARY
- PLANTED BUND
- PROCESSING AND STORAGE AREA
- EXISTING BUILDING
- NEW BUILDING
- HGV STORAGE
- CONTAINER STORAGE
- PEDESTRIAN WALKWAY
- BARRIER
- DUST SUPPRESSION NETTING (EXISTING)
- DUST SUPPRESSION SPRAY/NOZZLE
- DUST SUPPRESSION NETTING (PROPOSED)



AMENDMENTS

REV REF	DETAILS	DATE	MADE BY	CHKD BY

TECHNIA ENVIRONMENT AND PLANNING
SUITE 4, ST. MARGARET'S PARK
PENGAM ROAD, ABERBARGOED, CF81 9FW
TEL: 01443 821619
EMAIL: PLANNING@TEPL.EU

PROPOSED CHANGE OF USE OF FORMER NURSERY AND CONSOLIDATION OF RECYCLING USE

DUST SUPPRESSION MEASURES

Drawn	SW	Scale	
Ch'kd	GH	1:750	
Appr'd	KB	@A3	
Date	16/12/14		

Job No.	SWWR	Drg No.	10914 - 000 - L

APPENDIX 1 NOZZLE SPECIFICATION

FF

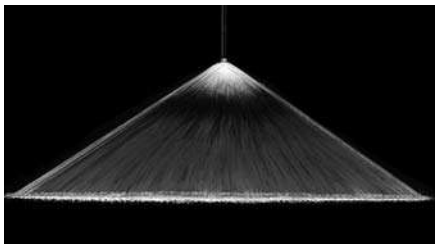
Extra-Wide Angle

DESIGN FEATURES
- One-piece construction
- Clog resistant
- Durable
- All 3/8" FFs in Brass are available with UL approval
- Male connection

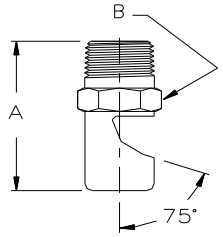
SPRAY CHARACTERISTICS
- Extra-wide 145° spray angle
- Medium-impact spray
- Spray discharge deflected 75° from inlet axis
- Coarse atomization

Spray pattern: Flat Fan
Spray angle: 105° and 145°
Flow rates: 0.510 to 757 l/min

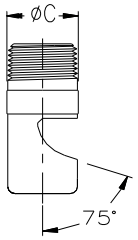
Plastic



Fan 145°



Metal



Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

FF Flow Rates
Fan, 105° and 145° Spray Angle, 1/8" to 1" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	Approx. Orifice Dia. (mm)
	FF016	105°	0.114	0.0510	0.0806	0.0953	0.114	0.161	0.197	0.255	0.360	0.406
	FF024	105°	0.228	0.102	0.161	0.191	0.228	0.322	0.395	0.510	0.721	0.610
	FF028	105°	0.342	0.153	0.242	0.286	0.342	0.483	0.592	0.764	1.08	0.711
	FF033	105°	0.456	0.204	0.322	0.381	0.456	0.645	0.789	1.02	1.44	0.838
1/8	FF041	145°	0.684	0.306	0.483	0.572	0.684	0.967	1.18	1.53	2.16	1.04
	FF046	145°	0.912	0.408	0.645	0.763	0.912	1.29	1.58	2.04	2.88	1.17
	FF052	145°	1.14	0.510	0.806	0.953	1.14	1.61	1.97	2.55	3.60	1.32
	FF057	145°	1.37	0.611	0.967	1.14	1.37	1.93	2.37	3.06	4.32	1.45
	FF065	145°	1.82	0.815	1.29	1.53	1.82	2.58	3.16	4.08	5.77	1.65
	FF073	145°	2.28	1.02	1.61	1.91	2.28	3.22	3.95	5.10	7.21	1.85
	FF093	145°	3.42	1.53	2.42	2.86	3.42	4.83	5.92	7.64	10.8	2.36
1/8	FF104	145°	4.56	2.04	3.22	3.81	4.56	6.45	7.89	10.2	14.4	2.64
or	FF116	145°	5.47	2.45	3.87	4.58	5.47	7.73	9.47	12.2	17.3	2.95
1/4	FF125	145°	5.70	2.55	4.03	4.77	5.70	8.06	9.87	12.7	18.0	3.18
	FF129	145°	6.84	3.06	4.83	5.72	6.84	9.67	11.8	15.3	21.6	3.28
	FF141	145°	8.20	3.67	5.80	6.86	8.20	11.6	14.2	18.3	25.9	3.58
	FF148	145°	9.12	4.08	6.45	7.63	9.12	12.9	15.8	20.4	28.8	3.76
	FF156	145°	10.0	4.48	7.09	8.39	10.0	14.2	17.4	22.4	31.7	3.96
1/4	FF161	145°	10.9	4.89	7.73	9.15	10.9	15.5	18.9	24.5	34.6	4.09
	FF173	145°	12.3	5.50	8.70	10.3	12.3	17.4	21.3	27.5	38.9	4.39

Flow Rate ($l/_{min}$) $= K\sqrt{bar}$

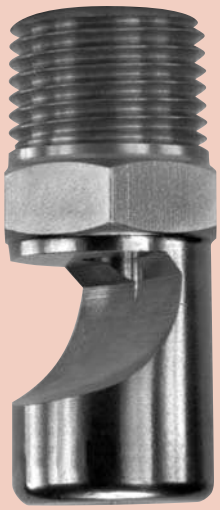
FF Dimensions

Pipe Size	Dim. (mm) A	B	C	Wt. (g) M	P
1/8	25.4	11.2	12.7	14	3
1/4	35.1	14.2	16.0	35	7.5

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC, and PTFE
(PTFE and PVC not available in nozzles FF016 to FF028; PTFE not available in nozzles FF033 to FF065).

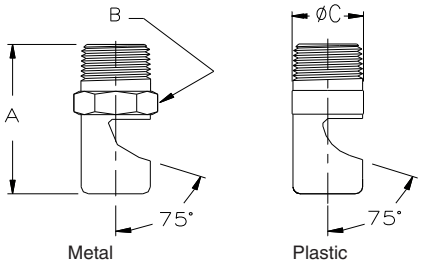
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: *specify pipe size, connection type, nozzle number, spray angle, and material.*



Metal

All 3/8" FFs in Brass have UL approval



Dimensions are approximate. Check with BETE for critical dimension applications.

FF Flow Rates

Fan, 105° and 145° Spray Angle, 1/8" to 1 " Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	Approx. Orifice Dia (mm)
3/8	FF187	145°	13.7	6.11	9.67	11.4	13.7	19.3	23.7	30.6	43.2	4.75
	FF196	145°	16.0	7.1	11.3	13.3	16.0	22.6	27.6	35.7	50.4	4.98
	FF209	145°	17.0	7.6	12.0	14.2	17.0	24.0	29.4	38.0	53.8	5.31
	FF218	145°	18.2	8.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	5.54
	FF221	145°	20.5	9.2	14.5	17.2	20.5	29.0	35.5	45.9	64.9	5.61
1/2	FF209	145°	17.0	7.6	12.0	14.2	17.0	24.0	29.4	38.0	53.8	5.31
	FF218	145°	18.2	8.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	5.54
	FF250	145°	23.9	10.7	16.9	20.0	23.9	33.8	41.4	53.5	75.7	6.35
	FF256	145°	27.3	12.2	19.3	22.9	27.3	38.7	47.4	61.1	86.5	6.55
	FF281	145°	31.9	14.3	22.6	26.7	31.9	45.1	55.3	71.3	101	7.14
	FF312	145°	36.5	16.3	25.8	30.5	36.5	51.6	63.2	81.5	115	7.92
	FF375	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.53
3/4	FF316	145°	41.0	18.3	29.0	34.3	41.0	58.0	71.0	92	130	8.03
	FF332	145°	45.6	20.4	32.2	38.1	45.6	64.5	78.9	102	144	8.43
	FF348	145°	50.1	22.4	35.5	41.9	50.1	70.9	86.8	112	159	8.84
	FF368	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.35
	FF375	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.53
	FF406	145°	63.8	28.5	45.1	53.4	63.8	90.2	111	143	202	10.3
	FF437	145°	72.9	32.6	51.6	61.0	72.9	103	126	163	231	11.1
	FF453	145°	82.0	36.7	58.0	68.6	82.0	116	142	183	259	11.5
	FF484	145°	95.7	42.8	67.7	80.1	95.7	135	166	214	303	12.3
	FF500	145°	109	48.9	77.3	91.5	109	155	189	245	346	12.7
1	FF578	145°	137	61.1	96.7	114	137	193	237	306	432	14.7
	FF625	145°	166	74.4	118	139	166	235	288	372	526	15.9
	FF703	145°	205	91.7	145	172	205	290	355	459	649	17.9
	FF750	145°	239	107	169	200	239	338	414	535	757	19.1

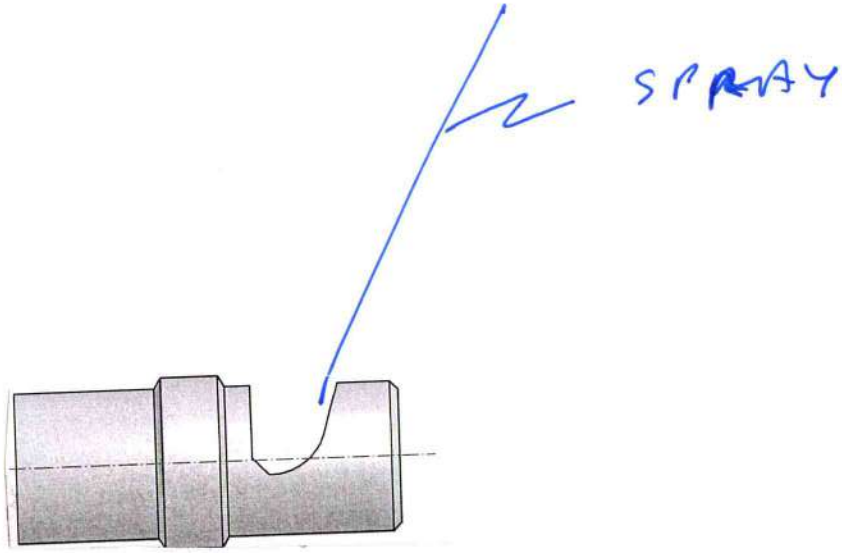
Flow Rate $(l/_{min}) = K\sqrt{bar}$

FF Dimensions

Pipe Size	Dim. (mm) A	B	C	Wt. (g) M	P
3/8	44.5	17.5	19.1	72	15
1/2	50.8	22.4	22.4	117	25
3/4	66.8	38.1	38.1	345	73
1	85.9	50.8	50.8	908	192

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC, and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



ROUGH SKETCH
SHOWING NOZZLE ORIENTATION

BY . STANLEY

FF 73-145 at 2 bar
FF073145
Flow 3.2L/min at 2.0bar
Sauter mean 230 microns

gas flow at 0 m/s at 270°, nozzle orientation 90°