

# Glyn Rhonwy Pumped Storage Development Consent Order

## Deadline 5 – Dust Management Plan

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# DUST CONTROL AND AIR QUALITY MANAGEMENT PLAN

## 1.1 Introduction

1.1.1 The following document comprises the Dust Management Plan (DMP) for the construction phase of the Glyn Rhonwy Pumped Storage scheme (hereby known as the Development).

1.1.2 The purpose of this document is to recognise the potential construction dust issues identified in the Environmental Statement and as agreed with Gwynedd Council as part of the examination phase of the Development Consent Order (DCO) process, and to present a management plan to control the emission of dust in accordance with the Code of Construction Practice (CoCP).

1.1.3 This management plan is a definitive list of the actions that will be implemented to ensure that significant adverse effects do not arise due to the construction of the scheme.

### *Environmental Statement*

1.1.4 The Environmental Statement (ES) identified the receptor locations near to the scheme that may be sensitive to emissions of dust or changes in air quality.

1.1.5 These locations are identified in Table 1, and Figure 1.

1.1.6 The ES also identified activities that may lead to dust generation and local air quality effects, and associated mitigation measures that have been incorporated into this document.

### *Structure of the Dust Management Plan*

1.1.7 The sections within this DMP are ordered as follows:

- Standards and Codes of Practice
- Summary of Main Construction Impacts

- Mitigation Control Procedures
- Monitoring Plan

## **1.1 Standards and Codes of Practice**

- 1.1.1 A Statement of Statutory Nuisance has been issued for the Development. This was produced for the purpose of identifying the matters set out in section 79(1) of the Environmental Protection Act 1990 in respect of statutory nuisances and considers whether the Development would engage one or more of those matters. Where any of those matters may be potentially engaged, the ES sets out the proposals for mitigating or limiting them.
- 1.1.2 The statement concludes that, with the mitigation and control measures proposed in the ES, which are captured within and implemented by this plan, it is not anticipated that a statutory nuisance will result from the construction or operation of the Development due to emissions of dust or effects on local air quality.
- 1.1.3 There are a number of standards for the protection of human health and vegetation, although it is considered that the pollutant concentrations in the region of the development site are sufficiently low that they are unlikely to be close to national air quality objective values. However, it is the objective of this plan to maintain the existing conditions as far as is practicable and to facilitate this action trigger levels will be established based on measurements of baseline dust deposition rates and baseline air pollutant concentrations.

## **1.2 Predicted Construction Impacts**

- 1.2.1 The construction phases of the proposed development will lead to the generation of dust and fine particulate matter (such as PM<sub>10</sub>) within the boundaries of the construction areas. Although the majority of this dust would be contained within the boundaries, some may be transported in the air to sites outside the construction areas. Activities which have the potential to give rise to dust emissions during the construction phases include:

- Site preparation, reprofiling and establishment, including blasting;
- Construction of infrastructure and buildings;
- Materials handling including;
  - transfer to and from trucks/lorries/conveyors;
  - material spills during transportation and handling; and
  - storage/stockpiling/use of cement or other fine particulate materials.
- Vehicle/plant movements, including on unpaved haul routes;
- Tarmac laying, bitumen surfacing and coating; and
- Construction and fabrication processes.

1.2.2 The effective mitigation will be achieved by controlling the emissions at the source through measures that prevent or reduce potential dust generation, or capture it before it can travel a significant distance.

1.2.3 This plan considers the potential local air quality and dust effects that may arise due to working in four main areas, which have been grouped together for the purposes of this plan. The grouping are referred to as; Head Pond, Tail Pond, Penstock, Tailrace and Spillway Infrastructure.

#### *Head Pond*

1.2.4 The head pond area incorporates the Q1 reservoir and dam, access shaft and spillway infrastructure to the Nant Y Betws.

1.2.5 Without the application of the recommended mitigation there is a risk of effects in this area that may constitute dust deposition on the adjacent Snowdonia National Park, and visual discolouration of the land that may affect the visual amenity.

#### *Tail Pond*

1.2.6 The Tail Pond area incorporates the Q6 reservoir and dam, access shaft and spillway infrastructure to Llyn Padarn, the pumping station at Llyn Padarn and an aboveground power house and underground turbine hall at Glyn Rhonwy Industrial Estate.

1.2.7 Without the application of the recommended mitigation there is a risk of effects in this area that may constitute dust effects on the residential and commercial properties.

1.2.8 Receptors near this area are the residential properties to the north-west (Ty-newydd and Groeslon), commercial sites to the south, and residential and commercial properties to the north-east between the site and Llyn Padarn, including the Mountain Centre, Glyn Peris and Lake View Hotel.

#### *Penstock*

1.2.9 The penstock comprises a tunnel that will be constructed from the head pond to the tail pond.

1.2.10 Without the application of the recommended mitigation there is a risk of effects in this area that may constitute dust effects on the residential and commercial properties, dust deposition on the National Park and visual discolouration of the ground.

1.2.11 Receptors nearest to this area are the National Park, and residential properties (Llys Ellen, Ty-newydd and Groeslon).

#### *Tailrace and Spillway Infrastructure*

1.2.12 The Tailrace and the Spillway infrastructure comprises a discharge point from the head pond and a joint discharge/abstraction point from the tail pond. Construction in this area will occur for a defined period, and the working area will relocate as each stage of the work is completed.

1.2.13 Without the application of the recommended mitigation there is a risk of effects in this area that may constitute dust effects on the residential and commercial properties, and the car park and amenity areas in Llyn Padarn.

1.2.14 Receptors near this area are residential and commercial properties including Gallt-y-glyn, DMM Engineering and the Mountain Centre.

### **1.3 Receptors**

1.3.1 The significance of these processes upon nearby sensitive receptors and sites of ecological interest will depend upon the exact nature, location, duration and scale of the construction work. According to the Institute of Air

Quality Management (IAQM), effects may occur where there are sensitive receptors within 350 metres (m) of the boundary of a site and/or within 50 m of route(s) used by construction vehicles on the public highway and/or, up to 500 m from the site entrance.

1.3.2 Table 1 gives a list of receptors identified in the ES which are considered to be sensitive to dust in accordance with guidance published by the IAQM (2014). This list includes residential properties, amenity and commercial sites within 500m of the site.

<b>Table 1: Sensitive Locations near Construction Activities Identified in the ES</b>						
<b>ID</b>	<b>OS Grid Coordinate</b>		<b>Location</b>	<b>Type</b>	<b>Approximate Distance to Activity (m)</b>	
	<b>X</b>	<b>Y</b>			<b>Construction / Excavation / Stockpiling</b>	<b>Temporary Depot Site</b>
1	255796	360922	Llys Ellen	Residential	-	-
2	256092	360927	Ty-newydd	Residential	410 (Q6)	-
3	256074	361017	Ty-newydd	Residential	455 (Q6)	-
4	256172	361033	Ty-newydd	Residential	375 (Q6)	500 (Turbine)
5	256187	361121	Groeslon	Residential	420 (Q6)	-
6	255566	361221	Pen-draw	Residential	-	-
7	256977	360447	Siemens	Hi-Tech	360 (Q6)	400 (Turbine)
8	257082	360458	Siemens	Hi-Tech	390 (Q6)	450 (Turbine)
9	257280	360842	Ynys-wen	Commercial	375 (Q6) 280 (Spillway)	460 (Depot)
10	257201	360884	Pen-gilfach	Industrial	300 (Q6) 200 (Spillway)	450 (Turbine) 370 (Depot)
11	257120	360945	Gallt-y-glyn	Hotel	240 (Q6) 100 (Spillway)	390 (Turbine) 270 (Depot)
12	257141	361013	DMM Engineering	Industrial	280 (Q6) 65 (Spillway)	440 (Turbine) 285 (Depot)
13	257015	361134	Mountain Centre	Amenity	190 (Q6) 70 (Spillway)	390 (Turbine) 200 (Depot)



<b>Table 1: Sensitive Locations near Construction Activities Identified in the ES</b>						
<b>ID</b>	<b>OS Grid Coordinate</b>		<b>Location</b>	<b>Type</b>	<b>Approximate Distance to Activity (m)</b>	
	<b>X</b>	<b>Y</b>			<b>Construction / Excavation / Stockpiling</b>	<b>Temporary Depot Site</b>
14	256970	361130	Mountain Centre	Amenity	160 (Q6) 90 (Spillway)	360 (Turbine) 170 (Depot)
15	256824	361150	Glyn Peris	Residential	60 (Q6) 130 (Spillway)	300 (Turbine) 75 (Depot)
16	256866	361139	Glyn Peris	Residential/ Commercial	85 (Q6) 115 (Spillway)	300 (Turbine) 100 (Depot)
17	257273	361063	Car Park	Amenity	420 (Q6) 0 (Spillway)	360 (Depot)
18	256618	361211	Lake View Hotel	Residential/ Commercial	180 (Q6) 300 (Spillway)	200 (Turbine) 360 (Depot)
19	256540	361193	Off A4086	Commercial	185 (Q6) 360 (Spillway)	245 (Turbine) 380 (Depot)
20	256449	361427	Hafod Wen	Residential	430 (Q6)	475 (Depot)
21	256452	361458	Tan-y-ffynnon	Residential	450 (Q6)	500 (Depot)
22	257123	360363	Ael-y-Glyn	Residential	490 (Q6)	-
23	-	-	Llyn Padarn	SSSI	0 (Spillway)	-
24	257070	360700	Permitted caravan park	Residential / Amenity	200 (Q1) 300 (Spillway)	320 (Turbine)

## 1.4 Mitigation Controls

1.4.1 The sections below give further detail as to the activities that have the potential to generate dust, and appropriate mitigation measures for each activity are outlined in accordance with the guidance published by IAQM (2014).

1.4.2 The DMP is a live document and will be maintained and audited by the Environmental Manager / Clerk of Works to ensure that it incorporates

changes and improvements that recognise any potential changes to the risk of dust effects due to the activities at the site, or to the sensitivity of receptors.

- 1.4.3 The mitigation controls outlined below are intended to be sufficient to ensure that significant dust incidents or events do not occur. However, the controls also incorporate additional actions that may be implemented in the event of equipment / control failures, or other abnormal or unintentional situation. In the event that appropriate mitigation controls cannot be implemented, then the work programme should be postponed until effective controls can be put in place in accordance with the DMP.

*Pre-Project Planning Measures and On Site Management*

- 1.4.4 Before construction commences, the following general pre-project planning measures should be implemented or arranged:

- Identification of dust generating activities;
- Preparation of environmental risk assessments;
- Assembly of method statements;
- Allocation of responsibilities – action and reporting;
- Training of relevant personnel;
- Preparation and maintenance of a log for complaints from the public;
- Fulfilment of planning requirements;
- Handling of public relations;
- Control of site traffic and set up of access routes;
- Management of housekeeping (clean and tidy)

- 1.4.5 As dust emissions from construction sites are likely to be the sum of many smaller processes or activities, attention to detail can result in effective management of the total emissions from site (BRE, 2003). It is very difficult to prevent the dispersion of particles once they are airborne, and so it is important to control dust at the source where possible.

- 1.4.6 The contractor will appoint an Environmental Liaison Officer (ELO) to coordinate communications with stakeholders, to represent a point of contact for members of the public, and fulfil the roles and responsibilities

outlined in Table 2. The Officer will be appointed prior to starting any work on the site.

1.4.7 Appropriate management systems and procedures to be implemented prior to work starting are given in Table 2.

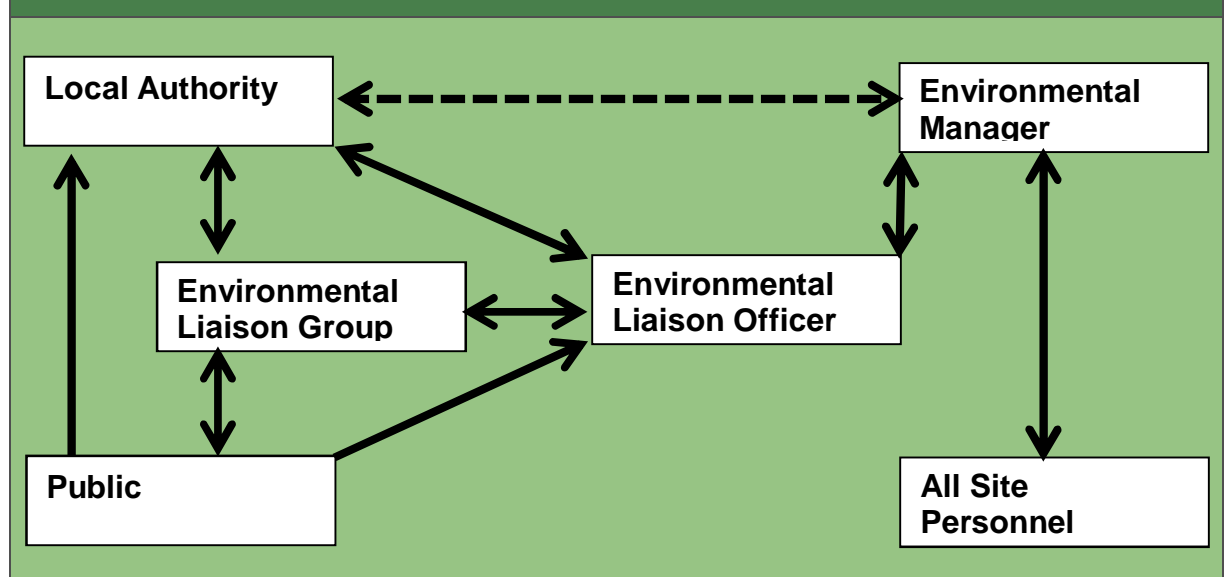
<b>Table 2: Communication and Management Prior to Site Preparation</b>	
<b>Activity</b>	<b>Control Measure</b>
Communication	<ul style="list-style-type: none"> <li>• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.</li> <li>• Display and publish the name and contact details of person(s) accountable for air quality and dust issues on the site boundary, including the Environmental Liaison Officer, as well as the regional office contact information.</li> <li>• Set up regular, accessible liaison arrangements</li> <li>• Provide information about the programme as freely as possible</li> </ul>
Site Management	<ul style="list-style-type: none"> <li>• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.</li> <li>• Make the complaints log available to the local authority when asked.</li> <li>• Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.</li> <li>• Respond to any complaints with information about what actions were undertaken in to order demonstrate a proactive response.</li> </ul>
Training	<ul style="list-style-type: none"> <li>• Regular training will be provided to the site personnel on dust mitigation.</li> <li>• Dust awareness and management training will be incorporated into the training programme.</li> </ul>
Site Inductions	<ul style="list-style-type: none"> <li>• The site induction will be mandatory for all personnel working on the site.</li> <li>• The induction will include specific dust awareness training.</li> <li>• The key items from the DMP will be included to ensure that personnel are aware of their responsibilities, and the control measures that are implemented at the site.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Carry out regular site inspections to monitor compliance with the DMP and record inspection results.</li> <li>• Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.</li> <li>• Record any dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.</li> </ul>

**Table 2: Communication and Management Prior to Site Preparation**

Activity	Control Measure
	<ul style="list-style-type: none"> <li>• Undertake regular on-site and off-site inspection, where receptors are nearby to monitor dust and record inspection results.</li> <li>• The Air Quality Monitoring Plan will be adhered to, and used to demonstrate compliance and inform revisions to the Management Plan.</li> </ul>

1.4.8 An indicative organogram for the communication structure is provided in Figure 1, and the defined roles and responsibilities with regard to air quality are outlined in Table 3.

**Figure 1: Indicative Organogram of Communication Structure**



<b>Table 3: Environmental Responsibilities</b>	
<b>Individual</b>	<b>Role</b>
All site personnel	Charged with following good practice and encouraged to provide feedback and suggestions for improvements. Compliance with the requirements of the CoCP.
Environmental Manager / Clerk of Works	Principal responsibility for Environmental Management on site including auditing environmental practice and subcontractors, and liaising with regulators. The manager, or a delegated representative, will define, monitor and control environmental practice.
Environmental Liaison Officer	Principal responsibility for public liaison, and providing first point of contact for stakeholders. The primary objective of the ELO will be to be the main point of contact between the PC, the Applicant, regulators and also the public. They will be the focal point for any community liaison committees, project meetings, reporting and also communication on critical activities of the Development. This will include communicating when enabling works are likely to commence and then keeping the local communities aware of the continuing activities which will occur during the construction phase including regular updates on progress. The officer will communicate regularly with the site manager to ensure that all parties are aware of potential dust risks associated with site activities, and that the management is properly implemented. The officer will be responsible for scheduling and coordinating liaison meetings with stakeholders, and for coordinating site visits or tours for stakeholders. Once the PC is appointed and the construction programme confirmed, the ELO will communicate this programme to community and facilitate meetings as required. The ELO will chair the Environmental Liaison Group. The ELO will ensure that records of communication relating to off site dust or air quality issues (including verbal communication) are kept, and that regular reporting is provided to Gwynedd Council, NRW and also to the local communities.

<b>Table 3: Environmental Responsibilities</b>	
<b>Individual</b>	<b>Role</b>
	<p>The ELO will communicate the following construction activities to local communities:</p> <ul style="list-style-type: none"> <li>- which involve the loss or temporary replacement of access (for example the PRowS and permissive routes at Q1);</li> <li>- works adjacent or within Llyn Padarn;</li> <li>- blasting and any temporary closures of PRowS, permissive routes and roads such as Clegir Road;</li> <li>- delivery of plant or abnormal loads on both the A4086 and A4085;</li> <li>- progress / compliance with mitigation measures and reporting;</li> <li>- progress of any ordnance management;</li> <li>- changes in working hours.</li> </ul>
Environmental Liaison Group	<p>The liaison group will comprise representatives from the local community, business representatives, as well as local authority officers or other relevant stakeholders.</p> <p>The Group will be responsible for attending periodic liaison meetings.</p>
Site engineers/foremen	<p>Need to understand the environmental obligations and the practical measures needed to comply with them. Should review what training site personnel need and arrange for it to be provided.</p>
Company executives	<p>Responsible for the corporate environmental protocols and responsibilities.</p> <p>Ensure that works are carried out in a manner that is consistent with the management controls outlined in this plan.</p>

*Site Preparation*

1.4.9 Site preparation works have the potential to generate of dust, particularly during periods of dry weather followed by strong winds.

1.4.10 Guidance to mitigate dust generation from site preparation in a way to minimise nuisance dust is given in Table 3.

**Table 4: Dust Control During Site Preparation**

Activity	Control Measure
Design and location of dust-generating activities	<ul style="list-style-type: none"> <li>○ Dust-generating activities should, where possible, be located where maximum protection can be obtained from topography, woodland or other sheltering features.</li> <li>○ Stockpiles, haul roads, tips and mounds, and exposed areas should be located as far away as possible from sensitive receptors. Where practicable, they should not be located directly upwind of the sensitive receptors.</li> </ul>
Earthworks, excavation and digging	<ul style="list-style-type: none"> <li>○ Vegetation and cover should be removed in discrete sections and not all at once.</li> <li>○ Earthworks, excavation and digging activities should be kept damp and, if possible, be avoided during exceptionally dry weather periods.</li> </ul>
Completed earthworks	<ul style="list-style-type: none"> <li>○ Stabilise surfaces and/or re-vegetate where practicable, as soon as possible.</li> </ul>
Storage mounds	<ul style="list-style-type: none"> <li>○ Seal surfaces by seeding or surface with vegetation that has previously been removed from the site.</li> <li>○ Cover dusty materials with correctly secured tarpaulins.</li> </ul>
Landscaping	<ul style="list-style-type: none"> <li>○ Soils may be landscaped into suitable shapes for secondary functions, such as screening temporary stockpiling areas from wind.</li> </ul>
Transitory soil mounds	<ul style="list-style-type: none"> <li>○ Soil mounds may be treated with surface binding agents, or covered with appropriate materials to reduce wind erosion.</li> <li>○ Consultation with the Environment Agency is necessary before employing any binding agent due to potential water run-off.</li> </ul>
Processing slates, crushing and screening	<ul style="list-style-type: none"> <li>○ Material to be crushed should be dampened. Crushers should be sited as far away as possible from sensitive receptors or the site boundary, and should be sited to use the landscape for screening wherever practicable.</li> <li>○ Mobile plant for crushing, screening and grading of materials may require authorisation by the appropriate Local Authority in whose area the operating company's registered office is situated.</li> </ul>

<b>Table 4: Dust Control During Site Preparation</b>	
<b>Activity</b>	<b>Control Measure</b>
Blasting using explosives	<ul style="list-style-type: none"> <li>○ Blasting will only be undertaken following communication with stakeholders, and only be carried out within defined working times.</li> </ul>
Biological materials	<ul style="list-style-type: none"> <li>○ Accumulations of bird droppings and other biological material should be removed prior to demolition.</li> <li>○ Care must be taken that the material does not become airborne, but is sufficiently contained.</li> </ul>
Water sprays	<ul style="list-style-type: none"> <li>○ Suitable and sufficient water sprays must be available</li> <li>○ Spraying should be carried out prior to and during works whenever the risk of visible emissions of dust are identified.</li> <li>○ Consultation with the Environment Agency may be necessary to discuss the control of surface water run-off</li> </ul>
Chutes for dropping materials to lower level	<ul style="list-style-type: none"> <li>○ Enclose chutes and skips. Regular water spraying should be carried out.</li> <li>○ Material drop heights should be minimised.</li> </ul>
Removal of materials from site	<ul style="list-style-type: none"> <li>○ Waste materials should be removed from the site as soon as is practical to avoid prolonged storage on site.</li> </ul>
Transport of materials	<ul style="list-style-type: none"> <li>○ Vehicles removing dry materials must have their loads effectively sheeted.</li> <li>○ Conveyor belts will be used for semi-permanent haul routes within the site boundary in preference to haulage vehicles</li> </ul>
Vehicle routes	<ul style="list-style-type: none"> <li>○ As far as practical, routes should be located away from residential and commercial properties.</li> </ul> <p>Additional vehicle controls are outlined in Table 9</p>

*Materials Handling, Storage, Stockpiling, Spillage and Disposal*

1.4.11 Method statements should be established at the pre-project planning stage to define the procedures to be followed for the storage and handling of fine, powdery and dry materials.

1.4.12 Settled dust may become airborne during windy conditions. Solid fencing or hoarding can provide shelter from the wind and reduce the possibility of dust suspension from the ground. Areas of the site that are expected to be significant local sources of dust generation can be fenced in this way. In general, fences need to be of the same approximate size as, or slightly



larger than the object being protected (e.g. stockpiles) if they are to be effective.

- 1.4.13 Wet material is likely to dry out during periods of hot weather and more frequent damping will be required. Advice and approval from the Environment Agency may be required on how to control the run-off when dusty material is damped down using water.
- 1.4.14 Under the Clean Air Act (1993), open fires should be avoided on site. The use of small incinerators is regarded as more acceptable, but requires approval under Section 21 of the Clean Air Act (1993).
- 1.4.15 Specific guidance on materials handling is given in the following tables.

<b>Table 5: Dust Control for Emissions from Handling of Materials</b>	
<b>Activity</b>	<b>Control Measure</b>
Material handling operations	<ul style="list-style-type: none"> <li>○ Always keep the number of handling operations to a minimum by ensuring that dusty material isn't moved or handled unnecessarily.</li> </ul>
Transport of fine powdery materials	<ul style="list-style-type: none"> <li>○ Use closed tankers.</li> </ul>
Transport of dusty materials and aggregates	<ul style="list-style-type: none"> <li>○ Use enclosed or sheeted vehicles.</li> </ul>
Handling areas	<ul style="list-style-type: none"> <li>○ Keep clean and free from dust.</li> </ul>
Vehicle loading	<ul style="list-style-type: none"> <li>○ Use material handling methods that minimise the generation of airborne dust.</li> <li>○ Damp down using water.</li> </ul>
Loading materials onto vehicles	<ul style="list-style-type: none"> <li>○ Drop heights must be kept to a minimum and conveyors and enclosed wherever practicable.</li> <li>○ Damp down with water.</li> </ul>
Chutes, skips and conveyor transfer points	<ul style="list-style-type: none"> <li>○ Drop heights must be kept to a minimum and enclosed wherever possible.</li> <li>○ Damp down with water.</li> </ul>
Dust dispersing	<ul style="list-style-type: none"> <li>○ Use static sprinklers, bowsers, hand held over the site boundary hoses and other watering methods, as necessary.</li> </ul>
Conveyors	<ul style="list-style-type: none"> <li>○ Enclose transfer points and conveyor discharges where visible dust emissions occur.</li> <li>○ installation on an even alignment with no abrupt changes in grade</li> <li>○ return belt cleaners, with arisings collected into a bin or cleaned up</li> <li>○ maintenance of the structures and rollers to minimise spillages</li> <li>○ shrouding of feed hoppers, transfer points and discharges;</li> <li>○ fixed sprays where required</li> </ul>

**Table 5: Dust Control for Emissions from Handling of Materials**

Activity	Control Measure
	<ul style="list-style-type: none"> <li>○ clearance of any spillages to minimise accumulations of loose dry material around the structures</li> <li>○ minimisation of drop heights at feed hoppers and discharges</li> <li>○ screening material to remove dusty fractions prior to external storage</li> <li>○ dampen material using sprays, mists, microfoam or foam;</li> <li>○ design hopper load systems to ensure a good match with truck size, and enclose fully on all sides</li> </ul>

**Table 6: Dust Control for Emissions from Storage of Powder Material**

Activity	Control Measure
Bulk cement, bentonite and similar materials	○ Delivered by tanker and stored in silos
Silos	○ Ventilators should be fitted with particle filters.
Accidental spills when filling / operating silos	○ Methods and equipment for cleaning should be in place. If necessary, include the use of audible and visual alarm systems.
Fine, dry materials (less than ~3 mm in particle size)	○ Store inside buildings or enclosures or with adequate protection from the wind e.g. by using sheeting.
Dry materials (greater than ~3 mm in size)	○ Store materials in bunded areas.

Table 6: Dust Control for Emissions from Storage of Powder Material	
Activity	Control Measure
Storage location	<ul style="list-style-type: none"> <li>o Store materials away from the site boundary and sensitive areas, wherever possible.</li> </ul>

Table 7: Dust Control for Emissions from Stockpiles	
Activity	Control Measure
Stockpile location	<ul style="list-style-type: none"> <li>o Stockpiles should be located away from sensitive receptors e.g. residential, commercial and educational buildings, places of public access or other features, such as watercourses.</li> </ul>
Building stockpiles	<ul style="list-style-type: none"> <li>o Ensure slopes of stockpiles, tips and mounds are at an angle not greater than the natural angle of repose of the material.</li> <li>o Avoid sharp changes of shape.</li> </ul>
Small and short-term stockpiles	<ul style="list-style-type: none"> <li>o Where possible, ensure stockpiles are kept or under sheeting.</li> <li>o Dusty materials can be damped down using suitable and sufficient water sprays.</li> <li>o Wind barriers (protective fences) of similar size and height to the stockpile may be used.</li> </ul>
Larger and long-term stockpiles	<ul style="list-style-type: none"> <li>o Shrouding, wind shielding using screens, watering and controlled spraying of the surface with chemical bonding agents, should be carried out (subject to necessary approval from the Natural Resources Wales).</li> <li>o Wind barriers (protective fences) of similar size and height to the stockpile may be used.</li> <li>o Long-term stockpiles can be capped or grassed over.</li> </ul>

<b>Table 8: Dust Control for Emissions from Spillages</b>	
<b>Activity</b>	<b>Control Measure</b>
Cleaning up	<ul style="list-style-type: none"> <li>○ Methods and equipment should be in place for immediate clean-up of spillages of dusty or potentially dusty materials.</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>○ Regularly inspect site for spillages.</li> </ul>
Cement powder (and similar)	<ul style="list-style-type: none"> <li>○ Clean up spillages using wet handling methods.</li> </ul>

*Vehicle/Plant Movements and Roads, Surfaces and Highways*

- 1.4.16 Engine emissions, especially from diesel engines, can be a significant source of fine particle matter, which is monitored and controlled under the Air Quality Strategy (HMSO, 2007) due to potential adverse health impacts. Control measures with regard to routes used during the construction phases are detailed in Table 9.
- 1.4.17 In addition to the dust caused by construction vehicles, Non-Road Mobile Machinery (NRMM) is capable of significant emissions. Where possible, NRMM should achieve exhaust emissions standards equal or better than Euro IV.

<b>Table 9: Dust Control for Roads, Surfaces and Highways</b>	
<b>Activity</b>	<b>Control Measure</b>
Major haul roads and traffic routes	<ul style="list-style-type: none"> <li>○ Install permanent surfaces where possible, with regular inspection and maintenance</li> <li>○ Plan routes to be away from residents and other sensitive receptors near the site boundary.</li> </ul>
Construction and maintenance of unsurfaced roads and verges	<ul style="list-style-type: none"> <li>○ Grade fine materials from unsurfaced haul roads.</li> <li>○ Keep in compacted condition using static sprinklers, bowsers, commercially available additives and binders (subject to Environment Agency (EA) requirements).</li> </ul>
Public roads	<ul style="list-style-type: none"> <li>○ Clean regularly subject to Highway Authority approval.</li> </ul>
Edges of roads and footpaths	<ul style="list-style-type: none"> <li>○ Clean by using hand broom with damping, as necessary.</li> </ul>
Vehicle waiting areas and hard standings	<ul style="list-style-type: none"> <li>○ Regularly inspect and keep clean by brushing or vacuum sweeping.</li> <li>○ Spray regularly with water to maintain surface moisture if needed.</li> </ul>
Vehicle and wheel washing	<ul style="list-style-type: none"> <li>○ Washing facilities, such as hose-pipes and ample water supply should be provided at site exits, including mechanical wheel spinners where practicable.</li> <li>○ If necessary, all vehicles should be washed down before exiting the site</li> </ul>
Site traffic management and speed control	<ul style="list-style-type: none"> <li>○ Restrict general site traffic to watered or treated haul roads.</li> <li>○ Keep vehicle movements to a minimum.</li> <li>○ Limit vehicle speeds - the slower the vehicle speeds, the lower the dust generation. Appropriate speed limits are:</li> </ul>

<b>Table 9: Dust Control for Roads, Surfaces and Highways</b>	
<b>Activity</b>	<b>Control Measure</b>
	<ul style="list-style-type: none"> <li>- 20 mph or less for surfaced roads</li> <li>- 5 mph for unmade surfaces.</li> </ul>
Road cleaning	<ul style="list-style-type: none"> <li>o Approved mechanical road sweeper should be readily available, with circular brush commonly fitted to side for cleaning kerbs, removed.</li> <li>o Frequency of cleaning will depend on site size, location and operation. However, cleaning should be carried out as frequently as required.</li> </ul>

<b>Table 10: Emission Control for Static and Mobile Plant Emissions</b>	
<b>Activity</b>	<b>Control Measure</b>
Visible exhaust smoke	<ul style="list-style-type: none"> <li>o Vehicles and static plant should not emit black smoke from exhaust systems except during ignition at start-up.</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>o Engines and exhaust systems should be maintained so that exhaust emissions do not breach statutory emission limits set for the vehicle/equipment type and mode of operation.</li> </ul>
Servicing	<ul style="list-style-type: none"> <li>o This should be routinely scheduled, rather than just following breakdowns.</li> </ul>
Operating time	<ul style="list-style-type: none"> <li>o Internal combustion plant should not be left running unnecessarily.</li> </ul>
Exhaust direction	<ul style="list-style-type: none"> <li>o Vehicle exhausts should be directed away from the ground and other surfaces and preferably upwards to avoid road dust being re-suspended to the air.</li> </ul>



**Table 10: Emission Control for Static and Mobile Plant Emissions**

<b>Activity</b>	<b>Control Measure</b>
Exhaust heights	○ Exhausts should be positioned at a sufficient height to ensure adequate local dispersal of emissions.
Location of plant and equipment	○ Plant and equipment should be operated away from sensitive receptors or the site boundary.

*Tarmac Laying, Bitumen Surfacing and Coating*

1.4.18 Relevant control measures which may minimise the production of black smoke particles from hot bitumen processes are detailed in Table 11.

**Table 11: Dust Control for Tarmac Laying, Bitumen Surfacing and Coating**

Activity	Control Measure
Bitumen over-heating	<ul style="list-style-type: none"> <li>○ Do not overheat bitumen, but use minimum acceptable temperature.</li> <li>○ Measure temperature directly, especially on large heating plant.</li> <li>○ Avoid if possible, heating with open flame burners.</li> </ul>
Fume production	<ul style="list-style-type: none"> <li>○ Cover pots or tanks containing hot bitumen.</li> </ul>
Small accidental fires	<ul style="list-style-type: none"> <li>○ Extinguish immediately.</li> </ul>
Spillage	<ul style="list-style-type: none"> <li>○ Minimise spillages, especially any likely to contact open flames.</li> </ul>
Direct application of open flames ('torching')	<ul style="list-style-type: none"> <li>○ Use great care.</li> <li>○ Avoid overheating the surface.</li> </ul>

*Construction and Fabrication Processes*

1.4.19 Relevant control measures which may minimise the production of black smoke particles from hot bitumen processes are detailed in Table 12.

**Table 12: Dust Control for Construction and Fabrication Processes**

Activity	Control Measure
Cutting, grinding, drilling, sawing, trimming, planning, sanding	<ul style="list-style-type: none"> <li>○ Cutting on site should be avoided by using prefabrication whenever possible.</li> <li>○ Avoid cutting out errors and re-bars.</li> <li>○ Employ equipment and techniques that minimise dust emissions, using best available dust suppression measures.</li> <li>○ Use water sprays to minimise dust from cutting equipment.</li> <li>○ Local exhaust ventilation should be used where</li> </ul>

**Table 12: Dust Control for Construction and Fabrication Processes**

Activity	Control Measure
	<p>possible.</p> <ul style="list-style-type: none"> <li>○ Fans and filters should be serviced and maintained to ensure correct operation.</li> <li>○ Design to fill wherever feasible rather than cutting back oversized work.</li> </ul>
Cutting roadways, pavements blocks, etc	<ul style="list-style-type: none"> <li>○ Use a diamond bladed floor saw with water pumped through to suppress dust.</li> <li>○ Standard angle grinders and disk cutters with no dust control should not be used for this purpose.</li> </ul>
Raking out mortar/pointing	<ul style="list-style-type: none"> <li>○ Standard angle grinders and disk cutters with no dust control should not be used.</li> <li>○ A mortar raking kit, fitted on to a standard 5" angle grinder can be used on soft mortar. For hard mortar, a super-saw with oscillating blades can be used.</li> </ul>
Angle grinders and disk cutters	<ul style="list-style-type: none"> <li>○ Dust extraction/minimisation systems should always be used.</li> </ul>

## 1.5 Monitoring

1.5.1 Air quality monitoring will be undertaken in order to identify the existing environmental conditions prior to construction work, and in order to identify any increase in the rate of dust deposition or the concentration of nitrogen dioxide (NO<sub>2</sub>) that may arise during the construction phase.

1.5.2 The need for monitoring was outlined in the ES, and has been incorporated into this DMP. The baseline conditions will be established, the baseline data will be used to establish action trigger criteria and then those criteria will be applied during all subsequent monitoring. A Baseline Air Quality Plan will be prepared based on the requirements of the DMP set out below.

### *Monitoring Methodology and Equipment*

1.5.3 The baseline monitoring will be used to determine the pollutant concentrations prior to any work being undertaken.

- 1.5.4 Frisbee dust deposition gauges will be used to measure dust deposition for approximate 30-day periods over the 6-month baseline period. The deposited dust will also be analysed for character and composition in order to create a record of the types of dust that are currently present, and to provide source information in the event of incidents during the construction works. The average rate of dust deposition for each sample period will be reported as milligrams per square metre per day ( $\text{mg}/\text{m}^2/\text{day}$ ).
- 1.5.5 Passive diffusion tubes will be used to measure the concentration of Nitrogen Dioxide ( $\text{NO}_2$ ), which is a product of engine exhaust. The tubes will be exposed in each monitoring location for 30-day periods over the 6-month baseline period. The average concentration of  $\text{NO}_2$  for each sample period will be reported as micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ).
- 1.5.6 In addition to the methods described above, in the early stages of the construction it will be beneficial to use automatic dust monitoring equipment that can measure a uniform dust size fraction, and may assist the site manager to implement this plan effectively.
- 1.5.7 Automatic particulate monitoring equipment will be used to measure the concentration of particulate matter. These instruments may be mounted on posts or walls and provide continuous monitoring of  $\text{PM}_{10}$ . Indicative measurements of Total Suspended Particulates (TSP),  $\text{PM}_{2.5}$  and  $\text{PM}_1$  size fractions should be collected to inform the analysis of  $\text{PM}_{10}$  data. The equipment will operate continuously and the data downloaded remotely for checking and analysis. This equipment will include a facility to report incidents of elevated concentrations in real-time to site managers, the environmental liaison officer and the local authority.
- 1.5.8 Anemometers will be co-located with the automatic dust monitoring equipment in order to simultaneously measure wind direction and speed along with the dust concentrations, for the purposes of interpreting  $\text{PM}_{10}$  measurement data.

### *Monitoring Criteria*

- 1.5.9 The IAQM have published the guidance that are considered to represent the best practice for the control of dust from construction sites<sup>1</sup>, and the most appropriate means of incorporating monitoring<sup>2</sup>. The guidance includes action trigger level values that have proven to be effective in major urban development sites, for example in central London.
- 1.5.10 The IAQM<sup>2</sup> recommend the following generic upper action trigger levels for construction sites:
- PM<sub>10</sub> concentrations of 250 µg/m<sup>3</sup> averaged over a 15-minute period; and
  - Dust deposition rates sampled using Frisbee-type Deposition Gauges of 200 mg/m<sup>2</sup>/day, averaged over a 4-week period.
- 1.5.11 The previous permission adopted the above generic values. The plan for all works is to adopt lower criteria, where the results of the baseline study indicate it is appropriate to do so. Consequently this plan will be updated following completion of the baseline air quality survey, which will recommend on upper and lower action trigger level values.
- 1.5.12 Appendix A of this plan includes a table that will be completed after the baseline monitoring period to record the action trigger levels and air quality limits to be applied during the construction phase, following approval by Gwynedd Council.

### *Baseline Monitoring*

- 1.5.13 Baseline studies will be undertaken for a minimum of 6-months prior to the start of work in order to determine the ambient concentration and dust deposition rates.
- 1.5.14 Monitoring will be undertaken near sensitive receptors identified in Table 9 that may be near specific activities with a high potential to generate dust.

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<sup>1</sup> IAQM (2014), Guidance on the assessment of dust from demolition and construction

<sup>2</sup> IAQM (2012) Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites

1.5.15 The equipment will be located within the grounds of the property or, where this not possible, at the nearest point of the fence line around the construction site.

1.5.16 The generic trigger levels discussed above may be too low to provide appropriate levels of protection in the area around the scheme, and so the baseline monitoring will be used to determine the trigger levels that should be used during the construction phase to ensure effective protection from dust effects. This will be subject to discussion and agreement with the local authority.

#### *Construction Monitoring*

1.5.17 Construction monitoring will be undertaken at the same locations during the operational phase using similar methodologies and types of equipment.

1.5.18 The monitoring during the construction phase will be undertaken for two main purposes:

- To limit potential health effects through the sampling of ambient concentrations, and secondly to limit nuisance dust by measuring dust deposition.
- To ensure that good practice is being followed, and that the mitigation measures are successful in reducing any dust or emissions to acceptable levels. 'Acceptable' levels are defined by the use of 'trigger' levels, above which action should be taken to reduce dust or other emissions.

#### *Reviews*

1.5.19 The optical particulate monitoring units will initially be operated for a period of 12-months. The results from this period will be reviewed with regard to the following in order to determine how it may be undertaken after this time:

- Number of pollution events
- Pollution events associated with the construction work
- Locations and types of work activities undertaken or completed during the monitoring period

1.5.20 In the event that the measured pollutant concentrations clearly demonstrate that the mitigation controls are effective, and that significant effects will not arise, then the monitoring methodologies will be reviewed. The decision to change the monitoring method will be discussed and agreed with the Gwynedd Council air quality officer, and is recommended to comprise the following:

- A hand-held nephelometer will be stored on-site, and maintained in a state of good service and calibration.
- The unit will be used to respond to complaints or concerns.
- The unit will also be used to sample the concentration of dust during specific activities with a potential increased risk of dust arising, such as temporary works where significant mitigation controls may not be appropriate or possible.

1.5.21 The monitoring data will continue to be reviewed annually.

*Monitoring Locations*

1.5.22 Monitoring will be undertaken near representative sensitive receptor locations identified in Table 13 that may be near specific activities with a high potential to generate dust.

1.5.23 The equipment will be located within the grounds of the property or, where this not possible, at the nearest point of the fence line around the construction site.

1.5.24 Particulate monitoring units will be located near the boundary of the proposed working areas and near sensitive receptor locations, although the location of the units will be subject to the availability of a secure and reliable electricity supply, and safe access.

<b>Table 13: Air Quality Monitoring Locations</b>		
<b>Location</b>	<b>Monitoring Methodology</b>	<b>Reason</b>
Glyn Peris guesthouse	<p>Automatic dust monitoring to measure the concentration of atmospheric dust</p> <p>Frisbee gauge monitoring units to measure the rate of deposited dust.</p> <p>Diffusion tubes to measure the concentration of atmospheric Nitrogen Dioxide</p>	<p>The properties to the east of the site are in proximity to the tail pond and tailrace area and the main road.</p> <p>A conveyor route is also proposed to be located near this boundary that is a specific potential source of dust.</p>
Lake View Hotel	<p>Automatic dust monitoring to measure the concentration of atmospheric dust</p> <p>Frisbee gauge monitoring units to measure the rate of deposited dust.</p> <p>Diffusion tubes to measure the concentration of atmospheric nitrogen dioxide</p>	<p>Monitoring in this area will be used to protect these locations from potential emissions of dust and engine exhaust pollutants.</p>
Site access / exit	<p>Automatic dust monitoring to measure the concentration of atmospheric dust</p> <p>Frisbee gauge monitoring units to measure the rate of deposited dust.</p> <p>Diffusion tubes to measure the concentration of atmospheric nitrogen dioxide</p>	<p>The main site access point represents a potential significant location for construction dust emissions due to vehicle track-out.</p> <p>It is not specifically near any sensitive locations, but monitoring in this area is a cautious approach to protect receptors near the main access routes from emissions from track-out and engine exhaust pollutants.</p>



<b>Table 13: Air Quality Monitoring Locations</b>		
<b>Location</b>	<b>Monitoring Methodology</b>	<b>Reason</b>
Tailrace working area	Frisbee gauge monitoring units to measure the rate of deposited dust.  Diffusion tubes to measure the concentration of atmospheric nitrogen dioxide	The working area from the tail pond to Llyn Padarn will be near commercial, industrial and amenity locations.  Monitoring in this area will be used to protect these receptors from emissions during this work.
North boundary of the Head Pond area	Frisbee gauge monitoring units to measure the rate of deposited dust.	Monitoring dust near the working areas of potentially significant dust generating activities will be used for the protection of the surrounding land and receptors.
South boundary of the head pond area, near excess spoil mounds	Frisbee gauge monitoring units to measure the rate of deposited dust.	
West side of the Tail pond area	Frisbee gauge monitoring units to measure the rate of deposited dust.	
Public Highway through Llanberis	Diffusion tubes to measure the concentration of atmospheric nitrogen dioxide	Monitoring on the main route through Llanberis will be used to protect receptors from vehicle exhaust emissions on the road access route to the site

*Visual Inspections*

- 1.5.25 Daily visual inspections should be undertaken to ensure that best practice is being followed and that the mitigation measures are successful in reducing any dust or emissions to acceptable levels.
- 1.5.26 A five point assessment scale has been derived from professional experience and judgment, which may be used when making a daily visual assessment of any impacts on the downwind boundaries of the site.
- 1.5.27 A wind sock will be co-located with a logging meteorological station in a prominent location within the site boundary away from tall or large structures that may disrupt the airflow. The Environmental Manager / Clerk of Works and foreman will use this as a primary response to comments or incidents to determine when high wind speeds, gusty conditions, or wind directions may lead to increased risk of emissions arising and/or leaving the site due to wind transport or track-out from vehicles.
- 1.5.28 In the event that activities with high dust generating potential occur, the wind sock will be used as a continuous visible reference to monitor conditions and ensure that an appropriate level of mitigation control is implemented.
- 1.5.29 In the event that automatic dust monitoring equipment is no longer required after the annual review, stand-alone logging meteorological station(s) will continue to be used on the site to provide an accurate record of local weather conditions and to provide information that may support the site manager and environmental liaison officer to implement and maintain this plan.

**Table 14: Visual Inspection Criteria**

Significance		Description	Response
1	None	No visible emission	Water Bowser on standby / intermittent spraying of site roads
2	Slight	Visible emission settling within 50	Stockpiles to be monitored and relevant action taken

**Table 14: Visual Inspection Criteria**

Significance		Description	Response
		m of the source	Road sweepers in operation on surrounding roads where required
3	Moderate	Visible emission settling more than 50 m from the source but more than 100 m from the boundary	<p>Full time operation of water bowser undertaking spraying on targeted site roads</p> <p>Stockpiles sprayed with water and/or sealed</p> <p>Construction traffic to be further controlled with wheel washes/jet washes/'right turn only' strategy</p> <p>Increase frequency of road sweeper</p>
4	Serious	Visible emissions settling less than 100 m from the site boundary	<p>Increased number/size of water bowzers working full time</p> <p>All stockpiles sprayed</p> <p>Increased control of construction traffic and delivery traffic</p>
5	Major	Visible emission crossing the site boundary	<p>Repeated occurrence of Red status may result in dust monitoring equipment being installed if not already</p> <p>Assess for the possibility of a second road sweeper on site</p>

### *Reporting*

1.5.1 A summary report will be issued at the end of the baseline monitoring period. This will comprise:

- Presentation of the results from the monitoring undertaken for the baseline period.

- Analysis and interpretation of the environmental conditions that were experienced, with reference to the metrological data recorded on the site, and regional monitoring stations.
- Recommendations for the upper and lower action trigger levels that should be adopted in the Dust Management Plan.

1.5.2 Data will be made available on request to the liaison group and other stakeholders by the ELO.

# APPENDIX A – AIR QUALITY MONITORING CRITERIA

## *Nitrogen Dioxide*

Monthly sampling period data will be combined to calculate annual mean values. The annual mean values will be compared against the Welsh Air Quality Objective Value set out in Table A1.

<b>Table A1: Welsh Air Quality Objective Value</b>				
<b>Pollutant</b>	<b>Averaging Period</b>	<b>No of Permitted Exceedances</b>	<b>Value</b>	<b>Units</b>
Nitrogen dioxide (NO <sub>2</sub> )	Annual Mean	None	40	µg/m <sup>3</sup>
Particulate Matter (PM <sub>10</sub> )	Annual Mean	None	40	µg/m <sup>3</sup>
	24-Hour Mean	35 per year	50	µg/m <sup>3</sup>

## *Particulate Matter Action Trigger Levels*

Short term measurements of particulate matter will be 15 minute mean values of the PM<sub>10</sub> size fraction. Long term measurements of particulate matter will be monthly mean dust deposition rates. Lower and upper action trigger levels are set for both short and long term measurements. The lower action trigger level is set to inform site staff of increasing concentrations so that early action can be taken, to avoid concentrations rising above the upper action trigger value.

**Table A2: Project Action Trigger Levels For Particulate Matter**

Pollutant	Criteria	Averaging Period	No of Permitted Exceedances	Value	Units
Dust Deposition Rate	Lower Action Trigger Level	Monthly Mean	Unlimited	TBC*	mg/m <sup>2</sup> /day
	Upper Action Trigger Level	Monthly Mean	None	TBC*	mg/m <sup>2</sup> /day
PM <sub>10</sub>	Lower Action Trigger Level	15 Minute Mean	Unlimited	TBC*	µg/m <sup>3</sup>
	Upper Action Trigger Level	15 Minute Mean	None	TBC*	µg/m <sup>3</sup>

\*Values to be proposed within the baseline air quality monitoring report.