



The Construction Environmental Management Plan (CEMP) has been prepared to set out the details for the management of the proposed development during the pre-construction and main construction phases in order to minimise the risk of harm to persons, property and existing habitats within and within influencing distance of the site and the activities associated with the development of the site.

This CEMP shall be adhered to and implemented throughout the construction period strictly in accordance with the details contained herein, unless otherwise agreed by the Local Planning Authority.

Risk assessment of potentially damaging construction activities and practical measures (both physical measures and sensitive working practices) to avoid or reduce impacts during construction.

- Preparing and maintaining the site
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable;
- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable; and
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas;

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;

- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Measures specific to earthworks

There is a high risk of dust associated with earthworks activities on site. The following measures will therefore be implemented:

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

Measures specific to demolition

Demolition activities can generate significant dust and also cause resuspension of dust currently within the building. Soft stripping is an effective way of screening dust and preventing dispersion. Water suppression should be used to damp down dust and other debris that could generate dust, and, where practical, manual or mechanical demolition techniques should be used. Blasting should be avoided in order to control dust.

Measures specific to construction

There is a medium risk of dust associated with construction on site. The following measures will therefore be implemented:

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Measures specific to trackout

There is a medium risk of dust associated with trackout. The following measures will therefore be implemented:

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface immediately;
- Record all inspections of haul routes and any subsequent action in a site log book;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned;
- Implement a wheel washing system, with rumble grids to dislodge accumulated dust and mud prior to leaving the site and include measures to prevent mud being transferred from site during wet weather. The exact details and location of this facility (to be marked clearly on a plan) to be approved by condition prior to commencement of works;
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit; and
- Access gates to be located at least 10m from receptors where possible.

Biodiversity

A full ecological appraisal of the site has been conducted in October 2023 (ref.: P.1202.19A Ascerta Preliminary Ecological Appraisal) which considers very limited impact on the local ecology if the following recommendations are followed:

1. An updated survey for water vole, otter surveys and white-clawed crayfish to be undertaken on the River Irwell and the stream within the site to assess the potential impacts on these species;
2. Control of the invasive species Himalayan balsam, montbretia, wall cotoneaster and Japanese knotweed to stop it from spreading into the wild during development works (Ascerta report P.1202.19 Invasive Species Management Plan);
3. Enhancing the site for species through appropriate landscape planting that includes native, species rich hedgerows, trees and areas of wildflowers plus provision of integrated bat and bird features within newly constructed buildings;
4. Production of the Defra Metric Biodiversity Net Gain Calculations to minimise impacts on biodiversity and provide net gains in biodiversity;
5. Production of a Management Plan to ensure the long-term commitments to manage the planting, protection and enhancement of biodiversity in and around a new development site; and
6. Vegetation clearance or pruning should be undertaken outside of the nesting bird season

(1st March to 31st August Inclusive) to avoid any impact on breeding birds. Or a nesting bird check undertaken by a suitably experienced ecologist should be undertaken immediately prior to works commencing.

The above recommendations, if fully implemented, will enable the proposals to meet the requirements of national and local guidance and legislation including the NPPF and Policy EN6 of the Bury Council Unitary Development Plan (UDP).

Use of protective fences, exclusion barriers and warning signs

The fencing will be erected in advance of the commencement of the main site activities and maintained in-situ throughout the course of the development until such times as the ecological and arboricultural consultants approve its removal. In addition to the ordinary site safety and warning signs relating directly to the construction works, the following signage will be attached, A4 size, at 4m intervals to the tree / biodiversity protection fencing.



General Control of Dust & Mud

During construction works, dust levels will be monitored. When necessary a mobile jet wash and misting bowser will be utilised to provide dust and mud suppression.

The site compound will be accessed from the estate road and will contain a hard surface for receiving and storing deliveries. The site compound will be secured using heras fencing.

Each property will receive a temporary haul road for the loading of materials.

Where necessary, haul roads, work areas and stockpiles will be damped down with water mist spray using a mobile mist wash bowser.

Any stockpiles will be sealed by compacting at the surface. If this proves insufficient to prevent wind whipping then the stockpile will be either damped down at regular intervals or ultimately the windrows will be sheeted. It is anticipated that the average height of stockpiles will not exceed 4m. Vehicle speeds and movements on site will be kept to a maximum of 5mph.

Where possible pre-fabricated materials will be used. In cases, where cutting, grinding and sawing must take place, then equipment will use water suppressant or suitable local exhaust ventilation systems.

Site Management

The site manager will follow the site management practices set out below, to ensure that the site is responsibly managed during the demolition and construction phases of the development.

Contact details for the person responsible for dust and emissions generated from the site will be displayed on the site boundary so that local residents and businesses are able to contact the developer and/or contractor to raise any issues that they may have and report complaints. The site manager will be responsible for the monitoring and implementation of dust and emissions control measures and will keep a record of all such complaints and respond to them as soon as possible. The log of complaints and action taken will be made available to the local authority on request.

The potential cumulative effects of emissions from several development sites should be considered and managed between the sites. For high risk sites, liaison meetings should be held with site managers of other high risk construction sites within 200m of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. The site manager and contractor are to actively monitor the site to ensure the control of dust and emissions. Dry and windy conditions increase the likelihood of dust and emissions being produced and dispersed, so extra site monitoring should take place during these times.

Reducing Emissions from Vehicles

Emissions from vehicles associated with construction sites can significantly add to levels of local air pollution, so it is important that best practice is employed to reduce these.

The site will be managed so that vehicles do not have to wait to park safely. However, should vehicles have to wait they should not idle. Generally, if a vehicle is stationary for more than a minute, turning off the engine will reduce emissions and fuel costs.

Deliveries to construction sites can contribute greatly to congestion and emissions at and around sites. Larger sites should develop and implement Construction Logistics Plans (CLPs) / Construction Traffic Management Plans as part of wider transport assessments. A CLP is a framework that allows deliveries and removals to be managed so that they are made when they are most needed, at times when they will contribute less to congestion and at locations where loading and unloading can take place safely. CLPs can help site managers to: cut congestion in the local area, reducing the environmental impact of deliveries and inconvenience to local road users; save time and money; improve the safety of deliveries; and improve delivery reliability.

Even modern diesel or petrol powered plant items emit higher levels of PM and NO_x than electric equivalents. Therefore, wherever possible, renewable, mains or battery powered plant items should be used.

Operations

Ideally, cutting, grinding and sawing should not be conducted on-site and pre-fabricated material and modules should be brought in where possible. In cases where such work must take place, spraying water, preferably from a water efficient spray pump, over the material as it is being cut greatly reduces the amount of dust generated.

Scabbling is the process of grinding concrete using a machine tipped with steel or carbide material to rapidly pound it. The following measures should be in place at all sites to comply with best practice: pre-wash work surfaces; screen off work areas; and sweeping away.

Skips, chutes and conveyors will be completely covered and, if necessary, completely enclosed to ensure that dust does not escape. Similarly, drop heights should be minimised to control the fall of materials.

General Control of Noise

Construction and demolition works can pose different noise control problems compared with most other types of industrial activity for the following reasons:

- they are mainly carried out in the open;
- they are of temporary duration although they can cause great disturbance while they last;
- the noise they make arises from many different activities and kinds of plant, and its intensity and character can vary greatly at different phases of the work; and
- the sites cannot be excluded by planning control, as factories can, from areas that are sensitive to noise.

If a site upon which construction or demolition work will be carried out involves an existing operational railway, special features that are significant in relation to noise control have to be taken into account.

Much of the noise from construction and demolition sites is generated by plant and machinery. The noise levels so generated are unacceptable in many instances and reductions are necessary for the benefit of both the industry and the public.

Control of Noise at Source

There are many general measures that can reduce noise levels at source such as:

- a) avoid unnecessary revving of engines and switch off equipment when not required;
- b) keep internal haul routes well maintained and avoid steep gradients;
- c) use rubber linings in, for example, chutes and dumpers to reduce impact noise;
- d) minimize drop height of materials;
- e) start up plant and vehicles sequentially rather than all together.

The movement of plant onto and around the site should have regard to the normal operating hours of the site and the location of any NSPs as far as is reasonably practicable.

The use of conventional audible reversing alarms has caused problems on some sites and alternatives are available. Audible reversing warning systems on mobile plant and vehicles should be of a type which, whilst ensuring that they give proper warning, have a minimum noise impact on persons outside sites. When reversing, mobile plant and vehicles should travel in a direction away from NSPs whenever possible. Where practicable, alternative reversing warning systems should be employed to reduce the impact of noise outside sites.

Modification of Existing Plant and Equipment

Noise from existing plant and equipment can often be reduced by modification or by the application of improved sound reduction methods, but this should only be carried out after consultation with the manufacturer. Suppliers of plant will often have ready-made kits available and will often have experience of reducing noise from their plant.

For steady continuous noise, such as that caused by diesel engines, it might be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or by designing an acoustic canopy to replace the normal engine cover. Any such project should be carried out in consultation with the original equipment manufacturer and with a specialist in noise reduction techniques. The replacement canopy should not cause the engine to overheat nor interfere excessively with routine maintenance operations.

It might be possible in certain circumstances to substitute electric motors for diesel engines, with consequent reduction in noise. On-site generators supplying electricity for electric motors should be suitably enclosed and appropriately located.

Noise caused by resonance of body panels and cover plates can be reduced by stiffening with additional ribs or by increasing the damping effect with a surface coating of special resonance damping material. Rattling noises can be controlled by tightening loose parts and by fixing resilient materials between the surfaces in contact; this is generally a maintenance issue.

Impact noise during steel construction can be a nuisance. Direct metal-to-metal contact should be minimized.

Enclosures

As far as reasonably practicable, sources of significant noise should be enclosed. The extent to which this can be done depends on the nature of the machine or process to be enclosed and their ventilation requirements.

When it is necessary to enclose a machine or process and its operator(s) in an acoustic enclosure or building, precautions should be taken to protect the operator(s) from any consequential hazard.

The effectiveness of partial noise enclosures and of screens can be reduced if they are used incorrectly, e.g. the noise being enclosed should be directed into and not out of enclosures. There should not be a reflecting surface, such as a parked lorry, opposite the open side of noise enclosures. Any openings in complete enclosures, e.g. for ventilation, should be effectively sound-reduced.

Use and Siting of Equipment

Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas. Special care is necessary when work has to be carried out at night but it might be possible to carry out quiet activities during that time.

Machines such as cranes that might be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and wastes energy.

Plant from which the noise generated is known to be particularly directional should, wherever practicable, be orientated so that the noise is directed away from noise-sensitive areas. Acoustic covers to engines should be kept closed when the engines are in use and idling.

If compressors are used, they should have effective acoustic enclosures and be designed to operate when their access panels are closed.

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved should be covered by resilient material.

When a site is in a residential environment, lorries should not arrive at or depart from the site at a time inconvenient to residents.

In certain types of piling works there will be ancillary mechanical plant and equipment that might be stationary, in which case care should be taken in location, having due regard also for access routes. Stationary or quasi-stationary plant might include, for example, support fluid preparation equipment, grout or concrete mixing and batching machinery, lighting generators, compressors, welding sets and pumps.

When appropriate, screens or enclosures should be provided for such equipment. Additional mitigation might be required at night, e.g. by moving plant away from sensitive areas to minimize disturbance to occupants of nearby premises.

Maintenance

Regular and effective maintenance by trained personnel is essential and will do much to reduce noise from plant and machinery. Increases in plant noise are often indicative of future mechanical failure.

Sound-reducing equipment can lose its effectiveness before failure is indicated by visual inspection.

Noise caused by vibrating machinery having rotating parts can be reduced by attention to proper balancing. Frictional noise from the cutting action of tools and saws can be reduced if the tools are kept sharp. Noises caused by friction in conveyor rollers, trolleys and other machines can be reduced by proper lubrication.

Controlling the Spread of Noise

If noisy processes can be avoided, then the amount of noise reaching the noise-sensitive area will be reduced. Alternative ways of doing this are either to increase the distance between the noise source and the sensitive area or to introduce noise reduction screens, barriers or bunds.

Distance

Increasing the distance from NSPs is often the most effective method of controlling noise. This might not be possible when work takes place on a restricted site or fixed structures, e.g. railway tracks. Stationary plant such as compressors and generators should be located away from any noise-sensitive area.

Screening

On sites where it is not possible to reduce a noise problem by increasing the distance between the source and receiver, screening might have to be considered. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Careful positioning of noise barriers, such as bunds or noise screens, can bring about significant reductions in noise levels, although account should be taken of the visual impact of such barriers.

Planting of shrubs or trees can have a beneficial psychological effect but will do little to reduce noise levels unless the planting covers an extensive area. If possible, decisions as to the most suitable types of screening should be made at project planning stages, because it will often be found that a site layout can itself contribute quite effectively towards the provision of useful screening. It might be necessary for safety reasons to place a hoarding around the site, in which case it should be designed taking into consideration its potential use as a noise screen. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. Site buildings such as offices and stores can be grouped together to form a substantial barrier separating site operations and nearby NSPs. On some sites, stacks of certain materials such as bricks, aggregate, timber or top soil can be strategically placed to provide a barrier. Areas which have been excavated below ground level such as basements or river works can be used to position static plant such as generators, compressors and pumps. This is a useful and often necessary method of reducing noise from plant that is required to operate continually day and night. Mechanical plant operating in confined spaces should be adequately ventilated, to allow for fume dispersal and to provide cooling air. Safety issues should be taken into account.

Earth bunds can be built to provide screening for major earth-moving operations and can be subsequently landscaped to become permanent features of the environment when works have been completed. The construction of a bund can be a noisy activity and should be planned carefully, e.g. it might be possible to construct the outer side of the bund first so that remaining work on the bund is shielded from NSPs. When earth barriers are not practicable due to lack of space, it might be possible for protective features ultimately needed as permanent noise screening to be built in during

the early stages of site work. Such an approach is particularly pertinent to major road construction works.

The effectiveness of a noise barrier will depend upon its length, effective height, position relative to the noise source and to the sensitive area, and the material from which it is constructed.

General Control of Vibration

Vibration can be more difficult to control than noise, and there are few generalizations which can be made about its control. It should be borne in mind that vibration can cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement.

Substitution

Where reasonably practicable, plant and/or methods of work causing significant levels of vibration at sensitive premises should be replaced by other less intrusive plant and/or methods of working.

Vibration Isolation of Plant at Source

Vibration from stationary plant (e.g. generators, pumps, compressors) can, in some instances, prove disturbing when located close to sensitive premises or when operating on connected structures. In these instances, equipment should be relocated or isolated using resilient mountings.

Controlling the Spread of Vibration

Where reasonably practicable, vibrating equipment should be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises. In some instances it might be possible to reduce transmitted vibration by cutting a structure to separate site work from sensitive premises.

It is essential to take account of safety and structural issues before carrying out any work of this nature.

The demolition of tall or large structures, especially if explosives are used, can give rise to impulsive vibrations and air overpressure when the felled structures hit the ground.

Vibration Control Targets

All reasonably practicable means should be employed to ensure the protection of local communities and of people on construction sites, from detrimental effects of the vibration generated by construction operations. The means employed should be determined by local circumstances and can include vibration reduction measures for individual items or plant and machinery, the fixing of hours of work, the setting of noise or vibration limits or any other appropriate measures.

Those seeking to determine suitable vibration limits for construction operations should be aware of the particular noise problem that can occur when such operations take place in existing buildings that are either occupied or contiguous with occupied buildings. Vibration introduced directly into the structure by equipment such as breakers, hammers and drills might attenuate only slowly as it is transmitted through the structure and might therefore produce unacceptable levels of noise in rooms remote from the source. In particularly sensitive situations it might be necessary to use alternative techniques and equipment.

Selection of Plant

The characteristics of vibration emissions from each item of plant, and their collective effect, should be assessed during the selection process for the acquisition of plant. Where practicable, plant should be selected which will have the least impact in terms of vibration.

Deployment of Plant

The movement of plant on and off the site should be restricted as far as practicable to within the agreed working hours for the site.

Operatives

Operatives should be familiar with the relevant conditions of the planning permission, details of which should be available for inspection on site at all times. The site should be operated in accordance with these conditions at all times and where practical difficulties arise discussion should be sought with the relevant authority as soon as these become apparent.

Supervision and Maintenance

It is likely that vibration will be an important factor in any opencast pit or quarry plan and/or environmental management, which might also involve monitoring of site performance or more detailed audits carried out by site staff or other appropriate parties. Records should be kept of any complaints received or other breaches of the controls or planning conditions relevant to vibration, in order to assist effective site management.

Site supervision and maintenance are essential in ensuring that throughout its life, operations are carried out as they were intended. Plant and machinery (including measurement equipment) should be maintained in good working order and used in accordance with the manufacturer's instructions. Special attention should be paid to any aspects which might affect the vibration likely to arise.

Transport Routing

Measures should be put in place to ensure that where it is intended that both on-site and off-site lorry traffic should follow a particular route, sufficient information is provided to all drivers and other relevant staff to ensure that they are aware of their responsibilities.

This can be provided by on-site signage or through other information handed to drivers.

Monitoring

In order to ensure optimum control of vibration, monitoring should be regarded as an essential operation. In addition to vibration monitoring, static tell-tale measurements can also be useful. Precision tell-tales are capable of registering longer term trends and can provide early warning of impending structural problems. Failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access.

Where site activities other than pile driving can affect existing structures, a thorough engineering appraisal of the situation should be made at the planning stage.

Methods of Measurement

General

The method selected to characterize building vibration will depend upon the purpose of the measurement and the way in which the results are intended to be used. Although a measurement technique which records unfiltered time histories allows any desired value to be extracted at a later stage, it might not be strictly necessary for the purpose of routine monitoring.

Positions

The number of measurement positions will depend upon the size and complexity of the building. When the purpose is to assess the possibility of structural damage, the preferred primary position is in the lowest storey of the building, either on the foundation of the outer wall, in the outer wall, or in recesses in the outer wall. For buildings having no basement, the point of measurement should be not more than 0.5 m above ground level. For buildings with more than one storey, the vibration might be amplified within the building. In the case of horizontal vibration, such amplification might be in proportion to the height of the building, whereas vertical vibration tends to increase away from walls, towards the mid-point of suspended floors.

It might therefore be necessary to carry out measurements (which should be simultaneous if a transfer function is required) at several positions to record maximum vibration magnitudes. When the building is higher than four floors (approximately 12 m) additional measuring points should be added every four floors and at the top of the building. When the building is more than 10 m long, the measuring positions should be selected at a horizontal spacing not exceeding 10 m. Measurements should be made on the side of the building facing the source.

When the purpose is to evaluate human exposure to vibration in the building, or to assess the effect of vibration on sensitive equipment within the building, measurements should be taken on the structural surface supporting the human body or the sensitive equipment.

When ground vibration sources are being considered, it is usual to orientate the transducers with respect to the radial direction, defined as the line joining the source to the transducer.

When studying structural response to ground vibration, it is more usual to orientate transducers with respect to the major and minor axes of the building structure.

If it is not possible to make measurements at the foundation, transducers should be well coupled to the ground.

Parameter to Measure

With an impulsive source of vibration, it is recommended to measure the peak value attained from the beginning to the end of a drive. It is also recommended to measure in terms of PPV if the risk of damage to the building is the primary concern, and there is also an interest in human reaction. If the concern is purely for human tolerance, then weighted acceleration is the preferred parameter. In the case of sensitive equipment, it is necessary to check the environmental vibration limit data supplied by the manufacturer and select accordingly.

A survey of the sensitivity of the neighbourhood to vibration is desirable.

Record Sheets

An important aspect of monitoring vibrations is the preparation and maintenance of records of salient details of the site observations. The format should be determined according to the circumstances appropriate to each investigation.

Monitoring of Local Weather Conditions

It will be the duty of our Site Manager to monitor the weather conditions, with works carefully planned taking into account weather conditions. Should adverse weather conditions be encountered, the works generating dust & mud will be suspended until conditions improve.

Surface water drainage and pollution prevention control

The appropriate surface water drainage and pollution prevention measures set out below will be implemented to ensure the surface water flows are retained on site during construction and measures are taken to prevent siltation and pollutants from the site entering into any receiving ground water and/or surface water and watercourses.

The prevention of surface water and groundwater pollution from construction sites is one of the biggest issues facing construction companies. Effective surface water drainage systems are becoming increasingly vital and can help construction companies better manage their projects, while avoiding fines and damage to the environment.

Water pollution can come from any number of different sources, including spills or leaks from oil or chemical containers, run-off containing salt, silt and soil, fuel spills and runoff that contains concrete and grout. Excavations on a construction site can also disturb existing soil contamination.

Site Clearance

Strip vegetation and topsoil in sequence, clearing only the areas where you need to work. Large areas of cleared vegetation will increase the risk of run-off causing pollution. Do not dispose of removed vegetation in watercourses and prevent debris from vegetation removal operations from falling into the water. This can be done by removing vegetation from behind the bank and pulling it away from the water. Vegetation removal is likely to destabilise the banks and/or bed of the watercourse or make them more vulnerable to erosion. Removal of vegetation can also alter flow patterns and induce or accelerate bank or bed erosion. It is vital to take measures to ensure the stability of the bank, particularly where there is a risk of raised water levels (high flows) until the vegetation is re-established. Biodegradable textiles can be used to protect areas of bare soil. Do not strip soil up to the edges of any watercourse, stream or drainage ditch because loose soil can be washed into the watercourse. This can silt-up the riverbed and harm wildlife. You can be liable for causing pollution even if the pollution was only caused by your indirect actions.

By minimising the amount of exposed ground and stockpiles of soil on site, this will reduce the amount of silty water that we will have to deal with.

Works will be phased to ensure that mud from vehicles or roads or surface water run-off from areas under construction do not enter surface water drainage of areas already completed.

As this project will have open trenches, work will be planned so that the length of trench needed at any one time is kept to a minimum. Open trenches will produce silty water.

Pollution Prevention

Contaminated water can arise from a number of sources including:

- direct disturbance of the river bed or bank;
- de-watering of excavations;
- run-off from exposed ground and material stockpiles;
- run-off from roads and haul routes and river crossings;
- plant washings;
- fuel and chemical storage/refuelling areas;
- leaking/vandalised equipment.

The risk of water becoming polluted in the first place should be minimised. All sources of pollution should be identified at the planning stage and the following mitigation measures should be put in place:

- DIVERT clean surface water away from exposed soils. This can significantly reduce the volume of water contaminated with sediment on site thus reducing the risk of pollution and the costs associated with treating contaminated water before discharge.
- MINIMISE erosion of exposed soils.
- PREVENT contaminated water from entering watercourses untreated.

Control Measures

The selection of control measures will depend on how effective they will be on a site-by-site basis. The effectiveness of control measures will depend on weather, site characteristics and construction activities. It is important that the selected control measures are inspected regularly, particularly after rainfall to assess:

- Effectiveness;
- Maintenance or replacement with alternative measures.
- Diversion drains - Such diversion can be implemented on the upstream perimeter of the site or immediately upstream of areas of exposed soil on the site (e.g. excavations, embankments and stockpiles). Line drains with a non-erodible material such as turf/geotextiles.
- Bunds - These can be placed around exposed soils such as excavations/material stockpiles. This will prevent clean water entering the area and dirty water from leaving the area. Bunds should be made of non-erodible material such as straw bales/geotextiles.

- During the construction phase the use of filter strips, swales and cut off ditches, combined with settlement ponds or settlement tanks can effectively control silty runoff and protect nearby watercourses. These must be designed to cope with the volume of runoff that can be expected from the site.
- A silt fence comprises a geotextile filter fabric, straw bales or a combination of the two installed in the path of sheet flow run off to filter out heavy sediments. A silt fence will remove heavy settleable solids but is not effective at reducing turbidity (fine solids in suspension).

Silt fences are useful for:

1. Along the edge of the river Irwell.
2. Below the toe of a cleared slope.
3. Around temporary stockpile areas.
4. Across swales with catchments less than 0.5 ha.

The silt fence detains sediments laden water, promoting sedimentation behind the fence. Posts support the fabric, the base of which should be well buried in the ground. Commercially available products permit easy installation and use; the correct method of installation should be ascertained from the supplier. A selection of a filter fabric is dependant on soil conditions at the construction site, the filter fabric should retain the soil yet have openings large enough to permit drainage and avoid clogging. Accumulated sediments need to be cleared away regularly (commercially available fences have a printed indicator line for maximum sediment Level), and the fence should be replaced if it rips, sags or is pulled out of the ground.

Straw bales can also be used to filter out heavy sediments. During wet weather bales deteriorate rapidly and require frequent replacement, but they are a cost effective temporary measure. If straw bales are merely placed on the ground without proper anchoring and trenching, they will provide only minimal erosion control.

Odour Impacts

The magnitude of odour impact depends on a number of factors and the potential for complaints varies due to the subjective nature of odour perception. The **FIDOL** acronym (also stated as **FIDOR** in Environment Agency (EA) guidance²) is a useful reminder of the factors that will determine the degree of odour pollution. These are described by the IAQM3 as follows:

- **Frequency** - How often an individual is exposed to odour;
- **Intensity** - The individual's perception of the strength of the odour;
- **Duration** - The overall duration that individuals are exposed to an odour over time;
- **Odour unpleasantness** - Odour unpleasantness describes the character of an odour as it relates to the 'hedonic tone' (which may be pleasant, neutral or unpleasant) at a given odour concentration/ intensity. This can be measured in the laboratory as the hedonic tone, and when measured by the standard method and expressed on a standard nine-point scale it is termed the hedonic score; and,

- **Location** - The type of land use and nature of human activities in the vicinity of an odour source. Tolerance and expectation of the receptor. The 'Location' factor can be considered to encompass the receptor characteristics, receptor sensitivity, and socio-economic factors.

The **FIDOL** factors can be further considered in relation to the potential for an odour emission to cause a nuisance:

- The rate of emission of the compound(s);
- The duration and frequency of emissions;
- The time of the day that this emission occurs;
- The prevailing meteorology;
- The sensitivity of receptors to the emission i.e. whether the odorous compound is more likely to cause nuisance, such as the sick or elderly, who may be more sensitive;
- The odour detection capacity of individuals to the various compound(s); and,
- The individual perception of the odour (i.e. whether the odour is regarded as unpleasant). This is greatly subjective and may vary significantly from individual to individual. For example, some individuals may consider some odours as pleasant, such as petrol, paint and creosote.

If necessary, olfactory monitoring for odour nuisance will be undertaken at the site boundary downwind of the excavation area during all excavation works. Odour monitoring will be carried out at these locations no less than three times a day during active site works.

At each monitoring event, the odour level will be subjectively classified as none, slight, moderate, or high, where:

- a slight odour level is detectable but not particularly noticeable,
- a moderate odour level is noticeable but not offensive, and
- a high odour level is offensive.

Mitigation

At all times during the excavation works, Best Practicable Means shall be employed to minimise dust, odour and VOC generation and their emission off site.

If dust or VOC concentrations in air exceed the long-term trigger levels in the vicinity of the excavation area, but are below the long-term trigger levels at the site boundary, then respirator protection will be required for all site personnel working in the excavation area.

Respiratory protection that conforms to the European Product Directive (CE) shall be readily available for personnel exposed to odours. Twin cartridge respirators, that conform to EN140, fitted with class A1 filters cartridges, which conform to EN141 (organic gases and vapours), shall be used. If highly odorous material is encountered on site then masks with Class A2 filters shall be used.

In addition, one or more of the following corrective actions to mitigate against the generation of air-borne dust or volatile organic contamination will immediately commence:

- Mist and water spraying to eliminate dust and/or reduce generation of volatile compounds.
- Reduction of the exposed active excavation area by backfilling or covering to reduce the generation of volatile compounds.

If dust or VOC concentrations in air exceed the long-term trigger levels at the site boundary then excavation activities will be stopped immediately and one or more of the above corrective actions will commence. Work will not begin again until the air quality at the site boundary has returned to an acceptable level and only after all reasonable actions have been taken to prevent the air quality at the site boundary from again declining to an unacceptable level.

References

The Control of Dust and Emissions during Construction and Demolition – July 2014.

BSI British Standards – Code of practice for noise and vibration control on construction and open sites Part 1: Noise BS 5228-1: 2009.

BSI British Standards – Code of practice for noise and vibration control on construction and open sites Part 2: Vibration BS 5228-2: 2009.

Environment Agency (EA) guidance 2.

Institute of Air Quality Management (IAQM) guidance.