



Regulations for Management of Environmental Nuisance from Construction Activities

December 2008

Revision 01

Table of Contents

PART 1	2
1.1 REGULATION OBJECTIVES.....	2
1.2 REGULATION CONTEXT.....	2
1.3 REGULATION DEFINITIONS.....	2
1.4 REGULATION ADMINISTRATION.....	3
1.5 REGULATION APPLICATION.....	4
1.6 REGULATION ENFORCEMENT.....	4
PART 2	6
2.1 GENERAL ENVIRONMENTAL MANAGEMENT REQUIREMENTS.....	6
2.1.1 <i>Pro-Active Approaches</i>	6
2.1.2 <i>Reactive Approaches</i>	7
2.2 SPECIFIC MANAGEMENT REQUIREMENTS – DUST.....	7
2.2.1 <i>Dust</i>	7
2.2.2 <i>Dust Sources</i>	7
2.2.3 <i>Dust Nuisances</i>	8
2.2.4 <i>Criteria</i>	8
2.2.5 <i>Management Techniques</i>	8
2.3 SPECIFIC MANAGEMENT REQUIREMENTS – ODOUR.....	9
2.3.1 <i>Odour</i>	9
2.3.2 <i>Odour Sources</i>	9
2.3.3 <i>Odour Nuisances</i>	9
2.3.4 <i>Criteria</i>	10
2.3.5 <i>Management Techniques</i>	10
2.4 SPECIFIC MANAGEMENT REQUIREMENTS – NOISE.....	11
2.4.1 <i>Noise</i>	11
2.4.2 <i>Noise Sources</i>	11
2.4.3 <i>Noise Nuisances</i>	11
2.4.4 <i>Criteria</i>	11
2.4.5 <i>Management Techniques</i>	12
2.5 SPECIFIC MANAGEMENT REQUIREMENTS – VIBRATION.....	13
2.5.1 <i>Vibration</i>	13
2.5.2 <i>Vibration Sources</i>	14
2.5.3 <i>Vibration Nuisances</i>	14
2.5.4 <i>Criteria</i>	14
2.5.5 <i>Management Techniques</i>	16
2.6 SPECIFIC MANAGEMENT REQUIREMENTS – LIGHT.....	17
2.6.1 <i>Light</i>	17
2.6.2 <i>Light Sources</i>	17
2.6.3 <i>Light Nuisances</i>	17
2.6.4 <i>Criteria</i>	17
2.6.5 <i>Management Techniques</i>	17
2.7 SPECIFIC MANAGEMENT REQUIREMENTS – WATER POLLUTION.....	18
2.7.1 <i>Water Pollution</i>	18
2.7.2 <i>Water Pollution Sources</i>	18
2.7.3 <i>Water Pollution Nuisances</i>	18
2.7.4 <i>Criteria</i>	18
2.7.5 <i>Management Techniques</i>	20

Part 1

1.1 Regulation Objectives

The objective of this regulation is to direct the environmental management of construction sites to eliminate or reduce the incidence of environmental nuisance to residential communities.

1.2 Regulation Context

This regulation is complementary to the following regulations:

- Ports, Customs and Free Zone Corporation (PCFC), Environmental Control Rules and Requirements, Fifth Edition 2008;
- PCFC Environmental Guidelines, Second Edition 2008;
- PCFC Health and Safety Regulations and Standards, Third Edition 2006;
- UAE Federal Environmental Agency (FEA) Federal Law No. 24 of 1999 for the Protection and Development of the Environment, UAE Official Gazette, Issue No. 340, October 1999;
- Jebel Ali Free Zone (JAFZA) Planning & Construction Planning Regulations, Third Edition 2003; and
- Nakheel Environmental Management Requirements for Construction Contractors (EMR 2008).

1.3 Regulation Definitions

CEMP

Construction Environmental Management Plan, a document that states the environmental protection practices, resources and sequence of activities necessary to comply with all the requirements of relevant environmental legislation, conditions of any applicable license, approval or permit.

Construction

The building, altering, improving, repair or demolition of any structure or infrastructure, or the dredging and/or reclamation of a water body, beach or land mass.

Corrective Action Request

A requirement to improve environmental compliance following an audit or inspection of environmental systems or site work.

Corrective Action Statement

Prepared in response to a Corrective Action Request, a Corrective Action Statement provides information about how the issue was mitigated or remedied, and proposes a method for ensuring that the issue will not occur again.

EHS

Ports, Customs and Freezone Corporation's Trakhees Department, Environment, Health and Safety Division, who are the authority for this Regulation.

EIA

Environmental Impact Assessment, which is conducted during the planning stage of a proposed development. It lists mitigation measures to mitigate environmental impacts.

Environment

- a) Ecosystems, people and communities; and
- b) all natural and physical resources; and

- c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and
- d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

Environmental Nuisance

A use of property or course of conduct that interferes with the legal rights of others by causing damage, annoyance, or inconvenience.

Types of Environmental Nuisance

Nuisance Dust

Minute solid particles found in the atmosphere from various sources including soil lifted by wind and pollution causing damage, annoyance or inconvenience to people or property.

Nuisance Odour

Is a chemical dissolved in air, generally at a very low concentration, which can be perceived by the sense of smell and cause annoyance or inconvenience to people or damage to human health.

Nuisance Noise

Sounds or sound frequencies causing damage, annoyance or inconvenience to people or property.

Nuisance Vibration

Movements in the ground or from sound pressure causing damage, annoyance or inconvenience to people or property.

Nuisance Lighting

Light that is used at night which causes annoyance or inconvenience to people.

Nuisance Water Pollution

The introduction of any substance into the water environment which causes damage to human health or impedes water activities such as swimming or fishing, or impairs visual water quality.

NOC

No Objection Certificate issued by Ports, Customs and Freezone Corporation's Trakhees or other relevant authority as an approval.

Stop Work Notice

Order issued by an authority to cease construction activities on a work site or part of a work site until an issue is resolved.

1.4 Regulation Administration

This Regulation will be administered by the administering authority, Ports, Customs and Freezone Corporation's Trakhees Environment, Health and Safety Division (EHS).

The role of EHS in relation to the administration of this Regulation will include the following:

- Making and publication of this Regulation;
- Review and re-publication of this Regulation as required from time to time;
- Liaising with contractors and developers to ensure that the intent of this Regulation is understood and implemented;
- Review and approval of nominated CEMPs;

- Issuing relevant NOCs;
- Monitoring contractor and developer performance;
- Investigating complaints, including entering sites and interviewing people both on- and off-site;
- Requiring improvement to contractor and/or developer management systems and practices as deemed necessary by EHS; and
- Enforcing requirements, including penalty provisions at the discretion of EHS.

1.5 Regulation Application

This regulation will apply to all construction sites under the jurisdiction of Ports, Customs and Freezone Corporation's Trakhees Environment, Health and Safety Division (EHS). All construction contractors working on these sites must meet the requirements of this regulation.

This regulation specifically applies to the management of environmental nuisance to residential communities due to construction related activities. For comprehensive regulatory advice regarding environmental management relating to construction refer to the documents listed in Section 1.2.

1.6 Regulation Enforcement

This regulation will be enforced by EHS. In enforcing this regulation, EHS has the authority to:

- Enter construction sites and offices under their jurisdiction without notice;
- Conduct inspections and investigations of construction sites;
- Request and review CEMPs and issue Corrective Action Requests;
- Request documents required under this Regulation and related regulations, including monitoring records and complaints registers;
- Request identification of personnel:
- Question contractor's personnel to ensure that they are appropriately staffed to implement CEMP requirements;
- Question contractor's personnel to ensure that they are appropriately trained in the requirements of this Regulation;
- Withdraw NOCs;
- Withdraw building permits;
- Issue on the spot fines;
- Issue stop work notices; and
- Take legal action.

In the process of enforcing this Regulation, EHS will adopt the following inspection protocol:

Stage 1: Initial Site Inspection

An initial site inspection will involve a contractor's site (or vessel) walkover by EHS, who will review environmental housekeeping practices with reference to this regulation. It is preferable (but not compulsory) for the contractor's representative to be present during this inspection. EHS will highlight any identified sources of environmental nuisance to the contractor during the inspection.

Within 24 to 48 hours after the completion of the initial site inspection, EHS will issue an Initial Site Inspection (ISI) Report addressed to the Project Manager. The report will highlight the identified sources of environmental nuisance, with comments regarding the corrective action that is required within a specified timeframe, the Required Action Date. It is then the contractor's responsibility to undertake all required corrective action to comply with the environmental management requirements by the Required Action Date, as specified in the ISI Report.

Stage 2: First Follow-Up Inspection

A First Follow-up Inspection (FFUI) will be conducted by EHS in the presence of the contractor's representative. The locations of all previously-identified sources of environmental nuisance are re-visited during the FFUI, at which time EHS will confirm whether the corrective action taken by the contractor is adequate or inadequate.

Should the corrective action taken by the contractor be found to be adequate during the FFUI, EHS will advise the contractor's representative verbally during the site visit and follow-up with written confirmation (by email) shortly thereafter.

Should the corrective action taken by the contractor be found to be inadequate during the FFUI, EHS will advise the contractor's representative verbally during the site visit and subsequently in writing, in the form of a First Follow-Up Inspection (FFUI) Report, addressed to the Project Manager. The report will highlight any outstanding sources of environmental nuisance, with comments regarding the corrective action that is still required to be taken by the respective contractor within a revised timeframe. It is then the contractor's responsibility to undertake the required corrective action to comply with the environmental management requirements by the revised timeframe (First Follow-Up Action Date) specified in the FFUI Report. All outstanding non-compliance issues must be rectified by the agreed First Follow-Up Action Date. A Second Follow-Up Inspection shall be scheduled with the contractor's representative at the conclusion of the first follow-up inspection to confirm that all necessary corrective action has been completed.

Stage 3: Second Follow-Up Inspection

All outstanding NCIs will be inspected during the Second Follow-Up Inspection (SFUI), at which time EHS will assess whether the corrective action taken by the contractor is adequate or inadequate. Should the corrective action taken by the contractor be found to be adequate during the SFUI, EHS will advise the contractor's representative verbally during the site visit and follow-up with written confirmation (by email) shortly thereafter.

Should the corrective action taken by the contractor again be found to be inadequate, EHS will advise the contractor's representative verbally during the site visit and a penalty will be issued to the contractor for continued non-compliance with the Regulation.

Part 2

2.1 General Environmental Management Requirements

2.1.1 Pro-Active Approaches

Consistent with the type and scale of a project, construction work methods, hours of work, project duration, site location and proximity to sensitive neighbours, developers and contractors are required to adopt a pro-active approach to environmental planning and environmental management to avoid any occurrence of environmental nuisance. A pro-active approach includes all of the following:

Planning	At the development (master) planning stage, developers must identify the potential for proposed construction to cause nuisance to nearby occupants and wherever practicable, eliminate, or at least minimize, this potential through appropriate design or scheduling measures. Such measures include, allocating buffer open space and/or positioning projects with shorter construction times in the locations adjacent to the occupied areas.
EIA	For those developments with the potential for nuisance, developers must ensure that the development EIA identifies environmental nuisance mitigation measures and requires that these be described by contractors in their CEMPs.
Implementation of EHS Conditions of Approval	In addition to those mitigation measures already identified in the EIA, EHS may require additional measures that will be set out in the EIA Conditions of Approval. Where relevant these additional measures must also be implemented by contractors through their CEMPs.
Tendering	In the tendering stage, contractors must inform all of their sub-contractors of their responsibilities with respect to environmental management so they can make the necessary provisions to minimize the risk of environmental nuisance.
CEMP	The contractor must prepare a CEMP and submit it to the relevant business unit for approval. The CEMP must describe the measures that will be implemented to minimise the potential nuisance. An example of a CEMP template can be found in Nakheel's Environmental Management Requirements for Construction Contractors (EMR 2008).
Staffing and training	Contractors must adequately staff their project with suitably trained personnel to ensure that the mitigation measures described in the CEMP are implemented to a satisfactory standard.
Community Consultation	For projects with a significant potential to cause environmental nuisance, developers and/or contractors may be required by EHS to carry out a community consultation program with potentially affected communities, commencing during the design stage and carrying on through construction and commissioning. This requirement may be directed by EHS, as part of the Conditions of Approval of an EIA or as part of an NOC or building permit, or other time at the discretion of EHS. Voluntary consultation programs by developers and/or contractors are encouraged, in order for best project planning, budgeting and staff allocation.

2.1.2 Reactive Approaches

In the event of the incidence of environmental nuisance, the contractor must implement appropriate systems and actions to eliminate the nuisance. A reactive approach may include one or all of the following:

Complaints Management Developers and/or contractors must have an effective method for recording, responding to, closing out and reporting on complaints that arise from their activities, or those of their sub-contractors or other associated parties. This method must be functional 24 hours per day, 7 days per week for the duration of the work. Such methods are to be described in the contractor's CEMP. The Complaints Management System is subject to audit by EHS. Guidance on methods for complaints management, including a template complaints register, can be found in Nakheel's Environmental Management Requirements for Construction Contractors (EMR 2008).

Corrective Action A Corrective Action Statement is to be prepared describing the corrective actions taken following receipt of complaint/s and/or incidence of environmental nuisance. The Corrective Action Statement must summarize the details of the complaint or incident, including the complainant/s, nature of the nuisance complaint, source of the complaint, and duration of the nuisance, and is then to describe both the short-term actions taken to respond to the complaint, together with the management actions taken to prevent recurrences of similar complaints. Such actions may include:

- Process review;
- Procedures review;
- Equipment review;
- CEMP review;
- Training; and
- Letter box drops or other more formal community consultation.

Copies of Corrective Action Statements are to be retained by the contractor and provided to EHS as requested. Also, periodic reports on complaints received and actions taken may be required by EHS.

Additional guidance on corrective action can be found in Nakheel's Environmental Management Requirements for Construction Contractors (EMR 2008).

2.2 Specific Management Requirements – Dust

2.2.1 Dust

Construction works must be undertaken in such a way that air quality is not unacceptably impacted and environmental nuisance does not result.

Dust control is particularly important when working near residents or labour accommodation areas. Dubai is subject to dust storms and winds which create dusty conditions. However, outside of these events, contractors must meet the following requirements for dust control.

2.2.2 Dust Sources

Dust generation is associated with construction activities that involve uncovered fine, loose materials, disturbing ground sediments during clearing, cutting, driving and earth moving, demolition of existing structures, concrete cutting or grinding, blasting, and concrete batching plants.

2.2.3 Dust Nuisances

The nuisance effects of dust can be subjective and are difficult to measure in any quantitative or objective way. They are also very dependent on the sensitivity of the receiving environment.

Many forms of dust are considered to be biologically inert, and hence the primary effects on people relate to our sense of aesthetics. There can also be minor health effects, such as eye irritation when the dust is airborne.

Some nuisance dust may have the potential to cause other types of health effects because of the presence of specific biologically active materials. For instance, some mineral dusts contain quantities of quartz, which can cause the lung disease known as silicosis when persistent at high concentrations. Other dusts may contain significant amounts of toxic metals such as mercury or lead.

Soiling and Amenity Value Effects

The most common causes of dust complaints include the visual soiling of clean surfaces, such as cars, window ledges, and household washing. Dust deposits inside the house are often the impact of greatest concern in residential areas, followed by soiling of the outside of the house and the effects on paintwork.

Dusty conditions can also affect people's ability to enjoy their outdoor environment, making activities such as barbeques and sports unpleasant and unappealing.

For most people, a major effect of a dust nuisance problem is annoyance at the increased requirement for cleaning. However, this can also involve a financial aspect, through the increased use of cleaning materials, water, and possibly paid labour.

Visibility

Visibility effects are largely a matter of aesthetics. Loss of visibility is also a safety concern under extreme conditions, especially for road traffic or aircraft.

Effects on Plants

Dust deposits can have significant effects on plant life, though mainly at high dust loadings. This can include:

- Reduced photosynthesis due to reduced light penetration through the leaves. This can cause reduced growth rates and plant vigour.
- Dust deposits can act as a medium for the growth of fungal diseases.
- Reduced effectiveness of pesticide sprays due to reduced penetration.

2.2.4 Criteria

No observable dust beyond site boundaries.

Refer to Table 2-A: Ambient Air Quality Standards in PCFC's Environmental Control Rules and Requirements, Fifth Edition 2008, for ambient air quality standards for total suspended solids and particulate matter.

2.2.5 Management Techniques

The contractor must adopt the following measures (as appropriate) to prevent the generation of dust:

- Prepare and implement a dust management plan.
- Use water sprays on temporary stockpiles.
- Cover loaded trucks with tarpaulins.
- Specify materials to be stored on site and their exposure to wind and the weather elements. Detail methods for preventing loose materials from becoming airborne.

- Perimeter fencing must be designed to minimise the impact of dust on the public and adjacent areas.
- Equipment powered by internal combustion engines must be properly maintained and regularly serviced to prevent the discharge of excessive pollutants, including smoke and/or toxic fumes or odours, and must meet acceptable noise levels.
- Exhausts and ductwork from equipment must be located away from air intakes, windows, enclosed areas and public areas.
- Materials can only be cut in designated areas set away from boundaries and public areas, with adequate dust (and noise) suppression. Where cutting needs to occur in situ, localised dust suppression measures must be used.
- Plan earthworks, so that the ground area that is disturbed is minimised. Concentrate activities in one area only where possible, rather than spreading out across a work site.
- Avoid non-critical earthworks on windy days.
- Drivers must obey site speed limits, in particular on unsealed roads.
- All loads of sand, aggregate or dry waste being delivered to or from the site must be covered, to prevent dust. Trucks must not be filled higher than 0.3 metres from the top of the tray walls.
- Locate stockpiled material in sheltered areas and limit the height and slope of the stockpile.
- Keep the ground surfaces damp (not wet) through irrigation by tanker (water truck) or similar where the ground surface is disturbed for an extended period, particularly on windy days. Watering of roads and surfaces should be done in a way that there is no water run-off. Use treated sewage effluent or groundwater from dewatering instead of potable water where possible.
- Approved chemical “stabilisers” that are mixed with the water used for spraying can reduce the frequency that dust suppression watering is required.
- Regularly clean entry / exit roads and major traffic thoroughfares on site.
- Install site fences with gauze to minimise wind erosion effects.
- Establish landscaping quickly once works are completed.
- Painting and abrasive blasting must be carried out within enclosed and ventilated areas to minimize discharge of volatile substances, fumes and dust/grit.

2.3 Specific Management Requirements – Odour

2.3.1 Odour

Odorous air pollutants are often judged important primarily for their nuisance value and the number of complaints they generate. Odours are normally the result of inorganic gaseous emissions (e.g. hydrogen sulphide or ammonia) or organic vapours, often in quite small concentrations, which are released or escape into the local environment.

2.3.2 Odour Sources

The generation of odour is associated with the management of construction sites and the storage of odorous materials and processes. Potentially odorous materials and processes include poor management of sewage/ septic tanks, poor management of hygiene facilities including bathrooms and kitchens, storage and usage of fertilizers and compost, storage and usage of hazardous or volatile materials and fuels, excavation of contaminated material, poor maintenance of vehicle/plant emission systems, poor waste management practices.

2.3.3 Odour Nuisances

Different odours have different 'threshold' levels, the level at which they can be detected. This can make dealing with a mixture of odours quite a complex operation, since odours can interact with each other thus masking or indeed modifying individual odours.

Specific odours can represent a health risk. A prolonged bad odour will be considered uncomfortable and will often lead to complaints being made. Unpleasant odours can affect the success of local businesses and prevent people from residing in nearby premises.

Effects that have been reported by people include nausea, headaches, retching, difficulty breathing, frustration, annoyance, depression, stress, tearfulness, and reduced appetite.

2.3.4 Criteria

Odour is subjective (what is offensive to one person may be acceptable to another) and factors that are investigated when considering the existence of a statutory nuisance are:

- Type of odour;
- Wind strength and direction;
- Duration of odour;
- Time of day; and
- How often it occurs.

The odour needs to be considered to be a nuisance from an EHS Officer's professional opinion. In addition, the source needs to be beyond reasonable doubt as the cause of the odour. To be a nuisance the odour needs to be witnessed as materially affecting the comfort or enjoyment of the complainant's property or the public at large.

Table 2-A: Ambient Air Quality Standards in PCFC's Environmental Control Rules and Requirements, Fifth Edition 2008, standards for specific parameters that can be related to odour.

2.3.5 Management Techniques

Controlling odours is an important consideration for protecting the environment and our community amenity. There are several methods of dealing with odorous gases and each method should be considered based on its inherent advantages and disadvantages for the specific treatment system required. The contractor must adopt the following measures (as appropriate) to manage odour due to construction activities:

Site Planning

Site planning is the key consideration for all odour sources, particularly those that are diffuse and difficult to capture and control, such as waste management activities. The following issues should be considered:

- The proposed odour generating activity on the site and the land use of the surrounding land.
- The location of activities within the site and their orientation in relation to prevailing winds and sensitivity of the downwind receptors.
- The presence of buffer distances to the site boundary and to sensitive land uses.
- The need for screening, such as by earth bunds, shelter belts or natural topography.

General Management

- Ensure odour sources are adequately enclosed and that equipment is accessible for cleaning.
- Have a regime of good housekeeping of hygiene facilities, waste management areas, materials storage areas.
- Incorporate and monitor process operating conditions to minimise odour, and monitor parameters that are important for good performance.
- Implement a preventative maintenance programme to minimise equipment failure and unplanned downtime.
- Educate staff about the importance of regulatory compliance and good management for achieving compliance.

- Conduct odorous operations during weather conditions that are most favourable for dispersion where no other mitigation option is available (e.g. avoid early morning and evenings, consider wind direction in relation to sensitive areas, avoid hot humid weather).
- Remove waste from construction sites frequently to prevent odour generation.
- Locate sewage / septic tanks away from sensitive receivers.
- Pump out sewage / septic tanks on a regular basis.
- Store and ventilate fuels and hazardous materials appropriately.
- Undertake effective and rapid dewatering and ventilation of excavations with groundwater generating hydrogen sulphide and other odourous gases.
- Implement effective ventilation and management of compost heaps.
- Implement correct sighting and storage of fertilisers and administer fertilisers appropriately to landscaped areas – with community notification, as appropriate.
- Monitoring exhaust emissions and maintain equipment as required.

2.4 Specific Management Requirements – Noise

2.4.1 Noise

Community response to noise and vibration is subjective and variable. Noise and vibration that is considered acceptable by a neighbour one day may provoke complaints the next. Similarly, noise and vibration that may be tolerated by one neighbour may be a source of complaint for another.

2.4.2 Noise Sources

The generation of noise and vibration is associated with the use of assets and the carrying out of activities. Assets and activities include construction and maintenance, and the operation of fixed and mobile plant and equipment, transformers, utility compressors and pumps, and ventilation and air conditioning.

2.4.3 Noise Nuisances

Noise is measured on the decibel scale. Noise levels, referred to as decibels on the (A) scale (written as dB(A)) are a good indicator of people's response to noise.

Speech Interference

Noise interferes with speech. When the background noise level is 50dB(A), normal conversation can be easily carried with someone up to 1m away. Any more than that and problems will arise.

Sleep Interference

Noise can wake people and keep them awake if noise levels exceed 45dB(A) within a bedroom. Even if not actually woken, a person's sleep pattern can be disturbed, resulting in a reduced feeling of well-being the next day.

Decreased Work Performance

If noise levels exceed levels 55dB(A) – 60dB(A), our ability to concentrate and work efficiently and accurately reduces. Louder noise bursts can be more disruptive. Noise is more likely to reduce the accuracy of the work than reduce the total quantity of work done. Complex tasks are more likely to be impaired. Noise can also make instructions or warnings unclear, resulting in accidents.

2.4.4 Criteria

Section 6 of PCFC's Environmental Control Rules and Requirements, 5th Edition 2008, describes the control measures and performance testing techniques for complying with maximum allowable noise levels. Table 6: Noise Allowable Limits in Different Areas provides the day and night time noise levels which should not be exceeded. These limits are to be used as the basis for determining reasonable noise levels being generated from sites located within the nominated

areas. (The allowable limits should be assessed at the boundary fence line of the property generating the noise. They represent $L_{Aeq\ 15min}$ values.)

The following noise levels in Table 2.4.1 are typical predicted construction equipment noise levels and vibration levels at various distances. Contractors must only use plant which comply with these values.

Table 2.4.1: Predicted noise (sound pressure) levels from construction plant, dB(A)

Plant Description	Predicted Noise Levels (L_{A10}) at Various Distances					
	5m	10m	20m	40m	80m	160m
Air compressor (silenced)	76	70	64	58	52	46
Backhoe	82	76	70	64	58	52
Concrete leveller	93	87	81	75	69	63
Concrete pump	83	77	71	65	59	53
Concrete truck	87	81	75	69	63	57
Jackhammers	93	87	81	75	69	63
Pneumatic hand tools (general)	91	85	79	73	67	61
Pneumatic jacks	91	85	79	73	67	61
Rockbreaker	98	92	86	80	74	68
Truck (> 20tonne)	84	78	72	66	60	54
Welders	83	77	71	65	59	53

2.4.5 Management Techniques

The contractor must adopt the following measures (as appropriate) to manage noise due to construction activities:

- Prepare a Noise Management Plan as part of a CEMP.
- Carry out a site noise survey to identify the potentially most affected or sensitive receivers in the vicinity of the project.
- Carry out higher risk operations or activities during restricted hours.
- Change operation or work methods and equipment.
- Fit acoustic mitigation measures.
- Participate in a community consultation program and provide regular updates on the program.
- Manage community noise and vibration complaints.
- Route heavily loaded trucks away from residential streets, if possible. Select streets with the fewest homes, if no alternatives are available.
- Operate earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible.
- Schedule the use of high impact equipment (e.g. mechanical rockbreakers, jackhammers, pile drivers) during day time to minimise adverse affects.
- Schedule use of several high impact pieces of equipment so that they are used separately rather than simultaneously, wherever possible e.g. avoid breaking of pile caps with jackhammers at the same time as using pile drivers.
- Use equipment suitable for work in sensitive areas:
 - Low noise hammers on rockbreakers;
 - Insulated compressors and generators;

- Electrical rotary jackhammers;
- Rubber treads/tires instead of metal tracks;
- Insulated and baffled mobile plant engines;
- Power tools with induction motors;
- Hydraulic rock splitters;
- Rock saws and rock grinders;
- Electric motors instead of petrol/diesel; and
- Hand tools.
- Select low impact hire machinery.
- Arrange the worksite to take advantage of natural barriers and structures or temporary screening (e.g. unfinished buildings, hills, fences, work trucks, stockpiles) to break the line of sight between working equipment and sensitive receivers. Barriers become more effective the closer they are to the source. Remember to check for reflected noise from barriers – you may inadvertently transfer the problem to someone else.
- Use solid hoarding around fixed or long-term construction sites.
- Use portable screening barriers around high impact equipment/activities. Position the barrier so that the sound is directed into the enclosure not out the open end.
- Site higher impact activities (e.g. loading and unloading) at the greatest distance from sensitive receivers.
- Orient equipment to minimise noise e.g. face vents or exhaust discharges away from sensitive receivers.
- Turn off idling equipment and vehicles when practical.
- Restrict vehicle speeds on or near the work site.
- Discourage raised voices or radios/music at high volumes, particularly at the start of shift or out of hours.
- Dampen or line metal trays or bins, both fixed or truck mounted, and minimise the unloading height.
- Influence staff behaviour through awareness, induction and refresher training on procedures to minimise noise.
- Construct noise barriers, such as temporary walls or pile of excavated material, between noisy activities and noise receivers.
- Re-route truck traffic away from residential streets, if possible. Select streets with fewest homes, if no alternatives are available.
- Site equipment on the construction lot as far away from noise-sensitive areas as possible.
- Construct walled enclosures around especially noisy activities, or clusters of noisy equipment. For example, shields can be used around pavement breakers, vinyl curtains can be draped under elevated structures.

2.5 Specific Management Requirements – Vibration

2.5.1 Vibration

Vibration is a form of mechanical energy. It can be described as the oscillation of solid bodies which may cause damage or discomfort. Particles of the solid bodies may oscillate about their equilibrium position in all three perpendicular axes (x, y and z), usually referred to as transverse, longitudinal and vertical components of vibration. The oscillations may occur at various times per second, referred to as the frequency of the vibration, measured in hertz (Hz). Vibration may be classified as continuous, intermittent or transient (impulsive).

This regulation addresses vibration that is transmitted from a source through the ground (ground borne vibration) to the surrounding buildings and structures, which then vibrate in turn. The magnitude (amplitude) and frequency of the vibration in the building or structure determines its perception and extent as an environmental problem. Usually, only vibration at frequencies below 100Hz is of concern with respect to building damage.

2.5.2 Vibration Sources

Types of vibration commonly found on construction sites are listed in Table 2.5.1 below.

Table 2.5.1: Types of Vibration and the Common Sources

Continuous Vibration	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive Vibration	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period (daytime or night-time – see Note 1 to Table 2.5.2 below), e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent Vibration	Frequent activities that create more than 3 distinct vibration events in an assessment period (daytime or night-time – see Note 1 to Table 2.5.3 below) e.g. nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers.

2.5.3 Vibration Nuisances

Construction activities can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations which spread through the ground and diminish in strength with distance. Buildings founded on the soil in the vicinity of the construction site respond to these vibrations, with varying results ranging from no perceptible effects at the lowest levels, low rumbling sounds and detectable vibrations at moderate levels and slight damage at the highest levels. Ground vibrations from construction activities very rarely reach the levels that can damage structures, but can achieve the audible and detectable ranges in buildings very close to the site.

Humans are capable of detecting vibration levels at relatively low levels, and will typically find levels that are only marginally higher to be annoying. Vibration at these levels is considerably below those at which structural damage might occur. Damage in this case can be regarded as reducing the serviceability of the building or one of its components.

Materials respond differently to vibration. Some materials are good transmitters of vibration, whereas others are poor. Generally, the denser or harder the material, the better it will transmit vibration. The vibrations caused by excavating in rock will be felt further away than if excavating in soil. The harder the rock, the better the transmission.

All materials are vibrating on a microscopic level, called the material's natural or resonant frequency. Each material has its own unique frequency response characteristics. Resonance can occur in structures as a whole, not just the individual component materials. Resonance can occur in people too. There have been recorded cases of people suffering both acute and chronic irreparable damage due to low frequency vibration. Natural self protection is most probably the reason that people are so sensitive to low frequency vibration.

2.5.4 Criteria

Factors that affect the degree to which environmental vibration can become an issue and factors that are investigated when considering the existence of a statutory nuisance are:

- Type of source;

- Magnitude and frequency of the source vibration;
- Distance between the source and the receiver;
- Isolation of the source and/or receiver;
- Ground geology and surface material;
- Type of building or structure;
- Age and condition of building or structure;
- Construction method and building materials;
- Floor material; and
- Personal sensitivity.

The following values in Table 2.5.2 and Table 2.5.3 are to be used as preferred and maximum vibration levels.

Table 2.5.2: Preferred and Maximum Weighted RMS Values for Continuous and Impulsive Vibration Acceleration (m/s^2) 1-80Hz

Location	Assessment Period ¹	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous Vibration					
Critical areas ²	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools and other educational institutions, places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive Vibration					
Critical areas ²	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools and other educational institutions, places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

Notes:

- 1 Daytime is 7.00 am to 8.00 pm and night-time is 8.00 pm to 7.00 am;
- 2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this guideline, and other guidance documents (e.g. relevant standards) should be referred to (Source: BS 6472-1992).

Table 2.5.3: Acceptable Vibration Dose Values for Intermittent Vibration (m/s^{1.75})

Location	Daytime ¹		Night-time ¹	
	Preferred	Maximum	Preferred	Maximum
Critical areas ²	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools and other educational institutions, places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:

1. Daytime is 7.00 am to 8.00 pm and night-time is 8.00 pm to 7.00 am;
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this guideline, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992

2.5.5 Management Techniques

The Contractor must adopt the following measures (as appropriate) to manage vibration due to construction activities:

- Route heavily loaded trucks away from residential streets, if possible. Select streets with the fewest homes, if no alternatives are available.
- Remove potholes, refit loose manhole covers and ensure road surface is smooth.
- Operate earthmoving equipment on the construction lot as far away from vibration-sensitive sites as possible.
- Prepare a Vibration Management Plan as part of a Construction Environmental Management Plan.
- Undertake a dilapidation survey prior to commencing work, to benchmark any potential for structural damage due to ground borne vibration. Specialist consultancy advice may be required to establish a likely vibration “zone of influence”, based upon the site conditions and proposed equipment and work methods. This zone will define the extent of the survey (i.e. how many buildings need to be surveyed at what distance from the work site).
- Undertake vibration monitoring and reporting.
- Change operation or work methods and equipment.
- Schedule the use of high impact equipment (e.g. mechanical rockbreakers, jackhammers, pile drivers) during day time to minimise adverse affects.
- Schedule use of several high impact pieces of equipment so that they are used separately rather than simultaneously, wherever possible (e.g. avoid breaking of pile caps with jackhammers at the same time as using pile drivers).
- Excavate a buffer trench along the perimeter of large excavations before commencing the bulk excavation works at a fixed construction site. This trench will help to isolate neighbours from the ground borne vibration during the bulk works.
- Cut isolation trenches at the site boundary if demolishing concrete slabs that contact neighbouring foundations. This trench will help to isolate neighbours from the ground borne vibration.
- Influence staff behaviour through awareness, induction and refresher training on procedures to minimise vibration.

2.6 Specific Management Requirements – Light

2.6.1 Light

Construction sites must be established and managed in such a manner that light nuisance from safety and security lighting or vehicle lights does not adversely affect the occupancy and operation of residential or commercial premises.

2.6.2 Light Sources

Construction activities conducted at night are the common source of light as an environmental nuisance. Light could be used at construction interfaces, construction depots, site offices and security areas.

2.6.3 Light Nuisances

Intrusion of over bright or poorly directed lights onto neighbouring property, which affect the neighbours' right to enjoy their own property, is a common source of complaint.

The use of lights for construction during the hours of 6.00pm to 6.00am can potentially cause sleep disturbance to nearby residences. It is important that the impacts of construction lights are mitigated during these hours.

Inconsiderate or incorrectly set lighting can have other effects:

- It produces glare which occurs when the over brightness of a light source against a dark background interferes with a person's ability to view an area or object, i.e. glare can conceal rather than reveal.
- It can detract from the architectural appearance of a building and even hide complex or attractive features.
- It can impact on the ecology and wildlife of an area, and affect the behavioural patterns of mammals, birds, insects and fish.
- The wasting of light is a waste of the energy which powers the light and is therefore a waste of resources and money.

2.6.4 Criteria

In the case of light nuisance the investigating officer will take account of a range of factors including:

- Duration;
- Frequency;
- Material interference with use of property or personal comfort;
- The nature and character of the local environment;
- Whether the light is due to unreasonable behaviour or commonplace action;
- Sensitivity of the complainant (age, health, or occupation); and
- Number of households affected.

2.6.5 Management Techniques

Controlling light pollution is an important consideration for protecting the environment and our community amenity. The contractor must adopt the following measures (as appropriate) to prevent light nuisance:

- Arrange vehicle access and egress so that vehicle headlights are not directed into residential communities or properties. Use shielding where appropriate.
- Educate personnel regarding the appropriate use of light and the need to minimise disturbance to adjacent community areas.
- Do not fit or use unnecessary security / safety lighting.
- Do not use excessively bright lights. Assess the necessity of considerable powerful light bulbs and the area that they are being used.

- Do not leave lights on when they are not needed. Consider controlling lights with passive infra-red detectors, ensuring that they are correctly aligned and installed.
- Direct light towards the ground and away from reflective surfaces.
- Shield light fixtures in order to direct any rays from adjacent properties.
- Do not direct flood lighting into the night sky or onto adjacent residential property.
- Site offices using canopies must have recessed lights with diffusers, which do not extend below the surface of the canopy.
- Use flat lens "shoebox" or full cutoff design light fixtures.
- Do not use sag-lens or drop lens fixtures, which waste energy and produce unnecessary glare.
- Use fluorescent and metal halide lamps where security is a concern.
- Turn off all non-essential exterior lighting after business hours and/or when not in use.
- Install timers or sensor activated lights.
- Do not use mercury vapor lamps.

2.7 Specific Management Requirements – Water Pollution

2.7.1 Water Pollution

Construction sites must be established and operated in a manner such that there is no unauthorized discharge of fluids or materials to the marine environment or to any lake or other water body. Management of construction sites is of particular importance in areas adjacent to swimming beaches or waterfront residential communities.

2.7.2 Water Pollution Sources

The primary sources of water pollution are generally grouped into two categories based on their point of origin. Point-source pollution refers to contaminants that enter a waterway through a discrete "point source". Examples of this category include discharges from a dewatering activity or a drain, or foam from a dredging operation, or leaking underground tanks. The second primary category, non-point source pollution, refers to contamination that does not originate from a single discrete source. Non-point source pollution is often a cumulative effect of small amounts of contaminants gathered from a large area. Nutrient runoff from landscaped areas, waterborne litter, or hydrocarbons from a road surface are examples of non-point source pollution.

2.7.3 Water Pollution Nuisances

For community residents and patrons of commercial enterprises (e.g. hotels, fishing charters, SCUBA companies) nuisance water pollution can have the effect of reducing the safe recreational access to and aesthetic and ecological appreciation of affected water bodies.

2.7.4 Criteria

The following values in Table 2.7.1 must be met for all construction discharges to sea.

Table 2.7.1: Water Quality Criteria for Water being Discharged to the Coastal Marine Environment

Indicator Parameters	Units	Maximum Allowable Limits for Discharge of Wastewater to Sea & Coastal Marine Environments
<i>Physical and Chemical Parameters</i>		
Colour and Odour	-	No aesthetically undesirable discoloration or objectionable odours at the point of discharge ¹
Total Suspended Solids (TSS)	mg/L	25
Floating Particles	mg/m ³	None ²
pH	pH units	6 – 9 (acceptable range)
Change in Temperature (ΔT)	°C	$\pm 2^\circ\text{C}$ from seasonal background level at point of discharge ³
Total Dissolved Solids (TDS)	mg/L	$\pm 2\%$ from seasonal background level at point of discharge ³
Turbidity	NTU	75
Dissolved Oxygen (DO)	mg/L	>3 ²
Biological Oxygen Demand (BOD _{5 day})	mg/L	20
Chemical Oxygen Demand (COD)	mg/L	125
Total Residual Chlorine	mg/L	1.0
Nitrogen – ammonia (NH ₄ -N)	mg/L	2
Nitrogen – nitrate (NO ₃ -N)	mg/L	40 ²
Total Kjeldahl Nitrogen (TKN)	mg/L	10 ²
Total Phosphorus (total-P)	mg/L	2 ²
Sulfide as S	mg/L	0.1
Petroleum Hydrocarbons (total)	mg/L	15 ²
Oil & Grease	mg/L	10 (on shore facilities)
Phenols	mg/L	0.1
Cyanide	mg/L	0.1
Total Organic Carbon (TOC)	mg/L	75
<i>Trace Metals</i>		
Aluminium	mg/L	0.2
Arsenic	mg/L	0.1
Cadmium	mg/L	0.05
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Iron	mg/L	2.0
Lead	mg/L	0.1
Manganese	mg/L	0.2 ²
Mercury	mg/L	0.001
Nickel	mg/L	0.1
Selenium	mg/L	0.02
Silver	mg/L	0.005
Zinc	mg/L	0.1
<i>Bacteriological Parameters</i>		
Fecal Coliforms	MPN/100ml	150 ³

References:

Threshold limits are taken from Standards for Discharge of Wastewater to Open Sea in PCFC (2008) Environmental Control Rules and Requirements Fifth Edition, PCFC-EHS, unless otherwise indicated, and as below.

¹ Taken from Article 19 – Disposal of Wastewater to Marine Waters in DM (1991) “Chapter II: Regulations concerning the disposal of wastewater into marine waters”, Local Order No.61 of 1991, DM Health Department, July 1991.

² Taken from Standards for Discharge of Wastewater to Harbour in PCFC (2008) Environmental Control Rules and Requirements Fifth Edition, PCFC-EHS.

³ Taken from Table 5.2.2 Summary of Water Quality Guidelines for Recreational Waters in ANZECC Guidelines for Fresh and Marine Water Quality, Volume 1, October 2000.

2.7.5 Management Techniques

Controlling water pollution is an important consideration for protecting the environment and our community amenity. The Contractor must adopt the following measures (as appropriate) to manage water pollution due to construction activities:

General

- Do not pump or drain water containing suspended materials, dangerous waste or volatile materials, such as mineral spirits, oil or paint thinner into the storm water drains, sewers, waterways, or the marine environment.
- A permit from EHS is required for all dewatering activities on and off the site.
- Store diesel, oil, paint, thinners and other chemicals being used on the site in minimum quantities and store in a manner that prevents any potential water contamination/safety risks as per the relevant MSDS.
- Undertake post-operation cleaning of all machines and heavy equipment such as concrete mixers, truck washing, etc. within a specified washing area that is bunded and paved to prevent groundwater, surface water or marine pollution.
- Confine marine siltation generated by construction activities using floating booms and silt curtains.
- Skim marine surface waters to eliminate any scum generated through reclamation, which may migrate to surrounding waters.
- Limit marine traffic to the minimum necessary.

Chemical Storage Units

- All liquid chemicals must be stored within sealed drums, containers or tanks. Drums must have lids in place.
- All storage units must be in good condition. For example, do not use rusty drums.
- Drums, containers and tanks must be positioned on a sealed surface, such as concrete or a metal catch tray. Inter-locking paving is not considered a sealed surface.
- All individual drums, containers and tanks must be labeled showing current contents.
- Material Safety Data Sheets (MSDS) for all chemicals must be kept nearby.
- Pesticide containers must have their original label in place.
- Ensure that all chemical storage areas are adequately ventilated.

Location of Storage Areas

The general location for storage drums, containers and tanks must be:

- Away from drains, lakes (including temporary dewatering lakes), the sea or other environmentally sensitive areas;
- Above high tide level and areas subject to flooding or inundation;
- In a secure site to prevent unauthorised access, for example within a fenced construction site;
- In such a way as to minimise the potential for damage by vehicle collision or vandalism;
- Above ground. Underground chemical storage is not permitted on Nakheel projects;
- Out of direct sunlight, and in a cool area;
- Away from other chemicals likely to cause reactions. For example, acids containers must be positioned so that rain or other waters are not likely to come into contact with them, as water added to acid creates a potentially dangerous reaction; and
- Away from heating or ignition sources (for example, do not locate near a fuse box or welding area).

Usage of Chemical Storage Areas

- The storage area should be kept free of combustible materials and debris.
- Valves draining bunds must be kept locked in the closed position when not in active use where installed.

- Drums, containers and tanks must be placed a sufficient distance from the edge of the storage area, such that fuel will be contained in the case of puncture or drums/containers falling over.
- Hoses, hand-pumps and fittings used for dispensing chemicals should be kept within the bund or storage area when not in active usage.
- Do not drill, puncture or allow holes to be made in the bund walls for pipes and cables, unless effective sealing around the opening can be easily demonstrated.

Workshops / Maintenance

- All permitted workshops should be on impervious, hardstand areas and must drain to a monitored collection sump with sufficient capacity for 110% of largest volume of liquid contained within the workshop or 25% of the total capacity whichever is greater. The sump must be regularly emptied with the contents to be disposed of as hazardous waste to an authorised facility.
- Tanks, drums, containers, pipe work and seals must be kept in a sound condition to prevent leakage or rupture.
- The storage area and bund must be regularly inspected for damage, build-up of sand/sediment, accumulation of spilt liquids, and unauthorised usage (for example, building materials should not be stored within bunds).
- All wastes liquids and residue (including sand) collected within bunds or storage areas must be transferred into drums or containers for collection by a Dubai Municipality-approved contractor, and correct disposal. Rainwater captured within a bund is an example of collected liquid waste.

Chemical Spills and Clean-up

- An spill clean-up kit must be readily accessible from the storage area.
- The spill kit must have appropriate signage indicating its normal location when not in use, and instructions for usage within the kit.
- The spill kit must be suitable for the size and type of chemical being stored.

Concrete

- Concrete mixing areas must be a minimum of 20 meters from any waterways such as lakes or the ocean.
- Concrete mixing must be undertaken over a sealed and impermeable surface, to prevent runoff to the surrounding environment or soil contamination. Examples of suitable areas include a large concrete pad; a smaller concrete pad with a drainage collection sump, a piece of plywood thick enough not to crack. The mixing area must be located on flat ground to prevent concrete mix running off the temporary mixing area.
- Wastewater resulting from concrete batching must be contained, as the cement content of the wastewater can cause contamination of soil, groundwater and stormwater.
- All concrete equipment including small mixers, shovels, wheelbarrows and trowels must be cleaned and washed within the concrete mixing facility, so that drainage is contained.
- It is not permitted to discharge waste water from concrete washing to unsealed ground, drains or waterways.
- If trucks are to be washed out on-site; a truck washout facility must be constructed.

Refuelling

- Contractors should aim to refuel vehicles at commercial petrol stations off-site where practical. This applies in particular for light vehicles such as saloons, 4WDs, and light pick-up trucks. Refuelling at commercial off-site facilities is usually beneficial as it transfers any on-site environmental contamination risks to purpose-built, permanent facilities, which are able to manage problems more easily.
- Where it is not practical to do this, refuelling of vehicles and equipment on-site must be done at a dedicated area, over an impervious concrete pad. Light vehicles, trucks and

equipment such as loaders are considered easily mobile, and should return to the designated area for refuelling.

- Mobile refuelling of equipment shall only be carried out after the above options have been considered and found to be impractical. This may apply for heavy and slow moving equipment, non-mobile equipment such as pumps and generators, and where the refuelling area is very far away.

Groundwater Dewatering

- Adopt best practice for disposal of groundwater to the marine environment in accordance with PCFC regulations and water quality criteria.

Marine Activities

Contractors working in the marine environment have the potential to cause marine pollution with direct nuisance effects for waterfront residents and beach users. As a minimum requirement the following standards must be applied:

- Contractors must not discharge bilge waste water from their vessels into the marine environment within the coastal limits of UAE territory;
- Bilge waste water may only be off-loaded at approved port waste water facilities and/or to waste management sub-contractors, approved by Dubai Municipality;
- Records of amounts of bilge water disposed of at port facilities must be kept by all contractors and sub-contractors for future auditing purposes;
- Contractors must not discharge ballast waste water from their vessels into the marine environment within the coastal limits of UAE territory;
- Ballast waste water may be managed using a range of options, including:
 - Tanker-to-tanker transfer; and
 - Full ballast water exchange at sea;
- Records of amounts of ballast water transferred or disposed, and details of the method must be kept by all contractors and sub-contractors for future auditing purposes;
- Waste produced on board must be segregated and stored in lidded skips;
- Sewage must drain into enclosed tanks;
- Dumping of any waste overboard is prohibited;
- Waste skips and sewage tanks must be cleared (i.e. emptied and disposed of) by authorized contractors on a regular basis. Waste contractors must be equipped to prevent loss of waste solids and fluids to the marine environment;
- Records of disposal amounts of waste must be kept on board for auditing purposes;
- Contractor vessels must include contained areas for the storage of hazardous liquids, including dredge sludge. Uncontained storage on open decks is not permitted;
- All hazardous materials must be stored in accordance with MSDS provisions;
- Records of amounts and disposal of hazardous waste must be kept for future auditing purposes;
- Spill kits must be provided for response to potential leaks or spills;
- Contractor personnel must be trained in the use of spill kits and in effective incident response procedures;
- Washout mixtures must be contained after cleaning to enable appropriate disposal; and
- Measures must be implemented to prevent the migration of sediment, waste or chemicals (including oil and grease) into the marine environment.

2.8 Other Environmental Nuisances

2.8.1 Flooding

Referred to specific facility management handbook accordingly.

2.8.2 Gas Leaks

Referred to specific facility management handbook accordingly.

2.8.3 Blocked Sewage

Referred to specific facility management handbook accordingly.

2.8.4 Radiation

Engineering activities relating to testing procedures involving radiation emitting technologies are referred to EHS environmental regulation in connection with Free Zone Industrial guidelines.