



Technical Guideline (5)

Environmental Site Assessment

and Restoration of Contaminated Site

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قسم الدراسات والتخطيط البيني - إدارة البينـــة Environmental Planning and Studies Section – Environment Dept





1.0 Introduction

This guidance document, titled the "Technical Guidelines No.5 on Environmental Site Assessment and Restoration of Contaminated Site", revision 1, issue of August 2014, was prepared as per the relevant Laws and Regulations and with reference to the best industry practices. This revision shall supersede and replaces the old version of the same title issue dated April 2011.

Sites or areas covered by this guidance document includes, but without limit to, any contaminated site or site suspected of being contaminated with chemical or dangerous substance, abandoned site of industrial or manufacturing activity, abandoned waste disposal site, or any site that requires clean-up, remediation or restoration. Heretofore are the outline of requirements and procedures for the investigation, assessment, and remediation of the site in subject.

Clean-up of contaminated site and its restoration to background or original condition is necessary in keeping the beneficial use of the site and sustainability for the next generation. The legislation reference for the clean-up and restoration are provided for under Local Order 61 of 1991 on the Environment Protection Regulations in the Emirate of Dubai.

2.0 Reference Legislations

- 2.1 This Technical Guideline is issued under the relevant provisions of the following UAE Legislations:
 - Local Order No. 61 of 1991 on the Environment Protection Regulations in the Emirate of Dubai.
 - Federal Law No. 24 of 1999 for the Protection and Development of the Environment, as amended by Federal Law No. 11 of 2006.
 - Local Order No. 15 of 2008 on the Protection of Groundwater in the Emirate of Dubai.
- 2.2 Best practices around the world and relevant legislations were also used as reference such as, in particular, the ASTM Standard Practice for Environmental Site Assessment (ASTM, E1527-05); and ASTM test E1903-97, a US EPA Standard, which



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outlines detailed investigation procedures involving chemical analysis for hazardous substances and/or petroleum hydrocarbons

3.0 Definitions

- 3.1 Within the context of this Guideline the following definitions of certain key words, symbols or acronyms apply.
 - DM The Dubai Municipality
 - EDEnvironment Department, under DM and which is the Authority
on environmental issues in the Emirate of Dubai
 - EPSS The Environmental Planning & Studies Section. It is the lead Section under ED which is responsible for the preparation and enforcement of this TG on ESA.
 - ESA An acronym for Environmental Site Assessment, and means the methodical investigation of environmental conditions of a site. It aims to examine the potential contamination of a site, including the identification and extent of chemical contaminants, qualitatively and quantitatively.
 - **Contaminated** is the site, plot or parcel of land which is contaminated with site foreign material or of waste that was disposed into. It also refers to any site where a release of any hazardous chemical, hydrocarbon product or other product has occurred or suspected to have occurred and which resulted of the site being contaminated or polluted.
 - Site Also referred to as a plot or parcel of land and which, on physical account, includes the natural subsurface resources, the groundwater, the on-ground environment as well as the manmade structures or fixtures built thereat.
 - **Groundwater** The subsurface natural water including those in aquifers and the water in the zone of saturation where all interstices are filled with water.
 - **Hydrocarbon** Also referred to and the same as the petroleum products



- **BTEX** An acronym that stands for Benzene, Toluene, Ethylbenzene, and the Xylene isomers; a group of volatile mono-aromatic hydrocarbon compounds commonly found in petroleum fuel products.
- **Remediation** is the set of actions and the process of removing the contaminants off the contaminated site or by treating the contamination in-situ with the objective of restoring the conditions of the site back to its original state or to a level deemed beneficially acceptable to present and future use.

4.0 Key Guidelines

4.1 Standard of Restoration

- 4.1.1 Clean-up of contaminated site and its restoration back to natural condition are necessary in keeping the beneficial use and sustainability for the next generation. The extent of clean-up and removal of contamination shall include the subsurface soil and groundwater.
- 4.1.2 The contaminated site must be restored up to background level of the contaminants in question or to such a level where any risk to the beneficial use of the site/land/groundwater, both for present and future, becomes insignificant and as agreed to in writing by the Competent Department of Dubai Municipality.
- 4.1.3 The person, company, party, and/or Occupier who has caused the contamination of a site bears the costs and responsibility, jointly or separately, for the restoration of the contaminated site and for undertaking the prerequisite ESA procedures.

4.2 Phases of Environmental Site Assessment

- 4.2.1 A tiered level of environmental site assessment exercise is normally conducted on most sites under investigation. The phases of ESA exercise begins with Level 1 (Phase I) and based on the result it may progress to the next Level 2 (Phase II) or Level 3 (Phase III) depending on the scope and objective of the investigation.
- 4.2.2 Level 1 ESA (also called Phase I ESA) is generally considered the first step in the process with the main objective of identifying, to the extent feasible, the recognized environmental conditions of the subject site.



- 4.2.3 Level 1 ESA exercise shall include the following components as minimum:
 - a) **Review** of relevant records and obtain information that will help identify recognized environmental conditions in connection with the site.

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- b) Site Reconnaissance, a visit and physical observations of the site conditions, including the adjacent land or environment to obtain information indicating the likelihood of identifying recognized environmental conditions thereat.
- c) Interviews with the present and past owners, operators, and occupants of the property, and with local government officials. Interviews may be done in person, by telephone, or in writing, whether before, during, or after the site visit or in some combination thereof. To interview a reasonable number of occupants of the site is an advantage.
- d) **Report,** a written account of the preceding components (a, b, c) and which shall include the evaluation, conclusion and recommendations. The report must be signed by the competent person who conducted the ESA exercise.
- 4.2.4 If Phase I ESA determines a likelihood of site contamination or a site is considered contaminated, a Level 2 or Level 3 ESA exercise should proceed.
- 4.2.5 Level 2 (Phase II ESA) is the next tier exercise whether it may base on the result of Phase I ESA or based upon a direct instruction from the Director of Environment Department of Dubai Municipality.
- 4.2.6 Phase II ESA exercise is an intrusive investigation, which includes the collection of original samples of soil, groundwater, gaseous release or building materials to be analyzed for quantitative values of various contaminants. Phase II ESA aims to delineate the physical extent of contamination identified during Phase I. It involves intensive testing, sampling, monitoring, modeling studies on behavior and transport of contaminants, and the design of feasibility studies for remediation or restoration action plans.
- 4.2.7 The primary objective of conducting a Phase II ESA is:
 - a) to evaluate the recognized environmental conditions identified in the Phase I ESA;
 - b) providing sufficient information regarding the nature and extent of contamination, quantitatively; and



- c) to determine the appropriate scope, process or further action plan towards any clean-up or restoration works.
- 4.2.8 Where the intrusive investigation includes remediation, the environmental site assessment is of Level 3 (also called Phase III ESA).
- 4.2.9 Phase III ESA normally involves the assessment of alternative cleanup methods, costs and logistics. The associated reportage details the steps taken to perform site cleanup and the follow-up monitoring for residual contaminants.
- 4.2.10 Both Phase II ESA and Phase III ESA involves intrusive investigation. This process includes collection of original samples of soil, groundwater, gaseous release or building materials to be analyzed for quantitative values of various contaminants
- 4.2.11 A "Validation" process involving another round of environmental testing procedure of the investigated site. This is normally carried out after the ESA exercise or remediation procedures have taken place. *(See also the related Section 6.4 and Section 7.5)*

NOTE: ASTM test E1903-97 a US EPA Standard, which has more detailed investigation involving chemical analysis for hazardous substances and/or petroleum hydrocarbons can also be used as reference for ESA Phase II exercise; while the Standard for Phase I ESA is the ASTM Standard E1527-05.

5.0 **Requirements and Procedures**

5.1 ESA Scope of Work

- 5.1.1 It is advisable that the site Owner or Occupant of a contaminated site under study must engage the service of environmental expert person in undertaking the ESA exercise of all levels, particularly before the actual process of investigation is carried out.
- 5.1.2 The "designated environmental expert person" shall prepare a Scope of Work (SoW) for the investigation exercise. The SoW document shall be submitted to the Environment Department for review and approval before proceeding with the ESA exercise on site.
- 5.1.3 The Scope of Work must include, as minimum, the following subjects:
 - Description and boundaries of site
 - Objective of investigation, methodology and approach





- List of sampling devices and analytical apparatus in use
- Sampling protocol and quality control plan to provide integrity of test results
- Program to manage the potential aspects/effects of secondary pollution
- Site-specific safety, health, and environmental risks management plan
- 5.1.4 The approved Scope of Work described in the preceding Sections above will be the basis of monitoring the progress of the ESA exercise and for ensuring that the remediation works are carried out objectively and in an environmentally sound manner.

5.2 Sampling Program and Chain of Custody

- 5.2.1 A comprehensive sampling program must be included in the Scope of Work described in the preceding Sections (Sections 5.1.2 & 5.1.3) of this Guideline.
- 5.2.2 Sampling program must be systematic, comprehensive and be able to represent the area of investigation. An extensive sampling based on a grid system is recommended. The scope of the grid depends on the size of the affected site, local conditions, the nature of the contamination, and site limitations.
- 5.2.3 The samples collected must be representative, properly handled from the time of collection up to the delivery to and tested by a DCA accredited laboratory. A "chain of custody" document should be kept for reference and QC/QA purposes.
- 5.2.4 The chemical testing program shall be designed to detect the contaminants suspected and include the requirements for data deliverables and quality control protocol. The analytical test methods shall be appropriate for detecting the indicator constituents of the hazardous substances and hydrocarbon products,

5.3 Field Sampling and Testing Equipments

- 5.3.1 Any equipment in use for sampling should be dedicated to a single sample. In case of restriction by site conditions, any sampling devise earlier used must be thoroughly cleaned between sampling episode to avoid occurrence of cross-contamination between samples and/or sampling points.
- 5.3.2 Any one or combination of one or more of the hereunder listed main methods for soil sampling can be used:



- a) Manual Surface Grab Sampling (MSGS) this is usually performed using trowels or scoops made of metal, wood or plastic.
- b) Manual Shallow Sub-Surface Drilling Technique (MSSDT) this method using hand held augers, metal push tubes or split barrel devices for obtaining soil samples within the first one meter depth of soil.
- c) Deeper Sub-Surface Boring (DSSB) for soil sample beyond one meter deep. This is usually accomplished by the use of truck mounted, or skid mounted drilling rigs.
- 5.3.3 Collection of a representative groundwater sample, in case of deep borehole, shall be carried out only and immediately after the bore well is purged completely and recharged.
- 5.3.4 For detecting gaseous emissions in situ, or during field screening, a portable flame photometric or photo-ionization detectors, or equivalent industry accepted device maybe used. These field apparatus have higher detection limits but lower precision and accuracy compared to laboratory analytical instruments such as gas chromatography/mass spectrometry (GC/MS) apparatus. The former are most suited to general qualitative analyses and health and safety monitoring. Therefore, for more precise quantitative analyses, the laboratory based analytical instruments, such as the GC/MS are preferred.

5.4 Secondary Pollution and Waste Generation

- 5.4.1 Intrusive explorations may also create additional pathways for pollutant migration or a generation of hazardous wastes which may add to contamination, pollution or burden for waste disposal. Therefore, the likely distribution of potential contaminants, their properties, behavior, transport characteristics and effect must be assessed and a plan to manage these aspects must be included in the Scope of Work.
- 5.4.2 Any contaminated soil, cuttings, or wastewater must be handled and disposed off in a safe and environmentally sound manner, preferably, the contaminated earth materials is/are remediated or treated in-situ.
- 5.4.3 Any off-site disposal of waste, treatment thereof or in-situ remediation must have prior written approval obtained from the Environment Department.





5.5 Health, Safety and Emergency Incidents

- 5.5.1 All contaminated site presents many risks on safety and health at the site as well as towards the adjacent properties. The Scope of Work therefore must include a site-specific safety, health and environmental management plan (SHEMP); and if necessary, an emergency response, rescue and evacuation plan (ERREP).
- 5.5.2 There shall be a designated competent person (as "Safety Officer") who will be responsible for and oversee the implementation of the above mentioned SHEMP and ERREP.
- 5.5.3 The person responsible for the site works shall ensure that any person involved in these activities is adequately protected against any risk arising out of the hazardous materials present at the site. There must be visible symbols and text hazard warning signs posted at conspicuous places of the site
- 5.5.4 All persons working at or visiting the site must be provided with adequate personal protective equipment (PPE). No person shall be allowed into any site under investigation unless he or she is authorized and has adequate PPE.
- 5.5.5 The designated environmental expert person and/or the "Safety Officer" must provide prompt notice of any emergency, hazard or significant environmental conditions observed to the Environment Department and other concerned governmental agencies. Prompt notice means within the 24 hrs of the occurrence of such incident or conditions.

5.6 Liability and Damages

- 5.6.1 Any damages caused by the intrusive investigations and any indemnity accrued due to these damages shall be to the account of the Site Owner or Occupier and/or their Authorized representative expert person.
- 5.6.2 Compliance to the provisions of Section 5.6.1 above does not affect any outstanding liability or encumbrances of the Owner and/or Occupier of the site under study. DM will review the merits of such compliance based on the applicable provisions of the Local Order 61 of 1991 and its Executive Regulations.



6.0 Approvals and NOC Requirements

- 6.1 Written approval or NOC ("No Objection Certificate") must be obtained from the Environment Department and other concerned Departments, Authority or Utility & Service Providers before any ESA work can be started on site.
- 6.2 The Owner or Occupier of the contaminated site and/or its authorized representative is responsible for the identification of existing subsurface structures, facilities or utility lines to enable them obtain the required NOC from respective concerned Departments, Authority or Utility & Service providers.
- 6.3 Off-site treatment or disposal of any contaminated matter is also subject to a separate NOC and/or permitting procedure under the existing DM Waste Disposal System (WDS), the on-line application request for waste disposal permit. Any such off-site disposal must have prior written NOC from EPSS.
- 6.4 On request by the Owner of the site, a site-specific "Environmental Clearance Certificate" or ECC may be issued by Dubai Municipality for the site being cleared of contaminations. Issuance of ECC depends on the status of remediation and only after reviewing all of the relevant documents and reports pertaining to clean-up operation (remediation) and the final validation testing reports.

7.0 Documentation and report

- 7.1 Full documentation of the ESA exercise, clean-up operation and validation testing report of the "restored" site must be prepared by the designated environmental expert person who conducted the ESA or restoration works and whose name/names and signature/signatures is/are affixed on the ESA report.
- 7.2 The ESA report must reflect the true environmental conditions of the site, comprehensive and well documented to minimize misinterpretation, document uncertainty, and present clearly the findings.
- 7.3 The ESA report must include an "Executive Summary" presented in layman's language. A suggested Table of Contents of the required report is attached as Appendix 1 to this Guideline
- 7.4 The ESA report, along with a covering letter signed by the Owner or Occupier of the subject site, must be submitted to the Director of Environment Department of





Dubai Municipality within 30 days upon completion of the ESA exercise and/or restoration works.

7.5 Based upon the review of the ESA report and/or restoration works the Environment Department may require a validation testing exercise on the restored site. The scope and methodology of validation testing shall be discussed beforehand and in agreement with all of the concerned parties and stakeholders.

For further information, please visit Dubai Municipality website www.dm.gov.ae or contact the Environmental Planning & Studies Section at Tel. No: 046066757, Fax: 047033565





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