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Part 202: Preliminary investigations

Qualité du sol — Échantillonnage —

Partie 202: Investigations préliminaires

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 2, *Sampling*.

This first edition of ISO 18400-202, together with ISO 18400-104, ISO 18400-203 and ISO 18400-205, cancels and replaces the first editions of ISO 10381-4:2003 and ISO 10381-5:2005, which have been technically and structurally revised.

The new ISO 18400 series is based on a modular structure and cannot be compared to the ISO 10381 series clause by clause.

A list of all parts in the ISO 18400 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

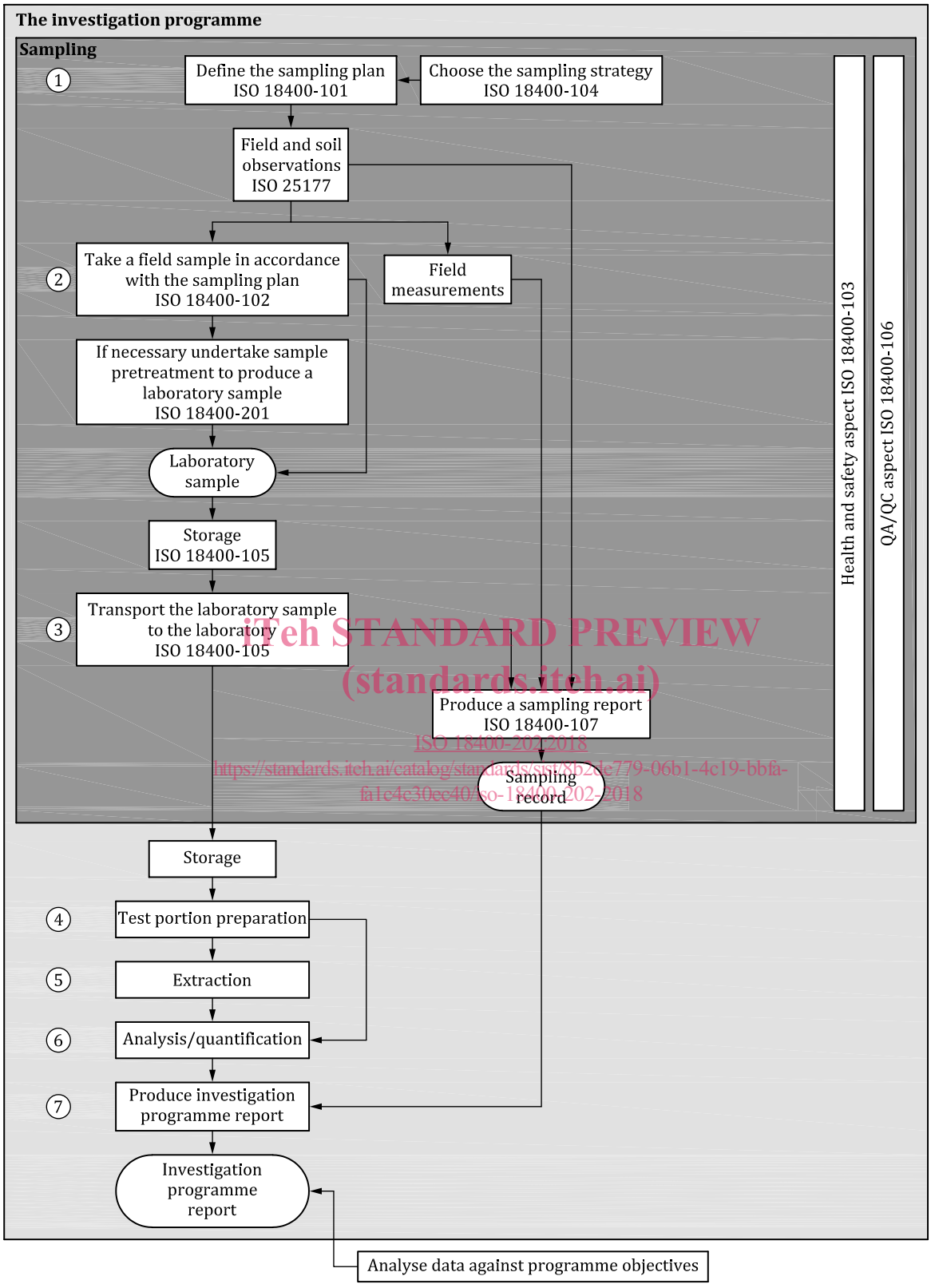
All investigation programmes to gather information about soil quality need some basic information about the subject site and its environmental setting to allow appropriate planning of the field work. To collect this information, a preliminary investigation is carried out comprising desk studies, retrieval of data from archives and databases, interviews and a site reconnaissance. From the information gathered, and the observations made, a conceptual site model can be developed including hypotheses about soil characteristics and their possible spatial distribution.

It is for the user of this document to decide the extent and nature of information required in any particular case taking into account the nature of the site and the objectives of the overall investigation: however, some preliminary information will always be needed. Detailed guidance is provided in the document based mainly on the need to obtain detailed information on many aspects of a site in the more complex cases, e.g. a potentially contaminated site, but the guidance is intended to be helpful when preparing to investigate all types of site.

The sources of information available for use in preliminary investigations will vary from country to country and jurisdiction to jurisdiction and, thus, the guidance given about sources of information in this document is of necessity generic in character. The user will find it useful to prepare detailed information about local sources for their own use. National standards providing guidance on the design and execution of geotechnical investigations often contain a requirement that a desk study and site reconnaissance should be carried out and thus could provide useful guidance about potential sources of information. Similarly, standards covering the demolition and dismantling of old buildings and industrial plant could provide useful information and guidance.

This document deals only with the investigation of the ground. It should be recognized that there could be derelict buildings and/or industrial plants awaiting demolition, dismantling or refurbishment on old urban and industrial sites, but that buildings in a poor state and containing potentially hazardous materials could also be present on farms and similar sites. Failure to investigate these buildings before demolition could put the safety of workers at risk or lead to the spread of contamination on and around the site[7][8]. The investigation of derelict buildings or remnant foundations is outside the scope of this document.

This document is part of a series on sampling standards for soil. The role/position of the standards within the total investigation programme is shown in Figure 1.



NOTE 1 The numbers in circles in Figure 1 define the key elements (1 to 7) of the investigation programme.

NOTE 2 Figure 1 displays a generic process which can be amended when necessary.

Figure 1 — Links between the essential elements of an investigation programme

Soil quality — Sampling —

Part 202: Preliminary investigations

1 Scope

This document provides guidance on the design and execution of preliminary investigations comprising desk studies and site reconnaissance, and where appropriate, preliminary risk assessment. It is applicable whenever sampling exercises or investigations are to be carried out to determine soil quality.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11074, *Soil quality — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
conceptual site model
synthesis (mental representation) of all information about a site relevant to the task at hand including interpretation of the information as necessary, and recognition of uncertainties in the information including identification of what is known to be unknown

Note 1 to entry: A conceptual site model can be presented in narrative, tabular and/or diagrammatic form.

3.2
conceptual site model
<potentially contaminated site> synthesis (mental representation) of all information about a site relevant to the task at hand with interpretation as necessary and recognition of uncertainties in the information, including, as appropriate, information regarding the ground, groundwater, surface water, soil quality, and surrounding environment, and if the occurrence of contamination is likely, the nature and potential sources of hazardous substances that could be present including soil gases and volatile organic compounds (VOCs), potential migration pathways, and potential receptors, taking into account, when appropriate, planned changes of use and anticipated changes in the environmental setting such as in groundwater levels or propensity to flood

Note 1 to entry: A conceptual site model can be presented in narrative, tabular and/or diagrammatic form.

Note 2 to entry: The future use or uses will not always be known and could also be the subject of client confidentiality.

4 General/principle

A preliminary investigation (Phase I investigation) should always be carried out prior to any intrusive sampling exercise or site investigation. It should be a two-step process involving data collection followed by interpretation and reporting. Data collection should always comprise

— a desk study (including when appropriate consultations), and

— a site reconnaissance (walk-over survey, site inspection).

The assessor should decide the extent and nature of information required in any particular case taking into account the nature of the site, the purpose and the objectives of the overall investigation, the availability of existing information, the size and complexity of the site, known or projected future land uses and other relevant site-specific factors: the investigation needs to be no more detailed than the task at hand requires. However, some preliminary information will always be needed.

It will often be appropriate for a site investigation to be iterative with several stages of investigation within each phase. The objectives should be reconsidered at each stage, and the requirements for further investigation reviewed as the investigatory and assessment processes are developed.

When an investigation is carried out in a number of phases or stages, the preliminary investigation would ordinarily only be undertaken prior to the initial phase or stage. However, the results should be reviewed on completion of the first stage or phase, and after each subsequent stage or phase to determine whether the conclusions, including any preliminary risk assessment require amendment.

The results of the preliminary investigation enable a preliminary conceptual site model to be developed (see Clause 8).

In the case of potentially contaminated sites, the possibility of contamination can be deduced, and hypotheses can be formulated on the nature, location and distribution of the contamination (8.2). These hypotheses form part of the overall preliminary conceptual site model that should be developed, encompassing not only the contamination aspects but also the geology, pedology, hydrogeology, geotechnical properties and the environmental setting. The current and planned site uses are also important aspects of the conceptual site model.

NOTE Although the conceptual site model is usually first formally prepared following a preliminary investigation, it first comes into existence the moment the question is asked whether the site needs to be investigated. At that stage, for example, it could be recognized that the site is agricultural land or is industrial land and the assessor will immediately form an initial picture about what the site might be like and act accordingly. Thus, it is this initial conceptual site model and the purpose of the overall investigation that guide decisions about the scope and depth of the preliminary investigation required.

5 Phases of investigation

A phased approach as described in ISO 18400-104:2018, Clause 4 should always be taken to site investigation. The principal phases are

— preliminary investigation (this document),

— exploratory investigation, and

— detailed site investigation.

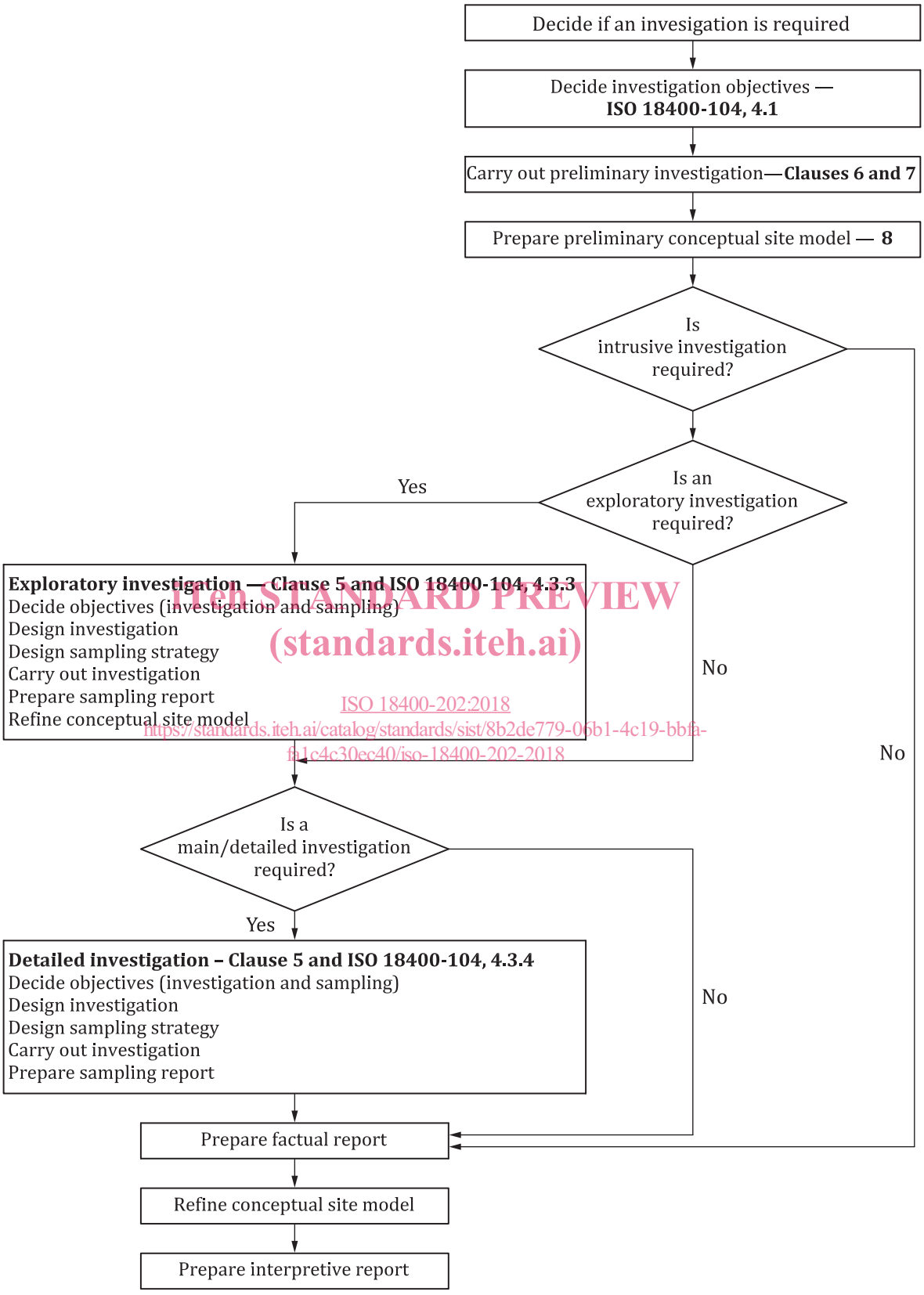


Figure 2 — Flow-chart of phases of site investigation for a potentially contaminated site

NOTE A preliminary investigation is always required but whether intrusive investigation is required, and if so, whether both an exploratory investigation and a detailed (main) investigation are required, will depend on the context and the findings of the preliminary investigation (see ISO 18400-104 for further guidance).

Supplementary investigations could be required subsequent to the detailed site investigation in order to

— fill information gaps, and

— design works and, in the case of a contaminated site, select remedial methods, or design remediation or construction works.

The relationship between these phases for a potentially contaminated site is illustrated in Figure 2.

Before embarking on any phase or stage of investigation including a preliminary investigation, it is important to set data quality objectives in terms of the type, quantity and quality (e.g. analytical quality) of the data and other information that is to be collected. These data quality objectives will depend in part on the nature of the decisions to be made on the basis of the investigation, and the confidence required in those decisions. Failure to set data quality objectives at the outset can lead to significantly higher costs, if, for example, the data collected are not suitable or sufficient for a reliable risk assessment, or leave too many uncertainties in the "conceptual site model" (see 8.1).

6 Objectives of preliminary investigations

The objectives of the preliminary investigation should be set out formally before the investigation is started to ensure that the scope (e.g. sources of information searched) is appropriate.

The preliminary investigation should always provide sufficient information to:

— enable a sampling programme including preparation of a sampling plan if deemed necessary to be designed that is both technically effective and economically acceptable;

— identify measures required to protect the health and safety of the investigating personnel;

— identify measures necessary to protect the environment during any subsequent intrusive investigation;

— identify any aspect of the site requiring immediate attention for reasons of health and safety or protection of the environment (e.g. insecure fences, hazardous substances accessible to trespassers or likely to be dispersed by wind or water) so that those in control of the site (e.g. owner or occupier) can be made aware of potential liabilities.

Other information relevant to the conduct of the sampling programme should also be gathered, e.g. means of access for equipment, locations for site facilities (e.g. laboratories, stores, equipment decontamination), availability and location of power and water, etc., and whether warfare or other military activities might have affected the site (including, for example, whether unexploded ordnance might be present).

NOTE In some jurisdictions, detailed information on the location of WWII bomb hits and, hence, possible unexploded ordnance is available.

Depending on the nature of the site and the objectives of the overall investigation, specific objectives could include:

— providing information on past and current uses of the site and surrounding area and the nature of any hazards and physical constraints;

— providing information on the geology, geomorphology, geochemistry, soil, hydrogeology and hydrology of the site and surrounding area;

— identifying potentially different sub-areas (zones) of a site, based on differing ground conditions; potential contamination; and past, present and future uses;

— identifying areas where informed decisions are to be made using specialist assessment techniques or advisors, e.g. if there are ecological, unexploded ordnance (UXO) or archaeological considerations;

— identifying the need to involve regulatory bodies prior to intrusive investigation;

— determining whether there is a need to inform the neighbourhood.

And in the case of potentially contaminated sites, specifically to obtain information:

— assessing the likelihood of contamination, its nature and its extent;

— evaluating the environmental setting of the site;

— identifying current and likely future receptors, potential sources of contamination and likely pathways and any features of immediate concern, including those that could be introduced in the future;

— providing information from which likely source-pathway-receptor relationships can be identified, and which can then be used to formulate a conceptual site model to enable the design of a field investigation (if required);

— producing a preliminary conceptual model for the site as a whole and/or for zones within the site;

— providing information for the preliminary risk assessment (see 8.4).

7 Scope of preliminary investigations

7.1 General/strategy

The preliminary investigation should consist of:

— a desk study, including consultations (see 7.3) with those who might have relevant information about the site, in which information on the history and other relevant aspects of the site, is collected and critically reviewed (see 7.2);

— a site reconnaissance (site inspection, walk-over survey) (see 7.4);

— development of a conceptual site model (see Clause 8), which in the case of potentially contaminated sites should include:

  — formulation of hypotheses on the possible type(s) and amount of contamination, migration pathways (on- and off-site), and spatial and temporal distribution; together with hypotheses regarding other aspects of the site, such as the hydrogeology;

— drawing conclusions with regard to the need for and scope of further investigations (see 8.4);

— identification of any need for immediate actions to protect humans or the environment (e.g. fencing, removal of superficial deposits).

In most cases, it should be possible to make a preliminary qualitative assessment of (potential) risks to humans and other receptors (see 8.3).

The minimum information that should be collected in the preliminary investigation is set out in 7.2 and 7.3 and the procedures on how the information can be obtained are provided in 7.2.3. Guidance on reporting the results of the preliminary investigation is provided in Clause 9.

The objectives of the preliminary investigation might not require all the elements recommended in 7.2, 7.3 and 7.4, in which case the strategy should identify what elements of the preliminary investigation are essential and those that do not need to be addressed. Some examples of information that could be required relating to stockpiles are listed in Table 1, to agricultural sites in Table 2 and wooded sites in Table 3. Much of the guidance in Table 1 is also applicable to other site types.

Where elements of a preliminary investigation described in 7.2 to 7.4 are not to be included, these should be documented in the report, and any limitations on the final assessment arising from the omissions should be clearly understood by all parties involved and stated in the report.

The strategy should provide for a review of the information obtained at the conclusion of the preliminary investigation to determine if the objectives have been achieved (and are still appropriate) and whether there is a need to carry out an exploratory investigation and/or detailed investigation (see Clause 5).

The site should be divided into zones if necessary or advantageous if this has not already been done (guidance on site zoning is provided in ISO 18400-104). Separate conceptual models should be developed for each zone that is identified.

NOTE It is likely that there will be different requirements for further investigation of each zone.

Care should be taken that a focus on separate zones does not obscure the overall picture and that the potential interactions between zones are not overlooked.

The output from the preliminary investigation should include the preliminary conceptual site model (see Clause 8) and, in the case of potentially contaminated sites, a preliminary risk assessment (see 8.3) based on the information available.

Table 1 — Examples of information requirements for stockpiles

General	Site details	History of the stockpile	Material type and dimensions
Background information on a stockpile will often be essential in order to get (general) information on the material to be sampled. The effort that should be put into obtaining prior information depends on the purpose for sampling in combination with the sampling strategy that is used to fulfil this purpose. Prior information can also be essential for assessing the safety aspects of sampling the particular stockpile.	The project manager should establish details of the site location and access, including any perceived hazards relating, for example, to high stockpiles, non-consolidated stockpiles or difficult access. In some situations, there could be a difference between the owner of the site where the stockpile is situated and the client for whom the stockpile is sampled. If so, the project manager should contact the site owner in order to get access to the stockpile and be informed about any site specific health and safety regulations to comply with.	The project manager should establish a history of the stockpile in order to determine the potential environmental risks involved. The history should include the period before the soil or other material was placed in the stockpile. The history of the stockpile should be based on the location(s) where the material in the stockpile originated from and the processes that occurred on that site. It should also include the process in which the stockpile was formed (e.g. placement in layers, placement by end-tipping, "single" or mixed materials) as this can give prior information on the spatial variability of material within the stockpile.	The project manager should establish the material characteristics (e.g. soil type, water content, particle size distribution, maximum particle size) and dimensions of the stockpile to be sampled.

Table 2 — Background Information requirements for investigation of agricultural sites

— Owner and occupiers.
— Relevant requirements in lease/rental agreements.
— Soil type(s).
— Whether the land to be investigated is used for raising crops or animals and the history of these activities (e.g. what crops or animals and when).
— Whether the farm is “organic” or conventional.
— Whether genetically modified crops are grown.
— Use of pesticides, soil amendment materials, and fertilizers, and how these have been applied.
— If organic wastes (e.g. farmyard manure, sewage sludge) has been spread the time period that has elapsed since this was done (important for safety in respect of the possible presence of pathogens).
— Current or past presence of plant or animal pathogens (7.2.4).
— Presence of ground-nesting birds.
— Whether irrigation is used and if so in what form.
— Presence of areas of stressed vegetation.
— Location of areas of wet ground and/or ground liable to flooding.
— Location used for servicing farm machinery.
— Location of waste deposits (slurry ponds, dung heaps, etc.).
— Location of animal burial pits and filled ponds.
— Location of natural water courses and artificial drainage ditches.
— Location of any in-ground drainage system (e.g. presence of land-drains).
— Location of any old redundant or little used machinery (could be a hazard, impede investigation or be a source of contamination).
— Presence of fuel tanks.
— Presence of underground fuel or gas pipelines (hazardous and there could be severe restrictions of excavation over wide zone).
— Presence of overhead cables.
— Presence of public rights of way (footpaths, bridle paths, etc.) or a “right to roam” (e.g. public access subject to some restrictions).
— Non-farming activities in buildings (e.g. vehicle maintenance, workshops, storage).
— Presence of ecologically sensitive areas or features within or close to the site (farm buildings often house protected birds and bats).
— Presence of archaeological remains.