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# Kalıcı Organik Kirleticiler (KOK) ile Kirlenmiş Sahaların Tespiti ve iyileştirilmesi Projesi

## KILAVUZ HAKKINDA İSTİŞARE TOPLANTISI

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Kirlenmiş Sahalar Uzmanı



TÜRKİYE CUMHURİYETİ  
ÇEVRE, ŞEHİRCİLİK VE  
İKLİM DEĞİŞİKLİĞİ BAKANLIĞI



Çevre ve İklim Eylemi  
Sektör Operasyonel Programı



Kalıcı  
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# Contaminated site inventory and prioritization of contaminated sites

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## Contaminated sites inventory

Clearly, the accuracy of the information gathered and analyzed during the investigation is vitally important because it forms the basis for the risk assessment phase, for making decisions on the need for, and type of, remedial action and, eventually, for the design and implementation of necessary actions.

During a site investigation, every item of information collected must be recorded properly in words, along with photographs of the site and the surrounding area, with a radius of about 50-100 m (depending on the size of the site).



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## Contaminated sites inventory

**Reporting** is essential for each stage of the investigation as site-specific information is invaluable to decision makers in their efforts to protect the environment.

It is suggested that **national levels** should be established for contaminated sites.

**Data collection and compilation, data management, and evaluation** should refer to the *Contaminated Site Toolkit*.



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## Contaminated sites inventory

### Reporting of potential contaminated sites

Reporting is essential for each stage of the investigation as site-specific information is invaluable to decision-makers in their efforts to protect the environment.

The PSI stage 1 report should identify potential contamination:

- Potential source of contamination;
- Potential contaminants of concern;
- Areas of potential environmental concern (potential lateral extent, vertical extent, media).



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## Contaminated sites inventory

The **PSI stage 2 report** should identify contamination and potential contamination including:

- ↪ Source of contamination;
- ↪ Contaminants of concern (i.e. types of POPs);
- ↪ Areas of environmental concern (potential lateral extent, vertical extent, media);
- ↪ Recommendations for action.
- ↪ For further information on reporting, refer to the *Contaminated Site Toolkit*.



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## Contaminated sites inventory

### The inventory of contaminated sites could include:

- ↪ Types and quantities of contaminant containing materials disposed
- ↪ The names and addresses of those entities responsible for disposal of contaminant-containing materials
- ↪ Details of the treatment of waste before disposal
- ↪ Records of site contamination
- ↪ Details of the clean-up process (if any) once a site has been registered as being contaminated
- ↪ Information on the monitoring of contaminated sites
- ↪ Records of ongoing monitoring and research



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## Inventory of contaminated sites

- National, regional, local inventory of chemical pollution problems
- Development of the National register of contaminated sites
- Feasibility studies
- Risk analysis - development of conceptual model
- Post remediation monitoring
- Monitoring





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## National, regional, local inventory of chemical pollution problems





**Stock with hazardous waste**

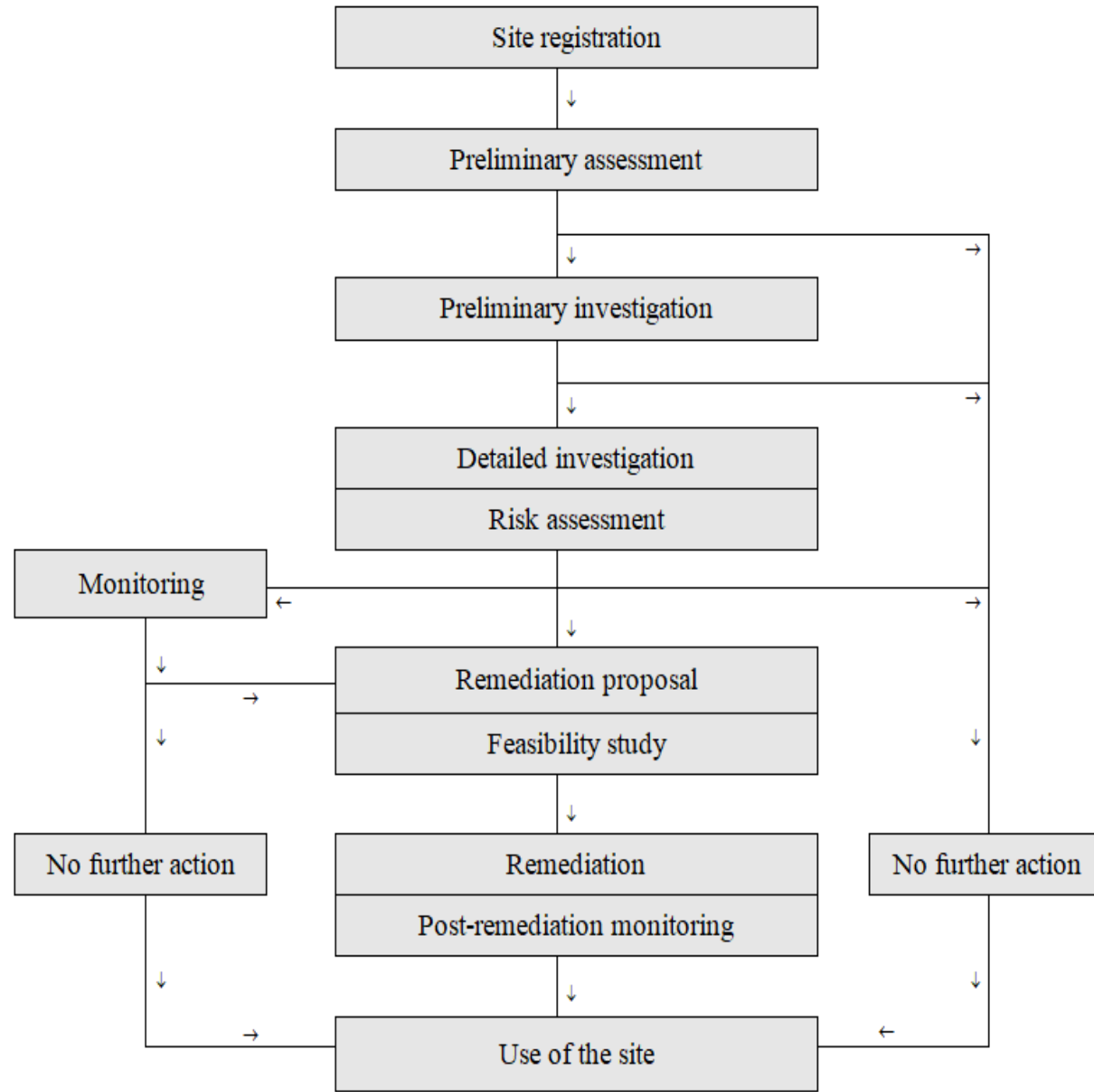


**Contaminated building**

**Buried hazardous waste**

**Contaminated soils and groundwater  
plus source area**





# Methods for collecting and completing data to identify potential contaminated sites



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A site is generally considered contaminated by mixtures of chemicals when the concentration of one or more contaminants exceeds the regulatory criteria or poses a risk to humans and/or the environment.

Site investigation, comprising preliminary site investigation (PSI) and detailed site investigation (DSI), provides valuable information on a site, including:

- ↪ The nature and location of contaminants with respect to the soil and groundwater table;
- ↪ Potential pathways for contaminant migration;
- ↪ The location of nearby sensitive receptors;
- ↪ Potential for direct human exposure to the contaminants;
- ↪ Potential of food and feed contamination.



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## Preliminary site investigations

The **preliminary investigation** is the first activity during which sampling and laboratory analyses of soil and/or groundwater are carried out, when first information on the actual existence or non-existence of the contamination is obtained.

The **basic aim of this investigation phase** is confirmation or disproval of the contamination suspicion, with as low costs as possible.

Because of that, the sampling focuses, primarily, on places where it is supposed that polluting took place directly, and, thus, where **the highest pollutant concentrations may be expected**.



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## Preliminary site investigations

The objective of **PSI stage 1** is to gather sufficient information to estimate the likelihood of **POP** contamination that may be present at a site.

**Sampling relevant environmental media and investigations of subsurface conditions are not required at this stage.**



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## Preliminary site investigations

PSI stage 1 includes the following activities:

- ↪ **Historical review:** review of a site's historical use and records to determine current and past activities or uses, accidents and spills, and practices and management relating to potential contamination at the site and at adjacent sites.;
- ↪ **Site visits:** one or more walk-through site visits to verify the information gathered during the literature review for indicators or presence of contamination;
- ↪ **Interviews:** interviews with current or former owners, occupants, neighbours, managers, employees, and government officials who can, with reasonable attempts, be contacted about information on activities that may have caused contamination.



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## Preliminary site investigations

**PSI stage 2** should be conducted only if stage 1 indicates there is a likelihood of POP contamination at the site or if there is insufficient information to conclude that there is no potential for POP contamination.

**The objective of stage 2** is to confirm the presence or absence of the suspected contaminants identified in stage 1 and to obtain more information about them.





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## Preliminary site investigations

To achieve this objective, site investigators must carry out the following activities:

- ↪ Development of a **conceptual site model**
- ↪ Development of a **sampling plan**
- ↪ **Sampling of relevant environmental media** laboratory or field instrumental analysis of sampled and selected environmental media for substances that may cause or threaten to cause contamination.



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## Preliminary Investigation

The investigation is carried out by expert companies, the state administration experts consider its conclusions.

The activity may have two kinds of results:

- Suspicion of contamination that could represent an unacceptable risk for human health and/or the environment was not confirmed in the site, or:
- The found out concentrations indicate that the site contamination could represent an unacceptable risk for human health and/or the environment; the suspicion has to be verified by further investigation.



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## Management/evaluation data

Based on the data collected, a **conceptual site model (CSM)** can be then developed to establish the relationship between the contaminants, exposure pathways and receptors.



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## Management/evaluation data

The CSM, which should be developed at the very beginning of PSI stage 2, identifies the zones of the site with different contamination characteristics (i.e., whether contaminants in the soil are likely to be at the surface or at deeper levels, distributed over an entire area or in localized "hot spots").

Exposure pathways and receptors should be identified, where appropriate, for both current and future uses of the site.

The CSM is based on a review of all available data gathered during stage 1, and should be continuously modified as more information becomes available during stage 2 and the detailed site investigation.

# A multi-stage investigation approach



- (1) Desk study**
  - look at archive and current info
  - possible zoning
  - design the main investigation
- (2) Site reconnaissance**
  - inspection to confirm desk study
- (3) Exploratory survey**
  - test preliminary hypotheses, with minimal sampling
  - refine main investigation design
- (4) Main investigation**
  - complete hazard assessment
  - data for risk assessment
- (5) Supplementary investigation**
  - assist in selection of scenarios and uncertainty reduction
  - gather data to assist in remediation design
- (6) Post-remediation**
  - verify whether remediation targets attained



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## Key elements of a conceptual site model

- ↔ Site history and setting
- ↔ Potential contaminants of concern – contaminant properties and behaviour
- ↔ Potential areas of environmental concern (Source Zones)
- ↔ Geology and stratigraphy
- ↔ Regional and local
- ↔ Overburden – sedimentary, glaciology, depositional processes
- ↔ Bedrock – fracture networks, representative elementary volume
- ↔ Hydrogeology

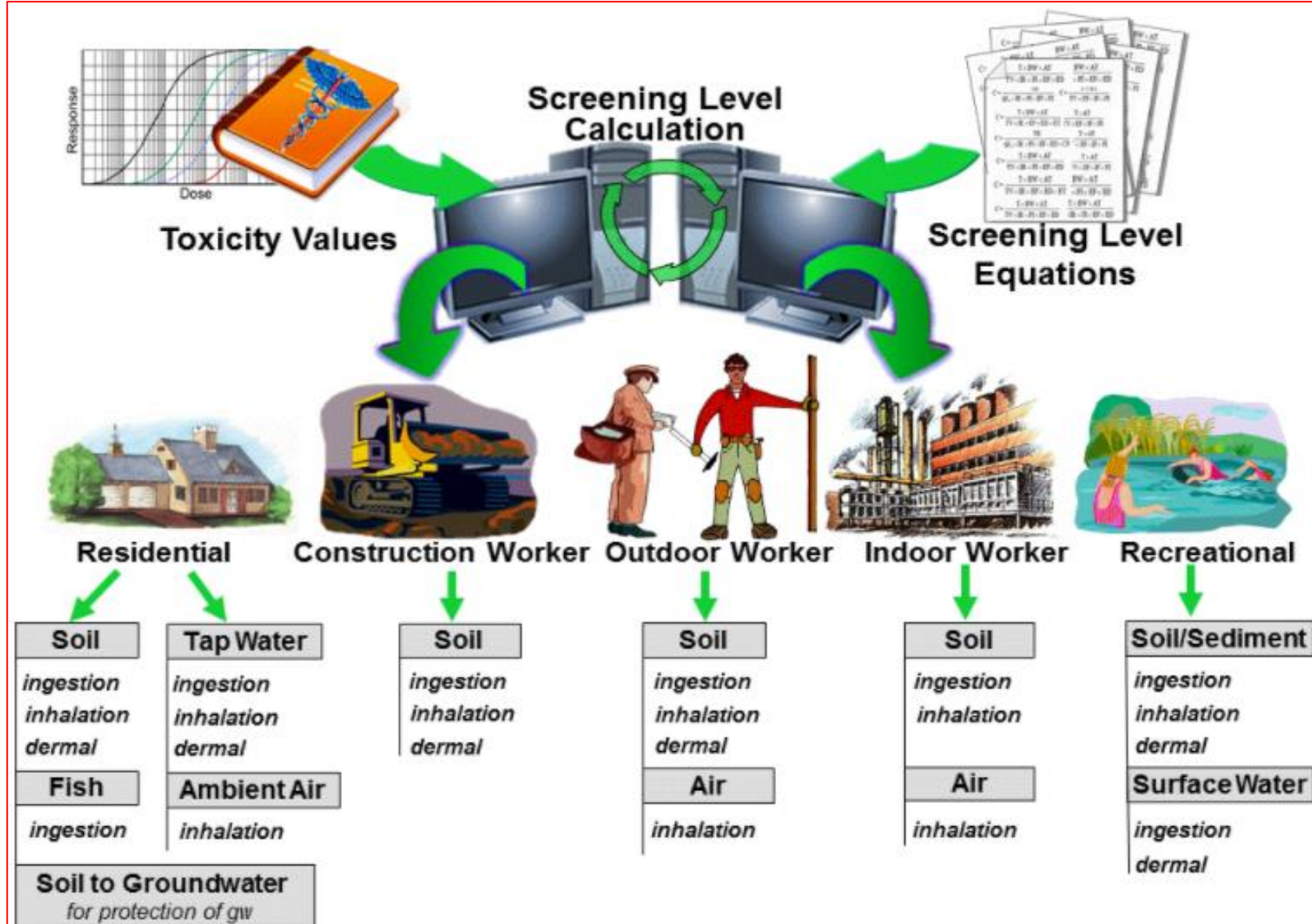


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## Key elements of a conceptual site model

- ↗ Aquifers and aquitards
- ↗ Groundwater levels and elevations
- ↗ Hydraulic gradients and velocities
- ↗ Boundaries
- ↗ Plumes and pathways
- ↗ Groundwater and vapour
- ↗ Transport and attenuation processes
- ↗ Heterogeneity, anisotropy and scale
- ↗ Receptors and risk

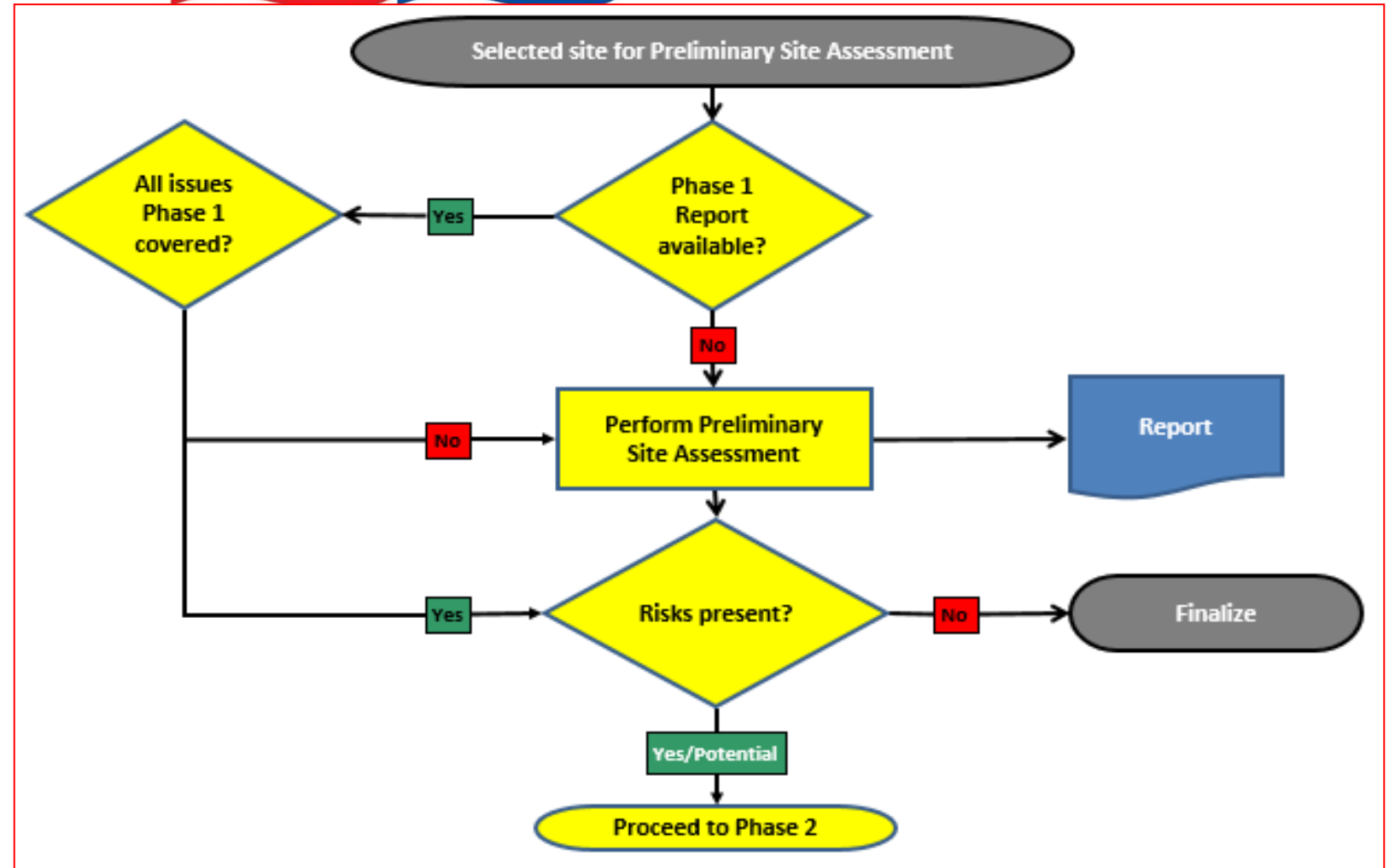
US EPA Site specific risk assessment tools for developing screening levels and preliminary remediation goals in a range of land use scenarios, US EPA (2020)







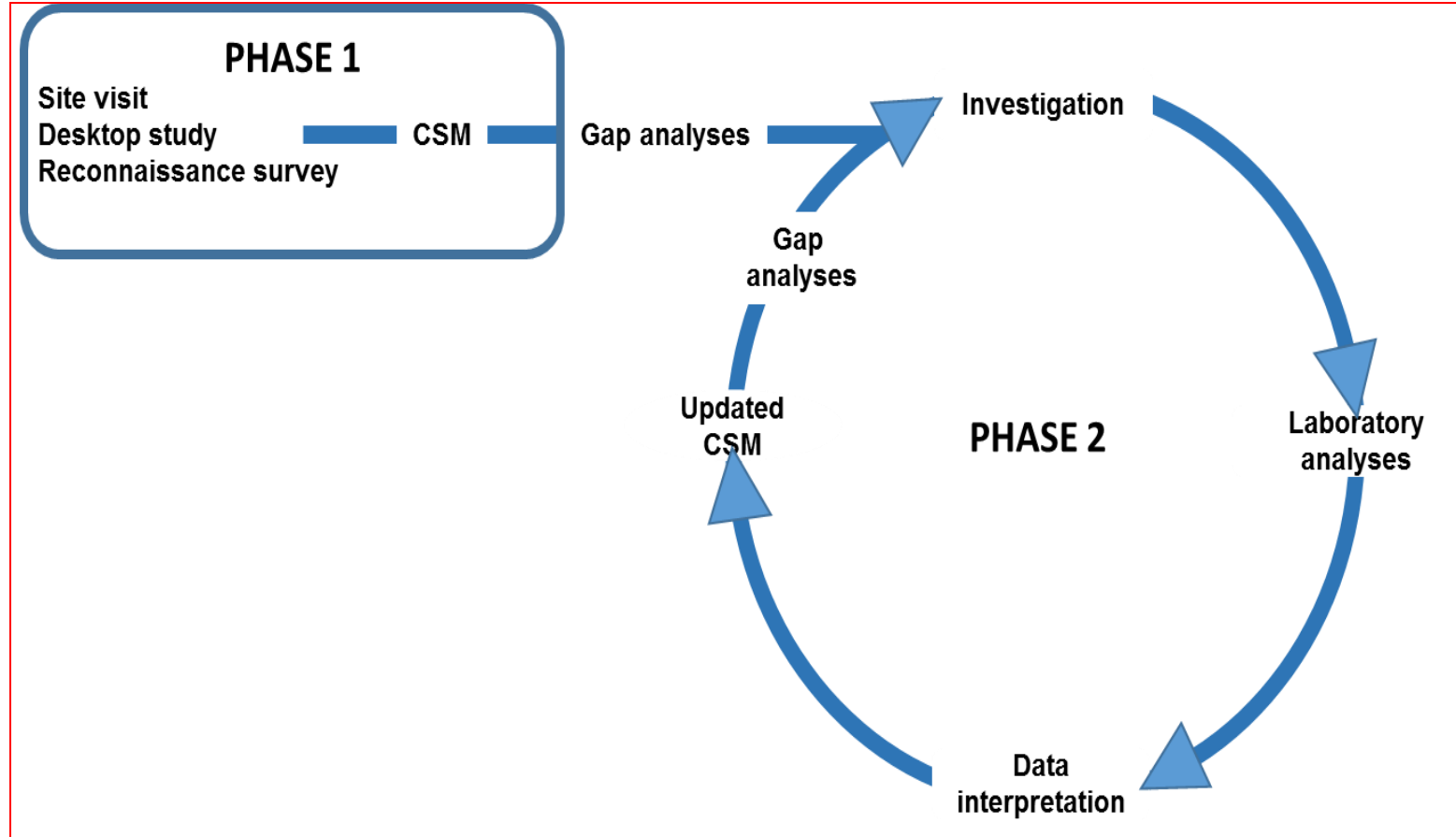
**Process for the Phase 1  
Preliminary Site  
Investigation for the  
sustainable  
management of  
contaminated sites  
( Tauw, 2015 a)**



# Contaminated sites evaluation – Phase 1 and 2



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# Contaminated site reporting in the inventory document



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- **Types and quantities of POP-BDE-containing materials disposed**
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- **Details of the treatment of waste before disposal**
- **Records of site contamination**
- **Details of the clean-up process (if any) once a site has been registered as being contaminated**
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- **Records of on-going monitoring and research**



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## TEŐEKKÜR EDERİM...

