# PHASE 2 ENVIRONMENTAL SITE ASSESSMENT CHECKLIST

This Phase 2 Environmental Site Assessment (ESA) Checklist (Checklist) is designed for the site owner, consultant, and report reviewers to ensure the site is thoroughly assessed, the substance(s) delineated, and reports contain the appropriate information for remediation and/or risk management. Please ensure that the following information has been taken into consideration, documented, and submitted to Alberta Environment and Sustainable Resource Development (ESRD). The Checklist forms the basis for Director reporting requirements for Phase 2 ESA reports that must be submitted to the Department under the Environmental Protection and Enhancement Act. For further information refer to *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (2007, as amended) (Alberta Tier 1 guidelines) and *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* (2007, as amended) (Alberta Tier 2 guidelines).

## Phase 2 ESA Report Content

The Phase 2 ESA report describes all aspects of the Phase 2 ESA program. The report must be a stand-alone document, but should reference any previous investigations performed (e.g., Phase 1 ESA or initial Phase 2 ESA). The author(s) of the Phase 2 ESA report must provide documentation of the completed work, present and interpret the findings, and provide conclusions and recommendations that are drawn from those results.

The report shall state the dates to which all of the findings relate and identify and discuss anomalous data. All findings resulting from the investigation performed including nil findings shall be included in the report. It shall have a Conclusions section that states that the Phase 2 ESA revealed:

- No evidence of contamination in connection with the property;
- evidence of actual contamination in connection with the property (listed and described); or
- evidence of actual and potential contamination in connection with the property (listed and described); and
- potential risk to receptor(s) both on and off the property.

Following is a list of required elements and a reviewer's checklist for Phase 2 ESA reports that are submitted to the department. For facilities under EPEA approval and Code of Practice, further reporting requirements in Soil Monitoring Directive (AENV, 2009, as amended) must be met.

# List of Required Information for a Phase 2 ESA Report

| SECTION | CONTENT |
|---|---|
| **Title Page** | - A title clearly identifying it as a Phase 2 ESA report, site name, site address, municipality and legal land description, consulting company, client and date of report. |
| **Executive Summary** | - Synopsis of the report, summary of work undertaken and key findings/conclusions. |
| **Table of Contents** | - Table of contents, figures, tables and appendices included in the report. |
| **Introduction** | - Description of the objectives and scope of work.<br>- Background information on site that includes:<br>o Summary of any previous Phase 1 or Phase 2 ESA or other investigation findings for the site;<br>o Summary of all preliminary work and field activities conducted at the site as part of the Phase 2; and<br>o Any regulatory requirements, directions, approval requirements, environmental protection orders, or directions from and investigator or Director that apply to the site (referenced verbatim). This should be followed by information or cross reference to information that is intended to fulfill the regulatory requirements.<br>. |
| **Site Characterization** | - Regional and site characteristics including:<br>o Preliminary understanding of site geology and hydrogeology;<br>o Description and map (at the appropriate scale) indicating the regional setting, including but not limited to legal location, topography, surficial geology, soil types, vegetation, water bodies and major land use;<br>o Description of the site, including but not limited to topography, surface drainage, parent geological materials, soil types, fill material, vegetation, depth to groundwater, groundwater flow direction, adjacent water bodies and land use; and;<br>o Detailed site plan, or photo mosaic or aerial photograph with a 1:5000 scale or finer resolution indicating major facility areas including waste handling areas and relevant surface features;<br>- Overview of the conceptual site model.<br>o Description of any identified environmental issues including a description of processes or activities undertaken at the site and a listing of contaminants of potential concern (CoPC) identified in earlier investigations;<br>o Description of known and reported historical releases, including locations and the status of any subsequent ESA and remediation;<br>o Map clearly indicating historical releases and contamination that has been delineated; and<br>o Description of processes or activities associated with the substances of concern.<br>- Basis for choosing applicable site remediation guidelines. |

| SECTION | CONTENT |
|---|---|
| **Sampling and Analysis** | - Description of buried utility clearances at the site, particularly where they are important to site assessment or contaminant migration patterns.<br>- Description of all field work, including equipment used, methods of sample collection, date when work was performed, field observations, summary of samples collected (recorded in borehole logs), sample depth increment, and analyses performed, and laboratory used (described in laboratory reports).<br>- Detailed site plan, or photo mosaic or aerial photograph at 1:5000 scale or finer resolution indicating all known (former and current) sampling locations and facility features.<br>- Table identifying targeted facility areas, rationale for choosing the proposed sampling locations, and proposed analytical parameters for each sampling location.<br>- Rationale for using selected methods including:<br>o Soil and groundwater quality guidelines for each CoPC onsite and offsite; and rationale for using each soil and groundwater quality guideline.<br>o Rationale for choosing the proposed sampling procedure(s) and depth increments;<br>o Rationale for choosing the screened interval in each monitoring well;<br>o Rationale for using the analytical methods and a description of relevant laboratory QA/QC procedures.<br>- Description of QA/QC protocol followed for sampling and handling soil and other sampled media during the program. |
| **Findings** | - Presentation and discussion of analytical results (including use of graphical and tabular form, as appropriate).<br>- Detailed site plan, or photo mosaic or aerial photograph at 1:5000 scale or finer resolution indicating site location, location of all sample points, sampling locations where substances of concern exceed any applicable criteria and groundwater elevation maps where applicable.<br>- Analytical result tables presenting all analytical results for all sampling locations, highlighting values that are greater than background values, Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2007a), or any other applicable criteria<br>- Evaluation and interpretation of all analytical results. Identification and description of any contaminants or wastes found at the site, potential source and concentration of the contaminant, spatial extent (horizontal and vertical) and potential pathways and receptors that may be at risk.<br>- Description of potential for, or known off-site migration of contamination.<br>- Discussion of laboratory and field QA/QC results, including inconsistencies or anomalies in the data. |
| **Conclusions** | - Identification including the physical extent of any CoPC remaining on the site above applicable remediation objectives.<br>- Description of the known physical extent of CoPC that are present above applicable site guidelines.<br>- Summary of risks posed by the contaminants of concern onsite and/or offsite.<br>- Recommendations regarding risks posed by any contaminants remaining and whether applicable risk-based criteria have been met.<br>- Recommendations for any further work along with timelines to address the exceedance on site and off-site. |
| **Record of Site Condition** | - Completed Record of Site Condition. |

| SECTION | CONTENT |
|---|---|
| **References and Supporting Documents** | - Documentation and key exhibits to support findings and conclusions including published works and guidelines.<br>- All borehole logs and monitoring well installation logs.<br>- Copies of all laboratory data sheets.<br>- Groundwater elevation measurements (reported in tabular format or on the borehole logs) including: hydrostatic zone monitored, elevations of well screen and sand pack, surveyed reference point elevation, depth to water measurement, calculated water surface elevation, thickness of immiscible layers, and where appropriate, corrected hydraulic head measurement (with discussion of the correction method).<br>- Hydrogeological cross-sections for larger or more complex sites (or sites where applicable), as they illustrate the geologic materials, groundwater levels, hydraulic flow paths and contamination zones. Typically, cross-sections parallel and perpendicular to the direction of groundwater flow are necessary.<br>- Groundwater contour maps for larger or more complex sites that depict groundwater flow directions and gradients for all groundwater systems found at the site. Include all borehole logs where a sampling location is drilled and a copy of laboratory data sheets in appendices. |
| **Professional Sign-off** | - Professional sign-off, with original signatures, and registration/member number or a stamp/seal confirming the findings and conclusions contained in the report, from a professional practicing member in good standing with an organization that has professional legislation in Alberta that explicitly allows them to conduct remediation and reclamation work[1]. |

[1] The member must have a minimum of five years verifiable experience related to the Competencies for Remediation and Reclamation Advisory Committee's Recommendations Report (AENV 2006). The signatory professional or their employer must have general insurance and errors and omissions insurance coverage. The seven professional regulatory organizations that are eligible to sign off are members of the Alberta Institute of Agrologists (AIA), Alberta Society of Professional Biologists (ASPB), Association of the Chemical Profession of Alberta (ACPA), Association of Professional Engineers Geoscientists of Alberta (APEGA), Association of Science and Engineering Technology Professionals in Alberta (ASET), College of Alberta Professional Foresters (CAPF), and College of Alberta Professional Forest Technologists (CAPFT).

# Phase 2 Environmental Site Assessment Checklist

This checklist is designed to facilitate a review of the key elements of the Phase 2 Environmental Site Assessment (ESA) for practitioners and reviewers. It is important to ensure the site is thoroughly assessed, the substance(s) delineated, and reports contain the appropriate information for remediation and/or risk management. A focus of the review is to assess the completeness of the ESA, and to identify data gaps that may exist. Key technical requirements for ESAs are also itemized in the checklist, which will allow the user to identify potential deficiencies in the report and/or in the methods used to conduct the ESA. Please ensure that the following items have been taken into consideration when an ESA report is submitted to Alberta Environment and Sustainable Resource Development.

| A. | SITE CHARACTERIZATION |
|---|---|
| i) | Site information has been provided. |
| ii) | Site description has been provided. |
| iii) | Scaled site map(s) with north arrow(s) have been provided showing site use and features such as the current buildings, impacted and/or remediated areas, current site and adjacent land uses, natural features, receptors, and sampling locations and areas/contaminants of potential environmental concern. Surface and underground structures including utilities services must be included in the site plan. |

| B. | RECEPTORS AND EXPOSURE PATHWAYS |
|---|---|
| i) | The existing land use or zoning has been identified. Where zoning is identified, it has been determined that the zoning requirements correspond to receptor, land use assumptions in the AENV Tier 1 land use definition |
| ii) | If the future end land use is different from the existing land use, it has been identified. The site has been assessed against remediation objectives for both existing and future end land use. |
| iii) | The predominant soil texture has been documented based on the most conservative assumption regarding receptor risks. The lab analysis was conducted for determining soil grain size at the site. |
| iv) | Any site features that prevent the use of Tier 1 guidelines have been identified (see: Section 5 of *Alberta Tier 1 Soil and Groundwater Remediation Guideline* (AENV 2007a, as amended). |
| v) | All receptors as listed in Alberta Tier 2 Guidance or CCME Protocol for Derivation of Environmental and Human Health Guidelines are identified. |
| vi) | All exceptions to the use of Tier 1 tables and/or exclusion of specific pathways and receptors as outlined in the Tier 2 guideline have been assessed and documented. Appropriate modifications have been made to account for these cases. |
| vii) | For site adjacent to a residential property, the required setback distance was applied to the remediation criteria. |
| viii) | The underlying Domestic Use Aquifer (DUA), if any, has been identified. |
| ix) | Where required for a Tier 2 evaluation, the hydraulic conductivities and gradients of all relevant soil and geological media have been determined |
| x) | The hydraulic connection between the underlying DUA and the contaminated zone has been identified. (see Tier 2 for more information) * |
| xi) | Impacts to the underlying DUA have been identified, if any**. |
| xii) | All onsite water wells have been identified. |
| xiii) | The impacts, if any, to all onsite water wells have been identified. |
| xiv) | All offsite water wells, within 300m, have been identified. |
| xv) | The impacts, if any, to all offsite water wells have been identified. |

| **B.** | **RECEPTORS AND EXPOSURE PATHWAYS** |
|---|---|
| xvi) | Ground truthing of water wells within 300m down-gradient and 100m up-gradient of the plume has been completed. |
| xvii) | Any seasonal and permanent surface water bodies within 300m of the plume, as per Tier 2 guidance have been identified. |
| xviii) | Any cellar/basement with an earthen or bare dirt floor has been identified. |
| xix) | Stressed vegetation on- and off-site has been identified. |

| **C.** | **CONTAMINANT ASSESSMENT**<br>*Is the delineation complete in both soil and groundwater?* |
|---|---|
| i) | Existing information has been reviewed and used to develop an initial conceptual site model. |
| ii) | The features of any subsurface materials affecting transport of contaminants have been identified. (shallow water table, sand lenses, gravel, fractured bedrock, peat deposits, fill material, utility locations, etc.). Maps are provided to clearly delineate the subsurface features and locations on site. |
| iii) | All borehole logs and monitoring well installations are properly documented and included in the report. |
| iv) | Detailed site plans and cross-sections providing stratigraphic and hydrogeological information, sampling locations, and contaminant delineation have been provided. |
| v) | Field sampling methodologies including field screening, borehole drilling, monitoring well construction, and other activities used for sampling have been documented. |
| vi) | Background conditions for soil have been determined and documented in the report. |
| vii) | Background conditions for groundwater have been properly determined and documented in the report or delineation information clearly demonstrates that groundwater is not impacted by any contamination on site. |
| viii) | Contamination in the soil and geological material has been fully delineated in the vertical direction from the source until measured concentrations are less than Tier 1 or 2 remediation guidelines. |
| ix) | Contamination in the soil and geological material has been fully delineated in the horizontal direction from the source until measured concentrations are less than Tier 1 or 2 remediation guidelines. |
| x) | Contamination in the groundwater has been fully delineated fully in the vertical direction from the area of original contamination until measured concentrations are less than Tier 1 or 2 remediation guidelines. |
| xi) | Contamination in the groundwater has been fully delineated fully in the horizontal direction from the area of original contamination until measured concentrations are less than Tier 1 or 2 remediation guidelines. |
| xii) | Where a contaminant has the potential to form a free phase, free phase liquid product is identified and fully delineated in the vertical and horizontal directions. The zone of free phase contamination has been clearly identified. |
| xiii) | If contamination has entered bedrock, it has been identified and fully delineated in the vertical and horizontal direction. |
| xiv) | All analytical results have been summarized in tables or on the site plan detailing results and comparing against background conditions, Tier 1 and any other Tier 2 remediation criteria developed for the site. |
| xv) | All contaminants of potential concern, transformation products, and complementary parameters have been tested for all relevant media. |
| xvi) | Representative data/samples have been obtained through proper appropriate sampling design and methodology. There has been sufficient sampling to characterize weather, spatial conditions, and temporal variability. |

| **C. CONTAMINANT ASSESSMENT**<br>*Is the delineation complete in both soil and groundwater?* | |
|---|---|
| xvii) | Field QA/QC procedures have been undertaken and documented including the collection of field duplicate samples, trip blanks, equipment blanks and field blanks. |
| xviii) | All analytical tests have followed appropriate QA/QC practices using recommended laboratory procedures from qualified laboratories, following policies and procedures outlined by the department. |
| xix) | There is an adequately comprehensive description of the QA/QC program and results of data quality indicators relative to targets. Conclusions are provided on the reliability of data are based on a QA/QC program. |

| **D.** | **REMEDIATION ACTION PLAN/REMEDIATION OBJECTIVES*** ** |
|---|---|
| i) | The purpose and objectives of the report and the remediation action plan are clearly stated. |
| ii) | All sources, as defined in guideline documents have been determined on- and off-site. |
| iii) | All sources, as defined in guideline documents have been removed completely on- and off-site. |
| iv) | The remediation action plan has fully accounted for all residual contamination at the on- and off-site locations that are above stated objectives. |
| v) | The report clearly defines the Tier 1, Tier 2 guidelines, or Tier 2 site-specific risk assessment options used. Closure state relative to both Tier 1 and Tier 2 (where implemented) have been clearly outlined and documented in the report. |
| vi) | On-site remediation outcome meets appropriate remediation objectives or applicable environmental standards. |
| vii) | Off-site remediation outcome meets appropriate remediation objectives or applicable environmental standards. |
| viii) | All investigation and sampling design objectives have been met. |
| ix) | It is noted whether further assessment to delineate the extent of vertical or horizontal contamination is required. |

| **E.** | **NOTIFICATION** |
|---|---|
| i) | All impacted property owners have been identified and notified. |
| ii) | The affected owners/third party was provided a company and consultant contact to discuss any concerns with respect to the contamination issue. |
| iii) | All third party/landowner concerns have been properly documented and included in the final report. |

| **F.** | **REPORTING REQUIREMENTS** |
|---|---|
| i) | Phase I and Phase II site assessment reports that fulfill all guideline requirements have been provided in the attached reports |
| ii) | All areas of potential environmental concern and all contaminants of potential concern have been adequately investigated and clearly identified in the report. |
| iii) | An updated conceptual site model has been provided that integrates available information on contamination sources, migration pathways, receptors, and exposure mechanisms. |
| iv) | Where Tier 1 objectives have been employed, specific requirements as laid out in the Tier 1 guideline have been included in the report with supporting information. |
| v) | Where Tier 2 objectives have been employed, specific requirements as laid out in the Tier 2 guidelines have been met and supporting information is provided in the final report. |

| | |
|---|---|
| vi) | Conclusions and recommendations are clear, unambiguous, and complete. |
| vii) | All documentation is complete, including logs, sampling sheets, and laboratory reports including QA/QC. |
| viii) | Primary authors and their respective qualifications have been provided. |
| ix) | A completed and signed Record of Site Condition has been provided. |

| **G.** | **COMMENTS** |
|---|---|
| | Other comments:<br>_____<br>_____<br>_____ |

* A hydraulic connection is assumed to be absent if the professional can demonstrate that:

- there is sufficient thickness of uncontaminated, natural geologic material between the contaminant plume and the DUA based on either:
  1) a five meter thickness of massive, unfractured saturated fine-grained material, with a bulk hydraulic conductivity less than 1 x 10-7 m/s (from: *Alberta Tier 2 Soil and Groundwater Remediation Guideline AENV 2007b)*; or
  2) an equivalent thickness of uncontaminated material supported by technical arguments prepared and accepted by the professional.

** A town's reliance on municipal systems does not exclude the groundwater ingestion pathway.

*** For all sites where either administrative or engineered controls are required to protect one or more pathways for all or a portion of the contaminated material (e.g. for any exposure control risk management scenario), All aspects that are included under the Tier 2 exposure control guidance and subsequent documents must be considered and documented as part of the risk management plan.

## References

Alberta Environment (AENV), 2006. Competencies for Remediation and Reclamation Advisory Committee: Recommendations Report.

Alberta Environment (AENV), 2007a, as amended. Alberta Tier 1 Soil and Groundwater Remediation Guidelines.

Alberta Environment (AENV), 2007b, as amended. Alberta Tier 2 Soil and Groundwater Remediation Guidelines.

Alberta Environment (AENV), 2009, as amended. Soil Monitoring Directive.

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Any comments, questions or suggestions regarding the content of this document may be directed to:

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