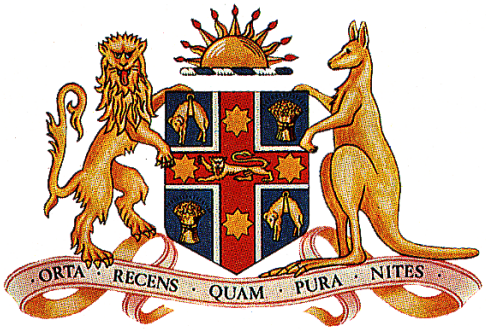

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CONTAMINATED LAND MANAGEMENT ACT 1997

Notice of Guidelines

'Consultants reporting on contaminated land: Contaminated Land Guidelines'

I hereby give notice under section 105(1) of the *Contaminated Land Management Act 1997*, that the 'Consultants reporting on contaminated land: Contaminated Land Guidelines' are made. This guideline takes effect under section (2)(c) of the *Contaminated Land Management Act 1997* upon publication in the *Government Gazette*.

The 'Consultants reporting on contaminated land: Contaminated Land Guidelines' revokes the 'Guidelines for Consultants Reporting on Contaminated Sites, Office of Environment and Heritage August 2011'.

1 April 2020

Jacquelyn Miles
A/Director Regulatory Policy and Reform
Environment Protection Authority

Consultants reporting on contaminated land

Contaminated land guidelines

NSW EPA

www.epa.nsw.gov.au

Cover: Contaminated materials at an old gasworks site, Photo: EPA

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Contents

Introduction

Purpose

These guidelines provide a reporting framework and information to ensure that reports prepared by consultants on the management of contaminated land[1] contain the right information in a suitable format to inform and explain management decisions, document outcomes, and provide for efficient review by regulators, the site auditor and other interested parties.

These guidelines:

- describe the stages of reporting on the management of contaminated land and the objective of the reports for each stage
- provide checklists of reporting requirements for consultants to use when reporting on contaminated land.

For contaminated land subject to planning processes such as a rezoning application, development application and/or building approval, the appropriate planning authority and planning guidance should also be consulted, including the:

- Local Government contaminated land policies and records (check with the relevant planning authority)
- State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)
- *Managing Land Contamination Planning Guidelines SEPP 55 - Remediation of Land* (Department of Urban Affairs and Planning and EPA 1998) (Planning Guidelines) (or updates).

The Planning Guidelines describe the roles and responsibilities of the key stakeholders involved in the planning process.

Contaminated land guidelines

The Guidelines for *Consultants reporting on contaminated Land: Contaminated land guidelines* are made by the NSW Environment Protection Authority (EPA) under section 105 of the *Contaminated Land Management Act 1997* (CLM Act) and take effect on the day that they are published in the NSW Government Gazette. They revoke the 2011 edition of the Guidelines for Consultants Reporting on Contaminated Sites.

These guidelines form part of a series of statutory guidelines made or approved by the EPA to support the administration of the CLM Act. The EPA website contains a statutory guidelines list to assist with each stage of reporting. Before undertaking their work, consultants should refer to these statutory guidelines.

The National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM) is the key approved national guidance. The ASC NEPM provides the policy framework for a nationally consistent approach to assessment of site contamination, and the recommended process to ensure this. It also sets national heath-based standards for determining the risk of contamination to human and environmental health.

The assessment of site contamination process is outlined in ASC NEPM Schedule A – Recommended general process for assessment of site contamination. Detailed technical guidelines are provided in ASC NEPM Schedule B – General guidelines for the assessment of site contamination. Consultants must refer to Schedules A and B along with other relevant EPA made or approved statutory guidelines, when

[1] Management of land or of contamination of land means management in relation to the actual or possible contamination of the land, including investigation into the existence, nature and extent of the contamination of the land and remediation of contaminated land. (Section 4 Definitions, Part 1 Preliminary, CLM Act).

undertaking and reporting on contaminated land assessment works. More detailed guidance may be found in documents listed in the ‘References’ section of this guideline.

Compliance with the relevant guidelines supports sound, professional work by contaminated land consultants which is fundamental to the successful management of contaminated land. Quality work and reports by consultants help to achieve desired contaminated land management outcomes more quickly, efficiently and cost effectively. Where work is done poorly, including poor reporting, it can lead to poor or inaccurate transfer of information to stakeholders, ultimately leading to human health or environmental risks. This can result in significant delays, much higher costs, and risk regulatory penalties from the EPA or planning consent authority.

Acknowledgements

The EPA acknowledges the contributions and comments on these guidelines provided by:

- GHD
- Office of Environment and Heritage (now part of Department of Planning, Industry and Environment)
- Environmental Laboratory Industry Group
- National Measurement Institute
- Submissions received in response to the public release of the draft guidelines.

1. Reporting stages

The process of contaminated land management can be broadly divided into the following stages:

1. Preliminary site investigation
2. Sampling and analysis quality plan
3. Detailed site investigation
4. Site specific risk assessment and modelling
5. Remedial action plan
6. Site remediation and validation
7. Environmental management plan
8. Ongoing monitoring

Consultants' reports most often address one or more of these stages. Reports may be presented separately or combined (for example preliminary and detailed site investigations can sometimes be combined into a single document).

Each report must stand alone, containing enough information to be readily understood. A summary of certain information can be provided, if relevant information has been included in a previous report prepared by a consultant (unless that information has since been superseded). Final documents should be submitted to regulatory authorities to support decision-making relating to contaminated land.

Work undertaken by consultants must comply with relevant contaminated land guidelines and policies and provide a robust basis for decisions or actions relating to the land concerned.[2]

The Guidelines for the NSW Site Auditor Scheme (3rd edition [October 2017]) (Guidelines for the NSW Site Auditor Scheme) and the EPA Contaminated Land Consultant Certification Policy are included in these guidelines.

Role of site auditors and consultants

The introduction of the Guidelines for the NSW Site Auditor Scheme describes the objectives of the scheme and the roles and responsibilities of site auditors and consultants in the site assessment and audit process. Site auditors accredited under the NSW Site Auditor Scheme are often engaged to independently review consultant activities including site assessments, remediation and validation work to ensure the work complies with current regulations and guidelines and meets the standard appropriate for the proposed land use. For example, site investigation reports and remediation proposals prepared by consultants relating to development application proposals may therefore require review and sign off by an accredited site auditor through the issue of a site audit statement.

The EPA does not accredit or certify environmental consultants. The EPA's Contaminated Land Consultant Certification Policy lists the certification schemes recognised by the EPA. This policy requires any consultant reports submitted to the EPA to comply with requirements of the CLM Act, to be prepared, or reviewed and approved, by a consultant certified under one of these schemes. Note the responsibility of a certified consultant for reviewing and approving a report is the same as if they were co-author, either in substance or in a supervising role. Their sign-off of approval should not be subject to disclaimers limiting responsibility for completeness or accuracy.

[2] Section 3.2.4 Scope of a site audit, Guidelines for the NSW Site Auditor Scheme (3rd edition) (EPA 2017) (Site Auditor Guidelines).

A Guideline on the Competencies and Acceptance of Environmental Auditors and Related Professionals (Schedule B9) is provided in the ASC NEPM.

Reporting requirements

The reporting requirements of each contaminated land management stage are discussed in this Section of the guideline. A series of checklists are provided in the 'Reporting Requirements' section to help consultants meet these requirements when preparing their reports. The text boxes throughout this guideline are relevant to multiple reporting stages, but only appear in the stage where first expected to be used.

All reports should present and discuss information in a 'Plain English' style and include supporting text for any information presented in a table or diagram. Where technical language is required to avoid misinterpretation, the report should explain the meaning of the technical terms used.

1.1. Preliminary site investigation

The objective of the preliminary site investigation and associated report is to assess whether contamination has the potential to exist on the site and whether further investigation is needed.

This process is described in Section 8 Stages of reporting, Preliminary – Schedules to the Measure of the ASC NEPM. Key factors include:

- the purpose of the investigation
- the site history
- past and present potentially contaminating activities (on- and off-site sources)
- potentially contaminated media
- the condition of the site and surrounding environment
- the geological and hydrogeological setting
- a preliminary assessment of site contamination and contaminants of potential concern
- a conceptual site model
- identification of data gaps in the assessment of site contamination
- recommendations for further investigation.

An appraisal of the site history is fundamental to the preliminary investigation and may be used to assess the likelihood of site contamination. It is important to review and assess all relevant information about the site, including information available from planning authorities and the EPA and information obtained during site inspections. A comprehensive list of site history characteristics can be found in Section 3.3 Site History, Schedule B2 - Guideline on Site Characterisation (ASC NEPM) and the NEPM toolbox 'field checklist'.

A preliminary site investigation report must adequately identify potential human and ecological receptors (on- and off-site) and identify potentially affected media (soil, sediment, groundwater, surface water, soil vapour and indoor and outdoor air). The report must also indicate all contaminants of potential concern including emerging contaminants that have been identified during the preliminary site investigation.

Where a complete site history clearly shows that activities have been non-contaminating, there are no impacts from off-site contamination sources, and observations do not indicate any potential for contamination, there may be no need for further investigation or site sampling. Refer to Section 2 Stages of investigation, (Schedule B2, ASC NEPM). However, where contaminating activities are suspected or known to have occurred, or if the site history is incomplete, it may be necessary to undertake a preliminary sampling and analysis program to assess the need for a detailed investigation.

Box 1 Conceptual site model

A conceptual site model is an essential part of all stages of site assessment including the preliminary site investigation. An overview of conceptual site models is provided in *Section 4 Conceptual Site Models, Schedule B2 - Guideline on Site Characterisation (ASC NEPM*) and is summarised here. A conceptual site model provides the framework for identifying sources of contamination, contaminant migration pathways, receptors and exposure mechanisms. The complexity of the conceptual site model should correspond to the scale and complexity of the known or potential contamination impacts.

a) The essential elements of a conceptual site model are:

b) known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination

c) list of potentially affected media including biota if applicable

d) list of human and ecological receptors (both on- and off-site)

e) potential and complete exposure pathways (both on- and off-site, including preferential pathways which are of particular relevance to the assessment of vapour).

All conceptual site models must identify the theories and assumptions underlying the model including:

a) how representative the available data is likely to be

b) the potential sources of variability and uncertainty

c) how important the identified data gaps are to the objectives and reliability of the site assessment.

Developing and refining a conceptual site model is an iterative process. The conceptual site model must be refined throughout the site assessment process based on any available environmental or site historical or field information.

A conceptual site model can take various forms, including text, tables, graphics, and flow diagrams, they can also take the form of site-specific plans and figures including cross-sections.

1.2. Sampling and analysis quality plan

The objective of a sampling and analysis quality plan is to provide the context, justification and details of the selected sampling and analysis approach.

The ‘sampling and analysis quality plan’ has a critical role in ensuring that the data collected is representative and provides a robust basis for site assessment decisions, as indicated in Schedule B2 - Guideline on Site Characterisation, of the ASC NEPM. A sampling and analysis quality plan may be either a standalone document, or may be incorporated into the relevant investigation report.

The sampling and analysis quality plan:

- must be prepared before sampling is conducted
- must specify the chosen strategy with justification for the chosen sampling design including explaining how the data collection and evaluation will be representative and relevant
- must ensure that field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data to meet project objectives, including (where applicable) the relevant site characterisation requirements of the detailed site investigation
- must include a figure showing target sampling locations, scale, location ID and north point, drainage and related features
- should vary in detail including the scope and level of information, according to the site-specific circumstances and the stage of site investigation
- must be flexible to allow changes during the site investigations in response to identified site conditions, data gaps and allow the review and update of the conceptual site model.

Box 2 Data quality objectives

Data quality objectives are performance and acceptance criteria which are developed during the planning of a site assessment. They are used to evaluate whether there is enough data of a high enough quality to support decision making. Data quality objectives should be integrated into all stages of reporting. Development of data quality objectives should be guided by identifying critical data gaps in the conceptual site model. Changes to the conceptual site model may involve revision of the data quality objectives.

See the ASC NEPM (Appendix C Assessment of Data Quality, and Schedule B2 - Guidance on Site Characterisation) and USEPA Guidance on Systematic Planning Using the Data Quality Objectives Process: EPA QA/G-4 (USEPA 2006) for further guidance.

1.3. Detailed site investigation

The objective of a detailed site investigation report is to provide more complete and definitive information on issues raised in the preliminary site investigation.

The detailed site investigation report must be designed to provide information on the type, extent and level of contamination for the site and (as relevant) assessment of:

- primary sources of contamination, for example potentially contaminating activities, infrastructure (such as underground storage tanks, fuel line, sumps or sewer lines) or site practices
- contaminant dispersal in air, hazardous ground gases, surface water, groundwater, soil vapour, separate phase contaminants, sediments, infrastructure (e.g. concrete), biota, soil and dust
- contaminant characterisation and behaviour (volatility, leachability, speciation, degradation products and physical and chemical conditions on-site which may affect how contaminants behave)
- potential effects of contaminants on human health, including the health of occupants of built structures (for example arising from risks to service lines from hydrocarbons in groundwater, or risks to concrete from acid sulphate soils) and the environment
- potential and actual contaminant migration routes including potential preferential pathways
- the adequacy and completeness of all information available for use in the assessment of risk and for making decisions on management requirements, including an assessment of uncertainty
- the review and update of the conceptual site model from the preliminary and detailed site investigations.

If the results of the detailed site investigation indicate that the contamination at the site has the potential to pose unacceptable risk to human health or the environment (on- or off-site), under either the current or the proposed land use, then further assessment needs to be carried out and/or a remedial action/management plan needs to be prepared and implemented. Consultants should refer to the ASC NEPM during the preparation of a detailed site investigation including:

- Schedule B2 - Guideline on Site Characterisation
- Schedule B3 - Laboratory Analysis of Potentially Contaminated Soils.

Supplementary site investigations can be undertaken to fill data gaps identified by the detailed site investigation. Investigative efforts should be focused on addressing the critical data gaps in a manner that is proportional to the uncertainties identified. The purpose of the supplementary investigation must be well defined. For example; are the original data quality objectives still appropriate, or do new targeted objectives need to be developed? The sampling and analysis quality plan must then be developed or updated as necessary. When reporting on this stage include a summary of both the relevant components of previous site investigations and the historical results.

As new information becomes available, data quality must be reassessed, and the conceptual site model iteratively updated to reflect changes in how the site is understood. Any new findings or remaining uncertainties must be discussed. If the conclusions of the previous site investigation have changed, this should be made clear to the reader.

Landowners and parties responsible for land contamination must report the contamination to the EPA. A contaminated land notification form is available on the EPA website.

Following any site investigations, consultants should take reasonable steps to draw their client's attention to any potential duty to report contamination to the EPA in accordance with EPA Guidelines on the Duty to Report Contamination Under the *Contaminated Land Management Act 1997* (EPA 2015).

1.4. Site-specific risk assessment and modelling

The objective of a site-specific risk assessment is to further assess potential for harm to human health and/or the environment from a specific site.

The process of assessing human health risks and ecological risks usually follows a tiered approach where each tier progressively builds on the data collection and analysis undertaken at the previous tier. The ASC NEPM adopts a three-tiered approach, which is explained in Section 1.4.3 and Section 2.4 of Schedule B4 Guidance on site-specific health risks assessments.

Tier 1 is the screening assessment stage where site analytical data is compared with generic assessment criteria for various environmental values to decide if further assessment is needed. The generic assessment criteria, for example, health investigation and screening levels, ecological investigation and screening levels, groundwater investigation levels and water quality guidelines are in the form of published risk-based guidance assessment criteria.

Tier 2 and Tier 3 involve progressively higher levels of site specific risk assessment.

A Tier 2 and Tier 3 site-specific risk assessment may be undertaken where:

a. concentrations of contaminants exceed generic Tier 1 assessment criteria and indicate that further investigation and evaluation is required,
b. assessment criteria are not available for certain contaminants, or
c. where further assessment is required to reduce uncertainties and consider site-specific conditions.

A risk assessment must consider all relevant data available, and might include collecting data under different conditions (such as changes in atmospheric conditions over time and seasonal changes) and results from different media. This includes soil, groundwater, surface water, sediment and/or soil vapour contamination, and ground gases, and may also involve the use of quantitative contaminant fate and transport models.

It may be necessary to undertake modelling to predict the environmental concentrations and fate of the contaminants of concern. Fate and transport models can be used to:

- validate a conceptual site model
- predict contaminant concentrations for comparison against assessment criteria
- derive site specific assessment or remediation criteria
- assist in remedial design.

Consultants must clearly justify their input data and assumptions. Models should be calibrated where possible, against the results of existing samples (or new sampling results) to verify that they accurately represent site conditions. Also, a quantitative sensitivity and uncertainty analysis must be completed to understand whether changes in site conditions, or a better understanding of site conditions, could significantly change the outcome.

For details on contaminant fate and transport modelling refer to the ASC NEPM Schedule B2 Guideline on Site Characterisation, Section 10 Contaminant fate and transport modelling and the EPA's Guidelines for the Assessment and Management of Groundwater Contamination (DEC 2007) (made under the CLM Act)(or update).

For details on preparation of risk assessments refer to the ASC NEPM:

- Schedule B4 - Guideline on Site-Specific Health Risk Assessment and Methodology.
- Schedule B5a - Guideline on Ecological Risk Assessment.
- Schedule B5b - Guideline on Methodology to Derive Ecological Investigation Levels in Contaminated Soils.
- Schedule B5c - Guideline on Ecological Investigation Levels for Arsenic, Chromium (III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc.
- Schedule B6 - Guideline on The Framework for Risk-Based Assessment of Groundwater contamination. Schedule B7 - Guideline of the Derivation of Health Investigation Levels.

Further details can be found in the Environmental Health Standing Committee (enHealth) documents[3]:

- Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (2012)
- Australian exposure factor guide Environmental Health Subcommittee (enHealth) of the Australian Health Protection Principal Committee, Canberra (enHealth, 2012)
- Management of asbestos in the non-occupational environment, Department of Health and Aging, Canberra (enHealth, 2005).

These documents are available at www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-publicat-environ.htm.

1.5. Remedial action plan

The objective of a remedial action plan is to set remediation objectives and document the process to remediate the contaminated site.

The remedial action plan must:

- summarise the findings of the preliminary and detailed site investigations and risk assessment (where applicable), and present the refined conceptual site model
- document the identified contamination risks to human health and/or the environment
- set remediation objectives that ensure the remediated site will be suitable for its current and/or proposed use and which will result in no unacceptable risk to human health or to the environment and state remediation criteria
- define the extent of remediation required across the site
- assess options and remedial technologies to achieve the remediation objectives and select and justify a preferred approach, which must include the consideration of the principles of ecologically sustainable development
- document in detail all procedures and plans to reduce risks posed by contamination to acceptable levels for the proposed site use
- identify the need for and reporting requirements of remedial technology pilot trials (if applicable)
- establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner, including consideration of the potential for off-site impacts (such as air quality, odour and aesthetics)
- address contingencies and unexpected finds protocols

[3] These documents are reflected with the ASC NEPM Schedules.

- identify the necessary approvals and licences required by regulatory authorities including any items contained in development consent conditions
- clearly outline waste classification, handling and tracking requirements in accordance with the Guidelines for the NSW Site Auditor Scheme and Waste Classification Guidelines (EPA 2014)
- ensure remediation is consistent with relevant laws, policies (including planning instruments and policies) and guidelines and reference these in the remedial action plan
- identify how successful implementation of the remedial action plan will be demonstrated, for example the validation requirements by documentation of site works and sampling and analysis etc (when sampling and analysis is required, a validation sampling and analysis quality plan must be included, with clearly defined acceptance validation criteria indicating what statistics will be used and any trend analysis following remediation, i.e. Mann-Kendall test)
- identify the need for, and nature of, any long-term management and/or monitoring following the completion of remediation and, if required, provide an outline of an environmental management plan and include this in the remedial action plan.

Remediation objectives may differ for example, where a site has a residential area and a roadway. When reporting on the results of the remedial action plan, previous result tables can be divided into several tables that relate to particular activities or remedial zones, if relevant.

If restrictions are needed to manage risks, always ensure these are documented and can be practically undertaken.

If dedication of either remediated or contaminated assets to Council is being considered as part of the remediation action plan, the relevant Council must be consulted first.

1.6. Site remediation and validation

The objective of the site remediation and validation report is to detail the site work undertaken and demonstrate compliance with the remedial action plan for the site, and compliance with contaminated land guidelines and all other applicable regulatory requirements.

Regulatory requirements include for example a notice issued by the EPA under the CLM Act such as a management order, licences and/or development consent conditions issued by a regulatory authority.

The site remedial work must be ‘validated’ to ensure that the objectives stated in the remedial action plan have been achieved once remediation is complete including whether the site is suitable for the proposed use. A report detailing the results of the site validation is required.

The extent of validation required will depend on the:

- degree of contamination originally present
- type of remediation processes that have been carried out
- current and/or proposed land use.

The validation report must:

- clearly describe the remedial works undertaken, the validation carried out and the final condition of the site
- confirm statistically that the remediated site complies with the remediation criteria set for the site (for guidance, see Contaminated Sites Sampling Design Guidelines (EPA 1995) (or update made under the CLM Act))
- assess the results of the post-remediation testing against the remediation criteria stated in the remedial action plan. Where these criteria have not been achieved, reasons must be stated and additional site work proposed to achieve the original objectives, or a management plan put in place (see Section 1.7 and Table 2.7).

The person who engaged the consultant may may also engage a site auditor accredited under the CLM Act to independently review remediation and validation reports to ensure the methods and interpretation of data are consistent with EPA guidance. They may elect to do this or may be required to do this for example by the:

- EPA in relation to management order issued under the CLM Act relating to significantly contaminated land, or
- a planning authority, for example, if land with a known or suspected history of potentially contaminating activities is planned to be redeveloped for a more 'sensitive' use, such as residential.

Box 3 Waste classification report

If waste materials are to be generated for off-site disposal or processing during remediation, then a waste classification report is required. A waste classification report must be prepared prior to waste being disposed to landfill or taken to a recycling facility. The waste classification report must confirm the classification of the waste and must be prepared in line with the relevant Waste Classification Guideline which includes:

Part 1 Classifying Waste

Part 2 Immobilising Waste

Part 3. Waste containing radioactive material

Part 4. Acid sulfate soils

Addendum to Part 1: classifying waste to include PFAS.

See bullet list below for more details.

A waste classification report must include:

- the full name, address, Australian Company Number (ACN) or Australian Business Number (ABN) of the organisation and person(s) providing the waste classification
- location of the site where the waste was generated, including the site address
- history of the material and the processes and activities that have taken place to produce the waste
- potential contaminating activities that many have occurred at the site where the waste was generated
- description of the waste, including photographs, visible signs of contamination, such as discolouration, staining, odours etc
- quantity of the waste
- number of samples collected and analysed
- sampling method including pattern, depth, locations, sampling devices, procedures, and photos of the sample locations and samples
- contaminants tested
- laboratory documentation – chain-of-custody, sample receipt, laboratory report
- all results regardless of sample mean, sample standard deviation and the 95% upper confidence limit
- short summary of findings including discussion of results, exceedances of the relevant contaminant threshold or specific contaminant concentration and toxicity characteristics leaching procedure threshold values
- a clear statement of the classification of the waste as at the time of the report.

Some chemical wastes may also be subject to additional controls set by a chemical control order under the *Environmentally Hazardous Chemicals Act 1995*. These controls are used to manage specified hazardous chemicals and chemical wastes, for example, include the Scheduled Chemical Waste Chemical Control Order 2004 (https://www.epa.nsw.gov.au/). For more information about these waste issues see Section 4.3 Remediation of Contamination of the Guidelines for the Site Auditor Scheme.

1.7. Environmental management plan

The objective of an environmental management plan is to document mitigation measures and/or monitoring requirements, where full clean-up is not feasible, or on-site containment of the contamination is proposed.

The environmental management plan must state its objectives and describe:

- the nature and location of contamination remaining on site
- what long-term site management is needed to ensure the ongoing protection of human health and the environment on- and offsite
- a mechanism for enforcement of the monitoring.

The environmental management plan must also show that the feasibility of implementing the plan over the long-term and that the consequences of inadequate implementation have been considered during its development. The plan must contain enough detail and clarity about the site and actions needed to be readily understood as a standalone document. The length and precise content of the plan will depend on the complexity of the site issues. A short, concise plan may be enough for simple sites. A more detailed plan will be required for complex sites.

Systems to manage contamination detailed within an environmental management plan may be passive or active. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components. In some cases, passive systems may relate to notification of residual contamination to ensure mechanisms for managing risks are applied, e.g. procedures that protect people who could come into contact with contaminated groundwater, such as workers undertaking excavations below the water table.

Active management systems usually incorporate mechanical components and/or require monitoring and regular maintenance and inspection. Most active management systems are applied at sites where, if the systems are not implemented, an unacceptable risk may occur. Active management systems must only be considered for properties where effective long-term management is feasible.[4]

Where an active system is proposed, the consultant must ensure that the proposal is reasonable and feasible for future asset owners to comply with in the long-term, taking into account the specific circumstances in each case. The relevant authority must be consulted (the EPA or the planning authority, generally the Council) before an environmental management plan containing an active or passive management system is issued to confirm that the conditions are enforceable.

1.8. Ongoing monitoring

Sometimes ongoing monitoring of one or more media (on- and/or off-site) may be required. In these cases, a monitoring program must be documented detailing the proposed strategy, parameters to be monitored, locations, frequency, decision process for additional actions and for ending monitoring, and reporting requirements. For example, this monitoring might be needed to:

- meet the requirements of an order issued under the CLM Act
- meet the requirements of planning instruments or development consent conditions issued by the planning authority
- demonstrate attenuation of residual contaminants post-remediation

[4] Section 3.4.6 Environmental Management plans, the Guidelines for the Site Auditor Scheme.

- demonstrate ongoing containment of contamination.

An ongoing monitoring report must include the following:

- A concise background, including conceptual site model and reference (where applicable) to other reports with more detailed information.
- Justification of any departures from the required monitoring plan.
- Clear presentation and discussion of results.
- Comparison with previous monitoring rounds (and statistical analysis where sufficient data has been collected) if appropriate).
- Comparison to site-specific criteria which might trigger the need for extra work/remediation, or to notify the EPA, or lead to pre-defined outcomes.
- Contingency actions to be undertaken or required in response to monitoring results, and by whom.

2. Reporting requirements

2.1. How to use the EPA checklists

This section provides a series of checklists in table form for consultants to use when reporting on contaminated sites. These checklists have been prepared to help achieve a uniform approach when reporting on contaminated sites and ensure that environmental and health issues have been addressed.

Where a consultant chooses to deviate from the relevant requirements in these checklists, clear reasons must be given to justify any significant deviations at each reporting stage (or a summary of the reasons provided in a previous report prepared by the consultant).

The ASC NEPM Field Checklist is referred to throughout the tables as a resource to help in applying the ASC NEPM. The ASC NEPM Field Checklist provides a comprehensive list of items to include for:

- site identification
- site history
- site condition and surrounding environment
- sampling and analysis quality plan
- conceptual site models.

Each subject on this bullet list needs to be considered for all sites, but not all the items relating to each subject will be relevant to every contaminated site.

The checklists also refer to the ASC NEPM Schedules by letter (A, B etc) where relevant throughout, including the flowchart of the recommended process for site assessment (Schedule A) and the series of detailed technical guidelines for assessing land contamination in Australia (comprising Schedule B). The full title of each schedule is listed in the References section at the end of this document.

The first column of each table lists the 'report sections' you need to include in your report. The second column lists the 'required information' to be included in each report section and provides references for further information. The structure and order of the report sections may vary to fit the circumstances.

Use the 'reporting stage' checklists together with the objectives described in Section 1 of these guidelines. When completing the reporting stage checklists, refer to the key reporting components where necessary.

Checklist items that refer to another table in this document are hyperlinked.

The EPA checklists are:

Reporting stages checklists

Key reporting components checklists

Table 2(a) Conceptual site model

Table 2(b) Data quality objectives

Table 2(c) Quality assurance/controls

Table 2(d) Waste classification

2.2. Reporting stages checklists

Table 2.1 Preliminary site investigation

Preliminary site investigation		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Executive summary	Background	☐
	Objectives of the investigation	☐
	Scope of work	☐
	A summary of key findings, observations and sampling results (if available)	☐
	Summary of conclusions and recommendations	☐
Objectives	The objectives of the investigation/report and the broader objectives for the site/investigation	☐
Scope of work	Scope of work performed (and work not undertaken where relevant)	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet	☐
Site history	Site history items from ASC NEPM Field Checklist 'Site information' sheet	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet	☐
Conceptual site model	See Table 2(a)	☐
Data quality objectives (if sampling is undertaken)	See Table 2(b)	☐
Sampling and analysis plan and sampling methodology (if sampling is undertaken)	See Table 2.2, and note and explain the rationale for any deviations from the plan	☐
Quality assurance/quality control data evaluation (if sampling is undertaken)	See Table 2(c)	☐
Field and analytical results	Summary of previous results, if applicable	☐

(if sampling is undertaken)	A table(s) of analytical results that:	
	• shows all essential details such as sample identification numbers and sampling depth	☐
	• shows assessment criteria	☐
	• highlights all results exceeding any assessment criteria	☐
	Summary/discussion of the analytical results table	☐
	Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, soil vapour, ground gas, indoor air and biota)	☐
	Test pit or bore logs (well construction details where appropriate for example groundwater level expressed in Australian height datum)	☐
	Site plan showing all sample locations	☐
	Site plan(s) showing the extent of soil and groundwater contamination (if known)	☐
	Refer to ASC NEPM Schedule B2 sections 13 and 14 for information regarding the data presentation	
Conclusions and recommendations	Summary of all findings and discussion of results	☐
	Conclusions addressing the stated objectives	☐
	Assumptions used in reaching the conclusions	☐
	Extent of uncertainties in the results (quantified where possible)	☐
	Recommendations for further work (if appropriate)	☐

Table 2.2 Sampling and analysis quality plan

Sampling and analysis quality plan		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Objectives	The objectives of the plan and the broader objectives for the site/investigation	☐
Scope of work	Scope of work to be performed (and work outside the scope where relevant)	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report	☐
Conceptual site model	Outline of existing and potential Source-Pathway-Receptor linkages that require investigation include contaminants of potential concern and a data gap analysis (see Table 2(a))	☐
Assessment criteria	Table listing all selected assessment criteria and references	☐
	Rationale for the selection of assessment criteria, including assumptions and limitations of the criteria (relevant to the assessment and current or proposed land use) and any deviations from approved guidelines.	☐
	Rationale for any site-specific assessment criteria developed through a site-specific risk assessment. Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7	☐
	Refer to ASC NEPM Schedule B1 sections 2 and 4.7 for more details on basis for assessment criteria	
	Refer to HEPA (2018) PFAS National Environmental Management Plan (NEMP) for technical guidance for investigations of PFAS in soil, groundwater and surface water for contaminated land assessment and management	
Sampling and analysis strategy and sampling methodology	Sampling and analysis data quality objectives. See Table 2(b)	☐
	A strategy to achieve pre-determined data quality objectives, including the sampling strategy and justification for the sampling design	☐
	Procedures to be undertaken if the data does not meet the expected data quality objectives	☐
	Sampling and analysis plan and methodology items from ASC NEPM Field Checklist 'SAP, QAQC' sheet	☐
	Refer to the updated conceptual site model and identified data gaps to determine sampling locations (to ensure source-pathway-receptors have been considered)	

	Consideration of existing production, residential or monitoring wells when determining groundwater sampling locations	☐
	Refer to ASC NEPM Schedule B2 sections 5 and 6 for sampling and analysis plan and sampling methodology	
	Refer to Sampling Design Guidelines for additional information on sampling design	
Data quality indicators	See Table 2(c) including details of the required quality assurance/quality control samples for the project (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spikes), including acceptable limits for field quality assurance/quality control	☐

Table 2.3 Detailed site investigation

Detailed site investigation		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Executive summary	Background	☐
	Objectives of the investigation	☐
	Scope of work	☐
	Where appropriate, a summary of key findings, observations and sampling results (if available)	☐
	Summary of conclusions and recommendations	☐
Objectives	The objectives of the investigation/report and the broader objectives for the site/investigation	☐
Scope of work	Scope of work performed (work not undertaken where relevant)	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet.	☐
Site history	Site history items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report.	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report, to be updated with site-specific information.	☐
Sampling and analysis quality plan and sampling methodology	See Table 2.2 and note and explain the rationale for any deviations from the plan	☐
Results	Summary of previous results, if applicable	☐
	A table(s) of analytical results that:	
	• shows all essential details such as sample identification numbers and sampling depth	☐
	• shows assessment criteria	☐
	• highlights all results exceeding any assessment criteria (not just the highest)	☐
	• includes a summary/discussion of the analytical results	☐
	• includes sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, biota)	☐

	• includes test pit or bore logs (well construction details where appropriate for example groundwater level expressed in Australian height datum)	☐
	• includes site plan showing all sample locations	☐
	• includes site plan(s) showing the extent of soil and groundwater contamination exceeding selected assessment criteria for each sampling depth, including identification numbers and depths of all samples analysed	☐
	• follows appropriate statistical procedures when comparing site data with the investigation and screening levels. Refer to ASC NEPM Schedule B1 sections 2, 3 and 4	☐
	Refer to ASC NEPM Schedule B2 sections 13 and 14 for information regarding the data presentation	
Quality assurance/quality control data evaluation	See Table 2(c)	☐
Conceptual site model	See Table 2(a)	☐
Site characterisation	Assessment of extent of contamination considering all relevant media, including offsite areas	☐
	Assessment of aesthetic issues	☐
	Assessment of secondary toxicity (if conducting an ecological risk assessment)	☐
	Assessment of potential effects of contaminants on human health, and built structures (for example arising from risks to service lines from hydrocarbons in groundwater, or risks to concrete from acid sulphate soils)	☐
	Assessment of chemical degradation products	☐
	Assessment of possible exposure routes and exposed populations (human, ecological)	☐
	Any evidence of, or potential for, migration of contaminants from the site, including odour, air quality, stormwater, sedimentation, soil vapour, ground gases and groundwater issues	☐
Waste management (if applicable)	Waste classification details in accordance with EPA Waste Classification Guidelines (see waste classification checklist – Table 2(d)	☐
	Statements regarding materials being disposed via appropriately licensed facility or re-used under an order or exemption	☐
	Waste disposal dockets or other waste documentation for any disposed waste	☐
	Refer to the Site Auditor Guidelines section 4.3.7 Waste management for waste management requirements	
Conclusions and recommendations	Summary of all findings	☐
	Conclusions addressing the stated objectives	☐

Assumptions used in reaching the conclusions	☐
Extent of uncertainties in the results	☐
A clear-cut statement that the consultant considers the site to be suitable for the proposed use (where applicable)	☐
A statement detailing all limitations and constraints on the use of the site (where applicable)	☐
Recommendations for further work, if appropriate	☐

Table 2.4 Site-specific risk assessment and modelling

Site-specific risk assessments and modelling		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Executive summary	Background to the site	☐
	Rationale and objectives for conducting the risk assessment	☐
	Description of the type of risk assessment conducted	☐
	Description of the elements of the risk assessment	☐
	Results of uncertainty or sensitivity analysis	☐
	Summary of the key conclusions, key assumptions of the risk assessment and recommendations arising from it	☐
Problem identification	Objectives and scope of the risk assessment	☐
	Data quality objectives and conceptual site model considerations, including any significant data gaps, extent and degree of contamination, potential exposure pathways and receptors (on- and off-site)	☐
	Background to the events leading to the risk assessment, including stakeholder objectives	☐
	Level of risk assessment being conducted	☐
	A site description and history (summary is enough if presented in an available referenced previous report)	☐
	Summary of site information, data contained in any previous site assessment reports and which data will be used in the risk assessment	☐
	Contaminants of potential concern for the site and information sources	☐
	Justify which contaminants are the subject of the risk assessment	☐
	Evaluation of quality assurance/control data on any previous field measurements and laboratory analysis contained in site assessment reports	☐
	Conclusions that can be drawn from problem identification	☐
Environmental values	Ecological or human health values to be protected	☐
	Approach used to identify human health or ecological risks, based on the identified environmental values	☐
Data collection and Tier 1 screening	Objectives of the data collection	☐

	Identification of the data used in the risk assessment	☐
	Explanation of any fate and transport modelling (if used)	☐
	Identification of any need for site zoning of contamination. For example, to consider specific source areas separately (e.g. hotspots), or identify on- or off-site locations with specific receptors/exposure (e.g. groundwater users)	☐
	Selection of, and justification for, Tier 1 screening criteria	☐
	Presentation of Tier 1 screening results	☐
Quality assurance/control	Summary of field and laboratory quality assurance/quality control for data used in risk assessment and modelling (see Table 2(c)	☐
Updated conceptual site model	Updated conceptual site model, including identification and justification of contaminants of concern and complete source-pathway-receptor linkages for Tier 2 assessment. Conceptual site model can be included as a visual representation of the site for example with site plans and schematic conceptual site model diagrams	☐
	As per conceptual site model (see Table 2(a)) updated for the risk assessment purpose	☐
	Identify-source-pathway-receptors which are complete/incomplete, with justification for pathways considered in the Tier 2 risk assessment	☐
Exposure assessment	Selection of contaminants of potential concern taken forward for assessment, with rationale	☐
	Fate and transport modelling of contaminants of potential concern; if undertaken	☐
	Analysis of contaminant releases	☐
	Identification of all relevant exposure pathways, with justification, and estimation of exposure concentrations for each pathway	☐
	Details on statistical approach used to determine exposure concentrations (e.g. mean, median, 95% upper confidence limit (UCL) and/or maximum used and reasoning for the chosen approach)	☐
	Identification of all potential receptors	☐
	Estimation of contaminant intake for each exposure route (this includes species-specific inhalation, ingestion and dermal exposure). All assumptions used are outlined with appropriate references and justification	☐
	Identification of media properties that affect contaminant mobility/availability	☐
	Bioavailability and bioaccumulation factors (where appropriate)	☐
	Sampling and analysis of water, sediments, soil, air/dust and food (where relevant)	☐
	Information on biota behaviour relevant to assessing exposure	☐

	Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7	
Hazard/toxicity assessment (not required for fate and transport modelling) (*when generating site specific reference doses)	Review qualitative and quantitative toxicity information (relevant to reference values) and identify most appropriate reference value*	☐
	Detailed literature review or relevant toxicological studies*	☐
	Determine appropriate dose-response relationships for contaminants of potential concern and identify if responses are threshold or non-threshold*	☐
	Potential ecological effects at the individual organism, population and community levels	☐
	Identify the critical toxic effects	☐
	Known toxicity modifying factors*	☐
	Characterise potential for adverse health effects, including summary of the effects on each body system (for example renal, hepatic, cardiovascular and developmental) and the types of effects (for example genotoxic and carcinogenic)	☐
	Discuss all relevant toxicological data and check for accuracy*	☐
	Justify the reference value(s) and toxicity data that have been selected	☐
	Follow hierarchy of toxicity assessment (ASC NEPM Schedule B4, Table 4 – Sources of information for toxicity assessment)*	☐
	Results of in-situ field or laboratory toxicity tests*	☐
Risk characterisation	Development of site-specific target levels (if required)	☐
	Presentation of all equations used in the risk assessment with modelling used (including units, conversion factors, clear definition of all parameters and values)	☐
	Identify any data gaps in the risk assessment, including all pathways and receptors that could not be assessed.	☐
	Chemical mixtures, concentrations of contaminants of potential concern	☐
	Identify any data gaps in the risk assessment, including all pathways and receptors that could not be assessed	☐
	Summary of key issues, including the assumptions made when conducting the risk assessment	☐
	Identification of risk driving contaminants and exposure pathways based on the risk analysis	☐
Uncertainty analysis	Summary of the analyses of uncertainty that have been undertaken for each component of the risk assessment	☐
	Presentation of a sensitivity/uncertainty analysis	☐

	Discussion of the implications of the uncertainty for the findings of the report	☐
	Methods of reducing uncertainty	☐
Conclusions and recommendations	Summary of the results of the risk assessment	☐
	Conclusions drawn based on the above assessment	☐
	Discussion of uncertainties and sensitivities	☐
	Recommendations	☐

Table 2.5 Remedial action plan

Remedial action plan		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Executive summary	Background – include a summary of site contamination	☐
	Objectives of the remediation	☐
	Summary of selected scope of remediation works	☐
Objectives	Objectives of the remediation	
Scope of work	Summary of the scope of work	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet	☐
Site history	Site history items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report.	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report.	☐
Remediation criteria	Table listing all selected remediation criteria and references	☐
	Rationale for the selection of criteria, including assumptions and limitations of the criteria and any deviations from the approved guidelines.	☐
	Rationale for any site-specific remediation criteria developed through a site-specific risk assessment. Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7	☐
	Refer to HEPA (2018) PFAS National Environmental Management Plan (NEMP) or guidance on environmental levels that indicate the need for action.	
Results	A summary is enough if detailed information was included in an available referenced previous report	
	Tabulated previous results relating to the remedial action plan that:	
	• show all essential details such as sample identification numbers and sampling depth	☐
	• show remediation assessment criteria	☐
	• highlight all results exceeding any remediation criteria	☐

	Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, biota)	☐
	Site plan showing all sample locations	☐
	Site plan(s) showing the extent of soil and groundwater contamination exceeding selected remediation criteria for each sampling depth, including sample identification numbers and sampling depths of all samples analysed	☐
	Site plan(s) showing the proposed extent of remediation	☐
Site characterisation	A summary is enough if detailed information was included in an available referenced previous report	
	Assessment of types of all environmental contamination	☐
	Assessment of extent of all identified contamination, including off-site areas	☐
Conceptual site model	See Table 2(a)	☐
Remediation Options Assessment and Remediation Strategy	Remediation objectives (these should already be defined under the general objectives and then the criteria derived.)	☐
	Assessment of possible remedial options and how risk can be reduced	☐
	Rationale for the selection of recommended remedial option, in accordance with the preferred hierarchy of site remediation and/or management set out in Key Principles for Remediation and Management of Contaminated Sites of the ASC NEPM Toolbox	☐
	Description of the remediation works to be undertaken	☐
	A validation plan which includes proposed testing to validate the site during/after remediation, including SAQP as per Table 2.2	☐
	Confirmation that waste imported onto the site is lawful Note: materials transported onto site will either need to meet the definition of virgin excavated natural material, or a resource recovery order and resource recovery exemption. In addition, materials imported onto the site must be adequately assessed as being appropriate for the final use of the site, including QA/QC evaluation of any sampling and analysis for material brought to site	☐
	Contingency plan if the selected remedial strategy fails	☐
	Interim site management plan before remediation, including fencing, erection of warning signs, stormwater diversion, etc.	☐
	Site management plan requirements (operational phase):	
	• site stormwater management plan	☐

	• soil management plan, including material tracking	☐
	• noise control plan	☐
	• dust control plan, including wheel wash (where applicable)	☐
	• odour control plan	☐
	• work health and safety plan	☐
	• remediation schedule	☐
	• hours of operation	☐
	• contingency plans to respond to site incidents, to remove potential effects on surrounding environment and community	☐
	Description of regulatory compliance requirements such as licences and approvals or financial assurance	☐
	Names and phone numbers of appropriate personnel to contact during remediation	☐
	Community relations plans (where applicable)	☐
	Staged progress reporting (where appropriate)	☐
	Outline of environmental management plan for ongoing management of contamination at the site (if needed)	☐
Waste management (if applicable)	Waste classification reporting requirements in accordance with EPA Waste Classification Guidelines (see Table 2(d))	☐
	Description of material handling and tracking plan	☐
	Statements regarding materials being disposed via appropriately licenced facility or re-used under an order or exemption	☐
	Waste disposal dockets or other waste documentation for any disposed waste	☐
	Refer to the Site Auditor Guidelines section 4.3.7 Waste management for waste management requirements	
Remediation Technology Pilot Trail (if applicable)	Details and results from treatability trials and Proof of Performance testing, to demonstrate the remediation option chosen was suitable for the site (for major remediation projects). If trials have not been completed, include an indicative scope of the proposed trial.	☐
Conclusions and recommendations	A list summarising the activities and physical changes proposed for the site	☐
	Conclusions addressing the stated objectives	☐

	Assumptions used in reaching the conclusions	☐
	A clear statement as to why the consultant considers the site can be made suitable for the proposed use if the remedial action plan is implemented	☐
	A summary of proposed limitations and constraints on the use of the site post remediation and proposed environmental management plan for long-term management of residual contamination at the site (where applicable)	☐
	Recommendations for further work, if appropriate	☐

Table 2.6 Site remediation and validation

Site remediation and validation		
Report section	**Required information**	**Included**
Document control	Date, version number, author and reviewer (including certification details) and who commissioned the report	☐
Executive summary	Background	☐
	Objectives of the investigation	☐
	Scope of works	☐
	Where appropriate, a summary of key findings, observations and sampling results (if available)	☐
	Summary of conclusions and recommendations	☐
Objectives	Objectives of the remediation and validation	☐
Scope of work	A summary of the scope of work	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet	☐
Site history	Site history items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report; however, changes to the site condition due to remediation should be summarised here	☐
Previous results	Brief summary of previous results	☐
Conceptual site model	See Table 2(a)	☐
Implementation of remediation action plan	A summary of the remediation plan	☐
	Remediation objectives and criteria including a table listing all selected remediation criteria and references	☐
	Description of remedial activities with any deviations from the remedial action plan (e.g. volumes and characteristics of material treated or disposed, design of permanent treatment installations, etc.)	☐
	Plans showing areas remediated and areas of residual contamination or subsurface structures	☐
	Summary and evidence (for example documentation) of compliance with regulatory requirements set by the regulatory authority and local government	☐
	Contractor reports	☐

	Field inspection checklists and photolog (as appropriate)	☐
	Dates of operations	☐
	Quantity of material treated and/or disposed	☐
Sampling and analysis plan and sampling methodology	See Table 2.2	☐
Validation Results and Discussion	Summary of all results, in a table that:	
	• shows all essential details such as sample identification numbers and sampling depth	☐
	• shows remediation criteria	☐
	• highlights all results exceeding remediation criteria (not just the highest)	☐
	Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, biota)	☐
	Test pit or bore logs (well construction details where appropriate, for example groundwater level expressed in Australian height datum)	☐
	Site plans or excavation logs showing all sample locations, photoionisation detector results, lithology changes and field observations, if appropriate	☐
	Site plan(s) showing the extent of soil and groundwater contamination exceeding remediation criteria for each sampling depth, including identification numbers and depths of all samples analysed (clearly mark concentrations of contaminants remaining on site)	☐
	Follow appropriate statistical procedures when comparing site data with the investigation and screening levels. Refer to in ASC NEPM Schedule B1 sections 2, 3 and 4	☐
Quality assurance/quality control data evaluation	Assessment of the implementation of the validation plan from the remedial action plan, with justification for departures (if necessary)	☐
	Details of a statistical analysis of validation results and evaluation against the remediation criteria	☐
	Verification of compliance with regulatory requirements set by EPA, SafeWork NSW and consent authority	☐
	Identify and discuss ongoing management or monitoring (if required)	☐
	See Table 2(c)	☐
Waste management (if applicable)	Waste classification reports in accordance with EPA Waste Classification Guidelines (see Table 2(d))	☐
	Summary of material handling and tracking and reconciliation of volumes or weight of soil removed from site and disposed off-site	☐

	Statements regarding materials being disposed via appropriately licenced facility or re-used under an order or exemption	☐
	Confirmation that waste imported on to the site is lawful Note: materials transported onto site will either need to meet the definition of virgin excavated natural material, or a resource recovery order and resource recovery exemption. In addition, materials imported onto the site should be adequately assessed as being appropriate for the final use of the site, including QA/QC evaluation of any sampling and analysis for material brought to site'	☐
	Waste disposal dockets or other waste documentation for any disposed waste	☐
	Refer to the Site Auditor Guidelines section 4.3.7 Waste management for waste management requirements	
Conclusions and recommendations	Summary of all findings	☐
	Conclusions addressing the stated objectives	☐
	Assumptions used in reaching the conclusions	☐
	Extent of uncertainties in the results	☐
	A clear-cut statement that the consultant considers the site to be suitable for the proposed use (where applicable)	☐
	A clear-cut statement of proposed limitations and constraints on the use of the site post remediation and proposed environmental management plan for long-term management of residual contamination at the site (where applicable)	☐
	Recommendations for further work, if appropriate	☐
	Clearly state any ongoing management or monitoring (if required)	☐

Table 2.7 Environmental management plan

Environmental management plan		
Report section	**Required information**	**Included**
Document status	Including date, version control, author and reviewer names (including certification details where applicable) and who commissioned the report	☐
Title	Use 'environmental management plan' not 'site management plan' or other alternative wording	☐
Purpose	Reason for, and purpose of, the plan and time period	☐
	How the plan will be made enforceable	☐
	Whether the environmental management plan is active or passive	☐
	Parties responsible for implementation and review/maintenance of the plan and their tasks	☐
	Where the plan will be recorded	☐
Background	Site identification (including street number, street name and suburb, lot and Deposited Plan number, co-ordinates, locality map, site survey plan), site owner, local government area, consent authority and site zoning (current and future)	☐
	Summary of site history as it relates to the existing site contamination which requires management	☐
	Current/future site use and layout (relevant to the environmental management plan)	☐
Description of existing/residual contamination	Identify the contaminants of concern, contaminated media, concentrations and location(s) of the contaminants. Use a site plan to show location(s). Details of migration of contamination, if relevant	☐
	Summary of the geology and hydrogeology (relevant to the environmental management plan)	☐
Management activities	Outline the activity(s), and detail procedures that are to be applied	☐
	Management structure and responsibilities	☐
	How the plan sits within an existing environmental management system (EMS) (if applicable)	☐
	Monitoring of site conditions and site management measures	☐
	Approval and licensing requirements (if applicable)	☐
	How the environmental management plan is consistent with conditions of consent under a planning instrument (if applicable)	☐
	Reporting requirements for environmental management plan implementation. Include list of people responsible for preparing the reports, who receives the reports and by when.	☐
	Communications protocols (if applicable)	☐

	Emergency contacts and response, including 24-hour emergency phone number (if applicable)	☐
	Operating hours (if applicable)	☐
	Contingency plans (if applicable)	☐
Inspection, maintenance, environmental sampling, analysis and reporting (if applicable)	Relevant sections from sampling and analysis quality plan (See Table 2.2), including:	
	Data quality objectives (see Table 2(b))	☐
	Basis for assessment criteria	☐
	Sampling and analysis plan and sampling methodology, identifying sampling locations and media	☐
	Quality assurance/quality control (see Table 2(c))	☐
	Frequency of monitoring	☐
	Outline triggers for responses or reassessment arising from the environmental sampling, analysis and reporting, and required actions	☐
	Outline provision for maintenance of existing sampling points and their replacement if necessary	☐
	Integrity inspection or testing or maintenance inspection program and frequency (if applicable) (for example where capping exists)	☐
Monitor and review of environmental management plan	Schedule for environmental management plan review	☐
	Monitoring checklist	☐
	Description of corrective actions and triggers for these actions	☐
	Notification to the regulator and/or consent authority with request to amend or end management activities (if applicable)	☐
Communications and notifications	List of stakeholders	☐
	Outline details for how affected stakeholders including potential purchasers will be notified of the existing/residual contamination and the environmental management plan	☐
	How the environmental management plan is communicated and made enforceable, including any financial assurance requirements	☐
	Outline details for informing stakeholders of changes to activities and/or responsible parties	☐

Table 2.8 Ongoing monitoring

Ongoing monitoring		
Report section	**Required information**	**Included**
Document status	Including date, version control, author and reviewer names (including certification details where applicable) and who commissioned the report	☐
Executive summary	Background	☐
	Objectives of the investigation	☐
	Scope of works	☐
	Where appropriate, a summary of key findings, observations and sampling results (if available)	☐
	Summary of conclusions and recommendations	☐
Objectives of the report	Clearly state the purpose of the assessment/report	☐
Scope of work	Clearly state the scope of work and note if there is an environmental management plan for long term management of contamination at the site (if applicable)	☐
Site identification	Site identification and detail items from ASC NEPM Field Checklist 'Site information' sheet	☐
Site history	Site history items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report	☐
Site condition and surrounding environment	Site condition and surrounding environment items from ASC NEPM Field Checklist 'Site information' sheet. A summary is enough if detailed information was included in an available referenced previous report. The site condition (at the time of monitoring) is to be included if not reported elsewhere	☐
Site condition – remediation features	Description of site in its present state	☐
	Details of party(ies) responsible for maintenance and monitoring program	☐
	Details on the capping and containment works (if applicable) with reference to the Site Auditor Guidelines for all requirements including site inspection frequency/capping integrity maintenance inspection program and frequency	☐
Conceptual site model	See Table 2(a)	☐
Sampling and analysis plan and sampling methodology	As per sampling and analysis quality plan (see Table 2.2)	☐
Field quality assurance/quality control, laboratory quality assurance/quality control, quality	See Table 2(c)	☐

assurance/quality control data evaluation		
Basis for assessment criteria	Table listing all selected assessment criteria and references	☐
	Rationale for and appropriateness of the selection of criteria. If the assessment criteria from guidelines made or approved under the CLM Act have not been used, include a statement providing the reasons why this is considered acceptable.	☐
	A list of any target levels developed through a site-specific assessment, or where investigation levels are not available for particular contaminants. Refer to ASC NEPM Schedules B4, B5a, B5b, B5c, B6 and B7	☐
	Assumptions and limitations of criteria	☐
	Refer to ASC NEPM Schedule B1 sections 2 and 4.7 for more details on basis for assessment criteria	
	Refer to HEPA (2018) PFAS National Environmental Management Plan for technical guidance	
Results	Summary of previous results (if applicable)	☐
	Summary of all results, in a table that:	
	• shows all essential details such as sample identification numbers and depth	☐
	• shows assessment criteria	☐
	• highlights all results exceeding any assessment criteria (not just the highest)	☐
	Sample descriptions for all media where applicable (e.g. soil, sediment, surface water, groundwater, biota)	☐
	Test pit or bore logs (well construction details where appropriate for example groundwater level expressed in Australian height datum)	☐
	Site plan showing all sample locations	☐
	Site plan(s) showing the extent of soil and groundwater contamination exceeding selected assessment criteria for each sampling depth, including identification numbers and depths of all samples analysed	☐
	Follow appropriate statistical procedures when comparing site data with the investigation and screening levels. Refer to ASC NEPM Schedule B1 sections 2, 3 and 4	☐
	Refer to ASC NEPM Schedule B2 sections 13 and 14 for information regarding the data presentation	
Site characterisation based on post-remediation monitoring	Assessment of types of all environmental contamination	☐
	Assessment of extent of all identified contamination, including offsite effects	☐
	Assessment of aesthetic issues	☐
	Assessment of secondary toxicity (if conducting an ecological risk assessment)	☐

	Assessment of potential impacts to buildings and structures from the presence of contaminants	☐
	Assessment of chemical degradation products	☐
	Assessment of possible exposure routes and exposed populations (human, ecological)	☐
	Any evidence of, or potential for, migration of contaminants from the site, including odour, air quality, stormwater, sedimentation, soil vapour, ground gases and groundwater issues	☐
Ongoing site monitoring	Ongoing site monitoring requirements (if any), including monitoring parameters and frequency	☐
	Results of monitoring analyses	☐
	Justification of any departures to the requirement monitoring plan	☐
	Comparison of results with previous monitoring rounds and statistical analysis (e.g. trend analysis where enough data has been collected))	☐
	Comparison to site-specific criteria (if available) which might trigger the requirement for extra work/remediation or lead to pre-defined outcomes	☐
	Contingency actions undertaken or required in response to monitoring results	☐
	Refer to the Site Auditor Guidelines section 4.3.11 Groundwater remediation and management	
Waste management (if applicable)	Waste classification details in accordance with EPA Waste Classification Guidelines (see checklist – Table 2(d))	☐
	Description of material handling and tracking plan	☐
	Statements regarding materials being disposed via appropriately licensed facility or re-used under an order or exemption	☐
	Waste disposal dockets or other waste documentation for any disposed waste	☐
	Refer to the Site Auditor Guidelines section 4.3.7 Waste management for waste management requirements	
Conclusions and recommendations	Summary of findings	☐
	Extent of uncertainties in the results	☐
	Statement on whether the monitoring has met the requirements of the environmental management plan	☐
	Response actions to be implemented following monitoring (if applicable)	☐
	Recommendation for further work (if appropriate)	☐

2.3 Key reporting components checklists

Table 2(a) Conceptual site model

Conceptual site model		
Relevant reports	**Required information**	**Included**
All stages of reporting	Regional and local geology, hydrogeology and hydrology items from ASC NEPM Field Checklist 'CSM' sheet	☐
	List of potential contaminants of concern	☐
	Potential and known sources of contamination, on- and offsite	☐
	Mechanism of contamination (e.g. 'top down' spill, sub-surface release from tank or pipe, atmospheric, deposition etc.)	☐
	Potentially affected environmental media	☐
	Consideration of spatial and temporal variations (e.g. weather).	☐
	Actual or potential exposure pathways. Also consider preferential pathways for contaminant migration.	☐
	Human and ecological receptors	☐
	Frequency of exposure	☐
	Linkage of source, pathway and receptor assessed in terms of potentially complete pathways and likelihood	☐
	Discussion on multiple lines of evidence (for complex sites)	☐
	Refer to ASC NEPM Schedule B2 section 4 for a guide in presenting conceptual site models	
Sampling analysis and quality plan, detailed site investigation, site-specific risk assessment, remedial action plan, detailed environmental management plan, ongoing monitoring	Previous site investigations, contaminant characteristics and migration items from ASC NEPM Field Checklist 'CSM' sheet	☐
	Conceptual site model items from ASC NEPM Field Checklist 'CSM' sheet	☐
	Meteorological data items from ASC NEPM Field Checklist 'CSM' sheet	☐
	Sources of variability	☐
	Data gap identification	☐
	Sensitivity analysis where modelling is undertaken Refer to NEPM Schedule B2 Section 4 for the requirements for developing a CSM	☐
	Refer to ASC NEPM Schedule B2 section for a guide in presenting conceptual site models	

Table 2(b) Data quality objectives

Data quality objectives		
Relevant reports	**Required information**	**Included**
Preliminary site investigation, detailed site investigation, sampling and analysis quality plan, site-specific risk assessments, remedial action plan, environmental management plan, ongoing monitoring	Step 1: State the problem	☐
	Step 2: Identify the decision/goal of the study	☐
	Step 3: Identify the information inputs	☐
	Step 4: Define the boundaries of the study	☐
	Step 5: Develop the analytical approach	☐
	Step 6: Specify performance or acceptance criteria	☐
	Step 7: Develop the plan for obtaining data	☐
	Are the data quality objectives linked to the conceptual site model, and have they been updated with the conceptual site model?	☐
	Refer to ASC NEPM Schedule B2 Appendix B for a comprehensive guide in reporting data quality objectives	☐

Table 2(c) Quality assurance and control[5]

Relevant reports	Required information	Quality assurance and quality control					Included
		Completeness	Comparability	Representativeness	Precision	Accuracy	
Any reports where sampling has been undertaken	Details of sampling team	X	X				☐
	Reference to sampling plan/method, including any deviations from it – sampling and analysis quality plan	X					☐
	Any information that could be required to evaluate measurement uncertainty for subsequent testing (analysis)				X	X	☐
	Decontamination procedures carried out between sampling events			X	X	X	☐
	Logs for each sample collected, including date, time, location (with GPS coordinates if possible), sampler, duplicate samples, chemical analyses to be performed, site observations and weather/environmental (i.e. surroundings) conditions. Include any diagrams, maps, photos.		X	X			☐
	Chain of custody fully identifying – for each sample – the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method, departure time from the site and dispatch courier(s) (where applicable)	X	X				☐
	Field quality assurance/quality control results (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spike)				X	X	☐
	Sample splitting techniques – subsampling, containers/preservation (ensure unique ID for subsequent samples provided)			X			☐
	Statement of duplicate frequency			X	X		☐
	Background sample results	X	X				☐
	Field instrument calibrations (when used)				X	X	☐
	Sampling devices and equipment	X	X				☐
	A copy of signed chain-of-custody forms acknowledging receipt date, time and temperature and identity of samples included in shipments	X	X				☐

[5] Including data quality indicators as relevant.

Relevant reports	Quality assurance and quality control Required information	Completeness	Comparability	Representativeness	Precision	Accuracy	Included
Any reports where laboratory analysis has been undertaken	Record of holding times and a comparison with method specifications	X	X				☐
	Analytical methods used, including any deviations	X	X				☐
	Laboratory accreditation for analytical methods used, also noting any methods used which are not covered by accreditation	X			X		☐
	Laboratory performance for the analytical method using inter-laboratory duplicates		X			X	☐
	Surrogates and spikes used throughout the full method process, or only in parts. Results are corrected for the recovery	X	X				☐
	A list of what spikes and surrogates were run with their recoveries and acceptance criteria (tabulate)		X			X	☐
	Practical quantification limits (PQL)	X	X				☐
	Reference laboratory control sample (LCS) and check results	X					☐
	Laboratory duplicate results (tabulate)	X				X	☐
	Laboratory blank results (tabulate)	X				X	☐
	Results are within control chart limits	X					☐
	Evaluation of all quality assurance/control information listed above against the stated data quality objectives, including a quality assurance/control data evaluation	X	X	X	X	X	☐

Table 2(d) Waste classification

Waste classification		
Report section	**Required information**	**Included**
Document status	Including date, version control, author and reviewer names (including certification details where applicable) and who commissioned the report	☐
Background	Full name, address, Australian Company Number (ACN) or Australian Business Number (ABN) of the organisation and person(s) providing the waste classification and the owner of the waste	☐
	Location of the site where the waste was generated, including the site address and Lot and Deposited Plan number	☐
	History of the material and the processes and activities that have taken place to produce the waste	☐
	Potential contaminating activities that may have occurred at the site where the waste was generated	☐
Waste description	Description of the waste, including photographs and visible signs of contamination (discolouration, staining, odours, etc)	☐
	Quantity of the waste	☐
Sampling and analysis plan and sampling methodology	Number of samples collected and analysed	☐
	Sampling method, including pattern, depth, locations, devices, procedures, and photographs of the sample locations and samples	☐
	Contaminants tested with justification	☐
	Justification for sampling density, pattern and method used	☐
	Justification for leachate analysis using the toxicity characteristics leaching procedure (if undertaken)	☐
	Justification for the number of samples collected and analysed	☐
Field quality assurance/quality control, laboratory quality assurance/quality control	See Table 2(c)	☐

Waste classification		
Report section	**Required information**	**Included**
Results	Summary of results, including sample numbers or identifications, contaminants analysed, sample results with minimum, average, maximum, standard deviation and 95% UCL average concentration calculated. All results are to be included regardless of whether they are not used in the classification process	☐
	Representative photographs of the waste	☐
	Sample locations marked on a schematic of the stockpile and/or source site	☐
	Scientifically valid reasons for the exclusion of sample results (if required) with reasons clearly outlined	☐
Discussion	Summary of findings, including discussion of results, exceedances of the relevant contaminant threshold or specific contaminant concentration and toxicity characteristics leaching procedure threshold values	☐
Waste classification	Clearly state the classification of the waste as at the time of the report, and its justification	☐

References

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- SA EPA 2006, Environmental management of on-site remediation, SA EPA 2006.
- USEPA 2006a Guidance on Systematic Planning Using the Data Quality Objectives Process: EPA QA/G-4.

ASC NEPM SCHEDULES

- Schedule A – Recommended general process for assessment of site contamination
- Schedule B – General guidelines for the assessment of site contamination
- Schedule B1 – Investigation Levels for Soil and Groundwater
- Schedule B2 – Site Characterisation
- Schedule B3 – Laboratory Analysis of Potentially Contaminated Soils
- Schedule B4 – Site-Specific Health Risk Assessment Methodology
- Schedule B5a – Ecological Risk Assessment
- Schedule B5b – Methodology to Derive Ecological Investigation Levels in Contaminated Soils
- Schedule B5c – Ecological Investigation Levels for Arsenic, Chromium (III), Copper, DDT, Lead, Naphthalene, Nickel & Zinc
- Schedule B6 – The Framework for Risk-Based Assessment of Groundwater Contamination
- Schedule B7 – Derivation of Health-Based Investigation Levels:
- Schedule B7 – Appendix 1 The Derivation of HILs for Metals and Inorganics
- Schedule B7 – Appendix 2 The Derivation of HILs for PAHs and Phenols
- Schedule B7 – Appendix 3 Derivation of HILs for Organochlorine Pesticides
- Schedule B7 – Appendix 4 The Derivation of HILs for Herbicides and Other Pesticides
- Schedule B7 – Appendix 5 The Derivation of HILs for PCBs and PBDEs
- Schedule B7 – Appendix 6 The Derivation of Interim HILs for Volatile Organic Chlorinated Compounds
- Schedule B7 – Appendix B Equations for Derivation of HILs and Interim HILs
- Schedule B7 – Appendix C Derivation of Investigation Levels for Generic Land Uses
- Schedule B7 – Appendix D Blood lead model assumptions
- Schedule B8 – Community Engagement and Risk Communication
- Schedule B9 – Competencies & Acceptance of Environmental Auditors and Related Professionals.