



# Land

## EIS information guideline



**Queensland**  
Government

Prepared by: Environmental Impact Assessment, Operational Support, Department of Environment and Science

© State of Queensland, 2022.

*The Department of Environment and Science acknowledges Aboriginal peoples and Torres Strait Islander peoples as the Traditional Owners and custodians of the land. We recognise their connection to land, sea and community, and pay our respects to Elders past, present and emerging.*

*The department is committed to respecting, protecting and promoting human rights, and our obligations under the Human Rights Act 2019.*

The Queensland Government supports and encourages the dissemination and exchange of its information. This work is licensed under a Creative Commons Attribution 4.0 International License.



Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms. You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

For more information on this licence, visit <https://creativecommons.org/licenses/by/4.0/>

#### **Disclaimer**

This document has been prepared with care, based on the best available information at the time of publication. The department holds no responsibility for any errors or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties. Information contained in this document is from a number of sources and, as such, does not necessarily represent government or departmental policy.

If you need to access this document in a language other than English, please call the Translating and Interpreting Service (TIS National) on 131 450 and ask them to telephone Library Services on +61 7 3170 5470.

This publication can be made available in an alternative format (e.g. large print or audiotape) on request for people with vision impairment; phone +61 7 3170 5470 or email <[library@des.qld.gov.au](mailto:library@des.qld.gov.au)>.

#### **Citation**

Department of Environment and Science 2022, *Land—EIS information guideline*, ESR/2020/5303, Queensland Government, Brisbane.

ESR/2020/5303, version 1.03, last reviewed: 21 Apr 2022

# Contents

Introduction .....	1
Existing environment and environmental values .....	1
Topography .....	1
Cadastral data .....	1
Land use.....	1
Infrastructure .....	1
Area of regional interest.....	2
Native title and Indigenous Land Use Agreements.....	2
Geology and geomorphology .....	2
Mineral resources, ore reserves, petroleum and energy resources, and GHG storage resources .....	2
Soils.....	2
Land evaluation .....	3
Contaminated land .....	3
Landscape character.....	3
Visual amenity .....	3
Lighting .....	3
Potential impacts .....	4
Land disturbance.....	4
Subsidence.....	4
Land use.....	4
Infrastructure .....	4
Area of regional interest.....	4
Native title and Indigenous Land Use Agreements.....	5
Land degradation or contamination .....	5
Erosion and stability .....	5
Resource utilisation .....	5
Landscape character.....	5
Visual amenity .....	5
Lighting.....	5
Avoidance and mitigation measures.....	5
References.....	6

## Introduction

This guideline informs proponents about the matters to be assessed in relation to land when preparing an environmental impact statement (EIS).

The EIS will be part of the application process for the project's environmental authority. Consequently, in addition to following this guideline, you should ensure the EIS is in accordance with the latest version of the department's guideline [Application requirements for activities with impacts to land](#) (DES 2017).

Furthermore, the Land section of the EIS is likely to include matters regulated by government departments other than the Department of Environment and Science (the department). When preparing the EIS, consult those departments that regulate such matters as: natural resources; agriculture; forestry; fisheries; quarrying; and regional and land use planning. Also, make use of their guidelines, such as the [DAF environmental impact assessment companion guide](#) (DAF 2014).

Illustrate all descriptions and assessments with maps, diagrams, cross-sections, photographs, satellite images, and/or aerial photographs. Identify locations and map coverage by latitude and longitude in decimal degrees referenced to the Geocentric Datum of Australia 2020 (GDA2020).

For information on rehabilitation refer to department's [Rehabilitation—EIS information guideline](#) (DES 2022).

## Existing environment and environmental values

Describe the existing features and environmental values of the land that may be affected by the project. Cross-reference to other sections of the EIS that provide a more detailed description of the existing features of the landscape, such as transport infrastructure. As a minimum, provide the information required by the following subsections.

### Topography

Describe the topography of the project site and the surrounding area, and highlight any significant features. Provide maps with contours at suitable increments (at least every metre in areas of low relief) shown with respect to the Australian Height Datum (AHD).

### Cadastral data

Describe and map the cadastral data for the project site and the surrounding properties. Show the boundaries of each parcel of land with its legal lot on plan description and relevant attributes. Also, show any easements over relevant land.

### Land use

Describe and illustrate land uses in and around the project area in relation to current land tenures, and particularly mention any land with special attributes. Show the locations of existing dwellings, workplaces, and any other sensitive receptors.

Describe and illustrate the zoning of land in and around the project area according to any existing town or strategic plan. Include any areas that are zoned for a future use, such as 'future residential'.

In rural areas, describe the agricultural and/or grazing uses of land, and any residential acreage properties. Make particular mention of any nearby current or periodic land use that could be adversely impacted by the project (e.g. a cotton growing area that might be impacted by coal dust).

### Infrastructure

Describe and show on suitably-scaled maps the location and owners or custodians of all infrastructure and easements on the potentially affected land, including roads and road reserves, railways and rail reserves, stock routes, power lines, and telecommunication towers. Indicate the locations and routes of any buried gas or water pipelines, power lines, or telecommunication cables.

## Area of regional interest

Report whether the project would be conducted in an *area of regional interest* under the *Regional Planning Interests Act 2014*.

## Native title and Indigenous Land Use Agreements

Describe any native title determinations or applications for land and waters on or around the project site. Also, describe the agreement area for any relevant Indigenous Land Use Agreement.

## Geology and geomorphology

Describe the geology of the project area, not only within the site boundary, but also any structures and strata in the surrounding land that might be affected by the project, including aquifers. Make particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures that could have an influence on, or be influenced by, the project's activities. Describe geological properties that may influence: ground stability (including seismic activity, if relevant); rehabilitation programs; occupational health and safety; or the quality of wastewater leaving any area disturbed by the project. Describe known sites of palaeontological significance and address the potential for significant fossil finds in locations where the age and type of geology is such that significant specimens may be uncovered during construction or operations.

Describe the geomorphology of the project site and the surrounding area. Describe any sites of geomorphological significance, such as: prominent ridges, ranges, fault scarps, gorges, mesas, karst, or lava tubes.

## Mineral resources, ore reserves, petroleum and energy resources, and GHG storage resources

Summarise the results of studies and surveys undertaken to identify and delineate the mineral resources, and ore reserves within the project area (including any areas underlying related infrastructure).

Report the mineral resources (measured, indicated or inferred) and ore reserves (proved or probable) in accordance with the *Australasian code for reporting of exploration results, mineral resources and ore reserves* (JORC 2012) and the principles outlined in the *Australian guidelines for the estimating and reporting of inventory coal, coal resources and coal reserves* (Coalfields Geology Council of New South Wales and Queensland Resources Council 2014). Include the modifying factors and assumptions made in arriving at the estimates.

Describe in detail the location, tonnage and quality of the mineral resources and ore reserves within the project area. For coal projects, describe the deposits on a seam-by-seam basis.

Illustrate, with appropriately-scaled maps and diagrams, the location, areal extent and depth of the mineral resources to be developed or mined, and show those resources in relation to the following features:

- boundaries of mining tenures, granted or proposed, to which the project area is, or would be subject
- proposed mine excavation(s)
- features that would result from the proposed mining, including waste/spoil dumps, water storage facilities and other infrastructure
- proposed buffers surrounding the working areas
- boundaries of any other project sites
- any part of the resource not intended to be mined and any part of the resource that might be sterilised by the proposed mining operations or infrastructure.

Similarly report, to the extent practicable, on other resources related to the geology of the locality, including petroleum and energy resources (including geothermal), and any greenhouse gas (GHG) exploration permits or GHG leases. Include information from publicly available or searchable studies and surveys undertaken by other entities than the proponent.

## Soils

Describe the soil types, horizons and profiles in accordance with relevant, best-practice guidelines and methods, such as:

- *Australian soil and land survey field handbook* (National Committee on Soil and Terrain 2009)
- *Guidelines for surveying soil and land resources* (McKenzie et al. 2008)
- *The Australian soil classification* (Isbell 2016)

- *Queensland soil and land resource survey information guidelines* (Department of Resources 2021).

Ensure the spatial extent of the soil survey, and the number and depth of pits, auger holes and/or cores, are sufficient to characterise all soils that would be disturbed and/or used in rehabilitation of the site.

Report the results of soil tests and laboratory analyses of representative samples down the soil profile, with particular reference to the physical and chemical properties of the materials that would influence erosion potential, storm water run-off quality, rehabilitation and agricultural productivity of the land.

For any proposed pipeline routes, undertake the analysis and classification at least to the depth of excavation.

Provide geotechnical information on the soils' stability and suitability for construction of project facilities.

For coastal land where acid sulfate soils may be present, or inland soils where conditions may have been conducive to the formation of ASS, undertake an investigation in accordance with relevant, best-practice sampling and laboratory guidelines and methods, such as:

- *Soil management guidelines* in the *Queensland acid sulfate soil technical manual* (Dear et al. 2014)
- *National acid sulfate soils guidance: National acid sulfate soils sampling and identification methods manual* (Sullivan et al. 2018)
- *National acid sulfate soils guidance: National acid sulfate soils identification and laboratory methods manual* (Sullivan et al. 2018)
- *Queensland acid sulfate soils laboratory methods guidelines* (Ahern et al. 2004).

## Land evaluation

Report the results of a land evaluation for areas that would be temporarily or permanently disturbed by the project. Assess the *land suitability* and *agricultural land classification* for those areas. Also, assess whether or not the land is *good-quality agricultural land* or *versatile cropping land*. More information on [land evaluations](#) can be found on the Queensland government's webpage.

## Contaminated land

Report whether any land that might be disturbed by the project is listed on either the environmental management register (EMR) or the contaminated land register (CLR). Also, assess whether the history of the land indicates that current or past activities might have caused contamination. Particularly, describe any *notifiable activity* listed in Schedule 3 of the EP Act that has, or might have been, conducted on the land.

If the land is listed on a relevant register, or it might be contaminated, investigate and assess the current possible contamination in accordance with the *Queensland auditor handbook for contaminated land* (DES, 2018) and the National Environment Protection (Assessment of Site Contamination) Measure (contaminated land NEPM), made by the National Environment Protection Council under the Commonwealth *National Environment Protection Council Act 1994*. Provide a detailed report in the EIS in accordance with the department's guideline [Contaminated land—EIS information guideline](#) (DES 2022).

## Landscape character

Describe in general terms the existing character of the landscape that would be affected by the project. Comment on any changes that have already been made to the natural landscape since European settlement.

## Visual amenity

Describe existing landscape features, panoramas and views that have, or could be expected to have, value to local residents and/or the community, and which might be impacted by the project. Include such features as views from landmarks, lookouts, heritage places, walking trails, and scenic/tourist routes, and address whether the time of day affects the visual value (e.g. whether the sunset from a particular vantage point is popular). Also, address the value of existing vegetation as a visual screen.

## Lighting

Describe the current light environment at night of the site and its surrounds. Describe the locations and characteristics of existing significant sources of artificial light or flares.

## Potential impacts

Assess the potential impacts of the project on any aspects of the land in accordance with the following subsections. However, this guidance is not limiting or exhaustive, and some projects may require additional assessment.

Assess which potential impacts can be avoided or mitigated, and which would have a long-term or permanent residual effect. For those impacts that would have a long-term or permanent residual effect, assess the potential liabilities for landholders and/or the state.

### Land disturbance

Describe and quantify the areas of temporary and permanent works. This includes earthworks, excavations, laydown areas, rock dumps, stream diversions, regulated dams, hazardous dams, topsoil stripping and stockpiling, and so on, that would alter the surface of the land. Show the changes at the various stages of the project's development, operation and closure.

Detail the proposed long-term changes that would occur to the land after mining ceases compared to the situation before mining commences. Those changes should be illustrated on suitably scaled maps with contours at intervals sufficient to assess the likely drainage pattern for ground and surface waters. However, the assessment of the impacts on drainage and water quality should be provided in the water resources section of the EIS.

For all stages of the project, show the position of all mining infrastructure, works and proposed voids in relation to the Probable Maximum Flood (PMF) level.

### Subsidence

Model the extent, and assess the impacts of, surface subsidence taking into account factors such as topographic variations and geological complexities. Fully describe the methodology of the modelling, and assess the accuracy and precision of the predictions. Show the results of the predictions on maps with contour increments of one metre and a scale appropriate for assessing surface subsidence impacts. Assess the potential impacts that subsidence might cause due to surface cracking, increased water infiltration, and the capture, delay/pooling, or redirection of overland or stream flow. Assess the long-term impacts of subsided land on final land uses including agricultural productivity.

### Land use

Assess the impact of any temporary or permanent changes to land use(s) either on, or close to, the project site. Relevant nearby land would, for example, be a protected area, or land that is used for tourism.

Assess any possible impacts on the potential use of nearby land that is zoned for a future use, such as residential. In particular, assess whether any adjacent or nearby potential land use may be problematic or incompatible with the project and its long-term effects.

Assess any impacts on, or changes to, land suitability, agricultural land classification, good-quality agricultural land or versatile cropping land and property and project plans approved under the *Soil Conservation Act 1986*.

Assess any loss of value from land use changes (both on the site and on nearby land), including: reduced property value; lower financial returns; reduced liveability or amenity; and constraints on future land use(s).

Assess any residual risks or liabilities that would be transferred to the subsequent landholder of the site.

### Infrastructure

Assess the potential impacts on infrastructure, particularly where any road, rail, pipeline, cable or powerline would need to be relocated.

### Area of regional interest

Assess whether the project would need a *regional interests development approval* (RIDA) under the *Regional Planning Interests Act 2014*. If the project would be an *exempt resource activity*, state the reasons for the exemption.

## Native title and Indigenous Land Use Agreements

Assess any impacts the project might have on matters relevant to native title. If necessary, nominate a native title process for addressing native title issues. Assess any impacts the project might have on any matters covered by an existing ILUA.

## Land degradation or contamination

Assess the potential impacts of any *notifiable activity* (Schedule 3, *Environmental Protection Act 1994*; EP Act) that would be conducted at the site. Also, assess the possible degradation or contamination of land that could result from any other activities of the project, such as:

- long-term use of mine affected water for dust-suppression
- disposal to land of any waste water
- seepage from waste rock dumps;
- tailings disposal
- disturbance of acid sulfate soils
- spills at chemical and fuel storage areas.

## Erosion and stability

Assess the erosion potential (due to wind and water) of all disturbed land including, waste rock dumps, stockpiles, unsealed roads, infrastructure corridors, and so on.

## Resource utilisation

Assess how effectively the project would achieve the optimum utilisation of the mineral and/or petroleum resources within the project area, and assess the projects impacts on other resources. Demonstrate that the project would best develop the resources within the project area, minimise resource wastage, and avoid any unnecessary sterilisation of these or any other of the state's resources, including coal, mineral, petroleum, coal seam gas, geothermal, and GHG storage resources.

## Landscape character

Assess the impacts on the landscape character of the site and the surrounding area, with particular regard to large features, such as spoil dumps, excavated voids and broad-scale clearing.

## Visual amenity

Assess the impacts on the visual amenity of the site and the surrounding area, with particular regard to any panorama, view, outlook, or skyline that is valued by local residents and/or the community. Use artist's impressions, sketches, diagrams, and photos to illustrate the effects of the project on visual amenity.

## Lighting

Assess the potential impacts of artificial lighting and/or flares during all stages of the project, with particular regard to:

- the effects of night operations, maintenance or increased vehicular traffic on nearby residents
- changed habitat conditions for nocturnal animals
- the attraction of animals to lights at night.

## Avoidance and mitigation measures

Develop measures to avoid or mitigate all identified potential impacts on matters related to land. Measures can include physical works, processes or treatments and may include management or monitoring practices. Detail how the measures will link back to and address the previously identified impact(s). All measures must have outcomes that can be audited for success. The measures should be presented in a series of practical management plans that could be used to direct actions during day-to-day operations of the project. The department's guideline [Application requirements for activities with impacts to land](#) (DES 2017) outlines the necessary scope of such management plans.



Provide details of how the project would minimise the extent and severity of land disturbance.

Describe the methods proposed for managing disturbed land, including backfilling, covering, re-contouring, topsoil handling and revegetation.

Demonstrate that there are feasible means of decommissioning and closing the site's operations.

An EIS for any type of resource project must include a progressive rehabilitation plan that meets the requirements of Chapter 5, Division 3, of the EP Act. Refer to the department's following guidelines:

- [Rehabilitation—EIS information guideline](#) (DES 2022)
- [Progressive rehabilitation and closure plan \(PRC plan\) guideline](#) (DES 2019).

Describe how safe access to the site would be ensured after surrender of the lease.

Propose detailed, practical measures to prevent or control erosion with regard to: (a) the long-term stability of waste dumps and voids; (b) preventing soil loss in order to maintain land capability/suitability; and (c) preventing significant degradation of water quality in local waterways due to suspended solids. Erosion rates from disturbed or rehabilitated land should be approximately the same as the local landscape that hasn't been disturbed by the project.

Detail how waste rock would be tested, selectively handled, and capped to encapsulate acid forming, sodic, or dispersive material. Selective handling must maximise long-term stability of final landforms with regard to slumping and erosion both on and below the surface. Describe measures to prevent contaminated runoff or seepage, and to monitor and detect any failure of those measures. Refer to the department's [Waste—EIS information guideline](#) (DES 2022).

Describe how the project would manage low grade or currently uneconomic deposits or excavated material to ensure that a potential future resource is not sterilised. Also, describe measures to ensure the minimal dilution of mineralised but currently sub-economic waste rock by non-mineralised waste rock. Provide details and maps of expected residual or remnant resources within the project area including any low grade stockpiles, tailings and currently uneconomic material.

Demonstrate that the proposed locations of dumps, stockpiles and tailings dams would minimise impacts on land.

Propose any measures required for the management and possible remediation of any existing contamination on the site in accordance with the [Queensland auditor handbook for contaminated land](#) (DES 2018) and the [National Environment Protection \(Assessment of Site Contamination\) Measure 1999](#) (contaminated land NEPM). Similarly, propose measures that would prevent or remediate any degradation or contamination of land due to the proposed activities. Also, refer to the department's guideline: [Contaminated land—EIS information guideline](#) (DES 2022).

Propose detailed mitigation and rehabilitation measures for any significant impacts that would result from subsidence, such as surface cracking, increased water infiltration, pooling, overland flow impedance or change of direction, land use changes, or impacts on ecological value(s). The subsidence management plan must state the intended outcomes and land uses for the final landscape. If subsidence would have significant impacts on water flow, whether in a natural channel or a constructed watercourse diversion, the Water section of the EIS must assess the impacts in detail and provide practical measures to avoid or mitigate the impacts.

If the site's geological conditions are conducive, propose measures that would not only preserve any significant fossil specimen(s) that may be uncovered during construction or operations, but also alert the Queensland Museum to the find(s).

Propose measures to avoid or mitigate impacts on visual amenity.

For activities that may disturb coastal or inland acid sulfate soils, propose management measures that would prevent the contamination of groundwater or surface water. The proposed management measures must accord with all relevant guidelines, such as:

- the *Soil Management Guidelines* in the *Queensland acid sulfate soil technical manual* (Dear et al. 2014)
- *National acid sulfate soils guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments* (Shand et al. 2018)
- publications mentioned in *National acid sulfate soils guidance: a synthesis* (Sullivan et al. 2018).

Propose measures to avoid or mitigate all potential impacts due to operating artificial lighting or flares.

## References

*Note: These references were correct at the time of publication. Where more recent versions are available, these must be used. For all Department of Environment and Science publications, the latest version of a publication can*

be found by using the publication number as a search term at the [Queensland Government website](http://www.qld.gov.au) <[www.qld.gov.au](http://www.qld.gov.au)>.

Ahern, CR, Ahern, MR and Powell, B 1998, *Guidelines for sampling and analysis of lowland acid sulfate soils in Queensland*, Department of Natural Resources, Brisbane, Queensland.

Ahern, CR, McElnea, AE and Sullivan, LA 2004, *Acid sulfate soils laboratory methods guidelines*, Queensland Department of Natural Resources, Mines and Energy, Brisbane, Queensland.

Coalfields Geology Council of New South Wales and Queensland Resources Council 2014, *Australian guidelines for the estimating and reporting of inventory coal, coal resources and coal reserves*, Coalfields Geology Council of New South Wales and the Queensland Resources Council, viewed June 2019, <[http://www.jorc.org/docs/Coal\\_Guidelines\\_2014\\_-\\_Final\\_Ratified\\_Document.pdf](http://www.jorc.org/docs/Coal_Guidelines_2014_-_Final_Ratified_Document.pdf)>

Dear, SE, Moore, NG, Dobos, SK, Watling, KM and Ahern, CR 2014, *Soil management guidelines in Queensland: Acid sulfate soil technical manual*, Queensland Department of Science, Information Technology, Information and the Arts, Brisbane, Queensland, viewed April 2020, <<https://publications.qld.gov.au/dataset/acid-sulfate-soil-guidelines/resource/6d880993-4b80-45e3-9110-5c24fa7a7e75>>.

Department of Agriculture, Fisheries and Forestry 2014, *DAFF environmental impact assessment companion guide*, Department of Agriculture, Fisheries and Forestry, Brisbane, viewed April 2020, <<https://www.daf.qld.gov.au/business-priorities/agriculture/sustainable/environmental-impact-assessment>>.

Department of Environment and Science 2017, *Application requirements for activities with impacts to land*, ESR/2015/1839, Department of Environment and Science, Brisbane, viewed April 2020, <<https://environment.des.qld.gov.au/assets/documents/regulation/era-gl-air-impacts.pdf>>.

Department of Environment and Science 2019, *Progressive rehabilitation and closure plan*, ESR/2019/4964, Department of Environment and Science, Brisbane, Queensland, viewed April 2020, <<https://www.business.qld.gov.au/running-business/environment/licences-permits/rehabilitation/progressive-rehabilitation-closure-plans>>.

Department of Environment and Science 2022, *Contaminated land—EIS information guidelines*, ESR/2020/5300, Queensland Government, Brisbane, Queensland, viewed April 2022, <<https://www.qld.gov.au/environment/pollution/management/eis-process/about-the-eis-process/developing-an-eis>>.

Department of Environment and Science 2022, *Rehabilitation—EIS information guidelines*, ESR/2020/5308, Queensland Government, Brisbane, Queensland, viewed April 2022, <<https://www.qld.gov.au/environment/pollution/management/eis-process/about-the-eis-process/developing-an-eis>>.

Department of Environment and Science 2022, *Waste—EIS information guidelines*, ESR/2020/5311, Queensland Government, Brisbane, Queensland, viewed April 2022, <<https://www.qld.gov.au/environment/pollution/management/eis-process/about-the-eis-process/developing-an-eis>>.

Department of Natural Resources and Mines 2019, *Native title work procedures*, viewed April 2020, <<https://www.dnrm.qld.gov.au/qld/atsi/native-title-work-procedures/work-procedures>>.

Department of Resources 2021, *Queensland soil and land resource survey information guidelines*, Queensland Government, Brisbane, Queensland, viewed June 2021, <[https://www.resources.qld.gov.au/?a=109113:policy\\_registry/guideline-soil-land-resource-survey.pdf&ver=2.00](https://www.resources.qld.gov.au/?a=109113:policy_registry/guideline-soil-land-resource-survey.pdf&ver=2.00)>.

Isbell, RF 2016, *The Australian soil classification*, CSIRO Publishing, Melbourne, Victoria.

Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy 2012, *Australasian code for reporting of exploration results, mineral resources and ore reserves* (The JORC Code), Australian Institute of Geoscientists and Minerals Council of Australia, viewed April 2020, <[https://www.asx.com.au/documents/asx-compliance/appendix5a\\_jorc\\_code.pdf](https://www.asx.com.au/documents/asx-compliance/appendix5a_jorc_code.pdf)>.

McKenzie, NJ, Grundy, MJ, Webster, R and Ringrose-Voase, AJ 2008, *Guidelines for surveying soil and land resources*, CSIRO Publishing, Melbourne, Victoria.

National Committee on Soil and Terrain 2009, *Australian soil and land survey field handbook*, CSIRO Publishing, Melbourne, Victoria.

Shand, P, Appleyard, S, Simpson, SL, Degens, B and Mosley, LM 2018, *National acid sulfate soils guidance: Guidance for the dewatering of acid sulfate soils in shallow groundwater environments*, Department of Agriculture and Water Resources, Canberra, Australian Capital Territory, viewed April 2020, <<https://www.waterquality.gov.au/issues/acid-sulfate-soils/dewatering-groundwater-environments>>.

Simpson, S, Batley, G, Mosley, L, Shand, P 2018, *National acid sulfate soils guidance: Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management*, Department of Agriculture and Water

Resources, Canberra, Australian Capital Territory, viewed April 2020, <<https://www.waterquality.gov.au/issues/acid-sulfate-soils/dredge-spoil-management>>

Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, *National acid sulfate soils guidance: National acid sulfate soils sampling and identification methods manual*, Department of Agriculture and Water Resources, Canberra, Australian Capital Territory, viewed April 2020, <<https://www.waterquality.gov.au/issues/acid-sulfate-soils/sampling-and-identification-methods-manual>>.

Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, *National acid sulfate soils guidance: National acid sulfate soils identification and laboratory methods manual*, Department of Agriculture and Water Resources, Canberra, Australian Capital Territory, viewed April 2020, <<https://www.waterquality.gov.au/issues/acid-sulfate-soils/identification-and-laboratory-methods-manual>>.

Sullivan, LA, Clay, C, Ward, NJ, Baker, AKM, and Shand, P 2018, *National acid sulfate soils guidance: a synthesis*, Department of Agriculture and Water Resources, Canberra, Australian Capital Territory, viewed April 2020, <<https://www.waterquality.gov.au/issues/acid-sulfate-soils/a-synthesis>>.