# CHAPTER 20

# Soils and contamination

ILLABO TO STOCKINBINGAL ENVIRONMENTAL IMPACT STATEMENT

ARTC | INLAND RAIL An Australian Government Initiative

# Contents



## Figures



## Tables

# 20. Soils and contamination

*This chapter provides a summary of the soils and contamination impact assessment for the Inland Rail—Illabo to Stockinbingal project (the proposal). It describes the existing environment, assesses the impacts of construction and operation of the proposal, and provides recommended mitigation and management measures. The full assessment report is provided as Technical Paper 14—Contamination (Technical Paper 14).*

## 20.1 Overview

Soils across the proposal site were not identified as comprising a significant erosion risk, and the presence of acid sulfate soils (ASS) and saline soils were not identified at the proposal site.

There were no specific issues raised in relation to soils and contamination during stakeholder and community consultation.

During construction, the proposal would require significant excavation and ground disturbance, and the movement of plant and equipment within unsealed areas, including light vehicles. If not managed correctly, impacts to soils could include erosion of exposed soil and stockpiled materials, dust generation, increased sediment loads entering the surrounding waterways and/or soil compaction, resulting in reduced productivity or impacts to drainage.

To address impacts, vegetation clearing and ground-disturbing works would be staged sequentially/across the proposal, where practical, and a progressive erosion and sediment control plan, decommissioning and rehabilitation requirements for local roads and water quality monitoring would be implemented under the Construction Environment Management Plan (CEMP).

In relation to contamination:

- the potential for contamination within the proposal site is generally low, with some areas of medium risk identified
- field surveys identified potential areas of environmental concern related to the existing railway connections, roadway and agricultural land uses
- there is potential for contamination impacts associated with the presence of building structures along the proposal site requiring demolition.

To address these impacts, for these areas and building structures, a contaminated land and hazardous materials management plan would be prepared and implemented as part of the CEMP to identify mitigation measures and any further investigations to be carried out during detailed design, and to further develop appropriate treatment measures (as required).

During operation, the key impacts in relation to soils and contamination would be as follows:

- The proposal is not likely to result in any significant impacts on soils, topography or geology.
- The risk of soil erosion would be minimal, as all areas impacted during construction would be reinstated or revegetated and landscaped to prevent soil erosion.

Maintenance activities involving ground disturbance and those with potential to contaminate soil or groundwater from spillage of hazardous materials would be undertaken in accordance with proposed operational measures, including the review of existing spill response procedures.

## 20.2 Approach

### 20.2.1 Legislative and policy context to the assessment

The assessment of soils and contamination was undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) with consideration of the following legislation and policies:

- *Contaminated Land Management Act 1997 (*NSW) (CLM Act)
- Contaminated Land Management Regulation 2013
- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended) (the NEPM) (National Environment Protection Council (NEPC), 2013)
- *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act)
- *State Environmental Planning Policy (Resilience and Hazards) 2021*

- *Protection of the Environment Operations Act 1997* I(NSW) (POEO Act)
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act)
- Protection of the Environment Operations (General) Regulation 2009
- Protection of the Environment Operations (Waste) Regulation 2014.

A detailed description of the legislative and policy context for the assessments is provided in Technical Paper 14.

### 20.2.2 Secretary's Environmental Assessment Requirements

The SEARs relevant to soils and contamination, together with a reference to where they are addressed in the EIS, are provided in Appendix A.

### 20.2.3 Methodology

#### 20.2.3.1 Study area

The study area for assessment for the contamination assessment includes the proposal site and adjoining areas.

#### 20.2.3.2 Key tasks

The assessment of soils was informed by desktop information, a site walkover and the results of geotechnical assessments undertaken to identify design constraints for the feasibility design of the proposal. This included the completion of 29 test pits and 21 boreholes across the study area (see Figure 20-1). Data collected on soil type and geological conditions was used in the assessment.

The contamination assessment was undertaken to identify potential contamination within the proposal site from information gathered through the following methods:

- a review of current and historical aerial photographs to identify whether there are or have been any land uses that may have resulted in contamination issues
- searches of relevant databases, including the ARTC Contam-Map Register, the NSW EPA Contaminated Sites Register, a list of sites which have been notified to the EPA, and environmental protection licences (EPLs) held under the POEO Act
- the database searches undertaken were generally based on a search area for the Cootamundra–Gundagai and Junee Shire Local Government Areas (LGAs)
- completion of a site walkover on 19 and 20 February 2019 to identify potential contamination within the proposal site
- assessment of potential risks from contamination during construction and operation of the proposal
- development of mitigation and management measures.

The purpose of the contamination assessment was to assess the potential for, or actual presence of, existing contamination in the proposal site, and assess the risks associated with that contamination during construction and operation of the proposal. No site environmental sampling was completed for identified areas of environmental concerns (AECs), however the assessment included a comprehensive desktop search and literature review providing adequate information on existing conditions further described in section 20.3. The assessment also considers potential future risks of contamination caused directly or indirectly by construction or operation of the proposal. As such, contamination risks from the proposal are further discussed in this chapter and are informed by the contamination assessment.

### 20.2.4 Risks identified

The environmental risk assessment for the proposal (refer to Appendix G) included consideration of potential soils and contamination risks. Risks with an overall assessed rating of medium or above as identified by the environmental risk assessment (pre-mitigated) included:

During construction:

- potential to disturb contaminated soils during construction and mobilise contamination
- contamination of soils/groundwater due to spills and leaks during construction
- exposure of acid sulfate soils or saline soils and subsequent erosion.

- potential to disturb hazardous materials during the demolition of buildings and structures
- potential for direct contact exposure by construction workers to soils associated with dumped materials and stockpiles or machine storage and maintenance areas.

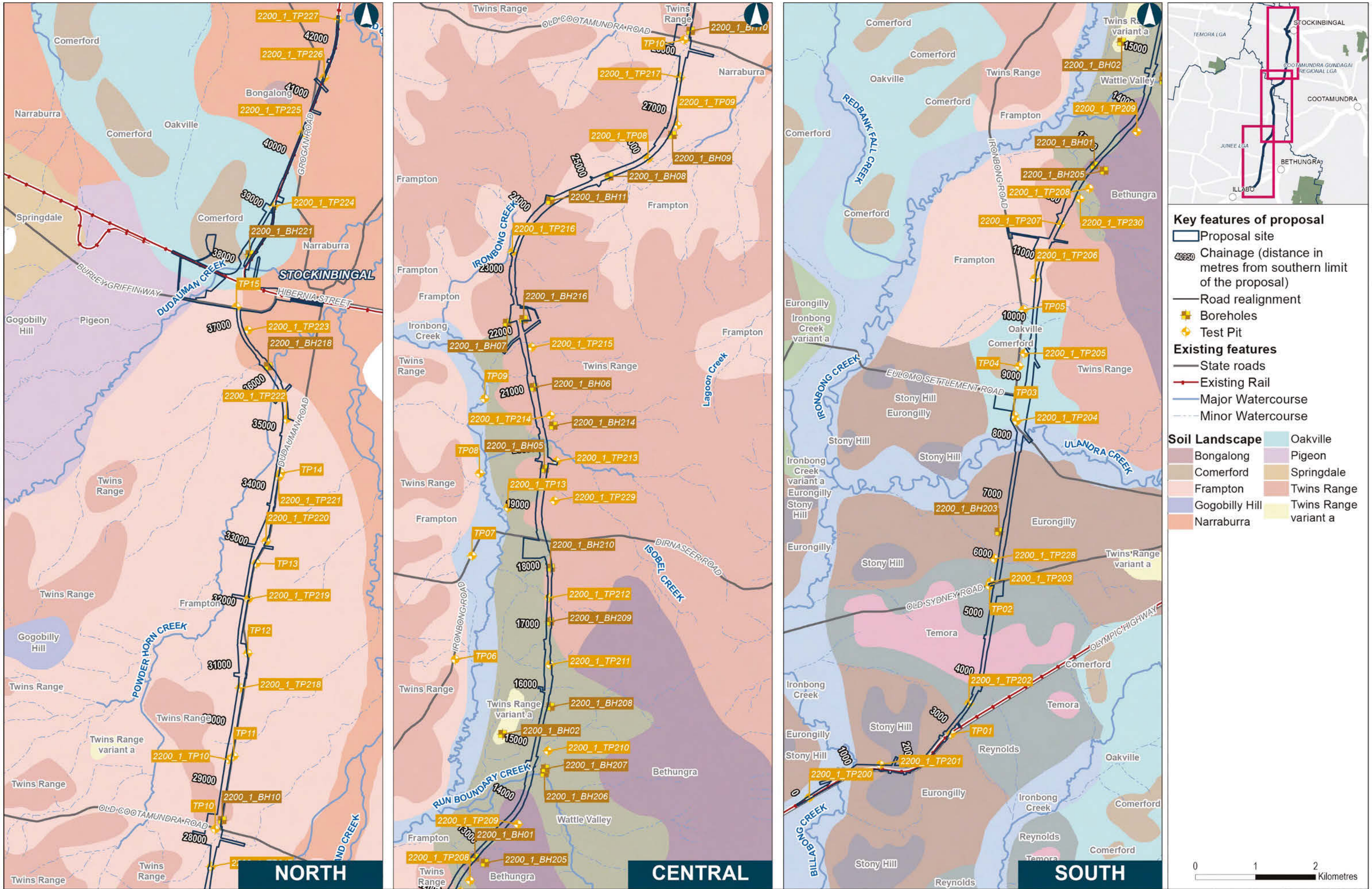
During operation:

- erosion during operation maintenance works
- changes to surface, including vegetation removal and creation of embankments, increasing potential for erosion, or exacerbation of salinity hazards in proposal site and sedimentation down-gradient
- contamination of land due to leaks and spills from train operations.

The soils and contamination assessment considered the potential risks identified by the environmental risk assessment, in addition to the potential risks and impacts identified by the scoping report, the SEARs and relevant guidelines and policies.

### 20.2.5 How potential impacts have been avoided/minimised

The option development and assessment process for the Inland Rail location/route options is summarised in Chapter 6: Alternatives and proposal options. The shortlist of route options was subject to a detailed assessment, and the proposed alignment was refined based on evaluation of key considerations, including environmental impacts. Potential environmental impacts were included in the list of selection criteria used for the analysis of options (refer to Chapter 6.)




20.1 Soil landscapes within the study area and geotechnical investigations

Coordinate System: GDA 1994 MGA Zone 55
Paper size: A3 Scale: 1:60,000
Date: 5/19/2021

Data Sources: ####

## 20.3 Existing environment

This section describes the study area of the soils and contamination assessment, and the particular characteristics of the proposal site.

### 20.3.1 Geology and soils

The study area is located on gently to moderately sloping terrain. The topography of the southern portion of the study generally slopes to the south and east. This transitions to higher ground in the central portion, with moderate undulations cut by Run Boundary Creek and Isobel Creek, north of Old Cootamundra Road, the proposal passes through flat to gently sloping farmland, before passing through a low hillslope around Dudauman Creek.

Based on the Cootamundra 1:250,000 geological map (Series SI/55-11, 1996) (DMR, 1995), the geology of the study area varies from south to north as follows:

- the southern section is underlain by quaternary alluvium comprising gravel, sand, silt and clay. Small outcrops of the Junawarra Volcanics, comprising andesite, andesitic agglomerate, latite, sedimentary rocks and minor dacite and the Combaning Formation, comprising siltstone, sandstone, shale, conglomerate, and minor felsic volcanic rock are also present
- the central part of the study area is underlain by the Frampton Volcanics, which comprise rhyolite, rhyodacite, dacite, quartz–feldspar sandstones, siltstone, conglomerate, numerous rhyolithic and rhyodacitic dykes, and limestone
- the northern part of the study area passes through quaternary alluvium, comprising gravel, sand, silt and clay and north of Stockinbingal, passes through the Ironbong Dacite Member, comprising rhyolite, rhyodacite, and dacite.

A review of (then) NSW DPIE land and soil information mapping (eSPADE) identified a number of soil landscapes within the study area. These are summarised in Table 20-1, with their extent shown on Figure 20-1.

**TABLE 20-1: SOIL LANDSCAPES WITHIN THE STUDY AREA**

| Soil landscape | Soils | Recorded limitations |
|---|---|---|
| Stoney Hill | Generally shallow (<50 cm) deep gravelly tenosols and rudosols (young soils with limited profiled development) some deeper red kandosols and dermosols. | ‣ Shallow, rocky soils<br>‣ Localised erosion hazard<br>‣ Localised salinity hazard<br>‣ Low fertility. |
| Eurongilly | Generally deep (>100 cm) clay dominated soils including imperfectly drained red and brown chromosols, kurosols and dermosols. Some poorly drained sodosols on lower slopes and drainage lines. | ‣ Sheet erosion hazard<br>‣ Localised gully erosion<br>‣ Localised salinity hazard<br>‣ Poor drainage<br>‣ Localised acidity<br>‣ Localised sodality and dispersive soils<br>‣ Low fertility. |
| Ironbong Creek | Moderately deep (>50 cm) brown imperfectly drained chromosols and red Kandosols, and mottled brown sodosols on flood plains. Young kandosols and rudosols are present along creek lines. | ‣ Seasonal waterlogging<br>‣ Sheet erosion<br>‣ Localised gully erosion<br>‣ Poor drainage<br>‣ Localised flood hazard<br>‣ Localised topsoil acidity. |
| Oakville | Deep red and brown chromosols on upper slopes and red and brown sodosols on lower slopes and depressions. | ‣ Sheet erosion<br>‣ Localised gully erosion<br>‣ Poor drainage<br>‣ Localised topsoil acidity<br>‣ Localised salinity hazard<br>‣ Low fertility. |

| Soil landscape | Soils | Recorded limitations |
|---|---|---|
| Twin Range | Shallow (<25 cm) to deep (>100 cm) tenosols and chromosols on crests, deep red chromosols and kandosols and dermosols on slopes and brown clay dominated sodosols and sandy tenosols on lower slopes and flats. | ▸ Localised salinity hazard<br>▸ Rock outcropping<br>▸ Sheet erosion hazard<br>▸ Localised poor drainage<br>▸ Acidity<br>▸ Dispersive subsoils. |
| Frampton | Shallow (<50 cm) sandy tenosols on upper slopes, imperfectly drained red chromosols, dermosols and kandosols on mid slopes and poorly drained brown chromosols in drainage depressions. | ▸ Soil erosion hazard<br>▸ Topsoil acidity<br>▸ Hard setting surfaces. |
| Narraburra | Deep (>100 cm) sandy rudosols and poorly drained clayey sodosols along creek floodplains and depressions. Deep red chromosols and kurosols, brown dermosols on adjacent levees and plains and occasional red vertosols on back plains. | ▸ Poor drainage<br>▸ Sheet erosion hazard<br>▸ Localised flood hazard<br>▸ Localised salinity hazard<br>▸ Seasonal waterlogging<br>▸ Shrink/swell. |

*Source: Descriptions for NSW (Mitchell) Landscapes Version 2 (2002)*

Further detail on subsurface conditions was noted during the geotechnical investigations completed to inform the design of the proposal. The location of the geotechnical investigations is shown in Figure 20-1. The general soil types identified during these investigations are summarised in Table 20-2.

**TABLE 20-2: SUMMARY OF SUBSURFACE CONDITIONS**

| Soil type | Depth | Generalised description |
|---|---|---|
| Topsoil | 0.1 to 0.4 m | Generally comprising silty clay, medium plasticity, dark brown/brown. |
| Fill | Up to 0.3 m | Fill material was not identified within the majority of the proposal site. However, areas of fill were identified within existing railway line at the northern and southern extents of the proposal site, comprising variable clay, sand, and gravel materials. |
| Alluvium | 8 m, with deeper deposits of up to 20 m encountered near Billabong Creek and to the north of Burley Griffin Way | Variable clay, with silts, sands and gravels, medium to high plasticity, stiff to hard consistency. |
| Residual | Below 8 m | Clay, silty clay, or gravelly clay, medium to high plasticity, brown/some mottling, very stiff to hard consistency. |

### 20.3.1.1 Erosion risk

Based on a review of available regional soil mapping for the study area, the soil landscapes present within the study area may contain erosion risk.

The results of the geotechnical investigations completed for the proposal (including emersion tests for soil dispersion), indicate that soils present at the site are generally non-dispersive. As such, the erosion potential of the soils across the proposal site was assessed as low; however, evidence of significant soil erosion was identified in some areas of the proposal site, including:

- significant depths of gully/bank erosion within several incised drainage gullies and waterways, including:
  - Ulandra Creek
  - Isobel Creek
  - Dudauman Creek
- erosion on some crests and ridges to exposed bedrock.

#### 20.3.1.2 Acidity

Acidity of the soil and rock may be generated by acid sulfate soils (ASS), naturally acidic soils, and from sulfidic rock.

ASS are naturally occurring sediments that contain iron sulfide minerals that, if drained, excavated or exposed to air, react with oxygen to form sulfuric acid. ASS are common to coastal regions (coastal ASS) and may also form inland (inland ASS) where sources of salinity and organic matter coincide with anaerobic conditions. Given the distance of the proposal site from the coast and its elevation, no ASS are expected or known to occur. A review of the Australian Soil Resource Information System (ASRIS) undertaken on 13 May 2019 (Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2018) identified that the proposal site is located in an area of low probability of ASS, also including inland ASS.

Naturally acidic soils should not be confused with ASS. They may be acidic as a result of natural acidity inherent in the parent rock, due to organic acids being present in the soil or thought agricultural practices (fertiliser use).

Typical pH ranges from surface level to approximately 1.0 m deep within the soil profile for each three predominant soil types in the proposal site are as follows:

- Frampton: Profile 1; 7.0–9.5 pH. Profile 2; 6.5–7.5 pH. Profile 3; 7.0–6.5 pH
- Twins Range: Profile 1; 6.0–7.0 pH. Profile 2; 7.5–8.5 pH. Profile 3; 5.5 pH
- Eurongilly: Profile 1; 5.0–7.0 pH. Profile 2; 7.0–8.0 pH. Profile 3; 8.5–9.0 pH.

These pH ranges indicate soils are generally neutral to alkaline, with some instances of weak acidity. The acidity, where present, is unlikely to worsen significantly with time.

Sulfidic rock can occur across a wide range of geologies, both igneous and sedimentary; they are not necessarily acidic in their undisturbed state. Site-specific testing to assess for the presence of potential acidity should be undertaken where cuttings into underlying bedrock are planned.

#### 20.3.1.3 Saline soils

The majority of soil landscapes identified within the study area are identified to have localised salinity issues.

The NSW EES Soil and Land Information System contains data points identifying evidence of soil salinity where soils have been sampled previously. A review of the database was undertaken 13 May 2019 (eSpade, 2019) identified that generally no salting was evident at sample locations within the study area.

There is generally no evidence of surface salt at sample locations in the vicinity of the proposal site (within 1 km) and this indicates that the likelihood of salt scalds at the surface is low; however, salinity remains a potential hazard on the site and could develop in localised areas as a result of the proposal if not managed appropriately, as salinity hazard is complex and relates to the soil type, landscape features, local hydrology and also the development on the land.

### 20.3.2 Contamination

#### 20.3.2.1 Database searches and historical land uses

A review of the EPA Contaminated Sites Register (22 February 2019) did not identify any listed contaminated sites within 1 km of the proposal site. There were some identified contaminated sites within the Cootamundra and Junee Shire LGA's; however, they are located a substantial distance from the proposal site and would not be considered likely to have an impact to the proposal site (NSW EPA, 2019a).

A search of the POEO Act public register undertaken on the 22 February 2019 did not identify sites holding an environmental protection licence within one kilometre of the proposal site. In addition, a search in the ARTC contamination records did not identify any areas relevant to the proposal (NSW EPA, 2019b).

Further detail on the searches undertaken is provided in Technical Paper 14.

A review of current and historical land uses indicates the proposal site has been predominantly utilised for agriculture since European settlement. Other land use within the study area includes rail and road infrastructure, as well as residential and commercial properties within Stockinbingal. While the potential for significant contamination across the study area was noted as a low to moderate risk, potential sources of contamination associated with the historical use of the study area were identified to include:

- spraying of agricultural land with herbicides and pesticides
- machinery storage and maintenance, including hydrocarbons and heavy metals
- sheep dips, including use of heavy metals and chemicals

- uncontrolled fill material
- contamination within areas of existing railway line, potentially including pesticides, hydrocarbons, heavy metals and asbestos
- illegally dumped waste.

#### 20.3.2.2 Site walkover

Significant sources of contamination were not identified during the site walkover. A number of areas were identified as having the potential for localised contamination to be encountered. Based on the site visit, a number of AEC were identified in Technical Paper 14. A summary of the AECs is provided in Table 20-3 and shown in Figure 20-2. While none of these areas were identified as containing significant quantities of chemicals or materials indicating high risk of contamination, they may require further assessment during further design development prior to construction of the proposal, measures may need to be identified to minimise the risk of localised spills or contamination of soils, including cross-contamination of other material.

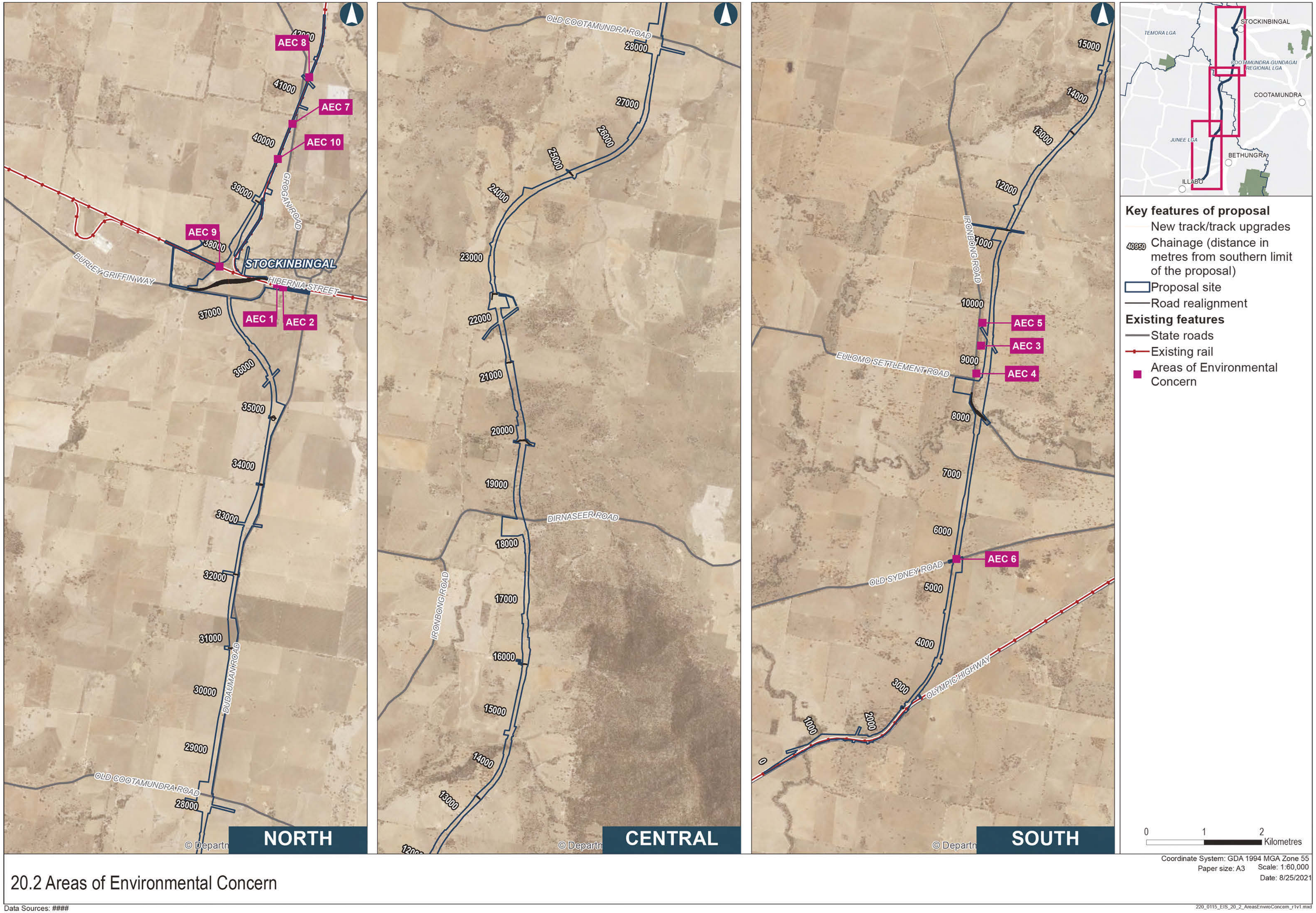
**TABLE 20-3: AREAS OF ENVIRONMENTAL CONCERN IDENTIFIED WITHIN THE PROPOSAL SITE**

| AEC | Description |
|---|---|
| AEC 1 | Three grain silos adjacent to the railway line. These sites would have a higher density of heavy vehicle movements at times in the year and potential for some historical vehicle maintenance and of refuelling or other to have occurred. |
| AEC 2 | Disused broken machinery and parts, potential asbestos containing material. |
| AEC 3 | Four grain silos and machinery associated with these silos including tractors and multi-feeders within a private property. |
| AEC 4 | Bethungra Rural Fire Brigade service shed with associated fire suppressants and one water tank. |
| AEC 5 | A locked chemical storage shed and drums containing pesticides. Drums were identified to contain herbicides ranging from a pre-emergence herbicide to non-residual, non-selective herbicide. |
| AEC 6 | Fox baits. |
| AEC 7 | Stockpile of waste including wood and rubble. |
| AEC 8 | The Main South Line (railway line). |
| AEC 9 | Crossing the Main South Line (railway line). |
| AEC 10 | The Forbes Line (railway line north of Stockinbingal). |

In addition to these AECs, the following were observed from the site walkover:

- raised dam walls were identified at a number of locations adjacent to or intersected by the proposal site, which could indicate some filling but are more likely to be constructed using natural materials excavated from the dam and surrounding area
- stockpiles of waste at various locations along the proposal site, particularly where the proposal followed existing roads, comprising of demolition materials
- some broken machinery dumped opposite Stockinbingal station, which included large fragments of potentially asbestos-containing materials
- the alignment crosses many sealed and unsealed roads—where no obvious signs of contamination were noted.

In summary, the proposal site is predominantly used for rural and agricultural purposes and rail activities, with a generally low likelihood of associated contamination. Areas of pesticide, hydrocarbon and heavy metals contamination may be present where chemicals were stored, spray rigs were refuelled or maintenance activities took place. For areas near the existing railway, there may be contamination risks from operating railway activities; e.g. ash from historical steam trains in the rail easement and maintenance chemicals along tracks or refuelling activities. Where the proposal site is close to existing roadways, or crosses gullies, agricultural land and draining easements, it is possible there may be increased presence of litter or dumped waste (e.g. asbestos).




20.2 Areas of Environmental Concern

Data Sources: ####

## 20.4 Impact assessment—construction

While potential contamination risks may arise from areas near the existing railway line primarily from heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN), poly-cyclic aromatic hydrocarbons (PAHs), asbestos, lead containing dust and/or paint, run-off from agricultural areas and some specific sites, no significant risks from soils or widespread contamination were identified. The environmental risk assessment for the proposal is included in Appendix G.

### 20.4.1 Erosion and sedimentation impacts

Construction of the proposal includes activities involving significant quantities of excavation and ground disturbance with the potential to impact soils leading to erosion and sedimentation. Disturbance associated with the movement of plant and equipment within unsealed areas, including light vehicles, may also result in potential erosion and sedimentation risks. If these activities are not managed appropriately, impacts to soils may include:

- erosion of exposed soil and stockpiled materials
- dust generation from excavation, backfilling and vehicle movements over exposed soil
- increased sediment loads entering the surrounding waterways
- compaction of soils leading to reduced productivity or impacts on drainage.

The exposure of soils during construction of the proposal would be temporary and short-term in duration as these activities would be staged along the length of the proposal site. It is expected that all excavated spoil would be reused during track formation works (as described in Chapter 8: Proposal description—construction). In general, soils across the site were not considered to comprise a significant erosion risk. Potential impacts of the proposal would be typical of any similar construction project, and a range of mitigation measures would be implemented to manage soils.

Excess spoil would be assessed as part of the Earthworks Materials Specification (ARTC, 2020b) which include a process for assessing and minimising contamination and spoil generation. For excess spoil deemed not suitable to be used due to its geotechnical properties, or the potential presence of contamination (discussed further below), would be stockpiled, with appropriate controls to prevent cross contamination, in a suitable location for transportation and disposal offsite at an appropriately licensed waste facility.

Exposure of the ground surface through vegetation removal and excavation of construction of structures, including culverts and underbridges, to the physical process of water runoff and wind could increase soil erosion potential. Periods of heavy and frequent rainfall could lead to increased runoff and flooding. Loose material may be eroded during rainfall events by runoff, increasing the potential for movement of soils and sedimentation.

### 20.4.2 Acidity

The presence of ASS and saline soils was not identified at the proposal site and no impacts are anticipated. Furthermore, occurrences of acid soils are not anticipated. The soils along the route are likely to generally be alkaline or slightly acidic and, as such, are unlikely to be a significant limitation. The risk of encountering sulfidic rock is uncertain and should be assessed in areas where cutting into the underlying bedrock is proposed.

Given the uncertainty with respect to salinity in various soil profiles, there may be a low risk for saline soils at the proposal site.

### 20.4.3 Saline soils

Overall, the potential for saline soils to be encountered during construction is low; however, there is potential for salting of localised areas if not managed appropriately. Whether salinity is exacerbated by the proposal would depend on many factors including the underlying soils, the local topographical features and draining, and the construction design.

The most likely scenarios leading to an increase in salinity presence at the surface would be excavation of salt-affected soil from deeper horizons and placing it at the surface, and disruption of existing drainage patterns allowing salts to be brought to the surface through development of seeps. Changes to groundwater flow paths, including groundwater flow barriers or groundwater discharge may mobilise salts, and impact surface water and groundwater quality (refer to is provided in Chapter 14: Groundwater. Soil disruption associated with excavations or cuttings into the landscape for the proposed railway line, footings, construction compounds, bridges or levelling works are potential activities that could increase salinity risk in either of these pathways.

### 20.4.4 Contamination

Based on the results of database searches, historical land uses within the study area and the site walkover, the potential for significant widespread contamination within the proposal site is generally considered low; however, activities from current and historical land uses may have a moderate risk of significant contamination in discreet areas of the proposal site. A number of low-to-medium risk areas (AECs) have been identified, which may require management. While a specific need for remediation has not been identified, further pre-construction investigations may indicate the presence of some localised contamination and the need for appropriate management responses. The key medium risks identified include the potential for direct contact exposure by construction workers or future maintenance workers to soils associated with dumped materials and stockpiles, or machine storage and maintenance areas.

In addition to the potential impacts resulting from existing AECs, construction of the proposal may also result in the potential for chemical and fuel spills from the operation and movement of construction plant and vehicles, leading to localised contamination of soils and/or water.

Potential impacts associated with the AECs are outlined in Table 20-4.

**TABLE 20-4: POTENTIAL IMPACTS FROM AREAS OF ENVIRONMENTAL CONCERN[1]**

| Activity | Contaminant source | Potential contaminants of concern | Pathway | Receptors |
|---|---|---|---|---|
| Roadway and general use | Dumped material and stockpiles adjacent to the proposal site, particularly at road crossings (AEC 7) | Heavy metals, asbestos, PAHs | ▸ Direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/fibres. | ▸ Future workers on the proposal site. |
| | Rural fire sheds and fire suppressants (AEC 4) | TRH, BTEX, PAHs and PFAS | ▸ Direct contact through ingestion, or dermal absorption or soils<br>▸ Migration from overland flow into surface water bodies<br>▸ Migration through leaching into groundwater. | ▸ Future workers on the proposal site<br>▸ Current and future residents<br>▸ Terrestrial and aquatic ecology (flora and fauna) within/adjacent to creeks or waterways<br>▸ Groundwater. |
| | Fauna baits, particularly fox baits (AEC 6) | Heavy metals, sodium fluoroacetate | ▸ Direct contact through inadvertent ingestion, or dermal absorption. | ▸ Future workers on the proposal site. |
| Agricultural land adjacent to the proposal site | Use of agricultural chemicals on farm land (AEC 5) | Heavy metals, OCPs and OPPs | ▸ Direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/vapour spray. | ▸ Future workers on the proposal site. |
| | Machinery storage and maintenance, refuelling and spray rig filling, agricultural sheds and silos (Identified AECs 2 and 3) | Point sources of heavy metals, TRH, BTEX, solvents, OCPs and OPPs, and asbestos fragments | ▸ Direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/vapour spray<br>▸ Migration through leaching into groundwater. | ▸ Future workers on the proposal site<br>▸ Current and future residents<br>▸ Groundwater. |
| Existing railway line | Fill used in construction of the original railway line, possible historical waste disposal along the alignment and weed suppression activities (sections of the alignment between chainage 0 and 3500, and 38500 and 42500) | Diffuse presence or isolated hotspots of Heavy metals, TRH, BTEX, PAHs, asbestos along the existing rail easement, lead containing dust and/or paint | ▸ Direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/fibres. | ▸ Future workers on the proposal site. |

| Activity | Contaminant source | Potential contaminants of concern | Pathway | Receptors |
|---|---|---|---|---|
| | Old broken railway machines left near to Stockinbingal station<br>(AEC 2 and 3) | Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint | ▸ Direct contact through inadvertent ingestion, or dermal absorption of impacted soils<br>▸ Inhalation of impacted soils/dust/fibres<br>▸ Migration through leaching into groundwater. | ▸ Future workers on the proposal site<br>▸ Current and future residents<br>▸ Groundwater. |
| | Rail line ballast[1] | Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint | ▸ Direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/fibres. | ▸ Future workers on the proposal site. |
| | Possible maintenance activities in sidings and near silos<br>(identified as AECs 1 and 3) | Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint | ▸ direct contact through inadvertent ingestion, or dermal absorption of soils<br>▸ Inhalation of impacted soils/dust/fibres<br>▸ Migration through leaching into groundwater. | ▸ Future workers on the proposal site<br>▸ Current and future residents<br>▸ Groundwater. |

1. Rail line ballast is listed in SEPP 55 as a potential contaminant. Fill is commonly used in the construction of railway lines along with other contaminants identified in the use of ballast. The risk is identified as low but would be confirmed with additional sampling investigation.

## 20.5 Impact assessment—operation

### 20.5.1 Soils

Exposed soils would be reinstated and revegetated at the completion of construction and significant impacts to soils during operation of the proposal are not anticipated. Erosion of soils may occur in some areas, potentially resulting in silting up of drainage infrastructure, including culverts. The proposal would continue to be designed to minimise potential impacts to soils during operation.

Maintenance and repair activities may require excavation and ground disturbance, which could result in minor short-term impacts.

### 20.5.2 Contamination

The main risk of contamination during operation of the proposal is from accidental spillage of petroleum, chemicals or other hazardous materials as a result of leakage or rail accidents, which could result in pollution of the surrounding environment; however, these impacts would be minimised by implementing existing ARTC procedures to manage potential leaks and spills.

## 20.6 Mitigation and management

### 20.6.1 Approach to mitigation and management

#### 20.6.1.1 Approach to managing the key potential impacts identified

The key approach to managing soils during construction would involve preparing a soil and water management sub-plan as part of the CEMP in accordance with mitigation measure SC-6. The plan would define the processes, responsibilities and erosion and sediment control measures that would be implemented during construction.

The potential for contamination impacts associated with the presence of building structures along the proposal site requiring demolition would also be managed by preparing and implementing a contaminated land and hazardous materials management plan as part of the CEMP in accordance with mitigation measure SC-7. The contaminated land and hazardous materials management plan would be prepared prior to the demolition of structures. In the event that asbestos or other hazardous materials are identified in these structures, mitigation measures would be carried out in accordance with the plan to avoid the release of asbestos.

To confirm the risk of contamination and associated management requirements, additional soil investigations would be undertaken within the proposal site, at identified AECs during the detailed design phase of the proposal, to further develop appropriate treatment measures (as required). Design documents would specify construction procedures to manage soils.

Site-specific analysis would be undertaken during detailed design to inform how issues associated with constructing infrastructure in dispersive and saline or sodic soils would be managed, including appropriate treatment measures (as required). Design documents would specify construction procedures to identify and address 'unsuitable' subgrade soils.

Auditing and monitoring would be undertaken during construction to ensure that the CEMP and relevant included plans are being implemented.

A detailed list of mitigation measures is listed in Table 20-5.

#### 20.6.1.2 Approach to managing other impacts

An unexpected finds protocol would be developed as part of the contamination and hazardous materials plan to ensure that any unexpected contamination encountered during construction does not expose workers, site users, and/or the environment to contamination in excess of regulatory guideline levels. The unexpected finds protocol would outline the activities to be undertaken in the event that previously undetected contamination is identified, which would include making the site safe, carrying out an assessment of the finds, and managing the finds based on the results of the assessment.

Other impacts would be managed by implementing the measures provided in Table 20-5.

### 20.6.2 Expected effectiveness

Erosion and sediment control measures would be implemented in accordance with the requirements of the Blue Book. The measures contained in the Blue Book are based on field experience and have been previously demonstrated to be effective. In general, implementing measures in accordance with the Blue Book would reduce the potential for the impact to be realised (by using controls such as hay bales, covers on stockpiles, etc.) or enable the impact to be avoided completely (e.g. by not undertaking works during wet weather). As a result, the proposed mitigation measures are expected to be effective.

In relation to potential impacts associated with contamination, implementing the proposal measures (including the unexpected finds protocol and spill procedures) would reduce the potential for impacts.

### 20.6.3 Interactions between mitigation measures

Mitigation measures to control impacts associated with soil and contamination may overlap with measures proposed for the control of Chapter 10: Biodiversity (including aquatic), Chapter 13: Water quality, Chapter 21: Waste, Chapter 24: Air quality and Chapter 25: Health and safety (including hazardous materials). All mitigation measures for the construction of the proposal would be consolidated and described in the CEMP.

The CEMP would identify measures that are common between different aspects. Common impacts and common mitigation measures would be consolidated to ensure consistency and implementation.

### 20.6.4 Recommended mitigation measures

Mitigation measures for potential impacts to soils and contamination are outlined in Table 20-5.

**TABLE 20-5: MITIGATION MEASURES**

| Ref | Impact | Mitigation measures | Timing |
|---|---|---|---|
| SC-1 | Structural integrity | Detailed design would include engineering measures to minimise operational risks from dispersive, saline and/or low strength soils, particularly through foundation and batter design. | Detailed design/ pre-construction |
| SC-2 | Contamination | Hazardous materials surveys would be undertaken during detailed design for all proposed demolition activities. | Detailed design/ pre-construction |
| SC-3 | Contamination (waste) | Any hazardous or dangerous waste (for example asbestos, chemicals, oils) would be correctly stored and managed onsite, and if necessary, disposed of by a licensed contractor or facility and in accordance with the relevant State occupation health and safety legislative and regulatory obligations. This includes wastes generated as a result of demolition. | Detailed design/ pre-construction |
| SC-4 | Contamination (investigations) | Site investigations would be undertaken by a suitably qualified and experience consultant as defined in Schedule B9 of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC, 2013) to assess exposure risks to site workers and other receptors as a result of disturbances to the following areas considered to be at a medium to low risk of being contaminated:<br>▸ AEC 2—disused broken machinery and parts, potential asbestos containing material<br>▸ AEC 3—four grain silos and machinery associated with these silos including tractors and multi-feeders within a private property<br>▸ AEC 5—a locked chemical storage shed and drums containing pesticides<br>▸ AEC 6—fox baits<br>▸ AEC 7—stockpile of waste including wood and rubble<br>▸ AEC 8—the Main South Line (railway line)<br>▸ AEC 9—crossing the Main South Line (railway line)<br>▸ AEC 10—The Forbes Line (railway line north of Stockinbingal).<br>The results of the site investigations would be assessed against the criteria contained within the *National Environment Protection (Assessment of Site Contamination) Measure 1999* to determine the need for any remediation. | Detailed design/ pre-construction |
| SC-5 | Erosion and sedimentation control | Where practical, vegetation clearing and ground-disturbing works should be staged sequentially/across the project to minimise areas exposed to erosion and sediment risk. | Detailed design/ pre-construction |
| SC-6 | General soil and erosion management | A soil and water management plan (SWMP) would be prepared as part of the CEMP. The SWMP would comply with the conditions of approval and be in accordance with best practice, reflected in *Managing Urban Stormwater: Soils and construction—Volume 1* (Landcom, 2004), *Volume 2C Unsealed roads* (DECC, 2008) and *Volume 2D, Main Road Construction* (DECC, 2008) (collectively known as the Blue Book).<br>The SWMP would include:<br>▸ water quality and soil/land conservation objectives for the proposal<br>▸ a progressive erosion and sediment control plan that allows for staging and site-specific erosion and sediment controls at all work sites in accordance with the Blue Book. Physical controls may include sediment fences and basins, containment bunds, silt traps, turbidity barriers and diversions, dust suppression and earth compaction around stockpiles and earthworks areas.<br>The controls would aim to:<br>▸ divert water from upslope areas around the site<br>▸ reduce erosion from within the site<br>▸ intercept runoff and capture sediment from site<br>▸ protect watercourses, drainage lines and drain inlets down-gradient from the site. | Construction |

| Ref | Impact | Mitigation measures | Timing |
|---|---|---|---|
| | | The plan would identify:<br>‣ monitoring locations at discharge points and selected watercourses where works are being undertaken, monitoring parameters and frequency and duration of monitoring. | |
| SC-7 | Contamination management | A contaminated land and hazardous materials management plan would be prepared and implemented as part of the CEMP. The plan would include, but not be limited to:<br>‣ further investigations during detailed design would be required to characterise contamination at registered or otherwise identified contaminated sites. Results would be used to further inform CEMP requirements<br>‣ a methodology to manage excavation and spoil management with known contaminated sites<br>‣ capture and management of any surface runoff contaminated by exposure to the contaminated land<br>‣ measures to ensure the safety of site personnel, environment and local communities during construction<br>‣ procedures for incident management and managing unexpected contamination finds (an unexpected finds protocol). | Construction |
| SC-8 | Rehabilitation (local roads) | Where decommissioning or realignment of local roads is required, the CEMP would include decommissioning and rehabilitation requirements, as per relevant conditions of approval and road authority requirements. This would include measures to manage:<br>‣ milling and removal of bitumen pavement<br>‣ removal of any decommissioned culverts<br>‣ tying and ripping of base and sub-base material<br>‣ application of soil ameliorants<br>‣ topsoiling and/or compost blanket<br>‣ stabilisation and rehabilitation (e.g. planting and or seeding). | Construction |
| SC-9 | Soil erosion and sedimentation | During any maintenance work where soils are exposed, sediment and erosion control devices would be installed in accordance with *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom, 2004). | Operation |
| SC-10 | Contamination | ARTC's existing spill response procedures would be reviewed to determine applicability and suitability during operation. The adopted procedure would include measures to minimise the potential for impacts on the local community and the environment as a result of any leaks and spills. | Operation |

### 20.6.5 Managing residual impacts

Residual impacts are impacts of the proposal that may remain after implementation of:

- design and construction planning measures to avoid and minimise impacts (refer to section 20.2.5) and Chapter 8: Proposal description—construction
- specific measures to mitigate and manage identified potential impacts (see section 20.6.4).

The key potential soils and contamination issues and impacts originally identified by the environmental risk assessment (refer to Appendix G) are listed in Table 20-6.. The (pre-mitigation) risks associated with these impacts, which were identified by the environmental risk assessment, are provided. Further information on the approach to the environmental risk assessment, including descriptions of criteria and risk ratings, is provided in Appendix G.

The potential issues and impacts identified by the environmental risk assessment were considered as part of the soils and contamination assessment, summarised in sections 20.4 and 20.5. The mitigation and management measures (listed in Table 20-5 that would be applied to manage these impacts are also identified. The significance of potential residual impacts (after application of these mitigation measures) is rated using the same approach as the original environmental risk assessment.

Provided the mitigation measures are implemented, the proposal poses a negligible to low risk of impacting soils and contamination as identified by the risk assessment in Table 20-6.

TABLE 20-6: RESIDUAL IMPACT ASSESSMENT—SOILS AND CONTAMINATION

| Phase | Potential impacts | Pre-mitigated risk | | | Mitigation measures (refer to Table 20-5) | Residual risk | | | How residual impacts would be managed |
|---|---|---|---|---|---|---|---|---|---|
| | | Likelihood | Consequence | Risk rating | | Likelihood | Consequence | Risk rating | |
| Construction | Potential to disturb contaminated soils during construction and mobilise contamination. | Possible | Moderate | Medium | SC-4, SC-8 | Rare | Moderate | Low | n/a |
| | Contamination of soils/ groundwater due to spills and leaks during construction. | Likely | Minor | Medium | SC-6 to SC-7 | Unlikely | Minor | Low | n/a |
| | Exposure of acid sulfate soils or saline soils and subsequent erosion. | Possible | Moderate | Medium | SC-1 to SC-5 | Possible | Not Significant | Low | n/a |
| | Potential to disturb hazardous materials during the demolition of buildings and structures. | Possible | Moderate | Medium | SC-2 to SC-4, SC-8 | Unlikely | Moderate | Low | n/a |
| | Potential for direct contact exposure by construction workers to soils associated with dumped materials and stockpiles or machine storage and maintenance areas. | Possible | Moderate | Medium | SC-2 to SC-4 | Unlikely | Moderate | Low | n/a |
| Operation | Erosion during operation maintenance works. | Possible | Moderate | Medium | SC-1, SC-9 | Rare | Moderate | Low | n/a |
| | Changes to surface, including vegetation removal and creation of embankments, increasing potential for erosion, or exacerbation of salinity hazards in proposal site and sedimentation down-gradient. | Possible | Moderate | Medium | SC-1, SC-5 | Unlikely | Moderate | Low | n/a |
| | Contamination of land due to leaks and spills from train operations. | Possible | Moderate | Medium | SC-10 | Unlikely | Moderate | Low | n/a |