CrossRiver**Rail**

8. Land Contamination

Cross River Rail

CHAPTER 8
LAND CONTAMINATION

JULY 2011

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8 Land contamination

8.1 Introduction

This Chapter addresses Section 3.3.2 of the Terms of Reference. It describes known contaminated land potentially affected by the Project and assesses the potential impacts of contaminated land on the Project. It also describes proposed mitigation measures to minimise or manage potential impacts.

8.1.1 Methodology

The study area for this assessment includes the study corridor for the EIS as well as a 1 km buffer surrounding the study corridor (refer to **Figure 8-1**). The study area has also taken account of the potential groundwater drawdown associated with the tunnel and especially the southern tunnel portal (refer to **Chapter 12 Groundwater**).

The purpose of this assessment was to identify known and potentially contaminated sites within the study area. It involved the review of:

- data from the Environmental Management Register (EMR) and Contaminated Land Register (CLR) provided by the Department of Environment and Resource Management (DERM)
- past land uses to identify potentially contaminated sites within the study area based on the review of current and historical aerial photographs and the 1965 Brisbane City Council (BCC) Land Use Plan
- potential for unexploded ordnance (UXO) as described on the Department of Defence website
- BCC records relating to flammable/combustible goods and historic landfills
- Queensland Rail contaminated land information
- relevant contaminated land findings of other recent EIS studies undertaken for projects within and near to the study area.

A roadside inspection of listed commercial/industrial properties and properties identified as being potentially contaminated, based on the assessment of past land uses, was also undertaken.

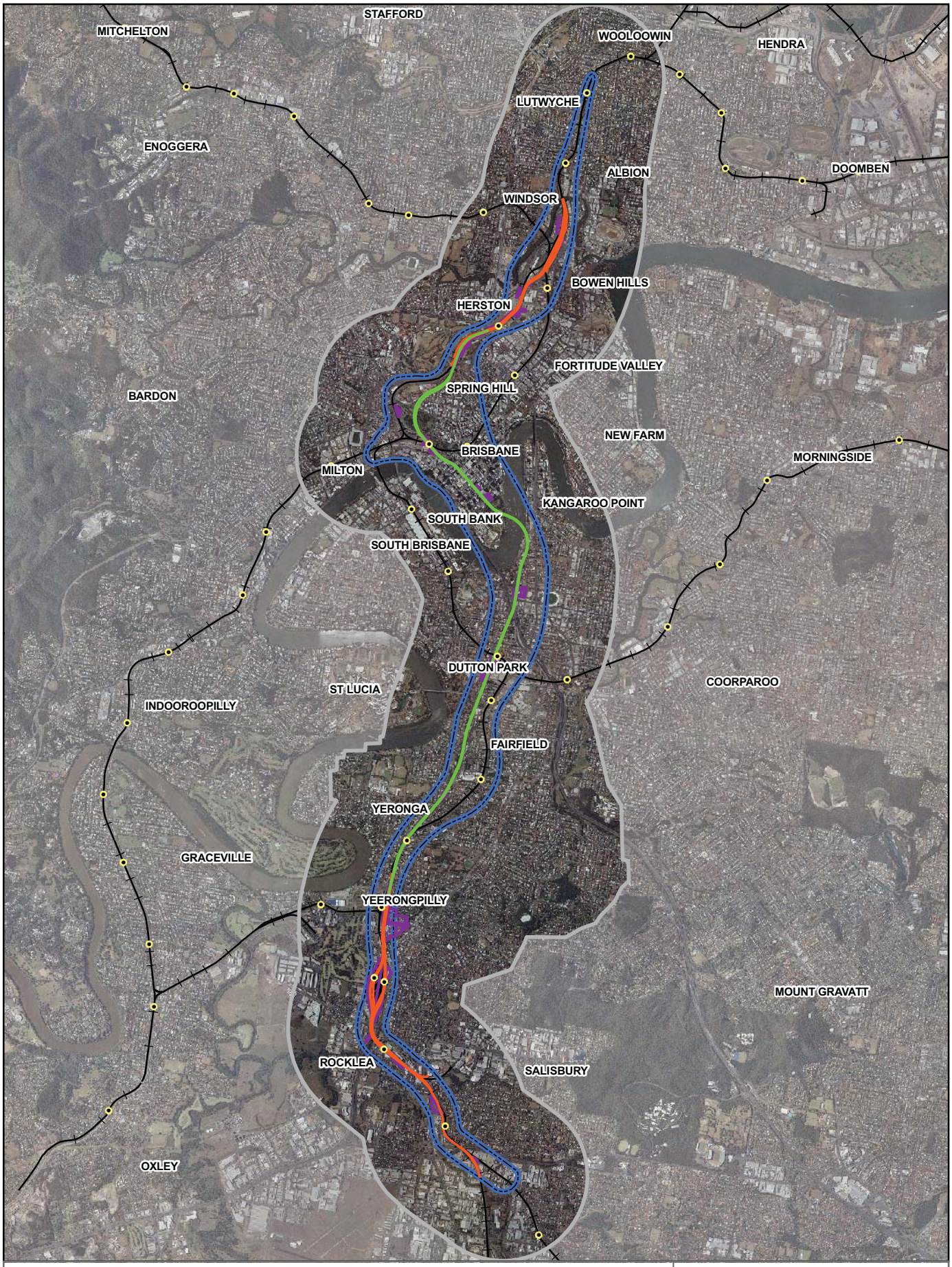
A qualitative assessment was undertaken of potential impacts of the Project on known and potentially contaminated sites within the study area. Mitigation measures are proposed to minimise or manage potential impacts associated with land contamination during construction and operation of the Project.

8.1.2 Legislative framework

Legislative requirements for contaminated land in Queensland are primarily contained in the Environmental Protection Act 1994 (EP Act) and subordinate policies and regulations.

The methodology used in this assessment is largely based on the following guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999* ("the NEPM") (National Environment Protection Council 1999)
- *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*, May 1998 ("the Draft Guidelines") (Department of Environment and Heritage 1998).



LEGEND

- Study Corridor
- Contaminated Land Study Area
- Station
- Track
- Worksites

Alignment

- Above Ground
- Underground

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-1

Contaminated Land Study Area

0 0.5 1 1.5 2 2.5 km

1:75,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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These documents provide a framework for assessing and managing contaminated soil and groundwater, based on an evaluation of three components in the risk chain identified below. Each of these links must be present in the risk chain for a risk to exist:

- contamination (source): soil and/or groundwater contamination must be present. Contamination is the release of a hazardous contaminant into the environment that is likely to cause serious or material environmental harm because of its physical, chemical or infectious characteristics or due to its concentration.
- receptors: humans and/or a receiving environment must be present and be potentially impacted by the identified contaminants
- pathways: the contamination must be able to contact receptors by means such as
  - humans – ingestion, skin contact and inhalation
  - environment – seepage into waterways, wind-blown deposition on plants, root uptake as well as ingestion, skin contact and inhalation by various life forms.

Appendix 9 of the Draft Guidelines provides investigation thresholds for contaminated soils in Queensland. The threshold levels are based on the risk of human exposure to potential contaminants in soil in association with particular types of land use (e.g. residential, open space recreation and industrial). The threshold levels do not necessarily take into account environmental concerns such as the protection of a species or ecosystem. Further information on the guidelines is provided in *Technical Report No.2 – Contaminated Land)*.

The National Environment Protection Council (NEPC) initiated a variation to the NEPM in June 2007 which aims to incorporate new scientific and technical information to minimise overly conservative investigation levels, provide clarification around the contaminated site assessment process and minimise unnecessary remediation. Consultation on the variation was undertaken in 2010. The outcome of the final variation is pending and consideration would be given to changes in relevant technical protocols upon approval of the variation.

8.2 Description of existing environment

This section provides a summary of the potentially contaminated sites identified within the study area. A detailed review is provided in *Technical Report No.2 – Contaminated Land.*

8.2.1 Environmental Management Register

The EMR and CLR databases are the principal source of land use planning data for contaminated land in Queensland. Land that has been or is being used for a “notifiable activity”, of which DERM has been advised, is recorded on the EMR. The EMR provides information on historic and current land uses, including whether the land has been, or is currently used for a notifiable activity, or has been contaminated by a hazardous material.

The CLR includes land which is proven (through investigation) to be contaminated land which is causing or has the potential to cause serious environmental harm. Land is recorded on the CLR when investigation shows it is contaminated and action needs to be taken to remediate or manage the land. There are no land parcels within the study area listed on the CLR.

As part of a desktop assessment, each notifiable activity was classified as being of either higher or lower risk. Notifiable activities considered to be of higher risk include those activities which present a greater risk of generating contaminants that are likely to be mobile in groundwater. Land parcels listed on the EMR for hazardous contaminants are also considered to be of higher risk. Where more than one notifiable activity is listed for a land parcel, the notifiable activity considered to be of higher risk is described.

A total of 2,972 land parcels within the study area are listed on the EMR. Of these, 506 land parcels are located within the study corridor, whilst 2,466 land parcels are located outside of the study corridor but within the study area.

Property description information including lot and plan number and notifiable activity is presented in Appendix A of *Technical Report 2 – Contaminated Land*. 46 land parcels listed on the EMR comprise common land and do not include a lot and plan description. Of these, 31 land parcels are listed for notifiable activities considered to be higher risk.

Table 8-1 provides a summary of higher and low risk land parcels listed on the EMR potentially affected by the Project. These are also shown on **Figure 8-2**, **Figure 8-3** and **Figure 8-4**.

Within the study corridor:

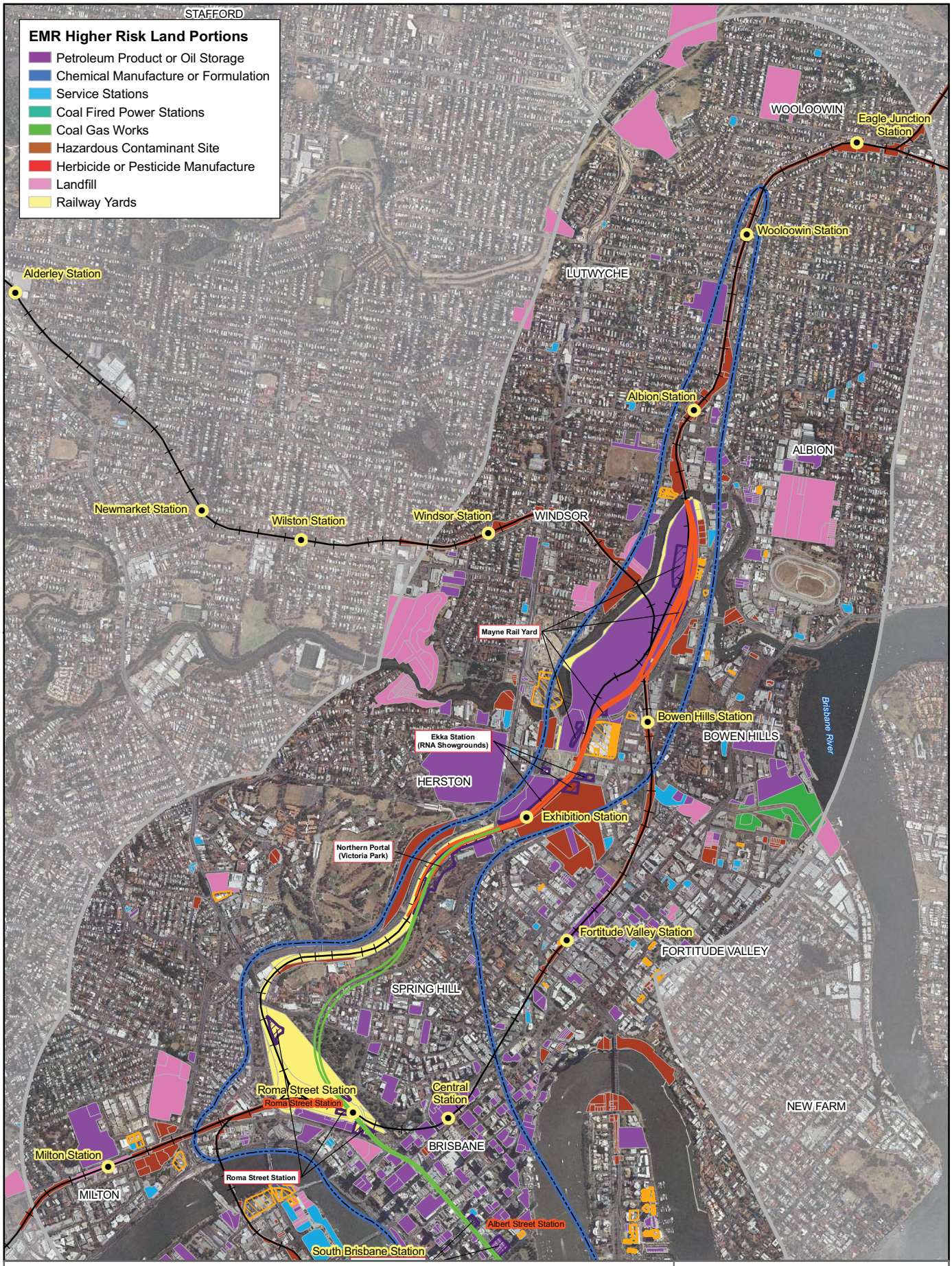
- 506 land parcels are listed on the EMR
- 432 land parcels are identified with notifiable activities considered to be of higher risk
- 74 land parcels are identified with notifiable activities considered to be of lower risk
- 14 land parcels are managed under a Site Management Plan (SMP), including 9 land parcels considered to be of higher risk.

Outside the study corridor, but within the wider study area:

- 2,466 land parcels are listed on the EMR
- 1,437 land parcels are identified with notifiable activities considered to be of higher risk
- 1,029 land parcels identified with notifiable activities considered to be of lower risk
- 114 land parcels are managed under a SMP, including 98 land parcels considered to be of higher risk.

Table 8-1 EMR listed land parcels potentially affected by the Project

Notifiable activity	Land parcels within the study corridor		Land parcels outside of the study corridor but within the study area	
	EMR listed land parcels	SMP managed land parcels	EMR listed land parcels	SMP managed land parcels
Higher risk				
Chemical manufacture or formulation	1	-	3	4
Coal fired power station	4	-	5	-
Coal gas works	-	-	10	-
Hazardous contaminant	84	1	291	34
Herbicide or pesticide manufacture	-	-	1	-
Landfill	50	-	291	17
Petroleum product or oil storage	198	5	591	28
Rail yards	86	3	35	-
Service stations	13	-	210	15
Total higher risk land parcels	**432**	**9**	**1,437**	**98**
Lower risk				
Abrasive blasting	1	-		
Asbestos manufacture or disposal	1	-		
Battery manufacture or recycling	-	-	1	-
Chemical storage	-	-	2	-
Drum reconditioning or recycling	1	-	-	-
Dry cleaning	1	-	17	1
Foundry operations	21	-	2	1
Livestock dip or spray race	-	-	2	-
Metal treatment or coating	3	-	908	7
Paint manufacture or formulation	1	-	3	-
Pest control	1	-	4	-
Pharmaceutical manufacture	-	-	1	-
Printing	25	2	63	-
Radioactive contaminant	1	-	-	-
Scrap yards	17	3	17	6
Waste storage, treatment or disposal	1	-	4	1
Wood treatment and preservation	-	-	5	-
Total lower risk land parcels	**74**	**5**	**1,029**	**16**



LEGEND

- Station
- Track
- Study Corridor
- Study Area
- EMR Low Risk Land Parcels

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-2

EMR Listed Parcels
Wooloowin to Bowen Hills (Northern Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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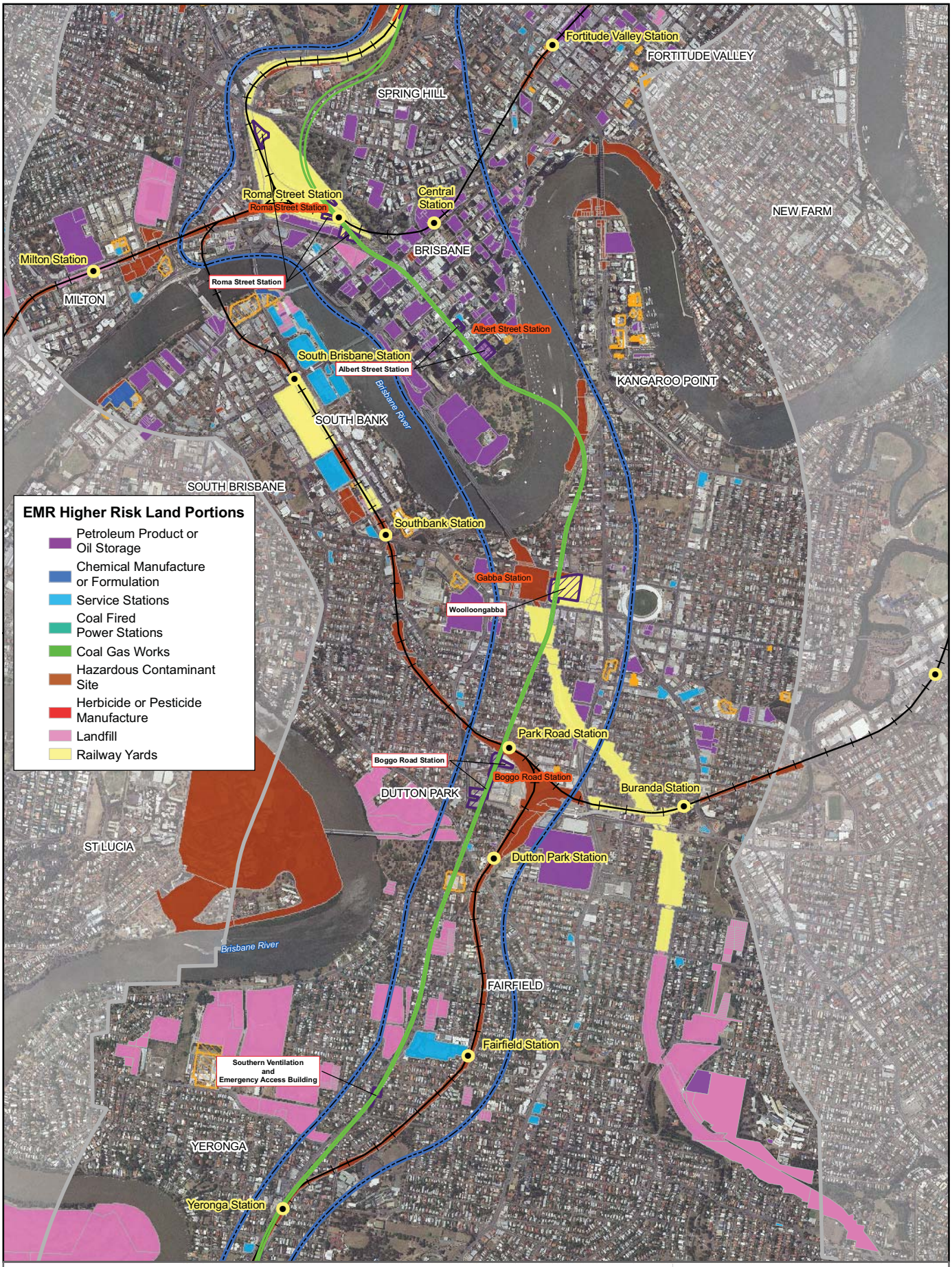

LEGEND

- Station
- Track
- Study Corridor
- Study Area
- EMR Low Risk Land Parcels

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-3

EMR Listed Parcels
Spring Hill to Fairfield (Central Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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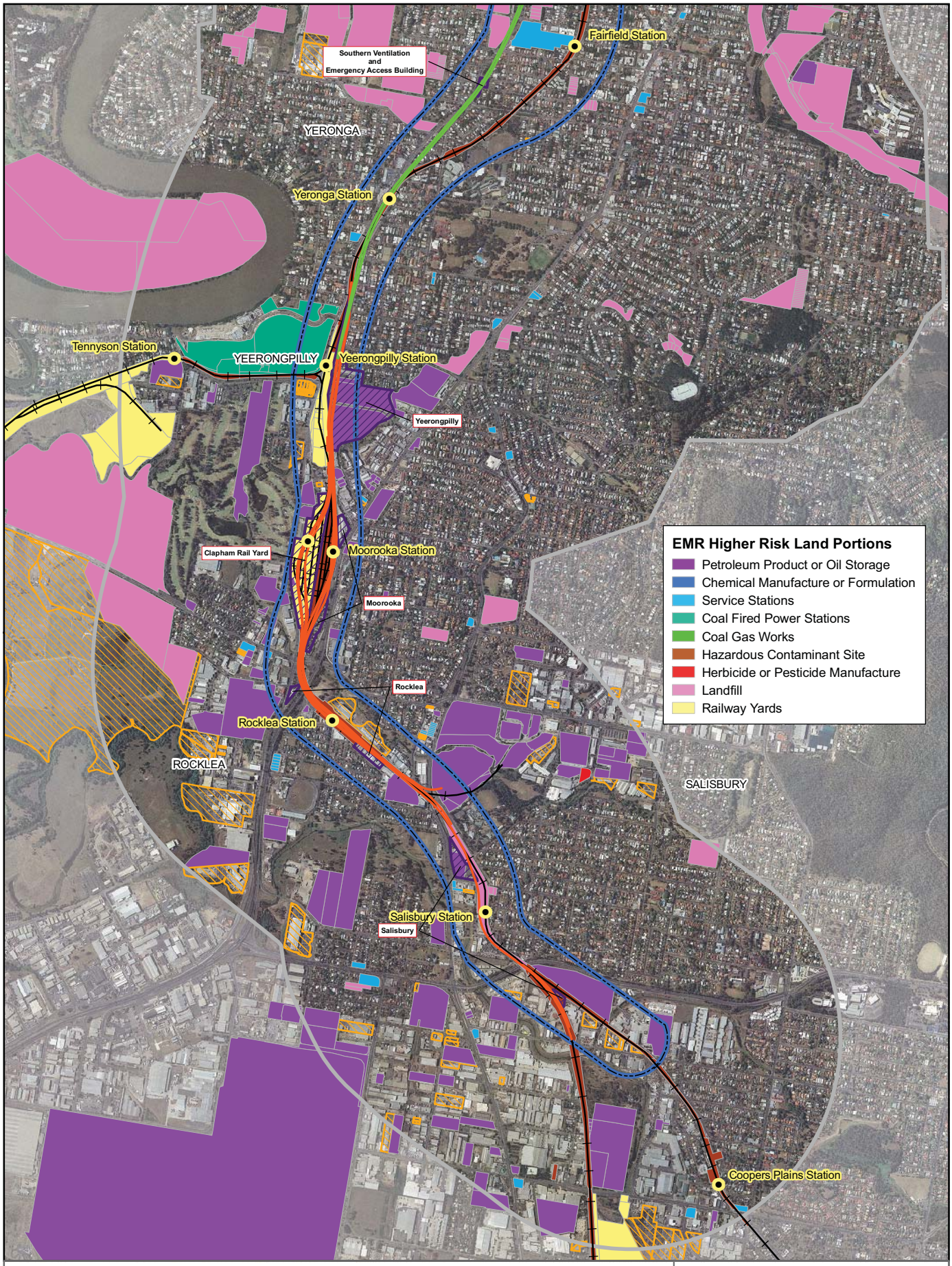

LEGEND

- Station
- Track
- Study Corridor
- Study Area
- EMR Low Risk Land Parcels

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-4

EMR Listed Parcels
Yeronga to Salisbury (Southern Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CrossRiverRail

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8.2.2 Historical records review and preliminary roadside inspection

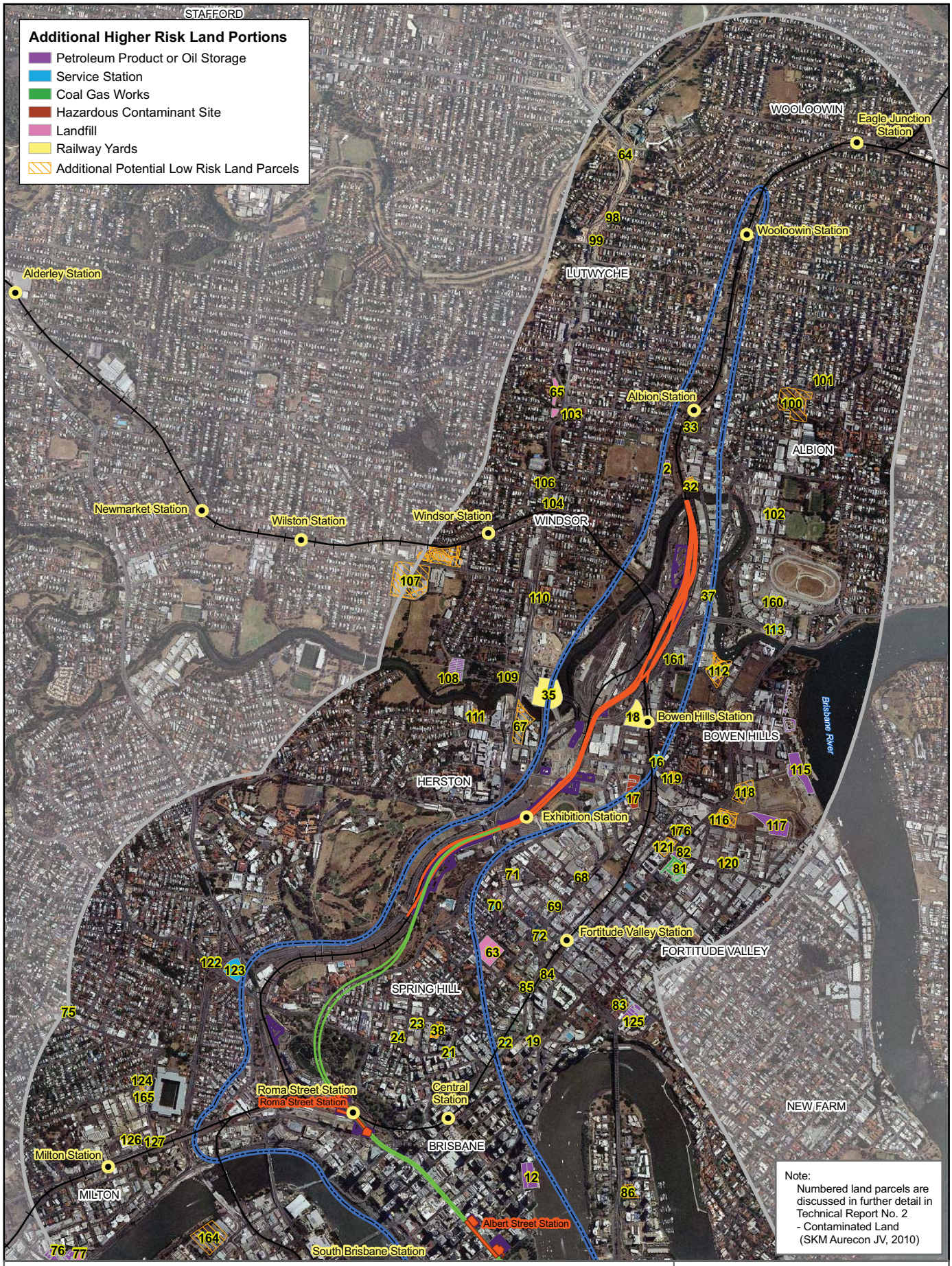
A review was also undertaken of other publicly available records to assess the potential for contaminated land within the study area which is not recorded on the EMR/CLR. These parcels are referred to as "additional potentially contaminated land parcels". Land which is listed on the EMR or has been identified as an additional potentially contaminated land parcel is referred to in this EIS chapter as a potentially contaminated site.

A preliminary roadside inspection was also undertaken of commercial and industrial areas within the study area and of buildings identified from the review of aerial imagery as having potentially contaminating activities.

Fifty additional potentially contaminated land parcels were identified within the study corridor, with a further 91 additional potentially contaminated land parcels identified outside the study corridor but within the study area. These are summarised in **Table 8-2** and are shown in **Figure 8-5**, **Figure 8-6** and **Figure 8-7**. A full list of these land parcels has been included in *Technical Report No.2 – Contaminated Land.*

Table 8-2 Additional potentially contaminated land parcels in the study area

Land use	Land parcels within the study corridor	Land parcels outside of the study corridor but within the study area
Asbestos manufacture or disposal	2	4
Chemical storage/drum reconditioning or recycling	1	2
Coal gas works	-	1
Defence establishments or training areas/explosives production or storage	-	2
Dry cleaning	-	3
Foundry operations/metal treatment or coating	-	4
Hazardous contaminant	2	-
Paint manufacture or formulation	-	2
Petroleum product or oil storage/service stations/engine reconditioning works	27	51
Rail yards	6	-
Scrap yards/landfill	5	10
Wood treatment and preservation	7	12
Total	**50**	**91**



LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Underground Station

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-5

Additional Potentially Contaminated Properties Wooloowin to Bowen Hills (Northern Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CrossRiverRail

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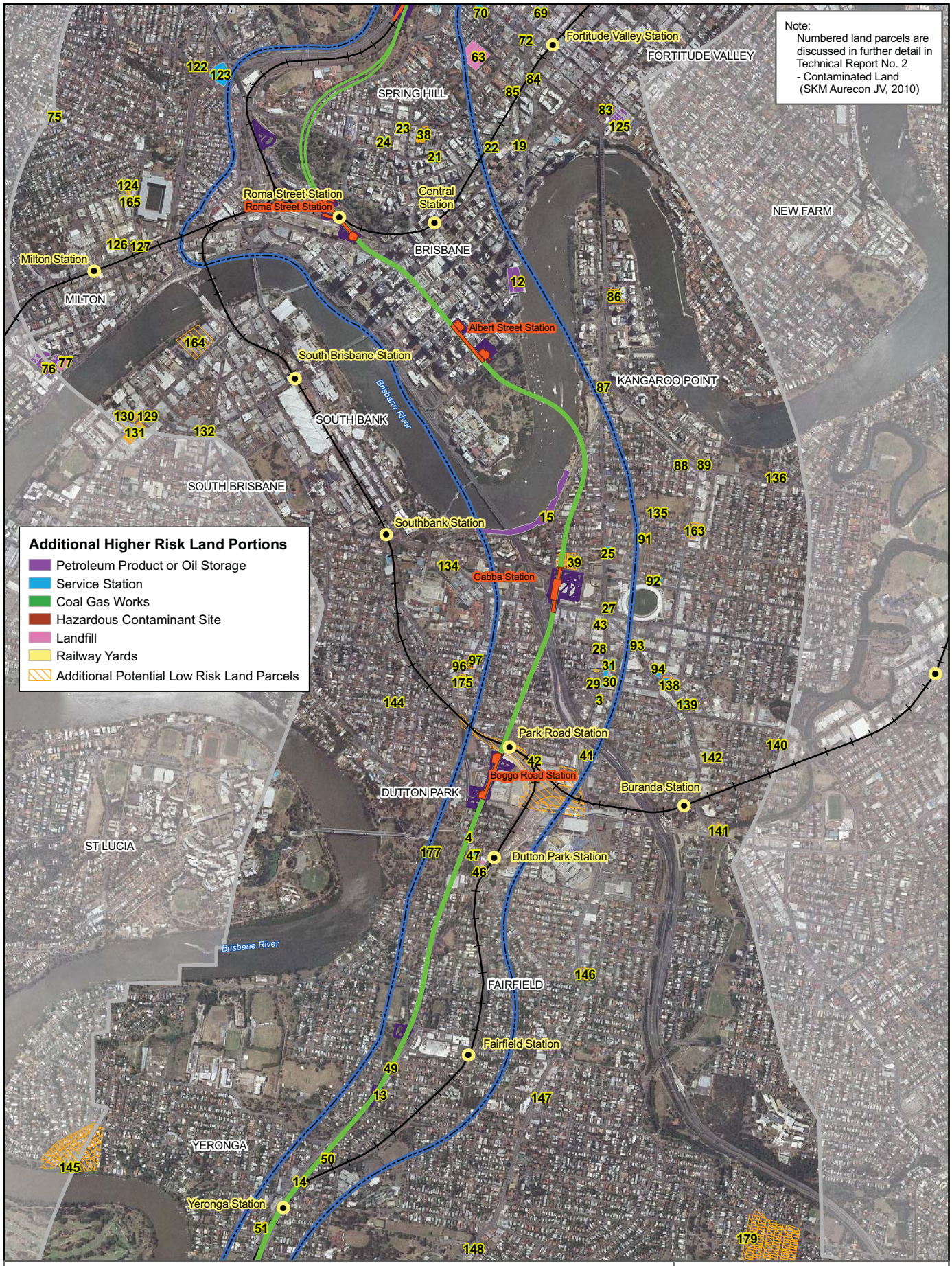

LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Underground Station

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-6

Additional Potentially Contaminated Properties Spring Hill to Fairfield (Central Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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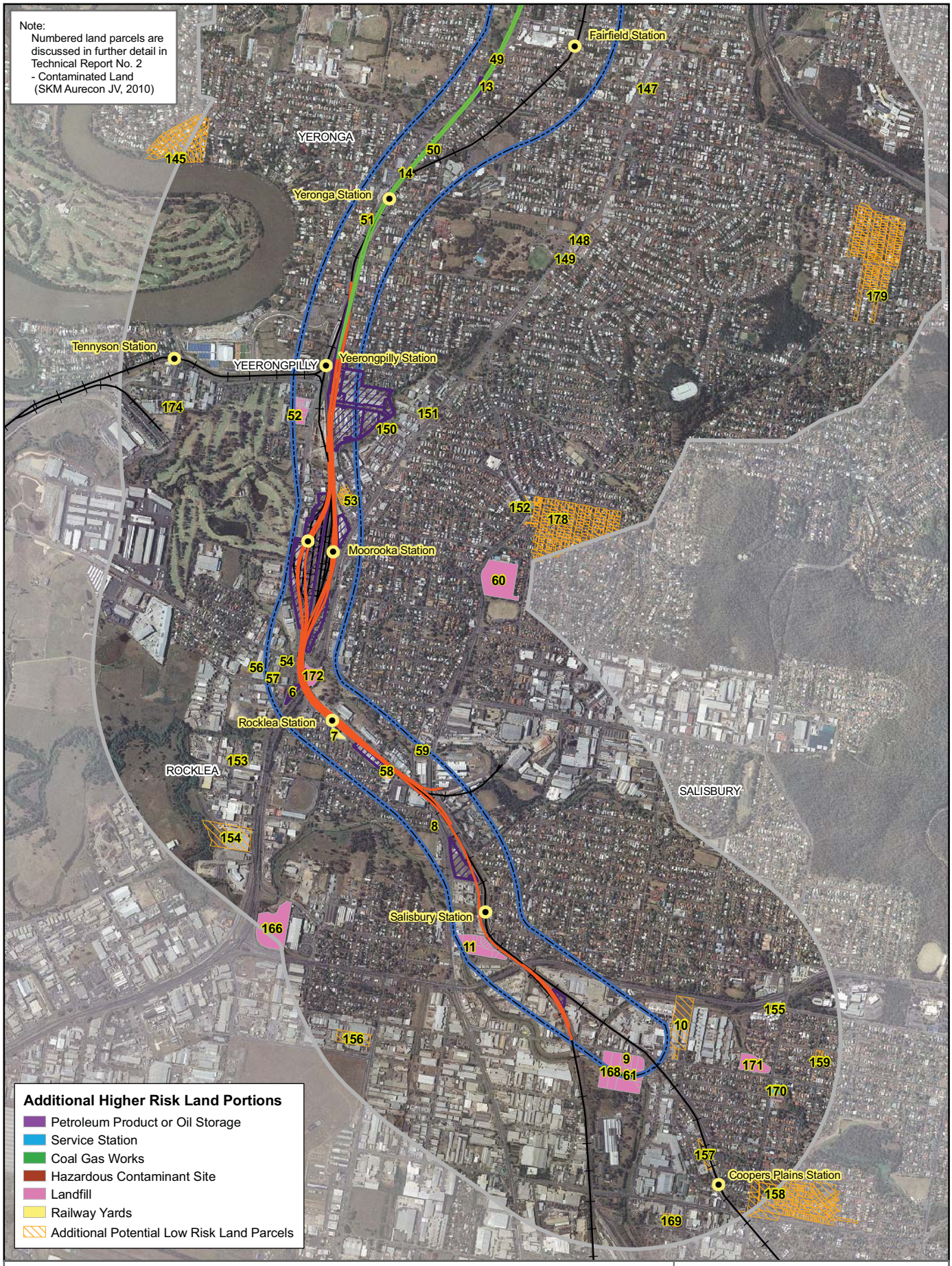

LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Underground Station

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-7

Additional Potentially Contaminated Properties Yeronga to Salisbury (Southern Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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8.2.3 Brisbane City Council flammable and combustible liquids licenses

BCC maintains a register of flammable and combustible liquids (F/C) stored on properties having current and/or cancelled licenses under the Dangerous Goods Safety Management Regulation 2001. DERM make use of this register to identify F/C licences that exceed threshold limits set by DERM that require listing on the EMR as a notifiable activity. Examples of notifiable activities that may also require an F/C licence include: chemical storage, petroleum product or oil storage; and service stations. If a property with an F/C licence does not meet or exceed the threshold limits set by DERM (for notifiable activities), it is not listed on the EMR.

Underground storage tanks are generally considered to pose a higher risk of land contamination given that leaks from these tanks may not be readily noticeable. Conversely, sites with above ground storage tanks are generally considered to pose a lower risk to land contamination.

In the study area, 234 land parcels have been identified as holding F/C licenses. The locations of these are shown in **Figure 8-8**, **Figure 8-9** and **Figure 8-10**. Further information is also provided in *Technical Report 2 – Land Contamination*.

Of these land parcels, 124 parcels are not listed on the EMR. These properties constitute additional potentially contaminated land parcels. A breakdown of these properties is provided in **Table 8-3**.

Table 8-3 Additional potentially contaminated land parcels licensed for F/C storage not listed on EMR

Land use	Land parcels within the study corridor	Land parcels outside of the study corridor but within the study area
Higher risk F/C storage ie underground storage	6	35
Lower risk F/C storage ie above ground storage	52	31
Total	**58**	**66**

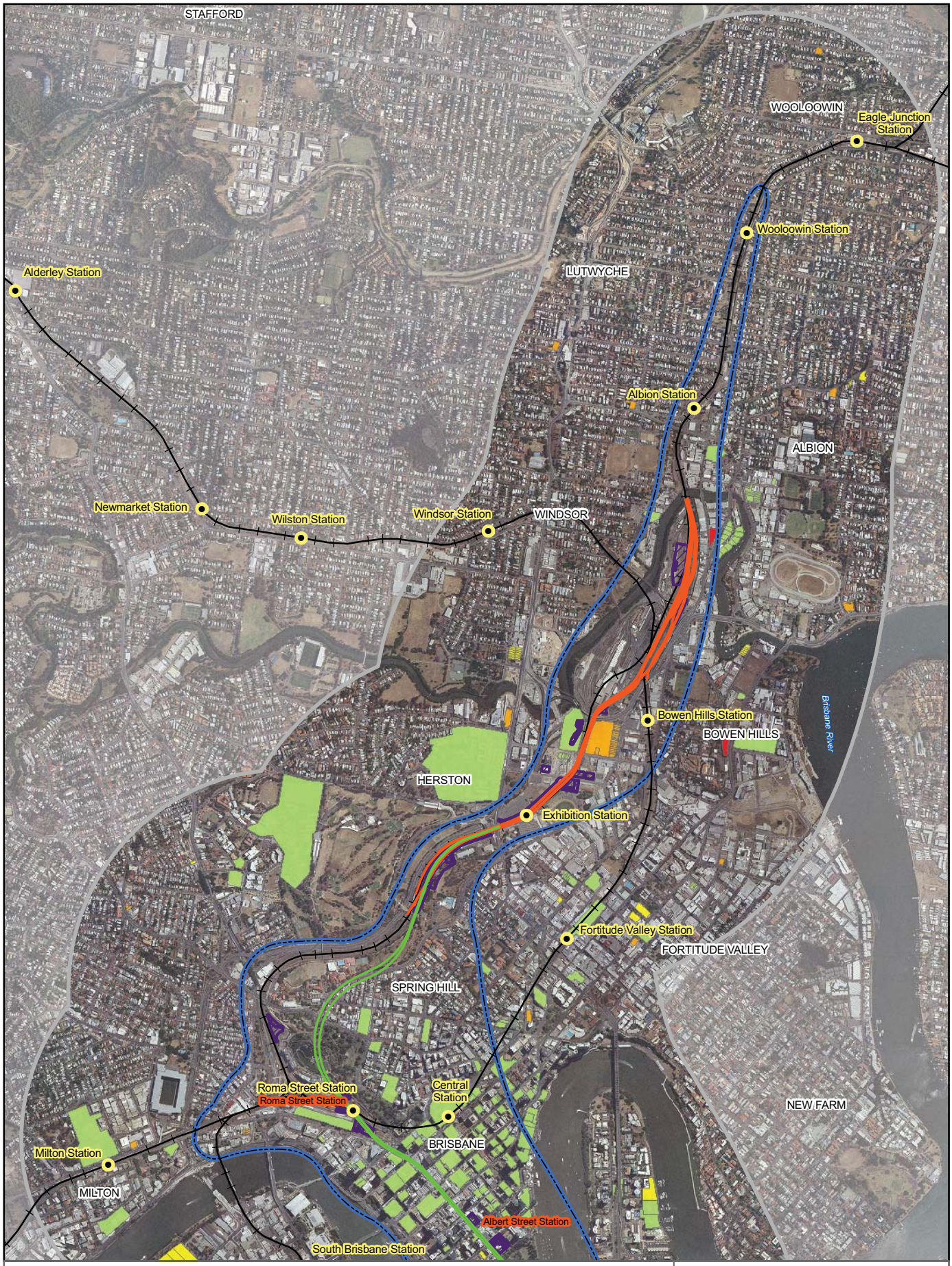
8.2.4 Potential for unexploded ordnance

Sites which are known or suspected of having been used for military activity are categorised according to the assessed potential for UXO. The Archerfield Airport, located in the study area, is listed on the Defence database as ‘other’. This means that UXO may still sometimes be found on this site. No other potential for UXO was identified in the study area.

8.2.5 Queensland Rail contaminated land review

While not all land within the rail corridor is listed on the EMR, Queensland Rail and DERM acknowledge that past practices may have resulted in soil and/or groundwater contamination within rail land. Potential contaminating activities that may be associated with rail land include:

- disposal of ash material
- stockpiling of fill and ballast
- maintenance activities and the use of chemicals (including solvents)
- leaks and spills from freight and locomotive machinery
- use of herbicides/pesticides
- petroleum product and oil storage.



LEGEND

- Study Corridor
- Study Area
- Station
- Track

Alignment

- Above Ground
- Underground
- Worksites

Flammable/Combustible Goods

- Low Risk (Generator or AST)
- UST < 50,000 L
- UST 50,000 to 200,000 L
- UST > 200,000 L

0 0.25 0.5 0.75 1 km

1:30,000 at A4

N

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-8

Flammable/Combustible Liquids Licenses Wooloowin to Bowen Hills (Northern Section)

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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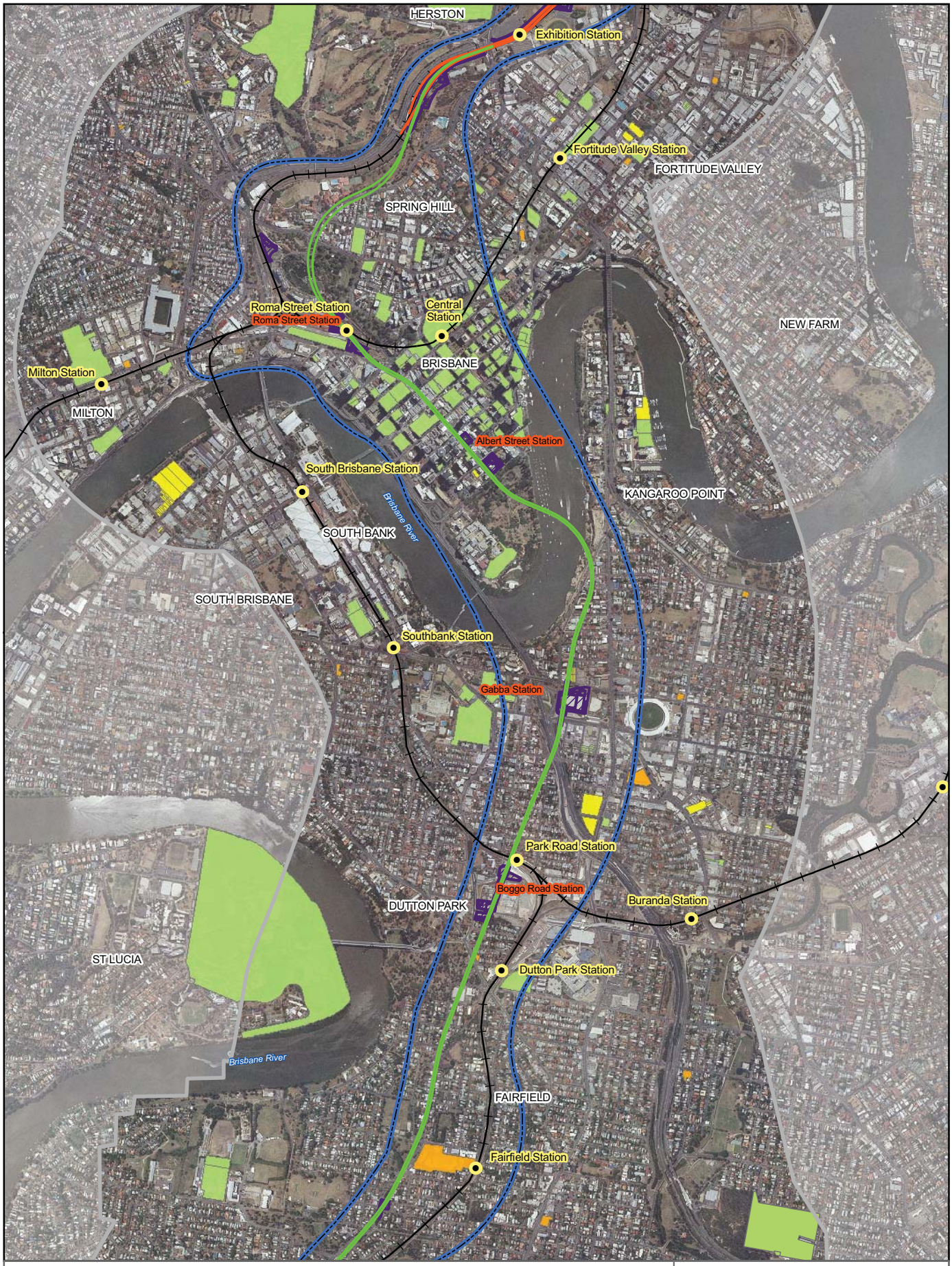

LEGEND

- Study Corridor
- Study Area
- Station
- Track

Alignment

- Above Ground
- Underground
- Worksites

Flammable/Combustible Goods

- Low Risk (Generator or AST)
- UST < 50,000 L
- UST 50,000 to 200,000 L
- UST > 200,000 L

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-9

Flammable/Combustible Liquids Licenses Spring Hill to Fairfield (Central Section)

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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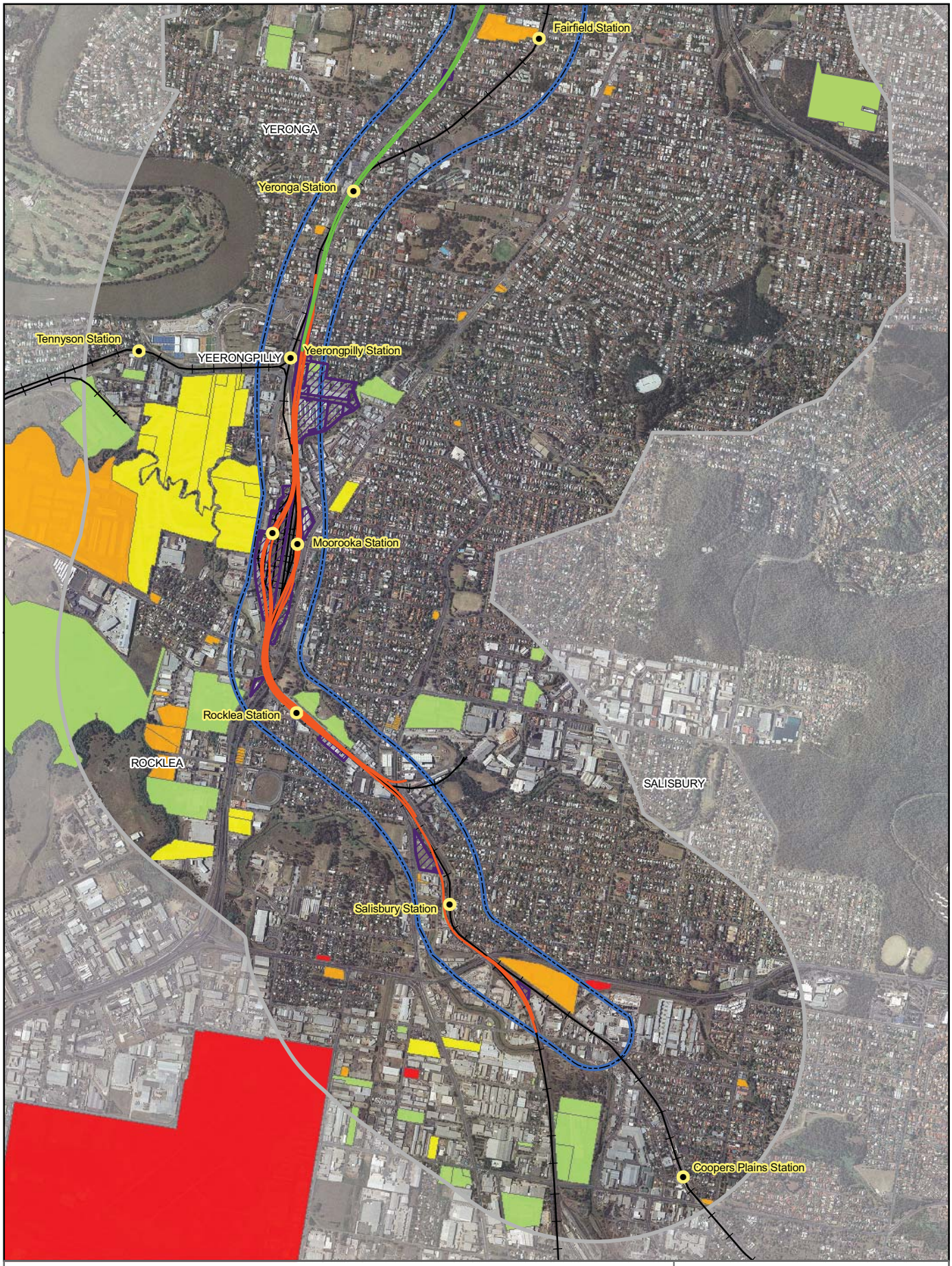

LEGEND

- Study Corridor
- Study Area
- Station
- Track

Alignment

- Above Ground
- Underground
- Worksites

Flammable/Combustible Goods

- Low Risk (Generator or AST)
- UST < 50,000 L
- UST 50,000 to 200,000 L
- UST > 200,000 L

0 0.25 0.5 0.75 1 km

1:30,000 at A4

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CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-10

Flammable/Combustible Liquids Licenses Yeronga to Salisbury (Southern Section)

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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The study corridor generally follows the existing rail corridors managed by Queensland Rail north of Spring Hill and south of Boggo Road, and also includes the Roma Street Station. Major current Queensland Rail assets within the study area include:

- Mayne Rail Yard at Bowen Hills, which accommodates the majority of maintenance works and off-site storage of the Queensland Rail fleet. The yard has generally held a similar footprint since 1946 and has been progressively redeveloped over time to cater for additional rail lines and facility upgrades. Rail lines in the northern section of the yard were removed prior to 2007 with current aerial photography showing this section of the yard as vacant.
- Clapham Rail Yard at Fairfield Road, which has occupied the same general layout since it was developed prior to 1946
- Exhibition Loop, which was developed prior to 1946, and currently includes maintenance sheds located along a portion of the loop adjacent to Victoria Park, which are used for cleaning and general carriage maintenance
- Park Road Junction, which connects the Cleveland line to the South Coast line. The junction was developed prior to 1946, with the South Coast line reconfigured to a more central alignment in the 1990s to allow the development of commercial land east of the rail corridor. A former freight line servicing the Kangaroo Point wharves was also routed through the northern part of the junction.
- Yeerongpilly and Tennyson Junction, which was developed prior to 1946. A small outpost and bypass rail line was developed immediately south of the junction prior to 1946, with several additional buildings progressively developed adjacent to the outpost. The area was cleared of structures and rail lines prior to 2007.
- south of Salisbury Station, a secondary line splits from the main South Coast line to service commercial and industrial properties in the area. The line leads into a freight yard before splitting further and terminating at several large commercial/industrial buildings. Rail infrastructure for this line was developed prior to 1983.

The study corridor also includes a number of sites formerly used as rail infrastructure. These areas were identified from the review of historical aerial photography and include:

- Roma Street Parkland, which formerly contained the Roma Street goods and freight yards. The yards were decommissioned in 1991 and redeveloped as parkland in 2000 (Blake 2004)
- former freight rail line, which extended north from Park Road Junction, following an alignment west of Ipswich Road, crossing Ipswich Road at Hawthorne Street and continuing through to Logan Road, before looping west toward a former shunting yard on the Goprint site. The rail line then headed north toward the former wharves at South Brisbane and Kangaroo Point. Use of this rail line appears to have been discontinued in the early 1970s, coinciding with the development of the Pacific Motorway.
- former rail yards at Woolloongabba on the site accommodating Goprint, the DERM Land Centre and the dental hospital. The yards were developed prior to 1946 and were decommissioned prior to 1983. The Goprint, DERM Land Centre, and the dental hospital buildings were developed prior to 1994.
- former rail yards at Woolloongabba, west of the Princess Alexandra Hospital. The purpose of the yards cannot be determined, but may have been used for shunting and freight storage. The yards were redeveloped prior to 1994 and are currently used for rail maintenance.
- small rail terminus located north of Albion Station, which has progressively been reconfigured since 1946. Prior to 2001, the rail line through the centre of the site appears to have been removed with the land currently managed by Queensland Rail as a maintenance yard.

- former freight line servicing the former Newstead Gasworks and wharves, extending from the current Fortitude Valley/Bowen Hills line and following the suburb boundary to Breakfast Creek Road, before entering the former Newstead Gasworks where it split to two separate lines servicing the northern and southern Newstead wharves. The northern line terminated at Newstead Avenue. Aerial photography shows that by 1994, the freight line appeared disused and the wharves serviced by the northern and southern terminus were under redevelopment. By 2007, several buildings had been constructed directly over the former line and the former gasworks infrastructure had been removed.

In relation to the management of Queensland Rail land in the study area, anecdotal information provided by Queensland Rail suggests that typically, Queensland Rail corridor land is listed on the EMR for hazardous contaminant for arsenic residue from herbicide/pesticide spraying during the 1940s and 1950s. Limited soil sampling and testing has been conducted within metropolitan corridors. However, it is expected that levels of arsenic are low as procedures were in place to prevent or limit the herbicide treatment in sensitive areas near residential buildings, creeks, etc. The application of herbicide was limited by equipment, with a thin strip spray directed on the track. Residues of arsenic still exist in track formation soils as arsenates bind well to soil particles. There has been no indication of arsenic contamination effects on groundwater in any Queensland Rail land (SKM-Connell Wagner JV 2008b).

Rail stations within the study area service the passenger network and typically do not have contamination issues other than minor arsenic contamination in soil along rail tracks (SKM-Connell Wagner JV 2008b). There is also the potential for oils and other contaminants to be discharged to the track with incidental leakage of fluids from carriage mechanics or freight.

The following information was also provided in relation to specific sites within the study area:

- Mayne Rail Yard (Lot 2 on SP116599) has been used by Queensland Rail for over 100 years. Hydrocarbon contamination exists on the site, with a layer of ‘free phase’ hydrocarbon product floating on top of the shallow groundwater system identified during site excavation activities in the late 1990s and early 2000s (SKM-Connell Wagner JV 2006b; SKM-Connell Wagner JV 2008b). The source of the contamination was a leaking diesel reticulation line associated with two above ground storage tanks (AST) and related to above ground handling. The ASTs were removed during construction of the Inner City Bypass and replaced with a smaller AST located toward the centre of the southern yard.
- a contamination risk assessment was conducted at Mayne Rail Yard in the mid-1990s and residual contamination was being managed at the site (SKM-Connell Wagner JV 2006b; SKM-Connell Wagner JV 2008b). ‘Free phase’ hydrocarbon products floating on top of the groundwater system was confirmed in May 2010. A monitoring and remediation program is currently being undertaken at the yard which involves pumping the ‘free phase’ hydrocarbons from the groundwater for treatment at the site wastewater treatment plant. On-going water quality monitoring is also being undertaken in Breakfast Creek to monitor compliance with the site’s environmental licence (GeoEnvironmental Consultants 2010).
- two plumes were present onsite during the April 2010 groundwater monitoring at Mayne Rail Yard undertaken by GeoEnvironmental Consultants (2010); the western plume exceeding 75 m in breadth, and the eastern plume exceeding 25 m in breadth. The thickness of “free phase” hydrocarbons within monitoring wells intersecting the two plumes did not exceed 5 mm at any location (GeoEnvironmental Consultants 2010).
- land south of Mayne Rail Yard (Lot 14 on SP158920) has the potential for diesel fuel contamination in groundwater due to its proximity to the Mayne Rail Yard (SKM-Connell Wagner JV 2006b; SKM-Connell Wagner JV 2008b)
- an SMP applies to the former rail corridor at Breakfast Creek in Newstead, adjacent to the former Gas Works.

8.2.6 Landfills

There are no operating landfills within the study area. However, there are 50 land parcels within the study area which have been listed on the EMR for the notifiable activity of 'landfill'. These sites have generally been redeveloped as parks and open space areas, although one stretch of rail line associated with Salisbury Station is listed as a landfill. Twenty-one additional properties have also been identified through the review of aerial photography which may have previously been used for land filling activities.

BCC maintains records of known BCC landfill sites. This information was not provided as part of these investigations, although information from BCC records obtained for previous projects in the study area provide the following information:

- Lot 2 on RP114914 and Lot 20 on RP56334 (61 Cartwright Street and 46/4 Bryden Street Windsor), included an operational landfill between September 1952 and June 1953. The landfill contains refuse which is approximately two metres deep (SKM-Connell Wagner JV 2006b).
- Lot 1 on RP19518 (2A Jimbour Street, Wooloowin), included a sanitary landfill from March 1958 to May 1958. The depth of waste is approximately 2 m. BCC does not monitor this landfill or surrounding water courses (SKM-Connell Wagner JV 2006b).
- 28 individual land parcels at Butterfield Street and Ramsey Park, Herston were listed on the EMR in 2006. This area operated as a landfill between the 1930s and 1940s, with waste disposed predominately comprising domestic refuse and ash. The depth of waste is approximately 2.5 m (SKM-Connell Wagner JV 2008b).
- Lot 556 on SP133445 (137 Kelvin Grove Road, Kelvin Grove) was listed on the EMR in 1994. No details about the type or duration of filling are available (SKM-Connell Wagner JV 2008b).

8.3 Potential impacts and mitigation

This section provides an assessment of the potential impacts of contaminated land on the construction and operation of the Project, including:

- disturbance of potentially contaminated soils and groundwater
- contamination from adjacent potentially contaminated sites
- disturbance of asbestos
- unforeseen contamination, including potential for the Project to cause contamination during construction and operation.

For the purposes of this assessment, a land parcel which is listed on the EMR or which has been identified as an additional potentially contaminated land parcel is referred to as a "potentially contaminated site".

Details of potential acid generation from the disturbance of acid sulphate soils are presented in **Chapter 7 Topography, Geology, Geomorphology and Soils**.

Further information on contaminated land impacts is provided in *Technical Report No.2 – Contaminated Land*.

8.3.1 Disturbance of potentially contaminated soils

This section provides an assessment of the potential for the Project to disturb potentially contaminated soils and identifies mitigation measures to manage potential impacts.

Construction activities located at the surface or which involve excavation of soil have the potential to intercept contaminated soil, where works occur on land identified as a potentially contaminated site or, to a lesser extent, on land located adjacent to a potentially contaminated site.

The disturbance of potentially contaminated soil could occur at 74 potentially contaminated sites across the study area, based on a direct surface footprint. These are summarised in **Table 8-4** and are shown in **Figure 8-11**, **Figure 8-12** and **Figure 8-13**.

Table 8-4 Potentially contaminated sites directly impacted by the Project

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
North (Wooloowin to Bowen Hills)					
Existing northern rail corridor	Lot 22 on plan SP122245	C1	Hazardous contaminant	The notifiable activity for which this land parcel is listed on the EMR indicates contamination is present. The nature of contamination has not been established in the context of this EIS.	Surface works that disturb the ground to install temporary crossovers for track diversion, if required.
Mayne Rail Yard	Lot 2 on plan SP158926	C2	Petroleum product or oil storage/rail yards	Groundwater at the Mayne Rail Yard is known to be contaminated from a historic diesel release onsite and is currently undergoing remediation and monitoring. Further investigation and mitigation has been proposed as part of the detailed design phase of work (refer to Section 8.3.1 – mitigation measures).	Reconfiguration and addition to rail lines through Mayne Rail Yard, as well as piling for viaduct piers. Parts of the yard would also be used for construction laydown and temporary storage.
	Lot 1 on plan RP892797	C3	Rail yards		
	Lot 34 on plan SP158925	C4	Rail yards		
	Lot 13 on plan SP158918	C5	Petroleum product or oil storage	F/C liquids license records indicate the land parcel has a current license for the above ground storage of between 50,000 and 200,000 litres of F/C liquids.	Construction of a new electrical substation is required to support infrastructure upgrades.

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
Mayne feeder station	Lot 14 on plan SP158920	C6	Petroleum product or oil storage	F/C liquids license records indicate the land parcel has a current license for the above ground storage of between 50,000 and 200,000 litres of F/C liquids.	Construction of a new Mayne feeder station.
O'Connell Terrace worksite	Lot 2 on plan SP144596	C7	Petroleum product or oil storage		Use of the site as a construction/laydown yard.
Existing northern rail corridor, Ekka Station	Lot 455 on plan SL3473	C8	Hazardous contaminant	The notifiable activity for which these land parcels is listed on the EMR indicates contamination is present. The nature of contamination has not been established in the context of this EIS. Further investigation and mitigation has been proposed as part of the detailed design phase of works.	Duplication of the surface rail tracks within the existing Queensland Rail corridor and construction of the Ekka Station.
	Lot 11 on plan SP156029	C9			
	Lot 454 on plan SP122217	C10			
	Lot 3 on plan RP113229	C11			
	Lot 474 on plan SL12086	C12			
	Lot 481 on plan SP196765	C13			
	Lot 3 on plan SP190738	C14	Petroleum product or oil storage		
Existing northern rail corridor, northern tunnel portal	Lot 496 on plan SL12309	C15	Defence establishment or training area	The land parcels are identified as a former RAAF Store.	Excavation of part of these properties may be required for the northern portal.
	Lot 691 on plan SL12309	C16			
	Lot 32 on plan SP172136	C17			
	Lot 34 on plan SP172136	C18			
	Lot 32 on plan SP122215	C19			

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
Central (Spring Hill to Fairfield)					
Roma Street Station	Lot 1 on plan SP207220	C20	Petroleum product or oil storage/rail yards	The Roma Street Transit Centre is currently listed on the EMR for 'petroleum product or oil storage'. Lot 1 on SP207220 includes a license for between 50,000 litres and 200,000 litres of on-site above ground F/C storage. The Roma Street Parkland occupies the site of the former Roma Street rail yards. The rail yard was remediated during redevelopment although the land parcels remain on the EMR. Further investigation is required to determine whether contamination remains on the site.	Construction and operation of the underground Roma Street Station, including excavation of shafts and the underground station. Portions of Lot 60 on plan SP207215 have been identified as a satellite worksite (ie for storage, laydown, worker parking).
	Lot 35 on plan SP207219	C21	Rail yards		
	Lot 60 on plan SP207215	C22			
	Lot 37 on plan SP169852	C23			
Lower Albert Street Station, including site accommodating the Royal on the Park	Lot 1 on plan RP110657	C24	Petroleum product or oil storage	The site of the Royal on the Park is listed on the EMR for 'petroleum product or oil storage'. There are no current F/C licenses for the land parcels.	Construction and operation of the underground station at lower Albert Street, including excavation of shafts and the underground station. Demolition of the Royal on the Park for construction works.
	Lot 1 on plan RP1068	C25			
	Lot 2 on plan RP1068	C26			
	Lot 3 on plan RP1068	C27			
	Lot 2 on plan RP111828	C28			
	Lot 22 on plan B118243	C29			
	Lot 23 on plan B118243	C30			
	Lot 36 on plan B118243	C31			
	Lot 37 on plan B118243	C32			

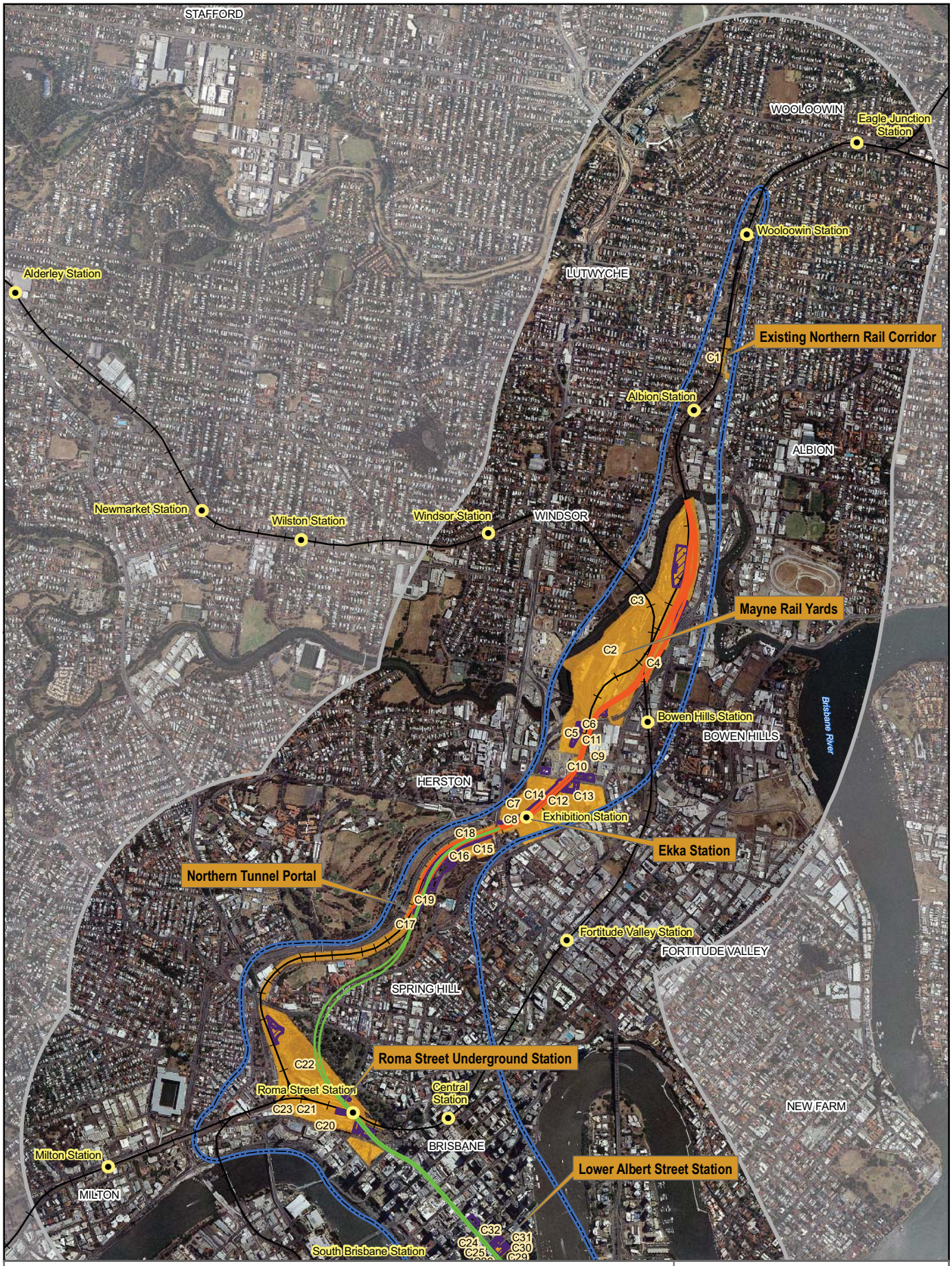
Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
The Gabba Station, including site accommodating Goprint and the DERM Land Centre.	Lot 63 on plan SP184386	C33	Rail yards	The site of the current Goprint building and DERM "Land Centre" was formerly a rail yard and remains on the EMR. The notifiable activity for which this land parcel is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the context of this EIS. Further investigation and mitigation has been proposed as part of the detailed design phase of works (refer to Section 8.3.1 – mitigation measures).	Construction and operation of the Gabba Station, including excavation of the station and establishment of worksite.
	Lot 1291 on plan CP899829	C34	Rail yards/hazardous contaminant		
	Lot 1292 on plan CP899830	C35			
	Lot 11 on plan RP11195	C36	Petroleum product or oil storage		
Fairfield	Lot 1 on plan RP230277	C37	Landfill	BCC records indicate that landfill operations occurred on this land parcel.	Work may be required on land immediately adjacent to this site for the establishment of an access road to facilitate access to the ventilation and emergency access building worksite.

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
South (Yeronga to Salisbury)					
Southern rail corridor, southern tunnel portal	Lot 550 on plan SP117131	C38	Hazardous contaminant	The notifiable activity for which this land parcel is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the context of this EIS. Further investigation and mitigation has been proposed as part of the detailed design phase of works (refer to Section 8.3.1 – mitigation measures).	The tunnel portal skirts along Queensland Rail properties listed on the EMR and would require removal of some material from the Queensland Rail corridor. Extension of the existing footbridge to the realigned Wilkie Street and construction of new Yeerongpilly Station.
Site of the Yeerongpilly Transit Oriented Development	Lot 566 on plan SP214202	C39	Coal fired power station/petroleum product or oil storage		Minor surface works would occur to reconstruct footpaths impacted as part of the pedestrian bridge works.
Existing southern rail corridor	Lot 1 on plan RP37619	C40	Petroleum product or oil storage	There are no current F/C licenses for any of these land parcels.	Properties fall within the proposed rail alignment.
	Lot 37 on plan SP211345	C41			
	Lot 38 on plan SP211345	C42			
Existing southern rail corridor	Lot 70 on plan RP37616	C43	Wood treatment or preservation		Properties fall within the proposed rail alignment.
	Lot 71 on plan RP37616	C44			
	Lot 72 on plan RP37616	C45			
	Lot 73 on plan RP37616	C46			
	Lot 74 on plan RP37616	C47			

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
Existing southern rail corridor	Lot 21 on plan SP117132	C48	Rail yards		Duplication of surface rail track, including construction of an additional three track bridge structure over Moolabin Creek.
Adjacent to existing southern rail corridor	Lot 10 on plan SP155727	C49	Petroleum product or oil storage		Property falls within the proposed rail alignment.
Existing southern rail corridor, Clapham Rail Yard	Lot 101 on plan SP105842	C50	Rail yards	There are no current F/C licenses held for Lot 2 on plan RP107515.	Duplication of surface rail track, and use of the north-western portion of Clapham Rail Yard worksite and laydown area.
	Lot 6 on plan RP94512	C51			
	Lot 3 on plan RP94511	C52			
	Lot 4 on plan RP94511	C53			
	Lot 5 on plan RP94511	C54			
	Lot 3 on plan RP107515	C55			
	Lot 2 on plan RP107515	C56	Petroleum product or oil storage; rail yards		
Existing southern rail corridor, Moorooka and Rocklea Stations	Lot 10 on plan SP122190	C57	Hazardous contaminant	The notifiable activity for which this land parcel is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the context of this EIS. Further investigation and mitigation has been proposed as part of the detailed design phase of works (refer to Section 8.3.1 – mitigation measures).	Duplication of surface rail track, including construction of an additional three track bridge structure over Moolabin Creek and two track bridge structure over Muriel Avenue. Upgrade of Moorooka and Rocklea Stations. Areas north and south of Rocklea Station identified for construction laydown areas.
	Lot 102 on plan SP105842	C58			

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
Existing southern rail corridor	Lot 12 on plan SP122191	C59	Landfill	Land parcels within the existing Queensland Rail corridor are listed on the EMR.	Extension of the existing footbridge at Salisbury Station. Western portions of this site have been identified for construction laydown areas.
Rocklea, Ipswich Motorway	Lot 907 on plan SP149004	C60	Rail yard; engine reconditioning works; service station	The notifiable activity for which this land parcel is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the context of this EIS. Further investigation and mitigation has been proposed as part of the detailed design phase of work (refer to Section 8.3.1 – mitigation measures).	Realignment of the on-ramp to the Ipswich Motorway from Fairfield Road, including tunnelling under the existing motorway.
Yeerongpilly	Lot 1 on plan RP179869	C61	The property is not currently listed on the EMR.	The land parcel currently holds a F/C license for the storage for less than 10,000 litres of above ground storage.	Yeerongpilly worksite.
	Lot 1 on plan RP179845	C62	Petroleum product or oil storage	There are no current F/C licenses held for these land parcels.	Yeerongpilly worksite. Excavation of soil is not anticipated on this site.
	Lot 1 on plan RP217835	C63			
	Lot 1 on plan RP115818	C64	Foundry operations; petroleum product or oil storage		

Location	Lot and plan	Ref no. on Figure 8-11, Figure 8-12 and Figure 8-13	Notifiable activity	Comment on likely contamination	Construction activity likely to impact on contaminated land
Salisbury	Lot 5 on plan RP105182	C65	Landfill; scrap yard	These land parcels are identified as having previously contained a scrap yard or land fill.	Materials storage area.
	Lot 1 on plan RP112751	C66			
	Lot 2 on plan RP112751	C67			
	Lot 10 on plan RP75020	C68			
	Lot 11 on plan RP75020	C69			
	Lot 12 on plan RP75020	C70			
	Lot 13 on plan RP75020	C71			
	Lot 14 on plan RP75020	C72			
	Lot 4 on plan RP105182	C73			
	Lot A on plan RP177953	C74			



LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Potentially Contaminated Properties intersected by Surface Works

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-11

Potentially Contaminated Land intersected by Surface Works - Wooloowin to Bowen Hills (Northern Section)

0 0.25 0.5 0.75 1 km

N

1:30,000 at A4

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Potentially Contaminated Properties intersected by Surface Works

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-12

Potentially Contaminated Land intersected by Surface Works - Spring Hill to Fairfield (Central Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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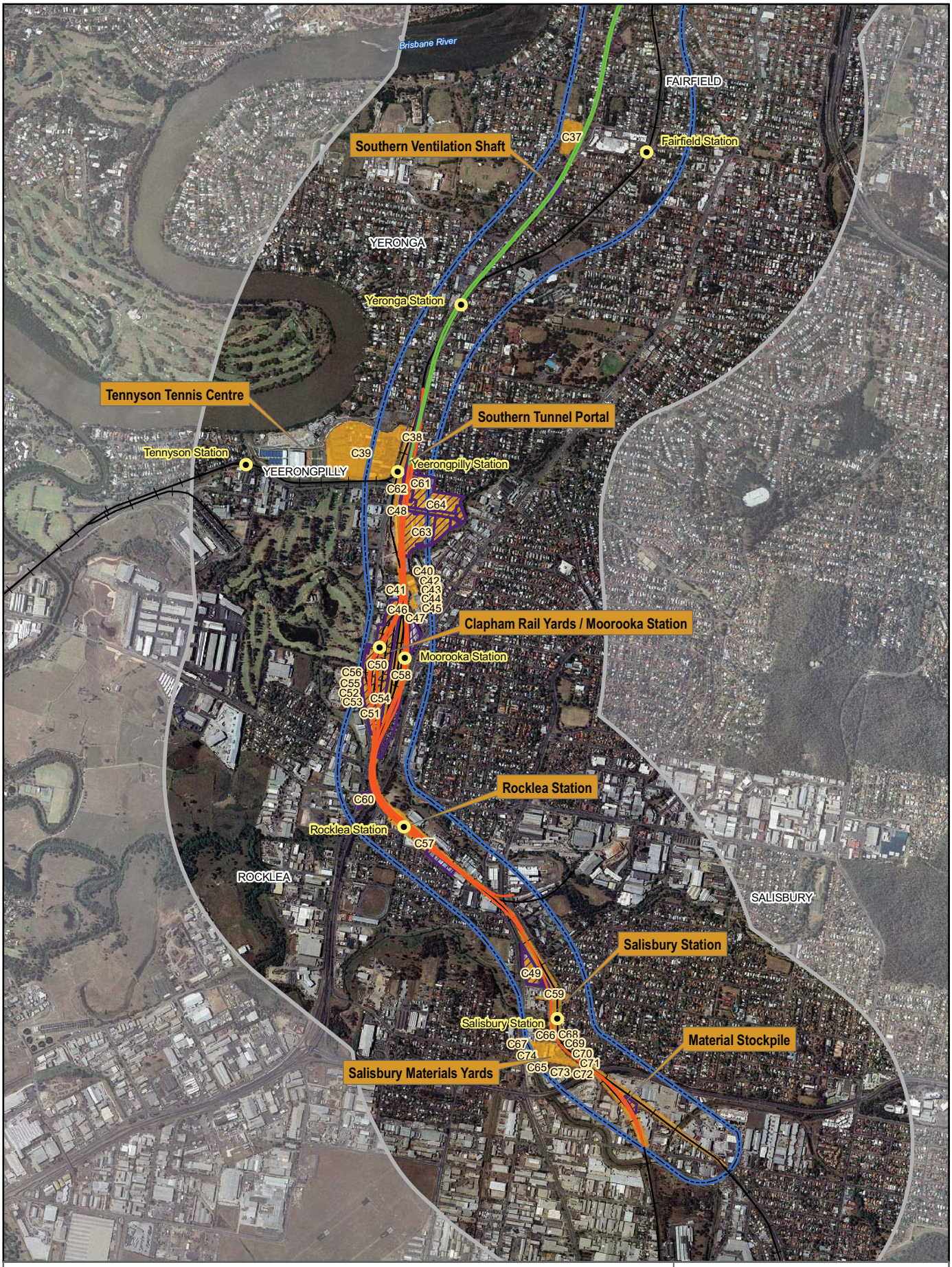

LEGEND

- Study Corridor
- Study Area
- Station
- Track
- Potentially Contaminated Properties intersected by Surface Works

Alignment

- Above Ground
- Underground
- Worksites

CROSS RIVER RAIL
ENVIRONMENTAL IMPACT STATEMENT

Figure 8-13

Potentially Contaminated Land intersected by Surface Works - Yeronga to Salisbury (Southern Section)

0 0.25 0.5 0.75 1 km

1:30,000 at A4

N

CrossRiverRail

SKM aurecon CRR JOINT VENTURE

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Worksites which are not located within land parcels on the EMR and are therefore unlikely to disturb potentially contaminated soils are described in **Table 8-5**.

Table 8-5 Project worksites not located within land parcels on EMR

Worksite Name	Purpose	Location
O'Connell Terrace	Support worksites for the regrading of O'Connell Terrace, including road over rail bridge.	Three worksites would be located on O'Connell Terrace, between Sneyd Street and the Inner City Bypass (ICB) and either side of Tufton Street.
Albert Street – north	Worksite for the construction of the northern station entrance and associated plant.	North east corner of Albert Street and Mary Street.
Boggo Road Station	Worksite for the construction of the cut and cover station box, entrance shafts and associated plant.	Adjacent to Annerley Road at Boggo Road Urban Village, either side of Peter Doherty Street. A second support site is located between Boggo Road and the Boggo Road busway station.
Ventilation and emergency access building	Construction of ventilation shaft and emergency access building.	On the median between Fairfield Road and Railway Road, south of Bledisloe Street and on Energex land east of Railway Road, between Bledisloe Street and Sunbeam Street.
Moorooka	Worksite and stockpiling of materials for the construction of new viaduct.	Two worksites would be located in this area: 1. residential land located between Ipswich Road and the existing rail corridor 2. industrial land bounded by Unwin Street, Ipswich Road and the rail corridor, adjacent to Moorooka Station.
Rocklea	Materials laydown area for construction of new surface tracks.	On industrial land between Annie Street and the rail corridor, east of Rocklea Station.

Mitigation measures

The significance of contamination at the 74 potentially contaminated sites directly affected by the Project and the level of impact these sites may have on the Project due to the disturbance of contaminated soil and/or groundwater is unknown. To accurately assess the impacts of each potentially contaminated site, detailed investigations would be required, including consultation with the land owners, BCC and/or DERM, to determine the availability of contaminated site information.

Where appropriate information is not available, further investigation would be required in accordance with the *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland, 1998* and NEPM (*Assessment of Site Contamination 1999*) (including variations to the NEPM approved by DERM). These investigations would be undertaken by a person whose qualifications and experience complies with the requirements of Section 381 of the EP Act. A suitably qualified person would also supervise the activities. A detailed mitigation plan for the construction and operation phases of the Project would be developed following the acquisition of appropriate data. A draft outline of this plan is provided in **Chapter 24 Draft Outline EMP**.

In accordance with the EP Act, a disposal permit would also be required for the removal and/or disposal of contaminated soil from land which is recorded on the EMR or CLR to an off-site location.

Construction activities relating to the disturbance, excavation, removal and/or disposal of contaminated soil and/or groundwater would ensure that environmental harm is prevented. To achieve this, specific mitigation measures are to be developed and implemented prior to the commencement of site activities and would consider as a minimum:

- provision of appropriate barriers to prevent public access to construction areas
- management and prevention of dust emissions
- appropriate erosion and sediment controls and staging of site activities to minimise the extent of disturbed areas, and hence to minimise the potential run-off of contaminated soils
- measures to minimise the exposure of humans and the environment to potentially contaminated soils during excavation activities
- controls for material haulage, such as covering loads or wetting material to reduce airborne dust emissions
- documentation of all contaminated material during transport operations (including the descriptions of processes, personnel and organisations involved in the removal, transportation and placement of contaminated material)
- monitoring of contaminated material movement and disposal
- appropriate workplace health and safety procedures, including use of personal protective equipment (PPE) and hygiene controls, and documentation of inspections and workplace health and safety compliance throughout construction and operation.

In addition, the following mitigation measures are relevant to specific sites within the study area, and may require engineered management strategies as part of the detailed design:

- at Mayne Rail Yard, further investigations would be undertaken to determine the position of groundwater remediation works and the impact of construction activities on these works. Project works in Mayne Rail Yard would minimise impacts on these remediation works
- at Salisbury (Lot 12 on plan SP122191), where Project works disturb any liners or capping systems containing landfill refuse (if present), mitigation measures would ensure that the integrity of these systems are maintained
- at Moorooka and Rocklea Stations (Lot 10 on plan SP122190, Lot 102 on plan SP105842), further investigations would be undertaken to determine the nature of hazardous contaminants
- at the existing northern rail corridor (Lot 22 on plan SP122245), further investigations would be undertaken to determine the nature of hazardous contaminants
- at the southern tunnel portal (Lot 550 on plan SP117131), further investigations would be undertaken to determine the nature of hazardous contaminants
- at the Gabba Station (Lot 1291 on plan CP899829), further investigations would be undertaken to determine the nature of hazardous contaminants.

Consideration would also be given to the management of contaminated land during the operation of the Project. Where contaminated material remains on-site, current practices to prevent contact with the general public and the environment is to provide adequate protection or containment capping (ie to break pollutant linkage pathways). Where practicable, contaminated soils would be retained and managed on-site to minimise off-site disposal requirements. This strategy may be incorporated in areas of the rail corridor where materials could potentially be preferentially reused on site, as opposed to importing fill materials from other sources.

8.3.2 Contamination from adjacent potentially contaminated sites

A potential impact of the Project may occur through the migration of contamination via groundwater and/or soil gas from potentially contaminated sites located adjacent to the construction footprint within the study area and this is summarised in **Table 8-6**.

Those sites considered to be of higher risk to the Project include potentially contaminated sites where migration of contamination via groundwater and/or soil gas is considered more likely. Lower risk sites include those sites where the potential for migration is considered less likely.

Table 8-6 Risk assessment of potentially contaminated properties adjacent to the construction footprint

Lot and plan	Description of adjacent Project works	Potential for contaminant presence
Potentially contaminated land parcels outside of the construction footprint with a higher risk to the Project		
Lots 41-43 on plan SP145686 Lot 17 on plan RP903101 Lot 490 on plan SL6858 Lot 18 on plan SP201216	Adjacent to Roma Street Station development	Notifiable activity 'rail yards', higher risk of land contamination.
Lot 12 on plan SP147396 Lot 13 on plan SP168000	Close proximity to Roma Street Station development	Notifiable activity 'landfill', higher risk of land contamination. A review of the BCC landfill records indicates that this property was not a municipal landfill.
Lot 61 on plan SP188566 Lot 60 on plan SP184385	Adjacent to the Gabba Station development	Notifiable activity 'rail yards', higher risk of land contamination.
Lot 5 on plan RP212124	Adjacent to the ventilation and emergency access building	Notifiable activity 'petroleum product or oil storage; engine reconditioning works' higher risk of land contamination.
Lot 1 on plan RP59681 Lot 2 on plan RP48402 Lot 55 on plan RP214173 Lot 23 on plan RP126884	Adjacent to track duplication works north of Mayne Rail Yard	The notifiable activity of 'hazardous contaminants' for which this property is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the scope of this EIS, and would be investigated further as part of the detailed design works.
Lot 13 on plan RP158918 Lot 14 on plan SP158920	Adjacent to works at Mayne Rail Yard	Notifiable activity 'petroleum product or oil storage', higher risk of land contamination.
Lot 74 on plan RP9371 Lot 75 on plan RP9371 Lot 2 on plan RP55530 Lots 1, 79 on plan RP8963 Lot 68 on plan RP54391 Lot 1 on plan RP152614	Adjacent to works at Mayne Rail Yard	Notifiable activity 'scrap yards', higher risk of land contamination.
Lot 88 on plan RP856195 Lots 1, 2 on plan RP91289 Lot 204 on plan RP46694	Adjacent to works at Mayne Rail Yard	The notifiable activity of 'hazardous contaminants' for which this property is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the scope of this EIS, and would be investigated further as part of the detailed design works.

Lot and plan	Description of adjacent Project works	Potential for contaminant presence
Lots 1, 2 on plan SP129361	Adjacent to works at north-eastern end of Mayne Rail Yard	Notifiable activity 'rail yards', higher risk of land contamination.
Lot 4 on plan RP9955	Adjacent track duplication works immediately south of Mayne Rail Yard	Notifiable activity 'petroleum product or oil storage/engine reconditioning works' higher risk of land contamination.
Lot 5 on plan SP123915	Adjacent to Exhibition Loop	The notifiable activity of 'hazardous contaminants' for which this property is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the scope of this EIS, and would be investigated further as part of the detailed design works.
Lots 13, 15 on plan RP11195	Adjacent to the Gabba Station development	Notifiable activity 'petroleum product or oil storage' or license for underground F/C storage, higher risk of land contamination.
Lot 195 on plan SP198200	Boggo Road rail junction	Notifiable activity 'rail yards', higher risk of land contamination.
Lot 4 on plan SP164685	Adjacent to track duplication works for South Coast Line	Notifiable activity 'coal fired power station, petroleum product or oil storage', higher risk of land contamination.
Lot 32 on plan SP12206 Lot 566 on plan SP214202	Tennyson rail junction	The notifiable activity of 'hazardous contaminants' for which this property is listed on the EMR indicates that contamination is present. The nature of the contamination has not been established within the scope of this EIS, and would be investigated further as part of the detailed design works.
Lots 17 to 23 on plan SP119393 Lots 1, 2 and 7 on plan SP119390	Part of South Coast line immediately south of existing Yeerongpilly Station on west side of existing rail line	Notifiable activity 'rail yards', higher risk of land contamination.
Lot 1 on plan SL12723 Lot 6 on plan RP62968	Adjacent to Clapham Rail Yard redevelopment	UST containing <50,000 litre flammable/combustible liquid, higher risk of land contamination.
Lot 2 on plan RP151575	Adjacent to Clapham Rail Yard redevelopment	Notifiable activity 'abrasive blasting; metal treatment or coating; petroleum product or oil storage', higher risk of land contamination.
Lot 3 on plan RP175530	Adjacent to reconfiguration of Farlie Terrace	Notifiable activity 'abrasive blasting; petroleum product or oil storage' higher risk of land contamination.
Lot 1 on plan RP170384 Lot 1 on plan RP70669 Lot 1 on plan SP203733 Lot 2 on plan RP112585 Lot 1 on plan SL7106 Lot 5 on plan RP178629	Adjacent to track duplication works for South Coast Line	Notifiable activity 'petroleum product or oil storage' higher risk of land contamination.
Lot 6 on plan RP129451	Adjacent to track duplication works and Salisbury Station	Notifiable activity 'landfill', higher risk of land contamination.

Lot and plan	Description of adjacent Project works	Potential for contaminant presence
Potentially contaminated land parcels outside of the construction footprint with a lower risk to the Project		
Lot 2 on plan RP183570	Adjacent track duplication works	Notifiable activity 'printing', lower risk of land contamination.
Lots 1-2, 12, 14 on plan RP11195	Adjacent to the Gabba Station development	Notifiable activity 'wood treatment or preservation', lower risk of land contamination.
Lot 1 on plan RP183641	Adjacent to track duplication works for South Coast Line on east side of existing Rocklea Station	Notifiable activity paint manufacture or formulation', lower risk of land contamination.
Lot 5 on plan RP167929	Track duplication adjacent to Rocklea Station	Potential notifiable activity 'wood treatment or preservation', lower risk of land contamination.
Lot 5 on plan RP167929	Adjacent to track duplication works for the South Coast Line	Potential notifiable activity 'wood treatment or preservation', lower risk of land contamination.
Lot 2 on plan RP810914 Lots 1-4 on plan RP83497	Adjacent to track duplication works for South Coast Line	Notifiable activity 'foundry operations', lower risk of land contamination.

Notes:
Adjacent properties are those that share a property boundary with the Project's construction footprint.
The potential extent of Project induced groundwater drawdown is described in ***Section 12.3.4*** *of* ***Chapter 12 Groundwater.***

During the detailed design phase, further investigations would be undertaken of those sites where contaminant migration is considered a higher risk to the Project and appropriate mitigation measures would be detailed for construction and operation. Proposed mitigation measures are outlined in **Chapter 24 Draft Outline EMP**.

At those sites where contaminant migration is considered to be a lower risk to the Project, should unforeseen contamination for these properties be identified, this would be managed in accordance with the requirements of the draft outline EMP for construction.

Disturbance/migration of contaminated groundwater

A conceptual hydrogeological and groundwater drawdown model has been prepared for the Project which identifies the area of land potentially subject to groundwater drawdown. Further information on this model and the extent of the drawdown area is provided in **Chapter 12 Groundwater** (**Section 12.3.4**).

A total of 3,245 potentially contaminated sites are located within the study area, of which 99 sites of higher risk are located within the groundwater drawdown predicted for 10 years following tunnel construction. **Figure 12-9** in **Chapter 12 Groundwater**, shows the locations of potential groundwater contamination within the study area.

Potential impacts

During construction, potential impacts from contaminated groundwater include:

- Dermal (skin contact) and/or ingestion risk to construction workers working in open excavations or confined spaces where contaminants are present in groundwater
- discharge of potentially contaminated groundwater from worksites to surface water, potentially impacting on human or ecosystem health
- inhalation risk to construction workers working in open excavations or confined spaces where volatile or semi-volatile contaminants are present in groundwater

- restrictions on the utilisation and disposal of contaminated groundwater arising from dewatering of the below ground works.

During operation, potential impacts from contaminated groundwater include:

- risk to the public and workers within underground infrastructure, ie stations, tunnels and shafts, where volatile or semi-volatile contaminants are present in groundwater
- risk to Project infrastructure susceptible to contaminants in groundwater, such as rubber ring joints in pipes which are susceptible to hydrocarbons in groundwater
- the need to treat the discharge from the underground works prior to disposal to avoid subsequent human health or ecosystem health implications.

Mitigation measures

Investigations are required during the detailed design phase of the Project to determine the availability of groundwater information for the higher risk sites within the groundwater drawdown area. This would include consultation with BCC and/or DERM.

Where appropriate groundwater information is not available, regional groundwater monitoring would be undertaken to establish whether contamination is likely to be present in groundwater systems potentially impacted by the Project. This would also assist in establishing mitigation measures for construction and operation, such as the need to treat groundwater drawn into the Project infrastructure prior to discharge. A groundwater monitoring program is proposed to inform and support the construction and operation phases of the Project and is described in **Chapter 12 Groundwater** (**Section 12.3.5**). This monitoring program would also include triggers to identify mobilisation of contaminated groundwater both insitu and at collection points.

Soil gas accumulation in underground infrastructure

Potential impacts

Soil gas refers to the air and/or vapour that occupy the spaces between soil particles in the ground. Where contamination or putrescible (decaying) material in soil and/or groundwater produces gas or is of a volatile nature, potential exists for the vapour or gas produced (soil gas) to be noxious.

Soil gas has the potential to migrate into and accumulate in underground infrastructure (ie tunnels, stations and shafts) located in the vicinity of:

- former landfills, tips or areas of fill containing putrescible materials
- ground and/or groundwater contamination associated with volatile and semi-volatile organic substances
- naturally occurring materials which contain high concentrations of organic materials such as former marshes, peats or alluvial areas.

Soil gas has the potential to pose a risk to human health or result in explosive atmospheres. In particular, properties located within the vicinity of current or former landfills are at risk from the lateral migration of gases. Lateral gas migration from landfill sites can occur long after waste has been disposed of, with underground services potentially acting as conduits for gases to enter subterraneous structures.

As discussed in **Section 8.3.1**, the potential for soil gas intrusion into subsurface structures would require investigation during the detailed design to ensure that suitable mitigation measures are integrated into the design of structures.

Mitigation measures

During detailed design, further investigation of the potential risk from soil gas and contaminants in soil and groundwater would be undertaken. In particular, these investigations would focus on underground infrastructure to determine soil gas regimes and identify mitigation measures for construction and operation of the Project.

Managing inflows of potentially contaminated groundwater and or/soil gas into underground infrastructure, through design, use of appropriate construction methods or installation of ventilation systems, can help to minimise the accumulation of soil gas.

Where further investigations identify potential risks from soil gas, gas monitoring systems and alarms would be fitted in underground infrastructure during construction and operation to assess ambient gas concentrations, including oxygen, methane, carbon dioxide and carbon monoxide.

8.3.3 Disturbance of asbestos containing materials

Potential impacts

There is potential for buildings or historically filled areas of land to contain asbestos materials, which if disturbed, may require mitigation during construction. If inappropriately managed, asbestos has the potential to impact on human health due to the inhalation of fine particulates.

Mitigation measures

Where buildings or structures are to be partially or fully demolished for the Project, an asbestos audit would be required prior to commencing demolition.

During intrusive works, where asbestos is suspected in previously filled areas, works would cease until analytical testing can confirm the presence or absence of asbestos. If asbestos is present, appropriate management measures for asbestos containing materials would be implemented. Asbestos would be managed in accordance with the following:

- *Environmental Protection Act 1994*
- *Workplace Health and Safety Act 1995*
- *Workplace Health and Safety Regulation 2008*
- *National Code of Practice for the Management and Control of Asbestos in Workplaces 2005*
- *National Code of Practice for the Safe Removal of Asbestos (2nd Edition) 2005.*

8.3.4 Unforeseen contamination and prevention of contamination

The potential exists for unforeseen contamination to be encountered or for land contamination to occur during construction and operation, such as the accidental spillage or leakage of hazardous materials or waste products.

Should land contamination be encountered or occur from construction activities, appropriate procedures and measures would be required for the notification, mitigation, investigation, remediation and validation of the contamination. These are documented in **Chapter 24 Draft Outline EMP**. During construction, mitigation measures that would be undertaken, should unforeseen contamination be encountered or land contamination occurs from construction activities, include:

- preparation of a Construction Occupational Health and Safety Plan (OH&S Plan), which includes measures to manage exposure of construction workers to potential contaminants in soil and/or water eg through the wearing of PPE and the control of dust during construction

- preparation of a contaminated land management procedure prior to the commencement of construction, which includes
  - identification of the likely forms of contamination that could occur eg fuels, oils, paints, etc
  - procedures for the appropriate storage of hazardous materials in compliance with relevant standards
  - the prevention of land contamination during construction
  - the identification, investigation and management of unforeseen contamination
  - spill response and remediation
  - listing properties on the EMR in accordance with the EP Act
  - the management, remediation and disposal of contaminated soil and/or spoil generated from properties listed on the EMR/CLR
  - post construction management and/or monitoring requirements
  - approval and disposal permits obtained from DERM for the removal of contaminated soil in accordance with the EP Act, as required.

Specific measures for managing any spills and leaks of fuels or chemicals are contained within the draft outline EMP. These include:

- the proper storage and handling of hazardous materials, such as chemicals, in accordance with relevant Australian Standards and Material Safety Data Sheets (MSDS), to minimise the risk of environmental impact. This documentation, including schedules of potentially hazardous materials on worksites and their relevant MSDSs, would be made readily available to all employees and contractors working on the Project.
- site training for appropriate materials handling and environmental awareness to encourage good material handling practices, spill management and incident reporting
- siting all hazardous liquid stores above ground on an impervious base within a bund and secured. The base and bund walls would be impermeable to the material(s) stored
- storing smaller quantities of chemicals, fuels and oils in either self-bunded pallets, within a bunded area, or in a bunded container, while storing bulk quantities of diesel in self-bunded tanks or within an appropriately bunded area
- containing waste products such as oil/water separator waste, sludges and residues within weatherproofed, sealed and bunded areas to prevent any leakages or spills potentially causing environmental harm to soils, surface water or groundwater
- locating spill kits in the vicinity of hazardous material storage areas and training site staff in their use
- securing fences and locking or manning access points to adequately protect worksites and storage areas from theft and/or vandalism
- clearly marking the contents of tanks and displaying notices requiring that the valves and trigger guns be locked when not in use
- undertaking regular inspections of tanks, bunds and storage areas to ensure the integrity of all facilities.

Further details of proposed management measures from spills or leaks of chemicals and fuels are provided in **Chapter 17 Waste Management** and **Chapter 24 Draft Outline EMP**.

The storage of hydrocarbons and/or large quantities of chemicals associated with construction and operation of the Project may result in the site being listed on the EMR.

8.3.5 Summary of potential impacts and mitigation measures

Table 8-7 provides a summary of potentially contaminated sites likely to be impacted by the construction and operation of the Project.

Mitigation measures are also outlined, together with likely management plans, investigation reports and permits applicable to contaminated land management. These include:

- preparation of a sampling and analysis plan (SAP)
- site investigation report (SIR)
- remediation action plan (RAP), which outlines the process for remediating contaminated land identified through a contaminated site investigation
- site management plan (SMP), which outlines procedures for the on-site management of contamination associated risks
- disposal permit (DP), in accordance with the EP Act.

Chapter 24 Draft Outline EMP describes how these sub plans, report and permit systems would be integrated.

Table 8-7 Summary of potentially contaminated sites within the Project construction footprint and higher risk adjacent land parcels and mitigation measures

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
Surface works within the existing rail corridor					
Surface works within the rail corridor would occur on the following potentially contaminated sites (refer to **Figure 8-11, Figure 8-12** and **Figure 8-13**): Lot 22 on plan SP122245 Lot 2 on plan SP158926 Lot 1 on plan RP892797 Lot 34 on plan SP158925 Lot 455 on plan SL3473 Lot 11 on plan RP156029 Lot 454 on plan SP122217 Lot 3 on plan RP113229 Lot 474 on plan SL12086 Lot 21 on plan SP117132 Lots 101, 102 on plan SP105842 Lot 10 on plan SP122190 Lot 107 on plan SP122201 Lot 51 on plan SP122192 Lot 2 on plan RP42836 Lot 481 on plan SP196765 Lot 3 on plan SP190738 Lots 496, 691 on plan SL12309 Lot 10 on plan SP155727	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements. There is a potential that construction may impact on the current remediation of known groundwater contamination at the Mayne Rail Yard. Further investigations would be undertaken to determine the location of groundwater remediation works and the impact of the Project on these works. Project works in Mayne Rail Yard to minimise potential impacts on these works.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
Surface works adjacent to the existing rail corridor					
Surface works on land parcels outside the rail corridor to support the Project would occur on the following potentially contaminated sites: Lot 13 on plan SP158918 Lots 3-5 on plan RP94511 Lots 2 and 3 on plan RP107515 Lot 6 on plan RP94512 Lot 1 on plan RP37619 Lots 37 to 38 on plan SP211345 Lots 70-74 on plan RP37616 Lot 566 on plan SP214202 Lot 420, 421 on plan SP116165 Lot 702 on plan SP183568 Lot 14 on plan SP158920 Lot 2 on plan SP144596	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Northern tunnel portal					
The development of the northern tunnel portal may occur on the following potentially contaminated sites: Lot 32 on plan SP172136 Lot 34 on plan SP172136 Lot 32 on plan SP122215	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
Roma Street Station					
The construction and operation of the Roma Street underground station may be impacted by the following potentially contaminated sites: Lot 1 on plan SP207220 Lot 35 on plan SP207219 Lot 60 on plan SP207215 Lot 37 on plan SP169852 Portions of Lot 60 on plan SP207215 have also been identified as a potential satellite worksite.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
The construction and operation of the Roma Street Station may be impacted by the following potentially contaminated sites outside the Project construction footprint: Lots 41-43 on plan SP145686 Lot 17 on plan RP903101 Lot 490 on plan SL6858 Lot 18 on plan SP201216	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
The construction and operation of the Roma Street Station may be impacted by the following potentially contaminated sites outside the Project construction footprint: Lot 12 on plan SP147396 Lot 13 on plan SP168000	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
Lower Albert Street Station					
The construction and operation of the lower Albert Street Station may be impacted by the following potentially contaminated sites: Lot 1 on plan RP110657 Lots 1 to 3 on plan RP1068 Lot 2 on plan RP111828 Lots 22-23, 36-37 on plan B118243	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Gabba Station					
Construction and operation of the Gabba Station may be impacted by the following potentially contaminated sites: Lot 63 on plan SP184386 Lot 1291 on plan CP899829 Lot 1292 on plan CP899830	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Construction and operation of the Gabba Station may be impacted by the following potentially contaminated sites outside the Project construction footprint: Lot 61 on plan SP188566 Lot 60 on plan SP184385	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Southern laydown area					
The following land parcel is proposed to be used as a temporary laydown area to support construction: Lot 1 on plan RP230277 No construction activities or surface disturbance are proposed for this land parcel.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction	High	Detailed design phase	SAP SIR RAP SMP

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
The construction and operation of the ventilation and emergency access building may be impacted by the following potentially contaminated sites outside the Project construction footprint: Lot 5 on plan RP212124	Further investigations would be undertaken confirm the significance of contamination and mitigation requirements.	Construction and/ or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Southern tunnel portal					
The duplication of the surface rail track would impact on properties within the existing Queensland Rail corridor and the development of the southern tunnel portal may occur on the following potentially contaminated site: Lot 550 on plan SP117131	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Ipswich Motorway on-ramp reconfiguration at Rocklea					
The duplication of the surface rail track would require changes to the Ipswich Motorway onramp at Rocklea, and would require disturbance of the following potentially contaminated site: Lot 907 on plan SP149004	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP DP
Surface works and footbridge at Salisbury					
Surface works within the existing rail corridor and the construction of a pedestrian bridge would impact on this potentially contaminated site: Lot 12 on plan SP122191 Western portions of this property have been identified as potential laydown and construction areas.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction	High	Detailed Design Phase	SAP SIR RAP SMP DP

Impact	Mitigation	Project phase of likely impact	Likelihood	Timing of Action	Likely management plans, investigation reports and permits
Yeerongpilly construction laydown areas					
The following potentially contaminated sites are proposed to be acquired for use as a worksite: Lot 1 on plan RP115818 Lot 1 on plan RP179845 Lot 1 on plan RP217835 Excavation of soil from the land parcel is not anticipated.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction	High	Detailed design phase	SAP SIR RAP SMP
The following potentially contaminated site is proposed to be acquired for use as a worksite: Lot 1 on plan RP179869 Excavation of soil from the land parcel is not anticipated.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction	High	Detailed design phase	SAP SIR RAP SMP
Salisbury material storage area					
The following potentially contaminated sites are proposed to be acquired for use as a material storage area and for access road construction: Lots 4, 5 on plan RP105182 Lots 1, 2 on plan RP112751 Lots 10-14 on plan RP75020 Lot A on plan RP177953 Excavation of soil from the land parcels is not anticipated.	Further investigations would be undertaken to confirm the significance of contamination and mitigation requirements.	Construction and/or operation	High	Detailed design phase	SAP SIR RAP SMP

Residual effects

The residual effects described below are those effects remaining after mitigation measures have been implemented.

Construction

With the implementation of the proposed mitigation measures described in **Section 8.3,** residual effects are predicted to be low for the short-term duration of construction activities.

Operation

Following the implementation of mitigation measures, no long-term residual effects are predicted during operation from land contamination.

8.4 Summary

The potential for land contamination within the study area has been investigated to identify properties which, due to either direct interference and/or acquisition, or as a result of potential contaminated groundwater drawdown, may require further investigation or management as part of the Project works.

A total of 2,972 land parcels in the study area were listed on the EMR. Within the study corridor:

- 506 land parcels were listed on the EMR
- 432 land parcels were identified with notifiable activities which are considered to be of higher risk
- 74 land parcels were identified with notifiable activities which are considered to be of lower risk
- 14 land parcels are managed under a SMP.

Outside the study corridor, but within the wider study area:

- 2,466 land parcels were listed on the EMR
- 1,437 land parcels were identified with notifiable activities which are considered to be of higher risk
- 1,029 land parcels were identified with notifiable activities which are considered to be of lower risk
- 114 land parcels are managed under a SMP.

A total of 108 additional properties were identified which were not listed on the EMR but may potentially contain contamination within the study corridor. Of these:

- 46 land parcels were identified with notifiable activities which are considered to be of higher risk
- 62 land parcels were identified with notifiable activities which are considered to be of lower risk.

A total of 74 land parcels have been identified within the Project construction footprint and on adjacent land parcels as containing potential soil and/or groundwater contamination. These would require further investigation as part of the Project works.

There is a potential that the Project may have the following impacts:

- disturbance of potentially contaminated soils
- disturbance of unexpected contamination
- disturbance/migration of potential groundwater contamination
- contamination sourced from potentially contaminated sites adjacent to project works

- soil gas accumulation in subsurface structures
- disturbance of asbestos containing materials.

Areas identified as being of key interest for the Project in relation to contaminated land include:

- Mayne Rail Yard, which has confirmed hydrocarbon groundwater contamination that is currently undergoing remediation and is being monitored by Queensland Rail as part of the site's environmental licence
- rail corridor, which is likely to be contaminated from past management practices involving the use of pesticides (including arsenic) and other solvents and oils and the presence of uncertified fill material
- Goprint site, which was a former rail yard, with a former rail line running north-west to service the wharves at South Brisbane and Kangaroo Point
- Roma Street Parkland, which is the site of the former Roma Street goods and freight yards and which may contain contamination
- various properties within the Brisbane CBD which are listed on the EMR for the notifiable activity of "petroleum product or oil storage", although many of the storage facilities are above ground and pose a lower risk of ground contamination
- the 50 land parcels within the study area that are listed on the EMR for the notifiable activity of "landfill", as well as an additional 21 properties which have been identified from historical information as potentially being used for land filling activities.

To accurately assess the impacts of each potentially contaminated site, detailed investigations would be undertaken. A detailed mitigation plan for the construction and operation phases of the Project would be developed following the acquisition of appropriate data. A draft outline of this plan is provided in **Chapter 24 Draft Outline EMP**. Specific mitigation which would be developed and implemented prior to the commencement of site activities would consider as a minimum:

- management and prevention of dust emissions
- appropriate erosion and sediment controls and staging of site activities to minimise the extent of disturbed areas and reduce the potential for run-off of contaminated soils
- measures to minimise the exposure of humans and the environment to potentially contaminated soils during excavation activities
- measures to manage spills and leaks of fuels or chemicals
- monitoring the movement of contaminated material and its disposal
- implementing appropriate workplace health and safety procedures.