Appendix G
Local Air Quality Assessment



Moorebank Intermodal Terminal - Revised Project - Local Air Quality Impact Assessment

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This document is issued in confidence to Parsons Brinckerhoff for the purposes of the assessment of air quality impacts associated with the proposed Moorebank Intermodal Terminal Project. It should not be used for any other purpose.

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Contents

List of Figures

List of Tables

List of Appendices

Executive Summary

ENVIRON Australia Pty Ltd (ENVIRON) was commissioned by Parsons Brinckerhoff Pty Limited (Parsons Brinckerhoff) to undertake an Air Quality Impact Assessment (AQIA) for the proposed Moorebank Intermodal Terminal (IMT) Project (the Project). The Environmental Impact Statement (EIS) AQIA (ENVIRON, 2014) was included as Technical Paper 5 within the EIS for the Project, lodged with the NSW Department of Planning and Environment (DPE) in October 2014.

Prior to the EIS exhibition, the Moorebank IMT proposal was being developed by Moorebank Intermodal Company (MIC) as a stand-alone project. The Sydney Intermodal Terminal Alliance (SIMTA) development was also being pursued separately, with its own planning approval sought. SIMTA is a consortium consisting of Qube Holdings and Aurizon Holdings.

Since exhibition of the EIS, MIC and SIMTA have reached in-principle agreement for SIMTA to develop and operate a precinct-wide intermodal facility and associated warehousing across the Moorebank and SIMTA sites. Additionally in this time, MIC has revised the design of the Project. This report assesses the potential air quality impacts associated with the revised Project design.

Drawing on resources developed for the EIS AQIA, annual emissions of four emission scenarios were selected to calculate annual air quality emissions from the revised Project design as follows:

- Scenario 1 – during Phase A – construction only (2016);
- Scenario 2a – during Phase B - construction and operation (2019);
- Scenario 2b – during Phase B - construction and operation (2023); and
- Scenario 3 – Full Build operations (2030).

The above emission scenarios were identified to provide a representative, upper bound assessment of the air quality impact potential of the construction and operational phases of the revised Project. Air emission sources associated with the above construction and operational phases were identified and quantified.

Pollutants assessed in this report include particulate matter (PM) and combustion-related gaseous pollutants.

Particulate matter size fractions quantified and assessed during the study comprised total suspended particulates (TSP), particulate matter less than 10 microns in equivalent aerodynamic diameter (PM_{10}), and particulate matter less than 2.5 microns in equivalent aerodynamic diameter ($PM_{2.5}$). The finer particle size fractions are of interest due to their health risk potential.

Combustion-related gaseous pollutants of interest include oxides of nitrogen (NO_x) and specifically nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). While numerous VOC species are emitted during the combustion of diesel fuel, the study focussed primarily

on the compounds benzene, toluene, xylenes, 1,3-butadine, formaldehyde and acetaldehyde to assess the potential health impact of individual organic pollutants.

Emissions were estimated using a range of published emissions factor sources, including the United Stated Environmental Protection Agency (US-EPA) and the Australian National Pollution Inventory (NPI) emission factor documentation. Key findings of the emissions inventory included:

- emissions of TSP and PM_{10} would be higher during the construction phases of the revised Project; and
- emissions of diesel combustion related pollutants (specifically $PM_{2.5}$, NO_x, SO_2, CO, VOCs and PAHs) would increase in line with increasing IMT operations.

Existing air quality was quantified using available monitoring data sources, including on-site monitoring equipment and the nearby NSW Office of Environment and Heritage (OEH) Liverpool monitoring station. Meteorological conditions were characterised using data from the OEH Liverpool station and supported by Bureau of Meteorology stations at Holsworthy and Bankstown. Data recorded during 2013 were adopted for this assessment.

During 2013, baseline PM_{10} and $PM_{2.5}$ concentrations were shown to exceed the 24-hour average NSW Environment Protection Authority (EPA) assessment criterion on three occasions, and the National Environment Protection Measure (NEPM) advisory reporting goal on two occasions. Analysis of these data highlighted that the exceedances coincided with the wide-spread bushfire events that occurred across NSW during late 2013.

In cases where existing ambient air pollutant concentrations may exceed the impact assessment criteria, the NSW EPA requires the Project proponent to demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity.

Due to extensive bushfires in 2013, the five-year annual average (between 2009 and 2013) PM_{10} and $PM_{2.5}$ concentrations recorded at the OEH Liverpool station were calculated to reflect annual average concentrations of these pollutants in the local area. Elevated PM concentrations associated with natural events, including bushfires and dust storms, were retained in the calculation of the five-year average concentrations, resulting in a conservative annual average baseline concentration for PM_{10} and $PM_{2.5}$.

All other baseline concentrations of recorded air pollutants analysed for 2013 were below applicable NSW EPA assessment criteria.

Atmospheric dispersion modelling carried out as part of this assessment used the AMS/US-EPA regulatory model (AERMOD). Focus in the modelling was given to Scenario 1 and Scenario 3, as these scenarios collectively represented the highest periods of emissions for the various pollutants.

Inputs to the model included local topographic data, calculated emissions and hourly-varying meteorology from the OEH Liverpool station. Project-only (incremental) ground level concentrations and deposition rates were predicted for an area covering 7 km by 7 km centered over the Project site, with a grid resolution of 200 m. Additionally, model predictions were made at 38 sensitive receptor locations, representative of the local area.

Key findings of the air quality assessment are:

- incremental (Project-only impacts excluding the contribution of ambient air quality) air pollutant concentrations and dust deposition rates associated with all modelled scenarios were predicted to be within NSW EPA criteria and NEPM advisory reporting goals at all surrounding receptor locations;
- taking elevated background airborne PM concentrations into account, no additional exceedance days were predicted for the 24-hour average PM_{10} and $PM_{2.5}$;
- exceedance of the annual average NEPM advisory reporting goal for cumulative $PM_{2.5}$ is predicted for one receptor (R33) in Scenario 3 (Full Build). Whilst this receptor was relocated in 2014 it has been retained in the assessment for completeness. The likely future land use at R33 would be associated with the SIMTA project. The elevated ambient background is the key contributor to these exceedances; and
- all incremental cumulative and gaseous pollutants assessed are below applicable NSW EPA assessment criterion for all scenarios,

In addition to the assessment of emissions from the revised Project site, modelling was conducted to account for potential cumulative impacts of operations at the Project site and potential operations at the adjacent SIMTA site. Four cumulative assessment scenarios were developed accounting for possible future site configurations at the two sites. The findings of this cumulative assessment are as follows:

- cumulative incremental (Moorebank IMT and SIMTA only) concentrations are below NSW EPA and NEPM advisory reporting goals at all surrounding receptor locations;
- additional exceedance of the NSW EPA 24-hour average PM_{10} criterion and NEPM advisory reporting goal for 24-hour average $PM_{2.5}$ is predicted to occur at R33 when existing air quality is accounted for;
- cumulative annual average (Moorebank IMT and SIMTA only + background) $PM_{2.5}$ concentrations are in exceedance of the NEPM advisory reporting goal at receptor R33;
- the exceedances predicted at R33 are attributable to the location of R33 directly within the SIMTA site emission sources; and
- no other cumulative (Moorebank IMT and SIMTA only + background) pollutant exceedances are predicted for any scenario at any of the surrounding receptor locations.

Predicted impacts from both the revised Project in isolation and cumulative operations at the revised Project and SIMTA sites presented within this report show minor varience from the impacts predicted in the EIS AQIA. The predictive dispersion modelling demonstrates that concentrations of most pollutants (TSP, PM_{10}, NO_x, CO, SO_2, benzene, toluene, xylene, 1,3-butadiene, acetaldehyde and PAHs) emitted from the Project would be below acceptable ambient air quality criteria and would not adversely affect the receiving environment. Exceedance of the $PM_{2.5}$ advisory reporting goals for the cumulative concentrations are predicted, but only at a receptor location that is marked for the SIMTA development.

Where the Moorebank IMT Project operates simultaneously with operations at the proposed SIMTA site, the air impacts are predicted to be greater than for the operation of the Moorebank IMT Project alone. It is considered that the improvement of engine standard compliance for the truck (Euro VI) and locomotive (minimum Tier 2) fleets servicing the Project would significantly reduce the impacts $PM_{2.5}$ predicted concentrations.

1 Introduction

1.1 Assessment background

ENVIRON Australia Pty Ltd (ENVIRON) was commissioned by Parsons Brinckerhoff Pty Limited (Parsons Brinckerhoff) to undertake an Air Quality Impact Assessment (AQIA) for the proposed Moorebank Intermodal Terminal (IMT) Project (the Project). The Environmental Impact Statement (EIS) AQIA (ENVIRON, 2014) was included as Technical Paper 5 within the EIS for the Project, lodged with the NSW Department of Planning and Environment (DPE) in October 2014.

The Project involves the construction and operation of an IMT and associated infrastructure, including warehousing and other facilities at Moorebank, in the southwestern suburbs of Sydney. The purpose of the IMT is to facilitate the distribution of freight to and from Port Botany.

The Project includes a rail link and road entry and exit points, connecting the Project site to existing regional rail and road networks. The Project proponent is Moorebank Intermodal Company (MIC), a Government Business Enterprise set up to facilitate the development of the Project.

The EIS AQIA assessed three possible site rail access options for the Project, namely northern rail access, central rail access and southern rail access. For each rail access option, four scenarios capturing key periods during the development of the Project site and increasing in IMT operations were configured and assessed – a total of 12 emissions scenarios. These scenarios provided a representative, upper bound assessment of the potential air quality impacts of the Project’s construction and operation. Air emission sources associated with the construction and operational stages were identified and quantified.

1.2 Revised Project

Prior to the EIS exhibition, the Moorebank IMT proposal was being developed by MIC as a stand-alone project. The Sydney Intermodal Terminal Alliance (SIMTA) development was also being pursued separately, with its own planning approval sought. SIMTA is a consortium consisting of Qube Holdings and Aurizon Holdings.

When the Moorebank IMT EIS was developed, three hypothetical scenarios for the final form of development across the two sites were considered. These scenarios enabled the Moorebank IMT EIS to assess the possible cumulative impacts of both projects. The scenarios considered different placements of the proposed IMEX terminal, interstate terminal and warehousing across the Moorebank and SIMTA sites.

Since exhibition of the EIS, MIC and SIMTA have reached in-principle agreement for SIMTA to develop and operate a precinct-wide intermodal facility and associated warehousing across the Moorebank and SIMTA sites. SIMTA would develop and operate both sites under a commercial agreement with MIC. As part of that agreement, the Commonwealth Government would retain ownership of the Moorebank IMT site, with SIMTA occupying the site under a long-term lease. MIC would remain involved to ensure the Commonwealth Government’s objectives for construction and operation of the site (including environmental compliance requirements) are satisfied.

Under the terms of the agreement, SIMTA would develop the entire precinct, as follows:

- on the SIMTA site (consistent with SIMTA's concept plan approval):
  - a 1 million twenty-foot equivalent units (TEU) import/export (IMEX) facility; and
  - 300,000 sq. m warehousing.
- on the Moorebank site (the subject of this report):
  - a 500,000 TEU interstate (IS) facility; and
  - 300,000 sq. m warehousing.
- rail access to the precinct via a connection to the Southern Sydney Freight Line (SSFL) near the south of the Moorebank site.

MIC has also commissioned the assessment of the construction of a 1.05 million TEU IMEX facility on the Moorebank site. Importantly, MIC is seeking a condition of its approval under the Environmental Planning and Assessment Act 1979 that stipulates if an IMEX terminal is built on the SIMTA site, the IMEX terminal component of any approval on the Moorebank site will become void (i.e. not built). That is, there would only be one IMEX terminal in the precinct.

This report should be read in conjunction with the EIS AQIA (ENVIRON, 2014) from the original Project EIS, which remains the primary reference document.

2 Revised Project description

The revised Project has been developed as a result of an in-principle agreement between MIC and SIMTA that may result in the development of both the Moorebank IMT site (the subject of the EIS and this revised project report) and the SIMTA IMT site to create an intermodal precinct solution.

The following sections document how the Project design has changed from the design presented and assessed in the EIS (October 2014).

2.1 Changes to the IMT Terminal layout since the EIS

2.1.1 Elements remaining unchanged

The project is unchanged in respect of the key components of the development, comprising of the following:

- *An Import/Export (IMEX) freight terminal* – designed with a maximum capacity of 1.05 million twenty-foot equivalent units (TEU) a year (525,000 TEU inbound and 525,000 TEU outbound) servicing international IMEX freight movement between Port Botany and the Project site.
- *An interstate (IS) freight terminal* – designed to handle up to 500,000 TEU a year (250,000 TEU inbound and 250,000 TEU outbound) of interstate freight, servicing trains travelling to, from and between Sydney and regional and interstate destinations. The interstate terminal would provide for a total of up to 500,000 TEU a year, of which approximately 406,000 TEU would generate truck movements and approximately 94,000 TEU would remain on-site as transit movements (between trains only).
- *Warehousing facilities* – with capacity for up to 300,000 square metres (sq. m) of warehousing to provide an interface between the IMEX and interstate terminals and commercial users of the facilities such as freight forwarders, logistics facilities and retail distribution centres.

2.1.2 Elements of the project layout and built form that have changed

Amendments to the Project layout and built form comprise:

- changes to the layout and operation of the IMT terminal, including the location of the warehousing, working tracks and storage tracks, IMT freight village precinct, IMEX and interstate equipment storage and repair area and detention ponds;
- confirmation that the southern rail access into the site will be required (the EIS summary sought flexibility to build either a southern, central or northern rail access into the site from the SSFL) and a minor amendments to the alignment and a reduction in the southern rail access corridor;
- changes to the upgrade of Moorebank Avenue as described in the EIS summary (changes in the extent and timing of the upgrade works;
- changes to access and circulation including heavy and light vehicle access to the facility via the Moorebank Avenue and Anzac Road intersection along a dedicated road at the north and along the western boundary of the Project site; and
- an increase in the size of the conservation area as a result of the new IMT.

In terms of warehousing, the site built form controls associated with heights, setbacks and floor space ratio remain unchanged (refer section 7.7.2 of the EIS); however the setback control on Moorebank Avenue is no longer required as warehouses are no longer proposed on the eastern boundary of the site. To supplement the setback controls, asset protection zones will be established between the conservation area and the proposed warehouse buildings to safeguard against bushfire risk.

The proposed staging of the revised Project design and associated assessment scenarios (see **Section 6** for further discussion) is presented in **Figure 1**.

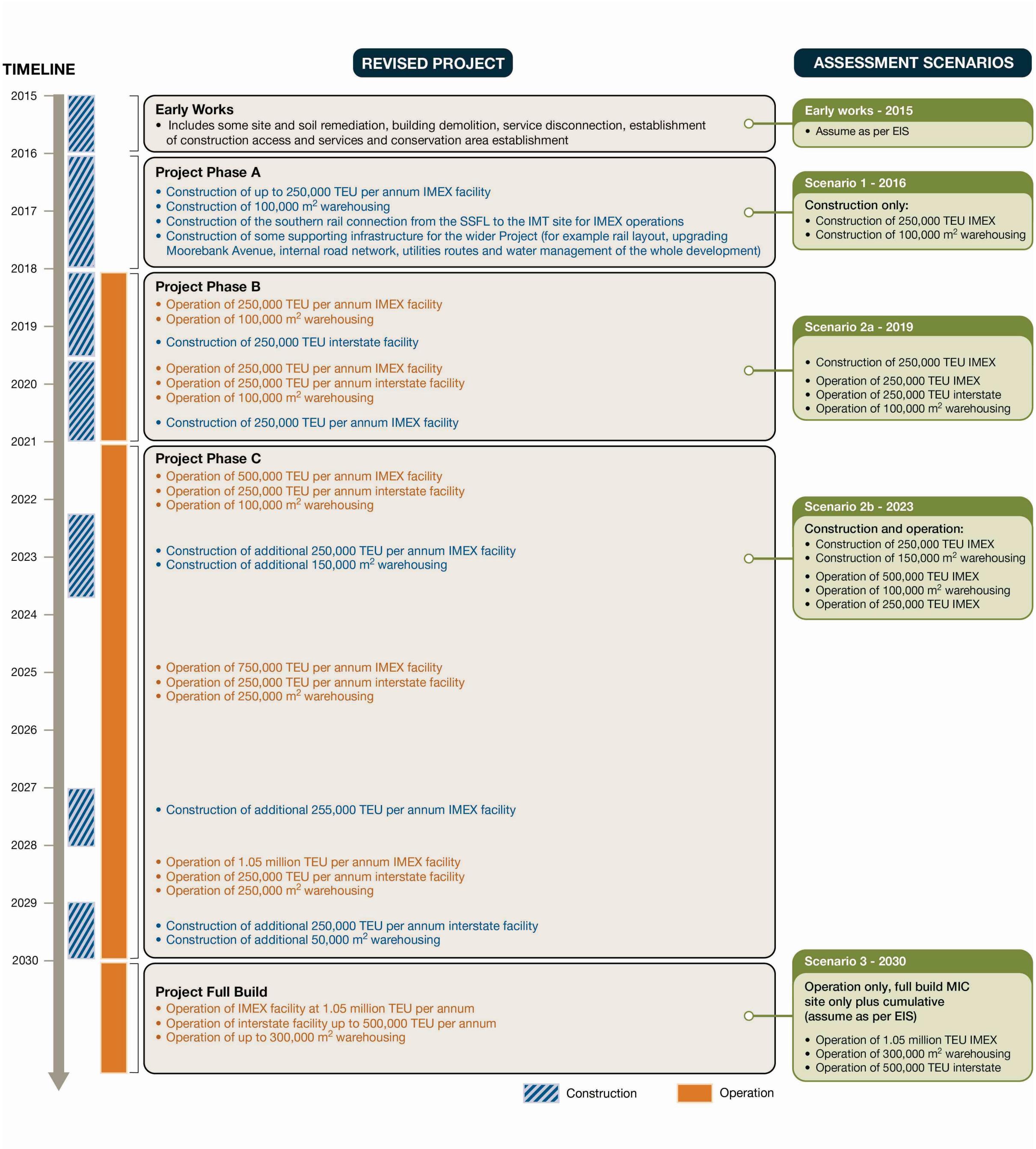

Figure 1: Revised Project Design staging and assessment scenarios

2.1.3 Proposed terminal layout

The revised terminal layout consists of:

- confirmation of the development of a southern rail access from the SSFL to the western boundary of the Project site.
- reorientation of the terminal layout to place warehousing (approximately 300,000 sq. metres) on the western area of the Project site bordering the proposed conservation area.
- reorientation to place the intermodal infrastructure including rail tracks (working tracks and storage tracks) on the eastern side of the Project site adjacent to the terminals and bordering Moorebank Avenue.
- changes to the site access and vehicle circulation within the Project site.
- modification to the locations and footprint of the detention basin and administrative office buildings, employee facilities and parking.

The revised Project design for the full build IMT is presented in **Figure 2**. The indicative progressive development phases duringof the construction and operational of the Project is illustrated in **Figure 3** through to **Figure 6**.

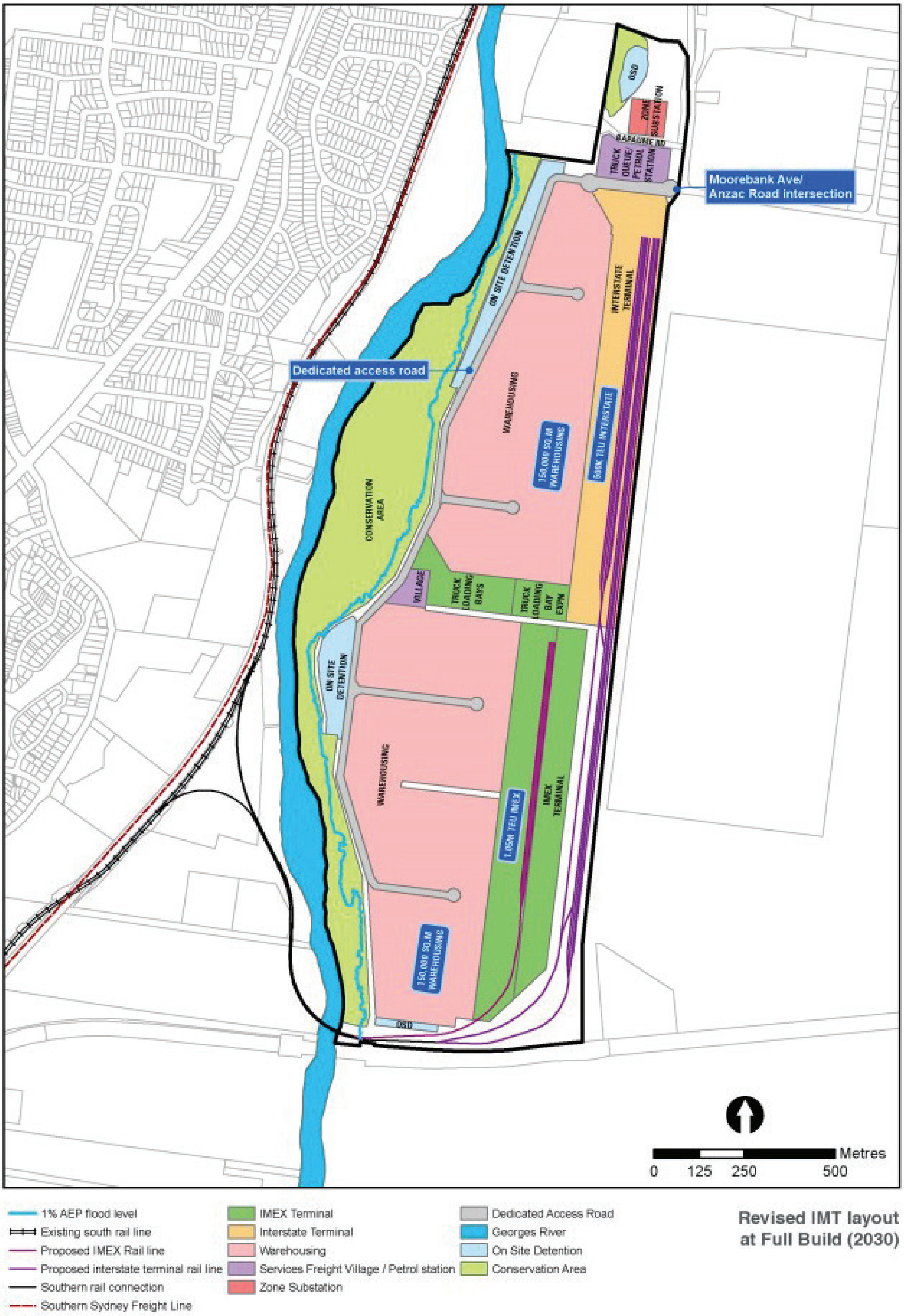

Figure 2: Revised Project – Indicative IMT Site Layout

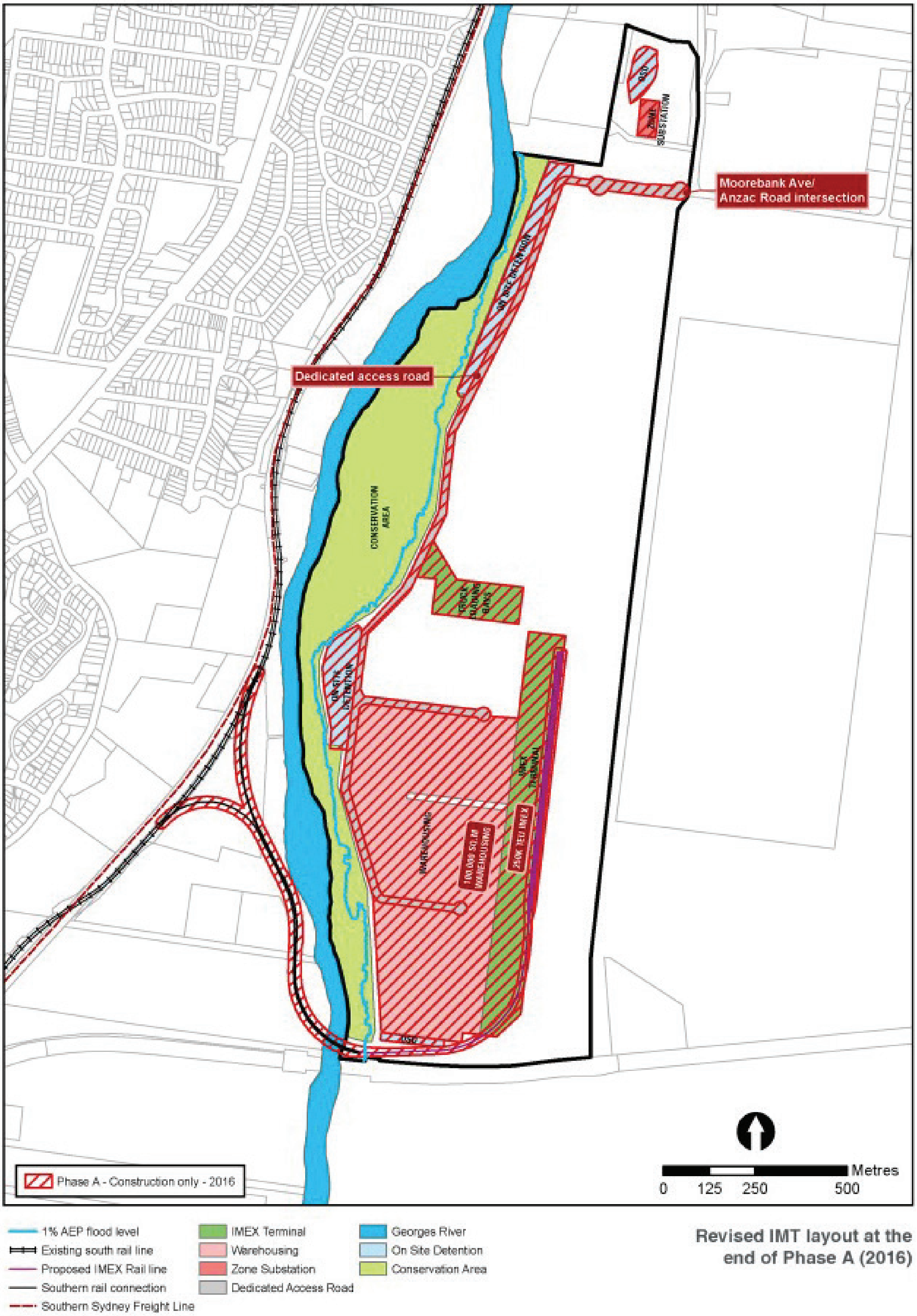

Figure 3: Revised Project – Scenario 1 (Phase A) Layout

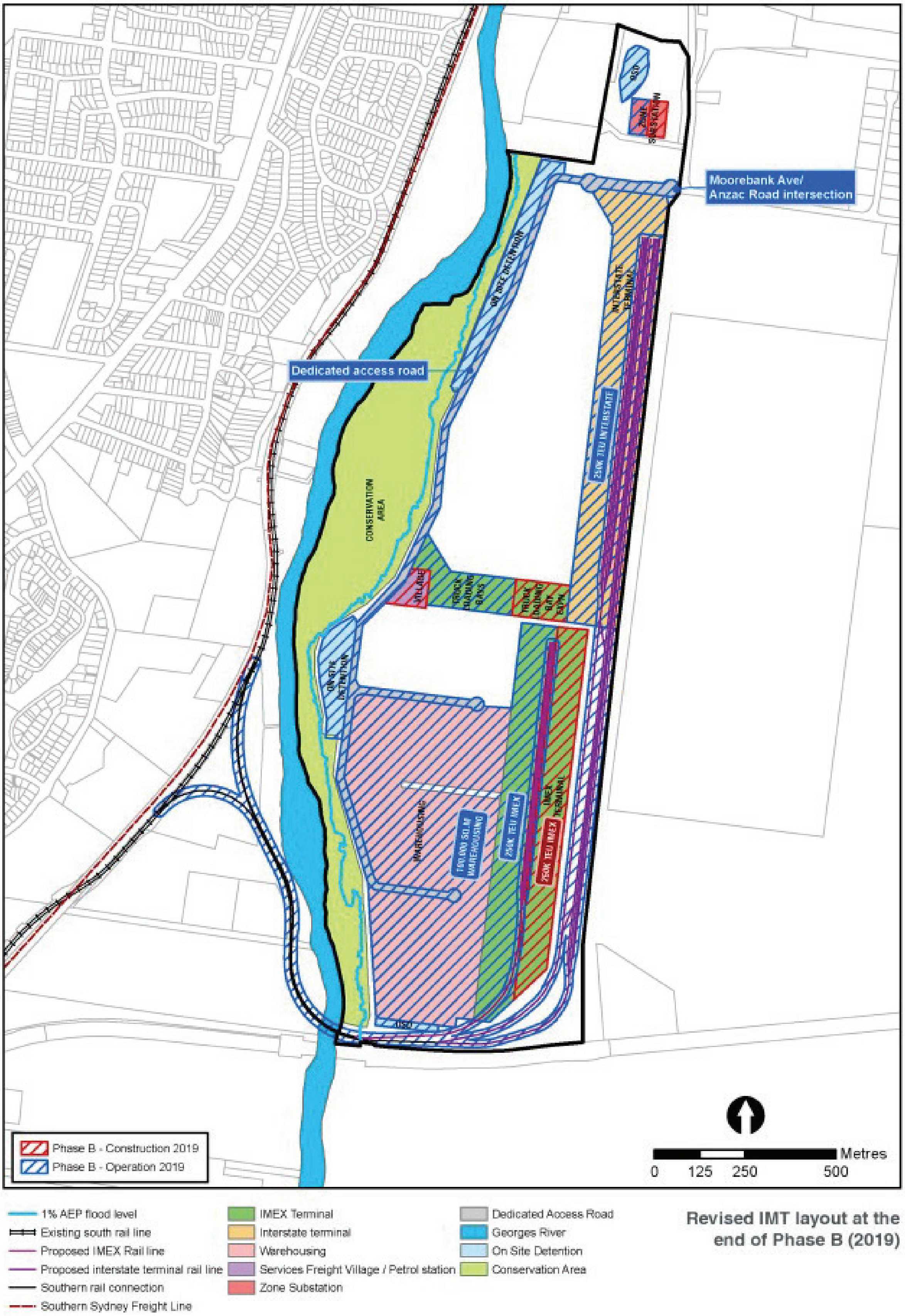

Figure 4: Revised Project – Scenario 2 (Phase B) Layout

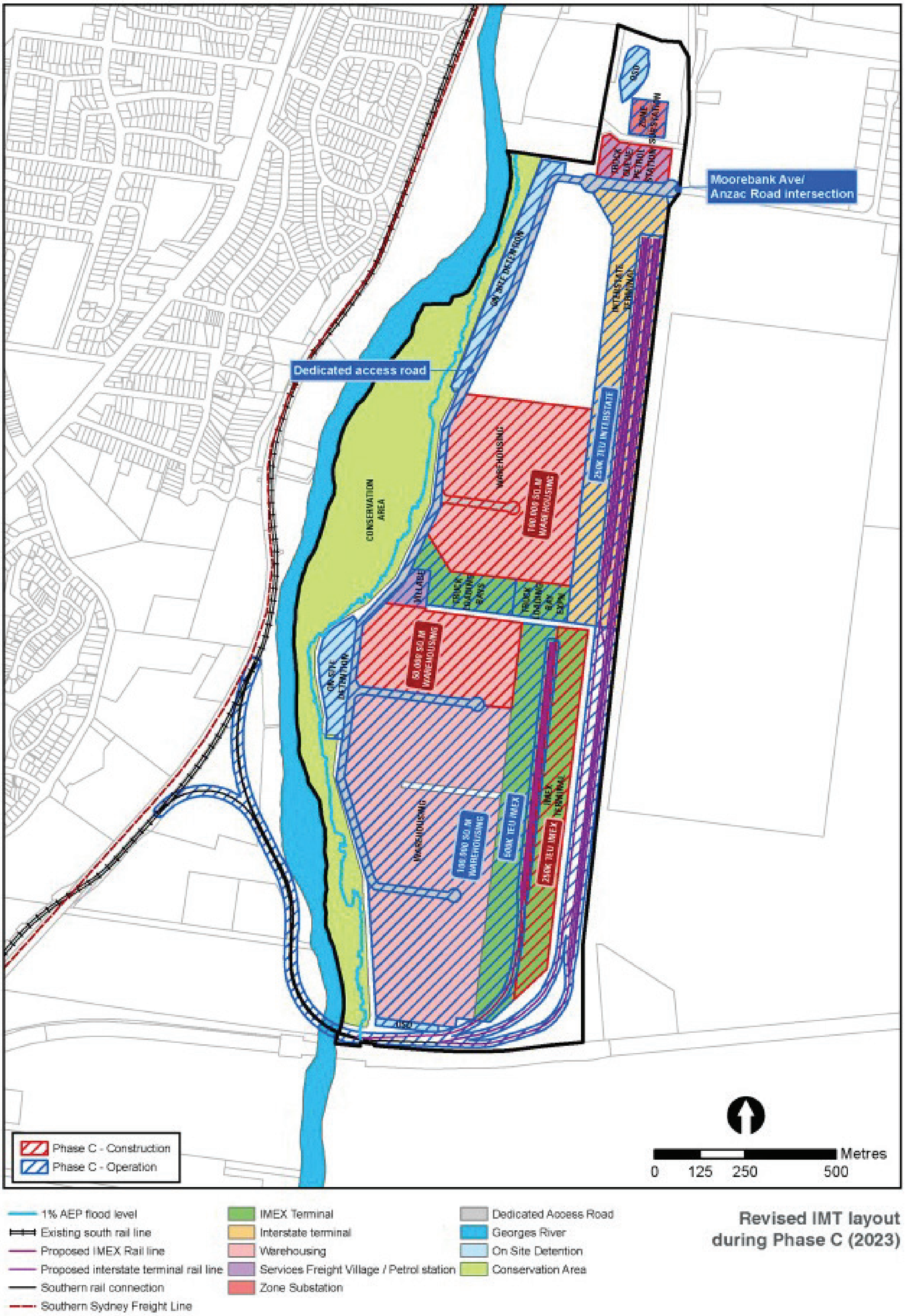

Figure 5: Revised Project – Scenario 2b (Phase C) Layout

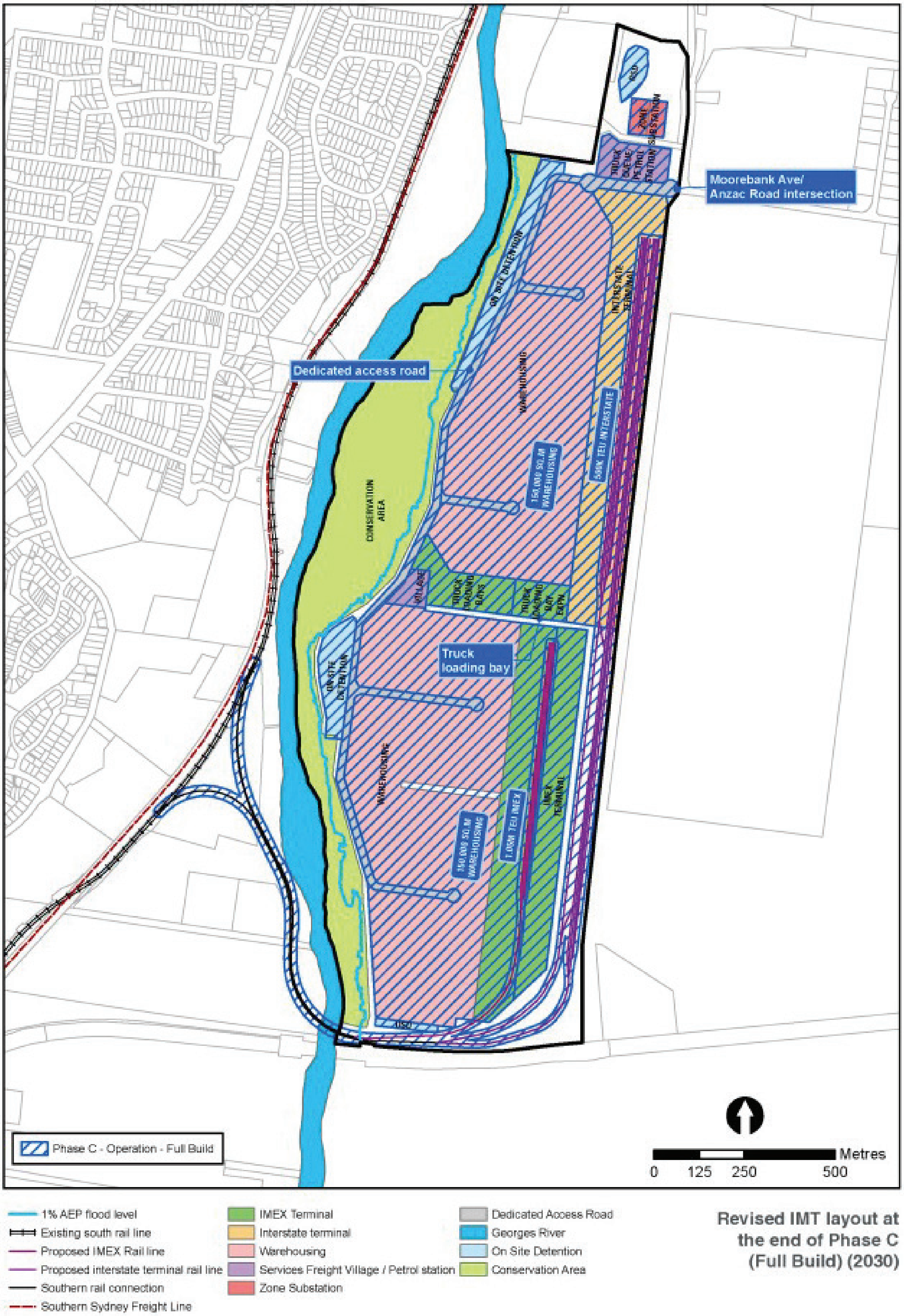

Figure 6: Revised Project – Scenario 3 (Full Build) Layout

3 Project setting

The Project setting, including the surrounding land use, topographic features and the assessment locations used are described in Section 3 of the EIS AQIA and are therefore not repeated in this report. The selected assessment locations are illustrated in **Figure 7**.

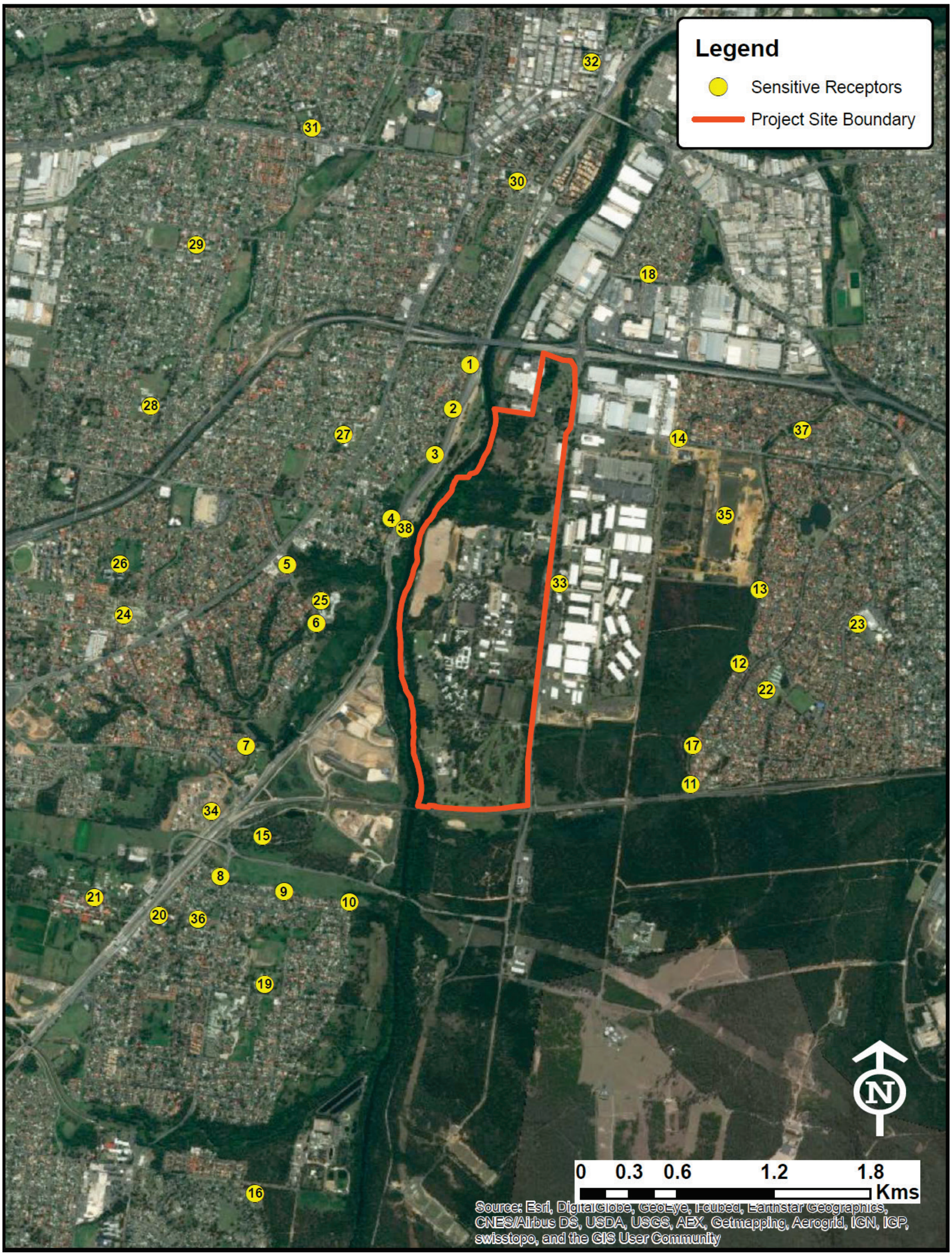

Figure 7: Surrounding Sensitive Receptor Locations

4 Air quality assessment criteria

The air quality assessment criteria are comprehensively documented in Section 4 of the EIS AQIA and are therefore not repeated in this report.

5 Baseline meteorology and air quality environment

The baseline meteorology and air quality environment at the Project site are comprehensively documented in Section 5 and Section 6 of the EIS AQIA respectively and are therefore not repeated in this report.

6 Emission estimation

Air emission sources associated with the construction and operation phases of the revised Project were identified and quantified through the application of National Pollution Inventory (NPI) and United States Environmental Protection Agency (US-EPA) AP-42 emission estimation techniques. The emission estimation techniques adopted in this assessment are the same as those used in the EIS AQIA.

Particulate releases were quantified for various particle size fractions. TSP emissions were estimated and used in the modelling to predict dust deposition rates. Fine particulate (PM_{10} and $PM_{2.5}$) emissions were estimated using ratios for the different particle size fractions available within the literature (principally the US-EPA AP-42), as documented in subsequent sections of this report. Gaseous products of combustion for which emissions were quantified were SO_2, NO_x, CO and VOCs (benzene, toluene, xylenes, 1,3-butadine, formaldehyde and acetaldehyde) and PAHs.

6.1 Emission scenarios

To assess the progressive development of the revised Project over a 15 year period, four emission scenarios have been developed, corresponding to development Phase A, Phase B, Phase C and Full Build (Full Build). **Table 1** provides a summary of each scenario.

Table 1: Project emission scenarios

Project Phase	Scenario ID	Construction	Operations
Phase A – 2016	Scenario 1	✓	
Phase B – 2019	Scenario 2a	✓	✓
Phase C – 2023	Scenario 2b	✓	✓
Full Build – 2030	Scenario 3		✓

6.2 Construction activities

Indicative earthworks totals for the three construction phases of the revised Project have been provided by Parsons Brinckerhoff and listed within **Table 2**. For comparison, the estimated earthworks totals applied for the southern rail access option scenario in the EIS AQIA are also presented in **Table 2**. The following points are noted from **Table 2**:

- In comparison with the EIS AQIA southern rail access option, earthwork activities are more evenly distributed between development Phase A and Phase B for the revised Project; and
- total earthwork amounts are comparable between the EIS AQIA and revised Project.

It is noted that the duration of each construction phase is expected to be two years. Material totals presented in **Table 2** were divided by two to calculate annual construction phase emissions.

Table 2: Bulk earthworks estimates – Revised Project vs Southern rail access option (EIS)				
Item	**Phase A**	**Phase B**	**Phase C**	**Total**
Revised Project Construction				
Total excavated cut (m^3)	559,827	598,191	431,490	1,589,508
Total fill required (m^3)	312,468	405,456	197.000	914,924
Excavated material for disposal (unsuitable for use on-site) (m^3)	427,129	468,499	320,914	1,216,542
Import required (m^3) (fill required – acceptable material)	N/A	23113	N/A	23113
Southern rail access option				
Total excavated cut (m^3)	640,840	480,980	434,430	1,556,250
Total fill required (m^3)	367,740	228,170	369,100	965,010
Excavated material for disposal (unsuitable for use on-site) (m^3)	485,210	365,440	330,080	1,180,730
Import required (m^3) (fill required – acceptable material)	N/A	N/A	108,444	108,444

6.2.1 Dust emissions

Air pollutant emissions during the construction phase will largely comprise of particulate matter (TSP, PM_{10} and $PM_{2.5}$). Particulate matter emission sources associated with construction activities at the Project site would include:

- vehicle movements on paved and unpaved roads;
- erosion of stockpiles and freshly exposed areas on-site;
- handling, transfer and storage of materials;
- heavy earthwork operations such as excavation and earth moving activities; and
- re-contouring of land and soil exposure for reseeding.

Construction work would be undertaken between the hours of 7am and 6pm.

6.2.2 Vehicle emissions

During construction, emissions are likely to be associated with the combustion of diesel fuel and petrol by machinery and vehicles. The operation of on-site machinery during construction and general site operations would generate CO, NO_X, SO_2, particulate matter (PM_{10} and $PM_{2.5}$) and trace amounts of un-combusted hydrocarbons. The emission rates and impact potential will depend on a range of factors including the number and power output of the combustion engines, the quality of the fuel, and the age and condition of the combustion engines.

During construction, daily maximum truck trips to the Project site delivering equipment and materials as well as the removal of extracted materials are projected to total 695 for Phase A, 130 for Phase B and 180 for Phase C. Combustion emissions from these trucks have been included in the dispersion modelling assessment. A comparatively small number of other mobile sources (excavators, bulldozers, scrapers) would be operating on-site each day, however it is expected that very low levels of combustion emissions would be generated by these activities. Such sources have therefore not been considered further in this assessment.

6.2.3 Odour emissions

Part of the excavation works includes the removal of potentially contaminated soils from within the construction footprint. As a result of the contaminated soils being exposed to the ambient air environment there is potential for some odorous emissions to be released. On-site surveys of the soils identified that there were few volatile contaminants and odorous compounds detected (Parsons Brinckerhoff 2014b). The primary contamination was asbestos and heavy metals.

Additionally, it is noted that the proposed rail access option of the revised Project would involve construction activities occurring on land currently occupied by the Glenfield Landfill. It is understood that the Glenfield Landfill involves the disposal of inert material such as building and construction waste and smaller quantities of garden and timber waste but not the disposal of putrescible waste, limiting the potential for odourous emissions if the area is excavated.

Prior to the commencement of construction activities on land within the Glenfield Landfill site, a comprehensive construction management plan, with specific focus on the control and minimisation of odour emissions, would be prepared.

Overall, odorous emissions are not expected to significant during excavation works related to the revised Project.

6.3 Operational activities

The main air emission sources during the operation phase of the revised Project include:

- emission from locomotives entering/exiting and idling at the Project site;
- switch engines transporting wagons and idling;
- emissions from mobile on-site equipment, including in-terminal transport vehicles (ITV), sidepicks and forklifts;
- emissions from off-terminal transport vehicles (OTVs) entering/exiting and idling at the Project site;
- emissions from petrol and diesel vehicles (e.g. trucks, cars);
- miscellaneous emission sources (e.g. fuel and chemical storage); and
- LNG-fired heating/cooling of warehousing areas.

A list of operations-related equipment by Project phase is presented in **Table 3**. It is noted that these equipment numbers are unchanged from **Table 22** of the EIS AQIA.

Table 3: Operations phase equipment schedule

Equipment type	Fuel type	Early Works / Phase A	Phase B	Phase C	Full Build
Working track Rail Mounted Gantry (RMG)	Electric	1	1	4	9
RMG	Electric	2	2	10	16
Side pick	LNG	2	2	4	6
ITV	LNG	5	5	26	53
Bomb cart	n/a	4	4	21	47
Yard chassis	n/a	2	2	18	23
Switch engine	Diesel	1	1	2	3
Forklift	LNG	0	0	34	34

6.3.1 Emissions from diesel locomotives and switch engines

Air emissions would be generated from diesel fuel combustion by freight train locomotives travelling to and from the IMEX and interstate terminals and the switch engines used to transport the wagons within the working tracks.

Locomotive and switch engine emissions would include particulate matter fractions (TSP, PM_{10} and $PM_{2.5}$), CO, CO_2, NO_x, SO_2, VOCs and PAHs.

6.3.2 On-site mobile equipment

On-site mobile emission sources would likely include forklifts, side picks and ITVs. This equipment would be used to transport the TEUs to the warehousing facilities and container storage facilities. Forklifts would be limited to the warehouses and would not be required until Phase B of the Project when the warehousing facilities become operational. The side picks and ITVs would be operating throughout the site.

All forklifts, side picks and ITVs engines will be powered by liquefied natural gas (LNG). Emissions from LNG equipment will include NO_X, $PM_{2.5}$, CO, VOCs and PAHs.

6.3.3 OTVs, diesel and petrol vehicles

Emissions are anticipated to arise from the combustion of diesel and petrol fuel by delivery trucks, heavy goods vehicles, and employee and visitor cars entering and leaving the Project site. The estimated number of vehicles that would enter the site is presented in **Table 4**. For comparison, the estimated vehicle movements applied for the southern rail access option scenario in the EIS AQIA are also presented in **Table 4**.

Table 4: Maximum hourly and daily traffic movements

Revised Project	Maximum traffic movements (one way) by operations area and vehicle type						
	Period	IMEX		IS		Warehousing	
		HV	LV	HV	LV	HV	LV
Phase B	Hourly	30	8	-	-	27	10
	Daily	326	131	-	-	290	755
Phase C	Hourly	61	16	33	16	40	10
	Daily	651	168	355	131	426	755
Full Build	Hourly	127	32	54	32	76	20
	Daily	1,363	337	576	261	822	2,264
EIS AQIA (Table 23)	**Maximum traffic movements (one way) by operations area and vehicle type**						
	Period	**IMEX**		**IS**		**Warehousing**	
		HV	**LV**	**HV**	**LV**	**HV**	**LV**
Phase B	Hourly	30	16	-	-	16	10
	Daily	710	168	-	-	387	755
Phase C	Hourly	63	32	-	-	35	20
	Daily	1,506	337	-	-	822	1,887
Full Build	Hourly	62	32	25	32	82	20
	Daily	1,516	337	565	261	1,963	2,264

Note: HV = Heavy Vehicle, LV = Light Vehicle

It is noted that for heavy vehicles servicing the Project, the comparable peak hourly traffic flows for the revised Project are higher than those applied in the EIS AQIA; however the daily total traffic flows are lower. The light vehicle movements are generally comparable between the two Project designs.

Combustion emissions from the OTVs and passenger vehicles include NO_x, PM_{10}, $PM_{2.5}$, SO_2 and CO, VOCs and PAHs.

6.3.4 Miscellaneous emissions

Emissions could be generated by fugitive releases from fuel and chemicals stored on-site (e.g. LNG, diesel, lubricant oils, cleaning chemicals), however these emissions are likely to be minor relative to fuel combustion emissions and have not been considered further.

Some minor odour emissions may be generated as part of the revised Project's general operation, primarily associated with an on-site sewage treatment plant. Details relating to the on-site sewage treatment plant were not available for assessment at the time of reporting. It is proposed that the on-site sewage treatment plant would be minor in size, servicing only the Project site. In order to minimise potential odour impacts to the surrounding environment, the on-site sewage treatment plant would be located at an appropriate buffer distance from surrounding sensitive receptors and integrate modern plant design and odour emission treatment technologies. Odour emissions from an on-site sewage treatment plant have not been considered further in this assessment and would be considered in detail at a future design stage.

6.4 Emissions summary

Full details relating to the calculated Project emissions are provided in **Appendix A**.

Summaries of total annual estimate emissions for each phase of the revised Project are presented in **Table 5**. Further, a breakdown of estimated annual construction and operational emissions by Project phase is presented in **Table 6** and **Figure 8**.

These tables and figures highlight the following, which are consistent with the findings of the EIS AQIA:

- emissions of TSP and PM_{10} are higher during the construction phases of the Project and are greatest during Phase A; and
- diesel combustion related pollutants (specifically $PM_{2.5}$, NO_x, SO_2, CO, VOCs and PAHs) emissions increase in line with increasing operations between Phase B and Full Build.

In comparison to the southern rail access option emissions inventory from the EIS AQIA, the revised Project design emissions inventory differs in the following ways:

- emissions of TSP, PM_{10} and $PM_{2.5}$ are higher for Phase A and B and lower for Phase C and D. The primary cause of increase in emissions is the increased unpaved haulage distance assumed for Phase A and the increased material handling applied for Phase B; and
- combustion pollutants are in general lower for the revised Project design, however the difference is considered relatively minor. The primary reason for this difference is the reduction in daily maximum traffic flow leaving/arriving site.

Table 5: Annual total Emissions by layout option (kg/annum)

Operational phase	TSP	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOCs	PAHs
Revised Project								
Scenario 1	67,095.6	18,842.1	2,519.4	5,978.6	6.8	2,253.7	332.4	3.4
Scenario 2a	32,609.7	11,063.4	3,237.3	81,866.4	100.6	56,286.8	20,621.6	9.6
Scenario 2b	23,729.2	9,645.5	4,428.1	173,286.7	185.7	170,994.5	63,892.0	12.8
Scenario 3	7,372.1	7,372.1	7,232.1	256,921.4	247.1	263,889.8	122,659.6	19.0
Southern Option – EIS AQIA								
Phase A	40,845.7	13,386.8	2,396.1	21,668.7	24.6	8,168.8	1,202.5	9.6
Phase B	26,112.9	9,988.9	3,671.8	98,454.1	126.1	38,675.6	11,417.9	19.0
Phase C	29,352.6	13,391.2	6,279.8	146,128.3	136.3	180,549.2	67,898.8	10.6
Full Build	7,691.0	7,691.0	7,551.4	262,224.4	246.5	289,794.3	133,083.5	18.9

Table 6: Annual calculated emissions summary – Revised Project

Pollutant	Construction emissions (kg/annum)	Operations emissions (kg/annum)	Total emissions (kg/annum)
Scenario 1			
TSP	67,359.6	-	67,359.6
PM_{10}	19,106.0	-	19,106.0
$PM_{2.5}$	2,775.4	-	2,775.4
NO_x	15,684.0	-	15,684.0
SO_2	17.8	-	17.8
CO	5,912.7	-	5,912.7
VOC	870.4	-	870.4
PAH	6.9	-	6.9
Scenario 2a			
TSP	31,273.4	1,600.2	32,609.7
PM_{10}	9,727.2	1,600.2	11,063.4
$PM_{2.5}$	1,923.7	1,569.7	3,237.3
NO_x	21,875.1	80,748.5	81,866.4
SO_2	24.8	99.3	100.6
CO	8,246.6	55,864.8	56,286.8
VOC	1,213.9	20,559.0	20,621.6
PAH	9.7	8.6	9.6
Scenario 2b			
TSP	20,686.4	3,306.8	23,729.2
PM_{10}	6,577.9	3,331.6	9,645.5
$PM_{2.5}$	1,421.1	3,263.0	4,428.1
NO_x	3,377.7	172,078.0	173,286.7
SO_2	3.2	184.5	185.7
CO	1,061.6	170,614.7	170,994.5
VOC	156.9	63,835.2	63,892.0

Table 6: Annual calculated emissions summary – Revised Project

Pollutant	Construction emissions (kg/annum)	Operations emissions (kg/annum)	Total emissions (kg/annum)
PAH	0.5	11.9	12.8
Scenario 3			
TSP	-	7,372.1	7,372.1
PM_{10}	-	7,372.1	7,372.1
$PM_{2.5}$	-	7,232.1	7,232.1
NO_x	-	256,921.4	256,921.4
SO_2	-	247.1	247.1
CO	-	263,889.8	263,889.8
VOC	-	122,659.6	122,659.6
PAH	-	19.0	19.0

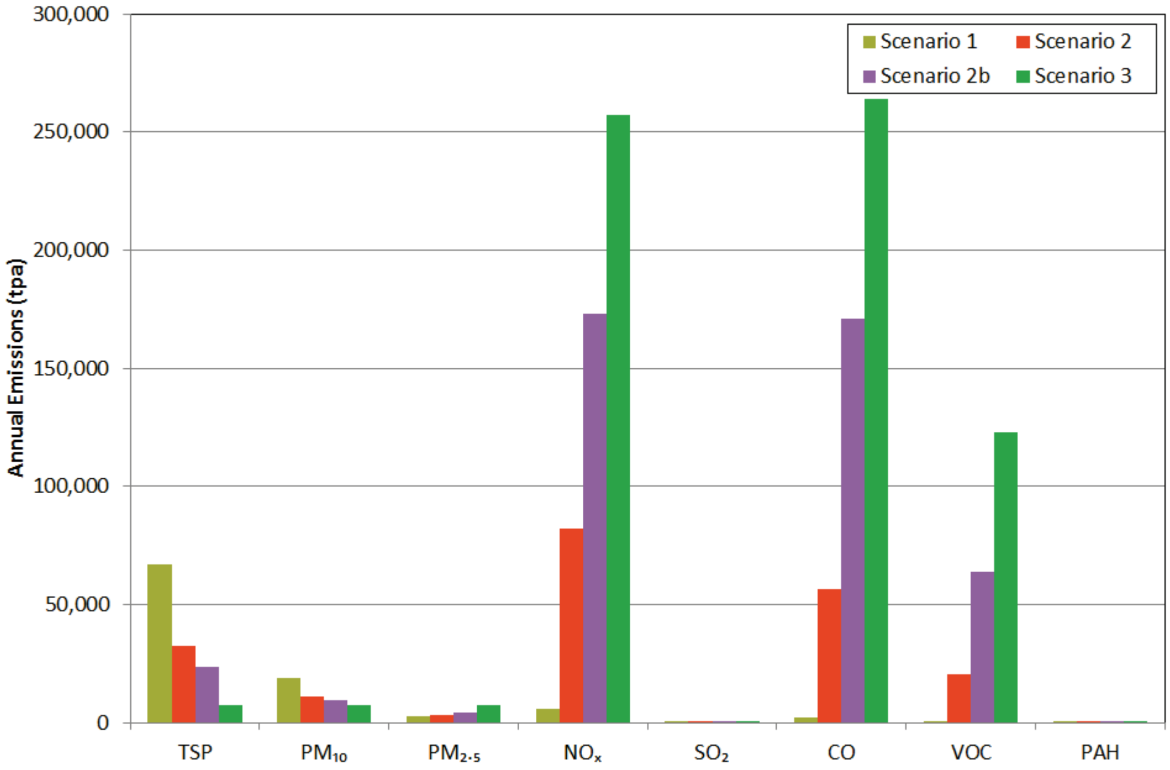

Figure 8: Annual emissions – Revised Project

7 Air Dispersion Modelling

The AERMOD model that was used for the EIS AQIA was configured and run to account for the revised Project layout and predict particulate matter and combustion-related concentration. The model configuration applied in this report is consistent with **Section 9** of the EIS AQIA.

The results of the modelling conduted in the EIS AQIA highlighted that for all phases of all site access options assessed (northern, central and southern), exceedance of State and Federal air quality impact assessment criteria and advisory goals would not occur at surrounding sensitive receptors. Additionally, the modelling results demonstrated that the predicted impacts at surrounding receptors would be comparable between each site configuration option at the same Project phase (e.g. Phase A for northern, central and southern rail access options).

As highlighted in **Section 6**, annual calculated emissions for TSP and PM_{10} are greatest in Phase A, while Full Build represents the peak phase for all other pollutants. Furthermore, annual calculated emissions from the revised Project are higher for Phase A and comparable for Full Build relative to annual emissions for the EIS AQIA.

On the basis of these points, it is considered that the phases with the greatest potential for air quality impacts from the revised Project were the Phase A and Full Build. These are representative of assessment Scenarios 1 (during Phase A; see **Figure 3**) and assessment Scenario 3 (Full Build) (see **Figure 6**). Consequently, dispersion modelling was conducted for these two scenarios only.

Dispersion simulations were undertaken and results analysed for TSP, PM_{10}, $PM_{2.5}$, dust deposition, SO_2, NO_2, CO, VOCs (benzene, toluene, xylenes, 1,3-butadine, formaldehyde and acetaldehyde) and PAHs. It is noted that predictions of TSP and dust deposition impacts for Full Build operations (Scenario 3) were not included in the assessment as the major source of coarse dust emissions would arise during construction and not operational activities.

The results are presented in the following formats:

- discussion of key results for each modelling scenario in **Section 8**;
- tabulated results of concentrations and dust deposition rates at the selected assessment locations are presented in **Appendix B**; and
- isopleth plots, illustrating spatial variations in Project-related incremental concentrations for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix C**.

Isopleth plots of the maximum 1-hour and 24-hour average concentrations presented in **Appendix C** do not represent the dispersion pattern on any individual time period, but rather illustrate the maximum concentration that was predicted to occur at each model calculation point given the range of meteorological conditions occurring over the 2013 modelling period. It is noted that based on the modelling results presented in Section 8, PM_{10}, $PM_{2.5}$ and NO_2 are the most significant in comparison with applicable impact assessment criterion. Due to the large number of modelling scenarios and pollutants in this assessment, only plots of PM_{10}, $PM_{2.5}$ and NO_2 have been provided in **Appendix C**.

8 Dispersion modelling results

Air quality assessments undertaken in accordance with the Approved Methods for Modelling generally provide a conservative (upper bound) estimate of the potential for air quality impacts occurring due to a project.

During this assessment modelling scenarios were established for the Project to provide an upper bound assessment of Project-related air emissions and related risks, taking into account existing air quality.

8.1 Summary of modelling results

8.1.1 Scenario 1 – (during Phase A)

The results for Scenario 1 are presented within **Appendix B**. There were no exceedances of any NSW EPA criteria and NEPM advisory reporting goals predicted for the assessed particulate matter or combustion pollutants across all surrounding receptor locations for Phase A construction.

Incremental (Project-only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix C**.

8.1.2 Scenario 3 – Full Build

The results for Scenario 3 are presented within **Appendix B**. Air pollutant concentrations due solely to the Project were predicted to be within NSW EPA criteria and NEPM advisory reporting goals. The following criteria exceedance was predicted to occur due to cumulative concentrations during proposed Full Build activities, accounting for existing air quality:

- exceedance of the cumulative annual average $PM_{2.5}$ advisory reporting goal at R33.

No other exceedances were predicted across the remaining sensitive receptors for all pollutants assessed during Full Build Southern Option.

Incremental (Project-only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix C**.

8.2 Discussion of results

The following key points are taken from the modelling results generated for the revised Project:

- Project-only incremental concentrations and dust deposition rates for both phases modelled are below NSW EPA and NEPM advisory reporting goals at all receptor locations;
- No additional criteria exceedances, beyond those already in the baseline, are predicted for the cumulative (Project-only increment + background) 24-hour average PM_{10} or $PM_{2.5}$ concentrations;
- Cumulative annual average (Project-only increment + background) $PM_{2.5}$ is predicted to be exceeded a receptor R33 only for the Full Build operational intermodal facility. It is noted that the background concentration is elevated relative to the NEPM advisory reporting goal and contributes the majority of the cumulative concentration at R33.

- No other cumulative (Project-only increment + background) pollutant exceedances are predicted for any of the surrounding receptor locations for the two assessed scenarios.

In order to illustrate the difference between the results predicted for the southern rail access option in the EIS AQIA and the revised Project design, maximum predicted 24-hour average PM_{10} concentrations at each sensitive receptor location have been extracted and compared. Plots comparing these concentrations are presented in **Figure 9** and **Figure 10**.

It can be seen from these figures that for both Scenario 1 (during Phase A) and Scenario 3 (Full Build), for the majority of surrounding receptor locations the predicted concentrations do not vary significantly between the EIS AQIA and revised Project design. Where differences do occur, in particular at receptor R33 during Scenario 1, this is considered attributable to the variation in spatial distribution of emission sources about the Project site between the two iterations of the dispersion modelling (e.g. the relocation of site access road from the east of the site to the west).

The illustrated variation in predicted 24-hour average PM_{10} concentrations between the EIS AQIA and revised Project is reflected across all modelled pollutants. The conclusion of the revised Project design dispersion modelling remains unchanged from the EIS AQIA; specifically that no exceedance would occur in the surrounding environment, with the exception of R33, as a result of emissions from the revised Project.

As stated in Section 3.2 of the EIS AQIA, R33 corresponds to the former location of the Defence National Storage and Distribution Centre (DNSDC) headquarters. The DNSDC facility was relocated to the new site in 2014 and consequently this receptor is no longer an existing sensitive receptor location. As the future land use at the former DNSDC site is likely to be related to the SIMTA project, receptor location R33 has been retained within this assessment for completeness. The background annual average $PM_{2.5}$ concentration of 7.6 $\mu g/m^3$ is very close to the advisory reporting goal of 8 $\mu g/m^3$ and is the key contributing factor to the predicted exceedances at R33 (approximately 90% of total cumulative concentration at a minimum).

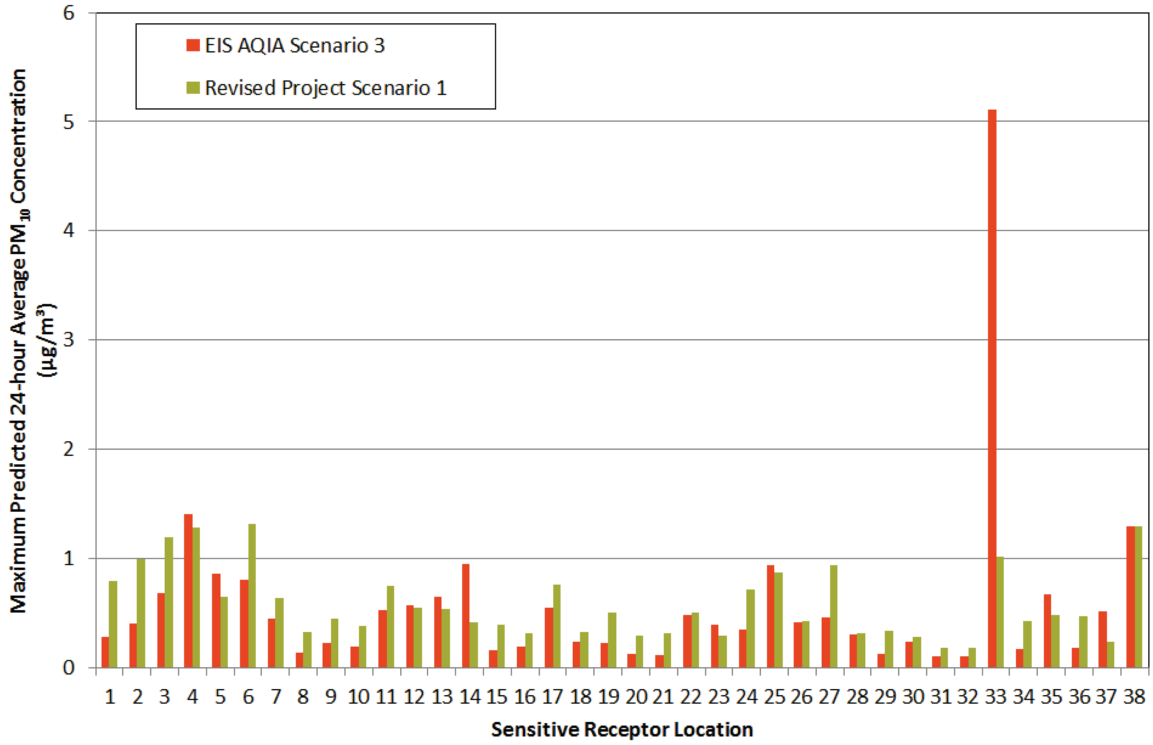

Figure 9: Comparison of maximum predicted 24-hour average PM_{10} concentration – Scenario 1 - EIS AQIA vs Revised Project design

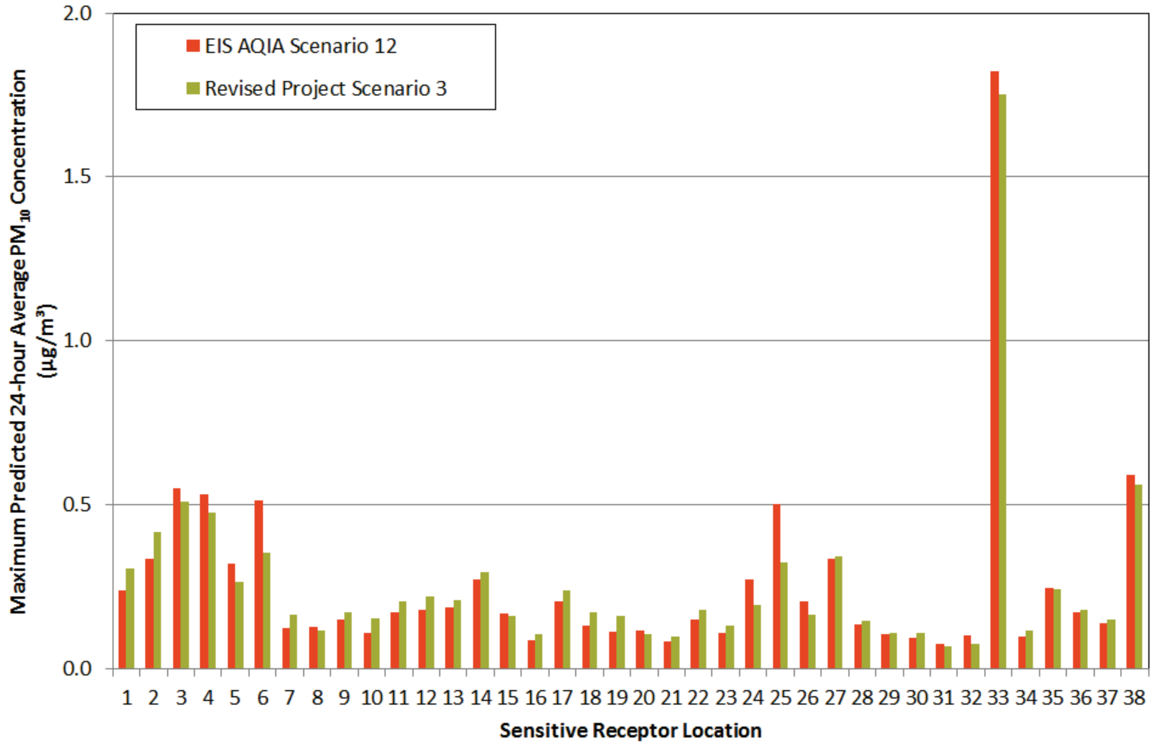

Figure 10: Comparison of maximum predicted 24-hour average PM_{10} concentration – Scenario 3 (Full Build) - EIS AQIA vs Revised Project design

9 Mitigation and management measures

Discussion regarding air pollution emission mitigation and management measures is provided in Section 11 of the EIS AQIA. It is noted that further assessment of the potential impacts of the Project and more detailed development of mitigation measures would be conducted during the detailed design phase of the Project.

10 SIMTA cumulative scenario

SIMTA is proposing to develop an IMT facility on the site currently occupied by the DNSDC on Moorebank Avenue, Moorebank. In light of this, the Environmental Assessment Requirements (EARs) require a cumulative assessment of the impacts that would occur in the event that both projects were developed. This chapter provides a description of the approach to the cumulative impact assessment of the Moorebank IMT Project and the proposed development on the SIMTA site and the potential impacts identified from the assessment.

10.1 Approach to cumulative impact assessment with the Moorebank IMT Project and the SIMTA development

The site for the SIMTA development is to the immediate east of the Moorebank IMT Project site and the two projects would, if both approved, operate simultaneously. In accordance with the EARs an assessment of potential cumulative impacts levels is required to assess these simultaneous operations.

The line capacity of the SSFL is likely to constrain the development and operational capacity of the two IMTs. Even assuming future upgrades are made to the line, including additional passing loops and intermediate signalling, the SSFL is likely to be capacity-constrained above a throughput of 1.7 million TEUs.

In order to assess cumulative impacts from operations at the two sites, accounting for the line capacity of the SSFL, the following two scenarios (presented in **Table 7**) have been developed:

Table 7: Cumulative Moorebank IMT and SIMTA assessment scenarios

Scenario	Moorebank IMT Project site	SIMTA Site
Cumulative Scenario A (scenario at 2030 Full Build)	• 1.05 million TEUs (IMEX facility) and 0.5 million TEUs (interstate facility) throughput capacity • 300,000 m^2 Warehousing	• 300,000 m^2 Warehousing
Cumulative Scenario B (scenario at 2030 Full Build)	• 0.5 million TEUs (interstate facility) throughput capacity • 300,000 m^2 Warehousing	• 1 million TEUs (IMEX facility) throughput capacity • 300,000 m^2 Warehousing
Cumulative Scenario C1 (interim scenario at 2020)	• 0.25 million TEUs (IMEX) and 0.25 million TEUs (interstate facility) throughput capacity • 100,000 m^2 Warehousing	• 0.25 million TEUs (IMEX facility) throughput capacity • 200,000 m^2 Warehousing
Cumulative Scenario C2 (scenario at 2030 Full Build)	• 0.55 million TEUs (IMEX) and 0.5 million TEUs (interstate facility) throughput capacity • 300,000 m^2 Warehousing	• 0.5 million TEUs (IMEX facility) throughput capacity • 300,000 m^2 Warehousing

An air quality impact assessment was conducted for the SIMTA site by Pacific Environment in 2013 (PEL, 2013). The SIMTA air quality impact assessment (PEL, 2013) assumed an operational scenario of 1 million TEU throughput capacity and 300,000 m^2 of on-site warehousing. Wherever possible, that assessment has been referenced to quantify emissions and impacts arising from the SIMTA site.

These cumulative modelling scenarios accounting for possible simultaneous operations have been assessed in order to provide the local community and assessment agencies with adequate information on potential cumulative impacts of developments on these two sites.

For the cumulative scenarios it is assumed that:

- With the exception of cumulative scenario C1, operations at the Moorebank IMT site are based on the Full Build configuration scenario;
- Cumulative scenario C1 assess an interim year and includes both construction and operation IMT emissions;
- both sites are assumed to be operational 24 hours a day seven days a week for operational scenarios; and
- Cumulative scenario A, B and C2 would consider cumulative operations of the two developments at year 2030 – when peak full build capacity is reached across the two

sites.. This allows for an assessment of potential 'worst case' impacts resulting from a number of configuration options for the two developments.

10.1.1 Cumulative SIMTA emissions

Emissions adopted in the EIS AQIA for Cumulative Scenario 1 and Cumulative Scenario 3, documented in Section 12 of that report, have been applied to Cumulative Scenario A and Cumulative Scenario B respectively. For full details of these emissions, the EIS AQIA should be reviewed.

It is noted that as the PEL (2013) SIMTA assessment only assessed PM_{10}, $PM_{2.5}$ and NO_2 concentrations, the cumulative modelling scenarios in this assessment only give attention to these three pollutants.

Emissions from the Moorebank IMT site are based on the emission calculations for the revised Project Full Build (2030 operations) presented within **Section 6**. Cumulative scenario A emissions are consistent with Scenario 3 emissions, while cumulative Scenario B has reduced emissions based on the described reduction in TEU throughput capacity.

Annual emissions for the Moorebank IMT and SIMTA sources for each of the three cumulative scenarios are presented in **Table 8**. The emissions presented in presented in **Table 8** were input into the dispersion model configured discussed in **Section 7**. Source locations and dimensions for the SIMTA site were input as presented in the PEL 2013 assessment.

Table 8: Calculated annual SIMTA emissions

Pollutant	Annual Emission (kg/annum)	
	Moorebank IMT Site	**SIMTA**
Cumulative Scenario A		
PM_{10}	7,372.1	3,752.8
$PM_{2.5}$	7,232.1	3,640.2
NO_x	256,921.4	37,843.2
Cumulative Scenario B		
PM_{10}	2,089.9	3,960.9
$PM_{2.5}$	2,057.8	3,842.1
NO_x	66,757.7	48,250.1
Cumulative Scenario C1		
PM_{10}	11,251.7	2,553.9
$PM_{2.5}$	3,420.0	2,477.3
NO_x	93,827.2	27,830.5
Cumulative Scenario C2		
PM_{10}	3,107.3	3,856.9
$PM_{2.5}$	3,038.1	3,741.1
NO_x	119,910.7	43,046.6

N.B. Cumulative Scenario C1 Moorebank IMT emissions contain construction and operational emissions

10.2 Summary of modelling results

10.2.1 Cumulative Scenario A

The results for the Cumulative Scenario A are presented within **Appendix D**. Air pollutant concentrations due solely to the combination of emissions from the two proposed operations were predicted to be within NSW EPA criteria and NEPM advisory reporting goals. The following criteria exceedances were predicted to occur due to cumulative concentrations due to the Cumulative Scenario A activities in combination with the existing air quality:

- one additional exceedance of the cumulative 24-hour average PM_{10} assessment criterion at R33;

- five additional exceedances of the cumulative 24-hour average $PM_{2.5}$ advisory reporting goal at R33; and
- exceedance of the cumulative annual average $PM_{2.5}$ advisory reporting goal at R33.

No other exceedances were predicted across the remaining sensitive receptors for all pollutants assessed during the Cumulative Scenario A. Incremental (cumulative SIMTA concentration only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix E**.

10.2.2 Cumulative Scenario B

The results for the combined Cumulative Scenario B are presented within **Appendix D**. Air pollutant concentrations due solely to the combination of emissions from the two proposed operations were predicted to be within NSW EPA criteria and NEPM advisory reporting goals. The following criteria exceedances were predicted to occur due to cumulative concentrations due to the Cumulative Scenario B activities in conjunction with the existing air quality:

- three additional exceedances of the cumulative 24-hour average $PM_{2.5}$ advisory reporting goal at R33; and
- exceedance of the cumulative annual average $PM_{2.5}$ advisory reporting goal at R33.

No other exceedances were predicted across the remaining sensitive receptors for all pollutants assessed during the Cumulative Scenario B. Incremental (cumulative SIMTA concentration only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix E**.

10.2.3 Cumulative Scenario C1

The results for the combined Cumulative Scenario C1 are presented within **Appendix D**. Air pollutant concentrations due solely to the combination of emissions from the two proposed operations were predicted to be within NSW EPA criteria and NEPM advisory reporting goals. The following criteria exceedances were predicted to occur due to cumulative concentrations due to the Cumulative Scenario C1 activities in conjunction with the existing air quality:

- one additional exceedance of the cumulative 24-hour average PM_{10} assessment criterion at R33;
- three additional exceedances of the cumulative 24-hour average $PM_{2.5}$ advisory reporting goal at R33; and
- exceedance of the cumulative annual average $PM_{2.5}$ advisory reporting goal at R33.

No other exceedances were predicted across the remaining sensitive receptors for all pollutants assessed during the Cumulative Scenario C1. Incremental (cumulative SIMTA concentration only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix E**.

10.2.4 Cumulative Scenario C2

The results for the combined Cumulative Scenario C2 are presented within **Appendix D**. Air pollutant concentrations due solely to the combination of emissions from the two proposed operations were predicted to be within NSW EPA criteria and NEPM advisory reporting goals. The following criteria exceedances were predicted to occur due to cumulative concentrations due to the Cumulative Scenario C2 activities in conjunction with the existing air quality:

- three additional exceedances of the cumulative 24-hour average $PM_{2.5}$ advisory reporting goal at R33; and
- exceedance of the cumulative annual average $PM_{2.5}$ advisory reporting goal at R33.

No other exceedances were predicted across the remaining sensitive receptors for all pollutants assessed during the Cumulative Scenario C2. Incremental (cumulative SIMTA concentration only) isopleth plots for PM_{10}, $PM_{2.5}$ and NO_x are presented in **Appendix E**.

10.3 Summary of impacts

The following key points are taken from the cumulative modelling results generated for the operations at the Moorebank IMT site and SIMTA site:

- Cumulative incremental (Moorebank IMT and SIMTA only) concentrations are below NSW EPA and NEPM advisory reporting goals at all surrounding receptor locations, for all assessed site configurations;
- Additional exceedance of the NSW EPA 24-hour average PM_{10} criterion and NEPM advisory reporting goal for 24-hour average $PM_{2.5}$ is predicted to occur at R33 when existing air quality is accounted for;
- Cumulative annual average (Moorebank IMT and SIMTA-only increment + background) $PM_{2.5}$ concentrations are in exceedance of the NEPM advisory reporting goal at receptor R33.
- Exceedance at R33 is attributable to the location of R33 directly amongst SIMTA site emission sources.
- No other cumulative (Moorebank IMT and SIMTA -only increment + background) pollutant exceedances are predicted for any scenario at any of the surrounding receptor locations.

In order to illustrate the difference between the results predicted for cumulative SIMTA scenarios within the EIS AQIA and the Revised Project design, maximum predicted 24-hour average PM_{10} concentrations at each sensitive receptor location have been extracted and compared. Plots comparing these concentrations are presented in **Figure 11** and **Figure 12**. It is noted that only Cumulative Scenario A and B were comparable with the cumulative scenarios in the EIS AQIA.

As was the case for the Project site emissions only (**Section 8**), for the majority of surrounding receptor locations the predicted concentrations arising from cumulative MIT/SIMTA site emissions do not vary significantly between the EIS AQIA and Revised Project design.

The illustrated variation in predicted 24-hour average PM_{10} concentrations between the EIS AQIA and Revised Project is reflected across all modelled pollutants. Dispite the minor differences in predicted concentrations, the conclusion of the Revised Project design dispersion modelling remains unchanged from the EIS AQIA; specifically that no exceedance would occur in the surrounding environment, with the exception of R33, as a result of emissions from the Project. It is reiterated that receptor R33 is located within SIMTA site emission sources.

It is considered that based on the magnitude of incremental concentrations predicted for all pollutants assessed at all surrounding receptors, excluding R33 which is located amongst SIMTA emission sources, the likelihood of adverse impacts in the surrounding environment arising from cumulative operations at the two sites is very low.

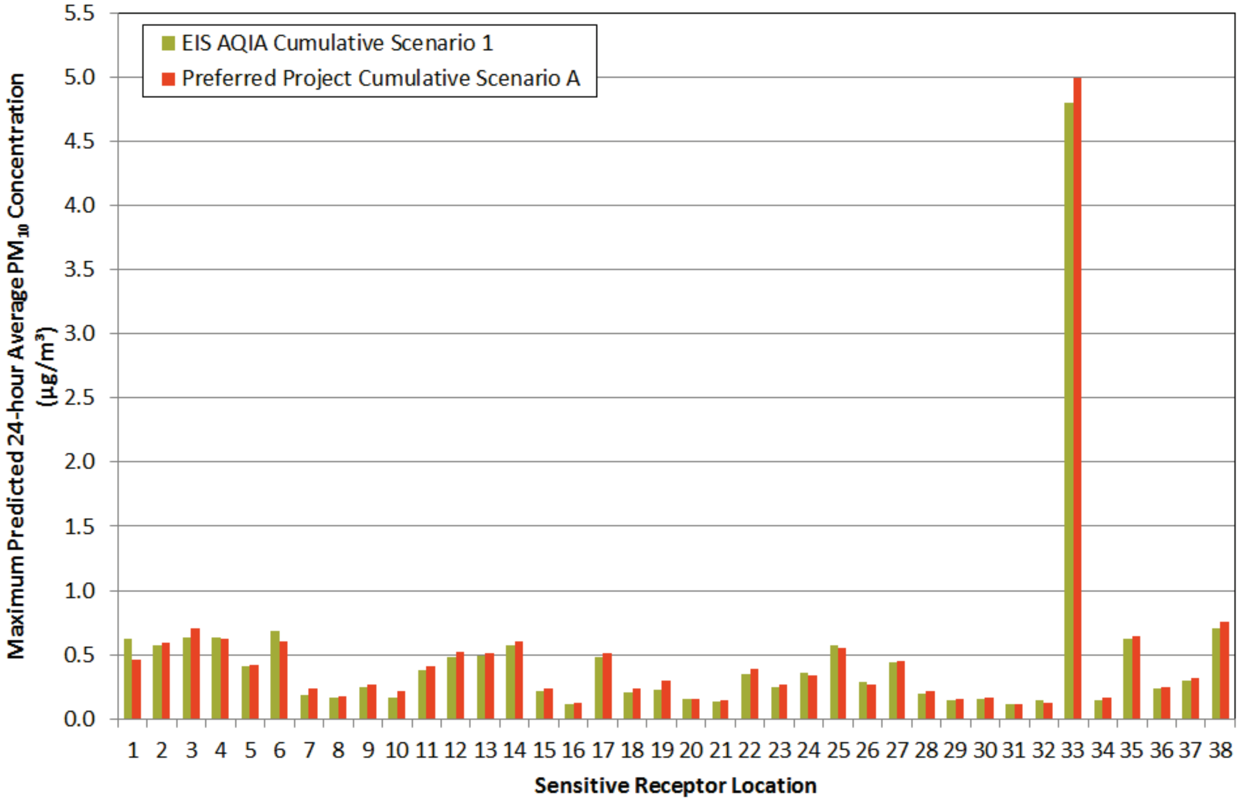

Figure 11: Comparison of maximum predicted 24-hour average PM_{10} concentration –- EIS AQIA cumulative SIMTA scenario 1 vs Revised Project design cumulative SIMTA scenario A

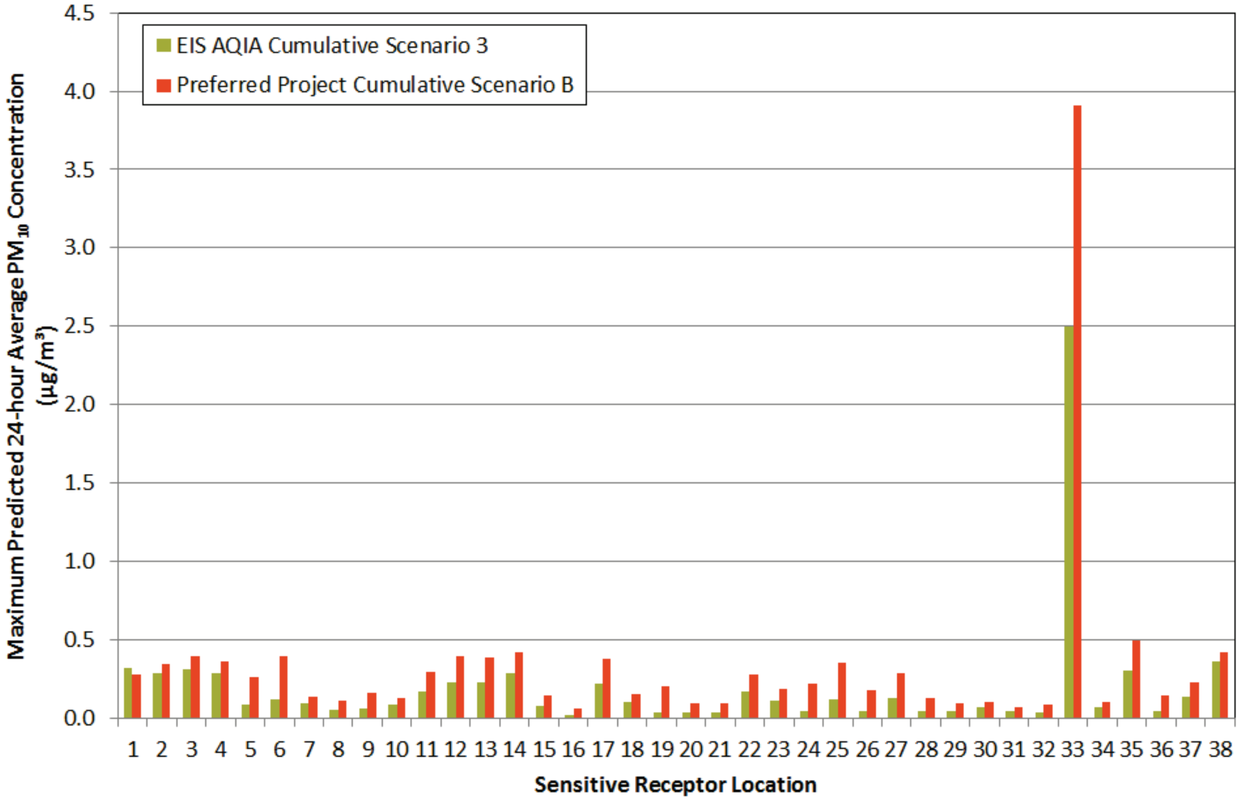

Figure 12: Comparison of maximum predicted 24-hour average PM_{10} concentration –- EIS AQIA cumulative SIMTA Scenario 3 vs Revised Project design cumulative SIMTA scenario B

11 Conclusions

ENVIRON was commissioned by Parsons Brinckerhoff undertake an AQIA of the revised Project design for the proposed Moorebank Intermodal Terminal.

This report has quantitatively assessed the potential local air quality impacts associated with the construction (Scenario 1, during Phase A) and operation (Scenario 3 Full Build) scenarios of the revised Project design. The assessment has drawn heavily on resources developed for the EIS completed for the Project in October 2014.

Dispersion modelling has been used to predict off-site incremental pollutant concentrations for the Project. Cumulative impacts were assessed by the pairing these incremental predicted concentrations with ambient air quality monitoring data from on-site and nearby OEH monitoring stations. Meteorological conditions used in the dispersion modelling were largely sourced from the OEH Liverpool monitoring station. The dispersion conditions for the area were characterised using available OEH and BoM meteorological data. Dispersion modelling was conducted using the US-EPA regulatory model AERMOD with ground level concentrations predicted for impacts for NO_2, CO, PM_{10}, $PM_{2.5}$, SO_2, TSP, deposited dust, VOCs and PAHs.

The findings of the assessment are summarised as follows:

- incremental (Project-only impacts excluding the contribution of ambient air quality) air pollutant concentrations and dust deposition rates associated with all modelled scenarios were predicted to be within NSW EPA criteria and NEPM advisory reporting goals at all surrounding receptor locations;
- taking elevated background airborne PM concentrations into account, no exceedances were predicted for cumulative 24-hour average PM_{10} and $PM_{2.5}$ beyond those already recorded due to bushfire events in 2013;
- exceedance of the annual average NEPM advisory reporting goal for cumulative $PM_{2.5}$ is predicted for one receptor (R33) in the Full Build scenario (Scenario 3). It is noted that this receptor was relocated in 2014, however has been retained for completeness. The likely future land use at R33 would be associated with the SIMTA project. The elevated ambient background is the key contributor to these exceedances; and
- all incremental cumulative and gaseous pollutants assessed are below applicable NSW EPA assessment criterion for all scenarios,

In addition to the assessment of emissions from the Project site, modelling was conducted to account for potential cumulative impacts of operations at the Project site and at the adjacent SIMTA site. Four cumulative assessment scenarios were developed accounting for possible future site configurations at the two sites. The findings of this cumulative assessment are as follows:

- cumulative incremental (Moorebank IMT and SIMTA only) concentrations are below NSW EPA and NEPM advisory reporting goals at all surrounding receptor locations;
- additional exceedance of the NSW EPA 24-hour average PM_{10} criterion and NEPM advisory reporting goal for 24-hour average $PM_{2.5}$ is predicted to occur at R33 when existing air quality is accounted for;

- cumulative annual average (Moorebank IMT and SIMTA only + background) $PM_{2.5}$ concentrations are in exceedance of the NEPM advisory reporting goal at receptor R33;
- the exceedances at R33 are attributable to the location of R33 directly within the SIMTA site emission sources; and
- no other cumulative (Moorebank IMT and SIMTA only + background) pollutant exceedances are predicted for any scenario at any of the surrounding receptor locations.

Predicted impacts from both the Project in isolation and cumulative operations at the Project and SIMTA sites presented within this report show minor varience from the impacts predicted in the EIS AQIA. The predictive dispersion modelling demonstrates that concentrations of most pollutants (TSP, PM_{10}, NO_x, CO, SO_2, benzene, toluene, xylene, 1,3-butadiene, acetaldehyde and PAHs) emitted from the Project would be below acceptable ambient air quality criteria and would not adversely affect the receiving environment. Exceedance of the $PM_{2.5}$ advisory reporting goals are predicted, but only at a receptor location that is marked for the SIMTA development.

Where the Moorebank IMT Project operates simultaneously with operations at the proposed SIMTA site, the air impacts are predicted to be greater than for the operation of the Moorebank IMT Project alone. It is considered that the improvement of engine standard compliance for the truck (Euro VI) and locomotive (minimum Tier 2) fleets servicing the Project would significantly reduce impacts associated with $PM_{2.5}$.

12 References

The following references were accessed in the preparation of this report and the EIS AQIA:

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13 Glossary of Acronyms And Symbols

$\mu g/m^3$	Micrograms per cubic metre
ha	Hectare
km/hr	Kilometres per hour
mg/m^3	Milligrams per cubic metre
m	Metre
m^2	Square metres
ppb	Parts per billion
ppm	Parts per million
ABB	Asea Brown Boveri
AMG	Australian Map Grid
AERMOD	AMS/US-EPA regulatory model
AQMP	Air Quality Management Plan
ARI	Annual Recurrence Interval
AWS	Automatic Weather Station
BACT	Best available control technology
BMP	Best management practice
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CEMP	Construction Environmental Management Plan
CO	Carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEC	Department of Environment and Conservation
DECCW	Department of the Environment, Climate Change and Water
Deposited dust	Any particulate matter that falls out from suspension in the atmosphere. This measurement is expressed in units of mass per area per unit time (e.g. g/m^2/month).
DGRs	Director General's Requirements
Defence	Department of Defence
DoE	Department of Environment
DoFD	Department of Finance and Deregulation
EARs	Environmental Assessment Requirements
EIS	Environmental Impact Statement
Fugitive dust	Dust derived from a mixture of sources (non-point source) or not easily defined sources. Examples of fugitive dust include dust from vehicular traffic on unpaved roads, materials transport and handling, and un-vegetated soils and surfaces.
GFA	Ground floor area
GMR	Greater Metropolitan Region
IAC	Impact assessment criteria
IMEX	Import/export
IMT	Intermodal Terminal
ITS	Intelligent Transportation Systems
ISC	Industrial Source Complex model
ITV	In-terminal vehicle
L	Monin-Obukhov length
LGA	Local Government Area
LNG	Liquefied Natural Gas
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Ambient Air Quality) Measure. National Environment Protection Measures are broad framework-setting statutory instruments defined under the (National Environment Protection Council (New South Wales) Act 1995). They outline agreed national objectives for

	protecting or managing particular aspects of the environment. NEPMs are similar to environmental protection policies and may consist of any combination of goals, standards, protocols, and guidelines.
NHMRC	National Health and Medical Research Council
NMHC	Non-methane hydrocarbons
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NSW	New South Wales
NSW DP&E	NSW Department of Planning & Environment
NSW EPA	NSW Environment Protection Authority
Nuisance dust	Dust which reduces environmental amenity without necessarily resulting in material harm. Nuisance dust comprises particles with diameters nominally from about 1 millimetre to 50 micrometre (microns).
OEH	Office of the Environment and Heritage
OEH	Office of Environment and Heritage
OLM	Ozone Limiting Method
Organic compounds	Organic compounds include (but not limited to) reactive organics, VOCs, SVOCs (semi), NHMC and PAHs
OTV	On the road trucks
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate matter
PM_{10}	Particulate matter less than or equal to 10 µm in aerodynamic diameter.
$PM_{2.5}$	Particulate matter less than or equal to 2.5 µm in aerodynamic diameter.
POEO Act	Protection of the Environment and Operations Act (1997)
POEO Regulations	Protection of the Environment and Operations Regulations (2010)
Project	Moorebank Intermodal Terminal
REL	Reference Exposure Level
RMG	Rail mounted gantry
SIMTA	Sydney Intermodal Terminal Alliance
SME	School of Military Engineering
SO_2	sulphur dioxide
SSD	State significant development
SSFL	South Sydney Freight Line
STP	Sewerage Treatment Plant
SWC	Sydney Water Corporation
TEOM	Tapered Element Oscillating Microbalance
TEU	Twenty foot equivalent unit
TSP	Total Suspended Particulates
TVOC	Total volatile organic compounds
UTM	Universal Transverse Mercator
VOCs	Volatile organic compounds

Appendix A

Project Emissions Inventory

Construction Assumptions

The following table presents the assumptions made in calculating the annual emission from the construction activities at the Project site.

Table A-1: Construction Phase Assumptions

Parameter	Phase A	Phase B	Phase C	Assumption / Reference
Annual equipment numbers (%)	100	100	100	Assumed that the maximum number of equipment will be operating during the whole year.
Material handled per year	50%	50%	50%	The construction will be staggered over a number of years. Therefore the total materials to be handled for each stage would be split to occur over a series of years within each stage.
Gross Vehicle mass of haul truck (t)	50	50	50	PB assumption
Silt content of haul road surface (%)	4	4	4	Assumed
Level of control for unpaved haul roads (%)	75	-	-	75% achieved through watering (OEH 2011). Assumed that no haul trucks would be travelling on unsealed roads by Phase B.
Haul truck distance travelled (km return trip)	6	6	6	Assumed
Haul truck distance travelled along Moorebank Ave (km)	1	1	1	Assumed. Distance from Project site to M5 Motorway
Haul road usage paved v unpaved (on-site)	25:75	100:0	100:0	Assumed that all roads would be paved by Phase B.
Material movements VKT (km)	Unpaved – 66,576 Paved – 22,576	Paved – 75,615	Paved – 54,093	Based on material required to be transported.
Construction footprint (ha)	39.9	40.1	26.1	Based on total area to be constructed during each stage.

Table A-1: Construction Phase Assumptions

Parameter	Phase A	Phase B	Phase C	Assumption / Reference
Area of exposed land at any one time (ha)	9.4	8.0	5.2	Assumed that 20% of the construction footprint would be exposed at any one time. This assumption is based on the high level mitigation that would be employed during construction.
Level of control for exposed surface (%)	30	30	30	It has been assumed that wind breaks (e.g. screening) will be employed to mitigate potential wind erosion.
Silt content of excavated material (%)	10	10	10	Assumed
Moisture content of excavated material (%)	8	8	8	Moisture content takes into account regular watering
Grader speed (km/hr)	8	8	8	Assumed
Active dozer time (%)	50	50	50	Assumed that 50% of the time the dozers will not be used.
Active grader time (%)	50	50	50	Assumed that 50% of the time the graders will not be used.
Level of control for loading/unloading (%)	0	0	0	No control adopted
Level of control for scraper (%)	50	50	50	50% control when soil is naturally or artificially moist. This would be achieved through regular watering (OEH 2011)
Level of control for graders (%)	50	50	50	50% control when soil is naturally or artificially moist. This would be achieved through regular watering (OEH 2011)
Level of control for dozers (%)	50	50	50	50% control when soil is naturally or artificially moist. This

Table A-1: Construction Phase Assumptions				
Parameter	**Phase A**	**Phase B**	**Phase C**	**Assumption / Reference**
				would be achieved through regular watering (OEH 2011)

Operational Assumptions

To compile an emissions inventory for proposed operations, the following general assumptions were made:

Table A-2: Operations Phase Assumptions		
Parameter	**Assumption**	**Reference**
Locomotive		
Locomotive Fleet	The locomotive fleet that would enter the Project has factored the upgrade of locomotives over time. US-EPA engine emission tiers have been used to classify the locomotive fleet. The following fleet has been adopted for each year: <table><tr><td>% of locomotives</td><td>Pre Tier 0</td><td>Tier 0</td><td>Tier 1</td><td>Tier 2</td></tr><tr><td>Phase B</td><td>81%</td><td>3%</td><td>16%</td><td>-</td></tr><tr><td>Phase C</td><td>50%</td><td>34%</td><td>16%</td><td>-</td></tr><tr><td>Full Build</td><td>-</td><td>-</td><td>50%</td><td>50%</td></tr></table>Assumptions: • No Tier 2 emission factors have been included for Phase B and C • 50% of locomotives have been upgraded to Tier 1 emission standards and the other 50% to Tier 2 by 2030.	OEH (2012)
Emission rates	• Emission rates for Locomotives are as per the US-EPA standard. Horse power based on the kW output as per those presented in Lilley (1996) for each notch speed. Idle bhp was assumed to be 20% of notch 1 power output.	US-EPA (2009); Lilley (1996)
$PM_{2.5}$ emission factor	US-EPA (2009) state that $PM_{2.5}$ emissions make up 97% of PM emissions from locomotives.	US-EPA (2009)
SO_2 emission factor	SO_2 emission factor assumes that all of the sulphur in the diesel fuel is converted to SO_2. Sulphur content of locomotive diesel in Australia is up to 10 ppm (0.001%). Density of diesel assumed to be 0.8361 kg/L.	Department of Environment Heritage and Water (DEHWA) (2008)
PAHs emission factor	PAH emission factors taken from the OEH GMR 2008 Emissions Inventory. This inventory in turn references Table C-5 (California low sulfur diesel) - Documentation for Aircraft, Commercial Marine Vessel, Locomotive, and other NonRoad Components of the National Emissions Inventory, Volume I – Methodology (Pechan, 2005).	EPA (2012)
VOCs	No VOC emission rate was available. It has been assumed that VOC	US-EPA (2009)

Table A-2: Operations Phase Assumptions

Parameter	Assumption	Reference
emission factor	emissions are equal to 1.053 times hydrocarbons (HC) emissions.	
Train speeds	• Stationary trains were assumed to be idling and not turned off. • Emission factors for trains entering and exiting the Project site were assumed to travel at Notch 1 (~20km/hr) trains speeds	Lilley (1996)
Idle times on-site	• IMEX – 5.3 hours per day • IS – 3 hours per day	IMT Project concept masterplan reference design
Enter/exit times	• IMEX – 20 minutes to enter/exit per day • IS – 20 minutes to enter, 1 hour to exit per day	IMT Project concept masterplan reference design
Locomotive numbers	• IMEX train – two locomotives per train • IS – four locomotives per train	IMT Project concept masterplan reference design
Switch Engines		
Switch engine	Assumed that 50% of the time that switch engine will be idling. The other 50% of the time the switch engine would be travelling around the site at approximately 20 km/hr.	Assumed
Emission rates	Based on US-EPA Tier 2+ emission factors. Power usage based on Lilley (1996). Idle bhp was assumed to be 20% of notch 1 power output.	US-EPA (2009); Lilley (1996)
$PM_{2.5}$ emission factor	US-EPA (2009) state that $PM_{2.5}$ emissions make up 97% of PM emissions from locomotives.	US-EPA (2009)
Mobile LNG Equipment		
Pollutant emission factor	• Emission factors for all LNG powered on-site equipment assumed to be the same due to similar engines being used. • Emissions assumed to be similar to >25 hp engine that complies with Tier 2 US emission standards. This includes forklifts and terminal vehicles (ITVs). • Side pick pollutant emission rates are assumed to be the same as those from a forklift.	US-EPA (2010)
PM_{10} emission factor	100% of LNG PM emissions are $<PM_{2.5}$. Therefore there are no PM_{10} emissions.	US-EPA (2010)
$PM_{2.5}$ emission factor	100% of LNG PM emissions are $<PM_{2.5}$.	US-EPA (2010)
SO_2 emission factor	No emission factor provided in US-EPA (2010). Assumed that any Sulphur present in LNG would be at trace concentrations and not considered a significant source of SO_2.	US-EPA (2010)
PAHs emission factor	No emission factor provided in US-EPA (2010). Assumed that any PAHs present in LNG would be at trace concentrations and not considered a significant source.	US-EPA (2010)
VOCs emission factor	Assumed that all hydrocarbons emitted are equivalent to VOCs	US-EPA (2010)
Engine power	• ITV – 160 hp	IMT Project concept masterplan reference design; Cummins (2012)

Table A-2: Operations Phase Assumptions

Parameter	Assumption	Reference
	• Forklift and side pick – 300 hp	
Load factor	• ITV – 0.5 (assumed have a similar load factor to an off highway truck) • Forklift – 0.2 • Side pick - 0.2 (have a similar load factor to a forklift)	DEHWA (2008b)
OTV Movements		
Pollutant emission factor	Base hot running exhaust emission factors for articulated trucks used (EPA, 2012), in addition to idling vehicle emission factors for Heavy-Duty Trucks (US-EPA, 2008). Fleet composition emission factors were calculated for each year assessed using the articulate truck age profile data documented within EPA (2012).	EPA (2012); US-EPA (2008)
Fuel consumption	Based the average articulated truck fuel consumption for 2010 was 56.2 L per 100 km	ABS (2011)
Power output	It has been assumed that 80% of the time trucks spend idling (~80hp) and the other 20% of the time the trucks are at maximum torque (i.e. ~200hp). This equate to 77.5 kW.	Mack (2012)
VKT	OTVs would travel 10 km/hr (factored to include idling time on-site)	PB assumption
Load factor	Load factor for OTV is 0.25	DEHWA (2008b)
Time	Assumed that each OTV spends 1 hour on-site	PB assumption
OTV numbers	The split between OTVs that would visit warehouses main (Zones 1 to 5) and Warehouses in Zone 6 is 88% and 12%, respectively. It has been assumed that 10% of OTVs will be early and therefore require use of the troubled parking area	Traffic Impact Assessment (PB 2012)
Passenger vehicles (diesel and petrol)		
Pollutant emission factor	• Diesel passenger vehicles emissions based on Table 9 - diesel vehicle (car) • Petrol passenger vehicles emissions based on Table 10 - petrol cars	DEHWA (2008b)
Fuel consumption	Diesel passenger fuel consumption is based on the average passenger vehicle fuel consumption for 2010 (13.8 L per 100 km)	ABS (2011)
Distance travelled on-site	Assumed that both petrol and diesel passenger cars would travel 400 metres on-site	n/a
Load factor	Load factor not required when vehicle used for on road purposes	DEHWA (2008b)
Vehicle split	The total passenger vehicles have been split in accordance with passenger vehicle fuel consumption for 2010: petrol – 84.1% and diesel – 15.9%	ABS (2011)

Construction Phase Particulate Matter Emission Factors Applied

The emission factor equations applied to construction phase activities within the assessment are documented in this subsection.

Table A-3: Construction Phase Emission Factors					
Emission Source	**Emission Factor**			**Emission Factor Unit**	**Source of Factor**
	TSP	**PM_{10}**	**$PM_{2.5}$**		
Grader	0.31	0.11	0.01	kg/VKT	AP-42 Table 11.9-2
Scraper	0.029	0.0073	0.0011	kg/t	AP-42 Table 11.9-4, $PM_{2.5}$ particle multiplier used AP-42 Ch 3.2.5
Dozer on Overburden	2.76	0.58	0.14	kg/hour	NPI Mining Equation 16/17 - Bulldozer on Material other than Coal
Excavator / Truck Loading / Unloading	0.00014	0.00007	0.00001	kg/tonne	AP-42 13.2.4 - Materials Handling Equation / NPI Mining Equation 10
Haulage - Unpaved	2.37	0.58	0.06	kg/Vehicle km Travelled	AP-42 13.2.2 - Unpaved Road Equation
Haulage - Paved	0.08	0.02	0.004	kg/Vehicle km Travelled	AP-42 13.2.1 - Paved Road Equation
Wind Erosion – Exposed Areas	850.0	425.0	63.8	kg/ha/year	AP-42 11.9 - Wind erosion of exposed areas factor

Details relating to the emission equations referenced in the above table are presented in the following sections.

Unpaved Roads Equation

The emissions factors for unpaved roads, as documented within AP42 Chapter 13.2.2 - “Unpaved Roads” (US-EPA 2006a), was applied as follows:

$$E = k\,(s/12)^a(W*1.1023/3)^b$$

Where:
E = Emissions Factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tonnes)

The following constants are applicable:

Constant	TSP (assumed from PM_{30})	PM_{10}	$PM_{2.5}$
K (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

The metric conversion from lb/VMT to g/VKT is as follows:

$$1\ lb/VMT = 0.2819\ kg/VKT$$

Paved Roads Equation

The emissions factors for paved roads, as documented within AP42 Chapter 13.2.2 -“Paved Roads” (US-EPA 2011), was applied as follows:

$$E = k\ (sL)^{0.91}(W)^{1.02}$$

Where:
E = Emissions Factor (g/VKT)
sL = road surface silt loading (g/m^2) – 0.4g/m^2 adopted from US-EPA 2011
W = mean vehicle weight (tonnes)

The following constants are applicable:

Constant	TSP (assumed from PM_{30})	PM_{10}	$PM_{2.5}$
k (g/VKT)	4.9	1.5	0.15

Materials Handling

Particulate matter emissions from material transfer operations were calculated through the application of the US-EPA predictive emission factor equation for continuous and batch drop loading and tipping operations (AP42, Section 13.2.4), given as follows:

$$E = k(0.0016) * \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right)$$

where,

E =Emissions (kg/tonne transferred)
U = mean wind speed (m/s)
M = material moisture content (%)
k = 0.74 for TSP, 0.35 for PM_{10} and 0.053 for $PM_{2.5}$
Emission rates were calculated on an hourly basis to reflect hourly variations in the wind field.

Bulldozing on Overburden Equation

The emissions factors for bulldozer operations were taken from the Emission Estimation Technique Manual for Mining (NPI, 2012).

Units	TSP	PM_{10}	$PM_{2.5}$
kg/hr	$\frac{2.6(s)^{1.2}}{(M)^{1.3}}$	$\frac{0.45(s)^{1.5}}{(M)^{1.4}} \times 0.75$	PM_{10} x 0.15

Where: s = material silt content (%)

M = material moisture content (%)

The $PM_{2.5}$ emission factor taken from $PM_{2.5}/PM_{10}$ ratios presented by Countess Environmental (2006) in the *WRAP Fugitive Dust Handbook.*

Operations Phase Emission Factors Applied

Operational phase emissions were estimated based on a range of published emission factor resources, including the following:

- Locomotives – Line-haul Emission Factors from *Emission Factors for Locomotives* (US-EPA 2009)
- Shunting engines – Switch Emission Factors from *Emission Factors for Locomotives* (US-EPA 2009)
- LNG ITV equipment – Spark-Ignition Engines >25hp from *Exhaust Emission Factors for Nonroad Engine Modeling – Spark-Ignition* (US-EPA 2010);
- OTV Idling – HDDV factors from *Idling Vehicle Emissions for Passenger Cars, Light-Duty Trucks, and Heavy-Duty Trucks* (US-EPA 2008)
- OTV Moving - Base hot running exhaust emission factors for articulated trucks - NSW EPA 2008 GMR Inventory
- Passenger vehicles – Factors for Diesel and Petrol cars from Emission Estimation Manual for Combustion Engines (NPI, 2008)
- LPG combustion for heating/cooling – Factors for Natural Gas combustion from Emission Estimation Manual for Combustion in Boilers (NPI, 2011)

A summary of emission factors applied to calculate operational phase emissions is presented in the following table.

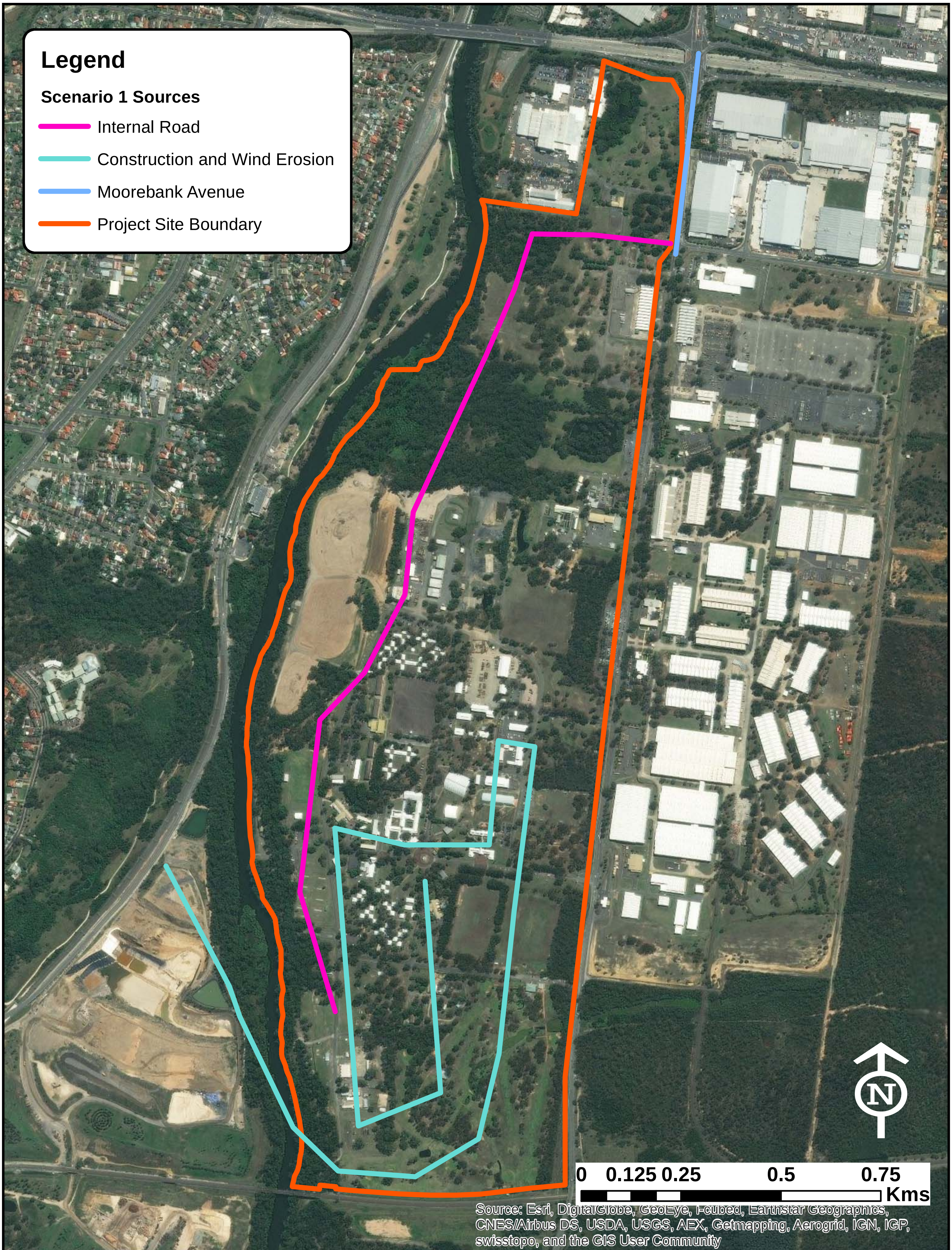
Table A-4: Operational Phase Emission Factors

Source	Factor Unit	Key Parameter	PM_{10}	$PM_{2.5}$	NO_x	SO_2	CO	VOC	PAH	Reference
Locomotive - Pre Tier 0	g/bhp-hr	Idling - 46bhp Low Speed (Notch 1) - 228hp	0.32	0.3104	13	0.020	1.28	0.48	0.0006	Factors - US-EPA 2009. Engine Power – Notch 1 Lilley 1996 Idling Power – 20% of Notch 1
Locomotive - Tier 0+	g/bhp-hr		0.2	0.194	7.2	0.012	1.28	0.3	0.0004	
Locomotive - Tier 1+	g/bhp-hr		0.2	0.194	6.7	0.012	1.28	0.29	0.0004	
Locomotive - Tier 2+	g/bhp-hr		0.08	0.0776	4.95	0.005	1.28	0.13	0.0002	
Shunting Engine	g/L diesel	34.2 L/hr	0.44	0.43	29.31	8.36	7.35	1.10	0.0036	Factors - US-EPA 2009
Truck Idling	g/hr	0.5 hr idling per truck	1.196	1.16012	33.763	0.049699	25.628	3.455	0.0000	Factors - US-EPA 2008
Truck Moving - Phase A	g/hr	1hr on-site per truck	1.04	1.010	43.25	0.043	9.85	1.61	0.027	Factors - NSW EPA 2008 GMR Inventory
Truck Moving - Phase B	g/hr	1hr on-site per truck	1.04	1.010	43.25	0.043	9.85	1.61	0.027	Factors - NSW EPA 2008 GMR Inventory
Truck Moving - Phase C	g/hr	1hr on-site per truck	0.47	0.4602	29.98	0.0197	1.92	0.45	0.0074	Factors - NSW EPA 2008 GMR Inventory
Truck Moving - Full Build	g/hr	1hr on-site per truck	0.44	0.428	29.15	0.018	1.49	0.38	0.006	Factors - NSW EPA 2008 GMR Inventory
Forklift	g/bhp-hr	300 Hp	0.05	0.0485	0.89	0	3.92	1.57	0	Factors - US-EPA 2010
ITV	g/bhp-hr	160 Hp	0.05	0.0485	0.89	0	3.92	1.57	0	Factors - US-EPA 2010
Sidepick	g/bhp-hr	300 Hp	0.05	0.0485	0.89	0	3.92	1.57	0	Factors - US-EPA 2010
Passenger Vehicle (diesel)	g/L diesel	0.0023 l/hour	2.08	1.98	6.69	0.0167	10.1	0.818	0.000319	Factors – NPI 2008
Passenger Vehicle (petrol)	kg/km	0.017 km/hr	8.03E-06	7.45E-06	0.0008	1.17E-05	0.00444	0.000292	6E-10	Factors – NPI 2008
LPG Gas Heating	Kg/GJ	6,900GJ/year	0.0036	0.0036	0.0828	0.00053676	0.0117	0.00268	0.00000031	Factors – NPI 2011

Emission Source Maps

The modelled location of emission sources for Scenario 1 and Scenario 3 are presented in Figure A1 and Figure A2 respectively. The following points are noted:

- All emission sources are volume sources distributed along the marked lines.
- Locomotive idling emissions are distributed across the Yard sources.
- Locomotive moving emissions are distributed across the Spur sources.
- Shunting emissions are distributed across the Yard sources.
- ITV, sidepick and forklift emissions are distributed across the Warehousing sources.
- All construction emissions (fugitive activities, haul truck movements, wind erosion) are distributed across the Construction and Wind Erosion sources.
- Truck traffic emissions are allocated along Internal Road and Moorebank Avenue emission sources.



ENVIRON

Scenario 1 Emission Source Locations

FIGURE
A1

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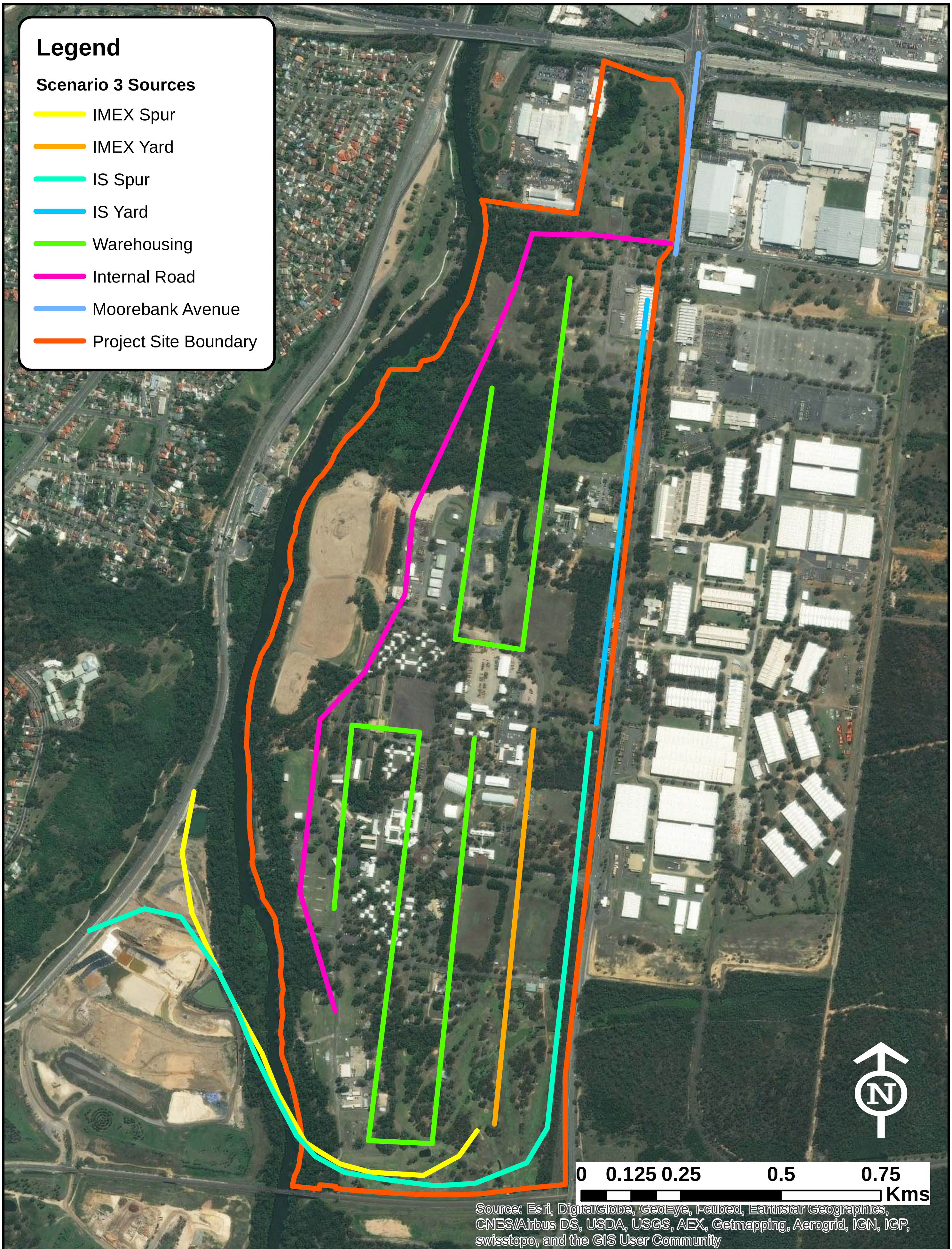

ENVIRON

Scenario 3 Emission Source Locations

FIGURE

A2

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Project AS121562