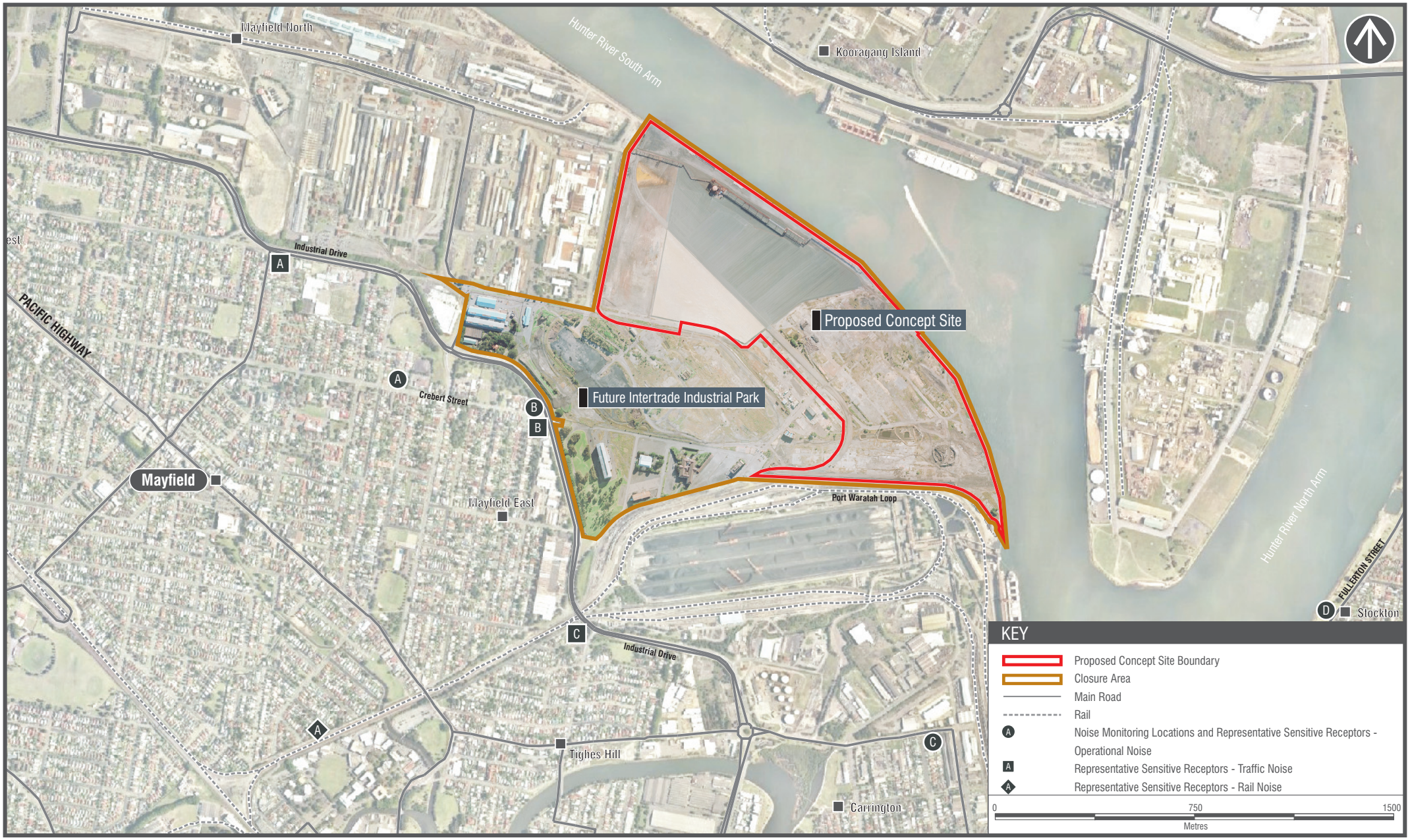

AECOM

SENSITIVE RESIDENTIAL RECEIVERS FOR NOISE

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-4

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Mayfield

Noise levels at residences to the west of the site, as represented by the Arthur Street noise monitoring location A, are subject to relatively constant noise levels throughout the day. An industrial noise contribution to the area of 45 dBA has been estimated based on site observations and noise measurements.

Noise levels at residences further to the south are represented by the Crebert Street noise monitoring location B. These residences are subject to significant levels of traffic noise associated with intermittent traffic, including trucks on Industrial Drive. An industrial noise contribution to the area of 40 dBA has been estimated based on site observations and noise measurements.

The noise data at this location has been processed to determine the following traffic noise descriptors which are likely to be indicative of noise at residences in the vicinity of Industrial Drive.

- $L_{Aeq(15\ hr)}$ – Day 66 dBA
- $L_{Aeq(9\ hr)}$ – Night 62 dBA

Carrington

Residences on the northern end of Carrington residential area, represented by noise monitoring location C, are subjected to industrial noise from nearby industry and to a lesser degree noise from the Carrington Coal Loader. These areas can be classified as an “urban/industrial interface”. A review of the noise data indicates that noise from industry is clearly noticeable during the day, whereby a noise contribution from industry of 57 dBA during the day and 54 dBA in the evening has been established.

Stockton

The western side of Stockton is adjacent to Kooragang Island which is a major industrial area. As such, industrial noise is present in the area. The noise contribution from existing industry in this area (location D) is in the order of 47 dBA.

9.3.2 Methodology

Noise Criteria

Industrial Noise Criteria

For sources such as the fixed plant associated with the facilities, appropriate noise criteria are specified in the INP. The INP recommends two criteria, “Intrusiveness” and “Amenity”, both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and becomes the dominant noise criteria.

Where noise levels are currently low, noise levels from the proposed operation are limited by the intrusiveness criterion. In general, the L_{Aeq} noise level from such sources should not exceed the RBL by more than 5 dBA. This is assessed over a typical worst case period of 15 minutes.

The amenity criterion sets an upper limit to control the total L_{Aeq} noise level from all industrial sources. For example, the potentially affected residences in Mayfield and Stockton are in an area which would be classified as “urban” and the relevant recommended “acceptable” amenity criteria for the $L_{Aeq,period}$ are 60, 50 and 45 dBA for daytime, evening and night time periods, respectively. The potentially affected residences in Carrington are in an area which would be classified as “urban/industrial interface” and the relevant recommended “acceptable” amenity criteria for the $L_{Aeq,period}$ are 65, 55 and 50 dBA for daytime, evening and night time periods, respectively.

Where noise levels from industrial sources are close to or above the acceptable levels then the amenity criterion, which incorporates a sliding scale to set limits, would apply. The sliding scale prevents the overall noise level exceeding the acceptable level due to the addition of a new noise source. Amenity criterion also needs to consider the possibility of other developments which may affect noise levels.

Table 9-40 presents applicable noise criteria for all surrounding receivers during the day, evening and night periods. As the most stringent noise criteria are based on the night period, compliance with criteria during this period would ensure compliance during all other periods.

Table 9-40: Project-Specific Noise Criteria at Residences

Location	Area	Intrusiveness $L_{Aeq,15min}$ (dBA)			Amenity $L_{Aeq,period}$ (dBA)		
		Day	Eve	Night	Day	Eve	Night
A - 1 Arthur Street, Mayfield	Urban	51	52	51	60	49	43
B - 2 Crebert St, Mayfield	Urban	54	47	45	60	50	43
C - 32 Elizabeth Street, Carrington	Urban / Industrial Interface	49	48	44	65	49	50[1]
D -Stockton	Urban	46	48	48	60	47	37

[1] The night time amenity noise criterion is higher than the evening criterion at Carrington due to the fact that there is currently no significant industrial noise affecting residences during the night period. As a result, the criterion for this period is the recommended acceptable level of 50 dBA. In the case of the evening period, the existing industrial noise at Carrington has been determined to be 54 dBA therefore, in accordance with Table 2.2 of the INP, the amenity criterion for the evening is the acceptable level 55 dBA minus 6 dBA which is 49 dBA.

Sleep Disturbance Criteria

To avoid sleep disturbance from industrial operations the DECCW recommends in its *Environmental Noise Control Manual* (ENCM) that the $L_{A1,1minute}$ of the intruding noise should not exceed the background noise level by more than 15 dBA. The $L_{A1,1minute}$ represents the typical maximum noise level of transient events such as container handling and the use of horns etc.

As a result of a recent review of the latest research into sleep disturbance, the DECCW recognises that the current ENCM criterion is not ideal. Nevertheless, as there is insufficient evidence to conclude what should replace it, the DECCW recommends that this approach be used as a guide. Where the criterion in the ENCM is likely to be exceeded, more detailed analysis is required. This analysis generally involves determining the extent to which the criterion is exceeded and how many noise events are likely to occur during each night.

The sleep disturbance criteria are provided in **Table 9-41**.

Table 9-41: Sleep Disturbance Screening Criteria

Location	RBL (dBA)	Sleep Disturbance Screening Criterion, $L_{A1,1minute}$ (dBA)
A - 1 Arthur Street, Mayfield	46	61
B - 2 Crebert St, Mayfield	40	55
C - 32 Elizabeth Street, Carrington	39	54
D - Stockton	43	58

Traffic Noise Criteria

Traffic associated with the proposed concept would travel both north and south on Industrial Drive. It is assumed that approximately 80 percent of vehicles would travel to and from the north on Industrial Drive, with the remaining 20 percent travelling to and from the south. This would result in vehicles passing residences located along Industrial Drive.

Guidance on setting noise criteria applicable to public roads in NSW is provided by the *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999). Table 1 of the ECRTN provides the following guidance presented in **Table 9-42**.

Table 9-42: Road Traffic Noise Criteria

Type of Development	Criteria		
	Day (7AM – 10PM) dB(A)	Night (10PM – 7AM) dB(A)	Where Criteria are Already Exceeded
7. Land use developments with potential to create additional traffic on existing freeways / collector Roads	$L_{Aeq,15hr}$ 60	$L_{Aeq,9hr}$ 55	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using 'quiet' vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB.

Existing measured traffic noise levels at residences on Industrial Drive exceed the noise objectives of the ECRTN. Therefore, the traffic noise contribution of the proposed concept should not result in an increase in traffic noise levels by more than 2 dBA.

Rail Noise Criteria

The DECCW's *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP), 2007 provides guidance for assessment of rail infrastructure projects. IGANRIP specifies 'trigger levels', which are "non mandatory targets that can be used to initiate an assessment of noise impacts and consideration of feasible and reasonable mitigation measures".

For residential receivers along the rail corridor that accesses the site, the noise trigger levels for absolute levels of rail noise have two components, L_{Aeq} (the equivalent continuous noise level due to train movements during an assessment period) and L_{Amax} (the maximum noise levels due to train pass by).

The L_{Aeq} contribution level of rail noise is assessed over both day and night periods. The application of the L_{Amax} descriptor for residential land uses recognizes that rail events are not adequately described solely by the L_{Aeq} descriptor in terms of their effect on residential amenity and wellbeing.

For the purpose of this assessment, the rail line is considered a 'redevelopment of an existing line' because residences are currently exposed to railway noise (refer to **Table 9-43**).

Table 9-43: Airborne Rail Traffic Noise Trigger Levels for Residential Land Uses

Type of Development	Day (7 AM – 10 PM)	Night (10 PM – 7 AM)	Comment
New rail line development	Development increases existing rail noise levels and resulting rail noise levels exceed:		These numbers represent external levels of noise that trigger the need for an assessment of the potential noise impacts from a rail infrastructure project. An 'increase' in existing rail noise levels is taken to be an increase of 2 dBA or more in L_{Aeq} in any hour or an increase of 3 dBA or more in L_{Amax}.
	60 $L_{Aeq(15hr)}$ 80 L_{Amax}	55 $L_{Aeq(9hr)}$ 80 L_{Amax}	
Redevelopment of existing rail line	Development increases existing rail noise levels and resulting rail noise levels exceed:		
	65 $L_{Aeq(15hr)}$ 85 L_{Amax}	60 $L_{Aeq(9hr)}$ 85 L_{Amax}	

Source: Extract of Table 1 of the DECCW's IGANRIP

Operational Vibration Criteria

When assessing vibration associated with train movements past residences there are two components that require consideration:

- Human exposure to vibration; and
- The potential for building damage from vibration.

The DECCW's *Assessing Vibration: A Technical Guideline* provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992. Vibration from train passbys is intermittent vibration and is best assessed by the Vibration Dose Value (VDV) which is based on the weighted root mean quartic (rmq) acceleration. Research has shown that the VDV can be adequately approximated by the estimated vibration dose value (eVDV) for vibration exhibiting a crest factor (the ratio between peak and rmq acceleration) below 6. Typically, train vibration has a crest factor well below 6 and thus the eVDV is a suitable assessment parameter. BS6472:1992 provides the advice provided in **Table 9-44** on the probability of adverse comment resulting from various values of eVDV.

Table 9-44: Probability of Adverse Comment Resulting from VDV in Residences

Period	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Day (7 AM – 10 PM)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Night (10 PM – 7 AM)	0.13	0.26	0.51

Source: Table 7, Appendix A, BS6472:1992

For operational vibration, it is recommended that values expected to have a low probability of adverse comment be adopted as goal levels. Therefore, a VDV of 0.2 to 0.4 was adopted during the day and a VDV of 0.13 was adopted during the night.

Noise Modelling

Operational Noise Modelling

A typical "worst case" operational scenario has been selected for noise modelling. The typical "worse case" scenario consists of site operations that are proposed when the entire site is operational and at peak capacity in 2034. For noise modelling purposes, equipment has been located across the site, representing typical locations during the relevant day and night periods. Ships were also included in the noise model. Additional detail on the operations and equipment included in this scenario are included in **Section 5** of **Appendix E**.

Site-related noise emissions were modeled using the CONCAWE algorithms implemented in the "Cadna A" acoustic noise prediction software. Factors that are addressed in the noise modeling are:

- Equipment sound level emissions and location;
- Screening effects from buildings;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption;
- Atmospheric absorption; and
- Meteorological conditions.

Computation of noise emissions were carried out based on three assessment conditions: calm meteorological conditions for the day periods, north westerly winds at 3 metres per second, and for a night temperature inversion of 3 degrees per 100 metres (the worst case condition).

Due to the lack of available information on construction practices and equipment, construction noise was not analysed in the EA but ought to be addressed at the Project application stage.

Traffic Noise Modelling

The *Calculation of Road Traffic Noise* (CORTN) traffic noise prediction model was used to determine traffic noise levels at residences along Industrial Drive. The model takes into account the following factors:

- Hourly traffic flows;
- Vehicle speeds (60 kilometres per hour);
- Distance to residences from each traffic lane;
- Percentage heavy vehicles; and
- Shielding from barriers or topography.

No noise barriers or fences have been included in the traffic noise prediction model.

Rail Noise Modelling

It is anticipated that operation of the proposed concept would generate four trains per day in 2034. The rail line to the site would join the Port Waratah Loop which services the Carrington coal loaders and other Carrington industrial users. Current rail operations on the Port Waratah and Bullock Island Loop are in the order of 24 train movements per day.

To simulate a typical worst case scenario for modelling purposes, it was assumed that the proposed concept would generate additional trains as follows:

- Day 1 - three trains daytime, one train night time
- Day 2 - two trains daytime, two trains night time and so on

Estimates of train noise levels at residences along the rail access corridor, conducted using the rail noise database that has been developed by Wilkinson Murray for Railcorp, have been based on the following assumptions:

- Type NR locomotives;
- An average distance of 30 metres to residences from the main rail line; and
- A speed of 60 kilometres per hour.

9.3.3 Impact Assessment

Operational Noise

Table 9-45 presents the predicted noise levels based on the modeled scenario and **Figure 9-4** shows the location of the receptors.

Table 9-45: Predicted 2034 $L_{Aeq,15minutes}$ Noise Levels at Residential Receivers

Location of Receptors	Assessment Condition			Maximum Predicted Noise Level (dBA)	Day / Night Noise Criterion (dBA)
	Neutral (dBA)	Wind NW (dBA)	Inversion (dBA)		
A - 1 Arthur Street, Mayfield	40	37	45	45	51/43
B - 2 Crebert St, Mayfield	45	45	50	50	54/43
C - 32 Elizabeth Street, Carrington	39	44	44	44	49/44
D - Stockton	39	44	44	44	46/37

A review of the predicted noise levels, which are a typical worst case scenario, indicate that, during the day and evening, noise levels associated with the site would not likely contribute to noise levels that would adversely impact on the residential amenity of surrounding residences.

Whilst not excessive or unmanageable, it is in the night period, particularly when adverse weather conditions occur, such as temperature inversions, that there is more potential for adverse noise impact at residences. This is particularly the case at residences in Crebert Street, Mayfield where an exceedance at night of up to 7 dBA is predicted. These residences are in closest proximity to the site. An exceedance at night of up to 2 dBA is anticipated at residences in Arthur Street, Mayfield and up to 7 dBA is anticipated at residences in Stockton. However, it is important to note that the results are likely to be conservative because they assume that day and night activities operate at the same level of intensity which is unlikely.

A review of the potential noise contributions from site have identified that the main contributors to noise levels are the Intra Terminal Vehicles (ITV's) and noise associated with loading and unloading activities.

The potential operational noise impacts associated with the site are manageable with the adoption of the mitigation measures recommended in **Section 9.3.4**.

Sleep Disturbance

Maximum noise levels have been predicted at all residences for a north west wind and for temperature inversion conditions. The highest predicted noise levels are presented in **Table 9-46**. The presented noise levels have a 5 dBA penalty applied for tonality.

Table 9-46: Maximum Noise Levels at Residences – $L_{A1,1minute}$

Location	Predicted Noise Level (dBA)	Sleep Disturbance Screening Criterion (dBA)
A - 1 Arthur Street, Mayfield	48	61
B - 21 Crebert Street, Mayfield	54	55
C - 32 Elizabeth Street, Carrington	46	54
D - Stockton	46	58

As shown in **Table 9-46**, noise levels are predicted to comply with the sleep disturbance screening criterion at all locations. However, it is noted the beeping of typical reversing alarms can be audible at long distances during night time hours, even if the noise level of the alarms complies with the noise criterion. Mitigation measures are recommended in **Section 9.3.4** for minimizing the impacts associated with reversing alarms.

Road Traffic Noise Levels

Assessment of traffic noise impact has been conducted at three residential locations at residences on Industrial Drive, namely north west of Ingall Street, south of George Street and at Crebert Street (refer to **Figure 9-4**). **Table 9-47** presents the results of traffic noise predictions at these residential receivers.

Table 9-47: Predicted 2034 Industrial Drive Traffic Day and Night Noise Levels

Roadway	Traffic Noise Levels (dBA)		Predicted Increase in Traffic Noise (dBA)	Noise Criteria $L_{Aeq(15\ hr)}$ / $L_{Aeq(9\ hr)}$
	No Development	With Development		
Location A – North of Ingall Street				
Day	71.3	72.7	1.4	60 / 55
Night	64.5	67.1	2.6	
Location B – Crebert Street				
Day	71.3	72.7	1.4	60 / 55
Night	64.5	67.1	2.6	
Location C – South of George Street				
Day	71.3	71.7	0.4	60 / 55
Night	64.5	64.8	0.3	

The results indicate that noise levels at the nearest residences to Industrial Drive are subjected to relatively high traffic noise levels which exceed DECCW noise criteria with or without the proposed concept. Therefore the second noise objective, being that noise levels should not increase by more than 2 dBA as a consequence of the development, is applicable.

A review of predicted traffic noise levels indicates that the 2 dBA requirement is satisfied in all instances with the exception of residences on Industrial Drive in the vicinity of Ingall and Crebert Streets (Locations A and B) in the night period where an increase of 2.6 dBA is anticipated. At these locations, a noticeable change in traffic noise levels is likely to be experienced due to a predicted significant increase in heavy vehicle movements associated with the proposed concept. It is anticipated that the night time exceedances in traffic noise levels would occur at the later stages of the development, when approaching peak operations. Mitigation measures for traffic noise are recommended in **Section 9.3.4**.

Rail Noise

There are currently 24 train movements on the Port Waratah Loop and approximately 30 percent of the train movements occur in the night period. This equates to seven existing train movements during the night time. The existing seven train movements during the night time generates an $L_{Aeq(9hr)}$ noise level of 53.9 dBA at residences adjacent to the rail line. The addition of two trains at night (worst case scenario) equates to 11 future train movements which is predicted to result in a $L_{Aeq(9hr)}$ noise level of 55.9 dBA at residences adjacent to the rail line. This level is below the IGANRIP night trigger level of 60 dBA. The residence selected to be representative of residences adjacent to the rail line is 28 Ackeron Street, Mayfield as shown on **Figure 9-4**.

Based on the results of the modelling, existing train movements generate an L_{Amax} noise level of 83 dBA at residences nearest the rail line. Since the L_{Amax} is the maximum noise level due to a train passby, the L_{Amax} would not increase as a result of the additional rail movements. The L_{Amax} of 83 dBA complies with IGANRIP trigger level of 85 dBA.

In the case of vibration generated by trains at residences along the rail line these are not anticipated to change from existing train vibration levels associated with trains currently servicing the Port Waratah Loop. In addition, since residences are more than 20 metres from the rail line, vibration from freight trains at low speeds is not considered to be an issue of concern. Therefore the VDVs are not expected to be exceeded as a result of additional trains using the rail line.

9.3.4 Mitigation Measures

To minimise the impacts associated with operational noise from the proposed concept during the night time it is recommended that the following mitigation measures be considered for implementation by Project applicants:

- The design of loading or unloading facilities at future developments should take into consideration Mayfield and Stockton residences in particular. The use of building walls and roofs that shield noise associated with site activities from those residences should be considered. The use of sound absorptive treatment on large walls can reduce the likelihood of noise transfer to residences. Reductions in the order of 5 to 10 dBA can be readily achieved by strategically located noise barriers and buildings constructed in proximity of noise sources. Higher reduction in the order of 20 dBA can be achieved by constructing enclosures/buildings around noise sources requiring mitigation.
- Provide silencers and noise treatment to items such as ITV's and other items of equipment that are identified to generate high noise levels (in the order of 115 to 120 dBA). As this is a new development, an audit of new equipment can be conducted at the planning stage to determine any noise risks associated with equipment. Such an approach can allow the operator to adopt noise reduction equipment which is often an option when purchasing new equipment. Typically reductions of up to 10 dBA can be achieved by using acoustically treated motors and high performance silencers on equipment.
- The operation and location of site buildings and storage sheds should take into account noise emissions to nearby residences. When noise is taken into account in planning a new development the most cost effective noise reductions can be achieved.
- Minimize the operation of site vehicles during the night period where practical and feasible. In reality, the site is unlikely to operate at the same level of intensity in the night time compared to the day time.

As best practice it is recommended that "squawker" or broadband reversing alarms be installed on all equipment that would be used on-site during night time hours in order to minimise the potential for sleep disturbance. The squawker type of alarm is less audible at distance but is still satisfactory in terms of safety.

The recommended option to mitigate the identified night time noise impact associated with traffic is to provide façade treatments to identified residences so that the internal acoustic amenity of residences is protected during the night time. Given that there are only approximately 20 residences located in the vicinity of the site that would require mitigation for night time traffic noise, façade treatment is considered to be the most appropriate type of mitigation. These treatments typically consist of improved glazing on windows facing the roadway, along with mechanical ventilation. It is anticipated that only the front row of residences would require some form of treatment as these residences would shield those that are located behind them.

It should be noted that other noise mitigation measures such as noise barriers can be adopted to mitigate noise from traffic. However, as the predicted exceedance is limited to night time noise levels, and because there are a limited number of residences along Industrial Drive, the use of façade treatments would be the most targeted and cost effective mitigation measure.

Since the results of the traffic noise assessment are based on traffic generation assumptions for the proposed concept in 2034, it is recommended that detailed traffic noise assessments be conducted at the Project application stage to determine the need for, and timing of, traffic noise mitigation along Industrial Drive. This is recommended because additional detail on traffic generation would be available at the Project application stage and also because it would enable the timing of the predicted noise exceedences and therefore the need for mitigation to be more accurately determined. Due to the lack of available information on construction practices and equipment, construction noise was not analysed in the EA but ought to be addressed at the Project application stage.

It is recommended that Project applicants prepare Noise Management Plans addressing construction and operation of the proposed concept, and that noise monitoring be undertaken (refer to **Section 11.5.3**). It is also recommended that NPC establish a noise complaint 'hotline'.

9.3.5 Conclusion

Predicted noise levels from final operations at the site in 2034 indicate that the potential for noise impact at surrounding residences would be greatest in the night period when adverse weather conditions (temperature inversions) occur. Noise criteria exceedances of up to 7 dBA during the night period are predicted at Crebert Street, Mayfield. An exceedance at night of up to 2 dBA is anticipated at residences in Arthur Street, Mayfield and up to 7 dBA is anticipated at residences in Stockton. In the case of day time operations, noise levels at all surrounding residences are expected to be below established noise criteria. In the case of night time operations, noise levels are predicted to comply with the sleep disturbance screening criterion at all locations.

Based on a review of the predicted results, noise mitigation measures have been recommended for minimising night time noise including the use of noise barriers at select locations and providing silencers on equipment. These measures should be included in future detailed assessments at the time Project applications are prepared.

Review of traffic noise based on projected traffic volumes with and without the proposed concept development indicates compliance with DECCW traffic noise criteria at residences along Industrial Drive during the daytime period. However, at night an exeedance is indicated at a number of residences along Industrial Drive due to an increase in heavy vehicle traffic. It is anticipated that the exceedances in night time traffic noise levels would occur at the later stages of the development, when approaching peak operations. It is considered that the most feasible measures to protect the acoustic amenity of these residences is to provide façade treatment and ventilation to affected rooms of these residences.

An increase of up to eight rail movements (four trains a day) has been assessed with respect to DECCW IGANRIP criteria. Based on the results of the modelling, an $L_{Aeq(9hr)}$ noise level of 55.9 dBA and L_{Amax} noise level of 83 dBA at residences nearest the rail line is anticipated during the night time, which is below the applicable trigger levels specified in the IGANRIP.

Based on the findings of this noise assessment it is considered that the night time operational and traffic noise impacts associated with the proposed concept are manageable and can be mitigated to acceptable levels. It is recommended that further detailed assessments be conducted at the Project application stage to confirm the need for, timing and extent of mitigation required.

9.4 Air Quality

The air quality impact assessment (AQIA) is presented in **Appendix F**.

9.4.1 Existing Environment

Meteorological and Terrain Features

Meteorology in the area surrounding the Port is affected by several factors such as terrain and land use. Wind speed and direction are largely affected by topography at the small scale, while factors such as synoptic scale winds (which are modified by sea breezes near the Newcastle coast in the daytime) and complex valley drainage flows that develop during night hours, affect wind speed and direction on the larger scale. As the proposed concept is located in a coastal environment, varying wind patterns would be expected due to onshore and offshore winds. The flat terrain surrounding the Port and the sea breeze/land breeze influences affect the local wind regime.

The Bureau of Meteorology (BoM) collects meteorological data from various locations in the Newcastle area. The closest BoM station recording long term meteorological data is at Williamtown Airport, approximately 12 kilometres to the north west of the site.

In summer the average temperature ranges from 16.5°C to 27.9°C, and the average winter temperature ranges from 6.3°C to 18.6°C. On average, the wettest months are February to June, with average rainfall of greater than 100 millimetres for each of the months.

In the morning winds are lighter than average and dominated by north westerly flows. These flows represent a land breeze generated on clear nights with light prevailing wind conditions, most common in winter. Winds from the east coming from the coast in the afternoon are generally stronger than the land breeze winds. By afternoon, winds are stronger and most frequently from the south east to north east, representing both common synoptic scale influences and some sea breeze effects, respectively.

Significant seasonal differences are indicative from wind conditions measured at Williamtown Airport. In the warmer months (summer and spring) the winds are predominantly from the north east to south direction and in the cooler months north westerly winds dominate.

Regional Air Quality

Regional air quality is influenced by major industry located around the Port and emissions from vehicles using major arterial roads feeding Newcastle. Primary industrial sources of air emissions likely to affect the Port include the OneSteel and Smorgon facility at Mayfield, the Orica and Incitec plants on Kooragang Island and the Tomago Aluminium Smelter at Tomago (to the north). Additional pollutant sources include emissions from the coal and grain terminals and oil seed and fat manufacturing (Cargill), and three fuel storage facilities in Newcastle, Caltex (Wickham), BP (Carrington) and Shell (Hamilton).

Ambient pollutant concentrations derived from available monitoring data were used to provide a preliminary assessment of the existing air quality in the study area. The NSW DECCW operates an ambient air monitoring station at an athletic field in Smith Street, Newcastle. The station is approximately 5 kilometres to the south of the site. The following pollutants are currently measured at the station:

- Ozone (O_3)
- Nitric oxide (NO), nitrogen dioxide (NO_2) and nitrogen oxides (NO_x)
- Carbon monoxide (CO)
- Sulphur dioxide (SO_2)
- Particulate matter (PM_{10})

Key statistics for the monthly data monitored from 2006 to 2007 at the Smith Street station showed that the 24-hour PM_{10} guideline was the only *National Environment Protection Measure* (NEPM) level breached at the station (in November 2006 and May 2007). However, the NEPM goal of five days allowable exceedances per year was met.

Air quality monitoring data collected from May 2006 to August 2008 on behalf of the HDC at sites in Mayfield, Steel River and Stockton (refer to **Figure 9** of **Appendix F**) provides information relevant to the assessment of the existing air quality in the immediate vicinity of the Port. The HDC monitoring data identified two days in the monitoring period that the 24-hour average PM_{10} concentration exceeded the relevant DECCW criterion (55 micrograms per cubic metre ($\mu g/m^3$) on 3 October 2007 and 56 micrograms per cubic metre on 1 July 2008). It was noted that exceedances of 24-hour average PM_{10} concentrations are not uncommon and often attributed to natural sources such as bushfires or dust storms. The annual average Total Suspended Particulate (TSP) and PM_{10} concentrations were below the relevant DECCW assessment criteria of 90 micrograms per cubic metre and 30 micrograms per cubic metre, respectively.

Sampling undertaken at Mayfield from June to August 2008 for BTEX (Benzene, Toluene, Ethylbenzene and Xylenes) concentrations show all monitored concentrations were significantly lower than the Air Toxics NEPM monitoring investigation levels. The monitored concentrations and investigation levels are provided in **Table 4-2** of **Appendix F**.

9.4.2 Methodology

The air quality impact assessment (refer to **Appendix F**) examined the likely sources of air pollution during both the construction phase (qualitative assessment) and operational phase (quantitative assessment) of the proposed concept, and investigated the local and regional air quality characteristics to determine the capacity of the local air-shed to absorb emissions from the proposed concept. A qualitative analysis was undertaken for the construction phase because specific construction vehicle and equipment details were not available for modelling at the Concept application stage. The qualitative analysis was based on the use of conventional construction equipment to assess air quality impacts during construction.

Regulatory Framework

The air quality impact assessment was conducted in accordance with the following Acts and guidelines:

- *Protection of the Environment Operations Act 1997* (POEO Act). The POEO Act, combines earlier legislation regulating air, water, noise, waste and licensing.
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (hereafter referred to as the Approved Methods), DEC 2005 (now known as DECCW).
- *Action for Air: The NSW Government's 25-Year Air Quality Management Plan* 1998 (updated in August 2006) published by the NSW EPA (now known as DECCW), provides the strategic framework for improving air quality in the Greater Metropolitan Regions of NSW. The specific objectives applicable to the Port relate to the promotion of cleaner business and reducing industrial emissions.
- *Newcastle Environmental Management Plan* 1994 (NEMP).
- *Newcastle Airshed Management Plan* 1998 (NAMAP) key actions to improve the air quality of the local and regional airsheds.
- The National Environment Protection Council (NEPC) released a NEPM for *Ambient Air Quality* 1998, setting out national standards and goals for six common ambient air pollutants. These are SO_2, particulate matter as PM_{10}, CO, lead (Pb), O_3 and NO_2. In May 2003, the NEPC also released a *Variation to the Ambient Air Quality* NEPM, which introduced advisory reporting standards for $PM_{2.5}$.
- The *National Environment Protection (Ambient Air Toxics) Measure* (Air Toxics NEPM) was set by the NEPC in 2004. The Air Toxics NEPM includes monitoring investigation levels specified for five compounds: benzene, toluene, xylenes, formaldehyde and benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons). They are not compliance standards but provide guidelines in order to assess the significance of the monitored levels of air toxics with respect to protection of human health. However, if these limits are exceeded in the short-term it does not mean that adverse health effects have occurred.

Air Dispersion Modelling Methodology

Air dispersion modelling was undertaken to predict the likely air quality impacts that the operational phase of the proposed concept may have on the surrounding area. The methodology undertaken to assess the potential air quality impacts from the proposed concept is as follows:

- **Development of an Emissions Inventory.** The inventory contains all emissions information required to undertake dispersion modelling. The inventory was generated using operational information supplied by NPC and the emission factors supplied in relevant documents (Commonwealth 2008a and 2008b, EPA 1997a).

- **Guideline.** Modelling was conducted in accordance with the Approved Methods DEC 2005. The Approved Methods outlines the requirements for developing air dispersion modelling methodology, analysing meteorological data, and the criteria applicable when considering the potential impacts as a result of a site's operation.
- **Dispersion Modelling.** The CALPUFF dispersion model, which is a non steady-state three dimensional Gaussian puff model, was used in the assessment in accordance with the Approved Methods. The CALMET meteorology model was utilised to calculate the three-dimensional meteorological data based upon observed ground and upper level meteorological data, as well as modelled data. CALPUFF then calculates the dispersion of plumes within this three-dimensional meteorological field. Model inputs include meteorology, source characteristics, modelling scenarios and pollutant emissions data (refer to **Section 8.**2 of **Appendix F**).
- **Modelling Scenario.** The proposed concept at full operation in 2034 was the one modelling scenario included in the assessment. The assessment considered the operations of the five land-based operational precincts and the Berth Precinct, and included emissions from the following sources:
  - Ships at berth;
  - Trains breaking, forming, shunting and idling on the site;
  - Trucks on the site;
  - Bulk material stockpile (wind erosion, loading and unloading operations); and
  - Bulk liquid precinct (including two bulk liquid operators with a total fuel storage volume of approximately 1,010 mega litres).

Appendix F provides more information on the methodology used for the assessment.

9.4.3 Impact Assessment

Sensitive Receptors

The closest residential area to the site is Mayfield East (approximately 900 metres to the south west), Stockton (approximately 2 kilometres to the south east) and Tighes Hill (2 kilometres to the south). The South Arm of the Hunter River is to the north and east of the site.

DECCW considers sensitive receptors to be areas where people are likely to either live or work, or engage in recreational activities. On this basis, representative sensitive receptors were selected at 14 locations surrounding the site. The receptors were chosen from local residential and commercial buildings. Industrial facilities were not chosen as these locations are less sensitive to industrial emissions. A summary of the sensitive receptor locations is provided below in **Table 9-48** and shown in **Figure 9-5**.

Table 9-48: Sensitive Receptor Locations

Receptor Number	Sensitive Receptor Location	Type
1	Selwyn Street	Commercial
2	George Bp. Drive	Commercial
3	Selwyn Street	Commercial
4	Industrial Dr and Crebert Street Crossroad	Residential
5	Industrial Drive	Residential
6	Industrial Drive and Ingall Street Crossroad	Residential
7	Dead End of Arthur Street	Residential
8	Industrial Drive and George Street Crossroad	Residential
9	George Street and Margaret Street Crossroad	Residential
10	Crebert Street and Ingall Street Crossroad	Residential
11	Havelock Street and Crebert Street T-Section	Residential
12	Phoenix Sports Club	Commercial
13	Industrial Drive and Bull Street T-Section	Residential
14	Kerr Street Dead End	Residential

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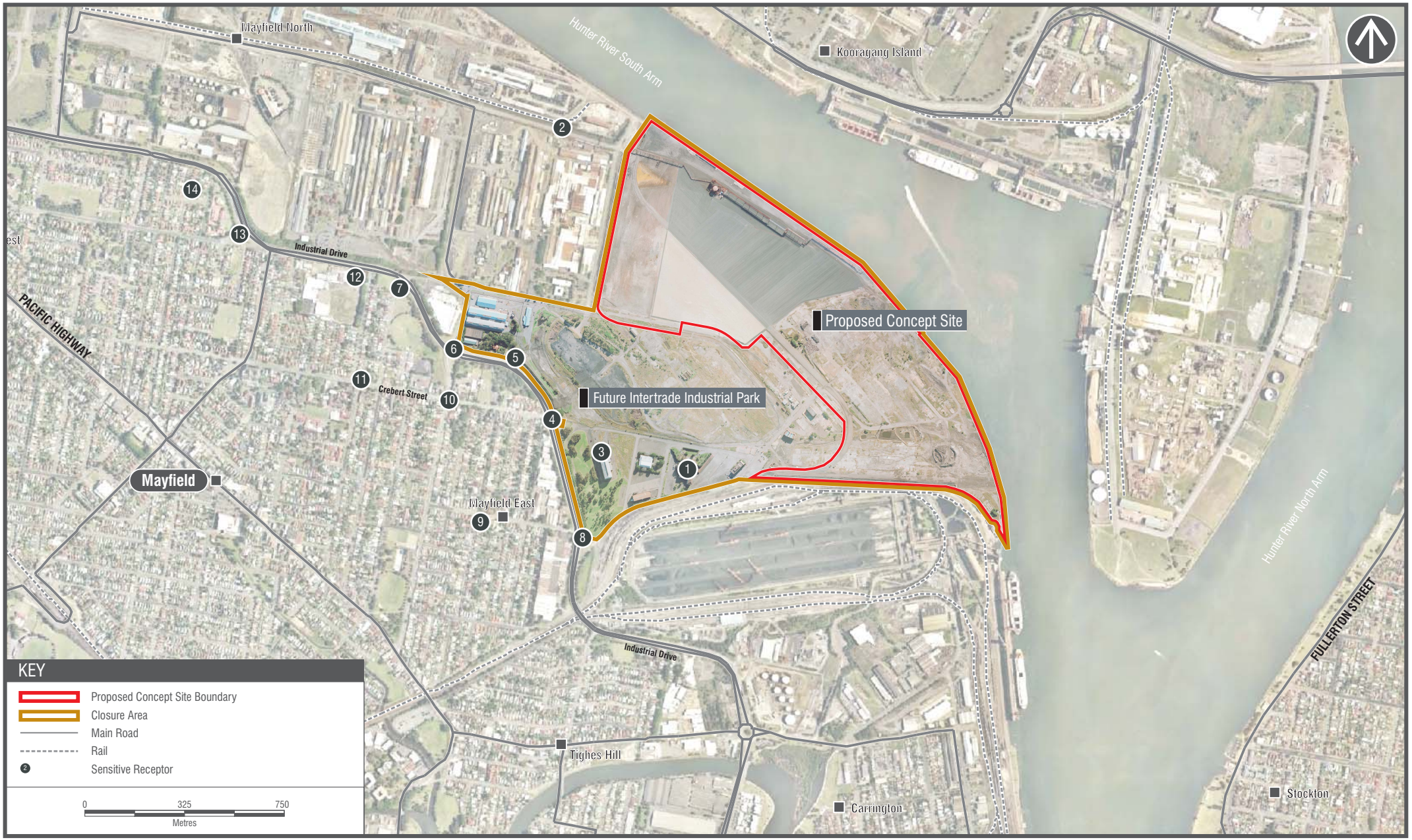

AECOM

SENSITIVE RECEPTORS FOR AIR QUALITY

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-5

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Construction

During construction, potential air emissions include products of fuel combustion from vehicles and equipment used in construction and transportation activities, dust and odour emissions from construction activities and other air pollutants (toxics) from contaminated soils disturbed during construction works.

Specific construction vehicle and equipment details were not available at the time of assessment. Therefore impacts discussed are based on the use of conventional construction equipment.

Fuel combustion emissions from vehicles and equipment would largely be diesel engine based and depend on the grade and composition of the fuel and the status of equipment maintenance. Fuel combustion emissions of concern include:

- Particulate matter
- CO
- NO_2
- SO_2
- Organic compounds such as volatile organic compounds (VOCs) and polyatomic aromatic hydrocarbons (PAHs)

Dust may be generated as a result of earthworks including earth moving and materials handling operations. Internal site traffic moving on unsealed roads within the site may cause sufficient mechanical disturbance of loose surface materials to generate dust. Common sources of fugitive dust include unpaved roads, aggregate storage stockpiles, and heavy construction operations.

Emissions of other air pollutants other than dust such as VOCs, vapour phase PAHs and acidic aerosols may also occur during construction works where the ground is contaminated. The chemical composition of these has the potential to further exacerbate potential short-term and long-term health effects associated with inhalation of particles. It is expected that the emissions of specific pollutants of concern from the contaminated soils would be addressed by the site RAP and CSMP.

During construction, odour could be generated from earthworks, disturbance of potentially anoxic or contaminated material, construction of primary and ancillary infrastructure and vehicle exhaust emissions.

Further assessment of construction impacts should be undertaken as part of subsequent Project applications when construction details are available.

Operational Activities

Potential air quality impacts associated with operation of the proposed concept include:

- **Fuel Combustion Emissions** associated with delivery and removal of cargo, and the operation of site machinery and vehicles (road, marine and rail), may impact on air quality. These emissions would largely be diesel-based and the emissions of concern would be the same as those specified for the construction activities. Other equipment at the site such as forklifts, cranes, and gantries would be electric or powered by compressed natural gas and would be low-emitting.
- **Fugitive Dust Emissions** from the mechanical disturbance of granular material, for example from roads, stockpiles, conveyors, transfer points and materials handling have the potential to impact on air quality. All fugitive dust sources, including conveyors, would be covered with the exception of the bulk material stockpile used for soil and boutique coal materials.
- **VOC Emissions** associated with the transfer and storage of fuels and other bulk liquids may occur as a result of storage tank losses, potential pipeline losses, and emissions during loading. Fuels and organic liquids are typically volatile and evaporation of these liquids during storage has the potential to generate odour and VOCs. Highly volatile fuels would be stored in internal floating roof tanks aimed at reducing emissions from the tanks. This measure would reduce the potential for accumulation of vapours within the tanks, significantly reducing the potential for emissions. Minor quantities of fugitive emissions (hydrocarbon based) may occur due to potential pipeline losses from flanges, valves, pump seals and other fittings. Given that the design of the pipeline is centred on leak prevention and that the facilities would be newly constructed, total emissions from pipelines are expected to be negligible. Product and tank vapour emissions of VOCs are also generated during filling operations. Vapour recovery units can be used for vapour recovery during tanker truck loading with removal efficiencies of greater than 99.9 percent.

- **Fumigant Emissions** have the potential to occur as a result of fumigation operations performed at the Port using methyl bromide. Fumigation operations may be performed in the Bulk and General Precinct for grain storage and in the General Purpose Precinct and Container Terminal Precinct for dosing containers. Fumigant recapture equipment would be used to minimise the impacts from releases of fumigant gases at the site.

Air Dispersion Modelling Results

The modelling results for operation of the proposed concept suggest that with the exception of short term (24-hour) PM_{10} concentrations, annual PM_{10},TSP and dust deposition emissions comply with the relevant criteria as shown in **Table 9-49**. Background PM_{10} levels already exceed the DECCW criteria of 50 micrograms per cubic metre for 24-hour PM_{10}.

Operation of the proposed concept combined with background PM_{10} would result in 24-hour PM_{10} levels exceeding the DECCW criteria at all of the 14 discrete receptors surrounding the site. The modelling demonstrated that the criteria would be exceeded by up to 21 micrograms per cubic metre at Receptor 1 which is located at Selwyn Street. It should be noted that while the proposed concept would generate PM_{10} emissions and contribute to exceedance of the criteria, the contribution from the proposed concept alone is minor (less than 11 percent of the assessment criteria and around 8 percent of the predicted cumulative concentration).

Table 9-49: Maximum Predicted Ground Level Concentrations at the Discrete Sensitive Receptors for PM_{10}, TSP and Dust Deposition

Receptor Number	PM_{10} ($\mu g/m^3$)		TSP ($\mu g/m^3$)	Dust Deposition (g/m^2.month) [1]
	24 Hour	Annual	Annual	Annual
1	5.4 (**71.0**)	1.1 (22.1)	1.3 (30.4)	< 0.01
2	4.2 (**69.8**)	0.5 (21.5)	0.7 (29.8)	< 0.01
3	5.0 (**70.6**)	0.8 (21.8)	1.0 (30.1)	< 0.01
4	5.1 (**70.7**)	0.6 (21.6)	0.8 (29.9)	< 0.01
5	4.1 (**69.7**)	0.6 (21.6)	0.7 (29.8)	< 0.01
6	3.2 (**68.8**)	0.4 (21.4)	0.5 (29.6)	< 0.01
7	3.1 (**68.6**)	0.3 (21.3)	0.4 (29.5)	< 0.01
8	3.9 (**69.5**)	0.5 (21.6)	0.6 (29.7)	< 0.01
9	2.6 (**68.2**)	0.4 (21.4)	0.4 (29.5)	< 0.01
10	3.6 (**69.2**)	0.4 (21.4)	0.5 (29.6)	< 0.01
11	2.6 (**68.2**)	0.3 (21.3)	0.3 (29.4)	< 0.01
12	2.5 (**68.1**)	0.3 (21.3)	0.3 (29.4)	< 0.01
13	1.6 (**67.1**)	0.2 (21.2)	0.2 (29.3)	< 0.01
14	1.5 (**67.0**)	0.1 (21.1)	0.2 (29.3)	< 0.01
Criteria	50	30	90	2

Bold denotes exceedence of criteria.

First modelling result figure denotes Ground Level Concentrations in isolation of background, whilst the second figure within brackets denotes the cumulative impact of predicted Ground Level Concentrations from the proposed concept combined with background concentrations.

[1] < 0.01 is the limit of detection (LOD) for dust gauge measurement in the field. All predictions were less than this level and hence have been designated less than the LOD.

Oxides of nitrogen (as NO_2) and SO_2 pollutant levels met the DECCW criteria at all of the discrete sensitive receptors as shown in **Table 9-50**.

Table 9-50: Maximum Predicted Ground Level Concentrations at the Discrete Sensitive Receptors for NOx (as NO_2) and SO_2

Receptor Number	Oxides of Nitrogen (as NO_2) ($\mu g/m^3$)		Sulfur Dioxide (SO_2) ($\mu g/m^3$)			
	1 Hour	Annual	10min	1 hour	24 hour	Annual
1	78.3 (133.6)	13.3 (29.7)	7.3 (7.3)	9.8 (133.3)	1.8 (36.2)	0.3 (4.1)
2	69.4 (153.5)	7.0 (26.4)	19.0 (19.0)	25.7 (149.2)	2.5 (36.9)	0.3 (4.1)
3	57.0 (112.4)	10 (29.3)	13.5 (13.5)	18.3 (141.8)	1.6 (36.1)	0.3 (4.1)
4	69.3 (132.9)	8.2 (27.6)	8.5 (8.5)	11.5 (134.9)	2.3 (36.7)	0.2 (4.1)
5	65.4 (128.9)	7.9 (27.2)	12.8 (12.8)	17.4 (140.9)	1.9 (36.3)	0.3 (4.1)
6	67.6 (133.2)	5.9 (25.2)	12.8 (12.8)	17.4 (140.8)	2.2 (36.6)	0.3 (4.1)
7	60.3 (123.9)	4.5 (23.8)	11.4 (11.4)	15.5 (139)	2.3 (36.7)	0.3 (4.1)
8	65.5 (131.1)	7.0 (26.4)	12.5 (12.5)	17.0 (140.5)	2.4 (36.9)	0.3 (4.1)
9	70.4 (156.5)	5.1 (24.5)	9.7 (9.7)	13.1 (136.6)	2.0 (36.4)	0.3 (4.1)
10	78.1 (164.2)	5.8 (25.2)	13.0 (130)	17.6 (141.1)	2.2 (36.6)	0.3 (4.1)
11	46.6 (112.2)	3.7 (23.0)	7.4 (7.4)	10.0 (133.5)	1.8 (36.2)	0.2 (4.0)
12	50.9 (114.4)	3.5 (22.9)	11.1 (11.1)	15.1 (138.6)	2.0 (36.4)	0.2 (4.0)
13	43.1 (106.6)	2.1 (21.4)	5.8 (5.8)	7.8 (131.3)	1.3 (35.7)	0.1 (3.9)
14	43.6 (111.2)	1.8 (21.2)	7.2 (7.2)	9.7 (133.2)	1.3 (35.7)	0.1 (3.9)
Criteria	246	62	712	570	228	60

Bold denotes exceedence of criteria.

First modelling result figure denotes Ground Level Concentrations in isolation of background, whilst the second figure within brackets denotes the cumulative impact of predicted Ground Level Concentrations from the proposed concept combined with background concentrations.

Carbon Monoxide met the DECCW criteria at all of the discrete sensitive receptors as shown in **Table 9-51**.

Table 9-51: Maximum Predicted Ground Level Concentrations at the Discrete Sensitive Receptors for CO

Receptor Number	Carbon Monoxide (CO) ($\mu g/m^3$)		
	15 Minutes	1 hour	8 Hours
1	241.8	306.1 (306.1)	96.2 (98.9)
2	134.4	170.1 (170.1)	36.9 (39.7)
3	156.3	197.8 (197.8)	67.5 (70.2)
4	137.2	173.7 (173.7)	52.8 (55.6)
5	134.7	170.5 (170.5)	56.5 (59.2)
6	99.8	126.3 (126.3)	41.4 (44.1)
7	78.6	99.5 (99.5)	35.3 (38.1)
8	116.3	147.2 (147.2)	53.4 (56.2)
9	95.5	120.9 (120.9)	28.9 (31.7)
10	108.7	137.6 (137.6)	34.7 (37.4)
11	69.3	87.7 (87.7)	22.9 (25.6)

Receptor Number	Carbon Monoxide (CO) ($\mu g/m^3$)		
	15 Minutes	1 hour	8 Hours
12	57.5	72.8 (72.8)	27.6 (30.4)
13	35.1	44.5 (44.5)	16.6 (19.4)
14	30.4	38.4 (38.4)	15.0 (17.7)
Criteria	100,000	30,000	10,000

Bold denotes exceedence of criteria.

First modelling result figure denotes Ground Level Concentrations in isolation of background, whilst the second figure within brackets denotes the cumulative impact of predicted Ground Level Concentrations from the proposed concept combined with background concentrations.

All selected pollutants of Benzene, Toluene, Xylenes, Ethanol, and H_2S met the DECCW criteria at all of the discrete sensitive receptors as shown in **Table 9-52**.

Table 9-52: Maximum Predicted Ground Level Concentrations at the Discrete Sensitive Receptors for Benzene, Toluene, Xylenes, Ethanol and H2S

Receptor Number	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Xylenes ($\mu g/m^3$)	Ethanol ($\mu g/m^3$)	H_2S ($\mu g/m^3$)
	1 hour	1 hour	1 hour	1 hour	1 hour
1	1.9 (2.5)	28 (28.3)	37.4 (37.6)	18.8	0.4
2	1.7 (2.3)	25.7 (26.0)	34.2 (34.4)	17.9	0.4
3	2.2 (2.8)	32.6 (32.9)	43.5 (43.7)	21.9	0.5
4	1.7 (2.2)	25.0 (25.4)	33.4 (33.6)	16.7	0.3
5	1.3 (1.8)	18.9 (19.2)	25.1 (25.4)	12.6	0.3
6	0.6 (1.2)	8.4 (8.7)	11.2 (11.4)	6.2	0.1
7	0.4 (0.9)	4.9 (5.2)	6.6 (6.8)	3.9	0.07
8	0.9 (1.5)	13.1 (13.4)	17.4 (17.7)	9.3	0.2
9	0.5 (1.1)	7.5 (7.9)	10 (10.3)	5.6	0.1
10	0.5 (1.1)	6.9 (7.2)	9.2 (9.4)	5.2	0.1
11	0.3 (0.9)	4.3 (4.6)	5.7 (6.0)	3.3	0.06
12	0.3 (0.9)	4.2 (4.5)	5.5 (5.8)	3.2	0.06
13	0.2 (0.8)	2.4 (2.7)	3.2 (3.5)	1.9	0.03
14	0.2 (0.7)	2.0 (2.3)	2.6 (2.9)	1.6	0.03
Criteria	29	360	190	2100	1.38

Bold denotes exceedence of criteria.

First modelling result figure denotes Ground Level Concentrations in isolation of background, whilst the second figure within brackets denotes the Cumulative Impact of predicted Ground Level Concentrations from the proposed concept combined with background concentrations.

Future operators should consider the night time meteorological affect of lower dispersion potential during subsequent Project applications, particularly in relation to particulate emissions. Future analysis and atmospheric dispersion modelling may be required to re-assess the potential for impact from the fumigation process and particulate matter on the regional air shed using updated background particulate levels and meteorological data once the proposed concept and other local developments are operational.

9.4.4 Mitigation Measures

Emissions of dust from construction and operation of the proposed concept, pollutant emissions from transport (fuel combustion from trains, trucks and ships) and VOC emissions from the operation of the Bulk Liquid Precinct have been identified as predominant sources of emissions.

Project applicants should prepare appropriate construction and operation Air Quality Management Plans (AQMPs) and include the mitigation measures outlined below as appropriate. Based on the findings of the assessment, monitoring of ambient pollutant levels, in particular PM_{10}, should be undertaken by Project applicants during construction and operation of the proposed concept. The monitoring program should be incorporated into the AQMPs. The AQMPs should be updated regularly based on the monitoring results.

Construction

Mitigation measures and management procedures to be implemented to control fugitive dust and odour from exposed surfaces, and hazardous and other air pollutants from the disturbance of potentially contaminated soil, include:

- Covering or watering exposed surfaces such as stockpiles at the end of each shift and during dry/windy conditions;
- Covering loads during transport;
- Erecting wind barriers at the site boundary;
- Watering exposed surfaces and roads;
- Carrying out surface stabilisation measures to minimise wind-blown dust;
- Sealing as many regularly trafficked surfaces as possible;
- Controlling roadway use i.e., define road access to minimise dust;
- Adjusting work practices (as required) based on wind observations and dust monitoring results; and
- Conducting dust monitoring.

Measures to minimise the potential for impact from fuel combustion emissions of vehicles and equipment during construction include:

- Turning off engines whilst parked on-site;
- Confining vehicular access to designated access roads;
- Regularly tuning and maintaining equipment, plant and machinery to minimise visible smoke and emissions;
- Implementing site speed limits; and
- Minimising haul road lengths where possible.

Operation

Mitigation measures and management procedures to be carried out during operation of the proposed concept to mitigate potential for impact from fugitive dust and odour include:

- Covering or watering exposed surfaces such as stockpiles at the end of each shift and during dry/windy conditions;
- Covering loads during transport;
- Controlling roadway use, i.e. define road access to minimise dust;
- Adjusting work practices (as required) based on wind observations, and on dust monitoring results; and
- Conducting dust monitoring.

Measures to minimise the potential for impact from fuel combustion emissions from vehicles and equipment during operation include:

- Turning off engines whilst parked on-site;
- Confining vehicular access to designated access roads;
- Regularly tuning and maintaining equipment, plant and machinery to minimise visible smoke and emissions;
- Implementing site speed limits;
- Minimising haul road lengths where possible; and
- Providing alternative marine power for vessels while at berth.

Measures to minimise potential for the release of VOC emissions during the transfer and storage of fuels and other bulk liquids, and emissions of fumigant gases at the site include:

- Storing fuels in atmospheric steel storage tanks of various sizes with internal floating roofs to minimise vapour emissions and maintain quality;
- Designing all storage tanks to meet the requirements of the POEO Regulation in relation to the control of volatile organic liquids. In addition, it is anticipated that each tank would have:
  - Auto level gauging;
  - High/low level alarms;
  - Multi-level temperature measurement;
  - Multi-level sampling equipment;
  - Water draining; and
  - Low-level product drains for maintenance purposes.
- Installing vapour recovery units to recover vapour during tanker truck loading; and
- Using fumigant recapture equipment.

9.4.5 Conclusion

A qualitative assessment of the potential impacts associated with construction was undertaken because details on construction vehicles and equipment were not available at the Concept Approval stage. Construction would result in emissions from fuel combustion from vehicles and equipment, dust emissions as a result of earthworks and other construction activities, and odour emissions from the disturbance of anoxic or contaminated material. Mitigation measures such as watering exposed surfaces, covering loads of loose material during transportation, and switching off equipment when it is not in use would minimise these potential impacts. It is recommended that further assessment of construction impacts be undertaken as part of future Project applications when construction details are available.

A quantitative assessment was undertaken to assess the impacts of operation of the proposed concept. The assessment was undertaken using the CALPUFF dispersion model and the inputs were based on the known aspects of the proposed concept i.e. shipping numbers, train numbers, truck numbers, bulk material quantities, fuel storage quantities etc, along with other relevant factors such as meteorology, receptor locations and terrain surrounding the site. The modelling results for operation of the proposed concept suggest that with the exception of short term (24-hour) PM_{10} concentrations, all pollutants comply with the relevant criteria. Background PM_{10} levels, influenced by major industry located around the Port and emissions from vehicles using major arterial roads feeding Newcastle, already exceed the DECCW criteria of 50 micrograms per cubic metre for 24 hour PM_{10}. Operation of the Concept Plan combined with background PM_{10} would result in 24-hour PM_{10} levels exceeding the DECCW criteria at all of the 14 discrete receptors surrounding the site. The modelling demonstrated that the criteria would be exceeded by up to 21 micrograms per cubic metre at Receptor 1 which is located at Selwyn Street. It should be noted that while the proposed concept would generate PM_{10} emissions and contribute to exceedance of the criteria, the contribution from the proposed concept alone is minor (less than 11 percent of the assessment criteria and around 8 percent of the predicted cumulative concentration).

Emissions of PM_{10} during the operation phase can be limited by implementing site specific ‘best practice’ dust mitigation measures which should be incorporated into AQMPs to be developed by Project applicants. A variety of management measures have been recommended including covering loads of loose material during transportation, and switching off equipment when it is not in use, and adjusting work practices as needed and based on wind observations. The recommended measures can be evaluated at any time during the project life and reviewed accordingly.

As PM_{10} is a dominant fraction of dust generated by construction and some operational activities, it is recommended that a PM_{10} measurement and monitoring program be implemented during the construction and operational activities. If new information or regulation supports monitoring of other particle size fractions (such as $PM_{2.5}$), this recommendation can be reviewed at a later date and incorporated into the monitoring program as appropriate. The monitoring program would be an integral part of the AQMP.

9.5 Hazard and Risk

9.5.1 Existing Environment

The existing site is a relatively vacant parcel of land upon which soil and groundwater remediation activities have been conducted since 2006. Hazards and risks associated with contamination at the site are addressed in **Section 9.9** of this EA. This section assesses the hazards and risks associated with handling dangerous goods at the site during operation.

The site has little infrastructure and few structures. Koppers has a plant located to the north west of the site and ancillary facilities, including a wharf and aboveground pipeline for handing coal tar and pitch products. The pipeline runs east to west across the northern portion of the site. Koppers has a lease for use of Ex-BHP No.6 Berth and operation of the pipeline.

NPC has constructed a general cargo handling facility at the site. The facility is known as Mayfield No.4 Berth and it became operational in 2010. The berth provides facilities for the import and export of a range of cargo types including AN, but does not have any storage or processing facilities. The facility imports and exports a maximum of 6,500 and 3,000 tonnes of AN per shipment, respectively.

9.5.2 Methodology

The proposed concept would involve temporary storage of dangerous goods that are listed in the Australian Dangerous Goods Code. These goods would be stored at the site, until they can be transported off-site. The Bulk Liquids Precinct would store fuels and the General Cargo Precinct and Container Terminal Precinct may include Dangerous Goods that enter the Port in containers or bulk products in portable tanks or Intermediate Bulk Containers (IBCs). Mayfield No.4 Berth, which handles the import and export of AN, is located in the General Cargo Precinct.

Based on the potential quantity of Dangerous Goods that would be stored at the Bulk Liquids Precinct alone, SEPP 33 would apply to the proposed concept. The DoP requested that a PHA be submitted with the EA, to demonstrate whether or not the proposed concept poses a risk to adjacent facilities and the site itself. The PHA is provided in **Appendix G**.

The methodology selected for the PHA was that prescribed in the DoP Multi-Level Risk Assessment approach, supported by *Hazardous Industry Planning Advisory Paper* (HIPAP) *No.6 Guidelines for Hazard Analysis* (DoP, 2008). The basic approach for the PHA was as follows:

- **Hazard Analysis.** Identifying those hazards with the potential to impact off-site;
- **Consequence Analysis.** Assessment of the consequence impacts for those incidents identified to impact off-site, including comparison of impacts with acceptable impact criteria; and
- **Risk Analysis.** Assessment of those incidents that exceed the acceptable consequence criteria for risk and comparison of the assessed risk with acceptable criteria.

The findings of the PHA are summarised in the sections below.

9.5.3 Impact Assessment

Hazard Analysis

The potential for hazard impacts both on and off-site may result from the following activities occurring within the precincts.

NPC Operations Precinct

The NPC Operations Precinct would consist of various personnel buildings, maintenance workshops and small scale facilities. The precinct would also likely be the berthing location of the NPC dredge vessel and pilot cutters. Port craft, owned by NPC would be refuelled at Berth 1 adjacent to the NPC Operations Precinct, using an on-site underground diesel fuel storage tank (approximately 10,000 litres). NPC vehicles would also be refuelled at the precinct from an underground unleaded petrol tank (approximately 5,000 litres), using a bowser type filling operation. Whilst small quantities of Dangerous Goods would also likely be stored in the maintenance areas, these would not constitute a hazard to surrounding land uses.

As a result of the hazard analysis, the following incident has been carried forward for consequence analysis:

- Fuel release, ignition and fires at the NPC Operations Precinct.

Bulk and General Precinct

The Bulk and General Precinct would be used for grain storage, and for handling other bulk cargos such as cement, fertilizer and coke cargoes. This precinct would not be used for the storage and handling of Dangerous Goods. However, fumigation operations for grain storage may be performed in this precinct using methyl bromide. Fumigant recapture equipment is available for fumigation operations. It is assumed that recapture equipment would be used to minimise the impacts from releases of fumigant gases at the Port and therefore releases of fumigants was not carried forward into the consequence analysis.

General Purpose Precinct

The General Purpose Precinct would handle cargo containers, heavy machinery, Ro/Ro and break bulk cargo. Handling shipping containers in this precinct may require fumigation operations using methyl bromide. However, it is assumed that recapture equipment would be used to minimise the impacts from releases of fumigant gases and therefore releases of fumigants was not carried forward into the consequence analysis.

As mentioned previously, the general cargo handling facility Mayfield No. 4 Berth has been already approved within this precinct and commenced operation in 2010. This facility has approval for handling AN in a dedicated area located adjacent to the berth. AN would not be transported in large bulk lots (such as uncontained bulk storage in sheds at the wharf or transferred directly to or from the holds of ships). AN would be held in 1 tonne bulk-bags in shipping containers or in plastic lined shipping containers. Where AN is being shipped out of the Port, the containers would be transported to the area fronting the berth by truck and placed in a dedicated location. Once the cargo is approved for loading to the ship, the containers would be transported to the wharf by NPC forklift trucks and loaded using cranes. For cargoes entering the Port, the containers would be unloaded using cranes and transported to the dedicated area on the wharf where the containers would be held until cleared by customs. Once cleared by customs, the containers would be delivered by truck. There would be no transfer of AN between containers or removal of AN from containers during the handling period.

As a result of the hazard analysis, the following incident has been carried forward for consequence analysis:

- Fire in the AN storage area leading to explosion with the potential to impact adjacent sites.

Container Terminal Precinct

The Container Terminal Precinct would be used for container storage and transfer, and would include an area to accommodate 1 million TEU of containers per annum.

Once the ships are tied up, the cargo would be unloaded using ship-mounted lifting equipment or mobile cranes which lower the containers to the wharf where they are transported to the container storage area. A percentage of these containers would be fumigated, which requires dosing the containers with a charge of methyl bromide (up to 100 kilograms per container). It is assumed that recapture equipment would be used to minimise the impacts from releases of fumigant gases and therefore releases of fumigants was not carried forward into the consequence analysis. Once fumigation has been completed, the fumigated containers would be transferred to temporary storage, with the non-fumigated containers, where they would remain until cleared by customs. Once cleared, the containers would be transferred to premises off-site.

As part of the Container Terminal Precinct operations, there is a potential for Dangerous Goods to be transported using shipping containers. These goods would be delivered to the Port by the owners for transport to other Ports within Australia or overseas. In some cases, Dangerous Goods may be shipped into the Port for distribution within the Newcastle region or further afield. The goods would only be stored for a relatively short time during the customs clearance period and the loading to, or unloading from, the ships.

As a result of the hazard analysis, the following incidents have been carried forward for consequence analysis:

- Flammable gas leak into a container from a gas cylinder, delayed ignition and explosion;
- Flammable liquids release, ignition and pool fire;
- Flammable solids ignition and fire within a container; and
- Toxic chlorine gas release and dispersion downwind towards sensitive land uses (off-site).

Bulk Liquids Precinct

The Bulk Liquids Precinct would be used for the receival, storage, blending and distribution of fuels and biofuels for customers in the local region, and would have storage capacity of approximately 1,010 mega litres. The precinct would likely contain two bulk liquid terminals consisting of fuel tanks, transfer pumps, pipelines and truck loading bays. Fuels would be delivered to the site in tankers (ships) and transferred at the dedicated tanker unloading Berth 7. Once berthed, flexible hoses would be connected to the ship and shore pipelines, and the fuel transferred using ship-mounted pumps. Once the fuel transfer is complete, the flexible hoses would be disconnected and the ship would leave the berth.

Fuel bunkering operations may also occur at the site whereby fuel bunkering barges would be loaded from the terminals via the transfer pipeline (to and from the terminals to the wharf) and flexible hoses. Once the barge transfer is complete, the hoses would be disconnected and the barges transferred by tug to the ship requiring fuelling. The barges would be tied up to the ship and flexible hoses connected to the ship fuel-filling manifold. Fuel would then be transferred using barge-mounted pumps. On completion of the fuel transfer, the hoses would be disconnected and the barge would leave the fuelling area.

Fuel would be distributed to the Newcastle region and areas further afield by road tankers. Road tankers would be loaded using dedicated fuel transfer gantries constructed within the terminal areas. Trucks would load using loading arms, operated by a trained driver and computer-based loading system. Once loaded, trucks would leave the Bulk Liquids Precinct and deliver the fuel to the specific location.

As a result of the hazard analysis, the following incidents have been carried forward for consequence analysis:

- Fuel release at the bulk liquids wharf, ignition and pool fire;
- Ignition of fuel in a bulk liquids terminal storage tank, tank roof fire; and
- Release of fuel into a bulk liquids terminal tank bund, ignition and pool fire in the bund.

Consequence Analysis

As a result of the hazard analysis, the following incidents have been carried forward for consequence analysis. Each incident has been assessed in detail and all incidents were assessed for impacts at specific heat radiation levels (fire), overpressure (explosion) and toxic gas impact (toxic gas release). The distances to the specific levels of consequence impact were calculated to determine whether the impact at the site boundary exceeded the acceptable impact criteria. Results of the consequence analysis for each incident carried forward are described below.

Conclusions derived from the consequence analysis enabled detailed mitigation measures to be prepared outlining the required distances of development from potentially hazardous materials (refer to **Figure 9-6**). Mitigation measures and detailed design recommendations for subsequent Project applications are outlined in **Section 9.5.4**.

NPC Operations Precinct

- *Fuel release, ignition and fires at the NPC Operations Precinct.*

  Incidents resulting in release of fuels (diesel/petrol) during filling of tanks, fuelling of vehicles and/or boats could result in fuel ignition and fire, leading to heat radiation impact to the surrounding areas.

  A detailed consequence analysis for fuel releases during filling of tanks, fuelling of vehicles and/or boats identified that the worst case incident related to releases and subsequent fires during the filling of the underground tanks.

  Fires as a result of spills during underground fuel tank filling could impact the off-site areas within 16.1 metres of the filling point with a heat radiation level of 4.7 kilowatts per square metre (kW/m^2). A review of the NPC Operations Precinct indicates that a there would be sufficient area within this precinct to locate the underground tanks greater than 16.1 metres from the site boundary and the boundary of adjacent precincts within the site.

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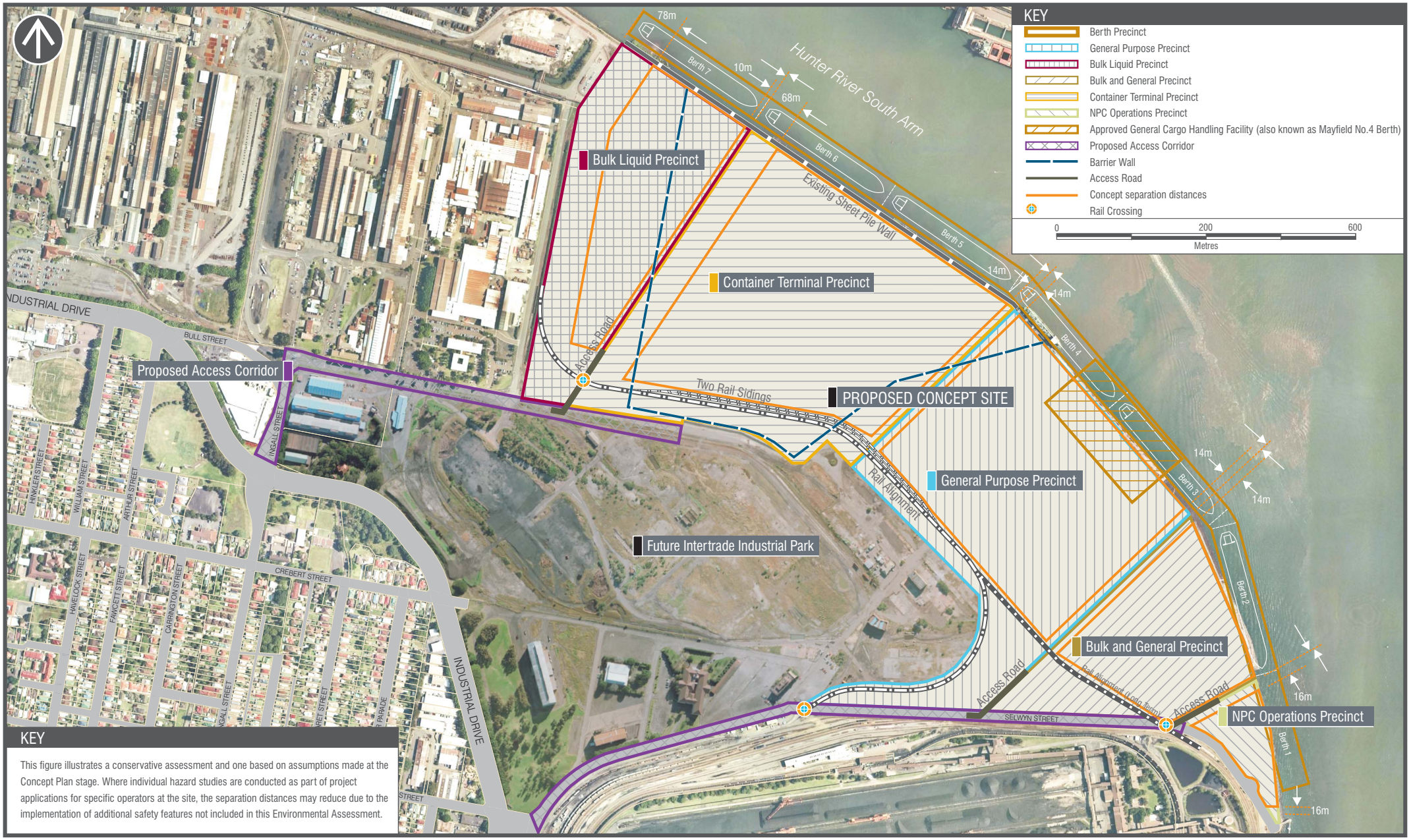

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CONCEPT SEPARATION DISTANCES BETWEEN PRECINCTS AND ADJACENT INDUSTRIAL FACILITIES

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-6

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General Purpose Precinct

- *Fire in the AN transit area leading to explosion with the potential to impact adjacent sites*.

  A detailed AN quantitative risk analysis showed that at the nearest sensitive land uses (a school 1.7 kilometres away), only an explosion of 6,500 tonnes of AN could cause injury to any occupants. The explosion analysis did not identify any explosion case that would cause a fatality due to overpressure in the residential areas. At the nearest residence (1.4 kilometres) an explosion of 3,000 tonnes (export volume) or 6,500 tonnes (import volume) could cause injury to occupants. This incident has been carried forward for risk review.

  Fires involving AN can generate toxic gases (e.g. nitrous oxides). Hence, the analysis conducted for the AN transit area identified that in the event of fire, a toxic smoke plume could result in fatalities up to 350 metres from the fire location. This distance is contained within the site, therefore no further analysis is required.

Container Terminal Precinct

- *Flammable gas leak into a container, from a gas cylinder, delayed ignition and explosion*.

  In the event of a flammable gas release (e.g. LPG) from a cylinder into a container, the gas would mix with air resulting in a flammable mixture that if ignited may result in explosion. *HIPAP No. 4 Risk Criteria for Land Use Safety Planning* indicates that an explosion over pressure of 7 kilopascals (kPa) should not be exceeded without further assessment. A detailed gas release and explosion analysis identified that the distance to an explosion overpressure of 7 kilopascals was estimated to be 78 metres from the container storage area. A separation distance of 78 metres between the containers and the precinct boundary is achievable under the proposed concept and therefore this item is not required to be carried forward for risk assessment.

- *Flammable liquids release, ignition and pool fire.*

  In the unlikely event of a release of flammable liquid from an isotainer into the flammable liquids bunded area, there is a potential for the liquid to ignite resulting in a pool fire. The fire would radiate heat to the surrounding area with the potential to impact off-site. HIPAP No. 4 indicates that a heat radiation level of 4.7 kilowatts per square metre should not be exceeded without further assessment. The distance to a heat radiation level of 4.7 kilowatts per square metre is 26.5 metres from the container storage area. A separation distance of 26.5 metres between the containers and the precinct boundary is achievable under the proposed concept and therefore this item is not required to be carried forward for risk assessment.

- *Flammable solids ignition and fire within the container.*

  Flammable solids would be transported in containers and may be ignited whilst in transit storage at the site. As the materials are solids, they do not spread like flammable liquids and therefore the fire would be contained in the immediate vicinity of the container itself. In the worst case, the container roof would collapse and the fire would be exposed across the top of the whole container. Analysis concluded that the distance to a heat radiation level of 4.7 kilowatts per square metre is 14.4 metres from the container storage area. A separation distance of 14.4 metres is achievable under the proposed concept and therefore this item is not required to be carried forward for risk assessment.

- *Toxic gas release and dispersion downwind towards sensitive land uses (off-site).*

  Ammonia would be transported in cylinders (1,000 kilograms) and possibly horizontal tanks (2,000 kilograms). Cylinders would be stored in containers in the upright position, with the valves at the top. Horizontal tanks would also be stored with the valves at the top. Valve caps and covers are installed on the cylinders and tanks, and damage to valves is highly unlikely. However, as a worst case incident a broken valve has been assumed for the assessment.

  In the event of a broken valve, the gas would be released via the hole remaining where the valve is fitted to the cylinder. Whilst it is recognised that excess flow valves are fitted to cylinders and tanks, this has not been included in the assessment for the sake of conservatism. A leak and dispersion analysis identified that there is potential for fatality from ammonia gas at distances of up to 320 metres from the ammonia storage area in the Container Terminal Precinct.

Chlorine would be transported in 70 kilogram cylinders and 900 kilogram drums. Chlorine cylinders and drums have an extremely robust cap fitting and drums have concave dished ends with the valves set back inside the concave section of the end. The potential for damage to valves in chlorine cylinders and drums is negligible, and anecdotal evidence indicates that such incidents have not occurred in the industry. However, leaks at valve connection and through valve seals is possible, albeit very low probability. A detailed chlorine leak and dispersion analysis indicates that there is a potential for fatality from chlorine gas release at distances up to 558 metres from the chlorine storage area at the Container Terminal Precinct. The study also identified that there is a potential for injury as a result of chlorine release up to a distance of 1,558 metres from the chlorine storage area at the Container Terminal Precinct.

The potential fatality and injury distances for chlorine are higher than those for ammonia, hence, the location of the toxic gas storage area would be governed by the chlorine analysis. A review of the proposed Container Terminal Precinct layout indicates that the storage for toxic gases could be located clear of adjacent properties. However, by locating the toxic gas storage close to the berths in the Container Terminal Precinct, the maximum distance to the site boundary (adjacent industrial site to the south) is only 500 metres. Therefore, the required separation distance is not able to be met under the proposed concept and there is risk that the toxic chlorine plume may extend into the adjacent site at a potentially lethal concentration. In addition, there is also a potential for a harmful (injurious) toxic plume to reach the residential areas to the south, as these areas are closer than 1,550 metres from the site. This incident has therefore been carried forward for risk review.

Bulk Liquids Precinct

- *Fuel release at the bulk liquids wharf, ignition and pool fire.*

  Analysis of potential impacts from a fire at Berth 7 as a result of a fuel release, ignition and fire indicates that the impact distance to 4.7 kilowatts per square metre for incidents at Berth 7 is 25.4 metres. The berth layout provides for adequate space in the berth area for the required separation distance without impacting adjacent facilities. The adjacent Berth 6 would be over 50 metres from the bulk liquids transfer area, hence, there would be no impact at this location from incidents at Berth 7.

- *Ignition of fuel in a Bulk Liquids Precinct storage tank and tank bund, tank roof fire, and pool fire in the bund.*

  A detailed analysis of fires in tanks and bunds at the proposed Bulk Liquids Precinct was based on the proposed storage quantities at each terminal within the precinct, a typical terminal layout, and the heat radiation from fires in bunds. Fires in bunds were assessed to be the worst case incident at the terminals due to the bund size in relation to the smaller tank diameters. The analysis concluded that terminals can be located such that there is no impact exceeding 4.7 kilowatts per square metre at the adjacent OneSteel facility to the west. However, impacts exceeding 4.7 kilowatts per square metre would extend into the adjacent Container Terminal Precinct by approximately 67 metres. This would not create any potential cumulative hazard or risk impacts, as long as the transit Dangerous Goods storage areas within the Container Terminal Precinct are not located within 67 metres of the edge of the bunds in the Bulk Liquids Precinct.

Risk Analysis

Only two incidents were identified to have the consequence potential to impact areas off-site, these were:

- *A leak from a chlorine drum valve within the Container Terminal Precinct leading to the development of a toxic plume which is directed towards the adjacent sites and residential areas by wind.*

  The hazard and consequence analysis identified that a release of chlorine from a valve on a chlorine drum could impact industrial off-site areas causing fatalities after an extended period of exposure to the toxic plume.

  A conservative drum leak frequency analysis was conducted and combined with the wind direction, weather conditions and the probability of fatality at the adjacent industrial land uses and/or injury at the closest residential area. The risk of injury and fatality was estimated to be 30 chances in a million per year (pmpy). The acceptable fatality and injury risk criteria is 50 pmpy. Hence, the assessed risk does not exceed the acceptable risk criteria and therefore the storage of the toxic gases would only constitute a potential hazard.

  A conservative drum leak frequency analysis was conducted and combined with the wind direction, weather conditions and the probability of fatality (at the adjacent industrial site) and/or injury at the closest residential area. The analysis identified that the closest residential area may be subjected to chlorine concentrations not exceeding 5ppm (see details above). At this level, injury to sensitive members of the community may occur.

Incident release frequency for chlorine was estimated to be 30 chances in a million per year (pmpy). Hence, the risk of injury at the closest residential area is 30pmpy. The acceptable injury risk at residential areas is 50 pmpy, hence this criteria is not exceeded. It is noted that the concentration of chlorine at the closest residential area is not sufficient to result in fatality. Hence, the risk of fatality at the closest residential area does not exceed the acceptable fatality risk criteria of 1 pmpy.

The concentration of chlorine at the adjacent precincts or industrial facilities has the potential to exceed 20 ppm. Hence, at this level of chlorine concentration fatalities may occur. The analysis identified that the release of chlorine could occur with a frequency of 30 chances in a million per year. Hence, the fatality risk at the adjacent sites would be 30 pmpy. The acceptable fatality risk criteria for industrial facilities is 50 pmpy.

Hence, in summary, the assessed risk does not exceed the acceptable risk criteria and therefore the storage of the toxic gases would only constitute a potential hazard.

In the event of a chlorine release at the Container Terminal Precinct, staff would have more than 20 minutes to raise the alarm and commence evacuations. As chlorine has such a pungent odour, early detection at extremely low levels is most likely, providing more than adequate time to initiate evacuation.

- *AN incidents within the General Purpose Precinct which could include fire, explosion and toxic plume.*

  The risks associated with the transit and handling of AN was assessed prior to construction of Mayfield No.4 Berth. This analysis indicated that a fatality risk of 0.5 pmpy extended a maximum of approximately 40 metres from the AN transit area. This risk is well contained within the General Purpose Precinct and therefore the risk criterion of 50 pmpy at the adjacent precinct was not exceeded.

Based on the analysis conducted, it was determined that the potentially hazardous areas within the site can be located such that they do not impact adjacent surrounding residential and industrial land uses (OneSteel, Carrington Coal Terminal and the IIP), and that potentially hazardous facilities can be located within specific precincts such that potential impacts do not overlap causing accumulation of risks. Therefore, the proposed concept can be classified as potentially hazardous and not actually hazardous, and would be permitted at the proposed location under the provisions of SEPP 33.

9.5.4 Mitigation Measures

Not withstanding the conclusion that the proposed concept can be classified as potentially hazardous and not actually hazardous, a number of mitigation measures are recommended to ensure the potential hazards and risks assessed are maintained in the As Low As Reasonably Practicable (ALARP) Range. The mitigation measures detailed below would be implemented by Project applicants where applicable:

- A detailed PHA would be conducted for each of the facilities proposed under subsequent Project applications to confirm the results of the PHA for the proposed concept and to ensure that the detailed site layouts and Dangerous Goods storage quantities and operations do not result in the acceptable risk criteria being exceeded;
- It was identified that methyl bromide would be used for fumigation of grain storage silos and containers that may contain contamination (e.g. wildlife, insects, etc.). Methyl bromide is a Chlorofluorocarbon (CFC) gas and has a detrimental effect on the environment if released. The Bulk and General Precinct, General Purpose Precinct and Container Terminal Precinct would be designed and operated with methyl bromide dosing and capture systems to minimise the risk of harmful gas release to the atmosphere;
- Liquid Dangerous Goods could be held in transit storage at the site. These goods may be held in packages, drums, intermediate bulk containers and isotainers (20,000 litre tanks). It was identified that a leak from a Liquid Dangerous Goods container could spill to the ground and, if ignited, could result in a pool fire and negatively impact on the environment. Spill containment areas should be constructed at the site. The spill retention area for flammable liquids (Class 3), toxic liquids (Class 6), corrosive liquids (Class 8) and environmentally hazardous liquids (Class 9) would be constructed to retain a minimum of 20,000 litres;
- In the event of a fire in the flammable solids container storage area within the Container Terminal Precinct, the fire would impact at a heat radiation level of 4.7 kilowatts per square metre up to a distance of 14.4 metres from the storage area. Any flammable solids storage area would be separated from other Dangerous Goods storages and the site/precinct boundary. It is also recommended that the assessment conducted in this study for the heat radiation impact from flammable liquids fires be reviewed during the detailed design of each subsequent Project application;
- In the event of a fire in the flammable liquids container storage area within the Container Terminal Precinct, the fire would impact at a heat radiation level of 4.7 kilowatts per square metre up to a distance of

26.5 metres from the storage area. Any flammable liquids storage area would be separated from other Dangerous Goods storages and the site/precinct boundary. It is also recommended that the assessment conducted in this study for the heat radiation impact from flammable liquids fires be reviewed during the detailed design of each subsequent Project application;

- In the event of a flammable gas release in a cylinder storage container within the Container Terminal Precinct, a gas ignition could result in explosion. The explosion overpressure impact to a level of 7 kilopascals (the maximum permissible at the precinct boundary without further analysis) was estimated to occur at a distance 78 metres from the storage area. The storage of flammable gases in cylinders would be separated from other Dangerous Goods storages and the site/precinct boundary;
- In the event of an incident at the site, the implementation of emergency response would result in the reduction of incident impacts. An Emergency Response Plan would be developed for each of the facilities at the site as part of subsequent Project applications and should be consistent with *HIPAP No.1 Emergency Planning Guidelines for Industry* (DoP, 2008);
- Detailed hazard analysis studies conducted for the terminals within the Bulk Liquids Precinct would include an assessment of risks to identify whether the buffer zones assessed in this concept analysis can be reduced by the introduction of terminal safety features (e.g. fire detection and protection systems, emergency response plans, etc.); and
- Future operators would consider risk reduction measures for chlorine gas at the Project application stage.

In addition to the safety management of the Port temporary Dangerous Goods storages (i.e. transit storages), and the safeguards listed above, a number of additional safeguards would be provided at the site. The following safeguards would be provided by future operators:

- Fire hydrants;
- Fire pumps that draw water from the South Arm of the Hunter River (unlimited water supply);
- Fire hose reels in the buildings in each facility; and
- Fire extinguishers in the buildings in each facility and on each vehicle used within the Port (e.g. forklifts, trucks, etc.).

NPC would be responsible for:

- Updating NPC's existing Port Emergency Response Plan to include any additional response measures specific to the site;
- Responding to port-related emergencies at the site by the Port Emergency Response Team;
- Purchasing and providing spill retention equipment (i.e., spill kits, booms, etc.) at the site for quick response and deployment; and
- Training NPC site personnel in emergency response procedures.

9.5.5 Conclusion

Based on the analysis conducted in the PHA it was identified that the potentially hazardous areas within the site could be located such that they do not impact adjacent surrounding land uses (e.g. OneSteel, Carrington Coal Terminal, IIP and residential areas, etc.) in a manner exceeding permissible impact levels published in HIPAP *No.4, Risk Criteria for Land Use Planning* and HIPAP *No. 10, Land Use Safety Planning*. It was also identified that the Dangerous Goods storage areas within each precinct can be located such that there is no accumulation of risk resulting in risk values exceeding permissible impact levels published in HIPAP No.4 and No. 10. Hence, the proposed concept can be classified as only potentially hazardous and not actually hazardous and therefore would be permitted at the proposed location under the provisions of SEPP 33.

9.6 Water Management

9.6.1 Existing Environment

Surface Water Management

The Port of Newcastle is located in the Hunter Estuary at the mouth of the Hunter River. The Hunter estuary is the second largest estuary in NSW, comprising over 100 kilometres of waterways, including the South Arm of the Hunter River which flows to the south of Kooragang Island.

The estuary has been substantially modified as a result of demand for industrial land and the major changes in land use which have taken place upstream. In addition to port-related activities, a range of other commercial

activities exist within the estuary, including tourism, commercial and recreational fishing, ship building and maintenance, and general and heavy industry. These types of land use contribute sediments and other pollutants to the estuary, impacting on water quality and habitat integrity (Hunter Valley Research Foundation, 2008).

The site is located adjacent to the South Arm of the Hunter River. The site is generally flat and has been altered through the ongoing remediation works (refer to **Section 9.9**). The remediation works at the Closure Area included decommissioning of site drainage, grading of the site, installation of a subterranean barrier wall, capping the surface of the site and installation of a stormwater management system to control runoff and discharge of contaminated suspended sediments and stormwater (HDC, 2008).

In unremediated areas, stormwater flows unrestricted into the South Arm of the Hunter River or is retained in existing low points across the site and is infiltrated. There is also a stormwater drainage network in place at the site, including stormwater pits, pipes and discharge structures into the South Arm of the Hunter River. The layout of the existing site drainage at the site is shown in **Figure 9-7**. The design of the stormwater system including main drains, pits and culverts was guided by the *Preliminary Stormwater Strategy* (PSS) prepared for the site (refer to **Appendix H**).

Two drains, the Eastern Drain and Western Drain, were constructed as part of the remediation works. The Eastern Drain, located along the southern boundary of the site near the proposed NPC Operations Precinct, is approximately 900 metres in length. For most of its length it is an open drain constructed with high density polyethylene (HDPE) geomembrane, crushed concrete and soil (refer to **Figure 9-8**). Approximately 250 metres of the drain is precast concrete box culvert and conveys stormwater beneath Selwyn Street to the South Arm of the Hunter River. The Western Drain, located along the north western boundary of the Bulk Liquids Precinct, is approximately 700 metres in length. It is an open drain for most of its length (refer to **Figure 9-7**), constructed of HDPE, crushed concrete and soil. A box culvert approximately 220 metres in length conveys stormwater beneath the Koppers pipeline to the South Arm of the Hunter River. The main drains were lined to prevent contamination from groundwater into the drainage system.

The open sections of the main drains have grassed sloping channel edges which meet benches (2.5 metres to 3 metres wide) located in the intertidal zone. The benches of the Eastern Drain are vegetated with mangroves to provide a water quality function and visual amenity. Incorporated into each main drain is a weir at the downstream end to maintain permanent water (RL 0.1 metres AHD) at low tide. Permanent pools created by the weirs and deep water zones located within the channel, provide stormwater attenuation and low flow velocities within the channels and promote settlement of sediments. Both drains (including culvert sections) were designed for the 1 in 100 year Average Recurrence Interval (ARI).

The main drains receive runoff from across the site via a series of open drains and trunk stormwater pipes that are connected to the main drains. Runoff from the adjacent site to the south (the proposed Intertrade Industrial Park) also flows into the Eastern and Western Drains. Stormwater from the main drains is discharged into the South Arm of the Hunter River. The discharge points of the main drains to the South Arm of the Hunter River are located at the north west and south east of the site and are shown in **Figure 9-7**. There is also a culvert that discharges stormwater from the contoured low area within Area 1 into the South Arm of the Hunter River (refer to **Figure 9-7**).

A number of temporary lined shallow ponds have been constructed across the remediation area. These ponds contain weirs to control water levels, and drain off-site via lined channels or existing underground drainage.

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EXISTING SITE DRAINAGE

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-7

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Figure 9-8: Eastern Drain Upstream

The site has been partly contoured to direct stormwater runoff into the stormwater drains. Area 1 and the area directly to the west of Area 1 (refer to **Figure 2-3**) have been contoured to alleviate areas of ponding and reduce surface water infiltration, thereby reducing interaction with, and recharge of, contaminated groundwater.

A key element of the 2001 consent and the VRA prepared in September 2005 was the requirement for the site to be sealed with an inert capping layer to prevent infiltration of surface water runoff. The capping has been completed for Area 1 (refer to **Figure 9-7**). Area 2 recontouring and capping works commenced in 2010 and will be completed in 2012 (HDC, 2009).

The stormwater management system in conjunction with the capping of the site, provide a barrier minimising groundwater and surface water interaction and have been designed to work together to reduce the amount of rainwater infiltrating the site and the movement of groundwater through contaminated soil and into the South Arm of the Hunter River (refer to **Figure 9-9**).

Mayfield No. 4 Berth is a two hectare berth and hardstand within the Closure Area that was constructed as part of the refurbishment of former BHP Wharf 5. The site has a stand-alone stormwater management system consisting of source control devices for the capture and retention of contaminants as well as a biofiltration swale to collect water from the hardstand. The surface levels were designed and constructed to be free draining to drainage pits to ensure stormwater does not collect at low points. The pits are connected to the stormwater management system and the quality of the water discharged to the South Arm of the Hunter River is governed by the concentration limits contained in the EPL for the Mayfield No. 4 Berth (refer to **Appendix H**).

Surface Water Quality

Hunter River

The estuary of the Hunter River is one of the largest and most developed estuaries in NSW and has undergone significant environmental and physical changes associated with port and industrial development over the last 200 years (Newcastle City Council, 2009). The site is adjacent to the South Arm of the Hunter River, which is highly disturbed as a result of historical and ongoing industrial activity in and around the Port of Newcastle. Heavy industry, manufacturing and shipping have contributed to poor water quality within the lower reaches of the Hunter River, including the South Arm.

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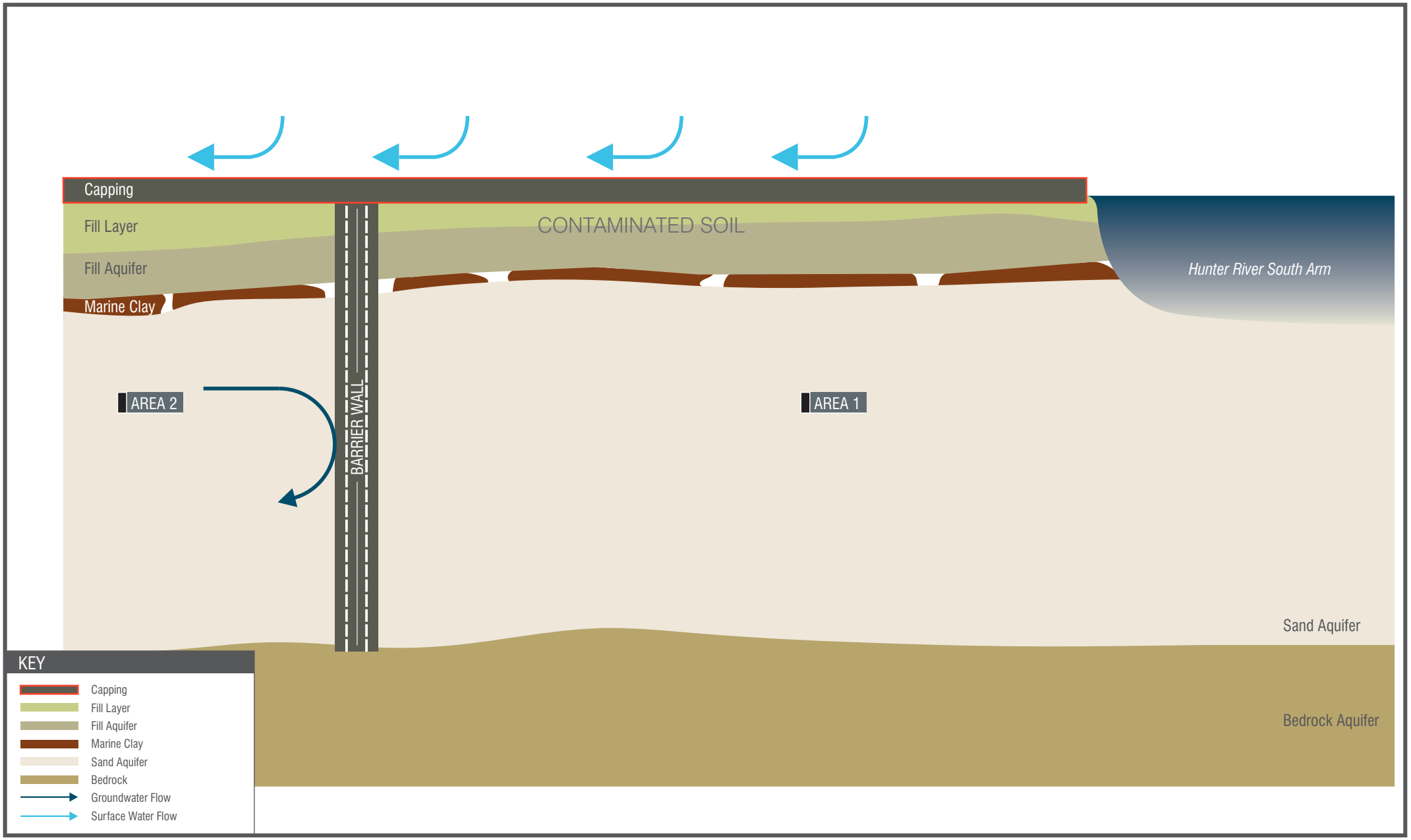

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Drawing Source: RLMC (2006)

NOT TO SCALE

CONCEPTUAL DIAGRAM OF GROUNDWATER AND SURFACE WATER BEHAVIOUR WITH CAPPING AND BARRIER WALL IN PLACE

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-9

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The Site

Sampling of surface water monitoring locations across the Closure Area was undertaken by Coffey Environment (refer to **Appendix H**) between June 2007 and March 2008, following rainfall (greater than 10 millimetres in 24 hours). Monitoring locations are shown on **Figure 9-10**. In general, the following observations were made:

- Exceedances of Australian and New Zealand Environment Conservation Council (ANZECC) marine trigger values (95 percent level of protection) were common for heavy metals across all monitoring locations, particularly copper, lead and zinc. Chromium and cadmium exceedances were also observed. Elevated heavy metal concentrations were attributed in part to suspended particles in the water samples (which were not filtered prior to laboratory testing).
- Turbidity exceedances of the ANZECC guideline value (0.5 to 10 Nephelometric Turbidity Units (NTU)) were attributed to increased suspended sediments resulting from earthworks, including construction of the cap, and erosion of uncapped areas.
- In general, Total Petroleum Hydrocarbons (TPH) concentrations were below the intervention/investigation level of 325 micrograms per litre (µg/L). Elevated TPH concentrations in one sampling location was attributed to the high use of trucks, cars and other heavy equipment.
- Elevated concentrations of PAHs were recorded. Higher concentrations in Area 1 were partly attributed to runoff from the bitumen seal used to coat the cap constructed in that area.

Sampling was also undertaken by GHD between November 2008 and October 2009 (refer to **Appendix H**). The results demonstrated:

- In general, turbidity exceedances were observed at all locations, with the highest and most frequent exceedances occurring in the south east of the site (in Area 2). These areas are currently uncapped and turbidity exceedances are likely the result of disturbance of sediments from earthworks and erosion of uncapped areas draining to the sampling locations.
- Heavy metal exceedances, particularly copper, lead and zinc, occurred for all sampling events and in all locations, including the Eastern and Western Drains.
- TPH concentrations were generally below detection limits for all sites except SW9 (Daracon Drain), located in the south east of the site, which recorded elevated levels of TPH since May 2009, with an exceedance of the guideline value on one sampling event (September 2009).
- PAH concentrations were generally below limits of recording for all sites except SW9.

Flooding

The flat nature of the site and its proximity to the South Arm of the Hunter River means that flooding within the site could occur from runoff from local rainfall (rainfall dominated), high water levels in the Port of Newcastle (tide dominated) or a combination of both. The site ground levels range from 1.5 to 5.5 metres AHD. The estimated peak 100 year flood level in the Port adjacent to the site is 1.35 metres AHD (RLMC, 2006).

Flood modelling undertaken by Patterson, Britton and Partners in 2006 to determine the performance of the PSS assessed the performance under a 1 in 100 year storm. An assessment of floods rarer than the 1 in 100 year ARI (such as the probable maximum flood level) was not required as the site would be industrial in nature (RLMC, 2006).

Groundwater Management

The site is underlain by three distinct groundwater aquifers with generally low to very low permeability (URS, 2000):

- A shallow, unconfined aquifer is associated with the fill layer. The aquifer thickness varies from 5 metres in the west to 0 metres thick in the east of the site and the predominant flow direction is north to north east towards the South Arm of the Hunter River. Groundwater flow in some areas is in a southerly direction towards the Eastern Drain. There is some vertical interaction with the underlying estuarine aquifer.
- The estuarine aquifer is located in the estuarine clay and sands between the fill material and the bedrock. The groundwater flow is north to north easterly towards the South Arm of the Hunter River and is influenced by tidal channels and drains.
- The bedrock aquifer is the deepest of the three aquifers and is a low permeability aquifer located within the bedrock of the Tomago Coal Measures. The groundwater flow is generally north to north easterly towards the South Arm of the Hunter River and there is also some upwards flow into the estuarine aquifer.

Tidal effects on the groundwater differ depending on the level of groundwater in comparison to sea level. However, previous investigations within the Closure Area revealed little evidence of tidal interaction and that tidal mixing of river water with shallow groundwater is likely to be limited (URS, 2000).

In 2008, a subterranean barrier wall constructed from primarily a mix of soil and bentonite, was installed on the boundary between Area 1 and Area 2 of the Closure Area. The barrier wall extends from the ground surface to the bottom of the natural sand and alluvial deposits of the South Arm of the Hunter River (30 to 49 metres). The barrier wall minimises groundwater flow into Area 1. The alignment of the barrier wall is shown in **Figure 9-7** and a conceptual diagram of the groundwater environment in the vicinity of the barrier wall is presented in **Figure 9-9**.

Capping and installation of the barrier wall have caused groundwater levels in fill materials to be lower inside the wall compared to outside. With the barrier wall restricting groundwater flow, groundwater outside the wall is diverted around the enclosed area towards the South Arm of the Hunter River (Environmental Earth Sciences, 2008). This is due to the barrier wall acting as a low permeability pathway for groundwater flow, that is, groundwater flows along the outside of the barrier wall rather than through it. Reduced infiltration and groundwater flow have meant that contaminants in Area 1 remain in situ and are less likely to be mobilised to discharge to the South Arm of the Hunter River (RLMC, 2006b).

The site groundwater is currently being monitored by HDC, in accordance with the VRA, for groundwater levels and water quality through a number of groundwater monitoring wells on the site.

Groundwater Quality

Historically, groundwater quality at the site has been very poor as a result of contamination from industrial activity. Groundwater quality prior to remediation works was assessed by URS in 2000. Select areas within the site showed elevated concentrations of PAH and lower concentrations of phenolic compounds and BTEX.

Monitoring undertaken by Douglas Partners in 2005 and 2006 found that organics were generally below guideline criteria but inorganics and PAHs generally exceeded guideline criteria. Heavy metals and ammonia concentrations were also present above guideline criteria in most wells. In 2006, Douglas Partners reported that concentrations of chemicals in groundwater were generally decreasing with time.

Large scale remediation works have been undertaken to address groundwater and soil contamination at the site, including containment of contaminated soils via cut and fill, construction of on-site emplacement areas for highly contaminated soils, capping of the site and installation of the barrier wall.

Groundwater quality monitoring was undertaken and reported by Environmental Earth Sciences in 2008 and 2009 EA. Boreholes generally showed neutral pH between 6.5 and 8.5, with isolated boreholes showing more alkaline or acidic conditions. Vertically, salinity ranged from least saline in the fill aquifer, to very saline in the deep aquifer. TPH concentrations were measured above detection limits but were mostly within site specific guideline values, with occasional exceedences in isolated boreholes. Exceedences of PAH, phenols and BTEX components predominantly occurred in Area 1, indicating that organic contamination at the site appears to be largely contained within the barrier wall. Isolated exceedences of heavy metal guideline values were also recorded.

AECOM

SURFACE WATER MONITORING LOCATIONS

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-10

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9.6.2 Future Drainage Conditions

Development as part of the proposed concept would be staged across the five precincts and individual proponents would prepare Project applications to develop areas within the precincts. The individual developments would be developed in accordance with the CSMP prepared in September 2009. The CSMP provides the common framework for the design, implementation, use and maintenance works across the whole Closure Area.

Parsons Brinkerhoff Partners prepared a Preliminary Design Stormwater Strategy (PDSS) for the preliminary design of the site earthworks and drainage that forms the remediation works for the Closure Area. The PDSS was based on preliminary designs for roads and stormwater networks to prove the earthworks design was compatible with technically viable solutions for the future roads and drains. The PDSS was developed in accordance with Newcastle City Council design criteria (refer to **Appendix H**). The PDSS considered trunk drainage infrastructure (implemented as part of Stage 1 works) as well as road and lot drainage to be constructed synergistically with future individual developments within the site.

A site-wide Stormwater Management System (SMS) is to be prepared which would build on elements in the PDSS which have not been superseded by design changes. The detailed design of stormwater systems for individual Project applications would be required to comply with the SMS. The SMS would be designed and implemented in accordance with Newcastle City Council design criteria, principles set out in the CSMP and in consultation with DECCW.

The key design objectives of the stormwater system for the proposed concept include:

- Design of the stormwater system to be coordinated across the site but would also reflect specific requirements of each precinct;
- Convey stormwater generated on-site to the South Arm of the Hunter River (receiving water);
- Isolate the stormwater from the local groundwater table;
- Provide sufficient capacity in main drains and basins to retain the 1 in 100 ARI;
- Maintain water quality and provide aquatic habitats where possible;
- Promote recycling and reuse of drainage runoff where possible;
- Provide maintenance access where necessary;
- Provide an aesthetically appealing drainage solution;
- Utilise existing infrastructure where possible; and
- Minimise construction costs and spatial requirements.

The final design and arrangement of stormwater drainage features would be developed as part of the individual Project applications. There would likely be a drainage line constructed adjacent to the future rail line. Stormwater would flow to the east and west and connect to the existing Eastern and Western main drains. At the eastern end, water would drain to a new culvert that would most likely be located adjacent to the existing culvert on the Eastern Drain. A culvert would also be constructed under the future rail line in the west of the site. A topographical ridge would be formed between the river and the new rail line. Stormwater from land to the north of the future rail line would be collected in a series of low points, which would have surface water quality improvement devices fitted and drains constructed to convey water to the South Arm of the Hunter River.

The existing temporary lined ponds across the site would be superseded in Stage 2 remediation works. The stormwater system for individual projects would incorporate a range of detention and surface water quality management features to ensure that surface and groundwater quality and quantity are managed effectively across the whole site. These features, which would be designed to be consistent with the final land use within each precinct, are described in **Section 9.6.4**.

A sheet pile wall may be installed along the shoreline between the land and water-based areas at Berths 2 and 3, to provide stability along the foreshore. The sheet-pile wall, if constructed, would be for foreshore stability rather than hydraulic containment. It is typical for sheet-pile walls to allow some groundwater flow beneath the base of the wall, however, the amount of flow depends on the design of the sheet-pile wall, the depth of the wall, and the material into which the wall is anchored. Assuming a sheet-pile wall would be required at Berths 2 and 3, the design of the wall and future groundwater flow from this area of the site to the South Arm of the Hunter River would be determined at the Project application stage when design details are available.

The NSW Government has recently adopted a policy on sea level rise, which considers that an estimated sea level rise of 0.9 metres could occur progressively to 2100. Sea level rise would have implications for flood levels however, with the exception of the Eastern and Western drains which are flat drains, it is not expected that an increase in flood levels due to sea level rise would affect a large proportion of the site (Worley Parsons, 2010). The impacts of sea level rise would be considered during the development of the SMS and would be taken into account in future stormwater modelling to ensure that appropriate mitigation measure and stormwater management infrastructure is implemented across the site.

9.6.3 Impact Assessment

Given the proposed use of the site, the greatest potential for adverse impacts to the water environment at the site is through:

- General land-based construction works;
- Volumes of drainage runoff generated from hardstand areas and buildings;
- Discharge of contaminated stormwater runoff during construction and operation; and
- Spill and leaks during construction and operation.

The following section describes the potential impacts on the water environment during construction and operation of the proposed concept. These impacts would be addressed in more detail in subsequent Project applications, when detailed design, construction and operation methodologies would allow a more detailed assessment of potential impacts and management measures.

General Impacts for all Precincts

Construction

Drains (not including the main Eastern and Western Drains) and shallow ponds constructed during the remediation works were intended to serve as an interim drainage system until the final use of the site was determined and a permanent drainage system implemented. Construction works would alter the existing drainage regime of the site, with the potential to impact on localised flooding and water quality.

The ground surface of Area 1 is contoured to drain runoff to main drains prior to discharge to the South Arm of the Hunter River. The surface of Area 2 would also be profiled to direct runoff away from the river to the main drains (refer to **Figure 9-6**) prior to discharge.

There is the potential that the surface gradient within the precincts would be altered during construction works for the proposed concept, resulting in impacts on surface water drainage across the site. Changes to the surface gradient could result in areas of ponding and lead to infiltration and interaction with contaminated soil and groundwater.

During construction there would be the potential for impacts arising from erosion and sedimentation where there are construction material stockpiles and exposed work areas within the construction site, such as unsealed access roads, rail construction and construction areas for buildings. Fine particles from eroding soils and associated heavy metal and organic contaminants could be generated and mobilised during the construction activities on-site, including earthworks and excavation for foundations, rail and road infrastructure and stormwater drainage networks. Without the implementation of appropriate control measures, erosion and mobilisation of sediments could result in degradation of water quality on-site and in the Hunter River.

There would be the potential for impacts on water quality in the Hunter River or drains on-site resulting from spills and leaks from plant and machinery operating during construction.

Vehicle and plant movements during construction would also have the potential to impact on water quality. Potential pollutants in road runoff include combustion products of hydrocarbons, fuel and fuel additives, catalytic converter materials, metal from friction and corrosion of vehicle parts and lubricants. Particulate contaminants originating from vehicles and vehicle related activities include carbon, rubber, plastics, grit, rust and metal filings. Water quality impacts could occur through the increased load of pollutants such as hydrocarbons, heavy metals and particulates deposited on roads and taken up by runoff during rainfall.

Operation

The greatest potential for impacts on hydrology and water quality during operation of the proposed concept would be from stormwater management from buildings and hardstand areas and transport and portside operation activities.

As part of the remediation works (under the 2001 consent and the VRA), Area 1 was sealed with an inert capping layer to prevent surface water infiltration. Area 2 would also be capped as part of individual developments within the site or as separate remediation projects. The capped surfaces across the site would be further covered by impervious hardstand. Surface water runoff from the impervious surface has the potential to mobilise sediments and contaminants (such as litter and hydrocarbons from oil and fuel spills and leaks) and organic matter which would degrade receiving water quality.

Road and rail infrastructure constructed to service the site could be the source of a range of potential pollutants in surface runoff from the site. Large volumes of trucks would use access roads and internal road networks to import and export bulk goods, liquids and general cargo. Runoff from roads and railways servicing the site would be likely to have elevated concentrations of heavy metals, sediments and other contaminants. Untreated, this contaminated runoff could impact on water quality.

Road and rail infrastructure has the potential to divide catchments and provide a barrier to surface water flow from one part of the site to another. This would in turn potentially increase flood risk within the site. Flood risk impacts would be addressed by ensuring that appropriately designed culverts are installed and maintained.

Failure of part of the surface water management system, for example drain/pipe blockages, could result in uncontrolled discharge of contaminated surface water runoff within the site or to the South Arm of the Hunter River. Malfunction or poor maintenance of the surface water management system could also result in increased localised flooding, with the potential to impact on the site and on neighbouring land.

Although unlikely, cargo losses, fuel and oil spills and leaks, for example from damaged transfer pipelines or general wear and tear on facilities and infrastructure, would have the potential to impact on water quality of the stormwater within the site and the South Arm of the Hunter River if not controlled.

Impacts Specific to Individual Precincts

NPC Operations Precinct

The NPC Operations Precinct would contain several buildings, including offices and storage and maintenance sheds, small scale vehicle and marine equipment maintenance areas and a helipad. The culvert located at the downstream end of the Eastern Drain would pass under this precinct and discharge into the South Arm of the Hunter River.

Two underground storage tanks (10,000 and 5,000 litre capacity) would be constructed in this precinct. Construction activities would have the potential to disturb the groundwater environment directly by altering groundwater flows. There could also be impacts on groundwater quality by mobilising contaminated sediments through intrusive construction works. In order to construct the underground tanks, the capping would need to be penetrated, which would increase the potential for interaction of surface and groundwater. This in turn would increase the potential for creating a contaminated groundwater plume should the infiltrated water come into contact with subsurface contaminated sediments. Management measures and construction restrictions set out in the CSMP would address this impact.

During operation, the underground tanks would be used to store diesel and unleaded petrol, presenting the potential for spills and leaks to the groundwater environment. These tanks would be designed according to international design standards and management measures (outlined in **Section 9.6.4**) would be implemented to reduce the risk of spills and leaks from tanks.

The precinct is likely to house the NPC dredging vessel therefore impacts resulting from spills and leaks during maintenance of marine vessels and dredging equipment or refuelling of vessels at the berth could occur and have adverse impacts on the water quality of the South Arm of the Hunter River. Impacts could also occur if contaminated runoff from vessel and machinery storage areas was allowed to flow into site drains or directly from the precinct into the South Arm of the Hunter River.

Runoff flowing over hardstand areas that receive vehicle traffic, such as parking areas and access roads, could contain elevated levels of pollutants such as heavy metals and PAHs. Hardstand areas would also minimise infiltration and result in increased flow volumes and velocities, potentially increasing localised flood risk within the precinct and to the adjacent Bulk and General Precinct. Runoff from buildings and hardstand areas would be captured and reused on-site thereby reducing the volume and velocity of stormwater runoff across the site.

Bulk and General Precinct

The Bulk and General Precinct would consist of facilities for handling and storage of bulk goods. There would be covered and uncovered storage areas, storage silos, conveyor systems and office buildings. Goods to be handled and stored include grain, dry-bulk cement, fertiliser, coke, soda ash, meals and sand. All goods would be stored in covered storage areas, except boutique coal and sand which would be stored uncovered.

During operation, there is the potential for spills from ship loaders/unloaders during transfer of bulk goods from ships to land and vice versa. Malfunction of conveyor systems and pipelines could result in uncontrolled spills and leaks and lead to degradation of stormwater quality. Fuel and oil leaks and spills from machinery and plant could also result in water quality impacts in this precinct.

There is the potential for contaminated runoff to be produced by uncovered sand and boutique coal stockpiles during rainfall. In addition, materials and particles blown from uncovered stockpiles during windy conditions, could result in deposition and contamination of waterways within and adjacent to the site. Measures such as bunding to capture runoff, as well as dust and sediment control measures (refer to **Section 9.6.4**) would be implemented to reduce the potential for stockpiles being the source of contaminated runoff.

Road and rail infrastructure constructed to service the precinct could be the source of a range of potential pollutants in surface runoff from the precinct. A large number of trucks would use the access road and internal road network to import and export bulk goods. The potential pollutant loads in road runoff, including hydrocarbons, fuels, heavy metals and particulates, would increase and result in impacts on water quality in the stormwater drainage system and potentially the Hunter River. First flush stormwater containment would be designed into the SMS, to capture and separate the most contaminated portion of stormwater runoff.

The construction of a new access road off Selwyn Street and the internal road network, could form barriers across the local catchment area during operation, potentially altering flood risk within the site and to the adjacent Container Terminal Precinct and IIP. Appropriately sized culverts would be designed and constructed under roads to convey flows across the site to main drains and retention basins.

General Purpose Precinct

The General Purpose Precinct would be used for handling and storage of cargo containers, heavy machinery, break bulk and Ro/Ro cargo. A range of cargo and machinery would be imported and exported through the General Purpose Precinct. Cars, farm and road construction machinery and excavators would be imported while ammonia nitrate, scrap metal and pine logs would be exported from this precinct. Cargo including large industrial components, luxury boats, transformers, machinery, steel and timber products would be imported and exported.

Part of the subterranean barrier wall installed as part of the remediation activities is located in the northern corner of the General Purpose Precinct. Construction activities have the potential to impact the integrity of the barrier wall, which could in turn result in groundwater or surface water infiltration into the highly contaminated sediments of Area 1. There is a 15-metre easement in place around the barrier wall and the CSMP places restrictions on construction activities within the vicinity of the barrier wall. These measures would minimise the potential for the barrier wall to be damaged, in turn reducing the likelihood of infiltration and contamination (refer to **Section 9.9**).

A large number of trucks would service the import and export activities in this precinct, which would increase the concentration of pollutants in surface water runoff from the internal road network and potentially impact on water quality.

During operation, there is the potential for spills during transfer of cargo and machinery from ships to land and vice versa. Malfunction of cranes and conveyors could result in uncontrolled spills and leaks and lead to degradation of stormwater quality. Fuel and oil leaks and spills from machinery and plant could also result in water quality impacts in this precinct. Strict procedures for cargo transfer and regular maintenance of cranes, conveyors and machinery would be implemented to manage the potential for spills during operation.

The large weight of mobile cranes and heavy machinery moving across the precinct could result in damage to the barrier wall at the land surface. This could result in infiltration of surface water and a potential increase in the volume of water in contact with contaminated sediments and groundwater. The likelihood of this impact occurring is low as the barrier wall has been designed to withstand sustained heavy loads associated with port operations (refer to **Section 9.9**).

Container Terminal Precinct

Containers would be imported, exported and stored in this precinct. Development of this precinct would include buildings, quayside infrastructure such as mobile cranes, hardstand areas, workshop, quarantine facilities and road and rail infrastructure.

Part of the subterranean barrier wall installed as part of the remediation activities is located in the east, west and south of the Container Terminal Precinct. Construction activities have the potential to impact the integrity of the barrier wall, which could in turn result in groundwater or surface water infiltration into the contaminated sediments of Area 1. The likelihood of this impact occurring is low as the CSMP places restrictions on construction activities within the vicinity of the barrier wall, which would minimise the potential for the barrier wall to be damaged, in turn reducing the likelihood of infiltration and contamination.

During operation, a large number of trucks and some trains would service the precinct at peak operation (1 million TEU). Pollutants generated from the increased volumes of road and rail movements, including hydrocarbons, fuels, heavy metals, lubricants and particulates would potentially contaminate surface water runoff and impact on water quality of receiving drains and the Hunter River.

The large weight of mobile cranes and container stacks within the precinct could result in damage to the barrier wall at the land surface, resulting in a potential increase in the volume of water in contact with contaminated sediments and groundwater. The likelihood of this impact occurring is low as the barrier wall has been designed to withstand sustained heavy loads associated with port operations (refer to **Section 9.9**).

Bulk Liquid Precinct

Receival, storage, blending and distribution of fuels and biofuels would occur in this precinct. Fuel types handled would include unleaded petrol, diesel, biodiesel, fuel oil and ethanol. Unleaded petrol, diesel and fuel oil would be delivered to the site by ship and biodiesel would be delivered by road. Infrastructure would include tank farms with steel storage tanks, fuel distribution pipelines, loading/unloading facilities for trucks, bunded areas, workshops and administration buildings.

Ships at Berth 7 would transfer unleaded petrol, diesel and fuel oil through flexible hoses to an aboveground pipeline and into the bulk liquid facilities. There is the potential for spills and leaks to occur during transfer of the liquids from ships to facilities, from damaged hoses and pipelines. There is also the potential for overfilling of storage tanks during receival of fuels from both ships and road tankers which could result in large spills into the drainage system of the precinct or directly to the South Arm of the Hunter River. Large spills are unlikely to occur as there would be strict procedures set out in environmental management plans, incorporating visual inspections, supervision of transfers and regular maintenance of hoses and pipes.

Bulk fuel storage tanks would have the capacity to store approximately 1,010 megalitres of fuel on the site. Damage to tanks, corrosion, malfunction of valves and level gauges and failure of bunding, although highly unlikely, could result serious leaks, spills and overflows of potentially large volumes of fuels and oils to the receiving environment. The resultant impacts of uncontrolled fuel spills on the Hunter River would be significant and potentially cause long-term damage to water quality, habitats and sediments within the river. Bunding would be placed around storage tanks to contain spills and overflows and emergency response plans would be implemented to ensure the risk and impact of spills and overflows is minimised.

Bunded areas would create micro-catchments within the precinct, potentially impacting flood risk potential. Stormwater drainage infrastructure would be designed to ensure bunded areas are incorporated into the stormwater system, thereby managing the potential for flood risk impacts within or downstream of the precinct.

Berth Precinct

During operation, runoff from the hardstand areas of the berths could become contaminated with sediment and pollutants associated with machinery and vehicles and result in impacts on water quality if allowed to drain directly to the Hunter River. The first flush containment system that would form part of the SMS (refer to **Section 9.6.4**) would capture rainfall runoff containing accumulated pollutants, reducing their release to the South Arm of the Hunter River.

9.6.4 Mitigation Measures

The recommended mitigation measures described in this section are intended to address the general impacts identified at this stage for the proposed concept. Potential project-specific impacts would be addressed in subsequent Project applications ensuring that a comprehensive suite of safeguards would be in place to minimise potential impacts on the water environment.

General Mitigation Measures for all Precincts

Construction

Construction works would be undertaken in accordance with Construction Environmental Management Plans (CEMPs), the CSMP and appropriate environmental controls and work method statements would be prepared for construction activities carried out across the site.

Water quality impacts during construction would be managed according to the CEMPs that would be prepared for each Project application. The CEMPs would set out appropriate controls to manage and mitigate potential impacts on water quality and would outline appropriate response procedures for dealing with emergencies such as spills and leaks during construction activities. These controls would be detailed in a series of sub-plans including:

- Soil and Water Management Plan
- Emergency Response Plan

The existing temporary drainage system would continue to be utilised during construction works. Prior to decommissioning interim environmental drains, individual projects would obtain regulatory approval for the design of a permanent stormwater management system, which would comply with the overarching SMS and be consistent with relevant council and agency requirements.

Erosion and sediment control measures would be set out in the Soil and Water Management Plan could include:

- Covering of transport vehicle loads;
- Watering of stockpiles;
- Stabilisation of finished areas and stockpiles as soon as practicable;
- Provision of wheel wash facilities;
- Use of soil conservation works including silt fencing and bunding;
- Removal of temporary soil and water management structures only after areas have been stabilised; and
- Daily visual inspections of stockpiles, drains and construction works areas.

These preventative measures are relatively standard on construction projects and would reduce the potential for erosion and sedimentation impacts on water quality.

The integrity of the barrier wall would be maintained through the application of development restrictions set out in the CSMP (HDC, 2009), which apply to construction works, land uses and operations in the vicinity of the barrier wall.

Plant and machinery would be operated in a responsible manner by experienced drivers to ensure that spills of construction materials are minimised. All plant and machinery would be regularly maintained to ensure good working order, to minimise the risk of fuel and oil leaks. In the unlikely event of a spill or leak, the use of spill kits, located in strategic positions within the construction site, and emergency containment would minimise the impacts on surface and/or groundwater quality.

Water quality monitoring programs would be developed, in consultation with Newcastle City Council and DECCW, and implemented during construction, to ensure that water quality objectives in the Hunter River are not compromised. The water quality monitoring programs would form part of the CEMP and would:

- Establish existing baseline conditions;
- Identify monitoring parameters;
- Identify representative sampling locations and frequency of sampling;
- Identify testing procedures (ensuring chemical testing is undertaken by NATA accredited laboratory); and
- Outline the framework and format for reporting monitoring results.

Operation

Stormwater Management System Concept Design

A SMS is proposed for the collection and discharge of stormwater runoff and management of water quality, particularly the receiving waters of the South Arm of the Hunter River. The objective of the SMS is to minimise the impacts of stormwater runoff generated by the proposed concept on property, infrastructure and the receiving environment. The detailed design of stormwater systems for individual projects would be required to comply with the SMS, which would be designed in accordance with Newcastle City Council design criteria, principles set out in the CSMP and in consultation with DECCW. Individual operators would be responsible for maintaining the SMS and ensuring that it is functioning as designed.

Six overarching stormwater management principles would be developed as part of the SMS to guide stormwater, flooding and water quality management across the site. Integrated water cycle management and water sensitive urban design approaches form the basis of the SMS. The principles are as follows:

Stormwater Management

PRINCIPLE 1: DESIGN AND ADOPT STORMWATER MANAGEMENT MEASURES THAT ARE APPROPRIATE FOR SITE CONSTRAINTS, LAND USE AND CATCHMENT CONDITIONS.

PRINCIPLE 2: MINIMISE RUNOFF AND REDUCE PEAK FLOWS

A permanent stormwater drainage system would be designed and constructed generally in accordance with Newcastle City Council and relevant authority guidelines, standards and requirements including:

- Newcastle City Council *Development Control Plan 50* (particularly Elements 4.03 and 4.05);
- Newcastle City Council *Flood Management Technical Manual;*
- Newcastle City Council *Stormwater and Water Efficiency for Development Technical Manual;*
- *DECCW Manual for Authorised Officers; and*
- *Australian Standard AS3500*

The stormwater drainage system would comprise the following components:

- Minor drains – to capture and convey minor (day to day) stormwater within the site, with sufficient capacity to convey the 20 year ARI.
- First flush collection system (refer to Water Quality below) – to capture the first 10 millimetres of rainfall which is likely to contain pollutants that have accumulated on surfaces such as roofs, hardstand areas and roads.
- Main trunk drains – for collection and conveyance of stormwater from minor drains. Trunk drains would have capacity to convey the 100 year ARI peak flow.
- Detention basins – these would perform either a water quality or flood attenuation function and would be connected to the main drains.
- Discharge points – clean and treated stormwater to be discharged in accordance with appropriate EPLs.

Drainage networks for the individual projects would be designed and constructed progressively and would incorporate some or all of the components listed, depending on the location of each project within the site, the size of the drainage sub-catchment and existing drainage features in place at the time of the project development.

Flood Management

PRINCIPLE 3: MINIMISE FLOODING IMPACTS WITHIN AND DOWNSTREAM OF THE SITE

PRINCIPLE 4: INTEGRATE STORMWATER CAPTURE, TREATMENT AND REUSE INTO THE OPERATING ENVIRONMENT.

The stormwater drainage system and finished levels and gradients across the site would be designed to ensure that flood risk to projects within the site and to adjacent developments is minimised.

Existing main drains would be retained. New flood attenuation basins and trunk drains would be designed with sufficient capacity to contain up to the 100 year ARI.

Grading of the site to create sub-catchments would allow catchment-specific flood attenuation measures (such as basins, storage tanks) to be implemented to reduce the risk of flooding within the site and to adjacent land (e.g. IIP, Carrington Coal Terminal, OneSteel).

Water sensitive urban design features such as vegetated swales and rainwater harvesting would be incorporated into the SMS. These features would have a beneficial impact on flood risk by reducing the volume and rate of stormwater discharge to the drainage network. Harvested stormwater (e.g. from buildings) would be stored and reused across the site for wash down areas, irrigation of landscaped areas and potentially for fire fighting, thereby reducing the quantity of mains water required.

Water Quality

PRINCIPLE 5: MAINTAIN OR IMPROVE SURFACE AND GROUNDWATER QUALITY WITHIN THE SITE

PRINCIPLE 6: MAINTAIN OR IMPROVE QUALITY OF SURFACE AND GROUNDWATER DISCHARGES TO THE SOUTH ARM OF THE HUNTER RIVER

Pollutants generated during normal operational activities settle on surfaces such as roofs, hardstand areas and roads. Higher levels of pollutants can accumulate due to wind, accidental leaks and spills and long periods between rainfall events. During rainfall, stormwater runoff can become contaminated with the pollutants, particularly the initial, first flush, flows of stormwater. The SMS would incorporate measures to reduce the impacts on the water quality of the main drains and ultimately the Hunter River.

First flush collection systems, consisting of pits, trenches or retention tanks, would capture the initial pollutant-laden stormwater flows created by the first 10 millimetres of rainfall. Oil/grit separators would be installed to separate oils, greases and other hydrocarbons from the first flush stormwater. The stormwater would then be transferred to holding tanks for testing, prior to discharge to main drains or storage tanks for reuse on-site.

Sediment and pollutants removed from first flush stormwater (i.e., at the bottom of settling tanks and retention pits and from separators) would be discharged to the sewerage system or transported off-site for disposal at an approved waste facility.

Water sensitive urban design features, such as vegetated or bioretention swales, would be incorporated into the SMS, primarily along roads and rail lines. They would capture runoff potentially contaminated with sediments and other pollutants and provide filtration to remove contaminants from the stormwater, thus providing water quality improvements.

Areas with greater potential for accumulation of contaminants or spills/leaks (e.g. tank farms) would be bunded to separate clean stormwater runoff from potentially contaminated stormwater. Stormwater captured within bunded areas would be retained within the bunded area until tested as suitable for reuse on-site or for discharge.

Water quality monitoring programs would be developed, in consultation with DECCW, and implemented during operation, to ensure that Water Quality Objectives in the South Arm of the Hunter River are not compromised. These monitoring programs would outline monitoring frequencies and testing procedures. Monitoring results would be used to identify emerging trends or problems, provide data for measuring the impact of operational activities, determine whether pollution controls are working and provide a basis for efficient response to emergencies such as floods and spills.

Surface water quality monitoring points would be located in main drains and discharge outfalls to the South Arm of the Hunter River. Monitoring would be undertaken in accordance with methods described in *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (EPA, 1998).

All discharges to the Hunter River would be in accordance with the discharge criteria and/or ANZECC 2000 guidelines and other requirements set out in the EPLs to be obtained for the operations within each precinct.

Regular and timely maintenance of drainage infrastructure would be the responsibility of individual operators.

Other Operational Mitigation Measures

Operation Environmental Management Plans (OEMPs) would be prepared and implemented for individual projects. The OEMPs would outline appropriate mitigation measures and emergency response procedures during operation. These controls would be detailed in a series of sub-plans including:

- Soil and Water Management Plan
- Spill Management Plan
- Emergency Response Plan

The OEMPs would include the following controls, as a minimum, to manage impacts on hydrology and water quality:

- Implementation and maintenance of the SMS;
- A control system for the management of bulk material stockpiles and materials within handling areas, through the use of containment walls, bunding, stormwater and dust controls;
- Measures to minimise excess materials being deposited off-site during loading and transportation of bulk materials from the material handling area. Controls such as vehicle brush shaker pads, use of vacuum road sweepers, covering loads during transport and dust suppression would be implemented to reduce any potential impacts on water quality; and
- Emergency spill response procedures.

Contaminated runoff from hardstand areas would be captured by the first flush containment system and tested prior to discharge or off-site disposal. Vegetated and bioretention swales would also provide some treatment of road runoff prior to entering main drains, thereby reducing the load of pollutants entering the South Arm of the Hunter River.

Impacts on water quality from fuel and oil spills, cargo losses and general wear and tear on facilities and infrastructure would be controlled by measures contained in the site OEMPs. Emergency response plans would be activated to mitigate the impacts on water quality should emergencies such as spills occur.

Shipping transport controls would be contained in the OEMPs and would include the following requirements:

- Operational vessels to have a Ship Board Oil Pollution Emergency Plan (SOPEP) in place and on-board emergency spill kits;
- Disposal of solids and liquids from vessels to be in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL); and
- Ballast water to be managed in accordance with requirements outlined in the *National Ballast Water Management Arrangements* (Department of Infrastructure, Transport, Regional Development and Local Government).

Soil and Water Management Plans would be prepared as part of individual projects to outline the monitoring requirements and reporting procedures during operation.

Mitigation Measures Specific to Individual Precincts

NPC Operations Precinct

Construction of underground storage tanks would be in accordance with the CSMP and CEMP. Detailed excavation and construction methodology would be prepared in consultation with HDC and DECCW to ensure that disturbance to contaminated soils and infiltration to groundwater are minimised during construction and that impervious capping is reinstated once intrusive works are complete.

Landside spills and leaks from the dredging fleet, if they occurred, would likely be minor and able to be managed according to spill response plans that would be prepared for the site.

Increased runoff from impervious surfaces would be managed by implementing measures such as roof rainwater collection, flood attenuation basins and vegetated swales to reduce runoff volumes and rates of flow. These measures would ensure that flooding impacts to the site and adjacent developments is minimised.

Bulk and General Precinct

Operation of ship loaders/unloaders would be carried out by experienced personnel. Computer-aided systems, alarms and warning systems would be used to reduce the risk of spills and cargo losses as a result of transfer machinery failure, pipeline damage or conveyor malfunction. Regular maintenance and inspection of pipelines, machinery and plant would reduce the potential for spills and leaks. Should a spill occur during the transfer of bulk goods, it would be managed in accordance with NPCs Emergency Response Plan and OEMPs for the individual projects.

Management measures for uncovered sand and coal stockpiles would include:

- Locate stockpiles outside erosion hazard areas such as drainage paths and not within 5 metres of open drains or driveways.
- Locate stockpiles within bunded areas (e.g. using silt fences) to separate potentially contaminated stockpile runoff from clean stormwater runoff.
- Regular wetting down of stockpiles to minimise airborne particulates (e.g. coal dust and sand); and
- Maintain appropriate stockpile sizes and configurations.

Swales and detention basins connected to the road drainage network would encourage settlement of pollutants and sediments out of stormwater prior to being discharged, thereby reducing the load of pollutants entering the South Arm of the Hunter River.

Appropriately sized culverts and/or ditches would be constructed under road and rail infrastructure to maintain connectivity within and between catchments and reduce the likelihood of localised flooding. The OEMP would set out maintenance requirements for the culverts including regular inspections for blockages and damage.

General Purpose Precinct

Work method statements would be prepared to guide construction activities such as earthworks and excavations for building and crane foundations. The use of geotextile liners or temporary capping would reduce infiltration of surface water runoff where the capping is disturbed during construction. Capping would be reinstated and maintained during operation.

Swales and detention basins would be implemented to provide a level of treatment of road runoff prior to entering main drains.

A program of regular maintenance and review of operating procedures would ensure that the potential for spills and leaks resulting from crane and other heavy machinery malfunction is limited.

In accordance with the CSMP, excavation within the barrier wall easement would be limited, to ensure its integrity is maintained and it can operate effectively (refer to **Section 9.9**). The 15-metre easement would allow for routine maintenance and checks to ensure the integrity of the barrier wall has not been compromised.

Container Terminal Precinct

The risk of terminal construction impacts on the barrier wall would be minimised by the 15-metre barrier wall easement that is in place.

The barrier wall at the ground surface has been designed with sufficient bearing capacity to withstand the weight of heavy machinery, plant and large trucks moving over the finished surface (refer to **Section 9.9**).

Increased truck movements would increase the availability of surface contaminants. The use of vegetated and bioretention swales would provide some treatment of road runoff prior to entering main drains and the first flush containment system to be implemented as part of the SMS would capture the initial and most heavily polluted portion of the road runoff during rainfall.

Bulk Liquids Precinct

Spills and leaks of liquids during ship-to-shore transfer would be minimised through a combination of computer alarms and warning systems and on-board and landside supervision of liquid transfer. Regular inspections of pipes and hoses would be undertaken to ensure any damage or potential for malfunction is detected and rectified.

Appropriate spill containment measures would be implemented in operational areas where there is a high risk of accidental spills, including tank farms but also maintenance areas, mobile plant cleaning areas, wash down facilities and refuelling areas. The first flush containment system would contain minor accidental spills within retention pits and tanks

The design of storage tanks would meet appropriate engineering standards. Storage tanks would be placed on a reinforced concrete foundation and would have a tell-tale drain installed under each tank to assist with leak detection.

Bulk liquid storage tanks would be located within sealed bunded areas and connected to the stormwater collection system. As an additional safeguard, a bund with sufficient capacity to contain 120 percent of the storage volume, would encompass the whole tank farm area to provide a second line of defence in the unlikely event of an internal bund failure. Following containment, spills would be disposed of by either trucking off-site to an appropriate facility or discharging to the sewer, after treatment to a suitable standard.

Each storage tank would be fitted with auto-level gauging, high/high and high/low level alarms, multi-level temperature measurement, multi-level sampling equipment, water draining and low-level product drains for maintenance. Filling of storage tanks would be controlled by a computer control system that would monitor storage tank levels and reducing the likelihood of spills resulting from overfilling.

Berth Precinct

No specific measures in addition to general surface water management controls during construction are proposed for the berth precinct.

9.6.5 Conclusion

Construction and operation activities associated with the proposed concept have the potential to impact on surface and groundwater quality and flow if not managed appropriately. A Stormwater Management System to be developed for the site, would be integral to the management of stormwater, flooding and water quality across the site. NPC and individual operators would develop a suite of management plans, monitoring programs and mitigation measures as part of the CEMPs and OEMPs for individual Project applications, which would address potential impacts arising during construction and operation of the proposed concept.

With the implementation of the appropriate management measures across the site, it is concluded that the proposed concept is unlikely to have significant impacts on the water environment.

9.7 Heritage and Cultural

9.7.1 Existing Environment

Indigenous Heritage

A search of the National Parks and Wildlife Service (NPWS) Register of Aboriginal Sites (now known as the DECCW Aboriginal Heritage Information Management System (AHIMS) database) was carried out as part of the Environmental Impacts Statement titled *Development of a Multi Purpose Terminal and Remediation of the Closure Area, BHP Newcastle Steelworks* (URS, 2000). No Indigenous heritage sites were identified through this search and therefore it was assumed that any Indigenous sites once present in the vicinity of the site would have been removed or destroyed during previous reclamation, construction and operational activities associated with the BHP Steelworks.

Historic Heritage

Background

In 1896 BHP purchased the site and commenced the construction of an industrial complex for the production of steel. The site evolved as a complex of changing and evolving buildings as the success of the works ebbed and flowed. Starting in the 1980s elements of the complex were decommissioned and slowly demolished.

The heritage significance of the site was identified in the *Hunter Regional Environmental Plan.* It is unclear whether the REP listed the complex as a whole or elements within it. In 1991, EJE Architecture produced a *Conservation Plan* for the BHP Steelworks site. The *Conservation Plan* was prompted by the proposal to incorporate heritage schedules into the Newcastle LEP and a desire within BHP to manage their heritage assets, as listed on the LEP and the *Hunter Regional Environmental Plan*. The *Conservation Plan* provides a comprehensive history of the site and the succession of structures and processes that have occurred on the site.

The *Conservation Plan* identified items on the site of State, regional and local significance. It is these assessments that have informed the majority of heritage decision-making on the site. With the closure of the Steelworks in 1999, the process of determining the future use of the site began, with the preferred option being development of a MPT.

A heritage assessment was undertaken during the preparation of the EIS (URS 2000) and approval was sought to demolish 15 heritage-listed items, being:

- Remnant of the No.1 Blast Furnace
- No. 1 Blower House
- Open Hearth Building
- No.1 Bloom and Rail Mill
- Soaking Pits Building
- Steel Foundry
- DC Substation
- Original Timber Wharves
- No. 3 Blast Furnace
- AC Pump House
- Power House
- Open Hearth Change House
- Mould Conditioning Building
- Basic Oxygen Steelmaking (BOS) Plant
- No. 4 Blast Furnace

Archival recording of the 15 heritage-listed items was undertaken and Statements of Heritage Impact (SOHI) were prepared (EJE, 2000), which can be found appended to *Assessment of the Historical Archaeology and Research Design: Newcastle Steel Works Closure Area* prepared by Umwelt (2005). The SOHIs concluded that the heritage significance of items was invested in the iron and steel making processes, rather than the built fabric of the structures. EJE concluded that as the site had been decommissioned, this had an impact on the interpretation of the significance of the item. Furthermore, retaining these structures, which could not be reused or regenerated, would require significant expenditure to maintain and stabilise. These items were demolished in accordance with the 2001 consent issued following the submission of the EIS. The items, however, remain listed on the LEP.

The EIS identified that potential impacts to heritage items outside the Multi-Purpose Terminal footprint would require assessment as part of future development proposals on the site. The EIS specifically referred to several buildings which could potentially form part of a Heritage Precinct on the site, including Delprat's Quarters (since demolished), ex-Tool Room building and adjacent lightly wooded area, the Administration building, Laboratory Technical Services, Information Technology and General Office buildings. The Heritage Precinct, located on the western portion of the Closure Area, would act as repository for heritage items as an alternative for preserving items *in situ*. As shown on **Figure 9-11**, the Heritage Precinct referred in the EIS falls outside of the site of the proposed concept.

The 2001 consent, under Sections 6.3 and 6.4, required the production of an *Archaeological Management Plan* (AMP) for the Closure Area. Umwelt (Australia) Pty Ltd were commissioned to prepare the document which is provided in **Appendix I** (Umwelt, 2002b). As shown in **Figure 9-11** the site was divided into two areas, known as the Heritage and Non-Heritage Precincts or Areas (these terms are used interchangeably between the Umwelt reports) (Umwelt, 2002a, 2005). It should be noted that the Heritage Precinct/Area discussed by Umwelt is different to the Heritage Precinct referenced in the EIS.

The AMP for the Non-Heritage Area (Umwelt, 2002b) required an archaeological assessment to be undertaken based on the concerns of the Heritage Office. The assessment was also completed in 2002 (Umwelt, 2002a) (refer to **Appendix I**) and identified four potential archaeological resources within the proposed concept site:

- Hunter River Smelting Co.
- No. 1 Pig Mill
- Ferro-Manganese Blast Furnace
- No. 2 Blast Furnace

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BOUNDARIES USED IN HERITAGE REPORTS 1990 - 2010

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-11

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Subsequently an AMP was prepared for the Heritage Area (Umwelt 2004). The Heritage Area AMP necessitated the completion of an archaeological assessment. The archaeological assessment was completed by Umwelt in 2005 and titled *Assessment of the Historical Archaeology and Research Design: Newcastle Steel Works Closure Area.* Umwelt assessed and ascribed significance to the 15 items on the site as if they were still extant. This document was submitted to the Heritage Council to support an application for an Excavation Permit under Section 140 of the *Heritage Act 1977*. The research design advocated that the site be monitored for archaeological evidence in the vicinity of the above 15 items. An additional item, the Ferro-Manganese Blast Furnace, was identified as being of archaeological potential and was included in the areas for archaeological monitoring.

The documentation was lodged in June 2005 and issued as Excavation Permit No. 2005-S140-041 with Mr Paul Rheinberger as Excavation Director. The permit was amended in 2008 to change the applicant to HDC. The permit is valid for five years, being due to expire in September 2010. The permit requires archaeological monitoring in the vicinity of the 15 listed items and the four identified areas of potential archaeological resource by an archaeologist. The Excavation Director additionally has the discretion to ascribe categories of archaeological potential (high or moderate) to parts of the Heritage Area and determine the manner in which works would be carried out.

Current Situation and Heritage Listings

A total of 30 items are currently listed on the LEP for the whole BHP Steelworks site. Of those, 15 occur within the site of the proposed concept. The Soaking Pits Building has not been explicitly assessed. The Building is attached to the western end of the No. 1 Bloom and Rail Mill. As such, EJE included the archival recording within the Mill. Umwelt continued with this convention. Therefore, for the sake of continuity the Soaking Pits building is included in discussions of the No. 1 Bloom and Rail Mill. Two additional listed items, the Pattern Store and Master Mechanics Office, are over 100 metres outside the concept site. The current proposal will not impact on these items.

It is understood that HDC intend to continue with the Excavation Permit to the extent necessary to complete the remediation works. Only those areas to be impacted by these works will be archaeologically investigated and cleared under the Excavation Permit. The cut and fill plan prepared by HDC (refer to **Figure 9-12**) indicates that cutting will take place across part or all the following items:

- No. 1 Blast Furnace
- Ferro-Manganese Blast Furnace
- No. 2 Blast Furnace
- Hunter River Copper Smelting Co.
- No. 1 Blower House
- No. 3 Blast Furnace
- No. 4 Blast Furnace
- Open Hearth Change House
- Original location of No. 1 Pig Mill
- DC Substation
- Steel Foundry
- No. 1 Bloom and Rail Mill
- Soaking Pits Building

It is therefore understood that no further archaeological works would be required in these areas by NPC. This is, however, an interpretation of the plan and further clarification of the exact extent of the archaeological works undertaken by HDC would need to be sought prior to commencement of works by NPC.

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AECOM

HERITAGE ITEMS

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-12

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Potential Archaeological Resource

A total of 19 items comprise the potential archaeological resource. The potential archaeological resource identified by Umwelt consists of 18 items. Through an examination of the Umwelt reports and the *Conservation Plan*, AECOM has determined that the site of the No. 1 and 2 Pig Mills is also of archaeological potential. Umwelt identified the original location of the No. 1 Pig Mill as being of archaeological potential. The No. 1 Pig Mill was relocated next to the No. 2 Pig Mill. There is, therefore, two sites listed for the Pig Mills. A background to each of the 19 items is provided below as context for the management recommendations.

No. 1 Blast Furnace Precinct

The No. 1 Blast Furnace was designed by the US office of Master Engineer James Ladd, before he moved to Australia. At its installation it was at the forefront of technical innovation as the first fully mechanised blast furnace in Australia. The Furnace was demolished in 1988, prior to archival recording.

No. 1 Blower House Precinct

Built in 1915, the Blower House originally housed three blowing engines, later increased to five. In 1941 the first turbo blowers were introduced and the original blowers were retained on standby until 1963, when the building became a workshop for the Power Department and later the Blast Furnace Department. The No. 1 Blower House Precinct was archivally recorded in 2000, prior to demolition.

Original Open Hearth Building Precinct

A total of 14 Open Hearths were constructed between 1915 and 1945. Four of these were later removed for the construction of the BOS Plant. The Original Open Hearth Building Precinct was the only remaining evidence of open hearth steelmaking in Australia (EJE Architecture, 1991: 77).

No. 1 Bloom and Rail Mill Building and Soaking Pits Precinct (Two items)

The Bloom and Rail Mill Building was opened in 1915. It was modified numerous times to adapt to the changing needs of the industry. In 1917, for example, it was modified to produce steel plates for the construction of the No. 2 Blast Furnace and for use in the shipbuilding industry. Rolling ceased in 1982, although the recuperative soaking pits were operational until 1988. From 1985 part of the building was used as a tundish repair and mould segment workshops. The Precinct was archivally recorded in 2000, prior to demolition.

Steel Foundry Precinct

The Steel Foundry was completed in 1917 to ensure a supply of rolls for the rolling mills and also to produce piece-meal orders for external clients. The building and plant continued to be expanded and modified until its decommissioning in 1990, at which time the furnaces were demolished, the pits filled and the building used for storage. The building was archivally recorded in 2000, prior to demolition.

DC Substation Precinct

Built c.1915, it was the original powerhouse of the steelworks, housing the steam driven Direct Current generators. After the installation of the Alternating Current Powerhouse in 1923, the steam DC generators were kept for standby. By the 1960s the standby was no longer required and the building became a distribution centre for AC and DC power using static converters. The DC Substation Precinct was archivally recorded in 2000, prior to demolition.

Original Timber Wharves Precinct

The wharves were constructed in 1915 and were the key to the viability and success of the site. The location of the Steelworks on the harbour allowed for the import of raw materials and export of product at competitive prices. The Original Timber Wharves Precinct was archivally recorded in 2000, prior to demolition.

No. 3 Blast Furnace Precinct

The No. 3 Blast Furnace was constructed in 1921 and relocated 1.8 metres south in 1960. The Furnace was designed by BHP staff and was constructed using local components where possible. The Furnace was representative of 1920s iron production and was a symbol of industry on the skyline of Newcastle. The No. 3 Blast Furnace Precinct was archivally recorded in 2000, prior to demolition.

AC Saltwater Pump House Precinct

The Pump was installed in 1924 and retained much evidence of the complex technology used. It was one of only a few complete installations of its type. The AC Saltwater Pump House Precinct was archivally recorded in 2000, prior to demolition.

Pump House

The decision to construct the Pump House was taken in 1923, with construction beginning in the same year with the driving of 505 piles for the foundations. It was constructed of riveted steel framework encased in concrete. In 1924 two 5000 kW 25 cycle alternators were commissioned. Capacity was up-graded or additional boilers installed in 1936, 1938, 1959, 1968 and 1975. Shut downs and failures were progressive from 1980. In 1995 internal power generation ceased and the House was decommissioned.

Open Hearth Change House Precinct

The Open Hearth Change House was constructed in 1936-7 for the employees of the Open Hearth Furnaces. It included a shower area, lockers, lunch room and an annex on the eastern end containing two air compressors and three tar pumps. As use of the Open Hearths declined so did employment and the House was successively occupied by other departments. In 1965 pressure was applied to upgrade the facilities, upgrades did not take place until 1980.

Mould Conditioning Building Precinct

The Mould Conditioning Building was completed in 1942 to house mould strippers prior to the ingots being transported to the soaking pits. The loss of heat led to many of the ingots splitting and the process was discontinued. The building was used to re-condition moulds. The Mould Conditioning Building Precinct was archivally recorded in 2000 as part of the Open Hearth Building and Open Hearth Change House Precinct, prior to demolition.

Basic Oxygen Steelmaking (BOS) Plant Precinct (1959)

The BOS Plant was built on the site of the Open Hearths, to maximise productivity, and began operations in 1962. To maintain production during construction of the Plant the new building was constructed around part of the old Open Hearth Building, which was later removed in sections. This lead to the unique arrangement of the molten iron and scrap steel entering the furnace from opposite sides and the development of handling systems that are not seen elsewhere. It was the first BOS Plant constructed in Australia (EJE Architecture 1991: 67). The Basic Oxygen Steelmaking (BOS) Plant Precinct was archivally recorded in 2000, prior to demolition.

No. 4 Blast Furnace

The construction of the No. 4 Blast Furnace was approved in 1960 and was constructed on the site of the former Brass Foundary. The Furnace was blown in during July 1963. It was modified to allow fuel injection through the blow pipe walls in 1965, relined in 1970, 1973, 1979 and 1989. It was decommissioned in 1999 after a large crack was detected in the downcomer.

Hunter River Smelting Co

The Hunter River Smelting Co. (also known as the Wallaroo Mining and Smelting Co. and the Wallaroo and Moonta Mining and Smelting Co.) was a subsidiary of the South Australian Mining and Smelting Co. who constructed a copper smelting works on the site in 1868. Due to the cost of coal, it was cheaper to transport the copper from Broken Hill to Newcastle for smelting. A drop in world copper prices forced the closure of the works in 1893. The closure coincided with a major flood that did much damage to the equipment. The Company removed much of the equipment in 1895 for an operation in Wallaroo. BHP took up the option of purchasing the site in 1896 and began the process of reclaiming and raising the land level (EJE Architecture,1991:12). It was proposed that rather than demolishing buildings associated with the earlier smelting works they were simply filled around with only those portions above the final ground level being razed (Umwelt, 2002a :3.3). The site is thought to be under three metres of fill. Umwelt ascribed the site local significance under criteria a, b, c, d, e and g (Umwelt, 2005: 3.12).

Original No. 1 Pig Mill and No. 1 & 2 Pig Mill Precincts

The No. 1 Pig Mill (also known as Casting Machine) was constructed around 1915 near the Open Hearths Precinct. A second Mill was built in 1921 to the south-west and in 1934 the No. 1 Pig Mill was dismantled and rebuilt adjacent to the No. 2 Pig Mill. The site of the No 1 Pig Mill was utilised by buildings ancillary to the

No. 4 Blast Furnace. The Pig Mills are shown on BHP maps until 1956. The documentary record of the Pig Mills is extremely limited.

No. 2 Blast Furnace Precinct

Construction of the No. 2 Blast Furnace began in 1916, driven by demand created by World War 1 (WWI). It began operation in 1918, was rebuilt in 1927/8 and 1929/33 before being demolished in 1946/7. A subsequent furnace was constructed on the site, which was demolished in 1985, prior to any archival recording on the site.

Ferro-Manganese Blast Furnace

The Ferro-Manganese Blast Furnace began operation in 1918, after its construction was requested by the Federal government to secure a supply of pig iron for government purposes. The Furnace also produced ferro-manganese, a substance necessary in the refining of steel, but which was expensive and in short supply. The Furnace, however, was fickle and difficult to operate. Known as “Maggie”, the Furnace was demolished in 1934 and the cast house re-erected for the 12 inch Mill. Umwelt believe that the foundations of the Furnace were also completely removed, that no archaeological potential remains and the existence of the Furnace was largely lost from local knowledge.

Additional Items

Two additional items occur outside the Concept Area, but are in close proximity. These are the Pattern Store and the Master Mechanics Office. Neither of these items were assessed by Umwelt (2005) because they do not occur within the Heritage Area, which was the focus of that report. These items, together with the unlisted Medical Building, form a small discreet precinct of extant buildings between the Heritage Area and the railway.

- **Pattern Store.** This item was constructed using sandstone blocks from Duckenfield House near Maitland, and was identified as having Local heritage significance in the 1991 Conservation Plan for that association, rather than for any heritage value in the building itself, or its use. Whilst the sandstone cladding is intact, the building itself is in a state of disrepair. The building is listed on the LEP.
- **Master Mechanics Office.** This item was constructed in the Inter-War Mediterranean architectural style and is one of only three buildings extant in the vicinity of the Heritage Area. The item was identified as having Local heritage significance in the Conservation Plan (EJE Architecture, 1991) for its ability to demonstrate the importance of a visible chain of command at the site, and the duality of the Master Mechanic’s role as being the intermediary between management and the workforce. The building is listed on the LEP.

9.7.2 Basis for Heritage Assessment

There has been conflicting views on the heritage significance of the Steelworks site at Mayfield over the past 20 years. Individual items that were considered to have State significance in the SOHIs prepared by EJE Architecture in 2000, were subsequently considered by URS (2000) to have little significance for their fabric, but rather for their potential to contribute knowledge on the iron and steel making process. URS considered that the potential to interpret that process would be detrimentally impacted by the demolition of the structures, and therefore the items would not retain any heritage significance.

Umwelt considered the archaeological values of the steelworks (in accordance with the Development Consent) and ascribed local heritage significance to the 15 heritage items within the Heritage Area as though the structures were still standing, rather than the extant archaeological remains (Umwelt, 2002a, b; 2004, 2005).

AECOM considers that a revised heritage significance assessment for the site is necessary to provide more consistent advice based on the extant archaeological resource and has undertaken this assessment below. The significance of archaeological resources is in their potential to provide heritage information that is not available from other sources, such as documentary evidence. That is, to warrant archaeological examination a site must be able to provide new or substantial information. Consequently, the archaeological footprint of items that have been substantially archivally recorded prior to their demolition are less likely to provide useful data than items that were demolished prior to any archival recording or that are not well represented in the documentary records.

Furthermore, AECOM considers the listing of individual items in the Heritage Area as items of heritage significance on the Newcastle LEP to be inconsistent with the demolition of the structures. If listed items are subsequently considered worthy of demolition, it seems inconsistent to then ascribe significance to the archaeological remnants, such as the building footings. As stated by URS, significance for these items is related to the iron and steelmaking *process* rather than their fabric (URS, 2000).

On that basis, AECOM has devised the following criteria for an assessment of heritage values at the site:

Is the building/structure still extant or has it been demolished?

1. If still extant, is the building/structure within or adjacent to the site?
    a. If yes, then it will be assessed as an individual heritage item;
    b. If no, then it will not be assessed;
2. If demolished, has the building/structure been archivally recorded prior to its demolition?
    a. If yes, then it will not be assessed as an individual heritage item, but as part of a broader assessment of the site as a whole;
    b. If no, then it will be assessed for its archaeological value.

A total of 22 items have been identified in previous reports as having heritage significance, archaeological potential, are still extant, or are listed on heritage instruments. **Table 9-53** below identifies those items and assesses their eligibility for further assessment against the above criteria.

A review of **Table 9-53** shows the following conclusions:

- Fifteen (15) items, all of which are currently listed on the Heritage Schedule of the Newcastle LEP, have been substantially recorded prior to their demolition (note that the No. 1 Bloom and Rail Mill and soaking pits building are two items but they were combined for archival recording in **Table 9-53**). Consequently, AECOM considers that their significance as individual items has been substantially altered and their significance relates to their contribution to the site as a whole rather than as individual items;
- Two (2) extant items, both currently listed on the Heritage Schedule of the Newcastle LEP, are over 100 meters outside the proposed concept site. No impacts are anticipated; and
- Five (5) items were demolished at various stages prior to the 1990s. These items were not archivally recorded prior to their demolition and are consequently considered to hold significant archaeological potential. These six items are assessed for heritage significance and impact. The six items are:
    - No. 1 & 2 Pig Mill
    - Original No. 1 Pig Mill
    - Ferro-Manganese Blast Furnace
    - No. 1 Blast Furnace
    - No. 2 Blast Furnace
    - Hunter River Smelting Company.

Table 9-53: Heritage Potential of Items in and Adjacent to the Concept Area

Item	Listing	Status	Location	Archivally Recorded?	Further Assessment
Remnant No. 1 Blast Furnace	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
No. 1 Blower House	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Open Hearth Building	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
No. 1 Bloom and Rail Mill and Soaking Pits Building (Two items)	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Steel Foundry	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
DC Substation	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Original Timber Wharves	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
No. 3 Blast Furnace	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
AC Pump House	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Power House	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Open Hearth Change House	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Mould Conditioning Building	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
BOS Plant	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site

Item	Listing	Status	Location	Archivally Recorded?	Further Assessment
No. 4 Blast Furnace	LEP	Demolished	Proposed concept site/Heritage Area	Yes (EJE Architecture 2000)	Significance and impact assessment as part of whole Mayfield site
Pattern Store	LEP	Extant	100 metres from proposed concept site	No	No further assessment required
Master Mechanics Building	LEP	Extant	100 metres from proposed concept site	No	No further assessment required
Hunter River Smelting Co Precinct	-	Demolished	Proposed concept site/Heritage Area	No	Significance assessment and SOHI Recommended
Original No. 1 Pig Mill	-	Dismantled	Proposed concept site/Heritage Area	No	Significance assessment and SOHI Recommended
Pig Mills (No.1 & 2)	-	Demolished	Proposed concept site/Non-Heritage Area	No	Significance assessment and SOHI Recommended
Ferro-Manganese Blast Furnace	-	Demolished	Proposed concept site/Heritage Area	No	Significance assessment and SOHI Recommended
No. 2 Blast Furnace	-	Demolished	Proposed concept site/Heritage Area	No	Significance assessment and SOHI Recommended

9.7.3 Significance Assessments

In order to understand how development will impact on a heritage item it is essential to understand why an item is significant. An assessment of significance is undertaken to explain why a particular site is important and to enable the appropriate site management to be determined.

Cultural significance is defined in the *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (the *Burra Charter*) as meaning "aesthetic, historic, scientific or social value for past, present or future generations" (Article 1.1). Cultural significance may be derived from the fabric of a place, association with a place, or the research potential of a place. The significance of a place is not fixed for all time, and what is of significance to us now may change as similar items are located, more historical research is undertaken and community tastes change.

The process of linking this assessment with a site's historical context has been developed through the NSW Heritage Management System and is outlined in the guideline *Assessing Heritage Significance,* part of the *NSW Heritage Manual* (Heritage Branch, DoP). The *Assessing Heritage Significance* guidelines establish seven evaluation criteria (which reflect four categories of significance and whether a place is rare or representative) under which a place can be evaluated in the context of State or Local historical themes. Similarly, a heritage item can be significant at a local level (i.e., to the people living in the vicinity of the item), at a State level (i.e., to all people living within NSW) or be significant to the country as a whole and be of National or Commonwealth significance.

The NSW Heritage significance criteria and guidelines are:

Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of significant human activity or maintains or shows the continuity of historical process or activity. An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local to area). The site must show evidence of significant human occupation.

An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

An item can be excluded on the grounds that it has lost its design or technical integrity or its landmark qualities have been more than temporarily degraded.

Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

This criterion does not cover importance for reasons of amenity or retention in preference to proposed alternative.

Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area). Significance under this criterion must have the potential to yield new or further substantial information.

Guidelines for exclusion include the information would be irrelevant or only contains information available in other sources.

Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of the element/function etc proposed to be rare.

Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's:

- cultural or natural places; or
- cultural or natural environments.

An item is excluded under this criterion if it is a poor example or has lost the range of characteristics of a type.

Significance assessments have been undertaken on the 15 heritage-listed items by EJE Architecture (1991) and Umwelt (2002a, 2005). The most recent assessments by Umwelt appear to be based on the premise that the structures are still extant, even though they have been demolished (Umwelt, 2002a, 2005). In order to accurately and adequately address the significance of the site it was determined necessary to re-evaluate the values of the former structures.

9.7.4 Re-Assessment of Heritage significance

During the re-assessment of significance it became apparent that following the demolition of all structures on the site there was little sense in assessing the footprint of the structures individually, as undertaken by Umwelt in 2002 and 2005. The significance of the site has always been invested in the process of steelmaking, the inter-relationships between the precincts and the evolution of the site as steelmaking and industrial technology advanced. With the removal of the physical elements each precinct falls below the significance threshold, while the site as a whole remains significant under some criteria. The following re-assessment of significance therefore evaluates the site as a whole, drawing on the assessments completed by EJE Architecture (1991) and Umwelt (2002a, 2005).

9.7.5 BHP Steelworks (Whole Site)

Statement of Significance (based on EJE Architecture 1991: 108)

The BHP Steelworks is of State significance for its intangible historical and associative values and for its archaeological potential to provide information regarding the Hunter River Copper Smelting Works and the former Ferro-Manganese Blast Furnace (refer to **Table 9-54**).

Historically, the influence of the Steelworks has been felt across Australia, from its establishment as the first integrated iron and Steelworks to be established in Australia to its role during WWI and WWII in the production of iron and steel for the war effort. The Steelworks also provided impetus for the completion of railway networks and the expansion of port facilities at Newcastle, which continues to influence State transportation and the location of industry.

BHP has dominated Newcastle for over 75 years and represents the introduction of secondary industries into the region, has been a significant employer and has attracted additional industry to the region.

The Steelworks site is of State significance for its potential to yield information regarding the early history of the area as the site of the Hunter River Copper Smelting Works. The former location of the Ferro-Manganese Blast Furnace is of State significance for its potential to provide information regarding this rare technical process. The sites of the former No. 2 Blast Furnace and the No. 1 and 2 Pig Mills are of local significance for their potential to contribute to our understanding of the operations of the Steelworks.

Additionally, the Steelworks site is of local significance for its social values as a place that is strong in the memory and psyche of Newcastle residents.

Assessment against NSW Heritage Branch Criteria

Criterion (a) - historical: The Steelworks site is of State significance as the location of the longest enduring and most influential steelworks in the State. It was the first integrated iron and steelworks to be established in Australia. The Steelworks was economically viable, where so many others were not, due to its location on the South Arm of the Hunter River allowing for the shipment of raw materials and finished product and the proximity to coal for fuel. From the initial use of the site by the Hunter River Smelting Company through the BHP years, the site has become synonymous with Newcastle and steelmaking. The site was of vital importance during WWI and WWII through the production of iron and steel for the war effort. This significance is attested through the Japanese submarine attack on the Steelworks during WWII.

The Steelworks meets the following themes:

Table 9-54 Historical Themes relevant to the Steelworks

National	State	Local
Developing local, regional and national economies	Industry	Steelworks
Developing local, regional and national economies	Mining	Processing Plant
Working	Labour	Work site
Marking the phases of life	Persons	BHP

Criterion (b) - associative: The Steelworks site is of State significance for its strong and enduring association with BHP. BHP is Australia's largest mining company and is also known as the 'Big Australian'. The site represents for BHP its first foray into iron and steelmaking.

Criterion (c) - aesthetic: The Steelworks site does not meet this criterion as it has lost its technical integrity through demolition.

Criterion (d) - social: The Steelworks site is of local social significance for the enduring place it holds in the psyche of local residents. Due to the relatively recent closure, many residents associate the site with their working lives. For some, it was almost seen as a family business, with successive generations working on the site. For other residents, it is the backdrop against which their lives have moved.

Criterion (e) - scientific: Portions of the Steelworks site are of State or local significance for their archaeological potential to yield information regarding the operation of the Steelworks.

The following items are assessed as having archaeological potential based on the lack of site recording prior to their demolition (refer to **Section 9.7.3**):

- *The Hunter River Smelting Co. site* is of State significance for its potential to yield additional information concerning the layout and operation of one of the first smelters in Newcastle. The sitting of the smelter in Newcastle led the way for further operations of its type. There is a large possibility that evidence of the Company's operations exists under the fill added to the site by BHP.
- *The original location No. 1 Pig Mill* is of local significance for its potential to yield information regarding the structure and its role within the larger steelmaking process on the site. Limited documentary sources regarding the original location No. 1 Pig Mill means that any archaeological evidence is likely to expand knowledge of its operations.
- *The No. 1 & 2 Pig Mill* is of local significance for its potential to yield information regarding the former structure as it was demolished shortly after 1956, with no archival recording.
- *The No. 2 Blast Furnace* is of local significance for its potential to yield information regarding the structure and its role within the larger steelmaking process on the site. The Furnace was substantially modified over time and the archaeology has the potential to enhance our understanding of these modifications.
- *The Ferro-Manganese Blast Furnace* is of possible State significance for its potential to yield information regarding the former structure. While Umwelt state that the foundations were completely removed and the area paved (Umwelt, 2002a), no guarantee can be provided that evidence of the Furnace is not present. Should archaeological evidence of the Furnace be extant it would be of possible State significance, given the possible rarity of such information. Further comparative research into the occurrence of ferro-manganese furnaces would be necessary in conjunction with archival records relating to this Furnace.

The material remains of these items are likely to consist of building footings and/or foundations, and possibly moveable relics associated with use of the buildings.

Other areas of the site are assessed as having limited archaeological significance, based on the extent of prior recording and extant maps and plans.

Criterion (f) - rarity: The Steelworks site does not meet this criterion as it does not display elements of rarity.

Criterion (g) -representative: The Steelworks site does not meet this criterion as it has lost the range of characteristics of its type and is a poor example.

9.7.6 Impact Assessment

Indigenous Heritage

No Indigenous heritage sites are known, nor are any predicted. There will be no known or likely impact on Indigenous heritage.

Historic Heritage

AECOM has assessed five items as having archaeological significance. Of these five items, four are within the area to be cut, and therefore archaeologically recorded, by HDC as part of the remediation works before the site is transferred to NPC. There remains potential for the No. 1 and 2 Pig Mills to be impacted by future works. The location of the Pig Mills is currently covered by Virgin Excavated Natural Material as part of the completed remediation works in this part of the site.

Statement of Heritage Impact

To assess the potential broader impacts to the site a Statement of Heritage Impact has been prepared. The objective of a SOHI is to evaluate and explain how a proposed development, rehabilitation or land use change would affect the value of the heritage item and/or place. A SOHI should also address how the heritage value of the item/place can be conserved or maintained, or preferably enhanced by the proposed works.

This assessment has been prepared in accordance with the DoP's guidelines *NSW Heritage Manual* (NSW Heritage Office and DUAP, 1996a) and *Statements of Heritage Impact* (NSW Heritage Office, 2002). These guidelines provide a series of questions to be considered. In keeping with the guideline format, questions are posed and answered. The series of questions most relevant to the current proposal are 'change of use'.

- *Is the proposed use compatible with the heritage values of the site?*

  Yes. As the majority of the values are intangible (since demolition) there is no conflict. The use remains industrial, thereby preserving that aspect of the site's association.
- *Does the existing use contribute to the significance of the heritage item?*

  No. The site is currently a vacant area. The use of the site in an industrial manner, such as the proposed concept, would maintain historical links to its industrial past.
- *Why does the use need to be changed?*

  The site is currently a vacant area, which is an ineffective and wasteful land use. It is recognised as a strategically important site in the context of the Port of Newcastle operations.
- *Is the development sited on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?*

  Yes. The development is sited on the site of the original No. 1 Pig Mill, No. 2 Blast Furnaces, the Ferro-Manganese Blast Furnace and the Hunter River Copper Smelting Works. These sites are to be archaeologically examined by HDC as part of the remediation works and under the current Excavation Permit. NPC would address the archaeological impacts to the location of the No. 1 and 2 Pig Mill if it is to be impacted by the proposed concept.

  Alternative sites have been considered but this site is a strategically important industrial site with direct port access (refer to **Section 4.0**).

- *How is the impact of the new development on the heritage significance of the area to be minimised?*

  The significance of the Steelworks is in its intangible historical and associative values. These would not be impacted by re-use of the site.

  The archaeological values of the No. 1 and 2 Pig Mill may be impacted. Archaeological testing, monitoring and salvage will be undertaken in the area as necessary. While the Hunter River Smelter Co. Works are of archaeological significance, due to the depth of fill added to the site it is unlikely that the proposed works would uncover the remains of the Works. If, however, evidence of the Works is uncovered work should cease and the Heritage Branch, DoP, be contacted.

- *Could the development be located elsewhere on the site and the archaeological deposits retained?*

  No. The proposed concept requires use of the entire site.

9.7.7 Mitigation Measures

Safeguarding the heritage significance would be undertaken by the following management measures:

- Undertake archaeological testing, monitoring, recording and salvage in those areas of archaeological potential, as identified in this section, that have not been investigated by HDC;
- Undertake archaeological testing, monitoring, recording and salvage should there be impacts in the area of the No. 1 and 2 Pig Mills; and
- Should excavation within the area of the Hunter River Copper Smelting works exceed two metres, undertake archaeological testing, recording, monitoring and salvage.

If items are not impacted they can remain insitu.

9.7.8 Conclusion

Due to the complexity of the site, there have been a number of conflicting assessments regarding heritage significance. The heritage significance has been re-assessed based on the current status of the site. The Steelworks site is ascribed State level significance for its historical and associative values. The site was deemed to have State and local significance for its archaeological potential in relation to the former locations of the former location of the No. 1 Pig Mill, No. 2 Blast Furnace, the No. 1 and 2 Pig Mills, the Ferro-Manganese Blast Furnace and the Hunter River Copper Smelter Works. The site also retains Local social significance for the place it holds in the memory of the local residents who worked in or grew up under the shadow of the Steelworks.

HDC have undertaken to address the archaeological resource in areas to be impacted by the remediation works. This includes the locations of four of the five items of archaeological significance.

The SOHI concludes that the proposed concept is not incompatible with these heritage values. Construction activities could, however, impact on the archaeological values of the site. The following commitments are made to ameliorate this impact:

- Undertake archaeological testing, monitoring, recording and salvage should there be impacts such as installation of footings and services in those areas of archaeological potential, as identified in this report, that have not been investigated by HDC.

9.8 Infrastructure

9.8.1 Existing Environment

This section describes existing site infrastructure, services, utilities and energy usage and consultation undertaken with service preoviders. Discussion in this section excludes infrastructure such as road, rail and stormwater drainage, as these components are discussed in detail in **Sections 9.1**, **9.2** and **9.6**, respectively.

In September 1999 the BHP Steelworks closed and all utility services to the site became redundant. Demolition and remediation has been conducted at the site, with most redundant utility services being removed in the process. In recent years, limited new utility services have been provided to support operations currently on-site. Further information on existing infrastructure, services and utilities at the site is provided in the sections below.

Potable Water

The site is located in the Newcastle Water Supply System and Hunter Water Corporation (Hunter Water) provides potable water services to the local area. In March 2010, Hunter Water advised that there is currently no Hunter Water infrastructure immediately available to service the site. The nearest potential connection points are to the existing 300 or 500 millimetre potable water mains located in Ingall Street. Potable water mains are also located along Crebert Street and Selwyn Street.

Existing water requirements at the site are minimal due to the relatively undeveloped nature of the site. The general cargo handling facility Mayfield No. 4 Berth has two demountable site offices which use potable water. Potable water is provided by a tank located on-site. Potable water is also supplied to Koppers wharf.

Wastewater

Hunter Water provides wastewater services to the local area. In March 2010, Hunter Water advised that there is no existing sewage infrastructure available at the site and that the wastewater system in the Mayfield area is currently at capacity and requires upgrades. As detailed in **Section 9.8.2**, Hunter Water is currently upgrading the Burwood Beach WWTW which services the area and connects to the inceptor system in Mayfield.

Existing wastewater requirements at the site are minimal and are required only for operations at Mayfield No. 4 Berth. Disposal of wastewater from Mayfield No.4 Berth relies on collection in effluent tanks which are emptied regularly. Wastewater is transported off-site and disposed of appropriately.

Natural Gas

Jemena provides natural gas to the local area. A natural gas main is located on Industrial Drive. A natural gas supply pipeline is also located beneath the road surface along Steelworks Road, generally adjacent to OneSteel's main office. There are no gas supply pipelines within the site currently.

Electricity

The major components of the network currently servicing the area surrounding the site are as follows:

- A substation known as Waratah West owned by Transgrid;
- 132 kilovolt (kV) distribution lines owned by Energy Australia which connect the Waratah West substation to the former BHP 132/33 kilovolt substation;
- A switch room adjacent to the transformers, owned by OneSteel;
- Cables owned by OneSteel from the 132 kilovolt substation to the boundaries of the Closure Area, and then across the Closure Area to a 33 kilovolt substation;
- A 33 kilovolt substation within the Closure Area and 33 kilovolt distribution line located along Industrial Drive;
- Above and below ground mains from the on-site substation to buildings within the Closure Area; and
- A number of 11 kilovolt substations within the Closure Area and 11 kilovolt distribution lines located along Industrial Drive, Ingall Street and Bull Street.

Electricity consumed at the site is minimal, and is only required for lighting and powering general site office equipment at Mayfield No. 4 Berth. Electricity is currently temporarily provided to Mayfield No. 4 Berth by OneSteel through Koppers. Koppers consumes electricity at the wharf located at the site.

Telecommunications

The former BHP Steelworks utilised fibre optic services and had significant telephone capacity, however, this system was removed during demolition of the BHP Steelworks. An existing fibre optic cable links the Roll Shop with OneSteel and runs along Steelworks Road and Ingall Street.

Pipelines

Koppers utilise the Ex-BHP No.6 Berth for handling coal tar and pitch products. To facilitate these operations, the Koppers pipeline runs west to east across the site connecting the Koppers plant to the Ex-BHP No. 6 Berth. The Koppers pipeline runs parallel to, and some 80 metres south of, the South Arm of the Hunter River. It is an elevated pipeline, elevated approximately 1 to 7 metres above ground level.

NPC have made provisions to accommodate a pipeline through and underneath Mayfield No.4 Berth as an interim measure if required to accommodate bulk fuel and shipping services to the proposed Bulk Liquids Precinct if Berth 7 is not available.

9.8.2 Impact Assessment

The proposed concept would require provision of water, sewer, natural gas, electrical, and telecommunications services, and installation of pipelines. This section makes general assumptions on the service and utilities load and infrastructure requirements for the proposed concept by taking into consideration the activities that would be undertaken in each precinct, the types of buildings and structures that would be provided at the site, and the workforce requirements. At the Concept Approval stage service demand is difficult to determine and it is recommended that Project applicants conduct detailed design and assessments of service requirements and provision of the necessary service and utility infrastructure at the Project application stage.

This section also describes how infrastructure and services would be provided to future operators within the site. Three options exist for providing services as follows:

- **Connection to the IIP.** The IIP development would deliver trunk infrastructure in stages from which the site may connect. Indicative times for the delivery of infrastructure to the IIP, following the commencement of construction (anticipated to occur in 2010), are as follows:
  - Stage 1 – 27 months. Some trunk roads, water, telecommunications, sewer and gas and an electrical substation capable of upgrade for port-side users.
  - Stage 2 – 36 months. Additional trunk roads (including Steelworks Road), water, telecommunications, sewer and gas. (NPC, 2009)

  Whilst it is known that trunk infrastructure would be designed and installed within the IIP, these works do not fall under the proposed concept. As such, potential for connection and augmentation of trunk services through the IIP is likely but not certain.
- **Connection through OneSteel.** There are options to provide services to the site via connections to existing services provided to OneSteel.
- **Connection through existing service providers.** Infrastructure provision for all future Project applications falling under the proposed concept would need to consider the option of sourcing infrastructure from existing service providers where coordination cannot be achieved through the future IIP or OneSteel.

New service corridors would be delineated under each subsequent Project application to connect to the existing or planned services in the local area. It is anticipated that these service corridors would connect to a services corridor for the Container Terminal Precinct, General Purpose Precinct, and Bulk and General Precinct which NPC anticipates would be developed by a master developer. As the site develops, it is likely that the design and construction phases of individual projects would run in parallel. Therefore, subsequent Project applications would need to consider coordinating to provide services within the service corridors.

Each future operator would arrange the services connection and work with the service providers to identify capacity of local service and utilities networks to accommodate operational load requirements.

As service and utility infrastructure currently servicing the site is minimal, it is anticipated that there would be minimal potential for impact on existing infrastructure during the construction stages of the proposed concept. The following sections focus on describing in more detail the demand for and provision of infrastructure and services during construction and operation of the proposed concept.

Potable Water

Construction activities at the site would generate demand for potable water for the following uses:

- Dust suppression;
- Washing down and cleaning equipment;
- Concrete batching and curing (if carried out on-site);
- Fire water in case of an emergency; and
- General purposes in site amenities.

Water trucks would initially supply water to individual construction sites until such time that core infrastructure is constructed and connected to Hunter Water. It is anticipated during construction works that the domestic potable water use would be approximately 80 litres per person per day. Allowing for 150 to 200 construction workers at the site it is estimated that the peak daily domestic use is approximately 16 kilolitres per day. For construction purposes, the potable water requirements are difficult to assess because they depend largely on the type of construction activity. For the purposes of this assessment it is assumed that up to 50 kilolitres per day could be required for the construction activities. Therefore, the total potable water requirement during construction is estimated to be approximately 60 to 70 kilolitres per day or 20 to 25 mega litres per annum.

Operations at the site would likely generate the following demand for potable water:

- Site buildings;
- Maintenance activities;
- Equipment wash down;
- Ship potable water supplies;
- Fire water in case of an emergency; and
- Processes undertaken on-site during operation, where required.

Based on an allowance of 310 equivalent tenements (ET) at the site it is anticipated that the maximum daily water demand at the site would be in the order of approximately 0.8 mega litres.

It is anticipated that potable water would be supplied through connection to Hunter Water mains in Ingall Street and located in the proposed access corridor to the site. The exact size of the water pipes and their location would need to be determined in consultation with Hunter Water when more detailed information can be provided to Hunter Water at the Project application stage.

According to Hunter Water, there appears to be capacity available in the existing water supply system to cater for the proposed concept. However, the available capacity would need to be more accurately assessed at the Project application stage when more detailed information is available.

Wastewater

During construction, wastewater would be managed by the use of on-site proprietary sanitary units which would be emptied regularly and the wastewater disposed of appropriately.

Wastewater would be generated from the facilities of future operators including as a minimum showers, toilets, wash basins, and tea rooms. As detailed below, it is anticipated that capacity to dispose of wastewater generated at the site would exist through the new sewerage system planned to be constructed at the future IIP. Hunter Water has advised that an allowance of 310 ET has been provided in the transfer pumping station under this servicing strategy. This equates to a design wet weather flow of 11 litres per second (Hunter Water, 2010).

The NSW Government has made provisions for funding a new sewerage system on the IIP site. The new system will include a sewage pumping station and a rising main connection to Hunter Water assets in Mayfield. The main sewage pump station will be fed by gravity collector sewers within the central catchment and a series of smaller satellite pumping stations in the other catchments. The new sewage pumping station will likely be located on the south eastern side of the IIP, in the vicinity of the Selwyn Street and David Baker Drive intersection.

The new sewerage system planned for the IIP site would not be connected to the Hunter Water system until upgrading works are completed by Hunter Water. The upgrading works are scheduled for completion in mid-2011. It is anticipated that individual facilities within the proposed concept site would connect to the new sewage system in the IIP and that the system would be operational and connected to the Hunter Water system in time to receive wastewater from the site.

Depending on the number of facilities intended to be constructed initially within each precinct and across the site, and on any forward knowledge about occupancy rates and future uses, it may be that a temporary rising main (of lower capacity) is built initially, followed by a permanent and larger rising main when the site nears full capacity. These mains would connect to the new sewage system planned to be constructed at the IIP site.

The wastewater system in the Mayfield area is currently at capacity and requires upgrades to the system to service the proposed concept. Hunter Water has advised that allowance for the proposed concept was made in the servicing strategy for the adjacent future IIP in the proposed regional sewage pumping station. The Burwood Beach WWTW is currently being upgraded and will have the capacity to service the development when the work is commissioned in late 2010. Hunter Water advised that Burwood Beach WWTW includes an allowance to service 310 ET from the proposed concept.

The nearest suitable connection point in the existing wastewater system is Shaft 28 in the interceptor system in Mayfield. However, Hunter Water advises that the interceptor system in the Mayfield area does not have sufficient capacity to handle peak wet weather flow. Hunter Water advises that although design is underway for the upgrade of the system for wet weather it is unable to give a firm commitment on the timing for the delivery of these upgrades.

Waste from the site during operations would also include trade waste discharge to Hunter Water sewers. Trade waste would arise from maintenance and washdown facilities and from bunded areas such as fuel storage areas within the Bilk Liquids Precinct. All trade waste generated at the site that would discharge to Hunter Water sewers would be subject of a Trade Waste Agreement under Section 37 of the *Hunter Water Act*.

Once specific details of the development are known, Hunter Water advised that a Section 50 application would be required to be lodged by developers within the precincts to allow Hunter Water to formally assess the development and issue their requirements.

Natural Gas

Natural gas would not be required for construction, but could be required for the operations at the site. It is anticipated that natural gas could be required for heating site buildings and also for powering the gas fired steam systems in the Bulk Liquid Precinct. It is anticipated that the proposed concept would be a small consumer.

Consultation with Jemena indicates that there is sufficient capacity in the local network to accommodate these requirements and that a connection could be made to the existing natural gas connection point located along Industrial Drive. It is also possible that a connection could be made to the natural gas supply pipeline located beneath the road surface along Steelworks Road, generally adjacent to OneSteel's main office.

Subsequent Project applications would be required to consult with Jemena to confirm load capacity and extension of gas supply pipelines. Jemena advise that final layout and load configurations would be required during this consultation which would aid in determining the requirements for providing natural gas to the site.

Electricity

There is likely to be minimal requirement for electricity during construction with electricity being provided by generators. Future operators would require electricity for the following:

- Powering terminal equipment such as quayside and mobile cranes, and rail mounted gantries;
- Cooling refrigerated containers (reefers);
- Providing lighting, cooling and telecommunications to site buildings and materials handling systems such as pumps and conveyors; and
- Powering computer control systems and any remote monitoring systems.

Based on readily available information from other similar developments, namely the *Port Botany Expansion EIS* prepared by URS in 2003, it is anticipated that the Container Terminal Precinct alone would consume approximately 21,000 megawatt hours of electricity per annum. Total demand for electricity at the site is difficult to estimate at the concept stage, where design details are not available.

Energy Australia are currently rolling out significant capital works programs in the Lower Hunter Region including major zone substation developments at Mayfield, Broadmeadow and Carrington. The new Mayfield West Zone Substation (132 kilovolt to 11 kilovolt) is located to the west of Tourle Street, the new Broadmeadow Zone Substation (132 kilovolt to 11 kilovolt) is located to the south west of the site near Griffiths Road in the Georgetown area, and the new Carrington Zone Substation (33 kilovolt to 11 kilovolt) is located in Elizabeth Street, Tighes Hill near King Street.

Consultation with Energy Australia in April, 2010 indicates these new major zone substations would likely be capable of supporting development within the site. Should the Mayfield West Zone Substation be the best option to supply electricity to the site, it would be necessary to install multiple underground 11 kilovolt cables along Tourle Street, Industrial Drive, Bull Street and into the site. Project applicants would be required to consult directly with Energy Australia with detailed load requirements of the proposed operations. Where loads are expected to exceed normal requirements of an industrial area, Energy Australia advised that applicants should discuss the need for any sub transmission connection upgrades with Energy Australia.

Energy Australia advised that depending on the capacity required it may be possible to meet some of the electricity requirements of the site during the early stages of development by extending the existing 11 kilovolt mains in Bull Street and Industrial Drive into the site. However, the capacity of the connections would be limited.

There is potential for electricity connection to the site via a new substation (and easements) proposed for the IIP site. Feeders from Energy Australia's network to the IIP would connect to a main substation on-site. Space would be allocated for smaller substations on-site to supply buildings, yard lighting and equipment. The number of substations, location of cable pits and power conduits would be determined during the detailed design phases of subsequent Project applications. Other options for electricity connection to the site include provision through OneSteel.

Telecommunications

It would be the responsibility of future operators to inquire with local telecommunications companies as to the availability of services to the site. Given that the requirement for land-line systems would not be extensive, it is not anticipated that there would be any system constraints.

Pipelines

Aboveground pipelines would ultimately be constructed from Berth 7 to facilities within the Bulk Liquid Precinct. However, provisions made through and underneath the Mayfield No.4 Berth may be used as an interim arrangement prior to the development of Berth 7. It is intended that any interim arrangement would utilise the Koppers structures to support the pipeline(s) across the site into the precinct.

It is anticipated that Koppers infrastructure would ultimately relocate to the proposed Bulk Liquids Precinct as part of the proposed concept. Koppers lease agreement requires two years notice to relocate away from the existing berth.

9.8.3 Mitigation Measures

The following mitigation measures would be implemented:

- NPC would prepare an Infrastructure Plan for the site that would ensure coordination in relation to the provision of services across the site;
- NPC would coordinate with Project applicants regarding the provision of services to the site via a services corridor, and would negotiate with Project applicants on cost sharing mechanisms for provision of services; and
- Project applicants should consult with local service providers regarding demand for, and provision of, services when more detailed information is available.

9.8.4 Conclusion

There is very little existing infrastructure at the site and therefore existing infrastructure would not be significantly impacted by the development and potential impacts would be suitably managed. The proposed concept would require provision of water, sewer, natural gas, electrical, and telecommunications services, and installation of pipelines. Local service providers, namely Energy Australia, Hunter Water, and Jemena have advised that there is likely to be capacity available to service the proposed concept, particularly since there are a number of significant service upgrades planned for the area. However, Project applications should consult with local service providers regarding demand for, and provision of, services when more detailed information is available at the Project Approval stage.

9.9 Geology and Soils

9.9.1 Existing Environment

Soils and Geology

Soils at the site are highly disturbed and are characterised by fill material of variable thickness underlain by marine and estuarine sediments. Fill material extends from the surface of the site to a depth of approximately 10 metres, and consists of coal washery rejects, slag, fly-ash and rubble. As detailed in the following sections, the fill material has been contaminated by past industrial use of the site and is in the process of being covered with capping materials as part of the ongoing remediation activities.

Estuarine sediments of inter-bedded soft to firm clays, silty clays/clayey silt, sandy clay/clayey sand, silty sand and sand are located beneath the fill material. Estuarine sediments are underlain by very stiff to hard silty clay at depths of 15 to16 metres, although in some locations the estuarine sediments extend to depths in excess of 20 metres. Bedrock occurs beneath the estuarine sediments, at depths ranging from 25 to 28 metres.

Soil Contamination

Extensive investigation of the site was undertaken prior to preparation of the *Development of a Multi Purpose Terminal and Remediation of the Closure Area, BHP Newcastle Steelworks, EIS* (URS, 2000). The findings of the site investigations as reported in the EIS indicated that PAHs, which are common to steel or gas works sites, were the only group of chemicals present in the surface fill layer at sufficiently high concentrations to warrant remediation prior to redevelopment of the site (URS, 2000). Elevated concentrations of VOCs such as BTEX were also found to occur at depth at the site. The area of PAH and VOC contamination was largely confined to Area 1, a 30-hectare parcel of land abutting the South Arm of the Hunter River in the northern portion of the site. Site investigations also indicated the presence of tar or tar like materials at some locations (URS, 2000). Extracts from the EIS that document the results of the site investigations are provided in **Appendix J**. Asbestos materials were also found at the site (HDC, 2009).

Remediation Activities

Remediation works have been conducted at the site since 2006 in accordance with the 2001 consent, and are scheduled for completion in 2012. A RAP was prepared in September 2004 to provide a basis for preparing a VRA and to comply with the conditions of the 2001 consent for the approved remediation works. A VRA was prepared in conjunction with the EPA (now DECCW) and HDC is currently responsible for implementing the VRA. The VRA is provided in **Appendix K**.

The remediation strategy for the site is based on a strategy of containment (through capping and groundwater controls) rather than treatment. The remediation activities on the site are being undertaken in three stages, identified as Stage 1a, Stage 1b and Stage 2:

- **Stage 1a.** The Stage 1a works, consisting of priority remediation activities, including capping and recontouring the site, installation of major drains (known as the Eastern and Western Drains), and installation of a subterranean barrier wall have been completed. The area subject to the Stage 1a works is known as Area 1, which is located in the centre of the site within the subterranean barrier wall.

  Area 1 contains the most highly contaminated material found on-site, including PAH and VOC contaminated soil and asbestos materials. Two types of caps have been provided in Area 1. A 0.5-metre thick cap of Virgin Excavated Natural Material (VENM) has been provided in the south western portion of Area 1. A paved cap has been provided in the balance of Area 1. The paved cap comprises 300 millimetres of granular site material overlain by 100 millimetres of 20-millimetre size crushed concrete which has been sealed with a bituminous two-coat seal to meet permeability requirements under the VRA (HDC, 2009).

  The levels and grades achieved during re-contouring and capping were designed to be compatible with anticipated future land uses, while also meeting remediation objectives. For example, the paved cap has been constructed to a level which is 400 millimetres below the finished surface levels to allow ‘air space’ for the construction of additional pavement thickness in the Container Terminal Precinct which requires heavy duty hardstands for handling and stacking containers.

A subterranean barrier wall is located in the centre of the site and extends around Area 1. It is approximately 1.4 kilometres in length and extends from the surface of the site approximately 30 to 49 metres underground. The remediation objective of the subterranean barrier wall is to minimise further contamination of groundwater by blocking the horizontal flow of groundwater through the main area of contamination which is located in Area 1. The barrier wall effectively cuts off Area 1 from the rest of the site. The barrier wall was constructed using bentonite slurry for trench support, with the barrier wall then formed by backfilling the trench with a high slump mixture of soil and bentonite slurry and clay additives (HDC, 2009).

- **Stage 1b.** The Stage 1b works include installation of a low permeability cap in the northern portions of Area 1, adjacent to the foreshore of the South Arm of the Hunter River. However, these works have been deferred pending completion of the HRRP by BHP (HDC, 2009). BHP are currently using over 30 hectares of Area 1 to treat contaminated sediments dredged from the Hunter River. The HRRP is scheduled for completion in 2012.
- **Stage 2.** The Stage 2 works primarily involve re-contouring and installation of a low permeability cap in Area 2. Area 2 is located outside the subterranean barrier wall, to the south east and north west of Area 1. The Stage 2 works commenced in 2010 and will be complete in 2012. As part of the Stage 2 works, five areas of soil contamination 'hotspots' were excavated and placed in Area 1.

Site monitoring of volatile gases conducted in December 2005, indicated the presence of volatile hydrocarbons in the vicinity of the former Benzol Plant of the BHP Steelworks. Vents have been installed in the low permeability cap to mitigate the potential build-up or migration of volatile gases under the cap within Area 1. This is an appropriate interim measure for managing risks associated with volatile gases in this area but is not intended as a final solution for future development (HDC, 2009).

The locations of Areas 1 and 2, within which the Stage 1a, Stage 1b, and Stage 2 remediation works have been or are currently being conducted, are shown on **Figure 2-3**.

Acid Sulfate Soils

Potential acid sulfate soils (ASS) are waterlogged soil layers rich in iron sulphide, primarily pyrite. They generally occur in low lying areas. When excavation or drainage brings these soils into contact with oxygen, the pyrite is oxidised to form sulphuric acid. If the amount of acid exceeds the neutralising capacity of the soil, and the pH falls below 4, the soils are known as actual ASS.

Review of the *NSW Acid Sulfate Soil Risk Maps* for the Newcastle area shows the following:

- There is a high risk of occurrence of ASS in soils at a depth of up to 1 metre in the area to the south and south west of the site;
- There is a low risk of occurrence of ASS in soils at a depth of greater than 4 metres in the area south west of the site in the IIP lands; and
- There are no ASS identified at the site.

9.9.2 Impact Assessment

Construction Impacts

Construction activities have the potential to disturb the soil, capping materials and underlying contaminated soils, and compromise the integrity of the subterranean barrier wall. Since the site is not identified as containing ASS, there would be no potential impacts associated with the disturbance of ASS.

Construction activities associated with the proposed concept may give rise to soil erosion as a result of the following activities:

- Excavation for construction of foundations for buildings and other structures;
- Temporarily stockpiling sub-base and other construction materials;
- Laying various sub-base materials prior to the construction of hardstand areas;
- Construction of buildings and other structures;
- Construction of roadways and rail sidings;
- Constructing the stormwater management system;
- Excavation to enable installation of service infrastructure; and
- Movement of construction equipment.

During construction, there is potential for the capping materials to be disturbed and contaminated soils to be exposed. However, the likelihood of contaminated soils being exposed would be minimised by conducting the construction activities in accordance with the existing CSMP which was prepared in September 2009. The main volume of the CSMP is provided in **Appendix L**. The CSMP provides a common framework for the design, implementation, completion, use and maintenance of works across the whole Closure Area. The CSMP is applicable to both remediation and redevelopment works, and includes restrictions relating to surface development in certain areas (HDC, 2009). For example, the CSMP states that works must be designed and carried out such that there are no building basements or other accessible voids constructed below the final cap surface level and that excavations are no deeper than 1.5 metres below the Area 1 finished cap level. These measures would minimise the potential for contaminated soils to be exposed and for construction workers to come into contact with contaminated materials.

The VENM cap, which is located across the site, would not be suitable for a significant load bearing surface. Operational activities for a number of precincts, for example stacking containers in the Container Terminal Precinct, would require heavy duty hardstands and therefore, all or part of the VENM cap may need to be removed. Replacement or reinforcing of the existing capping system to support the required loads, where higher design loads are required would be undertaken in accordance with conditions 5.18, 5.18A and 5.19 of the 2001 consent. These conditions consider the requirements for capping of remediation areas with a hardstand or seal bearing layers, consideration of any subsequent Project applications which seek to vary the permeability requirements for capping materials, and a requirement for subsequent Project applications to engage a qualified geo-technical engineer to provide certification of the permeability of any seal bearing layer.

Construction activities carried out in the Bulk Liquid Precinct, Container Terminal Precinct, and General Purpose Precinct in the vicinity of the subterranean barrier wall would have the potential to compromise the integrity of the wall if the requirements of the CSMP are not adhered to. The barrier wall is constructed from a soil-bentonite mix, which has a lesser load bearing capacity than the surrounding ground. The barrier wall construction includes a surface completion beam to distribute surface loadings across the wall. The completed wall has been designed to accommodate a sustained traffic load equivalent to the Stationary and Moving traffic load models (SM1600), as outlined in Australian Standard (AS) 5100, applied at any location(s) on the existing ground surface, including asymmetrical loadings. The SM1600 design loading is equivalent to a 3.2-metre wide sustained loading of 36 kilopascals.

Operation Impacts

The majority of the site would be covered with buildings and sealed surfaces such as hardstand areas, parking areas, roadways and railway line which would not give rise to erosion. Any areas not covered by buildings or sealed surfaces would be minimal e.g., drains, and would be surfaced or landscaped so that they would not be susceptible to erosion. Therefore, there would be little to no potential for erosion to occur during operation.

9.9.3 Mitigation Measures

NPC would prepare an overall Soil and Water Management Plan for the site to manage soil erosion during construction. The plan would be consistent with the publication *Managing Urban Stormwater – Soils and Construction* (the Blue Book) (Landcom, 2004) and would be maintained for the duration of the construction period. The mitigation measures included in the Soil and Water Management Plan would include:

- Installation of water diversion structures to ensure surface water runoff does not enter zones of exposed soils or stockpiles;
- Limiting the area of soils exposed at any one time and rehabilitating disturbed areas as soon as practical after construction;
- Minimising stockpiling wherever possible by coordinating construction activities and locating stockpiles away from drainage lines; and
- Vegetating stockpiles or covering where material is to remain on-site for an extended period of time.

Due to the lower strength and consolidation properties of the barrier wall structure, there is a risk of surface and subsurface displacement resulting from sustained future loadings, both laterally and vertically. To minimise the risk of surface and subsurface displacement of the barrier wall, the CSMP requires:

- That an easement be created within the vicinity of the barrier wall. The easement would be created by NPC. The easement is to be one continuous easement extending around the entire length of the barrier wall, and have a total width of 15 metres, comprising 5 metres on the side of the barrier wall which is within the inside

of the containment area and 10 metres on the side of the barrier wall which is exterior to the containment area;

- That work is not to include any activity that would result in a combination of dead and live loads that are in excess of the design load for the surface completion beam unless an engineer, the site auditor, or the State confirms that doing so would not have an adverse effect on the barrier wall, beam, cap, or surrounding ground;
- Works to be designed to allow for any differential settlement that may occur as a result of deformation of the barrier wall under load; and
- Works that involve trenching or excavation through the capping beam to include appropriate controls and work methods to minimise damage to the beam and appropriate design to replace or reinstate the beam to ensure that the functionality of the beam, barrier wall and cap is not adversely effected.

In order to minimise potential impacts to the cap, and minimise the potential for exposure to contaminated soils, all construction activities would be undertaken in manner that is consistent with the existing CSMP (HDC, 2009). NPC would oversee development of the site to ensure that it is carried out consistent with the VRA and CSMP, and in a way that would not cause surface and subsurface displacement of the barrier wall, would minimise disturbance of the cap wherever possible, and would not compromise the remediation outcome for the site.

Where it is necessary to excavate beneath the capping layer, any excavated soils would be tested for contamination and classified as Level 1, 2 or 3 as specified in the CSMP. The excavated soil would be managed in accordance with the appropriate Materials Management Plan and Work Management Plan and disposed of appropriately. If impacted, the cap would be properly reinstated following excavation.

The mitigation measures recommended above are intended to address the impacts identified for the proposed concept. They do not address the potential specific impacts associated with each subsequent Project application. Therefore, subsequent Project applications should include additional project-specific mitigation measures as appropriate, as well as the mitigation measures recommended above. Project applicants should prepare individual Soil and Water Management Plans.

In addition, NPC is committed to ensuring that construction activities associated with subsequent Project applications would not commence until such time that DECCW determines contamination at the site no longer presents a significant risk of harm, or where DECCW determines that construction activities which start prior to completing remediation can be done so synergistically and without impact on the remediation outcome.

9.9.4 Conclusion

The main potential for impact to soils and geology would occur during construction. Construction activities have the potential to cause soil erosion, disturb the capping materials and underlying contaminated soils, and compromise the integrity of the subterranean barrier wall. The potential for erosion to occur would be minimised by implementing the erosion control measures detailed in **Section 9.9.3**. In order to minimise potential impacts to the barrier wall and cap, and minimise the potential for exposure to contaminated soils, all construction activities would be undertaken in manner that is consistent with the existing CSMP.

Since the site is not identified as containing ASS, there would be no potential impacts associated with the disturbance of ASS.

When fully operational, the majority of the site would be covered with buildings and sealed surfaces such as hardstand areas, parking areas and roadways which would not give rise to erosion. Therefore, there would be little to no potential for erosion to occur during operation.

9.10 Socioeconomic

9.10.1 Existing Environment

Workforce and Local Economy

Total employment in the Hunter Region has experienced 16.9 percent growth between the 1996 and 2006 census surveys, with the total persons employed increasing from 209,930 in 1996 to 245,351 in 2006. Employment growth has been attributed to continued expansion and diversification of the regional economy, increased female participation in the labour force, and falling unemployment (Hunter Valley Research Foundation (HVRF), 2008). The unemployment rate in NSW as well as the Hunter Region has shown a steady decline over the past decade. Initially the recent global financial crisis led to a rise in unemployment. However the region has begun to experience a decline in unemployment once again.

Compared with NSW, in 2006 the Hunter Region demonstrated proportionally higher employment of technicians and trade workers, machinery operators, drivers and labourers, reflecting the higher proportion of people with trade and vocational qualifications, as well as higher employment in industries such as manufacturing and mining. The industries providing the greatest employment within the Newcastle LGA were health care and social assistance (15 percent), retail trade (11.4 percent) and manufacturing (9.8 percent). The first three sectors experienced increased growth at the 2006 census and contributed to 60 percent of all regional jobs growth from 1996 to 2006, while the latter experienced a slight decline. The professional, scientific and technical services and public administration and safety sectors also experienced relative growth. Employment opportunities continue to decline in the agriculture and mining sectors, with drought and farm amalgamations having a negative impact on the agricultural sector (HVRF, 2008).

A strategic plan for the Lower Hunter Region has been developed by the NSW Government outlining the provision of sufficient, appropriately placed housing and employment land to cater for the Region's predicted growth of up to 160,000 people by 2030.

Tourism is also recognised as having significant potential into the future to fuel economic growth. The Hunter Region is the fourth most visited region by tourists in NSW behind Sydney, and the North and South Coasts, respectively.

Port of Newcastle influence on Local Economy and Employment

The Hunter Region accounts for 14 percent of Australia's total exports which are sent to both international markets and other Australian Ports through the Port of Newcastle (DoP, 2008). In addition, Newcastle is Australia's largest port in bulk terms and the world's largest coal exporting port. During 2006/07 the Port was visited by 1,426 commercial and naval vessels and in 2007 coal berths loaded 973 vessels (HVRF, 2008).

The primary use of the Port is for the export of coal. However, the Port also handles other cargo (i.e. bulk cement, fertilisers, bulk liquids, alumina and a variety of agricultural products) and is used for activities such as ship repairs, maintenance, and small vessel berths.

The Port of Newcastle generates an important source of employment for the Hunter Region through the activities operating throughout the Port and also the supporting ancillary activities. The Port of Newcastle directly employed 120 people in 2010 (NPC, 2010). The Port and related activities also generate an important source of indirect employment for the local economy, such as warehousing and transport of goods being transferred through the Port.

A study by independent research organisation, HVRF titled, *Estimates of Economic Impacts in the Hunter Region from the Development and Operation of the Port of Newcastle*, confirmed the Port's economic importance for both the Hunter Region and NSW with value of trade through the Port placed at more than $8 billion (NPC, 2008).

The study found that between 2008 and 2010, day-to-day costs of running the Port, such as paying wages, operating port services and operating tugs, would inject $5 billion into the local economy. The study indicated that port development and investment would approach $1.5 billion up to 2010 and would generate 1,630 jobs throughout the region each year. Investment in port and port-related infrastructure of $1.5 billion would have significant flow-on, or multiplier, benefits and was expected to generate total output in the Hunter Region of $2.9 billion during the period. The multiplier effects of the investment were estimated to generate income across the Hunter Region estimated to total $638 million.

Community Infrastructure and Services

A range of community infrastructure and services are available in the Newcastle LGA, primarily located within the Newcastle City Centre. Community infrastructure and services available within the LGA include health services, education, sport and leisure and aged care support services. Community facilities proximal to the site include Mayfield East Primary School and the Mayfield Sport and Recreation Club on Crebert Street, and the Pheonix Sports Club on William Street.

9.10.2 Impact Assessment

Economic Impacts

The proposed concept would generate positive economic benefits for Newcastle, the Hunter Region and NSW through the significant capital investment and establishment of port infrastructure. The estimated CIV of the proposed concept is $200 million.

The proposed concept would support the *Lower Hunter Region Strategy* by providing additional infrastructure and job opportunities to cater for the Hunter Region's predicted growth of up to 160,000 people by 2030.

The proposed concept would support the development and growth of the Hunter Region by:

- Providing key infrastructure for the region, indirectly strengthening employment opportunities;
- Stimulating business growth and development; and
- Creating port infrastructure that reinforces the region as a strategic eastern seaboard gateway.

Construction required to develop subsequent Project applications would generally require an average full-time workforce of approximately 60 workers. The maximum workforce would be approximately 160 workers given the staged development of the proposed concept. Personnel likely to be required would include:

- Hazardous materials workers
- Site foremen
- Operators of heavy equipment
- Safety officers
- Administration personnel
- Project managers
- Environmental consultants, who would be employed to undertake environmental monitoring outlined in this EA and prepare subsequent Project applications

The presence of the construction workforce in Mayfield is anticipated to have short-term positive impacts for the local economy due to the demand for goods and services by the construction workforce over the construction period.

During operation, it is estimated that the proposed concept would employ a total workforce of approximately 300 full-time personnel over three shifts in 2034. The type and number of personnel required during each shift would be dependent on future operational requirements. Broadly, employment activities may include:

- Senior clerk
- Administration staff
- Driveway booth operators
- Crane operators
- Longshoremen
- Runners
- RTG operators
- Tractor and tri-trailer set operators
- Forklift operators
- Vehicle maintenance staff
- Road sampling and testing office operator
- Laboratory personnel
- Ship loader operator (only required during ship loading operations)

- Equipment and terminal maintenance staff
- Truck drivers
- First aid officer

It is anticipated that many of these positions would be filled by people from the local area. The proposed concept would also result in indirect benefits to the Hunter Region associated with expenditure on local goods and services, food, fuel, infrastructure and other supplies, which would be beneficial to a range of industries.

Community Infrastructure and Services

There would potentially be additional demand for community resources such as education and healthcare if employees relocate to the area from other areas. However, it is anticipated that most positions would be filled by people from the local area and for those people that relocate to the area their needs would be able to be catered for by existing resources.

Amenity Impacts

The amenity of an area can be affected by noise levels, air pollution, traffic generation, etc. While not excessive or unmanageable, the potential for noise impact at surrounding residences would be greatest in the night period when adverse weather conditions occur (temperature inversions). As detailed in **Section 9.3**, mitigation measures such as the use of "sqwawker" or broadband reversing alarms on equipment which are less audible at a distance than traditional alarms, minimising operation of site vehicles during the night period as much as practical, and installing noise barriers would be used to minimise the potential for noise impacts at surrounding residences during the night period. There would also be traffic noise impacts along Industrial Drive which can be mitigated by treating the facades of residences.

Analysis of the regional air shed using existing pollution data shows that with the exception of short term episodic particulate matter (short term concentrations of PM_{10} can on occasion exceed the assessment criteria) there is the capacity to increase the pollutants of concern in the air shed without exceeding relevant criteria. Mitigation measures would be implemented to control dust emissions. The transportation assessment demonstrated that as long as a portion of the site traffic can be diverted to the Industrial Drive/George Street intersection which has more spare capacity, the Industrial Drive/Ingall Street intersection would perform at a satisfactory LOS. Potentially hazardous areas within the site can be located such that they do not impact surrounding residential and industrial areas in a manner exceeding permissible impact levels.

The proposed concept would enhance the amenity of the surrounding area by transforming the highly disturbed site into that of a modern, state-of-the-art facility with a visual appearance in keeping with the existing port-related industrial activities conducted in the Port. Provided suitable mitigation measures are implemented, it is not anticipated that the proposed concept would have an adverse impact on the amenity of the area.

9.10.3 Mitigation Measures

NPC would continue to liaise with the Mayfield CCC to periodically update them on the status of development of the proposed concept and to discuss issues of concern to the community.

9.10.4 Conclusion

The $200 million CIV of the proposed concept is anticipated to provide numerous social and economic benefits for Newcastle, the Hunter Region and NSW through establishment of port infrastructure and port-related activities at Mayfield. The overall impact of the proposed concept on the social and economic characteristics of the area would be positive. The proposed concept would also have a long-term positive impact on the competitive environment for NSW ports. Construction would generate significant direct and indirect employment opportunities for the Hunter Region, as well as in NSW as a whole. Development of the proposed concept would also provide long-term stimulus to the local economy, long-term employment generation, and contribute a significant amount of added value to the economy.

9.11 Visual

9.11.1 Existing Environment

Visual Character and Landform Surrounding the Site

The site is located in the Port of Newcastle, approximately 7 kilometres north west of the Newcastle CBD. The Port of Newcastle is located within a landscape which has been highly modified and disturbed by industrial use over the last century, and is now dominated by port-related industrial and commercial activities (refer to **Figure 9-13**).

The visual envelope of the Port of Newcastle is typical of an active port, and includes commercial and industrial premises that range in size, building style and features that have the following types of visually-prominent structures:

- Large industrial and storage buildings and sheds
- Coal loaders
- Elevated conveyors
- Elevated pipelines
- Silos (for coke and alumina storage)
- Stockpiles
- Stacks
- Railway yards and railway lines
- Roads
- Berths and ships

Many of these structures, especially the stacks, silos, and elevated loaders, conveyors and ships, are highly visible and dominate the landscape, particularly given that the landform is generally low-lying and flat.

With the exception of its northern border, the site is bordered entirely by industrial and port-related activities. To the north and east, the site is bordered by the South Arm of the Hunter River and Kooragang Island is located further to the north and east. Kooragang Island is a port-related industrial area facilitating the import and export of coal, alumina and coke. Physical features of Kooragang Island include loading and unloading facilities, storage facilities, conveyors, berths and ships. There are also waste and sediment disposal areas and associated stock piles on Kooragang Island. Cormorant Road on Kooragang Island is a well-trafficked publicly accessible road from which the site is visible.

OneSteel wire, rod and bar mill is located immediately to the west of the site. Port Waratah Coal Service Carrington Coal Terminal is located immediately to the south of the site, and has prominent coal loaders, elevated conveyors, ship loaders, berths and ships. The future IIP is also located to the south of the site, and currently consists largely of vacant land which is largely devoid of vegetation, infrastructure and structures.

The residential areas of Mayfield, Mayfield East, Tighes Hill, Carrington and Stockton are located in the areas surrounding the Port of Newcastle. The residential areas of Mayfield and Mayfield East are located closest to the site, approximately 900 metres to the south west. Mayfield and Mayfield East are separated from the site by Industrial Drive and the IIP lands. Parts of Industrial Drive are slightly more elevated, however, views of the site are largely obstructed due to topography, buildings and roadside vegetation. Mayfield East Public School is located at the intersection of Industrial Drive and Ingall Street. The suburbs of Tighes Hill, Maryville and Carrington are located approximately 1 to 1.5 kilometres to the south of the site. The suburb of Stockton is located approximately 1.5 kilometres to the south east of the site. These residential areas consist of low density residential development as well as vacant land yet to be developed.

There are several areas of open space within and proximal to Mayfield including Stevenson Park, Hexham Swamp Nature Reserve and Kooragang Nature Reserve. These areas provide recreational amenity for individuals and groups. Recreational boating and fishing is also popular on the Hunter River.

AECOM

Visual Context of Port of Newcastle

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-13

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Visual Character of the Site

The site is relatively low-lying, flat and largely devoid of infrastructure and structures since the demolition activities on-site during 2006 (refer to **Figure 9-14**). Prior to the closure of BHP Steelworks in 1999, and the demolition of the BHP structures in 2006, the site consisted of several industrial and administration buildings, gas holders, blast furnaces, several mills, storage areas, stockpiles and parking areas.

NPC and Koppers currently conduct port-related industrial activities at the site. NPC operates a general cargo handling facility, known as Mayfield No.4 Berth, at the site. The facility consists of a wharf structure with one berth, mobile cranes for unloading goods, a hardstand area, demountable buildings, lighting and access road (refer to **Figure 9-15**).

Koppers' currently utilise the Ex-BHP No.6 Berth for shipping and an elevated pipeline with associated infrastructure for handling coal tar and pitch products runs east to west across the northern portion of the site. A large portion of the site has been remediated and sealed with asphalt as part of the remediation works. The portside area of the site has new sheetpile wall in places, and also old sheetpile wall, rip-rap and timber structures. The new sheetpile was installed along the north western length of the foreshore as part of the BHP HRRP. BHP currently occupy part of the site (foreground of **Figure 9-14**) to undertake land-based remediation activities involving the treatment of contaminated sediments dredged from the Hunter River.

The site is largely devoid of vegetation. Introduced grasses and weed species, and a limited number of shrubs, have colonised small pockets of the site.

Figure 9-14: Existing Site in the Foreground with Carrington Coal Terminal in the Background

Figure 9-15: Site with Mayfield No. 4 Berth in the Foreground and Kooragang Island in the Background

9.11.2 Assessment Criteria

The visual assessment has been based on consideration of the visibility of the proposed concept and the capacity of the existing landscape to absorb the proposed concept. These two assessment criteria have been described in more detail below:

Visibility

Visibility is a measure of the extent that a proposed development is visible in surrounding areas. In considering the visibility of a proposed development a range of factors including the number of viewers, the length of viewing time, and the viewing distance are taken into account. For the purposes of this assessment viewing distance has been divided into three categories:

- Immediate vicinity (within 1 kilometre)
- Local area (between 1 and 4 kilometres)
- Regional area (greater than 4 kilometres)

Length of view has been divided into three categories:

- Short (a few seconds)
- Moderate (a few minutes up to an hour)
- Long (longer than an hour)

Visual Absorption Capacity

Visual absorption capacity is the ability and extent to which an existing landscape is able to absorb a new development without creating a major change in the general visual envelope. With regard to the proposed concept, the capacity of the existing port-related infrastructure and associated industry, such as OneSteel, Koppers, and Carrington Coal Terminal, to absorb additional port infrastructure is high. For the purposes of this study, the capacity of a landscape to absorb new development has been divided into three categories:

- Low
- Moderate
- High

By comparing the visibility and absorption capacity of a view it is possible to determine a level of visual impact as defined in **Table 9-55**.

Table 9-55: Level of Visual Impact

Visual absorption capacity	Visibility		
	Low	***Moderate***	***High***
High	Low	Low-Moderate	Moderate
Moderate	Low	Moderate	High
Low	Low	Moderate	High

Viewing Locations

Each of the viewing locations has been assessed through consideration of the location of the view, likely type of viewers, context of the view, likely number of viewers, distance of view from the proposed concept, likely length of view, extent that the proposed concept is visible from the view, and the capacity of the surrounding area to absorb the proposed concept. The viewing locations, shown on **Figure 9-16**, are:

Immediate Vicinity:

1) Industrial Drive opposite Mayfield East Primary School
2) Industrial Drive opposite Selwyn Street
3) Mayfield East residential area
4) Mayfield residential area

Local Area:

5) Cormorant Road.
6) Stockton residential area.
7) Walsh Point Reserve.

Regional Area:

8) Kooragang Nature Reserve.
9) Stevenson Park.
10) Hexham Swamp Nature Reserve.

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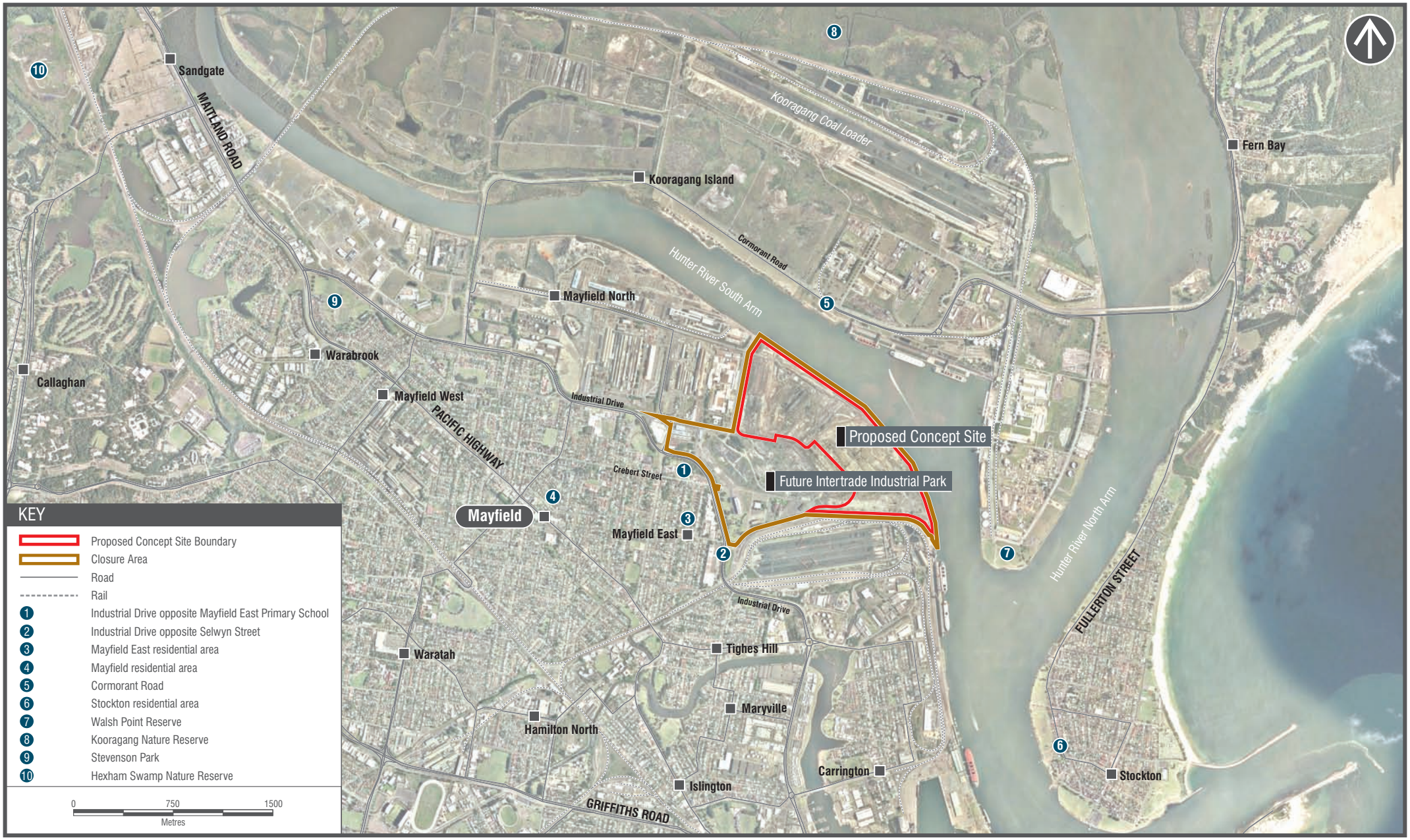

AECOM

VIEWING LOCATIONS

Environmental Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 9-16

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9.11.3 Impact Assessment

A broad account of visual impacts associated with both construction and operation of the proposed concept is provided below.

Construction

During construction there would be temporary visual impacts relating to the introduction of plant and equipment such as earthmoving and other construction equipment. There would also be visual impacts associated with the construction of berths, road and rail infrastructure, construction lighting, stockpiling, and construction of buildings and other structures such as storage tanks and conveyors. The existing industrial activity within the Port would assist with absorbing the potential impact associated with these activities.

Operation

The proposed concept would transform the site from a relatively vacant parcel of land with exposed earth and asphalt and little vegetation into a state-of-the-art facility with a visual appearance in keeping with the existing port-related industrial activities conducted in the Port. Activity and infrastructure associated with the operation of the facilities, berths and rail and road infrastructure would have low to moderate visual impacts on the landscape. The main visual impacts would result from increased port infrastructure such as cranes, elevated conveyors, storage silos, forklifts and gantry cranes, and from increased shipping and rail movements into and out of the area and impacts from lighting to facilitate night time operations. It is typical for port facilities to be illuminated at night and existing land uses at the Port are currently illuminated at night.

The visual impacts based on viewing location are as follows:

- **Immediate Vicinity**. Viewers in the residential suburbs of Mayfield and Mayfield East, and staff and children of Mayfield East Primary School, would have partial views of the site due the height and scale of the proposed bulk fuel storage tanks, cranes associated with the container terminal, and the silos for storing grain. Motorists on Industrial Drive would have short-term, intermittent views of these structures at the site. These views would be largely obscured by the mature roadside trees of Industrial Drive. The level of visual impact has been assessed as low-moderate prior to development of IIP. When the IIP development takes place, it is anticipated that it would partially screen the site from these viewpoints, and that the visual impact would be reduced to low.
- **Local Area.** There are open views of the site across the South Arm of the Hunter River from Cormorant Road which is used by tourists, residents and commuters into Newcastle CBD. However, motorists on Cormorant Road would only have short-term, intermittent views of the site and therefore the visual impact has been assessed as low-moderate. Due to the distance and orientation of the site from Stockton residential area, views would restricted such that only some areas of the eastern portion of the site and the most prominent structures such as the grain silos would be visible. In addition, the site is partially obscured by the Carrington Coal Terminal in the foreground. Therefore, the visual impact was assessed as low. From Walsh Point Reserve there would be unrestricted views of the site across the South Arm of the Hunter River and therefore there would be moderate visual impact.
- **Regional Area.** Due to the low-lying and flat nature of the land, it is not anticipated that the site would be visible from Kooragang Nature Reserve, Stevenson Park, or Hexham Swamp Nature Reserve. If the site is visible at all, only the tops of the tallest structures such as the bulk liquid fuel storage tanks and grain silos would be visible, and these features would blend into the existing port and industry related visual amenity of the area. It is anticipated that there would be no to low visual impact from these locations.

9.11.4 Mitigation Measures

Project applicants would prepare Lighting and Material Finishes Management Plans. The following mitigation measures would be included in the plans to mitigate potential visual impacts on the immediate and local landscape as appropriate:

- Lighting used for evening and night time construction work would be projected downward and toward the work area to minimise light spill into surrounding areas;
- Construction areas and plant/machinery and materials storage areas would be clearly delineated to ensure visual amenity of the site is maintained;
- The height of stockpiles created during construction would be minimised where possible;

- Lighting for operational areas would be carefully selected to minimise light spill on surrounding areas outside the site boundaries and minimise visual impact when viewed from adjacent premises;
- Suitable colours and materials would be selected for the buildings and other structures to minimise reflectivity and contrast; and
- Landscaping works would be conducted in appropriate areas of the site such as the landward boundary of the site adjoining the IIP site.

9.11.5 Conclusion

Whilst the proposed concept would alter the existing visual landscape of the site, proposed new features, although significant, are typical of the local and wider landscape character as an industrial port area and are consistent with the past industrial use of the site. The proposed concept is also consistent with the proposed development of the adjoining IIP site.. There are very few visual receivers with direct views of the site. Most receivers would be transitory and would be affected by visual changes for limited and short times. In this regard, the proposed concept is not expected to have an adverse effect on the visual amenity of the area.

9.12 Ecology

9.12.1 Existing Environment

The site is located within an existing industrial port along the South Arm of the Hunter River and has been subject to extensive disturbance over the past century, through industrial development, past land use practices, and recent landside remediation activities.

The estuarine environment of the South Arm of the Hunter River has been subject to intensive port-related activities over the past century including shipping movements, wharf development and dredging. Further port-related development along and within the South Arm of the Hunter River, which would include the expansion of the shipping channels, has already been approved as described in **Section 5.2.6.**

Terrestrial Flora and Fauna

A flora and fauna survey and assessment was conducted at the site utilising the random meander method during preparation of the *Development of a Multi Purpose Terminal and Remediation of the Closure Area, BHP Newcastle Steelworks, EIS* (URS, 2000). The majority of vegetation recorded on the site consisted of exotic weeds, shrubs and tree species such as Bitou bush, Lantana and exotic figs (URS, 2000). The flora survey found no threatened plant species or vegetation communities which are listed on schedules of the *Threatened Species Conservation Act* 1995 (TSC Act). Since then, the BHP Steelworks have been demolished and site remediation is ongoing. As a result, the site contains very little vegetation consisting of exotic weeds and shrubs. The site does not contain any trees. The fauna survey did not identify threatened fauna species. It was concluded that the site does not provide suitable habitat for threatened species of fauna.

The site is located approximately 2 kilometres south west of the recently established Hunter Estuary National Park. The park incorporates the former Kooragang Nature Reserve, which covers an area in excess of 2,923 hectares, and sections of which are a RAMSAR site (pertaining to the conservation and sustainable utilisation of wetlands). The wetland area is important to migratory and Australasian waders, waterfowl and other wetland birds and these are protected under the terms of an ‘Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment’ (JAMBA) and an ‘Agreement between Australia and the People’s Republic of China for the Protection of Migratory Birds and their Environment’ (CAMBA). The site itself does not provide habitat for migratory birds.

Estuarine Flora and Fauna

A small stand of mangroves, consisting of Grey Mangrove (*Avicennia marina*), is situated on the southern foreshore of the South Arm of the Hunter River, along the river bank in the northern portion of the site. The stand is approximately 5 metres wide by 15 metres long and has medium density trees that are approximately 3 metres tall. No other areas of mangroves occur near the site. This stand of marine vegetation is to be cleared as part the BHP’s HRRP and extension of the Hunter River South Arm shipping channel. Appropriate permits have been received from the NSW Department of Primary Industries for the clearing to proceed. The benches of the Eastern Drain are vegetated with mangroves.

The estuarine muds on the foreshore of the South Arm of the Hunter River which border the site provide habitat for organisms commonly found on rocky shores and within the benthos, i.e. worms, shellfish, and crabs.

The Hunter River estuary functions as a shipping harbour, port and recreation area. It receives industrial discharges, periodic urban stormwater runoff and flood waters from the Hunter Valley following heavy rain. A range of aquatic organisms occur in the Hunter River, for example benthic organisms, plankton, shellfish and fish. These include commercially important species such as oysters (*Saccostrea commercialis*), two species of crustaceans including school prawns (*Metapenaus macyleai*) and blue swimmer crabs (*Portunus pelagicus*), four species of estuarine fish including yellowfin bream (*Acanthopagrus*), flat-tail mullet (*Liza argentea*), dusky flathead (*Platycehalus fuscus*) and large-toothed flounder (*Pseudorhombus arsius*). None of these species are threatened or endangered but are commercially important.

9.12.2 Methodology

Consideration of potential habitat impacts to threatened species, TECs and migratory species that potentially occur within 10 kilometres of the site, was undertaken on 23 April 2009 using the following databases applicable to the TSC Act and EPBC Act:

- Department of the Environment, Water, Heritage and the Arts (DEWHA): *EPBC Protected Matters Search Tool*.
- DECCW: *Atlas of NSW Wildlife*

9.12.3 Impact Assessment

Terrestrial Flora and Fauna

A comprehensive list and habitat considerations of all potentially occurring threatened species potentially occurring within 10 kilometres of the site is provided in **Appendix M**. Consideration of the favoured habitat of all listed species, the habitat attributes of the site, and count information of each listed species revealed that no listed species were likely to occur on the site due to the site's highly disturbed nature, lack of fresh water bodies and trees.

Key Threatening Processes (KTPs) are processes that threaten, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Types of KTPs that may be occurring in the area include:

- Clearing of native vegetation;
- Competition and grazing by the feral European rabbit;
- Predation by feral cats; and
- Predation by the European Red Fox.

The proposed concept does not involve works that constitute KTPs.

The site is highly disturbed from previous industry, land use, and current and ongoing remediation works, as such it contains no habitat value for native species. The proposed concept would not require clearing or other activities which have the potential to impact native species and their habitats, and therefore, would not have a significant impact upon terrestrial flora and fauna.

The mangroves which are on the benches of the Eastern Drain would not be impacted.

The proposed concept is unlikely to affect the Kooragang Nature Reserve, due to distance and separation by the South Arm of the Hunter River and other intervening industrial uses on Kooragang Island, or other native flora and fauna in the areas surrounding the site.

Threatened Ecological Communities

The White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands are a TEC known to occur within 10 kilometres of the site (refer to **Table 1** of **Appendix M**). The White Box-Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grasslands has a ground layer of native tussock grasses and herbs, and a sparse, scattered shrub layer. White Box (*Eucalyptus albens*), Yellow Box (*E. meliodora*) or Blakely's Red Gum (*E. blakelyi*) dominate the ecological community, where a tree layer still occurs. This TEC is not present on the site due to the lack of vegetation and the highly disturbed nature of the site.

Estuarine Flora and Fauna

Potential impacts to estuarine flora and fauna from future projects on the site would include:

- Impacts to organisms through pollutants from leaks / spills and from stormwater discharge into the South Arm of the Hunter River during construction and operation; and
- The introduction of exotic marine species through the release of ballast water from ships.

9.12.4 Mitigation Measures

Terrestrial Flora and Fauna

Development of the site in keeping with a modern state-of-the-art port facility, would predominantly include structures and hardstand areas. As such, there would be minimal areas available on-site for landscaping. Project applicants would prepare Landscape Management Plans which would include a requirement for landscaping appropriate areas of the site using native vegetation. This would encourage native bird species and other fauna species to return to the site for foraging and shelter.

Estuarine Flora and Fauna

Potential fuel or chemical spills would be managed through the implementation of protocols and safeguards to ensure that runoff is contained on-site to prevent degradation of the estuarine environment in the vicinity of the site.

The implementation of safeguards relating to the control of surface water runoff and sedimentation (refer to **Section 9.6** and **Section 9.9**) during the construction and operation of the proposed concept would ensure that potential impacts to the estuarine environment are minimised.

Ballasting would be undertaken in accordance with the *Australian Ballast Water Guidelines* produced by the AQIS. AQIS would carry out mosquito vector monitoring and Project applicants would be required to implement measures to control mosquitos.

If necessary, additional mitigation measures would also be provided and appropriate safeguards put in place as part of subsequent Project applications to ensure that potential impacts on the estuarine environment are minimised.

9.12.5 Conclusion

It is not anticipated that the proposed concept would have an adverse impact on terrestrial flora and fauna at, or in areas surrounding, the site due to the existing cleared and highly disturbed nature of the site. The proposed concept has some limited potential to enhance the ecological value of the site, where feasible, through the provision of landscaping.

The proposed concept would not affect the Kooragang Nature Reserve, due to the nature of the proposed works, distance and separation by the South Arm of the Hunter River, and other intervening industrial uses on Kooragang Island.

9.13 Waste Management

9.13.1 Existing Environment

The site is mostly vacant and generally devoid of vegetation, infrastructure and structures. Remediation throughout a portion of the site has been completed and this part of the site is covered with asphalt. Remediation works across the balance of the site is progressing. The site is currently utilised for limited port-related industrial activities, which include a general cargo handling facility known as Mayfield No. 4 Berth, and the Ex-BHP No. 6 Berth which is utilised by Koppers. The operation of these facilities does not generate a substantial amount of waste. Only small volumes of municipal waste are currently generated from demountable buildings and small-scale maintenance activities.

9.13.2 Impact Assessment

The *NSW Waste and Resource Recovery Strategy 2007* (NSW WARR) has been considered to assess waste generation as a consequence of the proposed concept. The broad targets for the NSW WARR are highlighted in **Table 9-56**.

The strategy aims to maximise the conservation of natural resources and to minimise environmental harm from waste management and disposal of waste. Inadequate collection, storage and disposal of waste generated during construction and operational activities may have the potential to pollute the surrounding environment, including soil and water. The targets of the NSW WARR have been considered in developing the waste management strategies for the proposed concept.

Table 9-56: NSW WARR Strategy Key Result Areas

Key Result Area	Target
Preventing and avoiding waste	To hold level of total waste generated for five years from the release of *Waste Strategy 2003.*
Increased recovery and use of secondary materials	By 2014, to: Increase recovery and use of materials from the municipal waste stream, from 26 percent (in 2000) to 66 percent; Increase recovery and use of materials from the commercial and industrial waste stream, from 28 percent (in 2000) to 63 percent; and Increase recovery and use of materials from the construction and demolition sector, from 65 percent (in 2000) to 76 percent.
Reducing toxic substances in products and materials	By 2014 or earlier to: Phase out priority substances in identified products as a first choice or maximise recovery for re-use.
Reduce litter and illegal dumping	Reduce total amount of litter reported annually. Reduction in total tonnages of illegally dumped material reported by regulatory agencies and Regional Illegal Dumping (RID) squads annually.

Waste would be generated during construction and operation of the proposed concept. Waste generating activities would include excavation, construction of buildings, laying hardstands, road and rail infrastructure works, drainage works and equipment operation and maintenance. Waste types generated during the construction and operation of the proposed concept would likely include:

- Excavated spoil material, including concrete and building rubble.
- Wooden piles and other structural steel from jetties.
- Steel and scrap metal.
- Fuels and oils.
- Batteries.

- Empty chemical and paint containers.
- Vegetation.
- Office waste – paper, cardboard, used cartridges, food waste.

At the Concept Approval stage, it is difficult to quantify the amount and types of waste that would be generated for the proposed concept. While the general terms with which each precinct would be used and developed is known, sufficient detail on waste types and quantity would not be available until the Project application stage. Subsequent Project applications would be required to consider the quantity and types of waste generated in more detail.

The management of waste is not considered a key issue given that standard measures are available to address waste generation, disposal and reuse in order to minimise potential impacts.

Construction Waste Generation

The various waste types that are likely to be generated during construction of the proposed concept include spoil, concrete, building rubble, scrap metal, scrap wood, packaging materials, cardboard, paper, plastic, glass, used cartridges, food/organic waste and small quantities of spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil.

The excavation and preparation of the site would generate wastes such as spoil, concrete and building rubble which are classified as General Solid Waste (Non-Putrescible) under DECCW's *Waste Classification Guidelines*. There is also the potential for contaminated soil to be exposed during site excavation works (refer to **Section 9.9**).

Construction activities including infrastructure (road, rail and drainage) works, laying hardstand and building construction are likely to produce various waste types, including building rubble, concrete, scrap metal, steel, scrap wood and packaging materials. These waste types are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*.

The operation and maintenance of construction equipment is expected to produce small quantities of spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil which would be classified as Hazardous Waste under DECCW's *Waste Classification Guidelines*.

Construction site office-related activities are likely to generate wastes such as cardboard, paper, plastic, glass and used cartridges which are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*. These activities would also generate food/organic waste which is classified as General Solid Waste (Putrescibles) under DECCW's *Waste Classification Guidelines*.

Operational Waste Generation

The various waste types that are likely to be generated during operation of the proposed concept include cardboard, paper, plastic, glass, used cartridges, food/organic waste, vegetation/green waste and small quantities of machinery parts, scrap metal, oils, used rags, spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil.

Office-related activities during operation are expected to produce cardboard, paper, plastic, glass and used cartridges which are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*. These activities would also produce food/organic waste which is classified as General Solid Waste (Putrescibles) under DECCW's *Waste Classification Guidelines*.

Waste from maintenance of equipment, machinery and facilities would generally include small quantities of machinery parts and scrap metal which are classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*. Maintenance waste may also include small quantities of oil and used rags which are classified as Hazardous Waste under DECCW's *Waste Classification Guidelines*.

Waste from the operation of equipment and machinery would include small quantities of spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil which would be classified as Hazardous Waste under DECCW's *Waste Classification Guidelines*.

Maintenance of landscaped areas would generate vegetation/green waste which is classified as General Solid Waste (Non-Putrescibles) under DECCW's *Waste Classification Guidelines*.

The seagoing cargo vessels that visit the Port may generate oily waste water, garbage, quarantine waste and may also generate hazardous waste.

9.13.3 Mitigation Measures

Construction Waste Management

A Waste Management Plan (WMP) would be prepared by Project applicants prior to the commencement of construction on the site. The WMP would form part of the CEMP. These plans would address appropriate waste identification, handling, storage and disposal in accordance with the DECCW Guidelines. The different waste streams would be stored separately, collected and disposed of by licensed waste contractors.

General Solid Waste (Non-Putrescibles) would be separated and stored in separate containers and reused on-site where possible. Spoil, concrete and building rubble would be reused on-site as road/rail base or fill where suitable. Scrap metal and wood would be reused on-site where practicable or sent off-site for reprocessing. Packaging materials such as plastic and cardboard would be separated and sent to off-site recycling facilities. Recyclable office waste like paper, cardboard boxes and used printer cartridges would be segregated and stored separately. A licensed waste collection contractor would collect the recyclable material for delivery to off-site recycling facilities.

Waste classified as General Solid Waste (Putrescibles) such as food scraps and organic waste would be separated from other waste types such as paper and plastics. There is potential for food and organic waste to be sent off-site to a food waste composting facility.

General waste (putrescibles and non-putrescibles) would be stored in a variety of receptacles of differing styles and sizes depending on the waste collection requirements and the management or disposal method to be used for each material. All bins and/or skips would be emptied on a regular basis to prevent overflow of materials.

Small quantities of hazardous waste would be generated from construction equipment and vehicle maintenance activities and may also arise from the exposure of contaminated soils during excavation. All construction activities would be carried out as detailed in the CSMP to minimise the potential for exposure to contaminated soils.

Hazardous waste would be stored so as to prevent or control accidental releases to air, soil and water resources in the area. Storage provisions would include:

- Sufficient space between incompatibles or physical separation such as walls or containment bunds;
- Store in closed containers away from direct sunlight, wind and rain;
- Secondary containment systems would be constructed with materials appropriate for the wastes being contained and adequate to prevent loss to the environment;
- The available volume of secondary containment would be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in that specific location for liquid hazardous waste; and
- Provide adequate ventilation where volatile wastes are stored.

Hazardous waste storage activities would be subject to special management actions, conducted by employees who have received specific training in handling and storage of hazardous wastes. Management actions would include:

- Provision of readily available information on chemical compatibility to employees, including labelling each container to identify its contents;
- Limiting access to hazardous waste storage areas to employees who have received proper training;
- Clearly identifying (label) and demarcating the area, including documentation of its location on a facility map or site plan;
- Conducting periodic inspections of waste storage areas and documenting the findings; and
- Preparing and implementing spill response and emergency plans to address their accidental release.

Operational Waste Management

A WMP would be prepared by Project applicants to address handling, storage and disposal of waste during operation. Waste that is transported to the Port through ships arriving from outside Australia would be subject to Quarantine regulations. Licensed waste contractors would be made responsible for collection and appropriate disposal of waste.

General waste (putrescibles and non-putrescibles) generated during the operation of the proposed concept would be stored, reused, recycled or disposed of in the same manner as described for construction waste in the previous section.

Green waste would be reused on-site as mulch where required and if appropriate or would be transported to a local composting facility. Food waste would be sent off-site to a food waste composting facility.

Small quantities of hazardous waste would be generated from the operation and maintenance of equipment, vehicle, buildings and facilities. Hazardous waste would be managed in accordance with the provisions outlined in the construction waste management section above.

Waste materials generated from seagoing cargo vessels would be managed once the vessel arrives in the Port and processes would be in place to prevent pollution during the transfer of the waste to land. Incoming vessels to the Port would be subjected to assessment in accordance with the *Quarantine Act 1908* and would be required to dispose of waste consistent with AQIS requirements. Recycling of this waste would occur where possible.

Transportation of Waste

On-site and off-site transportation of waste would be conducted so as to prevent or minimise spills, releases, and exposures to employees and the public. Waste containers designated for transportation off-site would be secured and labelled with the contents and associated hazards (if any), would be properly loaded on the transport vehicles before leaving the site, and would be accompanied by a shipping paper (manifest) that describes the load and any associated hazards.

Monitoring

Monitoring activities associated with the management of hazardous and non-hazardous waste would include:

- Regular visual inspection of all waste storage collection and storage areas for evidence of accidental releases and to verify that wastes are properly labelled and stored. Monitoring activities would include regular checking of vessels, bins and systems, documentation and regular audits.
- Maintaining records of hazardous waste collected, stored, or shipped, including name and identification number, physical state, quantity, tracking documentation, storage, repackaging, treatment, disposal and location within the facility.

9.13.4 Conclusion

The proposed concept would generate various different waste types during construction and operation including concrete, scrap metal, cardboard, paper, plastic, glass, used cartridges, food/organic waste, vegetation/green waste and small quantities of machinery parts, oils, used rags, spent solvents, empty paint cans, chemical containers, used lubricating oil, and batteries. Inappropriate waste management has the potential to pollute the surrounding environment, including soil and water.

Waste avoidance and management measures would be required in order to prevent potential environmental harm. Where possible, non-putrescibles waste would be reused on-site. Non-putrescibles waste which cannot be reused and all general putrescibles waste would be stored separately and collected, and either disposed of or recycled via a licensed contractor. Hazardous waste would be subject to strict storage procedures and would be disposed of via a licensed contractor to an approved site.

A WMP would be prepared for the entire site and would form part of the CEMP and the OEMP, and would be consistent with the NSW WARR Strategy. WMP for specific Project applications should be prepared, consistent with the overall WMP for the site.

9.14 Cumulative Impacts in the Locality

9.14.1 Approach to Assessment

An assessment of the potential cumulative impacts of the proposed concept in the context of the existing and known major proposed developments in the area has been undertaken. The cumulative impact assessment has been conducted for the site as a whole. The cumulative impacts of development within the precincts has been considered in the impact assessment sections of **Section 9.0**. The proposed concept is anticipated to be completed and at peak operational capacity by 2034. During the progressive completion of the proposed concept over the next 23 years, there would be a number of other project proposals that could have cumulative impacts in combination with the proposed concept.

Due to the long timeframe of the proposed concept and uncertainty as to future projects which may be approved, it is not possible at this stage to assess in detail the potential cumulative impacts that may occur in later years of the proposed concept. Detailed assessment of cumulative impacts in later years would be undertaken as part of separate Project applications based on existing conditions and known proposals at that time. Therefore, this assessment focuses on the cumulative impacts of the proposed concept in the context of projects recently approved or those that are currently or soon likely to be seeking approval for development.

9.14.2 Cumulative Impact Assessment

Existing Development

Significant existing or recently approved developments in the vicinity of the site include:

- GrainCorp Grain Handling Facility, Carrington.
- Port Waratah Coal Services Coal Loader, Carrington.
- Cargill Oilseed Facility, Kooragang Island.
- Orica Ammonium Nitrate Facility Upgrade, Kooragang Island.
- Manildra Park Bulk Liquid Facility, Kooragang Island.
- Marstel Bulk Liquid Facility, Kooragang Island.
- Pacific Carbon Coke Production, Kooragang Island.
- Blue Circle Southern Cement, Kooragang Island.
- Newcastle Coal and Infrastructure Group third coal export terminal, Kooragang Island.
- Port Waratah Coal Services Kooragang Coal Terminal Stage 3 Coal Loader, Kooragang Island.
- Koppers facility, Mayfield (Koppers berth and pipeline are located within the site).
- BHP HRRP, Mayfield (contaminated sediments from the HRRP are currently being treated at the site).
- NPC Mayfield No.4 Berth, Mayfield (located within the site).

These developments are part of the existing industrial environment of the Port of Newcastle. Therefore, cumulative impacts of the proposed concept with these projects have been assessed as part of baseline conditions in undertaking the environmental assessment for the proposed concept. The cumulative impacts associated with those developments which are operational has been undertaken quantitatively in the air quality, noise, and traffic assessments.

Future Development Proposals

The nearest potential future project to the site which is likely to have cumulative impacts with the proposed concept is the future IIP. The IIP is located adjacent to the south west boundary of the site within the Closure Area. Buildev Intertrade Consortium was selected as the preferred developer in December 2008 to develop the 62-hectare IIP, which has been unused since BHP ceased steelmaking in 1999.

At this stage, no application has been lodged and no approval granted for the IIP, and therefore there is very little information available. The draft master plan prepared for the IIP indicates it will comprise an intermodal and port support zone, a general industry precinct, a commercial and technology precinct and a heritage precinct. Road, drainage, water, sewer and electricity infrastructure will be provided in the IIP. It is anticipated that the IIP would generate up to 3,000 jobs (Minister for Planning, 2008).

There is potential for the future IIP, in combination with the proposed concept, to result in cumulative impacts on the environment. The construction and operation of the future IIP and the proposed concept, would occur within an area characterised by existing heavy industry and port-related activities. Within this context and based on a review of readily available information on these major developments, potential cumulative impacts arising from the combined effects of the proposed concept and the future IIP on ecology, soils and geology, waste management, heritage and visual amenity would be minimal and therefore have not been included in the cumulative impact assessment. Contamination is a key issue for both the IIP and the proposed concept, but there would be no cumulative impacts associated with contamination. HDC are currently working to complete remediation of both sites and redevelopment of the sites can be conducted without compromising the remediation outcome.

Potential cumulative impacts would primarily be associated with traffic and transport, noise and vibration, air quality, hazard and risk, water management, infrastructure and socioeconomics. Potential cumulative impacts in these categories are discussed in the subsequent sections.

Traffic and Transport

Of the major future developments, the one which is likely to have a significant impact on the road and rail network surrounding the site is the future IIP.

Both the proposed concept and the future IIP developments would employ large numbers of staff and generate significant truck movements associated with the transportation of goods. Depending on how access to and from the site is planned and the modal split expected for the intermodal operations, there may be considerable impact on the transport networks, particularly the local road network and the two main intersections near the site.

The traffic assessment conducted for the proposed concept indicates that under the 2024 operations development traffic scenario, the Industrial Drive/George Street intersection would operate at LOS B in both the AM and PM peak hours while the Industrial Drive/Ingall Street intersection would operate at LOS B in both the AM and PM peak hours if an internal link road is included within the site to ensure a more strategic distribution of trucks between the two intersections (the Industrial Drive/George Street intersection has some spare capacity by comparison with the Industrial Drive/Ingall Street intersection).

The traffic assessment conducted for the 2034 final operations development traffic scenario indicates that the LOS at the Industrial Drive/Ingall Street intersection is likely to remain at a LOS B in the AM peak but decrease to a LOS D in the PM peak, whereby the intersection would operate close to capacity. The 2034 analysis also assumes that there is a link road that allows a portion of the traffic from the Industrial Drive/Ingall Street intersection to be redirected to the Industrial Drive/George Street intersection.

With the additional operational traffic generated by the future IIP, there is potential for significant cumulative impacts to occur if traffic is not managed appropriately. Cumulative traffic generated would have potential implications for:

- The nature and timing of any upgrade works to local roads and intersections;
- Cost sharing for any required upgrade works;
- Any new road network or access points proposed as part of the IIP; and
- Truck queuing from the two rail crossings.

While the timing for development of the future IIP is not known, it is likely that construction of the proposed concept and the IIP would overlap at some time but more likely in the short to medium timeframe. Therefore, there is also potential for cumulative impacts to occur as a result of the movement of construction vehicles that would need to be managed appropriately. For example, there is potential for cumulative impacts to the condition of the local road network, site access, and parking of construction vehicles and construction employee vehicles that would need to be managed.

There is potential for cumulative rail impacts associated with rail operations at the concept site and operation of the intermodal and port support zone at the IIP. Cumulative rail impacts may occur within the Morandoo Yard and Port Waratah Loop if not coordinated and planned appropriately.

It is recommended that when a formal application is made for development of the IIP, the potential cumulative road and rail impacts would need to be assessed in greater detail by the IIP proponents and the Project applicants at the proposed concept site. Traffic, and possibly rail, mitigation would likely be required to manage potential cumulative impacts.

Noise and Vibration

The future IIP would consist of a number of buildings used for commercial and industrial purposes, a heritage precinct and an intermodal and port support zone. There is potential for cumulative noise impacts associated with the IIP depending on the type of industrial activities conducted in the general industry precinct, the nature of the activities conducted in the intermodal and port support zone, the hours of operation, the layout of the site etc. The buildings on the IIP site may provide additional noise shielding of operations within the site to the residences along Industrial Drive immediately to the west of the IIP. So while noise generated by the IIP has the potential to generate noise which could result in cumulative impacts with noise from other industrial land uses in the area and with operations at the site, the likely shielding by the IIP buildings, the type of activities conducted at the IIP, and the hours of operation of the IIP would likely reduce the occurrence of cumulative noise impacts.

It is likely that construction of the proposed concept and the IIP would overlap at some time. Therefore, there is potential for cumulative impacts to occur as a result of noise generated during construction.

Air Quality

The intermodal and port support zone and general industry precinct may be a source of emissions of air pollutants during operation. The type of air emissions generated from operation of the IIP would depend on the type of industrial activities conducted in the general industry precinct, the nature of the activities conducted in the intermodal and port support zone etc. The air quality impact of these activities would depend on a number of variables such as the hours of operation and the mitigation measures adopted etc. For example, the dispersion of air pollutants is higher during the daytime period compared to the night time period when temperature inversions result in less dispersion.

Construction of the IIP may overlap with construction of the proposed concept at some stage, particularly in the short to medium timeframe, and therefore there is potential for cumulative air quality impacts to occur during construction. Cumulative emissions of PM_{10} would be of particular concern especially considering that PM_{10} emissions are already an issue of concern in the Region.

It is recommended that when a formal application is made for development of the IIP, the potential cumulative air quality impacts would need to be assessed in greater detail by the IIP proponents and the Project applicants at the proposed concept site. Given that particulate matter is an issue in the regional air shed, it is recommended that future cumulative impact assessments place an emphasis on assessing impacts from particulate emissions during construction and operation, and recommending mitigation measures as appropriate.

Hazard and Risk

Implementation of the proposed concept would result in the location of a number of potentially hazardous facilities within the various precincts at the site. Whilst the individual facilities may not result in a potential risk to surrounding land use, an analysis was conducted to assess whether locating potentially hazardous facilities at adjacent precincts would result in an accumulation of hazard and risks such that cumulative impacts could exceed the acceptable risk criteria.

Review of the consequence impacts at each of the potentially hazardous facilities within each precinct, indicates that there is adequate space within the precincts such that the potentially hazardous facilities (e.g. Dangerous Goods transit storages, fuel tanks, ammonium nitrate transit areas, etc.) do not result in an accumulation of risk. Based on this assessment, it was determined that the proposed concept can be implemented such that it would not exceed the acceptable risk criteria both individually (i.e., each potentially hazardous facility) and as a total site (taking account of all potentially hazardous facilities).

It was also determined that the proposed concept would not have cumulative impacts with existing (i.e., OneSteel or Carrington Coal Terminal) or future land uses (i.e., the IIP) adjacent to the site provided any potentially hazardous facilities developed as part of future developments are designed and sited appropriately. It is recommended that when a formal application is made for development of the IIP, the potential cumulative hazards and risks would need to be assessed in greater detail by the IIP proponents and the Project applicants at the proposed concept site. The results of the assessment would be taken into account in sitting and designing facilities.

Water

Each precinct would be developed individually and in stages over a period through 2034. Drainage alteration would therefore occur in stages, which would minimise the disturbance to small areas at a time, enabling project-specific mitigation to be implemented cumulatively as the precincts are developed. The staged nature of the proposed concept would not result in a piecemeal drainage system because individual stormwater management systems developed for individual sites would be driven by the overall SMS for the proposed concept, and would be designed to ensure each stormwater system complements other elements already in place to service the operation of individual projects.

Staged development of the proposed concept would result in overlap between operation in some parts of the site and construction in other parts of the site. CEMPs and OEMPs would be in place to ensure that suitable water management controls are in place to minimise potential impacts on surface water quality and flow which could occur simultaneously during staged construction and operation of the proposed concept.

The potential for cumulative impacts on surface water flows and quality resulting from the proposed concept and the future IIP development would be minimised through the implementation of the SMS. Measures outlined in the SMS would ensure that surface water is drained from the site in a manner that does not impact on the IIP site and other adjacent areas. The detailed stormwater drainage network for the site would be designed with sufficient capacity to contain and convey stormwater within the site and to designated discharge points so as not to impact on the IIP site. It is anticipated that with the exception of utilisation of the Eastern and Western Drain, the stormwater systems within the IIP and the proposed concept site would operate independently.

The proposed concept would discharge stormwater to the South Arm of the Hunter River, and would be a source of potentially polluted discharge to the River. The discharge would be in addition to already approved (and pending) discharge consents associated with major projects in the vicinity of the site. An EPL would be sought for discharges to the South Arm of the Hunter River and testing and monitoring would be undertaken on the site to ensure that discharges are within licensed limits set out in the EPL. In addition, individual operators would be required to comply with performance standards for stormwater management and water quality improvement as set out in the SMS. Therefore, the cumulative impacts resulting from the proposed concept and other major projects would be minor and manageable with the implementation of the proposed mitigation measures and environmental management plans.

Infrastructure

The proposed concept would require provision of water, sewer, natural gas, electricity, and telecommunications services to the site. As detailed in **Section 9.8**, services are planned to be provided to the IIP site in stages and there is potential for the site to connect to the trunk services to be provided through the IIP. Ideally, the provision of infrastructure to the proposed concept and IIP should be coordinated in terms of capacity, alignment and timing where common services are to be provided. The proposed concept may also obtain services through OneSteel or through local service providers. It is anticipated that these connections could be made without adverse cumulative impacts. Energy Australia, Jemena and Hunter Water have all advised that there is likely to be available future capacity to serve the proposed concept and in some cases (such as for wastewater treatment) have advised that future servicing strategies in the area have taken into account both the future IIP and the proposed concept. Therefore, there are not anticipated to be any adverse cumulative impacts associated with the provision of services to the site or future IIP.

Social and Economic

The $200 million CIV of the proposed concept is anticipated to provide numerous social and economic benefits for Newcastle, the Lower Hunter Region and NSW through establishment of port infrastructure and port-related activities at Mayfield. Throughout construction and operation, the proposed concept would generate increased employment opportunities and stimulate the local and regional economy. Construction would also generate significant direct and indirect employment opportunities for the Lower Hunter Region during this period, as well as in NSW as a whole.

It is anticipated that the future IIP will bring $120 million of new investment and up to 3,000 jobs into Newcastle (Minister for Planning, 2008). Therefore, there would be cumulative beneficial impacts resulting from the proposed concept in combination with the future IIP.

9.14.3 Mitigation Measures

Project applicants would conduct detailed, more quantitative assessments of cumulative impacts. It is recommended that Project applicants liaise with Newcastle City Council, the DoP, proponents of other projects and land holders to determine the timing and location of developments (particularly the IIP) that may coincide with the individual projects within the site. Specific mitigation measures for cumulative impacts would be determined following this consultation.

9.14.4 Conclusion

There is potential for major developments, in combination with the proposed concept, to result in cumulative impacts on the environment. The construction and operation of these projects, including the proposed concept, would occur within an area characterised by existing heavy industry and port-related activities.

Within this context and based on a review of readily available information on these major developments, potential cumulative impacts arising from the combined effects of the proposed concept and other major potential future projects on ecology, soils and geology, air quality, waste management, heritage and visual amenity are anticipated to be minimal.

However, there is potential for adverse cumulative impacts with the future IIP to occur, particularly in relation to traffic, noise, hazard and risk, water quality and the provision of infrastructure. The mitigation measures recommended above and in other sections of this EA have been designed to minimise environmental impacts, including potential cumulative impacts.

There would be cumulative beneficial socioeconomic impacts resulting from the proposed concept in combination with the future IIP. Potential cumulative impacts would be considered in more detail at the Project application stage when more detailed information is available on individual projects within the proposed concept site and the IIP.

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10.0 Climate Change and Sustainability

This section describes the consistency of the proposed concept with the principles of ESD. It also addresses future requirements for adopting sustainability strategies, a number of which relate to climate change.

10.1 Greenhouse Gas Emissions and Climate Change

The greenhouse effect involves certain gases, known as greenhouse gases, capturing heat radiated from the earth and re-radiating heat back to the earth. The thermal balance that is known to control earth's climate is maintained by this mechanism, and is influenced by the steadily increasing concentrations of greenhouse gases such as carbon dioxide, methane, ozone and CFCs in the atmosphere. Greenhouse gas emissions occur as a result of energy production and consumption.

The Australian Government has identified climate change as one of its highest policy priorities. The Government's climate change policy is built on three pillars:

- Reducing Australia's greenhouse gas emissions;
- Adapting to climate change that cannot be avoided; and
- Helping to shape a global solution to climate change.

The proposed concept would generate greenhouse gases during construction and operation. Due to the detailed nature of the information required to conduct a thorough greenhouse gas emissions inventory, an inventory has not been prepared as part of this EA. Individual operators would be required to conduct greenhouse gas emission inventories as part of future Project applications and to implement sustainability strategies included in **Section 10.2.3**, many of which focus on energy conservation and would reduce greenhouse gas emissions.

10.2 Sustainability

10.2.1 Principles of Ecologically Sustainable Development

Sustainable development is defined by the World Commission on Environment and Development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (UN, 1992: 2/1). The EP&A Act encourages ESD in line with four sustainability principles set out under the EP&A Regulation. The sustainability principles are:

- The precautionary principle;
- The principle of intergenerational equity;
- Conservation of biological diversity and ecological integrity; and
- Improved valuation, pricing and incentive mechanisms.

The following provides a summary of key issues for each of the ESD principles as they relate to the proposed concept.

> **The precautionary principle,** *namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

The proposed concept has considered the precautionary principle by carrying out detailed environmental investigations in order to gain as much knowledge about the environmental characteristics of the site and surrounding area, and the processes and interactions of various components of the environment as is reasonably possible. This knowledge has been used to determine the potential environmental impacts and recommend environmental management practices and mitigation measures to ensure significant impacts do not occur and residual environmental impacts are minimised.

The site would be re-developed and used for port-related activities similar to the activities currently undertaken in the Port of Newcastle and other ports in NSW. In addition, the typical construction methods for establishing the types of facilities anticipated to be located at the site are typical and proven. Therefore, the potential environmental impacts of construction and operation of these port-related activities are well known. While a number of potential threats are outlined in the residual environmental risk analysis in **Section 12.0**, all are considered unlikely to cause serious or irreversible environmental damage.

As detailed in **Section 9**, measures to prevent environmental degradation during construction and operation would be addressed by a series of management plans and monitoring programs, and by an extension of NPC's existing policies and best practices. This approach is consistent with the precautionary principle.

The environmental assessment of the proposed concept has been undertaken in parallel with consultation with Government agencies to ensure the key issues have been identified and addressed, and lack of scientific certainty with respect to potential issues has been minimised.

> **Inter-generational equity**, *namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

Mitigation measures have been developed as part of this EA in accordance with current best management practice recognising the requirement to achieve, where possible, a neutral or beneficial effect on the environment. The mitigation measures which form a fundamental part of the proposed concept would ensure that there are not significant adverse impacts to the environment and that the quality of the environment is maintained for the benefit of future generations.

Benefits to future generations would also be realised by:

- Provision of jobs during construction and operation, potentially reducing the number of people who commute outside the Region for employment;
- Generation of direct economic benefits for the regional and State economy;
- Attraction of investment in the Hunter Region and the Newcastle LGA;
- Construction of hardstand areas, buildings and roadways would further seal off the contamination at the site and reduce exposure of future generations and the environment to contaminated materials; and
- Transformation of the visual appearance of the site from a relatively vacant parcel of land with exposed earth and asphalt and little vegetation, into a modern, state-of-the-art facility with a visual appearance in keeping with the existing port-related industrial activities conducted in the Port.

Further discussion on the economic and social benefits of the proposed concept is provided in **Section 9.10**.

> **Conservation of biological diversity and ecological integrity**, *namely that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

The industrial history of the site (and surrounding area) and remediation activities has changed the site conditions to the point where the site and immediate surrounding area has very limited biological diversity and ecological integrity. The proposed concept is able to be constructed without any significant impact on the biological diversity and ecological integrity of the locality. There would be no adverse impact upon threatened species, populations or ecological communities or their habitats as a result of construction or operation. In fact, the proposed concept would improve the management of stormwater runoff from the site which would result in benefits to water quality and the environment of the South Arm of the Hunter River. Further discussion on water quality and aquatic ecology is included in **Sections 9.6** and **9.12**.

> **Improved valuation, pricing and incentive mechanisms**, *namely, that environmental factors should be included in the valuation of assets and services.*

This principle identifies that environmental factors should be included in the valuation of assets and services, such as polluter pays, full life cycle costing, and utilising incentive structures/market mechanisms to meet environmental goals.

It is difficult to assign a monetary value to the environment of the locality given a lack of precedent in valuing environmental resources not considered for commercial use. As monetary value could not be placed on the environmental attributes of the site, the approach taken was to manage environmental impact by identifying site-specific safeguard measures to mitigate against adverse environmental effects, and to include the cost of these measures in the overall cost of the proposal. This enables the value and price of the environmental resource to be more accurately reflected.

The proposed concept approach to valuation and pricing of environmental resources allows the strategic development of a valuable and important facility to accommodate the growing market.

10.2.2 NPC's Commitment to Sustainability

NPC is committed to sustainability. As documented in NPC's *Environmental Policy*, NPC's purpose is to provide safe, effective and sustainable port operations and to deliver port development that enhances the economic growth of the Hunter Region and NSW.

Through their Environmental Management System (EMS), NPC is committed to achieving the following objectives of the *Environmental Policy*:

- Establishing, monitoring, reviewing and continually improving environmental objectives, targets and action plans;
- Minimising the environmental impacts of Port operations and developments;
- Developing and maintaining effective Emergency Response Plans to protect the environment;
- Ensuring contractors engaged by NPC meet NPC's environmental standards and requirements and comply with relevant legislation;
- Encouraging port tenants/lessees to meet NPC's environmental standards and requirements;
- Encouraging port tenants/lessees to act in an environmentally responsible manner. Environmental clauses would be included in all new leases and environmental management plans are required to be submitted to ensure all federal, state and local regulations are being met and best management practices are adopted; and
- Communicating the EMS to all employees and communicating the *Environmental Policy* to the community.

Consistent with NPC's commitment to sustainability, **Section 10.2.3** outlines how Project applicants would be required to incorporate sustainability strategies into the design of individual facilities. NPC would include the sustainability strategies in agreements for lease and/or project development agreements or land leases with future operators.

10.2.3 Recommended Sustainability Strategies

Project applicants would be required to incorporate sustainability strategies into the design of individual facilities. At a minimum, sustainability strategies would be required to address:

- Use of renewable energy and energy conservation;
- Waste reduction, reuse, and recycling; and
- Water conservation.

Sustainability plans detailing sustainability strategies would be prepared by Project applicants. Auditing energy and water consumption, and waste generation by Project applicants would be necessary to monitor performance and identify areas for improvement.

In addition to the environmental benefits of incorporating sustainability strategies into the design of individual facilities, adopting sustainability strategies would also:

- Enhance the public profile of individual operators and the site as a whole;
- Create a world-class port that showcases innovative technology;
- Attract investment and clients with similar commitments to the environment and sustainability; and
- Reduce operational expenditure on energy and water.

Renewable Energy and Energy Conservation

The site provides the potential to harvest wind and solar energy in line with the Australian government's legislative initiative for 20 percent renewable energy by 2020. Ports are windy environs, so there is potential for power generation from micro and large scale wind turbines as part of future design and construction works, for example small-scale wind turbines could be installed on the roof tops of buildings. Similarly, there is potential to generate power from the sun by installing solar panels on structures to take advantage of the solar potential.

Wherever prudent and feasible, Project applicants would be required to incorporate renewable energy technologies into the design of individual facilities. As a supplement to on-site renewable energy generation, Project applicants should also consider purchasing green power.

Project applicants would also be required to adopt strategies to conserve energy and reduce greenhouse gas emissions. Strategies may include:

- Designing buildings to maximise daylight hours and reduce energy consumption by utilising materials such as highly reflective roofing;
- Use of energy efficient lighting and appliances;
- Use of occupancy sensors for lighting and switching off office equipment when not in use;
- Use of alternative fuel vehicle fleets during construction and operation;
- Eliminate vehicle idling;
- Procurement of construction materials from local sources;
- Use of construction materials with high recycled content;
- Procurement of lower embodied carbon construction materials;
- Preparation of energy efficiency management plans for construction and operation; and
- Encourage the use of public transportation, carpooling and bicycle commuting by employees.

Waste Reduction, Reuse and Recycling

The NSW WAAR aims to maximise conservation of natural resources and to minimise environmental harm from waste management and disposal of waste (refer to **Section 9.13**). Consistent with the NSW WAAR, opportunities exist on-site for reducing the amount of waste produced as well as for reuse and recycling of waste materials. Waste reduction, reuse and recycling enable the conservation of raw materials and the energy required to extract and manufacture these materials. It also ultimately leads to cost savings.

Project applicants would be required to adopt strategies to reduce waste generation and to encourage and facilitate reuse and recycling. Such strategies may include:

- Encouraging staff to reduce waste by adopting simple practices such as double-sided photocopying and printing;
- Installing “take only what you need” signs near paper towel dispensers;
- Using vendors who use minimal packaging;
- Using construction materials with high recycled content;
- Reusing construction materials;
- Recycling construction materials and materials used in operation, including paper, plastics, etc;
- Using materials such as paper and plastic products with a high recycled content;
- Using materials with rapidly renewable materials content;
- Composting organic waste such as food and vegetation; and
- Substituting hazardous materials with more environmentally sustainable products.

Water Conservation

There are opportunities for efficient use of water throughout construction and operation. Project applicants would be required to implement strategies to capture and reuse water wherever prudent and feasible to do so. Due to the relatively large areas of hardstand and large roof areas that would be constructed as part of the proposed concept, there is vast potential to capture and reuse stormwater runoff and rainwater. The captured water could be stored in water tanks on-site, treated if necessary, and reused for other on-site uses, such as:

- Dust suppression during construction and for dry bulk stockpiles and other bulk material handling activities;
- Toilet flushing within amenities;
- Vehicle/equipment washing;
- Irrigation for landscaping; and
- Fire fighting.

In addition, Project applicants would be required to conserve water by installing low-flow fixtures in washbasins, toilets and showers. Installation of grey water treatment systems should also be considered. Project applicants would also be required to install water-efficient landscaping using native plants and drip irrigation systems.

10.3 Conclusion

The proposed concept would generate greenhouse gases during construction and operation. Individual operators would be required to conduct greenhouse gas emission inventories as part of Project applications and to implement sustainability strategies which focus on energy conservation, waste reduction and reuse and water conservation.

The four principles of ESD have been considered throughout the design and assessment of the proposed concept. The mitigation measures and monitoring programs recommended in **Section 9.0** have incorporated the four principles of ESD. The precautionary principle has been considered through the reduction in residual environmental impacts. Inter-generational equity has been considered in the implementation of best practice management measures and through the social and economic benefits of the proposed concept. Conservation of biological diversity and ecological integrity has been achieved as there would be no adverse impact upon threatened species, populations or ecological communities or their habitats as a result of the proposed concept. Improved valuation, pricing and incentive mechanisms has been addressed through the strategic development of a valuable and important port facility to accommodate the growing market and sustaining the economic viability of the Port of Newcastle.

The consideration of the four principles of ESD as well as the implementation of sustainability strategies would enable a reduction in greenhouse gas emissions, conservation of resources, potential long-term cost savings and protection of the environment.

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11.0 Environmental Commitments and Performance

This section contains the Statement of Commitments (SoC) and also details the environmental performance objectives, criteria, and management strategy set for the proposed concept.

11.1 Introduction

11.1.1 Statement of Commitments

In accordance with the EA requirements under Part 3A of the EP&A Act, a SoC has been prepared which sets out NPC's environmental mitigation, management and monitoring commitments for the proposed concept. The preparation and implementation of environmental mitigation and management measures for the proposed concept holds great significance in ensuring that potential environmental impacts are minimised.

The SoC addresses construction and operation of the proposed concept and has been compiled on an issues basis. It has been informed by the environmental impact assessment undertaken as part of this EA and detailed in **Section 9.0**. The SoC is provided in **Sections 11.2** through **11.16**, within the environmental and performance management subsections.

Project applicants would prepare separate SoC's as part of their EAs. The SoC should be generally consistent with these SoC's and reflect the more detailed project information that is available.

11.1.2 Environmental Performance Criteria and Management

As discussed in detail in **Section 1.5,** the Concept Approval for the proposed concept would set the broad parameters and environmental management framework within which subsequent Project applications would be required to fit. An important component of this framework is the development of environmental performance objectives to guide development of the site and the development of environmental performance criteria from which to measure the environmental performance of the port-related developments which would occur at the site progressively over time.

Environmental performance objectives and criteria have been developed for the following key environmental issues:

- Transport (road and rail)
- Noise
- Air quality
- Hazard and risk
- Water management
- Contamination

The environmental performance objectives and criteria are for operation of the port-related developments which would occur at the site.

General performance requirements have also been developed. Project applicants would be required to meet the general requirements, and would be required to achieve the environmental performance objectives and meet the environmental performance criteria set for the site. In doing so, Project applicants and NPC (who has the responsibility for managing the Port of Newcastle and the site) would have a degree of certainty that development of the site as a whole would not have adverse environmental impacts.

The following sections detail the environmental performance objectives and criteria for each of the key environmental issues. It also describes the process for performance management whereby Project applicants and NPC would be responsible for continually monitoring and managing performance to ensure the environmental performance objectives and criteria are being met. Where appropriate, overall site management plans and models would be developed to facilitate management of the site as a whole.

NPC would include the environmental performance objectives and criteria in agreements for lease and/or project development agreements or land leases with future operators. Performance management requirements applicable to future operators would also be included.

11.2 General

NPC would ensure that Project applicants meet the following general performance requirements:

- Prepare Project applications in a manner which is generally consistent with the key assumptions and recommendations contained in this Concept Plan and EA.
- Develop and operate individual facilities in a manner which is generally consistent with the Concept Plan and this EA.
- Develop and operate individual facilities in compliance with the mitigation and management measures contained in this SoC, where applicable.

NPC would be responsible for preparing a CEMP and OEMP for the NPC operations precinct and other common areas of the site that are not leased out by individual operators. Project applicants would be responsible for preparing CEMPs and OEMPs for individual projects. The CEMPs and OEMPs would include the sub-plans described in **Sections 11.3** through **11.16**, as appropriate.

11.3 Road Transport

11.3.1 Objective

NPC has the following objective in relation to road transportation:

To maintain an acceptable level of performance of existing intersections and roadways in the vicinity of the site, and encourage modal split towards rail.

The objective for road transportation would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.3.2 Environmental Performance Criteria

Project applications would be required to comply with the following environmental performance criteria. Overall site and precinct-specific criteria have been developed for road transportation.

Overall Site Criteria

Project applications would be required to comply with the following environmental performance criteria. Overall site criteria have been developed for road traffic and transportation where it intersects with the external road network.

The site as a whole would be required to comply with the intersection performance criteria detailed in **Table 11-1**. These correspond with those set out in the RTA *Guide to Traffic Generating Developments* (2002) and take into account background traffic volumes generated by other activities in the area.

Table 11-1: Peak Hour Intersection Performance Criteria

Intersection	Level of Service	Average Delay (seconds per vehicle)
Industrial Drive/George Street Intersection	**D**	**43 to 56**
Industrial Drive/Ingall Street Intersection	**D**	**43 to 56**

Additional overall site criteria are as follows:

- Operation of the site should not cause vehicles to queue so as to interfere with the movement of through traffic, operation of intersections, and access to adjoining properties.
- The total predicted volume of traffic generated by the proposed concept is within the mid-block lane capacity of the existing local road network.
- The types of vehicles accessing the site must be able to be safely accommodated within the road geometry.

Precinct Criteria

In order to comply with the overall site criteria, operators within the individual precincts would be required to generally comply with the truck and vehicle movements presented in **Table 11-2**.

Table 11-2: Truck and Employee Vehicle Movement Criteria

Precinct	Truck Movements Per Daytime Peak Hour	Employee Vehicle Movements Per Daytime Peak Hour
Bulk and General	**24**	**N/A**
General Purpose	**16**	**N/A**
Container Terminal	**165**	**N/A**
Bulk Liquid	**9**	**N/A**
Total	**214**	**90**

11.3.3 Environmental and Performance Management

Based on the current intersection operations and the potential trip distribution from the precincts, there is potential for the Industrial Drive/Ingall Street intersection to exceed the criteria. Therefore, traffic from the Container Terminal Precinct and employee traffic would likely need to be distributed to the Industrial Drive/George Street intersection in order to ensure the criteria is met. An internal link road connecting all precincts would allow this distribution of trips, and a TMP should be established to allow management of the traffic between the intersections. Other mitigation options should also be considered for managing traffic should there be potential for the intersection performance criteria to be exceeded.

To ensure the site functions in accordance with the environmental performance criteria, NPC would:

- Establish a TMP for the entire site, and ensure that Project applicants adhere to the TMP. The TMP would:
  - Set out the environmental performance criteria for the site and individual facility;
  - Identify the access points between the site and the local road network (Selwyn Street and Ingall Street), and the use of these access points by operators within the precincts;
  - Identify access points for neighbouring properties;
  - Detail appropriate traffic mitigation and management measures, one of the most important being the need for distributing traffic between the Industrial Drive/Ingall Street and Industrial Drive/George Street intersections. Mitigation and management measures that address queuing associated with the railway crossings, maintaining access to neighbouring properties, and maintaining and/or upgrading the road pavement condition and/or road geometry should also be included;
  - Detail an appropriate traffic and road condition monitoring program including the frequency of the monitoring, the duration of the monitoring program, the protocol for making the traffic and roadway condition observations etc;
  - Specify the reporting procedures;
  - Define corrective action and contingency measures in the event that the relevant environmental performance criteria are likely to be exceeded; and
  - Include a process for regularly reviewing and updating the TMP.
- Conduct periodic assessments of operation of the internal and external intersections and roadways.
- Periodically review the trip generation and distribution to reflect actual site conditions, taking into account any cumulative traffic impacts associated with the future IIP. This would be of particular importance where a precinct generates traffic levels below those documented because it may allow other precincts to generate higher traffic levels while still complying with the overall site criteria.

Given the potential for cumulative traffic impacts with the future IIP (refer to **Section 9.14**), NPC commits to managing traffic on the local road network in close cooperation with Buildev Intertrade Consortium who have been selected as the preferred developer to develop the IIP.

Workplace Travel Plans should be considered at the Project application stage for the individual facilities when these are made by the prospective operators of the facilities, with attention given to access by walking, cycling and public transport. This would reduce the impact made by employee traffic.

Project applicants would be responsible for preparing individual TMPs, consistent with the TMP for the overall site.

11.4 Rail Transport

11.4.1 Objective

NPC has the following objective in relation to rail transportation:

To ensure rail operations have minimal impact on other rail activities within Morandoo Yard, Port Waratah Loop and Bullock Island Loop, and that rail cargo volumes are maximised within the constraints of the rail network that exist at a particular point in time.

The objective for rail transportation would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.4.2 Environmental Performance Criteria for the Site

Project applications would be required to comply with the environmental performance criteria developed for the overall site. The overall site criteria are as follows:

- The Bullock Island Loop arrival roads and coal arrival roads to Port Waratah coal unloaders need to be kept clear. Trains should not prevent access into these arrival roads, excluding normal access to the Port Waratah and Bullock Island Loops.
- Trains should only stable in the dedicated rail sidings to be provided within the proposed concept site. Trains should be broken up to stable within the sidings in the Morandoo Yard.
- A future rail exit road from the site to the Bullock Island Loop would need to be constructed when the number of required trains exceeds two per day.
- The number of trains accessing the site should not exceed four per day without conducting a further assessment of the capacity of the rail network and infrastructure within and adjacent to the site and the capacity of the wider rail network.
- Train movement and shunting within Morandoo Yard must be agreed and coordinated with the Terminal Operation Coordinator and the Signaller at Port Waratah Loop.
- Any modifications to the Morandoo Yard need to be prepared in consultation with and approved by ATRC (or owner at the time).

11.4.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria NPC would:

- Establish a Train Operations Plan for proposed movements within the Morandoo Yard and the site, and ensure that Project applicants adhere to the plan. This plan would be developed in consultation with other rail operators, the Terminal Operation Coordinator and the Signaller at Port Waratah Loop. The Train Operations Plan would include the following:
    - Train scheduling, including the arrival and departure of trains to and from the site;
    - Train loading and unloading procedures, with emphasis on maximising the transportation of cargo by rail but within the constraints of the rail network and infrastructure;
    - Procedures for use of the sidings within the site, including shunt manoeuvres to split the trains and enter the sidings and for reforming the train prior to departure from the sidings whilst minimising impact on railway crossings and OneSteel;
    - Procedures relating to train movement and shunting within the Morandoo Yard;
    - Procedures for crossing the Selwyn Street and new western road (needed to service the Bulk Liquid and Container Terminal Precincts) railway crossings; and
    - Procedures for accessing the Port Waratah Loop and Bullock Island Loop.

- Require Project applicants to conduct operational assessments of any impacts on the existing Morandoo Yard, Port Waratah Loop and Bullock Island Loop, including any impacts on roadway level crossings, and provide the results to NPC.
- Periodically review the rail operations and Train Operations Plan to reflect actual site conditions and operations in the Morandoo Yard, Port Waratah Loop and Bullock Island Loop.

11.5 Noise

11.5.1 Objective

NPC has the following objective in relation to noise:

> **To ensure noise generated by operations at the site, and from road and rail traffic travelling to and from the site, does not have an adverse impact on surrounding residential receivers.**

The objective for noise would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.5.2 Environmental Performance Criteria for the Site

Project applications would be required to comply with the following environmental performance criteria. Overall site and precinct-specific criteria have been developed for noise.

Overall Site Criteria

The site as a whole would be required to comply with the industrial noise criteria detailed in **Table 11-3** and the sleep disturbance criteria detailed in **Table 11-4**.The criteria take into account background noise levels generated by other activities in the area.

Table 11-3: Project-Specific Noise Criteria at Residences

Location	Area	Intrusiveness $L_{Aeq,15min}$ dBA			Amenity $L_{Aeq,period}$ dBA		
		Day	Evening	Night	Day	Evening	Night
1 Arthur Street, Mayfield	Urban	51	52	51	60	49	43
2 Crebert Street, Mayfield	Urban	54	47	45	60	50	43
32 Elizabeth Street, Carrington	Urban	49	48	44	65	49	50
Stockton	Urban	46	48	48	60	47	37

Table 11-4: Sleep Disturbance Noise Criteria

Location	Rating Background Level	Sleep Disturbance Screening Criterion, $L_{A1,1minute}$ dBA
1 Arthur Street, Mayfield	46	61
2 Crebert Street, Mayfield	40	55
32 Elizabeth Street, Carrington	39	54
Stockton	43	58

Traffic generated by the proposed concept would be required to comply with the *Environmental Criteria for Road Traffic Noise* (ECRTN) which states that where the criteria are already exceeded (as is the case at some locations along Industrial Drive) traffic arising from the proposed concept should not lead to an increase in existing noise levels of more than 2 dBA at residences. Mitigation would be required if there is an exceedance of more than 2 dBA.

Precinct Criteria

In order to comply with the overall site criteria, operators within the main noise-generating precincts (other than the NPC Operations Precinct) would be required to comply with the sound power levels presented in **Table 11-5**.

Table 11-5: Precinct Noise Criteria

Precinct	Sound Power Level (dBA) – Total for Precinct
Bulk and General Purpose Precinct	119
General Purpose Precinct	116
Container Terminal Precinct	117
Bulk Liquid Precinct	114

Note: The sound power levels were developed based on the results of the noise modeling. Indicative equipment and operation scenarios for each precinct were input into the noise model and project noise levels were generated. The sound power levels presented in this table are the sum of the sound power levels of the individual equipment within each precinct. Sound power level criteria were not presented for the NPC Operations Precinct because the precinct is not acoustically significant to surrounding receivers (taking into account the activities conducted within the precinct and the location of the precinct relative to residential receivers).

If Project applications present noise levels above the precinct criteria stated in **Table 11-5**, noise control measures should be incorporated at these noise sources to reduce the sound power level. The projects would be assessed to ensure the overall site criteria would be met and that there would be an acceptable noise outcome at surrounding residential receivers.

Project applicants would be required to input the sound power levels (and the noise control measures if applicable) from the proposed project into an overall site noise model developed for NPC and determine whether the cumulative noise contribution at surrounding residential receivers is in compliance with the overall site criteria.

11.5.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria NPC would:

- Require Project applicants to prepare Noise Management Plans addressing operation of individual facilities at the site. The noise assessment undertaken during preparation of this EA has shown that predicted noise levels from operations at the site during the night time would exceed the noise criteria at nearby residences unless noise mitigation measures are adopted. Night time traffic noise levels at residences along Industrial Drive would also exceed the traffic noise criteria and require mitigation. Therefore, the key focus of the Noise Management Plans should be on minimising night time operational and traffic noise emissions. The Noise Management Plans should:
  - Set out the regulatory guidelines and conditions of consent relevant to noise;
  - Assign responsibilities and communication requirements;
  - Identify the objectives and environmental performance criteria for noise management at the site;
  - Identify the operational noise sources;
  - Detail appropriate noise mitigation and management measures, such as those included in **Section 9.3.4** of this EA, including the timing and extent of mitigation required (particularly relevant for traffic noise impacts to residences along Industrial Drive during the night time);
  - Detail an appropriate noise monitoring program. For example, the noise monitoring program should identify the noise monitoring locations, the equipment used to measure noise, the frequency of the monitoring, the duration of the monitoring program, the protocol for taking the noise measurements, and the equipment calibration methodology and schedule;
  - Specify the reporting procedures;
  - Define corrective action and contingency measures in the event of exceedances of the relevant environmental performance criteria;
  - Include protocols for evaluating performance i.e., inspection checklists, maintenance records, reporting and assessment of monitoring results; and
  - Include a process for regularly reviewing and updating the Plan to identify continual improvement or modifications to procedures.

- Require Project applicants to conduct periodic compliance noise measurements once facilities are operational and provide the results to NPC.
- Update the overall site noise model to reflect compliance noise measurements from individual facilities and maintain the noise model for the site as a whole or cumulatively.
- Periodically review the precinct criteria presented in **Table 11-5** to reflect actual site conditions. This would be of particular importance where a precinct generates noise levels either below or above those documented in the table because it may allow other precincts to generate higher or lower noise levels while still complying with the overall site criteria.
- Establish a noise complaint 'hotline' and distribute information on the hotline and noise complaint process to the local community.

Due to lack of available information on construction practices and equipment, construction noise was not analysed in the EA but ought to be addressed at the Project application stage. Noise Management Plans should be prepared by Project applicants to address construction noise.

11.6 Air Quality

11.6.1 Objective

NPC has the following objective in relation to air quality:

To ensure air pollutants emitted from the site do not have an adverse impact on surrounding residential receivers.

The objective for air quality would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.6.2 Environmental Performance Criteria for the Site

Project applications would be required to comply with the environmental performance criteria developed for the overall site. The overall site criteria are listed for each pollutant of concern in **Table 11-6**.

Table 11-6: Air Quality Criteria at the Site and Surrounding Residential Areas

Pollutant	Averaging period	Concentration		Source
		pphm	µg/m^3	
SO_2	10 minutes	25	712	NHMRC (1996)
	1 hour	20	570	NEPC (1998)
	24 hours	8	228	NEPC (1998)
	Annual	2	60	NEPC (1998)
NO_2	1 hour	12	246	NEPC (1998)
	Annual	3	62	NEPC (1998)
O_3	1 hour	10	214	NEPC (1998)
	4 hours	8	171	NEPC (1998)
Pb	Annual	-	0.5	NEPC (1998)
PM_{10}	24 hours	-	50	NEPC (1998)
	Annual	-	30	EPA (1998)
TSP	Annual	-	90	NHMRC (1996)
H_2S	Nose-response time[4]	-	1.38 [5]	AWT (2001)
		g/m^2.month	g/m^2.month	
Deposited dust	Annual	2[1]	4[1]	NERDDC (1988)
		ppm	mg/m^3	
CO	15 minutes	87	100	WHO (2000)
	1 hour	25	30	WHO (2000)
	8 hours	9	10	NERDDC (1998)
Benzene	1 hour	0.04	0.19	EPA VIC (2001)
Toluene	1 hour	0.09	0.36	EPA VIC (2001)
Ethyl Benzene	1 hour	1.8	8	EPA VIC (2001)
Xylenes	1 hour	0.04	0.19	EPA VIC (2001)
		µg/m$^{3(2)}$	µg/m$^{3(3)}$	
HF	90 days	0.5	0.25	ANZECC (1990)
	30 days	0.84	0.4	ANZECC (1990)
	7 days	1.7	0.8	ANZECC (1990)
	24 hours	2.9	1.5	ANZECC (1990)

pphm – Parts Per Hundred Million
ppm – Parts Per Million
[1] Deposited dust criteria allow for a maximum increase of 2 g/m^2.month with a total cumulative rate of 4 g/m^2.month.
[2] Fluoride criteria refer to non sensitive land use.
[3] Fluoride criteria refer to sensitive land use e.g. grapes, stone fruit etc.
[4] Nose response time average is assessed using the 99th percentile (DEC, 2005).
[5] Hydrogen sulfide criterion is based on an affected community population of greater than 2000 (DEC, 2005).

The NSW DECCW Approved Methods (DEC, 2005) ambient air quality criteria are applicable to all predicted sensitive receptor concentrations, independent of their source facility/precinct. In addition, impacts must take into consideration those pollutant contributions from all local and regional sources (cumulative assessment) i.e.,

internal and external to the site. As such, it was not considered appropriate to develop precinct-specific air quality criteria for the site.

11.6.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria NPC would:

- Require Project applicants to prepare AQMPs addressing operation of individual facilities at the site. The air quality modelling undertaken during preparation of this EA has shown dust (in particular PM_{10}) to be a pollutant of concern from some operational activities associated with the proposed concept. Therefore, the key focus of the AQMPs should be on minimising and managing dust emissions. The AQMPs should:
  - Set out the regulatory guidelines and conditions of consent relevant to air quality;
  - Assign responsibilities and communication requirements;
  - Identify the objectives and environmental performance criteria for air quality at the site;
  - Identify the main potential dust sources and other sources of air quality impacts;
  - Detail appropriate air quality and dust mitigation and management measures, such as those detailed in **Section 9.4.4** of this EA;
  - Detail an appropriate air quality monitoring program. For example, the air quality monitoring program for dust should identify the dust fraction to be measured i.e., TSP, PM_{10}, $PM_{2.5}$ etc, the equipment used to measure the selected dust fraction, the frequency of the monitoring i.e., sample collection schedule, the duration of the monitoring program, the location of the monitoring station(s), the standards/guidelines that are to be followed for location/construction of the monitoring station, the protocol for collection of samples and analysis of samples, and the equipment calibration methodology and schedule. It should be noted that there could be opportunities for Project applicants to share monitoring stations;
  - Specify the reporting procedures;
  - Define corrective action and contingency measures in the event of exceedances of the relevant environmental performance criteria;
  - Include protocols for evaluating performance i.e., inspection checklists, maintenance records, reporting and assessment of monitoring results; and
  - Include a process for regularly reviewing and updating the AQMP to identify continual improvement or modifications to procedures.
- Require Project applicants to undertake periodic air quality and meteorological monitoring at the site to monitor for the primary pollutants of concern, in particular PM_{10}. This data would be used to establish a rolling data set that would be used to assess future site compliance with the above environmental performance criteria and to assess the capacity of the airshed in the future to absorb additional pollution.
- Require Project applicants to compile annual air quality monitoring data summaries to allow monitoring of long-term meteorological and pollutant concentration trends at the site and submit the results to NPC.
- Develop and maintain a dispersion model for the site as a whole that allows for a consistent future assessment approach for Project applicants at the site and allows air quality emissions to be managed for the site as a whole or cumulatively.
- Periodically review the criteria presented in **Table 11-6** with reference to Project applications and include additional criteria as necessary and consistent with DECCW's list of air pollutants of concern.

Due to a lack of available information on construction practices and equipment, potential air quality impacts associated with construction were not analysed quantitatively the EA. Considering that background PM_{10} levels already exceed the DECCW criteria, dust emissions during construction should be addressed in detail at the Project application stage. Construction AQMPs should be prepared by Project applicants to address potential air quality impacts during construction.

11.7 Hazard and Risk

11.7.1 Objective

NPC has the following objective in relation to hazard and risk:

To ensure potentially hazardous areas within the site do not pose unacceptable risks to surrounding land uses and that the location of facilities within the site do not result in an accumulation of risk that would exceed the acceptable risk criteria.

The objective for hazard and risk would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.7.2 Environmental Performance Criteria

Project applications would be required to comply with the following environmental performance criteria. Overall site and precinct-specific criteria have been developed for hazard and risk.

Overall Site Criteria

Potentially hazardous facilities/areas within the site would be required to be sited with appropriate separation distances (refer to **Section 11.7.3**) and designed such that they do not cumulatively impact adjacent surrounding industrial and residential land uses in a manner exceeding permissible impact levels published in *HIPAP No.4 Risk Criteria for Land Use Safety Planning*. Potentially hazardous facilities/areas are those used to store Dangerous Goods that are listed on the *Australian Dangerous Goods Code* and exceed the threshold levels listed in SEPP 33.

Precinct Criteria

Potentially hazardous facilities/areas within each precinct would be required to be sited with appropriate separation distances (refer to **Section 11.7.3**) and designed such that they do not impact adjacent precincts in a manner exceeding permissible impact levels published in *HIPAP No.4 Risk Criteria for Land Use Safety Planning.* Potentially hazardous facilities/areas are those used to store Dangerous Goods that are listed on the *Australian Dangerous Goods Code* and exceed the threshold levels listed in SEPP 33.

11.7.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria NPC would:

- Require Project applicants that are subject to SEPP 33 to prepare and operate under a Safety Management System that would control risks identified in the PHA conducted for the overall site; and
- Conduct a Hazard Audit of the site in accordance with the requirements of *HIPAP No.5, Hazard Audits* once every three years to demonstrate that the site Safety Management System is effectively controlling the identified hazards and risks.

In addition, and to ensure that the potential hazards and risks are maintained in the ALARP Range, NPC would be responsible for:

- Updating NPC's existing Port Emergency Response Plan to include any additional response measures specific to the site.
- Responding to port-related emergencies at the site via NPC's Port Emergency Response Team.
- Providing spill retention equipment (i.e., spill kits, booms, etc.) for quick response and deployment.
- Training NPC personnel in emergency response procedures specific to the site.

Project applicants would be responsible for conducting the following where applicable:

- Preparing a detailed PHA for each of the facilities proposed under subsequent Project applications to confirm the results of the PHA for the proposed concept and to ensure that the detailed site layouts and Dangerous Goods storage quantities and operations do not result in the acceptable risk criteria being exceeded.
- It was identified that methyl bromide would be used for fumigation of containers that may contain contamination (e.g. wildlife, insects, etc.). Methyl bromide is a CFC gas and has a detrimental effect on the environment if released. The Bulk and General Precinct, General Purpose Precinct and Container Terminal Precinct would be designed and operated with methyl bromide dosing and capture systems to minimise the risk of harmful gas release to the atmosphere.

- Liquid Dangerous Goods could be held in transit storage at the site. Spill containment areas would be constructed at the site. The spill retention area for flammable liquids (Class 3), toxic liquids (Class 6), corrosive liquids (Class 8) and environmentally hazardous liquids (Class 9) would be constructed to retain a minimum of 20,000 litres. Based on the assumptions made in this EA, transit Dangerous Goods storage areas within the Container Terminal Precinct would not be located within 67 metres of the edge of the bunds in the Bulk Liquids Precinct. This separation distance would be confirmed at the Project application stage when design details are known.
- Any flammable solids storage area would be appropriately separated from other Dangerous Goods storages and the site/precinct boundary. Based on the assumptions made in this EA, a minimal separation distance of 14.4 metres would be required but this would be confirmed at the Project application stage when design details are known. It is also recommended that the assessment conducted in this study for the heat radiation impact from flammable liquids fires be reviewed during the detailed design of each subsequent Project application.
- Any flammable liquids storage area would be appropriately separated from other Dangerous Goods storages and the site/precinct boundary. Based on the assumptions made in this EA, a minimal separation distance of 30 metres would be required but this would be confirmed at the Project application stage when design details are known. It is also recommended that the assessment conducted in this study for the heat radiation impact from flammable liquids fires be reviewed during the detailed design of each subsequent Project application.
- In the event of a flammable gas release in a cylinder storage container within the Container Terminal Precinct, a gas ignition could result in explosion. The storage of flammable gases in cylinders would be appropriately separated from other Dangerous Goods storages and the site/precinct boundary. Based on the assumptions made in this EA, a minimal separation distance of 78 metres would be required but this would be confirmed at the Project application stage when design details are known.
- The underground storage tanks within the NPC Operations Precinct would be located greater than 16.1 metres from the site boundary and adjacent precincts.
- An Emergency Response Plan should be developed for each of the facilities at the site as part of subsequent Project applications and should be consistent with *HIPAP No.1, Emergency Planning Guidelines for Industry* (DoP, 2008).
- Detailed hazard analysis studies conducted for the facilities within the Bulk Liquids Precinct would include an assessment of risks to identify whether the buffer zones assessed in this concept analysis can be reduced by the introduction of terminal safety features (e.g. fire detection and protection systems, emergency response plans, etc.).
- Future operators would consider risk reduction measures for chlorine gas at the Project application stage.
- Future operators would provide fire hydrants, fire pumps that draw water from the South Arm of the Hunter River (unlimited water supply), fire hose reels in the buildings in each facility, and fire extinguishers in the buildings in each facility and on each vehicle used within the Port.

11.8 Water Management

11.8.1 Objective

NPC has the following objectives in relation to water management:

To minimise the impacts of stormwater runoff on property, infrastructure and the receiving environment.

To ensure flooding impacts within the site are minimised.

To minimise pollutants in runoff from the site and to contribute towards achieving the water quality objectives of the Hunter River.

The objectives for water management would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.8.2 Environmental Performance Criteria

Project applications would be required to comply with the overall site environmental performance criteria provided below. At the concept stage, the overall site and precinct-specific criteria are the same, however, when more detail is available on the exact nature of the activities to be conducted within the precincts additional criteria may need to be developed and tailored specifically to the activities being carried out on-site.

Surface water management environmental performance criteria are as follows:

- Stormwater is to be managed on-site and stormwater infrastructure must comply with the overall SMS prepared for the site.
- There is to be no uncontrolled discharge of stormwater to the South Arm of the Hunter River.

Flood risk management environmental performance criteria are as follows:

- Finished site levels are to be greater than the level of the 1 in 100 year ARI of 1.35 metres AHD plus additional freeboard.
- Main drains and minor drains are to have the capacity to convey the 1 in 100 year and 1 in 20 year ARI, respectively.
- The drainage system is to have the capacity to contain the 1 in 100 ARI.

Water quality environmental performance criteria are as follows:

- Discharges to sewer would be in accordance with Trade Waste Agreements between operators and Hunter Water.
- Discharges to the South Arm of the Hunter River are to be in accordance with the requirements of EPLs and/or the ANZECC guideline trigger values for marine water at 95 percent level of protection of species.

11.8.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria for water management NPC would:

- Update the existing Port Emergency Response Plan to include any spill response measures specific to the site.
- Require Project applicants to prepare individual Spill Management Plans and Emergency Response Plans which would identify activities and operations where potential exists for spills to occur, detail spill control and response strategies, identify equipment for use in spill response and cleanup, include a program for staff education on spill response procedures, and detail spill reporting requirements.
- Prepare an overall Soil and Water Management Plan addressing operational activities at the site. The Soil and Water Management Plan would:
    - Set out the regulatory guidelines and conditions of consent relevant to soil and water management;
    - Assign responsibilities and communication requirements;
    - Identify the objectives and environmental performance criteria for soil and water management at the site;
    - Identify the key water management issues, including flood risk, water quality and stormwater management;
    - Detail appropriate soil erosion and water quality mitigation and management measures, such as those detailed in **Section 9.6.4** of this EA;
    - Detail an appropriate water quality monitoring program, focusing on the discharge points from the site to the South Arm of the Hunter River. The water quality monitoring program would identify sampling locations, the sampling methodology and equipment, the parameters to be analysed, the frequency of monitoring i.e., sample collection schedule, the duration of the monitoring program, the protocol for collection and analysis of samples (ensuring chemical testing is undertaken by NATA accredited laboratories), the equipment calibration methodology and schedule, and the quality control procedures;
    - Specify the reporting procedures;
    - Define corrective action and contingency measures in the event of exceedances of the relevant environmental performance criteria;

  - Include protocols for evaluating performance i.e., inspection checklists, maintenance records, reporting and assessment of monitoring results; and
  - Include a process for regularly reviewing and updating the Plan to identify continual improvement or modifications to procedures.
- Require Project applicants to prepare individual Soil and Water Management Plans (consistent with the overall Plan) specific to their operations and include a water quality monitoring program which focuses on monitoring water quality from individual facilities. The water quality monitoring program should identify the monitoring locations, parameters to be analysed, the sampling methodology and equipment, the frequency of the monitoring i.e., sample collection schedule, the duration of the monitoring program, the protocol for collection of samples and analysis of samples (ensuring chemical testing is undertaken by NATA accredited laboratories), and the equipment calibration methodology and schedule. Project applicants would be required to provide the water quality monitoring results to NPC.
- If water quality monitoring consistently presents pollutant levels above the environmental performance criteria, additional water control measures would be implemented to reduce pollutant loads in stormwater discharged to the South Arm of the Hunter River.
- Periodically review the environmental performance criteria to facilitate continual improvement in the quality of stormwater discharged to the South Arm of the Hunter River.

Construction Soil and Water Management Plans would be prepared by Project applicants to address potential water quality impacts during construction.

11.9 Heritage and Cultural

Environmental performance objectives and criteria have not been developed in relation to heritage and cultural issues. HDC have undertaken to address the archaeological resources in areas to be impacted by the remediation works. This includes the locations of all of the five items identified as having archaeological significance. NPC commits to:

- Undertaking archaeological testing, monitoring, recording and salvage should there be impacts, such as the installation of footings and services, in those areas of archaeological potential (as identified in **Section 9.7** of this EA) that have not been investigated by HDC.
- Undertaking archaeological testing, monitoring, recording and salvage should there be impacts, such as the installation of footings and services, in the area of the No.1 and 2 Pig Mills.
- Undertaking archaeological testing, monitoring, recording and salvage should excavation within the area of the Hunter River Copper Smelting works exceed two metres.

11.10 Infrastructure

Local service providers have advised that there is likely to be available capacity to service the proposed concept, particularly since there are a number of significant service upgrades planned for the area. Alternatively, there is also the potential for provision of services to the site via IIP or OneSteel. Environmental performance objectives and criteria have not been developed in relation the provision of infrastructure and services to the site, however, NPC commits to:

- Preparing an Infrastructure Plan for the site to identify the services required in each precinct, identify the services corridors to and within the site, detail coordination and cost sharing mechanisms for provision of services, and include protocols for installation of services etc.
- Working with Project applicants regarding the provision of services to the site via services corridors in a coordinated manner, and negotiating with Project applicants on cost sharing mechanisms for provision of services.

Project applicants would be responsible for consulting with local service providers regarding demand for and provision of, services when more detailed information is available on the service requirements for each facility.

11.11 Contamination

11.11.1 Objective

NPC has the following objective in relation to contamination:

To ensure development of the site is carried out in a way which would not compromise the remediation outcome as set out in the VRA nor pose a risk to the environment or personnel.

The objective for contamination would be achieved by ensuring Project applications meet the environmental performance criteria presented below.

11.11.2 Environmental Performance Criteria

Project applications would be required to comply with the following environmental performance criteria:

- Development would be carried out in a way which would not cause surface and/or subsurface displacement of the barrier wall.
- Development would be carried out in a way that minimises disturbance of the cap wherever possible. Where it is necessary to excavate beneath the capping layer, any excavated soils would be tested for contamination and disposed of appropriately in accordance with the CSMP.
- Development would be carried out in accordance with the requirements of the VRA and the CSMP.

11.11.3 Environmental and Performance Management

To ensure the site functions in accordance with the environmental performance criteria NPC would:

- Obtain confirmation from the Site Auditor that the design of the individual facilities complies with the requirements of the VRA and CSMP prior to the commencement of any works. Should there be any instances of non compliance, Project applicants would be required to alter the design or include appropriate management controls to obtain compliance.
- Ensure that construction activities associated with subsequent Project applications would not commence until such time that DECCW determines contamination at the site no longer presents a significant risk of harm, or where DECCW determines that construction activities which start prior to completing remediation can be done so synergistically and without impact on the remediation outcome.
- Oversee development of the site to ensure that it is carried out consistent with the VRA and CSMP.

11.12 Socioeconomic

Environmental performance objectives and criteria have not been developed in relation socioeconomics. The proposed concept would result in economic benefits to the local area and the Hunter Region. The amenity of the area would be maintained through the mitigation and management of traffic, air quality, and noise impacts which are addressed in **Sections 11.3**, **11.5** and **11.6**. In addition, NPC would be responsible for continuing to liaise with the Mayfield CCC to periodically update them on the status of development of the proposed concept and to discuss issues of concern to the community.

11.13 Visual

The proposed concept would be a state-of-the-art facility and would result in a positive visual transformation of the site. Therefore, environmental performance objectives and criteria have not been developed. However, NPC would require Project applicants to prepare Lighting and Material Finishes Management Plans for the individual facilities. The plans would include requirements to minimise the potential for visual impacts such as the use of directional lighting to minimise light spill into surrounding areas during the night time and the use of suitable colours and materials for the buildings and other structures to minimise reflectivity and contrast. NPC would review the individual plans to ensure a level of consistency in the visual appearance of the individual facilities across the site.

11.14 Ecology

The proposed concept would not have an adverse impact on terrestrial flora and fauna at, or in the vicinity of, the site, and therefore, environmental performance objectives and criteria have not been developed. However, NPC would require Project applicants to prepare Landscape Management Plans for individual facilities and include a requirement to landscape appropriate areas of the site using native vegetation. It is important to note that with the exception of the landward boundary of the site, there would be very few areas at the site available for landscaping. NPC would review the individual Landscape Management Plans.

11.15 Waste Management

Environmental performance objectives and criteria have not been developed in relation to waste management. However, NPC would require Project applicants to prepare WMPs for the site, addressing waste management during both construction and operation. The WMPs should emphasise the potential for recovery and reuse of waste, the potential to minimise waste generation and include specific waste management requirements for waste types identified across the site consistent with the waste management strategies included in **Section 9.13** of the EA.

11.16 Climate Change and Sustainability

NPC is committed to sustainability and would require Project applicants to incorporate sustainability strategies into the design and operation of their developments.

Project applicants would be responsible for:

- Incorporating sustainability strategies into the design of individual facilities. At a minimum, sustainability strategies would be required to address the use of renewable energy and energy conservation, waste reduction, reuse, and recycling, and water conservation.
- Auditing energy and water consumption, and waste generation so as to monitor performance and identify areas for improvement. Auditing and performance management requirements would be included in the Sustainability Plans.
- Sustainability Plans detailing sustainability goals and objectives, and sustainability strategies would be prepared by Project applicants.

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12.0 Residual Environmental Risk Analysis

This section presents the results of the residual environmental risk analysis.

12.1 Approach

The Residual Environmental Risk Analysis for the proposed concept is based on a process adapted from *AS 4360:2004 Risk Management* and has also been prepared to meet the DGRs. Residual environmental risk is assessed qualitatively on the basis of the significance of environmental effects of the proposed concept and the ability to confidently manage those effects to minimise harm to the environment.

The significance of environmental effects was rated based on the receiving environment, the level of understanding of the type and extent of impacts, and community response to the environmental consequences of the proposed concept. This enables both the actual and perceived impacts to be considered. The environmental effects of the proposed concept are detailed in **Section 9.0**. The manageability of environmental effects was similarly given a rating based on the complexity of mitigation measures, the known level of performance of the mitigation measures proposed, and the opportunity for adaptive management. The mitigation measures are outlined in the SoC's in **Section 11.0**.

The rating for each environmental issue in the Residual Environmental Risk Analysis is based upon the following considerations:

Significance of Effects

Extreme	Undisturbed receiving environment; type or extent of impacts unknown; substantial community concern.
High	Sensitive receiving environment; type or extent of impacts not well understood; high level of community concern.
Moderate	Resilient receiving environment; type and extent of impacts understood; community interest.
Minor	Disturbed receiving environment; type and extent of impacts well understood; some local community interest.
Low	Degraded receiving environment; type and extent of impacts fully understood; little community interest.

Manageability of Effects

Complex	Complicated array of mitigation measures required; safeguards or technology are unproven; adaptive management inappropriate.
Substantial	Significant mix of mitigation measures required; limited evidence of effectiveness of safeguards; adaptive management feasible.
Straight forward	Straightforward range of mitigation measures required; past performance of safeguards is understood; adaptive management easily applied.
Standard	Simple suite of mitigation measures required; substantial track record of effectiveness of safeguards; adaptive management unlikely to be required.
Minimal	Little or no mitigation measures required; safeguards are standard practice; adaptive management not required.

Table 12-1 presents the results of the Residual Environmental Risk Analysis and compares this to the prioritisation of environmental issues undertaken prior to conducting the detailed environmental assessment and prior to developing mitigation measures for the proposed concept (refer to **Section 8.2**).

The Residual Environmental Risk Analysis indicates that the proposed concept presents an overall low/moderate risk in relation to each of the identified environmental issues, provided that the recommended mitigation, management and monitoring measures are implemented.

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Table 12-1: Residual Environmental Risk Analysis

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Traffic, Transport and Access				
Temporary increases in road traffic during construction	**3 (Low)**	Not assessed as part of the proposed concept due to lack of detail available. Impacts considered unlikely to exceed initial operations scenario (2024) which were considered applicable.	Further assessment and mitigation measures (if necessary) would occur as part of subsequent Project applications.	**N/A**
Increases in road traffic during operation	**5 (High)**	**Moderate:** Industrial Drive/George Street intersection appears to operate satisfactorily in the future under both initial (2024) and final (2034) operations development scenarios. Industrial Drive/Ingall Street intersection is likely to exceed capacity in the PM peak hour under the proposed initial or final operations scenario, while operating satisfactorily in the AM peak hour provided traffic flow is distributed between the two intersections. The truck queuing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield area (e.g. IIP) would need to be managed.	**Straightforward:** The impact on the Ingall Street intersection is due to all of the Container Terminal traffic using the intersection for access. It is recommended that a link road in the internal road network be introduced to enable this traffic and employee traffic to be redirected to the George Street intersection, allowing use of the available road/intersection capacity. It is recommended that a TMP be developed for the entire site to ensure that this distribution is enforced. Alternative management options may also be viable provided that it can be demonstrated that the intersections can still operate satisfactorily.	**Moderate/Minor**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Increases in rail transport during operation	**4 (Medium)**	**Minor:** There is no impact to the current operation of the Port Waratah rail facilities, or to OneSteel, in the initial operations scenario (600,000 TEU per annum in 2024) requiring three trains per day, and minor impacts to OneSteel in the final operations scenario (1 million TEU per annum in 2034) requiring four trains per day. It is assumed that the Main North Corridor Upgrade project is completed by 2034.	**Standard:** Two rail sidings would be provided within the site A new crossover would be installed connecting to number 6 and 7 roads in the Morandoo sidings. The existing OneSteel siding may need to be re-signalled to allow multiple train movements (required for initial operations). The Selwyn Street railway crossing would need to be assessed for treatment to separate rail and road movements, although a full barrier would likely be required (for initial operations). The new western road crossing of the railway line that would be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements (required for initial operations). It is likely that an exit road from the site onto the Bullock Island Loop would be required once more than two trains per day are run. A Train Operations Plan would be prepared by NPC to manage train operations within the Morandoo Yard and the site.	**Moderate/Minor**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Increases in ship transport during operation	**2 (Low)**	**Low:** The proposed concept would generate approximately 560 ships per annum. NPC advises that the Port has capacity to cater for up to 4,000 ships per annum and currently caters for approximately 1,500 ships per annum so there is more than adequate capacity to accommodate the ships associated with the proposed concept.	**Minimal:** No mitigation measures are required.	**Low**
Noise and Vibration				
Temporary noise emissions during construction	**4 (Medium)**	Not assessed as part of the proposed concept due to lack of detail available. Temporary noise emissions would occur for periods of time during development of each precinct.	Further assessment and mitigation measures (if necessary) would occur as part of subsequent Project applications.	**N/A**
Noise emissions during operation	**4 (Medium)**	**Moderate:** The potential for noise impact at surrounding residences would be greatest in the night period when adverse weather conditions occur (temperature inversions). Noise from daytime and evening operations at the site are expected to be below the noise criteria at nearby residences. Sleep disturbance criteria would not be exceeded. Traffic noise at residences along Industrial Drive would not comply with traffic noise criteria. Rail noise would be below acceptable criteria.	**Standard:** Mitigation measures such as the use of “squawker” or broadband reversing alarms on equipment which are less audible at a distance than traditional alarms, minimising operation of site vehicles during the night period as much as practical, and installing noise barriers would be used to minimise the potential for noise impacts at surrounding residences during the night period. The facades of residences along Industrial Drive could be treated to minimise the impacts from traffic noise.	**Moderate/Minor**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Vibration impacts during construction	**3 (Low)**	Not assessed as part of the proposed concept due to lack of available detail. Temporary vibration emissions would occur for periods of time during development of each Precinct.	Further assessment and mitigation measures (if necessary) would occur as part of subsequent Project applications.	**N/A**
Air Quality				
Emissions of air pollutants during construction	**4 (Medium)**	**Moderate:** Potential emissions to air include products of fuel combustion from vehicles and equipment used in construction and transportation activities, dust and odour emissions from demolition and construction activities, and other air pollutants (toxics) from contaminated soils disturbed during construction works.	**Straight forward:** These impacts would be minimised by implementing the mitigation measures described and outlined in AQMPs. A strict dust management strategy would be implemented for the duration of the proposed concept construction period, supplemented by the use of ambient pollutant monitoring. Mitigation measures to be incorporated into the AQMPs and dust management strategy would include covering loads during transport, watering of exposed surfaces and roads, sealing of as many regularly trafficked surfaces as soon as possible, turning off engines whilst parked on-site, and erection of windbreak barriers on the site boundary would aid toward mitigating construction emissions.	**Moderate/Minor**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Emissions of air pollutants during operation	**4 (Medium)**	**Moderate:** Emissions of dust from operational activities of pollutant emissions from transport (fuel combustion from trains, trucks and ships) and VOC emissions from the operation of the Bulk Liquid Precinct have been identified as predominant sources of emissions. The modelling results for operation suggest that with the exception of short term PM_{10} concentrations, all pollutants comply with the relevant impact assessment criteria. There are already high background PM_{10} concentrations in the region.	**Standard:** AQMPs would be prepared and an air quality monitoring program undertaken, the results of which would be used to regularly update the AQMPs. Mitigation measures would be implemented to minimise PM_{10} and emissions of other pollutants.	**Minor**
Odour emissions during operation	**2 (Low)**	**Minor:** Fuels and organic liquids are typically volatile and evaporation of these liquids during storage has the potential to generate odour and VOCs. Minor quantities of fugitive emissions (hydrocarbon based) may occur due to potential pipeline losses from flanges, valves, pump seals and other fittings. Product and tank vapour emissions of VOCs are also generated during filling operations.	**Straight forward:** Highly volatile fuels would be stored in internal floating roof tanks aimed at reducing emissions from the tanks. Given that the design of the pipeline is centred on leak prevention and that the plant is to be newly constructed, total emissions from pipelines are expected to be negligible. Vapour recovery units would be used for vapour recovery during tanker truck loading with removal efficiencies of greater than 99.9 percent.	**Minor**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Greenhouse gas emissions	**4 (Medium)**	**High:** The proposed concept would generate greenhouse gases during construction and operation. Due to the highly detailed nature of the information required to conduct a thorough greenhouse gas emissions inventory, an inventory has not been prepared as part of this EA. Individual operators would be required to conduct greenhouse gas emission inventories as part of Project applications.	**Straight forward:** Individual operators would be required to implement appropriate sustainability strategies which would conserve energy and reduce greenhouse gas emissions.	**Moderate/Minor**
Hazard and Risk				
Exposure of existing and future surrounding land uses and sensitive receivers to hazards and risks associated with operation	**4 (Medium)**	**Low:** Potentially hazardous areas within the site can be located and designed such that they do not impact adjacent surrounding land uses (e.g. OneSteel, residential areas, etc.) in a manner exceeding permissible impact levels. The proposed concept is classified as only potentially hazardous and not actually hazardous, and therefore would be permitted at the proposed location under the provisions of SEPP 33.	**Straight forward:** Mitigation measures such as appropriate separation of Dangerous Goods storage areas and use of methyl bromide dosing and capture systems would be incorporated into the design. In addition, a detailed PHA would be conducted for each of the facilities proposed under subsequent Project applications to confirm the results of the proposed concept PHA assessment and to ensure that the detailed site layouts and Dangerous Goods storage quantities and operations do not result in exceedences of the acceptable risk criteria.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Exposure of on-site employees to hazards and risks associated with operation	**4 (Medium)**	**Moderate:** There is potential for an incident, such as a leak from a chlorine drum valve, to occur at the site and potentially impact employees. However, these risks would be managed through the implementation of mitigation measures.	**Straight forward:** In the event of an incident at the site, the implementation of an Emergency Response Plan would result in the reduction of incident impacts. An Emergency Response Plan would be developed for each of the facilities as part of subsequent Project applications at the site using *HIPAP No.1, Emergency Planning Guidelines for Industry*.	**Low**
Water Environment				
Surface water quality impacts during construction	**4 (Medium)**	**Minor:** There is potential for impact on water quality of the South Arm of the Hunter River resulting from mobilisation of sediments and pollutants in runoff from hardstand areas, stockpiles and earthworks and from spills and leaks of fuels from machinery and plant.	**Straight forward:** These impacts would be minimised by implementing the mitigation measures described and outlined in the CSMP and Soil and Water Management Plan. Mitigation measures such as bunding to capture contaminated runoff, silt fencing, watering of stockpiles and drains would be implemented to reduce the potential for contaminated runoff and minimise the impacts on the South Arm of the Hunter River. The Soil and Water Management Plans would form part of the CEMPs.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Surface water quality impacts during operation	**4 (Medium)**	**Minor:** There is potential for impacts on the water quality of the South Arm of the Hunter River during operation as a result of spills and leaks from bulk storage tanks, liquid transfers and machinery, mobilisation of sediment and pollutants (e.g. heavy metals, hydrocarbons) by stormwater runoff from roads, hardstand areas, stockpiles and buildings, and disruption to the stormwater drainage system.	**Straight forward:** These impacts would be minimised by implementing the site-wide SMS and mitigation measures. The implementation of mitigation measures such as first flush containment systems, tank farm bunding, alarm and warning systems, drains, rainwater harvesting and reuse, and water quality monitoring would reduce the potential for impacts on the South Arm of the Hunter River.	**Low**
Impacts to groundwater during construction	**2 (Low)**	**Minor:** There is potential for surface water infiltration or damage to the barrier wall or site capping resulting in impacts on groundwater flow and quality through contaminated areas of the site.	**Standard:** Potential for impact would be minimised by implementing appropriate controls and management measures. Impacts would be minimised by ensuring that that requirements of the CSMP are adhered to, applying restrictions of works within easements, reinstatement of protective capping and undertaking groundwater monitoring.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Impacts to groundwater during operation	**2 (Low)**	**Minor:** Limited surface water infiltration or damage to the barrier wall could potentially result in impacts on groundwater flow and quality.	**Minimal:** Restriction of certain work and operations within the easement for the barrier wall would be implemented to reduce the risk of impacts to the wall and therefore groundwater. A groundwater monitoring program would be implemented and the SMS would ensure that surface water is conveyed from site efficiently whilst limiting infiltration and potential groundwater impacts.	**Low**
Heritage and Cultural				
Impacts on existing non-indigenous heritage items on the site	**4 (Medium)**	**High:** The site was deemed to have State and local significance for its archaeological potential in relation to the former locations of the No. 2 Blast Furnace, the original No. 1 Pig Mill, the No. and No. 2 Pig Mills, the Ferro-Manganese Blast Furnace and the Hunter River Copper Smelter Works located within or adjacent to the Heritage Area.	**Straight forward:** Undertake archaeological testing, monitoring, recording and salvage in those areas of archaeological potential that would be impacted by the proposed concept have not already been investigated by HDC.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
		The site also retains Local social significance for the place it holds in the memory of the local residents who worked in or grew up under the shadow of the Steelworks. The proposed concept is compatible with the heritage values. However, construction activities could potentially impact on the archaeological values of the site.		
Infrastructure				
Impacts on existing infrastructure and utilities	**2 (Low)**	**Low:** As service and utility infrastructure currently servicing the site is minimal, it is anticipated that there would be minimal potential for impact on existing infrastructure. It is anticipated that Koppers pipeline would ultimately relocate to the Bulk Liquid Precinct.	**Minimal:** No mitigation measures are required.	**Low**
Impacts on future service demand, capacity and augmentation of proposed infrastructure and utilities	**4 (Medium)**	**Low:** The proposed concept would require provision of water, sewer, natural gas, electrical, and telecommunications services to the site. There are three options for provision of services to the site. The site could connect to the trunk services to be provided through the IIP, make connections through OneSteel, or obtain services directly through local service providers. Energy Australia, Jemena and Hunter Water have all advised that there is likely to be available future capacity to serve the proposed concept.	**Standard:** An Infrastructure Plan would be prepared for the site and services would be provided to the site via a services corridor. NPC would coordinate with Project applicants to provide services to the site. Project applicants should consult with local service providers regarding demand for, and provision of, services when more detailed information is available.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Geology and Soils				
Erosion and sedimentation during construction	**4 (Medium)**	**Moderate:** Construction activities have the potential to cause soil erosion and sedimentation however, the potential impacts are manageable.	**Standard:** The potential for erosion to occur would be minimised by implementing erosion control measures detailed in a Soil and Water Management Plan. Erosion control measures would include measures such as minimising stockpiling, diverting surface water from disturbed areas, use of silt fences and settlement ponds and vegetating stockpiles.	**Low**
Erosion and sedimentation during operation	**3 (Low)**	**Low:** The majority of the site would be covered with buildings and sealed surfaces such as hardstand areas, parking areas and roadways which would not give rise to erosion. Therefore, there would be little potential for erosion or sedimentation to occur during operation.	**Minimal:** No mitigation measures are required.	**Low**
Migration of existing on-site contaminants during construction	**4 (Medium)**	**Moderate:** Construction activities have the potential to disturb the capping materials and underlying contaminated soils, however, the potential impacts are manageable.	**Straight forward:** In order to minimise the potential for exposure to contaminated soils, all construction activities would be undertaken in manner that is consistent with the existing CSMP.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Migration of existing on-site contaminants during operation	**3 (Low)**	**Low:** The majority of the site has been capped as part of the remediation activities under the 2001 consent (the balance of the site will be capped in 2012) and would be covered with buildings and sealed surfaces as part of the proposed concept. Therefore, there would be limited potential for infiltration of surface water and the migration of site contaminants during operation. Most of the impacted area is contained by a barrier wall which will remain intact.	**Minimal:** The site would be maintained in a manner consistent with the CSMP. Adhering to the requirements of the CSMP would ensure protection of the barrier wall. No other mitigation measures are required.	**Low**
Socioeconomic				
Impact upon amenity of nearby residential land uses (i.e. noise, air quality, hazard and risk)	**3 (Low)**	**Low:** While not excessive or unmanageable, the potential for noise impact at surrounding residences would be greatest in the night period when adverse weather conditions occur (temperature inversions). Traffic noise would impact residences along Industrial Drive during the night time. Air quality modelling for operation of the proposed concept suggest that with the exception of short term PM_{10} concentrations, all pollutants comply with the relevant impact assessment criteria.	**Standard:** Mitigation measures such as the use of “squawker” or broadband reversing alarms on equipment which are less audible at a distance than traditional alarms, minimising operation of site vehicles during the night period as much as practical, and installing noise barriers would be used to minimise the potential for noise impacts at surrounding residences during the night period.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
		Potentially hazardous areas within the site can be located such that they do not impact surrounding residential areas in a manner exceeding permissible impact levels. The proposed concept would enhance the amenity of the surrounding areas by transforming the highly disturbed site into that of a modern, state-of-the-art facility with a visual appearance in keeping with the existing port-related industrial activities conducted in the Port.	The façades of residences along Industrial Drive could be treated to minimise the impacts from traffic noise. AQMPs would be prepared and an air quality monitoring program undertaken during construction and operation. Results of the monitoring would be used to regularly update the AQMP.	
Demand for community resources and impact on the community	**2 (Low)**	**Low:** There would potentially be additional demand for community resources such as education and healthcare if employees relocate to the area from other areas. However, the majority of employees are likely to reside in the local area. It is anticipated that community resource needs would be able to be catered for by existing resources.	**Minimal:** No mitigation is required.	**Low**
Generation of employment opportunities	**4 (Medium)**	**High:** The proposed concept would employ an average full-time workforce of approximately 60 workers during construction. However, given the staged development of the proposed concept, the maximum construction workforce is anticipated to be approximately 160 workers. The proposed concept would employ a total workforce of approximately 300 full-time personnel during operation.	**Minimal:** No mitigation is required.	**High** (Note that the proposed concept would have positive benefits in terms of employment generation)

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Benefits to the regional economy	**4 (Medium)**	**High:** The proposed concept would generate positive economic benefits for the Region through the significant $200 million capital investment and establishment of port infrastructure. It would also result in indirect benefits to the Lower Hunter Region associated with expenditure on local goods and services, food, fuel, infrastructure and other supplies, which would be beneficial to a range of industries.	**Minimal:** No mitigation is required.	**High** (Note that the proposed concept would have positive benefits to the regional economy)
Visual				
Intrusive visual impacts on surrounding landscape	**3 (Low)**	**Low:** The proposed concept would transform the site from a highly disturbed relatively vacant parcel of land with exposed earth and asphalt and little vegetation, into a modern, state-of-the-art facility with a visual appearance in keeping with the existing port-related industrial activities conducted in the Port.	**Minimal:** Mitigation includes selecting suitable colours and materials for the buildings and structures, minimising light spill during night time operations etc in accordance with Lighting and Material Finishes Management Plans. Suitable areas of the site would be landscaped.	**Low**
Ecology				
Impact on flora and fauna at the site	**2 (Low)**	**Low:** The proposed concept would not have an adverse impact on terrestrial flora and fauna at the site due to the existing cleared and highly disturbed nature of the site.	**Minimal:** No mitigation is required. Landscape Management Plans would be prepared.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Impact on flora and fauna off-site	**2 (Low)**	**Low:** The proposed concept would not have an adverse impact on terrestrial flora and fauna in areas surrounding the site. In addition, it would not affect the Kooragang Nature Reserve. There is potential for adverse impacts to the estuarine environment through pollutants from leaks/spills and from stormwater discharge into the South Arm of the Hunter River. This environment is already degraded as a result of long standing industrial developments, dredging and shipping movements.	**Minimal:** A Soil and Water Management Plan would be prepared to ensure that operations do not pose a threat to the already modified estuarine environment.	**Low**
Waste				
Generation and management of waste during construction	**2 (Low)**	**Minor:** The proposed concept would generate various different waste types during construction including spoil, concrete, building rubble, scrap metal, scrap wood, packaging materials, cardboard, paper, plastic, glass, used cartridges, food/organic waste and small quantities of spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil. Inappropriate waste management has the potential to pollute the surrounding environment.	**Minimal:** Waste avoidance and management measures would be required in order to prevent potential environmental harm. WMPs would be prepared and would be consistent with the NSW WARR Strategy. Waste would be recycled and reused wherever possible.	**Low**

Issue	Priority (Pre-Mitigation)	Significance of Effects	Manageability of Effects	Allocation of Residual Environmental Risk (Post-Mitigation)
Generation and management of waste during operation	**3 (Low)**	**Minor:** The proposed concept would generate various different waste types during operation including cardboard, paper, plastic, glass, used cartridges, food/organic waste, vegetation/green waste and small quantities of machinery parts, scrap metal, oils, used rags, spent solvents, empty paint cans, chemical containers, used lubricating oil, batteries, lighting equipment and engine oil. Inappropriate waste management has the potential to pollute the surrounding environment.	**Minimal:** Waste avoidance and management measures would be required in order to prevent potential environmental harm. WMPs would be prepared. The plans would be consistent with the NSW WARR Strategy. Waste would be recycled and reused wherever possible.	**Low**
Energy				
Resource availability and demand (i.e. water, gas, electricity)	**3 (Low)**	**Low:** Energy Australia, Jemena and Hunter Water have all advised that there is likely to be available future capacity to serve the proposed concept.	**Minimal:** No mitigation measures are required. Project applicants would prepare Sustainability Plans recommending strategies for conserving resources.	**Low**

13.0 Justification and Conclusion

13.1 Needs and Benefits

The Port of Newcastle is one of three main international trade ports in NSW, the others being Port Botany and the Port of Port Kembla. The Port of Newcastle is Australia's largest port in bulk terms with 14 percent of Australia's total exports passing through the Port. The Port primarily handles the export of commodities and currently has 16 berths for handling coal, project cargo, break bulk, grain and other bulk cargos. There is currently no container terminal at the Port. The total volume of commodities handled by the Port increased from 85.5 million tonnes in 2006/07 to 95.8 million tonnes in 2008/09, representing growth of approximately 12 percent over this two year period. This growth in trade is consistent with the trend exhibited at other NSW ports.

The ability of the NSW port system to meet the forecast trade growth of the State is reliant on the planned and future expansion of all of the three major ports at Newcastle, Botany and Port Kembla, and cannot be achieved by the expansion of one or two ports alone. When looking solely at container trade, by 2035 it is expected that 6.5 million TEU would be handled in NSW Ports (Maunsell AECOM, 2005). Even with the current expansion of Port Botany it is anticipated that there would be a container facility capacity shortfall in NSW of up to 3 million TEU within a 30 year timeframe. Therefore, there is a need to expand the Port of Newcastle in order for the Port to meet its defined strategic role of becoming the states next major container facility and satisfy the needs of the State.

There are currently four NPC-owned sites within the Port of Newcastle, including Mayfield (the site), and the three operational sites of Kooragang Island, Walsh Point and Carrington Basin. Alternative site analysis revealed that Kooragang Island, Walsh Point and Carrington Basin do not have sufficient vacant land, ready Port access, and supporting road and rail infrastructure available for accommodating what would become the State's next major container terminal. Only Walsh Bay has sufficient area available for accommodating small to medium-sized facilities for importing and exporting bulk goods, bulk liquids and general cargo.

Current port operations at the Port of Newcastle do not have sufficient capacity to accommodate all growth indicated in trade forecasts and planned for under the State and Regional strategies, nor would the existing operations have capacity to facilitate expansion into strategic sectors such as container handling. The proposed concept is designed to align development of the site's precincts with the anticipated trade forecasts of the Port of Newcastle through 2034.

By developing the site for port-related industrial uses and by enhancing the economic efficiency of the NSW port system, the proposed concept is consistent with the *NSW Ports Growth Plan.* The *NSW Ports Growth Plan* has identified that when Port Botany reaches capacity, the Port of Newcastle would be the location of the State's next major container facility.

In the short and long-term the proposed concept would also allow the Port of Newcastle to act as a stimulus to the local and regional economy, by providing both direct and indirect employment predominantly in the building and construction trades, transportation and manufacturing, and also in other sectors that rely on ports for cargo handling. The concept plan provides forward planning for the Port to support economic growth within the Lower Hunter Region and NSW and is consistent with the priorities set out in the *NSW State Plan* and the *Regional Business Growth Plan - Hunter Region.*

In a strategic context, the proposed concept is consistent with all relevant Government policies and strategies and adequately addresses future trade forecasts for the Port of Newcastle.

13.2 Concept Plan and Description

On 16 April 2009 the Minister for Planning authorised the lodgement of a Concept Plan under Part 3A, Section 75M of the EP&A Act. The Concept Plan allows the proposed concept to be assessed by focusing on the broader strategic issues with detailed issues to be assessed as part of future Project applications.

Concept Approval was selected as the appropriate approval mechanism because it establishes the strategic framework for the progressive development of the site through to 2034, and would provide certainty for all stakeholders, including government agencies, the local community and potential developers that the site is suitable for the intended port-related uses and that potential environmental impacts can be minimised and managed to acceptable levels. The Concept Plan aims to ensure future development of the site occurs in a coordinated manner to promote the highest and best use of the site in accommodating trade forecast needs.

Once the proposed concept is approved, it is recommended that the 2001 consent be subsequently modified so that it relates only to the activities which are not specifically covered by this Concept Approval (e.g. remediation activities and construction of the general cargo handling facility known as Mayfield No.4 Berth). In all other respects, the 2001 consent would effectively be superseded by this Concept Approval. However, NPC is committed to ensuring the proposed concept does not compromise the requirements of the 2001 consent where relevant to the approximate 90-hectare footprint of the proposed concept.

NPC proposes to develop the 90-hectare site on the South Arm of the Hunter River for port-related uses. The site is currently largely devoid of vegetation, infrastructure and structures with the exception of Mayfield No.4 Berth, Koppers pipeline and wharf, and internal access roads. A large portion of the site has been remediated and sealed with asphalt and the balance of the remediation works are to be completed in 2012.

The proposed concept delineates five key land-based operational precincts which are:

- NPC Operations Precinct (approximately 3 hectares) including office, storage sheds, vehicle and marine equipment, NPC dredge vessel, pilot cutters and helipad.
- Bulk and General Precinct (approximately 12 hectares) capable of handling an approximate throughput of 2.4 million tonnes per annum of non-hazardous dry bulk products including grain, briquettes and coke cargoes.
- General Purpose Precinct (approximately 25 hectares) a flexible facility to handle and store a throughput of approximately 1.35 million tonnes per annum of cargo containers, heavy machinery, and break bulk cargo including Ro/Ro. This includes Mayfield No.4 Berth which was approved as part of the 2001 consent.
- Container Terminal Precinct (approximately 35 hectares) with a trade volume of approximately 1 million TEU per annum.
- Bulk Liquid Precinct (approximately 15 hectares) used for storage, blending and distribution of high quality fuels and biofuels capable of handling a throughput of approximately 1,010 mega litres.

A total of seven berths would be located within the Berth Precinct to service operation of the land-based precincts. Road and rail freight infrastructure would also be required to service the site.

13.3 Overview of Environmental Impacts

This EA has been prepared in accordance with the provisions of Part 3A of the EP&A Act and EP&A Regulation together with the DGRs which were issued to NPC on 29 May 2009 by the DoP. It has also been prepared in accordance with DoP Adequacy Review comments received on the draft EA.

Key environmental issues have been subject to assessment and potential for impact has been identified. Key potential environmental impacts associated with the proposed concept are summarised below:

- **Road Transport.** The Industrial Drive / George Street intersection appears to operate satisfactorily in the future under both initial (600,000 TEU per annum in 2024) and final operations development (1 million TEU per annum in 2034) scenarios. However, the Industrial Drive / Ingall Street intersection would only operate satisfactorily in the future under initial and final operation development scenarios if an internal link road between the precincts and a TMP is implemented to channel more traffic to the Industrial Drive / George Street intersection which has available capacity. The majority of impact on the Industrial Drive / Ingall Street intersection is due to all of the Container Terminal Precinct traffic using the intersection for access. The truck queueing associated with operation of the railway crossings has been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield area including the IIP site would need to be managed. It is recommended that as part of detailed project applications, precinct operators should be required to assess the impact of heavy goods vehicles on the road pavement condition of the local road network and confirm that the types of vehicles proposed for use can be accommodated with the road geometry.
- **Rail Transport.** The proposed concept would generate three and four trains per day in 2024 and 2034, respectively. There would be no impact to the current operation of the Port Waratah Loop rail facilities, or to OneSteel, in the initial operations scenario (600,000 TEU per annum), and only minor impacts to OneSteel in the final operations scenario (1 million TEU per annum). However, these impacts can be overcome by agreeing a timetable of operation within the Morandoo Siding and OneSteel Arrival Road. Two new 520-metre rail sidings would be required in the site. The sidings would need to be separated to allow reach stacker movement either side of wagons and connected at both ends to allow shunt manoeuvres. A new crossover would need to be installed between number 6 and 7 roads in the Morandoo Sidings. The existing OneSteel siding may need to be re-signalled to allow multiple train movements. The Selwyn Street railway crossing would need to be assessed for treatment to separate rail and road movements, although a full barrier would likely be required. The new western road crossing of the railway line that would be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements. It is likely that an exit road from the site onto the Bullock Island Loop would be required once more than two trains per day are run.
- **Noise and Vibration.** Whilst not excessive or unmanageable, predicted noise levels indicate that the potential for noise impact at surrounding residences would be greatest in the night period when adverse weather conditions (temperature inversions) occur. Mitigation measures such as the use of “squawker” or broadband reversing alarms on equipment which are less audible at a distance than traditional alarms, minimising operation of site vehicles during the night period as much as practical, and installing noise barriers would be used to minimise the potential for noise impacts at surrounding residences during the night period. In the case of day time and evening operations, noise levels at residences are expected to be below established noise criteria. Traffic noise at residences along Industrial Drive would exceed the traffic noise criteria during the night time. Rail noise would be below acceptable trigger levels and vibration generated by trains at residences would not change from existing levels.
- **Air Quality**. With the exception of short term (24-hour) PM_{10} concentrations, all pollutants comply with the relevant criteria. Due to the impact of existing industry and traffic in the Region, background PM_{10} levels already exceed the DECCW criteria of 50 $\mu g/m^3$ for 24 hour PM_{10}. Operation of the proposed concept combined with background PM_{10} would result in 24-hour PM_{10} levels exceeding the DECCW criteria at all of the 14 discrete receptors surrounding the site. The modelling demonstrated that the criteria would be exceeded by up to 21 micrograms per cubic metre at Receptor 1 which is located at Selwyn Street. It should be noted that while the proposed concept would generate PM_{10} emissions and contribute to exceedance of the criteria, the contribution from the proposed concept alone is minor (less than 11 percent of the assessment criteria and around 8 percent of the predicted cumulative concentration). AQMPs and a monitoring program would be developed to manage air quality impacts.

- **Hazard and Risk.** Potentially hazardous areas within the site such as the AN transit area, can be located such that they do not impact adjacent surrounding land uses (e.g. OneSteel, residential areas, etc.) in a manner exceeding permissible impact levels. The PHA indicates that the proposed concept is classified as only potentially hazardous and not actually hazardous, and therefore would be permitted at the site under the provisions of SEPP 33.
- **Water Management.** Construction and operation activities associated with the proposed concept have the potential to impact on surface and groundwater quality, flow and flooding if not managed appropriately. A site-wide SMS would be developed. In addition, NPC and individual operators would develop a suite of management plans, monitoring programs and mitigation measures for individual Project applications, which would address potential impacts arising during construction and operation of the proposed concept. With the implementation of the appropriate management measures across the site, the proposed concept is unlikely to have significant impacts on the water quality, flow or flooding.
- **Heritage and Cultural.** The site is largely devoid of vegetation, buildings and structures, and infrastructure. The Steelworks site is ascribed State level significance for its historical and associative values. The site was deemed to have State and local significance for its archaeological potential in relation to the former locations of the No. 2 Blast Furnace, the original No. 1 Pig Mill, the No. 1 and No. 2 Pig Mills, the Ferro-Manganese Blast Furnace and the Hunter River Copper Smelter Works. The site also retains Local social significance for the place it holds in the memory of the local residents who worked in or grew up under the shadow of the Steelworks. The SOHI concludes that the proposed concept is compatible with these heritage values. Construction activities could, however, potentially impact on the archaeological values of the site. Recommendations are made to ameliorate this impact, including testing, monitoring, salvage and recording of area/s of archaeological potential that may be impacted by the proposed concept and that have not already been investigated by HDC during completion of the remediation activities.
- **Infrastructure.** Existing infrastructure such as aboveground pipeline structures or easements would not be significantly impacted by the development and potential impacts would be suitably managed. The proposed concept would require provision of water, sewer, natural gas, electrical, and telecommunications services, and installation of pipelines. Services would be provided to the site either through connection to IIP, via OneSteel, or connection through existing service providers. Local service providers, namely Energy Australia, Hunter Water, and Jemena have advised that there is likely to be capacity available to service the proposed concept, particularly since there are a number of significant service upgrades planned for the area. An infrastructure Plan would be prepared to coordinate provision of infrastructure.
- **Geology and Soils.** Construction activities have the potential to cause soil erosion, disturb the capping materials and underlying contaminated soils, and compromise the integrity of the subterranean barrier wall. The site would be developed progressively, and a Soil and Water Management Plan would be prepared to manage the construction phases and the potential for soil mobilisation. Ultimately, the majority of the site would be covered with buildings and sealed surfaces such as hardstand areas, parking areas and roadways which would not give rise to erosion. Therefore, there would be little to no potential for erosion to occur during operation.
- **Socioeconomic.** The proposed concept would generate positive economic benefits for the Lower Hunter Region through the significant $200 million capital investment and establishment of port infrastructure. It would generate significant direct and indirect employment opportunities during construction and operation. It would also result in indirect benefits to the Lower Hunter Region associated with expenditure on local goods and services, food, fuel, infrastructure and other supplies, which would be beneficial to a range of industries.
- **Visual.** The site is relatively low-lying, flat and largely devoid of infrastructure and structures. Whilst the proposed concept would alter the existing visual landscape of the site, proposed new features such as storage tanks, silos, conveyors and storage sheds, are typical of the local and wider landscape character as an industrial port area. A positive visual transformation of the site would occur as a result of the proposed concept, changing the site from a relatively vacant parcel of land with exposed earth and asphalt and little vegetation into a modern, state-of-the-art facility in keeping with the existing port-related industrial activities conducted in the Port.

- **Ecology.** The proposed concept would not have an adverse impact on terrestrial flora and fauna at, or in areas surrounding, the site due to the existing cleared and highly disturbed nature of the site. The proposed concept has the potential to enhance the ecological value of the site, where feasible, through the provision of landscaping in defined areas of the site. There is potential for adverse impacts to estuarine environment through pollutants from leaks/spills and from stormwater discharge into the South Arm of the Hunter River and from discharges of ballast water. A Soil and Water Management Plan would be prepared to ensure that operations do not pose a threat to the already modified estuarine environment.
- **Waste Management.** The proposed concept would generate various different waste types, including non-putrescibles, general putrescibles, and hazardous waste. WMPs would be prepared for the site to manage the efficient re-use and recycling of waste where feasible, or where waste cannot be re-used or recycled to manage the appropriate disposal of waste.

More detailed mitigation measures to avoid or ameliorate these, and more minor potential impacts, have been recommended within relevant sections of this EA to reduce the potential impact to an acceptable level of environmental risk.

NPC is committed to sustainability. As documented in NPC's *Environmental Policy*, NPC's purpose is to provide safe, effective and sustainable port operations and to deliver port development that enhances the economic growth of the Hunter Region and NSW. Consistent with NPC's commitment to sustainability, Project applicants would be required to incorporate sustainability strategies into the design of individual facilities. At a minimum, sustainability strategies would be required to address:

- Use of renewable energy and energy conservation;
- Waste reduction, reuse, and recycling; and
- Water conservation.

This EA includes environmental performance objectives to guide future development of the site and contains environmental performance criteria from which to measure the environmental performance of the port-related developments which would occur at the site. Project applicants would be required to demonstrate that a project could achieve the environmental performance objectives and meet the environmental performance criteria set for the site. In doing so, Project applicants and NPC (who has the responsibility for managing the Port of Newcastle and the site) would have a degree of certainty that development of the site as a whole would not have adverse environmental impacts.

This EA and accompanying specialist studies, demonstrates that the Mayfield Site Port-Related Activities Concept Plan would not result in significant impact on the environment and would generate significant social and economic benefits to the Lower Hunter Region and NSW. They also confirm that the proposed concept has a strong justification for proceeding and is considered to be suitable for approval under Part 3A of the EP&A Act.

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