APPENDIX D - ENVIRONMENTAL RISK ASSESSMENT AND MITIGATION MEASURES

The following section provides recommendation for mitigation measures in response to potential impacts identified in **Section 6** of the EIS. The structure of mitigation measures is based on the DPIE's hierarchy of approaches for managing impacts identified in the *Draft Environmental Impact Assessment Guidance Series* released by DPE in June 2017, as:

- **Performance based measure** – identify performance criteria that must be complied with to achieve an appropriate environmental outcome but do not specify how the outcome is to be achieved.
- **Prescriptive measure** – require action to be taken or specify something that must not be done.
- **Management based measure** – identify one or more management objectives that must be achieved through the implementation of a management plan.

Following the implementation of appropriate mitigation measures as recommended, it is determined that the proposal will not result in any significant adverse impacts on the surrounding environment. The following table illustrates how the matters raised within the SEARs will be addressed.

This analysis comprises a qualitative assessment consistent with AS/NZS ISO 31000:2009 *Risk Management–Principles and Guidelines* (Standards Australia 2009). The level of risk was assessed by considering the potential impacts of the proposed development prior to application of any mitigation or management measures. In accordance with the SEARs, the Environmental Risk Assessment (ERA) addresses the following significant risk issues:

- The adequacy of baseline data;
- The potential cumulative impacts arising from other developments in the vicinity of the site; and
- Measures to avoid, minimise, offset the predicted impacts where necessary involving the preparation of detailed contingency plans for managing any significant risk to the environment.

Risk comprises the likelihood of an event occurring and the consequences of that event. For the proposal, the following descriptors were adopted for 'likelihood' and 'consequence'.

Likelihood		**Consequence**	
A	Almost certain	1	Widespread and/or irreversible impact
B	Likely	2	Extensive but reversible (within 2 years) impact or irreversible local impact
C	Possible	3	Local, acceptable or reversible impact
D	Unlikely	4	Local, reversible, short term (<3 months) impact
E	Rare	5	Local, reversible, short term (<1 month) impact

The risk levels for likely and potential impacts were derived using the following risk matrix.

		LIKELIHOOD				
		A	**B**	**C**	**D**	**E**
CONSEQUENCE	**1**	High	High	Medium	Low	Very low
	2	High	High	Medium	Low	Very low
	3	Medium	Medium	Medium	Low	Very low
	4	Low	Low	Low	Low	Very low
	5	Very low	Very low	Very low	Very low	Very low

The results of the environmental risk assessment for the proposed development are presented in the below table and are based upon the range of technical and specialist consultant reports appended to the EIS. The table has directly related mitigation measures responding to each impact also based upon the range of technical and specialist consultant reports appended to the EIS.

N.B. **'O' – Operational; 'C' – Construction**

'Pe' – Performance based mitigation measure; 'Pr' – Prescriptive based mitigation measure; 'Ma' – Management based mitigation measure

SEARS	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
Traffic and Transport	Impacts of the construction activities on the surrounding road network	C	B	3	Medium	▪ Temporary exclusion fencing (chain mesh fencing) will be erected along the entire boundary of the site and will be maintained for the duration of the construction program. ▪ Handling of all materials throughout the construction period shall adhere to the following: - It is proposed that all material loading will occur within the construction site boundary. - No loading is proposed to occur outside of the provisioned areas. - Equipment, materials, and waste will be kept within the construction site boundary. ▪ All vehicles transporting loose materials will have the entire load covered and/or secured to prevent any large items, excess dust or dirt particles depositing onto the roadway during travel to and from the site. ▪ An authorised Traffic Controller is to be present on-site throughout the construction stage of the project.	Ma	Low
Trees and Landscaping	Impacts of construction of trees to be retained	C	B	2	High	Tree protection: ▪ Tree protection fencing. ▪ Landscaping activities are to be low impact and sensitive to tree roots. ▪ Supervision of works within the fenced TPZ. ▪ Retention of the existing concrete slab in situ within the TPZ of tree 8.	Ma	Low
Trees and Landscaping	Tree removal	O	A	3	Medium	To mitigate the removal of the Hills Weeping Fig tree at the south-eastern corner of the site, a high level of planting is proposed across the site including large native copy trees.	Pr	Very low
Air Quality	Impacts of construction activities in relation to dust and human health at sensitive receptors	C	A	2	High	<u>Communication</u> ▪ Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. ▪ Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. ▪ Display the head or regional office contact information. ▪ Develop and implement a Dust Management Plan (**DMP**), which may include measures to control other emissions, approved by the relevant regulatory bodies. <u>Site Management</u> ▪ Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Ma	Low

SEARS	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
						▪ Make the complaints log available to the local authority when asked. ▪ Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book. ▪ Hold regular liaison meetings with other high-risk construction sites within 500 metres of the site boundary, to ensure plans are coordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes. <u>Monitoring</u> ▪ Carry out regular site inspections to monitor compliance with the DMP / CEMP, record inspection results, and make an inspection log available to the local authority when asked. ▪ Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. <u>Preparing and Maintaining the site</u> ▪ Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. ▪ Erect solid screens or barriers around dusty activities or the site boundary that they are at least as high as any stockpiles on site. ▪ Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period. ▪ Avoid site runoff of water or mud. ▪ Keep site fencing, barriers and scaffolding clean using wet methods. ▪ Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. ▪ Cover, seed or fence stockpiles to prevent wind erosion. <u>Operating Vehicle/Machinery and Sustainable Travel</u> ▪ Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable. ▪ Ensure all vehicles switch off engines when stationary - no idling vehicles. ▪ Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practical. ▪ Impose and signpost a maximum-speed-limit of 25 km/h on surfaced and 15 km/h on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). ▪ Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. ▪ Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).		

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						Construction Operations ▪ Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. ▪ Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate. ▪ Use enclosed chutes and conveyors and covered skips. ▪ Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. ▪ Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods. Waste Management ▪ Avoid bonfires and burning of waste materials. Construction Activities ▪ Avoid scabbling (roughening of concrete surfaces) if possible. ▪ Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. ▪ Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. ▪ For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust. Measures Specific to track-out ▪ Use water-assisted dust sweeper(s) on the access and local roads to remove, as necessary, any material tracked out of the site. ▪ Avoid dry sweeping of large areas. ▪ Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. ▪ Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. ▪ Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. ▪ Access gates to be located at least 10 metres from receptors where possible. Construction Traffic ▪ Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable.		

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						▪ Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. ▪ Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. ▪ Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. ▪ Record all inspections of haul routes and any subsequent action in a site log book.		
Noise and Vibration	Impact of construction activities on adjacent commercial receivers	C	A	3	Medium	<u>Implement community consultation or notification measures</u> ▪ Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. ▪ Notification should be a minimum of 7 calendar days prior to the start of works. For projects other than maintenance works more advanced consultation or notification may be required. Contact Roads and Maritime Communication and Stakeholder Engagement for guidance. ▪ Website (If required) ▪ Contact telephone number for community Email distribution list (if required) ▪ Community drop-in session (if required by approval conditions) <u>Site inductions</u> All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: ▪ all project specific and relevant standard noise and vibration mitigation measures ▪ relevant licence and approval conditions ▪ permissible hours of work ▪ any limitations on high noise generating activities ▪ location of nearest sensitive receivers ▪ construction employee parking areas ▪ designated loading/unloading areas and procedures ▪ site opening/closing times (including deliveries) ▪ environmental incident procedures. <u>Behavioural practices</u> ▪ No swearing or unnecessary shouting or loud stereos/radios on site. ▪ No dropping of materials from height, throwing of metal items and slamming of doors. <u>Verification</u> Where specified under Appendix C of the Roads and Maritime (now Transport for NSW) *Construction Noise and Vibration Guideline* (**CNVG**) a noise verification program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.	Ma	Low

SEARS	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
						Attended vibration measurements Where required attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage. Update Construction Environmental Management Plans The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies. Building condition surveys Undertake building dilapidation surveys on all buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage. Construction hours and scheduling Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Construction respite period during normal hours and out-of-hours work See Appendix C of the CNVG for more details on the following respite measures: ▪ Respite Offers (RO) ▪ Respite Period 1 (R1) ▪ Respite Period 2 (R2) ▪ Duration Respite (DR) Equipment selection Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained. Plant noise levels The noise levels of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the CNVG. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturer's specifications or Appendix H of the CNVG. Rental plant and equipment The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 2 of the CNVG. Use and siting of plant ▪ The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. ▪ Plant used intermittently to be throttled down or shut down. ▪ Noise-emitting plant to be directed away from sensitive receivers. ▪ Only have necessary equipment on site.		

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						Plan worksites and activities to minimise noise and vibration ▪ Locate compounds away from sensitive receivers and discourage access from local roads. ▪ Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. ▪ Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. ▪ Very noise activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11:00pm. ▪ Where practical, work should be scheduled to avoid major student examination periods when students are studying for examinations such as before or during Higher School Certificate and at the end of higher education semesters. ▪ If programmed night work is postponed the work should be re-programmed and the approaches in this guideline apply again. Reduced equipment power Use only the necessary size and power. Non-tonal and ambient sensitive reversing alarms ▪ Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. ▪ Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level. Minimise disturbance arising from delivery of goods to construction sites ▪ Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. ▪ Select site access points and roads as far as possible away from sensitive receivers. ▪ Dedicated loading/unloading areas to be shielded if close to sensitive receivers. ▪ Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. ▪ Avoid or minimise these out of hours movements where possible. Engine compression brakes ▪ Limit the use of engine compression brakes at night and in residential areas. ▪ Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard. Shield stationary noise sources such as pumps, compressors, fans etc. Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.		

SEARS	Potential Impact	Stage of Project	Likelihood	Consequence	Risk Level	Approach	Mitigation Measure (Pe/Pr/Ma)	Residual Impact
						<u>Shield sensitive receivers from noisy activities</u> Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant. <u>Structural surveys and vibration monitoring</u> ▪ Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. ▪ At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.		
Noise and Vibration	Operational noise impacts on receivers	O	B	2	High	▪ Lower noise output from roof mounted fans ▪ Use of broadband and/or ambient noise sensing reversing alarms ▪ Roller doors to be kept closed when un/loading is not occurring	Pr/Ma	Low
Stormwater and Wastewater	Impacts of construction stormwater, sediment and site run off	C	B	2	High	Erosion and sediment control plan: <u>Sediment Fences</u> Sediment fences are to be located around the perimeter of the site to ensure no untreated runoff leaves the site. They will also be located around the existing drainage channels to minimise sediment migration into waterways and sediment basins. <u>Stabilised Site Access</u> Stabilised site access is proposed at the entry to the works area. This will limit the risk of sediment being transported onto Raymond Avenue and other public roads. <u>Other Management Measures</u> Other management measures that will be employed include: ▪ Minimising the extent of disturbed areas across the site at any one time. ▪ Progressive stabilisation of disturbed areas or previously completed earthworks to suit the proposal once trimming works are complete. ▪ Regular monitoring and implementation of remedial works to maintain the efficiency of all controls.	Ma	Low
Aboriginal Cultural Heritage	Impacts of construction activities on unexpected archaeological finds	C	D	3	Low	<u>Archaeological Finds Procedure</u> Should any archaeological deposits be uncovered during any site works, the following steps must be followed: 1. All works within the vicinity of the find must immediately stop. The find must not be moved ‘out of the way’ without assessment. 2. The site supervisor or another nominated site representative must contact either the project archaeologist (if relevant) or Heritage NSW (Enviroline 131 555) to contact a suitably qualified archaeologist.	Ma	Very low

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						3. The nominated archaeologist must examine the find, provide a preliminary assessment of significance, record the item and decide on appropriate management measures. Such management may require further consultation with Heritage NSW, preparation of a research design and archaeological investigation/salvage methodology and registration of the find with the Aboriginal Heritage Information Management System. 4. Depending on the significance of the find, reassessment of the archaeological potential of the subject area may be required and further archaeological investigation undertaken. 5. Reporting may need to be prepared regarding the find and approved management strategies. 6. Works in the vicinity of the find can only recommence upon receipt of approval from Heritage NSW. <u>Human Remains Procedure</u> In the unlikely event that human remains are uncovered during the proposed works, the following steps must be followed: 1. All works within the vicinity of the find must immediately stop. The find must be cordoned-off and signage installed to avoid accidental impact. 2. The site supervisor or other nominated manager must notify the NSW Police and Heritage NSW (Enviroline 131 555). 3. The find must be assessed by the NSW Police, which may include the assistance of a qualified forensic anthropologist. 4. Management recommendations are to be formulated by the NSW Police, Heritage NSW and site representatives. 5. Works are not to recommence until the find has been appropriately managed.		
Environmental Heritage	Impacts of construction activities on unexpected archaeological finds	C	D	3	Low	<u>Archaeological Finds Procedure</u> Should any archaeological deposits be uncovered during any site works, the following steps must be followed: 1. All works within the vicinity of the find must immediately stop. The find must not be moved ‘out of the way’ without assessment. 2. The site supervisor or another nominated site representative must contact either the project archaeologist (if relevant) or Heritage NSW (Enviroline 131 555) to contact a suitably qualified archaeologist. 3. The nominated archaeologist must examine the find, provide a preliminary assessment of significance, record the item and decide on appropriate management measures. Such management may require further consultation with Heritage NSW, preparation of a research design and archaeological investigation/salvage methodology and registration of the find with the Aboriginal Heritage Information Management System. 4. Depending on the significance of the find, reassessment of the archaeological potential of the subject area may be required and further archaeological investigation undertaken.	Ma	Very low

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