

Glebe Island Concrete Batching Plant

Biodiversity Assessment



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14 February 2018

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Quality Information

Document Glebe Island Concrete Batching Plant Biodiversity Assessment

Ref \\ausyd1fp001\projects\605x\60555976\6. draft docs\6.1
reports\biodiversity\glebe island concrete batching plant biodiversity
assessment_20180214.docx

Date 14 February 2018

Prepared by J McMahon

Reviewed by D Jordan

Revision History



Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	30 January 2018	Draft for comment	Dr Darran Jordan – Senior Archaeologist and Heritage Specialist	
FINAL	14 February 2018	Final	Dr Darran Jordan – Senior Archaeologist and Heritage Specialist	

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Executive Summary

AECOM has been commissioned by Hanson Construction Materials Pty Ltd to prepare a Biodiversity Specialist Report in support of an application for the development of a new concrete batching plant on Glebe Island in Rozelle. This biodiversity specialist study relates to the construction of the proposed batching plant and the associated impact upon biodiversity values at the site.

This study focuses upon any threatened species previously recorded within the vicinity of the site, or likely to occur at the site. The report addresses likely impacts upon biodiversity values including threatened species and their habitat, and outlines relevant mitigation and management measures as recommendations. Where required, assessments of significance have been included for threatened species, and ecological communities as per the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.0 Introduction

1.1 Background

AECOM has been commissioned by Hanson Construction Materials Pty Ltd to prepare a Biodiversity Specialist Report in support of an application for the development of a new concrete batching plant on Glebe Island, which will have the capacity to produce up to one million cubic metres of cement per annum.

Hanson currently operates a concrete batching facility at Blackwattle Bay, which is located on Bridge Road. The Blackwattle Bay facility also includes an aggregate shipping terminal, so it can take delivery of aggregates shipped from Hanson's Bass Point Quarry at Shellharbour.

Hymix, a subsidiary of Hanson, operates a concrete batching plant that is located north of the Sydney Fish Market at Bank Street, Pyrmont. The Hymix facility does not have shipping capability, so aggregates are delivered via road.

These sites have a combined capacity of up to 1,000,000m³ per annum and together supply approximately 35% of Sydney City's concrete requirements. They collectively employ approximately 67 full time equivalent employees.

This biodiversity specialist study relates to the construction of the proposed batching plant and the associated impact upon biodiversity values at the site.

This study focuses upon any threatened species previously recorded within the vicinity of the site, or likely to occur at the site. The report addresses likely impacts upon biodiversity values including threatened species and their habitat, and outlines relevant mitigation and management measures as recommendations. Where required, assessments of significance have been included for threatened species, and ecological communities as per the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Study area

The location of the proposal area and study area are shown in Figure 1.

The proposal area refers to those areas that would be affected during construction, including locations of ancillary sites. For the purposes of this report, the study area also includes an area within a 50 metre buffer of the proposed works area (extended facility). This area has been included so as to identify and assess the potential direct and indirect impacts of the proposal upon biodiversity values in the vicinity of the development.

1.3 Description of the Proposal

Hanson proposes to construct a new concrete batching plant on Glebe Island in Rozelle. The proposed plant would serve two purposes:

- To act as an aggregate shipping facility that will support a number of Hanson (and Hymix) concrete batching plants to achieve a reduction in the number trucks by up to 65,000 vehicles per annum
- To operate as a concrete batching plant that can supply concrete for infrastructure and buildings in the CBD and inner suburbs.

The concrete batching plant would be supported by new aggregate shipping terminal facilities at GLB1 with the capacity to manage up to 1 million cubic metres of concrete aggregates per annum delivered by ship from the Hanson Bass Point Quarry and other facilities if deemed viable.

The plant is proposed to adopt a low profile design sympathetic to its surrounding environs. The majority of the batching activities will be undertaken in an enclosed area in order to limit the noise and

air quality impacts of the proposed plant. The highest structures will be the cement silos which will be up to 35 m tall, significantly less than the adjacent heritage listed Glebe Island Silos.

A locality map showing the location of the proposal is provided in Figure 1. A preliminary drawing of the layout of the proposal is included in Figure 2.



Figure 1 Location of the proposal

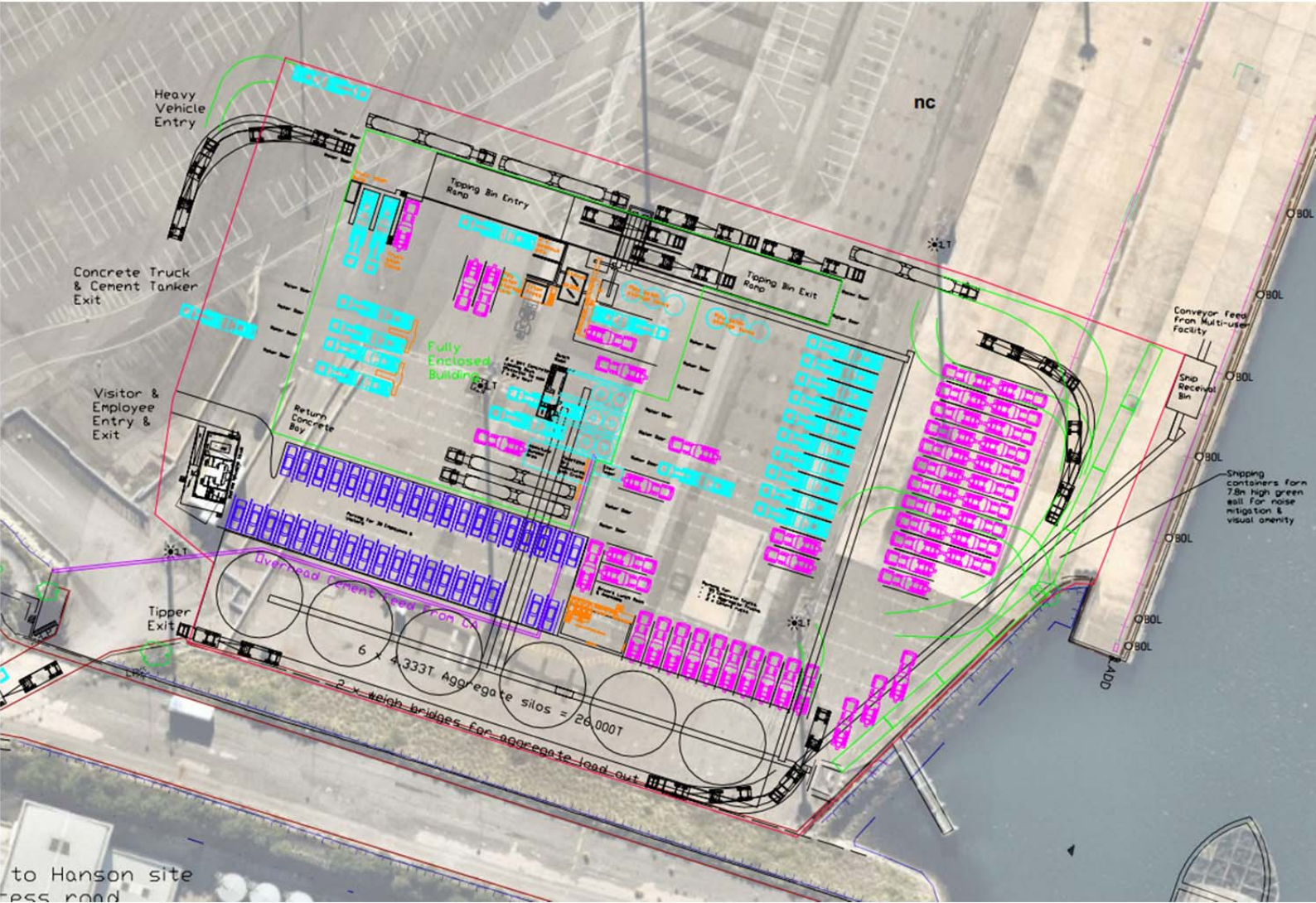


Figure 2: Proposed layout of Hanson concrete batching plant, Glebe Island

1.4 Legislative context

1.4.1 Commonwealth Legislation

1.4.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires that Commonwealth approval be obtained for certain actions, and establishes an assessment and approvals system for actions that have or are likely to have, a significant impact on Matters of National Environmental Significance (MNES). Matters of NES considered in this report include listed threatened species, populations and ecological communities as well as migratory species protected under international agreements. Particular consideration has been given to potential impacts on threatened biota that occur or could occur in the study area. Potential impacts are discussed in Section 4 of this technical report.

1.4.3 NSW State Legislation

1.4.3.1 Environmental Planning and Assessment Act 1979

This assessment has been prepared to consider the potential environmental impacts of the proposal, in keeping with the legislative requirements of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EP&A Act provides the statutory basis for planning and environmental assessment in New South Wales. This biodiversity specialist report is provided as part of the environmental assessment and technical considerations prepared in support of the Environmental Impact Statement for the proposal.

1.4.3.2 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) protects threatened flora and fauna species and ecological communities and their habitats within NSW. Particular attention has been given to potential impacts on threatened biota that occur or are likely to occur within the study area. Potential impacts are discussed in Section 4 of this technical report.

It should be noted that the BC Act typically requires the preparation of a Biodiversity Development Assessment Report (BDAR) and Biodiversity Offset Strategy (BOS) for all state significant projects (as this project is). In this case however the NSW Department of Planning and Environment (DPE) have provided amended Secretary's Environmental Assessment Requirements (SEARs) for the project that remove the requirement to prepare these reports. This is on the basis of the extremely low biodiversity value of the proposal area and the low degree of off-site impacts.

1.4.3.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) protects threatened species, populations and ecological communities of fish and marine vegetation, and other living resources of Australian waters. Species listed under this act are considered alongside those of the TSC and EPBC Acts and assessed within this report.

1.4.3.4 Biosecurity Act 2015

Under the *Biosecurity Act 2015*, Hanson as the occupier of the land is required to prevent, eliminate or minimise the risk posed by a prohibited matter as outlined in Schedule 2 of the Act so far as is reasonably practicable. Section 4.3 of this report considers weeds declared as priority weeds in the City of Sydney local government area (LGA) that occur within the study area. A priority weed is one that should be prevented, managed, controlled or eradicated in the region.

1.5 Study Aims

The key aims of this study are to:

- Undertake a review of published documentation and a desktop study of flora and fauna relevant to the proposal area, identifying species and communities that may be present
- Conduct a field inspection of the proposal area, with particular attention to impacts on species, populations and ecological communities listed under the BC Act, FM Act and/or the EPBC Act
- Identify and assess likely impacts to flora and fauna arising from the proposal
- Undertake assessments of significance under the BC Act and the EPBC Act for threatened biota, where required
- Identify measures for managing impacts on threatened biota during design, construction and operation of the proposed facility.

2.0 Methodology

2.1 Database searches and literature reviews

Desktop research was undertaken prior to the commencement of field surveys and included database searches and a review of relevant literature to determine if targeted surveys for specific species were required. These searches also helped to identify threatened biota known or likely to occur in the proposal area.

The following databases and resources were investigated:

- NSW Office of Environment and Heritage Atlas of NSW Wildlife Database within a 5 kilometre radius of the proposal area (OEH 2017a)
- Protected Matters Report that documents all Matters of National Environmental Significance (NES) within 5 kilometres of the proposal area; NES include threatened species, communities and migratory species which are listed under the EPBC Act (DoEE 2017)
- NSW Office of Environment and Heritage, Vegetation Types Database and Threatened Species Profile Database (OEH 2017b)
- NSW Department of Primary Industries. Fishing and Aquaculture – Profiles for species, populations and ecological communities (DPI 2017a)
- NSW Department of Primary Industries WeedWise Priority Weeds List (DPI 2017b)
- Survey methods were developed following a review of the OEH Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft) (DEC 2004).

2.2 Field survey

A field survey was undertaken at the site on 13 December 2017 by Jamie McMahon, a qualified and experienced ecologist from AECOM Australia. The survey was undertaken between 10:00am and 12:15pm, during which time the weather was sunny and approximately 28 degrees.

The field inspection generally documented relevant aspects such as slope, aspect, general vegetation coverage and drainage. The assessment also included a habitat assessment with particular reference to potential habitat for threatened species and populations. GPS-tagged site photographs were taken.

Due to the limited scope of the proposal and the cleared nature of the majority of the proposal area detailed floristics were not undertaken. Where required, specimens were collected for later identification. Notes were made however on the presence/absence of broad ecological communities and the structure of any vegetation. The site was also generally inspected for the purposes of informing an assessment of any off-site impacts that could arise from the proposal.

Based on the nature of the proposal and results of the desktop assessment it was deemed that the potential risk to fauna species including mammals, birds, reptiles, amphibians and invertebrates was low. Survey for potentially occurring threatened species was limited to habitat assessment only and did not include detailed fauna assessment such as trapping, spotlighting or deployment of bat detectors. The site inspection occurred during the daytime and no nocturnal survey was undertaken.

Fauna habitat assessments included targeted searches for important habitat features such as fruiting vegetation, hollow bearing trees, coarse woody debris, permanent and ephemeral waterways and other relevant features.

Marine survey of the adjacent Jones bay and White Bay was to undertaken though the foreshore and shallows adjacent to the proposal area were inspected from the existing dock.

2.3 Limitations

Limitations to the biodiversity survey, which may impact on survey results, included:

- Detailed floristics were not undertaken on site. Instead specimens were collected for later identification including allocation of ecological communities

- While fauna habitat assessment was undertaken, this technique is not an adequate substitute for fauna surveys. Fauna are capable of inhabiting sub-optimal habitat, and fragmentation, isolation or species density can all influence the presence and distribution of a particular species. Species likelihood of occurrence was informed by considering habitat characteristics and opportunistic sightings. No fauna trapping was undertaken
- Marine survey of the adjacent Jones bay and White Bay was not undertaken though the foreshore and shallows adjacent to the proposal area were inspected from the existing dock. It should be noted however that no threatened reptiles, aquatic invertebrates or fish have been previously recorded within 5 kilometres of the study area.

3.0 Existing Environment

3.1 Landscape context

The proposal area is located approximately 2 km from the centre of Sydney's CBD. The locality is dominated by a heavily urbanised landscape including existing and historic industrial and residential land uses.

The proposal area, as well as the surrounding concreted space, is completely flat. To the south the embankment for the western road approach of Glebe Island Bridge are present. This embankment is approximately 7 metres high with a gentle dip downwards to the west.

The site is located within the Sydney Harbour catchment.

3.2 Land use

The land surrounding the proposal area is generally dominated by heavily urbanised landscape including existing and historic industrial and residential land uses. Along the eastern side of the proposal area is Jones Bay, which is a part of the greater Sydney Harbour.

To the north and west of the site are large open expanses of sealed (concreted) areas historically used for shipping and logistics. To the south of the site is the historic and now unused Glebe Island Bridge, with Anzac Bridge slightly further south again.

Access to the site is via James Craig Road, which enters towards the southwest of the site. This connects to City West Link just to the east of The Crescent in Annandale.

Further afield the locality continues to be dominated by the urbanised landscape of the inner west of Sydney. This includes the major arterial roads of City West Link and Victoria Road, as well as large tracts of existing residential housing throughout Rozelle, Annandale, Lilyfield and Balmain.

Across Jones Bay to the east is Pyrmont, which is largely dominated by high rise commercial and residential properties.

3.2.1 Vegetation communities

The proposal footprint itself is completely cleared of all remnant vegetation. Review of aerial photography from 1943 indicates that this has been the case since at least that time and likely for many decades prior.

Within a 200 m buffer of the proposal footprint are several small areas of vegetation, with these being nearly exclusively exotic or common native vegetation. This includes groundcover along the embankment of the Glebe Island Bridge approach.

The nearest substantial areas of vegetation are those within Waterfront Park on the opposite side of Jones Bay, and landscaping vegetation along the approach to Anzac Bridge, approximately 200 metres to the west.



Figure 3: Vegetation on the Glebe Island Bridge Approach Embankment

3.2.2 Threatened ecological communities

A NSW Wildlife Atlas and Commonwealth protected matters search identified five threatened ecological communities (TEC) within 5 kilometres of the proposal area (See Appendix B). Of these, none were deemed to have a moderate or high potential of occurring within the study area (Table 1).

Table 1 Threatened ecological communities

Threatened ecological communities	BC Act	EPBC Act
Coastal Upland Swamps of the Sydney Basin Bioregion	E	E
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Coastal Upland Swamps in the Sydney Basin Bioregion	CE	E
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	CE	CE
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	CE	CE
Western Sydney Dry Rainforest and Moist Woodland on Shale	E	CE

The Sydney Metropolitan Area native vegetation mapping (2013) indicates the presence of estuarine mangrove forest, estuarine saltmarsh and seagrass meadows within 5 kilometres of the proposal area. These three types of vegetation are all protected under the FM Act and require approval from DPI Fisheries prior to undertaking any activities that would result in an adverse effect upon this vegetation.

Despite no marine assessment being undertaken as part of the ecological survey it was evident that no vegetation protected under the FM Act was present within the vicinity of the proposal.

3.2.3 Fauna habitat

The site comprises extremely little habitat value for most native fauna on the basis that it generally lacks functional stands of vegetation. One area adjacent to the site, the Glebe Island Bridge approach, is generally covered with exotic grasses (Foxtail grass) and Lantana and is not considered to offer any viable habitat.

The adjacent shoreline was observed to be generally rocky and liberally covered with Sydney Rock Oysters. Scattered outcrops of algae were present just below the waterline, though it was noted that

the seabed drops rapidly at this point, presumably to allow ships to dock alongside. As such the habitat value of the intertidal and subtidal area is not considered to be high.

The site may be occasionally used for overflight for migratory birds and bats, though this was not confirmed during the site visit.

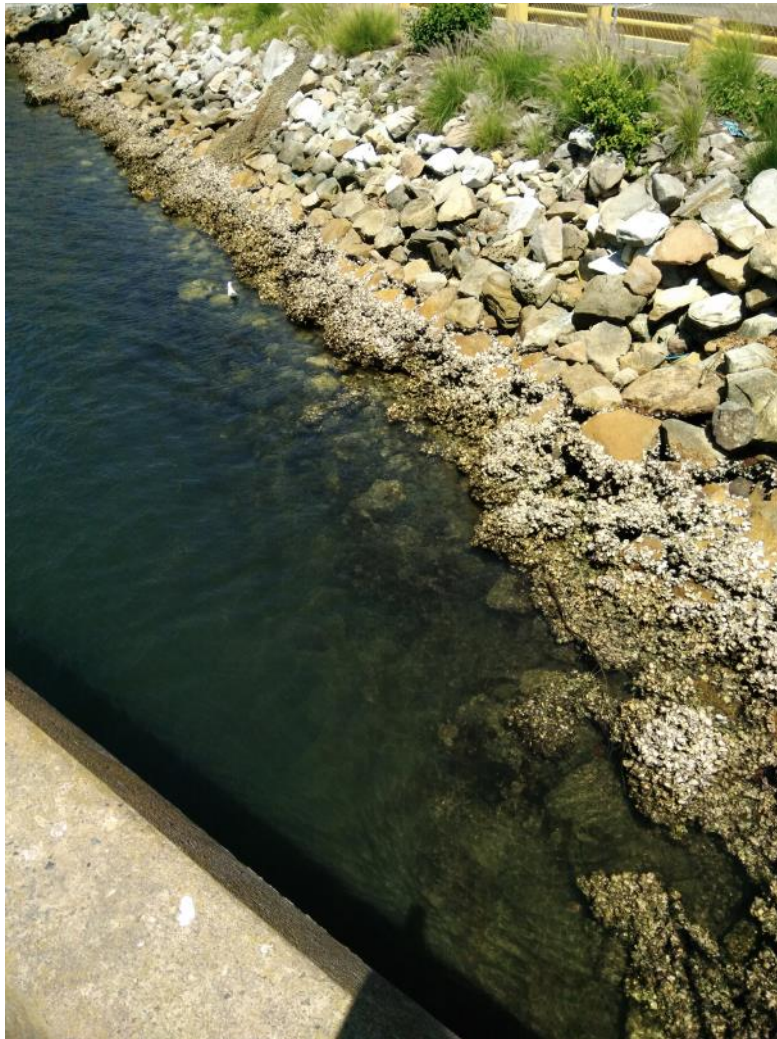


Figure 4: Intertidal habitat adjacent to the proposal area

3.2.4 Threatened flora and fauna species endangered populations

3.2.4.1 Flora

A NSW Wildlife Atlas search returned 27 threatened ecological communities within 5 kilometres radius of the study area (OEH 2017a). Of these 16 are also listed as threatened under the EPBC Act.

Searches of the NSW Wildlife Atlas also returned records for a total of 33 threatened flora species within the same search area. Of these 18 are also listed as threatened under the EPBC Act.

The Commonwealth Protected Matters search within a 5 kilometre radius of the site returned 16 flora species protected under the EPBC Act, all of which are also listed under the BC Act (Appendix B).

A search of NSW Flora online provided seven ROTAP (Rare or Threatened Australian Plants) species: *Convolvulus erubescens*, *Persoonia hirsuta*, *Tetratheca glandulosa*, *Tetratheca juncea*, *Acacia terminalis* sups *terminalis*, *Prostanthera marifolia* and *Boronia serrulata*, all based on specimens lodged at the National Herbarium of NSW.

Vegetation ecological communities mapped within 5 kilometres of the proposal area are shown in Figure 6.

Threatened flora records in the vicinity of the proposal area are shown in Figure 7.

Based on the nature of the study area, including the overall lack of any exposed soil, the proposal area is not considered likely to provide potential habitat for any threatened ecological community or threatened flora species.



Figure 5: Weeds and native vegetation along the Glebe Island Bridge embankment



Figure 6 Vegetation mapped within 5 km radius of the proposal (The Native Vegetation of the Sydney Metropolitan Area (2013))

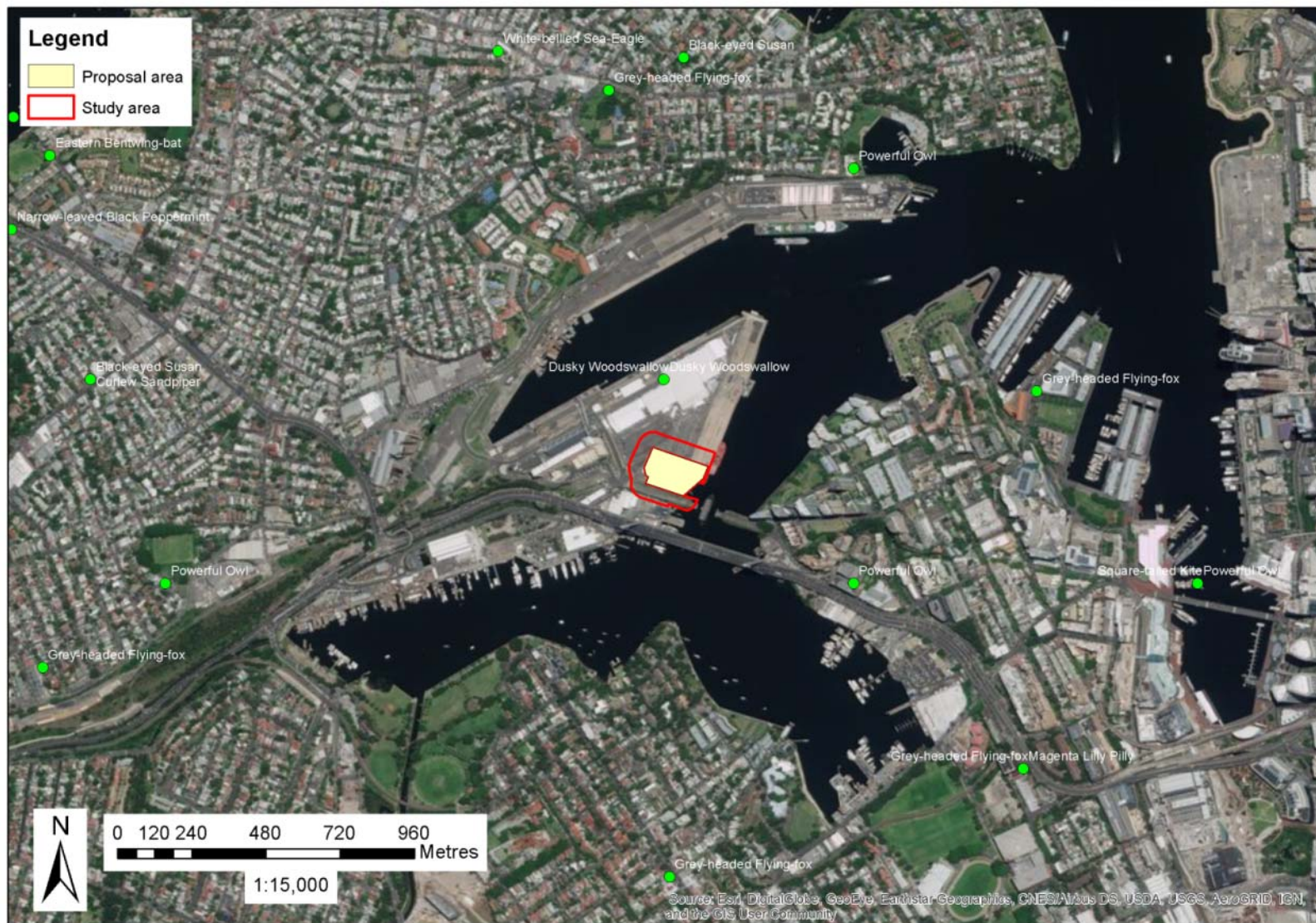


Figure 7 Threatened species records within the vicinity of the proposal area (NSW Wildlife Atlas 2016)

3.2.4.2 Fauna

A search of the NSW Wildlife Atlas for threatened fauna species was undertaken for a radius of 5 km from the site. This search yielded 55 species listed under the BC Act, 31 of which are also protected under the EPBC Act. A further 14 threatened or migratory species with known or potential habitat in the area are protected under the EPBC Act only (Appendix B).

Field surveys did not identify any threatened fauna species as being present within the site or having the potential to utilise the site in any non-trivial manner.

Based on the nature of the study area, including the overall lack of suitable foraging and roosting resources and exposed soil, the proposal area is not considered likely to provide potential habitat for any threatened ecological community or threatened fauna species.

3.2.4.3 Migratory species

The results of the 5 kilometres database search around the proposal area included 14 migratory species. The site was found to lack habitat for all of these species, largely due to the lack of any substantial shallow intertidal mud or sand flats.

3.3 Pest species

The proposal area is located within a highly urbanised area with a significant and obvious history of development. Such areas would be typically expected to accommodate a variety of pest species. In this case however the sheer lack of ecological function of nearly any kind indicates that the degree of usage by pest species is likely to be low.

4.0 Potential impacts

Due to the nature of the proposal and its location, impacts upon biodiversity values are generally expected to be very limited. Potential impacts detailed below have been assessed on the basis of consideration of both direct and indirect effects, and the resulting change to the biophysical and ecological processes that establish and support the biodiversity values of the study area.

The potential impacts identified in this chapter consider:

- The scale (local and regional), timing, frequency and duration of activities that may result in impacts during construction and operational phases of the proposal
- The significance of the impact, including reasoning from the assessments of significance (AoS) in Appendix C and Appendix D
- Other anthropogenic activities that influence cumulative impacts on biodiversity in the area.

4.1 Threatened species and ecological communities

No threatened ecological communities identified within 5 kilometres were identified as being present adjacent to the proposal area. As such there would be no direct impacts upon this matter.

Given the location of the project immediately adjacent to the harbour the potential for indirect impacts upon EECs is also considered to be negligible.

4.2 Loss of vegetation, habitat and connectivity

The proposal would not result in the direct removal/disturbance of any native vegetation. The proposal may include the removal of isolated patches of weeds though these would not provide any functional habitat value at this site.

Terrestrial habitat and connectivity through the site are similarly poor based upon the extensive historic clearing of this location and the lack of any functional habitat vegetation, native or otherwise. This site may provide an overflight area for mobile species birds and bats though this would not be affected by the presence of the proposed development.

The proposed development has the potential to affect local water quality, particularly adjacent to the dock at the east of the site. Based on the nature of the development it is likely that there would be quantities of unconsolidated material present within the site.

4.3 Weeds, pests and pathogens

Two species of Priority Weeds listed in the City of Sydney LGA were identified within the proposal area (Appendix A):

- Lantana (*Lantana camara*)
- Fireweed (*Senecio madagascariensis*).

The movement of vehicles and personnel into and throughout the proposal area has the potential to facilitate the spread of weeds and pathogens. For this proposal however the risk of such weed spread is considered to be minimal due to the proposal being undertaken wholly within cleared and sealed areas, as well as the use of appropriate mitigation measures. As such the overall weed impact associated with the construction phase of this proposal is considered to be minimal.

No significant impacts arising from the introduction or spread of weeds are expected during the operational phase providing relevant management measures are implemented.

The proposal area is likely to be utilised by some pest species such as rats and potentially rabbits. Impacts from pest species are likely to include ongoing grazing of the adjacent embankment and predation on small to medium native fauna. The proposal is unlikely to alter the levels of such species in and around the site, either positively or negatively, due to the localised nature of the works and the relative permeability of fencing proposed around the proposed facility. As such the overall impact in this regard is considered to be neutral with respect to the baseline scenario.

4.4 Noise, vibration and light

During the site inspection it was noted that the site is characterised by low to moderate levels of background noise. Noise generated around the site is generally restricted to the movement of small vehicles, distant traffic noise from Anzac Bridge and the movement of passing vessels.

Construction activities associated with the proposal would generate noise in the immediate locality. This would include noise associated with vehicles, plant and machinery as well as that from the movement of staff and materials into and out of the site. Lighting would be restricted to selected night works, which are only expected to be required intermittently.

Vibration during construction is expected to be restricted to the intermittent and infrequent use of heavy equipment.

Noise, vibration and light impacts upon biodiversity during construction are expected to be minimal based on the general lack of fauna likely to use the site in any substantive way. Some highly mobile species such as birds and bats may be discouraged from flyover behaviour under certain scenarios though this is not expected to be significant in the context of the surrounding highly urbanised environment.

During operation it is expected that the site would be relatively noisy compared to the existing baseline. Operation is likely to occur 24 hours a day, though the intensity of night works would be lower. Sources of noise would include the movement of heavy and light vehicles, delivery vessel movements and the operation of conveyors and other machinery. It is noted that much of the activity during operation would be undertaken in the site shed (concrete mixing, truck loading etc.), which would reduce external noise impacts.

Vibration during operation would be limited to that of heavy vehicles moving around the site, which is not considered likely to affect biodiversity values.

As per the construction phase, noise, vibration and light impacts upon biodiversity during operation are expected to be minimal based on the general lack of fauna likely to use the site in any substantive way. Some highly mobile species such as birds and bats may be discouraged from flyover behaviour under certain scenarios though this is not expected to be significant in the context of the surrounding highly urbanised environment and the fact that most operations would occur within the site shed, which is generally likely to minimise external impacts.

4.5 Runoff and sedimentation

The proposal would involve the transport of large quantities of sand, aggregate cement and concrete into, around and out of the site. There is the potential for these materials to unintentionally escape the site and wash into adjacent waters of Jones Bay (Sydney Harbour). Whilst there is a high likelihood that the sediments in this location are heavily contaminated from historical industrial activity the general water column appeared during the site inspection to be relatively clear and free of suspended sediment. The immediate shoreline below and in front of the dock supports oysters and a small amount of kelp, indicating that light commonly penetrates the upper parts of the water column.

The proposal includes a number of measures to minimise the escape of materials from the site by means of water or wind, including:

- All vehicle loads would be covered to prevent escape of loose materials during transport
- Concrete trucks would enter the wash area prior to exiting the site to ensure vehicles are clean
- Receival bins would be located inside the enclosed building to minimise exposure to wind
- Ships will deliver aggregate to the Site via Glebe Island Berth one. Using the shipping terminal capability with enclosed conveyors is designed to reduce the overall environmental impact and minimise regional road traffic impacts
- Fully enclosed conveyers and transfer points would be used to move aggregate and sand to holding hoppers
- Fully enclosed holding hoppers would be used

- An enclosed loading bay would be used
- Use of an enclosed pneumatic transfer system when filling cement and fly ash silos and loading agitator trucks
- The automatic silo fill system would shut the fill pipe near the tanker connection if the silo becomes full
- All cement hoppers would be fully enclosed
- Use of bag filters for dry dust collection and filtering
- All internal roads would be sealed and kept clean
- All vehicles on site would be subject to speed limits
- All truck loads would be covered
- A wash down area for agitator trucks and raw material delivery trucks would be included
- Regarding Washdown and Barrel 'Washout' water, approximately 61.5 kL/day of wastewater will be generated from washing down work areas and trucks, and 220kL/day from washing out truck concrete barrels. This water will be collected within the stirrer pit to be used to supplement other water supply for concrete production.

4.6 Injury and mortality

During both construction and operation the proposal would involve the movement of plant, machinery materials and heavy and light vehicles. The potential for direct injury or mortality within the site is expected to be minimal based on the near absence of functional fauna habitat.

4.7 Impacts from relevant key threatening processes

This proposal is not likely to result in the operation of, or increase the impact of, a key threatening process.

4.8 Cumulative impacts

The project is planned in the context of an active and rapidly developing part of the harbour and Sydney generally. Other known large projects within the vicinity of the proposal include:

- Glebe Island Multi-user Facility, Port Authority of NSW
- White Bay Power Station redevelopment
- Sydney Fish Markets redevelopment
- WestConnex M4-M5 Link, including surface road works to Victoria Road, City West Link and The Crescent
- Rozelle Rail Yards Site Management Works
- Sydney Light Rail Maintenance Facility (within Rozelle Rail Yards)
- The Bays Precinct Transformation Plan

The potential for cumulative impacts to occur is dependent upon this project resulting in an incremental and residual impact upon biodiversity. For most aspects of this assessment it is clear that there would be no incremental or residual impact, based upon the current general lack of biodiversity value within the site. As has been outlined in Section 4.5, the risk of stormwater run-off will be minimised through the Watercycle management strategy prepared by Martens and the other previously outlined mitigation measures. This manages the potential for an incremental and residual impact to adjacent marine environment by controlling run-off and removing the cause of sedimentation risk.

5.0 Management measures

Within the context of the proposed industrial use of the proposal area, and to the extent that is safe and practicable, consideration should be given to implementing the management measures described in Table 2 to protect and enhance existing ecological assets and values. These measures have been determined with view primarily to protecting residual biodiversity values within the proposal area.

The management measures provided are broadly listed in order of priority for managing ecological values.

Table 2: Proposed management measures for the mitigation of impacts upon biodiversity

Objective	Ref	Management measure
Protection of local habitats during construction	A1	Minimise unnecessary intrusion into the adjacent waterway during construction so as to minimise impacts upon marine species and habitats
	A2	If it is perceived that significant impacts are occurring to marine environments within the vicinity of the work area (e.g. spill of any chemicals), works at that location should cease and contact environment personnel for advice
	A3	If unexpected threatened flora or fauna species are discovered, stop works immediately and contact environment personnel for advice
	A4	WIRES should be consulted if any injured fauna are encountered
	A5	Reduce the potential for off-site impacts arising from sedimentation, dust, and noise through the implementation of a Construction Environment Management Plan (CEMP). Where practical the CEMP should seek to retain vegetation present within and around the proposal area. The plan should include a Site Erosion and Sediment Control Plan in accordance with the Blue Book (Landcom 2004). The need for additional sediment control measures should be considered prior to construction to ensure that sediment, chemicals, materials and any other material other than clean water is prevented from entering the adjacent waterway
Protection of local habitats during operation	B1	All commitments with respect to management of materials on site should be adequately implemented so as to reduce the potential for their escape by means of air, water or otherwise (e.g. vehicle tracks). All traps, sumps, bunds and other pollution control devices should be inspected on a weekly basis at a minimum to ensure that these are functioning correctly and that material is not being allowed to enter the waterway. Material caught in these devices should be removed by a licenced waste contractor and deposited in a licenced landfill site. No material is to be disposed of on or near the site
	B2	The loading and unloading of all vessels carrying materials (sand, aggregate etc) should be monitored at all times so that action can be taken immediately should conveyors or other equipment malfunction allowing material into the waterway
	B3	The tyres of all vehicles should be inspected and/or washed down as required prior to leaving the site in order to prevent the tracking of materials onto local roads (which would then wash into the harbour)

Objective	Ref	Management measure
	B4	Appropriate measures should be taken to ensure that material is prevented from leaving the site through wind action. This should include management procedures to close the doors to the facility during high winds or when high winds are expected
Weeds and disease	C1	Minimise the overall disturbance of soils where possible to avoid providing further disturbed ground for colonisation by weeds
	C2	Minimise the import or export of soil material from the site wherever possible to avoid the inadvertent movement of weed seed
Waste	D1	All waste material and rubbish associated with the proposal during operation and construction, particularly chemicals, to be removed from site and properly disposed of at a licenced waste facility

6.0 Conclusion

6.1 Overview of key findings

The proposal area is generally in a very poor ecological condition. The site is fully cleared and is virtually completely sealed. There are no substantial areas of existing vegetation, native or otherwise. The site has a clear history of general and heavy industrial land use and the potential for it to exhibit any reasonable level of ecological function without significant intervention is remote.

The proposed development is to construct a concrete batching plant within the site. This proposal would not require the clearing of any vegetation, nor would it substantially interfere with the immediate potential for the site in its current state to recover ecologically. Whilst it is recognised that there would be a minor degree of disturbance from noise, vibration and light during construction these and the other terrestrial ecological impacts associated with the proposal are expected to be very low.

During operation the site would be largely occupied by operational buildings and plant, sealed vehicles parking and other vehicle circulation areas. Whilst ongoing habitat value of the proposal area is expected to be low, there may be opportunities for the inclusion of local native species within landscaped areas, pending final design of the facility.

Indirect impacts arising from construction and operation may result in off-site impacts upon the adjacent waterway (Jones Bay) from the escape of materials (sand, cement, concrete etc.) The potential for adverse impacts upon the marine environment have been considered and are expected to be low, providing all commitments outlined in this report and mitigation measures are fully and consistently implemented throughout the life of the operation.

This report has assessed the potential for the presence of threatened species and ecological communities as listed under the BC Act and the EPBC Act. The assessment has found that there is a very low likelihood of occurrence for all such threatened species within the footprint of the site. As such the potential for impacts upon terrestrial threatened species and ecological communities is considered to be negligible.

Based on the nature of the proposal, the existing condition of the site and the commitment by the proponent to implement appropriate mitigation and management measures, the overall impact upon biodiversity values arising from this project is considered to be low.

6.2 Recommendations

The proposal is recommended to proceed subject to the ongoing implementation of the management measures provided in Section 5.0 of this report.

7.0 References

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Appendix A

Flora and Fauna
recorded during field
survey

Appendix A Flora and Fauna recorded during field survey

Scientific name	Common name	Observation method
Flora		
<i>Acacia longifolia</i>	Sydney golden wattle	Observed
<i>Ageratina adenophora</i> *	Crofton weed	Observed
<i>Ailanthus altissima</i> *	Tree of heaven	Observed
<i>Araujia sericifera</i> *	Moth vine	Observed
<i>Chloris sp.</i>	Windmill grass	Observed
<i>Conzya bonariensis</i> *	Fleabane	Observed
<i>Cyperus sp.</i>		Observed
<i>Foeniculum vulgare</i> *	Fennel	Observed
<i>Lantana camara</i> *^	Lantana	Observed
<i>Pennisetum alopecuroides</i> *	Foxtail grass	Observed
<i>Pennisetum clandestinum</i> *	Kikuyu	Observed
<i>Phoenix dactylifera</i> *	Date palm	Observed
<i>Prunus sp.</i> *	Prunus plum	Observed
<i>Rumex sp.</i> *	Dock	Observed
<i>Senecio madagascarensis</i> *^	Fireweed	Observed
<i>Verbena bonariensis</i> *	Purple top	Observed
Fauna		
<i>Chroicocephalus novaehollandiae</i>	Silver gull	Observed

* Denotes introduced species # Denotes threatened species ^ Denotes Priority Weed

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Appendix B

Flora and fauna species
with the potential to
occur in the proposal
area

Appendix B Flora and fauna species with the potential to occur in the proposal area

Note: List of threatened species, populations, or ecological communities which may be affected directly or indirectly by the Proposal is derived from searches of the following databases as well as on ground survey conducted February 2016:

1. NSW Office of Environment and Heritage Atlas of NSW Wildlife Database (OEH 2014a).
2. Protected Matters Report that documenting Matters of National Environmental Significance (MNES) within 10 kilometres of proposal area (Department of the Environment, 2014).
3. NSW Office of Environment and Heritage Endangered Ecological Community and Threatened Species Profiles (OEH, 2014b).
4. NSW Flora Online Search – Rare or Threatened Australian Plants (ROTAP) species (The Royal Botanic Gardens and Domain Trust 2014).
5. Department of Primary Industries: Fishing and Aquaculture – Profiles for species, populations and ecological communities (NSW Government, 2005)

Table 3 Threatened species with potential to occur within proposal area and assessment of likelihood of occurrence for each species. Note: V = Vulnerable, E = Endangered, EP = Endangered Population, CE = Critically Endangered, K = known to occur, P = predicted to occur

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
Amphibians						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog		V	V	Distributed through the Sydney Basin sandstone country in woodland, open woodland and heath vegetation, breeding habitat is generally soaks or pools within first or second order streams, but also 'hanging swamp' seepage lines and where small pools form from the collected water. Spend the majority of time in non-breeding habitat up to 300 m away and burrows in soil surface or leaf litter.	Low
<i>Litoria aurea</i>	Green and Golden Bell Frog		E	V	Large populations in NSW are located around coastal and near coastal areas of the metropolitan areas of Sydney, Shoalhaven and mid north coast. It inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.)	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Pseudophryne australis</i>	Red-crowned Toadlet		V		Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5.	Low
Birds						
<i>Actitis hypoleucos</i>	Common Sandpiper			M	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves.	Low
<i>Anseranas semipalmata</i>	Magpie Goose		V		Typically found in shallow open wetlands with fringing rushes or sedges.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Anthochaera phrygia</i>	Regent Honeyeater		CE	CE	Inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. NSW the distribution is very patchy and mainly confined to the two main breeding areas at Capertee Valley and the Bundarra-Barraba region and surrounding fragmented woodlands. Birds are also found in drier coastal woodlands and forests. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. These habitats have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Nectar and fruit from the mistletoes are also eaten during the breeding season.	Low
<i>Apus pacificus</i>	Fork-tailed Swift			M	Aerial space over a variety of habitat types; feeds on insects; breeds in Asia.	Low
<i>Ardea ibis</i>	Cattle Egret			M	The Cattle Egret is widespread and common according to migration movements and breeding localities surveys. Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass. Known to follow earth-moving machinery and has been located at rubbish tips. Uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. They have sometimes been observed in swamps with tall emergent vegetation. Often forages away from water on low lying grasslands, improved pastures and croplands. It is commonly found in cattle fields and other farm areas that contain livestock.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Ardenna pacificus</i>	Wedge-tailed Shearwater			M	A pelagic, marine bird known from tropical and subtropical waters. The species tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 ‰. In tropical zones the species may feed over cool nutrient-rich waters.	Low
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow		V		The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides and on golf courses	Low
<i>Botaurus poiciloptilus</i>	Australasian Bittern		E	E	Inhabits temperate freshwater wetlands and occasionally estuarine reedbeds, with a preference for permanent waterbodies with tall dense vegetation. The species prefers wetlands with dense vegetation, including sedges, rushes and reeds. Freshwater is generally preferred, although dense saltmarsh vegetation in estuaries and flooded grasslands are also used by the species.	Low
<i>Burhinus grallarius</i>	Bush Stone-curlew		E		Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Low
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper			M	Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Low
<i>Calidris canutus</i>	Red Knot			E, M	Tidal mudflats, sandflats, beaches, saltmarsh, ploughed fields, flooded pasture	Low
<i>Calidris ferruginea</i>	Curlew Sandpiper		E	CE, M	Coastal migratory species with a NSW distribution from Hastings Point to Shoalhaven Heads. Found in open, sandy beaches with exposed sand bars and rocky outcrops. Rare use of near-coastal wetlands.	Low
<i>Calidris melanotos</i>	Pectoral Sandpiper			M	Shallow freshwaters with low vegetation, flooded pasture, swamp margins, sewage ponds; occasionally mudflats and saltmarsh	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Calidris tenuirostris</i>	Great Knot		V	CE, M	Migratory shorebird distributed along entire coast of NSW. Occur on intertidal mudflats in sheltered coastal area	Low
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo		V		Occupy coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where Casuarina and Allocasuarina species are present. This species is dependent on large hollow-bearing eucalypts for nesting.	Low
<i>Charadrius leschenaultii</i>	Greater Sand-plover		V	V, M	Occurs in coastal areas and inhabits littoral and eustarine habitats. Prefer sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks.	Low
<i>Charadrius mongolus</i>	Lesser Sand-plover		V	E, M	Occur along the Australian coastline with highest abundance north of Shoalhaven estuary. Habitat preferences for beaches, mudflats and mangroves.	Low
<i>Dasyornis brachypterus</i>	Eastern Bristlebird		E	E	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey.	Low
<i>Epthianura albifrons</i>	White-fronted Chat		V		Open damp ground, grass clumps, fencelines, heath, samphire saltmarsh, mangroves, dunes, saltbush plains	Low
<i>Erythrorhynchus radiatus</i>	Red Goshawk		CE	V	Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Adults appear to occupy territories throughout the year and breeding territories are traditionally used from year to year.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Fregetta grallaria</i>	White-bellied Storm-Petrel		V	V		Low
<i>Gallinago hardwickii</i>	Latham's Snipe			M	Soft wet ground, shallow water with tussocks, inundated parts of paddocks, seepage below dams, saltmarsh and mangrove fringes	Low
<i>Glossopsitta pusilla</i>	Little Lorikeet		V		Mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. Nest in small hollows (entrance approx. 3 cm) of Eucalyptus spp. between 2 - 15 m above the ground.	Low
<i>Grantiella picta</i>	Painted Honeyeater		V	V	Occurs in Eucalyptus woodland and forests, with a preference for mistletoe (<i>Amyema</i> spp.). Can also occur along watercourses and in farmland. Nests from spring to autumn in outer canopy of eucalypts, she-oak, paperbark and mistletoe branches.	Low
<i>Haematopus longirostris</i>	Pied Oystercatcher		E		Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones. Two to three eggs are laid between August and January. The female is the primary incubator and the young leave the nest within several days.	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle			M	Coastlines, estuaries, large rivers and lakes; occasionally over adjacent habitats; builds a large stick nest in a tall tree, rarely on artificial structures	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Hieraaetus morphnoides</i>	Little Eagle		V		Occupies habitats rich in prey (birds, reptiles and mammals) within open eucalypt forest, woodland or open woodland. Requires tall living trees for building a large stick nest and preys on birds, reptiles and mammals and occasionally carrion.	Low
<i>Hirundapus caudacutus</i>	White-throated Needletail			M	Aerial space over a variety of habitat types, but prefers to forage over treed habitats as these would provide a greater abundance of insect prey; often forage on the edge of low pressure systems and may follow these systems ; breeds in Asia.	Low
<i>Hydroprogne caspia</i>	Caspian Tern			M	Coastal waters, beaches, mudflats, large rivers, dams and lakes	Low
<i>Ixobrychus flavicollis</i>	Black Bittern		V		Occurs below 200 m above sea level and inhabit both terrestrial and estuarine wetlands, with a preference for permanent water bodies and dense vegetation. Roosts in trees or amongst dense reeds.	Low
<i>Lathamus discolor</i>	Swift Parrot		E	CE	In NSW mostly occurs on the coast and south west slopes, occurring in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>).	Low
<i>Limosa lapponica</i>	Bar-tailed Godwit			M	Tidal mudflats, estuaries, shallow river margins, flooded pastures	Low
<i>Limosa lapponica</i>	Bar-tailed Godwit			M	Tidal mudflats, estuaries, shallow river margins, flooded pastures	Low
<i>Lophoictinia isura</i>	Square-tailed Kite		V		Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Macronectes giganteus</i>	Southern Giant Petrel		E	E, M	Migratory marine bird distributed from Antarctic to subtropical waters and nests on offshore and Antarctic islands.	Low
<i>Macronectes halli</i>	Northern Giant-Petrel		V	V, M	Circumpolar pelagic distribution with breeding on Australian offshore islands. Nest in secluded, sheltered coastal habitat with dense vegetation.	Low
<i>Neophema chrysogaster</i>	Orange-bellied Parrot		CE	CE	On the mainland, the Orange-bellied Parrot spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. The species also inhabits small islands and peninsulas and occasionally saltworks and golf courses. Birds forage in low samphire herbland or taller coastal shrubland. Diet mainly comprises seeds and fruits of sedges and salt-tolerant coastal and saltmarsh plants.	Low
<i>Ninox connivens</i>	Barking Owl		V		Occurs throughout NSW, where it inhabits dry open sclerophyll forests and woodlands, favouring dense riparian stands of eucalypts or casuarinas along watercourses or around wetlands, where there are many large trees suitable for roosting or breeding.	Low
<i>Ninox strenua</i>	Powerful Owl		V		Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. They require large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. Powerful Owls nest in large tree hollows (at least 0.5m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Low
<i>Numenius madagascariensis</i>	Eastern Curlew			CE, M	Estuaries, tidal mudflats, sandspits, saltmarsh, mangroves	Low
<i>Numenius minutus</i>	Little Curlew			M	Grasslands, floodplains, margins of drying swamps, tidal mudflats, airfields, sportsfields, crops, sewage ponds	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Pachyptila turtur</i>	Fairy Prion				A marine bird, found mostly in temperate and subantarctic seas. The Fairy Prion sometimes forages over continental shelves and the continental slope, but it can come close inshore in rough weather.	Low
<i>Pluvialis fulva</i>	Pacific Golden Plover			M	Estuaries, mudflats, mangroves, saltmarsh	Low
<i>Pterodroma leucoptera</i>	Gould's Petrel		V	E, M	Pelagic marine species, spending much of its time foraging at sea and coming ashore only to breed, with nesting sites at 2 islands of NSW.	Low
<i>Ptilinopus superbus</i>	Superb Fruit-Dove		V		Inhabits rainforests and similar closed forest at all altitudes.	Low
<i>Rostratula australis</i>	Painted Snipe (Australian subspecies)		E	E, M	Inhabits shallow inland wetlands, either freshwater or brackish water bodies. Nests on the ground amongst tall reed-like vegetation near water, and feeds near the water's edge and on mudflats.	Low
<i>Stagonopleura guttata</i>	Diamond Firetail		V		Found in grassy eucalypt woodlands, open forest, mallee, grassland and riparian areas.	Low
<i>Sterna hirundo</i>	Common Tern			M	Offshore waters, bays, estuaries, large freshwater wetlands	Low
<i>Sternula albifrons</i>	Little Tern		E	M	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Low
<i>Tringa nebularia</i>	Common Greenshank			M	Mudflats, estuaries, saltmarsh, margins of wetlands	Low
<i>Tringa stagnatilis</i>	Marsh Sandpiper			M	Salt, brackish or freshwater wetlands, mangroves, intertidal mudflats, estuaries	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Tyto tenebricosa</i>	Sooty Owl		V		Inhabits subtropical and warm temperate rainforest, and moist or dry eucalypt forest with a well-developed mid-storey of trees or shrubs. Roost and nest sites for the species occur in gullies. Utilise large hollows for nesting and prey on other hollow dependent species. Roost in hollows or dense vegetation.	Low
Fish						
<i>Epinephelus daemeli</i>	Black Cod	V		V	Adult black cod are usually found in caves, gutters and beneath bomboras on rocky reefs. They are territorial and often occupy a particular cave for life. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries.	Low
<i>Macquaria australasica</i>	Macquarie Perch	E		E	Found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	Low
<i>Prototroctes maraena</i>	Australian Grayling			V	Occur in freshwater streams and rivers, especially clear gravelly streams with a moderate flow, as well as estuarine areas.	Low
Mammals						
<i>Arctocephalus forsteri</i>	New Zealand Fur-seal		V		Prefers rocky parts of islands with jumbled terrain and boulders. Feeds principally on cephalopods and fish, but also seabirds and occasionally penguins.	Low
<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal		V		Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand Fur-seals where they occur together.	Low
<i>Balaenoptera musculus</i>	Blue Whale		E	E	Blue Whale habitat is variable, as shown by the main Australian feeding areas, generally associated with known upwellings.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Cercartetus nanus</i>	Eastern Pygmy-possum		V		In New South Wales the species is found in coastal areas and at higher elevation. Inhabit shrubby vegetation in a wide variety of habitats, from open heathland or shrubland to sclerophyll or rain forest. Require flowering plants and shrubs for foraging and access to hollows/nesting vegetation.	Low
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat		V	V	Roosts in disused mine shafts, caves, overhangs and disused Fairy Martin nests for shelter and to raise young. Also potentially roost in tree hollows. Occurs in low to mid-elevation dry open forest and woodlands, preferably with extensive cliffs, caves or gullies. Pied Bat is largely restricted to the interface of sandstone escarpment (for roost habitat) and relatively fertile valleys (for foraging habitat).	Low
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll		V	E	Utilises a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	Low
<i>Eubalaena australis</i>	Southern Right Whale		E	E	Oceans.	Low
<i>Isoodon obesulus</i>	Southern Brown Bandicoot		E	E	NSW distribution almost exclusively restricted to coastal fringe. Habitats including heathland, shrubland, sedgeland, heathy open forest and woodland and are usually associated with infertile, sandy and well drained soils, but can be found in a range of soil types. Within these vegetation communities they typically inhabit areas of dense ground cover.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Megaptera novaeangliae</i>	Humpback Whale		V	V	The population of Australia's east coast migrates from summer cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on northward migration and October and November, on southward migration.	Low
<i>Miniopterus australis</i>	Little Bentwing-bat		V		This species occurs in moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing Bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Low
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat		V		Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. This species tends to hunt in forested areas.	Low
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat		V		Habitats preference includes dry eucalypt forest and coastal woodlands but also include riparian zones in rainforest and wet sclerophyll forest. Forages above forest canopy or forest edge and requires roosts including tree hollows.	Low
<i>Myotis macropus</i>	Southern Myotis		V		This species generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. They forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Perameles nasuta</i>	Long-nosed Bandicoot		EP		Habitat includes rainforest, wet and dry forest, woodland, heathland, grassland and urban areas. North Head population occupy all of the habitat types available including woodlands, scrub, heath and open areas.	Low
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby		E	V	This species prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges, isolated rock stacks and tree limbs. Preference for north-facing slopes and cliff lines. A range of vegetation types are associated with Brush-tailed Rock-wallaby habitat, including dense rainforest, wet sclerophyll forest, vine thicket, dry sclerophyll forest, and open forest.	Low
<i>Phascolarctos cinereus</i>	Koala		V	V	Inhabits a range of eucalypt forest and woodland communities. Adequate floristic diversity, availability of feed trees (primarily <i>Eucalyptus tereticornis</i> and <i>E. viminalis</i>) and presence of mature trees very important. Preferred food tree species vary with locality and there are quite distinct regional preferences. They are able to persist in fragmented habitats, and even survive in isolated trees across a predominantly agricultural landscape.	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse			V	Inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. Nest in burrows and have a preference for deeper top soils and softer substrates to aid digging. Spends considerable time foraging above-ground for food in areas of high floristic diversity.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox		V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are commonly found in gullies, close to water, in vegetation with a dense canopy. They travel up to 50 km to forage, on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	Low
Reptiles						
<i>Caretta caretta</i>	Loggerhead Turtle		E	E, M	Loggerhead turtles have a worldwide tropical and subtropical distribution. In Australia, they occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of Queensland, Northern Territory, Western Australia and New South Wales.	Low
<i>Chelonia mydas</i>	Green Turtle		V	V, M	Ocean-dwelling species spending most of its life at sea. Carnivorous when young but as adults they feed only on marine plant material. Eggs laid in holes dug in beaches throughout their range. Scattered nesting records along the NSW coast.	Low
<i>Dermochelys coriacea</i>	Leathery Turtle		E	E, M	Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW. Number of sightings in southern waters suggest species actively seeks temperate feeding grounds, rather than occurring only as stray vagrants.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Eretmochelys imbricata</i>	Hawksbill Turtle			V, M	Hawksbill turtles typically occur in tidal and sub-tidal coral and rocky reef habitats throughout tropical waters, extending into warm temperate areas as far south as northern New South Wales. In Australia the main feeding area extends along the east coast, including the Great Barrier Reef. Other feeding areas include Torres Strait and the archipelagos of the Northern Territory and Western Australia, possibly as far south as Shark Bay or beyond. Hawksbill turtles also feed at Christmas Island and the Cocos (Keeling) Islands.	Low
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake		E	V	Confined to the Sydney basin within a radius of approximately 200 km of Sydney. Preferred habitat of sandstone outcrops with woodland, open woodland and/or heath vegetation. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges and tree hollows.	Low
<i>Natator depressus</i>	Flatback Turtle			V, M	The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution.	Low
Flora						
<i>Acacia bynoeana</i>	Bynoe's Wattle		E	V	Occurs mainly in heath and dry sclerophyll forest, open woodland with dense to sparse heath understorey; open woodlands with a sparse shrub cover and a grass/sedge ground cover; and heathlands with sparse overstorey. With sand or sandy clay substrate, often with ironstone gravel and usually well drained, infertile soil.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Acacia gordonii</i>			E	E	Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops. Flowers August to September and produces fruit October to February. The fruit is a pod containing hard-coated seed. The seed ultimately forms a persistent soil stored seedbank.	Low
<i>Acacia pubescens</i>	Downy Wattle		V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area.	Low
<i>Acacia terminalis subsp. terminalis</i>	Sunshine Wattle		E	E	Habitat requirements include open coastal eucalypt woodland or forest, usually in sandy soil on creek banks, hill-slopes or in shallow soil in rock crevices and sandstone platforms on cliffs.	Low
<i>Allocasuarina glareicola</i>			E	E	Occurs in Castlereagh woodland on lateritic soil. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Low
<i>Asterolasia elegans</i>			E	E	Occurs in the northern hills of Sydney. Habitat requirements are wet, sheltered sclerophyll forests on the mid to lower slopes of moist gullies and rocky outcrops.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid		E	V	Requires low, dry sclerophyll woodland with a heathy or sometimes grassy understorey on clay loams or sandy soils, specifically in dry, low Brittle Gum (<i>Eucalyptus mannifera</i>), Inland Scribbly Gum (<i>E. rossii</i>) and <i>Allocasuarina</i> spp. woodland with a sparse understorey and stony soil.	Low
<i>Callistemon linearifolius</i>	Netted Bottle Brush		V		Inhabits dry sclerophyll forest on the coast and adjacent ranges.	Low
<i>Camarophyllopsis kearneyi</i>			E		Small, gilled fungus, only known to occur in the Lane Cove Bushland Park	Low
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid		V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	Low
<i>Darwinia biflora</i>			V	V	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Occurs in Sydney Sandstone Ridgetop Woodland, often on rock shelves. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath.	Low
<i>Dichanthium setosum</i>	Bluegrass		V	V		Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Doryanthes palmeri</i>	Giant Spear Lily		V		Giant Spear Lily occurs on exposed rocky outcrops on infertile soils or on bare rock. It grows in a narrow band of vegetation along the cliff-tops and on steep cliff-faces or rocky ledges in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.	Low
<i>Epacris purpurascens</i> var. <i>purpurascens</i>			V		Found in a range of habitat types, most of which have a strong shale soil influence.	Low
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark		V	V	Occurs mostly in small scattered stands in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. Requires shallow sandy soils.	Low
<i>Eucalyptus fracta</i>	Broken Back Ironbark		V		Confined largely to State Forest. Locally common but restricted to the northern Broken Back Range near Cessnock, NSW. The dominant tree in a narrow band along the upper edge of a sandstone escarpment. Occurs in dry eucalypt woodland in shallow soils.	Low
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint		V	V	Occurs in grassy sclerophyll woodland in association with other eucalyptus species.	Low
<i>Eucalyptus pulverulenta</i>	Silver-leaved Gum		V	V		Low
<i>Genoplesium baueri</i>	Bauer's Midge Orchid		E	E	Occurs in coastal areas. Habitats include heathland, open forest, shrubby forest, heathy forest and woodland with sandy/sandy loam and well draining soils.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Hibbertia puberula</i>			E		Flowering time is October to December, sometimes into January. Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps.	Low
<i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i>			V		Occurs in the Lane Cove Bushland Park, Royal and Blue Mountains National Parks, with a preference for warm temperate rainforest and wet sclerophyll forest.	Low
<i>Hygrocybe aurantipes</i>			V		Occurs in Lane cove Bushland Park, Blue Mountains National Park (Mt Wilson) and Hazelbrook, with a preference for leaf litter and mossy creek banks under closed canopy.	Low
<i>Hygrocybe austropratensis</i>			E		NSW population only know to occur in the Lane Cove Bushland Park. Habitat includes leaf litter and mossy areas in dry forest, particularly in association with <i>Kunzea ericoides</i> .	Low
<i>Hygrocybe collucera</i>			E		NSW population only know to occur in the Lane Cove Bushland Park. Habitat preference for warm-temperate wet-sclerophyll forest.	Low
<i>Hygrocybe griseoramosa</i>			E		NSW population only know to occur in the Lane Cove Bushland Park. Habitat preference for warm-temperate wet-sclerophyll forest.	Low
<i>Hygrocybe lanecovensensis</i>			E		NSW population only know to occur in the Lane Cove Bushland Park. Habitat preference for warm-temperate wet-sclerophyll forest.	Low
<i>Hygrocybe reesiaae</i>			V		Occurs in Lane cove Bushland Park and Blue Mountains National Park (Hazelbrook area), with a preference for leaf litter under a closed canopy.	Low
<i>Hygrocybe rubronivea</i>			V		NSW population only know to occur in the Lane Cove Bushland Park. Habitat preference for warm-temperate wet-sclerophyll forest.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Leptospermum deanei</i>	Deane's Tea-tree		V	V	Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in Riparian Scrub - e.g. <i>Tristaniopsis laurina</i> , <i>Baechea myrtifolia</i> ; Woodland - e.g. <i>Eucalyptus haemstoma</i> ; and Open Forest - e.g. <i>Angophora costata</i> , <i>Leptospermum trinervium</i> , <i>Banksia ericifolia</i> .	Low
<i>Melaleuca biconvexa</i>	Biconvex Paperbark		V	V	The species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other <i>Melaleuca</i> species or as an understorey species in wet forest.	Low
<i>Melaleuca deanei</i>	Deane's Paperbark		V	V	Endemic to Sydney Basin region and grows in heath on sandstone or flat broad ridge tops. Strongly associated with sandy loam soils that are low in nutrients, sometimes with ironstone present	Low
<i>Pelargonium striatellum</i>			E	Marine	Known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. Has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	Low
<i>Persoonia hirsuta</i>	Hairy Geebung		E	E	Occurs in shrub-woodlands and dry sclerophyll forest. It grows in sandy to stony soils derived from sandstone or very rarely on shale, from near sea level to 600 m altitude.	Low
<i>Pimelea curviflora</i> var. <i>curviflora</i>			V	V	Confined to the coastal area of the Sydney and Illawarra regions. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain.	Low

Scientific name	Common name	FM Act	BC Act	EPBC Act	Habitat	Likelihood of occurrence
<i>Pimelea spicata</i>	Spiked Rice-flower		E	E	Occurs on an undulating topography on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark.	Low
<i>Prostanthera marifolia</i>	Seaforth Mintbush		CE	CE	Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses and occurs in woodland dominated by Eucalyptus sieberi (Black Ash) and Corymbia gummifera (Bloodwood) in or close to Duffys Forest Ecological Community (DFEC).	Low
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly		E	V	Grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	Low
<i>Tetradlea glandulosa</i>			V		Strongly associated with areas of shale-sandstone transition habitat and occupies ridgetops, upper-slopes and mid-slope sandstone benches. Preferred vegetation includes heaths, scrub, woodlands/open woodlands and open forest.	Low
<i>Tetradlea juncea</i>	Black-eyed Susan		V	V	Confined to the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. Usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest.	Low
<i>Thesium australe</i>	Austral Toadflax		V	V	Suitable habitat for this species includes grassland and grassy woodland, often in damp sites.	Low