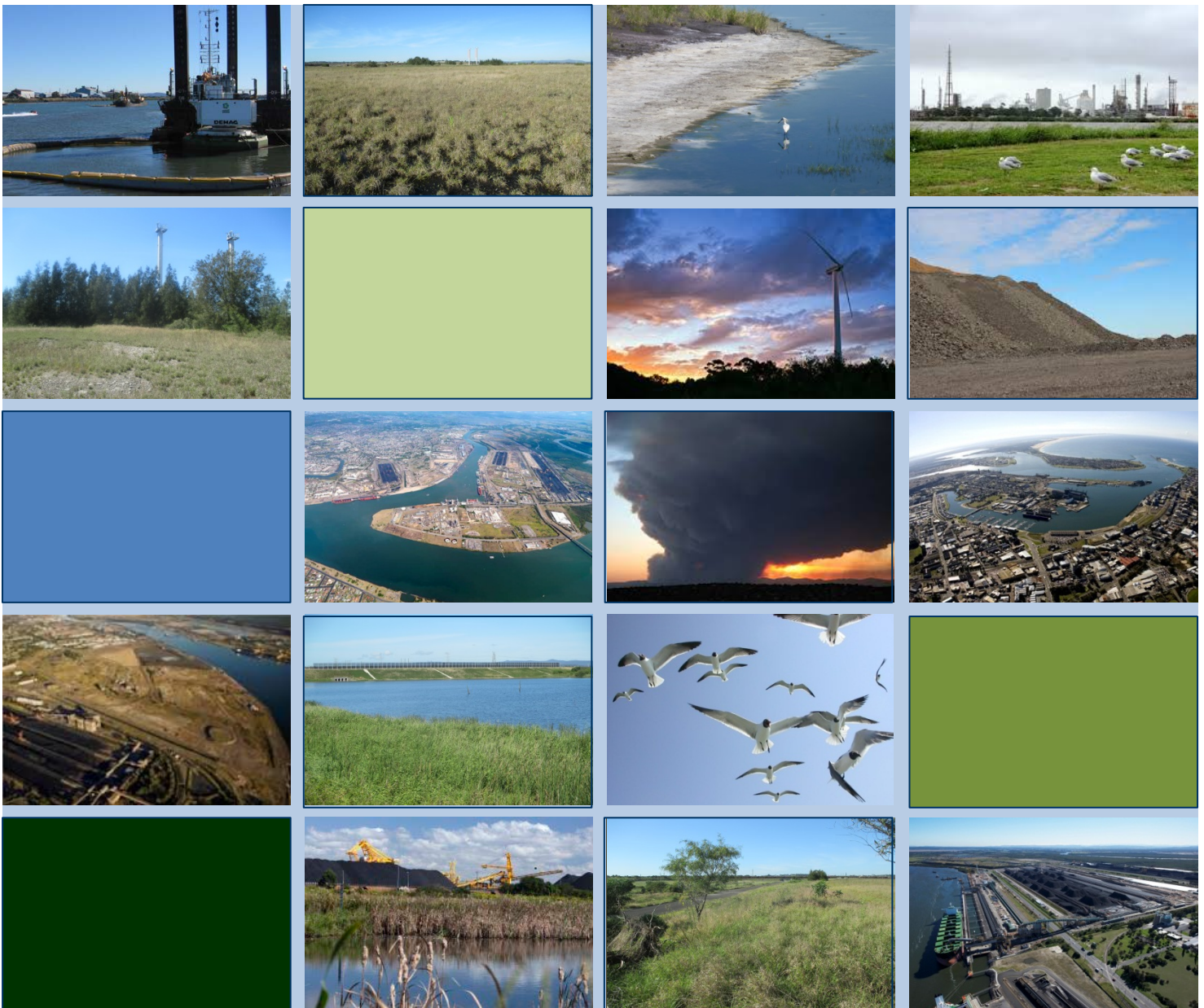




Kooragang Island Waste Emplacement Facility Area 2 Closure Works

Hunter Development Corporation

ERM Ref: 0320327 Final

December 2015

Referral of proposed action

Project title: Kooragang Island Waste Emplacement Facility – Area 2 Closure Works.

1 Summary of proposed action

1.1 Short description

The proposed action is to undertake the closure and rehabilitation of Area 2 of the Kooragang Island Waste Emplacement Facility (KIWEF), near Newcastle NSW, including the installation of drainage and sediment controls, capping and re-contouring of waste emplacement areas and rehabilitation using existing surface materials.

The site is a former landfill which operated under Environmental Protection Licence (EPL) number 6437 and continues to be regulated under the NSW Protection of the Environment Operations Act 1997. Closure obligations are regulated through the NSW Environmental Protection Authority (EPA) issued conditional Surrender Notice 1111840 for EPL 6437 and subsequent variation notices being issued on 2 May 2013 (notice number 1510956) and 17 April 2014 (notice number 1520063) collectively referred to as the Surrender Notice for the remainder of this report.

The application to surrender the licence was supported by the Revised Final Landform and Capping Strategy (GHD 2009) (the Capping Strategy) developed in consultation with the EPA. The Capping Strategy was supported by a Flora and Fauna Assessment (GHD, 2010) with the aim of best managing the threat of significant environmental harm from the contaminants within the KIWEF whilst minimising risk to threatened fauna habitat. The EPA has provided an endorsement for the Revised Final Landform and Capping Strategy (GHD, 2009) as the best balance to achieve positive environmental outcomes for the site. As such the approach to closure is to as far as possible implement minimal change in all site processes namely hydrology, vegetation and surface soils while further isolating potential contaminants through a reduction of permeability through the installation of capping leading to reduced infiltration and a reduced risk of contaminant migration collectively referred to as the Closure Works for the remainder of this report.

The potential impacts to MNES have been identified as follows:

- Short term construction impacts related to clearing of existing vegetation dominated by weeds and non-native species with impacts to pond fringing habitat avoided;
- Short term construction impacts associated with sedimentation able to be managed through the implementation of erosion and sediment control controls; and
- General improvements in water quality in receiving waterbodies with slightly wetter and fresher conditions expected.

The proposed action is to implement the requirements of the Surrender Notice through implementation of the Capping Strategy for Area 2. The proposed action does not include the development and use of the site for any purpose including waste disposal. As such the Referral addresses the temporary construction impacts and ongoing potential changes to hydrology associated with the construction of a low permeability capping layer above contaminated areas, with no ongoing loss of habitat considered likely.

1.2 Latitude and longitude

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

location point	Latitude			Longitude		
	degrees	minutes	seconds	degrees	minutes	seconds
Southern Section						
1	32°	52'	8.652"	151°	43'	40.070"
2	32°	52'	17.641"	151°	43'	48.904"
3	32°	52'	18.159"	151°	43'	49.870"
4	32°	52'	18.780"	151°	43'	50.233"
5	32°	52'	18.169"	151°	43'	47.408"
6	32°	52'	16.608"	151°	43'	42.389"
7	32°	52'	14.924"	151°	43'	38.574"
8	32°	52'	14.616"	151°	43'	37.929"
9	32°	52'	13.648"	151°	43'	37.701"
10	32°	52'	13.371"	151°	43'	37.213"
11	32°	52'	8.341"	151°	43'	39.253"
Northern Section						
12	32°	52'	6.252"	151°	43'	40.326"
13	32°	52'	4.982"	151°	43'	42.253"
14	32°	52'	3.322"	151°	43'	42.502"
15	32°	52'	2.513"	151°	43'	43.129"
16	32°	52'	2.389"	151°	43'	44.414"
17	32°	52'	3.038"	151°	43'	45.878"
18	32°	52'	2.476"	151°	43'	46.752"
19	32°	51'	58.658"	151°	43'	48.839"
20	32°	51'	57.158"	151°	43'	51.133"
21	32°	51'	57.614"	151°	43'	58.236"
22	32°	51'	58.416"	151°	44'	4.384"
23	32°	51'	53.843"	151°	44'	6.681"
24	32°	51'	53.765"	151°	44'	7.187"
25	32°	51'	54.368"	151°	44'	8.816"
26	32°	51'	54.893"	151°	44'	10.574"
27	32°	51'	55.635"	151°	44'	11.136"
28	32°	51'	55.855"	151°	44'	12.340"
29	32°	51'	55.921"	151°	44'	14.195"
30	32°	51'	56.365"	151°	44'	15.490"
31	32°	51'	56.419"	151°	44'	19.614"
32	32°	51'	57.312"	151°	44'	23.509"
33	32°	51'	59.000"	151°	44'	22.711"
34	32°	51'	58.266"	151°	44'	19.001"
35	32°	51'	57.229"	151°	44'	17.444"
36	32°	51'	57.069"	151°	44'	15.498"
37	32°	51'	56.598"	151°	44'	12.467"
38	32°	51'	56.244"	151°	44'	10.356"
39	32°	51'	55.423"	151°	44'	10.016"
40	32°	51'	54.609"	151°	44'	7.325"
41	32°	51'	58.482"	151°	44'	5.586"
42	32°	52'	3.697"	151°	44'	4.655"
43	32°	52'	18.851"	151°	44'	3.346"
44	32°	52'	18.694"	151°	44'	1.192"
45	32°	52'	19.674"	151°	44'	0.777"
46	32°	52'	19.821"	151°	43'	59.776"
47	32°	52'	19.812"	151°	43'	58.750"
48	32°	52'	19.570"	151°	43'	56.244"
49	32°	52'	19.048"	151°	43'	54.605"
50	32°	52'	17.096"	151°	43'	50.439"
51	32°	52'	14.813"	151°	43'	47.653"
52	32°	52'	7.213"	151°	43'	40.271"

- 1.3 **Locality and property description**
The site is located off Cormorant Road, Kooragang Island, Newcastle, NSW. The site is bounded by Newcastle Coal Infrastructure Group rail infrastructure to the south, the Port Waratah Coal Services - Kooragang Coal Terminal railway line to the west and north and adjacent industrial land consisting of third party waste facilities to the east.

Access to the site is via Cormorant Road. The site is comprised of completed and incomplete cells associated with the waste disposal facility and therefore has many levels. The landfill has been used for the disposal of by-products from the steelmaking industry primarily slag, coal washery rejects and plant refuse but also asbestos, leaded dusts, acid and lime sludge, tars and oils.

To aid description, KIWEF and neighbouring third party facilities are described in relation to nominal areas labelled K1 to K13 with this referral addressing Closure Works in K3, K5 and a small section of K7 (refer to *Annex A, Figure 2*). Waste disposal was conducted in most of these areas either by application to open ground or in numbered 'disposal ponds' which constructed bund walls comprised of slag materials. While the Capping Strategy describes these as ponds, for ease of description the Referral describes them as cells on the basis that incomplete or unfilled cells also contain ponds as illustrated in Figure 1 of Annex A.

- 1.4 **Size of the development footprint or work area (hectares)** Area 2 closure works will involve the capping, contouring and rehabilitation of approximately 36 hectares of the former KIWEF.
- 1.5 **Street address of the site** Cormorant Road, Kooragang Island, NSW.
- 1.6 **Lot description**
Part Lots 3, 4, 5 and 7 DP1207051 and Lot 8 DP1119752.
- 1.7 **Local Government Area and Council contact (if known)**
The site is located within the Newcastle City Council Local Government Area (LGA) but is not subject to Local Planning controls.
- 1.8 **Time frame**
Closure works are estimated to commence in quarter 2 of 2016 for practical completion in June 2017.

1.9	Alternatives to proposed action Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?		
		Yes	refer to section 2.2
1.10	Alternative time frames etc Does the proposed action include alternative time frames, locations or activities?	No	Preparatory works including final detailed design, securing all applicable licenses, permits and approvals and tendering for contractors is expected to take up to 9 months with works required to be completed by June 2017 in accordance with the timing agreed under the Surrender Notice. As such the timing of works is not flexible. Due to the nature of the proposed works no alternative location is possible. Refer to Section 2.2 for alternative activities considered.
1.11	State assessment Is the action subject to a state or territory environmental impact assessment?		
		Yes	Refer to Section 2.5.
1.12	Component of larger action Is the proposed action a component of a larger action?	No	

1.13	Related actions/proposals Is the proposed action related to other actions or proposals in the region (if known)?	Yes	HDC lodged a referral (Referral number 2011/5920) to DoE in mid-2011 for the full scope of the Revised Final Landform and Capping Strategy works. DoE decided that the full scope of works constituted a controlled action based on assessment of preliminary information but identified that HDC was not the appropriate applicant, given that HDC does not control the site and have no long-term interests in the land, and no benefit from the proposed action. This referral was subsequently withdrawn and HDC engaged with Newcastle Ports Corporation (the land owner at the time) to seek its support to act as the appropriate project applicant. NPC subsequently referred Area 1 and Area 3 (Referral number 2012/6464) to DoE as discussed below. It is noted that at the time of referral of Area 1 and Area 3 under referral number 2012/6464 that Area 2 was proposed to be excised from the State's Surrender Notice scope of work, and the equivalent capping and associated remediation works to appropriately manage the contamination risks to be undertaken as part of the PWCS T4 development. Construction of the PWCS T4 development has been delayed and Area 2 is now being referred in order to allow the completion of closure activities in accordance with the timings agreed under the Surrender Notice. Area 2 is not considered part of a larger activity of the full closure of all areas of KIWEF, on the following basis: • The activity assessed under referral 2012/6464 in Area K10 North and K2 are now complete with Area K10 South scheduled for completion prior to commencement of Area 2 closure; • Significant impacts have not eventuated from referral 2012/6464 and no cumulative impacts are expected to result that would render the compilation of all outstanding closure activities more significant than undertaking and assessing them individually; • The completion of each stage of closure can and has successfully been undertaken independently of each other and no stage relies on the completion of another; • The nature of the impact mechanisms being short term direct impacts associated with clearing, renders the staged completion of closure activities less impacting than the completion of clearing of all sites at one time; • Indirect impacts to Green and Golden Bell Frog population of changed pond hydro-salinity, while cumulatively impacting some ponds, do so by providing generally wetter and fresher conditions, while still retaining the variability between ponds considered critical to their survival on the site as discussed further in Section 3; and • The wetter, fresher and generally improved quality of surface water is a positive impact on other MNES and the environment in general and as such cumulative impacts are also positive. In addition to the referral 2012/6464 identified above the current referral is related (in location only) to the following referrals: • Australian Rail Track Corporation Kooragang Coal Terminal Arrival Roads (2014/7229); • Port Waratah Services Terminal 4 (T4) referral (2011/6029); and • Newcastle Coal Infrastructure Group Coal Export Terminal (2006/2987). The referral is located on land forming part of the ongoing assessment of the Port Waratah Services Terminal 4 (T4) referral (2011/6029). The proposed activity is related to T4 in location and is not part of the larger activity on the basis that: • The closure works and T4 proponents are different and operate independently of each other; • The closure works have the purpose of environmental improvement of a former landfill, while the T4 project is for the purpose of a coal export facility; • The proposed closure works are required regardless of whether the T4 development proceeds; and
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		T4 could proceed in the absence of the closure works and regardless of the closure works would require site remediation using different remediation strategies and approaches to the management of contaminants. The referral area is bisected by the NCIG Newcastle Coal Infrastructure Group (NCIG) rail fly-over assessed and decided not to be a controlled activity if undertaken in a particular manner under referral number 2006/2987. The NCIG development has implemented landfill closure obligations on parts of KIWEF in the process of completing the development but the proposed closure works are not part of the larger action of a coal export terminal for the reasons provide above in relation to T4. The Australian Rail Track Corporation Kooragang Coal Terminal Arrival Roads referral (2014/7229) relates to the rail corridor north and west of the referral area. This referral was determined not to be a controlled action.
1.14	Australian Government funding Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	No
1.15	Great Barrier Reef Marine Park Is the proposed action inside the Great Barrier Reef Marine Park?	No

2 Detailed description of proposed action

2.1 Description of proposed action

The proposed action is to undertake the closure of Area 2 (K3 and K5) of KIWEF (refer to *Annex A, Figure 1 and 2*) in accordance with the Surrender Notice and Capping Strategy (GHD, 2009) and the placement of Virgin Excavated Natural Material or Excavated Natural Material over a small area containing asbestos within K7. The closure works are a part of the State Government's Closure Works required under approval of surrender of licence number 6437 (notice number 1111840). The remaining parts (Area 1 and Area 3) have previously been referred under referral reference number 2012/6464 with referral decision of "not a controlled action if undertaken in a particular manner" being issued on 8 October 2013.

KIWEF ceased operation in 1999 and until this time was used by BHP as a landfill for disposal of waste from the Mayfield steelworks and associated operations. KIWEF was subject to Environmental Protection License (EPL) 6437 for the scheduled action of "Waste disposal by application to land" first issued in 1999 and subsequently transferred to Regional Land Management Corporation Pty Ltd in May 2003 and then the Hunter Development Corporation (HDC) in January 2008.

HDC surrendered EPL 6437 on 8 December 2010 and the EPA issued conditional Surrender Notice 1111840 and subsequent variation notices being issued on 2 May 2013 (notice number 1510956) and 17 April 2014 (notice number 1520063) collectively referred to as the Surrender Notice for the remainder of this report. Surrender conditions relate primarily to the closure process, and describe the capping that is required across much of the area through reference to the GHD (2009) Revised Final Landform and Capping Strategy (the Capping Strategy).

The KIWEF Capping Strategy (GHD 2009) identified and described the proposed stages of capping works to be progressively completed. Due to the development of portions of the KIWEF footprint by external stakeholders, the stages of capping works were revised within a Variation of the Conditions of Surrender (Notice 1510956, issued on 2 May 2013). The current Stages of works and their status are:

- Area 1 – K2 and K10 North closure works addressed by referral 2012/6464 and completed in 2015;
- Area 2 – North of Rail Line (K3 and K5) Closure Works the subject of this referral with works to be completed by 30 June 2017; and
- Area 3 – K10 South closure works addressed by referral 2012/6464 and to be completed by 30 June 2017.

Condition 4a of the surrender notice requires that the closure works be undertaken in accordance

- 'Hunter Development Corporation - Report on KIWEF - Revised Final Landform and Capping Strategy - August 2009 - Revision 2', prepared by GHD (the Capping Strategy);
- 'Green and Golden Bell Frog Management Plan – Kooragang Island Waste Emplacement Facility Closure Works' dated 19 April 2011 and prepared by Golder Associates;
- 'K26/32 and K24/31 Ponds Action Plan– Kooragang Island Waste Emplacement Facility' dated 31 May 2011 and prepared by Golder Associates; and
- 'Materials Management Plan - Kooragang Island Waste Emplacement Facility' dated November 2012 prepared by RCA Australia.

The capping methodology is dictated by Condition 4h which requires validation that closure has been implemented in accordance with Chapter 7 of the GHD (2009) Revised Final Landform and Capping strategy and other relevant conditions of the Surrender Notice and in doing so specifies the mitigation measures within the documentation and management reports listed above.

Chapter 7 of GHD requires that the construction of the capping strategy will involve the following tasks:

- Establishment of erosion and sedimentation controls and construction of sedimentation basins as required;
- Remove any vegetation and strip the top 100 mm of soil. Stockpile for re-use if deemed suitable;
- Construct trunk drainage where required;
- General earthworks (cut/fill) activities to establish the regraded surface with a final minimum 1% grade. If the stripped 100mm of soil is suitable for re-use, stockpile for use in revegetation, or screen and incorporate as fill for grading. Cut from within this area, if deemed suitable, may be used as fill and capped. Additional fill shall be sourced from an approved offsite source. Earthworks shall be compacted in accordance with the Technical Specification. Topsoil and revegetate the disturbed area if no further capping material is required. Any unsuitable cut material shall be stockpiled in Stage 7 area and later capped;
- Place 0.5m capping material over the regraded surface at a final minimum 1% grade. Compact the capping material to achieve a maximum permeability of $1 \times 10^{-7} \text{m/s}$. Construction of the capping layer "should ensure that the final surface provides a barrier to the migration of water into the waste (or fill), controls emissions to water and atmosphere, promotes sound land management and conservation, and prevents hazards and protects amenity" (EPA, 1998);
- Topsoil 100mm thick using stockpiled surface soils or imported topsoil and revegetate the disturbed area;
- Any cut material which is considered geotechnically unsuitable to use as fill shall be relocated to the proposed unsuitable material containment area; and
- Any cut material which is significantly contaminated (as defined by the materials management plan) shall be either disposed of off-site or relocated to a nominated containment cell area as directed by the principal.

Departures from the above standard approach to capping are described by the Capping Strategy in *Table 1* below.

Table 1 – Capping Strategy (2010).

Area	Recommended Strategy
K3	In areas identified as suitable GGBF habitat, including the area bordering the freshwater wetlands, capping will be undertaken up to within 30m of the identified habitat area, with the exception of the area located near K3/1W (which will be capped) and then revegetated. No regrading, capping or other disturbance will be undertaken within other Green and Golden Bell Frog habitat areas.
K5 (excluding Cell 5)	To reduce the risk of migration of impacts around Cell 5, the permeability is to be reduced to 1×10^{-8} m/s for a zone (nominally 10- 20m) adjoining the Cell 5 area.
Cell 5	Minor re-contouring of the area by placing compacted CWR is recommended to a minimum grade of 1% to shed surface water away from the north, west and southern boundaries of the GCL liner and tie into proposed surface levels of the adjoining capped areas.
K7	Placement of VENM or other material as approved in the EPL in the area where only 1.6m of fill has been placed, to provide at least 3m cover over asbestos disposal areas.

Further noted departures that may be required to fully implement the Capping Strategy in Area 2 include:

- No access to previously identified source of Coal Washery Reject for capping;
- Limited availability of “topsoil” requiring importation of alternative “revegetation medium” with low nutrient and low chytrid fungus risk; and
- No access to the previously identified geotechnically unsuitable material storage area (stage 7) requiring alternative disposal solutions.
- The Post HDC Remediation Runoff Flow Paths predicted by the GHD Capping Plan may also be altered to address changes in ground surfaces caused by neighbouring site developments (including the NCIG rail flyover) and the existing site topography.

Alternative Capping Source

Where possible, CWR will be won for re-use in capping where it meets geotechnical and material properties of the materials management plan. It is considered likely that there will be a deficit of appropriate capping material available within Area 2. At this stage it is unclear the source of the capping material but potential sources include:

- Surplus CWR from K10 South;
- VENM/ENM from local area construction sites; or
- Commercial sources/ quarries or other appropriately licensed sources of suitable capping and/or other fill material.

In accordance with referral number 2012/6464 in a particular manner decision, any capping materials that are imported from outside the closure works site will be sourced from an area that is demonstrated to be low in nutrients and free of chytrid fungus (to the extent possible).

Alternative revegetation medium

The existing surface soils in Area 2 is highly variable and ranges from an absence of any growth medium to fine or coarse coal washery reject supporting extensive non-native regrowth. It is necessary to limit stripping of “topsoil” to 100mm while ensuring a final revegetation medium of 100mm is provided in order to address the requirements of the Surrender Notice. This will require importation of a growth medium to address the deficiency in “topsoil” expected to eventuate based on requirement to exclude unsuitable materials and the complete lack of material in some areas. Subject to approval under State approval requirements, the proposed action will therefore include the importation of a regrowth material to be sourced from an area that is demonstrated to be low in nutrients and free of chytrid fungus (to the extent possible). Suitable material is expected to include crusher dust sourced from dry stockpiles at local hard rock quarries. The crusher dust has been demonstrated to support vegetation on other sites in Newcastle, is of low nutrient value and is not sourced from areas where amphibians are prevalent. Given the dry nature of the material and the absence of amphibians, the material is unlikely to contain Chytrid fungus spores or frogs infected with Chytrid fungus. The crusher dust is therefore considered to be an appropriate alternative revegetation medium for the closure works.

Geotechnically unsuitable material management

Experience in closure of other portions of KIWEF indicate high potential to encounter geotechnically unsuitable material that cannot be re-used in capping and that may be unsuitable as fill material. As the designated area for relocation envisaged in the Capping Strategy has been used by unrelated activities an alternative emplacement area will be identified during development of final detailed design. The area will be located to minimise risks to MNES through placement away from their preferred habitat and to avoid the requirement to disturb otherwise non-impacted areas of KIWEF.

Alternative post remediation runoff flow paths

The flow paths from the final design will be developed to reflect the natural flow paths created by the current site topography. The initial GHD capping plan identified several runoff flow paths that appear incongruent with the current landform. Additionally, adjacent developments have been constructed across the closure works area that will also greatly alter the proposed post remediation flow paths. Based on this assumption, it is proposed that the final design will be developed to direct surface water flows generally in the same direction as the existing water flow paths. Suitable surface water management controls will also be utilised to minimise impacts within sensitive environments such as erosion controls and sedimentation ponds.

2.2 Alternatives to taking the proposed action

Alternative approaches to closure are described in the Closure Strategy and include:

- Do nothing option; or
- Alternative capping design and methodology; or
- Alternative contamination management approach.

The Do-Nothing option

The “do-nothing” approach was considered for the site and in the absence of evidence of offsite contamination mobilisation likely to threaten harm to humans and the environment the do nothing option could be considered appropriate given the absence of intended post landfill land-use and high ecological constraints on the site. The Closure Strategy has applied a “do-nothing” approach where this has been adequately demonstrated. However, in order to satisfy Surrender Notice requirements and minimise risk of future migration of contamination the do-nothing option has been discounted in areas where the ecological impacts are able to be avoided or otherwise mitigated to an acceptable level. The proposed Capping Strategy has been endorsed as the best method of balancing contamination risks with risk of impact to ecological values of the site.

Alternative Capping Design and methodology

Alternative bulk earthworks and capping options are limited within the KIWEF due to the significant constraints of the existing NCIG rail loop, BHP emplacement cell, future use intentions of the landowner and ecological habitat. For Area 2 the alternatives are limited to alternative designs for final landform that achieve the Surrender Notice requirements while maintaining ecosystem functioning as close to its current form as possible. The final design is to consider the availability of on-site materials for use as capping, fill and revegetation medium, while the Closure Strategy was developed considering the availability of off-site disposal options and alternative remediation technologies.

Alternative Approach to Management of Contaminants

The objective of limiting potential migration of the contaminants within the landfill could otherwise be met through excavation of contamination for off-site disposal or possibly through the use of alternative remediation technologies. Off-site disposal is discounted due to the unavailability of appropriate disposal sites and that this would involve greater disturbance of the ecological values of the site. It is noted that the T4 project has developed a draft Remediation Action Plan aimed at making the site suitable for the intended use of a coal export terminal and to manage the additional risks of contaminant migration presented by additional site loading. This Remediation Action Plan is not considered a viable option for the proposed action as it increases habitat impact, is unnecessary for the protection of human and environmental health in the ‘no intended post landfill land-use scenario’ and is otherwise cost prohibitive in the absence of a post landfill use. The use of other remedial technologies further considered unviable due to the largely undocumented nature of the disposal practices meaning targeting specific contaminants in specific areas with appropriate remedial technologies is not possible.

2.3 Alternative locations, time frames or activities that form part of the referred action

No proposed alternatives are provided.

2.4 Context, planning framework and state/local government requirements

The principal legislation governing waste management and landfill disposal of waste in NSW is the Protection of the Environment Operations Act 1997 (POEO Act). All landfills must meet the requirements of the POEO Act and the Regulations made under that Act. The landfill occupier must not pollute waters in breach of section 120, cause air pollution in breach of sections 124, 125 or 126, or emit offensive odour in breach of section 129 of the Act. The POEO Act provides for an integrated system of licensing whereby a single schedule of activities requiring an Environmental Protection Licence (EPL) regulates all forms of pollution.

The site previously held EPL 6437 as a waste disposal facility under the POEO Act, which has since been surrendered. An Approval of the Surrender of a Licence (1111840) has been issued to HDC under Section 80(1) of the POEO Act which states a number of site specific conditions and mitigation measures that must be implemented prior to the release of the land from the Surrender Notice requirements. Measures identified within the surrender notice include capping specifications, monitoring requirements, environmental mitigation measures, the preparation and implementation of various reports and management plans. The Proposed action is intended to meet HDC's obligations under this surrender notice in Areas 2 (K3 and K5) and provide adequate cover to an identified trench containing asbestos (K7).

The site is within the Land Application Area of State Environmental Planning Policy (Three Ports) 2014 (Three Ports SEPP) and specifically is within the Three Ports Lease Area. The Three Ports SEPP is an environmental planning instrument created pursuant to the Environmental Planning and Assessment Act 1979 (EP&A Act) and has superseded the State Significant Site listing in the Major Project State Environmental Planning Policy under which previous KIWEF closure stages were assessed. As the applicable environmental planning instrument the Three Ports SEPP establishes the approval pathway under NSW planning context for the KIWEF site closure works.

Under the Three Ports SEPP development may be carried out for the purpose of Environmental Protection Works without development consent by or on behalf of a public authority on land within the Lease Area and as such be subject to assessment under Part 5 of the EP&A Act.

Environmental Protection Works are not defined in the Three Ports SEPP which notes that Words and expressions used in this Policy have the same meaning as they have in the standard instrument set out at the end of the Standard Instrument (Local Environmental Plans) Order 2006, unless otherwise defined in this Policy. Under the Local Environment Plan Standard Instrument environmental protection works means:

“works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works”.

ERM understands HDC has obtained legal advice to the effect that the capping works should meet this definition (or did so in relation to Area 1 and Area 3 under similar provisions of State Environmental Planning Policy (Major Development 2005).

The Three Ports SEPP does define Environmental Management Works which means:

“(a) works for the purpose of avoiding, reducing, minimising or managing the environmental effects of development (including effects on water, soil, air, biodiversity, traffic or amenity); and

(b) environmental protection works”.

The works to close the landfill by installation of a capping system are best defined as environmental management works in that they are exclusively aimed at minimising and managing the contamination related environmental effects of the landfill development and as such are also considered environmental protection works. Further the proposed activity will also be designed to include the revegetation of the capped area with a natural vegetative seed mix conducive to GGBF foraging habitat and the addition of erosion and sediment controls (including drainage lines and sediment basins). The regrading of the capping layer to a minimum 1% will also encourage clean runoff, rehabilitate the land towards its natural state and protect neighbouring land from degradation by the migration of chemicals.

The proposed capping works may meet the definition of remediation under State Environmental Planning Policy 55 – Remediation of Land, where remediation means:

“(a) removing, dispersing, destroying, reducing, mitigating or containing the contamination of any land, or

(b) eliminating or reducing any hazard arising from the contamination of any land (including by preventing the entry of persons or animals on the land)”.

However, it is considered more appropriate that the proposed works be considered ‘environmental management works’ since they include capping a formerly licensed landfill regulated under the Protection of Environment Operations Act, 1997 (POEO Act) to minimise potential future impacts of an existing development rather than actively remediating contaminated land under the Contaminated Land Management Act 1997 (CLM Act) for an intended future use. On this basis, the intent of the environmental management works provision seems more closely aligned with what is proposed than contaminated site remediation.

Remediation of land is permitted within the land use zone and SEPP 55 is not relied on to make it permissible. If SEPP 55 is considered then the same “remediation works” being the mitigation and reduction of a contamination hazard through capping are permissible without consent as “environmental management works” under the Three Ports SEPP. SEPP 55 asserts that it will prevail over inconsistent provisions of SEPP’s that prohibit remediation works, but not over provisions that require consent or say that no consent is required. This means that although the Closure Works would likely meet the definition of Category 1 remediation works due to the classification of Kooragang Island as a coastal zone (which would require consent), the Three Ports SEPP would prevail and as such the closure works would not require development consent under the EP&A Act as they would be considered Category 2 remediation works.

Where a proposal does not require development consent its environmental impacts must be addressed as an “activity” under Part 5 of the EP&A Act. The proposed development is considered permissible without consent under State Environmental Planning Policy (Three Ports) 2014 and, as such, the provisions of Part 5 of the EP&A Act apply.

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

The Closure Works are being assessed under the EP&A Act through the preparation of a Review of Environmental Factors under Part 5 of the EP&A Act.

Under Part 5 of the EP&A Act and for the purpose of attaining the objects of the EP&A Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. This includes consider the effect of an activity on:

- Any conservation agreement entered into under the National Parks and Wildlife Act 1974 and applying to the whole or part of the land to which the activity relates (not applicable);
- Any plan of management adopted under that Act for the conservation area to which the agreement relates (not applicable);
- Any joint management agreement entered into under the Threatened Species Conservation Act 1995 (not applicable),
- Any biobanking agreement entered into under Part 7A of the Threatened Species Conservation Act 1995 that applies to the whole or part of the land to which the activity relates (not applicable);
- Any wilderness area (within the meaning of the Wilderness Act 1987) in the locality in which the activity is intended to be carried on (not applicable);
- Critical habitat (consideration given to GGBF);
- In the case of threatened species, populations and ecological communities, and their habitats, whether there is likely to be a significant effect on those species, populations or ecological communities, or those habitats (relevant); and
- Any other protected fauna or protected native plants within the meaning of the National Parks and Wildlife Act 1974 (relevant).

The above consideration is undertaken in the form of the preparation and consideration of a Review of Environmental Factors by the determining authority, the public authority on whose behalf the activity is undertaken, required to form an opinion as to whether or not any significant impact is likely. Should a significant impact be likely an Environmental Impact Statement is required to be prepared for determination by the Minister of the Department of Planning and Environment. A Review of Environmental Factors is currently being progressed.

It is noted that assessment under Part 5 of the EP&A Act is an accredited assessment process under this bilateral agreement made under section 45 of the EPBC Act between the Commonwealth and NSW.

2.6 Public consultation (including with Indigenous stakeholders)

There are no formal requirements for public consultation under Part 5 of the EP&A Act. Nevertheless, consultation has been undertaken on an ongoing basis with the Landowner (Port of Newcastle Lessor Pty Ltd – a NSW State Government Entity), Port of Newcastle Lessee Pty Ltd (Holder of the land title under long term lease from the NSW Government for use and management of the land), NSW Roads and Maritime Services in relation to traffic and access and the NSW EPA in relation to completion of Surrender Notice requirements. No public consultation has been undertaken on the basis that there are no neighbours in close proximity to the site.

Because of the site's previous land use and highly modified nature, it is considered that there is no potential for impacts on items of Indigenous heritage, and the values of indigenous stakeholders. As such, no public consultation with Indigenous stakeholders has been undertaken.

The water bodies at KIWEF have become habitat for many local and migratory species. Consultation was undertaken with the Kooragang Bird Observers Group, the Society of Frogs and Reptiles, and the Shortland Wetlands Centre in relation to the development of the Capping Strategy.

2.7 A staged development or component of a larger project

Not Applicable

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Description

There are no World Heritage Properties within the Site or in the vicinity of the site.

Nature and extent of likely impact

The proposal will not have any impact on any World Heritage Properties.

3.1 (b) National Heritage Places

Description

There are no National Heritage Places within the Site or in the vicinity of the site.

Nature and extent of likely impact

The proposal will not have any impact on any National Heritage Places

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

One Ramsar Wetland, Hunter Estuary Wetlands (ID No 24) occurs within close proximity of the Site (refer to Annex A, Figure 1). At its closest point the Hunter Estuary Wetland (Kooragang Component) occurs approximately 260 meters to the north of the northern Site boundary.

The Hunter Estuary Wetlands Ramsar site is comprised of two components, Kooragang and Hunter Wetlands Centre Australia. The Kooragang component of the Hunter Estuary Wetlands Ramsar site (most relevant to this site) is located in the estuary of the Hunter River, approximately 7 km north of Newcastle on the coast of New South Wales. The Kooragang component includes Kooragang Island and Fullerton Cove, two areas that lie in the estuarine section of the Hunter River. Kooragang Island originally consisted of seven islands that were mostly separated by narrow mangrove lined channels. In the 1950s these islands were reclaimed and became "Kooragang Island". Habitat types within the Reserve include mangrove forests dominated by Grey Mangrove (*Avicennia marina*), Samphire (*Sarcocornia* sp.) saltmarsh, Paperbark (*Melaleuca* sp.) and Swamp she-oak swamp (*Casuarina glauca*) forests, brackish swamps, mudflats, and sandy beaches.

Hunter Wetlands Centre Australia is a small but unique complex of wetland types surrounded by urban development along three boundaries and is located approximately 2.5 km west of the proposed action. Previously degraded, this urban wetland has been restored. Habitat types at the Hunter Wetlands Centre Australia include restored semi-permanent/seasonal freshwater ponds and marshes, natural semi-permanent/seasonal brackish ponds and marshes, freshwater swamp forests and a coastal estuarine creek.

The Hunter Estuary Wetlands Ramsar site is important as both a feeding and roosting site for a large seasonal population of shorebirds and as a waylay site for transient migrants. Over 250 species of birds have been recorded within the Ramsar site, including 45 species listed under international migratory conservation agreements. In addition, the Ramsar site provides habitat for the nationally threatened Green and Golden Bell Frog, Red Goshawk and Australasian Bittern.

The Ramsar site was traditionally used by the Worimi, Awabakal and Pambalong peoples. There are numerous middens and campsites scattered throughout the lower Hunter River, particularly within the dunes along Stockton Bight. The Hunter Wetlands Centre Australia also contains an archaeological site that is believed to have been an area for the production of stone tools.

Currently, the Kooragang component is used for recreational and nature-based activities. The Hunter Wetlands Centre Australia actively promotes wetland conservation and wise use through communication and education, passive recreation and community involvement.

Justification of the listing criteria:

The Hunter Estuary Wetlands Ramsar site meets three of the nine criteria:

Criterion 2: The Hunter Estuary Wetlands Ramsar site supports 3 species that are nationally and internationally listed. The estuary stingray (*Dasyatis fluviatorum*) listed as vulnerable on the IUCN Red List) and the green and golden bell frog (*Litoria aurea*) listed as vulnerable under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) have been found within the Kooragang component of the Ramsar site. The Australasian bittern (*Botaurus poiciloptilus*) listed as endangered on both the EPBC Act and the IUCN Red List (Version 2009.1) has been found at both components of the Ramsar site.

Criterion 4: The Hunter Estuary Wetland Ramsar site supports 112 species of waterbirds and 45 species of migratory birds listed under international agreements, including the great egret (*Ardea alba*), cattle egret (*Ardea ibis*), terns (*Sterna* spp.), glossy ibis (*Plegadis falcinellus*) and white-breasted sea-eagle (*Haliaeetus leucogaster*).

The Hunter Estuary wetlands also provide refuge for waterbirds such as ducks and herons during periods of inland drought.

Criterion 6: The Hunter Estuary Wetland Ramsar site regularly supports 1% of the population of the eastern curlew (*Numenius madagascariensis*) and the red-necked avocet (*Recurvirostra novaehollandiae*).

Nature and extent of likely impact

The construction phase of the capping works will include some noise, light and vibration disturbance from machinery which may affect some species such as birds, within immediate proximity of the capping works. Given that the Ramsar site is at least 260 m from any construction disturbance, it is considered that the effect of the proposal would be negligible because it would be of low magnitude and limited to a small extent of the Ramsar site. This rationale is based on the local analogue of Stockton Sandspit which provides a resting and feeding place for large aggregations of migratory wading birds, despite being within 100 m off Stockton Bridge/B63 Road, which has heavy vehicle traffic especially during peak hour periods.

Once the capping works are completed, it will result in less infiltration of rainwater into the landfill. This will intern result in slightly higher runoff, which will drain into the surrounding small ponds. Runoff or overtopping of ponds would then drain in to the much larger Deep Pond, ultimately entering the Hunter River South Arm, which is not part of the Ramsar site. Water entering the ponds via overland flow is likely to be less saline and have fewer contaminants than water which has percolated through the landfill areas.

While potential groundwater connections between the Ramsar site and wetland areas adjacent to the Ramsar site may exist, the proposal is highly unlikely to cause any significant changes to the water quality of the Ramsar site. Modelling of contaminant migration associated with the T4 project indicates an increased timeframe before existing contaminants within KIWEF could potentially reach the Ramsar site under a post capping scenario. The proposed action does not include any additional waste emplacement and is designed to reduce the mobilisation of contaminants within the landfill and as such impacts to the Ramsar Wetlands are likely to be beneficial thorough improved water quality.

Given the temporary and negligible effects of the construction activities and the negligible ongoing negative impacts associated with completion of the capping activities, there will be no significant impact on the ecological character of the Ramsar wetland, nor the species it contains, refer to Annex C for the Assessment of Significance.

3.1 (d) Listed threatened species and ecological communities

Description

The protected matters search tool (PMST) identified that three listed Threatened Ecological Communities (TECs), 63 listed threatened species and 73 listed migratory species have the potential to occur within 10 km of the Ecology Study Area (refer to *Annex B*). EPBC Act-listed species identified through other means, such as searches of the Atlas of NSW Wildlife (Bionet) were also considered in this assessment.

The Site has been assessed previously by GHD (2010) and a larger area, encompassing the site of the closure works, has also been assessed for T4 by Umwelt (2012). The results from these previous investigations have been reviewed and included within this assessment, in order to produce a consolidated and up to date ecological assessment and consideration of MNES.

Summary of Field Survey techniques and Effort.

ERM 2015

ERM conducted a one day site survey on 10 November 2015, in order to ground truth the other surveys and vegetation mapping conducted by GHD and Umwelt. This allowed any regeneration of the vegetation subsequent to those studies to be verified and any changes to fauna habitats to be documented. During the survey any incidental fauna species were recorded.

GHD 2010

GHD conducted field surveys between 25th February and 26th March 2009. The field surveys were undertaken by eight ecologists over two nights on three separate occasions. Refer to *Table 2* below for weather records and the specific dates of the GHD surveys. The survey techniques and duration of each investigation method is summarised in *Table 3*.

Table 2 - GHD Field Survey Dates (2010).

Date	Min Temp (°C)	Max Temp (°C)	Rainfall (mm)
25/02/2009	21.7	25.9	0.0
26/02/2009	21.0	23.8	0.0
11/03/2009	21.1	23.0	0.2
12/03/2009	19.0	24.6	7.6
25/03/2009	19.1	26.9	0.0
26/03/2009	17.8	26.2	0.0

Table 3 - GHD Survey Techniques and Survey Effort.

Method	Effort
Green and Golden Bell Frog	
Habitat Assessment including transects to assess vegetation type and condition. Habitats defined as known or potential habitat.	3 days/evenings over a 2 week period.
Tadpole surveys using standardised dip-net surveys in all waterbodies observed within the site. Included searches for basking metamorphs.	5 repeats of 5 sweeps.
Auditory survey followed by call playback	3 evenings spread over a 2 week period.
Tadpole/Fish Traps using net traps and bait. Checked periodically.	
Spotlighting Surveys, including counts of GGBF and capture-release to swab for chytrid and measure and measurements of snout – urostyle length. Photographs were also taken to allow potential recaptures to be identified.	6-7 hrs after sunset, 3 evenings spread over a 2 week period.
Water Quality	
Water quality parameters were collected in each pond, including: Temperature (°C), pH, Redox, Conductivity (uS), and Dissolved Oxygen (DO).	
Vegetation Mapping	
Vegetation Mapping (LHCCREMS, 2003) was reviewed and ground verified during the field surveys using quadrats and transects. Focused on EECs and TECs. Dominant species recorded with random meanders also used to pick up additional species. Vegetation map was prepared to show results.	
Bats	
Anabats were used to record bat calls at several locations in the Site, with the calls subsequently identified.	11 hours on 25 th and 4 hours on 26 th March 2009.
Opportunistic Observations	
Incidental records of all vertebrate species were collected throughout the survey period.	Six days/evenings.

Table 3 is compiled from data sourced from GHD 2010.

Umwelt 2012

Umwelt conducted surveys across the T4 site over four seasons in order to account for seasonal variation and to increase detectability of different species. The surveys were conducted in a large area beyond just the KIWEF Closure Works Site, however many of the targeted surveys for key species such as the GGBF (*Litoria aurea*) and Australasian Bittern (*Botaurus poiciloptilus*) were conducted in the Closure Works Site or adjacent to it. In total, 103 person-days or nights (of 8-12 hours each) were used to comprehensively sample the fauna assemblages of the T4 project area and surrounds. Opportunistic fauna recording was also completed during other surveys completed within the T4 project area. Table 4 details the survey effort and timing of the Umwelt investigation.

Table 4– Terrestrial Fauna Survey Timing for T4 Project Area and Surrounds

Survey Area	Season	Year	Period	Length
T4 project area				
T4 Stockyard Site	Spring	2010	11, 12, 17, 22, 25, 29 & 30 November	14 person days/nights
	Summer	2010/2011	8 & 10 February	4 person days/nights
Proposed rail and utility corridor	Summer	2011	14, 15, 16, 17, 21 & 22 February	12 person days/nights
	Autumn	2011	7 & 10 March	4 person days/nights
	Summer	2012	31 January	2 person days/nights
Targeted On-site Threatened Fauna Surveys	Autumn	2010	9, 10, 15 & 16 March	8 person days/nights
	Winter	2010	6, 7 & 8 July, 18, 19 & 20 August	12 person days/nights
	Spring	2010	10, 11, 12 & 17 November	8 person days/nights
	Summer	2010/2011	8, 13, 14, 15 & 20 December, 19, 20, 24 & 27 January	18 person days/nights
Micro-bat habitat survey in mangroves	Summer	2011	15 February	2 person days/nights
	Autumn	2011	7 & 10 March	4 person days/nights
Off-site				
Off-site green and golden bell frog surveys	Summer	2011	1, 2, 3, 16 & 21 February	10 person days
	Autumn	2011	24 March	2 person days/nights
	Summer	2012	18, 19 January	3 person days/nights

Table 5 further details the Umwelt survey methods and the compares the identified State Government survey requirements against the actual surveys completed.

Table 5 – Terrestrial Fauna Survey Timing for T4 Project Area and Surrounds

Survey Target	Survey Method	Survey Requirement (DEC 2004)	Survey Effort Employed for EA	Habitat Stratification Units Surveyed (number of sites)
Amphibians (including Green and Golden Bell Frog)	Nocturnal Call playback	At least one playback on each of two separate nights	20 sessions of call playback were undertaken across 7 fauna survey sites over two seasons. In addition to this, at least two sessions were undertaken at the 24 targeted green and golden bell frog sites, over at least two seasons.	Freshwater Wetland (26) Saltmarsh (1) Mangrove Forest (2) Disturbed Land (2)
	Night watercourse search	Two hours per 200 metres of water's edge	Two nocturnal watercourse surveys, each of one person-hour on two separate nights, were undertaken at the 7 fauna survey sites over two seasons. Between two and five nocturnal watercourse surveys were undertaken at the 24 targeted green and golden bell frog sites, over three seasons.	Freshwater Wetland (31)

Survey Target	Survey Method	Survey Requirement (DEC 2004)	Survey Effort Employed for EA	Habitat Stratification Units Surveyed (number of sites)
	Diurnal herpetological searches	One hour per stratification unit	Two diurnal herpetological surveys, each of one person-hour on two separate days, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All
Reptiles	Diurnal herpetological searches	30 minute search on two separate days targeting specific habitat	Two diurnal herpetological habitat searches, each of one person-hour on two separate days, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Spotlighting surveys	30 minute search on two separate nights targeting specific habitat	Two nocturnal spotlighting surveys, each of one person-hour on two separate nights, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All
Diurnal Birds (including threatened raptors, migratory shorebirds, threatened wetland-dependent birds and threatened woodland birds)	Area search	Per stratification unit	Two diurnal bird surveys, each of one person-hour, were undertaken at the 7 fauna survey sites, over two seasons. In addition to this, bird surveys were undertaken at two sites areas considered to be 'important bird habitat' by Lindsey (2008) and Herbert (2007). Two survey periods, each comprising one person-hour, were sampled at the two locations over one season. An additional site was surveyed in the proposed rail and utility corridor on one occasion.	Freshwater Wetland (3) Mangrove Forest (2) Saltmarsh (3) Planting (1) Disturbed Land (2) Open Water (Deep Pond) (1)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All

Survey Target	Survey Method	Survey Requirement (DEC 2004)	Survey Effort Employed for EA	Habitat Stratification Units Surveyed (number of sites)
Nocturnal Birds (including threatened owls, bitterns and bush-stone curlew (<i>Burhinus grallarius</i>))	Call playback surveys	Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated as follows: - at least 5 visits per site, on different nights are required for the Powerful Owl, Barking Owl and the Grass Owl; - at least 6 visits per site for the Sooty Owl, and 8 visits per site for the Masked Owl are required. Sites for Bush Stone-curlew surveys should be 2-4 km apart and conducted during the breeding season.	20 sessions of call playback were undertaken across 7 fauna survey sites over two seasons. Two sessions of call playback were undertaken at the 6 targeted eastern grass owl sites, over three seasons. Two sessions of call playback were undertaken at the 13 targeted Australasian bittern sites, over four seasons.	Freshwater Wetland (14) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (6)
Nocturnal Birds (including threatened owls, bitterns and bush-stone curlew)	Spotlighting surveys	Spotlighting for plains wanderer and bush stone-curlew by foot or from a vehicle driven in first gear.	Two nocturnal spotlighting surveys, each of one person-hour on two separate nights, were undertaken at the 7 fauna survey sites, over two seasons. Spotlighting was undertaken in conjunction with call playback surveys at the 6 targeted eastern grass owl sites and 13 targeted Australasian bittern sites, over three and four seasons, respectively.	Freshwater Wetland (14) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land(6)
	Day habitat searches	Search habitat for pellets, and likely hollows. Flushing of bush stone-curlews by walking through potential habitat.	Two diurnal flushing surveys were undertaken at 3 targeted eastern grass owl sites in preferred habitat within the T4 project area, over two seasons. Two diurnal flushing surveys of potential diurnal roost habitat, such as tall emergent aquatic vegetation, was undertaken across the 13 targeted Australasian bittern sites within the T4 project area, over four seasons. One flushing survey was undertaken on one occasion within the proposed rail and utility corridor.	Freshwater Wetland (14) Disturbed Land (3)

Survey Target	Survey Method	Survey Requirement (DEC 2004)	Survey Effort Employed for EA	Habitat Stratification Units Surveyed (number of sites)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All
Mammals (excluding bats)	Hair tubes	10 large and 10 small tubes in pairs for at least 4 days and 4 nights.	Hair funnel transects were placed along a 200 metre transect at the 7 fauna survey sites. Each transect comprised 20 terrestrial hair funnels. Hair funnels remained on-site for 14 days thereby resulting in 280 trap nights per fauna site.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Spotlighting surveys	2 x one hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Two nocturnal spotlighting surveys, each of one person-hour on two separate nights, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Search for scats and signs	30 minutes searching each relevant habitat, including trees for scratch marks	Two general habitat searches, each of one person-hour on two separate days, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All
Bats (including threatened micro-bats and the grey-headed flying-fox (<i>Pteropus poliocephalus</i>))	Ultrasonic call recording (Anabat)	Two sound activated recording devices utilised for the entire night (a minimum of four hours), starting at dusk for two nights.	Anabat surveys, on two separate nights, were undertaken at the 7 fauna survey sites, over two seasons. In addition to this, Anabat surveys were conducted over two nights at nine targeted micro-bat habitat survey sites over three seasons. A targeted area search was also undertaken in mangrove habitat at two sites using a hand-held Anabat on one occasion.	Freshwater Wetland (5) Mangrove Forest (4) Saltmarsh (2) Planting (1) Disturbed Land (5) Open Water (Deep Pond) (1)
	Spotlighting surveys	2 x one hour spotlighting on two separate nights	Two nocturnal spotlighting surveys, each of one person-hour on two separate nights, were undertaken at the 7 fauna survey sites, over two seasons.	Freshwater Wetland (1) Mangrove Forest (2) Saltmarsh (1) Planting (1) Disturbed Land (2)

Survey Target	Survey Method	Survey Requirement (DEC 2004)	Survey Effort Employed for EA	Habitat Stratification Units Surveyed (number of sites)
	Stag watching	Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset (recommended for gliders and possums)	Two stag watching surveys, each of one person-hour on one occasion, was undertaken at two potential mangrove micro-bat roost sites.	Mangrove Forest (2)
Bats (including threatened micro-bats and the grey-headed flying-fox)	Day habitat searches	Searches for bat excreta at or near potential habitats.	One habitat assessment was undertaken on one occasion at four potential mangrove roost sites. Dominant species cover, ground cover, presence and quantity of perch sites, litter presence, number of stags, stumps and logs were recorded.	Mangrove Forest (4)
	Opportunistic observations	-	Opportunistic observations were made throughout all surveys.	All

This table has been extracted from Umwelt 2014 and adapted for the purposes of this referral.

Likelihood of Occurrence Methodology and Impact Assessment

The list of subject species was collated from a combination of the PMST, Atlas Records and Field Surveys. Any entirely marine species (such as Cetaceans, Marine Fish and Pelagic Seabirds) were excluded from the Subject Species list given a lack of marine habitat within the Closure Works area. Species which may occasionally occur within the Closure Works area or may flyover the site (such as shorebirds) were included.

Based on the field surveys and desktop research, the likelihood of each listed threatened species and TEC listed under the EPBC Act, was assessed using the following definitions:

- Known:
 - o The threatened matter has been recorded in the Ecology Study Area during recent field surveys; or
 - o Database records demonstrate that the threatened matter has been known to occur in the Ecology Study Area within the last 10 year period.
- Potential:
 - o The threatened matter's known distribution includes the Ecology Study Area, and suitable habitat is present within the Ecology Study Area; or
 - o Database records demonstrate that the threatened matter has been known to occur in the Ecology Study Area, however has not been recorded within the last 10 years; or
 - o The threatened matter is a wide ranging volant species which may 'fly-over' the Ecology Study Area, regardless of the habitat types present and has been recorded within 10 km of the Ecology Study Area.
- Unlikely:
 - o The threatened matter has not been recorded within 10 km of the Ecology Study Area and suitable habitat does not occur within the Ecology Study Area; or
 - o The Ecology Study Area is not within the threatened matter's known distribution; or
 - o Sufficient field surveys have been conducted within the Study Area to conclude that the species is likely to be absent.

Qualitative risk matrix

The assessment of significance of impacts assigns a rating for the 'sensitivity' of the matter or habitat and a 'consequence' is applied as defined in *Table 6*. The product of the sensitivity and the consequence is the 'impact significance rating'. That is, Sensitivity x Consequence = Impact Significance Rating. This risk matrix is applied if a threatened matter has the potential to occur or is known to occur. If the risk to the matter is considered **low** then further assessment is **not** considered necessary. If the matter has a **medium, high or very high risk** then further assessment is required, including an assessment of significance.

Table 6 - Impact Significance Ratings for Threatened Matters.

Consequence					
Sensitivity		Negligible ¹	Minor ²	Moderate ³	Major ⁴
	Ecological value not listed as threatened	Low	Low	Medium	High
	Ecological value listed as Vulnerable or Migratory	Low	Medium	Medium	High
	Ecological value listed as Endangered	Medium	High	High	Very High
	Ecological value listed as Critically Endangered	Medium	High	Very High	Very High

Consequence Definitions

¹Negligible: No impacts to an ecological community. Effect on species is within the likely normal range of variation. No removal of specific breeding habitat features.

²Minor: Indirect impacts to listed ecological community (eg changes to water quality, introduction of pathogens, introduction of invasive flora) which may affect a small proportion of the ecological community. Effects a small proportion of a population and Project-related mortality of a small number of individuals may occur, but does not substantially affect other species dependent on it, or the populations of the species itself. No removal of specific breeding habitat features.

³Moderate: Direct removal of a portion of a listed ecological community. Effects a sufficient proportion of a species population that may bring about a substantial change in abundance and/or reduction in distribution over one or more generations, but does not threaten the long term viability of that population or any population dependent on it.

⁴Major: Direct removal of a listed ecological community. Effects an entire population or species at sufficient scale to cause a substantial decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) may not return that population or species, or any population or species dependent upon it, to its former level within several generations, or when there is no possibility of recovery.

Species sensitivity definitions

Species sensitivities refer to the listing under either the EPBC Act or TSC Act. Where the species listings differ, the higher sensitivity is used.

Table 7 details the risk assessment process for each of the individual species identified through the PMST, Atlas Records and Field Surveys.

Table 7 - Likelihood of Occurrence Table and Risk Assessment for Threatened Entities Listed Under the EPBC Act

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
Amphibians							
<i>Litoria aurea</i> Green and Golden Bell Frog	E	V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites occur in highly disturbed areas (OEH 2015).	Known. This species has been recorded within and adjacent to the Closure Works area, including areas of known breeding habitat. A large number of field studies have been conducted in this area, including GHD 2010 and Umwelt 2012.	The Closure Works area contains potential terrestrial foraging habitat for this species which will be cleared, capped, and sequentially revegetated. Breeding areas (wetlands habitats) will not be directly impacted, however changes to hydrology may cause indirect impacts.	Minor.	Moderate.
<i>Litoria littlejohni</i> Littlejohns treefrog	V	V	Occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Unlikely. There are no records of this species within the locality, and the species has not been detected during field surveys.	NA	NA	NA
Reptiles							
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	E	V	Largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring (OEH, 2015)	Unlikely. Suitable habitat does not exist within the Closure Works area, and there are no records within the locality.	NA	NA	NA
Birds							
<i>Anthochaera phrygia</i> Regent Honeyeater	CE	CE	In NSW the distribution is very patchy and mainly confined to the two main breeding areas (Capertee Valley and Bundarra-Barraba regions) and surrounding fragmented woodlands. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests on the upper north coast.	Unlikely. There are records within the locality, however suitable habitat for the species, does not occur within the Closure Works area.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	Inhabits terrestrial and estuarine wetlands. Prefers dense vegetation including sedges, rushes and reeds.	Known. There several records directly adjacent to the Closure Works area recorded by Umwelt (2012).	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. There is the potential for indirect affects including changes to water quality. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Minor.	High.
<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE, Mi	Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland (OEH 2015).	Known. This species has been recorded on the mud flats surrounding Deep Pond by Umwelt. Deep pond is directly adjacent to the Closure Works area.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. There is the potential for indirect affects including changes to water quality. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Minor.	High.
<i>Grantiella picta</i> Painted Honeyeater	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches (OEH 2015).	Unlikely. Suitable habitat for this species does not occur within the site. The species has been recorded in close proximity to the Site.	NA	NA	NA
<i>Lathamus discolor</i> Swift Parrot	E	E	This species occurs 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>) and Spotted Gum (<i>Corymbia maculata</i>).	Unlikely. The species has not been recorded within the immediate vicinity of the Closure Works and suitable habitat does not exist within the site.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Numenius madagascariensis</i> Eastern Curlew		C E, Mi	This species preferred foraging and roosting habitat are intertidal mudflats, particularly where mangroves are present, and saltmarsh. They occur in intertidal coastal mudflats, coastal lagoons, sandy spits (Pizzey and Knight 2003). The species does not breed in Australia.	Known. this species has been recorded several times within the Site, especially in the Deep Pond area, which is likely to provide (sub-optimal) foraging habitat for the species. The species is associated with the periphery of wetland areas, and is unlikely to utilise other area of the closure works.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. There is the potential for indirect affects including changes to water quality. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Minor.	High.
<i>Rostratula australis</i> Australian Painted Snipe	E	E, M	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (OEH, 2015).	Potential. The species has been recorded within 1 km of the Site, during 2012 (Bionet). Field surveys have failed to detect the species however, owing to suitable habitat existing within the Closure Works area the species is considered to have the potential to occur, perhaps intermittently.	The proposed work will temporarily remove potential sub-optimal foraging and nesting habitat in the terrestrial areas. The construction activities may also disturb the species in adjacent wetland areas, causing it to temporarily vacate foraging habitat.	Minor.	High.
Mammals							
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	This species is found in well-timbered areas containing gullies and generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. It roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariei</i>).	Unlikely. This species has been recorded in the locality at Ash Island, however there is an absence of well-timbered habitat within the Closure Works area and therefore the species is not anticipated to occur.	NA	NA	NA
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds.	Unlikely. This species has been recorded within the locality, however suitable habitat for this species does not exist within the Closure Works area .	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Brush-tailed Rock-wallaby</i> <i>Petrogale penicillata</i>	E	V	This species often occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Their distribution generally follows the line of the Great Dividing Range, however this has become increasingly more fragmented.	Unlikely. There are no records of this species within the locality (Bionet 2015) and the habitat within the Closure Works area is unsuitable for the species	NA	NA	
<i>Phascolarctos cinereus</i> Koala	V	V	Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The Area 13 Koala Plan of Management (KPOM) identifies four feed trees within the region: Forest Red Gum (<i>E. tereticornus</i>), Tallowwood (<i>E. microcorys</i>), Swamp Mahogany (<i>E. robusta</i>), and Grey Gum (<i>E. propinqua</i>) (Biolink 2008).	Unlikely. There are records within the locality, however suitable habitat for the species does not exist within the Closure Works area. Furthermore there is no connectivity between the Study Area and areas where the species has been recorded.	NA	NA	NA
<i>Potorous tridactylus tridactylus</i> Long-nosed Potoroo (SE mainland)	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. (OEH 2015).	Unlikely. There are records of this species within the locality (Bionet 2014), however suitable habitat does not exist within the Closure Works area.	NA	NA	NA
<i>Pseudomys novaehollandiae</i> New Holland Mouse	-	V	In NSW, the New Holland Mouse is known from Royal National Park, Kangaroo Valley and from Port Stephens to Evans Head (OEH SPRAT). This species is known to inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes. Soil type may also be an important indicator of suitability of habitat, with deeper top soils and softer substrates being preferred for digging burrows.	Unlikely. There are records of this species within the locality (Bionet 2014), however the Closure Works area does not constitute preferred habitat, due to the lack of suitable vegetation and preferred habitat features.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<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 generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50km from the camp to forage; commuting distances are more often <20km. Feed on the nectar and pollen of native trees, in particular <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Banksia</i> , and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops (OEH 2015).	Known. There are numerous records of this species within the locality, including records of the species flying over the subject site (GHD 2010). Despite the presence of the species, the Closure Works area does not include any habitat likely to be utilised by the species, with no foraging or roosting resources present.	The capping works will not impact the species as the species is only anticipated to fly over the Closure Works area and no habitat for the species exists, within the Closure Works area.	Negligible.	Low.
Flora							
<i>Allocasuarina defungens</i> Dwarf Heath Casuarina	E	E	Dwarf Heath Casuarina grows mainly in tall heath on sand, but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains (OEH 2015).	Unlikely. Records do not occur within the locality (Bionet 2015). No suitable habitat within the Closure Works area.	NA	NA	NA
<i>Angophora inopina</i> Charmhaven Apple	V	V	Occurs most frequently in four main vegetation communities: (i) <i>Eucalyptus haemastoma</i> – <i>Corymbia gummifera</i> – <i>Angophora inopina</i> woodland/forest; (ii) <i>Hakea teretifolia</i> – <i>Banksia oblongifolia</i> wet heath; (iii) <i>Eucalyptus resinifera</i> – <i>Melaleuca sieberi</i> – <i>Angophora inopina</i> sedge woodland; (iv) <i>Eucalyptus capitellata</i> – <i>Corymbia gummifera</i> – <i>Angophora inopina</i> woodland/forest	Unlikely. Recorded within the locality, however suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Commersonia prostrata</i> Dwarf Kerrawang	E	E	Occurs on sandy, sometimes peaty soils in a wide variety of habitats.	Unlikely. Recorded within the locality, however suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Cynanchum Elegans</i> White-flowered Wax Plant	E	E	This species usually occurs on the edge of dry rainforest vegetation. In the Hunter Valley it is known to occur at Singleton Military Area and Kooragang Island.	Unlikely. Suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys. The species has been recorded close to the Study Area on Ash Island within forested areas.	NA	NA	NA
<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>) (OEH 2015).	Unlikely. There are no records within the Locality (Bionet 2015). Not recorded within the Closure Works area and suitable woodland communities types which support this species were not recorded within the impact area.	NA	NA	NA
<i>Diuris praecox</i> Rough Doubletail	V	V	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Occurs in the coastal region between Ourimbah and Nelson Bay.	Unlikely. Recorded within the locality, however suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Eucalyptus camfieldii</i> Camfield's Stringybark	V	V	Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone and coastal heath mostly on exposed sandy ridges. Usually in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of narrow-leaved stringybark (<i>E. oblonga</i>), brown stringybark (<i>E. capitellata</i>) and scribbly gum (<i>E. haemastoma</i>).	Unlikely. Recorded within the locality, however suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Eucalyptus parramattensis</i> subsp. <i>Decadens</i> Earp's Gum	V	V	The Tomago Sandbeds population is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south. It generally occupies deep, low- nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant. Flowering occurs from November to January (OEH 2015)	Unlikely. Recorded within the locality, however suitable habitat and associated vegetation types do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Euphrasia arguta</i>	CE	CE	Grows in grassy areas near rivers. Preliminary determination as CE following rediscovery of four populations in the Nundle area in 2008. Distribution highly restricted to rediscovered records.	Unlikely. There are no records within the Locality (Bionet 2015). Not recorded within the Closure Works area, and neither suitable nor potential habitat exists.	NA	NA	NA
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	V	V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest and a range of altitudes from flat, low lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	Unlikely. Recorded within the locality, however suitable soil types and associated vegetation do not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Grevillea shiressii</i>	V	V	Known from two populations within the Gosford Local Government Area. There is also a naturalised population at Newcastle. Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils	Unlikely. Recorded within the locality, however habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Melaleuca biconvexa</i> Biconvex Paperbark	V	V	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire (OEH 2014).	Unlikely. Recorded within the locality, however suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Persicaria elatior</i> Tall Knotweed	V	V	This species normally grows in damp locations, especially beside lakes and streams. It has occasionally been known to occur in swamp forest as well as in association with disturbance. This species is known to occur in two disjunct areas; in south-eastern NSW and northern NSW (OEH, 2015).	Unlikely. Recorded within the locality, however not within close proximity to the Closure Works area. Despite some suitable habitat existing, the species has not been detected during multiple field surveys.	NA	NA	NA
<i>Phaius australis</i> Lesser Swamp-orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	Unlikely. Not recorded within the locality and suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Rutidosia heterogama</i> Heath Wrinklewort	V	V	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Unlikely. Recorded within the locality, however suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Streblus pendulinus</i> Siah's Backbone		E	On the Australian mainland, Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m above sea level. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest (ATRP 2010 as cited in DSEWPac 2013).	Unlikely. Recorded within the locality, however suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E	V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Unlikely. Recorded within the locality, however suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
<i>Tetralochea juncea</i> <i>Black-eyed Susan</i>	V	V	This species is confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover.	Unlikely. Recorded within the locality, however suitable habitat does not occur within the Closure Works area. It has not been recorded during previous field surveys.	NA	NA	NA
Threatened Ecological Communities (TECs)							
Central Hunter Valley eucalypt forest and woodland		CE	An open forest or woodland, typically dominated by eucalypt species; it has an open to sparse mid-layer of shrubs and a ground layer of grasses, forbs and small shrubs. The canopy of the ecological community is dominated by one or more of the following four eucalypt species: Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>), Spotted Gum (<i>Corymbia maculata</i>), Slaty Gum (<i>E. dawsonii</i>) and Grey Box (<i>E. moluccana</i>).	Unlikely. The community was not recorded within the Closure Works area as the site does not offer potential given its history of modification and the landscape position which (unmodified) would provide more mesic conditions.	NA	NA	NA
Lowland Rainforest of Subtropical Australia	E*	CE	Generally a moderately tall (≥ 20 m) to tall (≥ 30 m) closed forest (canopy cover $\geq 70\%$). Tree species with compound leaves are common and leaves are relatively large (notophyll to mesophyll). Typically there is a relatively low abundance of species from the genera <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Casuarina</i> . Buttresses are common as is an abundance and diversity of vines. The canopy comprises a range of tree species but in some areas a particular species may dominate e.g. palm forest, usually dominated by <i>Archontophoenix cunninghamiana</i> (Bangalow Palm) or <i>Livistona australis</i> (Cabbage Palm); and riparian areas dominated by <i>Syzygium floribundum</i> (syn. <i>Waterhousea floribunda</i>) (Weeping Satinash/Weeping Lilly Pilly).	Unlikely. Not recorded within the Closure Works area, and neither suitable nor potential habitat exists, given that the site has been cleared and extensively modified from its original condition.	NA	NA	NA

Species Name	Species Sensitivity		Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
	TSC Act Status	EPBC Act Status					
Subtropical and Temperate Coastal Saltmarsh	E [#]	V	The ecological community consists of dense to patchy areas of mainly salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges and shrubs that may also include bare sediment as part of the mosaic). Characteristic plant species include <i>Gahnia filum</i> , <i>G. trifida</i> , <i>Juncus kraussii</i> , <i>Samolus repens</i> , <i>Sarcocornia quinqueflora</i> , <i>Sporobolus virginicus</i> , <i>Suaeda australis</i> , <i>Tecticornia pergranulata</i> , <i>T. arbuscula</i> , <i>Triglochin striata</i> , <i>Wilsonia backousei</i> and <i>W. rotundifolia</i> . There are a number of key diagnostic characteristics for describing the <i>Coastal Saltmarsh</i> ecological community but principally this EEC occurs on the coastal margin, along estuaries and coastal embayments and on low wave energy coasts (TSSC 2013).	An area of habitat exist within the Wetland of K6 Cell 10, which has floral assemblages similar to that of Coastal Saltmarsh. However the community within the Site is permanently disconnected from the intertidal influence and therefore is not considered part of the listed community, despite having species attributes similar to the listed community.	NA	NA	NA

Species Sensitivity Status: V – Vulnerable; E – Endangered; CE – Critically Endangered.

Mi – Migratory (under the EPBC act only)

* Listed under the TSC Act as *Littoral Rainforest in the South East Corner, Sydney Basin and NSW North Coast Bioregions* (E,TSC Act)

* Listed under the TSC Act as *Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions*, and *Lowland Rainforest on floodplain in the NSW North Coast Bioregion* (E,TSC Act)

[#] Listed under the TSC Act as *Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions* (E,TSC Act)

The Likelihood of Occurrence Table and Risk Assessment considered 38 entities (*Table 6*), including Three (3) TECs, 18 Plants, seven (7) mammals, seven (7) birds, one (1) snake and two (2) frog species. Threatened species records with relation to the Closure Works site are provided in *Annex A, Figure 3*. Of the species considered, one (1) TEC, four (4) birds and one (1) frog species are considered to warrant further assessment, these are;

- Eastern Curlew (*Numenius madagascariensis*);
- Australian Painted Snipe (*Rostratula australis*);
- Australasian Bittern (*Botaurus poiciloptilus*);
- Curlew Sandpiper (*Calidris ferruginea*), and
- Green and Golden Bell Frog.

Nature and extent of likely impact

The key direct impact of the project is the clearance of exotic grassland and exotic shrubby grassland. This will not directly impact any of threatened shorebirds or wetland birds, which do not typically utilise these terrestrial habitats. The clearance will remove some terrestrial habitat which has the potential to provide foraging habitat for the Green and Golden Bell Frog which is discussed in detail below.

The hydrological changes resulting from the capping works is discussed in Section 3.3(b). In summary greater surface run-off will occur due to the reduced permeability of the capping layer. This will result in greater runoff into Deep Pond. As the run-off will travel through a series of sediment controls, it is anticipated that this water will have a low sediment load, especially once revegetation is complete. The corresponding reduction in ground water flowing through the landfill will reduce the amount of contaminants reaching wetlands and Deep Pond. These impacts are considered of net benefit to the Wetlands and threatened species, however given the large dilution factors and other complicating external factors such as precipitation and evaporation, the effects are likely to be undetectable. There is anticipated to be no significant impact to any of the threatened species below caused by the indirect impact of changes to water quality.

The construction works will involve heavy machinery and increased human activity within the capping area. This will temporarily increase the amount of noise and visual disturbance in an area close to Wetlands. This may disrupt shorebirds and wetland birds utilising wetland habitat adjacent to the works. This impact is temporary and it is not considered significant as there are large areas of alternative habitat within the vicinity. It is also anticipated that the birds will become habituated to the disturbance and continue foraging in the area, as demonstrated at the local analogue site of Stockton Sandspit. Additional lighting during construction works will be minimal and there is no requirement for artificial lighting during the night.

The following threatened species are threatened under the EPBC Act and are considered as having the potential to be impacted by the proposed works. They are discussed below and are also considered in the Assessments of Significance (*Annex C*)

Eastern Curlew (*Numenius madagascariensis*) – Endangered and Migratory, EPBC Act

This species typically forages where intertidal mudflats are present and has occasionally been recorded in Deep Pond (refer to *Annex A, Figure 3*). It is unlikely that the habitat within the Closure Works site is important for the species given that it is not intertidal and that few records are present. Any impacts are therefore likely to affect a very low number of individuals. The proposal will not remove habitat for this species as wetlands will not be cleared or modified. The main potential impact to this species is due to construction disturbance related to the capping works. This is a temporary impact and considered negligible given that only a very small number of individuals will be affected. The species may also become habituated to the construction disturbance and therefore still able to utilise the sub-optimal foraging habitat present in Deep Pond. The Assessment of Significance (provided in *Annex C*) undertaken concluded that the impact to this species would be **not significant**.

Australasian Bittern (*Botaurus poiciloptilus*) –Endangered, EPBC Act and TSC Act

This species inhabits terrestrial and estuarine wetlands, preferring dense vegetation including sedges, rushes and reeds. It is a cryptic species, occurring at low densities within the Hunter Estuary. Habitat within and adjacent to the Closure Works site is limited to dense areas of wetland vegetation with Common Reed and Typha. The species has been recorded on four occasions during 2010 by Umwelt (2012). Locations where Bitterns were recorded include Easement Pond, Railway Pond and K6 Cell 11. Two individuals were recorded within the later location, which may indicate a single breeding pair occurring, adjacent to the site. Breeding pairs are territorial and occupy large area, therefore it is unlikely that more than one pair occurs within close proximity to the site. The proposal will not remove habitat for this species as wetlands will not be cleared or modified. The main potential impact to this species is due to construction disturbance related to the capping works. In the worst case scenario the proposed works may cause the species to avoid areas of potential foraging or breeding habitat, immediately adjacent to the proposed capping area. The wetlands adjacent to the works area are small in size and are likely to represent a small proportion of the territory required for individual birds, therefore it is anticipated that any temporary displacement that occurs will not significantly affect the species. The species will be able to forage or breed in alternative habitat within the locality. The species may also become habituated to the construction disturbance and persist in wetland habitats close to the construction works. The Assessment of Significance (provided in *Annex C*) undertaken concluded that the impact to this species would be **not significant**.

Curlew Sandpiper (*Calidris ferruginea*) Endangered and Migratory, EPBC Act; Critically Endangered, TSC Act;

Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. This species has been recorded foraging in large numbers at Deep Pond (up to 450) in 2003 and in small numbers between 2005 and 2007 (Lindsey 2008) and more recently by Umwelt (2012). It is likely that Deep Pond provides an intermittent foraging resource for the species and may be preferred during lower water levels due to more shallow foraging habitat becoming accessible. The proposal will not remove habitat for this species as wetlands will not be cleared or modified. The construction works will involve heavy machinery and increased numbers of people within the capping area. This may disrupt the Curlew Sandpipers foraging within the eastern areas of Deep Pond. This impact is temporary and it is **not significant** as there are large areas of alternative habitat within the vicinity. It is also anticipated that the birds will become habituated to the disturbance and may continue foraging in the area.

Green and Golden Bell Frog (*Litoria aurea*) Vulnerable, EPBC Act; Endangered, TSC Act

The Green and Golden Bell Frog, has been recorded both historically and recently within the Site. Collaborative targeted surveys by GHD and RPS HSO recorded the species on multiple occasions including both adults and tadpoles. All of these records were outside of the proposed capping area, however several records were found in close proximity to the capping area. The highest density of records was from K6 Cell 11 (*refer to Annex A, Figure 4 and 5*) with breeding also recorded in this area. Other areas in which the species was recorded includes K6 Cell 10 and 12, Easement Pond, Cell 34 and the South western Corner of K7 (often referred to as K7 Ponds or North Pond 3).

Further surveys were also completed by Umwelt within the Site and the surrounding area, between 2010 and 2011. The field surveys supported GHD's findings with a similar concentration of records as described with highest recorded concentrations of Green and Golden Bell Frog within K6 Cell 11.

The annual report on the 2013/2014 Field Season for Green and Golden Bell Frog on Kooragang Island (NCIG, 2015) provided information on the distribution of the species between September 2011 and March 2014. These surveys again supported the distribution of the species described above, however there were notably more records in Deep Pond especially where emergent vegetation was present. The species was also detected calling in the central eastern margins of Deep Pond, indicating that potential breeding habitat is present.

Annex A Figure 4 shows the records of Green and Golden Bell Frog within the site and the surrounding area. It should be noted that several of the records are spatially suspect and include a high density of individuals within wholly terrestrial areas of the site, or within open water habitat in Deep Pond. It is likely that these results are a central point survey point, reflecting effort over a much large area, with individual records lumped together to form a single point. These records could not be interrogated further as they did not have detailed attribute data. Notwithstanding these spatially suspect records, the majority of the records are accurate and show clear habitat preferences for certain wetland habitats and ponds. Umwelt has also completed habitat mapping to identify Green and Golden Bell Frog Habitat, which has been replicated within *Annex A Figure 5*.

The Table 8, below, provides an overview of the known habitat usage of site and the surrounding wetlands by the Green and Golden Bell frog, the locations of the Green and Golden Bell Frog habitat can be seen on *Annex A Figure 5*.

Table 8 – Green and Golden Bell Frog Habitat Values and Impacts

Location	Habitat Utilisation	Impacts as a result of the Proposed Works
Deep Pond	The margins of the ponds provide foraging habitat for the species and a likely refuge during dry periods of weather. There is potential for breeding to occur with calling adults recorded, however no tadpoles or metamorphs have been detected to date. Tadpole may be compromised owing to the presence of high numbers of predatory fish including native eels and exotic Eastern Gambusia, which are known to predate on their tadpoles. A number of wetland birds are also likely to prey on the species.	No direct impacts as outside of the capping area. Negligible hydrological changes.
K6 Cell 11 Railway Pond and; Other Ponds within K7	Pond areas provide important breeding habitat for GGBF, with a high density of adults, metamorphs and tadpoles recorded. Ponds are optimal habitat with no Eastern Gambusia recorded, emergent vegetation, areas of open water and unshaded areas for basking. Surrounding wetland and terrestrial habitat provide foraging resources for the species with dense native and exotic vegetation present.	No direct impacts as outside of the capping area. Negligible hydrological changes.

Location	Habitat Utilisation	Impacts as a result of the Proposed Works
K6, Cells 9,10 & 12	Mosaic of wetland and terrestrial habitats which are likely to provide drought/dry weather refuge and optimal foraging resources for the species and are within close proximity to wetland habitat and breeding habitats. There are a number of records within these areas.	No direct impacts as outside of the capping area. Negligible hydrological changes.
K5, Cells 6 & 8	These areas are highly vegetated and are likely to provide some foraging habitat for adult GGBF. They are a considerable distance from the breeding ponds and unlikely to provide habitat for metamorphs. There are a small number of records in this area. Areas of similar habitat also occur within the wider K7 area (outside of the capping area) and this habitat is not considered unique. It is not anticipated that high proportions of the population would be recorded within these areas at any given time.	Temporary clearance of all vegetation and levelling earthworks.
K3 K5: 1,2,3,4,5,7 Cells	These areas are dominated by exotic grassland, without large tussock forming species or other habitat complexity which is likely to provide shelter for the species. These habitats are considered largely unsuitable for the species however individuals may occasional traverse these areas.	Temporary clearance of all vegetation and levelling earthworks.

The clearance of vegetation within K5 and K3, associated with the capping works, may cause some direct impacts to the Green and Golden Bell Frog. K5 Cell 6 and 8 in particular offer potential foraging habitat for the adult Green and Golden Bell Frog, occupying an area of approximately 5.2 ha. Dense vegetation is present including large tussocks of Pampas Grass in which the species may shelter. These areas are not directly adjacent to wetland habitat and it is considered unlikely that significant numbers of the local population are located within this area at any given time. Given the dense vegetation within the site there will be a limit to the effectiveness of preclearance surveys, designed to capture and relocate individuals outside of the impact area. Attendance of clearance work by ecologists and clearing at a measured rate is likely to be the most effective method of reducing clearance related mortality. Any frogs and other native fauna disturbed by the clearance can then be captured and relocated. These mitigation measures are further described in *Section 5*. Despite the preclearance and mitigation measures there is a residual risk of mortality to Green and Golden Bell Frogs as a result of the clearance works. The impact is not anticipated to be significant however, due to a small percentage of the population likely to occur within the area at any given time.

The capping works will also remove 5.2 ha of foraging habitat for the Green and Golden Bell Frog. This area is a small area of the total potential foraging habitat available to the population with optimal foraging habitat surrounding the wetland areas, including the K6 and K7 areas, which will not be impacted by the capping works.

The potential for indirect impacts to the Green and Golden Bell Frog are largely limited to the potential changes to the hydrology of the area, due to the capping works and in particular the potential effects on breeding habitat. It is considered that any of these impacts will be negligible resulting in no perceptible changes in the Green and Golden Bell Frog breeding habitats. Changes to hydrology of the site are discussed in *Section 3.3b*, while the hydrological implications related to the Green and Golden Bell Frog are discussed below.

GHD (2009) modelled the effects of significant rainfall events on pond water levels indicating changes up to 500mm in some ponds as a result of capping. These findings are no longer supported on the basis that maximum water levels are dictated by pond outlets based on the invert levels of weirs, culverts and overflow channels and that any short term increased water levels would dissipate rapidly. No modification is being made to physical nature of the ponds, so the maximum water levels and volumetric capacity of the ponds would not change from existing conditions. Furthermore, no significant change in minimum pond levels would occur in most of the ponds, as a result of altered future hydrology on the basis that there will be no significant change to the overall water balance for the site.

Salinity levels within waterbodies have previously been identified as of importance to the protection of Green and Golden Bell Frogs from Chytrid Fungus. Previous modelling work associated with referral number 2012/6464 for the southern portion of KIWEF closure identified that pond conditions of proximate ponds would be generally wetter and fresher.

The relationship between water quality (with a focus on salinity) and GGBF habitat can be summarised in the following ways:

- The capping works are designed to reduce contaminant loads leaving the landfill and affecting receiving waters by limiting surface water penetration into the fill aquifers. This includes mobilisation and leaching of salt content in the fill;
- The capping will increase volumes of less saline surface water runoff from capped areas, and reduce higher saline groundwater inflows into the ponds;
- Research indicates that chytrid fungal control is linked to salinity and water temperature (Stockwell, et al, 2012) with saline water acting to limit infection below the threshold that may result in mortality;

- Further research is needed to confirm if certain heavy metals (Cu and Zn) provide chytrid fungal control (Threlfall et al, 2008);
- Water temperature on standing water in ponds is related to rates of solar irradiance on pond surfaces and, as such, proposed capping works would not have a significant effect on water temperature;
- The current range of salinity within and between ponds varies significantly;
- Elevated salinity in the ponds are generally attributed to concentrating effects of evaporation during dry periods;
- Saline baseflow from the fill aquifer may also influences salinity in surrounding water bodies, but to a lesser degree than the evaporation effects; and
- Peak salinity values in low elevation ponds are recorded as high as 20 000 to 35 000 $\mu\text{S}/\text{cm}$, indicating intrusion of waters from the estuarine aquifer.

Salinity level changes have the potential to impact GGBF in two main ways. These are:

- An increase in salinity in ponds above “thresholds” that would prevent GGBF tadpole and/or adult survival or habitation; and
- Reductions in salinity below a “threshold” that may provide protection against Chytrid fungus infection or development.

SMEC (2013) reported that the independent GGBF expert, Dr Arthur White, provided guidance on these thresholds based on current GGBF research (reproduced in the *Table 9* below) and using Electrical Conductivity (EC) as a measure of salinity. It should be noted that these thresholds are indicators of the suitability of ponds as different GGBF habitat and do not constitute project triggers. They have been used in the assessment process to identify the potential for significant impacts on GGBF to occur.

Table 9 Suggested Salinity Comparison Values for KIWEF Surface Water Bodies

No Chytrid Protection	Chytrid threshold ¹	protection	GGBF tadpole health threshold ² ($\mu\text{S}/\text{cm}$)	GGBF Adult health threshold ³ ($\mu\text{S}/\text{cm}$)
0 – 1,650 $\mu\text{S}/\text{cm}$	1,650 $\mu\text{S}/\text{cm}$		2,900 $\mu\text{S}/\text{cm}$	4,100 $\mu\text{S}/\text{cm}$
1. EC below threshold presents increased risk of mortality resulting from Chytrid Fungus. 2. EC above threshold indicates unsuitability for GGBF tadpole survival. 3. EC above threshold indicates unsuitability as GGBF adult habitat.				

These levels are interpreted as follows in assessing impacts of closure works:

- Salinity levels below 1,650 ($\mu\text{S}/\text{cm}$) (Chytrid risk bracket) were identified as sub-optimal GGBF condition with individual animals likely not afforded salinity-related protection from chytrid fungus. Chronic or long term low salinity levels below this threshold are considered to increase the risks to GGBF although it would not put individuals at immediate risk of harm in the absence of Chytrid fungus (Stockwell, 2012).
- Salinity levels between 1,650 and 2,900 ($\mu\text{S}/\text{cm}$) are considered “optimal GGBF habitat” as this range provides Chytrid protection while also providing for tadpole survival and habitation and adult breeding.
- Salinity levels between 2,900 and 4,100 ($\mu\text{S}/\text{cm}$) are considered to be suitable for adult GGBF occupation, but would not be satisfactory for tadpole survival.
- Salinity above 4,100 ($\mu\text{S}/\text{cm}$) is not considered to be suitable habitat for GGBF adults over extended periods. It is likely that adult GGBF would move away from ponds with salinity levels above 4,100 $\mu\text{S}/\text{cm}$ rendering them unlikely to be used for breeding (and therefore egg laying, hatching and tadpole habitation).

Observed EC ranges within ponds potentially affected by changed hydrology post capping are presented in *Table 10* below, the locations of the ponds are illustrated on Figures within *Annex A*.

Table 10 KIWEF pond salinity ranges

Surface Water Body	Historic Indicative Conductivity Range
Deep Pond	1,650 – 5,250 (prior 10 years only)
Blue Billed Duck Pond	802 – 1,822
BHP Wetlands	723 – 1,424
Railway Pond	1,850 - 3,400
Easement Pond	2,100 – 3,882
Easement Pond South	450 – 1,000
K2 Basin	950 – 3,940
Windmill Road Open Channel	3,600 - 16,500
Long Pond	2,845 – 10,565
Delta Channel	No Data
K7 Ponds	No Data
Cells 9,10,11 and 12	No Data

From the above it can be seen there is considerable variability within and between ponds. Additionally some ponds are currently fluctuating between salinity levels providing no chytrid protection to levels where Green and Golden Bell Frog and tadpole survival is unlikely.

Modelling of hydro-salinity changes likely to result from the capping of Area 2 has not been undertaken and is not proposed on the basis that the level of accuracy likely to be achievable is unlikely to provide confidence beyond the observation of conditions being generally wetter and fresher. Overall it is ERM's opinion that the apparent series of divergent salinity conditions between the ponds is likely to be important through variable inter-annual wetting-drying cycles, thereby providing available aquatic habitat of suitable salinity at any time. It is likely that the maintenance of the series of ponds with variable salinity (and other water quality parameters) supports ecosystem resilience and helps sustain frog populations in relation to the set of salinity thresholds derived for Green and Golden Bell Frog ecology. The proposed activity will not reduce the variability of water quality within and between ponds despite the predicted minor move towards generally fresher conditions.

In summary, the capping works will temporarily remove an area of potential foraging habitat (5.2 ha) for adult Green and Golden Bell Frog, which may also result in some direct mortality to a small number of individuals during clearance works. The area impacted represents a small proportion of the total potential foraging habitat available to the species and due to the proposed revegetation after the works, it is considered a temporary impact. Furthermore only a small proportion of the population are likely to occur in the closure works area at any given time. Larger and more optimal foraging habitat surrounding the key wetland areas, including the K6 and K7 areas, will be retained and not impacted significantly by the action. Breeding habitat will remain unaffected by this proposal and large areas of foraging habitat will be retained. It is anticipated that the proposal will not affect the recovery of the species and the carrying capacity of the habitat within the area will remain largely unchanged. Appropriate mitigation measures and hygiene controls will prevent other factors such as Chytrid fungus and *Gambusia* becoming any more prevalent and risking impacting the species. The Assessment of Significance (provided in *Annex C*) undertaken concluded that the impact to this species would be **not significant**.

3.1 (e) Listed migratory species

Description

The PMST identified 73 migratory species listed under the EPBC Act that may occur within the locality. The Site does not include marine habitat for pelagic species, therefore entirely marine species were excluded from further individual assessment. This includes cetaceans, sharks, turtles and pelagic seabirds (such as Albatross and Petrel sp.).

Thirty seven species were considered with a likelihood of occurrence table using the criteria defined in *Section 3.1(d)*, and information from field surveys undertaken to date. Sixteen migratory species have been recorded within the Closure Works site or utilising the wetland habitat immediately adjacent to the Closure Works site. A further 10 species were considered as having the potential to occur within the site and eleven (11) species were considered unlikely to occur. These species are described in more detail in *Table 11*. The risk level within *Table 11* follows the same qualitative risk assessment tool described in *Table 6*.

Table 11 - Likelihood of Occurrence Table and Risk Assessment for Migratory Species Listed Under the EPBC Act

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Actitis hypoleucos</i> Common Sandpiper			The species utilises a wide range of coastal wetlands and some inland wetlands. The species has been recorded in estuaries and deltas of streams, as well as on banks further upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands. Birds sometimes venture into grassy areas adjoining wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves (DoE 2015).	Potential. The species may fly over the site and has the potential to occasionally forage around the margins of the wetland habitats. The species is regularly recorded in the Estuarine locality. This species has not been detected during field surveys.	The species is not likely to occur in large numbers within the site, nor is the site likely to contain important foraging or roosting habitat.	Negligible.	Low
<i>Apus pacificus</i> Fork-tailed Swift			The species is of Asian origin and is primarily aerial during its migratory stay in Australia. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. (DoE 2015).	Potential. It has been recorded within the locality and is wide ranging. May fly over the site or forage over the site intermittently for short periods.	The Site does not contain unique or important habitat for the species, impact is limited to temporary loss of a small area of potential foraging habitat.	Negligible.	Low
<i>Ardea alba</i> Great Egret			The Great Egret has been reported in a wide range of wetland habitats, including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (DoE 2014a).	Known. Recorded frequently within the Site with foraging habitat existing within the shallow wetland areas.	The species is likely to utilise habitat adjacent to the proposed works area for foraging. The construction works may cause the species to avoid the foraging habitat due to the temporary disturbance. This will not significantly affect the species given the large amount of similar and more optimal habitat within the hunter estuary.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Ardea ibis</i> Cattle Egret			The Cattle Egret 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; it avoids low grass pastures. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer (DoE 2014a).	Known. This species has been recorded within the Site and is likely to utilise the wetland margins for foraging. The species has not been recorded in large numbers.	The Site contains suitable foraging habitat, however large areas of similar and more optimal foraging habitat occur within the locality.	Negligible.	Low
<i>Arenaria interpres</i> Ruddy Turnstone			In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches.	Unlikely. Suitable foraging habitat does not exist within the Closure Works site. The species may occasionally fly over the site as it occurs in the Hunter Estuary and surrounding coastline	NA	NA	NA
<i>Calidris acuminata</i> Sharp-tailed Sandpiper			In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry (DoE 2014a).	Known. The species has been recorded in high numbers within deep pond and railway pond, adjacent to the proposed works.	The species are likely to intermittently utilise habitat adjacent to the proposed works for foraging. The construction works may cause the species to avoid the foraging habitat due to the temporary disturbance. This will not significantly affect the species given the large amount of more optimal habitat within the hunter estuary.	Negligible.	Low
<i>Calidris canutus</i> Red Knot			In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps	Known. The species has been recorded in within the deep pond area and railway pond, adjacent to the proposed works. It is frequently observed at Stockton Sandspit.	The species are likely to intermittently utilise habitat adjacent to the proposed works for foraging. The construction works may cause the species to avoid the foraging habitat due to the temporary disturbance. This will not significantly affect the species given the large amount of more optimal habitat within the hunter estuary.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE	Generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. Also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland (OEH 2015).	Known. This species has been recorded on the mud flats surrounding Deep Pond by Umwelt. Deep pond is directly adjacent to the Site.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Negligible.	Low*
<i>Calidris melanotos</i> Pectoral Sandpiper			In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. The species breeds in northern Russia and North America (DoE 2014a).	Known. This species has previously been recorded on one occasion in Deep Pond (Lindsey, 2007). It is rarely found in the Hunter Estuary and is likely to occasionally occurring within the site.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Negligible.	Low
<i>Calidris ruficollis</i> Red-necked Stint			In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands.	Known. This species has previously been recorded in large number in Deep Pond (Lindsey, 2007). It is rarely found in the Hunter Estuary and is likely to occasionally occur within the site. This species is also more regularly recorded at Stockton Sandspit and Ash Island.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Negligible.	Low
<i>Calidris tenuirostris</i> Great Knot	V		In NSW, the species has been recorded at scattered sites along the coast, typically occurring within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. They are also often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. They migrate to Australia from late August to early September.	Potential. This species has been recorded, approximately 250 m from the site. The habitat within the Site is considered sub-optimal for the species given the lack of large mudflats. The wetland areas of the site may provide some foraging habitat, especially when water levels are low, exposing area of potential foraging habitat. The species may fly over the site.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. The wetland habitat is considered to be sub-optimal for this species and therefore any impacts are likely to be negligible and affecting a small number of individuals.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Charadrius bicinctus</i> Double-banded Plover	V		In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. They occur mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. They roost during high tide on sandy beaches and rocky shores and begin foraging activity on wet ground at low tide. Their diet includes insects, crustaceans, polychaete worms and molluscs (OEH, 2015).	Known. The species has been recorded twice in Deep pond in 2004 and 2007. Only two individuals were recorded. The wetlands margins are likely to provide sub-optimal foraging habitat for the species.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. The wetland habitat is considered to be sub-optimal for this species and therefore any impacts are likely to be negligible and affecting a small number of individuals.	Negligible.	Low
<i>Charadrius leschenaultia</i> Greater Sand Plover			Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Infrequently recorded in southern NSW, more frequently form northern NSW, northwards (GHD 2010).	Unlikely. The species has been recorded within the hunter estuary, but not within the site. Habitat is not considered suitable given the lack of expansive sand or mud flats.	NA	NA	NA
<i>Charadrius mongolus</i> Lesser Sand Plover			Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Infrequently recorded in southern NSW, more frequently form northern NSW, northwards (GHD 2010).	Unlikely. The species has not been recorded recently within the locality, and there is a lack of large intertidal flats.	NA	NA	NA
<i>Gallinago hardwickii</i> Latham's Snipe			In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (DoE 2014a).	Known. A single individual was recorded at Deep Pond during 2006 (Lindsey, 2006). The wetland margins provide foraging habitat for this species.	The proposal will not remove habitat for this species as the wetland areas will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Negligible.	Low
<i>Gallinago megala</i> Swinhoe's Snipe			Occurs in a wide range of habitats including woodlands, grassland and wetland areas.	Unlikely. This species is not known to occur in NSW.	NA	NA	NA

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Gallinago stenura</i> Pin-tailed Snipe			Occur on the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands	Unlikely. This species is not known to occur in NSW.	NA	NA	NA
<i>Heteroscelus brevipes</i> Grey-tailed Tattler			Sheltered coasts with reefs and rock platforms or with intertidal mudflats, as well as shorelines with rocks, shingle, gravel or shells, often roosting in mangroves (Birdlife).	Potential. The species has not been recorded within the Site however has been recorded frequently within the Lower Hunter Estuary and Kooragang wetlands. Foraging habitat within the Closure Works area is limited to the wetland margins and is considered sub-optimal.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low
<i>Hirundapus caudacutus</i> White-throated Needletail			In Australia, the White-throated Needletail is almost exclusively aerial, most often above wooded areas. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks (DoE 2014a).	Potential. This species has been recorded around Ash Island and Hexham Swamp. Foraging habitat within the Site is sub-optimal but the species has the potential to fly over the site.	No impact is anticipated given that the species will still be able to fly over the site and the proposal will not affect any habitat important to this species.	Negligible.	Low
<i>Limicola falcinellus</i> Broad-billed Sandpiper	V		This species breeds in northern Siberia before migrating southwards in winter to Australia. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. They favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat (OEH, 2015).	Potential. This species has not been recorded within the site but it has been recorded on Ash island and other parts of the Hunter Estuary. The foraging habitat and roosting habitat within the Site is sub-optimal, although the species has the potential to fly over.	The species is anticipated to occasionally fly over the Site or occasionally settle on the edge of wetland areas. Impacts are restricted to indirect impacts such as the noise associated with construction.	Negligible.	Low
<i>Limosa lapponica</i> Bar-tailed Godwit			The bar-tailed godwit is usually identified in coastal areas such as estuaries and tidal mudflats, although it is sometimes found inland when migrating in shallow river margins, airfields, brackish/saline inland lakes, flooded pastures, sewage ponds and shallow river margins.	Known. Approximately 15 individuals have been recorded within Deep Pond (Umwelt). The species is regularly recorded at Stockton Sandspit and Kooragang Dykes.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Limosa limosa</i> Black-tailed Godwit	V		This species is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer. In NSW, it is most frequently recorded at Kooragang Island. They are usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. They forage for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. They roost on low banks of mud, sand and shell bars (OEH 2015).	Known. This species has been observed in Deep Pond, during recent field surveys. The species is likely to occasional forage within wetland areas of the site.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to capping works, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low*
<i>Merops ornatus</i> Rainbow Bee-eater			The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (DoE 2014a).	Unlikely. Few records within the locality and no suitable habitat for the species exists within the site.	NA	NA	NA
<i>Monarcha melanopsis</i> Black-faced Monarch			The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest (DoE 2014a).	Unlikely. No suitable habitat exists within the Site and species has not been recorded within the Site.	NA	NA	NA
<i>Monarcha trivirgatus</i> Spectacled Monarch			The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. The site is at the southern limit of the species range.	Unlikely. No suitable habitat exists within the Site and species has not been recorded within the Site.	NA	NA	NA
<i>Myiagra cyanoleuca</i> Satin Flycatcher			Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests (DoE 2014a).	Unlikely. No suitable habitat exists within the Site and species has not been recorded within the Site.	NA	NA	NA

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Numenius madagascariensis</i> Eastern Curlew		C E	This species preferred foraging and roosting habitat are intertidal mudflats, particularly where mangroves are present, and saltmarsh. They occur in intertidal coastal mudflats, coastal lagoons, sandy spits (Pizzey and Knight 2003). The species does not breed in Australia.	Known. This species has been recorded several times within the Site, especially in the Deep Pond area, which is likely to provide (sub-optimal) foraging habitat for the species. The species is associated with the periphery of wetland areas, and is unlikely to utilise other area of the site.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area.	Negligible.	Low*
<i>Numenius minutus</i> Little Curlew			The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.	Unlikely. The species has not been recorded in the site and the habitats present are considered sub-optimal. The species is occasionally recorded within the Hunter Estuary.	NA	NA	NA
<i>Numenius phaeopus</i> Whimbrel			The species inhabits a wide range of coastal habitats including: bare grasslands, coral cays, estuaries, exposed reefs, flooded paddocks, lawns, mangroves, sewage ponds, sports grounds and tidal flats.	Known. The species has been recorded in Deep Pond and is frequently recorded in the Hunter Estuary. Foraging habitat for the species exists adjacent within the Site around the wetland margins.	No direct loss of foraging. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low
<i>Pandion haliaetus</i> Osprey	V		Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea (OEH 2015).	Known. This species has been recorded flying over the site. Foraging habitat within the site is considered sub-optimal. The species is not likely to breed in the Site.	Impact to the species is likely to be negligible as the species is likely to fly over the site and will not rely on the area for significant foraging resources.	Negligible.	Low
<i>Philomachus pugnax</i> Ruff			Typically found on brackish, fresh or saline wetland with a preference for wetlands with exposed mudflats at the edges. It forages on exposed mudflats in shallow water and occasionally on dry mud. A rare but regular visitor to Australia.	Potential. This species is occasionally recorded on Kooragang Island but has not been recorded within the Site. Potential foraging habitat is present, surrounding the wetland areas.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Pluvialis fulva</i> Pacific Golden Plover			This species is typically identified in a wide range of coastal habitats in sheltered areas. It is infrequently recorded in terrestrial habitats and usually feeds on sandy or muddy shores in proximity to its roosting sites.	Known. Previously recorded at Deep Pond, Fine Disposal Facility Pond. Most frequently recorded in the North Arm of the Hunter River and Ash Island. The project area provides some suitable habitat for this species especially around the wetland margins.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low
<i>Pluvialis squatarola</i> Grey Plover			This species occurs in coastal areas, where it usually inhabits sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with or reef-flats. It also occurs around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	Potential. This species is occasionally recorded on Kooragang Island but has not been recorded within the Site. Potential foraging habitat is present on the wetland margins	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low
<i>Rhipidura rufifrons</i> Rufous Fantail			In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts usually with a dense shrubby understorey often including ferns (DoE 2014a). When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, often with a shrubby or heath understorey.	Unlikely. No suitable habitat exists within the Site and species has not been recorded within the Site.	NA	NA	NA
<i>Sterna albifrons</i> Little Tern	E		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. (OEH 2015).	Likely. This species has been recorded adjacent to the Site in 2007 and the species is frequently recorded in the lower Hunter Estuary. The species is likely to fly intermittently fly over the Site and may occasionally forage within the Site, although the habitat is considered sub-optimal.	Construction activities may disturb this species, however the effects are likely to be negligible given that the species is likely to occasionally fly over the site and is does not provide important habitat for the species.	Negligible.	Low*
<i>Tringa stagnatilis</i> Marsh Sandpiper			The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks.	Known. This species has been recorded foraging and roosting at Deep Pond. High densities of the species are found within Fullerton Cove, Ash island and the Kooragang Dykes.	No direct loss of foraging habitat. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area, however larger areas of more optimal habitat exist within close proximity of the site.	Negligible.	Low

Species Name	TSC Act Status	EPBC Act Status	Habitat Requirements	Likelihood of Occurrence	Description of Potential Impact	Consequence of impact on species	Risk Level
<i>Xenus cinereus</i> Terek Sandpiper	V		In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves or dead trees, often with related wader species (OEH 2015).	Potential. There are historical records of this species within the Site (1988, Bionet) and more recent records in the vicinity of the Site. The species may occasionally fly over the site, although foraging habitat is considered suboptimal.	The proposal will not remove habitat for this species as wetlands will not be cleared or modified. Construction disturbance may cause the species to vacate habitats adjacent to the direct impact area. The impact on the species is considered negligible considering the occasional use of the habitats present within the site.	Negligible.	Low
Species Sensitivity Status: V – Vulnerable; E – Endangered; CE – Critically Endangered. Note all species are also listed migratory under the EPBC Act							

Nature and extent of likely impact

Of the Migratory species considered in *Table 7*, Eleven (11) were considered unlikely to occur and therefore require no further impact assessment. A combined total of 26 species were considered to require further assessment as they have the potential to occur or have been recorded within the Site. Assessment of significance was undertaken by ERM, in accordance with the (DoE, 2015) Significant Impact Guidelines 1.1. Species were grouped according to their habitat and foraging requirements. The assessments can be found in *Annex C* and are also summarised below.

Migratory Waders and Shorebirds

The following migratory birds were grouped together as they have the potential to utilise the wetland areas adjacent to the site. Depending on the species this may include foraging within shallow water or on the shoreline around the margins of Deep Pond.

Common Sandpiper (<i>Actitis hypoleucos</i>)	Grey-tailed Tattler (<i>Heteroscelus brevipes</i>)
Great Egret (<i>Ardea alba</i>)	Broad-billed Sandpiper (<i>Limicola falcinellus</i>)
Cattle Egret (<i>Ardea ibis</i>)	Bar-tailed Godwit (<i>Limosa lapponica</i>)
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	Black-tailed Godwit (<i>Limosa limosa</i>)
Red Knot (<i>Calidris canutus</i>)	Eastern Curlew (<i>Numenius madagascariensis</i>)
Curlew Sandpiper (<i>Calidris ferruginea</i>)	Whimbrel (<i>Numenius phaeopus</i>)
Pectoral Sandpiper (<i>Calidris melanotos</i>)	Ruff (<i>Philomachus pugnax</i>)
Red-necked Stint (<i>Calidris ruficollis</i>)	Pacific Golden Plover (<i>Pluvialis fulva</i>)
Great Knot (<i>Calidris tenuirostris</i>)	Grey Plover (<i>Pluvialis squatarola</i>)
Double-banded Plover (<i>Charadrius bicinctus</i>)	Marsh Sandpiper (<i>Tringa stagnatilis</i>)
Latham's Snipe (<i>Gallinago hardwickii</i>)	

The species listed above have either been recorded, or are considered to have the potential to occur, within or adjacent to the Closure Works site. These species are typically associated with the wetland areas, including the margins and transitional habitats. They are not anticipated to occur in the landfill areas associated with the capping works, which are elevated above the wetlands. For this reason there will be no direct loss of habitat for these migratory species and impacts will be restricted to indirect and temporary impacts.

Once the capping works are completed, it will result in less infiltration of rainwater into the landfill stockpiles. Review of previous hydrological studies has revealed that the water entering the ponds via overland flow is likely to be slightly less saline and have fewer contaminants than water which has percolated through the landfill areas (refer to *Section 3.3b*). Surface water will pass through a number of sediment controls, incorporated within the capping area to reduce sediment load. These changes to the water quality as a result of the proposal are considered positive in the long term with less contaminant reaching the wetlands area. The effects on salinity are likely to be negligible due to the large dilution factors involved.

The construction phase of the capping works will include noise, light and vibration disturbance from machinery. These impacts are likely to be most acute for Deep Pond whilst heavy machinery is operated in the K3 area and within K5 Cell 8 (refer to *Annex A, Figure 2*). The noise impacts of the construction works have the potential to disturb migratory birds to the extent that some areas of foraging habitat are avoided. This impact is most likely to affect species foraging or roosting on the shoreline in the shallow sediments or those species which utilise the areas of emergent vegetation on the eastern edge of Deep Pond. The construction activities will be temporary occurring over a period of approximately six to eight months, and during this period there will be occasions when disturbance is minimal and does not occur adjacent to the wetland areas. Construction work will be undertaken during the daytime within standard construction hours, therefore will not affect roosting birds significantly. It is difficult to predict the degree of habitat avoidance by migratory birds however it is anticipated that it will mainly affect habitat along the eastern edges of Deep Pond. It is possible that species may become accustomed to the disturbance and return to the foraging site, whilst construction is continuing. For example, Stockton Sandspit within the Hunter Estuary provides a resting roosting and foraging resource for large aggregations of migratory wading birds, despite being within 100 m of Stockton Bridge/B63 Road, which has heavy vehicle traffic especially during peak hour periods.

The proposal will not significantly affect wetland and shorebird migratory species, given that the wetland habitats and margins will not be removed or modified. Impacts will be limited to the temporary disturbance caused by construction activities which may cause some species to avoid wetland habitat adjacent to the construction.

Migratory Species with Generalist Habitat Requirements.

Fork-tailed Swift (<i>Apus pacificus</i>)
White-throated Needletail (<i>Hirundapus caudacutus</i>)

The White-throated Needletail and Fork-tailed Swift have generalist habitat requirements, occurring in a range of landscapes including disturbed areas. Both are aerial species, foraging for insects on the wing and rarely alighting whilst in Australia. The entire site has the potential to provide foraging resources given that it supports flying insects, however neither species has been recorded. As the species have generalist habitat requirements and a very wide range, habitat within the Site is not of critical importance to the species and it is unlikely to contain high proportions of the species at any time. Impacts to these species are likely to be negligible.

Migratory Species which Forage Over Open Water.

Osprey (*Pandion haliaetus*)
Little Tern (*Sterna albitrons*)

Both of these species are likely to fly over the Site and on occasion may forage over deep pond. The Site does not contain important habitat for these species or likely to contain a high proportion of a population. There are no known nest sites for Osprey in or adjacent to the site. There are no known roosting sites for Little Tern in or adjacent to the Site. There will be no direct impacts to these species. Any indirect impacts to the species would be limited to construction disturbance associated with the terrestrial capping, and would be temporary and negligible.

3.1 (f) Commonwealth marine area

(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

There are no Commonwealth marine areas within the Site or within close proximity to the Site.

Nature and extent of likely impact

The Proposal will not have any impact on any Commonwealth marine areas.

3.1 (g) Commonwealth land

(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

No Commonwealth land is located within the Site.

Nature and extent of likely impact

No impact to Commonwealth land is expected as a result of the Proposal.

3.1 (h) The Great Barrier Reef Marine Park

Description

The Site is not within the vicinity of the Great Barrier Reef.

Nature and extent of likely impact

The Proposal will not have any impact on the Great Barrier Reef.

3.1 (i) A water resource, in relation to coal seam gas development and large coal mining development

Description

N/A

Nature and extent of likely impact

N/A

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	Is the proposed action a nuclear action?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (c)

Is the proposed action to be taken in a Commonwealth marine area?

X

No

Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

3.2 (d)

Is the proposed action to be taken on Commonwealth land?

X

No

Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))

3.2 (e)

Is the proposed action to be taken in the Great Barrier Reef Marine Park?

X

No

Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))

3.3 Other important features of the environment

3.3 (a) Flora and fauna

Information from a combination of the PMST, Atlas Records and Field Surveys were used to produce a list of subject species listed under both the EPBC act and the NSW *Threatened Species Conservation Act 1995* (TSC Act). Species listed under the EPBC act have been discussed in detail in *Section 3.1* and therefore are not considered further. A total of 69 subject species were considered, including 3 amphibians, 1 reptile, 47 birds and 18 mammals. Of these subject species 18 have been recorded within the Site (refer to *Table 12*).

Table 12– Threatened Species Listed under the TSC Act, recorded within and Directly Adjacent to the Site.

Species Name	TSC Act Status	EPBC Status
Flora		
<i>Zannichellia palustris</i> Horned Pondweed	E	
Amphibians		
<i>Litoria aurea</i> Green and Golden Bell Frog	E	V
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E
<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE, Mi
<i>Circus assimilis</i> Spotted Harrier	V	
<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	E	
<i>Epthianura albifrons</i> White-fronted Chat	V	
<i>Limosa limosa</i> Black-tailed Godwit	V	Mi
<i>Numenius madagascariensis</i> Eastern Curlew		C E, Mi
<i>Oxyura australis</i> Blue-billed Duck	V	
<i>Pandion cristatus</i> Eastern Osprey	V	Mi
<i>Stictonetta naevosa</i> Freckled Duck	V	
Bats		
<i>Falstirellus tasmaniensis</i> Eastern False Pipistrelle	V	
<i>Miniopterus australis</i> Little Bentwing-bat	V	

Species Name	TSC Act Status	EPBC Status
<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	V	
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	V	
<i>Myotis macropus</i> Southern Myotis	V	
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	

Flora

One threatened flora species, Horned Pondweed (*Zannichellia palustris*) was recorded within Deep Pond which is listed Vulnerable under the TSC Act. The aquatic plant species behaves as an annual and dies back in the summer. At the time of the latest field survey (November, 2015), the plant was observed as small floating pieces which, appeared to be degenerating. Owing to the species dispersal abilities, it should be considered cosmopolitan throughout Deep Pond and may colonise other areas of Wetland during flood events.

Considerable survey effort has been employed on the Site (GHD, Umwelt and ERM) with Horned Pondweed the only species recorded. Furthermore, Umwelt surveyed the larger T4 area with no additional threatened species recorded. Given the amount of field effort employed, desktop searches and consideration of habitats present it is considered unlikely that any additional flora species are likely to occur.

Horned Pondweed will not be significantly impacted by the proposal given that the wetland areas will not be modified or cleared.

Fauna

The majority of the fauna species recorded from the site are associated with the Wetland areas which will not be impacted directly by the closure works. A number of bats are listed under the TSC Act however the habitat within the Study Area is considered to be unimportant for the species with large areas of more optimal habitat existing within the vicinity of the site.

Endangered Ecological Communities (EEC)

One EEC is considered present within the site, *Freshwater Wetlands on Coastal Floodplains of The New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. This community is associated with coastal areas subject to periodic flooding and in which, standing fresh water persists for at least part of the year in most years. Wetlands which meet the EEC description exist to the north and east of the proposed capping area. There are not anticipated impacts given that there will be no clearance or modification of the Wetland areas.

3.3 (b) Hydrology, including water flows

KIWEF is located within the Lower Hunter Estuary of the Hunter River catchment. The Hunter River is classed as a waterway affected by urban development. The proposed action area is located on Kooragang Island which divides the Hunter River into the Hunter River North Arm and Hunter River South Arm. The proposed activity is located over 500 metres from the South Arm and over 1400 metres from the North Arm. The Hunter River National Park and Hunter Wetlands Ramsar site are located between the proposed activity and the Hunter River North Arm but no surface water pathway exists whereby any impact to these areas associated with the proposed activity would be likely. The potential for groundwater impacts are raised in the assessment of the T4 Project with the likely result of the capping works identified as a reduction of the potential for impact associated with the contaminants within the existing landfill.

Surface drainage within and surrounding the proposed action location is characterised by a highly modified landform formed by landfilling over wetland, mangrove and island complexes. The topography of the proposed activity area is generally flat with a series of benches formed by different filling practices. Highpoints have been created on the Site by the installation of the constructed waste disposal cells (slag walls) which in places rise 9 metres above the remainder of the land. The topography has also been altered by the NCIG rail spur line, fly-over and rail loop (referral 2006/2987).

The southern section of the referral area (between the NCIG rail spur and rail flyover) slopes gently towards Deep Pond in a westerly direction with raised rail embankments surrounding the capping area to the north, east and south.

The topography and current surface water flow of the northern section of the referral area (areas north of the NCIG rail flyover) is best described in relation to key features as follows:

- Raised NCIG rail flyover forms the southern boundary of the referral area's northern section, with drainage directed to the east and west and then via culverts to the BHP Wetlands;

- An access road (referred to as Delta Road) running in a north-south direction forming the eastern boundary of the referral area;
- A steep vegetated slag embankment rising from the western side of Delta Road to a plateau formed by the completed disposal cells 1, 3, 5 and 7;
- Flat lightly vegetated areas of cells 1, 3, 5 and 7 with less than 1% gradient and minimal off site surface water flows. The likely surface water flows in high rainfall events would be directed as illustrated in *Figure 6 of Annex A*;
- Lower but generally flat areas formed by incomplete filling in cells 2, 4, 6 and 8 bounded by protruding tops of slag cell walls with no surface water flows out of these cells considered possible;
- Slag cell walls slightly protruding to the north of completed Cell 7 and incomplete Cell 8 forming the northern boundary of the referral area and falling away to the largely unfilled cells 9 and 10 with some surface water flows possible in high rainfall events from Cell 7 into Cell 9;
- Area K3 generally draining towards the central drainage line flowing in a north westerly direction to Deep Pond; and
- A steep embankment from the western edge of K3 to deep pond.

Currently most rainfall is expected to infiltrate into the Cells, with drainage from within the referral area directed mainly to deep pond with minimal drainage directed to the east and south and north.

Drainage across the wider KIWEF area (surrounding the referral area) is complex and consists of a network of culverts, open drains, levees and constructed ponds that fill with surface runoff and ultimately drain to the Hunter River South Arm. The area surrounding the referral area includes a number of freshwater and brackish ponds (identified in *Annex A*) with typical flow paths identified as follows:

- Deep Pond which has recently been divided by the NCIG Rail Flyover but remains connected by culverts. Deep Pond is located immediately west of the referral area and collects most runoff from both the northern and southern portions of the referral area. The maximum water levels of Deep Pond are established by culverts and drainage channels that direct surface water south along the rail line via K2 Basin and to the Hunter River South Arm;
- Blue Billed Duck Pond and BHPB wetlands are separated from the referral area by the NCIG Rail Spur. These ponds receive runoff from the referral area via existing culverts beneath the NCIG Rail Spur and ultimately discharge into the southern portion of Deep Pond;
- Easement Pond currently receives minimal runoff from the outer slag wall of Area K5 via Delta Road and discharges in an easterly direction via Windmill Road Open Channel and Long Pond to the Hunter River South Arm;
- K7 Ponds receive minimal surface water flows from the referral area with maximum water level established by an access road separating North Pond 3 from Railway Pond;
- Railway Pond located in the North East corner of KIWEF and surrounding Area K7, receives water from the neighbouring PWCS fines disposal facility, runoff from K7 and the PWCS operated rail line which forms its northern bank. Railway Pond discharges in a westerly direction into Deep Pond; and
- Ponds 9, 10, 11 and 12 are formed by unfilled slag walled cells. These ponds are currently not receiving surface water flows from the referral area, with no change proposed. Ponds 9 and 11 have no direct linkages to other ponds while Pond 10 and 12 maximum water levels are established by low slag walls dividing them from Deep Pond.

Currently, surface water ponds on KIWEF are provided partly by surface water runoff from rainfall and partly by discharge from horizontal flows from the aquifer within the fill layer and the estuarine aquifer below. The water quality within surface waters is therefore influenced by the contaminants within runoff and within the fill aquifer and may also be influenced by saline conditions within the estuarine aquifer.

Surface water quality sampling has been undertaken over an extended period by a number of consultants and as a result, long term monitoring data is available for all major surface water bodies within KIWEF. Mean long term analytical results prepared by SMEC (2012) show the following areas exceeding ANZECC 2000 (95% Marine and Fresh) for a number of constituents:

- Deep Pond - mean concentrations of aluminium, cadmium, copper, chromium, manganese, mercury, zinc and cyanide are above ANZECC marine criteria;
- Hunter River - mean concentrations of cadmium, chromium, copper, mercury and zinc exceed ANZECC marine criteria. Other sources may also contribute to the water quality in Hunter River;
- Blue Billed Duck Pond – mean concentrations of aluminium, cadmium, chromium, copper, mercury, nickel and zinc exceed ANZECC freshwater criteria; and
- Easement Pond - mean concentrations of aluminium, cadmium, chromium, copper, lead, mercury, nickel and zinc exceed ANZECC freshwater criteria.

Trend analysis is not available for surface water quality data, however inspection of the dataset does not indicate any clear increasing or decreasing change in water quality. On this basis, it appears that dilution and attenuation processes are currently providing enough mitigation to result in a stable situation with respect to surface water contamination.

Pond hydrology may be altered as a result of the Proposed Activity when compared to the existing conditions, as a result of a general increase in surface water discharge from capped areas; and reduced groundwater flows due to decreased infiltration through the capped area. The changes to hydrology as a result of the proposed activity are expected to be negligible in comparison to the continuing effects of direct rainfall, evaporation and unchanged interaction with aquifers. The changes to pond hydrology at the KIWEF are expected to be limited to:

- Slightly altered wetting and drying regimes in ponds that will likely to be generally wetter due to an increase of surface water in-flows from the closure area via lined sediment basins; and
- Water quality changes in the ponds are expected to be slightly fresher with improved general water quality, due to the reduction of leached contaminants, as a result of increased surface water in-flows and reduced infiltration via the fill aquifer to surface water bodies.

Consideration of changes to the hydrology on the Green and Golden Bell Frog are considered in Section 3.1d.

3.3 (c) Soil and Vegetation characteristics

The upper profile of the soils of the referral area reflect the waste disposal operations and include areas of fine and coarse coal washery reject, granulated slag and consolidated slag cell walls with no natural soils present.

The NCIG Environmental Assessment (Resource Strategies and NCIG 2006) describes the natural soil profile (below fill materials) generally as an upper clay layer (soft silty sandy clay), a sandy layer (loose to dense sand), a lower clay layer (stiff to very stiff sandy silty clay), soft rock layers (siltstone and mudstone) and hard rock layers (sandstone). Due to the presence of the various fill materials and the historical flow paths of the Hunter River and its tributaries, the depth of each of the soil layers varies significantly.

Department of Land and Water Conservation's Newcastle 1:100 000 Soil Landscapes Map (Matthei 1995) confirm that:

- The area is described as highly disturbed due to filling and at the surface and is primarily consisted of exposed soil or Coal Washery Reject (CWR) largely covered in grasses.
- The site is underlain by Quaternary sand, silt, and clay overlying the sandstones, siltstones, claystones, coal and tuff of the Permian Tomago Coal Measures.

Vegetation

Three different vegetation communities are considered to occur within or adjacent to the Closure Work site (refer to *Annex A, Figure 5*);

- Exotic Grassland
- Exotic Shrubby Grassland, and
- Wetlands

Exotic Grassland

The majority of the Site contains exotic grassland which has colonised the capped areas of landfill. The dominant species include Red Natal Grass (*Melinis repens*), and the exotic forbs Fennel (*Foeniculum vulgare*), Purpletop (*Verbena bonariensis*) and Narrow-leaved Cottonbush (*Gomphocarpus fruticosus*). Very few native flora species are present and no threatened flora species are anticipated to occur or have been recorded by previous studies. The native Swamp Oak (*Casuarina glauca*) exists as isolated trees or small monospecific stands.

Exotic Shrubby Grassland

Exotic Shrubby Grassland areas are likely to reflect a succession of the Exotic Grassland community described above, with very similar ground cover composition. The ground cover in the Exotic Shrubby Grassland also has patches of Blady Grass (*Imperata cylindrica*), which is a native coloniser of disturbed areas. Pampas Grass (*Cortaderia selloana*) is abundant and listed as a class 3 Noxious Weed. Large shrubs and small trees are frequent, with the dominant species the naturalised Golden Wreath Wattle (*Acacia saligna*) and African Olive (*Olea europaea subsp. cuspidata*). The native Swamp Oak (*Casuarina glauca*) also exists as isolated trees or small monospecific stands. Other exotic trees and shrubs include Camphor Laurel (*Cinnamomum camphora*), Caster Oil Plant (*Ricinus communis*) and Lantana (*Lantana camera*). The native species Sydney Golden Wattle (*Acacia longifolia*) and Sweet Pittosporum (*Pittosporum undulatum*) occur in low abundances and these species are both colonisers of disturbed areas, as well as a component of more established native communities. This community occurs within the majority of Cells 6 and 8 and also extends outside of the proposed capping area into cells 9 and 10, intergrading with wetland areas.

Wetlands

Areas of freshwater wetland exist within the KIWEF Site, but are outside of the proposed capping area. The wetland communities have been described as there is a potential for indirect impacts to occur as a result of the proposed capping works. Deep Pond occurs along the western edges of the proposed capping area, it is somewhat of a misnomer, with areas of shallow water extending considerable distances from the banks, especially in the north and south of the pond. A considerable portion of the ponds margins has emergent vegetation including Common Reed (*Phragmites australis*), Broadleaf Cumbungi (*Typha orientalis*), *Bolboschoenus caldwellii*, and the exotic Sharp Rush (*Juncus acutus*). One threatened species, Horned Pondweed (*Zannichellia palustris*), listed as Vulnerable under the TSC Act, was recorded along the eastern margins of Deep Pond. Owing to the steep banks of Deep Pond the emergent wetland species flora rapidly transition to the Exotic Grassland and Exotic Grassy Shrubland communities. Wetland areas also exist within K6, cells 9-12. These include a series of semi-permeant to permeant ponds with large areas of marginal wetland vegetation and species composition similar to Deep Pond. A small area of Samphire (*Sarcocornia quinqueflora*) exists within the wetland which is growing in an area of coal washery reject.

3.3 (d) Outstanding natural features

The Site is heavily disturbed and entirely modified due to its previous use as a landfill. The wetland area complex, outside of the capping works is the most important feature within the immediate proximity as it provides habitat for a number of migratory and threatened bird species and the threatened green and golden bell frog. These wetlands are not natural and are due to extensive earthworks and historic reclamation within the Lower Hunter Estuary.

3.3 (e) Remnant native vegetation

No remnant vegetation is present on site, due to the entire site being previously cleared for landfill.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

The topography of the proposed activity area is generally flat with a series of benches formed by different filling practices. Highpoints have been created on the Site by the installation of the constructed waste disposal cells (slag walls) which in places rise 9 metres above the remainder of the land. The topography has also been altered by the NCIG rail spur line, fly-over and rail loop.

3.3 (g) Current state of the environment

The Site is highly disturbed given its former use as a landfill. The landfill has previously been capped which has become vegetated by colonising species, the majority of which are exotic weeds, including four noxious weeds. The ground cover is almost entirely exotic throughout terrestrial areas of the site. Mammalian fauna (excluding bats) is largely exotic including the Black Rat (*Rattus rattus*), European Rabbit (*Oryctolagus cuniculus*), Red Fox (*Vulpes vulpes*) and European Hare (*Lepus capensis*). The Eastern Gambusia (*Gambusia holbrooki*) was recorded in high numbers within Deep Pond.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

A database search of the EPBC Act using the Protected Matters Search Tool was undertaken on the

15 September 2015 (Annex B). No Commonwealth Heritage Places were identified within the Referral Area. The search identified two Commonwealth Heritage Places within 10 km of the to the Proposed Action, being Fort Wallace at Stockton (north of the Hunter River) and Nobbys Headland at Newcastle (south of the Hunter River), both located over 5 km from the referral area and not impacted upon by the proposed activity.

3.3 (i) Commonwealth Indigenous heritage values

Due to the highly disturbed nature of the Closure Works area and its former use as a landfill, it is considered unlikely that the Proposed Action will impact on any items of Indigenous Heritage significance. An Indigenous heritage site investigation has not been undertaken for the Proposed Action.

3.3 (j) Other important or unique values of the environment

The Hunter Wetlands National Park and Ramsar wetlands exist outside of the Site. The Ramsar Site - Hunter Estuary Wetlands (ID No 24) is considered in Section 3.1(c) and an Assessment of Significance has been compiled for this MNES in Annex C.

3.3 (k) Tenure of the action area (eg freehold, leasehold)

Port of Newcastle Lessor Pty Ltd, a NSW Government Owned entity, is the owner of the referral area freehold land. Port of Newcastle Lessor Pty Ltd is the proponent of the proposed activity based on previous advice that any ongoing management obligations are most appropriately assigned to the land-owner. The land is operated and managed by Port of Newcastle Pty Ltd under a long term lease agreement. The land is also subject to an agreement for lease with Port Waratah Coal Services to facilitate the potential future use of the site as a Coal Export Terminal.

3.3 (l) Existing land/marine uses of area

The site is not currently used for any purpose beyond that of a former landfill.

3.3 (m) Any proposed land/marine uses of area

The site has been assessed and approved at a State Level for the future potential use as a Coal Export Terminal. A decision on approval under the EPBC Act is due 24 December 2015. The proposed Closure Works are associated with the Coal Export Terminal through location only.

4 Environmental outcomes

The basic principles of the closure works are to reduce surface water infiltration into the groundwater by the following means:

- Regrading of the site to minimum 1% grade to prevent ponding of surface waters;
- Drainage improvements;
- Provision of a 0.5m thick, low permeability cap; and
- Rehabilitation using existing topsoil and alternative low nutrient and chytrid free imported growth medium.

As such the intended outcome of the proposed activity is a site supporting similar levels of vegetation (whilst reducing the prevalence of noxious weeds) and providing similar surface water flows to surrounding ponds and habitat areas with a reduced contaminant load migrating from the fill material to the surrounding environment.

No ongoing loss of foraging/sheltering habitat for MNES Species, particularly GGBF will eventuate on the basis that following construction, the site will be allowed to rehabilitate and no permanent loss of habitat of any type will result.

No direct impacts to GGBF breeding habitat is proposed as clearing will be restricted to 30 metres from the mapped habitat; or in the case of the area where capping is required in closer proximity to deep pond, a steep embankment is present and works will be limited to the top of this embankment with no pond fringing vegetation to be impacted.

The potential for indirect impacts to wetlands through sedimentation will be managed through the implementation of erosion and sediment control measures appropriate for sensitive environments.

Changes in hydro-salinity are predicted to result in marginally wetter and fresher conditions based on:

- An increase in fresher surface water runoff;
- Decrease in infiltration; and
- Decrease in mobilisation of water within the more saline fill aquifer.

The installation of hydro-salinity monitoring devices has been undertaken and will be monitored throughout the duration of capping with any identified significant changes in pond hydro-salinity attributable to the proposed activity to be investigated and mitigation measures explored. It is anticipated that any changes will be extremely negligible and will not be detected due to the high dilution factors involved with Deep Pond.

5 Measures to avoid or reduce impacts

Various measures to avoid or reduce impacts are currently enforced through the Surrender Notice and associated requirements to implement various plans and strategies. Of relevance to the Referral Area are:

- Hunter Development Corporation - Report on KIWEF - Revised Final Landform and Capping Strategy - August 2009 - Revision 2, prepared by GHD (the Capping Strategy);
- 'Green and Golden Bell Frog Management Plan – Kooragang Island Waste Emplacement Facility Closure Works' dated 19 April 2011 and prepared by Golder Associates; and
- 'Materials Management Plan - Kooragang Island Waste Emplacement Facility' dated November 2012 prepared by RCA Australia.

The surrender notice also requires that the implementation of these plans and strategies to be validated through a report provided to the NSW EPA to allow the lifting of the Surrender Notice obligations. Measures of relevance to MNES protection are summarised in the Table 13 that follows:

Table 13 – MNES Mitigation Measures

Environmental Aspect	Specific Mitigation Measures
Handling and reuse of site material in accordance with the Materials Management Plan (MMP).	Condition 4a) of the Surrender Notice requires that by 30 June 2017, the licensee shall complete implementation of the final landform and capping strategy as detailed in the documents titled: • 'Materials Management Plan – KIWEF', dated November 2012 prepared by RCA Australia. The preferred proposed landform design philosophy is for minimal engagement with the ground, balancing earthworks within each cell where possible, cover over known contamination hotspots (described as "Level 3 materials" within the Materials Management Plan), and to keep existing materials within each cell. The priority for landfill closure is to entirely cap the site with an inert low-permeability barrier, provide drainage upgrades to prevent infiltration and to consequently reduce the risk to the environment associated with the emplaced waste. All contaminated material encountered during the landfill closure works will be assessed and categorised. This can be achieved by imposing the common distinguishing visual and olfactory characteristics, analysis of PAH concentrations and use of instrumentation (PID) to determine the default category, as set out under Table 3 (Section 5.3 of RCA MMP).
Construction soil and water management	Condition 4d) of the Surrender Notice requires that the licensee shall implement, maintain and operate erosion and sedimentation controls during the final capping process to ensure that there is no sedimentation of waterways. Section 5.1 of GGBF Management Plan (Golder Associates, 2011) requires that appropriate erosion and sediment control structures will be installed at least 30 metres upslope of known and potential GGBF habitat. These erosion and sediment control structures will be regularly inspected and maintained, particularly after significant rainfall events. Chapter 7 of the Final Landform and Capping Strategy (GHD, 2009) requires the establishment of erosion and sedimentation controls and construction of sedimentation basins as required. Section 7.4, Flora and Fauna Impact Assessment included as Appendix A, of the Revised Final Landform and Capping Strategy (GHD, 2009) requires that: • Adequate run-off, erosion and sedimentation controls should be in place during construction, particularly in areas where run-off has the potential to impact on nearby waterways, surrounding native vegetation, EEC regrowth, and existing drainage line and dam areas; and • Development of an Erosion and Sedimentation Control Plan covering the works associated with the Proposal. Erosion and sediment controls are to be installed prior to construction, and maintained throughout construction, to minimise sediment entering the adjacent waterbodies, EECs and SEPP 14 wetland areas.

Environmental Aspect	Specific Mitigation Measures
Measures to prevent GGBF mortality and significant impacts to other threatened fauna and their habitat.	Condition 4a) of the Surrender Notice requires that by 30 June 2017, the licensee shall complete implementation of the final landform and capping strategy as detailed in the documents titled: • HDC – Report on KIWEF – ‘Revised Final Landform and Capping strategy’ – August 2009 - Revision 2, prepared by GHD (“the Landfill and Capping Strategy”); • ‘Green and Golden Bell Frog Management Plan – KIWEF Closure Works’, dated 19 April 2011 and prepared by Golder Associates; Section 5.1 of the GGBF Management Plan (Golder Associates, 2011) requires: • The boundaries of known and potential Green and Golden Bell Frog habitat will be clearly identified on the ground and communicated to personnel undertaking site works as part of the site induction; • Appropriate erosion and sediment control structures will be installed at least 30 metres upslope of known and potential GGBF habitat. These erosion and sediment control structures will be regularly inspected and maintained, particularly after significant rainfall events; • All plant entering and leaving the KIWEF site will be disinfected via a wash bay. The location and procedures involved at this wash bay will form part of the site induction and training. Records will be kept; • The Principal and all contractors involved in activities in areas of known (mapped) habitat for the Green and Golden Bell Frog (and other amphibian species) will be trained in site hygiene management in accordance with the hygiene protocol. This will be part of the environmental induction and training. Records will be kept; • PPE in contact with soil, particularly boots, entering and leaving the site will be disinfected as a matter of routine, following the methods outlined in the Hygiene Protocol; • All disinfection processes will be monitored and controlled at the KIWEF site’s entry and exit point. The location of these disinfection bays, and the obligations of disinfection, will be communicated during the site induction and training; • Any water required for dust suppression will be drawn from ponds established for the purpose. No water for dust suppression will be drawn from mapped GGBF ponds on the site. The establishment of dedicated dust suppression ponds will be undertaken to prevent the potential spread of Plague Minnow into ponds currently free of this species. The location and procedure for those dedicated dust suppression ponds will be communicated during the site induction and training; • If practicable, the capping and grading activities will be scheduled to occur outside of the core Green and Golden Bell Frog breeding period (that is, September to March), especially in areas adjacent to known and potential breeding habitat; • One week prior to works commencing in the disturbance area, a pre-works survey will be conducted by a qualified ecologist; and • In the event that any Green and Golden Bell Frogs are identified in the area (during pre-clearance surveys or following commencement of construction), they will be relocated (using appropriate amphibian hygiene protocols) to known and suitable Green and Golden Bell Frog habitat areas immediately adjacent to the disturbance footprint. Section 7.4 of the Final Landform and Capping Strategy (GHD, 2009) calls up the mitigation measures within the GHD Flora and Fauna Impact Assessment, which requires: • Proposed hours of construction are maintained to restrict noise and light impacts on nocturnal fauna; • Utilise an onsite ecologist during construction to re-locate any native fauna which may be displaced; • Avoid rubbish and other waste build up to deter feral animals; • Habitat features such as woody debris that may be utilised by fauna within the construction area would be retained and set-aside during the construction period for reinstatement at completion of works; • The site wide joint monitoring of the Green and Golden Bell Frog population should be continued seasonally, where feasible, from the next breeding season (spring 2009) to help best manage the population and determine if any adverse impacts have resulted from any works/modifications to Green and Golden Bell Frog habitat across Kooragang Island, before and after the emplacement capping works;

Environmental Aspect	Specific Mitigation Measures
	• Adequate run-off, erosion and sedimentation controls should be in place during construction, particularly in areas where run-off has the potential to impact on nearby waterways, surrounding native vegetation, EEC regrowth, and existing drainage line and dam areas; • Care should be taken that any noxious weeds occurring on the site are not further dispersed as a result of the Proposal. A follow up Weed Control Program may be necessary to control the encroachment of these species into surrounding areas. The landowner has a legal responsibility to control and suppress these species on their property under the Noxious Weeds Act 1995; • Stockpiling of soil that may contain seed of exotic species away from adjacent vegetation or drainage lines where they could be spread during rainfall events; • Placement of soil stockpiles away from vegetated areas; • Utilising existing disturbed corridors such as cleared areas, roads, tracks and existing easements, where possible for set up of equipment, stockpile areas and site facilities; • Development of an Erosion and Sedimentation Control Plan covering the works associated with the Proposal. Erosion and sediment controls are to be installed prior to construction, and maintained throughout construction, to minimise sediment entering the adjacent waterbodies, EECs and SEPP 14 wetland areas; and • Bitou Bush, Prickly Pear, Crofton Weed and Pampas Grass would be managed by following the Local Noxious Weed Control Plans (NCC 2006). It is recommended that the plants be removed by physical removal, as herbicides may impact Green and Golden Bell Frogs and their habitat.
Revegetation	Condition 4a) of the Surrender Notice requires that by 30 June 2017, the licensee shall complete implementation of the final landform and capping strategy as detailed in the documents titled: • HDC – Report on KIWEF – ‘Revised Final Landform and Capping strategy’ – August 2009 - Revision 2, prepared by GHD (“the Landfill and Capping Strategy”); Chapter 7 of Revised Final Landform and Capping Strategy (GHD, 2009) indicates that 100mm thick layer of topsoil will be utilised across the site and will be sourced using stockpiled surface soils or imported topsoil to revegetate the disturbed area. Section 7.4 of Flora and Fauna Impact Assessment (GHD, Appendix A, 2009) requires that: • Provenance native plant stock would be used for rehabilitation of the disturbed areas to maintain the genetic integrity of the vegetation communities present on site; • Revegetation of the Proposal capped areas following soil/capping material placement should be in accordance with a Revegetation and Restoration Plan; and • Restore and rehabilitate wetland communities disturbed by the Proposal in accordance with a Revegetation and Restoration Plan. Section 5.3 of the GGBF Management Plan (Golder Associates, 2011) requires that: • As part of the rehabilitation and revegetation plan for the KIWEF site, open stormwater infrastructure across the KIWEF site may be planted with species known to be favoured by Green and Golden Bell Frogs. This revegetation and rehabilitation strategy will include a 2 metre wide buffer on either side of the stormwater drains. The intention of these areas is to provide movement corridors for Green and Golden Bell Frogs across the site; • The capped areas will ideally be designed to shed water to table drains, which, in a similar manner to other stormwater infrastructure, will be vegetated with species known to be favourable to Green and Golden Bell Frogs; and • Drainage culverts will, where practicable, be vegetated and lined with rocks and objects that may provide temporary frog refuge, in the event that a frog seeks to traverse the future capped area of KIWEF.

These requirements generally reflect the “Particular Manner” requirements issued for Referral 2012/6464 which are also proposed to be incorporated into management of construction impacts associated with the proposed activity. The capping

of Area 1 under Referral 2012/6464 was completed in May 2015, generally utilising the mitigation measures as described within Table 13. While the long-term effects of the Area 1 capping are difficult to determine after such a relatively short timeframe since completion, the mitigation measures implemented during the construction works were considered to be appropriate and effective in controlling the potential construction impacts to the surrounding Green and Golden Bell Frog habitats. HDC and the EPA have discussed the completion of the Area 1 capping works and the EPA has indicated that the works were conducted in accordance with the relevant management plans and the requirements of the KIWEF Surrender License. The EPA are expected to release formal advice before the end of the year to this confirm this statement.

Slight changes to the previous "Particular Manner" requirements are required to address the identified topsoil deficiency and make them applicable to the referral area should a "in a Particular Manner" decision be formed. Based on assessments and experience to date the following mitigations measures are proposed to prevent significant impacts to MNES:

1. Works described within the Referral associated with the closure of the Kooragang Island Waste Emplacement Facility must only occur within the Referral Area as illustrated on *Annex A, Figure 2*; and must be restricted to the extent required to satisfy the Surrender Notice requirements.

2. The NSW Threatened Species Management Information Circular No.6 – Service Hygiene Protocol for the Control of Disease in Frogs (April (2008) or most recent revision of that document, must be implemented on the Closure Works site during all works and any other activities undertaken as part of the action.

3. Prior to the commencement of works, Green and Golden Bell Frog (*Litoria aurea*) breeding habitat, as identified within the referral must be:

- Clearly defined on construction site plans as habitat for authorised access only; and
- Protected from unauthorised access from the closure works site by sign-posting and temporary construction fencing installed outside of *Litoria aurea* breeding habitat.

4. Temporary frog exclusion fencing must be installed to prevent movement of GGBF into the works area from likely GGBF habitat and be located to avoid additional impacts on GGBF breeding habitat.

5. Pre-clearance surveys for *Litoria aurea* must be undertaken by a qualified ecologist in all works areas or their parts prior to commencement of physical disturbance of the site. Early works associated with the establishment of site facilities, fencing and signage should be undertaken in the presence of an Ecologist. The design of the pre-clearance survey must include active surveys aimed at maximising the capture and relocation of GGBF individuals prior to physical disturbance. Any GGBF encountered during pre-clearance surveys or during works are to be captured and relocated in accordance with the GGBF Management Plan (Golder, 2011).

6. Any capping materials that are imported from outside the KIWEF facility must be sourced from an area that is demonstrated to be low in nutrients and assessed as having a low risk of containing chytrid fungus.

7. Topsoil to be used for surface layers must be sourced from within KIWEF to the extent possible and will otherwise be demonstrated to be low in nutrients and assessed as having a low risk of containing chytrid fungus.

8. Design of erosion and sediment controls must be in accordance with environmental protection standards for sensitive environments, such as (but not limited to) 'Managing Urban Stormwater – Soils and Construction' (Landcom, 2004).

9. Upon completion of works, the works area must be rehabilitated with local native vegetation species.

6 Conclusion on the likelihood of significant impacts

6.1 Do you THINK your proposed action is a controlled action?

No	No, complete section 6.2
	Yes, complete section 6.3

6.2 Proposed action IS NOT a controlled action.

The potential impacts to MNES have been identified as follows:

- Short term construction impacts related to clearing of existing vegetation dominated by weeds and non-native species with impacts to pond fringing habitat avoided;
- Short term construction impacts associated with sedimentation able to be managed through the implementation of erosion and sediment controls;
- Potential short term indirect impacts to foraging wetland birds, due to construction disturbance in the adjacent capping area; and
- General improvements in water quality in receiving waterbodies with slightly wetter and fresher conditions expected.

There is no proposed ongoing loss of habitat for any MNES species and short term impacts associated with site disturbance during construction are able to be managed using methods previously implemented on KIWEF and demonstrated to be successful in avoiding significant impacts to MNES. None of the impacts are considered to significantly affect any MNES. Adequate regulation of the proposed activity and KIWEF in general is provided through the requirements of the Surrender Notice under the Protection of the Environment Operations Act and are able to be enforced under State Legislation. Should a reduction of salinity levels beyond that expected eventuate and be attributable to the proposed activity, the discharge levels of permanent basins can be raised to reduce surface water in-flows to the affected ponds effectively returning the hydrology of the site to the pre-activity conditions.

6.3 Proposed action IS a controlled action

Matters likely to be impacted

	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

7 Environmental record of the responsible party

	Yes	No
7.1 Does the party taking the action have a satisfactory record of responsible environmental management? Provide details The Port of Newcastle Lessor Pty Ltd (PoN Lessor) is a NSW Government (State) owned entity that owns the Kooragang Island Waste Landfill Facility (KIWEF) land, which is currently leased by the State to Port of Newcastle Investments (Property) Pty Ltd under a 98 year lease that began in May 2014. The State has also entered into a Binding Terms of Agreement (BTA) with the Hunter Development Corporation (HDC) for HDC to arrange the completion of the KIWEF Closure Works as specified under the Surrender License (issued by the NSW EPA) on behalf of the land owner. HDC will oversee the implementation of the Closure Works to ensure compliance with any environmental management controls that are stipulated throughout the construction phase of the remediation works. After completion of the remediation works (including signoff by the NSW EPA), HDC will hand over control and any ongoing obligations attached to the site, to the PoN Lessor. The Hunter Development Corporation (HDC) has previously arranged similar remediation works on behalf of the State (capping of Area 1 under Referral 2012/6464, completed in May 2015). The completion of the capping of Area 1 was also undertaken in close proximity to Green and Golden Bell Frog habitats. The mitigation measures implemented for the Area 1 closure works were similar to the proposed mitigation measures for the Area 2 closure works. The mitigation measures implemented during the construction works of the Area 1 closure works were considered to be appropriate and effective in controlling the potential construction impacts to the surrounding Green and Golden Bell Frog habitats. HDC and the EPA have discussed the completion of the Area 1 capping works and the EPA has indicated that the works were conducted in accordance with the relevant management plans and the requirements of the KIWEF Surrender License. The EPA are expected to release formal advice before the end of the year to this confirm this statement.	✓	
7.2 Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources? If yes, provide details Neither the PoN Lessor, nor the HDC have been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of a natural resource.		✓
7.3 If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework? If yes, provide details of environmental policy and planning framework The PoN Lessor is a NSW State Government owned entity that is governed by a Board of Directors comprised of senior members from two NSW State Government owned entities being, NSW Treasury and Government Property NSW. The PoN Lessor report directly to the NSW Treasurer. HDC is a NSW State Government organisation that is governed by a Board of Directors who report to the NSW Minister for Planning. The Board sets and oversees the direction of HDC by actively participating in strategic planning and providing guidance and overseeing the performance of the Corporations policies, management and operation.	✓	
7.4 Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act? Provide name of proposal and EPBC reference number (if known) PoN Lessor has not submitted a previous Referral. However HDC have previously arranged the submission of the following referrals on behalf of the former KIWEF landowner Newcastle Ports Corporation another NSW State Government owned entity. The previous Referrals include: - Report for KIWEF Capping Strategy (March 2011) [Referral Withdrawn, no number provided] - Kooragang Island Waste Emplacement Facility, Capping Strategy (July 2012) [2012/6464]	✓	

8 Information sources and attachments

(For the information provided above)

8.1 References

- GHD (2009) Hunter Development Corporation - Report on KIWEF - Revised Final Landform and Capping Strategy - August 2009 - Revision 2.
- GHD (2010) Hunter Development Corporation – Revised Capping Strategy KIWEF Flora and Fauna Impact Assessment January 2010 Revision 3.
- Golder Associates (2011) 'Green and Golden Bell Frog Management Plan – Kooragang Island Waste Emplacement Facility Closure Works' dated 19 April 2011.
- Herbert, C. (2007) Distribution, Abundance and Status of Birds in the Hunter Estuary, Hunter Bird Observers Club, Special Report No.4, prepared for Newcastle City Council, September 2007.
- Lindsey, A. (2008) The birds of Deep Pond – Kooragang Island 1993 - 2007. The Whistler 2: 1-12.
- RCA (2012) 'Materials Management Plan - Kooragang Island Waste Emplacement Facility' dated November 2012.
- EMGA Mitchell McLennan (2012) T4 Project Environmental Assessment prepared for Port Waratah Coal Services Limited (Publicly Available http://majorprojects.planning.nsw.gov.au/page/development-categories/transport--communications--energy---water/port---wharf-facilities/?action=view_job&job_id=4399).
- NCIG (2014) Annual Environmental Management Report, ENVIRON Australia.
- SMEC (2012) Terminal 4 Project Surface Water Assessment (Publicly Available http://majorprojects.planning.nsw.gov.au/page/development-categories/transport--communications--energy---water/port---wharf-facilities/?action=view_job&job_id=4399)
- SMEC (2013) Detailed Response to SEWPac Comments, Kooragang Island Waste Emplacement Facility – Final Report.
- Umwelt (2012) Ecological Assessment for Port Waratah Coal Services (PWCS) Proposed Terminal 4 Project, Port of Newcastle NSW.

8.2 Reliability and date of information

ERM has undertaken an extensive review of available information for the site and the documents used in preparing the referral are listed in Section 8.1. The reliability of data provided in the referral has been tested through review of multiple sources of information addressing each topic.

In relation to ecology, ERM has reviewed the listed reports and subsequently has undertaken a site inspection to ground truth the vegetation descriptions provided by both Umwelt and GHD. The ecological assessment is therefore fully reliable as it is based on extensive survey effort undertaken, assessed and ultimately approved under State Legislation for the T4 project and ground truthed to make it current.

Similarly, the understanding of water quality characteristics has been assembled based on extensive sampling effort by a number of technical specialists both on behalf of Hunter Development Corporation and in association with the T4 project and NCIG project. While sampling results reflect a single time in any given year they are considered generally indicative of the variability within and between ponds and suitable for the purposes of the assessment. Hydro-salinity loggers are also being established to monitor ongoing conditions in the waterbodies surrounding the referral area.

The hydrology and landform of the site has been interpreted based on the available survey data provided in association with the T4 project, NCIG project and in development of the Closure Strategy. The landform characteristics are described based on recent site observations and through review of available information contained within the PWCS T4 Environmental Assessment and the Final Landform and Capping Strategy. Completion of detailed design will further refine the current and proposed site landform and hydrology, but the available information is deemed adequate for the assessment of likely impacts on the basis that the detailed design will be completed with the objectives of achieving the outcomes described within the referral information.

8.3 Attachments

		Attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Annex A Figures 1-6: - Figure 1 - Project Locality, with Commonwealth Heritage Places and Ramsar Wetlands - Figure 2 - Project Area, Including Referral Area and Capping Area - Figure 3 - EPBC Listed Threatened Species Recorded within the Study Area - Figure 4 - Green and Golden Bell Frog Recorded within and Adjacent to the Site - Figure 5 - Vegetation Communities and Green and Golden Bell Frog Breeding Habitat - Figure 6 - Site topography and indicative surface water flow paths
	GIS file delineating the boundary of the referral area (section 1)	✓	
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	As above
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)		Surrender Notice (as amended) supplied separately and publically available.
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)		NA
	copies of any flora and fauna investigations and surveys (section 3)		Publicly Available or previously supplied
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)	✓	Annex C
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		NA

9 Contacts, signatures and declarations

Project title:

9.1 Person proposing to take action

1. Name and Title: Sarah Strang, Company Secretary
2. Organisation: Port of Newcastle Lessor Pty Ltd
3. EPBC Referral Number: Not Known
4. ACN / ABN: ACN 165 332 981
5. Postal address: Port of Newcastle Lessor Pty Ltd; c/- Government Property NSW, Level 9, Bligh House, 4-6 Bligh Street, SYDNEY, NSW, 2000
6. Telephone: (02) 9273 3845
7. Email: sarah.strang@property.nsw.gov.au
8. Name of designated proponent (if not the same person at item 1 above): Not Applicable
9. ACN/ABN of designated proponent (if not the same person named at item 1 above): Not Applicable

I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

- ☐ an individual; OR
- ☐ a small business entity (within the meaning given by section 328-110 (other than subsection 328-119(4)) of the *Income Tax Assessment Act 1997*); OR
- ☒ not applicable.

If you are small business entity you must provide the Date/Income Year that you became a small business entity:

Not Applicable

I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations. Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made:

☒ not applicable.

Declaration

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.
I agree to be the proponent for this action.
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature



Date

9/3/16

9.2 Person preparing the referral information

Name	Thomas Muddle
Title	Environmental Planner
Organisation	Environmental Resources Management Australia Pty Ltd
ACN / ABN (if applicable)	12 002 773 248
Postal address	PO Box 803, Newcastle, NSW, 2300
Telephone	+61249035500
Email	thomas.muddle@erm.com

Declaration I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.

I understand that giving false or misleading information is a serious offence.

Signature



Date

18 December 2015
