

A decorative background element consisting of a topographic map with contour lines, rendered in a light grey color. The map features several distinct peaks and valleys, with the most prominent peak located in the lower-left quadrant of the page.

Barton Park Precinct – Review of Environmental Factors

Bayside Council

DOCUMENT TRACKING

Project Name	Barton Park Precinct – Review of Environmental Factors
Project Number	21SYD - 18096
Project Manager	Rebecca Ben-Haim
Prepared by	Roshan Kalugalage, Geraint Breese
Reviewed by	Rebecca Ben-Haim and Daniel Magdi
Approved by	Daniel Magdi
Status	Final
Version Number	5
Last saved on	3 December 2021

This report should be cited as 'Eco Logical Australia 2021. *Barton Park Precinct – Review of Environmental Factors*. Prepared for Bayside Council.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Bayside Council

Disclaimer

This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and Bayside Council. The scope of services was defined in consultation with Bayside Council, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information. Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

Template 2.8.1

Contents

1. Introduction	1
1.1 Project Description and Background	1
1.2 Project Location and Context.....	3
1.3 Land Use and Ownership	3
2. The Project	6
2.1 Preliminary Construction Methodology.....	6
3. Project Justification and Consideration of Alternatives	10
3.1 A Metropolis of Three Cities	10
3.2 Eastern City District Plan	11
3.3 Future Bayside – Local Strategic Planning Statement	11
3.4 Do-Nothing Approach and Alternative Options.....	12
4. Statutory and Planning Context	14
4.1 Other Plans and Policies	19
4.2 NSW Planning and Approvals Process	19
5. Stakeholder Consultation	21
5.1 State Environmental Planning Policy (Infrastructure) 2007	21
5.2 Agency Consultation.....	22
5.3 Community Consultation	25
5.4 Community Bird Watching Groups	26
6. Existing Environment and Impact Assessment	27
6.1 Landform, Geology, Soils and Geotechnical Considerations.....	27
6.2 Contamination	36
6.3 Waterways, Coastal Wetlands and Aquatic Habitat	43
6.4 Biodiversity	56
6.5 Aboriginal Heritage.....	76
6.6 Historic Heritage.....	80
6.7 Noise and Vibration.....	83
6.8 Landscape and Visual Amenity.....	90
6.9 Traffic and Transport.....	93
6.10 Air Quality	96
6.11 Waste Management.....	99
6.12 Socio-Economic Considerations.....	101
6.13 Cumulative Impacts.....	104
7. Environmental Factors Considered	106

7.1 Matters of National Environmental Significance	106
7.2 Clause 228 of the Environmental Planning and Assessment Act 1979	106
7.3 Licences and Permits	108
8. Mitigation Measures	109
9. Conclusion.....	117
9.1 Assessor Declaration	118
10. References	119

Appendices

Appendix A: Barton Park Precinct Masterplan (MODE Design, 2021)

Appendix B: Long-term Site Management Plan for Open Space Use (Edison Environmental and Engineering, 2020a) (Report ID:EE17011-CU-03-SMP Rev4)

Appendix C: Preliminary Geotechnical Investigation Report (Edison Environmental and Engineering, 2020b) (Report ID: E17011-CU-15-R)

Appendix D: Preliminary Environmental Site Assessment (Edison Environmental and Engineering, 2020c) (Report ID: 17011-CU-17-RAP Rev1)

Appendix E: Remediation Action Plan (Edison Environmental and Engineering, 2021) (Report ID: 17011-CU-17-RAP Rev1)

Appendix F: Flora and Fauna Assessment (ELA, 2021)

Appendix G: Acoustic Assessment (Renzo Tonin and Associates, 2021)

Appendix H: Traffic and Parking Assessment Report (Varga Traffic Planning, 2021)

Appendix I: Waste Management Plan (Dickens Solutions, 2021)

Appendix J: Crime Prevention Through Environmental Design (CPTED) Report (The Design Partnership, 2021)

List of Figures

Figure 1-1: Location of Project site	4
Figure 1-2: Land zoning (Cooks Cove SREP)	5
Figure 2-1: Dynamic compaction process	7
Figure 2-2: Proposed scope of works	9
Figure 5-1: Maximum height tolerance of vegetation for roosting wader birds (Lawler, 1996)	26
Figure 6-1: Soil landscapes within the study area.....	28
Figure 6-2: Extent of past filling (Edison Environmental and Engineering, 2020b; Appendix C)	29
Figure 6-3: Potential ASS mapping within the locality (Rockdale Local Environment Plan (LEP) 2011) ..	32

Figure 6-4: Surface soil sampling locations (Edison Environmental and Engineering, 2020b; Appendix C)	38
Figure 6-5: Extent of 1% AEP Flooding (dark pink graduating to brown indicates greater depth of water and pale pink indicates shallower depth) (Bayside Council, 2021)	45
Figure 6-6: Mapped watercourses (Strahler stream order) within the study area	47
Figure 6-7: Coastal Wetlands within the study area	48
Figure 6-8: Validated vegetation communities within the Project site (ELA, 2021)	64
Figure 6-9 Location of Council and Community Bush Regeneration Activities	65
Figure 6-10: Previously recorded threatened species within the study area	67
Figure 6-11: AHIMS sites in proximity to the Project site	78
Figure 6-12: Listed heritage items in proximity to the Project site	81
Figure 6-13: Current obtrusive light on neighbouring properties in Banksia (Community member – Garnet Brownbill)	91

List of Tables

Table 3-1: A Metropolis of Three Cities objectives regarding green infrastructure	10
Table 4-1 Legislative Context	14
Table 5-1 Infrastructure SEPP consultation requirements	21
Table 5-2: Key themes identified in community consultation	25
Table 6-1: Stratigraphic sequence	30
Table 6-2: Mitigation measures for soils and landform	34
Table 6-3 Contaminants of Potential Concern (CoPC)	37
Table 6-4: Mitigation measures for contamination	40
Table 6-5: Types of Key Fish Habitat and sensitivity levels (from Fairfull, 2013)	46
Table 6-6: MUSIC Model results pre and post development (SPORTENG Civil, 2021)	50
Table 6-7: Response to Coastal Management SEPP Clauses	51
Table 6-8: Mitigation measures for flooding and waterways	54
Table 6-9: PCT 920 description	57
Table 6-10: PCT 1126 description	58
Table 6-11: PCT 1234 description	59
Table 6-12: PCT 1808 description	60
Table 6-13: Mixed Native Plantings description	61
Table 6-14: Weeds and Native Plantings description	62
Table 6-15: Mown Grassland description	63
Table 6-16: State level determined priority weeds and other weeds of concern present	66
Table 6-17: Fauna species known from the subject land, or considered likely/potentially occurring within the subject land	68
Table 6-18: Assessment of the vegetation impacted within the study area	70
Table 6-19: Mitigation measures for biodiversity	73
Table 6-20: Mitigation measures for Aboriginal heritage	79
Table 6-21: Heritage significance of heritage items in vicinity of study area	80
Table 6-22: Mitigation measures for historic heritage	82

Table 6-23: Long-term noise monitoring results dB(A) (Renzo Tonin & Associates, 2021)	84
Table 6-24: Short term noise monitoring results (Renzo Tonin & Associates, 2021)	84
Table 6-25: Project noise trigger levels (Renzo Tonin & Associates, 2021)	84
Table 6-26: Sleep disturbance assessment levels (Renzo Tonin & Associates, 2021)	84
Table 6-27: Road traffic noise assessment criteria for residential land uses (Renzo Tonin & Associates, 2021)	85
Table 6-28: Predicted noise levels, vehicle movements & carparking, $L_{Aeq,15min}$ (Renzo Tonin & Associates, 2021)	85
Table 6-29: Predicted noise levels, players and spectators, $L_{Aeq,15min}$ (Renzo Tonin & Associates, 2021)	86
Table 6-30: Predicted noise levels, all activities operating simultaneously, $L_{Aeq,15min}$ (Renzo Tonin & Associates, 2021).....	86
Table 6-31: Sleep disturbance noise assessment (Renzo Tonin & Associates, 2021)	87
Table 6-32: Traffic Flow Assessment (Renzo Tonin and Associates, 2021).....	87
Table 6-33: Mitigation measures for noise and vibration	88
Table 6-34: Mitigation measures for visual and landscape	92
Table 6-35: Local road network descriptions (Varga Traffic Planning, 2021)	93
Table 6-36: Mitigation measures for traffic	95
Table 6-37: Mitigation measures for air quality.....	97
Table 6-38: Mitigation measures for waste management.....	99
Table 6-39: Bayside population by age group in 2016 and 2036	101
Table 6-40: Mitigation measures for socio-economic considerations	103
Table 6-41: Mitigation measures for cumulative impacts	104
Table 7-1 Consideration of Matters of National Environmental Significance.....	106
Table 7-2 Clause 228 Factors.....	107
Table 8-1 Recommended mitigation measures for the proposed works	109

Abbreviations

Abbreviation	Description
AASS	Actual Acid Sulfate Soils
ACM	Asbestos Containing Material
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AS2021	Australian Standard AS2021-2015 – 'Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'
As	Arsenic
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	<i>Biosecurity Act 2015</i>
CAA	Controlled Activity Approval
CBD	Central Business District
Cd	Cadmium
CEMP	Construction Environmental Management Plan
CHL	Commonwealth Heritage List
CPTED	Crime Prevention Through Environmental Design
Coastal Management SEPP	<i>State Environmental Planning Policy (Coastal Management) 2018</i>
Cooks Cove SREP	<i>Sydney Regional Environmental Plan 33 – Cooks Cove</i>
CoPC	Contaminants of Potential Concern
Cu	Copper
DAWE	Department of Agriculture, Water and Environment
DBYD	Dial Before You Dig
DECC	Department of Environment and Climate Change
DLWC	Department Land and Water Conservation
DPI	Department of Primary Industries
EC	Electrical Conductivity
ELA	Eco Logical Australia
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning & Assessment Regulation, 2000</i>

Abbreviation	Description
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental Protection License
FM Act	<i>Fisheries Management Act 1994</i>
GGBFMP	Green and Golden Bell Frog Management Plan
Heritage Act	<i>Heritage Act 1977</i>
Hg	Mercury
ICNG	Interim Construction Noise Guidelines
Infrastructure SEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
KFH	Key Fish Habitat
Koala Habitat Protection SEPP	<i>State Environmental Planning Policy (Koala Habitat Protection) 2021</i>
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LTSMP	Long-Term Site Management Plan
MNES	Matters of National Environmental Significance
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NHL	National Heritage List
Ni	Nitrogen
NPfl	Noise Policy for Industry
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service
NRAR	Natural Resources Access Regulator
NSW	New South Wales
OCP	organochlorine pesticides
OPP	organophosphorus pesticides
PACM	Potential Asbestos Containing Material
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential Acid Sulfate Soils
Pb	Lead
PCB	polychlorinated bipheyls
PCT	Plant Community Type
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PPE	Personal Protective Equipment
RAP	Remediation Action Plan

Abbreviation	Description
RBL	Rating Background Levels
REF	Review of Environmental Factors
RNP	Road Noise Policy
RSWMP	Regional Strategic Weed Management Plan
SAC	Site Assessment Criteria
SDS	Safety Data Sheet
SEPP 55	<i>State Environmental Planning Policy 55 – Remediation of Land</i>
SHI	State Heritage Inventory
SHR	State Heritage Register
SIS	Species Impact Statement
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
VOC	Volatile Organic Compounds
vph	Vehicles Per Hour
WEMP	Wetlands Environmental Management Plan
WHL	World Heritage List
WIRES	NSW Wildlife Information, Rescue and Education Service Inc
WM Act	<i>Water Management Act 2000</i>
WoNS	Weeds of National Significance
Zn	Zinc

Executive Summary

INTRODUCTION

Eco Logical Australia Pty Ltd (ELA) was engaged by Bayside Council to prepare a Review of Environmental Factors (REF) for the proposed delivery of the Barton Park Precinct. The overall objective of the Project is to provide an environmentally safe and accessible open space and recreational facility which in turn, will encourage people to be more physically and socially active and improve health outcomes and enhance the overall liveability of the Local Government Area (LGA).

PROJECT OUTLINE

Barton Park is located at 88-96 Bestic Street, Banksia to the west of Sydney Airport and 10 km south of the Sydney Central Business District (CBD), Barton Park is currently utilised for active recreation. The proposed works will upgrade the outdated facilities of the park and provide amenities that meet the community's needs.

Generally, the works proposed will consist of:

- 4 sporting fields
- 4 tennis courts
- 2 multi-use courts
- Training field
- Play space
- 4 carparks (totally approximately 241 car spaces)
- Football and tennis clubhouses and amenities
- Fitness park
- Walking / cycling pathways
- Other associated infrastructure

PROJECT JUSTIFICATION

The Eastern City District Plan (Greater Sydney Commission, 2018) contains several objectives with four main goals in mind. These are to promote infrastructure and collaboration, to increase liveability, to improve productivity and to promote sustainability. The proposed upgrades to Barton Park are intrinsically linked to this goal, as the proposed works it will aid in creating a connected open space that will provide enhanced open space to growing communities within the LGA.

Future Bayside – Local Strategic Planning Statement (Bayside Council, 2020) sets out the vision for the area to 2036 and the actions that will be taken to achieve this vision. The Plan sets out several planning priorities, with the most relevant to this Project being: provision of social infrastructure, protection of the health of waterways and biodiversity and to deliver high quality open space.

STATUTORY CONTEXT

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of proposals. As Council is the proponent, the works are to be assessed as 'development permissible without consent' under Part 5 of the EP&A Act. Accordingly, Council must satisfy Sections 5.5 and 5.6 of the Act by

examining, and taking into account to the fullest extent possible, all matters which are likely to affect the environment

In this case, one environmental planning instrument, namely the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), addresses the type of work proposed. Pursuant to clause 65 of the Infrastructure SEPP, development for the purpose of parks and other public reserves may be carried out by or on behalf of a public authority without consent on any land. It is noted that the demolition of the existing grandstand is included as part of the proposed works however, the construction of a new grandstand is subject to a separate approval under Part 4 of the EP&A Act.

Part 5 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by or on behalf of public authorities that are permissible without development consent. It is therefore concluded that Part 5 is the appropriate approval pathway.

ENVIRONMENTAL ASSESSMENT

LANDFORM, GEOLOGY SOILS AND GEOTECHNICAL CONSIDERATIONS

A Preliminary Geotechnical Investigation Report was undertaken by Edison Environmental and Engineering (2020b), which concluded that the site was used as a market garden until early in the twentieth century and was then proceeded by a sewerage farm. The study area then operated as a landfill between the 1940s-1980s, when it was then capped and utilised as a recreational open space. The underlying natural lithology is most likely to be of alluvial origin, deposited as sub-aerial and sub-aqueous component of the Cooks River delta. The natural deposit has been reworked significantly in the last century as part of river diversion works. Waste landfills were then placed over natural sediments. There is also evidence of Acid Sulfate Soils (ASS) on site. However, an Acid Sulfate Soils Management Plan (ASSMP) is not required as the natural sediments are not proposed to be excavated, the proposed piled foundations will not bring natural sediments to the surface and no activities will be undertaken that involve the extraction of groundwater. Impacts are primarily associated to erosion and sedimentation during the construction process. This is of high importance due to the contaminated nature of the soil and potential for impacts to receiving watercourses and wetlands. However, such impacts are likely to be mitigated through strict soil and erosion measures. Furthermore, in accordance with the *Sydney Regional Environmental Plan – Cooks Cove 33* (Cooks Cove SREP), a Soil and Water Management Plan will also be prepared.

CONTAMINATION

A Preliminary Environmental Assessment was undertaken by Edison Environmental and Engineering (2020c; Appendix D), which concluded that the site was used for various activities that caused contamination, including use as a sewerage farm and a landfill. The landfill was constructed without engineering controls to manage leachate or gas impacts and was not formally capped. Therefore, Contaminants of Potential Concern (CoPC) are present onsite. There is potential for environmental impacts during the construction process and operations associated with contaminated soils such as transportation of dust, generation of asbestos fibres, exposure of waste material and contaminated groundwater and sedimentation and runoff from contaminated spoil stockpiles. Both a Long-Term Site Management Plan (LTSMP) and Remediation Action Plan (RAP) have been prepared by Edison Environmental and Engineering to mitigate potential contamination risks both during construction and

operation. The potential contamination impacts are considered manageable assuming such Plans will be strictly adhered to.

WATERWAYS, WETLANDS AND AQUATIC HABITAT

The Cooks River catchment is highly urbanised and serves as part of a stormwater system for the surrounding urban areas. Most of the River is a concrete channel and many of its tributaries have also been converted to concrete or brick-lined channels. The Cooks River has suffered extreme degradation due to sewerage, industrial and domestic waste, stormwater pollution and rubbish dumping. Muddy Creek is a tributary of the Cooks River and is predominantly a second order watercourse (in accordance with the Strahler System), which flows in a north-easterly direction and drains to a tidally flushed estuary. The Landing Lights Wetland is also situated within the study area, which is mapped as a Coastal Wetlands in accordance with the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP). Both Muddy Creek and the Landing Lights Wetland are considered Key Fish Habitat (KFH) in accordance with the *Fisheries Management Act 1994* (FM Act). The proposed works have the potential to indirectly impact on nearby watercourses and wetlands through sedimentation and runoff from contaminated soils. However, such impacts are appropriately managed by maintaining a buffer of at least 20 m from the wetlands and implementation of the LTSMP and RAP. Furthermore, the use of vegetated swales and bioretention basins are proposed to further mitigate impacts associated with stormwater management. Model for Urban Stormwater Improvement Conceptualisation (MUSIC) modelling was undertaken by SPORTENG Civil (2021), which concluded that the proposed works will significantly reduce pollutants such as suspended solids, phosphorus, nitrogen and gross pollutants entering the wetlands and Muddy Creek. In accordance with the Cooks Cover SREP, a WEMP will also be prepared prior to construction.

BIODIVERSITY

A Flora and Fauna Assessment was undertaken by ELA (2021), which identified vegetation within the study area as Plant Community Types (PCT) PCT 920: *Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Mangrove Forest)*; PCT 1126: *Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Saltmarsh)*; PCT 1234: *Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Swamp Oak Forest)*; and PCT 1808: *Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (Estuarine Reedland)*. All identified PCTs correspond to Threatened Ecological Communities TECs, including:

- Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, listed as Endangered under the *Biodiversity conservation Act 2016* (BC Act) and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, listed as Endangered under the BC Act
- Sydney Freshwater Wetlands in the Sydney Basin Bioregion, listed as Endangered under the BC Act

No threatened species were identified during the field survey however, the study area provides known and potential habitat for the following threatened species:

- *Anthochaera phrygia* (Regent Honeyeater)
- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow)

- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Calyptorhynchus lathamii* (Glossy Black Cockatoo)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Lathamus discolor* (Swift Parrot)
- *Anseranas semipalmata* (Magpie Goose)
- *Botaurus poiciloptilus* (Australasian Bittern)
- *Calidris acuminata* (Sharp-tailed Sandpiper)
- *Calidris alba* (Sanderling)
- *Calidris canutus* (Red Knot)
- *Calidris Ferruginea* (Curlew Sandpiper)
- *Calidris tenuirostris* (Great Knot)
- *Charadrius mongolus* (Lesser Sand-plover)
- *Epthianura albifrons* (White-fronted Chat)
- *Haematopus fuliginosus* (Sooty Oystercatcher)
- *Hirundapus caudacutus* (White-throated Needle-tail)
- *Ixobrychus flavicollis* (Black Bittern)
- *Numenius madagascariensis* (Eastern Curlew)
- *Limosa limosa* (Black-tailed Godwit)
- *Chalinolobus dwyeri* (Large-eared Pied-Bat)
- *Myotis Macropus* (Southern Myotis)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Litoria aurea* (Green and Golden Bell Frog)
- *Pandion cristatus* (Eastern Osprey)

Tests of Significance in accordance with Section 7.3 of the BC Act were undertaken for the above threatened species, which concluded that the proposed works are unlikely to have a significant impact. Therefore, the preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) was not recommended.

Significance Assessments in accordance with the EPBC Act were also undertaken for the above nationally listed species which also concluded that the proposed works are unlikely to have a significant impact.

In accordance with the Cooks Cove SREP, a GGBFMP will be prepared prior to construction.

ABORIGINAL HERITAGE

An assessment of Aboriginal heritage was undertaken with reference to the due diligence Code of Practice as set out in the Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010). No previously recorded Aboriginal sites or objects were identified within the study area. Due to the significant historical disturbance to the landform within the study area, the site is unlikely to contain archaeological potential.

HISTORIC HERITAGE

No items of historical heritage significance located within the study area however, two State listed heritage items are in proximity to the study area, being the Arncliffe Market Gardens and Kyeemagh Market Gardens. Both the Arncliffe and Kyeemagh market gardens are of historical significance for their

demonstration of a continuous pattern of land use since the late nineteenth century. They are also of significance for their association with the development of local industry and for their association with early Chinese immigration and the influence of ethnic communities on local industry. The proposed works will not impact on the historical significance as no impacts to the listed heritage items within the vicinity of the study area are proposed.

NOISE AND VIBRATION

An Operational Noise Assessment was undertaken by Renzo Tonin and Associates (2021) in accordance with the noise requirements of the NSW Noise Policy for Industry (NPfI) and the NSW Road Noise Policy (RNP). Existing noise levels in the vicinity of the study area are variable. Machinery and vehicles associated with construction have the potential to impact on nearby noise sensitive receivers, however due to separation distances between the works areas and the nearest receivers, this impact is anticipated to be minor. Predicted noise levels from the operation of the park were assessed against established noise goals for three separate scenarios, being ‘vehicle movements and car parking’ when operating at full capacity; ‘players and spectators’ when operating at full capacity; and predicted noise emissions based on both ‘vehicle movements and car parking’ and ‘players and spectators’ operating at 50% capacity simultaneously. It was concluded that the predicted noise levels will comply for all scenarios at all assessed locations.

LANDSCAPE AND VISUAL AMENITY

Barton Park is predominantly zoned as Open Space in accordance with the Cooks Cove SREP and has been subject to historical land clearing for market gardening, sewerage farming and landfill and most recently, to provide for the recreational use of public open space. The study area is bounded by Muddy Creek to the east and residential housing to the west. The northern extent is constituted by significant wetlands including the Landing Lights Wetland and Eve Street Wetlands. The proposed works will alter the visual landscape and amenity of the area as it involves the construction of infrastructure associated with recreational and sporting use, amenity buildings and landscaping. As the works will facilitate long-term higher amenity public recreation use the visual impact on the community is anticipated to be positive. The works will predominantly be undertaken within areas that have historically been used for public open space and recreation. As such, the nature of land use will not change. The extent of vegetation removal within the study area has been minimised where possible and the Masterplan design has been developed to be sympathetic to existing site conditions and environmental sensitivities.

TRAFFIC AND TRANSPORT

A Traffic and Parking Assessment Report was undertaken by Varga Traffic Planning (2021). Traffic surveys were undertaken at West Botany Street and Bestic Street intersection as well as the Bestic Street, Francis Avenue and Fishos site access driveway intersection. A General overview of findings indicated the following:

- The weekday afternoon peak period occurred between 5:00pm and 6:00pm
- The Saturday peak period occurred between 11:45am and 12:45pm
- During the weekday afternoon network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,300 vehicles per hour (vph), comprising approximately 550 vph eastbound and approximately 750 vph westbound

- During the Saturday network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,150 vph, comprising approximately 650 vph eastbound and 500 vph westbound.

In order to determine the absolute worst-case scenario, modelling of potential traffic impacts assumed that all 4 soccer games and all 4 tennis matches will finish during the weekday afternoon and Saturday network peak periods, whilst the next 4 soccer games and 4 tennis matches will also commence during the same weekday afternoon and Saturday network peak periods. Factoring in spectators, this equates to 132 vehicle movements into Barton Park and 132 vehicle movements out of Barton Park. However, it is highly unlikely that this scenario will be representative of on-site conditions.

A SIDRA NETWORK capacity analysis of surrounding intersections was undertaken, which determined that the traffic generation potential will not have any significant effect on the performance of nearby intersections and the two nearby intersections are expected to continue to operate at acceptable levels of service.

AIR QUALITY

The works area is in close proximity to areas that are primarily utilised for residential activities to the east and west, approximately 500 m northeast of the study area is the Sydney Airport. The existing air quality is typical of a Sydney suburban area. There is the potential for the generation of dust during construction activities, which may cause negative health impacts on nearby sensitive receivers, especially if the dust is generated from contaminated soil stockpiles. Such stockpiles could also be dispersed by wind to nearby watercourses and wetlands. However, such impacts are considered manageable if the mitigation measures outlined within the LTSMP, RAP and this REF are strictly adhered to. Generation of fumes and greenhouse gases from vehicles and machinery during construction are considered negligible.

WASTE MANAGEMENT

The proposed works have the potential to utilise a range of different resources and generate several different types of waste throughout its construction and operational phases. The construction of the Project would require the use of resources such as electricity, water, fuel, concrete, and paving materials. Other resources would be required for infrastructure such as signage, landscaping, and lighting. The generation of waste can reduce aesthetics in community areas, cause health impacts to residential receivers, and pollute the environment. Removal and appropriate disposal of general waste generated both during construction and operation will be undertaken. Furthermore, excavated spoil will be managed and disposed of in line with the recommendations of the LTSMP and RAP.

SOCIO-ECONOMIC

Bayside in 2016 had a population of 162,900 and is forecast to grow to 228,200 by 2036, which equates to an additional 65,300 people (Bayside Council, 2020a). Overall, the Bayside population is forecast to increase by 40% and become an increasingly older community. This change in the demographic profile is important when planning for community services and social infrastructure such as parks and community facilities. The Bayside LGA has a diverse range of open space and recreation sporting facilities however, distribution and access to open space varies across the LGA. The provision of new sport and active recreation is considered essential in the future with a growing population, however, is

challenging due to the urbanised nature of the LGA. It is therefore essential that existing sport and recreation facilities are upgraded to meet future needs. The proposed works are therefore considered to have a positive impact on the community of Bayside.

CUMULATIVE IMPACTS

Several major projects have been approved within the locality of the study area including the redevelopment of Kyeemagh Public School and Eden Street Site. Cumulative construction impacts on the community such as noise, air pollution and congestion on nearby roads could therefore arise if construction for both these projects and the proposed works coincide. However, this is considered unlikely and management through the implementation of the recommended mitigation measures outlined within this REF.

STAKEHOLDER CONSULTATION

The following agencies have been consulted with during the preparation of the REF:

- Crown Land
- Department of Planning, Industry and Environment (DPIE) – Environment, Energy and Science (EES) Division
- Civil Aviation Safety Authority (CASA)
- Sydney Airport
- Department of Primary Industry (DPI) – Fisheries

Feedback, where applicable has been incorporated into the final technical assessment and design of the Masterplan.

The draft Masterplan for the upgrading of Barton Park was publicly exhibited on the Bayside Council website from the 14th April 2020 – 26 May 2020. The detailed design plans for both Zones 1 and 2 were again open for comment on the 19th November 2020 – 7th December 2020. The public was invited to share feedback through online feedback forms, mail, phone and email. 83 submissions were received, of which:

- 68 approved
- 1 disapproved
- 18 recommended design input.

Regarding the submissions recommending design input, a number of key themes were discovered, including design suggestions for the cycleway, requests for the inclusion of a dog park and synthetic fields and potential impacts to the Landing Lights Wetland. Where feasible, Bayside Council have incorporated the feedback into the final Masterplan design.

CONCLUSION

Overall, the identified potential environmental impacts associated with the proposed works can be adequately managed provided the design recommendations and mitigation measures outlined within this REF are adhered to.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by Bayside Council to prepare a Review of Environmental Factors (REF) for the proposed upgrade of Barton Park, Banksia. The upgrade is proposed to provide the growing populations of Arncliffe, Banksia and Wollie Creek access to a variety of recreational activities, including organised sport, family outings, bird watching, and environmental education opportunities.

The works have been assessed under Part 5 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) with Bayside Council as the determining authority. This REF has assessed all environmental factors listed in clause 228 of the *Environmental Planning & Assessment Regulation, 2000* (EP&A Regulation); and outlined impact mitigation measures to be undertaken, in line with Council's policies and procedures.

As part of this assessment, the following studies were undertaken. The findings of such studies have been incorporated into this REF:

- Barton Park Precinct Masterplan (MODE Design, 2021; Appendix A)
- Long-term Site Management Plan for Open Space Use (Edison Environmental and Engineering, 2020a; Appendix B)
- Preliminary Geotechnical Investigation Report (Edison Environmental and Engineering, 2020b; Appendix C)
- Preliminary Environmental Site Assessment (Edison Environmental and Engineering, 2020c; Appendix D)
- Remediation Action Plan (Edison Environmental and Engineering, 2021; Appendix E)
- Flora and Fauna Assessment (ELA, 2021; Appendix F)
- Acoustic Assessment (Renzo Tonin and Associates, 2021; Appendix G)
- Traffic and Parking Assessment Report (Varga Traffic Planning, 2020; Appendix H)
- Waste Management Plan (Dickens Solutions, 2021; Appendix I)
- Crime Prevention Through Environmental Design (CPTED) Report (The Design Partnership, 2021; Appendix J)

1.1 Project Description and Background

Barton Park is currently utilised for active recreation and contains the following existing facilities:

- St George Football Stadium including, fenced grandstand, buildings & spectator mounds
- Other sports fields and lighting
- Barton Park Cycleway along the banks of Muddy Creek connecting to Riverine Park
- Landing Lights Wetland
- Overland flow path from Bestic Street to Landing Lights Wetland

Buildings associated with the St George Football Stadium were demolished in 2019 due to safety concerns arising from structural defects. The other existing sports fields contain outdated lighting on wooden poles, an existing gravel carpark, and an amenity building constructed from storage containers that do not provide adequate facilities for the community.

The Barton Park Cycleway is subject to regular inundation due to the proximity to Muddy Creek and its tidal influence and flood prone location. The asphalt surface is also uneven and is reaching the end of its serviceable life. The overland flow path is unmarked and not supported with pathways or other park facilities. This section of Barton Park is regularly flooded by overland flow and holds water that seeps into the Landing Lights Wetland.

The study area also has a history of several land uses, which are summarised below (Edison Environmental and Engineering, 2021):

- The site was used as a market garden until early in the twentieth century
- Parts of the site were used as a sewerage farm for approximately 40 years
- The sewage farm was decommissioned in the 1940s and filled with waste
- Following completion of landfill operations, the site was covered with soil, grassed and converted into a series of sports fields in the 1980s.

The study area is therefore subject to both a Long-Term Site Management Plan (LTSMP) and a Remediation Action Plan (RAP) to manage contaminated soils during construction.

Due to the above, Bayside Council are proposing to upgrade Barton Park to achieve the following objectives:

- Provide playing fields and other sporting facilities for active recreation to meet sporting group and user needs
- Improve amenity and lighting to meet user groups and regulatory requirements
- Improve interface with the Landing Lights Wetland and other adjacent open space
- Improve landscape and biodiversity outcomes through increased plantings
- Identify integrated movement network with connections to adjacent areas
- Increase safety using Safety by Design (Crime Prevention Through Environmental Design (CPTED)) principles.

To achieve the above, the following upgrades are therefore proposed:

- Demolition of existing grandstand and playing fields
- Site establishment works, including minor vegetation removal
- Remediation works in accordance with the LTSMP (Appendix B) and RAP (Appendix E)
- Construction of a new outdoor sports facility, consisting of:
 - 4 sporting fields
 - 4 tennis courts
 - 2 multi-use courts
 - Training field
 - Play space
 - 4 carparks (totally approximately 241 car spaces)
 - Football and tennis clubhouses and amenities
 - Fitness park
 - Walking / cycling pathways
 - Other associated infrastructure.

1.2 Project Location and Context

Barton Park is located at 88-96 Bestic Street, Banksia to the west of Sydney Airport and 10 km south of the Sydney Central Business District (CBD), extending between Spring Street Drain in the north, Bestic Street in the south, and West Botany Street and Eve Street in the west and Muddy Creek in the east (Figure 1-1).

Banksia is a residential area comprised of mostly low-density dwellings and some unit developments. The study area is 1 km from Banksia Train Station and town centre, 1 km to the foreshore of Cook Park in Kyeemagh and is adjacent to the banks of Muddy Creek within the Rockdale Wetlands Corridor identified as part of Sydney Green Grid recreational open space and wetlands.

Barton Park has road access from Bestic Street connecting to arterial roads West Botany Road to the west and General Holmes Drive to the east, as well as from adjacent residential streets to the west. The study area is serviced by a north south shared path that is well used by cyclists commuting to the airport and beyond.

1.3 Land Use and Ownership

1.3.1 Land Use

The study area is subject to the *Sydney Regional Environmental Plan 33 – Cooks Cove* (Cooks Cove SREP) and is predominantly zoned Open Space (Figure 1-2). In accordance with Clause 11 of the Cooks Cove SREP, the objectives of this zoning include:

- a. *to provide for active sporting and recreational land uses and club facilities, and*
- b. *to provide public access along the Cooks River and Muddy Creek foreshores, and*
- c. *to protect significant wetland areas within the Cooks Cove site and along the Cooks River foreshores, and*
- d. *to provide for facilities that are ancillary to the recreational use of public open space, and*
- e. *to provide vegetated riparian areas to enhance biological connectivity along the Cooks River and Muddy Creek foreshores,*
- f. *to protect and enhance the habitat of the Green and Golden Bell Frog established within Cooks Cove.*

1.3.2 Ownership

The study area is comprised of two land parcels and are owned by both Bayside Council and Crown Land:

- Lot 100 DP 1228008: Crown Land
- Lot 1 DP 576148 and Road Reserve: Bayside Council



Figure 1-1: Location of Project site

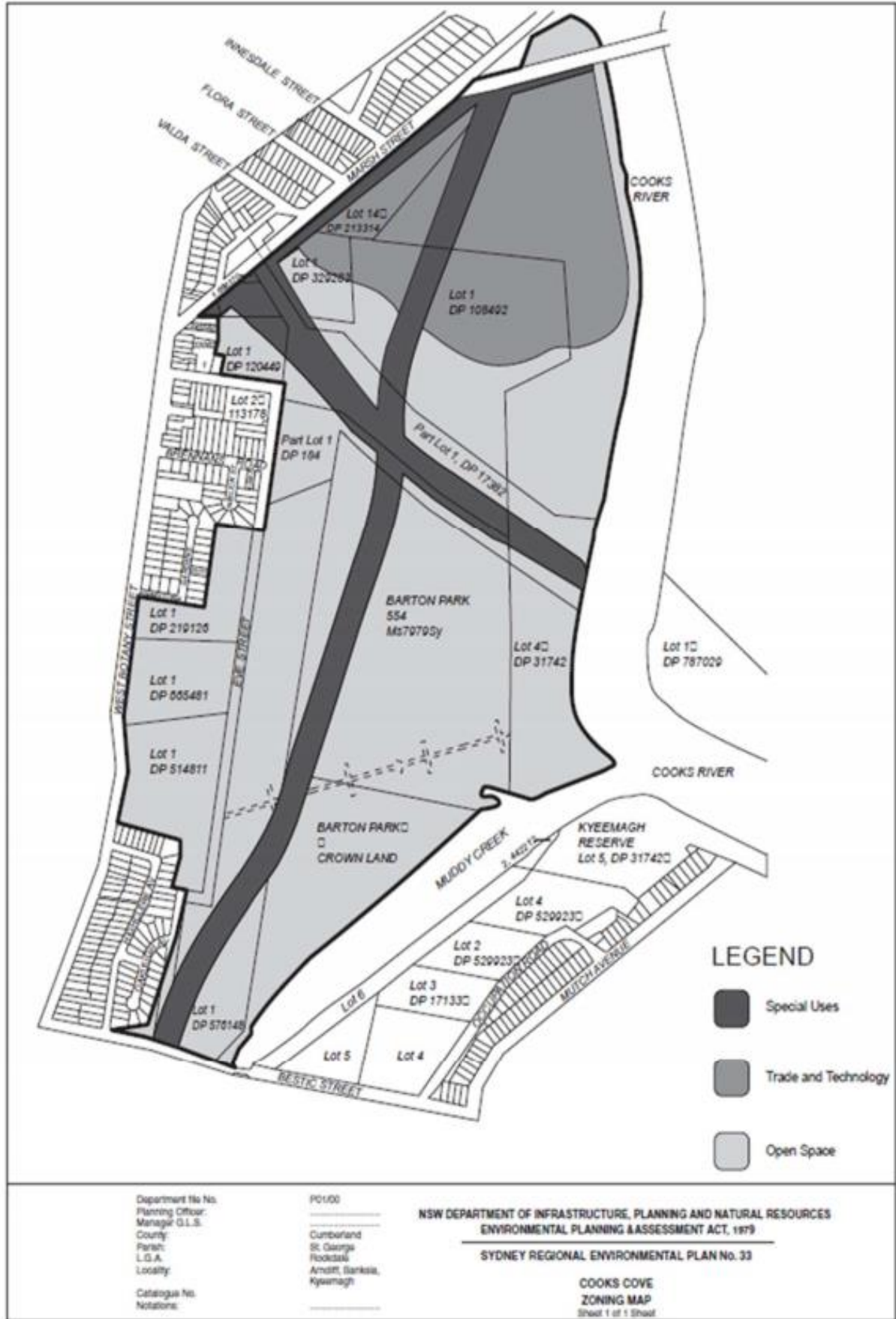


Figure 1-2: Land zoning (Cooks Cove SREP)

2. The Project

2.1 Preliminary Construction Methodology

This section provides one possible construction method and is used as a guide to assess the impacts of the works. The actual construction methods and timing will be determined by the Contractor. The detailed Masterplan (MODE, 2021) can be found in Appendix A.

2.1.1 Site Set Up

- A Dial Before You Dig Assessment (DBYD) will be undertaken prior to any excavation or construction works to locate any service infrastructure present on site
- Transport of machinery, equipment and materials to the site and establishment of site storage and parking areas. No formal compound area is proposed however, is likely to be established within existing cleared areas or carparks
- Installation of sediment and erosion protection measures in accordance with the 'Blue Book' Soils and Construction, Managing Urban Stormwater (Landcom, 2004) with reference to Chapter 5 'Erosion Control: Management of Water'
- Installation of protection and exclusion fencing around vegetation that is to be protected and to delineate area of works
- Installation of fencing to restrict pedestrian access and temporary park closure.
- The shared path will be kept open for use temporarily until the new pathway is constructed.

2.1.2 Construction Work

The following works are proposed as part of the proposal:

- Vegetation removal within delineated footprint only
- Earthworks including excavation and removal of topsoil and debris under pavement, building and field works areas. Stockpiling of topsoil on site for late reuse
- On-site treatment of the known contamination and excavated soil, so that it is destroyed, or the associated risk is reduced to an acceptable level or off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the site (Edison Environmental and Engineering, 2021)
- Demolition of existing grandstand and other derelict buildings
- Compaction of subgrade and proof rolling of formed surface with a steel drum roller of at least 12 T static weight capacity
- Removal of any soft, wet or unsuitable subgrade materials with replacement of approved materials. Removal of excess excavated materials to a place of legal disposal
- Construction of temporary construction batters
- Laying of underground services and sealing of pavements and pouring of concrete for proposed buildings
- Construction of drainage infrastructure and buildings
- Installation of lighting, signage and wayfinding.

Note that to improve the subsurface conditions within the carpark area, dynamic compaction is currently being considered and may be utilised. This technique is often utilised to avoid having to

remove contaminated fill, as well as improve soil conditions so that shallow foundations can be used without deep excavation or piling (where structure form, loadings, and settlements permit). Dynamic compaction involves the controlled impact of a crane hoisted weight, of between typically 10-40 tonnes, falling in a pre-determined grid pattern to improve loose, granular soils and fills. An example of this technique is shown in Figure 2-1. Whether or not Council chooses to utilise this technique has not yet been determined however, if Council do opt to undertake dynamic compaction, further assessments regarding potential noise and vibration impacts on both nearby residents and biodiversity will be undertaken and included within the final REF.

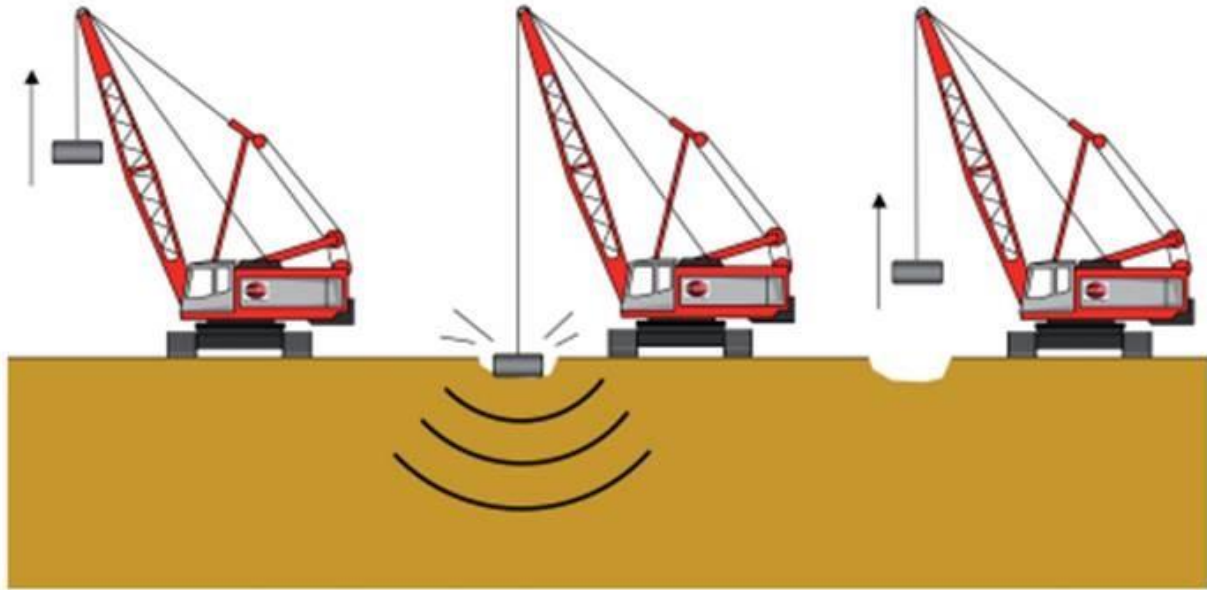


Figure 2-1: Dynamic compaction process

2.1.3 Post Construction Work

- Removal of excess materials and disposal of excavated debris as appropriate
- Reinstatement of disturbed surfaces, including pathways and abutments
- Maintenance of adequate soil cover to minimise human contact with impacted cover soils
- Implementation of measures to monitor and manage potential landfill-gas accumulation in buildings and buried conduits as detailed in the LTSMP
- Establishment of native species cover and density along the Muddy Creek riparian corridor and Landing Lights Wetland through revegetation works detailed in the Wetland Environmental Management Plan (WEMP)
- Ongoing threatened species monitoring, and bushland regeneration works within the Landing Lights Wetland in accordance with the WEMP and Green and Golden Bell Frog Management Plan (GGBFMP).

A Construction Environmental Management Plan (CEMP) will be prepared by the contractor prior to on-ground works. This will specify the location of proposed site compound and stockpiling areas for materials and equipment, and 'no go' zones around environmentally sensitive areas. The CEMP will also prescribe erosion and sediment controls during the construction period and include further mitigation and safeguards in accordance with Section 8.

2.1.4 Site Compounds and Construction Access

Site compounds would be established prior to the commencement of site works at multiple locations and would be retained in place for parts of or throughout the works period.

2.1.5 Finishing Works

Landscaping and ancillary works would generally be completed subsequent to all other activities being completed. Landscaping of areas would take place including installation of signage, park furniture, and planting of all trees, shrubs and groundcovers (including grasses).

Any damage from access or construction would be rectified.

2.1.6 Machinery and Equipment

A list of machinery that may be used at different points within the Project is provided below:

- Hand-held power tools
- Excavator drill rig
- Concrete ground line pump
- Excavator (5T)
- Concrete saw
- Concrete Truck
- Concrete Saw
- Site dumpers
- 5T tipper trucks
- Generator

2.1.7 Access

Vehicular access to the site is to be provided via a new entry/exit driveway located at the eastern end of the Bestic Street site frontage, in essentially the same location as the existing driveway, which is proposed to be widened in accordance with AS2890 requirements.

2.1.8 Duration and Working Hours

Where possible, construction hours will be in accordance with the Department of Environment and Climate Change (DECC) (2009) guidelines:

- 7am - 6pm Mondays to Fridays
- 8am – 1pm Saturdays
- No work on Sunday or public holidays.

Works are aimed to commence in 2022.

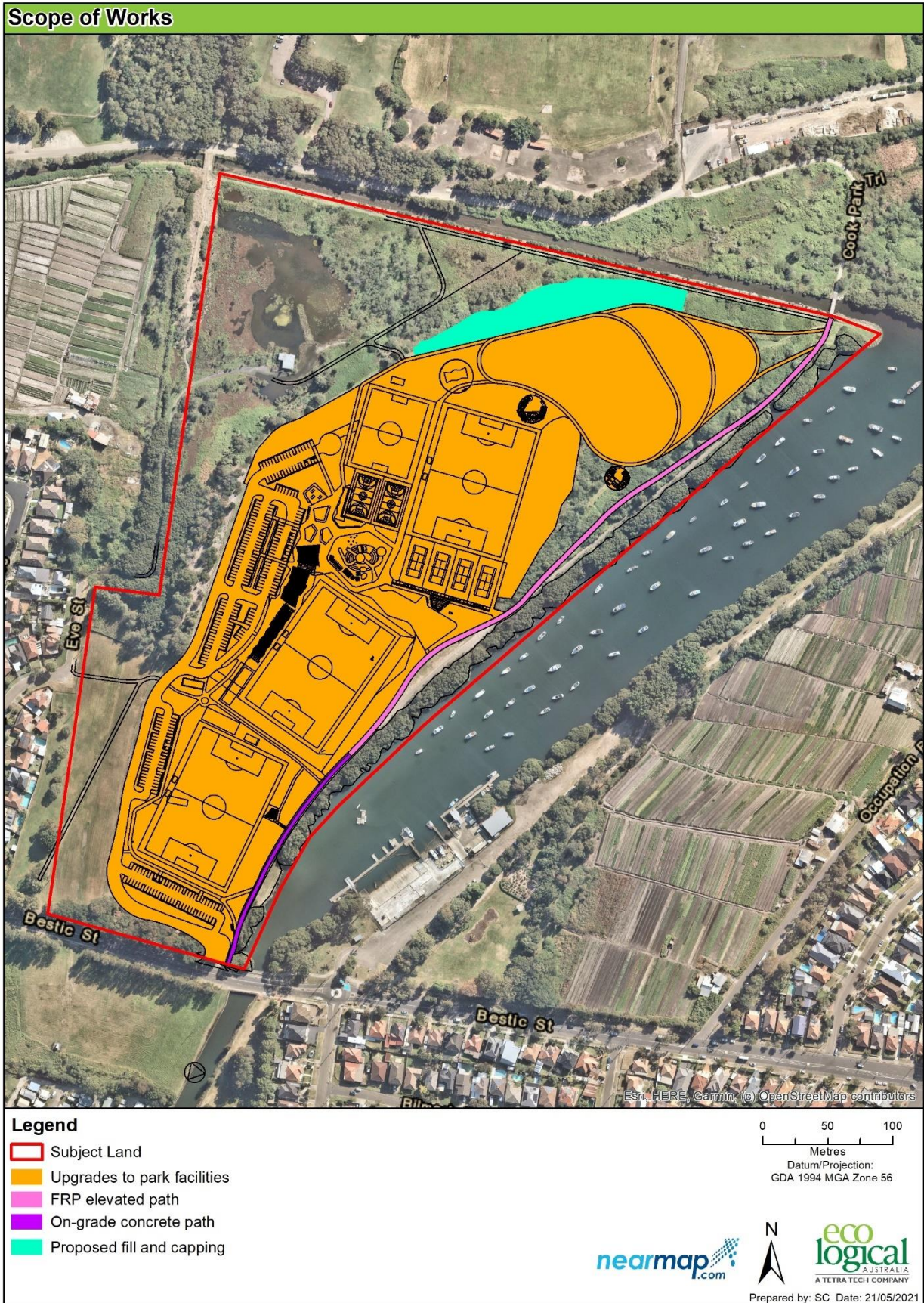


Figure 2-2: Proposed scope of works

3. Project Justification and Consideration of Alternatives

3.1 A Metropolis of Three Cities

The Greater Sydney Regional Plan, *A Metropolis of Three Cities* (Greater Sydney Commission, 2018a), sets a 40-year vision (to 2056) and establishes a 20-year plan to manage growth and change for Greater Sydney in the context of social, economic, and environmental matters. One of the four main themes of the Plan is sustainability and in particular, how sustainable outcomes can be delivered through green infrastructure.

Green infrastructure is the network of green spaces, natural systems and semi-natural systems that support sustainable communities. It has connected elements: waterways; urban bushland; urban tree canopy and green ground cover; parks and open spaces. It is fundamental to creating a high quality of life and is important in creating a region that is climate resilient and adaptable to future needs. The NSW Government’s draft green infrastructure policy *Greener Places: Establishing an urban green infrastructure policy for New South Wales* was produced to guide the planning, design, and delivery of green infrastructure and has been considered within the Landscape Plans produced by MODE Design (2021). Table 3-1 outlines the objectives within the Plan that are most relevant to the proposed works and how the Masterplan will aid in achieving these objectives.

Table 3-1: A Metropolis of Three Cities objectives regarding green infrastructure

Objective within the Greater Sydney Regional Plan, A Metropolis of Three Cities	Relevance to Proposed Works
Objective 27: Biodiversity is protected, urban bushland and remnant vegetation is enhanced	<p>The proposed Masterplan will achieve this objective by:</p> <ul style="list-style-type: none"> Supporting biodiversity conservation and the restoration of bushland corridors Managing urban bushland and remnant vegetation as green infrastructure. Managing the proposed works to reduce edge-effect impacts.
Objective 30: Urban tree canopy cover is increased	<p>The proposed Masterplan, in particularly the Landscape Plan (MODE Design, 2021) will achieve this objective by:</p> <ul style="list-style-type: none"> Expanding urban tree canopy in the public realm. Creating an interconnected urban tree canopy that will assist in reducing the urban heat island effect, improving urban ecology, and linking green spaces. Increasing tree canopy cover from 3% to 11% (including the existing 3%) within the Barton Park precinct.
Objective 31: Public open space is accessible, protected and enhanced	<p>The proposed Masterplan will achieve this objective by:</p> <ul style="list-style-type: none"> Providing an opportunity to expand a network of diverse, accessible, high quality open spaces, which respond to the needs of a growing population. Improving access to high quality and diverse local open space. Delivering a shared and co-located sports and recreational facility. Complementing the Greater Sydney Green Grid. Providing walking and cycling links for transport as well as leisure and recreational trips. Applying CPTED Principles within the design of the Masterplan.

3.2 Eastern City District Plan

The *Eastern City District Plan* (Greater Sydney Commission, 2018b) covers the Bayside, Burwood, City of Canada Bay, City of Sydney, Inner West, Randwick, Strathfield, Waverley, and Woollahra Local Government Areas (LGAs). It is a 20-year plan to manage growth in the context of economic, social, and environmental matters to achieve the 40-year vision for Greater Sydney.

The *Eastern City District Plan* (Greater Sydney Commission, 2018b) contains several objectives with four main goals in mind. These are to promote infrastructure and collaboration, to increase liveability, to improve productivity and to promote sustainability. The goal of promoting sustainability will be attained through the construction of more Green Grid connections. The Greater Sydney Green Grid will provide a regional network of high-quality green spaces that will support walking, cycling and community access to open spaces, and with urban tree canopy lining streets and neighbourhoods. The proposed upgrades to Barton Park are intrinsically linked to this goal, as the proposed works will aid in creating a connected open space that will provide enhanced open space to growing communities within the LGA. Barton Park is also being developed with the intention that it will encourage people to be more physically and socially active, which will improve health outcomes and enhance the overall liveability of the district.

Another key theme within the Plan is to create resilient cities that can adapt to climate change and future shocks and stresses. Some of the challenges that Council's will face include managing the worsening impacts of natural hazards on communities, managing damage to biodiversity and ecosystems, as well as natural systems that provide essential services such as clean air and clean drinking water and adapting communities to cope with more very hot days. The proposed works will help mitigate some of these challenges by reducing the urban heat island effect through increasing tree canopy cover throughout the Barton Park Precinct, mitigating localised flooding through upgrades to the walking / cycle pathway and providing a safe open space area for the local community through remediation works.

3.3 Future Bayside – Local Strategic Planning Statement

Future Bayside – Local Strategic Planning Statement (Bayside Council, 2020) sets out the vision for the area to 2036 and the actions that will be taken to achieve this vision. It provides the land-use planning framework for the LGA, providing a link between the *Eastern City District Plan* (Greater Sydney Commission, 2018) and *A Metropolis of Three Cities* (a land use plan for the Sydney region). The Plan sets out several planning priorities, with the most relevant to this Project being:

- B4: Provide social infrastructure to meet the needs of the Bayside community
- B19: Protect and improve the health of Bayside's waterways and biodiversity
- B20: Increase urban tree canopy cover and enhance green grid connections
- B21: Deliver high quality open space
- B24: Reduce community risk to urban and natural hazards and improve community's resilience to social, environmental, and economic shocks and stressors.

3.3.1 Celebrating Diversity and Putting People First

Healthy and active lifestyles can improve health outcomes. This means the design and management of streets, places and neighbourhoods are important, including access to daily needs such as fresh food,

services and facilities within walking and cycling distance. The proposed works will aid in providing high quality open space to ensure a healthy and vibrant urban life.

3.3.2 Valuing Green Spaces and Landscape

Water quality testing has shown that many of the Bayside waterways have poor water quality and there is significant ground water contamination in the eastern part of Bayside due to past heavy industrial developments. Furthermore, the Landing Lights Wetland contains significant native vegetation, consisting of Threatened Ecological Communities (TECs), is home to important fauna and flora habitat and provides a movement corridor for native fauna.

It is well understood that trees and other layers of vegetation are important urban assets, providing many economic, environmental, and social benefits. The District Plans recognise such benefits and have therefore set out a target of 40% tree canopy cover for each LGA. The suburb of Banksia is estimated to currently consist of approximately 11-15% tree canopy cover and the Bayside LGA ranges between 0-25%. The proposed works are therefore vital in helping to achieve the state target through protecting existing native trees and replacing exotic species with locally native species, to improve the LGA's biodiversity, liveability, and resilience.

Public open space enhances neighbourhoods and supports a healthy and active lifestyle and increases social connectivity through bringing people together. The demand for open space and sport infrastructure is evidently increasing. However, opportunities to deliver more open space in the future will be limited. Therefore, emphasis on the delivery of high-quality spaces that are linked by a network of paths and cycleways and public transport to increase accessibility is essential. Barton Park is a priority blue/green link within the Bayside LGA, which aids in creating a network of vital connections across the landscape and provides numerous benefits.

3.3.3 Adapting to a Changing World

Natural hazards such as flooding, heatwaves, storms, and coastal erosion will be exacerbated by climate change. It is likely that the Bayside LGA will experience more frequent, longer, and more extreme periods of uncomfortable heat and heatwaves in the future. Coastal erosion is already occurring at Cahill Park and Lady Robinsons Beach and stormwater management is a key consideration in some urban renewal areas. Due to the historical industry that occurred in the Bayside LGA, Council also needs to manage several urban hazards including contaminated land and groundwater. The proposed works realise multiple benefits for the area by providing public space and improving resilience to natural hazards. A key component to the improved resilience of the area is the proposed upgrades to the walking / cycle pathway, which are intended to mitigate localised flooding and inundation. Furthermore, the proposed remediation works will provide a safe open space area for the local community.

3.4 Do-Nothing Approach and Alternative Options

The proposed upgrades to Barton Park will aid in creating a connected open space that will provide enhanced open space to growing communities within the LGA and encourage people to be more physically and socially active, which will improve health outcomes and enhance the overall liveability of the district. In turn, the proposed works will aid in Bayside Council achieving multiple Planning Priorities as set out in both the *Eastern Sydney District Plan* and Bayside Council *Local Strategic Planning Statement*. The 'do-nothing' approach was therefore not considered.

The Project has been specifically designed to avoid significant impacts to the environment, including avoiding mapped Coastal Wetlands and proposing management measures to limit risks to public health during the operation of the proposed recreational facilities.

4. Statutory and Planning Context

Table 4-1 provides a description of the legislative context for the Project. Where a particular approval or consideration is required, this REF addresses the objectives and requirements of the legislation.

Table 4-1 Legislative Context

Name	Relevance to the project
Commonwealth	
<p><i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)</p>	<p>The EPBC Act protects Matters of National Environmental Significance (MNES), such as threatened species and ecological communities, migratory species (protected under international agreements), and National Heritage places (among others). Any actions that will or are likely to have a significant impact on the MNES require referral and approval from the Australian Government Environment Minister. Significant impacts are defined by the Commonwealth (reference http://www.environment.gov.au/epbc/guidelines-policies.html) for MNES.</p> <p>MNES have been identified within and near the Project site. A Significance Assessment was undertaken for:</p> <ul style="list-style-type: none"> • <i>Anthochaera phrygia</i> (Regent Honeyeater) • <i>Lathamus discolor</i> (Swift Parrot) • <i>Botaurus poiciloptilus</i> (Australasian Bittern) • <i>Calidris acuminata</i> (Sharp-tailed Sandpiper) • <i>Calidris alba</i> (Sanderling) • <i>Calidris canutus</i> (Red Knot) • <i>Calidris ferruginea</i> (Curlew Sandpiper) • <i>Calidris tenuirostris</i> (Great Knot) • <i>Charadrius mongolus</i> (Lesser Sand-plover) • <i>Hirundapus caudacutus</i> (White-throated Needletail) • <i>Limosa limosa</i> (Black-tailed Godwit) • <i>Numenius madagascariensis</i> (Eastern Curlew) • <i>Chalinolobus dwyeri</i> (Large-eared Pied-Bat) • <i>Pteropus poliocephalus</i> (Grey-headed Flying-fox) • <i>Litoria aurea</i> (Green and Golden Bell Frog) <p>The assessments concluded that the proposed works are unlikely to significantly impact these species.</p>
State	
<p><i>Biodiversity Conservation Act 2016</i> (BC Act)</p>	<p>The BC Act seeks to conserve biological diversity at bioregional and State scales; to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations; to assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process; and to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity. Section 7.3 of the Act requires proponents of activities subject to Part 5 of the EP&A Act to determine whether they will have a significant impact on threatened species. The test for significant impact is described in section 7.3 of the Act. A significant impact also occurs if the activity is carried out in an area of outstanding biodiversity value.</p> <p>If a significant impact is likely to occur, the proponent of the activity must prepare a Species Impact Statement (SIS) in accordance with section 7.20 or a Biodiversity Development Assessment Report (BDAR).</p> <p>Tests of Significance were undertaken for the following threatened species:</p>

Name	Relevance to the project
	<ul style="list-style-type: none"> • Regent Honeyeater • <i>Artamus cyanopterus cyanopterus</i> (Dusky Woodswallow) • <i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo) • <i>Calyptorhynchus lathamii</i> (Glossy Black Cockatoo) • <i>Glossopsitta pusilla</i> (Little Lorikeet) • Swift Parrot • <i>Anseranas semipalmata</i> (Magpie Goose) • Australasian Bittern • Curlew Sandpiper • Great Knot • Lesser Sand-plover • <i>Epthianura albifrons</i> (White-fronted Chat) • <i>Haematopus fuliginosus</i> (Sooty Oystercatcher) • White-throated Needletail • <i>Ixobrychus flavicollis</i> (Black Bittern) • Black-tailed Godwit • Large-eared Pied-Bat • <i>Myotis Macropus</i> (Southern Myotis) • Grey-headed Flying-fox • Green and Golden Bell Frog • <i>Pandion cristatus</i> (Eastern Osprey) <p>The assessments concluded that the works are unlikely to result in a significant impact to any threatened ecological communities or species and therefore, the preparation of a BDAR or SIS is not recommended.</p>
<p><i>Biosecurity Act 2015</i> (Biosecurity Act)</p>	<p>The Biosecurity Act repealed the <i>Noxious Weeds Act 1993</i> and provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.</p> <p>Part 3 of the Biosecurity Act applies a general biosecurity duty for any person who deals with a biosecurity matter or a carrier to prevent, eliminate or minimise any biosecurity risk they may pose. Under section 23 of the Act, a person who fails to discharge a biosecurity duty is guilty of an offence.</p> <p>Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. Appendix 1 of each RSWMP identifies the priority weeds for control at a regional scale. However, landowners and managers must take appropriate actions to reduce the impact of problem weed species regardless of whether they are listed in Appendix 1 of the RSWMP or not as the general biosecurity duty applies to these species.</p> <p>A number of priority weeds, as identified within the RSWMP, were present within the study area and will require management by Council.</p>
<p><i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)</p>	<p>The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of proposals.</p> <p>As Council is the proponent, the works are to be assessed as ‘development permissible without consent’ under Part 5 of the EP&A Act (see Section 4.1). Accordingly, Council must satisfy Sections 5.5 and 5.6 of that Act by examining, and taking into account to the fullest extent possible, all matters which are likely to affect the environment. This REF is intended to assist, and ensure compliance, with the EP&A Act including Sections 5.5 and 5.6.</p> <p>This REF also addresses the requirements of s228 of the EP&A Regulation (see Section 7.2).</p>

Name	Relevance to the project
<i>Fisheries Management Act 1994</i> (FM Act)	<p>The FM Act provides for the protection, conservation and recovery of threatened species defined under the Act. It also makes provisions for the management of threats to threatened species, populations and ecological communities defined under the Act, as well as the protection of fish and fish habitat in general.</p> <p>Both Muddy Creek and the Landing Lights Wetland are considered Key Fish Habitat (KFH). However, the proposed works do not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. Therefore, a permit or consultation under the FM Act is not required. The vegetation mapping shows the proposed concrete path potentially impacting on the mangroves near the north of the study area. This is likely due to the overhanging nature of the mangroves and there is unlikely to be a direct impact to these plants. If during the course of the works it is deemed necessary to trim mangroves along the edge of Muddy Creek, a permit under Part 7 of the FM Act to Harm Marine Vegetation must be obtained prior to works commencing.</p>
<i>Heritage Act 1977</i> (Heritage Act)	<p>The Heritage Act provides protection of the environmental heritage of the State which includes places, buildings, works, relics, movable objects or precincts that are of State or local heritage significance. The NSW State Heritage Register (SHR) is the statutory register under Part 3A of the Heritage Act. Listing on the SHR means that any proposed works or alterations (unless exempted) to listed items must be approved by the Heritage Council or its delegates under section 60 of the Act.</p> <p>No State or locally listed heritage items are located within the study area.</p>
<i>National Parks and Wildlife Act 1974</i> (NPW Act)	<p>The NPW Act is administered by the Director-General of the National Parks and Wildlife Services, who is responsible for the control and management of all national parks, historic sites, nature reserves, and Aboriginal areas (among others). The main aim of the Act is to conserve the natural and cultural heritage of NSW. The Act aims to conserve the natural and cultural heritage of NSW. Where works will disturb Aboriginal objects, an Aboriginal Heritage Impact Permit (AHIP) is required.</p> <p>A requirement of Clause 16 of the Infrastructure SEPP is for consultation with the National Parks and Wildlife Service (NPWS) where the proposed works occur on or adjacent to National Parks Estate. The proposed works are not within or adjacent to national park and therefore consultation is not required.</p> <p>No previously recorded Aboriginal items or objects are located within the study area. Due to the significant historical disturbance to the landform within the study area, the site is unlikely to contain archaeological potential.</p>
<i>Protection of the Environment Operations Act 1997</i>	<p>The POEO Act is the key environmental protection and pollution statute. The POEO Act is administered by the NSW Department of Environment, Energy Science and establishes a licensing regime for waste, air, water and pollution. Relevant sections of the Act are listed below:</p> <ul style="list-style-type: none"> • Part 5.3 Water Pollution • Part 5.4 Air Pollution • Part 5.5 Noise Pollution • Part 5.6 Land Pollution and Waste. <p>Any work potentially resulting in pollution must comply with the POEO Act. Relevant licences must be obtained if required. In accordance Section 48 and Schedule 1(15) of the POEO Act, an Environmental Protection Licence (EPL) is required for contaminated soil treatment if:</p> <ul style="list-style-type: none"> • Treatment of more than 1,000 m³ per year of contaminated soil received from off site is proposed • Incineration of more than 1,000 m³ of contaminated soil originating exclusively on site is proposed • Treatment (otherwise than by incineration) and storage of more than 30,000 m³ of contaminated soil is proposed, or

Name	Relevance to the project
	<ul style="list-style-type: none"> Disturbance of more than an aggregate area of 3 ha of contaminated soil is proposed. <p>Based on the Masterplan and civil plans, less than 3 ha in area of the study area is proposed to be excavated to an extent involved the disturbance of legacy waste. On the basis that cover soils overlying legacy waste have not been deemed to be unsuitable to remain on site (that is, these soils have not been deemed be ‘contaminated’), disturbance of ‘contaminated soil’ is considered to be restricted to activities involving the exposure or disturbance of legacy waste. On this basis, the corresponding licensing threshold in Schedule 1 of the POEO Act is not triggered and an EPL is not required for this aspect of the proposed works.</p>
<p><i>Water Management Act 2000 (WM Act)</i></p>	<p>The WM Act aims to provide for the sustainable and integrated management of water resources for NSW. The Act requires developments on waterfront land to be ecologically sustainable and recognises the benefits of aquatic ecosystems to agriculture, fisheries, and recreation.</p> <p>The WM Act is administered by the Natural Resources Access Regulator (NRAR) and establishes an approval regime for activities within waterfront land, defined as the land 40 m from the highest bank of a river, lake or estuary.</p> <p>A Controlled Activity Approval (CAA) is typically required for work within waterfront land. Section 91E of the Act creates an offence for carrying out a controlled activity within waterfront land without approval. However, according to Section 41 of the <i>Water Management (General) Regulation 2018</i>, a public authority is exempt from Section 91E (1) of the Act. Therefore, Council does not need to obtain a CAA from the NRAR as part of these works.</p>
Planning Instruments	
<p><i>State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)</i></p>	<p>The aim of the Infrastructure SEPP is to facilitate the effective delivery of infrastructure across NSW by identifying whether certain types of infrastructure require consent, can be carried out without consent or are exempt development.</p> <p>Pursuant to clause 65 of the Infrastructure SEPP, development for the purpose of parks and other public reserves may be carried out by or on behalf of a public authority without consent on any land. Such works include:</p> <ol style="list-style-type: none"> a. <i>development for any of the following purposes—</i> <ol style="list-style-type: none"> i <i>roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,</i> ii <i>recreation areas and recreation facilities (outdoor), but not including grandstands,</i> iii <i>visitor information centres, information boards and other information facilities,</i> iv <i>lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,</i> v <i>landscaping, including landscape structures or features (such as artwork) and irrigation systems,</i> vi <i>amenities for people using the reserve, including toilets and change rooms,</i> vii <i>food preparation and related facilities for people using the reserve,</i> viii <i>maintenance depots,</i> ix <i>portable lifeguard towers,</i> b. <i>environmental management works,</i> c. <i>demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area).</i> <p>It is noted that the demolition of the existing grandstand is included as part of the proposed works however, the construction of a new grandstand is subject to a separate approval under Part 4 of the EP&A Act.</p> <p>Part 2 of the Infrastructure SEPP contains provisions for public authorities to consult with other agencies prior to the commencement of development, as described in Section 5.</p>
<p><i>State Environmental Planning Policy 55 –</i></p>	<p>SEPP 55, along with the Contaminated Land Planning Guidelines provide the planning framework for the management of contaminated land in NSW.</p>

Name	Relevance to the project
<i>Remediation of Land (SEPP 55)</i>	SEPP 55 does not technically apply to ‘development without consent’, applying only to Development Applications. However, for completeness and in order to minimise the risks to the contamination of the environment, the recommendations of the relevant studies and management plans undertaken by Edison Environmental, and Engineering (2020 and 2021) referenced within this REF should be adhered to. The study area is the subject of an existing LTSMP accepted by Council. The LTSMP has been the subject of a Site Audit Statement (SAS). As part of the Masterplan implementation, it is proposed to implement a new LTSMP to reflect changes to the site. Council, in their role as consent authority for the Master Plan, has required that an updated SAS be prepared to endorse the updated LTSMP.
<i>State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala Habitat Protection SEPP)</i>	<p>The Koala Habitat Protection SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.</p> <p>The Koala Habitat Protection SEPP does not relate to works under Part 5 of the EP&A Act. Therefore, this SEPP is not relevant to the proposed works</p>
<i>State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)</i>	<p>The Coastal Management SEPP aims to manage development within coastal zones and protect the environmental assets of the coast. In accordance with Section 5 of the <i>Coastal Management Act 2016</i>, the term coastal zone is defined as any area of land that is comprised of the following coastal management areas:</p> <ul style="list-style-type: none"> • Coastal wetlands and littoral rainforests • Coastal vulnerability areas • Coastal environment areas • Coastal use areas. <p>In accordance with the NSW Department of Planning and Environment Coastal Management SEPP Interactive Map, the study area is mapped as a Coastal Environmental Area, Coastal Use Area, Coastal Wetlands and Proximity Area for Coastal Wetlands.</p>
<i>Sydney Regional Environmental Plan No 33 – Cooks Cove (Cooks Cove SREP)</i>	<p>The Cooks Cove SREP aims to establish planning principles for the development of land that promote the ecologically sustainable use of the Cooks Cove site. In accordance with the SREP, Barton Park is predominantly zoned Open Space (Figure 1-2) Clause 10(e), the following ecological and heritage planning principles must be adhered to:</p> <ul style="list-style-type: none"> • <i>Development within the Cooks Cove site is to make a significant contribution to ecological sustainability through promoting effective utilisation of public transport, reduced energy requirements, and the conservation and enhancement of natural resources.</i> • <i>Water and energy-efficient design criteria are to be promoted and soil erosion and sedimentation control measures implemented during remediation and construction phases.</i> • <i>Riparian areas with estuarine and native vegetation are to be established and maintained for the protection and enhancement of the Cooks River estuary and remaining natural areas.</i> • <i>Development should not have adverse impacts on the water quality of the Cooks River, Muddy Creek or wetlands.</i> • <i>The significant wetlands within the Cooks Cove site and along the foreshores of Cooks Cove are to be conserved, and the strategy for conservation is to include—</i> <ul style="list-style-type: none"> ○ <i>establishing adequate vegetated riparian buffers around the significant wetlands, including the Spring Street, Eve Street and Landing Lights wetlands, and</i> ○ <i>establishing adequate vegetated corridors between Cooks River and Muddy Creek and the wetlands, and</i> ○ <i>promoting the on-site recovery of the Green and Golden Bell Frog.</i> • <i>Conservation of the market garden within the Cooks Cove site is to be promoted.</i> <p>The proposed works have been designed with the above principles in mind. The Landing Lights Wetland, which provides habitat for the Green and Golden Bell Frog and migratory birds has been avoided and a 20 m buffer has been provided between the wetlands and the proposed construction works. Revegetation works are proposed for the Muddy Creek riparian corridor and Bayside</p>

Name	Relevance to the project
	<p>Council will implement both a WEMP and GGBFMP in accordance with Clause 17 of the SEPP prior to construction.</p> <p>The SREP also provides controls for building heights as to interfere with Sydney Airport activities. Section 16 of the SREP states that:</p> <ul style="list-style-type: none"> • A building within the Cooks Cove site must not exceed 6 storeys. • A building within 120 m of the Cooks River must not exceed 5 storeys. <p>The proposal requires light poles to be installed. The poles will be the tallest structure on site at 19.61 m tall. This is not considered to exceed 6 storeys. Additionally, consultation has been undertaken with the Civil Aviation Safety Authority (CASA) who posed no objection to the height of the proposed light poles propose works.</p>

4.1 Other Plans and Policies

4.1.1 Biodiversity Strategy 2014 – A strategy for the Natural Assets of the City of Rockdale

This strategy provides high level goals and targets to guide the development of open spaces with an emphasis on restoration and protection and enhancement of natural areas, improvement of waterway quality and creation of linkages along corridors of open space.

The strategy identifies the following priorities for Landing Lights Wetlands:

- Provide foraging and roosting habitat for a range of migratory and non-migratory shorebirds and small bush birds
- Comprise of a sequence of threatened estuarine and freshwater vegetation assemblages and coastal saltmarsh
- Function as important wetland links in the Wetlands Biodiversity Corridor.

The proposed works will not inhibit the above priorities being carried out. Ongoing restoration works for the Landing Lights Wetland will continue and the implementation of a WEMP and GGBFMP will ensure environmental sensitivities within the study area are protected during construction and during operation.

4.1.2 Bayside West Precinct Plan 2018

This Plan sets out strategic land use and infrastructure planning to guide the future transformation of the Bayside West Precincts. The Plan will inform future changes to the planning controls to enable the rezoning of the Arncliffe and Banksia Precincts (Bayside Council, 2020b).

The Bayside West Precinct identifies the importance of open space that is accessible, functional and adaptable to different stages of life for local residents. The proposed works align with the future planning for the Precinct.

4.2 NSW Planning and Approvals Process

The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of proposals. The proposal comprises of the construction of pedestrian pathways, car parks, outdoor recreation facilities, lighting, landscaping, amenities such as toilets and change rooms and environmental management works. These works may be carried out by

or on behalf of Council without development consent on a public reserve under the control of or vested in the council.

Part 5 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by or on behalf of public authorities that are permissible without development consent.

It is therefore concluded that Part 5 is the appropriate approval pathway.

5. Stakeholder Consultation

5.1 State Environmental Planning Policy (Infrastructure) 2007

Division 1 of the Infrastructure SEPP provides guidance on consultation with stakeholders.

Table 5-1 Infrastructure SEPP consultation requirements

Infrastructure SEPP Clause	Clause Relevance	Consultation Undertaken
Clause 13	<p>Impacts on council-related infrastructure or services</p> <p>Consultation is required if the public authority is of the opinion that the development:</p> <ul style="list-style-type: none"> a. will have a substantial impact on stormwater management services provided by a council, or b. is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or c. involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or d. involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or e. involves the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential, or f. involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the Roads Act 1993 (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath). 	No, Bayside Council is the proponent.
Clause 14	<p>Impacts on Local Heritage</p> <p>Consultation is required if the development:</p> <ul style="list-style-type: none"> a. is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area, and b. is development that this Policy provides may be carried out without consent. 	No, Bayside Council is the proponent.
Clause 15	<p>Impacts on Flood Liable Land</p> <p>In this clause, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time.</p>	The design of the Barton Park Masterplan is intended to mitigate existing flooding issues. Improvements to storm water drainage are proposed.
Clause 16	<p>Consultation with Public Authorities other than Councils</p> <p>Consultation is required if the development is:</p> <ul style="list-style-type: none"> a. development adjacent to land reserved under the <i>National Parks and Wildlife Act 1974</i>—the Department of Environment and Climate Change, 	N/A

Infrastructure SEPP Clause	Clause Relevance	Consultation Undertaken
	<ul style="list-style-type: none"> b. development adjacent to a marine park declared under the <i>Marine Parks Act 1997</i>—the Marine Parks Authority, c. development adjacent to an aquatic reserve declared under the <i>Fisheries Management Act 1994</i>—the Department of Environment and Climate Change, d. development in the foreshore area within the meaning of the <i>Sydney Harbour Foreshore Authority Act 1998</i>—the Sydney Harbour Foreshore Authority, e. development comprising a fixed or floating structure in or over navigable waters—the Maritime Authority of NSW, f. development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act)—the NSW Rural Fire Service. g. Note. The Act defines bush fire prone land, in relation to an area, as land recorded for the time being as bush fire prone land on a map certified as referred to in section 146 (2) of the Act. h. Note. When carrying out development of a kind referred to in paragraph (f), consideration should be given to the publication of the NSW Rural Fire Service Planning for Bush Fire Protection 2006. i. (g) (Repealed) 	

5.2 Agency Consultation

5.2.1 Crown Land

Consultation was undertaken with Crown Land, as partial landowner of the study area, during preparation of this REF. No response was received prior to finalisation of this document.

5.2.2 Department of Planning, Industry and Environment

The Environment, Energy and Science Group (EES) within DPIE reviewed the initial Barton Park Masterplan when it was publicly exhibited from the 14th April 2020 – 26th May 2020. The following comments were provided:

EES is concerned that the design, construction, operation and use of facilities proposed could have a negative impact on these values, in particular, the value of the saltmarsh wetland and adjoining areas as habitat for shorebird/wader species. In order to protect these values, EES recommends the following be considered in assessing proposed works within the Landing Lights Wetland area and the proposed works area:

- *Use of the Biodiversity Assessment Method (BAM), whether or not statutorily required, to guide any impact assessment of development works or other activities in any zone of the Precinct.*
- *Migratory wading shorebird species utilise tidally influenced wetlands in eastern Australia, such as those around Botany Bay, to either*
 - *Recover the depletion of their energy reserves after flying huge distances from their breeding grounds in the Arctic (northern Siberia, Alaska), or*
 - *To bulk up their energy reserves before the migration back to those breeding grounds.*

- *Consequently, such species are highly susceptible to harm if disturbed, by movement of humans, dogs and noise, for instance, during these important phases. EES is particularly concerned about the proximity to the Landing Lights Wetland of the proposed carpark and fields and requests that the configuration of the facilities be reconsidered to maintain a buffer of at least 30 m from the edge of any wetland to define a zone within which such facilities are not constructed.*
- *Wading shorebirds are birds of open spaces which generally require their feeding and roosting habitat to be unimpeded by tall vegetation, allowing them clear lines of sight to detect and avoid predators. EES therefore recommends that the design and landscaping be guided by advice from the Australasian Wader Study Group and/or an ecologist who has specialist knowledge and experience in this group of birds and their habitat requirements.*
- *Changes to the Landing Lights Wetland to improve the functionality and resilience of the coastal saltmarsh by opening the wetland to greater flushing by the tides via the stormwater channel that flows into Muddy Creek, and the possible expansion of the saltmarsh to the northeast, would be supported by EES.*

As no direct impacts to native vegetation are proposed and the works are being undertaken under Part 5 of the EP&A Act, Tests of Significance in accordance with Section 7.3 of the BC Act were considered sufficient and entry into the Biodiversity Offset Scheme (BOS) was not opted for. Potential indirect impacts to the Landing Lights Wetland, shorebirds, Green and Golden Bell Frog and other general biodiversity matters are appropriately managed through the preparation of the following:

- CEMP
- GGBFMP
- WEMP

The Masterplan will achieve a 22 m buffer from the Landing Lights Wetland to allow for the expansion for essential infrastructure such as the carpark. Consultation with Phil Straw was undertaken as outlined in Section 5.4. The recommendations of Lawler (1996) have been incorporated into the Landscape Plan (MODE Design, 2021), where feasible. Opening the Wetland is not currently proposed as part of this Masterplan, however, will be considered for future works.

5.2.3 Civil Aviation Safety Authority and Sydney Airport

Consultation was undertaken with CASA regarding the proposed lighting design and the height and location of the proposed floodlight masts for the proposed Masterplan.

Initial comments from CASA included the following:

- *Field 4 would be the closest to the runway 07/25 centre line and would be approximately 40 m south of the centre line and 900 m from threshold 07. Field 3 would be the closest big field to the runway 07/25 centre line and would be approximately 120 m south of the centre line and 870 m from threshold 07. Therefore, a proportion of the Project would be within Zone A as described in the National Airports Safeguarding Framework Guideline E 'Managing the Risk of Distractions to Pilots from Lighting in the Vicinity of Airports'.*
- *In Zone A the maximum intensity of light sources measured at 3° above the horizontal should be 0 cd. The Luminaire Specification provided by MODE Design (2021) advises that all the PL 1 – 11 field*

and courts adjustable flood lighting on poles up to 16 m have glare shields the luminaire head tilt to be maximum uplift $\leq 0-3^\circ$ (zero candelas above 3°). Therefore, the PL 1 – 11 field and courts should be compliant.

- The PL13/14 carpark and local road luminaires on 6 m poles (LED, 81 W. 6000 lm) appear to be aimed downward and would be compliant and should not be an issue.
- The only other lights that could possibly be aimed upward are:
 - The F1 clubhouse, Grandstand & Field 2 Amenities wall mounted adjustable flood uplighter LED, 36 W. 2938 lm 70° . These lights are not expected to be an issue, but the documentation does not describe the arrangement / direction in detail.
 - The W1 clubhouse wall mounted adjustable flood uplighter LED, 21 W. 1577 lm, which appear to be directed downwards and not expected to be an issue.
 - The IN1/2 signage walls and arrival space and play space in-ground continuous linear recessed lighting, which is not bright and is not expected to be an issue.
- The Illuminance Calculations Drawing includes a statement that the lighting conforms to Environmental Zone A3 - Medium District Brightness (suburban) limits AS/NZS 4282:2019 but there is no specific statement of compliance regarding the NASF Guideline E for the Project. If a statement of compliance regarding the NASF Guideline E is provided by the lighting designer, then CASA will have no objections to the Project.
- Also, the runway 07 approach Surface would be very approximately $800 \times 2\% = 16$ m above the level of the runway. The height of the poles closest to the airport need to be checked by Sydney Airport. The lighting designs show an 18 m pole height, which is close to critical surfaces.

The lighting designs were subsequently amended to address the above. The lighting poles will be erected to a maximum height of 19.61 m AHD. CASA has no objections to the Masterplan.

5.2.4 Department of Primary Industries – Fisheries

The draft REF was provided to DPI – Fisheries for comment. A response was received on 16th June 2021 with the following comments:

- The Key Fish Habitat adjacent to the site have been correctly identified.
- Contaminants of Potential Concern are present within the works footprint. If the Long-Term Site Management Plan or Remediation Action Plan require harm (direct or indirect) to adjacent mangroves, then a Part 7 section 205 Permit form DPI Fisheries will be required.
- It is requested that DPI – Fisheries has an opportunity to comment on the Wetlands Environmental Management Plan when it has been drafted.
- Erosion and sediment mitigation devices are to be erected in a manner consistent with currently accepted Best Management Practice (i.e., *Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004*) to prevent the entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.

It is noted that no harm to the existing mangroves is proposed. Strict erosion and sediment mitigation measures will be implemented in accordance with this REF and the draft WEMP will be provided to DPI – Fisheries once drafted.

5.3 Community Consultation

The draft Masterplan for the upgrading of Barton Park was publicly exhibited on the Bayside Council website from the 14th April 2020 – 26 May 2020. The detailed design plans for both Zones 1 and 2 were again open for comment on the 19th November 2020 – 7th December 2020. The public was invited to share feedback through online feedback forms, mail, phone and email. 83 submissions were received, of which:

- 68 approved
- 1 disapproved
- 18 recommended design input.

Regarding the submissions recommending design input, a number of key themes were discovered, which are outlined in Table 5-2, along with how such issues have been mitigated or responded to by Bayside Council.

Table 5-2: Key themes identified in community consultation

Key Theme	Community Suggestions	Bayside Council Response
Design Cycleway Suggestions	<ul style="list-style-type: none"> • Extend the cycle way west of the Landing Lights Wetland to complete a loop for cyclists. • Emphasis should be given to connectivity with neighbouring council's infrastructure. • Ensure signage is provided for cycling speeds 	<ul style="list-style-type: none"> • The final cycle pathway alignment has been designed to minimise potential indirect impacts to the Landing Lights Wetland while at the same time improving visitor access and safety. • Connecting the cycle pathway to Riverine Park and the airport is a key component of the proposed works and liaison with neighbouring councils will continue to ensure connectivity is achieved. • The Project proposes to widen the cycleway and install signage for safety and speed.
Design Suggestions – Inclusion of Dog Park	<ul style="list-style-type: none"> • It is recommended that a dog park is included within the Masterplan 	<ul style="list-style-type: none"> • The inclusion of a dog park is unfortunately not achievable due to the close proximity of the Landing Lights Wetland. However, alternative locations north of Barton Park are being explored.
Design Suggestions – Inclusion of Synthetic Fields	<ul style="list-style-type: none"> • It is recommended that the use of synthetic football fields are considered. 	<ul style="list-style-type: none"> • As Barton Park was extensively sand mined in the past and then used as a landfill, the site is unsuitable for synthetic fields.
Indirect Impacts to Landing Lights Wetland	<ul style="list-style-type: none"> • Consider the impacts of light spill on the adjoining Landing Lights Wetland and native fauna. • Consider inclusion of interpretive signage explaining the natural values of the park. 	<ul style="list-style-type: none"> • Potential indirect light impacts have been addressed within the FFA and mitigation measures have been provided to minimise risk of light spill. • The proposed works will provide wayfinding signage for the area which will also provide meaningful background information into the Park and it's history.

5.4 Community Bird Watching Groups

Consultation was undertaken with Phil Straw, a consultant in avian and wetlands ecology and team leader for many of the community bird watching groups found within the LGA. The following information was provided to be considered within the Masterplan and FFA:

- There have been ongoing discussions and proposals for the ecological management of Barton Park including the control of mangroves, the removal of tall vegetation, which impacts on feeding and roosting for shorebirds, and the construction of a drop-log weir to improve tidal flows.
- It was recommended that any future landscaping takes into consideration the findings of Lawler (1996; Figure 5-1), whereby vegetation within 70 m of roosting sites should be under 5 m in height to ensure safe roosting sites for wetland birds.

It is noted the Landscape Plan prepared by MODE Design (2021) has taken the findings of Lawler (1996) into consideration where feasible.

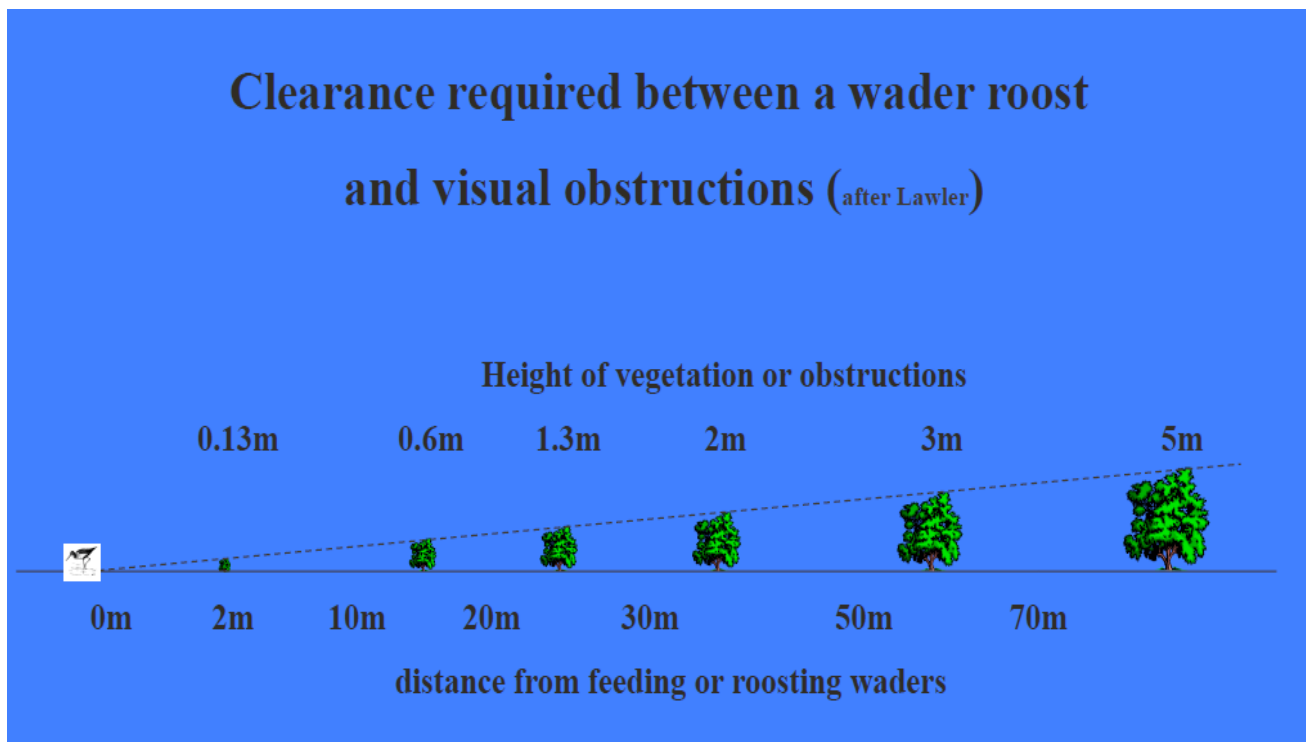


Figure 5-1: Maximum height tolerance of vegetation for roosting wader birds (Lawler, 1996)

6. Existing Environment and Impact Assessment

6.1 Landform, Geology, Soils and Geotechnical Considerations

6.1.1 Existing Environment

6.1.1.1 Geology

The site was used as a market garden until early in the twentieth century (Maunsell, 2001; Edison Environmental and Engineering, 2020b; Appendix C). Parts of the site were then used as a sewerage farm serving south and western Sydney for approximately 40 years, commencing in the late nineteenth Century. The sewerage farm was decommissioned in the 1940s and filled with waste by Rockdale Council. Following completion of landfill operations (1940s-1980s), the site has been used for recreational purposes. The previous municipal landfill occupied (80-90%) of the site.

The Sydney 1:100,000 Geological Series Map identifies the soil landscapes in the area to be Warriewood (wa) and Disturbed Terrain (Figure 6-1). The underlying natural lithology is described as consisting of silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers. This material is most likely to be of alluvial origin, deposited as sub-aerial and sub-aqueous component of the Cooks River delta. The natural deposit has been reworked significantly in the last century as part of river diversion works. These works would have involved significant dredging operations (CES, 2001). Additionally, waste landfills have been constructed over the natural sediments, this is indicated in the highlighted portion of Figure 6-2 which identifies the extent of past filling. A study of borehole logs from past studies generalised the stratigraphic sequence, which is summarised in Table 6-1.

The primary geotechnical issue is the presence of the uncontrolled waste fill layer. The layer consists of municipal waste placed at site between the 1940s and 1980s. The former landfill was not properly closed or capped and does not include provisions for the management of leachate and gas (Edison Environmental and Engineering, 2020b; Appendix C). When the landfill was decommissioned, waste was covered with a layer of predominately sand soil with gravel and minor construction waste (i.e., brick and concrete) and then a thin layer of topsoil and grass. This has caused the base of the landfill waste layer to range from approximately 1 m around the perimeter of the landfilled area and up to approximately 9 m in certain locations. This has caused undulations in the existing playing surfaces, which are a direct consequence of the differential settlement of uncontrolled waste fill material and the degradation of the municipal waste. A secondary geotechnical issue is the inconsistency of the alluvium underlying the waste. Alluvium varies from very loose to loose, to medium dense and dense, and therefore minimises any confidence on this layer being a suitable bearing stratum for the major structures that are proposed as part of the works.

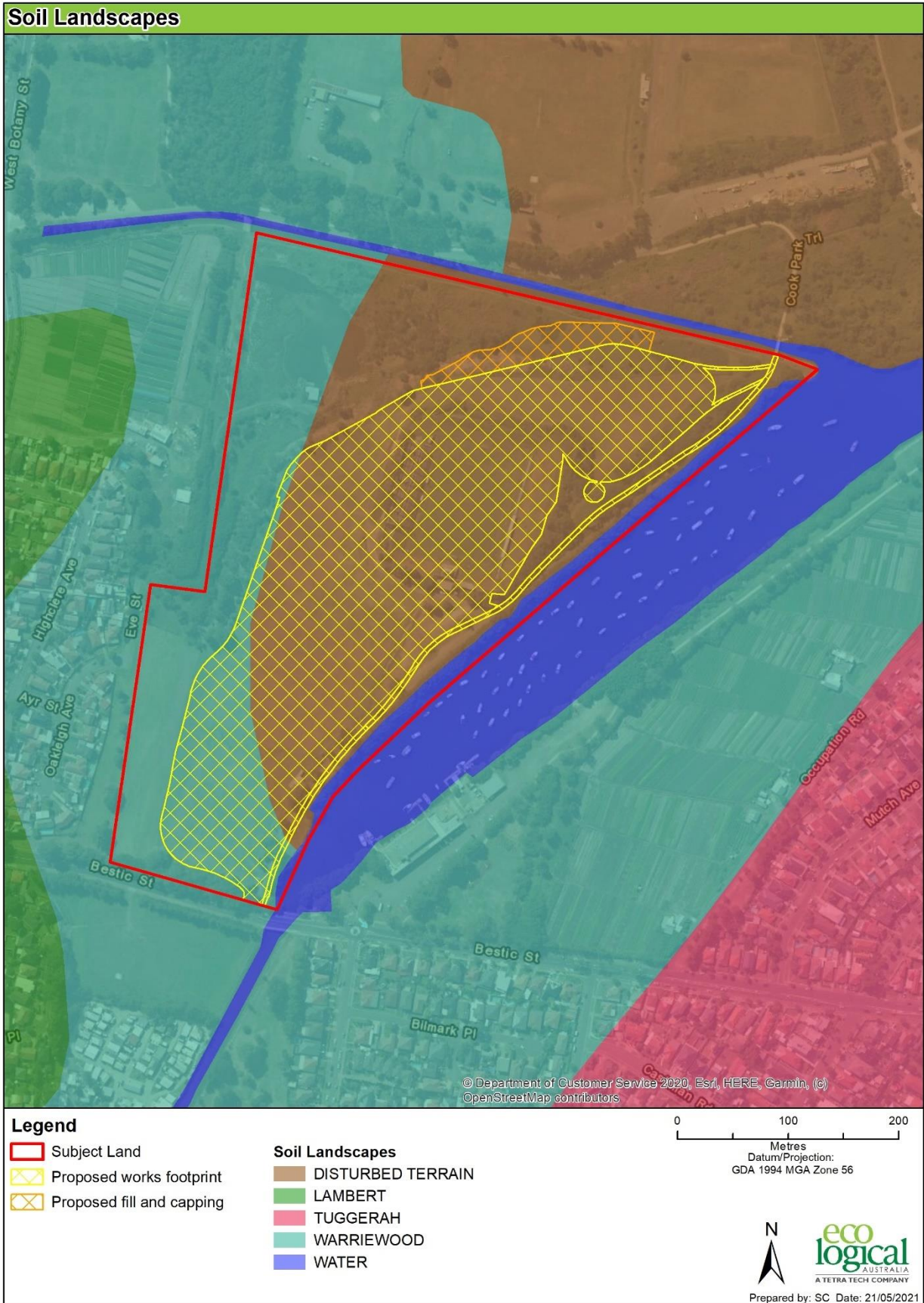


Figure 6-1: Soil landscapes within the study area



Figure 6-2: Extent of past filling (Edison Environmental and Engineering, 2020b; Appendix C)

6.1.1.2 Topography

The park and playing fields are relatively flat and according to the survey plan, undertaken by CMS Surveyors in 2020, the surface elevation is approximately 3.5m and 4.5m above the Australian Height Datum (AHD). As previously mentioned, the site is a former landfill site, with waste mass covering most of the site with batters sloping towards the boundaries where the surface elevation is between approximately 0.5 m and 1.0 m AHD. The study area is uneven due to the differential settlement rate of the underlying waste material. The Landing Light Wetland comprises the north western portion of the study area.

6.1.1.3 Soils

As previously discussed, the soils on site have been heavily modified through previous land uses. Table 6-1 presents the soil layers existing within the study area.

Table 6-1: Stratigraphic sequence

Layer / Unit	Description	Depth to Base of Layer (m)	Consistency / Relative Density / Rock Strength
1- TOPSOIL	SAND / Silty SAND: dark brown, fine to medium grained with roots	0.1 – 0.2	Loose
2 – GENERAL FILL	Silty SAND / SAND / Gravelly SAND: dark brown, grey and brown, fine to coarse grained sand, fine to coarse gravel with some cobble sizes and some construction and demolition waste (predominately brick and concrete).	1.0 – 1.7	Loose to medium dense
3 – WASTE FILL	Clayey SAND and SAND with much waste material (including wood, glass, plastic, metal, concrete, wire and rubber) and minor silt and gravel.	1.1 – 9.0	Very Loose
4 - NATURAL SOIL (Alluvial)	SAND / Silty SAND and CLAYEY SAND: light grey and dark grey, fine to medium grained sand, with shell fragments and pockets/bands or clay/organics. Noticeable landfill odour and a hydrocarbon odour was also noted in some areas.	13.5 - 18.5	Very Loose to Loose with some medium dense bands
5 – NATURAL SOIL (Residual)	Clayey SAND and Sandy CLAY: light grey, white and brown, fine to medium sand, low plasticity clay and trace gravel (sandstone).	16.2 - 20.8	Medium dense to dense / Stiff to Very Stiff
6a - BEDROCK	SANDSTONE with minor SHALE/LAMINITE bands: black, grey, orange, pink, fine to medium sandstone, extremely weathered to distinctly weathered (Class V shale/sandstone - Pells et al 2019)	17.4 - 24.85	Extremely low to low strength
6b - BEDROCK	SANDSTONE: grey and light grey, fine grained, fresh (Class III/II sandstone - Pells et al (2019)	--	Medium to high strength

The study area is not identified as containing Acid Sulfate Soils (ASS) on any environmental planning instrument mapping (Figure 6-3). This is due to the land being under the jurisdiction of Cooks Cove

SREP, which does not include potential ASS (PASS) mapping. Based on the results of soil testing (CES, 2008), the natural sediments are classified as PASS. PASS are soils containing iron sulfides or sulfidic material (usually ferrous iron disulfide or pyrite) which are waterlogged soils, rich in pyrite, that have not been exposed to air and oxidised. Any disturbance that admits oxygen (such as excavation works) will lead to the development of Actual ASS (AASS) layers, which may pose an environmental risk. However, an Acid Sulfate Soils Management Plan (ASSMP) is not required as the natural sediments are not proposed to be excavated, the proposed piled foundations will not bring natural sediments to the surface and no activities will be undertaken that involve the extraction of groundwater.

Soil salinity was assessed by Edison Environmental Engineering (2020b; Appendix C) using guidance published by the Department Land and Water Conservation NSW (DLWC, 2002). Selected samples of natural soil were submitted to Envirolab for NATA accredited testing of Electrical Conductivity (EC), which is the primary indicator of salinity. The test data indicate that the fill/natural soil profile is slightly to very saline with variation across the study area.



Figure 6-3: Potential ASS mapping within the locality (Rockdale Local Environment Plan (LEP) 2011)

6.1.2 Impact Assessment

As the study area is heavily modified and contaminated due to past uses the impacts associated to soil and geology are primarily associated to the disturbance and poor management of soils. Construction of the proposed works would involve disturbing the ground surface and subsurface. If inadequately managed, excavation and stockpiling activities could have the following impacts:

- Erosion of exposed soil and stockpiled materials
- Dust generation from excavation and vehicle movements over exposed soil
- An increase in sediment loads entering the stormwater system, Landing Light Wetland and Muddy Creek
- Continuation of unregulated contaminated groundwater discharging and then migrating offsite and into the stormwater system, Landing Light Wetland and Muddy Creek.

All of the above impacts are exacerbated due to the heavy load of contaminants located within the soil. Therefore, the potential indirect impacts of any sedimentation of adjacent waterways are greatly increased. Potential impacts could include:

- Aquatic and terrestrial flora poisoning from large chemical loads in site runoff. This may result in vegetation dying or being caused serious harm
- Aquatic and terrestrial fauna poisoning from large chemical loads in site runoff. This may result in animals dying or being caused serious harm.

These potential impacts are considered high-risk due to the proximity of the Landing Lights Wetland and onsite records of threatened fauna such as the Green and Golden Bell Frog. Reduction in water quality and hydrological changes, such as pollution, are considered a Key Threatening Process (KTP) to this species (DEWHA, 2009). It is considered that the mitigation measures outlined in Table 6-2 are able to manage these potential indirect impacts to acceptable level during the construction process.

PASS onsite has the potential to impact the surrounding environment and cause damage to infrastructure. When ASS are disturbed, they can generate large amounts of sulfuric acid, iron, aluminium and sometimes heavy metals. This can produce poor water quality, impact local flora and fauna that cannot tolerate acidity, and create infestations of acid tolerant species such as mosquitos. Sulfuric acid can also attack concrete and steel, slowly destroying pipes, roads, bridges, and building foundations. Mitigation measures are provided in Table 6-2 to reduce potential disturbance of ASS to an acceptable level. However, an ASSMP is not required as the natural sediments are not proposed to be excavated, the proposed piled foundations will not bring natural sediments to the surface and no activities will be undertaken that involve the extraction of groundwater

Cap and fill works are required to level areas of the study area to enable playing fields and buildings to be constructed. The maximum cut depth is approximately 2.5 m and the maximum fill depth is approximately 1.5 m. The embankment along the western edge of the study area may increase in height or steepness but this is not anticipated to be significant due to the localised fill in the area being below 1 m. The fall of the regrade areas will be from west to east.

6.1.3 Mitigation Measures

A LTSMP for Open Space Use (Appendix B) and RAP (Appendix E) have been developed by Edison Environmental and Engineering. The LTSMP is used to provide contamination management guidance for ongoing management of the site and minor works. Whilst the RAP is used to provide contamination management guidance for major works, such as this proposal. Both documents must be used in conjunction with this REF to develop a CEMP and for continued reference by the construction contractor and operational land managers.

Table 6-2 identifies mitigation measures that must be implemented to mitigate potential operational and construction impacts.

Table 6-2: Mitigation measures for soils and landform

Environmental Aspect	Mitigation Measures
Increase in sediment flow into watercourses and wetlands	<ul style="list-style-type: none"> • Due to the contaminated soils on site all materials removed from sediment erosion controls must be disposed of in line with materials management and supervision in accordance with Section 7.7 of the RAP (Edison, 2021; Appendix E). • Prepare a CEMP prior to any construction works to address measures to be adopted to minimise impacts on the environment as a result of the construction works, including sediment erosion and sedimentation. • Prepare a Sediment and Erosion Control Plan in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and implement prior to works. • Install soil and erosion control measures such as sediment fencing prior to on-ground works. Inspect these regularly (weekly), and more frequently during rain periods to ensure structures are in proper working order. • Prior to forecast heavy rain, cease work and remove accumulated material from sediment controls. • Schedule the major drainage and earthworks outside of predicted heavy rain periods. • Stop work during and following heavy rainfall to reduce risk of mobilising sediment. • In accordance with Clause 17(4) of the Cooks Cove SREP, prepare a Soil and Water Management Plan, addressing the following: <ul style="list-style-type: none"> ○ the likely impacts of development on water quality during and after construction, ○ the utilisation of effective erosion and sediment control measures in accordance with the State government guidelines entitled <i>Managing urban stormwater: soils and construction</i> (Department of Housing, 3rd ed., 1998) and consistently with any relevant industry standards, especially in relation to the golf course construction and operation, ○ the recommendations of the GGBFMP and WEMP.
Erosion hazard from works	<ul style="list-style-type: none"> • Inspect erosion controls regularly (daily during workdays) and after rainfall. Fix damaged controls immediately. Remove accumulated sediment or waste material from the sediment controls regularly and dispose of at a licensed waste facility. • Bare areas should be mulched, using on-site native vegetation if removed, following clearance works to prevent erosion or soil damage. Alternatively, erosion prone areas, when not in use, may be covered with biodegradable weed matting or similar product. • Monitor sedimentation down slope of excavated areas. • Leave erosion and sediment controls in place until after the works are completed.
Acid Sulfate Soils	<ul style="list-style-type: none"> • Do not disturb or excavate natural sediments. • Utilise piled foundations that will not bring natural sediments to the surface. • Do not undertaken any activities that involve the extraction of groundwater.

Environmental Aspect	Mitigation Measures
Management of contaminated stockpiles	<ul style="list-style-type: none"> • Excavated soil and approved, imported materials must be stockpiled within a designated stockpile area. • During site establishment, stockpile areas must be prepared and managed using the following methods: <ul style="list-style-type: none"> ○ Establishing stockpiles on existing paved or hardstand surfaces to minimise the requirement for validation after the stockpile has been removed. ○ Construction of diversion drains and bunds around the perimeter of the stockpile areas. Installation of sediment and erosion control measures including silt fencing and hay bales, where necessary. ○ Erection of signs at the entrance to the stockpile areas and at locations around the stockpile specifying individual stockpile number and the type of materials stored. ○ Establishment of buffer zones around each stockpile area to enable access to the stockpiles and minimise impacts of the stockpile area on the surrounding facilities. • Maintain, repair and replace the drainage, sediment and erosion control measures installed within the stockpiling areas at the commencement of the Project, where necessary for the duration of the stockpiling activities. All stockpiles must be maintained in a tidy and safe condition with stable batter slopes.
Unexpected finds - Geotechnically unstable materials	<ul style="list-style-type: none"> • Unexpected geotechnically unstable materials may be encountered, which may include large quantities of construction and demolition waste including geotechnically unsuitable or 'oversize' material. The following procedure is to be followed in the event of an 'unexpected find': <ul style="list-style-type: none"> ○ Cease work and contact site manager or foreman. ○ Site foreman to isolate the area to prevent access. ○ Site foreman or client contact Environmental Scientist appointed to the Project. ○ Environmental Scientist to conduct a detailed inspection of the area and undertake sampling with reference to guidelines endorsed by the NSW Environment Protection Authority (EPA). ○ Environmental Scientist to inform Site Auditor of the unexpected find and outcome of the site inspection. ○ Environmental Scientist to consider results of sampling and analysis with reference to EPA-endorsed guidelines. ○ Environmental Scientist to advise on further actions in consultation with the Site Auditor. ○ Environmental Scientist to submit an assessment/validation/clearance to site foreman following completing of approved works. • An Unexpected Finds Protocol is to be developed for the Project prior to the commencement of site works and include in the CEMP.

6.2 Contamination

6.2.1 Existing Environment

As previously discussed in Section 6.1.1, the study area was used for various activities that caused contamination, including use as a sewerage farm and a landfill. The landfill was constructed without engineering controls to manage leachate or gas impacts associated with leaching or degradation of deposited waste. The waste has been covered with a thin veneer of cover soil of varying thickness and permeability, which is not considered a formal cap.

Edison Environment and Engineering (2020b; Appendix C) assessed surface soils as suitable for ongoing use as recreational open space.

Concentrations of heavy metals exceeded the Site Assessment Criteria (SAC) for recreational/open-space land use in some samples of cover soils. The potential for the presence of Asbestos Containing Materials (ACM) in cover soil and waste is also acknowledged. Additionally, exceedances of the nominated SAC occurred in samples of buried waste material. Under a scenario of ongoing recreational/open-space land use, management measures are required with respect to the potential risk to users of the site from contact with exposed cover soils (concentrations exceeding the SAC) and, potentially, exposed waste materials in the event that cover soils are eroded.

The perimeter fill mounds are composed predominantly of construction and demolition waste covered with a thin veneer of soil of varying thickness and quality. Fill in the perimeter mounds variously contain elevated concentrations of lead, Polycyclic Aromatic Hydrocarbons (PAHs) and asbestos predominantly in the form of fragments of fibrous sheet or bituminous membrane. Petroleum-hydrocarbon impacted fill was identified at depth at one location (TP120, Figure 6-4), the extent of which has not been determined.

The former landfill has caused elevated concentrations of methane, derived from the decomposition of waste, within the waste mass. Methane is not accumulating under significant pressure within the waste mass, likely due to poor compaction on placement and the thin, relatively porous cover soils. Trace Volatile Organic Compounds (VOCs) have been detected at low concentrations within the waste mass (e.g., Benzene, toluene and chlorobenzene and 1,2,4 trimethyl benzene). Methane has been detected in some buildings on the site albeit at low concentrations. The Contaminants of Potential Concern (CoPC) identified within the study area are summarised in Table 6-3.

Table 6-3 Contaminants of Potential Concern (CoPC)

Period	CoPC	Phase/State	On site ¹	Off site ¹
Market Garden				
<1900s	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn)	Primarily sorbed on soil	Y	N
Sewerage Farm				
1900s ~1940s	Pathogens (human waste)	Pathogens (bacteria, viruses, etc)	Y	N
	Organic matter (human waste)	Solid	Y	N
	Nutrients (human waste)	Solid and dissolved	Y	N
	Biogas (primarily methane)	Vapour and dissolved	U	N
Landfilling				
1940s ~1980s	Petroleum hydrocarbons	Separated, dissolved, vapour	Y	Y
	Heavy metals	Sorbed and dissolved	Y	Y
	PAHs	Primarily solid phase in waste	Y	U
	OCPs/OPPs	Primarily sorbed on soil	Y	N
	PCBs	Primarily sorbed on soil	Y	N
	Asbestos	Solid and airborne particles	Y	N
	Ammonia	Dissolved in ground/surface-water	Y	Y
	Landfill gas (primarily methane)	Vapour and dissolved	Y	Y
	Volatile Organic Compounds (VOCs)	Vapour, sorbed and dissolved	Y	Y
Open Space				
1978 - Ongoing	Aesthetics	Bare soil on site surface	Y	N
	PACM on bare soil and from dumping	Solid and airborne particles	Y	N
	Herbicides	Sorbed on soil	Y	N
	Landfill gas (primarily methane)	Vapour and dissolved	Y	Y
	VOCs	Vapour, sorbed and dissolved	Y	Y
	Landfill leachate impact (ammonia, organic loading)	Dissolved. Surface water and groundwater	Y	Y

NOTE 1: Y = 'YES'; N = 'NO'; U = 'UNLIKELY'

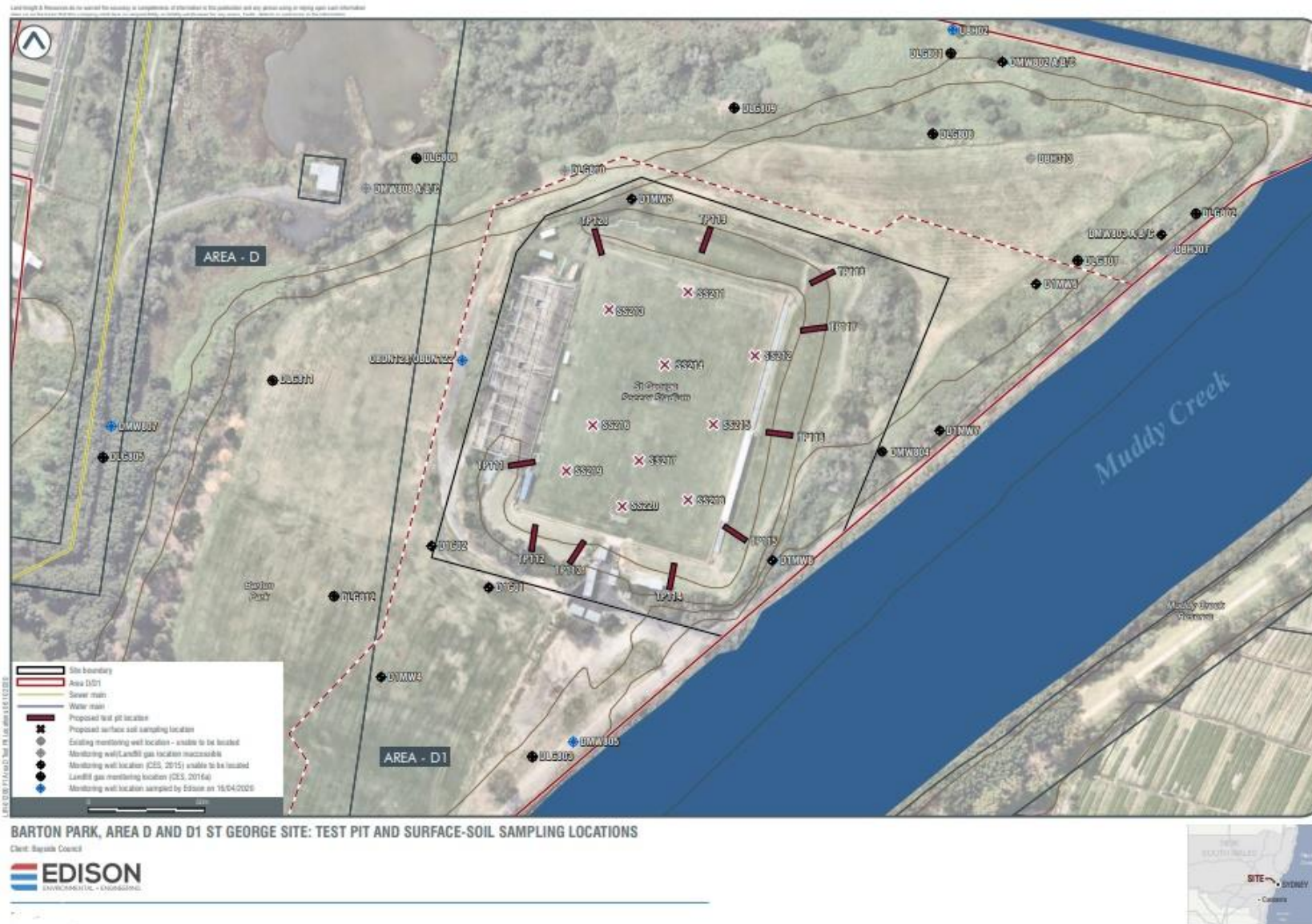


Figure 6-4: Surface soil sampling locations (Edison Environmental and Engineering, 2020b; Appendix C)

6.2.2 Impact Assessment

There is potential for contamination impacts during the construction process and operations, which may include the following:

- Transportation of dust containing CoPC from exposed excavation and spoil stockpiles from wind. In turn, impacting on the health of workers, adjoining residents and visitors
- Generation of asbestos fibres through inappropriate management methods, which can then be transported through windblown dust
- Exposure of waste material containing CoPC by construction workers, if appropriate Personal Protective Equipment (PPE) is not worn
- Exposure to contaminated groundwater and leachate during excavation
- Sedimentation and runoff from contaminated spoil stockpiles due to improper management.

There is potential for contamination related impacts to persist once the proposed works are operational if the study area is not remediated appropriately. This is considered unlikely if the LTSMP (Appendix B) and RAP (Appendix E) are implemented accordingly. The LTSMP (Appendix B) is used to provide contamination management guidance for ongoing management of the site and minor works. Whilst the RAP is used to provide contamination management guidance for major works. Both documents must be used in conjunction with this REF to develop a CEMP, and continued implementation by the construction contractor and asset managers will be required.

Both the LTSMP (Appendix B) and RAP (Appendix E) currently propose several approaches for the ongoing management of contaminated land. These include:

- On-site treatment of the known contamination and excavated soil, so that it is destroyed, or the associated risk is reduced to an acceptable level
- Consolidation and isolation of the contaminated soil and removal to an approved site or facility
- Sealing of contaminated areas through the placement of a vapour barrier and ventilation system.

It is understood that either one or a combination of these approaches will be implemented. All remediation activities must be validated once completed in compliance with the RAP and the LTSMP.

As the landfill site was not capped appropriately, landfill gas is emitting from the site. Landfill gas is a mixture of methane and carbon dioxide. It can cause adverse health effects to humans such as headaches, nausea, lung irritation and aggravation of asthma, the smell is generally agreed to be unpleasant as well. Landfill gas concentrates in confined spaces, such as buildings and buried conduits, which can exacerbate previous impacts and can also cause a fire hazard. Management measures and monitoring are required with respect to potential landfill-gas emissions and exposure during recreational/open-space land use and in confined spaces such as the amenities buildings and buried conduits

It is considered that mitigation measures are able to manage these potential indirect impacts to acceptable level during the construction and operational process, these are listed in Table 6-4.

6.2.3 Mitigation Measures

Table 6-4: Mitigation measures for contamination

Environmental Aspect	Mitigation Measures
Management of contaminated soil	<ul style="list-style-type: none"> • All contaminated land is to be managed in line with the materials management and supervision requirements as outlined in Section 7.7 of the RAP (Edison, 2021; Appendix E) and the LTSMP (Edison 2020a; Appendix B). The following information must be included in the CEMP and implemented prior and during construction: <ul style="list-style-type: none"> ○ Identification of areas of contamination requiring removal or relocation to accommodate the Barton Park Masterplan. ○ Identification of appropriate locations for on-site reuse of surplus material including recording of these locations. ○ Specification of design principles for re-use areas (namely the placement of a marker layer and clean soil barrier). ○ Classification of surplus material that cannot be re-used on site in accordance with EPA (2014) waste guidelines prior to lawful off-site disposal. • The importation of materials must be overseen by a qualified environmental scientist or engineer who has been appointed to the Project to complete the site validation report at the conclusion of works.
Management of contaminated soil - tracking	<ul style="list-style-type: none"> • All materials handling during the remediation works must be tracked in order to allow verification of the correct movement and handling. The system must track materials from cradle to grave and must provide detailed information on the location and quantity of all material movements both on and off site, so that the material being handled can be accounted for. • The tracking system must include accurate tracking of stockpiles through the entire material handling stage and include confirmation of stockpile locations via registered survey, if necessary • Plans must be made with respect to the extent of each excavation. A register of all analytical results for stockpiles and excavations must be maintained throughout the remediation works. • Standard forms must be prepared as part of the Materials Tracking Procedure. • In the event that off-site disposal is required then an Off-site Transport / Disposal Form must be prepared. This will provide a record of materials removed from the site and include the material type, quantity, origin, shipping destination and an approval by the supervising environmental scientist or engineer that the material meets the disposal requirements. • Each form must be completed on a weekly basis and collated into a cumulative log for each process on a weekly basis.
Management of contaminated soil - Transportation	<ul style="list-style-type: none"> • Trucks carrying excavated materials must be covered and passed through a designated wheel washing facility before entering and exiting the site. • Trucks must proceed directly to and from the soil stockpile area, as appropriate, along the predetermined roads. • Trucks carrying contaminated materials will not be permitted to drive over areas of the site which have previously been excavated, validated or reinstated. • Empty trucks must return directly to the excavation area along predetermined haul roads. • Wherever possible, imported material must be delivered directly to the area in which it is to be placed, thereby minimising the need for stockpiling and double handling. • Trucks carrying contaminated materials must be covered prior to exiting the site and will remain covered until authorised to unload at the destination. • If applicable, trucks must be fitted with seals to ensure that the movement of potentially saturated materials is undertaken appropriately. Seals must be inspected daily prior to commencement of haulage works.

Environmental Aspect	Mitigation Measures
	<ul style="list-style-type: none"> Trucks must exit the site through predetermined exit points and follow predetermined route to the destination (landfill).
Incidental discovery or disturbance of friable asbestos	<ul style="list-style-type: none"> Develop a site-specific Asbestos Management Plan for the Works. If friable asbestos is deemed to be present or likely on the site, the following must be implemented: <ul style="list-style-type: none"> Cease works and cover the exposed area with substantial plastic sheeting that is securely anchored to the ground surface and enclose within a barrier to prevent access. Notify the Site Manager immediately. The Site Manager is to determine if appropriate signage should be displayed to warn of the presence of these materials. The Site Manager is to contact a suitably qualified Occupational Hygienist to provide further advice. Do not undertake further works on the Site until the Site Manager has provided approval for Low Level Disturbance works to re-commence. If required, undertake asbestos removal works in accordance with the requirements of the relevant WH&S regulations and NSW Workcover. If required, obtain a Bonded Asbestos Licence from NSW Workcover (or as superseded at the time of works) to remove, repair or disturb more than 10 m² of bonded asbestos material such as fibro, corrugated cement sheeting and asbestos cement pipes. If the removal, repair or disturbance of any amount of friable asbestos, such as sprayed limpet, asbestos cloth, millboard and pipe lagging is proposed, obtain a Friable Asbestos Licence from NSW Workcover. This licence also allows the removal of bonded asbestos. Notify NSW WorkCover seven days before removing bonded asbestos. A work site permit from NSW WorkCover must be obtained before removing any friable asbestos. Applications must be lodged at least seven days before the proposed work is due to start.
Pollution of soils from chemical spills (e.g., fuel or oil from machinery).	<ul style="list-style-type: none"> For any excess spoil material which requires offsite disposal, formally classify waste before being taken to an appropriately licensed landfill in accordance with the EPA (2014) Waste Classification Guidelines. Store all chemicals (e.g., fuel, oil) in appropriate bunding/storage systems within the approved storage facility. Ensure appropriate spill kits are carried with the equipment. Establish dedicated refuelling areas outside environmentally sensitive areas and away from creek lines. These areas are to be bunded to ensure any spills do not enter these sensitive areas.
Remediation activity Validation	<ul style="list-style-type: none"> All remediation activity is to be validated in compliance with Section 9 Validation programme of the RAP (Edison, 2021) and the LTSMP (Edison 2020a; Appendix B). The LTSMP (Edison 2020a; Appendix B) will also be updated to reflect the completed works, landfill gas management systems and capping and marker layers installed, for ongoing management and monitoring of residual contamination risks at the site.
Landfill Gas Monitoring	<ul style="list-style-type: none"> Landfill gas monitoring is to be undertaken in accordance with section 9.4.1 of the RAP (Edison, 2021). Initial monitoring should commence prior to assessment of the passive venting system prior to installation of the vapour barrier. Monitoring is to be completed in buildings prior to occupation.
Landfill Gas – Building Design	<ul style="list-style-type: none"> All amenities’ buildings must incorporate appropriate protection measures from part 5 of the EPA Assessment and Management of Hazardous Ground Gases: Contaminated Land Guidelines (EPA, 2020).

Environmental Aspect	Mitigation Measures
Landfill Gas - Odours	<ul style="list-style-type: none"><li data-bbox="475 248 1434 356">• Users of the site are to advise Council, if any unusual odours observed within site buildings, specifically a landfill gas or hydrogen sulfide (rotten egg) gas. The origin of the odour should then be investigated in accordance with the process outlined in the LTSMP.

6.3 Waterways, Coastal Wetlands and Aquatic Habitat

6.3.1 Existing Environment

6.3.1.1 Cooks River Catchment

The Cooks River is a 23 km-long urban waterway, which starts at Graf Park, Yagoona and travels north-west through to Chullora. The River then turns south-west before flowing into Botany Bay at Kyeemagh, next to Kingsford Smith airport (Cooks River Alliance, 2017).

The Cooks River catchment is highly urbanised and serves as part of a stormwater system for the surrounding urban areas. Most of the River is a concrete channel and many of its tributaries have also been converted to concrete or brick-lined channels. The Cooks River has suffered extreme degradation due to sewerage, industrial and domestic waste, stormwater pollution and rubbish dumping. Dredging and artificial channel modifications have also severely impacted on the natural landscape of the river (Cooks River Alliance, 2017).

Barton Park is in the Spring Street and Muddy Creek sub-catchment. The topography of the catchment is relatively flat with the upper reaches of the Muddy Creek catchment generally sloping in a south-easterly direction with the lower reaches draining north east towards the Cooks River.

The Spring Street Drain has a peak elevation of 55.5m AHD with the catchment draining eastwards. The topography of the former land fill site impedes natural drainage which acts as a barrier for natural water flows from the west and exacerbates the impact of tides and flood waters along the banks of Muddy Creek along the east (Bayside Council, 2020b).

6.3.1.2 Hydrology and Flooding

The topography of the site is uneven but the predominate structure is from the former landfill waste mass situated in the middle of the site. Surface water flows follow the local relief and flows to Muddy Creek or the Landing Lights Wetland. There is a drainage line that conveys flows along the western portion of the site to the Landing Lights Wetland. The regional direction of groundwater flow is towards the Cooks River (CES, 2017). Spring Street Wetland, Spring Street Drain and the Landing Lights Wetland are local groundwater sinks along with the Cooks River and Muddy Creek. Groundwater associated with the site is unconfined. This is contributed to the filled land and underlying unconsolidated sediments. There are no registered groundwater extraction bores on the site. There are five registered groundwater bores on properties to the west (hydraulically upstream) of the site and four bores to the south-east. Groundwater is impacted with contaminants derived from anoxic and anaerobic waste degradation (primarily ammonia) and leachate.

Council has notated the site as being affected by the 1% Annual Exceedance Probability (AEP) flood. This means that there is 1% (1 in 100) chance of a flood of this magnitude or higher occurring in any one year. The flood levels for a 1% AEP flood event range from 1.66 m AHD to 2.11 m AHD, this is the height of the flood water. Figure 6-5 shows the distribution of flooding in a 1% AEP event. The park and playing field are not impacted due to the local topography in particular the raised area associated to the former landfill waste mass. The surface elevation of this area is approximately 3.5 m to 4.5 m above AHD. Some surface flooding would occur in south eastern portion of the old football stadium and the shared pathway is prone to inundation from Muddy Creek. Additionally, surface flooding occurs in localised areas in relation to the undulating surface and mounds caused by the land fill waste mass.

6.3.1.3 Water Quality

The NSW Water Quality and River Flow Objectives are the agreed environmental values and long-term goals for NSW's surface waters and set water quality and river flow objectives for major catchments including the Cooks River (DECCW, 2006). These objectives mapped the catchment of the Cooks River as predominantly containing waterways affected by urban development as well as estuaries. The supporting information behind these objectives identifies that some of the aquatic ecosystems within this catchment are considerably modified and that the extent of tidal flushing will significantly influence water quality (DECCW, 2006).

The quality of the water in the adjacent Cooks River, Muddy Creek and Landing Lights Wetland is low due to previous industrial uses in the area such as the landfill and urban runoff (Edison Environmental and Engineering, 2021; Appendix E). Bed sediments of these waterways are considered organic-rich, which further impacts the water quality of these bodies. The Landing Lights Wetland has high concentration of these sediments which is also likely to constitute a source of ammonia at low tide. Leachate from the old landfill impacts the groundwater of the site and produces ammonia (Edison Environmental, 2021; Appendix E).

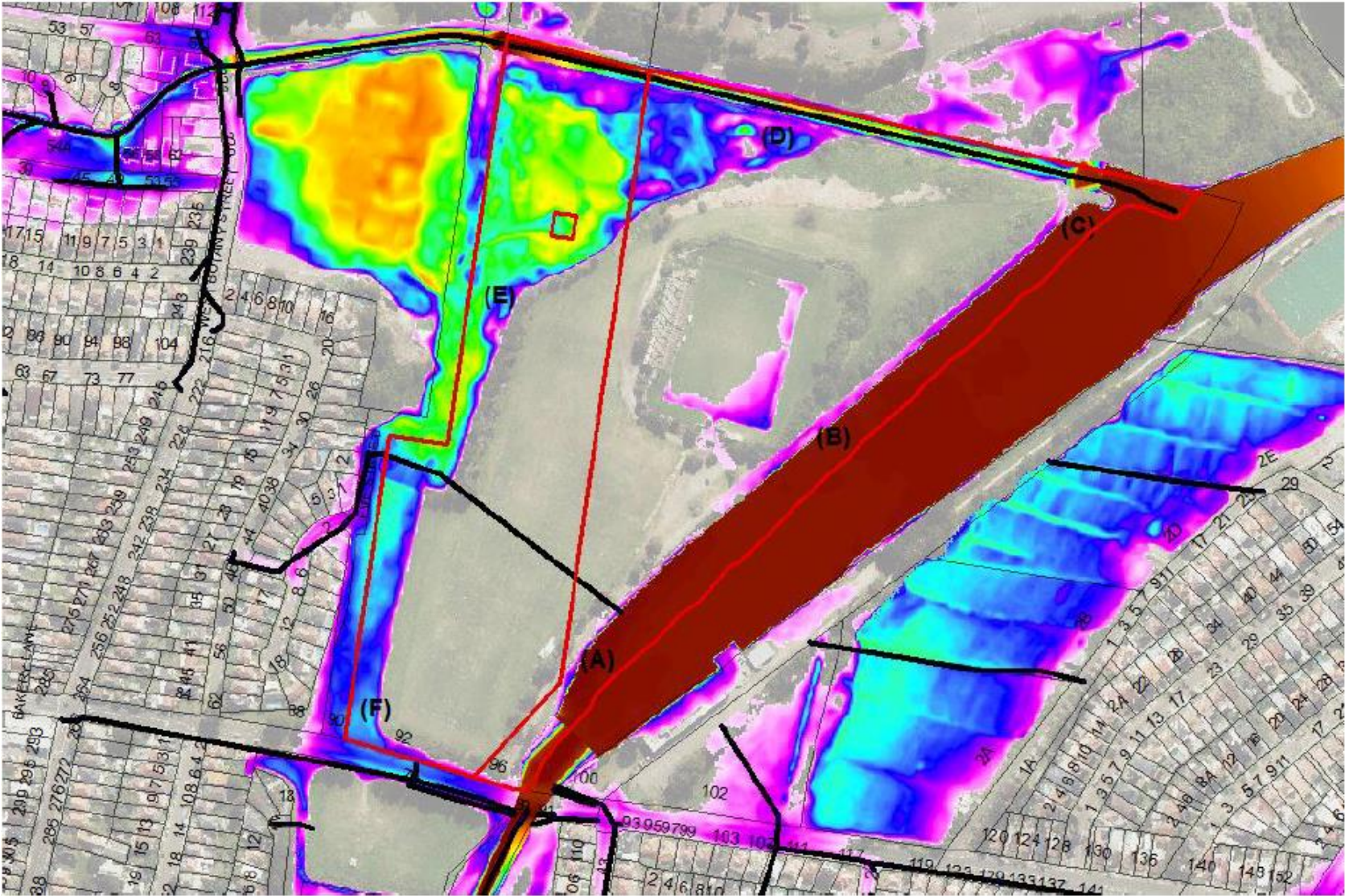


Figure 6-5: Extent of 1% AEP Flooding (dark pink graduating to brown indicates greater depth of water and pale pink indicates shallower depth) (Bayside Council, 2021)

6.3.1.4 Muddy Creek and Key Fish Habitat

Muddy Creek is a tributary of the Cooks River and is predominantly a second order watercourse (in accordance with the Strahler System) alongside the study area, which flows in a north-easterly direction and drains to a tidally flushed estuary. The Creek is popular with anglers and is lined with large boulders, preventing bank erosion. A thin strip of vegetation exists along the east and western banks, with predominantly native canopy species such as mangroves and *Casuarina* sp. observed growing along the banks.

Muddy Creek is also mapped as KFH by DPI Fisheries. The *Policy and guidelines for fish habitat conservation and management* (Fairfull, 2013) identifies three types of KFH, as shown in Table 6-5. As Muddy Creek is lined by mangroves, it would be considered Type 1 KFH.

Table 6-5: Types of Key Fish Habitat and sensitivity levels (from Fairfull, 2013)

Key Fish Habitat Type	Sensitivity	Example
Type 1	Highly sensitive	Coastal Management SEPP wetlands, freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres in length, or native aquatic plants
Type 2	Moderately sensitive	Mangroves, stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of infauna
Type 3	Minimally sensitive	Coastal and freshwater habitats not included in TYPES 1 or 2, ephemeral aquatic habitat not supporting native aquatic or wetland vegetation

6.3.1.5 Coastal Wetlands

As shown in Figure 6-7, the study area contains areas mapped as ‘Coastal Wetlands’ and ‘Proximity to Coastal Wetlands’ under the Coastal Management SEPP. The study area is also mapped as being within the Coastal Use Area and Coastal Environment Area.

The area mapped as Coastal Wetland in Figure 6-7 would be considered Type 1 KFH according to Table 6-5. The *Policy and guidelines for fish habitat conservation and management* (Fairfull, 2013) outline that a minimum buffer width of 50 – 100 m should be incorporated for development adjacent to Type 1 KFH. The Policy also states that where a buffer zone of at least 50 m is physically unachievable due to land availability constraints, the available buffer width must be maximised to achieve protection of Type 1 and 2 marine vegetation.

The area adjacent to the Coastal Wetlands within the subject land is a mown grass area that is highly degraded and contains contaminated material as a result of the area previously being used as a landfill site. Council will instate a 20 m buffer between the edge of Landing Lights Wetland and the development area. Land beyond this 20 m buffer has already been developed and it is not practical to widen this buffer. Remediation of contaminated land at the edge of the wetland is proposed as part of the development and further measures to protect the Wetland will be incorporated into the WEMP.

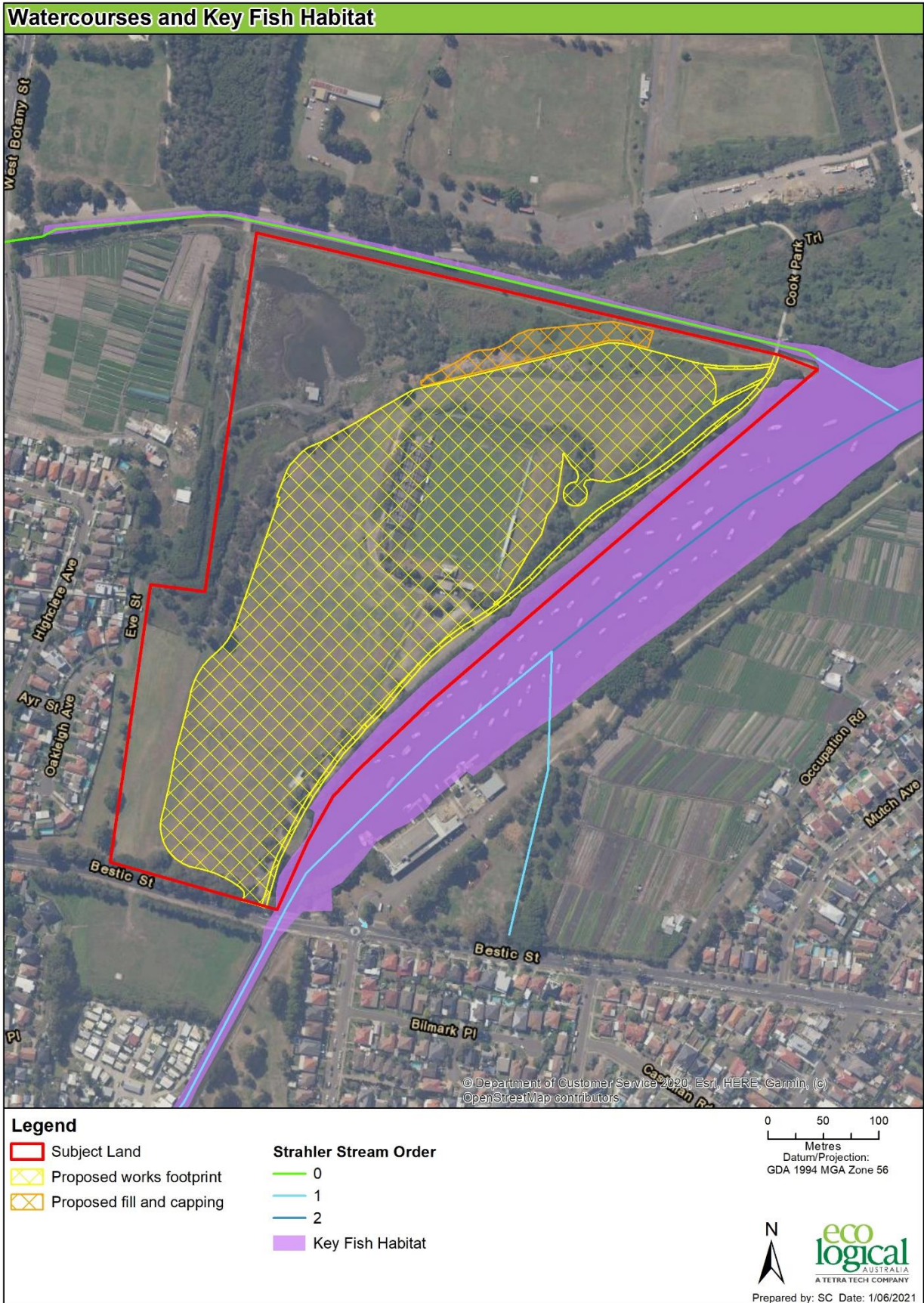


Figure 6-6: Mapped watercourses (Strahler stream order) within the study area

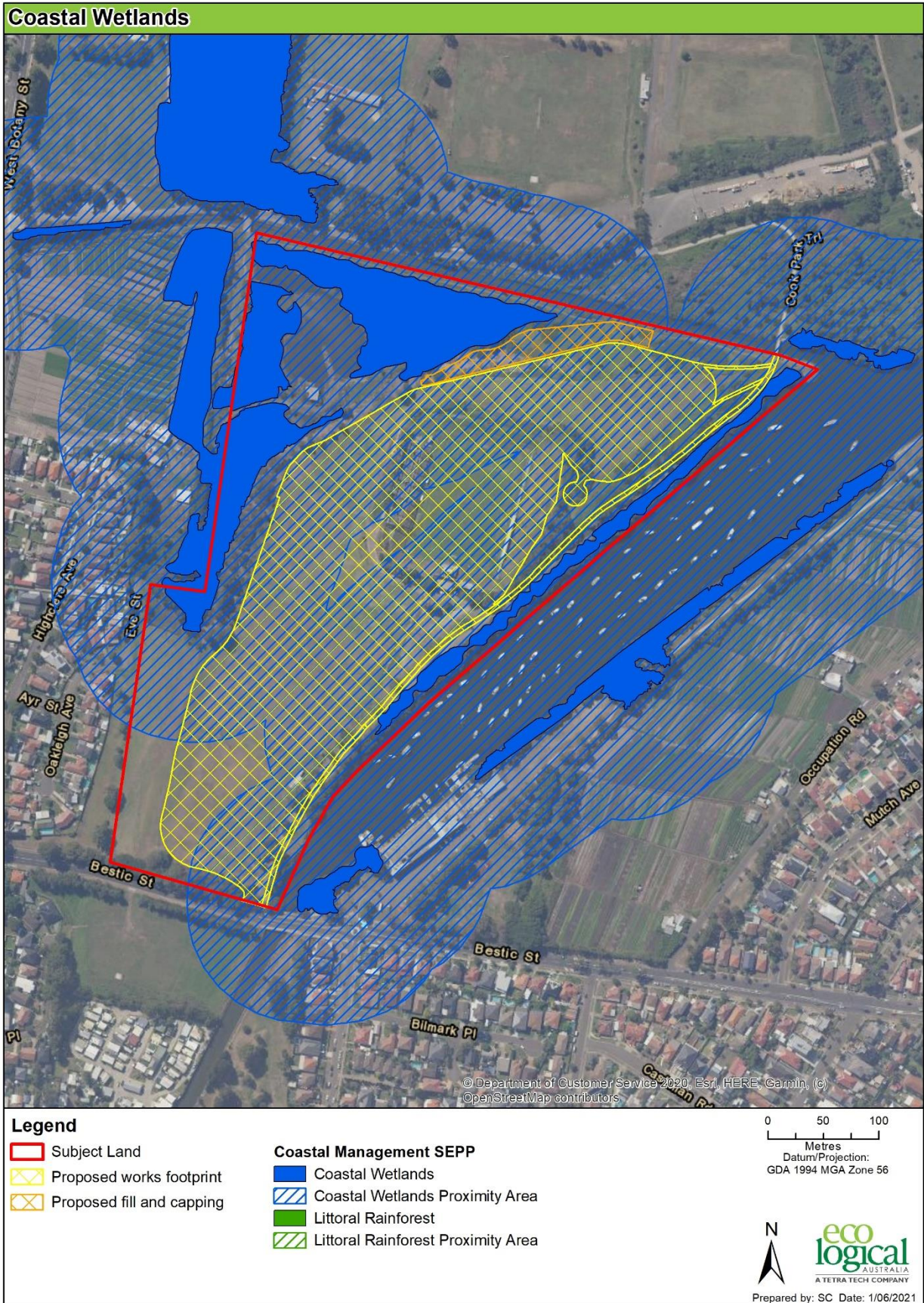


Figure 6-7: Coastal Wetlands within the study area

6.3.2 Impact Assessment

6.3.2.1 Cooks River Catchment

As there are no works proposed to take place in the surrounding waterways, there are unlikely to be any direct impacts to the Cooks River Catchment. However, there may be a number of indirect impacts to the Cooks River Catchment as a result of the proposed works.

Sediment-laden runoff from the site could affect water quality in surrounding watercourses, by increasing turbidity and carrying pollutants attached to sediment. Turbidity within the watercourses can reduce the amount of light that is available for aquatic flora and fauna and reduce the productivity of these species. Sediment particles may settle on aquatic plants. Sediment movement may also smother infauna burrows.

Sediment and waste material entering the creek line could potentially introduce chemicals to the water, leading to degraded water quality within the catchment.

6.3.2.2 Muddy Creek and Key Fish Habitat

No works are proposed to take place within Muddy Creek, therefore there are unlikely to be any direct impacts to the waterway. Indirect impacts are likely to be the same as for the Cooks River Catchment, in that if sediment is allowed to enter the waterway, it can increase turbidity. There are also not expected to be any impacts to KFH as a result of the proposed works, as no works will take place within the bed and banks of Muddy Creek.

It is understood that the mangroves along the edge of Muddy Creek, which are protected under the FM Act, will not require removal. However, if the proposed works require the trimming of these mangroves then a permit under Part 7 of the FM Act for Harm Marine Vegetation is required prior to trimming works taking place.

6.3.2.3 Hydrology and Flooding

The proposed works will modify the surface hydrology of the site by leveling the playing field areas. This will involve the removal of mounds and depression in the playing fields and park allowing surface flows to drain from the site more easily. The works will have a negligible impact on groundwater flows as there are no major excavations proposed and the existing groundwater contamination source is not proposed for removal.

The proposed works have the potential to reduce the impacts of flooding on the site by removing impediments to surface flows such as the football stadium, mounds and depression in the playing field and park. The proposed works are predicted to have negligible impact on flooding.

6.3.2.4 Water Quality

Due to the degraded nature of the surrounding waterbodies, the risk arising from ammonia-impacted groundwater to baseline flows in surface waterbodies is considered to be low, as well as being diluted from tidal flushing (Edison Environmental, 2020c; Appendix D). During remediation works, there is the potential for contaminated soils to enter the nearby waterways and Landing Lights Wetland, impacting on the water quality of these aquatic ecosystems.

The risk to nearby aquatic flora and fauna as a result of groundwater discharging into the nearby waterways is considered low, as the current condition of the waterways are degraded and subject to

ongoing impacts from urban runoff and tidal flushing (Edison Environmental, 2020c; Appendix D). The likelihood of human contact with impacted groundwater is considered to be low due to configuration of the discharge zone to receiving surface water ways.

The cut and fill operations in the north-western portion of the proposed works has the potential to increase the steepness of slopes that run down to the Landing Lights Wetland; however, this is not anticipated to be significant due to the localised fill in the area being below 1 m. In addition, this is not anticipated to deteriorate the quality of the water entering the Wetland provided the slopes are maintained appropriately (i.e., protected from erosion with relevant native groundcover species such as grasses and low-lying shrubs) and additionally the vegetated areas beyond the slope will provide a buffer between the slope and the Wetland. This area is to be managed in accordance with the WEMP. Furthermore, all water collected on the eastern side of the slope will drain to Muddy Creek. It is considered that the impacts of the steeper slopes will be neutral or beneficial subject to the implementation of measures specified in the WEMP.

6.3.2.5 Coastal Wetlands

The proposed works have been designed to ensure that any stormwater runoff is captured by proposed treatment measures on site and is then discharged through infiltration ponds or detention basins, following appropriate water quality treatment. To mitigate potential impacts associated with stormwater management, a number of management measures are proposed such as:

- vegetated swales to capture and treat surface runoff
- infiltration basins to collect flows from the vegetated swales and storm events
- bioretention basins to treat surface water runoff
- dust suppression of stockpiles on site to contain dust materials.

To aid in the assessment of potential impacts to the nearby Coastal Wetlands, SPORTENG Civil (2021) has undertaken MUSIC Modelling to predict the quantity and quality of surface and groundwater flows both pre- and post-development. The results are summarised in Table 6-6.

Table 6-6: MUSIC Model results pre and post development (SPORTENG Civil, 2021)

Parameter	Pre-Development	Post-Development	Change (%)
Flow (ML/yr)	18	17.7	-1.9
Total Suspended Solids (kg/yr)	3,710	525	-85.9
Total Phosphorus (kg/yr)	7.4	2.9	-61
Total Nitrogen (kg/yr)	51.9	28.4	-45.4
Gross Pollutants (kg/yr)	436	0	-100

The results indicate that the annual flow volume discharged from the developed site will be lower than existing conditions and water quality will improve post-development. Clauses 11, 13 and 14 of the Coastal Management SEPP outline specific requirements for development which is proposed within 'Proximity Areas for Coastal Wetlands', 'Coastal Environment Areas' and 'Coastal Use Areas'. Consideration of the proposed works in accordance with these clauses are addressed in Table 6-7.

Table 6-7: Response to Coastal Management SEPP Clauses

Coastal Management Zone	Development Control	Relevance to the Proposed Works
Proximity to Coastal Wetland and Littoral Rainforest	<p>11 (1)(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest</p> <p>11(1)(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest</p>	<p>The proposed works will be carried out in a distance of approximately 20 m from the Coastal Wetlands. No vegetation within the mapped Coastal Wetlands is proposed for removal therefore, the biophysical and ecological integrity of these areas will remain unchanged. Vegetation within the Proximity to Coastal Wetlands area will be removed as part of the proposed works, however this will not impact on the health of the Coastal Wetland. Changes in hydrological integrity are discussed below.</p> <p>There is potential for recreational users of the park and the new sports facilities to harm the vegetation surrounding the Landing Lights Wetland by trampling vegetation or allowing domestic animals, such as dogs to enter the area. The Wetland cannot be fenced in a manner that restricts fauna passage. Recommendations are provided in Section 6.3.3, but it will be at Council’s discretion to determine the most appropriate course of action to preserve the vegetation during operation of the proposed activity.</p> <p>The MUSIC Modelling undertaken by SPORTENG Civil (2021) for the study area identified that the volume of flow (MG/yr) discharged from the site post-development will decrease due to proposed stormwater management measures described above. However, this change is not considered detrimental as it will reduce the input of pollutants from the development site into the Coastal Wetlands. Furthermore, the Coastal Wetlands are estuarine, and thus not dependent on surface water flows, therefore the slight reduction in annual flow volume is not expected to significantly impact this community. As summarised in Table 6-6, Total Suspended Solids, Phosphorus, Nitrogen and Gross Pollutants levels will all significantly decrease post-development therefore, improving overall water quality entering these areas.</p>
Coastal Environment Area	<p>13 (1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following— the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,</p>	<p>No vegetation within the mapped Coastal Wetlands is proposed for removal therefore, the biophysical and ecological integrity of these areas will remain unchanged. The MUSIC Modelling undertaken by SPORTENG Civil (2021) concluded that the quality of water exiting the development site will significantly improve due to the proposed stormwater management initiatives. Although the annual volume of flow exiting the development site will slightly decrease, this is not considered likely to significantly impact the hydrological integrity of the surrounding environment.</p>

Coastal Management Zone	Development Control	Relevance to the Proposed Works
	<p>coastal environmental values and natural coastal processes</p> <p>the water quality of the marine estate (within the meaning of the <i>Marine Estate Management Act 2014</i>), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,</p>	<p>The proposed redevelopment of the site is not located within the beach or dune area of the coastal environment and is therefore not going to impact on coastal environmental values and natural coastal processes.</p> <p>In accordance with Section 6 of the <i>Marine Estate Management Act 2014</i>, 'Marine Estate' is defined as:</p> <ul style="list-style-type: none"> a. <i>the coastal waters of the State within the meaning of Part 10 of the Interpretation Act 1987,</i> b. <i>estuaries (being any part of a river whose level is periodically or intermittently affected by coastal tides) up to the highest astronomical tide,</i> c. <i>lakes, lagoons and other partially enclosed bodies of water that are permanently, periodically or intermittently open to the sea,</i> d. <i>coastal wetlands (including saltmarsh, mangroves and seagrass),</i> e. <i>lands immediately adjacent to, or in the immediate proximity of, the coastal waters of the State that are subject to oceanic processes (including beaches, dunes, headlands and rock platforms),</i> f. <i>any other place or thing declared by the regulations to be the marine estate.</i> <p>As discussed above and presented in Table 6-6, the overall water quality exiting the development site will significantly improve therefore, creating a beneficial outcome for the mapped Coastal Wetlands.</p>
	<p>marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,</p>	<p>The study area is located upstream from marine environments and does not contain any habitat features for marine fauna or any marine vegetation.</p>
	<p>existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,</p>	<p>The proposed works intend to upgrade public open space for members of the public, including along the foreshore of Muddy Creek. The proposed works will improve safe access, create viewing platforms along the foreshore and improve disability access.</p>
	<p>Aboriginal cultural heritage, practices and places,</p>	<p>The study area has been subject to significant landform disturbance including market gardens, dredging and reclamation of creek alignments, sewerage farming and landfill activities. No Aboriginal items or places have been previously recorded within the study area. It is also unlikely that the study area contains archaeological potential.</p>

Coastal Management Zone	Development Control	Relevance to the Proposed Works
	the use of the surf zone.	The study area is located inland from the surf zone and therefore there is not considered to be an impact to the use of the surf zone of this beach as a result of the proposed works.
Coastal Use Area	14 (1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following— existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposed works intend to upgrade public open space for members of the public, including along the foreshore of Muddy Creek. The proposed works will improve safe access, create viewing platforms along the foreshore and improve disability access.
	overshadowing, wind funnelling and the loss of views from public places to foreshores,	The proposed works are to take place inland from foreshore areas and within an area already subject to significant clearing and development through the operation of the existing recreational open space. As part of the proposed works, a public reserve will be reinstated in turn, improving views in the long-term.
	the visual amenity and scenic qualities of the coast, including coastal headlands,	The study area is not located along the coast or within coastal headlands. The proposed works will therefore not impact on the visual amenity and scenic qualities of the coast.
	Aboriginal cultural heritage, practices and places, cultural and built environment heritage.	The study area has been subject to significant landform disturbance including market gardens, dredging and reclamation of creek alignments, sewerage farming and landfill activities. No Aboriginal items or places have been previously recorded within the study area. It is also unlikely that the study area contains archaeological potential. No previously recorded heritage items are located within the study area. Two State listed heritage items are located in the vicinity of the study area being the Arncliffe Market Gardens and Kyeemagh Market Gardens. These heritage items will not be impacted as part of the proposed works.

6.3.3 Mitigation Measures

Table 6-8: Mitigation measures for flooding and waterways

Environmental Aspect	Mitigation Measures
Increase in sediment flow into waterways and wetlands	<ul style="list-style-type: none"> • Wash all equipment, including, erosion and sediment control measures and trailers to prevent spread of exotic species. Conduct a visual check for vegetation and seeds on all equipment machinery used in the activities before work commences. • Install erosion and sediment controls around remediation works area to prevent mobilisation of contaminated soils into adjacent aquatic habitats.
Reduction in water quality	<ul style="list-style-type: none"> • Store all chemicals (e.g., fuel, oil) offsite. If required to be stored onsite, store chemicals in appropriate bunding/storage systems, outside of the riparian zones and only for short periods. • Ensure appropriate spill kits, are present onsite. • Ensure all equipment is in good working order. • Carry associated Safety Data Sheets (SDS) for all chemicals. • Do not use any chemicals that are labelled as ‘Class 9 Environmentally hazardous’ as part of the proposed activities. • Do not stockpile rubbish or store chemicals near native vegetation or waterways. • Limit the use of fuel, chemicals and herbicides near waterways and other sensitive areas.
Impacts to flooding	<ul style="list-style-type: none"> • Do not increase the water level or hazard on adjoining properties. Investigate opportunities to ensure the design of the Masterplan is clear of the overland floodway and acts to reduce the impacts of these flows, possibly by removing inappropriate travel paths and/or reducing the hazard. • Where the proposed works may impact on the flood behaviour (e.g., filling within the flood affected area or obstruction to the flood water flow path) engaged a civil/hydraulic engineer to assess the impacts of the overland flows before and after development using a hydraulic model.
Indirect impacts to mapped Coastal Wetlands	<ul style="list-style-type: none"> • In accordance with Clause 17(3) of the Cooks Cove SREP, prepare a WEMP, which includes a description of the location of existing and proposed wetlands, including areas considered to be significant, and proposals about the following: <ul style="list-style-type: none"> ○ implementation of wetlands environmental management principles, ○ protection of threatened species, populations and ecological communities, ○ protection of aquatic and fish nursery habitats, ○ protection of migrating bird populations and their habitats, ○ the interrelationship of the Barton Park development and any buffer or treatment required to prevent or reduce run-off and nutrient loads from the fairways entering the wetlands, ○ the impact of the proposed development on tidal flows inundating the wetlands, ○ the impact of the development on the ecological significance of the Cooks River and Muddy Creek and the wetlands within the site, ○ measures to minimise adverse environmental impacts of development, including the provision of— <ul style="list-style-type: none"> - compensatory wetland habitats, and - vegetated riparian buffers around wetlands to mitigate the impact of human disturbance on native fauna, and - vegetated riparian buffers around wetlands to enhance appropriate terrestrial habitat, - establishment in riparian areas of appropriate local native plant species propagated, where possible, from locally genetic stock.

Environmental Aspect	Mitigation Measures
	<ul style="list-style-type: none"> • Council is to monitor the impacts of people recreating in and around the Wetland. If required, Council will implement measures to reduce access to the Wetland. Initially actions to safeguard the wetland could include: <ul style="list-style-type: none"> ○ Provision of signage advising that access is prohibited, and wildlife is to be protected ○ Community education and signage advising of the importance of the Wetland ecosystem and why it should be protected ○ Installation of a fence or barrier that still allows for fauna movement ○ Council may resolve to determine the area a Wildlife Protection Area (WPA) under the <i>Companion Animal Act 1998</i>. ○ If the Wetland is a WPA, Council can then undertake compliance action to protect the area • Install stormwater quality improvement devices and stormwater detention structures to reduce the annual volume of flow into the adjacent wetlands and improve water quality being delivered into the wetlands. • Develop Wetland Management Plan to ensure ongoing protection of adjacent wetland areas • Ensure erosion and sediment controls are in place and regularly maintained to prevent sediment runoff to the wetland, which can smother in fauna burrows within the exposed area of soil.

6.4 Biodiversity

A Flora and Fauna Assessment was undertaken by ELA (2021; Appendix F) in accordance with the requirements of the BC Act and EPBC Act. A summary of these findings are provided below.

6.4.1 Existing Environment

6.4.1.1 Vegetation Communities

Previous vegetation mapping identified the following vegetation types and Plant Community Types (PCTs) within the study area (DPIE 2016):

- **PCT 920:** Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Mangrove Forest)
- **PCT 1126:** Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Saltmarsh)
- **PCT 1234:** Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (Estuarine Swamp Oak Forest)
- **PCT 1808:** Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (Estuarine Reedland)
- Urban exotic/native.

Field survey validated the above PCTs however, separated Urban exotic/native into two separate vegetation types being, Mixed Native Plantings and Weeds, Native Plantings and Mown Grassland (Figure 6-8). Each vegetation type is described below in Table 6-9 - Table 6-15.

Table 6-9: PCT 920 description

PCT 920: Estuarine Mangrove Forest	
Associated TEC	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
BC Act Conservation Status	Endangered*
EPBC Act Conservation Status	Vulnerable**
Vegetation Description	<p>Occurrences of PCT 920 dominated the eastern boundary of the subject land abutting Muddy Creek, with another smaller patch present along the western boundary (Figure 6-8). PCT 920 was characterised by a canopy dominated by <i>Avicennia marina</i> var. <i>australasica</i> (Grey Mangrove), with <i>Casuarina glauca</i> (Swamp Oak). Midstorey was relatively sparse and comprised <i>Acacia longifolia</i> subsp. <i>longifolia</i> (Sydney Golden Wattle) (likely from plantings) and exotic species <i>Lantana camara</i> (Lantana) and <i>Opuntia monacantha</i> (Drooping Pear). The groundcover present was a mixture of native and exotic species and included species such as <i>Tetragonia tetragonioides</i> (New Zealand Spinach), <i>Solanum nigrum</i> (Blackberry Nightshade), <i>Panicum antidotale</i> (Giant Panic Grass), <i>Bidens pilosa</i> (Cobbler’s Peg), <i>Chloris gayana</i> (Rhodes Grass) and <i>Eragrostis curvula</i> (African Love Grass)</p> <p>*Occurrences of PCT 920 within the subject land did not meet the definition for the endangered <i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>, as described in the BC Act Final Determination, due to the absence of characteristic vascular species and dominance of <i>A. marina</i> var <i>australasica</i>.</p> <p>**Occurrences of PCT 920 within the subject land did not meet the definition for vulnerable <i>Subtropical and Temperate Coastal Saltmarsh</i>, as described in the EPBC Act Conservation Advice, because it did not meet the following key diagnostic characteristics:</p> <ul style="list-style-type: none"> “Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e., salt-tolerant herbs, succulent shrubs or grasses, that may also include bare sediment as part of the mosaic) <p>Proportional cover by tree canopy such as mangroves, Melaleucas or Casuarinas is not greater than 50% nor is proportional ground cover by seagrass greater than 50%”</p>
Area within subject land (ha)	1.13

Photo



Table 6-10: PCT 1126 description

PCT 1126: Estuarine Saltmarsh	
Associated TEC	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
BC Act Conservation Status	Endangered
EPBC Act Conservation Status	Vulnerable
Vegetation Description	<p>Occurrences of PCT 1126 within the subject land were present along the western boundary (Figure 6-8). As is characteristic of this PCT, occurrences of PCT 1126 within the subject land largely lacked a canopy. <i>C. glauca</i> and <i>A. marina</i> var. <i>australasica</i> saplings were scattered throughout the midstorey. These areas were dominated by a mix of native and exotic groundcover species, including <i>Suaeda australis</i> (Seablite) and <i>Sarcocornia quinqueflora</i> (Samphire) and <i>Juncus acutus</i> (Spiny Rush). Weeds were also present within the saltmarsh and includes species such as <i>Asparagus aethiopicus</i> (Asparagus Fern), <i>Stenotaphrum secundatum</i> (Buffalo Grass), <i>Atriplex patula</i>, <i>Vinca major</i> (Greater Periwinkle), <i>Lantana camara</i>, <i>Cynodon dactylon</i> (Couch), <i>Hydrocotyle bonariensis</i> (Kurnell Curse), <i>Solidago canadensis</i> var. <i>scabra</i> (Golden Rod) and <i>Medicago polymorpha</i> (Burr Medic)</p> <p>PCT 1126 within the subject land met the description and key diagnostic characteristics for <i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>, as set out by the Final Determination and Conservation Advice. This ecological community is listed as endangered under the BC Act and vulnerable under the EPBC Act, under the name <i>Subtropical and Temperate Coastal Saltmarsh</i>.</p>
Area within subject land (ha)	1.09
Photo	

Table 6-11: PCT 1234 description

PCT 1234: Estuarine Swamp Oak Forest	
Associated TEC	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
BC Act Conservation Status	Endangered
EPBC Act Conservation Status	Not Listed
Vegetation Description	<p>One small occurrence of PCT 1234 was identified south of the waterbody present in the northwest of the subject land (Figure 6-8). PCT 1234 contained similar species as vegetation identified as PCT 1126, however PCT 1234 differed in that it was dominated by stands of <i>C. glauca</i> regrowth.</p> <p>PCT 1234 within the subject land met the description for <i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> as set out by the Final Determination. This TEC is listed as endangered under the BC Act as well as the EPBC Act, under the name <i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</i>. PCT 1234 within the subject land met the key diagnostic and condition thresholds for the Federally listed TEC in Category C condition because it was greater than 0.5 ha, less than 2 ha and had a predominantly native understorey.</p>
Area within subject land (ha)	0.09
Photo	

Table 6-12: PCT 1808 description

PCT 1808: Estuarine Reedland	
Associated TEC	Sydney Freshwater Wetlands in the Sydney Basin Bioregion
BC Act Conservation Status	Endangered
EPBC Act Conservation Status	Not Listed
Vegetation Description	<p>The largest occurrence of PCT 1808 within the subject land was adjacent to the waterbody in the northwest, with a smaller patch present along the western boundary (Figure 6-8). As is characteristic of this PCT, occurrences of PCT 1808 within the subject land lacked a canopy. The midstorey and groundcover were dominated by a mix of native <i>Phragmites australis</i> (Common Reed), and exotic species <i>Paspalum dilatatum</i> (Paspalum), <i>Cynodon dactylon</i>, <i>Pennisetum clandestinum</i> (Kikuyu), <i>Foeniculum vulgare</i> (Fennel), <i>Eragrostis curvula</i>, <i>Cestrum parqui</i> (Green Cestrum), <i>Gomphocarpus fruticosus</i> (Narrow-leaved Cotton Bush) and <i>Lantana camara</i>.</p> <p>According to the BioNet Vegetation Classification, PCT 1808 can be associated with two TECs, <i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (listed as endangered under the BC Act) and <i>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</i> (listed as endangered under the BC Act and not listed under the EPBC Act). Occurrences of PCT 1808 within the subject land met the description for <i>Sydney Freshwater Wetlands</i> as set out by the Final Determination. However, occurrences of PCT 1808 within the subject land did not meet the description for <i>Swamp Oak Floodplain Forest</i> as set out by the Final Determination, because the PCT did not have a dominant tree canopy. This TEC is also listed under the EPBC Act, however PCT 1808 is not associated with the Federally listed TEC.</p>

Area within subject land (ha) 0.85

Photo



Table 6-13: Mixed Native Plantings description


Native Plantings	
Associated TEC	N/A
BC Act Conservation Status	-
EPBC Act Conservation Status	-
Vegetation Description	<p>Vegetation along the roadside of Bestic Street and the road along the eastern boundary of the subject land was identified as native plantings which did not conform to a PCT or TEC. The canopy was dominated by <i>Ficus macrophylla</i> (Moreton Bay Fig), with scattered <i>Eucalyptus grandis</i> (Flooded Gum), <i>Corymbia maculata</i> (Spotted Gum) and exotic <i>Celtis occidentalis</i> (Hackberry). Native plantings were also scattered throughout the midstorey, including <i>Banksia integrifolia</i> (Coast Banksia), <i>Callistemon citrinus</i> (Crimson Bottlebrush) and <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark). Groundcover was dominated by mulch with occasional <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) plantings and incursions of exotic species, <i>Ehrharta erecta</i> (Vasey Grass). This assemblage of native species did not conform to a PCT or TEC.</p> <p>Council and the community have undertaken bush regeneration activities within areas that have mapped under this PCT. This area is shown with Figure 6-9.</p>
Area within subject land (ha)	0.47
Photo	

Table 6-14: Weeds and Native Plantings description

Weeds and Native Plantings	
Associated TEC	N/A
BC Act Conservation Status	-
EPBC Act Conservation Status	-
Vegetation Description	Weeds and native plantings were prevalent throughout the subject land. Occurrences of vegetation identified as ‘weeds and native plantings’ differed from ‘mixed native plantings’ by the increased density of exotic species. Dominant weed species included <i>Lantana camara</i> , <i>Pennisetum s clandestinum</i> and <i>Cestrum parqui</i> . Vegetation identified as weeds and native plantings did not conform to a PCT or TEC.
Area within subject land (ha)	4.04
Photo	

Table 6-15: Mown Grassland description

Mown Grassland	
Associated TEC	N/A
BC Act Conservation Status	-
EPBC Act Conservation Status	-
Vegetation Description	Sports fields were comprised entirely of mown grassland dominated by exotic species, including <i>Poa annua</i> (Annual Poa), <i>Pennisetum clandestinum</i> and <i>Sida rhombifolia</i> (Paddy's Lucerne). These areas dominated the subject land and do not conform to any native PCT or TEC.

Photo



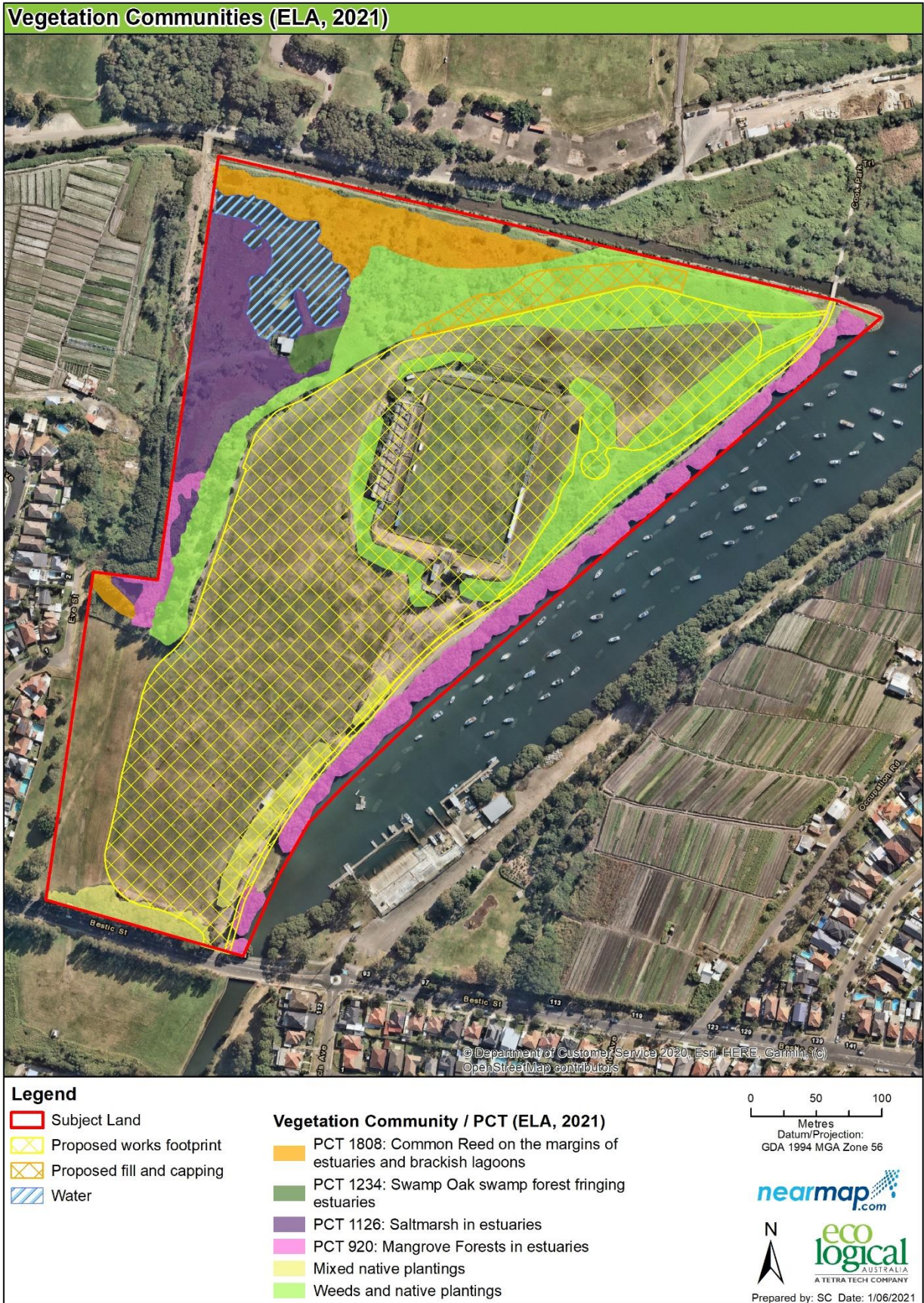


Figure 6-8: Validated vegetation communities within the Project site (ELA, 2021)

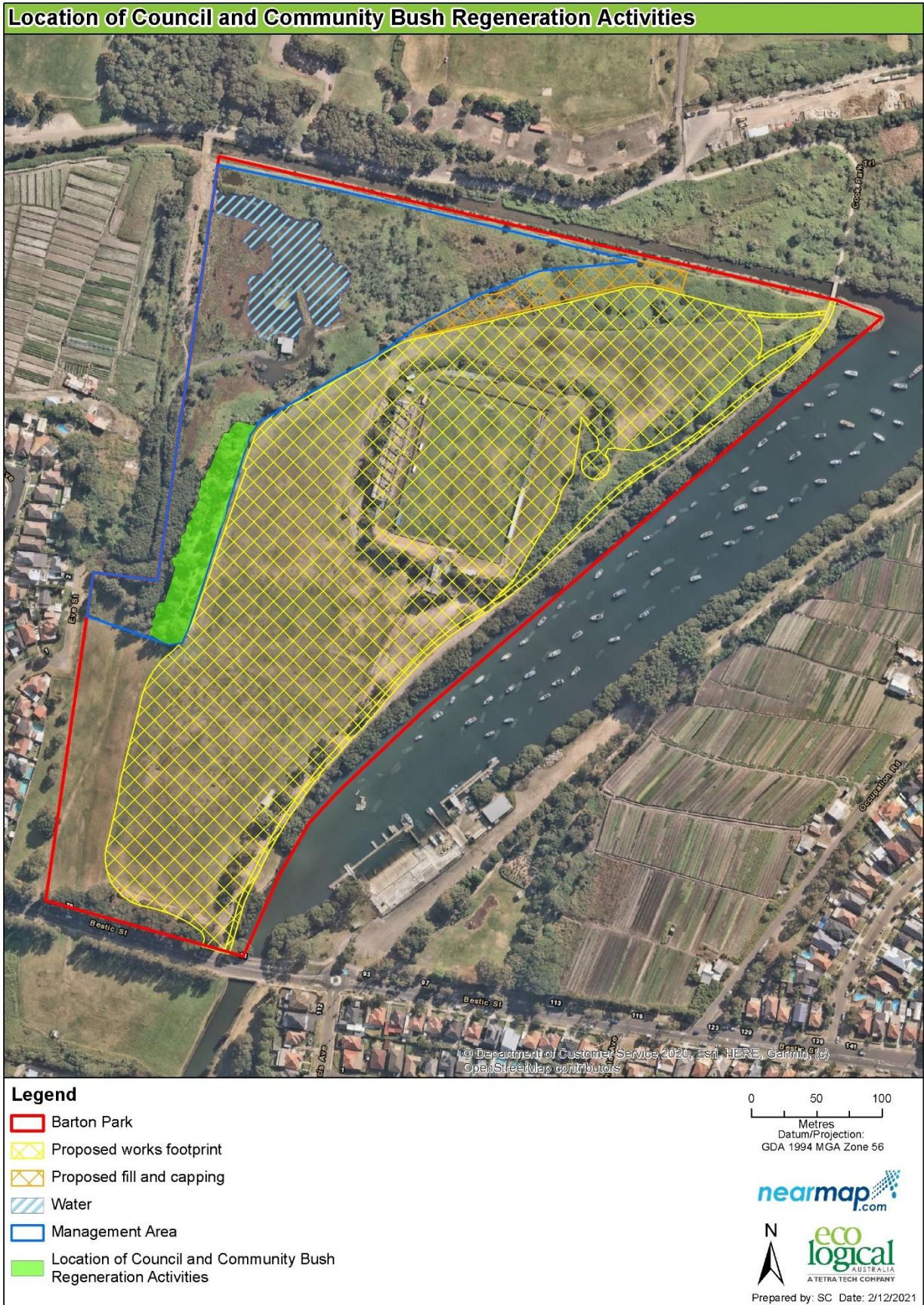


Figure 6-9 Location of Council and Community Bush Regeneration Activities

6.4.1.1.1 Priority Weeds and Weeds of National Significance (WoNS)

Of the weeds identified during the field survey, three species are listed as a state priority weed, two are listed as regional priority level weeds and the remaining 12 weeds are listed as other weeds of regional concern. The weeds present, their priority listing under the Act, their associated asset / value at risk and whether they are Weeds of National Significance (WoNS), are presented in Table 6-16.

Table 6-16: State level determined priority weeds and other weeds of concern present

Scientific name	Common name	WoNS	Priority Weed Obligation
State Level Priority Weeds			
<i>Asparagus aethiopicus</i>	Ground Asparagus	Yes	Asset protection
<i>Lantana camara</i>	Lantana	Yes	Asset protection
<i>Opuntia monacantha</i>	Drooping Pear	Yes	Asset protection
Regional Priority Level Weed			
<i>Cestrum parqui</i>	Green Cestrum	No	Asset protection
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	No	Containment
Other Priority Weeds			
<i>Acacia saligna</i>	Golden Wattle	Wreath No	Other regional weeds
<i>Acetosa sagittata</i>	Turkey Rhubarb	No	Other regional weeds
<i>Ageratina riparia</i>	Mistflower	No	Other regional weeds
<i>Araujia sericifera</i>	Moth Vine	No	Other regional weeds
<i>Celtis australis</i>		No	Other regional weeds
<i>Cenchrus clandestinus</i>	Kikuyu	No	Other regional weeds
<i>Chloris gayana</i>	Rhodes Grass	No	Other regional weeds
<i>Eragrostis curvula</i>	African Lovegrass	No	Other regional weeds
<i>Ipomoea indica</i>	Morning Glory	No	Other regional weeds
<i>Juncus acutus</i>	Spiny Rush	No	Other regional weeds
<i>Parietaria judaica</i>	Asthma Weed	No	Other regional weeds
<i>Phoenix canariensis</i>	Canary Island Palm	Date No	Other regional weeds

6.4.1.2 Threatened Flora and Fauna

The search for threatened species using the Protected Matters Search Tool and BioNet (Atlas of NSW Wildlife) (within a 10 km buffer around the study area) and the review of literature resulted in a list of 16 threatened ecological communities, 24 threatened flora species and 88 threatened or migratory fauna species, some of which are shown in Figure 6-10.



Figure 6-10: Previously recorded threatened species within the study area

6.4.1.2.1 Threatened Flora

Two *Syzygium paniculatum* (Magenta Lilly Pilly) individuals were identified within the subject land during survey. *S. paniculatum* is listed as endangered under the BC Act and vulnerable under the EPBC Act. However, the natural habitat for this species is restricted to remnant stands of littoral rainforest, which were not observed within the subject land. Horticultural varieties of this species are regularly planted throughout Sydney. The *S. paniculatum* species identified within the subject land were horticultural specimens and therefore do not require further assessment.

No habitat for threatened flora species was identified within the subject land.

6.4.1.2.2 Threatened Fauna

No threatened fauna species were observed within the study area during survey.

A list of threatened fauna known to occur within the subject land, or identified as likely or having the potential to occur within the subject land was compiled based on a review of the existing literature and habitat assessments conducted as part of the field survey and is within Appendix A of the Flora and Fauna Assessment (FFA) (Eco Logical Australia 2021). This list is presented in Table 6-17.

Table 6-17: Fauna species known from the subject land, or considered likely/potentially occurring within the subject land

Scientific name	Common name	BC Act listing	EPBC Act listing	Available habitat
Frogs				
<i>Crinia tinnula</i>	Wallum Froglet	Vulnerable	Not listed	Waterbodies and surrounding vegetation
<i>Litoria aurea</i>	Green and Golden Bell Frog	Endangered	Vulnerable	Waterbodies and surrounding vegetation
Woodland Birds				
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically endangered	Critically endangered	Presence of feed trees, particularly <i>Corymbia maculata</i> (Spotted Gum)
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Vulnerable	Not listed	Native vegetation, particularly Eucalypts
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Vulnerable	Not listed	Native vegetation, particularly Eucalypts
<i>Glossopsitta pusilla</i>	Little Lorikeet	Vulnerable	Not listed	Native vegetation, particularly Eucalypts
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically endangered	Presence of feed autumn-winter feed trees, particularly Eucalypts
Wetland Birds				
<i>Anseranas semipalmata</i>	Magpie Goose	Vulnerable	Not listed	Wetlands
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	Endangered	Wetlands
<i>Burhinus grallarius</i>	Bush Stone-curlew	Endangered	Not listed	Wetlands, saltmarsh and surrounding vegetation
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Not listed	Migratory	Wetlands
<i>Calidris alba</i>	Sanderling	Vulnerable	Migratory	Wetlands

Scientific name	Common name	BC Act listing	EPBC Act listing	Available habitat
<i>Calidris canutus</i>	Red Knot	Not listed	Endangered; Migratory	Wetlands
<i>Calidris ferruginea</i>	Curlew Sandpiper	Endangered	Critically endangered, Migratory	Wetlands
<i>Calidris tenuirostris</i>	Great Knot	Vulnerable	Critically endangered, Migratory	Wetlands
<i>Charadrius mongolus</i>	Lesser Sand-plover	Vulnerable	Endangered, Migratory	Wetlands
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable	Not listed	Wetlands
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	Vulnerable	Not listed	Wetlands
<i>Haematopus longirostris</i>	Pied Oystercatcher	Endangered	Not listed	Wetlands
<i>Hirundapus caudacutus</i>	White-throated Needletail	Not listed	Migratory	Wooded areas and wetlands
<i>Ixobrychus flavicollis</i>	Black Bittern	Vulnerable	Not listed	Wetlands
<i>Limosa limosa</i>	Black-tailed Godwit	Vulnerable	Migratory	Wetlands
<i>Numenius madagascariensis</i>	Eastern Curlew	Not listed	Critically endangered, Migratory	Wetlands

Bats

<i>Chalinolobus dwyeri</i>	Large-eared Bat	Pied	Vulnerable	Vulnerable	Potential roosting habitat in <i>Petrochelidon ariel</i> (Fairy Martin) mud nests
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox		Vulnerable	Vulnerable	Presence of feed trees, including <i>Corymbia maculata</i> (Spotted Gum) and <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark).

6.4.2 Impact Assessment

6.4.2.1 Direct Impacts

CLEARING OF VEGETATION

The proposed works would remove 1.91 ha of native vegetation identified as Mixed Native Plantings or Weeds and Native Plantings from within the study area (Table 6-18).

A total of 3.17 ha, made up of the following PCTs, will not be directly impacted by the proposed works:

- **PCT 920:** Estuarine Mangrove Forest
- **PCT 1126:** Estuarine Saltmarsh
- **PCT 1234:** Estuarine Swamp Oak Forest

- **PCT 1808:** Estuarine Reedland.

No TECs will be directly impacted by the proposed works.

Table 6-18: Assessment of the vegetation impacted within the study area

Vegetation community	Direct Impacts (ha)
PCT 920: Estuarine Mangrove Forest	None
PCT 1126: Estuarine Saltmarsh	None
PCT 1234: Estuarine Swamp Oak Forest	None
PCT 1808: Estuarine Reedland	None
Mixed Native Plantings	0.28
Weeds and Native Plantings	1.63
	TOTAL 1.91

THREATENED FLORA

The *S. paniculatum* species identified within the subject land were horticultural specimens which do not correspond to the threatened species, and therefore do not require further assessment.

No habitat for threatened flora species was identified within the subject land. Therefore, Tests of Significance in accordance the BC Act or Significant Impact Criteria in accordance with the EPBC Act were not applied.

THREATENED FAUNA

No threatened fauna was recorded during field survey. However, a list of species known from the subject land or identified as potentially occurring within the subject land is provided in Table 6-17.

Tests of Significance in accordance with the BC Act and Significant Impact Criteria in accordance with the EPBC Act were applied to the species listed in Table 6-17. It was concluded that the proposed works would not result in a significant impact to any threatened fauna species.

6.4.2.2 Indirect Impacts

Indirect impacts are those impacts that do not directly affect habitat and individuals but that have the potential to interfere through indirect action.

DURING CONSTRUCTION

Indirect impacts considered for this assessment are site impacts (noise, light, weed invasion and pathogens) and downwind impacts (sedimentation, dust, accidental spills and leaks). During the construction, noise, dust and to a small degree vibration will be emitted which could have an indirect impact on local fauna. These impacts result from the operation of heavy machinery to clear vegetation and construct the buildings and infrastructure. These impacts are short term only and therefore are unlikely to significantly impact fauna. Also, during the construction period there is a risk that sediment runoff may impact adjacent native vegetation and nearby tributaries if appropriate sediment and erosion measures are not in place. These impacts will be managed via an appropriate sediment and erosion control plan. The overall impacts are likely to be minor.

WEEDS

Possible increase in weed infestation can result if weed propagules are introduced or moved around by machinery during construction. Weed control measures are recommended to minimise this risk.

PATHOGENS

Pathogens are agents such as bacterium, virus or fungus that cause disease in flora and fauna, which are spread on footwear, vehicles or machinery. The three most common pathogens found in NSW include:

- **Phytophthora (*Phytophthora cinnamomi*):** A soil-borne fungus that attacks the roots of native plant species, causing them to rot and eventually die
- **Chytrid fungus (*Batrachochytrium dendrobatidis*):** A waterborne fungus that affects native frog species
- **Myrtle rust (*Uredo rangelli*):** An introduced fungus that attacks young leaves, shoot tips and stems of Myrtaceous plants (such as Bottle Brush, Tea Tree, Lilly Pilly and Turpentine), eventually killing the plant.

Chytrid fungus is listed as a KTP for the Green and Golden Bell Frog, which is known from the subject land. Construction works on development sites have the potential to promote the spread of pathogens. If the occurrence of pathogens is known within the locality, a test for presence through soil or water tests should be undertaken.

Indirect impacts to threatened species and native vegetation are unlikely to be substantial and would be managed. Mitigation measures relevant to the Green and Golden Bell Frog are provided in Section 6.4.3.

LIGHTING

Many aquatic organisms that inhabit wetlands depend on daily cycles of light and dark, and artificial lights can disrupt behaviours in some species (Rich and Longcore 2013). Artificial lighting can decrease the amount of daily vertical migration of aquatic invertebrates within the wetland waterbodies. This can potentially impact on ecosystem health through enhanced concentrations of algae, causing a deterioration of water quality and odour problems.

Amphibians are also particularly vulnerable to artificial lighting and increases in illumination can cause temporary reductions in visual acuity (Rich and Longcore 2013). Some amphibians only forage at low light levels so, artificial lighting can also disrupt foraging behaviours.

Additionally, artificial lighting has potential to reduce the abundance and diversity of microbat species utilising the wetlands. The impacts of artificial lighting on microbats is complex as it involves a number of factors, including but not limited to, the microbat's response to lighting, the microbat species' normal flight speed and how their prey items (mosquitoes) respond to artificial lighting (Rich and Longcore 2013).

The subject land is located within an urbanised setting where it is already subject to impacts resulting from artificial light emanating from surrounding residences, the M5 and Sydney Airport. The proposed works would increase the amount of artificial lighting in the area through the installation and use of lighting as part of the proposed sports fields and as part of measures to improve access and safety.

The proposed lighting system will produce less than one lux of illuminance to the Wetland area when all the of the fields are in simultaneous operation. One lux is the equivalent of same brightness as moonlight produced during a full moon (Green Business Light UK, 2021). At other times, the impact will be even lower as the closest fields will be dimmed or off. The system is designed to be on when the field is in use and then to be dimmed when not in use. The dimming will further reduce at 9 pm and again at 11 pm. The field lighting will be off after 11 pm, unless deemed important to be on for an event by Council.

All luminaires for the fields will be equipped with glare shield to further reduce any light spill to sensitive areas. The architectural exterior luminaires are placed on the side of the buildings/structures and are angled up to illuminate the soffit of the structure. This reflected light produces a softer and more gentle light to the area while providing a feeling of security. The car park luminaires have optics which provide a full cut off (no light above 90°) and will also dim throughout the night and will be activated by occupancy sensors to work at a very low level after 11 pm to 6 am.

To ensure that the visual impact of lighting on native fauna is minimised, additional restriction to operational hours may be put in place by Council and agreed upon through community consultation. By ensuring that lights are switched off or dimmed outside operational hours, the visual impacts from lighting will be minimal beyond typical usage periods. Management of light spill to the Landing Lights Wetland should be included within the overall WEMP and GGBFMP. Due to this design the impact of lighting is not considered to be significant on fauna subject to the implementation of mitigation measures.

KEY THREATENING PROCESSES

The KTP, “clearing of native vegetation”, is associated with the proposed works. However, impacts resulting from this process would be minimal given that vegetation removal would be limited to areas dominated by native plantings or weeds, and that 3.17 ha of native vegetation would be retained within the subject land.

The following KTPs are also associated with the proposed works:

- Invasion of native plant communities by exotic perennial grasses
- Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata*
- Invasion, establishment and spread of Lantana.

Impacts resulting from these processes are minimal given that the subject land already contains the exotic species included in the threatening processes listed above. Weed control measures are recommended to minimise these KTPs.

The KTP, “alteration to the natural flow regimes of rivers, streams, floodplains & wetlands,” is also associated with the proposed works. SPORTENG Civil (2021) undertook MUSIC Modelling to predict the quantity and quality of surface and groundwater flows both pre- and post-development. The results, presented in Section 6.3.2.5, indicate that both water quantity and quality exiting the proposed development will decrease post-development. A 20 m buffer has been provided between the wetlands and the proposed work to lessen indirect impacts on the Landing Lights Wetland, which provides habitat

for the Green and Golden Bell Frog and migratory birds. Mitigation measures to address this KTP are presented in Table 6-19.

6.4.3 Mitigation Measures

Table 6-19: Mitigation measures for biodiversity

Environmental Aspect	Mitigation Measures
Compaction of soil	<ul style="list-style-type: none"> Stabilise all disturbed areas and implement vegetation protection measures as required. Ensure revegetation of native vegetation is consistent with the relevant vegetation communities or as set out in the Barton Park Masterplan Landscape Plan and WEMP.
Accidental damage / clearing	<ul style="list-style-type: none"> Council staff are to undertake a pre-works briefing advising of sensitive areas and relevant safeguards for these areas. Stop works if any previously undiscovered threatened species are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Council has provided written approval to do so. Ensure the site-specific CEMP includes instructions for dealing with orphaned or injured native animals and ensure the CEMP includes the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES). Install temporary barrier fencing to prevent entry into adjacent vegetation and wetlands and appropriate 'no-go zone' signage. This must include areas of Council and Community bush regeneration activities shown in Figure 6-9. Install tree protection measures around trees to be retained in the study area. Structures should be adequate to prevent machinery from entering within the drip zone. Maintain temporary fencing to prevent access into the native vegetation.
Green and Golden Bell Frog and other amphibians	<p>General</p> <ul style="list-style-type: none"> Brief contractors on the presence of threatened species. <i>Hygiene Guidelines – Protocol to protect priority biodiversity areas in NSW from Phytophthora cinnamomi, myrtle rust, amphibian chytrid fungus and invasive plants</i> (DPIE, 2020) should be adhered to at all times. In accordance with Clause 17(5) of the Cooks Cove SREP, prepare a GGBFMP, which includes the location of existing and proposed habitat, and include proposals covering the following: <ul style="list-style-type: none"> protection of the Green and Golden Bell Frog protection of the Green and Golden Bell Frog habitat how existing and proposed wetlands relate to protection of the Green and Golden Bell Frog and its habitat how stormwater management processes relate to protection of the Green and Golden Bell Frog and its habitat how development and management of open space areas and public access relate to protection of the Green and Golden Bell Frog and its habitat management of the direct and indirect impacts of the proposed development on the protection of the Green and Golden Bell Frog and its habitat measures to mitigate adverse environmental impacts of the proposed development, including habitat enhancement and the provision of compensatory habitat for the Green and Golden Bell Frog measures to appropriately manage habitat areas in both the short and long term. Council must prepare the GGBFMP and serve the Coordinator-General, Environment, Energy and Science (previously the Director-General of the Department of Environment and Conservation) prior to consent being granted for the development in accordance with 17(1) of the Cooks Cove SREP. <p>Chytrid Fungus (<i>Batrachochytrium dendrobatidis</i>)</p>

Environmental Aspect	Mitigation Measures
	<ul style="list-style-type: none"> • Minimise work during excessively wet or muddy conditions. • Programming of works should always move from uninfected areas to infected areas. • Set up exclusion zones with fencing and signage to restrict access into contaminated areas. • All personnel (including visitors) to be inducted on chytrid management measures for the site. • Provide vehicle wash down facility. • Restrict vehicles to designated tracks, trails and parking areas. • Provide parking and turn-around points on hard, well-drained surfaces. • Provide boot wash down facility. • Disinfect with cleaning products containing benzalkonium chloride or 70% methylated spirits in 30% water (DOE, 2015) • Disinfect hands or change gloves between the handling of individual frogs and between each site. • Only handle frogs when necessary. Use the 'one bag-one frog' approach. • To avoid cross contamination, generally avoid transferring water between two or more separate waterbodies.
Migratory birds	<ul style="list-style-type: none"> • Brief contractors on the presence of threatened species. • If feasible, undertake construction works when migratory birds unlikely to be present. Birds are found in Australia year-round. However, major movements along coastlines take place between March and April, and August and November. Between August and April, shorebird abundance peaks. Smaller numbers are found from April to August. • Refer to Water Quality and Hydrology mitigation measures provided in Table 6-8 to minimise indirect impacts on adjacent wetlands • Landscape Plans should take into account the required clearance needed between wetlands and vegetation, whereby vegetation within 70 m of roosting sites should be under 5 m in height to ensure safe roosting sites for wetland birds (Lawler 1996).
Indirect lighting to Landing Lights Wetland	<ul style="list-style-type: none"> • Include management strategy for light spill within both the WEMP and GGBFMP. • Manage artificial lights using motion sensors and timers. • Aim light onto the exact surface area requiring illumination. Use shielding on lights to prevent light spill into the atmosphere and outside the footprint of the target area. • Avoid lights containing short wavelength, violet / blue light and white LEDs. • Avoid high intensity light of any colour. • If feasible, allow for a natural barrier (e.g., vegetation screen) between the Landing Light Wetland and artificial light. • Maintain a dark zone around Landing Lights Wetland.
Spread of priority weeds	<ul style="list-style-type: none"> • Wash down equipment and vehicles prior to and after use, to manage the introduction and spread of weed propagules. • Thoroughly clean all equipment of soil and weed propagules prior to entry into the study area. • Remove Priority weeds using best management practices (including appropriate controls to prevent impacts to threatened species) prior to removal of native vegetation. Remove weed propagules offsite. • Bag and remove all weed propagules offsite, preferably the same day and dispose of at designated green waste facility. • Consider the implementation of a Weed Management Plan and revegetation works following the completion of works for the Muddy Creek riparian corridor and Landing Lights Wetland.

Environmental Aspect	Mitigation Measures
Introduction/ spread of pathogens	<ul style="list-style-type: none"> • Adhere to the <i>Arrive Clean, Leave Clean</i> guidelines (DotE, 2015) at all times (https://www.environment.gov.au/system/files/resources/773abcd-39a8-469f-8d97-23e359576db6/files/arrive-clean-leave-clean.pdf). In particular: <ul style="list-style-type: none"> ○ Wash down equipment and vehicles prior to entering the site, to manage the introduction and spread of pathogens. Pay particular attention to cleaning mud flaps and tyres. ○ Thoroughly clean all equipment of soil and vegetation debris prior to entry into the study area. ○ Use a solution of 70% ethanol or methylated spirits in 30% water for wash down and equipment cleaning to effectively disinfect areas. ○ Wash down on a hard, well-drained surface, for example a road, and on ramps if possible. Don't allow wash-down water to drain into native bushland of Landing Lights Wetland. ○ Machinery and equipment must also be cleaned when leaving site. • Wash down protocols are required to control multiple impacts including, pathogens, weeds and contaminated soils. The CEMP should develop a single wash down process that addresses the requirements of all three potential environmental impacts.

6.5 Aboriginal Heritage

6.5.1 Existing Environment

A search of the Aboriginal Heritage Information Management System (AHIMS) database, which is maintained by Heritage NSW and regulated under Section 90Q of the NPW Act was conducted on 25 May 2021 to identify if any registered Aboriginal sites were present within, or adjacent to the study area. The search covered GDA, Zone: 56, Eastings: 322906 - 335906, Northings: 6235655 - 6248655. The search parameters identified 91 Aboriginal sites as being within 1 km of the study area (Figure 6-11). No Aboriginal sites have previously been recorded inside the study area or within 1 km (Figure 6-11). The majority of the AHIMS sites within the search area are located adjacent to the Cooks River and its tributaries.

Searches of the Australian Heritage Database, the SHR and the Rockdale LEP 2011 covering the study area were conducted on 25 May 2021 in order to determine if any places of archaeological significance are located within the study area.

No Aboriginal archaeological sites recorded on these databases occur within the study area.

6.5.1.1 Ethnohistory

When the British First Fleet arrived in 1788, the Sydney region was home to numerous Aboriginal communities that had been living there for thousands of years. Current estimates suggest there may have been 3000-5000 people living in the Sydney region at that time. Captain Cook and the later British colonists recorded some of their language and place names, observed and recorded their observations regarding the new arrivals, their physical appearance, tools, clothing, camps and shelters, the food they ate, their ceremonies and their items of material culture. In addition, many artists recorded individuals and the activities of groups of people. Within a year of the British arrival well over half the local population had succumbed to smallpox and, as the British colony expanded, loss of country and acts of aggression made their traditional way of life unachievable (Attenbrow 2010:8,158). Aboriginal people continued to live around Sydney's harbour and coastal areas for more than a century after Europeans arrived, adapting their traditional life to their new conditions of dispossession and displacement, and maintaining, in scattered campsites, some of their skills and culture (Dictionary of Sydney).

The peoples of the coast lived on a diet rich in fish and shellfish but mammals, reptiles, birds and plant-based resources such as yams, nuts and fruit were also consumed. Both men and women caught fish, but each used different equipment: men used multi-pronged fishing spears to catch from rock platforms and canoes, while women used a hook and line from a canoe. Both men and women used net bags or bark baskets to carry equipment and the fish they caught. David Collins, judge advocate and lieutenant-governor of the First Fleet was a keen observer of the Aboriginal population of Sydney and noted.

While fishing, the women generally sing; and I have often seen them in their canoes chewing mussels or cockles, or boiled fish, which they spit into the water as a bait' (Collins, 1798 [1975:461]).

Archaeological research on sites such as Aboriginal rock engravings, open camp sites and shell middens, along with the excavated artefacts and food remains, provide a record of the distant past. The archaeological record is important, as it reveals that many aspects of Aboriginal life changed over time, and people did not always use the same tools and subsistence technologies that were observed when

the British arrived. In addition, it provides additional details about some aspects of life that are not described in the historical records such as the range of land and marine animals eaten, and the raw materials used in making tools and weapons (Attenbrow 2010).

6.5.1.2 Previous Ground Disturbance and Contamination

The due diligence Code of Practice as set out in the Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) states that further investigation in the form of a visual inspection must be conducted if activities are proposed to be:

- *within 200 m of waters, or*
- *located within a sand dune system, or*
- *located on a ridge top, ridge line or headland, or*
- *located within 200 m below or above a cliff face, or*
- *within 20 m of or in a cave, rock shelter, or a cave mouth and is on land that is not disturbed land*

It is noted that a visual inspection was not undertaken due to the history of the study area, which is outlined below.

The definition of disturbed land within the Code of Practice is as follows:

“Land is disturbed if it has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable.”

Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks” (DECCW 2010).

As discussed, in Section 6.1, the study area has been subject to extensive disturbance including market gardening, sewerage farming and landfill (Edison Environmental and Engineering, 2021; Appendix E). The majority of Barton Park is located on a former waste landfill, which was historically grassed and used for passive recreation. The historic soil landscapes and deposits have been reworked significantly in the last century as part of river diversion works, which would have involved significant dredging operations.

Borehole testing by Edison Environmental and Engineering (2020a; Appendix B) confirmed that the cover soil located on top of the former landfill areas varies in depth from 0.1 – 2.7 m. Beneath this, the landfill consists of compacted municipal waste. Areas not subject to landfill consist of reworked alluvial sediments associated with historical diversions/re-alignments of the Cooks River/Muddy Creek with surface fill material.



Figure 6-11: AHIMS sites in proximity to the Project site

6.5.2 Impact Assessment

ELA has undertaken an extensive search of the AHIMS database maintained by Heritage NSW and a review of available background reports. The AHIMS data has been mapped over the proposed works (Figure 6-11) showing zero AHIMS sites in the study area or within 1 km.

A site inspection was not undertaken however, a review of the study area's history indicates significant disturbance to the landform. The study area is located in a densely developed urban areas therefore, areas of archaeological potential are unlikely to occur.

Due to the above assessment, Aboriginal objects are unlikely to be present in the study area and the proposed works are unlikely to impact sites and objects.

6.5.3 Mitigation Measures

Table 6-20: Mitigation measures for Aboriginal heritage

Environmental Aspect	Mitigation Measures
Discovery of unsuspected Aboriginal objects	<ul style="list-style-type: none"> Brief all contractors undertaking works on site on the protection of Aboriginal heritage objects under the NPW Act, and the penalties for damage to these items.
Discovery of human remains	<ul style="list-style-type: none"> If human remains are discovered, cease works immediately and contact the NSW Police. If the remains are suspected to be Aboriginal, consider contacting DPIE to assist in determining appropriate management.
Harm to AHIMS sites as well as other area of Aboriginal Significance	<ul style="list-style-type: none"> Should an unexpected Aboriginal object be identified during construction, stop works in the immediate vicinity of the find and fence the area off with suitable markers (star pickets, flagging or barrier mesh). Notify the Council Project Manager and engage an archaeologist to determine the significance of the find. If required, determine the notification, consultation, and approval requirements. Works must not recommence until Council has provided written approval to do so.

6.6 Historic Heritage

6.6.1 Existing Environment

Searches were made of the following heritage databases on 24 May 2021 in order to determine if any places of historical significance are located within or in proximity to the study area:

- Australian Heritage Database
 - World Heritage List (WHL)
 - National Heritage List (NHL)
 - Commonwealth Heritage List (CHL)
- NSW State Heritage Inventory (SHI)
 - SHR
 - Section 170 Registers
- Rockdale LEP 2011

The results of the searches indicated that there are no items of historical heritage significance located within the study area however, two heritage items are located in proximity to the study area (Figure 6-12). Table 6-21 summarises the heritage significance of each item.

Table 6-21: Heritage significance of heritage items in vicinity of study area

Item Name	Statement of Significance
SHR: 01395 (Arncliffe Market Gardens) Cooks Cove SREP: Market Garden Rockdale LEP 2011: I93 (Market Gardens)	The Arncliffe Chinese Market Gardens are of high significance for their association with the Chinese community and their demonstration of a continuous pattern of land usage since the late nineteenth century. They are one of only three such surviving market gardens in the Inner Sydney region and one of few similar surviving examples in the Sydney Metropolitan Region.
SHR: 01393 (Kyeemagh Market Gardens) Rockdale LEP 2011: I201(Market Gardens)	The Kyeemagh Market Gardens are of high significance for their association with the Chinese community and their demonstration of a continuing pattern of land use from the late nineteenth century to the present. Market gardens such as these were once typical in the Rockdale Municipality but are now becoming increasingly rare.



Figure 6-12: Listed heritage items in proximity to the Project site

6.6.2 Impact Assessment

Both the Arncliffe and Kyeemagh market gardens are of historical significance for their demonstration of a continuous pattern of land use since the late nineteenth century. They are also of significance for their association with the development of local industry and for their association with early Chinese immigration and the influence of ethnic communities on local industry. The proposed works will not impact on the historical significance as no impacts to the listed heritage items within the vicinity of the study area are proposed.

6.6.3 Mitigation Measures

Table 6-22: Mitigation measures for historic heritage

Environmental Aspect	Mitigation Measures
Impacts to Heritage items	<ul style="list-style-type: none"> • In accordance with Section 146 of the Heritage Act, cease work if an archaeological relic (such as a deposit or artefact) is uncovered during works and contact a qualified archaeologist to assess the find. Further advice and clarification may be sought from the Heritage Council of NSW, or the Heritage Division under delegation regarding assessment and approvals. • Should any unexpected historical archaeology be uncovered during any future excavation works, adhere to the following procedure: <ul style="list-style-type: none"> ○ Stop all work in the immediate area of the item and notify the Project Manager. ○ Establish a 'no-go zone' around the item. Use high visibility fencing, where practical. Inform all site personnel about the no-go zone. ○ No work is to be undertaken within this zone until further investigations are completed. ○ Engage a suitably qualified and experienced Archaeologist to assess the finds. ○ Notify the Heritage Council if the finds are of local or state significance. Additional approvals will be required before works can recommence on site (s146 permit).

6.7 Noise and Vibration

An Operational Noise Assessment was undertaken by Renzo Tonin and Associates (2021; Appendix G) in accordance with the noise requirements of the NSW Noise Policy for Industry (NPfI) and the NSW Road Noise Policy (RNP) for the proposed works. A summary of these findings is provided below.

6.7.1 Existing Environment

Existing noise levels in the vicinity of the study area are variable. A survey of background noise levels was conducted at various locations within the study area to determine the existing noise environment and provide indicative noise levels for a number of potential receivers near the study area. These included:

- 30 Highclere Ave, Banksia
- 2 Oakleigh Ave, Banksia
- 16 Oakleigh Ave, Banksia
- 112 Francis Ave, Brighton-Le-Sands
- 2B Occupation Rd, Kyeemagh
- St George Randwick Hockey Club
- Barton Park Driving Range
- Bayside Men's Shed
- Brighton Fishos Club

Two noise monitoring locations were adopted to establish representative noise levels within the study area, and both long-term and short-term noise monitoring was conducted. Long-term monitoring was undertaken from Wednesday 21 April 2021 to Wednesday 28 April 2021, and short-term monitoring was undertaken on 28 April 2021 between 18:00 and 18:15 to supplement the long-term monitoring results. Monitoring locations for each monitoring type were as follows:

- Long-term noise monitoring – 4 Oakleigh Avenue, Banksia
- Short-term noise monitoring – Whiteoak Reserve

The overall single Rating Background Levels (RBL) and representative ambient L_{eq} noise levels for each assessment period is outlined in Table 6-23 and Table 6-24 below for long-term and short-term noise monitoring respectively.

To interpret the data, the following is noted:

- **Day:** 07:00 – 18:00 Monday to Saturday and 08:00 – 18:00 Sundays & Public Holidays
- **Evening:** 18:00 – 22:00 Monday to Sunday & Public Holidays
- **Night:** 22:00 – 07:00 Monday to Saturday and 22:00 – 08:00 Sundays & Public Holidays

Table 6-23: Long-term noise monitoring results dB(A) (Renzo Tonin & Associates, 2021)

Monitoring Location	L _{A90} Rating Background Level (RBL)			L _{Aeq} Ambient noise levels		
	Day	Evening	Night	Day	Evening	Night
L1 – 4 Oakleigh Avenue, Banksia	43	46	40	49	49	45

AS REQUIRED BY THE NPFI, THE EXTERNAL AMBIENT NOISE LEVELS PRESENTED ARE FREE-FIELD NOISE LEVELS. [I.E. NO FAÇADE REFLECTION]

Table 6-24: Short term noise monitoring results (Renzo Tonin & Associates, 2021)

Location / Time	Measured noise level (dB(A))		Comments on measured noise levels
	L _{Aeq}	L _{A90}	
28 April 2021 S1 – Whiteoak Reserve 1800 -1815	69	61	The background L _{A90} was determined by distant traffic. The ambient L _{Aeq} noise level was determined by local traffic.

A number of project noise trigger levels have been adopted for sensitive receivers surrounding the study area (Table 6-25). Night-time criteria have been included to assess car movements associated with people leaving the site after 10 pm.

Sleep disturbance noise levels for the Project are presented in Table 6-26. Road noise impacts are assessed in accordance with the NSW RNP (2011). Applicable assessment criteria for residences are presented in Table 6-27.

Table 6-25: Project noise trigger levels (Renzo Tonin & Associates, 2021)

Receiver Location	L _{Aeq, 15min} Project noise trigger levels, dB(A)		
	Day	Evening	Night
Residential receivers	48	43	38
St George Randwick Hockey Field (external)	53	N/A	N/A
Barton Park Driving Range (external)	53	N/A	N/A
Bayside Mens Shed (external)	53	N/A	N/A
Brighton Fishos Club (external)	53	N/A	N/A

NOTE: CONVERSION OF TRIGGER LEVELS FROM INTERNAL TO EXTERNAL FOR SCHOOL CLASSROOM AND PLACE OF WORSHIP ASSUMES 10DB(A) LOSS FROM OUTSIDE TO INSIDE THROUGH OPEN WINDOW.

Table 6-26: Sleep disturbance assessment levels (Renzo Tonin & Associates, 2021)

Receiver type	Assessment Level L _{Aeq,15min}	Assessment Level L _{AFmax}
Residential	40 + 5 = 45	4 + 15 = 55

Table 6-27: Road traffic noise assessment criteria for residential land uses (Renzo Tonin & Associates, 2021)

Road Category	Type of project / land use	Assessment criteria – dB (A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Bestic Street (Sub-arterial Road)	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,(15 \text{ hour})}$ (external)	60 $L_{Aeq,(9 \text{ hour})}$ 55 (external)

NOTE: LAND USE DEVELOPERS MUST MEET INTERNAL NOISE GOALS IN THE INFRASTRUCTURE SEPP (DEPARTMENT OF PLANNING NSW 2007) FOR SENSITIVE DEVELOPMENTS NEAR BUSY ROADS (SEE APPENDIX C10).

6.7.2 Impact Assessment

6.7.2.1 Construction

Machinery and vehicles associated with construction have the potential to impact on nearby noise sensitive receivers, however due to separation distances between the works areas and the nearest receivers, this impact is anticipated to be minor. Works should occur during the following hours in line with those stipulated within the Interim Construction Noise Guideline (ICNG) (DECC, 2009):

- Monday to Friday 7 am to 6 pm
- Saturday 8 am to 1 pm
- No work on Sundays or public holidays.

Construction works will be temporary and short-term however it is recommended that further quantitative assessment of construction noise and vibration be undertaken as further staging of the Project occurs to ensure that noise and vibrational impacts on sensitive receivers can be minimised.

Individual notification to sensitive receivers situated near the study area should be provided prior to commencement of any construction works. A complaint register outlining concerns from sensitive receivers in proximity to the works should be maintained throughout the life of the Project.

6.7.2.2 Operation

Predicted noise levels from the operation of the park have been assessed against established noise goals for three separate scenarios. These scenarios are ‘vehicle movements and car parking’ when operating at full capacity (Table 6-28), ‘players and spectators’ when operating at full capacity (Table 6-29) and finally predicted noise emissions based on both ‘vehicle movements and car parking’ and ‘players and spectators’ operating at 50% capacity simultaneously (Table 6-30). Noise levels are predicted to comply with the established noise goals at the identified receivers for all time periods.

Table 6-28: Predicted noise levels, vehicle movements & carparking, $L_{Aeq,15min}$ (Renzo Tonin & Associates, 2021)

Receiver	Predicted noise level, dB(A)				Noise goal, dB(A)		
	Day – Bus ¹	Day – car ²	Evening ³	Night ⁴	Day	Evening	Night
30 Highclere Ave, Banksia	41	36	36	22	48	43	38
2 Oakleigh Ave, Banksia	45	40	40	24	48	43	38
16 Oakleigh Ave, Banksia	43	36	46	20	48	43	38
112 Francis Ave, Brighton-Le-Sands	42	39	49	20	48	43	38
2B Occupation Rd, Kyeemagh	31	30	30	9	48	43	38

Receiver	Predicted noise level, dB(A)				Noise goal, dB(A)		
	Day – Bus ¹	Day – car ²	Evening ³	Night ⁴	Day	Evening	Night
St George Randwick Hockey club	27	26	26	5	53		
Barton Park Driving Range	29	29	29	13	53		
Bayside Mens Shed	39	37	37	15	53		
Brighton Fishos Club	41	39	39	17	53		

NOTES:

1. 2 SCHOOL BUS MOVEMENTS AND 12 CAR MOVEMENTS
2. 162 CAR MOVEMENTS
3. 150 CAR MOVEMENTS
4. 12 CAR MOVEMENTS

Table 6-29: Predicted noise levels, players and spectators, L_{Aeq,15min} (Renzo Tonin & Associates, 2021)

Receiver ID	Predicted noise level, dB(A)		Noise goal, dB(A)	
	Day	Evening	Day	Evening
30 Highclere Ave, Banksia	34	34	48	43
2 Oakleigh Ave, Banksia	38	38	48	43
16 Oakleigh Ave, Banksia	34	34	48	43
112 Francis Ave, Brighton-Le-Sands	38	38	48	43
2B Occupation Rd, Kyeemagh	29	29	48	43
St George Randwick Hockey club	26	26	53	
Barton Park Driving Range	28	28	53	
Bayside Mens Shed	37	37	53	
Brighton Fishos Club	39	39	53	

Table 6-30: Predicted noise levels, all activities operating simultaneously, L_{Aeq,15min} (Renzo Tonin & Associates, 2021)

Receiver	Predicted noise level, dB(A)				Noise goal, dB(A)		
	Day – Bus ¹	Day – car ²	Evening ³	Night ⁴	Day	Evening	Night
30 Highclere Ave, Banksia	38	35	35	22	48	43	38
2 Oakleigh Ave, Banksia	42	39	39	24	48	43	38
16 Oakleigh Ave, Banksia	40	35	35	20	48	43	38
112 Francis Ave, Brighton-Le-Sands	40	38	38	20	48	43	38
2B Occupation Rd, Kyeemagh	30	30	30	9	48	43	38
St George Randwick Hockey club	27	26	26	5	53		
Barton Park Driving Range	29	28	28	13	53		
Bayside Mens Shed	38	37	37	15	53		
Brighton Fishos Club	40	39	39	17	53		

Receiver	Predicted noise level, dB(A)				Noise goal, db(A)		
	Day – Bus ¹	Day – car ²	Evening ³	Night ⁴	Day	Evening	Night

NOTES:

1. 1 SCHOOL BUS MOVEMENTS AND 12 CAR MOVEMENTS
2. 81 CAR MOVEMENTS
3. 75 CAR MOVEMENTS
4. 6 CAR MOVEMENTS

Sleep disturbance would most likely be caused by vehicle doors closing and/or engines starting in the carpark area. However, it is noted that sporting activities will be completed by 9.30 pm, and most vehicles will be off site by 10 pm. Noise predictions for sleep disturbance are presented in Table 6-31. It was concluded that compliance will be achieved at all assessment locations.

Table 6-31: Sleep disturbance noise assessment (Renzo Tonin & Associates, 2021)

Assessment Location	Predicted Noise Level, dB(A)		Sleep disturbance assessment level, dB(A)	
	L _{Aeq,15min}	L _{Amax}	L _{Aeq,15min}	L _{Amax}
30 Highclere Ave, Banksia	22	42	45	55
2 Oakleigh Ave, Banksia	24	45	45	55
16 Oakleigh Ave, Banksia	20	43	45	55
112 Francis Ave, Brighton-Le-Sands	20	45	45	55
2B Occupation Rd, Kyeemagh	9	26	45	55

NOTE: NIGHT IS DEFINED AS 10:00PM TO 7:00AM, MONDAY TO SATURDAY AND 10:00PM TO 8:00AM SUNDAYS & PUBLIC HOLIDAYS.

Noise from traffic generated by a development is assessed against the RNP. The assessment involves consideration of the existing traffic noise levels and potential change in noise as a result of the development. A traffic flow assessment predicted the increase in noise levels resulting from the upgrades and is outlined in Table 6-32.

Table 6-32: Traffic Flow Assessment (Renzo Tonin and Associates, 2021)

Road	Existing traffic (vehicles)	two-way volumes	Proposed traffic (vehicles) ¹	two-way volumes	Existing and proposed two-way traffic volumes (Vehicles) ²	Predicted increase in noise level (dB)
------	-----------------------------	-----------------	--	-----------------	---	--

Day 7:00am-10:00pm

Bestic Street	9,775		1,500		11,275	0.6
---------------	-------	--	-------	--	--------	-----

NOTE:

1. BASED ON THE VARGA TRAFFIC REPORT, WEEKEND PEAK HOUR TRAFFIC DATA (WHICH IS LOWER THAN THE WEEKDAY). DAYTIME TRAFFIC ASSUMED TO BE 85% OF THE AADT AND THE AADT ASSUMED TO BE 10 X PEAK HOUR TRAFFIC.
2. BASED ON 150 CARS (75 CARS ENTERING AND 75 LEAVING) EVERY 90MINS BETWEEN 7AM AND 10PM

In accordance with the RNP, in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. As the predicted noise level increases presented in Table 6-32 are not more than 2dB(A), the road traffic noise

generated by vehicles associated with the proposed development is considered to comply with RNP criteria.

An assessment of aircraft noise was also undertaken in accordance with Australian Standard AS2021-2015 – '*Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*' ('AS2021'). Design of the proposed Club Room is required to reduce aircraft noise. The study area is most impacted by aircraft take offs from runways. It was concluded that the maximum design noise level at Barton Park would be from a Boeing 737-800 with a maximum noise level of 94 dB(A) (Renzo Tonin and Associates, 2021). The required Aircraft Noise Reduction for the Club House was determined to be 19. It is anticipated that this can be achieved through design measures such as utilising standard brick veneer, a metal deck roof, laminated glass with acoustic seals and a 40 mm thick solid door with acoustic perimeter seals.

6.7.3 Mitigation Measures

Table 6-33: Mitigation measures for noise and vibration

Environmental Aspect	Mitigation Measures
Site management	<ul style="list-style-type: none"> • Avoid the use of radios or stereos outdoors where neighbours can be affected. • Avoid shouting and minimise talking loudly and slamming vehicle doors. • Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling).
Consultation and Negotiation	<ul style="list-style-type: none"> • Ensure consultation outlining building times, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur is undertaken. • Provide information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact. In some areas, the proponent will need to provide notification in languages other than English. A website could also be established for the Project to provide information.
Plant and Equipment	<ul style="list-style-type: none"> • Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric controlled units where feasible and reasonable. Where there is no electricity supply, use an electrical generator located away from residences. • Examine different types of machines that perform the same function and compare the noise level data to select the least noisy machine. For example, rubber-wheeled tractors can be less noisy than steel tracked tractors. • Pneumatic equipment is traditionally a problem – select super silenced compressors, silenced jackhammers and damped bits where possible. • Operate plants in a quiet and efficient manner. • Reduce throttle setting and turn off equipment when not being used. • Regularly inspect and maintain equipment to ensure it is in good working order. Also, check the condition of mufflers.
On-site considerations	<ul style="list-style-type: none"> • Place as much distance as possible between the plant or equipment and residences and other sensitive land uses. • Restrict areas in which mobile plant can operate so that it is away from residences and other sensitive land uses at particular times. • In all circumstances, the requirements of the relevant Occupational Health and Safety legislation must be complied with. For information on replacing audible warning alarms on a mobile plant with less annoying alternatives. • Use temporary site buildings and materials stockpiles as noise barriers. • Use natural landform as a noise barrier – place fixed equipment in cuttings, or behind earth berms.

Environmental Aspect	Mitigation Measures
Work Scheduling	<ul style="list-style-type: none"> Organise work to be undertaken during the recommended standard hours where possible. If works outside the recommended standard hours are planned, avoid scheduling on Sundays or public holidays. Schedule noisy activities around times of high background noise (local road traffic or when other local noise sources are active) where possible to provide masking or to reduce the amount that the construction noise intrudes above the background. Schedule deliveries to nominated hours only.
Transmission Path	<ul style="list-style-type: none"> Reduce the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers. Erect temporary noise barriers before work commences to reduce noise from works as soon as possible.
Complaints handling	<ul style="list-style-type: none"> Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow. Implement all feasible and reasonable measures to address the source of the complaint. Keep a register of any complaints, including details of the complaint such as date, time, the person receiving the complaint, complainant's contact number, the person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate.

6.8 Landscape and Visual Amenity

6.8.1 Existing Environment

Barton Park is predominantly zoned as Open Space in accordance with the Cooks Cove SREP and has been subject to historical land clearing for market gardening, sewerage farming and landfill and most recently, in order to provide for the recreational use of public open space. The study area is bounded by Muddy Creek to the east and residential housing to the west. The northern extent is constituted by significant wetlands including the Landing Lights Wetland and Eve Street Wetlands. In 2020, MODE Design undertook development of a detailed design package for the proposed upgrade works, the landscape design identified a number of key viewpoints that exist within the study area, these included:

- The water meadow at the southwestern portion of the study area
- The existing open space playing field to the south
- Lookout platforms to the east of the site, overlooking Muddy Creek
- A lookout platform to the northeast of the study area, which overlooks Muddy Creek.
- Views north to the airport runway from the north-eastern most portion of the study area
- Views of the wetlands from the north western portion of the study area.

6.8.2 Impact Assessment

6.8.2.1 Visual Amenity

The proposed works will alter the visual landscape and amenity of the area as it involves the construction of infrastructure associated with recreational and sporting use, amenity buildings and landscaping. As the works will facilitate long-term higher amenity public recreation use, the visual impact on the community is anticipated to be positive. The works will predominantly be undertaken within areas that have historically been used for public open space and recreation. As such, the nature of land use will not change. The extent of vegetation removal within the study area has been minimised where possible and the Masterplan design has been developed to be sympathetic to existing site conditions and environmental sensitivities such as the Landing Lights Wetland. Landscaping works will also be undertaken using species that are endemic to the area where possible to further reduce the impact on visual amenity from the proposal.

Furthermore, a 20 m setback from the existing wetlands within Barton Park will be maintained for all construction works which will ensure that further visual amenity impact beyond what is necessary will not occur.

6.8.2.2 Lighting Impacts on Native Fauna

The proposed lighting poles and flood lights have the potential to impact of native fauna and nearby residents. As a worst-case scenario, if it were assumed that there was a major game being played on Field One, all luminaires would be required to operate at 100% on each field and in the carpark. In this scenario, the Landing Lights Wetland would still only achieve a minimal light level of 1 lx average to just beyond the boundary of Barton Park (Cundall, 2021). This is well below the maximum allowable value of 10 lx. The control of the luminaires will manage and mitigate impacts to native fauna. Furthermore, general operation hours can be reduced during peak migratory bird dates, where only Fields One and Two will operate at this time.

6.8.2.3 Lighting Impacts on Nearby Residents

All sport and public domain lighting will comply with AS 4282 (effect of obtrusive light onto neighbouring properties) (Cundall, 2021). It is understood that the current lighting within Barton Park is obtrusive to neighbouring properties (Figure 6-13). The currently operating lights are non-dimmable, metal halide flood lights, which do not have glare control and are angled and/or incorrectly aimed vertically and not facing down to the ground. The newly proposed lighting system has glare shields and will not be angled above 5° to avoid the current issues faced by nearby residents (Cundall, 2021).



Figure 6-13: Current obtrusive light on neighbouring properties in Banksia (Community member – Garnet Brownbill)

In order to ensure that the visual impact of lighting on surrounding residents and native fauna is minimised, operational hours may be put in place by Council and agreed upon through community consultation. By ensuring that lights are switched off or dimmed outside operational hours, the visual impacts from lighting will be minimal beyond typical usage periods. This lighting will, however, improve visitor safety and if any permanently operational lighting is erected, it should be designed to provide a safe path of travel and discourage lingering to minimise the impact on light pollution to surrounding properties. Infrastructure construction works and associated amenity improvements will improve accessibility throughout the park and increase opportunities for the community to experience and appreciate these values.

6.8.2.4 Sydney Airport

The proximity of the proposed works to the Sydney Airport requires consideration of the potential impact of tall structures on airport activities. The tallest proposed structures within the Masterplan are the lighting poles, at 19.61 m high. This is below the Sydney Airport Prescribed Airspace Obstacle Limitation Surfaces for the study area. The study area is within the windshear assessment trigger area for runway 07/25. However, the proposed lighting poles will not penetrate the 1:35 surface and is there for in accordance with *Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports (DITRC, 2013)* and no windshear assessment is required. Consultation has also been undertaken with Sydney Airport and CASA who posed no objection to the proposal.

6.8.3 Mitigation Measures

Table 6-34: Mitigation measures for visual and landscape

Environmental Aspect	Mitigation Measures
Impact on the community	<ul style="list-style-type: none"> • Notify community or neighbours where light impacts are anticipated. • Position lighting in residential areas to direct light away from houses wherever possible. • Ensure all access restrictions are removed following construction. • Where possible, consider additional revegetation to further reduce impact of light spill on residences. • Floodlighting should be designed to face inward, which will reduce the potential impacts of light pollution to nearby sensitive receivers. • Position lighting to face away from Landing Lights Wetland.

6.9 Traffic and Transport

6.9.1 Existing Environment

A Traffic and Parking Assessment Report was undertaken by Varga Traffic Planning (2021; Appendix H). The local road network surrounding the study area is described in Table 6-35.

Table 6-35: Local road network descriptions (Varga Traffic Planning, 2021)

Road	Classification	Description
Princes Highway	State Road	Provides the key north-south road link in the area, linking St Peters to Heathcote and beyond. It typically carries three traffic lanes in each direction in the vicinity of the site, with kerbside parking generally permitted outside of commuter peak periods.
General Holmes Drive	State Road	Provides another key north-south road link in the area, linking the M5 East Motorway and the Grand Parade. It also typically carries three traffic lanes in each direction in the vicinity of the site, with turning lanes provided at key locations.
Bay Street	State Road	Provides the key east-west road link in the area, linking The Grand Parade to the Princes Highway. It typically carries two traffic lanes in each direction in the vicinity of the site with turning bays provided at key locations.
West Botany Street	Regional Road	Provides a north-south road link between Wickham Street and President Avenue. It typically carries one traffic lane in each direction in the vicinity of the site.
Bestic Street	Regional Road	Provides another east-west road link between Princes Highway and The Grand Parade. It typically carries one traffic lane in each direction, with kerbside parking generally permitted along both sides of the road in the vicinity of the site, subject to signposted restrictions.

Traffic surveys were undertaken at West Botany Street and Bestic Street intersection as well as the Bestic Street, Francis Avenue and Fishos site access driveway intersection on Monday 12 October and Saturday 17 October by Varga Traffic Planning. A General overview of findings indicated the following:

- The weekday afternoon peak period occurred between 5:00pm and 6:00pm
- The Saturday peak period occurred between 11:45am and 12:45pm
- During the weekday afternoon network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,300 vehicles per hour (vph), comprising approximately 550 vph eastbound and approximately 750 vph westbound
- During the Saturday network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,150 vph, comprising approximately 650 vph eastbound and 500 vph westbound.

As part of the Traffic and Parking Assessment report (Varga Traffic Planning, 2021), a review of previously undertaken traffic surveys by ARUP (2016) were conducted. These previous surveys were undertaken at the West Botany Street and Bestic Street intersection as well as the Bestic Street and Barton Park site access driveway intersection in August 2016. The results indicated the following:

- The weekday morning peak period occurred between 7:45am-8:45am

- The weekday afternoon peak period occurred between 4:45pm-5:45pm
- During the weekday morning network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,300 vph, comprising approximately 900 vph eastbound and 400 vph westbound
- During the weekday afternoon network peak period, two-way traffic flows in Bestic Street, past the site frontage, were typically in the order of 1,200 vph, comprising approximately 500 vph eastbound and 700 vph westbound
- During the weekday morning network peak period, two-way traffic flows into/out of Barton Park was in the order of four vph, comprising approximately one entry movement and three exit movements
- During the weekday afternoon network peak period, two-way traffic flows into/out of Barton Park was in the order of 65 vph, comprising approximately 42 entry movements and 23 exit movements.

6.9.2 Impact Assessment

6.9.2.1 Operation

In order to determine the absolute worst-case scenario, modelling of potential traffic impacts have assumed that all four soccer games and all four tennis matches will finish during the weekday afternoon and Saturday network peak periods, whilst the next four soccer games and four tennis matches will also commence during the same weekday afternoon and Saturday network peak periods.

Factoring in spectators, this equates to 132 vehicle movements into Barton Park and 132 vehicle movements out of Barton Park. However, it is highly unlikely that this scenario will be representative of on-site conditions.

A SIDRA NETWORK capacity analysis of surrounding intersections was undertaken, which determined the following:

- The Bestic Street and West Botany Street intersection currently operates at Level of Service “C” under the existing traffic conditions, which is expected to increase to Level of Service “D” under the proposed scenario. In this regard, the weekday PM parking restrictions along both sides of Bestic Street, on the approach and departure sides of the intersection, have also been adopted under the Saturday scenario. Consideration may also need to be given to investigating further parking restrictions along West Botany Street on Saturdays, to ensure the Level of Service remains unchanged between the existing and proposed scenarios.
- The Bestic Street and Francis Avenue intersection currently operates at Level of Service “A” under the existing traffic conditions and will continue to operate at Level of Service “A” under the proposed scenario.
- The proposed new Bestic Street and Barton Park access driveway intersection is expected to operate at Level of Service “A” under the proposed scenario, with minimal delays and queue lengths on all approaches.

The analysis determined that the traffic generation potential will not have any significant effect on the performance of nearby intersections and the two nearby intersections are expected to continue to operate at acceptable levels of service under the proposed scenario.

Furthermore, the construction of 240 off-street parking spaces, 48 bicycle spaces and 48 motorbike spaces are expected to satisfy the necessary parking requirements. Therefore, it is deemed reasonable to conclude that the proposed works will not have unacceptable implications in terms of road network capacity or off-street parking, servicing or site access requirements.

6.9.2.2 Construction

Based on the above assessment which modelled worst case scenario (132 vehicle movements to and from site), it is not anticipated that significant impacts to traffic will result from the construction phase of this project as the number of vehicle movements would be anticipated to be less than this at any one time. Furthermore, as site compound locations will be situated within the Barton Park itself, it is not anticipated that road closures of any kind will be required for site deliveries as the local road network will only be minimally and temporarily impacted. Additionally, the current road traffic volumes within the surrounding road network are relatively low.

6.9.3 Mitigation Measures

Table 6-36: Mitigation measures for traffic

Environmental Aspect	Mitigation Measures
Disruption to traffic flows	<ul style="list-style-type: none"> Position vehicles, materials and equipment to minimise impacts to public access and parking. Restrict heavy vehicles to specified routes. Implement a Traffic Management Plan prior to the commencement of any construction works to ensure that traffic disruptions are mitigated, and commuters are notified of detours and closures through signage. Maintain a project complaint register as part of the Traffic Management Plan.
Temporary road closures	<ul style="list-style-type: none"> If road closures required, undertake consultation, in accordance with Section 138 of the Roads Act, with TfNSW on classified Roads. Notify nearby businesses and sensitive receivers and give opportunity to comment on temporary road closures prior to commencement of construction.

6.10 Air Quality

6.10.1 Existing Environment

The works area is located in close proximity to areas that are primarily utilised for residential activities to the east and west, approximately 500 m northeast of the study area is the Sydney Airport. The existing air quality is considered to be typical of a Sydney suburban area.

Potentially affected receivers near the Project include residential properties and schools. A number of residences and businesses are located in close proximity to the study area. The study is located in close proximity to the following streets:

- Bestic Street
- Eve Street
- Oakleigh Avenue
- Highclere Avenue
- Ayr Street.

The elderly and children are considered to be the most at risk of adverse air quality impacts of the proposed works. Sensitive receivers within proximity to the works include, but are not limited to:

- St Dominic Savio School - <250 m from study area.

Local residents, particularly those located within the streets mentioned above, as well as residents located within streets that provide access for construction vehicles to the proposed construction sites and local businesses, particularly those located near the proposed construction vehicle access points, will be sensitive to air quality impacts from the works.

6.10.2 Impact Assessment

6.10.2.1 Construction

Anticipated sources of dust and dust-generating activities from the Project include:

- Operation of scrapers, graders, loaders and excavators across the entire project area
- Excavation and fill transfer works associated with the proposed works
- Dust loading and transfers from aggregate material on trucks, loaders and excavators
- Emissions of dust from the movement of vehicles on unsealed roads
- Wind erosion from exposed surfaces at disturbed areas
- Uncontrolled dust located within stockpiles due to aeolian transport.

The total amount of dust generated depends on the properties of soil materials (silt and moisture content), techniques adopted during excavation, demolition, grading and transfer of soils, and the prevailing meteorological conditions.

The dispersion of the dust relates to the quantity and drift potential of the particles. Larger particles generally settle out near the source, whereas fine particles can be dispersed over greater distances. Typically, the impacts on nearby sensitive receivers decrease with increased distance from the source.

During unfavourable meteorological conditions, dust emissions may be higher. The closeness of sensitive receptors, such as residential properties may require strict dust suppression measures to be utilised through duration of construction works, particularly where dust causing activities such as excavation are undertaken.

Where earthworks are proposed, and within project compound areas, a number of dust suppression methods will be required to ensure that the potential for dust generation is mitigated and negative impacts to sensitive receivers are minimised. These methods include utilising fencing with shade cloth, wetting down of stockpiled material, staging excavation works and water cart rotations or the application of misting systems.

Where potentially contaminated soils are to be excavated and stockpiled on site, measures outlined in the LTSMP (Appendix B) and RAP (Appendix E) should be adhered to avoid contaminated dust particle dispersing.

Emissions from construction vehicles and equipment associated with the combustion of fuel and petrol are also anticipated as a result of the works. Construction plant and equipment must be maintained to manufacturer's operating standards, shut down when not in use and simultaneous use should be minimised where possible. Provided that appropriate mitigation measures are adhered to and good site practices are used, the impacts of the works on greenhouse gas emissions are anticipated to be low.

6.10.2.2 Operation

During operation, the increased number of vehicle movements within the area will contribute to emissions. However, this is not anticipated to be to a significant extent in comparison to the existing land use of the area, proximity to the Sydney Airport and significant road use within the area on roads such as Bestic Street and the M5 motorway.

6.10.3 Mitigation Measures

Table 6-37: Mitigation measures for air quality

Environmental Aspect	Mitigation Measures
Dust generation from vibrating and ground disturbing works	<ul style="list-style-type: none"> • Minimise works during high wind periods. • Apply dust suppression as required to limit excessive dust generation. • Ensure vehicles maintain recommended speed. • Look for excessive dust generation and slow down if needed. • Minimise site movements. • Locate stockpiles away from sensitive receptors where possible. • Cover or water stockpiles that are not used for extended periods and keep moist to minimise transmission of dust. • Erect shade cloth surrounding excavation works to suppress dust. • Rehabilitate construction sites following completion of the works. • Excavated material that is potentially contaminated or has a risk of producing methane should be stored and disposed of appropriately in accordance with LTSMP and RAP.
Fumes generation from machinery	<ul style="list-style-type: none"> • Do not have machinery running while not in use. • Minimise use of machinery for required activity only. • Where odour emissions are perceivable and may impact nearby sensitive receivers, consider odour suppression systems.

Environmental Aspect	Mitigation Measures
Cumulative impacts of greenhouse gas emissions	<ul style="list-style-type: none"><li data-bbox="515 259 1433 322">• Maintain plant and equipment in accordance with manufacturer’s specifications to ensure that it is in a proper and efficient condition.<li data-bbox="515 331 1433 394">• Regularly inspect plant and equipment to ascertain that fitted emission controls are operating efficiently.<li data-bbox="515 403 1433 427">• On site burning of waste of any kind is not permitted

6.11 Waste Management

6.11.1 Existing Environment

The proposed works have the potential to utilise a range of different resources and generate a number of different types of waste throughout its construction and operational phases. The construction of the Project would require the use of resources such as electricity, water, fuel, concrete and paving materials. Other resources would be required for infrastructure such as signage, landscaping and lighting.

The maintenance and occasional repair of project infrastructure during operation would require resources. However, it is not anticipated that these activities would place a significant demand on resources.

6.11.2 Impact Assessment

6.11.2.1 Construction

Construction waste may be generated from excess spoil from earthworks, vegetation clearing, drainage works, demolition, equipment maintenance, pathway upgrades, waste concrete, wood and metal, materials packaging and as general waste from staff and contractors. Potential impacts from waste generation include:

- reduced aesthetics in community areas
- health impacts to residential receivers
- minor spills from hazardous fuel and chemical use
- pollution of the environment from other general wastes.

Any excess spoil from earthworks is proposed to be classified in accordance with Waste Classification guidelines (EPA, 2014) and disposed of at an appropriately licenced waste facility. No waste is to be imported into the site.

Removal and appropriate disposal of general waste generated by the contractors during the proposed works is the responsibility of the contractors unless advised differently by Council. Excavated spoil must be managed and disposed of in line with the recommendations of the LTSMP (Appendix B) and RAP (Appendix E).

6.11.2.2 Operation

During operation, waste bins should be positioned at accessible locations to encourage users and visitors to dispose of rubbish easily and appropriately.

6.11.3 Mitigation Measures

Table 6-38: Mitigation measures for waste management

Environmental Aspect	Mitigation Measures
General	<ul style="list-style-type: none"> • Adhere to the Waste Management Plan (Dickens Solutions, 2021; Appendix I).
Excess spoil in the form of excavated material	<ul style="list-style-type: none"> • Consider resource management options for the Project against a hierarchy of the following order embodied in the Waste Avoidance and Resource Recovery Act 2001: <ul style="list-style-type: none"> ○ Avoid unnecessary resource consumption

Environmental Aspect	Mitigation Measures
	<ul style="list-style-type: none"> ○ Recover resources (including reuse, reprocessing, recycling and energy recovery) ○ Dispose (as a last resort) • Classify all wastes and excess spoil in accordance to the Waste Classification Guidelines (DECC, 2009) prior to disposal and transported to a licensed waste disposal facility. • Remove all waste from the site on completion of the works. • Upon completion of waste disposal, retain all original weighbridge / disposal receipts issued by the receiving waste facility in a waste register as evidence of proper disposal.
Litter left on-site by staff/contractors	<ul style="list-style-type: none"> • Ensure an adequate number of bins are placed at the site for workers and that all litter is placed in these bins. Ensure work areas of the project site are kept clean and free of litter, including cigarette butts, at all times.

6.12 Socio-Economic Considerations

6.12.1 Existing Environment

6.12.1.1 Population

Bayside in 2016 had a population of 162,900 and is forecast to grow to 228,200 by 2036, which equates to an additional 65,300 people (Bayside Council, 2020a). Overall, the Bayside population is forecast to increase by 40% and also become an increasingly older community (Table 6-39). This change in the demographic profile is important when planning for community services and social infrastructure such as parks and community facilities.

Table 6-39: Bayside population by age group in 2016 and 2036

Age Group	2016	2036	Anticipated Change
0 – 4	11,200	14,300	28%
5 – 19	25,600	37,500	46%
20 – 29	24,300	29,650	22%
30 – 39	28,450	32,850	15%
40 – 49	22,400	31,700	42%
50 – 64	26,250	39,650	51%
65 – 84	20,750	34,500	66%
85+	3,950	8,050	104%

6.12.1.2 Social Infrastructure

The Bayside LGA has a diverse range of open space and recreation sporting facilities including parklands, sportsgrounds, natural areas, golf courses, aquatic centres, indoor sports facilities and pedestrian and cycle pathways. The distribution and access to open space varies across the LGA as some areas do not have access to local parks within a 400 m safe walking distance and other areas have a low supply of sporting open space (Bayside Council, 2020a).

The provision of new sport and active recreation will be essential in the future with a growing population, however, is challenging due to the urbanised nature of the LGA. It is therefore essential that existing sport and recreation facilities are upgraded to meet future needs. Where access to formal open space is constrained, the enhancement of active transport links between open and green spaces that can build upon the already identified Green Grids within the LGA will also be important, which will be provided, in part, through the proposed pedestrian and cycle pathways identified within the Barton Park Masterplan.

6.12.1.3 Community Volunteer Groups

There are multiple community volunteer groups that undertake biodiversity conservation measures within the LGA, which include:

- **The Flock:** A local bird-watching group that collates data for conservation purposes
- **Tempe Birders:** A local bird-watching group that monitor birdlife at Tempe Wetlands
- **Wolli Creek Preservation Society:** Voluntary group that helps manage the Wolli Creek Valley

- **Botany Bay and Catchment Alliance Inc.:** Voluntary organisation that are dedicated to the restoration, protection and sustainable use and enjoyment of Botany Bay and its catchment
- **Oatley Flora and Fauna Conservation Society:** Voluntary group that aids in biodiversity conservation works
- **Cooks River Valley Association:** Environmental and community group working to restore the river and connect the community
- **The Mud Crabs:** A local ecological volunteer group which cares for The Cooks River and its foreshore environment by regularly collecting rubbish and restoring the bush along The Cooks River.

The Flock regularly visit the Landing Lights Wetland within Barton Park to collate data on wetland and migratory birds.

6.12.2 Impact Assessment

The proposed works will ultimately provide a number of socioeconomic impacts within the local area, these will primarily be positive in the longer term, but may have some small short-term negative impacts.

6.12.2.1 Viability of Local Businesses

The proposed works could result in a minor negative impact to local businesses during construction from a decrease in trade/demand for services due to noise, vibration, access, visual amenity and traffic congestion. Some businesses may benefit from increased trade from construction works or demand for construction-related services and construction workers utilising local businesses. In the longer term, it is likely that the increased usage of Barton Park, associated public recreation areas and ability for residents to walk through the municipality will incentivise expenditure in local business.

6.12.2.2 General Disruption Due to Construction

Local residents and businesses are likely to have concerns about disruption and disturbances resulting from construction, which may result in a slight negative impact in the short term. Maintenance activities once the upgrades to Barton Park are completed are anticipated to be short term and infrequent and cause negligible disruptions on residents.

6.12.2.3 Impacts to Amenity

Sensitive receivers may be disrupted due to noise, vibrations, dust and increased traffic congestion during construction. Following construction, the design of Barton Park will improve the local area's visual amenity through further planting of native vegetation and landscape design that align with the planning principles outlined both within the Eastern Sydney District Plan and Bayside Council LSPS.

6.12.2.4 Short-term Impacts to Established Biodiversity Conservation Volunteer Groups

During construction, public access will not be permitted to Barton Park and potentially Landing Lights Wetland. Construction is anticipated to occur over a period. However, other bushcare sites within the LGA will be accessible during this time. It is also noted that the following grants will continue, with site access granted from West Botany Street:

- Crown Lands (December 2021)
- Coastal and Estuary (August 2022)
- Greater Sydney Local Land Services (May 2022)

The proposed works will encourage healthy lifestyle choices for the growing local community, which will ultimately be able to reduce healthcare costs provided that ample opportunity is provided for active recreation for both younger and older residents.

6.12.3 Mitigation Measures

Table 6-40: Mitigation measures for socio-economic considerations

Environmental Aspect	Mitigation Measures
General	<ul style="list-style-type: none"> • Prepare a CEMP to include the required management and mitigation measures. The CEMP will provide a framework for establishing how these measures will be implemented and who will be responsible for their implementation. The CEMP will be prepared prior to the proposal's construction and must be reviewed and certified by Council, prior to the start of any on site work. The CEMP will include sub plans for all impacts identified within this REF. • The Contractor is required to prepare a Stakeholder Engagement Plan to keep residents informed of progress and specific construction activities.
Safety	<ul style="list-style-type: none"> • Consider the recommendations outlined in the CPTED Report (The Design Partnership, 2021; Appendix J). • The Contractor is required to prepare a Stakeholder Engagement Plan to keep residents informed of progress and specific construction activities.
Impacts to amenity, noise, traffic and dust	<ul style="list-style-type: none"> • Ensure all recommended mitigation measures for noise and vibration, amenity, traffic, and air quality are adhered to.

6.13 Cumulative Impacts

6.13.1 Existing Environment

A search of the Department of Planning’s ‘Major Project Assessments Register’ (May 2020) indicated there are a small number of potential major projects located close to the study area.

These include the Kyeemagh Public School redevelopment and Eden Street Site redevelopment.

The Kyeemagh Public School Redevelopment comprises the demolition of all existing structures located on site and the construction of new school facilities to accommodate an increase in student numbers from the current 42 students to 500 students.

The Eden Street Site redevelopment involved the demolition of existing buildings, and construction and operation of a new mixed-use precinct comprising retail, residential and community uses across four tower buildings.

6.13.2 Impact Assessment

The major direct cumulative construction impacts that may be experienced from the Project include:

- Increased construction vehicle traffic on public roads causing congestion and delays
- Increased air pollution and noise for local residents
- Cumulative noise impacts associated with multiple construction works.

It is unlikely that the construction timeline of the Barton Park Precinct will match that of any major projects in the area however, there is potential for cumulative impacts on residents that are exposed to longer periods of construction.

The Projects specified above are located approximately 800 m and 1.1 km away from the works in Barton Park, respectively. As such, it is not anticipated that the works for these projects will utilise the same access roads for construction delivery.

Provided that the recommended management plans referenced throughout the REF are adhered to, it is not anticipated that negative cumulative impacts will result from the works. The works have been designed in order to improve the amenity, landscape value and effective uses of the environment.

The proposed works will create opportunity for the community to utilise a public asset which has already been assigned as a public open space and will incentivise its use as well as the appreciation of the existing natural values of the area.

6.13.3 Mitigation Measures

Table 6-41: Mitigation measures for cumulative impacts

Environmental Aspect	Mitigation Measures
Community notification	<ul style="list-style-type: none"> • Ensure a plan for community consultation is developed which outlines the dissemination of information to the community via letterbox drops, websites and newsletters. • Notify sensitive receivers including businesses and schools which are at risk of impacts to day-to-day functioning and trading at least 2 weeks prior to works commencement.

Environmental Aspect

Mitigation Measures

- Where multiple projects are occurring within the same vicinity at the same time, undertake communication between construction contractors to ensure that potentially noisy or disruptive activities are not undertaken at the same time.

7. Environmental Factors Considered

7.1 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, the following MNES and impacts on Commonwealth land are required to be considered to assist in determining whether the Project should be referred to the Australian Government Department of Agriculture, Water and the Environment (DAWE). Table 7-1 addresses the MNES for the Project.

Table 7-1 Consideration of Matters of National Environmental Significance

MNES	Impact
Any environmental impact on a World Heritage property?	No
Any environmental impact on National heritage places?	No
Any environmental impact on RAMSAR wetlands?	No
Any environmental impact on Commonwealth listed threatened species or ecological communities?	Non-significant impact
Any environmental impact on Commonwealth listed migratory species?	No
Does any part of the project involve nuclear action?	No
Any environmental impact on a Commonwealth marine area?	No
Any impact on Commonwealth land?	No

7.2 Clause 228 of the Environmental Planning and Assessment Act 1979

Clause 228(1) of the EP&A Regulation states:

For the purposes of Part 5 of the Act, the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment include

- a. *for activities of a kind for which specific guidelines are in force under this clause, the factors referred to in those guidelines, or*
- b. *for any other kind of activity—*
 - i *the factors referred to in the general guidelines in force under this clause, or*
 - ii *if no such guidelines are in force, the factors referred to subclause (2).*

No specific or general assessment guidelines for the proposed activity are known to be in force under Clause 228 (1). Therefore, the factors listed in Clause 228(2) of the Act apply. Clause 228(2) of the EP&A Regulation sets out 16 factors that need to be considered when assessing environmental impact under Part 5 of the EP&A Act. These factors are addressed in this report and relevant sections are listed in Table 7-2 below.

Table 7-2 Clause 228 Factors

Clause 228 Factors	Impact
(a) Any Environmental Impact on a Community?	Noise and other impacts on the community are anticipated to be minimal. The proposed works will result in a positive impact on the community through providing a safe and usable public open space and recreational facility.
(b) Any transformation of a locality?	No significant transformation of locality is likely as part of the works. The proposed works involve the demolition of derelict buildings and construction new recreational facilities in an area which has previously been modified. Vegetation removal will be minimised where possible.
(c) Any environmental impact on the ecosystems of the locality?	Impacts on ecosystems are anticipated to be non-significant if the recommended mitigation measures are followed.
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	The works involve the demolition of derelict buildings and construction of recreational facilities in an area that has predominantly been previously modified. Impacts on threatened ecological communities and species have been considered and mitigated. Therefore, the works will not significantly reduce aesthetic, scientific, or other environmental quality or value of the locality.
(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Impacts on Aboriginal cultural heritage and historical cultural heritage items are anticipated to be non-significant if the recommended mitigation measures are followed.
(f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?	The impact assessment on threatened fauna has been addressed and mitigated. The impact, if any, will not be significant. In addition, the impact resulting from the loss of general fauna habitat as a result of vegetation disturbance is not likely to result in the loss or reduction in the viability of more common fauna species.
(g) Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	Potential impacts on flora and fauna have been considered as part of this REF. There will be no significant impact on any threatened species or other more common fauna species.
(h) Any long-term effects on the environment?	The Project will not result in long-term impact if mitigation procedures are followed. Maintenance following the completion of the works will be infrequent. The works will have a long-term positive impact on the community through providing a safe and usable recreational facility.
(i) Any degradation of the quality of the environment?	No significant impacts to the quality of the environment were found. No degradation to the quality of the environment should occur if mitigation measures are adhered to.
(j) Any risk to the safety of the environment?	A low risk to the environment is associated with the works. Potential for contamination is possible if the relevant management plans and mitigation measures are not adhered to. There is a small potential for sedimentation from stockpiles during construction of the works. The risk to the

Clause 228 Factors	Impact
	environment is considered minimal if the prescribed mitigation measures are adopted.
(k) Any reduction in the range of beneficial uses of the environment?	No reduction in the range of beneficial uses of the environment will result as part of the works. The works will not limit or modify any uses of the environment.
(l) Any pollution of the environment?	No pollution of the environment is proposed or likely. The risk is minimal if the appropriate mitigation measures are followed.
(m) Any environmental problems associated with the disposal of waste?	All waste is to be taken offsite and disposed of appropriately or as stipulated in the relevant remediation plan.
(n) Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	No resources that are being utilised as part of this project are likely to become in short supply.
(o) Any cumulative environmental effect with other existing or likely future activities?	Minimal cumulative environmental effect is likely as a result of the works.
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	There are no impacts on coastal processes or hazards that will result as part of the works.

7.3 Licences and Permits

All relevant environmental impacts have been assessed in this REF. Due to the Project's nature and being a Part 5 Activity, there are several approvals and licences, as listed in Section 4.41 of the EP&A Act, that are **not** required. These include:

- Applications for separate permits under Sections 201, 205 or 219 of the FM Act.
- Applications for separate approvals under Sections 89, 90 and 91 (other than an aquifer interference policy) of the WM Act.
- An AHIP under Section 90 of the NPW Act.
- An EPL under Section 48 of the POEO Act.

Therefore, no other licences or permits are required for the proposed works.

8. Mitigation Measures

Table 8-1 Recommended mitigation measures for the proposed works

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
Soils and Landform	<ul style="list-style-type: none"> Increase in sediment flow into watercourses and wetlands Erosion hazard from works Acid Sulfate Soils Management of contaminated stockpiles Unexpected finds - Geotechnically unstable materials 	Prepare a CEMP prior to any construction works to address measures to be adopted to minimise impacts on the environment as a result of the construction works, including sediment erosion and sedimentation.	Contractor	Prior to Construction
		Prepare a Sediment and Erosion Control Plan in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and implement prior to works.	Contractor	Prior to Construction
		Install soil and erosion control measures such as sediment fencing prior to on-ground works. Inspect these regularly (weekly), and more frequently during rain periods to ensure structures are in proper working order.	Contractor	Prior to Construction
		Prior to forecast heavy rain, cease work and remove accumulated material from sediment controls.	Contractor	During Construction
		Schedule the major drainage and earthworks outside of predicted heavy rain periods.	Contractor	During Construction
		Stop work during and following heavy rainfall to reduce risk of mobilising sediment.	Contractor	During Construction
		In accordance with Clause 17(4) of the Cooks Cove SREP, prepare a Soil and Water Management Plan, addressing the following: <ul style="list-style-type: none"> the likely impacts of development on water quality during and after construction, the utilisation of effective erosion and sediment control measures in accordance with the State government guidelines entitled <i>Managing urban stormwater: soils and construction</i> (Department of Housing, 3rd ed., 1998) and consistently with any relevant industry standards, especially in relation to the golf course construction and operation, the recommendations of the GGBFMP plan and the WEMP. 	Contractor	Prior to Construction
		Due to the contaminated soils on site all materials removed from sediment erosion controls must be disposed of in line with materials management and supervision in accordance with Section 7.7 of the RAP (Edison, 2021; Appendix E).	Contractor	During Construction
		Inspect erosion controls regularly (daily during workdays) and after rainfall. Fix damaged controls immediately. Remove accumulated sediment or waste material from the sediment controls regularly and dispose of at a licensed waste facility.	Contractor	During Construction
		Bare areas should be mulched, using on-site native vegetation if removed, following clearance works to prevent erosion or soil damage. Alternatively, erosion prone areas, when not in use, may be covered with biodegradable weed matting or similar product.	Contractor	During Construction
		Monitor sedimentation down slope of excavated areas.	Contractor	During Construction
		Leave erosion and sediment controls in place until after the works are completed.	Contractor	During Construction
		An ASSMP may be required in the event that the proposed works will likely disturb natural sediments.	Contractor	During Construction
		If required, the ASSMP must comply with the <i>NSW Acid Sulfate Soils Manual (1998)</i>	Contractor	During Construction
		If required, implement and monitor ASS in line with the recommendations of the ASSMP.	Contractor	During Construction
		Excavated soil and approved, imported materials must be stockpiled within a designated stockpile area.	Contractor	During Construction
		During site establishment, stockpile areas must be prepared and managed using the following methods: <ul style="list-style-type: none"> Establishing stockpiles on existing paved or hardstand surfaces to minimise the requirement for validation after the stockpile has been removed. Construction of diversion drains and bunds around the perimeter of the stockpile areas. Installation of sediment and erosion control measures including silt fencing and hay bales, where necessary. Erection of signs at the entrance to the stockpile areas and at locations around the stockpile specifying individual stockpile number and the type of materials stored. Establishment of buffer zones around each stockpile area to enable access to the stockpiles and minimise impacts of the stockpile area on the surrounding facilities. 	Contractor	During Construction
		Maintain, repair and replace the drainage, sediment and erosion control measures installed within the stockpiling areas at the commencement of the Project, where necessary for the duration of the stockpiling activities. All stockpiles must be maintained in a tidy and safe condition with stable batter slopes.	Contractor	During Construction
Unexpected geotechnically unstable materials may be encountered, which may include large quantities of construction and demolition waste including geotechnically unsuitable or 'oversize' material. The following procedure is to be followed in the event of an 'unexpected find': <ul style="list-style-type: none"> Cease work and contact site manager or foreman. Site foreman to isolate the area to prevent access. Site foreman or client contact Environmental Scientist appointed to the Project. 	Contractor	During Construction		

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
		<ul style="list-style-type: none"> Environmental Scientist to conduct a detailed inspection of the area and undertake sampling with reference to guidelines endorsed by the EPA. Environmental Scientist to inform Site Auditor of the unexpected find and outcome of the site inspection. Environmental Scientist to consider results of sampling and analysis with reference to EPA-endorsed guidelines. Environmental Scientist to advise on further actions in consultation with the Site Auditor. Environmental Scientist to submit an assessment/validation/clearance to site foreman following completing of approved works. 		
		An Unexpected Finds Protocol is to be developed for the Project prior to the commencement of site works and include in the CEMP.	Contractor	During Construction
		All contaminated land is to be managed in line with the materials management and supervision requirements as outlined in Section 7.7 of the RAP (Edison, 2021; Appendix E) and the LTSMP (Edison 2020a; Appendix B). The following information must be included in the CEMP and implemented prior and during construction: <ul style="list-style-type: none"> Identification of areas of contamination requiring removal or relocation to accommodate the Barton Park Masterplan. Identification of appropriate locations for on-site reuse of surplus material including recording of these locations. Specification of design principles for re-use areas (namely the placement of a marker layer and clean soil barrier). Classification of surplus material that cannot be re-used on site in accordance with EPA (2014) waste guidelines prior to lawful off-site disposal. 	Contractor	During Construction
		The importation of materials must be overseen by a qualified environmental scientist or engineer who has been appointed to the Project to complete the site validation report at the conclusion of works.	Contractor	During Construction
		All materials handling during the remediation works must be tracked in order to allow verification of the correct movement and handling. The system must track materials from cradle to grave and must provide detailed information on the location and quantity of all material movements both on and off site, so that the material being handled can be accounted for.	Contractor	During Construction
		The tracking system must include accurate tracking of stockpiles through the entire material handling stage and include confirmation of stockpile locations via registered survey, if necessary	Contractor	During Construction
		Plans must be made with respect to the extent of each excavation. A register of all analytical results for stockpiles and excavations must be maintained throughout the remediation works.	Contractor	During Construction
		Standard forms must be prepared as part of the Materials Tracking Procedure.	Contractor	During Construction
		In the event that off-site disposal is required then an Off-site Transport / Disposal Form must be prepared. This will provide a record of materials removed from the site and include the material type, quantity, origin, shipping destination and an approval by the supervising environmental scientist or engineer that the material meets the disposal requirements.	Contractor	During Construction
Contamination	<ul style="list-style-type: none"> Management of contaminated soils Management of contaminated soil – tracking and transportation Incidental discovery or disturbance of soil contamination. Pollution of soils from chemical spills (e.g. fuel or oil from machinery). 	Each form must be completed on a weekly basis and collated into a cumulative log for each process on a weekly basis.	Contractor	During Construction
		Trucks carrying excavated materials must be covered and passed through a designated wheel washing facility before entering and exiting the site.	Contractor	During Construction
		Wash down protocols are required to control multiple impacts, pathogens, weeds and contaminated land. The CEMP should develop a single wash down process that address the requirement of all three components	Contractor	During Construction
		Trucks must proceed directly to and from the soil stockpile area, as appropriate, along the predetermined roads.	Contractor	During Construction
		Trucks carrying contaminated materials will not be permitted to drive over areas of the site which have previously been excavated, validated or reinstated.	Contractor	During Construction
		Empty trucks must return directly to the excavation area along predetermined haul roads.	Contractor	During Construction
		Wherever possible, imported material must be delivered directly to the area in which it is to be placed, thereby minimising the need for stockpiling and double handling.	Contractor	During Construction
		Trucks carrying contaminated materials must be covered prior to exiting the site and will remain covered until authorised to unload at the destination.	Contractor	During Construction
		If applicable, trucks must be fitted with seals to ensure that the movement of potentially saturated materials is undertaken appropriately. Seals must be inspected daily prior to commencement of haulage works.	Contractor	During Construction
		Trucks must exit the site through predetermined exit points and follow predetermined route to the destination (landfill).	Contractor	During Construction
		For any excess spoil material which requires offsite disposal, formally classify waste before being taken to an appropriately licensed landfill in accordance with the EPA (2014) Waste Classification Guidelines.	Contractor	During Construction
		Store all chemicals (e.g. fuel, oil) in appropriate bunding/storage systems within the approved storage facility.	Contractor	During Construction
		Develop a site-specific Asbestos Management Plan for the Works.	Contractor	Prior to Construction
		If friable asbestos is deemed to be present or likely on the site, implement the following procedure:	Contractor	During Construction

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing		
		<ul style="list-style-type: none"> Cease works and cover the exposed area with substantial plastic sheeting that is securely anchored to the ground surface and enclose within a barrier to prevent access. Notify the Site Manager immediately. The Site Manager is to determine if appropriate signage should be displayed to warn of the presence of these materials. The Site Manager is to contact a suitably qualified Occupational Hygienist to provide further advice. Do not undertake further works on the Site until the Site Manager has provided approval for Low Level Disturbance works to re-commence. 				
		If required, undertake asbestos removal works in accordance with the requirements of the relevant OH&S regulations and NSW Workcover.	Contractor	During Construction		
		If required, obtain a Bonded Asbestos Licence from NSW Workcover (or as superseded at the time of works) to remove, repair or disturb more than 10 m ² of bonded asbestos material such as fibro, corrugated cement sheeting and asbestos cement pipes.	Contractor	During Construction		
		If the removal, repair or disturbance of any amount of friable asbestos, such as sprayed limpet, asbestos cloth, millboard and pipe lagging is proposed, obtain a Friable Asbestos Licence from NSW Workcover. This licence also allows the removal of bonded asbestos.	Contractor	During Construction		
		Notify NSW WorkCover seven days before removing bonded asbestos. A work site permit from NSW WorkCover must be obtained before removing any friable asbestos. Applications must be lodged at least seven days before the proposed work is due to start.	Contractor	During Construction		
		Ensure appropriate spill kits are carried with the equipment.	Contractor	During Construction		
		Establish dedicated refuelling areas outside environmentally sensitive areas and away from creek lines. These areas are to be bunded to ensure any spills do not enter these sensitive areas.	Contractor	During Construction		
		All remediation activity is to be validated in compliance with Section 9 Validation programme of the RAP (Edison, 2021; Appendix E) and the LTSMP (Edison 2020a; Appendix B). The LTSMP (Edison 2020a; Appendix B) will also be updated to reflect the completed works and landfill gas management systems and capping and marker layers installed, for ongoing management and monitoring of residual contamination risks at the site.	Contractor	During Construction		
		Landfill gas monitoring is to be undertaken in accordance with section 9.4.1 of the RAP (Edison, 2021; Appendix E).	Contractor	During Construction		
		Initial monitoring should commence prior to assessment of the passive venting system prior to installation of the vapour barrier.	Contractor	During Construction		
		Monitoring is to be completed in buildings prior to occupation.	Contractor	During Construction		
		All amenities buildings must incorporate appropriate protection measures from part 5 of the EPA Assessment and Management of Hazardous Ground Gases: Contaminated Land Guidelines (EPA, 2020).	Contractor	During Construction		
		Users of the site are to advise Council, if any unusual odours observed within site buildings, specifically a landfill gas or hydrogen sulfide (rotten egg) gas. The origin of the odour should then be investigated in accordance with the process outlined in the LTSMP.	Contractor	During Construction		
		Water Quality and Coastal Wetlands	<ul style="list-style-type: none"> Increase in sediment flow into waterways Reduction in water quality and increase in rubbish Indirect impacts to Coastal Wetlands Impacts to flood regime 	Wash all equipment, including, erosion and sediment control measures and trailers to prevent spread of exotic species. Conduct a visual check for vegetation and seeds on all equipment machinery used in the activities before work commences.	Contractor	During Construction
				Store all chemicals (e.g. fuel, oil) offsite. If required to be stored onsite, store chemicals in appropriate bunding/storage systems, outside of the riparian zones and only for short periods.	Contractor	During Construction
Ensure appropriate spill kits, are present onsite.	Contractor			During Construction		
Ensure all equipment is in good working order.	Contractor			During Construction		
Carry associated Safety Data Sheets (SDS) for all chemicals.	Contractor			During Construction		
Do not use any chemicals that are labelled as ‘Class 9 Environmentally hazardous’ as part of the proposed activities.	Contractor			During Construction		
Do not stockpile rubbish or store chemicals near native vegetation or waterways.	Contractor			During Construction		
Limit the use of fuel, chemicals and herbicides near waterways and other sensitive areas.	Contractor			During Construction		
In accordance with Clause 17(3) of the Cooks Cove SREP, prepare a WEMP, which includes a description of the location of existing and proposed wetlands, including areas considered to be significant, and proposals about the following: <ul style="list-style-type: none"> implementation of wetlands environmental management principles, protection of threatened species, populations and ecological communities, protection of aquatic and fish nursery habitats, protection of migrating bird populations and their habitats, the interrelationship of the Barton Park development and any buffer or treatment required to prevent or reduce run-off and nutrient loads from the fairways entering the wetlands, 	Contractor Bayside Council			Prior, During and Post Construction		

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
		<ul style="list-style-type: none"> the impact of the proposed development on tidal flows inundating the wetlands, the impact of the development on the ecological significance of the Cooks River and Muddy Creek and the wetlands within the site, measures to minimise adverse environmental impacts of development, including the provision of— <ul style="list-style-type: none"> compensatory wetland habitats, and vegetated riparian buffers around wetlands to mitigate the impact of human disturbance on native fauna, and vegetated riparian buffers around wetlands to enhance appropriate terrestrial habitat, establishment in riparian areas of appropriate local native plant species propagated, where possible, from locally genetic stock 		
		<ul style="list-style-type: none"> Council is to monitor the impacts of people recreating in and around the Wetland. If required, Council will implement measures to reduce access to the Wetland. Initially actions to safeguard the wetland could include: <ul style="list-style-type: none"> Provision of signage advising that access is prohibited, and wildlife is to be protected Community education and signage advising of the importance of the Wetland ecosystem and why it should be protected Installation of a fence or barrier that still allows for fauna movement Council may resolve to determine the area a Wildlife Protection Area (WPA) under the <i>Companion Animal Act 1998</i>. If the Wetland is a WPA, Council can then undertake compliance action to protect the area 		
		Install stormwater quality improvement devices and stormwater detention structures to reduce the annual volume of flow into the adjacent wetlands and improve water quality being delivered into the wetlands.	Contractor	During Construction
		Ensure erosion and sediment controls are in place and regularly maintained to prevent sediment runoff to the wetland, which can smother infauna burrows within the exposed area of soil.	Contractor	During Construction
		Flow through open form fencing (louvres or pool fencing) is required for all new fencing and gates up to the 1% AEP Flood level to allow flood water flow through.	Contractor	Prior to Construction
		Do not increase the water level or hazard on adjoining properties. Investigate opportunities to ensure the design of the Masterplan is clear of the overland floodway and acts to reduce the impacts of these flows, possibly by removing inappropriate travel paths and/or reducing the hazard.	Bayside Council	Prior to Construction
		Where the proposed works may impact on the flood behaviour (e.g., filling within the flood affected area or obstruction to the flood water flow path) engaged a civil/hydraulic engineer to assess the impacts of the overland flows before and after development using a hydraulic model.	Bayside Council	Prior to Construction
		Stabilise all disturbed areas and implement vegetation protection measures as required.	Contractor	During Construction
		Ensure revegetation of native vegetation is consistent with the relevant vegetation communities or as set out in the Masterplan.	Contractor	Post Construction
		Council staff are to undertake a pre-works briefing advising of sensitive areas and relevant safeguards for these areas.	Bayside Council	Prior to Construction
		Stabilise all disturbed areas and implement vegetation protection measures as required.	Contractor	During Construction
		Stop works if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Council has provided written approval to do so.	Contractor	During Construction
		Ensure the site-specific CEMP includes instructions for dealing with orphaned or injured native animals and ensure the CEMP includes the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES).	Contractor	Prior to Construction
		Install temporary barrier fencing to prevent entry into adjacent vegetation and wetlands and appropriate 'no-go zone' signage. This must include areas of Council and Community bush regeneration activities shown in Figure 6 9.	Contractor	During Construction
		Install tree protection measures around trees to be retained in the study area. Structures should be adequate to prevent machinery from entering within the drip zone.	Contractor	Prior to Construction
		Maintain temporary fencing to prevent access into the native vegetation.	Contractor	During Construction
		Brief contractors on the presence of threatened species.	Bayside Council	Prior to Construction
		Hygiene Guidelines – Protocol to protect priority biodiversity areas in NSW from <i>Phytophthora cinnamomi</i> , myrtle rust, amphibian chytrid fungus and invasive plants (DPIE, 2020) should be adhered to at all times.	Contractor	During Construction
		In accordance with Clause 17(5) of the Cooks Cove SREP, prepare a GGBFMP, which includes the location of existing and proposed habitat, and include proposals covering the following: <ul style="list-style-type: none"> protection of the Green and Golden Bell Frog, protection of the Green and Golden Bell Frog habitat, how existing and proposed wetlands relate to protection of the Green and Golden Bell Frog and its habitat, how stormwater management processes relate to protection of the Green and Golden Bell Frog and its habitat, 	Contractor and Bayside Council	Prior, During and Post Construction
Biodiversity	<ul style="list-style-type: none"> Compaction of soil Accidental damage / clearing Green and Golden Bell Grog Migratory birds Indirect lighting impacts to Landing Lights Wetland 			

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
		<ul style="list-style-type: none"> how development and management of open space areas and public access relate to protection of the Green and Golden Bell Frog and its habitat, management of the direct and indirect impacts of the proposed development on the protection of the Green and Golden Bell Frog and its habitat, measures to mitigate adverse environmental impacts of the proposed development, including habitat enhancement and the provision of compensatory habitat for the Green and Golden Bell Frog, measures to appropriately manage habitat areas in both the short and long term. <p>Council must prepare the GGBFMP and serve it to the Coordinator-General, Environment, Energy and Science (previously the Director-General of the Department of Environment and Conservation) prior to consent being granted for the development in accordance with 17(1) of the Cooks Cove SREP.</p>		
		<p>Chytrid Fungus (<i>Batrachochytrium dendrobatidis</i>)</p> <ul style="list-style-type: none"> Minimise work during excessively wet or muddy conditions. Programming of works should always move from uninfected areas to infected areas. Set up exclusion zones with fencing and signage to restrict access into contaminated areas. All personnel (including visitors) to be inducted on chytrid management measures for the site. Provide vehicle wash down facility. Restrict vehicles to designated tracks, trails and parking areas. Provide parking and turn-around points on hard, well-drained surfaces. Provide boot wash down facility. Disinfect with cleaning products containing benzalkonium chloride or 70% methylated spirits in 30% water. Disinfect hands or change gloves between the handling of individual frogs and between each site. Only handle frogs when necessary. Use the 'one bag-one frog' approach. To avoid cross contamination, generally avoid transferring water between two or more separate waterbodies. 	Contractor	During Construction
		If feasible, undertake construction works when migratory birds unlikely to be present. Birds are found in Australia year-round. However, major movements along coastlines take place between March and April, and August and November. Between August and April, shorebird abundance peaks. Smaller numbers are found from April to August.	Contractor	During Construction
		Landscape Plans should take into account the required clearance needed between wetlands and vegetation, whereby vegetation within 70 m of roosting sites should be under 5 m in height to ensure safe roosting sites for wetland birds (Lawler 1996).	Contractor	Prior to Construction
		Include management strategy for light spill within both the WEMP and GGBFMP.	Bayside Council	Prior to Construction
		Manage artificial lights using motion sensors and timers.	Bayside Council	Post Construction
		Aim light onto the exact surface area requiring illumination. Use shielding on lights to prevent light spill into the atmosphere and outside the footprint of the target area.	Contractor	During Construction
		Avoid lights containing short wavelength, violet / blue light and white LEDs.	Design Contractor	Prior to Construction
		Avoid high intensity light of any colour.	Design Contractor	Prior to Construction
		If feasible, allow for a natural barrier (e.g. vegetation screen) between the Landing Light Wetland and artificial light.	Design Contractor	Prior to Construction
		Maintain a dark zone around Landing Lights Wetland.	Design Contractor	Prior to Construction
		Ensure revegetation of native vegetation is consistent with the relevant vegetation communities or as set out in the Barton Park Masterplan Landscape Plan.	Contractor	Post Construction
		Wash down equipment and vehicles prior to and after use, to manage the introduction and spread of weed propagules.	Contractor	During Construction
		Thoroughly clean all equipment of soil and weed propagules prior to entry into the study area.	Contractor	During Construction
		Remove Priority weeds using best management practices (including appropriate controls to prevent impacts to threatened species) prior to removal of native vegetation. Remove weed propagules offsite.	Contractor	Prior to Construction
		Bag and remove all weed propagules offsite, preferably the same day and dispose of at designated green waste facility.	Contractor	During Construction
		Consider the implementation of a Weed Management Plan and revegetation works following the completion of works for the adjacent riparian corridor.	Contractor	Post Construction
		Adhere to the <i>Arrive Clean, Leave Clean</i> guidelines (DotE, 2015) at all times (https://www.environment.gov.au/system/files/resources/773abcad-39a8-469f-8d97-23e359576db6/files/arrive-clean-leave-clean.pdf). In particular:	Contractor	During Construction
		<ul style="list-style-type: none"> Wash down equipment and vehicles prior to entering the site, to manage the introduction and spread of pathogens. Pay particular attention to cleaning mud flaps and tyres. Thoroughly clean all equipment of soil and vegetation debris prior to entry into the study area. Use a solution of 70% ethanol or methylated spirits in 30% water for wash down and equipment cleaning to effectively disinfect areas. 		
Priority Weeds and Pathogens	<ul style="list-style-type: none"> Spread of priority weeds Spread of pathogens into bushland or threatened species habitat 			

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
		<ul style="list-style-type: none"> Wash down on a hard, well-drained surface, for example a road, and on ramps if possible. Don't allow wash-down water to drain into native bushland of Landing Lights Wetland. Machinery and equipment must also be cleaned when leaving site. 		
		Wash down protocols are required to control multiple impacts including, pathogens, weeds and contaminated soils. The CEMP should develop a single wash down process that addresses the requirements of all three potential environmental impacts.	Contractor	During Construction
Aboriginal Heritage	<ul style="list-style-type: none"> Discovery of unsuspected Aboriginal objects Discovery of human remains Harm to AHIMS sites as well as other area of Aboriginal Significance 	Brief all contractors undertaking works on site on the protection of Aboriginal heritage objects under the NPW Act, and the penalties for damage to these items.	Contractor	Prior to Construction
		Should an unexpected Aboriginal object be identified during construction, stop works in the immediate vicinity of the find and fence the area off with suitable markers (star pickets, flagging or barrier mesh). Notify the Council Project Manager and engage an archaeologist to determine the significance of the find. If required, determine the notification, consultation, and approval requirements. Works must not recommence until Council has provided written approval to do so.	Contractor	During Construction
		If human remains are discovered, cease works immediately and contact the NSW Police. If the remains are suspected to be Aboriginal, consider contacting DPIE to assist in determining appropriate management.	Contractor	During construction
Historic Heritage	<ul style="list-style-type: none"> Impacts to Heritage items 	In accordance with Section 146 of the Heritage Act, cease work if an archaeological relic (such as a deposit or artefact) is uncovered during works and contact a qualified archaeologist to assess the find. Further advice and clarification may be sought from the Heritage Council of NSW, or the Heritage Division under delegation regarding assessment and approvals.	Contractor	During Construction
		Should any unexpected historical archaeology be uncovered during any future excavation works, adhere to the following procedure: <ul style="list-style-type: none"> Stop all work in the immediate area of the item and notify the Project Manager. Establish a 'no-go zone' around the item. Use high visibility fencing, where practical. Inform all site personnel about the no-go zone. No work is to be undertaken within this zone until further investigations are completed. Engage a suitably qualified and experienced Archaeologist to assess the finds. Notify the Heritage Council if the finds are of local or state significance. Additional approvals will be required before works can recommence on site (s146 permit). 	Contractor	During Construction
Noise and Vibration	<ul style="list-style-type: none"> Site management Consultation and Negotiation Complaints handling Plant and Equipment On-site considerations Work Scheduling 	Avoid the use of radios or stereos outdoors where neighbours can be affected.	Contractor	During Construction
		Avoid shouting and minimise talking loudly and slamming vehicle doors.	Contractor	During Construction
		Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling).	Contractor	During Construction
		Ensure consultation outlining building times, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur is undertaken.	Contractor	During Construction
		Provide information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact. In some areas, the proponent will need to provide notification in languages other than English. A website could also be established for the Project to provide information.	Contractor	Prior to Construction
		Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow.	Contractor	During Construction
		Implement all feasible and reasonable measures to address the source of the complaint.	Contractor	During Construction
		Keep a register of any complaints, including details of the complaint such as date, time, the person receiving the complaint, complainant's contact number, the person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate.	Contractor	During Construction
		Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric controlled units where feasible and reasonable. Where there is no electricity supply, use an electrical generator located away from residences.	Contractor	During Construction
		Examine different types of machines that perform the same function and compare the noise level data to select the least noisy machine. For example, rubber-wheeled tractors can be less noisy than steel tracked tractors.	Contractor	During Construction
		Pneumatic equipment is traditionally a problem – select super silenced compressors, silenced jackhammers and damped bits where possible.	Contractor	During Construction
		Operate plant in a quiet and efficient manner.	Contractor	During Construction
		Reduce throttle setting and turn off equipment when not being used.	Contractor	During Construction
Regularly inspect and maintain equipment to ensure it is in good working order. Also, check the condition of mufflers.	Contractor	During Construction		
Place as much distance as possible between the plant or equipment and residences and other sensitive land uses.	Contractor	During Construction		
Restrict areas in which mobile plant can operate so that it is away from residences and other sensitive land uses at particular times.	Contractor	During Construction		

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
		Avoid the use of reversing alarms by designing site layout to avoid reversing, such as by including drive through for parking and deliveries.	Contractor	During Construction
		In all circumstances, the requirements of the relevant Occupational Health and Safety legislation must be complied with. For information on replacing audible warning alarms on a mobile plant with less annoying alternatives	Contractor	During Construction
		Use temporary site buildings and materials stockpiles as noise barriers	Contractor	During Construction
		Use natural landform as a noise barrier – place fixed equipment in cuttings, or behind earth berms.	Contractor	During Construction
		Organise work to be undertaken during the recommended standard hours where possible.	Contractor	During Construction
		If works outside the recommended standard hours are planned, avoid scheduling on Sundays or public holidays.	Contractor	During Construction
		Schedule noisy activities around times of high background noise (local road traffic or when other local noise sources are active) where possible to provide masking or to reduce the amount that the construction noise intrudes above the background.	Contractor	During Construction
		Schedule deliveries to nominated hours only.	Contractor	During Construction
		Reduce the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers.	Contractor	During Construction
		Erect temporary noise barriers before work commences to reduce noise from works as soon as possible.	Contractor	During Construction
Air Quality	<ul style="list-style-type: none"> Dust generation from vibrating and ground disturbing works Fumes generation from machinery Cumulative impacts of greenhouse gas emissions 	Minimise works during high wind periods.	Contractor	During Construction
		Apply dust suppression as required to limit excessive dust generation.	Contractor	During Construction
		Regularly inspect plant and equipment to ascertain that fitted emission controls are operating efficiently.	Contractor	During Construction
		Maintain plant and equipment in accordance with manufacturer’s specifications to ensure that it is in a proper and efficient condition.	Contractor	During Construction
		Do not have machinery running while not in use.	Contractor	During Construction
		Minimise use of machinery for required activity only.	Contractor	During Construction
		Look for excessive dust generation and slow down if needed.	Contractor	During Construction
		Minimise site movements.	Contractor	During Construction
		Locate stockpiles away from sensitive receptors where possible.	Contractor	During Construction
		Cover or water stockpiles that are not used for extended periods and keep moist to minimise transmission of dust.	Contractor	During Construction
		Erect shade cloth surrounding excavation works to suppress dust.	Contractor	During Construction
		Rehabilitate construction sites following completion of the works.	Contractor	During Construction
		Excavated material that is potentially contaminated or has a risk of producing methane should be stored and disposed of appropriately in accordance with LTSMP and RAP.	Contractor	During Construction
Where odour emissions are perceivable and may impact nearby sensitive receivers, consider odour suppression systems.	Contractor	During Construction		
Waste Management	<ul style="list-style-type: none"> Excess spoil in the form of excavated material Litter left on-site by staff/contractors 	On site burning of waste of any kind is not permitted	Contractor	During Construction
		Adhere to the Waste Management Plan (Dickens Solutions, 2021; Appendix I)	Contractor	During Construction
		Consider resource management options for the Project against a hierarchy of the following order embodied in the <i>Waste Avoidance and Resource Recovery Act 2001</i> : <ul style="list-style-type: none"> Avoid unnecessary resource consumption; Recover resources (including reuse, reprocessing, recycling and energy recovery); and Dispose (as a last resort). 	Contractor	During Construction
		Classify all wastes and excess spoil in accordance to the Waste Classification Guidelines (DECC, 2009) prior to disposal and transported to a licensed waste disposal facility.	Contractor	During Construction
		Remove all waste from the site on completion of the works.	Contractor	During Construction
		Upon completion of waste disposal, retain all original weighbridge / disposal receipts issued by the receiving waste facility in a waste register as evidence of proper disposal.	Contractor	During Construction
		Ensure an adequate number of bins are placed at the site for workers and that all litter is placed in these bins. Ensure work areas of the Project site are kept clean and free of litter, including cigarette butts, at all times.	Contractor	During Construction
Traffic	<ul style="list-style-type: none"> Disruption to traffic flows Temporary road closures 	Position vehicles, materials and equipment to minimise impacts to public access and parking.	Contractor	During Construction
		If required, restrict heavy vehicles to specified routes.	Contractor	During Construction

Impact On	Reasons	Safeguards/Mitigation Measures	Responsibility	Timing
	<ul style="list-style-type: none"> Safety 	Implement a Traffic Management Plan prior to the commencement of any construction works to ensure that traffic disruptions are mitigated, and commuters are notified of detours and closures through signage.	Contractor	Prior to Construction
		If road closures required, undertake consultation, in accordance with Section 138 of the Roads Act, with TfNSW for any road closures required on classified Roads.	Contractor	Prior to Construction
		Notify nearby businesses and sensitive receivers and give opportunity to comment on temporary road closures prior to commencement of construction.	Contractor	Prior to Construction
		Maintain a project complaint register as part of the Traffic Management Plan.	Contractor	Prior to Construction
Visual Amenity and Landscape	<ul style="list-style-type: none"> Impact on the community and native fauna 	Notify community or neighbours where light impacts are anticipated.	Contractor	Prior to Construction
		Position lighting in residential areas to direct light away from houses wherever possible.	Contractor	During Construction
		Ensure all access restrictions are removed following construction.	Contractor	Post Construction
		Where possible, consider additional revegetation to further reduce impact of light spill on residences.	Contractor	During Construction
		Floodlighting should be designed to face inward, which will reduce the potential impacts of light pollution to nearby sensitive receivers.	Contractor	During Construction
		Position lighting to face away from Landing Lights Wetland.	Contractor	During Construction
Community	<ul style="list-style-type: none"> Perceived safety Visual, traffic, noise and dust impacts 	Ensure all recommended mitigation measures for noise and vibration, amenity, traffic and air quality are adhered to.	Contractor	During Construction
		Consider the recommendations outlined in the CPTED Report (The Design Partnership, 2021; Appendix J)	Bayside Council and Contractor	Prior to Construction
		Prepare a CEMP to include the required management and mitigation measures. The CEMP will provide a framework for establishing how these measures will be implemented and who will be responsible for their implementation. The CEMP will be prepared prior to the proposal's construction and must be reviewed and certified by Council, prior to the start of any on site work. The CEMP will include sub plans for all impacts identified within this REF.	Contractor	Prior to Construction
		The Contractor is required to prepare a Stakeholder Engagement Plan to keep residents informed of progress and specific construction activities.	Contractor	During Construction
Cumulative Impacts	<ul style="list-style-type: none"> Notifying community members 	Ensure a plan for community consultation is developed which outlines the dissemination of information to the community via letterbox drops, websites and newsletters	Contractor	Prior to Construction
		Notify sensitive receivers including businesses and schools which are at risk of impacts to day-to-day functioning and trading at least 2 weeks prior to works commencement.	Contractor	Prior to Construction
		Where multiple projects are occurring within the same vicinity at the same time, undertake communication between construction contractors to ensure that potentially noisy or disruptive activities are not undertaken at the same time.	Contractor	During Construction

9. Conclusion

The Project has been subject to assessment under Division 5.1, Part 5 of the EP&A act. This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration of other environmental planning instruments as well as other NSW and Commonwealth legislation.

The proposal will aid in the delivery of multiple objectives identified both in the Eastern City District Plan and Bayside Council LSPS such as providing improved social infrastructure, delivering high quality open space and protecting the health of Bayside's waterways and biodiversity.

The Project as described in this REF best meets the Project objectives, however, would still result in some impacts. Environmental impacts associated with the Project would generally be limited to contamination and biodiversity. Appropriate mitigation measures to be undertaken both during the detailed design stage and during construction have been recommended to ensure such impacts are minimised. This includes the recommendation for the following management plans:

- CEMP
- Sediment and Erosion Plan
- Soils and Water Management Plan
- Asbestos Management Plan, if required
- RAP
- LTSMP
- WEMP
- GGBFMP
- Noise and Vibration Management Plan
- Traffic Management Plan

This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and the requirements of the EPBC Act. Based on the assessment contained in this REF, it is considered that the proposal is not likely to have a significant impact upon the environment or any threatened species, populations or communities. Accordingly, an Environmental impact Statement (EIS) is not recommended.

The Project has also taken into account the principles of ecologically sustainable development and the objects of the EP&A Act. The proposal would be delivered to the maximum benefit for the community, be cost effective and minimise any adverse impacts on the environment. On balance, the Project is considered justified and in the public interest.

9.1 Assessor Declaration

This REF provides a true and fair review of the activity in relation to its likely effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the Project and provides sufficient information to determine whether there is likely to be a significant impact on the environment as a result of the Project.

I have considered all environmental impacts and safeguards to the best of my knowledge and have sought advice where required.

Project Name	Barton Park Precinct Masterplan
Project Director Daniel Magdi Eco Logical Australia Level 3, 101 Sussex Street, Sydney 2000 Ph: 02 9259 3757	 Date: 3 December 2021
Project Manager Rebecca Ben-Haim Eco Logical Australia Level 3, 101 Sussex Street, Sydney 2000 Ph: 02 9259 3745	 Date: 3 December 2021

10. References

Bayside Council. (2020a). Future Bayside – Local Strategic Planning Statement.

Bayside Council. (2020b). Barton Park Masterplan.

Bayside Council. (2021). *Flood Advice Letter for 90-96 Bestic Street, Banksia* (21/104995) (Australia, Bayside Council). Sydney, NSW.

Cooks River Alliance. (2017). Cooks River Catchment. Accessed 27/5/2021: <https://cooksriver.org.au/about-us/cooks-river/>

Consulting Earth Scientists. (2001). Phase I Environmental Site Assessment: Cooks Cove Development Site. Prepared for Trafalgar Properties Pty Ltd and Page Kirkland Management Pty Ltd. (Report ID: CES010403-TRF-01-D1).

Consulting Earth Scientists. (2008). Report on Additional Soil, Groundwater and Landfill Gas Assessment. (Report ID: CES050706-BCC-16-F)

Consulting Earth Scientists. (2017). Pumping Tests and Leachate Treatment Pilot Trial, Southern Precinct. (Report ID: CES130608-BP-AY)

Cundall. (2021). Email correspondence dates 3 August 2021 regarding potential lighting impacts on Landing Lights Wetland and nearby residents.

Department of the Environment, DOE. (2015). *Arrive Clean, Leave Clean* (Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems) (Australia, Australian Government, Department of the Environment). Canberra.

Department of Environment and Climate Change NSW (2009). Interim Construction Noise Guideline

Department of Environment, Climate Change and Water (2006). *Cooks River Water Quality and River Flow Objectives*. Accessed 15/6/2021 from <https://www.environment.nsw.gov.au/ieo/CooksRiver/report-02.htm>

Department of Environment, Water, Heritage and the Arts, DEWHA. (2009). *Significant impact guidelines for the vulnerable green and golden bell frog (Litoria aurea)* (Australia, Department of Environment, Water, Heritage and the Arts). Canberra, ACT.

Department of Infrastructure, Transport, Regional Development, Aviation. DITRC (2013). Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports. Canberra.

Department of Land and Water Conservation NSW. (2002). Site investigations for urban salinity

Eco Logical Australia. (2021). Flora and Fauna Assessment.

Edison Environmental and Engineering. (2020a). Long-term Site Management Plan, Recreational/Open-space Land Use, Barton Park, New South Wales (Report ID: E17011-CU-03-SMP Rev4).

Edison Environmental and Engineering. (2020b). Preliminary Geotechnical Investigation Report. Proposed Master Plan Development Barton Park, Bestic Street Banksia, New South Wales. (Report ID: E17011-CU-15-R)

Edison Environmental and Engineering. (2020c). Sampling, Analysis and Quality Plan (SAQP): Preliminary Environmental Site Assessment, Portion of Barton Park Occupied by Former St George Soccer Stadium, Banksia, New South Wales. (Report ID: E17011-CU-14-SAQP).

Edison Environmental and Engineering. (2021). Remediation Action Plan. Barton Park Master Plan Works, Banksia, New South Wales. (Report ID: 17011-CU-17-RAP Rev1)

Environmental Protection Authority. (2020). Assessment and Management of Hazardous Ground Gases: Contaminated Land Guidelines.

Green Business Light UK. (n.d.). Read our ultimate guide to lux vs lumens vs Watts for lighting installations: Warehouse & Factory Lighting. Green Business Light. Retrieved December 2, 2021, from <https://greenbusinesslight.com/resources/lighting-lux-lumens-watts/>.

Greater Sydney Commission, GSC. (2018a). *The Greater Sydney Regional Plan, A Metropolis of Three Cities* (Australia, Greater Sydney Commission). Sydney, NSW.

Greater Sydney Commission, GSC. (2018b). *Eastern City District Plan*. Sydney, NSW.

Maunsell McIntyre. (2001). Cooks Cove Master Plan, Site History Geotechnical and Contamination Issues – Desk Top Study.

Renzo Tonin and Associates. (2021). Acoustic Assessment

Varga Traffic Planning. (2020). Traffic and Parking Assessment Report

