Recreation facilities at Rockdale and Brighton-Le-Sands

Review of Environmental Factors

Transport for NSW | November 2019

NSW GOVERNMENT

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Prepared by AECOM Australia Pty Ltd for Transport for NSW

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Executive summary

The proposal

Transport for NSW (formally Roads and Maritime Services) propose to build new and upgraded recreational facilities at McCarthy Reserve/Ador Park Precinct, Rockdale and Brighton Memorial Fields, Brighton-Le-Sands, on behalf of Bayside Council. The proposal would improve the quality and functionality of the existing recreational areas by providing additional and enhanced facilities. The upgrades are being provided in lieu of compensation for the temporary loss of similar facilities within Rockdale Bicentennial Park. Those facilities will be removed when the M6 (previously known as the F6 Extension) Stage 1 construction starts. The proposed facilities will be permanent and provide a long term legacy for the community benefit.

The purpose of this Review of Environmental Factors (REF) is to describe and assess the proposal, to determine whether there are likely to be significant impacts on the environment and to inform the decision to proceed with the proposal.

Key features of the proposal would include:

McCarthy Reserve/Ador Park Precinct, Rockdale

- Upgraded full-sized sports field at McCarthy Reserve from a grass turf to a synthetic turf
- A new mid-sized grassed turf sports field at Ador Park Precinct
- A new public vehicle access point off West Botany Street and a new car park with increased capacity and improved layout
- Removal and replacement of the existing car park at Bay Street
- A new skate park
- New playground facilities to a regional classification
- A new pedestrian bridge over Muddy Creek to provide pedestrian connectivity
- A dedicated bicycle bridge over the West Botany Street crossing of Muddy Creek
- A pedestrian and cyclist shared path with links to local connections including the proposed M6 Stage 1 project pedestrian and cyclist shared
- Lighting will be provided around the new sports fields, along the shared pathway, at the new skate park and around the new car park area
- A new amenity building with change rooms, canteen kiosk and amenities servicing McCarthy Reserve
- A new toilet block with associated amenities servicing Ador Park Precinct users
- Fencing around the sports fields and reserve boundaries, where and as required
- Tree planting and landscaping.

Brighton Memorial Fields, Brighton-Le-Sands

- Upgraded full-sized sports field from a grass turf to a synthetic turf
- A new mid-sized grassed turf sports field with irrigation facilities
- A new amenities building servicing the playing fields
- New playground facilities to a local classification
- Upgraded car park with increased parking capacity
- Lighting will be provided around the sports fields and the upgraded car park
- New fencing around the sports fields and reserve boundaries where and as required
- Tree planting and landscaping.

Need for the proposal

Sporting fields and recreational facilities within Rockdale Bicentennial Park would be directly impacted by the M6 Stage 1 project as the area within and adjacent to the reserved F6 corridor is required to build Stage 1 of the M6. Facilities which the community will temporarily lose include a playground with equipment, a skate park, a recreational oval and three soccer playing fields. In response to community feedback and engagement with key stakeholders, Transport for NSW are proposing permanent upgrades to existing sporting facilities in the area, to minimise impact on local sporting clubs and the community during construction. This would include the creation of new grass and synthetic playing fields and the upgrade of existing amenity block facilities. Providing these new or upgraded facilities would benefit the Rockdale and Brighton-Le-Sands communities and minimise the impacts of the M6 Stage 1 project on local recreational facilities.

A key objective of the proposal is to have the upgrades available before the existing facilities at Rockdale Bicentennial Park are unavailable for use; and to minimise disruption to soccer games.

Options considered

Ten locations were considered as potential sites to provide offset recreational facilities.

Potential sites were compared against the following key criteria:

- Proximity to Rockdale Bicentennial Park and the local user community (eg within a one kilometre radius)
- Availability of public open space owned either by Bayside Council or Transport for NSW
- Suitability of land (minimal site constraints such as utilities, and public accessibility, with vehicle access, parking and public and active transport links)
- Opportunity to improve the existing facilities or provide new community facilities where there were none.

The preferred option selected was to provide new and upgraded recreational facilities at Brighton Memorial Fields and at McCarthy Reserve/Ador Park Precinct. These sites were considered to best meet the assessment criteria.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. Clause 65 of the ISEPP describes development permitted without consent from council.

As the proposal is for the development of recreation areas and recreation facilities (with associated amenities and demolition of existing buildings) and is to be carried out by Transport for NSW on behalf of Bayside Council, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from Bayside Council is not required as council is both the proponent and the determining authority for the proposed works.

Community and stakeholder consultation

Transport for NSW commenced engagement with the community and key stakeholders on the M6 Stage 1 project in 2017. Since this time, four community notifications containing information about open spaces impacted by the M6 Stage 1 project have been made available on the website and distributed to the community (refer to Section 5 for more details).

Community members and stakeholders were encouraged to provide their feedback, ask questions and make comments during direct stakeholder meetings as well as via email, mail or phone contact. This includes during the exhibition of the Environmental Impact Statement (EIS) and Preferred Infrastructure Report for the M6 Stage 1 project.

Matters raised that are relevant to the proposal included:

- Construction timing
- Safety and security concerns
- Construction impacts on sporting groups
- Temporary loss of facilities/community amenities
- Lighting impacts on surrounding properties
- Potential for social deviant behaviour in parks and open spaces
- Availability of parking in and around open spaces and playing fields.

This REF will be made available on the Transport for NSW and Bayside Council websites to inform the community and stakeholders about the proposal. The REF will be available for 15 business days. During this time, targeted engagement will be undertaken for residents and neighbours adjacent to and nearby the proposal sites. This would include door knocking visits and written communications. Feedback received on the REF will be incorporated into a Consultation Report and will be considered in the determination of the proposal.

Environmental impacts

The main findings of the assessment of the proposal are as follows.

Traffic, access and parking

- Construction activities would generate a minor increase in heavy vehicle traffic which are expected to be well accommodated by the surrounding road network capacity
- The upgraded car parking area is proposed to provide improved access and additional capacity
- The additional traffic that would be generated by the new and upgraded recreational facilities would be small and would not significantly change traffic network capacity in the local area (refer to section 6.1).

Noise and vibration

- Construction activities would generate temporary noise and vibration impacts for residents and other adjacent sensitive receivers. These would be managed through construction management practices
- Noise may at times be audible at nearby residential receivers, however given that the proposal is an upgrade of existing recreational facilities in the area, the character of the noise is not expected to change significantly and is considered to be typical and acceptable for the surrounding areas (refer to section 6.2).

Landscape character and visual amenity

- Construction activities would result in minor reductions in visual amenity for several receptors across a limited area, and for a temporary duration
- The proposal would result in a low to moderate impact on existing views and visual amenity for a small number of residents
- Moderate visual impacts from lighting is expected at McCarthy Reserve/Ador Park Precinct site during evening hours until the fields are closed. Negligible impacts from lighting are expected at Brighton Memorial Fields site.
- Lighting provided for the proposal would be designed to comply with Australian Standard (AS) 4282 – Control of the obtrusive effects of outdoor lighting and AS 2560:2007 Sports Lighting

Biodiversity

- The construction of the facilities at both sites would require the removal of native and non-native vegetation and open grassed areas. The native plants and some trees to be removed do not form a native vegetation community
- Areas of vegetation have been identified for retention (refer to section 6.4). Further opportunities to retain vegetation will be investigated as the proposal design progresses
- The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required
- The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

Surface water and flooding

- Potential surface water impacts associated with the construction include increased runoff and sedimentation, discharge and contamination. These would be managed through standard construction management practices
- McCarthy Reserve/Ador Park Precinct is located within the 1% Annual Exceedance Probability flood extent. Operational activities associated with the proposal could result in impacts if not mitigated.

Soils and contamination, geology and hydrology

- The movement and exposure of soil during construction would subsequently increase the potential for erosion and mobilisation of soil by wind and water action which may result in impacts to surface water quality
- There is a potential risk that acid groundwater and or leachate from stockpiles could migrate into surrounding soils and waterways if not managed appropriately
- There is potential to encounter contaminated material in the areas of modified fill at McCarthy Reserve/Ador Park Precinct. Other contaminants, such as asbestos, may also be present and would need to be managed.

Justification and conclusion

The proposed upgrade of existing and construction of new recreational facilities at McCarthy Reserve, Rockdale and Brighton Memorial Fields, Brighton-Le-Sands is subject to assessment under Division 5.1 of the EP&A Act. The 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.

The proposal will provide social benefit to the local community by providing new and improved recreational facilities, in lieu of compensation for the temporary loss of recreational facilities at Rockdale Bicentennial Park during the construction of the M6 Stage 1 project as well as providing long term facilities for the community. A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development. The proposal as described in the REF best meets the project objectives. Safeguards and management measures as detailed in this REF would minimise potential design and construction impacts. Impacts and measures would be refined further in consultation with Bayside Council as the detailed design of the proposal progresses.

Display of the review of environmental factors

This REF is on display for comment and can be accessed in the following ways:

Internet

The REF is available as a pdf file on the Transport for NSW website at ***www.rms.nsw.gov.au***, the NSW Government Have Your Say website at ***www.nsw.gov.au/haveyoursay*** and from a link found on the Bayside Council website ***www.bayside.nsw.gov.au***.

Printed copies

The documents can be viewed at the following locations:

- Transport for NSW: 20-44 Ennis Road, Milsons Point NSW 2061
- Rockdale Customer Service Centre, 444-446 Princes Highway, Rockdale NSW 2216
- Brighton-Le-Sands Library Brighton-Le-Sands Library: 1 Moate Avenue, Brighton-Le-Sands, NSW 2216
- Kogarah Library and Service Centre: Kogarah Town Square, Belgrave Street, Kogarah NSW 2223
- Eastgardens Library: Westfield Eastgardens, 152 Bunnerong Road, Eastgardens.

Copies by request

Printed and electronic copies are available by contacting ***M6Stage1@rms.nsw.gov.au*** or 1800 789 297 noting that there may be a charge for hard copies, CD or USB.

How can I make a submission?

To make a submission about this proposal, please send your written comments to:

Portal: ***rms.nsw.gov.au/m6portal***

Email: ***M6Stage1@rms.nsw.gov.au***

Post: M6 Project Team
Transport for NSW
Locked Bag 928,
North Sydney NSW 2059

Submissions will be managed in accordance with the Transport for NSW Privacy Statement which can be found here ***www.rms.nsw.gov.au*** or by contacting 1800 789 297 for a copy.

What happens next?

Transport for NSW and Bayside Council will consider the submissions received during public display of the REF.

Following this consideration, Bayside Council will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of the decision.

If the proposal is determined to proceed, Transport for NSW and Bayside Council will continue to consult with the community and stakeholders prior to and during construction.

Contents

Tables

Figures

Appendices

1. Introduction

This chapter introduces the proposal and provides the context of the environmental assessment.

1.1 Proposal identification

Transport for NSW (formally Roads and Maritime Services) propose to build new and upgraded recreation facilities (the proposal) to offset the temporary loss of similar facilities as a result of the construction of the M6 Stage 1 project. These facilities would be delivered by Transport for NSW on behalf of Bayside Council in lieu of compensation for the land area to be acquired for the M6 Stage 1 project.

The proposal would be located at two sites within the Bayside Council Local Government Area (LGA), providing facilities at Brighton Memorial Fields, Brighton-Le-Sands and McCarthy Reserve/Ador Park Precinct, Rockdale.

A key outcome of the proposal would be to provide alternative facilities for community use while some existing facilities at Rockdale Bicentennial Park and Bicentennial Park East are unavailable during the construction of the M6 Stage 1 project. The proposed facilities would be completed before construction for the M6 Stage 1 project to minimise disruption to the community. These recreational assets would be provided for the Bayside LGA permanently, with Bayside Council being the owner responsible for the care and maintenance of the facilities.

The existing facilities at Rockdale Bicentennial Park would not be affected while the proposed new facilities are being constructed and would be available for use. Once the proposed facilities are installed, the existing facilities at Rockdale Bicentennial Park would be unavailable for use for around four years while the M6 Stage 1 project is being built in this area. New facilities at Rockdale Bicentennial Park would be provided as part of the M6 Stage 1 project, expected to be complete by 2025. These facilities and the new and upgraded recreational facilities proposed would be available for use by all community members, community groups and associations and provide a long-term legacy for the community.

The location of the proposal is shown in Figure 1-1, Figure 1-2 and Figure 1-3. The proposed facilities to be provided at each site are shown in Figure 1-4 and Figure 1-5.

Chapter 3 describes the proposal in more detail.

Figure 1-1 Location of the proposal

Figure 1-2 Proposed site – McCarthy Reserve / Ador Park Precinct (Existing features)

Figure 1-3 Proposed site – Brighton Memorial Fields (Existing features)

Figure 1-4: The proposal - McCarthy Reserve/Ador Park Precinct

Figure 1-5: The proposal - Brighton Memorial Fields

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by AECOM Australia Pty Ltd (AECOM) and Transport for NSW on behalf of Bayside Council. For the purposes of the proposal, Bayside Council is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The design and construction of the proposal would be undertaken by Transport for NSW on behalf of Bayside Council. Further detail on the statutory context and requirements for the proposal are outlined in Chapter 4.

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposal and assessment of associated environmental impacts has been undertaken in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *Roads and Related Facilities EIS Guideline (DUAP 1996)*, the *Biodiversity Conservation Act 2016 (BC Act), the Fisheries Management Act 1994* (FM Act), and the *Australian Government's Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act including that Transport for NSW examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

During the development of the Environmental Impact Statement (EIS) for the proposed M6 Stage 1 project, which is a proposed motorway between the New M5 at Arncliffe and President Avenue at Kogarah, potential impacts on recreational facilities were identified. This included recreational facilities within Rockdale Bicentennial Park including impacts to a playground with equipment, a skate park, an open recreational oval and up to three soccer playing fields. To mitigate the temporary unavailability of these facilities, an upgrade to nearby similar facilities would be provided to offset this loss, prior to any impact to facilities within Rockdale Bicentennial Park.

These recreational facilities need to be provided in advance of the motorway construction works under a separate planning approval.

The proposal is therefore needed to help provide the required recreational facilities to meet the needs of users during the period the M6 Stage 1 project is being built.

2.2 Proposal objectives and development criteria

2.2.1 Proposal objectives

The objectives of the proposal include:

- Provide facilities within the Bayside LGA and located where council is able to secure short and/or long term land tenure
- Provide facilities while the existing facilities at Rockdale Bicentennial Park are unavailable for use
- Minimise disruption to the soccer season
- Provide facilities that are of equal value and/or use to that of existing assets
- Consider adjacent road function, local land use activity and access needs
- Comply with relevant council standards for a consistent approach to maintenance and operational activities
- Be consistent with any Plan of Management relating to the land
- Minimise potential environmental impacts and include user safety, road user safety and urban design considerations.

2.3 Alternatives and options considered

The initial investigation into alternatives for the proposal included consideration of:

- Alternative 1 - ‘do-nothing’ to offset the temporary loss of recreational facilities at Rockdale Bicentennial Park
- Alternative 2 - provide replacement facilities at another location(s) prior to the assets they are replacing being made unavailable.

The ‘do nothing’ approach would involve the removal of the current facilities at Rockdale Bicentennial Park to facilitate construction of the M6 Stage 1 project with no replacement facilities provided until reinstatement of this area post-construction. This was not considered to be a feasible alternative as it would result in considerable impacts on users of these facilities and would not meet the proposal objectives outlined in section 2.2.1.

Construction of new and upgraded facilities at another location(s) would help to offset the temporary loss of facilities at Rockdale Bicentennial Park, lessening the social impacts of the M6 Stage 1 project on the local community. This was considered to be the preferred alternative as it would best meet the proposal objectives.

In identifying this preferred alternative, several site options were considered to provide new facilities. The following section outlines the identification and consideration of these options.

2.3.1Criteria for options identification

Potential sites were compared against the following key criteria:

- Proximity to Rockdale Bicentennial Park and the local user community (eg within a one kilometre radius)
- Availability of public open space owned either by Bayside Council or Transport for NSW
- Suitability of land (minimal site constraints such as utilities, and public accessibility, with vehicle access, parking and public and active transport links)
- Opportunity to improve the existing facilities or provide new community facilities where there were none.

These criteria were established to align with the proposal objectives in section 2.2.1.

2.3.2Identified options

Ten potential sites to provide offset recreational facilities were considered. Relevant details of each site are provided in Table 2-1. The locations of the site options are shown in Figure 2-1.

Table 2-1: Features of recreational facility options considered

Site	Approx. Area (hectares)	Approx. distance from Rockdale Bicentennial Park	Existing Facilities	Constraints
1. Brighton Memorial Fields	2ha	Directly adjacent - east	• Playing fields • Playground • Tennis courts	• Utilities
2. McCarthy Reserve/Ador Park Precinct	2.6ha	900 metres north	• Playing field	• Flood affected
3. Barton Park	17ha	1.7 kilometres north	• Playing fields	• Flood plain • Distance
4. C A Redmond Field	6ha	1 kilometre north	• Playing fields	• Flood plain
5. Civic Avenue Reserve	16ha	Directly adjacent - south	• Playing fields	• Flood plain • Environmentally Sensitive Land* • Heritage

Site	Approx. Area (hectares)	Approx. distance from Rockdale Bicentennial Park	Existing Facilities	Constraints
6. Scarborough Park North	6ha	800 metres south	• Playing fields	• Flood plain • Environmentally Sensitive Land • Heritage
7. AS Tanner Park	2.6ha	750 metres south	• Playing fields	• Flood plain • Environmentally Sensitive Land • Heritage
8. Scarborough Park	12ha	1 kilometre south	• Playing fields • Playground	• Flood plain
9. James Cook Boys Technology High School	4.5ha	750 metres south-west	• High school • Playing fields • Multi-use Courts	• School buildings, facilities and operations
10. Moorefield Girls High School	3.7ha	850 metres south-west	• High school • Playing fields • Multi-use Courts	• School buildings, facilities and operations

* Environmentally Sensitive Land – Wetlands/Biodiversity – Rockdale LEP 2011

2.3.3Analysis of options

Each site was evaluated against the criteria in section 2.3.1. Table 2-2 provides a summary of the key considerations for each site which helped to inform the decision-making process. The locations of the site options are shown in Figure 2-1.

Table 2-2: Summary of site options analysis

Site	Assessment Criteria*				Commentary
	1	2	3	4	
1. Brighton Memorial Fields	✓	✓	✓	✓	Located directly adjacent to Rockdale Bicentennial Park east. Existing grassed playing field for training during the week and Saturday games.
2. McCarthy Reserve/Ador Park Precinct	✓	✓	✓	✓	Existing grassed playing field at McCarthy Reserve with potential space for new fields and facilities at Ador Park Precinct using open space that is currently utilised for training during the week and Saturday games.
3. Barton Park		✓	✓	✓	Existing playing fields with potential space for new fields and facilities. However, the distance from the intended user community is too far to provide equitable offset.

Site	Assessment Criteria*				Commentary
	1	2	3	4	
4. C A Redmond Field	✓	✓		✓	Existing grassed playing fields with potential space for new fields and facilities. However, existing use for rugby would compete with any new soccer fields. There is also less available parking and less direct access from main roads.
5. Civic Avenue Reserve	✓	✓			Adjacent to Rockdale Bicentennial Park providing good opportunity for proximal offsetting. However, the existing usable area is relatively small as the site is constrained by wetland habitat which covers a large area of the site.
6. Scarborough Park North 7. AS Tanner Park 8. Scarborough Park			✓		Existing grass playing fields which could be upgraded. However, no apparent space for new fields or facilities and distance from the intended user community is too far to provide adequate offsetting.
9. James Cook Boys Technology High School 10. Moorefield Girls High School	✓			✓	While these sites are both close to Rockdale Bicentennial Park and offer opportunity to improve existing facilities, they are both constrained by existing school buildings, facilities and operations and are not owned by Bayside Council or Transport for NSW.

* Criteria include: 1. Proximity to Rockdale Bicentennial Park and the local user community (eg within a one kilometre radius), 2. Availability of public open space owned either by Bayside Council or Transport for NSW, 3. Suitability of land (minimal site constraints such as utilities, and public accessibility, with vehicle access, parking and public and active transport links), 4. Opportunity to improve the existing facilities or provide new community facilities where there were none.

2.4 Preferred option

The preferred option selected was to provide offset recreational facilities at Brighton Memorial Fields and at McCarthy Reserve/Ador Park Precinct.

These sites were considered the most suitable locations as they met all the assessment criteria. A detailed description of the proposal at both locations is provided in Chapter 3.

Whilst the proposal would provide a major enhancement in the amenities and play facilities available at these sites, there would be a temporary loss in the number of fields during the M6 Stage 1 construction. However, given the provision of two full sized synthetic pitches, the proposal would be anticipated to provide an increased productivity. This is because the synthetic fields are easier to maintain and would cope better with wet weather. Once the reinstatement works for the M6 Stage 1 project are complete at Rockdale Bicentennial Park and the proposed recreational facilities are also completed, there would be a substantial increase in the quality and number of community assets in the area.

Table 2-3 outlines how the proposal would affect playing field community assets available before, during and after construction of the M6 Stage 1 project.

Table 2-3: Playing field assets available before, during and after construction

Location	Playing field assets available		
	Currently Existing	**During M6 Stage 1 construction**	**Post construction**
Rockdale Bicentennial Park	2xLarge grass 1xMid-sized grass	None	1xLarge grass 1xMid-sized grass 2xMini grass
McCarthy Reserve/Ador Park Precinct	1xLarge grass	1xLarge synthetic 1xMid-sized grass	1xLarge synthetic 1xMid-sized grass
Brighton Memorial Fields	1xLarge grass	1xLarge synthetic 1xMid-sized grass	1xLarge synthetic 1xMid-sized grass
Totals	4xLarge grass 1xMid-sized grass	2xLarge synthetic 2xMid-sized grass	2xLarge synthetic 1xLarge grass 2xMid-sized grass 2xMini grass

Figure 2-1 Playing field location options

3. Description of the proposal

This chapter describes the proposal including design criteria, engineering constraints major design features, construction method, utility adjustments and requirements for property acquisition.

3.1 The proposal

New and upgraded recreational facilities are proposed at McCarthy Reserve/Ador Park Precinct, Rockdale and Brighton Memorial Fields, Brighton-Le-Sands on behalf of Bayside Council. The proposal would improve the quality and functionality of the existing recreational areas by providing additional and enhanced facilities. The upgrades would offset the temporary loss of similar facilities within Rockdale Bicentennial Park, during the construction of the M6 Stage 1 project, as well as providing long term (permanent) facilities for the community.

The features to be provided and their layouts within the existing reserves have been developed in consultation with Bayside Council and other key stakeholders. For both locations, the majority of existing features and or facilities would be removed or substantially upgraded, eg amenities, carpark, light poles, tennis courts, and playing field surfaces.

Key features of the proposal would include:

McCarthy Reserve/Ador Park Precinct, Rockdale

- Upgraded full-sized synthetic sports field at McCarthy Reserve
- A new mid-sized grassed sports field at Ador Park Precinct
- Removal of the existing car park to allow for the mid-sized field
- A new public vehicle access point off West Botany Street, including a new and relocated car park with increased capacity and improved layout
- A new skate park
- New playground facilities to a regional classification
- A new pedestrian bridge over Muddy Creek to provide connectivity between McCarthy Reserve and Ador Park Precinct
- An addition to the West Botany Street bridge to provide a dedicated bicycle bridge for connectivity to the proposed M6 Stage 1 project pedestrian and cyclist shared pathway
- A pedestrian and cyclist shared path with links to local connections including the proposed M6 Stage 1 project pedestrian and cyclist shared pathway
- Lighting will be provided around the new sports fields, along the shared pathway, at the new skate park and around the new car park area
- A new amenity building with change rooms, canteen kiosk and bathroom amenities servicing McCarthy Reserve users
- A new toilet block with associated amenities servicing Ador Park Precinct users
- Fencing around the sports fields and reserve boundaries, where and as required
- Tree planting and landscaping.

Brighton Memorial Fields, Brighton-Le-Sands

- Upgraded full-sized synthetic sports field
- A new mid-sized grassed turf sports field with irrigation facilities
- A new amenities building servicing the playing fields
- New playground facilities to a local classification
- Removal of the tennis court facilities and replacement with grassed lawn area
- Upgraded car park with increased parking capacity
- Lighting will be provided around the sports fields and the upgraded car park
- New fencing around the sports fields and reserve boundaries where and as required
- Tree planting and landscaping.

The proposal would not affect Rockdale Bicentennial Park East. Construction of the proposal would be completed prior to impacts to Rockdale Bicentennial Park East due to construction of the M6 Stage 1 project.

It is proposed that there would be equitable sharing of the fields between the community, football clubs and other users including Brighton-Le-Sands Public School.

The concept designs for the proposal are shown in Figure 1-4 and Figure 1-5.

3.2 Design

The proposal design is based on a concept design for approval. Refinements to the design are expected prior to construction commencing.

3.2.1 Design criteria

The proposal would be designed having regard to the following:

- National Construction Code 2019 (NCC)
- Relevant Australian Standards, including (but not necessarily limited to):
  - AS 1428 Design for Access and Mobility
  - AS 2560:2007 Sports Lighting
  - AS 4282 – Control of the obtrusive effects of outdoor lighting
  - AS 4685 SET: 2014 Playground Equipment and Surfacing
  - AS 4685.0: 2017 Playground Equipment and Surfacing - Part 0 - Development, installation, inspection, maintenance and operation
  - AS 4422: 2016 - Playground surfacing - Specifications, requirements and test method
- Asset Standards Authority (ASA) standards
- Rockdale Local Environmental Plan 2011
- Rockdale Development Control Plan 2011
- Rockdale Technical Guide, Civil Infrastructure Design 2012
- Relevant Transport for NSW standards
- Crime Prevention Through Environmental Design (CPTED) principles
- FIFA and Football NSW standards.

3.2.2Engineering constraints

A number of potential engineering constraints have influenced the development of the concept design for the proposal. These constraints are considered in the following sections and would be investigated further during the detailed design stage.

Flooding/stormwater

The following section provides a summary of the existing flooding constraints for the sites. Further information on potential flooding impacts is provided in section 6.5.

McCarthy Reserve/Ador Park Precinct

The Bayside Council flood model indicates that both McCarthy Reserve and Ador Park Precinct are subject to flooding for the 1% Annual Exceedance Probability (AEP) for present day conditions (refer to Figure 6-10). The model indicates:

- The southern areas of McCarthy Reserve/Ador Park Precinct along the boundary with Bay Street experience flooding to depths in the order of 250 millimetres with deepening flood level within the road corridor of Bay Street
- The northern area of McCarthy Reserve (just south of the PCYC St. George building) experiences flooding to depths in the order of 500 millimetres
- The eastern portion of Ador Park Precinct (along West Botany Street) reaches depths in the order of 750 millimetres.

Brighton Memorial Fields

The Bayside Council flood model indicates that Brighton Memorial Fields is partially subject to minor flooding for the 1% AEP for present day conditions (refer to Figure 6-11). The model indicates:

- Private properties and road reserves to the east and upstream of the site are flood affected
- The northern area of the site experiences a small area of flooding to depths in the order of 100 millimetres
- The north-eastern area of Sybil Lane around the intersection with Crawford Street experiences a small area of flooding to depths in the order of 100 millimetres

The southern end of Sybil Lane around the intersection with O'Neill Street experiences flooding to depths in the order of 250 millimetres.

Major utilities

The development of the proposal design has considered the location of major utilities and services (such as electricity, water/wastewater and telecommunications) that may constrain the construction and operation of the new facilities. Key utilities that have been identified at the sites include:

- Ausgrid 132kV underground transmission cables
- Sydney Water pipelines
- Local overhead powerlines.

Further detail outlining how these utilities would be addressed is provided in section 6.13.

3.2.3Major design features

The following section provides detail of the major design features which are proposed at both of the sites. The section is broken up into three parts, with general features of the proposal which are relevant to both sites described in the 'general design features' section and unique aspects of each of the two sites described in the latter sections.

General design features

Synthetic turf

- Synthetic turf is proposed at both sites to provide high quality synthetic playing and training fields. Where synthetic turf is proposed this would be designed to meet FIFA and Football NSW standards.

Amenity buildings

New amenities buildings are proposed at both sites. The buildings would serve the following functions:

- Home and away teams changing rooms featuring locker spaces, shower cubicles and toilets
- Sporting club storage
- Sporting club meeting room
- Canteen
- Operational storeroom with roller shutter
- Public amenities
- Water tank (water to be used for toilet flushing)
- External handwash, bubbler/water fill station.

Each amenity building would be designed to a similar standard and specification as follows:

- A single storey building of around 9 metres wide by 30 metres long
- The materials selected for the structures would be of a robust nature to deal with heavy use and potential vandalism. This may include the following or similar:
  - Glazed brick externally and common brick internally
  - Skillion colorbond roof
  - Marine grade stainless steel
  - High gloss porcelain tiles
  - Anti-graffiti coating on painted surfaces and brickwork (internal and external).

Field lighting

New and upgraded field lighting is proposed at both sites. The proposed field lighting would provide for better quality playing and training areas and more effective lighting with lower light spill and glare. Field lighting would be controlled using lighting control gear stationed in the new amenities building and would include capabilities for automated shutdown. The field lighting would provide the following lighting levels (in accordance with FIFA 2 standards):

- 50 lux for recreation and training
- 100 lux for amateur competition
- 200 lux for professional competition.

Lighting would be designed to achieve these lighting levels to a similar standard and specification as follows:

- Field lighting layout and design would be designed to comply with Australian Standard AS 2560:2007 Sports Lighting and would be assumed for recreational, practice, competition and senior competition use only
- Light spill would be designed to comply with Australian Standard 4282 – Control of the obtrusive effects of outdoor lighting.

The proposed operational hours for the new field lighting is detailed in Table 3-1. These hours are slightly longer than what currently occurs at the fields.

Consultation would occur with residents potentially affected by increased light spill due to the proposal once detailed design for lighting has been completed.

Table 3-1: Field lighting hours proposed

Field	Hours of field lighting operation (proposed)
McCarthy Reserve	**Monday to Friday** Sunset to 9:45 pm **Saturday and Sunday** Sunset to 9:45 pm
Ador Park Precinct	
Brighton Memorial Fields	

Car park lighting

Car park lighting is proposed at both sites for safety and security in the new carpark areas. The lighting would be designed to comply with AS 4282 – Control of the obtrusive effects of outdoor lighting.

Playgrounds

New playgrounds are proposed at both sites catering for different age groups and varying needs including all ability access for children and adults. Equipment would be provided for each site based on the respective playground classification. In general, the play equipment selection will:

- Be robust
- Be accessible
- Fit for purpose
- Have readily replaceable parts
- Allow for the safe installation, efficient maintenance and parts repair/replacement
- Consider Safety in Design principles.

Selection would also be driven by reduced likelihood of vandalism, comfort, applicable standards and certification compliance.

Pedestrian/cycle bridges

The two proposed pedestrian and cycle bridges would be a design similar to the Fleetwood Urban - Balmoral (example provided in Figure 3-1). This design would typically have a timber deck atop of concrete beams. The superstructure would consist of girder beams, cross members, joists and bracing with a wide array of material options. The proposed bridge would have safety fencing of around 1.4 metres high along each side with constructed steel bolted posts and woven mesh safety fencing. Depending on the structure height and application there are various balustrade/handrail and kick rail options, embellishments and other design features that could be added to the structure. The width of the pedestrian bridge would be around 1.5 metres which would be sufficient for its intended use as a pedestrian only bridge. The width of the cyclist bridge on West Botany Street would be around three metres which would allow two cyclists, side-by-side, to pass.

Figure 3-1: Example of a Fleetwood Urban Balmoral bridge design (source: https://fleetwoodurban.com.au/product/balmoral/)

McCarthy Reserve/Ador Park Precinct

The following section details major design features at McCarthy Reserve/Ador Park Precinct.

Full-sized playing field

A full-sized synthetic field is proposed at McCarthy Reserve to replace the existing grass field in a like-for-like orientation and location. This would provide a north-south orientated field located adjacent to Muddy Creek. The upgraded field would replace the existing grassed field and provide high quality synthetic playing and training field. The field would be designed and marked for soccer with use predominantly for training and recreational games associated with local soccer clubs. The field would be designed to the following general standards and specifications:

- A marked field of 95 metre in length by 55/64 metre in width with additional three metre ‘run-offs’ around the outside of the marked field
- A synthetic turf carpet consistent with the description under General Design Features
- Perimeter fencing as follows:
  - A low perimeter chain link fence of around 1.2 metres located along the eastern and western boundaries of the field to protect the synthetic field
  - A high perimeter chain link fence of around 6 metres located along the northern and southern perimeters of the field to stop high balls and protect the synthetic field.

Mid-sized playing field

A new grassed mid-sized field is proposed to provide additional capacity for training and games. The new mid-sized field at Ador Park Precinct would be located in the southern area of the reserve adjacent to Bay Street and would replace the existing car parking area. The new field would be orientated north-south, aligned with the new shared pathway and Muddy Creek to the west. The field would be designed to the following general standards and specifications:

- A marked field of 40 metres in length by 30 metres in width with additional ‘run-offs’ around the outside of the marked field
- The new field would be a grassed turf consisting of sports grade couch
- Perimeter fencing would include a chain link fence of around 6 metres located along the northern and southern perimeters of the field to stop high balls.

Amenity buildings

A new amenity building is proposed to be located adjacent to the upgraded playing field at McCarthy Reserve. The building would be located directly west of the playing field and would be consistent with the description provided under *General Design Features*.

Toilet block

A new toilet block is proposed to be centrally located in Ador Park Precinct. The toilet block would be comprised of separate male and female bathroom facilities, a water tank (water to be used for toilet flushing) and external handwash, bubbler/water fill station. The materials selected for the structures would be of a robust nature to deal with heavy use and potential vandalism. This may include the following or similar:

- Glazed brick externally and common brick internally
- Skillion colorbond roof
- Marine grade stainless steel
- High gloss porcelain tiles
- Anti-graffiti coating on painted surfaces and brickwork (internal and external).

Car parking

An upgraded car parking area is proposed to provide improved access and additional capacity. The existing unpaved car parking area on Bay Street would be relocated and upgraded to a new location at West Botany Street. The new car parking area would provide around 88 car parking spaces including accessibility parking spaces, which is around an additional 78 parking spaces.

A new vehicle access would be constructed from West Botany Street to provide easy access and free flow circulation of traffic within the car park.

Signage indicating flooding, and bollards, would be implemented around the car park to highlight the potential risk of flooding.

In addition to car parking facilities, cycle parking hoops would also be provided. The location for the cycle parking hoops would be determined as part of the detailed design for the proposal.

Shared pathway – Ador Park Precinct

A new pedestrian and cyclist shared pathway of around 5 metres in width is proposed through Ador Park Precinct. This would– comprise a 3 metre wide cycle path and 1.5 metre pedestrian path. The shared pathway would be integrated with the new pedestrian bridge proposed across Muddy Creek as well as with the existing pedestrian bridge over Muddy Creek along West Botany Street.

Muddy Creek pedestrian bridge

A new pedestrian bridge over Muddy Creek is proposed between Ador Park Precinct and McCarthy Reserve. The proposed bridge would be around 1.5 metres in width for pedestrians and span a length of about 29 metres.

West Botany Street cyclist bridge

The existing West Botany Street pedestrian bridge would need to be upgraded to widen the existing footpath for use by both pedestrians and cyclists. This would involve the construction of a new lightweight metal bridge integrated with the existing bridge to provide for cyclists, while the existing footpath would remain in use for pedestrians. The proposed bridge would be around three metres in width and span a length of about 20 metres.

Play area

A new play area is proposed at Ador Park Precinct which would include inclusive playground equipment (ie disabled access) to compensate for the temporary loss of the playground at Rockdale Bicentennial Park. The playground would be designed to a 'regional' standard which provides:

- Significant space for residents in the local government area and people from outside the area
- Visually appealing and well-equipped spaces with a variety of infrastructure such as car parking, children's playground equipment, barbeque and picnic facilities, park lighting, public art and public amenities.

Skate park

A new skate park would be provided at Ador Park Precinct. The skate park is likely to comprise street skate features. The final design would be developed in consultation with local user groups of the future facility to best address the needs of the local community. Security lighting will be provided around the skate park.

Other amenities and features

Other amenities and features are proposed for the site as part of the upgrade. These are generally complimentary to the main playing fields and help to provide for a wider range of activities. These include:

- A new barbeque station at Ador Park Precinct
- General planting and landscaping.

Brighton Memorial Fields

The following section details major design features at Brighton Memorial Fields.

Full-sized playing field

A full-sized synthetic field is proposed in the north western area of the site. The upgraded field would replace the existing grassed field and provide high quality synthetic playing and training field. The field would be designed and marked for soccer with use predominantly for training and recreational games associated with local soccer club. The field would be designed to the following general standards and specifications:

- A marked field of 95 metre in length by 64 metre in width with additional three metre 'run-offs' around the outside of the marked field
- A synthetic turf carpet consistent with the description under General design features
- Perimeter fencing as follows:
  - A low perimeter chain link fence of around 1.2 metres located along the eastern and western boundaries of the field to protect the synthetic field
  - A high perimeter chain link fence of around 6 metres located along the northern and southern perimeters of the field to stop high balls and protect the synthetic field.

Mid-sized playing field

A new grassed mid-sized field is proposed to provide additional capacity for training and games. The new mid-sized field would be located to the south of the full-sized field, with the new amenity building located centrally between the car parking area and the full-sized field. The new mid-sized field would be orientated east-west. The field would be designed to the following general standards and specifications:

- A marked field of 40 metres in length by 27 metres in width with additional 'run-offs' around the outside of the marked field
- The new field would be a grassed turf consisting of sports grade couch
- Irrigation (to be confirmed as part of detailed design) designed to comply with Sydney Water's standards for irrigation systems.

Amenity building

A new amenity building is proposed to be located in the centre of the site between the full-sized playing field and carpark area. The building would be consistent with the description under *General design features*.

Car parking

An upgraded car parking area at Brighton Memorial Fields is proposed to provide improved access and additional capacity. The upgraded parking area would provide around 60 car parking spaces, including accessibility parking spaces, which almost doubles available parking with an additional 24 car parking spaces.

The existing vehicle access via Sybil Lane connecting onto Crawford Road and O'Neill Street along the eastern boundary of the park would be maintained. One-way vehicle circulation would be implemented with vehicles entering via O'Neill Street and exiting onto Crawford Road. The upgraded parking area and layout would provide better internal circulation of vehicles with less conflict between vehicles.

In addition to car parking facilities, cycle parking hoops would also be provided. The location of cycle parking hoops would be determined during detailed design.

Play area

A new play area would be provided with new equipment on a like-for-like basis i.e. comparable to what is currently present. The playground would be designed to a 'local' standard which provides a basic level of recreational infrastructure such as, children's playground equipment, seating and landscaping.

Other amenities and features

Other amenities and features are proposed for the site as part of the upgrade. These are generally complimentary to the main playing fields and help to provide for a wider range of activities. These include:

- General planting and landscaping around the site
- Removal of the tennis court facilities and replacement with grassed lawn area
- Reinstatement of the commemorative plaques on the entry gates, in consultation with the Brighton RSL Club.

3.3 Construction activities

3.3.1 Construction staging

The construction boundary, access and proposed staging of construction works at both sites are shown in Figure 3-2, Figure 3-3 and Figure 3-4.

Construction would be staged between the proposed sites in order to minimise impacts on the soccer playing season. The required program would be confirmed following discussions with contractors. Where possible, all endeavours would be made to undertake work completely outside of the soccer season.

Brighton Memorial Fields

Construction at Brighton Memorial Fields is anticipated to take around 12 months and is currently scheduled to commence in late 2020 with hand-over scheduled for late 2021. Brighton Memorial Fields will be available for use throughout the 2020 soccer season.

McCarthy Reserve/Ador Park Precinct

Construction at McCarthy Reserve/Ador Park Precinct is anticipated to take around 18 months and is currently scheduled to commence in mid-2020 with hand-over scheduled for late 2021. It is anticipated that the work would be undertaken in two stages to avoid impacts on the 2020 football season. The division of work areas is illustrated in Figure 3-2 and Figure 3-3 and indicative construction timing of staging is provided in Table 3-2. The key elements of the project and each stage are as follows:

Stage 1 – Ador Park Precinct

- New mid-sized grass turf sports field (including fencing and lights)
- New carpark with a vehicle access point off West Botany Street
- New skate park
- New children's playground, and barbeque area and park amenities
- New pedestrian bridge over Muddy Creek (phase 1 - eastern abutment and footings)
- Add-on to the West Botany Road Bridge to provide for the shared pathway
- Tree planting and landscaping.

Stage 2 – McCarthy Reserve (concurrent with Brighton Memorial Fields)

- Upgraded full-sized synthetic turf sports field (including fencing and lights)
- New amenities building
- New pedestrian bridge over Muddy Creek
- Tree planting and landscaping.

Table 3-2: Indicative construction staging – McCarthy Reserve/Ador Park Precinct & Brighton Memorial

Location	Site establishment	Construction complete
Brighton Memorial	Late 2020	Late 2021
Ador Park **Stage 1**	Mid 2020	Late 2021
McCarthy Reserve **Stage 2**	Late 2020	Late 2021

Figure 3-2 Construction features - Ador Park Precinct - Stage 1

Figure 3-3 Construction features - McCarthy Reserve - Stage 2

Figure 3-4 Construction features - Brighton Memorial Fields

3.3.2Work methodology

Prior to commencement of construction works for the proposal, site establishment activities would be undertaken including notification of nearby residents, fencing off adjacent vegetation and vegetation clearing, where necessary, installing erosion and sediment controls, and establishing site compounds.

Finalised methodologies for construction of each aspect of the proposal would be confirmed during detailed design phase and finalised once a contractor has been engaged for the work. For the purposes of this assessment, indicative construction methodologies have been outlined in Table 3-3.

Construction stockpiles, compound areas and site access would be provided within the construction boundary identified at each site. The indicative location of construction site access and compounds is shown on Figure 1-4 and Figure 1-5.

Table 3-3: Indicative construction methodology

Project aspect	Indicative construction methodology/sequence
Demolition of existing structures	• Demolition of existing buildings and structures, including removal of the tennis court facilities at Brighton Memorial Fields • Isolation of utilities • Waste sorting.
Synthetic fields	• Strip turf and stockpile topsoil • Excavate, grade and trim ground to design formation level (subgrade) • Install underground electrical conduits • Construct light poles and footings • Proof roll subgrade • Install underground drainage system (Incl. Geotextile) • Place approved road base fil material in layers and compact to design requirements • Grade compacted surface to design cross fall and profile • Construct concrete perimeter drain • Construct hard landscaping (Incl. concrete edge strips/hobs and perimeter footpaths • Spray prime coat to design specifications • Place heavy duty drainage cell • Place shock pads - either cast in situ with equipment or install pre formed roll outs manually (depending on design) • Install synthetic turf to manufacturer's specifications (Incl. base and performance infill) • Install perimeter fencing (Incl. high catch fencing) • Install light poles and complete electrical cabling • Finishing works.

Project aspect	Indicative construction methodology/sequence
Grassed field	• Strip turf and stockpile topsoil • Excavate, grade and trim ground to design formation level (subgrade) • Proof roll subgrade • Grade compacted surface to design cross fall and profile • Install sprinkler system • Install underground electrical conduits • Construct light pole footings • Install light poles and complete electrical cabling • Topsoil and lay new grass • Finishing works.
Amenities buildings	• Strip turf and stockpile top soil • Excavate ground to design subgrade level • Place approved road base material in layers and compact to design requirements • Place reinforcement and formwork for footing construction • Place all service connections required as cast in (eg water, sewer, communications, electrical) • Pour concrete • Construct superstructure to design and specifications • Install roof framework and sheeting • Complete internal finishes • Final paint • Final clean and defects.
Car parking	• Strip turf and topsoil and trim/remove vegetation where required • Excavate, grade and trim ground to design formation level (subgrade) • Place in-ground services • Proof roll subgrade • Place approved road base material in layers and compact to design requirements • Grade compacted surface to design cross fall and profile • Install kerbing • Install asphalt to design and specifications • Finishing works (e.g. lighting, landscaping).
Pedestrian bridge and West Botany Street cyclist bridge	• Detailed earthworks • Construct foundations • Install bridge decking and connections to footpaths.
Landscaping and rehabilitation	• Soft landscaping works, including tree plantings • Installation of park lighting, furniture and signage.

3.3.3Construction hours and duration

The majority of works required for the proposal would be undertaken during standard construction hours:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 1:00 pm Saturdays
- No work on Sundays or public holidays.

Some night works would be required, particularly around service/utility connections and for civil works on roads adjacent to McCarthy Reserve/Ador Park Precinct. Some works on West Botany Street and/or Bay Street (classified as a regional and State road respectively) may require a road occupancy licence with adequate working hours approved for night only e.g. Sunday to Thursday from 9:00 pm until 5:00 am. These works would be minor in nature and of short duration.

3.3.4Plant and equipment

The following provides an indicative list of plant and equipment which may be required for the construction of the proposal:

- Dump/tipper trucks
- Excavators/loaders/graders
- Rolling equipment
- Watercarts
- Concrete truck/pumps/vibrators
- Electrical generator
- Drill rigs
- Mobile cranes
- Elevated works platform
- Synthetic turf laying machinery
- Hand tools
- Utility vehicles
- Milling and paving machine
- Saw cutters
- Water pumps.

The plant and equipment list is subject to change depending on the construction methodology adopted by the awarded contractor.

3.3.5Earthworks

Earthworks would be required during construction for:

- Site preparation for the new/upgraded fields, new amenities building, car parking areas and landscaping and amenities
- Levelling of realigned fields
- Installation of field drainage
- Construction of vehicle and pedestrian access and new/upgraded car parks
- Relocation/protection of services

- New service connections
- Installation of footings for light poles
- Landscaping.

Where possible, the earthwork cut to fill ratio would be balanced to minimise earth material removed from site or needing to be brought in. However, it is currently anticipated that the majority of cut material generated during excavation would need to be removed from site. Additionally, all fill material is likely to be brought in from off-site, as much of the excavated material at the sites would be unsuitable for reuse. The main site for earthworks would be at McCarthy Reserve/Ador Park Precinct. At this site, around 10,000 cubic metres of fill would need to be imported and around 3,000 cubic metres would need to be taken off-site for disposal.

At McCarthy Reserve/Ador Park Precinct, the majority of cut material would be at the Ador Park Precinct side; and fill would be required at the new full-sized synthetic field at the McCarthy Reserve side. Where possible, material form the site would be reused as fill, where it is suitable for this purpose. This excavated spoil and topsoil material would be stockpiled at the Ador Park Precinct side prior to reuse on site. Should spoil be reused at McCarthy Reserve, this material would be transported by truck along West Botany Street and Bay Street.

Excavations at McCarthy Reserve/Ador Park Precinct have the potential to encounter man-made fill materials at the site. Material testing would be needed to ensure that material reused is suitable for its intended land use. It is expected that some material would need to be disposed of at a licenced facility in the region. This material would be fill that is contaminated and unsuitable for reuse. Detailed design would confirm the volume of material that could be reused and the volume that would need to be disposed of as waste.

Brighton Memorial Fields does not have a history of being filled with man-made material or contamination and it is assumed the design would achieve a cut to fill balance.

Issues associated with unexpected fill material, including potential contamination issues, have been assessed further in section 6.6. Geotechnical investigations, including material classification and contamination testing would be undertaken during the detailed design phase.

3.3.6 Source and quantity of materials

The source and quantity of materials required would be determined during the detailed design phase. Materials would be sourced from local suppliers where possible. Reuse of existing and recycled materials would be undertaken where practicable.

3.3.7 Traffic management and access

Traffic generated by construction activities would include construction worker light vehicles (utility vans), as well as heavy vehicles for periodic delivery and removal of materials and transport of construction plant and equipment. Vehicle types and sizes would vary depending on the required use but would typically include medium and large rigid vehicles and articulated vehicles for import or removal of materials, dump/tipper trucks for spoil haulage, as well as concrete trucks.

Heavy and light vehicle construction traffic for McCarthy Reserve would access the site via Bay Street, in the south western corner of the reserve. The traffic generated as a part of these works is not expected to exceed 10 light vehicles and 20 heavy vehicles per day at McCarthy Reserve/Ador Park Precinct during peak construction periods. Importation of fill material would result in around 1,500 truck movements at Ador Park Precinct. Over the estimated four month duration of the earthworks activity, this would result in 15 tipper trucks per day coming in and out of the site at Bay Street.

Construction traffic for Ador Park Precinct would access the site via West Botany Street and at times from Bay Street. Removal of waste material at Ador Park Precinct would result in around 500 truck movements, resulting in 10 tipper trucks per day coming in and out of the site at West Botany Street.

There would be no public access to the sites and existing carparks during construction. Construction traffic for Brighton Memorial Fields would access the site via the existing Sybil Lane access from O'Neill Street and exiting back out onto O'Neill Street. Construction traffic would not enter via Crawford Road. The traffic generated as a part of these works is not expected to exceed 10 light vehicles and 15 heavy vehicles per day during peak construction periods.

Traffic and transport impacts associated with the proposal are assessed in section 6.1.

3.4 Public utility adjustment

This section describes key public utilities in and around the sites that need to be considered during detailed design and construction. Requirements for adjustments or relocation would be confirmed during the detail design phase in consultation with the relevant utility owner.

Ausgrid 132kV transmission cable

An Ausgrid 132kV transmission cable easement runs north-south near the western edge of Brighton Memorial Fields. No permanent structures or significant fill can be placed over or around the easement that would impede access to or operation of the cables.

Sydney Water pipelines

Sydney Water owns and operates several pipelines which pass beneath both sites. Maintaining serviceable access to these pipelines will be considered further in designing the location of permanent structures.

Ongoing consultation has occurred with Sydney Water Corporation since August 2018. Discussions have been focused on flooding risks and the Sydney Water Muddy Creek Naturalisation project, specifically access and staging requirements for these works within McCarthy Reserve/Ador Park Precinct, as well as other M6 Stage 1 project areas.

The pipelines within each site are as follows:

McCarthy Reserve/Ador Precinct Park

- 225 millimetre diameter sewer line running north-south along the boundary of the site with West Botany Street
- 300 millimetre diameter potable water line running east-west along the boundary of the site with Bay Street.

Brighton Memorial Fields

- 300 millimetre diameter sewer line running north-south west of the playing field
- 250 millimetre diameter sewer line running east-west along the northern edge of the playing field
- 225 millimetre diameter sewer line running north-south along Sybil Lane.

Building Over and Adjacent approval would be required from the asset owner for works within the Zone of Influence of these assets.

Minor utilities

There are numerous minor utilities in and around each of the sites including:

McCarthy Reserve/Ador Precinct Park

- Above ground powerlines and associated power poles along Bay Street
- Above ground powerlines and associated power poles along West Botany Street.

Brighton Memorial Fields

- Above ground powerlines and associated power poles along Sybil Lane.
- Any utility works will be subject to consultation/coordination with the relevant utility authority.

McCarthy Reserve/Ador Park Precinct

- No utilities are expected to be affected within the park area
- Most utilities are located within West Botany Street and Bay Street - these may be affected by the construction of the new access and car parking area as well as the shared pathway along West Botany Street
- Minor pit lid adjustments along the West Botany Street eastern verge may be required to facilitate construction of the proposed pedestrian footpath that runs along the boundary.

3.5 Property acquisition

The proposal would occur within land which is owned and managed by Bayside Council. As the work would be done on behalf of the council, there is no requirement for property acquisition or lease agreements.

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 65 of ISEPP describes development permitted without consent for certain park and other public reserve purposes. This includes, under clause 65(3), development carried out by or on behalf of a council without consent on a public reserve under the control of or vested in the council:

(3) Any of the following development may be carried out by or on behalf of a council without consent on a public reserve under the control of or vested in the council:

(a) development for any of the following purposes:

(i) roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,

(ii) recreation areas and recreation facilities (outdoor), but not including grandstands,

(iii) visitor information centres, information boards and other information facilities,

(iv) lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,

(v) landscaping, including landscape structures or features (such as art work) and irrigation systems,

(vi) amenities for people using the reserve, including toilets and change rooms,

(vii) food preparation and related facilities for people using the reserve,

(viii) maintenance depots,

(ix) portable lifeguard towers,

(b) environmental management works,

(c) 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).

Development for the following purposes is relevant to the proposal:

- Recreation areas and recreation facilities (outdoor), but not including grandstands
- Amenities for people using the reserve, including toilets and change rooms
- 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).

As the proposal is:

- For the development of recreation areas and recreation facilities (with associated amenities and demolition of existing buildings)

- To be carried out on public reserve land that is owned by Bayside Council
- To be carried out by Transport for NSW on behalf of Bayside Council
- It can be carried out without development consent, subject to the consideration of environmental impacts under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Bayside Council is the determining authority for the proposed works.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by the State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (State Significant Precincts) 2005.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. As Transport for NSW would be undertaking the work on behalf of Bayside Council, consultation under Part 2 of the ISEPP is not required. This is described further in section 5.4.

State Environmental Planning Policy (Coastal Management) 2018

The State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) provides a strategic framework and objectives for managing coastal issues in NSW, with an aim to protect and enhance coastal environments, habitats and natural processes.

At Brighton Memorial Fields, the proposal is partially located on land mapped as a 'Proximity Area' to mapped 'Coastal Wetlands' under the Coastal Management SEPP. The McCarthy Reserve/Ador Park Precinct site is not located on land mapped under the Coastal Management SEPP.

As per Clause 8 (2) of the Coastal Management SEPP, development consent is not required under the Coastal Management SEPP for the proposal as the work is permissible without consent under the ISEPP.

Clause 11 (1) of the Coastal Management SEPP, which requires a consent authority to be satisfied of certain matters before granting consent for development on land within Proximity Areas, does not apply as the work is permissible without consent under the ISEPP. However, potential impacts to nearby waterbodies (mapped as 'Coastal Wetlands') are assessed in section 6.4 and 6.5. It is not expected that the proposal would result in significant impacts on Coastal Wetlands given the implementation of safeguards described in section 7.2.

4.1.2Local Environmental Plans

Rockdale Local Environmental Plan 2011

The proposal is located within the Bayside Council LGA. The applicable local planning instrument for the area is the Rockdale Local Environmental Plan 2011 (Rockdale LEP 2011).

Under the Rockdale LEP 2011, the proposal (at both sites) is located within an area zoned as RE1 Public Recreation. Details of the objectives of this land use zone and a discussion of the proposal's consistency with these objectives is included in Table 4-1

Table 4-1: Rockdale LEP 2011 assessment of objectives

Objective	How proposal meets objective
To enable land to be used for public open space or recreational purposes	• The proposal would provide improved recreational facilities
To provide a range of recreational settings and activities and compatible land uses	• The proposal includes multi-use playing fields which would providing for a range of activities
To protect and enhance the natural environment for recreational purposes	• The safeguards and management measures outlined in Chapter 7 will protect and enhance minimise the potential impacts of the proposal on the natural environment

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The aim of the *Biodiversity Conservation Act 2016* is to conserve and improve biodiversity in NSW, including protecting against harm to threatened flora and fauna.

Section 6.4 provides an assessment of direct and indirect impacts to threatened species listed under the BC Act. The assessment found that the proposal is not expected to significant impact threatened species or ecological communities or their habitats. Therefore, the preparation of a Biodiversity Development Assessment Report (BDAR) is not required. Nevertheless, environmental safeguards to manage and minimise potential biodiversity impacts are outlined in section 6.4.4.

4.2.2Heritage Act 1977

The *Heritage Act 1977* provides for the protection and conservation of non-Aboriginal cultural heritage items (such as buildings, works, relics and other places of historic, cultural, social, archaeological, architectural, natural and aesthetic significance) both of local and state heritage significance in.

There are no listed State heritage items located within 200 metres of the Brighton Memorial Fields and McCarthy Reserve sites. Section 6.9 found that the proposal would not directly impact on any known local heritage items.

Brighton Memorial Fields are listed on the NSW War Memorial Register, which is a database of war memorials in New South Wales. The Register is non-statutory and is hosted and maintained by the NSW Office for Veterans Affairs and the State Library of New South Wales. Impacts to the fields and the associated memorial plaques on the gates are discussed in more detail in section 6.9.

4.2.3Water Management Act 2000

The aim of the *Water Management Act 2000* is to provide for the sustainable and integrated management of the water sources of NSW. Transport for NSW, as a state owned body, is exempt from requiring a Controlled Activity Approval as per Schedule 4 of the Water Management (General) Regulation 2018 providing:

a) the activity does not cause any change in the course of the river, and

b) the body, after considering the environmental impact of the activity in accordance with section 5.5 of the *Environmental Planning and Assessment Act 1979* (as if the body were the determining authority under that section), is satisfied that the activity is not likely to significantly affect the environment.

The proposal would not cause any change in the course of Muddy Creek at McCarthy Reserve/Ador Park Precinct. In addition, with the implementation of standard mitigation measures outlined in Chapter 7, construction works would be unlikely to result in significant surface water impacts to Muddy Creek. Therefore, Transport for NSW are exempt from requiring a Controlled Activity Approval.

As per good practice, design of infrastructure and construction works within waterfront land of Muddy Creek would be undertaken in accordance with the *Controlled Activities on Waterfront Land guidelines* (DPI 2012).

4.2.4Bayside Council Plan of Management

The Bayside Council Plan of Management for Community Land and Public Open Space 2016, last updated in February 2017 (Bayside Council, 2017) provides a framework for the management and development of public open space in the Bayside LGA. The Plan of Management (PoM) prescribes current and future permitted uses at each proposal site. An assessment of the proposal against these uses is provided in Table 4-2

Table 4-2: Consistency of proposal Bayside Council PoM assessment of current and future permitted use

		Current and Future Permitted Use	Assessment
McCarthy Reserve/Ador Park Precinct	**Current Use**	Active recreation - soccer Sports amenities building Lighting	The proposal is consistent with these uses.
	Future Use	Active recreation Sports amenities building Lighting, sportsground levelling and resurfacing, irrigation and/or drainage Hire by the community, individuals, not for profit and/or community organisations for recreational, leisure or special event use Community leisure/recreation buildings, ancillary utility buildings Active recreation improvements, e.g. picnic furniture, bike track, play space and equipment, pedestrian lighting, event facilities	The proposal is consistent with these uses.
	Permitted Purposes	Related to active recreation needs – Sportsground amenities, park furniture, stormwater harvesting, flood amelioration and/or mitigation development, large cultural events/ activities e.g. festivals Utilities if required, green links, endemic and/or sustainable planting, play equipment In respect of the Muddy Creek canal: Active recreation, active transport links to and through open space, and climate change mitigation works – appropriate to site conditions but not where it will have an unacceptable negative impact on endangered ecological	The proposal is consistent with these uses.

		communities, threatened flora or fauna or significant negative impact on environmentally sensitive areas Passive open space, aesthetic value and environmental value Environmental restoration works	
	Scale and Intensity Use/ Development	Low scale and medium intensity only Appropriate scale and intensity developments to the size for the active open space area and the sites necessities for the level (local, regional, state) of active recreation facilities required	The proposal is consistent with these uses.
Brighton Memorial Fields	**Current Use**	Active recreation - soccer Sports amenities building Lighting, irrigation and/or drainage, car park	The proposal is consistent with these uses.
	Future Use	Active recreation Sports amenities building Lighting, sportsground levelling and resurfacing, irrigation and/or drainage	The proposal is consistent with these uses.
	Permitted Purposes	Subject to Rockdale LEP 2011 - SP2 (F6 Corridor)	The proposal will not be carried out on that part of Brighton Memorial Fields that is located within the SP2 zoned F6 corridor. Accordingly, the proposal will not be inconsistent with the proposed infrastructure purpose under the SP2 zoning. As noted above, the proposal will be carried out on that part of Brighton Memorial Fields that is zoned RE1 Public Recreation and will be consistent with the objectives of that zone and the intended future use for that land as outlined in the PoM.
	Scale and Intensity Use/ Development	Subject to Rockdale LEP 2011 - SP2 (F6 Corridor)	As above.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. This is considered further in Appendix A and potential impacts are assessed in Chapter 6. Chapter 7 describes the safeguards and management measures to be applied.

Findings – matters of national environmental significance

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of recreation areas and recreation facilities (including associated amenities and demolition works) and is being carried out by Transport for NSW on behalf of another public authority i.e. Bayside Council. The proposal is therefore permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can therefore be assessed under Division 5.1 of the EP&A Act. Bayside Council is the proponent and determining authority for the proposal. This REF fulfils Bayside Council's obligation under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5. Consultation

This chapter discusses the stakeholder and community consultation undertaken to date for the proposal and describes planned future consultation activities.

5.1 Consultation strategy

Transport for NSW (then Roads and Maritime Services) commenced engagement with the community and key stakeholders on the F6 Extension Stage 1 (now M6 Stage 1) project in 2017.

Community members and stakeholders were encouraged to provide their feedback, ask questions and make comments during direct stakeholder meetings as well as via email, mail or phone contact with Transport for NSW's project team including during the exhibition of the EIS and Preferred Infrastructure Report for the F6 Extension Stage 1 (now M6 Stage 1) project.

Since November 2018, four community notifications containing information about open spaces impacted by the F6 Extension Stage 1 (now M6 Stage 1) project have been made available on the website and distributed to the community. These included:

- February 2019 – Preserving community space
- February 2019 – Community update
- November 2018 – Preserving Community Space
- November 2018 – Shared cycle and pedestrian pathway.

In addition, specific door knocking activities to properties neighbouring McCarthy Reserve/Ador Park Precinct and Brighton Memorial Playing Fields were carried out in May 2019. The purpose of these activities was to inform residents of investigations required for the development of the recreational facilities concept design and discuss the proposal.

Key matters raised that are relevant to the proposal included:

- Construction timing
- Safety and security concerns
- Construction implications on sporting groups
- Temporary loss of facilities/community amenities
- Lighting impacts on surrounding properties
- Potential for social deviant behaviour in parks and open spaces
- Availability of parking in and around open spaces and the playing fields.

Feedback provided as part of the engagement for the broader F6 Extension Stage 1 (now M6 Stage 1) project has also been used to help inform the development of this proposal. This is discussed further in the following sections.

5.2 Community involvement

5.2.1Stakeholder Liaison Group

A key method of engagement with the community to date has been through the Stakeholder Liaison Group (SLG) initiated to discuss community land affected by the M6 Stage 1 project. The purpose of the SLG is to share information on the M6 Stage 1 project and related activities, including potential impacts to the recreational facilities at Rockdale Bicentennial Park, and to gather input and feedback from member organisations. Current members of the SLG include:

- Brighton-Le-Sands Public School
- St George Bicycle Users Group
- St George Children with Disabilities
- Bayside Council
- Rockdale City Suns Football Club
- St George Football Association
- Botany Bay and Catchment Alliance
- Dolls Point Football Club
- Rockdale Wetlands Preservation Society
- Department of Education
- Transport for NSW.

There would specifically be ongoing consultation with Brighton-Le-Sands Public School to help minimise and manage impacts during construction of the proposal at Brighton Memorial Fields.

In addition to the SLG, the management (including potential relocation/reinstatement) of the memorial plaques on the commemorative gates at Brighton Memorial Fields would be agreed through consultation with the Brighton RSL Club Sub-Committee. Transport for NSW discussed these matters with the Brighton RSL Club Sub-Committee in September 2019, who gave their support to the proposal.

Consultation with the SLG will be ongoing to receive their input during the development of the proposal. The outcomes of this REF will be made available to the SLG for their information.

5.2.2Recreational Needs Analysis

A Recreation Needs Analysis study has been carried out to better understand the impact of the M6 Stage 1 project on community use of existing open space and recreational facilities at Rockdale Bicentennial Park. A survey was undertaken within the community to understand the current and future utilisation and demand for sport, recreation and open space facilities within the vicinity of the M6 Stage 1 project. A total of 535 responses were received.

Key themes from the survey indicated that natural and passive features were highly valued with the top three activities enjoyed by respondents being walking (72%), connecting with nature (66%) and relaxing with family and friends (61%). Similarly, respondents indicated that the three most common features they would like to see in a future park were playground and play areas (19%), open space areas (14%) and natural bushland areas and wetland (11%).

The outcomes of this study were an input to the design of the proposal, and will be used to further refine the design of the proposal so that it best meets the identified community needs.

5.3 Aboriginal community involvement

An assessment was undertaken for the M6 Stage 1 project in accordance with the Roads and Maritime Procedure for Cultural Heritage Consultation and Investigation (PACHCI). The Metropolitan Local Aboriginal Land Council (MLALC) was the identified as appropriate stakeholder and was engaged to attend a field inspection and provide make an assessment of the potential to impact on Aboriginal heritage. The area visited included the two proposal sites. During this fieldwork, the MLALC Culture and Heritage Officer was consulted for any relevant cultural information pertaining to the project. Findings from this survey and consultation are included in section 6.8.3.

5.4 ISEPP consultation

Notification to Bayside Council as per the requirements of clause 13 or 15 of the ISEPP is not required for the proposal. As Transport for NSW would carry out the works on behalf of Bayside Council under clause 65 of the ISEPP, clause 17(1)(c) which provides exceptions to clauses 13 – 16 applies. This exception would operate such that the requirement to issue a notice under each of clause 13(2) and clause 15(2) do not apply.

5.5 Ongoing or future consultation

This REF will be made available on the Transport for NSW website (which will also be linked from the Bayside Council website), so that the community and stakeholders are informed about what is being proposed. The REF will be available for 15 business days feedback, with feedback on the REF to be incorporated into a Consultation Report that will be considered by Transport for NSW and Bayside Council during the determination of the project approval.

Other consultation activities at this time will include:

- Community update
- Stakeholder Liaison Group meeting
- Email sent to registered addresses
- Social media campaign
- Door knocking residents around the proposal sites to discuss the proposal
- Engagement with key stakeholders such as St George School, Brighton-Le-Sands Public School, PCYC St George and Brighton RSL Club.

5.5.1 Complaints during construction

If the proposal is approved, Transport for NSW would undertake the detailed design of the project and a construction contractor would be engaged to carry out construction. Both Transport for NSW and the construction contractor would be responsible for communication and engagement with the community and other key stakeholders during construction.

The objective of engagement activities supporting construction of the project is to:

- Keep the community informed about the project including construction activities, work programs and associated impacts
- Ensure there is an opportunity to provide feedback on the project or to register complaints about impacts

- Provide a process to resolve complaints and issues raised
- The community and stakeholder engagement carried out during construction would include updates on the planned construction activities and program and would respond to enquiries and concerns in a timely manner, while seeking to minimise potential impacts, where possible.

A Complaints Management System would be in place for the duration of construction. This system would include the recording of complaints and how the complaint has been addressed (within a Complaints Register). Complainants would be contacted within 24 hours to follow up and respond to their complaint.

The project team would ensure a number of different complaint mechanisms are provided to cater to different needs and preferences.

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered, and a relevant study area was selected for each individual environmental aspect. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.

The factors specified in the guidelines Is an EIS required? (DUAP 1995/1996) as required under clause 228(1) *of the* Environmental Planning and Assessment Regulation 2000 and the *Roads and Related Facilities EIS Guideline (DUAP 1996)*. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix B.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Transport, traffic and access

6.1.1 Methodology

In order to understand the current and future use of both the McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields, both qualitative and quantitative assessment methods were used. Information on usage was taken from Bayside Council field bookings, along with the St George Football Association webpage log of games played. This determined the number of games played on a Saturday, which represents the peak use that could be expected at each site.

A traffic model (SIDRA) was used to assess how the intersections that surround the proposal locations operated. This assessment was undertaken to understand the changes in traffic without the proposal and with the addition of the proposal. An assessment of construction traffic was also undertaken.

6.1.2Existing environment

Traffic

McCarthy Reserve/Ador Park Precinct

McCarthy Reserve/Ador Park Precinct is situated along the western side of West Botany Street with frontage along Bay Street. Figure 1-2 shows the adjacent streets and current carparking conditions at McCarthy Reserve/Ador Park Precinct.

Currently, McCarthy Reserve is an open field used as a soccer field. Another small section of the field is used for junior games, mostly Under 6 and Under 7 soccer games. The Ador Park Precinct adjacent to McCarthy is an open space area currently not used for formal sporting games.

The McCarthy Reserve/Ador Park Precinct is located close to several other playing fields and active recreation areas, such as the synthetic soccer field at Ador Avenue Reserve, north of the proposed site, the St George PCYC and netball courts situated on the eastern side of West Botany Street opposite Ador Avenue. Therefore, this area is associated with heavy traffic and parking demand during the game season on weekends.

A retail/industrial precinct located to the south of the proposal site, comprising tenancies such as ALDI, Bunnings, Fitness First, McDonalds and NRMA Car Servicing, also generates local vehicular trips. Other existing traffic generating land uses in the local area include Cairnsfoot School, St George Girls High School and Brighton-Le-Sands Public School.

Bay Street is a State road that connects to the A36 Princes Highway around one kilometre to the west and Brighton-Le-Sands foreshore to the east. West Botany Street is a regional road on the eastern border of Ador Park Precinct and operates as a local road connecting to the A1 President Avenue in the south and the A36 Princes Highway in the north. West Botany Street being is a thoroughfare to Sydney Airport.

Intersection counts were undertaken in June 2019 to understand the current usage around McCarthy Reserve/Ador Park Precinct. The survey period was undertaken on Thursday 13th June 2019 from 6:00 am to 10:00 am and 3:00 pm to 7:00 pm as well as on Saturday 15th June 2019 from 10:00 am to 4:00 pm.

Weekday peak hours occur between 7:30 am to 8:30 am and between 5:15 pm and 6:15 pm along West Botany Street. Saturday peaks are closer together due to the weekend traffic comprising of shoppers, airport travellers and recreational users within the area. The peak hours for Saturdays are 11:00 am to 12:00 pm and 12:45 pm to 1:45 pm.

Table 6-1 provides the volumes of traffic along West Botany Street and Bay Street.

Table 6-1: Traffic volumes surrounding Ador Park/McCarthy Reserve (2019)

Direction	West Botany Street, N of Bay Street	Bay Street, W of West Botany Street
Weekday AM Peak		
Eastbound/Northbound	920	610
Westbound/Southbound	390	390
Total	1310	1000
Weekday PM Peak		
Eastbound/Northbound	520	470
Westbound/Southbound	960	470
Total	1480	940
Saturday AM Peak		
Eastbound/Northbound	770	520
Westbound/Southbound	530	490
Total	1300	1010
Saturday PM Peak		
Eastbound/Northbound	830	600
Westbound/Southbound	690	470
Total	1520	1070

The results in Table 6-1 show that both weekday and weekend volumes are higher along West Botany Street than along Bay Street. The weekend traffic along West Botany Street has similar volumes on

Saturday compared to weekday traffic, as is the same for Bay Street. Parking is allowed along both West Botany Street and Bay Street on weekends only, which reduces road capacity impacting on the operation of this intersection on a Saturday when compared to during the week.

Brighton Memorial Fields

Brighton Memorial Fields is situated within the vicinity of several other playing fields and active recreation areas. Figure 1-3 shows the existing environment at Brighton Memorial Fields with the access gained from Sybil Lane and provision of 34 car spaces for use at the dedicated car park area. It is situated to the west of Sybil Lane and to the east of three fields within Bicentennial Park. To the west of Bicentennial Park is Ilinden Sports Centre and a full-sized synthetic playing field. To the north of the sports centre is a recreational park which includes a skate park. With all the current soccer fields within the area, it is expected that there would be high levels of associated traffic and parking demand during the game season.

Brighton-Le-Sands Public School and Little Sails Preschool are situated immediately to the north of the proposed site and are expected to generate traffic on weekdays during school pick-up and drop-off periods. Other existing traffic generating land uses in the local area include St George Private Hospital, TAFE St George, Kogarah High School and St George Girls High School, all to the west of the site.

Sybil Lane is a two-way local laneway connecting O'Neill Street and Crawford Road and would be the primary access road to the recreational facilities and carpark during operation. Sybil Lane has rear lane access to residents and is also a thoroughfare during school pick-up and drop-off periods. O'Neill Street and Crawford Road to the south and east of the site respectively, both terminate at A1 President Avenue, an arterial road located less than 200 metres to the south of Brighton Memorial Fields. A1 President Avenue travels around one kilometre west to the busy A36 Princes Highway and around one kilometre east to The Grand Parade at Brighton-Le-Sands beach.

Weekday peak hours occur between 7:15 am to 8:15 am and evening peaks occur between 3:00 pm and 4:00 pm along Crawford Road. These times coincide with school drop-off and pick-up as Brighton-Le-Sands Public School is immediately adjacent and to the north of Brighton Memorial Fields. Saturday peaks are 11:45 am to 12:45 pm and 1:00 pm to 2:00 pm.

Table 6-2 provides the current traffic volumes along these streets

Table 6-2: Traffic volumes around Brighton Memorial Park (2019)

Direction	Crawford Road, S of Sybil Ln	Sybil Ln, W of Crawford Rd	O'Neill Street, E of Sybil Ln
Weekday AM Peak			
Eastbound/Northbound	930	3	80
Westbound/Southbound	140	2	1
Total	1070	5	81
Weekday PM Peak			
Eastbound/Northbound	190	25	45
Westbound/Southbound	290	10	20
Total	480	35	65
Saturday AM Peak			
Eastbound/Northbound	290	4	50

Direction	Crawford Road, S of Sybil Ln	Sybil Ln, W of Crawford Rd	O'Neill Street, E of Sybil Ln
Westbound/Southbound	300	2	30
Total	590	6	80
Saturday PM Peak			
Eastbound/Northbound	280	5	50
Westbound/Southbound	300	5	30
Total	580	10	80

Note: Saturday traffic volumes were low as games were not played at Brighton Memorial Fields on this day of survey.

Use of Crawford Road is highest during the weekday morning peak with over 1,000 vehicles per hour, two ways. Saturdays are just over half of this. Both Sybil Lane and O'Neill Street are local roads with small volumes of traffic during the weekday and Saturdays.

Existing traffic conditions

Levels of service

Level of service (LoS) is a measure to describe the operational conditions and efficiency of a roadway or intersection. The definition of LoS generally outlines the operating conditions in terms of speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and road safety. It is a qualitative measure describing operational conditions within a roadway or intersection, as perceived by motorists and/or passengers.

Average delay is commonly used to assess the operational performance of intersections, with level of service used as an index. A summary of the intersection level of service criteria is shown in Table 6-3.

Table 6-3: Level of service criteria for intersections

LoS	Average delay/vehicles (sec/veh)	Traffic Signals/Roundabout	Give Way and Stop Signs
A	≤ 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operation near capacity	Near capacity and accident study required
E	57 to 70	At capacity, at signals incidents would cause excessive delays	At capacity, requires other control mode
F	› 70	Roundabouts require other control mode	At capacity, requires other control mode

Table 6-4 provides the traffic performance of the following intersections around McCarthy Reserve/Ador Park Precinct.

Table 6-4: Intersection operation along West Botany Street (2019)

Intersection	Day	Peak	LoS	Average delay (seconds/vehicle)
West Botany Street and Bay Street	Weekday (Thursday)	AM	D	50
		PM	E	61
	Saturday*	AM	F	80
		PM	F	>100
West Botany Street and Ador Avenue	Weekday (Thursday)	AM	C	40
		PM	D	51
	Saturday*	AM	C	35
		PM	E	60

*Saturday results are critical for the proposed works as usage of the sporting facilities along West Botany Street are highly utilised.

The SIDRA results indicate that West Botany Street and Bay Street operate near capacity during the weekday peaks. Saturdays show an even worse performance level (LoS F) due to the reduction of capacity along both West Botany Street and Bay Street due to parking being allowed. Peak clearways are provided during the week, however during weekends these restrictions are removed, reducing capacity and therefore reducing performance.

West Botany Street and Ador Avenue operate at a good level of service during weekdays and weekends. The reason for the intersection showing LoS C, D or E is due to the small volume of right turn traffic exiting out of Ador Avenue that is being delayed.

The performance of traffic around the Brighton Memorial Fields are provided in Table 6-5.

Table 6-5: Intersection operation around Brighton Memorial Fields (2019)

Intersection	Day	Peak	LoS	Average delay (seconds/vehicle)
Crawford Road/ Sybil Lane	Weekday (Thursday)	AM	B	15
		PM	A	8
	Saturday*	AM	A	8
		PM	A	8
Sybil Lane/ O'Neill Street	Weekday (Thursday)	AM	A	6
		PM	A	6
	Saturday	AM	A	6
		PM	A	6

The results in the table indicate that performance in and around Brighton Memorial Park operate well during both weekday and weekends.

Existing field usage at McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields

Based on Bayside Council information, all fields may be in use during the weekdays and on weekends. The fields' times of use are shown in Table 6-6. Bookings at the fields can be made during these times of use and have been used to inform the traffic impact assessment.

Table 6-6: Field bookings

	Brighton Memorial Fields	McCarthy Reserve
Monday	5:00 – 9:00 pm	N/A
Tuesday	4:00 – 9:00 pm	4:00 – 9:00 pm
Wednesday	4:00 – 9:00 pm	4:00 – 9:00 pm
Thursday	4:00 – 7:30 pm	4:00 – 7:30 pm
Friday	9:00 – 11:00 am 7:00 – 10:00 pm	7:00 – 9:00 pm
Saturday	8:30 am – 5:00 pm	8:30 am – 5:00 pm
Sunday	8:30 am – 2:00 pm	8:30 am – 2:00 pm

Council provided information suggests that the soccer clubs cater for 100 players at Brighton Memorial Fields and 400 players at McCarthy Reserve. During weekday training times there are around three to four teams at McCarthy Reserve and three teams using Brighton Memorial Fields. Usage at Bicentennial Park and Ador Avenue Reserve is similar during the week. It can be assumed that for 400 registrations over two training days, there is likely to be two to three sessions each day (i.e. 4:00 pm to 5:30 pm, 5:30 pm to 7:00 pm, possibly 7:00 pm to 9:00 pm for seniors). Based on a two session turn over, the player numbers may be around 70-100 players per hour and 140-200 players per hour in this short overlap. Many players would get dropped off for training and not everyone typically turns up for training.

For the purposes of this REF, only Saturday analysis was undertaken as it was agreed with Bayside Council that this would be considered the peak times for the traffic and parking analysis.

During weekends, fields are generally booked throughout the day (as shown in Table 6-6) although there is a tapering off at midday for most fields. Collation of the field usage from the club website was undertaken on the days that the intersection counts were surveyed ie Saturday 15th June 2019. Table 6-7 shows the games there were playing on 15th June 2019.

Table 6-7: Usage for 15th June 2019

Time	Age group/Division	Field
8:30	U10/Beg	Bicentennial East Mini
9:35	U11/Int	Bicentennial East Mini
10:40	U11/Int	Bicentennial East Mini
8:30	U09/Beg	Bicentennial East Mid-sized
9:25	U09/9G	Bicentennial East Mid-sized
10:20	U08/Beg	Bicentennial East Mid-sized
11:15	U08/Beg	Bicentennial East Mid-sized

Time	Age group/Division	Field
12:10	U08/Int	Bicentennial East Mid-sized
8:30	U06/Beg	Bicentennial East SSF1
9:25	U07/Beg	Bicentennial East SSF1
10:20	U07/Beg	Bicentennial East SSF1
8:30	U06/Beg	Bicentennial East SSF2
9:25	U06/Beg	Bicentennial East SSF2
10:20	U07/Beg	Bicentennial East SSF2
9:20	U12/B	Bicentennial East No. 1
10:25	U13/A	Bicentennial East No. 1
11:40	U13/C	Bicentennial East No. 1
13:00	PLR/R	Bicentennial East No. 1
15:00	PL1/1	Bicentennial East No. 1
8:30	U08/Beg	J Graham Mini
9:25	U08/Beg	J Graham Mini
11:45	U13/C	J Graham Park
13:00	AA/H	J Graham Park
15:00	AA/D	J Graham Park
8:30	U06/Beg	J Graham SSF1
9:25	U06/Beg	J Graham SSF1
10:20	U07/Beg	J Graham SSF1
8:30	U06/Beg	J Graham SSF2
9:25	U07/Beg	J Graham SSF2
13:00	PLR/R	Ador Avenue Reserve
15:00	PL1/1	Ador Avenue Reserve

The day on which the counts were undertaken had games playing at McCarthy Reserve, Ador Avenue Reserve and Rockdale Bicentennial Park. No games were being played at Brighton Memorial Fields on Saturday 15th June 2019. This is reflected in the small traffic volumes in and out of Sybil Lane in Table 6-2.

Therefore, field use for the following week was collated (i.e. Saturday 22nd June 2019) as shown in Table 6-8.

Table 6-8: Usage for 22nd June 2019

Time	Age group/Division	Field
10:05	U16G/A	Brighton Memorial Fields
11:30	U16/A	Brighton Memorial Fields
13:00	U17/18/B	Brighton Memorial Fields
15:00	AA/B	Brighton Memorial Fields
8:30	U11/Beg	Bicentennial East Mid-sized
9:35	U11/Int	Bicentennial East Mid-sized
10:40	U10/Beg	Bicentennial East Mid-sized
8:30	U09/Int	Bicentennial East Mini
9:25	U08/Beg	Bicentennial East Mini
10:20	U09/Int	Bicentennial East Mini
11:15	U08/Beg	Bicentennial East Mini
8:30	U06/Beg	Bicentennial East SSF1
9:25	U07/Beg	Bicentennial East SSF1
10:20	U07/Beg	Bicentennial East SSF1
11:15	U07/Beg	Bicentennial East SSF1
8:30	U06/Beg	Bicentennial East SSF2
9:25	U07/Beg	Bicentennial East SSF2
10:20	U07/Beg	Bicentennial East SSF2
11:15	U06/Beg	Bicentennial East SSF2
9:05	U12/B	Bicentennial Pk East No.1
10:15	U14/A	Bicentennial Pk East No.1
11:30	U16/A	Bicentennial Pk East No.1
13:00	AA/E	Bicentennial Pk East No.1
15:00	AA/H	Bicentennial Pk East No.1

Table 6-8 shows that all fields were generally used all day including Brighton Memorial Fields.

Ador Avenue Reserve and J Graham Park (McCarthy Reserve) holds games mostly for the larger age groups (i.e. 22 players) where there is a 2-hour turn around for each game. J Graham SSF1 holds games for the little league where there are only six to eight players per game. These games only go on to around lunch time whereas the larger games go on till 5:00 pm in the day.

The results for 22nd June show games being played at Brighton Memorial Fields compared with 15th June. Games played across Bicentennial Park are similar across both weekends. The small volumes surveyed

along Sybil Lane reflect the ‘no games’ at Brighton Memorial Fields. It also suggests that users of Bicentennial Park are parking outside of the Brighton Memorial Fields carpark, ie they are not using Sybil Lane.

Parking

McCarthy Reserve/Ador Park Precinct

There are two parking areas within and in the vicinity of McCarthy Reserve/Ador Park Precinct:

- Bay Street carpark located within the southern part of Ador Park Precinct, comprising around 10 car spaces and accessible from Bay Street via a left-in, left-out manoeuvre
- PCYC St George carpark is located to the north of McCarthy Reserve, comprising around 54 car spaces and accessible from Ador Avenue.

In addition, parallel on-street parking spaces are provided on Ador Avenue on the northern border of the playing fields in Ador Avenue Reserve. About 63 spaces are available within this section of Ador Avenue, located within a three-minute walk north of the proposal site.

The existing car parks are used by patrons form the recreational facilities currently operating in the precinct.

Brighton Memorial Fields

The primary parking facility is located on the eastern side of Brighton Memorial Fields. This is a council carpark provided for the use of recreational facility patrons. The carpark provides around 34 spaces and is accessible from Sybil Lane with separate entry and exit driveways. Sybil Lane is accessible from both Crawford Road and O’Neill Street.

In addition to servicing the recreational facilities, the car park also acts as a drop-off and pick-up point for Brighton-Le-Sands Public School parents.

Public transport

McCarthy Reserve/Ador Park Precinct

Several bus services operate along Bay Street in the local vicinity, including the 478 and 479 services from Rockdale Station to Miranda via Ramsgate and Kyeemagh via Brighton-Le-Sands, respectively. In addition, the 422 service operating between Kogarah and Central Station services Bryant Street to the north of the site. Rockdale Station is located around one kilometre west of McCarthy Reserve/Ador Park Precinct and provides services on the T4 Eastern Suburbs & Illawarra Line.

Brighton Memorial Fields

One bus service (947) operates in the vicinity of Brighton Memorial Fields. The 947 service travels along President Avenue and provides connectivity to Kogarah Station, about 2.1 kilometres west of Brighton Memorial Fields. Kogarah Station provides train services on the T4 Eastern Suburbs & Illawarra Line.

Pedestrian and cycling access

McCarthy Reserve/Ador Park Precinct

Pedestrian and cyclist access to McCarthy Reserve/Ador Park Precinct is available from surrounding local streets including Bay Street and West Botany Street. Pedestrians and cyclists may also access the site through the car parks located on Ador Avenue and Bay Street.

The perimeter of the site and surrounding areas are well serviced with paved pedestrian footpaths while limited cycleways are available in the immediate vicinity. The closest cycleways provide north-south connectivity to surrounding suburbs and are located approximately around 1 kilometre away on Princes

Highway, Francis Avenue and Rockdale Plaza Drive. Paved pedestrian and cyclist paths are not available within McCarthy Reserve and Ador Park Precinct.

Brighton Memorial Fields

Pedestrians and cyclists can access Brighton Memorial Fields via Sybil Lane from Crawford Road (this is an existing cycle route) where paved footpaths are provided to the car park. Pedestrian facilities are however not available along Sybil Lane from O'Neill Street.

The surrounding areas are well served by paved footpaths and cycleways. Low to moderate difficulty cycleways are provided in all directions of Brighton Memorial Fields, along West Botany Street, Rockdale Bicentennial Park, Crawford Road, The Grand Parade and O'Connell Street.

6.1.3 Potential impacts

McCarthy Reserve/Ador Park Precinct

Construction traffic overview

Construction vehicle access for McCarthy Reserve would be via the existing Bay Street maintenance access. Access for Ador Park Precinct would be via West Botany Street, at an existing driveway that will become the new entry/exit for the carpark. Figure 3-2 and Figure 3-3 show the construction layout and access points.

Construction traffic would comprise of light and heavy vehicles and would be greatest during the earthworks and civil construction phase. There would be a period of earthwork activity at the start of works for around three to four months. This time represents the peak volumes of heavy vehicle movements at the sites. Estimated numbers of vehicle movements, including spoil haulage, are provided in Table 6-9.

Table 6-9: Estimated daily construction traffic volumes at peak

Vehicle type	Approximate number of in/out movements (per day)
Light vehicles	10
Heavy Vehicles	20

Construction vehicles would park within the compound area identified on Figure 3-2 and Figure 3-3. Construction works for Ador Park Precinct would use vehicle access on West Botany Street. For construction works on the West Botany Street bridge and the new footpath along West Botany Street, the appropriate road opening and occupation permits would be sought from Bayside Council, accompanied by detailed traffic control plans. Construction works for McCarthy Reserve would use vehicle access from Bay Street. The assessment assumes works would commence separately within the two areas, with completion dates to coincide over the expected 18 month duration.

Construction Impacts

Construction of the soccer fields would be completed before the M6 Stage 1 project construction works occur in Rockdale Bicentennial Park. The forecast traffic year used to compare construction traffic was 2021.

Note that not all intersections analysed were available in the strategic traffic model and therefore some assumptions have been made in order to determine the traffic volumes for 2021. The strategic traffic model is a weekday model and weekend base and future forecasts are not available. Therefore, the following assumptions have been made for 2021 traffic forecasts:

- Future growth for West Botany Street/Bay Street weekday AM and PM volumes are from the model.
- West Botany Street/Ador Avenue volumes weekday AM and PM volumes have been based on the growth and volume changes at the intersection of West Botany Street/Bay Street. Growth is estimated at around three percent
- Crawford Road/Sybil Lane and O'Neill Street/Sybil Lane has an assumed seven per cent growth based on the growth in the model at Crawford Road/Teralba Road
- 2021 Saturday traffic volumes has been based on the same assumptions above that was established for weekday traffic
- Construction traffic assumes about 25 to 30 vehicles per day. It is assumed that weekday construction times would be 7:00 am to 3:30 pm (which would be outside the peaks) however Saturday construction times would be 8:00 am to 1:00 pm which would coincide with game times. Therefore, to be conservative, about four vehicles per hour in the weekday peak hours and 14 vehicles per hour on Saturdays (i.e. 10 light vehicles and four heavy vehicles) has been assumed. These volumes are split over two sites accesses, as described above.

Traffic performance for the McCarthy Reserve/Ador Park precinct indicates the following results in Table 6-10

Table 6-10: Intersection operation along West Botany Street during construction

Intersection	Day	Peak	2021 without construction traffic		2021 with construction traffic	
			LoS	Average delay (seconds/vehicle)	LoS	Average delay (seconds/vehicle)
West Botany Street and Bay Street	**Weekday (Thursday)**	AM	D	55	D	55
		PM	E	64	E	64
	Saturday	AM	F	93	F	93
		PM	F	>100	F	>100
West Botany Street and Ador Avenue	**Weekday (Thursday)**	AM	D	45	D	45
		PM	D	51	D	51
	Saturday	AM	D	45	D	45
		PM	E	64	E	65

As shown by the minimal change in delay in the table above, the operation of these intersections with the construction traffic in 2021 show a similar performance level without the proposal. Overall, construction activities would generate a small increase in traffic which would cause a minor change to the surrounding road network capacity. Construction vehicle movements are also not expected to impede upon regular road use, such as obstructing surrounding vehicle accesses and occupying roadways. As such, construction of the proposal is expected to have minimal impacts on network performance as a result of the movement of construction vehicles along Bay Street, West Botany Street and surrounding roads.

Brighton Memorial Fields

Construction traffic overview

The main construction access for Brighton Memorial Fields would be via the existing Sybil Lane access from O'Neill Street and exiting back out onto O'Neill Street. Construction traffic would not enter via Crawford Road. This arrangement would reduce any potential conflicts between school access and construction access.

Figure 3-4 shows the construction boundary and access arrangements for the site. General use of the surrounding streets and access to existing properties would be maintained throughout construction, where possible. Should any short term, temporary closures of O'Neill Street or Sybil Lane be required, residents and Brighton-Le-Sands School would be informed of construction times and access requirements by construction vehicles to ensure impacts of rear lane access closures to residential properties and the school are minimised.

Construction traffic would comprise of light and heavy vehicles and would be greatest during the earthworks and civil construction phase. It is assumed that there would generally be a balance of earthwork on the site, so not requiring large movement of spoil to or from the site. Estimated daily construction traffic volumes are provided in Table 6-11.

Table 6-11: Estimated daily construction traffic volumes at peak

Vehicle type	Maximum number of in/out movements (per day)
Light vehicles	10
Heavy vehicles	15

All construction-related vehicles would be parked within the existing car park or on site. Construction works are not likely to occur in the roadway.

Construction impacts

Based on the assumptions above the additional traffic from 2019 existing counts to 2021 forecast volumes is up to an additional 70 vehicles per hour for the intersection of Crawford Road and Sybil Lane. The additional traffic at the intersection of O'Neill Street and Sybil Lane would be far less than this.

Construction traffic assumes about 25 vehicles per day and the same working hours and peak hours of traffic as per McCarthy reserve noted above.

Table 6-12 shows the construction impacts for Brighton Memorial Fields along Crawford Road, Sybil Lane and O'Neill Street.

Table 6-12: Intersection operation around Brighton Memorial Fields during construction

Intersection	Day	Peak	2021 without construction traffic		2021 with construction traffic	
			LoS	Average delay (seconds/vehicle)	LoS	Average delay (seconds/vehicle)
Crawford Road/Sybil Lane	**Weekday (Thursday)**	AM	B	17	B	17
		PM	A	8	A	8
	Saturday	AM	A	9	A	8
		PM	A	9	A	8
Sybil Lane/ O'Neill Street	**Weekday (Thursday)**	AM	A	6	A	6
		PM	A	6	A	6
	Saturday	AM	A	6	A	6
		PM	A	6	A	6

Overall, construction activities would generate a minor increase in vehicle traffic which is expected to be accommodated by the surrounding road network capacity. Construction vehicle movements are also not expected to impede upon regular road usage, such as obstructing surrounding vehicle accesses and

occupying roadways. As such, construction of the proposal is expected to have minimal impact on network performance as a result of the movement of construction vehicles along Crawford Road, O'Neill Street and surrounding roads.

The existing car park within Brighton Memorial Fields would be unavailable during construction to be used as a drop-off and pick-up point for Brighton-Le-Sands. The new car park within the Brighton Memorial Playing Fields site would completed as soon as practicable, potentially allowing access to the car park for school drop-off and pick-up, prior to the completion of the rest of the works. Consultation would occur with Brighton-Le-Sands Public School to communicate changes in access to the car park and potential temporary, alternative drop-off options that are available in surrounding the area.

Operation

Traffic

To determine the additional usage of traffic it is important to first note the user types entering and exiting the sites.

An official game would include the following attendees:

- Players (with parents for underage games)
- Family and friends attendance
- Administrative roles and General support
- Referees and linesman
- Coaches and Managers
- Canteen staff and club officials.

Most officials attending the game i.e. referees, club officials and general support etc would be in attendance throughout the day. Therefore, for this assessment they would not be required during the peak traffic times considered in the traffic analysis. Players, family and coaches however, would be included in the analysis.

McCarthy Reserve/Ador Park Precinct

The proposal (as shown in Figure 1-4) comprises the construction of sports fields and amenities complex at McCarthy Reserve, and sports fields, carpark, a skate park and other recreational facilities at Ador Park Precinct, as well as shared paths and a pedestrian bridge across Muddy Creek.

Based on the current usage (shown in Table 6-6) the current fields include:

- McCarthy Reserve – full-sized field games are operating all day
- McCarthy Reserve SSF1 – mini games are operating for U6/U7 till around lunchtime
- 10 car parking spaces within Ador Precinct off Bay Street.

The proposed future use of the area comprises of:

- McCarthy Reserve – full-sized field
- Ador Park Precinct – mid-sized field (which could accommodate two mini fields)
- Recreational facilities which includes 88 car parking spaces off West Botany Street.

Based on the differences between existing use and future use there would be additional traffic due a change from a single mini field at McCarthy Reserve up to a mid-sized field at Ador Park Precinct as well as the addition of the recreational use.

The following assumptions have been made based on use after completion of the new facilities:

- The additional traffic moving from a mini field to a midi field would include the additional traffic:

- 8 additional players
- 8 additional family and friends
- 4 coaches and managers.

Therefore, the change for moving from a mini field to a midi field would attract an additional 20 cars per game/hour with a 20 car cross over.

- Assuming the recreational users are on the same time schedule, approximately 10 vehicles would enter while another 10 vehicles would exit. It is assumed that the skate park would have 20 users of which five would be parent's cars conservatively every hour and the same is assumed for the children's play area.

Therefore, the assumption of additional usage during the operation of the recreational facilities is around 30 vehicles entering and exiting off West Botany Street in and out of the carpark over a 30 minute period. This would occur during weekend game times only.

Based on the assumptions above, the impact of this additional traffic is shown in Table 6-13.

Table 6-13: Intersection operation along West Botany Street during operation (2021)

Intersection	Day	Peak	2021 prior to operation		2021 with operating traffic	
			LoS	Average delay (seconds/vehicle)	LoS	Average delay (seconds/vehicle)
West Botany Street/Bay Street	**Saturday**	AM	F	93	F	98
		PM	F	>100	F	>100
West Botany Street and Ador Avenue	**Saturday**	AM	D	45	D	47
		PM	E	64	E	67

Based on these conservative assumptions, the operation of the new facilities is unlikely to cause significant change in traffic impacts for the following reasons:

- Playing fields and open space areas are currently in use at the site. The upgraded and new recreational facilities would generate minimal additional traffic and can therefore be accommodated by sufficient network capacity
- The new carparking facility would accommodate substantially more vehicles than currently, thereby reducing delays from vehicles parking on the street
- No changes to the existing road network or public transport routes would occur as part of the proposal.

Some parking spaces on West Botany Street would need to be removed to accommodate the new driveway into the new parking within Ador Park Precinct. A road safety audit would be undertaken to consider the new access arrangements (and approaches), road frontage and internal parking/roadways and the interactions with the surrounding vehicle and non-vehicle movements (eg pedestrians). Recommendations from this safety audit would be considered in the final design prior to construction. The current parking available at the playing fields includes 10 spaces off Bay Street as well as on-road parking along West Botany Street which is in the order of around 40 to 45 spaces on both the eastern and western side. The new carpark would be sufficient to accommodate the loss of on-road parking. The additional traffic of 20 vehicles per hour in or out would be sufficiently accommodated in the carpark during peak conditions.

Brighton Memorial Fields

The proposal (as shown on Figure 1-5) comprises the construction of a new full-sized playing field, mid-sized playing field, amenities building, relocated play area and carpark.

Based on the current usage (shown in Table 6-6) the area includes:

- Brighton Memorial Fields – full-sized field, games operating all day
- Bicentennial Park East - two full-sized fields and one mid-sized field
- 34 car parking spaces at Brighton Memorial Fields off Sybil Lane.

The proposed future use of the area comprises of:

- Brighton Memorial Fields – full-sized field and mid-sized field
- A play area
- A 60 space car park off Sybil Lane.

The traffic assessment assumes that there is potential for at least 1.5 fields to be reinstated at Bicentennial Park East following the construction of the M6 Stage 1 project. Games currently played on Bicentennial Park would need to be redistributed within the region while these fields are disrupted by the construction of the M6 Stage 1.

Therefore, based on the total number of playing fields expected in future, there would be a reduction of one full-sized field to a mid-sized field. Currently the only games that require a full-sized field are played at Brighton Memorial Fields and Bicentennial Park East No. 1. All other games are currently played on full-sized fields which are line marked for games for U6/U7/U8/U9. With the current arrangement of games being played, the reduction in fields would not change the number of games being played; therefore, the recommendation is to either start games earlier or run games for longer in the day. The peak hour volumes during game time would reduce. There would be some recreational use; however, this would not be greater than that associated with the loss of a mid-sized field.

Overall, the change in traffic volumes at Brighton Memorial Fields would remain unchanged compared to current conditions.

By 2021, it has been assumed that Sybil Lane would become a one-way (northbound) to ease traffic flow and O'Neill Street off President Avenue would become a cul-de-sac.

Based on the assumptions above, the traffic results are shown below in Table 6-14.

Table 6-14: Intersection operation around Brighton Memorial Fields during operation (2021)

Intersection	Day	Peak	2021 prior to operation		2021 with operating traffic	
			LoS	Average delay (seconds/vehicle)	LoS	Average delay (seconds/vehicle)
Crawford Road/Sybil Ln	**Saturday**	AM	A	9	A	9
		PM	A	9	A	9
Sybil Lane/ O'Neill Street	**Saturday**	AM	A	6	A	6
		PM	A	6	A	6

Based on the analysis results, the operation of the proposed facilities is unlikely to cause traffic impacts for the following reasons:

- Playing fields and open space areas are currently in use at the site. The upgraded and new recreational facilities would generate minimal additional traffic and can therefore be accommodated by sufficient network capacity. However, with the reduction of fields at Bicentennial Park East, the difference in traffic volumes is negligible.
- The existing vehicle access via Sybil Lane connecting onto Crawford Road and O'Neill Street would be maintained.

Sybil Lane would operate as a one-way northbound laneway following completion of construction, with ingress from O'Neill Street and egress onto Crawford Road. Sybil Lane would have kerbs realigned where it is narrow around the tennis courts to eliminate the sharp bends. This change would improve safety of circulating vehicles and would mitigate risks of vehicles making a right turn from Crawford Road, thereby reducing delay.

Parking

McCarthy Reserve/Ador Park Precinct

The proposal for a new carpark on West Botany Street would provide additional car parking capacity by providing 88 car parking spaces, including accessibility parking. Accounting for the removal of around 10 car spaces from the unpaved Bay Street carpark, a net gain of approximately 78 parking spaces would be provided by the proposal.

Existing parking areas at PCYC St George and Ador Avenue would be maintained and would supply around 54 car spaces. The car parking facilities are expected to sufficiently cater for the associated parking demand.

In addition, cycle parking hoops would also be provided at the site. The number and location of the cycle parking hoops would be determined during detailed design.

Brighton Memorial Fields

An upgraded car parking area is proposed to provide improved access and additional capacity. The upgraded parking area would provide around 60 car parking spaces including accessibility parking spaces. This would add an additional 26 car spaces compared to the existing 34 car parking spaces currently provided. Additional cycle parking hoops are also proposed. The number would be determined during detailed design. The proposal is expected to generate similar parking demand to existing. As such, the proposed car park is expected to accommodate the parking demands of the recreational facilities.

Once the proposed works are complete, and whilst construction of the M6 Stage 1 project occurs, a review of parking demand would be undertaken. Should significant issues be identified, Bayside Council and Transport for NSW would identify alternative transport and access measures that may be temporarily implemented. Consideration would also be given to improving connectivity for field users between Ilinden Sports Centre and the proposal at Brighton Memorial Playing Fields, including the provision of a bus service between Ilinden Sports Centre and Brighton Memorial Playing Fields during peak game hours.

Other transport

At both sites there are opportunities to encourage greater access to the sites by means other than car based travel. Both sites are within less than a kilometre from a main railway station and there are high quality bus services and stops nearby. On West Botany Street, consideration should be given to improving the attractiveness of using bus services to access games through the relocation of bus stops to safer zones for pedestrians to cross and promoting green travel concessions through the club membership. Other initiatives such as end of trip cycle facilities may also assist with promoting non-car based travel.

6.1.4 Safeguards and management measures

Potential impacts on local traffic during the construction phase would be managed and mitigated by the construction contractor. This would be managed in such a way that minimises disruption of the operation of the existing recreational and sporting activities at McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields and on the surrounding road network. Traffic and access provisions would be detailed in a traffic plan (CTMP) which would form part of the Construction Environmental Management Plan (CEMP). Traffic management measures to be included in the CEMP would include those outlined in Table 6-15.

Table 6-15: Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	The CTMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The CTMP will include: • confirmation of haulage routes • construction vehicle parking controls and provision for worker parking off-street and on-site • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • a requirement to consult with those affected by changes to private driveway access • description of the access routes to construction sites including the entry and exit locations and measures to prevent construction vehicles queuing on public roads • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may	Contractor	Detailed design/pre-construction	Section 4.8 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.			
Traffic and transport	Notification of the local community and recreational facility users on construction progress including scheduling of works.	Contractor/ Transport for NSW	Pre-construction, construction	
Traffic and transport	The completion of the new car park within the Brighton Memorial Playing Fields site would be completed as soon as practicable within the wider program of works, and made available for school drop-off and pick-up, prior to the completion of the rest of the works. Consultation would occur with Brighton-Le-Sands Public School to communicate changes in access to the car park and potential temporary alternative parking options.	Transport for NSW/Bayside Council	Construction	
Traffic and transport	Construction works will not commence until the Site Access Approval (in writing) has been obtained from Bayside Council. The appropriate road opening and occupation permits will be sought from Bayside Council, accompanied by detailed traffic management plans prior to the works commencing. Any Road Occupancy Licences from the Transport Management Centre for work on State roads will also be obtained, where required.	Contractor	Pre-construction	
Traffic and transport	Cycle parking would be provided within the proposed car parks. End of trip cycle facilities would also be considered in the design to encourage greater access using cycles. The location for the cycle parking and end of trip facilities would be determined as part of the detailed design for the proposal.	Transport for NSW	Detailed design	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	Green travel concessions would be promoted through the club membership to encourage non-car based travel to the sites.	Bayside Council	Operation	
Traffic and transport	A road safety audit would be undertaken to consider the new access arrangements and the interactions with the surrounding transport network.	Transport for NSW	Detailed design	
Traffic and transport	Upon completion and within one month of soccer season starting, a review of parking demand would be undertaken. This review will consider whether temporary transport and access measures are required, and where necessary, implement those measures.	Transport for NSW/Bayside Council	Operation	

6.2 Noise and vibration

6.2.1 Methodology

Construction noise

A noise assessment was completed in accordance with the method described in the Roads and Maritimes Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime, 2016) to assess the potential construction noise impacts as a result of the proposal.

The proposed works are expected to be undertaken during standard construction hours. However, some limited out of hours works (no more than two consecutive nights) would be required for utility/services connections and civil works on roads adjacent to McCarthy Reserve/Ador Park Precinct. The assessment undertaken is based on 'reasonable' worst case construction scenarios and has been carried out using the Roads and Maritime Construction Noise Estimator Tool. This assessment methodology provides a simplified way to identify the cause of potential noise impacts and subsequent feasible and reasonable management and mitigation measures.

The noise assessment takes into consideration the type of equipment being used, the character of the noise emissions, time of day, the location and noise sensitivity of the nearest receivers.

The CNVG presents standard noise mitigation measures for construction works and additional mitigation measures which are triggered by certain exceedances of the noise management levels.

Operational noise

Operational noise from the proposal has been considered for compliance with the *Protection of the Environment Operations Act 1997* (PoEO Act).

The main acoustic requirement of the PoEO Act is to ensure that 'noise is not offensive'. The definition for offensive noise is provided in the Dictionary in the PoEO Act and states:

offensive noise is:

a. *that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*

   (i) *is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*

   (ii) *interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*

b. *that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.*

Noise emissions from the use of the recreational facilities has the potential to adversely affect surrounding noise sensitive receivers, particularly nearby residents.

The EPA's Noise Guide for Local Government (NGLG) (EPA, 2013) provides the following checklist of considerations to determine whether the noise is offensive:

1. Is the noise loud in an absolute sense? Is it loud relative to other noise in the area?
2. Does the noise include characteristics that make it particularly irritating?
3. Does the noise occur at times when people expect to enjoy peace and quiet?
4. Is the noise atypical for the area?
5. Does the noise occur often?
6. Are a number of people affected by the noise?

6.2.2Existing environment

McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields currently operate as active recreational areas, so general recreational and sports noise (such as shouting, whistles and ball impacts) are currently an established feature of the noise environment at nearby residential receivers. The current approved usage of the sites are as follows:

- Brighton Memorial Field – Monday to Thursday 4:00 pm to 9:45 pm (during season)
- Bicentennial Park East – 7:00 am to 8:30 pm and until 10:00 pm two nights per week
- Bicentennial Park South – (Sport ground) 7:00 am to 10:00 pm Monday to Sunday
- Ador Avenue Reserve – Lights extinguished by 9:45 pm Monday to Sunday.

It can reasonably be assumed that recreational and sports noise is an accepted feature at the proposal sites. While there is no skate park currently in the area, noise from the use of this facility could also be considered as recreational noise. Therefore, the proposal would not be introducing a new type of noise source into the area.

The noise environment in the study area of the McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields is considered to be suburban. Apart from recreational and sporting noise sources, other significant noise sources include arterial and sub-arterial roads such as West Botany Street, President Avenue and Bay Street. Noise at receivers located further away from these arterial/sub-arterial roads would

be exposed to local traffic noise and general suburban noise sources. Other key noise sources include light industry south of Bay Street and overhead aircraft movements.

Potential sensitive noise receivers near to the proposal sites include:

- Residential properties to the east of Ador Park Precinct on West Botany Street, to the west of McCarthy Reserve on Farr Street and Ador Avenue; and to the south on Bay Street
- Active recreational facility PCYC St George
- Residential properties to the east of Brighton Memorial Fields on Crawford Road and to the south on O'Neill Street
- Brighton-Le-Sands Public School to the north of Brighton Memorial Fields
- Active recreational facilities at Rockdale Bicentennial Park and Ilinden Sports Centre.

Ambient noise levels were measured previously as part of the noise and vibration assessment for the M6 Stage 1 project EIS. These noise levels are presented in Table 6-16.

Table 6-16: Ambient noise measurements

Noise logger	Location	RBL[1], dB(A)			Ambient noise level dB(A)		
		Day (7:00 am to 6:00 pm) $L_{A90,15\ min}$	Evening (6:00 pm to 10:00 pm) $L_{A90,15\ min}$	Night (10:00 pm to 7:00 am) $L_{A90,15\ min}$	Day (7:00 am to 6:00 pm) $L_{Aeq,15\ hour}$	Evening (6:00 pm to 10:00 pm) $L_{Aeq,4\ hour}$	Night (10:00 pm to 7:00 am) $L_{Aeq,9\ hour}$
NL05	CA Redmond Field (Rear of 103 Bruce Street, Brighton-Le-Sands)	39	39	34	56	49	45
NL09	53 Crawford Road, Brighton-Le-Sands	38	38	32	52	51	47

6.2.3Potential construction noise impacts

The construction at both McCarthy Reserve/Ador Park Precinct and the Brighton Memorial Fields is anticipated to be staged, take around 18 months and is currently scheduled to commence in mid 2020.

Construction noise from the works would require the use of noise intensive equipment at times, which would be located relatively close to sensitive receivers. At any particular sensitive receiver location, the potential impacts would vary over the duration of the project, depending upon factors such as the distance to the equipment, time of day, intensity and character of the construction noise.

Indicative construction noise levels for each construction stage were calculated using Roads and Maritime's Construction Noise Estimator. The following assumptions were made in the Construction Noise Estimator:

- Noise Area Category: R1 General Residential, based on the Rating Background Levels (RBLs) presented in Table 6-16
- No line of sight due to boundary fences and/or buildings
- Noisiest works during standard hours would be bulk earthworks
- Noisiest works during out of hours would be utility/service adjustments.

Calculations have been completed for standard construction hours and for out of hours work. For works during standard hours, it is likely that construction noise would be audible within 115 metres of the works and moderately intrusive for receivers within 35 metres of the works. For out of hours works, construction noise would be audible within 360 metres of the works, moderately intrusive for 150 metres of the works and highly intrusive within 50 metres of the works.

The CNVG presents standard noise mitigation measures that should be implemented for all construction projects with the potential to affect noise sensitive receivers. These standard mitigation measures are presented in section 6.2.6. The CNVG also presents additional noise mitigation measures depending on the predicted construction noise levels and their 'intrusiveness' at sensitive receivers.

Based on the construction noise assessment completed using the Construction Noise Estimator, the recommended additional mitigation measures and the associated catchment distances for residential receivers are presented in Table 6-17.

Table 6-17: Additional mitigation measures catchment distances for residential receivers

Highest noise generating construction activity	Catchment distance for notification of works	Catchment distance for specific notification of works	Catchment distance for respite offers
Standard hours works - Bulk earthworks	115 metres	-	20 metres
Out of hours works - Utility/service adjustments	540 metres	150 metres	10 metres

The additional mitigation measures are presented in Table 6-18.

Table 6-18: Additional noise mitigation measures

Mitigation measure	Description
Notification (letterbox drop or equivalent)	Advanced warning of work and potential disruptions can assist in reducing the impact on the community. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these would occur, impacts and mitigation measures. Notification distribution will be a minimum of five business days prior to the start of work.
Specific notifications	Specific notifications are usually in the form of a personalised letter or phone call to identified stakeholders no later than seven calendar days ahead of high noise generating construction activities. Alternatively (or in addition to), communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing. In summary, specific notifications may include: • Letters may be letterbox dropped or hand distributed • Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific concerns • Individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that will be implemented. Individual briefings provide affected stakeholders with personalised contact and

Mitigation measure	Description
	tailored advice, with the opportunity to discuss feasible and reasonable measures specific to them.
Respite offers	Respite offers will be considered where there are high noise and vibration generating activities near residential receivers. The respite would be a minimum period of one hour between blocks of continuous work which would be limited to three hours in duration. The actual duration of each block of work and respite should be flexible to accommodate the requirements of impacted receivers.

Brighton-Le-Sands Public School would also need to be notified about the works and respite offered for examination periods or during other sensitive periods identified during consultation with the school, if deemed necessary.

6.2.4Potential construction vibration noise impacts

Vibration intensive works may include the use of drum rollers. Typical minimum working distances for vibratory rollers are provided below in Table 6-19. These minimum working distances are based upon the minimum working distances presented in the CNVG. Should these minimum working distances be maintained, no adverse vibrational impacts are predicted.

Vibration intensive works are not expected to be undertaken within the minimum working distances. If vibration intensive works within the minimum working distances are identified, alternative equipment would be identified and vibration monitoring would be implemented, if necessary. Further mitigation of vibration would not be required where the minimum working distances are adhered to.

Table 6-19: Recommended minimum working distances for vibration intensive plant

Plant	Rating/description	Minimum working distance (m)	
		Cosmetic damage	Human response
		Residential	
Vibratory roller	< 50 kN (Typically 1-2t)	5	15-20
	< 100 kN (Typically 2-4t)	6	20
	< 200 kN (Typically 4-6t)	12	40
	< 300 kN (Typically 7-13t)	15	100
	> 300 kN (Typically 13-18t)	20	100
	> 300 kN (> 18t)	25	100

6.2.5Potential operational noise impacts

The proposed operational hours of the sites are representative of the main lighting controls that are used to light the two main full-sized playing fields. It is expected that these lights would be switched off during the times listed below:

- Monday to Friday: 9:45 pm to sunset
- Saturday and Sunday: 9:45 pm to sunset.

It is understood that the lighting would be in operation most days all year around, or otherwise as determined by Bayside Council.

As noted in section 6.2.1, general recreational and sports noise (such as shouting, whistles and ball impacts) are currently an established feature of the noise environments at nearby residential receivers. It can therefore reasonably be assumed that recreational and sports noise is an accepted feature at the proposed sites. The 'offensive noise' checklist is considered below to determine if nearby noise sensitive receivers are likely to be adversely affected by the proposal.

McCarthy Reserve/Ador Park Precinct

The noise generated by the use of the playing fields, playgrounds, skate park and car parks would not be loud in an absolute sense at nearby residential receivers. From Table 6-16 it can be seen that the ambient L_{Aeq} noise levels at the nearby residential receivers are over 50 dB(A) during the daytime and evening periods and would be higher closer to Bay and West Botany streets. Noise from use of the McCarthy Reserve/Ador Park Precinct recreational facilities would not be considered loud relative to these ambient noise levels.

Noise from use of the McCarthy Reserve/Ador Park Precinct may at times be audible at nearby residential receivers. However, given that the proposal is an upgrade of existing recreational facilities in the area, the character of the noise is not expected to change significantly and is considered to be typical and acceptable for the surrounding areas. Noise from use of the skate park would be less than the existing ambient noise levels in the area and can be considered typical recreational facility noise.

Generally, the McCarthy Reserve/Ador Park Precinct would be used most heavily during the daytime period with some activities during the evening periods also. It is likely that the McCarthy Reserve/Ador Park Precinct will be in frequent use, however the intensity of use is likely to be greater at weekends and in the evenings compared with the rest of the week.

Based on the above considerations, noise associated with the use of the McCarthy Reserve/Ador Park Precinct is unlikely to be considered 'offensive', as defined in section 6.2.1.

Brighton Memorial Fields

The noise generated by the use of the Brighton Memorial Fields would be similar to those already generated by the existing recreational facilities. The noise generated would not be considered loud relative to the ambient noise levels in the area. Noise from use of the Brighton Memorial Fields may at times be audible at nearby residential receivers, however given that the proposal is an upgrade of existing recreational facilities in the area, the character of the noise is not expected to change significantly and is considered to be typical and acceptable for the surrounding areas.

Generally, the Brighton Memorial Fields would be used most heavily during the daytime period with some activities during the evening periods also. It is likely that the Brighton Memorial Fields will be in frequent use, however the intensity of use is likely to be greater at weekends and in the evenings compared with the rest of the week.

Based on the above considerations, and similar to the McCarthy Reserve/Ador Park Precinct, noise associated with the use of the Brighton Memorial Fields is unlikely to be considered 'offensive'.

Road traffic noise

Give the existing relatively high volumes of road traffic on the roads surrounding the proposed sites, additional traffic generated by the proposal, as presented in section 6.1, would produce an increase of less than 1 dB(A). This is considered to be a negligible impact.

6.2.6Safeguards and management measures

The proposal will adhere to the Roads and Maritime *Construction Noise and Vibration Guideline* which details standard noise mitigation measures to be implemented during construction.

Table 6-20 presents a summary of the most pertinent noise mitigation and management measures.

Table 6-20: Construction and operational noise safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Construction noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The CNVMP will generally follow the approach in the ICNG and identify: all potential significant noise and vibration generating activities associated with the activity; and feasible and reasonable mitigation measures to be implemented. The measures will be consistent with the Roads and Maritime *Construction Noise and Vibration Guideline*. The CNVMP will include a monitoring program to assess performance against relevant noise and vibration criteria. Arrangements for consultation with key stakeholders and sensitive receivers, including notification and complaint handling procedures and contingency measures will be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Detailed design/pre-construction
Construction noise and vibration	Advance notification of work and potential disruption would be provided where receivers are likely to experience annoyance from noisy work. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these would occur, impacts and mitigation measures. Notification distribution will be a minimum of five business days prior to the start of work.	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Construction noise and vibration	Respite offers will be considered where there are intensively high noise and vibration generating activities near residential receivers. The respite would be a minimum period of one hour between blocks of continuous work which would be limited to three hours in duration. The actual duration of each block of work and respite should be flexible to accommodate the requirements of impacted receivers.	Contractor	Construction
Construction noise and vibration	Out of hours works would be undertaken over no more than two consecutive nights.	Contractor	Construction
Construction noise and vibration	Where feasible and reasonable, construction will be carried out during standard daytime construction working hours. Works generating high noise and/or vibration levels will be scheduled during less sensitive time periods.	Contractor	Construction
Construction noise and vibration	High noise and vibration generating activities near residential receivers will be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite will be flexible to accommodate the usage and amenity at nearby receivers.	Contractor	Construction

6.3 Landscape character and visual impacts

6.3.1 Methodology

This visual impact assessment has been undertaken in accordance with the Environment impact assessment practice note EIA-N04 – Guideline for landscape character and visual impact assessment (Roads and Maritime, 2018). In accordance with these guidelines, the following assessments have been carried out:

- Assessment of existing visual environment
- Assessment of visual impacts
- Recommendation of safeguards and management measure.

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views because of the change or loss of existing elements of the landscape and/or the introduction of new elements.

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint to change, and the magnitude of change arising from the proposal. The sensitivity of each viewpoint is mainly a

function of the occupation/activity of the people experiencing the view; the extent to which their attention is focused on the view and their experience of it; and the value attached to the view. The magnitude of change to views and visual amenity depends on the size or scale of change in the view; the geographical extent of the visual effect with different viewpoints; and the duration and reversibility of the visual effects.

An impact grading matrix (refer to Table 6-21) has been used to assess visual impacts and examines both sensitivity and magnitude to give a combined impact rating of between negligible and high.

Table 6-21: Visual impact grading matrix

		Magnitude			
Sensitivity		High	Moderate	Low	Negligible
	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Assumptions and limitations

As it was not possible to take photography from private property, this assessment infers what the view and visual impact of the proposal would be from described locations using digital mapping and site photography from publicly accessible land only.

The assessment of night lighting has been undertaken with a similar methodology to the daytime visual assessment. However, this assessment draws upon AS4282:2019 - Control of the obtrusive effects of outdoor lighting. This assessment addresses potential changes to the visual amenity of an area due to skyglow, glare, and light trespass.

The assessment of night-time lighting is not based on a lighting design, but rather assumptions have been made regarding the types and extent of lighting likely to be installed, with no assessment of existing or proposed luminescence levels.

It is assumed that lighting would be required until the playing fields cease operation at 9:45 pm and that lighting would be required every day of the year, even though this may not occur in reality.

6.3.2Existing environment

McCarthy Reserve/Ador Park Precinct

McCarthy Reserve and Ador Park Precinct are characterised by outdoor recreational areas with associated sporting and car parking infrastructure. Ador Avenue Reserve which is located to the north of the site is composed of a full-sized synthetic playing field and associated amenities. Also located directly north of McCarthy Reserve is the PCYC St George which provides a wide variety of indoor recreational activities.

McCarthy Reserve currently comprises a full-sized grass soccer field bordered to the east by Muddy Creek. This upper section of Muddy Creek is a fenced concrete channel which forms a barrier to the large open space located on the eastern side. This large open space is planted with established vegetation on the outer edges. The character of the areas surrounding McCarthy Reserve and Ador Park Precinct is largely defined by established single and double story residential dwellings.

Figure 6-1: Existing view from McCarthy Reserve looking east towards the densely planted vegetation associated with the Muddy Creek corridor

Brighton Memorial Fields

Brighton Memorial Fields forms one of a series of formal playing fields located to the east of Rockdale Bicentennial Park. Rockdale Bicentennial Park and Ilinden Sports Centre are located between West Botany Street and the Rockdale Wetlands. Brighton Memorial Fields are currently floodlit and are positioned to the edge of the residential area of Brighton-Le-Sands. It is densely enclosed with vegetation to the west, with Brighton-Le-Sands Public School located to the north and residents located to the east and south.

Figure 6-2: An existing view from Brighton Memorial Fields looking west towards the densely planted vegetation associated with the Rockdale Wetlands in the background

6.3.3Potential impacts

McCarthy Reserve/Ador Park Precinct

Construction

During construction, a temporary reduction in visual amenity is likely to result from construction activities such as earthworks, use of construction machinery, storage of construction materials and establishment and operation of temporary facilities such as laydown areas. These activities would result in minor reductions in visual amenity for several receptors including road users travelling along West Botany Street and Bay Street, a small number of local residences and the PCYC St George.

Selective removal and trimming of vegetation surrounding the Ador Park Precinct to facilitate construction activities would impact visual amenity of the park and may reduce a portion of the visual screening provided by vegetation, particularly for residents along Bay Street. Vegetation retention areas have been identified to help minimise visual amenity and biodiversity impacts (refer to Figure 3-2 and Figure 3-3). Other opportunities for retention would be investigated during detailed design. These visual impacts would be across a limited area, and temporary over a period of about 10 months until completion of construction.

Operation

Visual envelope mapping

The likely visibility of the proposal, once operational, from surrounding areas has been broadly mapped to define a visual envelope. This provides an indication of which parts of the proposal are likely to be viewed from surrounding areas. The mapping typically shows a ‘worst case’, i.e. some receptors may only see a small portion of the proposal while other receptors may view a more substantial part of the proposal.

Visual receptors

Five representative viewpoints have been identified. The location of these viewpoints reflects key locations that have sensitive visual receptors and/or a relatively high number of potential viewers.

Receptor locations are outlined below and shown in Figure 6-3:

- VR 1: West Botany Street - view west across West Botany Street towards the proposal
- VR 2: West Botany Street - view west from backyard of residential properties towards the proposal
- VR 3: Bay Street – view north across Bay Street towards the proposal
- VR 4: Farr Street – view east from backyard of residential properties towards the proposal
- VR 5: PCYC St George - view south from carpark towards the proposal.

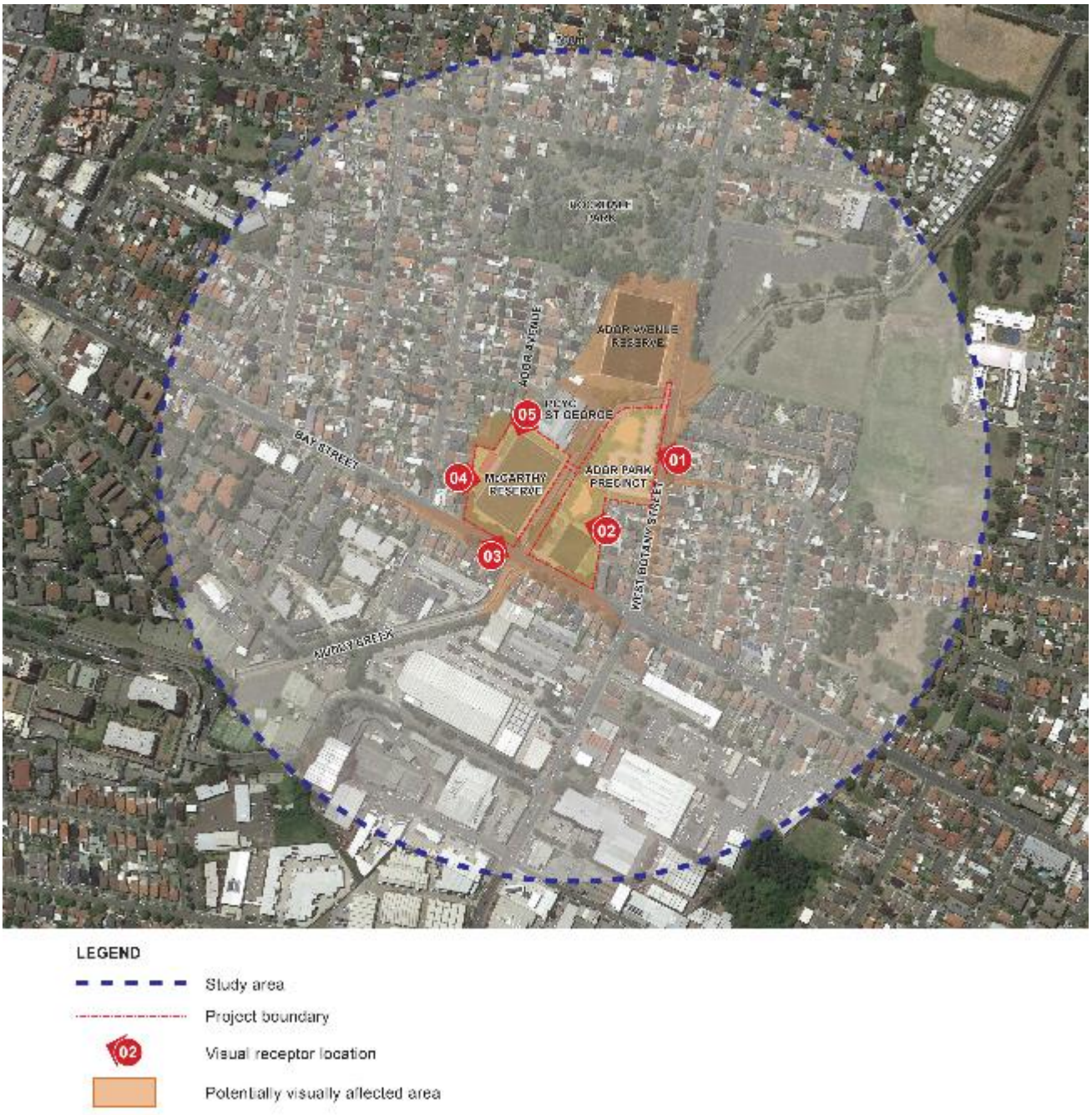

Figure 6-3: Visual envelope map – McCarthy Reserve/Ador Park Precinct

Table 6-22 summarises visual impacts to VR 1: West Botany Street.

Table 6-22: VR 1: West Botany Street – visual impact assessment

VR 1: West Botany Street

Figure 6-4: Existing view taken from the western footpath of West Botany Street looking west
Existing view The view is taken from the western footpath of West Botany Street, looking west towards the proposal. The key elements of the existing view comprise: • chain mesh fencing along the perimeter of Ador Park Precinct • extensive open grassed area • existing vegetation associated with the Muddy Creek corridor in the middle ground • partial view of the PCYC building in the background.
Anticipated change to view The key changes to the view would comprise: • the addition of the proposal, including: – the car park and associated light poles – the skate park – the toilet amenities block – partial view of the play area • loss of openness and green cover to the proposal area • the lit car park at night would comprise a visually prominent and contrasting backdrop to the Ador Park Precinct.

VR 1: West Botany Street
Sensitivity to change The sensitivity of VR 1 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 1 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the west facing orientation of the residential properties and associated windows and balconies, and proximity to the site. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 1 is high given that residents are likely to experience this view for longer than motorists, cyclists or pedestrians that are travelling along West Botany Street.
Magnitude of change The magnitude of change is **Moderate** as: *Size or scale* The size or scale of change likely to be experienced in the view would be moderate given: • the anticipated change arising from the addition of the proposal as described above is seen to be broadly commensurate with the size of the existing McCarthy Reserve and Ador Park Precinct • the high contrast and limited integration of the proposal with the existing landscape in terms of form, scale, materiality and colour with the existing low scale-built environment • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 1 would be moderate due to: • the angle of view from residential properties, associated windows and elevated balconies and the proximity to the proposal • the viewing distance of about 30 metres to the proposal meaning it would be seen in a high level of detail • the relatively small extent of the area over which the changes would be visible, given the expansive nature of the view. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something similar to, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 1 would be **Moderate**

Table 6-23 summarises visual impacts to VR 2: West Botany Street.

Table 6-23: VR 2: West Botany Street – visual impact assessment

VR 2: West Botany Street
Existing view The view is inferred from the backyard of residents* looking west towards the proposal. The key elements of the existing view comprises: • chain mesh fencing along the perimeter of Ador Park Precinct • extensive open grassed area • existing vegetation associated with the Muddy Creek corridor in the middle ground • partial view of the PCYC building in the background. *Note: As it was not possible to take a photograph from private property, this assessment infers what the view and visual impacts of the proposal would be from this location using Google Earth and site photography.
Anticipated change to view The key changes to the view are inferred as follows: • the addition of the proposal, including: – mid-sized grass playing field with associated fencing and light poles – play area and associated amenities – new plantings including trees, low shrubs and groundcover • removal of existing vegetation centrally located at the site for the mid-sized playing field.
Sensitivity to change The sensitivity of VR 2 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 2 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the west facing orientation of the backyard of residential properties and associated windows and balconies, proximity to the Proposal area. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 2 is high given that the residents will likely be focused on the view for long periods of time and have a proprietary interest in their outlook.

VR 2: West Botany Street
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to be broadly commensurate with the size of the existing McCarthy Reserve and Ador Park Precinct • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 2 would be low due to: • the angle of view from residential properties, associated windows and elevated balconies • the viewing distance of about 20 metres to the proposal meaning it would be seen in a high level of detail • the low extent of the area over which the changes would be visible. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something like, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 2 would be **Moderate-Low**.

Table 6-24 summarises visual impacts to VR 3: Bay Street.

Table 6-24: VR 3: Bay Street – visual impact assessment

VR 3: Bay Street

Figure 6-5: Existing view from the southern footpath of Bay Street, looking north towards the proposed site
Existing view The view is taken from the southern footpath of Bay Street, looking north towards the proposal. The key elements of the existing view comprises: • existing perimeter planting along the edge of the site along Bay Street which forms an effective screen • existing vegetation associated with the Muddy Creek corridor in the middle ground • informal car park area • partial view of the PCYC building in the background.
Anticipated change to view The key changes to the view would comprise: • the addition of the proposal, including: – mid-sized grassed playing field with associated fencing and light poles – full-sized synthetic playing fields with associated fencing and light poles – pedestrian bridge that traverses Muddy Creek – partial view of the amenities building at McCarthy Reserve – partial view of the play area at Ador Park Precinct in background. • removal of existing vegetation centrally located at the site for the mid-sized playing field.

VR 3: Bay Street
Sensitivity to change The sensitivity of VR 3 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 3 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the west facing orientation of the residential properties and associated windows and balconies, and proximity to the site. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 3 is high given that residents are likely to experience this view for longer than motorists, cyclists or pedestrians travelling along Bay Street.
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to be broadly commensurate with the size of the existing McCarthy Reserve and Ador Park Precinct • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 3 would be moderate due to: • the angle of view from residential properties, associated windows and elevated balconies and the proximity to the proposal • the viewing distance of around 40 metres to the proposal meaning it would be seen in a high level of detail • the relatively small extent of the area over which the changes would be visible, given the expansive nature of the view. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something similar to, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 3 would be **Moderate-Low**.

Table 6-25 summarises visual impacts to VR 4: Farr Street.

Table 6-25: VR 4: Farr Street – visual impact assessment

VR 4: Farr Street
Existing view The view is inferred from the backyard of residents* looking east towards the proposal. The key elements of the existing view comprise: • extensive open grassed area associated with McCarthy Reserve playing fields • existing trees adjoining the property boundary of the proposal • existing vegetation associated with the Muddy Creek corridor in the middle ground. *Note: As it was not possible to take a photograph from private property, this assessment infers what the view and visual impacts of the proposal would be from this location using Google Earth and site photography.
Anticipated change to view The key changes to the view are inferred as follows: • the addition of the proposal, including: – amenities building at McCarthy Reserve located in the foreground – full-sized synthetic playing fields with associated fencing and light poles – play area and associated amenities in the background at Ador Park Precinct – new plantings including trees, low shrubs and groundcover.
Sensitivity to change The sensitivity of VR 4 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 4 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the east facing orientation of the backyard of residential properties and proximity to the site. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 4 is high given that the residents will likely be focused on the view for long periods of time and have a proprietary interest in their outlook.

VR 4: Farr Street
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above is seen to be broadly commensurate with the size of the existing McCarthy Reserve and Ador Park Precinct • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 4 would be low due to: • the angle of view from residential properties, associated windows and elevated balconies • the viewing distance of about 20 metres to the proposal meaning it would be seen in a high level of detail • the low extent of the area over which the changes would be visible. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something similar to, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 4 would be **Moderate-Low**.

Table 6-26 summarises visual impacts to VR 5: PCYC St George.

Table 6-26: VR 5: PCYC St George – visual impact assessment

VR 5: PCYC St George

Figure 6-6: Existing view from the carpark of the PCYC St George, looking south towards the proposed site
Existing view The view is taken from the existing car park of the PCYC St George, looking south towards the proposal. The key elements of the existing view comprise: • extensive open grassed area associated with McCarthy Reserve playing fields • existing trees adjoining the property boundary of the Proposal • existing vegetation associated with the muddy creek corridor in the middle ground.
Anticipated change to view The key changes to the view would comprise: • the addition of the Proposal, including: – full-sized synthetic playing fields with associated fencing and light poles – amenities building – pedestrian bridge, play area and associated amenities in the background – new planting including trees, low shrubs and groundcovers.

VR 5: PCYC St George
Sensitivity to change The sensitivity of VR 5 to the anticipated change in the view is **Low**, as: *Susceptibility to change* The susceptibility of VR 5 to the changes in the view is low given: • the primary visual receptor who would experience this view of the proposal would be comprised of users of the PCYC and people engaged in active recreation • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the moderate amenity value associated with the view. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 5 is low given that people attending the PCYC are indoors and those engaged in active recreation do not depend upon an appreciation of views of the landscape. In addition, their attention is focused on the activity, not their surroundings.
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to be broadly commensurate with the size of the existing McCarthy Reserve • the low amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 5 would be low due to: • the angle of view from recreational users from within the PCYC car park • the viewing distance of around 20 metres to the proposal meaning it would be seen in a high level of detail • the extent of the area over which the changes would be visible is contained within the immediate visual curtilage of the PCYC car park. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something similar to, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 5 would be **Low**.

Night lighting

The setting of McCarthy Reserve and Ador Park Precinct is an intrinsically dark landscape with low lighting levels created by surrounding residential streets and development. Moderate lighting levels are created during night time sporting activities, creating a temporarily brightening of the night sky. There are no existing light fixtures within the Ador Park Precinct. However, existing light fixtures within McCarthy

Reserve comprise three light poles with three luminaires each that sit 12-15 metres high which illuminate the existing grass sports field. Two of these light poles are located on the western boundary and one light pole is located on the eastern boundary of the existing grass sports field.

Construction

Most works required for the proposal would be undertaken during standard construction hours. Some limited night works may be required on surrounding roads. Overall, there is expected to be no perceived change in the amenity of views in this area at night. This would result in a negligible visual impact outside of standard construction hours.

Operation

It is proposed that four new light poles would be required for the full-sized synthetic playing field at McCarthy Reserve. The lighting would be designed for professional competition and would minimise light spill and direct light that would be experienced by adjacent residential properties. The proposal would not result in a perceived change to the level of skyglow, glare, and light trespass by the surrounding visual receptors. The proposal does not contrast with the surrounding landscape at night and would result in a reduced number of fixtures associated with McCarthy Reserve. The lighting of the proposal would not create a perceived change in visual amenity, resulting in a negligible visual impact during evening hours (i.e. until the fields are closed).

However, the existing Ador Park Precinct has a moderate sensitivity visual setting at night. The proposal would have a noticeable change in visual amenity associated with two new light poles proposed for the mid-sized sports field and associated car park lighting, skate park and shared pathway lighting. The lighting of the car park would contrast with the intrinsically dark landscape at night, with moderate alteration to the level of sky glow, glare and trespass clearly visible in this area. It is expected that at night, there would be a moderate visual impact during evening hours (i.e. until the fields are closed). Lighting provided for the proposal would be designed to comply with Australian Standard (AS) 4282 – Control of the obtrusive effects of outdoor lighting and AS 2560:2007 Sports Lighting. Consultation would occur with residents potentially affected by increased light spill due to the proposal once detailed design for lighting is complete.

Brighton Memorial Fields

Construction

During construction, a temporary reduction in visual amenity is likely to result from construction activities such as earthworks, use of construction machinery, storage of construction materials and establishment and operation of temporary facilities such as laydown areas. These activities would result in minor reductions in visual amenity for a small number of local residences that reside along Sybil Lane.

Selective removal and trimming of vegetation surrounding Brighton Memorial Fields to facilitate construction activities would impact visual amenity of the site and may reduce a portion of the visual screening provided by vegetation, particularly for residents that back onto Sybil Lane. Vegetation retention areas have been identified at McCarthy Reserve to help minimise visual and biodiversity impacts (refer to Figure 3-4). Other opportunities for retention would be investigated during detailed design.

These visual impacts would be across a limited area and temporary over a period of about 10 months until completion of the proposal.

Operation

Visual envelope mapping

The likely visibility of the proposal, once operational, from surrounding areas has been broadly mapped to define a visual envelope. This provides an indication of which parts of the proposal are likely to be viewed

from surrounding areas. The mapping typically shows a ‘worst case’, ie some receptors may only see a small portion of the proposal, while other receptors may view a more substantial part of the proposal.

Visual receptors

Three representative viewpoints have been identified. The location of these viewpoints reflects key locations that have sensitive visual receptors and/or a relatively high number of potential viewers.

Receptor locations are outlined below and shown in Figure 6-7:

- VR 1: Brighton-Le-Sands Public School - view south towards the proposal
- VR 2: Sybil Lane - view west across Sybil Lane towards the proposal
- VR 3: Sybil Lane - view north across Sybil Lane towards the proposal.

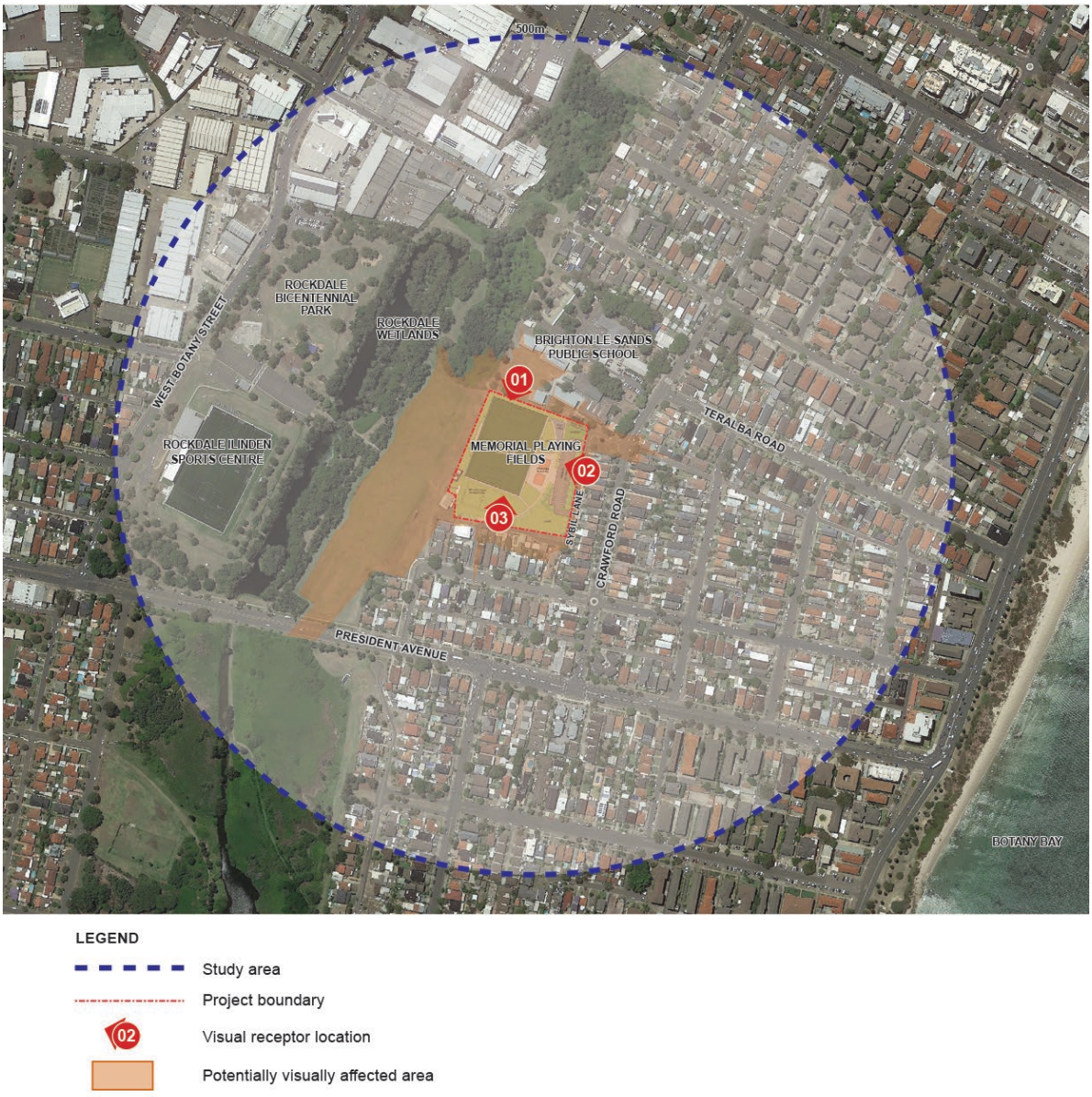

Figure 6-7: Visual envelope map – Brighton Memorial Fields

Table 6-27 summarises visual impacts to VR 1: Brighton-Le-Sands Public School.

Table 6-27: VR 1: Brighton-Le-Sands Public School – visual impact assessment

VR 1: Brighton-Le-Sands Public School
Existing view The view is taken near the boundary of the Brighton-Le-Sands Public School, looking south towards the proposal. The key elements of the existing view comprise: • extensive open grassed area associated with Brighton Memorial Fields • existing trees along the property boundary.
Anticipated change to view The key changes to the view would comprise: • the addition of the proposal, including: – full-sized synthetic playing fields with associated fencing and light poles – amenities building – play area and amenities building – new plantings including trees, low shrubs and groundcover.
Sensitivity to change The sensitivity of VR 1 to the anticipated change in the view is **Low**, as: *Susceptibility to change* The susceptibility of VR 1 to the changes in the view is low given: • the primary visual receptor who would experience this view of the proposal would be comprised of teachers and school children. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 1 is low given that school children and teachers will be focused on their work or activity and do not depend upon an appreciation of views of the landscape.

VR 1: Brighton-Le-Sands Public School
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to be broadly commensurate with the size of the existing Brighton Memorial Fields • the low amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 1 would be low due to: • the angle of view from school users from within the school yard and classrooms • the viewing distance of around 20 metres to the proposal meaning it would be seen in a high level of detail • the relatively small extent of the area over which the changes would be visible, given the expansive nature of the view. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something like, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 1 would be **Low**.

Table 6-28 summarises visual impacts to VR 2: Sybil Lane.

Table 6-28: VR 2: Sybil Lane – visual impact assessment

VR 2: Sybil Lane
Existing view The view is inferred from the backyard of residents* looking west towards the proposal. The key elements of the existing view comprises: • car parking and amenities building in the foreground • a playground • extensive open grassed area • vegetation associated with the Rockdale Wetlands in the background. *Note: As it was not possible to take a photograph from private property, this assessment infers what the view and visual impacts of the proposal would be from this location using Google Earth and site photography.

VR 2: Sybil Lane

Anticipated change to view
 	
The key changes to the view are inferred as follows:
 	
• the addition of the proposal, including:
  – the 60 car parking spaces and associated light poles
  – relocated playground and associated amenities
  – mid-sized grass playing field
  – full-sized synthetic playing field with associated fencing and light poles
  – new plantings including trees, low shrubs and groundcover
• removal of existing vegetation centrally located at the site for the car park.

Sensitivity to change The sensitivity of VR 2 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 2 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the west facing orientation of the backyard of residential properties and associated windows and balconies, and proximity to the site. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 2 is high given that the residents will likely be focused on the view for long periods of time and have a proprietary interest in their outlook.

VR 2: Sybil Lane
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to broadly commensurate with the size of the existing Brighton Memorial Fields • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 2 would be low due to: • the angle of view from residential properties, associated windows and elevated balconies • the viewing distance of around 30 metres to the proposal meaning it would be seen in a high level of detail • the low extent of the area over which the changes would be visible. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something like, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 2 would be **Moderate-Low**.

Table 6-29 summarises visual impacts to VR 3: Sybil Lane.

Table 6-29: VR 3: Sybil Lane – visual impact assessment

VR 3: Sybil Lane
Existing view The view is inferred from the backyard of residents* looking north towards the proposal. The key elements of the existing view comprise: • extensive open grassed area • existing tennis courts and playground • Brighton-Le-Sands Public School in the background. *Note: As it was not possible to take a photograph from private property, this assessment infers what the view and visual impacts of the proposal would be from this location using Google Earth and site photography.

VR 3: Sybil Lane
Anticipated change to view The key changes to the view are inferred as follows: • the addition of the proposal, including: – mid-sized grass playing field – full-sized synthetic playing field with associated fencing and light poles – removal of existing tennis courts and replacement with grassed lawn – relocated playground and associated amenities building – new plantings including trees, low shrubs and groundcover – partial view of the 60 car parking spaces and associated light poles.
Sensitivity to change The sensitivity of VR 3 to the anticipated change in the view is **Moderate**, as: *Susceptibility to change* The susceptibility of VR 3 to the changes in the view is moderate given: • the nature of the visual receptors who would experience this view of the proposal, comprising residents who could be expected to take a proprietary interest in changes to the view from their homes • the extent to which their attention or interest would be focused on the view would be expected to be moderate given the north facing orientation of the backyard of residential properties and associated windows and balconies, and proximity to the site. *Value of visual receptor* The value attached to the existing view and associated visual amenity of VR 3 is high given that the residents will likely be focused on the view for long periods of time and have a proprietary interest in their outlook.

VR 3: Sybil Lane
Magnitude of change The magnitude of change is **Low** as: *Size or scale* The size or scale of change likely to be experienced in the view would be low given: • the anticipated change arising from the addition of the proposal as described above, is seen to be broadly commensurate with the size of the existing Brighton Memorial Fields • the moderate amount of time a full view of the proposal would be seen. *Geographical extent* The geographical extent of the visual effect from VR 3 would be moderate due to: • the angle of view from residential properties, associated windows and elevated balconies • The viewing distance of around 50 metres to the proposed full size field and proposed amenities would be seen in a moderate level of detail • the low extent of the area over which the changes would be visible. *Duration and reversibility* The duration of the proposal would be long-term and partially reversible in that the landscape can be restored to something like, but not the same as, the original.
Significance of visual impact: The significance of the visual impact arising from the proposal on VR 3 would be **Moderate-Low**.

Night lighting

The setting of Brighton Memorial Fields is an intrinsically dark landscape with low lighting levels created by surrounding residential streets and development. Moderate lighting levels are created during night-time sporting activities, creating a temporarily brightening of the night sky. Existing light fixtures within Brighton Memorial Fields comprise four light poles with two luminaires each that sit around 18 metres high and which illuminate the existing grass sports field.

Construction

Most works required for the proposal would be undertaken during standard construction hours. Some limited night works may be required on adjacent roads. Overall, there is expected to be no perceived change in the amenity of views in this area at night. This would result in a negligible visual impact outside of standard construction hours.

Operation

It is proposed that four new light poles are required for the full-sized synthetic playing field at Brighton Memorial Fields. The lighting would be designed for professional competition in accordance with relevant standards and would minimise light spill and direct light that would be experienced on adjacent residential properties. Brighton Memorial Fields are currently floodlit. The proposal is not expected to result in a perceived change to the level of skyglow, glare, and light trespass by the surrounding visual receptors. The proposal does not contrast with the surrounding existing landscape at night and is not expected to create a perceived change in visual amenity, resulting in a negligible visual impact during evening hours (i.e. until the fields are closed). Consultation would occur with residents potentially affected by increased light spill once detailed design for lighting is complete.

Summary of impacts on views and visual amenity

As shown in Table 6-30, the significance of impacts on views and visual amenity range from Low to Moderate for all visual receptor locations. As such, this assessment finds that there was no significant effect on visual amenity arising from the proposal (ie a rating of High or High-Moderate).

Table 6-30: Summary of impacts on views and visual amenity

Visual receptor location	Sensitivity	Magnitude	Significance of visual impact
McCarthy Reserve and Ador Park Precinct			
VR 1	Moderate	Moderate	**Moderate**
VR 2	Moderate	Low	**Moderate-Low**
VR 3	Moderate	Low	**Moderate-Low**
VR 4	Moderate	Low	**Moderate-Low**
VR 5	Low	Low	**Low**
Brighton Memorial Fields			
VR 1	Low	Low	**Low**
VR 2	Moderate	Low	**Moderate-Low**
VR 3	Moderate	Low	**Moderate-Low**

6.3.4Safeguards and management measures

The safeguards and management measures in Table 6-31 will be implemented to reduce potential impacts of the proposal on visual amenity.

Table 6-31: Summary of visual impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Visual amenity	Consideration will be given to reducing visual amenity impacts associated with new structures during detailed design, for example in the choice of materials and finishes that are complementary to the surrounding visual landscape.	Detailed designer	Detailed design
	Measures to further minimise the construction footprint and to increase vegetation retention areas will be investigated during detailed design.	Contractors	Construction
	Additional landscaping will be provided at both sites that complements the existing vegetation and local character.	Contractors	Construction
	A site inspection will be undertaken prior to commencing construction to confirm tree removal, tree retention and tree protection measures. The implementation of site-specific safeguard measures will be checked before construction starts.	Contractors and Transport for NSW	Construction
Light spill	Lighting provided for the proposal would be designed to comply with Australian Standard (AS) 4282 – Control of the obtrusive effects of outdoor lighting and AS 2560:2007 Sports Lighting.	Detailed designer	Detailed Design
	Full cut-off fixtures will be used for lighting where feasible.	Detailed designer	Detailed Design
	Lighting will be operated at no more than 200 Lux.	Lessees	Operation
	Residents potentially affected by increased light spill would be consulted following the completion of the detailed lighting design.	Transport for NSW	Detailed Design

6.4 Biodiversity

6.4.1Methodology

A desktop review of available information and data was carried out. The data reviewed included:

- OEH Bionet database for threatened matters listed under the BC Act
- A Protected Matters Search for threatened matters listed under the EPBC Act
- Validated vegetation mapping from the M6 Stage 1 Biodiversity Development Assessment Report (ELA, 2018)
- Department of Industry - Fisheries key fish habitat
- Threatened matters listed under the Fisheries Management Act 1994
- Commonwealth listing advice for the Grey-headed Flying Fox
- National Flying-fox monitoring viewer
- Draft National Recovery Plan for the Grey-headed Flying Fox (DECCW, 2009)
- High resolution aerial photography.

For the McCarthy Reserve/Ador Park Precinct, a brief site inspection was carried out on 28 June 2019. The site was traversed on foot. Vegetation types were validated and condition information recorded. Photographs of the site were taken. Where hollow bearing trees were encountered, they were marked spatially. No targeted survey, floristic plots or condition transects were undertaken.

The vegetation at Brighton Memorial Fields, Brighton-Le-Sands had been previously validated and described as part of the EIS for the M6 Stage 1 project. No additional inspection of this area was undertaken.

6.4.2Existing environment

Desktop review

The desktop review revealed that at Brighton Memorial Fields and the McCarthy Reserve/Ador Park Precinct, the following threatened matters were recorded within a 5 kilometre radius:

- Two Endangered Ecological communities
- 15 threatened plant species
- 74 threatened birds
- Eight threatened mammals
- Three threatened amphibians
- Two threatened reptiles
- One threatened insect.

Vegetation

The vegetation at Brighton Memorial Fields was mapped as cleared/weeds and Urban Native and Exotic. No remnant native vegetation communities were observed. Refer to Figure 6-8. There were large specimens of an unidentified Eucalyptus at the edge of the playing field. The carpark vegetation was mostly *Banksia integrifolia* (Coast Banksia) planted with *Lomandra longifolia* (Mat Rush). A large *Grevillea robusta* (Silky Oak), *Lophostemon confertus* (Brush Box) and two *Araucaria heterophylla* (Norfolk Island Pine)

dominated the southern portion of the canopy. The area without canopy consisted of exotic grasses and formed the playing field surface.

The vegetation at the McCarthy Reserve/Ador Park Precinct consisted of Urban Native and Exotic and cleared/weeds (refer to Figure 6-9). The Urban Native and Exotic vegetation type does not correspond with any listed threatened ecological community. Rather the vegetation contained native canopy species such as *Eucalyptus botryoides/saligna* (intergrade), *Melaleuca armillaris*, *Casuarina cunninghamiana*, *Casuarina glauca*, *Eucalyptus microcorys* (Tallowwood) and *Callistemon* sp. (Bottlebrush). There were several large figs in the canopy. The area mapped as exotics contained either a canopy of *Olea europaea* subsp. *cuspidata* (African Olive) or was devoid of any canopy. The area without canopy consisted of exotic grasses and formed the playing field surfaces.

Aquatic habitat

The Muddy Creek waterway is fully concrete lined and there are no banks present due to the concrete channelisation. No aquatic instream vegetation was observed and there was no riparian vegetation on either side of the waterway. The section of Muddy Creek present within the McCarthy Reserve/Ador Park Precinct area is not mapped as Key Fish Habitat and there is no tidal influence here. There was one aquatic bird observed foraging in the waterway. This species, *Egretta novaehollandiae* (White-faced Heron) is not a listed threatened species, nor is it listed under the EPBC Act as a migratory species.

Fauna

Fauna present consisted of disturbance tolerant peri-urban bird species. No other fauna types were observed. The existing bridge over West Botany Street was considered for its potential to provide habitat to the Eastern Bentwing Bat. These bats do not commonly form maternity roosts in open bridge situations. Outside of the breeding period, these bats have been known to roost in cooler caves, old mines, and stormwater channels, under bridges and occasionally buildings. However, the bridge is well lit and little vegetation fringing along Muddy Creek, which is fully concrete lined. The bats are considered unlikely to use the bridge. The bridge would not be removed during construction, however temporary construction impacts such as noise could disturb the bats if they are found to be present.

A pre-construction survey would be undertaken of existing West Botany Street bridge over Muddy Creek to confirm presence of bats. The Flora and Fauna Management Plan for the proposal would include procedures for unexpected threatened species finds and fauna handling.

Fauna habitat

Both sites are highly modified and are well used areas for exercise and other sporting activities. Therefore, there is low probability of these areas providing habitats for threatened fauna. Two hollow bearing trees were observed at Ador Park Precinct, but outside the proposal area (refer to Figure 6-9). These trees would be retained. One hollow was occupied by *Trichoglossus haematodus* (Rainbow Lorikeet). The other hollow was not occupied, and no signs of use were observed.

The fig trees present at the Ador Park Precinct may provide foraging habitat for *Pteropus poliocephalus* (Grey-headed Flying-fox). The fig trees were large, mature and would produce fruits. Other native canopy species such as the numerous eucalypts may provide a floral nectar resource for Grey-headed Flying-fox and other common species. These trees would be considered for retention. This assessment has assumed that vegetation identified for retention within the construction boundary will not be cleared (refer to Figure 3-2, Figure 3-3 and Figure 3-4).

The *Banksia integrifolia* and *Eucalyptus* at Brighton Memorial Fields would provide floral nectar resources for a range of common bird species. These plants may provide potential foraging habitat for Grey-headed Flying-fox. Opportunities for vegetation retention would be considered further during detailed design.

Most of the two sites comprised exotic grass playing field surfaces. This vegetation type does not provide for important fauna habitat.

Figure 6-8: Validated vegetation communities – Brighton Memorial Fields

Figure 6-9: Validated vegetation communities – McCarthy Reserve/Ador Park Precinct

6.4.3Potential impacts

Construction

Removal of vegetation

The construction of the facilities at both sites would require the removal of native plants and the removal of open grassed areas. The native plants to be removed do not form any native vegetation community. The majority of trees at McCarthy Reserve/Ador Park Precinct would be retained (refer to Figure 3-2 and Figure 3-3). This assessment has assumed that all vegetation at Brighton Memorial Fields within the construction boundary would need to be removed. At McCarthy Reserve/Ador Park Precinct, vegetation that falls outside of the identified vegetation retention areas would be cleared.

EPBC Act and BC Act impact assessments were applied to the Grey-headed Flying-fox. Grey-headed Flying-fox are known to forage up to 50 kilometres nightly from roosting sites (camps) to feed on fruit, flowers, pollen and nectar (Churchill, 2008). Food sources for this species include *Eucalyptus* sp., *Ficus* sp. and mangrove tree species (Churchill, 2008). While Grey-headed Flying-fox are known to forage up to 50 kilometres for nightly foraging requirements, this species is mobile and seasonal movements occur across larger areas within the entire range for this species. Grey-headed Flying-fox have been found to disperse more than 2,000 kilometres over a nine-month period and the population distribution for this species fluctuates along the entire NSW coast in response to food availability or breeding (OEH 2019b).

The nearest known camp is located around 4.5 kilometres north of McCarthy Reserve/Ador Park Precinct. This camp, number 488, occurs at Wolli Creek and is classified as a category 2 camp (between 500 – 2, 499 individuals) (DE, 2018). A second nearby camp occurs in Oatley, (camp number 483) and is categorised as a category 1 camp (between 1 – 499 individuals) and is located less than 10 kilometres away from Brighton Memorial Fields (DE, 2018). Four other active flying fox camps are found further away than camps 488 and 483 but are within a 50 kilometre radius of the sites, these include Kurnell (camp 245), Centennial Park (camp 487), Kareena Park (camp 942) and Kareela (camp 364) (DE, 2018).

The removal of the small number of trees at both sites would not significantly affect the population of Grey-headed Flying-fox. None of the camps close to the sites are large. No camps would be directly affected by the removal of the vegetation. The area of foraging habitat required to support the local population would be much larger than the area affected by the proposed work. Further, the work would include landscaping following construction. Landscaping could include plant species that may be a foraging resource for this species.

Noise and light

There is a risk that noise and light during construction may negatively affect fauna habitats at both sites. The majority of works at the proposed sites would be undertaken during standard construction work hours. The proposed work could therefore occur as late as 6:00 pm. During winter solstice, sunset is at around 4:50 pm. Therefore, there may need to be construction lighting used if work occurred during winter. Extended and artificial lighting may affect fauna habitats at both sites. Similarly, noise occurring after sunset in winter may affect the quality of fauna habitats. While there is likely to be increased light and noise during construction, these impacts would be temporary and would be subject to standard noise and light spill reduction mitigation measures. Therefore, construction works are not likely to significantly affect threatened fauna.

Sedimentation

The removal of the existing playing fields would expose soil and other substrate materials. There is a risk that following rain, some of this soil would migrate into Muddy Creek (refer to section 7.2 for erosion and sedimentation, and surface water management measures). While Muddy Creek is fully concrete lined where it intersects McCarthy Reserve/Ador Park Precinct, the creek becomes more naturalised where it passes under Bestic Street to the north. At this location, the creek is mapped as Key Fish Habitat and has a tidal influence. The mobilisation of soil and other sediment may negatively affect this habitat downstream in a large rainfall event. These impacts should they occur, would be temporary and not likely to significantly affect threatened fauna. Soil and erosion controls would assist in managing this potential impact.

Operation

The loss of mature *Banksia* and other trees at Brighton Memorial Fields as well as vegetation at McCarthy Reserve/Ador Park Precinct would be permanent. This loss would not significantly affect any threatened species, population, community or their habitats.

During operation there would be an increase in lighting at both sites during evening hours, until the playing fields cease operation at 9:45 pm (refer to the night lighting assessment detailed in section 6.3). The proposal includes sports field lighting and carpark lighting at both sites. However, there would only be a perceptible change in lighting at Ador Park Precinct. Additional lighting for the proposal is not likely to affect any threatened species, population, community or their habitats such that they would be at increased risk of extinction. The lighting would be designed to minimise glare and light spill on surrounding areas.

Conclusion on significance of impacts

The proposal is not expected to significantly impact threatened species or ecological communities or their habitats, within the meaning of the BC Act or FM Act and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required (refer to Appendix C for relevant supporting documents).

The proposal is not expected to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.

6.4.4Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the *Landscape Guideline* (RTA, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • requirement for a suitably qualified arborist to be present for on-site for activities such as tree health assessments, when tree roots are encountered and during vegetation clearing • procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013), to manage the unlikely risk of sediment flowing into waterways • protocols to manage weeds and pathogens.	Contractor	Detailed design/ pre-construction
Biodiversity	A pre-construction survey would be undertaken of the existing West Botany Street bridge over Muddy Creek to confirm presence of Eastern Bentwing Bats. The Flora and Fauna Management Plan for the proposal would include procedures for unexpected threatened species finds and fauna handling.		
Biodiversity	Measures to further minimise the construction footprint and to increase vegetation retention areas will be investigated during detailed design and implemented where practicable and feasible. Habitat trees for threatened species will be considered for retention.	Detailed designer	Detailed design/ pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Biodiversity	Vegetation planted as part of the landscaping work will consider compatibility as a foraging resource for Grey-headed Flying-fox. Species such as eucalypts and figs would be consistent with a preferred resource, however species that produce nectar such as *Banksia* species would also be suitable.	Contractor	Detailed design/ construction

Other safeguards and management measures that would also address biodiversity impacts are identified in sections 6.6.4 and 6.7.4.

6.5 Surface water and flooding

6.5.1Methodology

A desktop review of existing information was undertaken to inform the qualitative assessment of surface water and flooding impacts from the proposal.

Surface water

The method of assessment for surface water included:

- A desktop review and analysis of existing information to determine potential receptors, characterise the existing environment and identify potential issues
- Assessment of potential construction and operational impacts related to surface water
- Identifying appropriate measures to mitigate potential impacts.

Flooding

The method of assessment for flooding included:

- A desktop review of available data and existing flood studies/models which captures the two sites. Flood model information provided by Bayside Council (Spring Street Drain, Muddy Creek and Scarborough Ponds Drainage Catchments Flood Study Review by BMT WBM, dated 2016) was assessed for both McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields. Transport for NSW and Bayside Council have agreed to adopt Bayside Council's flood model for the purpose of this assessment
- A broad qualitative assessment of the impact the proposal would have on flood behaviour and flood hazards
- Assessment of potential measures which are aimed at mitigating the risk of flooding on the proposal and its impact on existing flood behaviour and flood hazards.

6.5.2Existing environment

McCarthy Reserve/Ador Park Precinct

McCarthy Reserve/Ador Park Precinct is within the Muddy Creek catchment which covers an area of approximately 615 hectares and includes suburbs such as Hurstville, Allawah, Carlton, Kogarah, Bexley, Rockdale, Brighton-Le-Sands and Kyeemagh. High density residential and commercial development is present along major transport corridors and Rockdale Town Centre, while an industrial area is centred on West Botany Street and Lindsay Street south of the site. Muddy Creek is a concrete lined stormwater channel owned and maintained by Sydney Water which runs through the site in a north-easterly direction until it meets the Cooks River.

The topography of the site has higher surface elevations along the perimeter of the site along Bay Street, West Botany Street and the western boundary of McCarthy Reserve while gradually sloping (in the order of around 1% or less) towards the Muddy Creek channel.

The existing stormwater infrastructure around the site is described as follows:

- West Botany Street – road kerb inlet pits and pipes draining north to an outlet underneath the existing bridge into Muddy Creek
- Bay Street – road kerb inlet pits and pipes draining to an outlet underneath the existing bridge into Muddy Creek
- Ador Avenue – road kerb inlet pits and pipes draining east and crossing through the reserve to an outlet into Muddy Creek.

The Bayside Council flood model indicates that McCarthy Reserve and Ador Park Precinct are subject to flooding for the 1% Annual Exceedance Probability (AEP) for present day conditions (refer to Figure 6-10). The flood model indicates:

- The southern areas of the reserve experience flooding to depths in the order of 250 millimetres which deepen at Bay Street
- The centre reserve areas (just south of PCYC St. George building) experience flooding to depths in the order of 500 millimetres
- The eastern portion of the site reaches depths in the order of 750 millimetres.

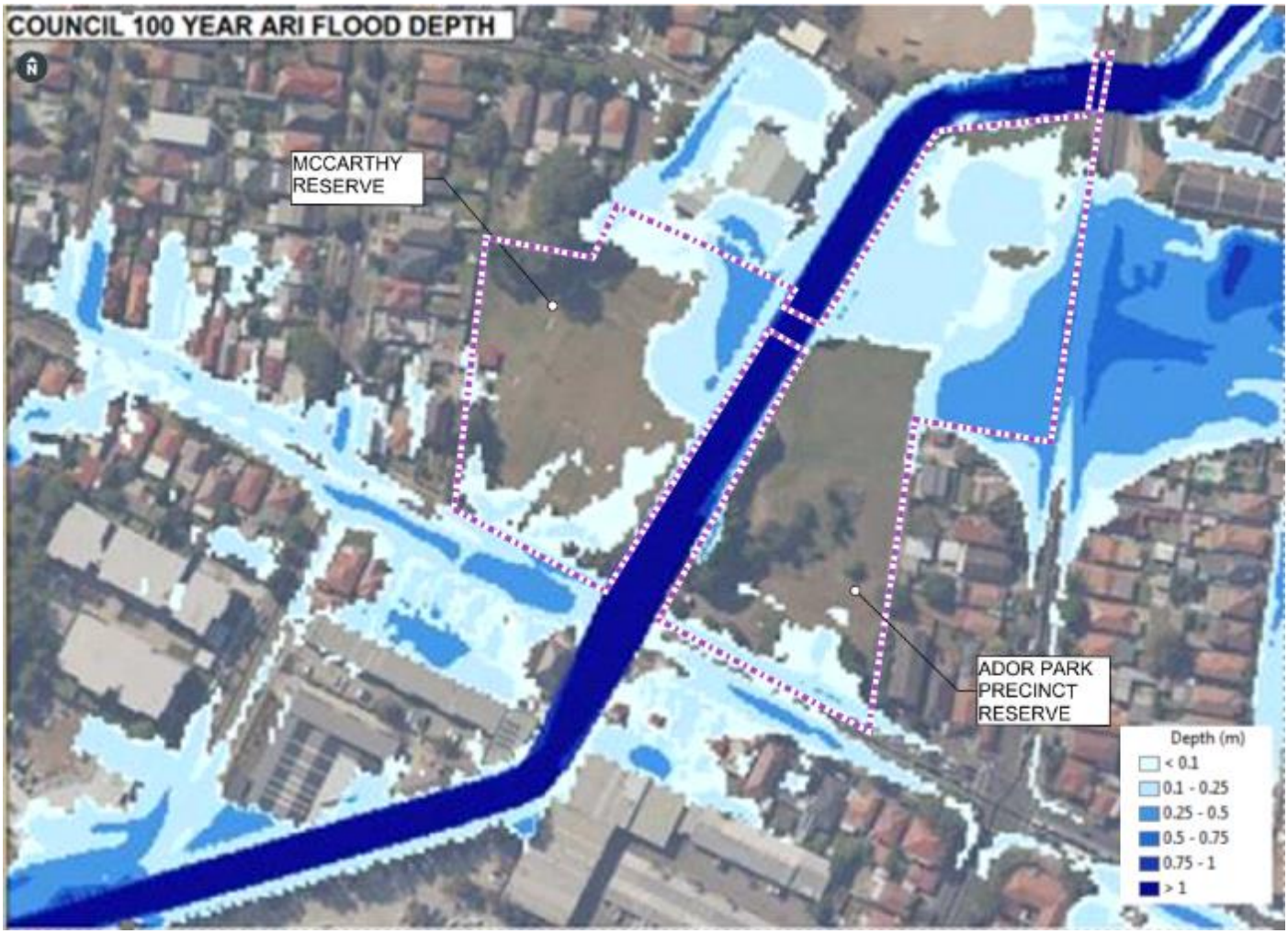

Figure 6-10: McCarthy Reserve/Ador Park Precinct Bayside Council flood model for present day 1% AEP flood patterns (provided by Bayside Council, April 2019)

Brighton Memorial Fields

Brighton Memorial Fields is within the Scarborough Ponds catchment (more specifically in the Bicentennial Ponds sub-catchment) which covers an area of around 400 hectares. The catchment is predominantly comprised of medium density residential development with some industrial development around the north of Rockdale Bicentennial Park. The Bicentennial Park Pond is around 200 metres west of the site and used to be known as Patmore Swamp until 1988 when Rockdale Council (now Bayside Council) filled in the area to consist of an open grassed field, carpark on the western side of the watercourse and playing fields on the eastern side. Bicentennial Park Pond drains south towards the Scarborough Park North wetlands, including a residual swap area referred to as Patmore Swamp.

The topography of the site is described as having higher surface elevations along the east perimeter along Sybil Lane, while generally sloping downward in the west and south-westerly direction toward Bicentennial Park Pond and the southern perimeter near Sybil Lane.

The existing stormwater infrastructure around the site is described as follows:

- Northern perimeter of the site – pits and pipes draining west to an outlet to Bicentennial Park Pond
- O'Neill Street – road kerb inlet pits and pipes draining west to an outlet at Bicentennial Park Pond.

The Bayside Council flood model indicates that Brighton Memorial Fields is subject to minor flooding for the 1% AEP for present day conditions (refer to Figure 6-11). The model also indicates that:

- Private properties and road reserves to the east and upstream of Brighton Memorial Fields are flood affected
- The northern area of the site experiences a small area of flooding to depths in the order of 100 millimetres
- The north-eastern boundary of the site at Sybil Lane experiences a small area of flooding to depths in the order of 100 millimetres
- The southern end of the site at Sybil Lane experiences flooding to depths in the order of 250 millimetres.

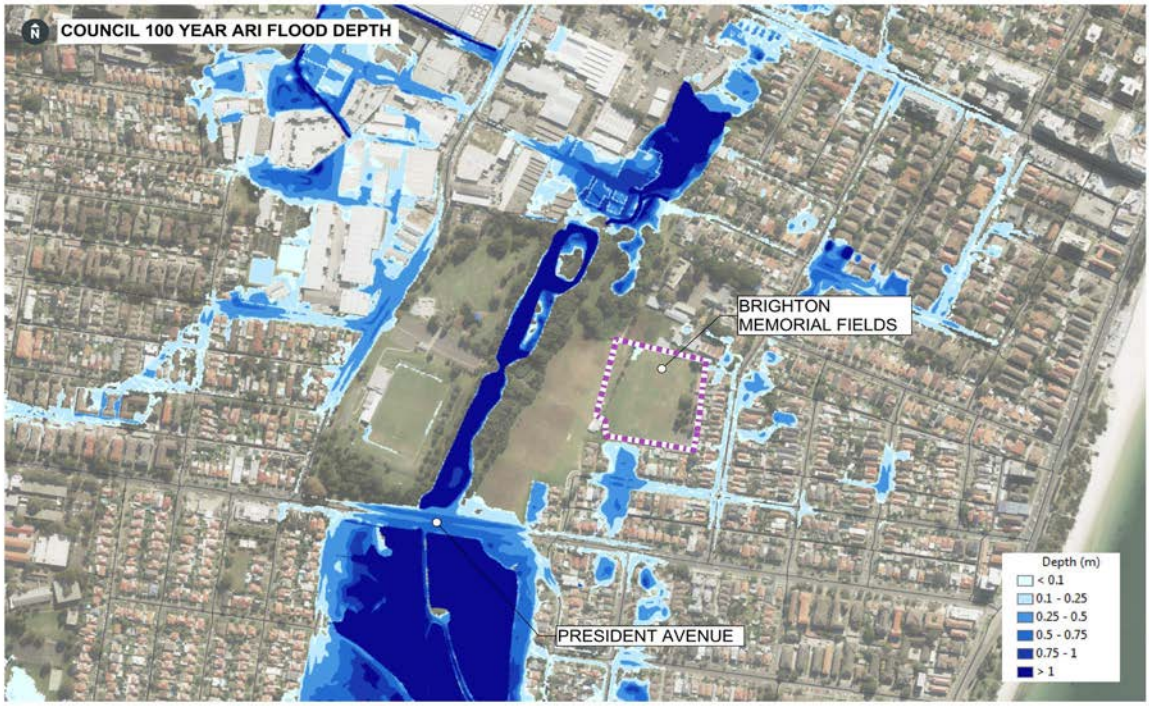

Figure 6-11: Brighton Memorial Fields Bayside Council flood model for present day 1% AEP flood patterns

6.5.3Potential impacts

Surface water

Construction

Construction of the recreational facilities would require connections into the existing stormwater system and a number of near surface earthworks to facilitate construction.

Potential surface water impacts associated with the construction include:

- Increased runoff and sedimentation into Muddy Creek and/or Bicentennial Park Pond (via surface runoff and nearby drains) as a result of soil disturbance during site establishment, preparation, stockpiling, earthworks and construction works
- Discharge and contamination through accidental spills of fuel, chemicals and/or oils from vehicles and machinery operating onsite
- McCarthy Reserve/Ador Park Precinct:

  - Runoff impacting PCYC St George, nearby private residential properties and road traffic corridors by transferring surface flows and sediments.
- Brighton Memorial Fields:
  - Runoff impacting Brighton-Le-Sands Public School, nearby private residential properties and road traffic corridors by transferring surface flows and sediments.

With the implementation of standard mitigation measures outlined in the following sections, construction works would be unlikely to result in significant surface water impacts.

Contamination of the soil and consequently surface runoff which drains to nearby waterways as a result of minor spills is considered possible. However, provided mitigation measures are implemented, such events are considered unlikely to occur or unlikely to be significant.

Operation

McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields would contain new drainage works.

McCarthy Reserve/Ador Park Precinct

It is expected that the proposed facilities would be drained to six separate discharge points:

- Amenities building – to the existing stormwater drainage system located within McCarthy Reserve
- Synthetic field - to Muddy Creek
- Mini grassed field and playground - to Muddy Creek
- Car park west side – to Muddy Creek
- Car park east side – to the existing stormwater drainage system within West Botany Street
- Skate park – to Muddy Creek.

Brighton Memorial Fields

It is expected that the proposed facilities would be drained to two separate discharge points:

- Amenities building, car park and playground – to the existing stormwater drainage system located within Brighton Memorial Fields
- Synthetic field – to the existing stormwater drainage system located within Brighton Memorial Fields.

The water tank for the irrigation of the mid-sized field would be fed from the water main as well as stormwater catchment from the proposed amenities building. At this stage of the development, it is unclear whether on-site detention tanks are required as part of the stormwater management design. It is not envisaged or expected that ponds will be included in the final design. The proposed stormwater drainage described above would be investigated further during detailed design.

A hydraulic assessment and consultation with the relevant asset owner (ie Sydney Water or Bayside Council) would be undertaken to ensure the proposed headwall connection arrangement and any stormwater detention works or stormwater quality measures are adequate.

The playing fields would contain cross/longitudinal falls and subsurface drainage consisting of slotted subsoil pipes according to the synthetic turf manufacturer’s specifications.

The finished surface levels of the McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields would be designed to match the existing surface levels of the areas (as reasonably as possible) in efforts to minimise the impacts on existing surface water behaviours. Site elements requiring cut or fill, such as the playing fields and skate parks, would be designed for a net balance of cut/fill and/or implemented with subsurface drainage systems to avoid ponding.

Increases in impervious areas exposed to direct rainfall would contribute to an increase in runoff volume and pollutant mobilization. Runoff from road pavement would typically contain pollutants such as

sediments, nutrients, oils and greases and heavy metals, from atmospheric deposition, vehicle leaks, operational wear, road wear or spills. These pollutants could potentially impact on water quality when discharged to receiving waterways. There are some grassed areas and vegetation surrounding the sites which would help provide passive treatment of stormwater runoff. Site grading would ensure that passive systems (such as grassed/vegetated landscape) would provide treatment in accordance with Bayside Council's Stormwater Management Technical Specifications.

Flooding

Construction

McCarthy Reserve/Ador Park Precinct is located within the 1% AEP flood extent. Construction activities associated with the proposal that could result in impacts if not mitigated may include:

- A range of temporary site facilities (if required) which may include offices, staff amenities, workshops and parking. Construction compound facilities, stockpiles, materials and equipment would be located outside the 1% AEP flood extents, where practicable, or suitable bunding would be provided that would divert any floodwater around these areas and prevent material washing off-site. Where this is not feasible, then further consultation with Bayside Council will be undertaken on suitable site-specific measures to be implemented. This may include developing a flood emergency strategy and evacuation plan in order to mitigate flood risks during construction.
- Stockpiles, materials and equipment located on the floodplain have the potential to obstruct floodwater and thereby alter flooding patterns. As such, the above items would be located outside of the flood extent at either the south west or the south east areas of the site (according to the Bayside Council flood maps) or suitable bunding would be provided that would divert any floodwater around these areas and prevent material washing off-site.
- The construction of the pedestrian bridge over Muddy Creek would be within the indicated flood extent. Weather forecasts would be monitored and flood risk mitigation strategies would be developed and implemented as part of the construction work safety procedures. In addition, efforts would be made for the construction methodology and schedule to have the least amount of impact on the on the conveyance of water in and around the channel in the event of a flood (i.e. construction during dry season, minimize size of construction enabling structures for the bridge and others).
- Surface earthworks would be required across the site within the indicated flood extents. The inundation of the area by floodwater has the potential to cause the transport of large debris and construction materials into the receiving waterways as well as damage to machinery and delays to the project schedule. Conversely, raising any areas to reduce the potential for flooding to the work areas would have the potential to displace floodwaters and exacerbate flood behaviour in adjacent areas.

The majority of Brighton Memorial Fields is not located within the 1% AEP flood extent and is unlikely to be significantly impacted by flooding. As such:

- Free conveyance of flood waters from the east to west would need to be preserved to ensure no worsening of flooding in road reserves and private property
- Only the western area of the site is subject to minor flood depths
- Any site facilities, stockpiles, materials or equipment would be located outside of flood affected areas
- Only a small area of surface earthworks would be within the indicated flood affected area. The inundation of the area by floodwater has the potential to cause the transport of sediment and construction materials into the receiving waterways as well as damage to machinery and delays to the project schedule. Conversely, raising any areas to reduce the potential for flooding to work areas would have the potential to displace floodwaters and exacerbate flood behaviour in adjacent areas.

Operation

McCarthy Reserve/Ador Park Precinct is located within the 1% AEP flood extents. Operational activities associated with the project that could result in impacts if not mitigated. Mitigation may include:

- Finished surface levels of the McCarthy Reserve would be designed to match the existing surface levels of the areas (as reasonably as possible) in efforts to minimize the impacts on current flooding behaviours in road reserves and private residential areas adjacent to the site. Elements requiring cut or fill, such as the playing fields and skate parks, would be designed for a net balance of cut/fill below the 1% AEP flood extent and no loss of floodplain storage or conveyance.
- The pedestrian bridge over Muddy Creek would be designed and located to have no material impact on flooding in surrounding private properties.
- Signage would be provided around the park to alert personnel that there is the risk of flooding in the area. In addition, bollards would be placed around the perimeter of the car park to prevent vehicles from being carried away in the event of a flood.

The majority of Brighton Memorial Fields is not located within the 1% AEP flood extents and is unlikely to be significantly impacted by flooding. Detailed drainage works would ensure free drainage and conveyance of floodwater from the east to the west. The finished surface levels of the Brighton Memorial Fields west area affected by minor flooding would be designed to match the existing surface levels of the areas (as reasonably as possible) in efforts to minimize the impacts on current flooding behaviours.

6.5.4Safeguards and management measures

Table 6-32: Summary of surface water and flooding impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	A Construction Soil and Water Management Plan (CSWMP) will be prepared and implemented as part of the CEMP. The CSWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. Measures that would be implemented as part of the CSWMP will include: • Erosion and sedimentation controls will be checked and maintained on a regular basis (including clearing of sediment from behind barrier) and records kept and provided on request • Erosion and sediment control measures will not be removed until the works	Contractor Contractor	Detailed design/pre-construction Detailed design/pre-construction	Section 2.1 of QA *G38 Soil and Water Management* Landcom's Managing Urban Stormwater: Soils and Construction 4th Edition

Impact	Environmental safeguards	Responsibility	Timing	Reference
	are completed and areas are stabilised. Work areas will be stabilised progressively during the works.			
Soil and water	A site specific Erosion and Sediment Control Plan (ESCP) will be prepared and implemented as part of the CSWMP. The ESCP will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. Erosion and sediment control measures will be implemented and maintained and will include: • The maintenance of established stockpile sites will be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10) • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site.	Contractor	Detailed design/Pre-construction	Section 2.2 of QA *G38 Soil and Water Management* Landcom's Managing Urban Stormwater: Soils and Construction 4th Edition

Impact	Environmental safeguards	Responsibility	Timing	Reference
Stormwater Detention	On-site retention or detention strategies will be implemented to manage permissible site discharge and reduce flood risk where the impervious playing fields construction constitutes an impermeable surface and triggers the need for detention. Assessment of the permissible site discharge and minimum on-site detention volume will be undertaken during the detailed design of the sites as per the respective catchments (Rockdale Technical Specifications – Stormwater Management Section 6.2 and Sydney Water requirements for Muddy Creek, whichever is more stringent).	Designer	Detailed Concept Design/Detailed design	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 5 & 6
Stormwater Quality	Stormwater quality management measures will be implemented to achieve stormwater pollution reduction targets in Botany Bay. These measures will include: • Prohibition of release of dirty water into drainage lines and/or waterways • Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) will be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. • Water quality control measures will be implemented to prevent any construction materials (eg concrete, grout, sediment, etc) entering drain inlets or waterways.	Designer	Detailed Concept Design/Detailed design	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 5 & 6

Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface Water Contamination	Measures to manage accidental spills and leaks will be included in the CEMP.	Contractors	Pre-construction/Construction	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 7.5
Flooding	Weather conditions will be monitored to identify potential flood conditions and manage potential flooding impacts in accordance with the CEMP.	Contractors	Pre-construction/Construction	Section 2.1 of QA *G38 Soil and Water Management*
Flooding	Design of the fields will demonstrate no impact to flooding through numerical flood modelling using Bayside Council's approved flood model. Construction of final surface levels will match the proposed design surface levels within 10 mm in areas of flood affectation. Proposal elements requiring cut or fill, such as the playing fields and skate parks, will be designed for a net balance of cut/fill.	Designers & Contractors	Approval Design/Detailed Design/Pre-construction/Construction	
Flooding	Construction site facilities, stockpiles, materials and equipment will be located outside the 1% AEP flood extents, where practicable. Where this is not feasible, further consultation with Bayside Council will be undertaken on suitable site-specific measures. The contractor will prepare a Flood Management Plan, including appropriate siting of plant, equipment and materials and a flood contingency plan, in order to mitigate flood risks during construction.	Designers & Contractors	Detailed Design/Pre-construction/Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding	Design and construction of the pedestrian bridge over Muddy Creek at McCarthy Reserve will minimize the effects on the existing channel and flood conditions.	Designers & Contractors	Detailed Design/Pre-construction/Construction	Sydney Water – Building bridges over Sydney Water's open stormwater channels (dated 05 November 2014)
Flooding	Signage will be provided around the McCarthy Reserve/Ador Park Precinct to alert personnel that there is the risk of flooding in the area. Installation of bollards or similar barriers will be considered around the perimeter of the car park at Ador Park Precinct to prevent vehicles from being carried away in the event of a flood.	Designers	Detailed Design	

6.6 Soils and contamination, geology and groundwater

6.6.1 Methodology

The scope of work undertaken included:

- Review of publicly available data and previous, relevant site contamination reports, including soil, groundwater, landfill gas data and geotechnical data outlined in:
  - AECOM (2015) WestConnex Stage 2: M5 Factual Contamination Assessment
  - AECOM (2018) M6 Stage 1 New M5 Motorway at Arncliffe to President Avenue at Kogarah Contamination Technical Report.
- A desktop review of historical records (aerial photographs and historical business directory records) and NSW EPA public registers of contaminated and licensed sites.

6.6.2 Existing environment

Topography

The sites are both relatively flat and low lying. McCarthy Reserve/Ador Park Precinct has a slight declining gradient towards Muddy Creek which bisects the site at around two to four metres Australian height datum (AHD). Brighton Memorial Fields has a slight decline toward the north with around four metres AHD.

Geology

The Sydney 1:1,000,000 Geological Series Sheet shows that McCarthy Reserve/Ador Park Precinct is located on the geological boundary between more recent Quaternary Alluvium towards the east and older Triassic aged Hawkesbury Sandstone (lower unit) to the west. The alluvium usually consists of a mixture of peat, sandy peat, and mud; coarse quartz sand with varying amounts of shell fragments; and medium to fine grained marine sand with podsols.

McCarthy Reserve/Ador Park Precinct is located in the former swamp area around Muddy Creek which was progressively filled over the nineteenth and twentieth centuries. The man-made fill often contains dredged estuarine sand and mud, demolition rubble and industrial and domestic waste.

The Sydney 1:1,000,000 Geological Series Sheet shows that Brighton Memorial Fields is located on Quaternary Alluvium generally consisting of coarse quarts sand and varying amounts of shell fragments.

Borehole testing undertaken as part of the WestConnex Stage 2: M5 Factual Contamination Assessment included boreholes located at Brighton Memorial Fields and McCarthy Reserve. A summary of the borehole logs is provided in Table 6-33.

Table 6-33: Summary of relevant borehole logs undertaken as part of the WestConnex Stage 2: M5 Factual Contamination Assessment.

Borehole	Depth	Geological Origin	Material Description
BH204 (Brighton Memorial Fields)	0.0 to 0.1 metres	Topsoil	Silty sand Fine to medium grained, dark grey-brown, trace fine to medium grained, sub-rounded basalt gravel, trace rootlets
	0.1+ metres	Alluvium/Estuarine Soil	Deep deposit of various sands including silty sand, clayey sand, and sandy gravel. Sandstone beyond 21 metres depth.
BH210 (McCarthy Reserve)	0.0 to 0.5 metres	Pavement	Asphalt Gravel medium to coarse grained base fill
	0.5 to 1.4 metres	Fill	Medium to coarse grained, sub-rounded to subangular, dark brown Brick fragments 0.7 m ceramic tiles and glass fragments Metal trolley wheel.
	1.4 to 3.0 metres	Residual Soil	Clayey sand Silty Sand
	3.0+ metres	Sandstone	Medium to coarse grained, light yellow-brown, mottled orange-brown and red
BH211 (McCarthy Reserve)	0.0 to 1.1 metres	Fill	Silty sand fine to medium grained, sub-angular, dark brown, with clay and rootlets. Low plasticity Sine to medium grained, sub rounded to subangular, yellow-grey, with fine to medium grained, sub-rounded gravel
	1.1 to 4.0 metres	Alluvium/Estuarine Soil	Sandy clay Silt and rootlets, trace fine grained gravel Sand
	4.0+ metres	Residual Soil	Sandy clay

Groundwater

Groundwater within the vicinity of the sites is recharged by rainfall runoff and infiltration. In lower lying areas tidal influences are typically experienced within close proximity to the foreshore. Seasonal variations in groundwater levels can be expected in response to natural climatic variation.

Results from borehole logs suggest that groundwater is around 1 to 2 metres below surface level at both sites.

Soils and Contamination

Soils

Soil landscape maps show that McCarthy Reserve/Ador Park Precinct is located on Swamp Warriewood soils while Brighton Memorial Fields is located on Tuggerah soil.

In NSW, land is classified based on the likelihood of Acid Sulfate Soils (ASS) being present in particular areas and at certain depths. The ASS Risk Maps show that McCarthy Reserve/Ador Park Precinct is located on Class 3 soils, while Brighton Memorial Fields is located on Class 4 soils (refer to Figure 6-12). In accordance with the Guidelines for the Use of ASS Risk Maps, the applicable site classifications are as follows:

- **Class 3**: Acid sulfate soils are likely to be found more than one metre below the natural ground surface. Any works that extend beyond one metre below the natural ground surface, or works which are likely to lower water table beyond one metre below the natural ground surface, would trigger the requirement for assessment and may require management
- **Class 4**: Acid sulfate soils are likely to be found more than two metres below the natural ground surface. Any works that extend beyond two metres below the natural ground surface, or works which are likely to lower the water table beyond two metres below the natural ground surface, would trigger the requirement for assessment and may require management.

Contamination

A search of the NSW Office of Environment and Heritage (OEH) Contaminated Site Register revealed that there were no registered contaminated sites recorded within 300 metres of the sites. A search of the List of NSW Contaminated Sites Notified to the EPA also identified no sites within 300 metres of the proposal site.

Historic aerials have been reviewed to determine past land uses of the site. A summary of historic and current land use based on historic aerial imagery is provided in Table 6-34. Available historic aerial images go back to 1943 when both sites where undeveloped. These images do not suggest any contaminant generating activities have occurred at the sites. However, based on the historic fill activities at the McCarthy Reserve/Ador Park Precinct and results of borehole logs, it is assumed that this site is likely to contain contaminants, for example asbestos. It is possible that contaminant concentrations may be above those permissible for open space land use, and as a result this material may need to be removed from the site. All waste taken from site would be appropriately disposed of at licenced facilities. Further geotechnical and contamination testing would be undertaken as part of the detailed design for the project to confirm the risk of contamination.

Table 6-34: Land use based on historic aerial images

Site	Land Use
McCarthy Reserve/Ador Park Precinct	**Current Land Use** Recreational playing field open space Low density residential Further south of the site is the Rockdale Industrial Park which is characterised by light industrial land use including warehousing, manufacturing and industrial services.
	Historic Land Use Historic aerials show that in 1943 the site was comprised of undeveloped scrubland surrounding Muddy Creek. The created channel was straightened and concrete lined.

Site	Land Use
Brighton Memorial Fields	**Current Land Use** Rockdale Bicentennial Park Further north-west of the site is the Rockdale Industrial Park which is characterised by light industrial land use including warehousing, manufacturing and industrial services.
	Historic Land Use Historic aerials show that the site was used for pastoral grazing up to at least 1943. At this time the dwellings along Crawford Street and O'Neill Street had been established as had Brighton-Le-Sands School. In 1943 Rockdale Bicentennial Park was yet to be formed with an expanded Kings Wetland occupying most of the area which now comprises the site. The site remained undeveloped until 1968 when the current sports fields were established. Upgrades to the playing fields and associated facilities were undertaken in the 1990s.

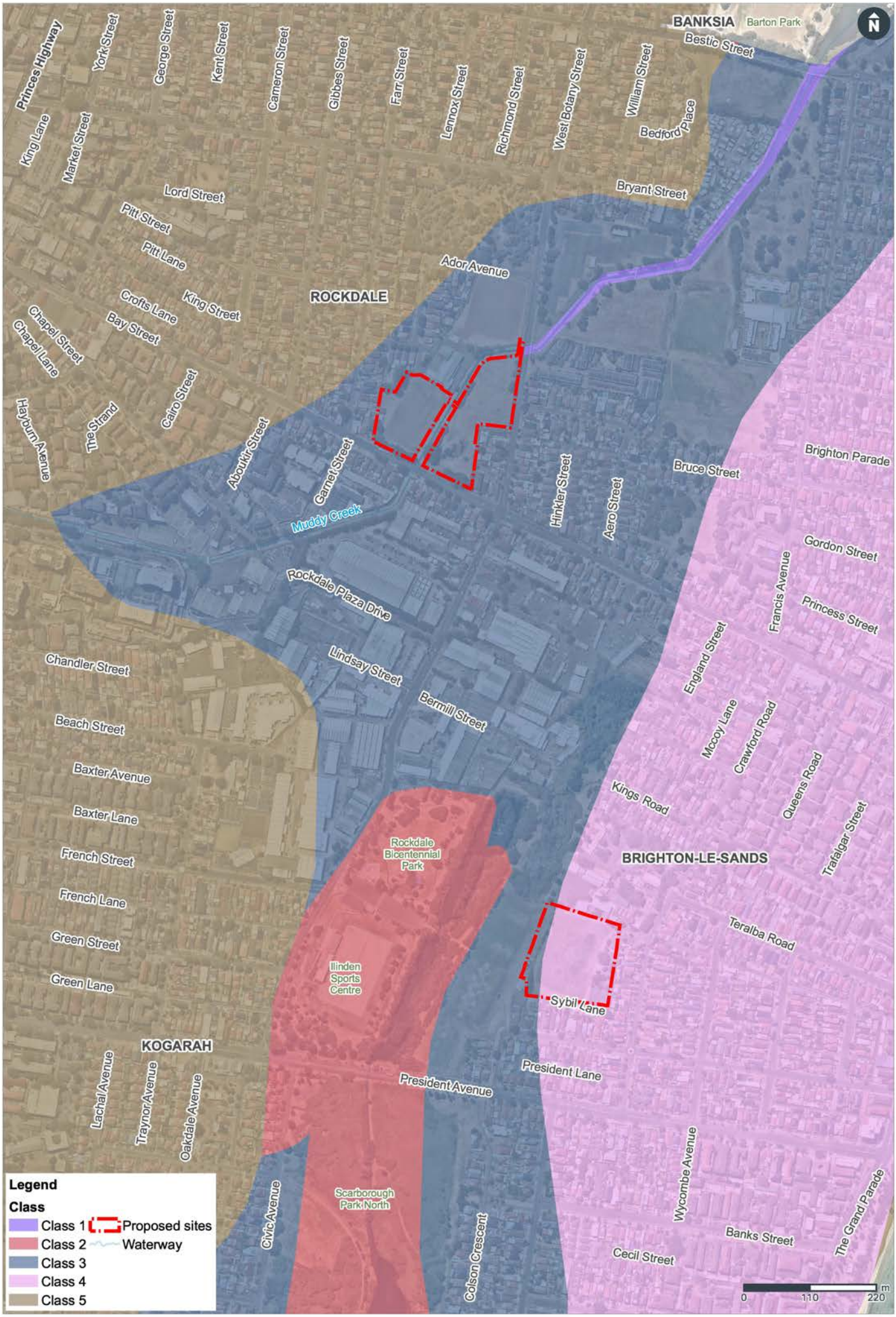

Figure 6-12 Acid sulfate soils in the vicinity of the proposal area

6.6.3Potential impacts

Construction

The proposed works would involve excavation to provide for construction of the new synthetic surfaces, new amenities buildings, new and upgraded car parking facilities, and installation of foundation for new lighting columns.

As a component of these construction works, other earthworks would be required and would include:

- Levelling of realigned fields
- Establishing artificial turf foundations
- Installation of field drainage
- Relocation/protection of services
- New service connections
- Installation of footings for light poles
- Site preparation works for new amenities buildings.

The design indicates that the bulk excavation would generally remain within the top 500 millimetres, though it is noted that in some areas, excavation may be deeper (eg for foundations and light pole footings, etc.). These levels are subject to detailed design and may change once a final design is compiled. Excavation works associated with the proposal may therefore intercept fill materials and have the potential to disturb ASS and/or contaminated soil.

Soil erosion

The proposal would involve excavation within an active stormwater channel (ie Muddy Creek). Excavations, earthworks and associated stockpiling, if not adequately managed, could result in:

- Soil disturbance and 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 and/or local runoff, with associated water quality impacts.

The movement and exposure of soil would subsequently increase the potential for erosion and mobilisation of soil by wind and water action. This may result in impacts to surface water quality in the nearby stormwater drainage lines. Sediment laden water also has the capacity to block stormwater drainage.

Acid sulfate soils

ASS are naturally occurring soils containing iron sulphides, which on exposure to air, oxidise and create sulfuric acid. Disturbance of acid sulfate soils and/or potential acid sulfate soils can result in adverse impacts on surface and groundwater quality, flora and fauna, and degradation of habitats.

If excavations encounter and disturb potential ASS, they can oxidise and generate sulfuric acid which can mobilise heavy metals such as aluminium and iron into water bodies. Runoff from areas of ASS can affect water quality with a lowering of pH that can lead to health effects and death of aquatic organisms. Excavated natural soils below the fill are likely to contain acid sulfate soils which may also require treatment and/or off-site disposal.

The proposal is situated within an area of Class 3 and Class 4 ASS. Unless managed correctly, there is a potential risk that acid groundwater and or leachate from stockpiles would migrate into surrounding soils and waterways. Accordingly, in accordance with the Guidelines for the Use of Acid Sulfate Soils Risk Maps, an Acid Sulfate Soil Management Plan (ASSMP) would be required where the ASS classification warrant the following triggers:

- Class 3: Any works that extend beyond one metre below the natural ground surface, or works which are likely to lower water table beyond one metre below the natural ground surface, would trigger the requirement for assessment and may require management
- Class 4: Works more than 2 metres below the natural ground surface. Works by which the water table is likely to be lowered more than 2 metres below the natural ground surface would trigger the requirement for assessment and may require management.

Prior to construction, the contractor will undertake acid sulfate soil testing to identify any potential acid sulfate soils and to inform management of acid sulfate soils. The CEMP will include an Acid Sulfate Soils Management Plan (ASSMP) to be prepared in accordance with the Roads and Maritime Services *Guidelines for the Management of Acid Sulfate Materials, 2005*.

Contamination

The proposal would be undertaken in an area that has been subject to modification and historical uncontrolled fill. It is likely that contaminated material would be encountered in the areas of modified fill. The variability in the fill material could indicate that other more contaminated or unsuitable material, such as asbestos, may be present in other areas of the site.

Based on the results of the previous investigation and known history of fill at McCarthy Reserve/Ador Park Precinct, contamination would be considered in the context of the design and proposed construction activities so that potential impacts to construction workers, site users and environmental receptors from known contamination are adequately managed. Management of the contaminated material, volumes and type of contaminated material, disposal quantities and suitability for re-use on site will be investigated further during detailed design.

Any contaminated waste material would be disposed of at an appropriately licenced waste facility.

Actual management strategies for the identified contamination would be developed in relevant contamination management plans once the detailed design is finalised.

Further investigations would be required to:

- Determine the extent of contamination present
- Identify potential impacts on workers during construction
- Assess the suitability of the fill to be reused on the site
- Identify if capping layers are required
- Develop management strategies for the identified contamination including methods for classification and disposal.

There is also potential for the proposal to result in the contamination of soil through accidental fuel or chemical spills from construction plant and equipment and the importation of potentially contaminated fill materials.

Geology and groundwater

As the proposal does not require any deep cuts, substantial fill or construction of structures which could alter groundwater flow, there would be no discernible impacts to the existing geological or groundwater profile as a result of construction. Further investigations would be required during detailed design to identify if capping layers are required.

Operation

No ongoing operational impacts on soils, contamination, geology or groundwater are anticipated during operations of the recreational facilities.

6.6.4Safeguards and management measures

Measures to manage geology, groundwater and contamination impacts during construction and operation of the proposal are outlined in Table 6-35.

Table 6-35: Summary of geology and soils mitigation measures

Impact	Environmental safeguards	Responsibility	Timing
Contamination Investigation	Further preliminary and detailed site contamination investigations will be undertaken to: • determine the extent of contamination present • identify potential impacts on workers during construction • assess the suitability of the fill to be reused on the site • identify if capping layers are required • develop management strategies for the identified contamination including methods for classification and disposal. Investigations will be completed by an appropriately qualified and experienced environmental consultant and be completed in accordance with the State Environmental Planning Policy 55 (SEPP 55), relevant NSW EPA Guidelines, and the National Environment Protection Measure (Assessment of Site Contamination) 1999 (revised 2013).	Detailed designer	Pre-construction
Exposure of acid sulfate soils	The CEMP would include an Acid Sulfate Soils Management Plan (ASSMP) to be prepared in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulfate Materials, 2005. The ASSMP would be prepared by an appropriately qualified and experienced consultant, prior to construction commencing, and would be informed by further contamination investigations undertaken during detailed design.	Contractor	Pre-construction
	Erosion and sedimentation control measures will be outlined in an ESCP and implemented for the works.	Contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Contaminated land	A Soil Contamination Management sub-plan will be prepared as part of the CEMP to document specific soil contamination mitigation and management measures to be employed during construction.	Contractor	Pre-construction/detailed design
	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.	Contractor	Detailed design/Pre-construction
Human health related impacts	Where excavation works at McCarthy Reserve/Ador Park Precinct uncovers previous landfill material, and that material is to be reused on site, an assessment of the material against the Health-based investigation levels (mg/kg) for Recreational C sites as defined in Schedule B 1 of the Guideline on Investigation Levels for Soil and Groundwater (NEPC, 2011) should be undertaken to determine the suitability of the material for recreational land use purposes. This assessment will be undertaken prior to the reuse of this material on site.	Contractors	Construction
Exposure of contaminated soils	Reinstatement of an appropriate capping layer on any exposed landfill material will be required on a progressive basis and as soon as practicable as part of the proposed works.	Contractors	Construction
Disturbance of asbestos containing material	If asbestos is identified during excavation, the material will be managed as Special Waste (containing asbestos) and disposed of an appropriately licenced waste facility.	Contractors	Construction

Impact	Environmental safeguards	Responsibility	Timing
Accidental spill	A site-specific emergency spill plan will be developed which will include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design/Pre-construction
Contaminated land	If a Remediation Action Plan is required (to be determined through the contamination assessment report), it will be provided to Bayside Council to review and provide input.	Detailed designer	Pre-construction

6.7 Air quality

6.7.1Methodology

A qualitative assessment was undertaken to assess the impact of the proposal on local air quality. This was considered an appropriate level of assessment as the potential impacts on air quality are expected to be limited to the construction period, temporary and manageable with standard industry measures. The assessment involved a desktop review of:

- The existing air quality environment based on:
  - Local meteorological data
  - Existing air quality analysis from the M6 Stage 1 project
  - Review of potential sensitive receivers.
- Potential pollutants generated during the construction phase of the proposal based on standard construction practices
- Potential pollutants generated during the operational phase of the proposal based on standard operational conditions
- Available background monitoring data.

6.7.2Existing environment

Climate and meteorological conditions

Table 6-36 presents the long-term average temperature and rainfall data for the Bureau of Meteorology (BoM) weather station at Sydney Airport (site 066037), which is broadly representative of the area. The annual average daily maximum and minimum temperatures are 22.3°C and 13.5°C, respectively. On

average, January is the hottest month with an average daily maximum temperature of 26.6°C. July is the coldest month, with an average daily minimum temperature of 7.3°C. The wettest month is March, with 117 millimetres falling over five rain days. The average annual rainfall is 1,083 millimetres over an average of 104 rain days per year.

Table 6-36: Long-term average climate summary for Sydney Airport AMO

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean daily maximum temperature (ºC)												
26.6	26.5	25.3	22.9	20.1	17.6	17.1	18.4	20.7	22.7	24.1	25.9	22.3
Mean daily minimum temperature (ºC)												
18.9	19.1	17.6	14.3	11.0	8.7	7.3	8.2	10.5	13.3	15.5	17.6	13.5
Mean monthly rainfall (mm)												
94.6	111.4	117.1	108.8	96.9	124.2	68.6	76.8	59.7	69.7	80.4	73.6	1083.4
Mean rain days per month (number)												
6.8	5.5	7.7	8.8	9.3	9.1	12.0	13.2	11.0	8.2	6.4	6.5	104.5

Source: BoM (2018) Climate averages for Station: 066037; Commenced: 1929 – last record January 2018; Latitude: 33.99°S; Longitude: 151.17 °E

Annual morning and afternoon wind roses were obtained from the BoM Sydney Airport AMO Weather Station. The weather station is located around 3 kilometres north-east of McCarthy Reserve/Ador Park Precinct and 3.2 kilometres north-east of Brighton Memorial Fields and is considered to be representative of the conditions in the locality.

Morning winds are predominantly westerly while afternoon winds are predominantly easterly, reflecting a typical on-shore/off-shore coastal wind pattern. Wind speeds are generally lighter in the morning (predominantly less than 20 kilometres per hour) and tend to pick up somewhat in the afternoon (predominantly less than 30 kilometres per hour).

Air quality

Air quality in the Sydney region has improved over the last few decades. The improvements have been attributed to initiatives to reduce emissions from industry, motor vehicles, businesses and residences. The existing air quality in the area surrounding the proposal is influenced by vehicle emissions and domestic activities and is expected to be characteristic of a suburban context. McCarthy Reserve/Ador Park Precinct is also influenced by industrial land located south of Bay Street.

A search of the National Pollutant Inventory (NPI) identified two existing air pollution sources within 1 kilometre of the sites:

- Rockdale Resource Recovery Centre, Lindsay Street, Rockdale, 350 metres south of McCarthy Reserve/Ador Park Precinct
- St George Private Hospital, South St, Kogarah, 1 kilometre south-west of Brighton Memorial Fields.

Sensitive receivers

McCarthy Reserve/Ador Park Precinct

Sensitive receivers in the immediate vicinity (within 250 metres) of the site comprise of:

- Users of the public recreation facilities at McCarthy Reserve or Ador Park Precinct while works are occurring at the adjacent site
- Users of the public recreation facilities at Ador Avenue Reserve 20 metres to the north, Rockdale Park 160 metres to the north and Rockdale Women's Sports Fields 150 metres to the north-east
- PCYC St George directly north of McCarthy Reserve
- Residential dwellings along Bay Street, Garnet Street, Aboukir Street, Farr Street, Gibbee Street, Cameron Street, Ador Avenue, West Botany Street, Bruce Street, Hinkler Street and Aero Street.

Brighton Memorial Fields

Sensitive receivers in the immediate vicinity (within 250 metres) of the site comprise of:

- Students, staff and visitors at Brighton-Le-Sands Public School directly north and Little Sails Preschool 150 metres to the north-east
- Users of the public recreation facilities at Rockdale Bicentennial Park 160 metres to the north-east, Rockdale Bicentennial Park East directly east, Rockdale Skate Park 200 metres to the west, Rockdale Ilinden Sports Centre 200 metres to the west, and Civic Avenue Reserve 250 metres to the south-east
- Residential dwellings along President Avenue, O'Connell Street, O'Neill Street, President Lane, Crawford Road, O'Neill Lane, Sybil Lane, Wycombe Avenue, Teralba Road, and Kings Road.

6.7.3Potential impacts

Construction

Potential localised air quality impacts associated with construction of the proposal include dust, odour and emissions from plant and machinery. Short-term dust emissions could potentially result from construction activities such as vehicle movements on unpaved/exposed surfaces, excavation, removal of vegetation, removal of concrete channel batters and wind erosion from stockpiles. Based on the long-term wind trends for the area, winds in the general vicinity of the site would blow predominantly westerly in the morning and predominantly easterly in the afternoon/evening. As such, airborne dust emitted during soil-disturbing works has the potential to result in minor temporary impacts at nearby sensitive receivers.

Odour may be generated by the disturbance of sediments and contaminated material. There is a potential for PASS/ASS to be present at the site (refer to section 6.6) should it be excavated as part of the works. Exposure of these materials to oxygen can generate sulfuric acid. The release of lime (used for ASS treatment) or particles bearing the properties of ASS into the atmosphere during excavation and treatment may occur if not properly controlled. The deposition of these particles has the potential to impact on nearby waterways, biodiversity or personnel working in the area.

Exhaust emissions generated by the operation of equipment and vehicles would also have the potential to impact local air quality. As a result of the limited duration and intensity of the proposed works, it is anticipated that dust or exhaust fumes would result in minor impacts to air quality.

While contributions from the proposal would add to existing background contributions from existing land uses (ie traffic and industrial operations), it is considered unlikely that this cumulative impact would result in a significant deterioration of local air quality given that the existing background air quality is characterised by low to medium pollution loads typical of an inner-city suburban area.

With the implementation of typical safeguards, it is considered that the air quality impacts generated by the construction of the proposal can be appropriately managed to not result in a significant impact.

Operation

There are not anticipated to be any discernible long-term changes to air quality as a result of the proposal.

6.7.4Safeguards and management measures

Table 6-37: Summary of air quality impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Dust emissions	Measures (including watering or covering exposed areas) will be implemented to minimise or prevent air pollution and dust emissions.	Contractor	Construction
Dust emissions	Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction
Dust emissions	Vehicle loads containing loose materials will be covered.	Contractor	Construction
Dust emissions	On-site vehicle speed limits will be established and enforced.	Contractor	Construction
Dust emissions	Soil stockpiles and unsealed construction areas will be treated (such as with water spraying) to minimise dust generation.	Contractor	Construction
Exhaust emissions	Vehicles and machinery will be regularly serviced and maintained in an efficient condition to minimise potential emissions.	Contractor	Construction
Dust emissions	During extreme weather events (such as high winds) where dust generation cannot be effectively minimised, dust generating works will cease until adequate controls can be implemented or until adverse weather conditions subside.	Contractor	Construction
Dust emissions	Exposed ground surfaces will be stabilised with plantings as soon as reasonable and feasible.	Contractor	Construction
Dust emissions	Stockpiled material be appropriately shaped to reduce wind erosion and covered/seeded/sealed if remaining onsite for more than 48 hours.	Contractor	Construction
Dust emissions	Vehicles and activities will be confined to designated work areas to prevent any inadvertent encroachment into exposed areas.	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Exhaust emissions	All emission controls used on vehicles and construction equipment will comply with standards listed in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010.	Contractor	Construction
Other emissions	Vegetation or other materials will not be burnt on site.	Contractor	Construction

6.8 Aboriginal Heritage

6.8.1Methodology

A desktop study was carried out to establish the Aboriginal heritage present within and around McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields. The review was undertaken in accordance with the assessment process outlined in the *Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)* (Roads and Maritime, 2011). The desktop study included a review of:

- Aboriginal Heritage Information Management System (AHIMS) database
- Recorded local history.

The outcomes of this desktop study were reviewed by an Aboriginal cultural heritage advisor (ACHA) to determine the potential impacts on aboriginal heritage.

6.8.2Existing environment

The traditional owners of what becomes the City of Rockdale include the Cadigal, the Gweagal and the Bidjigal tribes. Known as 'Water People', these tribes inhabited the Botany Bay area for thousands of years before European colonists arrive[1].

Kamay (Botany Bay) was formed by around 7,000 years ago, after sea levels rose at the end of the last ice age and flooded a swampy sand plain. Aboriginal people had already been living along the Cooks River for thousands of years and witnessed these changes, taking advantage of new resources. Attenbrow (2010) has suggested that the Gameygal likely occupied land around Botany Bay.

6.8.3Potential impacts

Construction

Construction activities would result in disturbance of the ground surface through excavation. Construction works would generally be carried out in areas which have been previously disturbed as a result of excavation and/or reclamation/filling activities at both sites.

[1] Bayside City Council (2019). About Rockdale, A Brief History of the City, ***https://www.rockdale.nsw.gov.au/Pages/Rockdale_History.aspx***

The potential to cause harm to any Aboriginal objects is considered low based on the following known information relevant to the study area:

- The AHIMS database search of 3 June 2019 did not identify any Aboriginal objects within 200 metres of the proposal sites
- There have been no discoveries of Aboriginal objects during previous geotechnical investigations in the area
- The proposal sites have undergone previous disturbance and modification.

The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Aboriginal origin are encountered.

Operation

Operation of the proposal would not result in any Aboriginal heritage impacts.

6.8.4 Safeguards and management measures

Table 6-38: Summary of aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aboriginal heritage	• *The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design/pre-construction

6.9 Non-Aboriginal heritage

6.9.1 Methodology

A desktop study was carried out to establish the non-Aboriginal heritage present within and around McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields. The desktop study included a review of:

- Rockdale LEP 2011 planning maps
- Historic aerial imagery
- NSW Heritage Inventory.

In addition to the above desktop review, Bayside Council provided a memorandum outlining the heritage significance of Brighton Memorial Fields (dated: 20 May 2019), which has been used to inform this assessment.

6.9.2Existing environment

The non-Aboriginal history of the study area dates to the landing of James Cook, aboard the Endeavour, at Botany Bay in 1770. In 1788 the First Fleet arrived at Botany Bay to establish the first European colony in Australia, however this location was rejected in favour of Sydney Cove.

Settlement of the study area occurred gradually throughout the nineteenth century and continued through the twentieth century. Many of the main roads in the area were established in the late nineteenth century, including West Botany Street, Bay Street and President Avenue. In 1884 the Illawarra Railway line was extended to Hurstville making the area more accessible and accelerating growth.

McCarthy Reserve/Ador Park Precinct is located on land which formed part of the wetland drained by Muddy Creek (formerly Black Creek). The wetland was progressively drained throughout the late-nineteenth and twentieth centuries. The wider area was notable as the ‘food-bowl of Sydney’ upon the turn of the twentieth century. However, historic aerials suggest that McCarthy Reserve/Ador Park Precinct were not used for this purpose with the land being undeveloped until the establishment of the current public open spaces.

The land on which Brighton Memorial Fields is located was left undeveloped (historic aerials show that the site was used for pastoral grazing up to at least 1943) and was eventually acquired by the Department of School Education in 1949 as a possible site for a high school. In 1967 the Brighton RSL Club committed funds to the construction of playing fields on the undeveloped land which had become neglected. The new facility opened in 1968 and had an oval for football, cricket and athletics, two tennis courts and dressing shed and toilets. The fields were e managed by Brighton-Le-Sands Public School during the week and a trust on weekends. In 1997 the Brighton Memorial Fields were acquired by Rockdale Council (now Bayside Council). Bayside Council currently maintains ownership of the fields.

NSW Heritage Inventory

There are no listed State heritage items located within 200 metres of the sites.

Rockdale LEP 2011 - Scheduled Heritage

Scheduled heritage items which are listed in the Rockdale LEP 2011 and are located within 200 metres of the sites as detailed in Table 6-39. These items are of local heritage significance.

Table 6-39: Rockdale LEP 2011 - Scheduled heritage

Item Name	Item No.	Address	Proximity	Description
School building —Brighton-Le-Sands Public School (1916)	I167	35 Crawford Road	Directly north of Brighton Memorial Fields	One of the earliest remaining buildings in Brighton-Le-Sands. The school building has aesthetic and social heritage significance.
Kings Wetland	I169	Kings Road	Around 50 metres north-west of Brighton Memorial Fields	Includes intact wetland which is representative of the original ecosystem of the area.
House	I211	142 Farr Street	Directly west of McCarthy Reserve	Representative of early development of the Rockdale Township subdivision.

Other notable items

Brighton Memorial Fields includes commemorative gates located at the entrance on Sybil Lane. The gates have inscribed plaques with a dedication to the "... men of the Australian Armed Forces who gave their lives…". The plaques were officially unveiled on 9 November 1968 by John Fairbairn Crighton (Brighton RSL Club President in 1967-1968).

Neither Brighton Memorial Fields nor the commemorative gates are listed in the Rockdale LEP heritage schedule or the NSW Heritage Register. While the gates are not of heritage value in their own right, they are of some local significance from a social perspective.

The social value of the gates is further described in section 6.11.

6.9.3Potential impacts

Construction

Construction activities would result in disturbance of the ground surface through excavation. Construction works would generally be carried out in areas which have been previously disturbed as a result of excavation and/or reclamation/filling activities at both sites.

The potential to cause harm to any non-Aboriginal heritage features is considered low based on the following known information relevant to the study area:

- The NSW Heritage inventory database search did not identify any features within 200 metres of the proposal sites
- The proposal would not directly impact on any known heritage items
- The proposal sites have undergone previous disturbance and modification.

The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered.

While the commemorative gates at Brighton Memorial Fields are not considered a heritage feature for protection, they do hold significance to the community. Brighton Memorial Fields are listed on the NSW War Memorial Register, which is a database of war memorials in New South Wales. The Register is non-statutory and is hosted and maintained by the NSW Office for Veterans Affairs and the State Library of New

South Wales. Consultation is underway undertaken with the Brighton RSL Club Sub-Committee regarding the appropriate relocation of the memorial plaques on the entry gates to the playing fields.

Operation

Operation of the proposal would not result in any non-Aboriginal heritage impacts.

6.9.4Safeguards and management measures

Table 6-40: Summary of non-aboriginal safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Unexpected Discovery of non-Aboriginal heritage	• *The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. • Work will only recommence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design/pre-construction	Section 4.10 of QA *G36 Environment Protection*
Brighton Memorial Fields - commemorative gate with plaques	The detailed design will be informed through consultation with the Brighton RSL Club Sub-Committee regarding the relocation of the memorial plaques and a new form of commemoration. Should any change to the gate and/or associated memorial plaques occur then the NSW War Memorial Register will require updating.	Detailed designer	Detailed design/construction	NSW War Memorials Register – Available at warmemorialsregister.nsw.gov.au

6.10 Property and land use

6.10.1 Existing environment

The following sub-sections describe the existing property and land use environments for McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields.

McCarthy Reserve/Ador Park Precinct

The existing land use of McCarthy Reserve/Ador Park Precinct is for public open space which is reflected in the land use zoning of 'RE1 Public Recreation' under the Rockdale LEP. McCarthy Reserve has an established playing field with an associated amenity building and is currently predominantly used for organised sporting activities (soccer training and recreational soccer games). Ador Park Precinct is un-marked with no notable recreational infrastructure (besides fencing and the carpark area) and is predominantly used for passive recreational activities and informal sporting activities.

The site is owned and operated by Bayside Council. Muddy Creek, which bisects McCarthy Reserve and Ador Park Precinct, is an infrastructure asset owned and managed by Sydney Water.

McCarthy Reserve/Ador Park Precinct forms part of a larger sports and recreational precinct which extends to the north and includes the PCYC St George, Ador Avenue Reserve, Rockdale Park, and Rockdale Women Sportsfield immediately surrounding the site and with continuous public open space extending north to Barton Park.

The existing land use surrounding the site is predominantly low density residential (reflected in the 'R2 Low Density Residential' under the Rockdale LEP). This is typified by one to two storey detached dwellings. Further south is the Kirby Industrial Estate which is over 30 hectares of predominately light industrial land use.

Brighton Memorial Fields

The existing land use of Brighton Memorial Fields is for public open space which is reflected in the land use zoning 'RE1 Public Recreation' under the Rockdale LEP. There is an existing grass playing field with an associated amenity building which is predominantly used for organised sports activities (soccer training and recreational games). There is also an existing playground area next to the carpark and two tar-sealed, marked tennis courts which are predominantly used for passive recreational and informal sporting activities.

The public open space land use continues to the west of Brighton Memorial Fields with neighbouring Rockdale Bicentennial Park. The land use zoning for this area is a mix of 'RE1 Public Recreation' and 'SP2 Infrastructure (Classified Road)' under the Rockdale LEP which is associated with land designated for the M6 Stage 1.

Brighton Memorial Fields is owned and managed by Bayside Council. Rockdale Bicentennial Park is a mix of ownership between Bayside Council, Transport for NSW and the State Planning Authority and is currently managed by Bayside Council. Lot 2 DP 849264 immediately west of the site is owned by the State Planning Authority.

Rockdale Ilinden Football Club has an existing license to use Rockdale Bicentennial Park – East, which includes Brighton Memorial Fields.

Brighton-Le-Sands Public School is located directly north of the site. The land use south and east is predominantly low density residential and is typified by one to two storey detached dwellings. All of these areas have the land use zoning 'R2 Low Density Residential' under the Rockdale LEP.

6.10.2 Policy setting

The Bayside Council PoM provides guidelines for the short-, medium- and long-term maintenance and management of all community land owned and/or under the care, control and management of Bayside Council. This includes both McCarthy Reserve/Ador Park Precinct and Brighton Memorial Fields.

Section 4.2.4 outlines the relevant objectives and policies and permitted uses for community land and public open space as prescribed by the Bayside Council PoM. While Clause 65 of ISEPP permits the proposal without consent, the proposal would comply with the 'permitted purposes' and 'permitted uses' as prescribed by the Bayside PoM.

6.10.3 Potential impacts

Construction

Construction of the proposal would result in temporary restrictions to access and use of public open space, including the existing playing field at Brighton Memorial Fields. However, the proposal would not change the current or future land use for either site. Once construction is complete, the sites would continue to be used for recreational activities.

Operation

The proposal would not change the land use of either site as they will continue to be used as public open space providing for a range of organised and informal recreational activities.

New recreational infrastructure would provide higher quality recreational facilities and allow a greater mix of recreational activities. This is particularly relevant for Ador Park Precinct which currently has limited recreational infrastructure. Providing synthetic turf would enable greater use of the sites for recreational activities. In particular, playing fields will be less affected by weather and will not need as much recovery time. The associated infrastructure and facilities such as field lighting, amenity buildings and improved car park areas would also facilitate improved use and access to the sites.

Overall, there would be no change to the current land use of either site and the proposed improvements would have positive land use outcomes, providing for the more efficient use of existing land.

6.10.4 Safeguards and management measures

Table 6-41: Summary of property and land use impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Disruption to land use	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • contact name and number for	Contractor	Detailed design/pre-construction

Impact	Environmental safeguards	Responsibility	Timing
	complaints The CP will be prepared in accordance with the Transport for NSW communications guidelines, standards and e-tool kit.		

6.11 Socio-economic

6.11.1 Existing environment

McCarthy Reserve/Ador Park Precinct is located in the suburb of Rockdale, while Brighton Memorial Fields is located in the suburb of Brighton-Le-Sands. These are both located within the former Rockdale LGA area which is now part of the Bayside LGA. The Bayside LGA is located around the northern and western shores of Botany Bay in Sydney's inner-south and is comprised of the former Rockdale LGA and Botany Bay LGA.

According to 2016 census data from the Australian Bureau of Statistics, the former Rockdale LGA had a population of 109,404 residents in 2016. Other relevant key statistics for the former Rockdale LGA identified in the census data include:

- The most common ancestries identified as Chinese (11.3%), English (11.1%), Australian (10.9%), Greek (8.5%) and Lebanese (5.6%)
- The most common occupation categories were Professional (22.6%), Clerical and Administrative workers (15.0%), Technicians and Trades Workers (11.9%), Managers (11.6%), Labourers (10.3%), Sales works (10.1%), Community and personal service works (10.0%) and Machinery operators and drivers (6.3%)
- Children aged 0 - 14 years made up 15.9% of the population and people aged 65 years and over made up 15.3% of the population, an older population compared with the State average.

The key local centres around the sites include Rockdale to the west, Brighton-Le-Sands to the east and Kogarah to the south-west. These provide local services and amenities, key public transport connections (including Rockdale Station and Kogarah Station) and local employment. Another important employment centre in the area is Kirby Industrial Estate which is located around 100 metres south of McCarthy Reserve/Ador Park Precinct and 300 metres north of Brighton Memorial Fields. Kirby Industrial Estate is over 30 hectares of predominately light industrial land use.

McCarthy Reserve/Ador Park Precinct

McCarthy Reserve and Ador Park Precinct are important local recreational facilities which have local socio-economic significance. This site currently provides for a range of organised and informal recreational activities. McCarthy Reserve is a ground used by the St George Football Association, while Ador Park Precinct is open to the public and currently provides for informal/passive use.

Sensitive receivers located within close proximity to the McCarthy Reserve/Ador Park Precinct are outlined in Table 6-42.

Table 6-42: Notable social and economic activities in close proximity (<500 metres) of McCarthy Reserve/Ador Park Precinct

Activity/Feature	Location	Proximity to works
PCYC St George	9 Ador Avenue, Rockdale	Directly north of the existing sports field at McCarthy Reserve. No buffer
Kirkby Industrial Estate	Various	Around 150 metres south. Separated from the site by Bay Street and dwellings
Rockdale Public School	4 Lord Street, Rockdale	Around 450 metres north-west. Separated from the site by dwellings
St Thomas More's Catholic School	Francis Avenue, Brighton-Le-Sands	Around 450 metres east. Separated from the site by dwellings
St Thomas More Catholic Church	298 Bay Street, Brighton-Le-Sands	Around 500 metres east. Separated from the site by dwellings
Cairnsfoot School	58A Francis Avenue, Brighton-Le-Sands	Around 450 metres east. Separated from the site by dwellings
Rockdale Park	321 West Botany Street, Rockdale	Around 150 metres north. Separated by PCYC St George

Brighton Memorial Fields

Brighton Memorial Fields is an important local recreational facility which has local socio-economic significance. This site currently provides for a range of organised and informal recreational activities. The soccer field is a ground used by the St George Football Association. There are also informal recreational facilities provided by the existing playing ground as well as courts used for tennis and netball in the southern area of the site. The existing car park within Brighton Memorial Fields is used as a drop-off and pick-up location for Brighton-Le-Sands Public School.

Brighton Memorial Fields forms part of a larger sports and recreational precinct which extends to the north and south of the site. This includes Rockdale Bicentennial Park, Ilinden Sports Centre and Civic Avenue Reserve immediately surrounding the site; and with continuous public open space extending south to Scarborough Park.

Sensitive receivers located within close proximity to the Brighton Memorial Fields are outlined in Table 6-43.

Table 6-43: Notable social and economic receivers in close proximity (<500 metres) to Brighton Memorial Fields

Activity/Feature	Location	Proximity to works
Commemorative gates with plaques	Brighton Memorial Fields	On-site
Brighton-Le-Sands Public School	35 Crawford Road, Brighton-Le-Sands	Directly north
Little Sails Preschool	35 Crawford Road, Brighton-Le-Sands	150 metres north
Crawford Road Corner Shops	Corner of Crawford Road and Resident Ave	200 metres south-east
Kirkby Industrial Estate	Various	400 metres north-west

Commemorative gates

Brighton Memorial Fields includes commemorative gates with two memorial plaques, located on Sybil Lane. As described in section 6.9.2, the gate and/or plaques are not registered on a heritage register; however Brighton Memorial Fields is listed on the NSW War Memorial Register.

This feature of the site has important social value with particular association with the Brighton RSL Club.

6.11.2 Potential impacts

Construction

Construction of the proposal would result in temporary restrictions to access and use of public open space, including the existing car park at Brighton Memorial Fields which is used as a school drop-off and pick-up point. These temporary restrictions to public access and use are necessary to maintain public safety. These impacts would directly affect the organised and informal users of both sites.

As detailed in section 3.3.1, the indicative staging of the construction of the recreational facilities has been developed with the intention of minimising disruption to the soccer playing season. It is anticipated that the works can be completed outside the winter soccer season avoiding the need for local clubs to find alternative soccer fields. In achieving this outcome, the potential social impact of construction would be minimised.

The development of the detailed design including the construction staging program will be undertaken with consideration of key stakeholders which currently use the sites to ensure that interruptions to the ongoing use of the sites for recreational and/or other purposes is limited as far as reasonable and feasible.

Passive recreational and informal sports users will not be able to use the sites during construction. These users are generally more adaptable (due to the more informal nature of their use) and would be able to temporarily shift their activities to other local public opens spaces which are in the area. As both of the sites are surrounded by a range of other public opens spaces (which include playing fields, other sports facilities and informal recreational areas), there are easily accessible alternative public open spaces available and construction disruption to passive recreational and informal sports users will be minimal.

There is potential for some localised amenity impacts to nearby sensitive receivers during construction of the proposal due to noise, dust and temporary loss of access to public open space. The potential loss of access would have a particular impact on those sports clubs which use the existing sports fields for organised sport. There would also be potential impacts on passive users of the facilities. However, these users generally have a greater ability to adapt to alternative locations in the area. Direct and indirect construction impacts associated with noise, dust, traffic and access, and visual amenity would be experienced by neighbouring residents and current users of the sites.

The commemorative gates at Brighton Memorial Park are an important social feature of the site which may be impacted by the construction of the proposal. If the memorial plaques on the gates cannot be retained in their current form and location, they would be reinstated elsewhere on the site or an alternative form of commemoration would be agreed through consultation with the Brighton RSL Club Sub-Committee. Roads and Maritime discussed these matters with the Brighton RSL Club Sub-Committee in September 2019, who gave their support to the proposal.

Appropriate communication of the construction programme and duration of loss of access will be provided to the local community prior to the commencement of works. Other relevant mitigation measures to minimise construction impacts are outlined in the various technical chapters above and summarised in Chapter 7.

Operation

The main objectives of the proposal are to offset the temporary loss of recreational facilities at Rockdale Bicentennial Park and provide improved long-term recreational facilities for the community. Accordingly, the proposal would have positive social outcomes.

The proposal would result in a minor loss of available passive recreation land as fencing of the new synthetic playing fields would restrict uses such as dog walking. In addition, as these facilities are intended to provide for organised recreational activities (particularly soccer) they may become less available for passive and informal recreational activities as the facilities are booked by sporting groups.

Tennis courts would no longer be an available facility at Brighton Memorial Fields. Bayside Council noted that the courts are currently not available for booking, although they are occasionally used by casual users. The courts are many decades old, in a state of disrepair and are no longer fit for purpose. It was considered more appropriate at this time to provide more open space in this location, where occasional use may be made by soccer association games. There are many other locations in the LGA where similar facilities are available. These include council courts at Cahill Park, Scarborough Park (Hawthorn Reserve) and private courts at Illawarra Tennis Centre. Bayside Council are currently developing a social infrastructure strategy that is considering community infrastructure needs/demands into the future, which would include tennis facilities.

However, it is proposed that there would be equitable sharing of the fields between the community, football clubs and other users including Brighton-Le-Sands Public School. Areas of passive recreational space would remain available at each site, providing for passive and informal activities. This includes improved facilities such as public toilets, playgrounds, lighting and car parks which would help to improve both the formal and informal recreational use of the sites. The sites are surrounded by a range of alternative public open spaces (which include playing fields, other sports facilities and informal recreational areas) which are easily accessible. Accordingly, some of the current informal/passive users of the sites may adapt to use these alternative local public opens spaces.

The new fields have the potential to result in changes in traffic, noise and lighting impacts at the sites. Traffic, noise and lighting impacts are discussed in sections 6.1, 6.2 and 6.3, respectively. Mitigation measures for these aspects are summarised in section 7.2. Overall, the proposal would not result in any significantly negative socio-economic impacts but will result in positive social outcomes through improved recreational facilities.

6.11.3 Safeguards and management measures

No specific social measures have been identified as necessary. Safeguards and management measures that would address noise and vibration, air quality and property and land use impacts, as identified in sections 6.2, 6.7 and 0 respectively, would be applicable.

6.12 Waste management and resource use

6.12.1 Existing environment

McCarthy Reserve/Ador Park Precinct is known to be built from reclaimed areas which were progressively filled with various materials over the nineteenth and twentieth centuries. This is reflected in borehole results from the site. In addition, the site is situated within areas of Class 3 and Class 4 Acid Sulfate Soils (described further in section 6.6.2).

Accordingly, material to be excavated at the site is expected to contain fill, varying in thickness, comprising a wide variety of materials. In addition, acid sulfate soils could potentially be present.

6.12.2 Potential impacts

Construction

Activities associated with the construction phase of the proposal have the potential to generate waste materials. Waste streams and types likely to be generated include:

- Excavated material (spoil, landfill material including kerbside and commercial waste, rock) unsuitable and/or not required for backfilling and restoration, including material classified as General Waste Solid (putrescible) or contaminated materials such as acid sulfate soils
- Construction and process waste from construction of the new building structures and general site reinstatement, including concrete, asphalt, gravels, sands, fencing and barricades
- General waste including domestic refuse generated by onsite personnel and construction workers
- Green waste including grass and other organic materials from vegetation clearance
- Maintenance waste generated from site plant and vehicle maintenance eg oil and wash down wastewater.

The nature and volume of waste generated during the construction of the proposal has the potential to impact on the local environment if not managed appropriately. Inappropriately managed waste may have potential adverse impacts on the following:

- Soil and groundwater quality of the site and immediate surrounds
- Visual amenity and aesthetic quality of the site
- Water quality of local drainage lines and watercourses
- Proliferation and spread of noxious weeds disturbed during excavation and bulk earthworks if not properly separated and contained.

Waste management strategies developed for the proposal would be developed in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) and by adopting the Resource Management Hierarchy principles (in order of priority) of avoidance, resource recovery and disposal. These principles would be included in the CEMP.

Operation

Waste associated with the operation of the proposal would include general waste including domestic refuse generated by onsite users. Minimal resource demands or waste impacts are expected to be associated with the operation of the proposal. This is not anticipated to result in the generation of large quantities of green waste over and beyond that generated by Bayside Council's current maintenance program.

6.12.3 Safeguards and management measures

Table 6-44: Summary of waste management and resource use impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Construction Waste	A Waste Management Plan (WMP) will be prepared as part of the CEMP in accordance with the Roads and Maritime Services Technical Guide: Management of road construction and maintenance waste.	Contractor	Construction
Construction waste	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery where possible) • Disposal is undertaken as a last resort.	Contractor	Construction
Green waste	If vegetation is to be mulched and transported off site for beneficial reuse, a Mulch Management Plan will be prepared, and mulch will be assessed for the presence of weeds, pests, and other diseases.	Contractor	Construction
Construction Waste	Excavated material, soil, fill and other erodible matter that are transported to or from the sites will be kept covered at all times during transportation.	Contractor	Construction
Construction Waste	All excess spoil generated from excavations classified as General Solid Waste (putrescible) will be disposed of at a licensed facility.	Contractor	Construction
Construction Waste	All waste will be classified in accordance with the Waste Classification Guidelines (EPA, 2014) so that different waste streams will be kept separate.	Contractor	Construction
Construction Waste	All general inert and solid waste material will be stored at designated points, isolated from surface water and stormwater drains.	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
Construction Waste	Wastes disposed offsite will be sent to a facility appropriately licenced to receive that waste.	Contractor	Construction
Construction Waste	Compilation of a waste data form for recording waste movement including; solid and inert waste materials, provision of a description of the waste types, physical nature of wastes, proposed treatment, dates of movement, transporters and waste destination details.	Contractor	Construction

Other safeguards and management measures that would address contaminated material impacts are identified in section 6.6.

6.13 Utilities

6.13.1 Existing environment

Utilities in and around each of the sites are described in section 3.4. In summary existing utilities include:

- Ausgrid 132kV transmission cable – Brighton Memorial Fields
- Sydney Water stormwater, potable and sewage pipelines – both sites
- Above ground powerlines – both sites.

6.13.2 Potential impacts

Construction

There are numerous utilities in and around each of the sites which while not providing significant site constraints, require consideration within the design and construction methodology. Disruption to these utilities could have potential impacts at a local and regional scale depending on circumstances.

To avoid potential impacts, all underground and above ground services in the vicinity of the sites would be identified during detailed design using the following mechanisms prior to works commencing:

- Dial Before You Dig request and plans
- Consulting with utility companies that have services in close proximity to the proposed works area, and if necessary, requesting a building plan approval from the respective company
- Identification of service locations using a specialised contractor
- Pot holing and visual identification of services.

Operation

No long term impacts on utilities are anticipated as a result of the proposal.

6.13.3 Safeguards and management measures

Table 6-45: Summary of utility impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Utilities	Identify all underground and above ground services in the vicinity of the proposal by undertaking a dial before you dig request, consulting with utility companies that have services within close proximity to the proposal; identifying services locations using a specialised contractor and potholing prior to undertaking ground disturbance.	Contractor	Detailed design/pre-construction	

6.14 Cumulative impacts

6.14.1 Potential impacts

Construction

Cumulative effects could result from other industrial, commercial or residential development in the vicinity operating during the construction period for the proposal. The key cumulative impact of these activities with respect to the proposal would generally be related to construction activities such as:

- Noise and vibration from construction plant and equipment
- Air quality as a result of dust from excavation activities and emissions from construction plant and equipment
- Water quality as a result of increased sedimentation in runoff from exposed areas
- Contamination of water and soil as a result of release of ASS
- Increased traffic volumes related to construction activities such as excavation of materials, delivery of plant and equipment and construction staff.

The M6 Stage 1 project is the most significant future construction project identified in the area. The construction of the tunnel portal and new intersection at President Avenue, as well as construction laydown area would result in direct impacts in and around Rockdale Bicentennial Park. This is particularly relevant to Brighton Memorial Fields which is directly adjacent to the Rockdale Bicentennial Park construction area. Wider impacts associated with the M6 Stage 1 project are also anticipated from the construction of the pedestrian and cyclist shared pathway which extends north of Rockdale Bicentennial Park, increased construction vehicle traffic, changes to traffic layout, and other impacts such as noise and vibration, dust and sediment runoff.

The objective of the proposal is to provide offset recreational facilities prior to the construction of the M6 Stage 1 project commencing. Accordingly, there is limited risk of cumulative effects between the proposal and the M6 Stage 1 project. There may be some early works such as geotechnical testing, site investigation and utility works which may coincide with the proposal. However, any such works would be discrete and unlikely to contribute to cumulative impacts.

There are no other known developments occurring in the area at the same time as the proposal that could contribute to cumulative impacts. Given the lower scale and intermittent nature of the works, the impacts associated with the proposal are unlikely to significantly contribute to cumulative impacts.

Operation

There are no long-term cumulative impacts anticipated from the proposal.

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design and construction. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment Officer, Sydney, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the following:

- QA Specification G36 – Environmental Protection (Management System)
- QA Specification G38 – Soil and Water Management (Soil and Water Plan)
- QA Specification G10 – Traffic Management.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design and construction phase of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor/Transport for NSW project manager	Pre-construction/detailed design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five business days prior to commencement of the activity.	Contractor/Transport for NSW project manager	Pre-construction	
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include*:* • adjoining residential areas requiring particular noise management measures.	Contractor/Transport for NSW project manager	Pre-construction/detailed design	
TRA1	Traffic and transport	The CTMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The CTMP will include: • confirmation of haulage routes • construction vehicle parking controls and provision for worker parking off-street and on-site • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist	Contractor	Detailed design/Pre-construction	Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		access • requirements and methods to consult and inform the local community of impacts on the local road network • a requirement to consult with those affected by changes to private driveway access • description of the access routes to construction sites including the entry and exit locations and measures to prevent construction vehicles queuing on public roads • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.			
TRA2	Traffic and transport	Notification of the local community and recreational facility users on construction progress including scheduling of works.	Contractor and Transport for NSW	Pre-construction, Construction	
TRA3	Traffic and transport	The completion of the new car park within the Brighton Memorial Playing Fields site would be completed as soon as practicable within the wider program of works, and made available for school drop-off and pick-up, prior to the completion of the rest of the works. Consultation would occur with Brighton-Le-Sands	Transport for NSW/Bayside Council	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Public School to communicate changes in access to the car park and potential temporary alternative parking options.			
TRA4	Traffic and transport	Construction works will not commence until the Site Access Approval (in writing) has been obtained from Bayside Council. The appropriate road opening and occupation permits will be sought from Bayside Council, accompanied by detailed traffic management plans prior to the works commencing. Any Road Occupancy Licences from the Transport Management Centre for work on State roads will also be obtained, where required.	Contractor	Pre-construction	
TRA5	Traffic and transport	Cycle parking would be provided within the proposed car parks. End of trip cycle facilities would also be considered in the design to encourage greater access using cycles. The location for the cycle parking and end of trip facilities would be determined as part of the detailed design for the proposal.	Transport for NSW	Detailed design	
TRA6	Traffic and transport	Green travel concessions would be promoted through the club membership to encourage non-car based travel to the sites.	Bayside Council	Operation	
TRA7	Traffic and transport	A road safety audit would be undertaken to consider the new access arrangements and the interactions with the surrounding transport network.	Transport for NSW	Detailed design	
TRA8	Traffic and transport	Upon completion and within one month of soccer season starting, a review of parking demand would be undertaken. This review will consider whether temporary transport and access measures are	Transport for NSW/Bayside Council	Operation	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		required, and where necessary, implement those measures.			
NOI1	Construction noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The CNVMP will generally follow the approach in the ICNG and identify: all potential significant noise and vibration generating activities associated with the activity; and feasible and reasonable mitigation measures to be implemented. The measures will be consistent with the Roads and Maritime *Construction Noise and Vibration Guideline*. The CNVMP will include a monitoring program to assess performance against relevant noise and vibration criteria. Arrangements for consultation with key stakeholders and sensitive receivers, including notification and complaint handling procedures and contingency measures will be implemented in the event of non-compliance with noise and vibration criteria.	Contractor	Detailed design/pre-construction	Section 4.6 of QA G36 Environment Protection
NOI2	Construction noise and vibration	Advanced notification of work and potential disruptions would be provided where receivers are likely to experience annoyance from noisy work. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these would occur, impacts and mitigation measures. Notification distribution will be a minimum of five business days prior to the start of work.	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NOI3	Construction noise and vibration	Respite offers will be considered where there are high noise and vibration generating activities near residential receivers. The respite would be a minimum period of one hour between blocks of continuous work which would be limited to three hours in duration. The actual duration of each block of work and respite should be flexible to accommodate the requirements of impacted receivers.	Contractor	Construction	
NOI4	Construction noise and vibration	Out of hours works would be undertaken over no more than two consecutive nights.	Contractor	Construction	
NOI5	Construction noise and vibration	Where feasible and reasonable, construction will be carried out during standard daytime construction working hours. Works generating high noise and/or vibration levels will be scheduled during less sensitive time periods.	Contractor	Construction	
NOI7	Construction noise and vibration	High noise and vibration generating activities near residential receivers will be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite will be flexible to accommodate the usage and amenity at nearby receivers.	Contractor	Construction	
VIS1	Visual amenity	Consideration would be given to reducing visual amenity impacts associated with new structures during detailed design, for example in the choice of materials and finishes that are complementary to the surrounding visual landscape.	Transport for NSW	Detailed design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
VIS2	Visual amenity	Measures to further minimise the construction footprint and to increase vegetation retention areas will be investigated during detailed design.	Contractors	Construction	
VIS3	Visual amenity	Additional landscaping would be provided around the proposed playing fields which will complement the existing vegetation present in the park lands	Contractors	Construction	
VIS4	Visual amenity	A site inspection will be undertaken prior to commencing construction to confirm tree removal, tree retention and tree protection measures. The implementation of site-specific safeguard measures will be checked before construction starts.	Contractors and Transport for NSW	Construction	
LIG1	Light spill	Lighting provided for the proposal would be designed to comply with Australian Standard (AS) 4282 – Control of the obtrusive effects of outdoor lighting and AS 2560:2007 Sports Lighting.	Transport for NSW	Detailed design	
LIG2	Light spill	Full cut-off fixtures would be used for lighting where feasible	Transport for NSW	Detailed Design	
LIG3	Light spill	Lighting would be operated at no more than 200 Lux	Lessees	Operation	
LIG4	Light spill	Residents potentially affected by increased light spill would be consulted following the completion of the detailed lighting design.	Transport for NSW	Detailed Design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO1	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the *Landscape Guideline* (RTA, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • requirement for a suitably qualified arborist to be present for on-site for activities such as tree health assessments, when tree roots are encountered and during vegetation clearing • procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013) protocols to manage weeds and pathogens, to manage the unlikely risk of sediment flowing into waterways • protocols for manage weeds and pathogens.	Contractor	Detailed design/pre-construction	Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO2	Biodiversity	A pre-construction survey would be undertaken of the existing West Botany Street bridge over Muddy Creek to confirm presence of Eastern Bentwing Bats. The Flora and Fauna Management Plan for the proposal would include procedures for unexpected threatened species finds and fauna handling.	Contractor	Pre-construction	
BIO3	Biodiversity	Measures to further minimise the construction footprint and increase vegetation areas will be investigated during detailed design and implemented where practicable and feasible. Habitat trees for threatened species will be considered for retention.	Detailed designer	Detailed design/pre-construction	
BIO4	Biodiversity	Vegetation planted as part of the landscaping work will consider compatibility as a foraging resource for Grey-headed Flying-fox. Species such as eucalypts and figs would be consistent with a preferred resource, however species that produce nectar such as *Banksia* species would also be suitable.	Contractor	Detailed design/construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
FLO1	Soil and water	A Construction Soil and Water Management Plan (CSWMP) will be prepared and implemented as part of the CEMP. The CSWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. Measures that would be implemented as part of the CSWMP will include: • Erosion and sedimentation controls will be checked and maintained on a regular basis (including clearing of sediment from behind barrier) and records kept and provided on request • Erosion and sediment control measures will not be removed until the works are completed and areas are stabilised Work areas will be stabilised progressively during the works.	Contractor Contractor	Detailed design/pre-construction Detailed design/pre-construction	Section 2.1 of QA *G38 Soil and Water Management* Landcom's Managing Urban Stormwater: Soils and Construction 4th Edition
FLO2	Soil and water	A site specific Erosion and Sediment Control Plan (ESCP) will be prepared and implemented as part of the CSWMP. The ESCP will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. Erosion and sediment control measures will be implemented and maintained and will include: • The maintenance of established stockpile sites	Contractor	Detailed design/Pre-construction	Section 2.2 of QA *G38 Soil and Water Management* Landcom's Managing Urban Stormwater: Soils and Construction 4th Edition

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		will be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10) • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site.			
FLO3	Stormwater Detention	On-site retention or detention strategies will be implemented to manage permissible site discharge and reduce flood risk where the impervious playing fields construction constitutes an impermeable surface and triggers the need for detention. Assessment of the permissible site discharge and minimum on-site detention volume will be undertaken during the detailed design of the sites as per the respective catchments (Rockdale Technical Specifications – Stormwater Management Section 6.2 and Sydney Water requirements for Muddy Creek, whichever is more stringent).	Designer	Detailed Concept Design/Detailed design	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 5 & 6

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
FLO4	Stormwater Quality	Stormwater quality management measures will be implemented to achieve stormwater pollution reduction targets in Botany Bay. These measures will include: • Prohibition of release of dirty water into drainage lines and/or waterways • Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) will be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. Water quality control measures will be implemented to prevent any construction materials (e.g. concrete, grout, sediment etc) entering drain inlets or waterways.	Designer	Detailed Concept Design/Detailed design	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 5 & 6
FLO5	Surface Water Contamination	Measures to manage accidental spills and leaks will be included in the CEMP.	Contractors	Pre-construction/Construction	Rockdale DCP 2011; Section 4.1.3 Water Management Rockdale Technical Specifications – Stormwater Management Section 7.5
FLO6	Flooding	Weather conditions will be monitored to identify potential flood conditions and manage potential flooding impacts in accordance with the CEMP.	Contractors	Pre-construction/Construction	Section 2.1 of QA *G38 Soil and Water Management*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
FLO7	Flooding	Design of the fields will demonstrate no impact to flooding through numerical flood modelling using Bayside Council's approved flood model. Construction of final surface levels will match the proposed design surface levels within 10 mm in areas of flood affectation. Proposal elements requiring cut or fill, such as the playing fields and skate parks, will be designed for a net balance of cut/fill.	Designers & Contractors	Approval Design/Detailed Design/Pre-construction/Construction	
FLO8	Flooding	Construction site facilities, stockpiles, materials and equipment will be located outside the 1% AEP flood extents, where practicable. Where this is not feasible, further consultation with Bayside Council will be undertaken on suitable site-specific measures. The contractor will prepare a Flood Management Plan, including appropriate siting of plant, equipment and materials and a flood contingency plan, in order to mitigate flood risks during construction.	Designers & Contractors	Detailed Design/Pre-construction/Construction	
FLO9	Flooding	Design and construction of the pedestrian bridge over Muddy Creek at McCarthy Reserve will minimize the effects on the existing channel and flood conditions.	Designers & Contractors	Detailed Design/Pre-construction/Construction	Sydney Water – Building bridges over Sydney Water's open stormwater channels (dated 05 November 2014)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
FLO10	Flooding	Signage will be provided around the McCarthy Reserve/Ador Park Precinct to alert personnel that there is the risk of flooding in the area. Installation of bollards or similar barriers will be considered around the perimeter of the car park at Ador Park Precinct to prevent vehicles from being carried away in the event of a flood.	Designers	Detailed Design	
CON1	Contamination Investigation	Further preliminary and detailed site contamination investigations are required to: • determine the extent of contamination present • identify potential impacts on workers during construction • assess the suitability of the fill to be reused on the site • identify if capping layers are required • develop management strategies for the identified contamination including methods for classification and disposal. Investigations will be completed by an appropriately qualified and experienced environmental consultant and be completed in accordance with the State Environmental Planning Policy 55 (SEPP 55), relevant NSW EPA Guidelines, and the National Environment Protection Measure (Assessment of Site Contamination) 1999 (revised 2013).	Transport for NSW	Pre-construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CON2	Exposure of acid sulfate soils	The CEMP will include an Acid Sulfate Soils Management Plan (ASSMP), prepared in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulfate Materials, 2005The ASSMP would be prepared by an appropriately qualified and experienced consultant, prior to the works commencing, and would be informed by further contamination investigations undertaken for detailed design.	Contractor	Pre-construction	
CON3	Erosion and sedimentation	Erosion and sedimentation control measures will be outlined in an ESCP and implemented for the proposed works.	Contractor	Pre-construction	
CON4	Contaminated land	A Soil Contamination Management sub-plan will be prepared as part of the CEMP, prior to the commencement of works, which documents specific soil contamination mitigation and management measures to be employed during the construction of the proposed works.	Contractor	Pre-construction/detailed design	
CON5	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.	Contractor	Detailed design/Pre-construction	Section 4.2 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CON6	Human health related impacts	Where excavation works at McCarthy Reserve/Ador Park Precinct uncovers previous landfill material, and that material is to be reused on site, an assessment of the material against the Health-based investigation levels (mg/kg) for Recreational C sites as defined in Schedule B 1 of the Guideline on Investigation Levels for Soil and Groundwater (NEPC, 2011) will be undertaken to determine the suitability of the material for recreational land use purposes. This assessment will be undertaken prior to the reuse of this material on site.	Contractors	Construction	
CON7	Exposure of contaminated soils	Reinstatement of an appropriate capping layer on any exposed land fill material would be required on a progressive basis and as soon as practicable as part of the proposed works.	Contractors	Construction	
CON8	Disturbance of asbestos containing material	If asbestos is identified during excavation, the material will be managed as Special Waste (containing asbestos) and disposed of an appropriately licenced waste facility.	Contractors	Construction	
CON9	Accidental spill	A site-specific emergency spill plan will be developed, which will include spill management measures in accordance with the Roads and Maritime *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design/Pre-construction	Section 4.3 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CON9	Contaminated land	If a Remediation Action Plan is required (to be determined through the contamination assessment report), it will be provided to Bayside Council to review and provide input.	Detailed designer	Pre-construction	
AIR1	Dust emissions	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction	
AIR 2	Dust emissions	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction	
AIR3	Dust emissions	Loads containing loose materials are required to be covered.	Contractor	Construction	
AIR4	Dust emissions	On-site vehicle speed limits are to be established and enforced.	Contractor	Construction	
AIR5	Dust emissions	Dust minimisation measures for exposed stockpiles (such as top soil stockpiles) and unsealed construction areas are to be implemented as required (such as water spraying).	Contractor	Construction	
AIR6	Dust emissions	Vehicles and machinery are to be regularly serviced and maintained in an efficient condition to minimise potential emissions.	Contractor	Construction	
AIR7	Dust emissions	During extreme weather events where dust generation cannot be effectively minimised (such as high winds), dust generating works would cease until adequate controls can be implemented or until adverse weather conditions subside.	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AIR8	Dust emissions	Exposed areas are to be stabilised with planting as soon as reasonable and feasible.	Contractor	Construction	
AIR9	Dust emissions	Stockpiled material is to be appropriately shaped to reduce wind erosion and covered/seeded/sealed if are to remain onsite for more than 48hrs.	Contractor	Construction	
AIR10	Dust emissions	Vehicles and activities are to be confined to the designated work areas to prevent any inadvertent encroachment into exposed areas.	Contractor	Construction	
AIR11	Dust emissions	All emission controls used on vehicles and construction equipment would comply with standards listed in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010.	Contractor	Construction	
AIR12	Other emissions	Vegetation or other materials are not to be burnt on site.	Contractor	Construction	
ABO1	Aboriginal heritage	*The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contactor	Detailed design/pre-construction	Section 4.9 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HER1	Unexpected Discovery of Non-Aboriginal heritage	*The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contactor	Detailed design/pre-construction	Section 4.10 of QA *G36 Environment Protection*
HER2	Brighton Memorial Fields - commemorative gate with plaques	The detailed design will be informed through consultation with the Brighton RSL Club Sub-Committee regarding the relocation of the memorial plaques and a new form of commemoration. Should any change to the gate and/or associated memorial plaques occur then the NSW War Memorial Register will require updating.	Transport for NSW	Pre-construction	NSW War Memorials Register – Available at warmemorialsregister.nsw.gov.au
LAN1	Land use and social and economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • contact name and number for complaints. The CP will be prepared in accordance with the Transport for NSW communications guidelines, standards and e-tool kit.	Contractor	Detailed design/pre-construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
COW1	Construction Waste	A Waste Management Plan (WMP) will be prepared as part of the CEMP in accordance with the Roads and Maritime Services Technical Guide: Management of road construction and maintenance waste.	Contractor	Construction	
COW2	Construction waste	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery where possible) • Disposal is undertaken as a last resort.	Contractor	Construction	
COW3	Green waste	If vegetation is to be mulched and transported off site for beneficial reuse, a Mulch Management Plan will be prepared, and mulch will be assessed for the presence of weeds, pests, and other diseases.	Contractor	Construction	
COW4	Construction Waste	Excavated material, soil, fill and other erodible matter that are transported to or from the sites will be kept covered at all times during transportation.	Contractor	Construction	
COW5	Construction Waste	All excess spoil generated from excavations classified as General Solid Waste (putrescible) will be disposed of at a licensed facility.	Contractor	Construction	
COW6	Construction Waste	All waste will be classified in accordance with the Waste Classification Guidelines (EPA, 2014) so that different waste streams will be kept separate.	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
COW7	Construction Waste	All general inert and solid waste material will be stored at designated points, isolated from surface water and stormwater drains.	Contractor	Construction	
COW8	Construction Waste	Wastes disposed offsite will be sent to a facility appropriately licenced to receive that waste.	Contractor	Construction	
COW9	Construction Waste	Compilation of a waste data form for recording waste movement including; solid and inert waste materials, provision of a description of the waste types, physical nature of wastes, proposed treatment, dates of movement, transporters and waste destination details.	Contractor	Construction	
UTI1	Utilities	Identify all underground and above ground services in the vicinity of the proposal by undertaking a dial before you dig request, consulting with utility companies that have services within close proximity to the proposal; identifying services locations using a specialised contractor and potholing prior to undertaking ground disturbance.	Contractor	Pre-construction	

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
SEPP 55 (s16)	Notification about Category 2 works to council or the Commissioner.	At least 30 days before start of the activity.

8. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential 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 proposal.

Sumaya Osman

Principal Environmental Scientist

AECOM Australia Pty Ltd

Date: 19 November 2019

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Chris Gorman

M6 Environmental Approvals Manager – Transport for NSW

Date: 19 November 2019

9. References

- Australian Standard AS 1428:2009 Design for Access and Mobility
- Australian Standard AS 4282:1997 Control of the obtrusive effects of outdoor lighting
- Australian Standard AS 2560:2007 Sports Lighting
- Australian Standard AS 4422: 2016 Playground surfacing - Specifications, requirements and test method
- Australian Standard AS 4685 SET: 2014 Playground Equipment and Surfacing
- Australian Standard AS 4685.0: 2017 Playground Equipment and Surfacing - Part 0 - Development, installation, inspection, maintenance and operation
- BMT WBM, 2016, Spring Street Drain, Muddy Creek and Scarborough Ponds Drainage Catchments Flood Study Review. Prepared for Bayside Council
- City of Bayside Council, 2017, Bayside Council Plan of Management for Community Land and Public Open Space 2016
- City Bayside Council 2019, About Rockdale, A Brief History of the City, *https://www.rockdale.nsw.gov.au/Pages/Rockdale_History.aspx*
- FIFA Quality Programme – Handbook of Requirements for Football Turf, 2015. Version 2.6
- Football NSW standards
- Louise Thorn (2019) Brighton Memorial Playing Fields, Bayside Council, 20 May 2019
- Lunney, D; Hutchings, P. A; Hochuli, D (2010) The natural history of Western Botany Bay, Royal Zoological Society of NSW
- National Construction Code
- Office of Environment and Heritage 2011, Sustainable Mountain Biking Strategy, Sydney
- Rockdale Development Control Plan 2011, Rockdale Council
- Rockdale Local Environmental Plan 2011, Rockdale Council
- Rockdale Technical Guide, Civil Infrastructure Design 2012, Rockdale Council

Terms and acronyms used in this REF

Term/Acronym	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW).
CEMP	Construction environmental management plan
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
Transport for NSW	NSW transport agency. Formally NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a) Any environmental impact on a community?	The proposal requires the disturbance of potential contaminated land at McCarthy Reserve/Ador Park Precinct. Further contamination testing will be completed as part of the detailed design process to better understand the potential contamination risk and to direct an appropriate risk management response.
b) Any transformation of a locality?	The proposal will improve existing recreational facilities. However, as these are existing recreational areas, this is not considered to be a *transformational* change.
c) Any environmental impact on the ecosystems of the locality?	The proposal requires some isolated vegetation removal and has the potential to generate environmental impacts associated with construction activities. However, these potential impacts can be appropriately managed through standard construction management practices. Therefore, any impacts on the ecosystem of the localities will be minor.
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	The proposal comprises providing improved recreational facilities. However, there would be temporary impacts associated with dust, noise and visual amenity duration construction. The proposal will also require minimal vegetation removal. However this will be mitigated through new planting across both sites, offsetting the loss of environmental quality.
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?	N/A
f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974)?*	N/A
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	The proposal will require minimal vegetation removal. As described in the biodiversity assessment in section 6.4, the vegetation is of low ecological value and is not habitat to any endangered species. Vegetation loss will be mitigated through new planting across both sites, offsetting the loss of environmental quality.
h) Any long-term effects on the environment?	The proposal will not have any long term effects on the environment.

Factor	Impact
i) Any degradation of the quality of the environment?	The proposal will not result in degradation of the quality of the environment.
j) Any risk to the safety of the environment?	The proposal will not pose a risk to the safety of the environment.
k) Any reduction in the range of beneficial uses of the environment?	The proposal will not result in a reduction in the range of beneficial uses of the environment.
l) Any pollution of the environment?	Construction of the proposal has the potential to generate environmental pollutants and sedimentation. However, this will be managed through the proposed construction management measures and standard work procedures.
m) Any environmental problems associated with the disposal of waste?	Spoil material from civil works at McCarthy Reserve/Ador Park Precinct has the potential to be contaminated due to historic filling of the site and will need to be disposed of at an appropriate facility.
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	N/A
o) Any cumulative environmental effect with other existing or likely future activities?	N/A
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	N/A

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy.

A referral is not required for proposed actions that may affect nationally listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a) Any impact on a World Heritage property?	Nil
b) Any impact on a National Heritage place?	Nil
c) Any impact on a wetland of international importance?	Nil
d) Any impact on a listed threatened species or communities?	Nil
e) Any impacts on listed migratory species?	Nil
f) Any impact on a Commonwealth marine area?	Nil
g) Does the proposal involve a nuclear action (including uranium mining)?	Nil
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Certain development types

Development type	Description	Yes/No	If 'yes' consult with	ISEPP clause
Car park	Does the project include a car park intended for the use by commuters using regular bus services?	No	N/A	ISEPP cl. 95A
Bus depots	Does the project propose a bus depot?	No	N/A	ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	N/A	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes/No/ NA	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No	N/A	ISEPP cl. 15A

Note: See interactive map here: ***https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management***. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	N/A	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	N/A	ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	N/A	ISEPP cl.13(1)(c)

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	N/A	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	Yes	Bayside Council	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	N/A	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than *minor* or *inconsequential?*	No	N/A	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	Yes	Bayside Council	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	Yes	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

Note: 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.

Public authorities other than councils

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	N/A	ISEPP cl.16(2)(a)
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	N/A	ISEPP cl. 16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	N/A	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998?*	No	N/A	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	N/A	ISEPP cl.16(2)(f)
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	N/A	ISEPP cl.16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	N/A	ISEPP cl. 16(2)(h)
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	N/A	ISEPP cl. 16(2)(i)

Appendix C

Biodiversity assessment supporting information

Likelihood of occurrence table

Results from both searches were combined to produce a list of threatened species, populations and communities that may possibly occur within the site. Likelihood of occurrences for threatened species, populations and communities on the site were then made based on the habitat characteristics of the subject site, determined from knowledge of the species' ecology. Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "known" = the species was or has been observed on the subject site
- "likely" = a medium to high probability that a species uses the subject site
- "potential" = suitable habitat for a species occurs on the subject site, but there is insufficient information to categorise the species as likely, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the subject site
- "no" = habitat on the subject site and in the vicinity is unsuitable for the species.

All species that were assessed as having the potential to occur on the site prior to field survey were considered during field survey. Where these candidate species were not found, and where habitat on the site was not considered to be suitable for supporting a species, population or community, or was extremely small relative to the habitat available elsewhere in the locality and within the species' known range, their likelihood of occurrence was considered to be "unlikely to occur" and thus an impact assessment for the species, population or community was not conducted.

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Threatened Ecological Communities						
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		E		Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally, occurs below 20 m (though sometimes up to 50 m) elevation. The composition of the community is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil, and latitude. The composition and structure of the understorey is	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.		
Coastal Upland Swamps in the Sydney Basin Bioregion		E	E	Occur primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils. May include tall open scrubs, tall closed scrubs, closed heaths, open graminoid heaths, sedge lands and fern lands. Larger examples may include a complex of these structural forms.	No	No
Fauna						
Actitis hypoleucos	Common Sandpiper	-	M	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also, estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves. Breeds in Eurasia, uncommon summer migrant to Australia (August to May). Some overwinter.	No	No
Anous stolidus	Common Noddy	-	M	Marine. Breeds in colonies on islands from the Abrolhos off WA to the Great Barrier Reef in Qld, as well as Norfolk and Lord Howe Islands.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Anthochaera phrygia	Regent Honeyeater	E4A	CE	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of *Casuarina cunninghamiana (*River Oak). Two of three known key breeding areas are in NSW: the Capertee Valley and Bundarra-Barraba region. The species breeds between July and January and usually nests in horizontal branches or forks in tall mature eucalypts and She oaks. The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes.	Unlikely	No
Apus pacificus	Fork-tailed Swift	-	M	Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes. Non-breeding visitor to all states and territories of Australia, arriving from its breeding grounds in Siberia around October, and departing in April. The species is thought to be highly mobile within Australia, moving across the country in search of food. They probably roost aerially.	Unlikely	No
Ardenna pacificus	Wedge-tailed Shearwater	-	-	Islands, offshore. Breeds in crowded colonies, October to May. Part-migratory, mostly absent from NSW in June-August.	No	No
Ardenna tenuirostris	Short-tailed Shearwater	-	M	Islands, offshore. Migrates May-August to the north Pacific, returning late September.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Arenaria interpres	Ruddy Turnstone	-	M	Tidal reefs and pools; pebbly, shelly and sandy shores; mudflats; inland shallow waters; sewage ponds, salt fields; ploughed ground. Breeds in the Arctic, regular summer migrant to Australia (August to April). Forages on foreshores, exposed rocky platforms, coral reefs and mudflats. Roosts on beaches, rocky islets among grassy tussocks, and on mudflats and sandflats.	No	No
Botaurus poiciloptilus	Australasian Bittern	E1	E	Permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bulrushes) and *Eleocharis* spp. (spike rushes). Feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.	No	No
Calidris acuminata	Sharp-tailed Sandpiper	-	M	Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Breeds Arctic Siberia, summer migrant to Australia August-April. Some overwinter. Forage in wetlands or intertidal mudflats, inundated vegetation of saltmarsh, grass or sedges, sewage ponds Roosting occurs at the edges of wetlands, on	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				sandy beaches, stony shores or on rocks in water.		
Calidris alba	Sanderling	V	M	Coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and lagoons; rarely recorded in near-coastal wetlands. A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. Feeds on insects, larvae, plants, seeds, worms, crustaceans, spiders, jellyfish and fish. Roosts on bare sand, behind clumps of beach-cast kelp or in coastal dunes.	No	No
Calidris canutus	Red Knot	-	E, M	Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps. Breeds around the Arctic migrates to non-breeding areas that extend to the southernmost parts of the Americas, Africa, Europe and Australasia. Arrives in south-eastern Australia September and departs Feb-April. Forages on intertidal mudflats or sandflats, lakes, sewage ponds and floodwaters Roosts on sandy beaches, spits and islets, and mudflats; also, in shallow saline ponds of saltworks.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Calidris ferruginea	Curlew Sandpiper	E1	CE, M	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds.	No	No
Calidris melanotos	Pectoral Sandpiper	-	M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Breeds in northern Russia and North America, migrates to non-breeding areas in South America. Recorded in Australia from September to June.	No	No
Calidris ruficollis	Red-necked Stint	-	M	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, salt fields, sewage ponds. Breeds Arctic Siberia and northern Alaska. Summer migrant to Australia August to April. Many overwinter.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Calidris tenuirostris	Great Knot	V	CE, M	Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Migrates to Australia from late August to early September. Most birds return north in March and April; however, some individuals may stay over winter in Australia. Forages for invertebrates such as bivalve molluscs, gastropods, polychaete worms and crustaceans.	No	No
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas. Favours old growth attributes for nesting and roosting.	Unlikely	No
Calonectris leucomelas	Streaked Shearwater	-	M	Marine. Breeds on Islands off Japan and Korea, migrating south November-May.	No	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Open forest and woodlands of the coast and the Great Dividing Range where stands of she oak occur. Feeds almost exclusively on the seeds of several species of she-oak *(Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				nest sites. A single egg is laid between March and May.		
Cercartetus nanus	Eastern Pygmy-possum	V	-	Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Also eats soft fruits and insects. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, *Pseudocheirus peregrinus* (Ringtail Possum) dreys or thickets of vegetation. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Frequently spends time in torpor especially in winter.	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces. It also possibly roosts in the hollows of trees. The species is thought to require roosting habitat that is adjacent to higher fertility sites which are used for foraging. This species probably forages for	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.		
Charadrius leschenaultii	Greater Sand-plover	V	V, M	Almost entirely restricted to coastal areas in NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Breeds in central Asia from Armenia to Mongolia, moving further south for winter. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders. Diet includes insects, crustaceans, polychaete worms and molluscs.	No	No
Charadrius mongolus	Lesser Sand-plover	V	E, M	Almost entirely coastal in NSW, using sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats, sandy beaches, coral reefs and rock platforms. Breeds in central and north eastern Asia and is present in Australia September to April/May. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge. Diet includes insects, crustaceans,	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				molluscs and marine worms.		
Crinia tinnula	Wallum Froglet	V	-	Acidic swamps on coastal sand plains (typically in sedge lands and wet heathlands), drainage lines, and swamp sclerophyll forests. The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months but can occur throughout the year following rain. Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.	No	No
Dasyornis brachypterus	Eastern Bristlebird	E1	E	Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey. Feeds on a variety of insects, particularly ants. Nests are elliptical domes constructed on or near the ground amongst dense vegetation. Two eggs are laid during August to February.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tailed Quoll	V	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber. Consumes gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines.	No	No
Gallinago hardwickii	Latham's Snipe	-	M	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands. Non-breeding migrant to Australia, arriving between July-November from its breeding grounds in Japan and far-eastern Russia, and departing by late February. It feeds in mud or in very shallow water with low, dense vegetation. Roosting occurs on the ground near or in foraging areas beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Grantiella picta	Painted Honeyeater	V	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema.* Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	Unlikely	No
Haematopus fuliginosus	Sooty Oystercatcher	V	-	Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks.	No	No
Haematopus longirostris	Pied Oystercatcher	E1	-	Intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				Two to three eggs are laid between August and January.		
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas. The breeding season extends from June to January (or sometimes February) in southern Australia. Breeding habitat is usually close to water but may occur up to a kilometre away. Nests are mainly located in tall open forest or woodland, but sometimes in other habitats such as dense forest, closed scrub or in remnant trees on cleared land. The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal.	Unlikely	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. This species breeds mainly in autumn but has been recorded calling throughout the year. Egg masses are	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				foamy with an average of around 500-800 eggs and are laid in burrows or under vegetation in small pools. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter.		
Hieraaetus morphnoides	Little Eagle	V	-	Open eucalypt forest, woodland or open woodland, including she oak or *Acacia* woodlands and riparian woodlands of interior NSW. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Unlikely	No
Hirundapus caudacutus	White-throated Needletail	-	M	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland. Breeds in eastern Siberia, north-eastern China and Japan. The species arrives in Australia in September–October, and most depart by April. It almost always forages aerially. Recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands. Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March.	No	No
Hydroprogne caspia	Caspian Tern	-	M	Coastal offshore waters, beaches, mudflats, estuaries, rivers, lakes. Breeds September to December in the south in colonies on sandspits and islands. They are mainly sedentary but numbers fluctuate seasonally in many areas.	Unlikely	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1	E	Heath or open forest with a heathy understorey on sandy or friable soils. Largely crepuscular. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogenous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				plant material. Nests may be located under *Xanthorrhoea* spp. (Grass trees), blackberry bushes and other shrubs, or in rabbit burrows. Mating occurs any time of the year, usually following heavy rain.		
Ixobrychus flavicollis	Black Bittern	V	-	Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present. Feeds on frogs, reptiles, fish and invertebrates, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. Breeding season is December to March. Nests built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks.	Unlikely	No
Lathamus discolor	Swift Parrot	E1	CE	Box-ironbark forests and woodlands. Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark), and *E. albens* (White Box). Commonly used lerp infested trees include *E. microcarpa* (Inland Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt). Following winter, they return to Tasmania where they breed from September to January.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Limicola falcinellus	Broad-billed Sandpiper	V	M	Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayment's, lagoons, saltmarshes and reefs. Breeds in northern Siberia before migrating southwards in winter to Australia. Roosts on banks on sheltered sand, shell or shingle beaches. Their diet includes insects, crustaceans, molluscs, worms and seeds.	No	No
Limosa lapponica	Bar-tailed Godwit	-	M	Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips. Breeds in the north of Scandinavia, Russia and north-west Alaska. Summer migrant to Australia September to April. Often overwinters.	No	No
Limosa limosa	Black-tailed Godwit	V	M	Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps. Breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. Forages for insects, crustaceans, molluscs, worms, larvae,	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars.		
Litoria aurea	Green and Golden Bell Frog	E1	V	Marshes, dams and stream-sides, particularly those containing Typha spp. (bulrushes) or *Eleocharis* spp. (spike rushes). Some populations occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs.	Unlikely	No
Lophochroa leadbeateri	Pink Cockatoo	V	-	Wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	Open forests or woodlands dominated by box and ironbark eucalypts, or by smooth-barked gums, stringybarks, river she oaks and tea-trees. Nectar is taken from flowers, and honeydew is gleaned from foliage. Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest.	Unlikely	No
Merops ornatus	Rainbow Bee-eater	-	-	Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedge land, vine forest and vine thicket. The breeding season extends from August to January. The nest is constructed in an enlarged chamber at the end of long burrow that is excavated by both sexes. Populations that breed in southern Australia are migratory, birds moving north to northern Australia, Papua New Guinea and eastern Indonesia after breeding, and remaining there for the duration of the Australian winter. Its diet mainly consists of bees and wasps.	Unlikely	No
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				It forages above and below the tree canopy on small insects, especially moths. The bats congregate at the same maternity roosts each year to give birth and rear young. In the southern part of the species' range this occurs during spring. Maternity roosts may be located in caves, abandoned mines, concrete bunkers and lava tubes. Over-wintering roosts used outside the breeding period include cooler caves, old mines, and stormwater channels, under bridges and occasionally buildings.		
Monarcha melanopsis	Black-faced Monarch	-	M	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens. The species spends summer and autumn in eastern Australia, and winters in southern and eastern Papua New Guinea from March to August. Breeds from October to March, in rainforest habitat.	Unlikely	No
Monarcha trivirgatus	Spectacled Monarch	-	-	Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves. Summer breeding migrant to north-east NSW and south-east QLD from September/October to May. Nests in a tree fork or in hanging vines, 1 m - 6 m above the ground, often near water.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Motacilla flava	Yellow Wagtail	-	M	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns. Breeds Europe to Siberia and west Alaska, Regular summer migrant to Australia (November-April).	Unlikely	No
Myiagra cyanoleuca	Satin Flycatcher	-	M	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies. Satin Flycatchers move north in autumn to spend winter in northern Australia and New Guinea and returning south in spring. In NSW, they depart between February and March and return between September and October. In NSW, breeding occurs between November and March, with a nest usually built in the high, exposed outer branches of a tree.	Unlikely	No
Myotis macropus	Southern Myotis	V	-	Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20 m. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Neophema chrysogaster	Orange-bellied Parrot	E4A	CE	Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also, small islands and peninsulas, saltworks, golf courses, low samphire herb land and taller coastal shrubland. Diet mainly comprises seeds and fruits of sedges and salt-tolerant coastal and saltmarsh plants. Occasionally, flowers and stems are eaten. Recent records from unexpected places, including Shellharbour and Maroubra suggest that the species may be expanding their selection of habitats and foraging plant species. Birds seen in NSW in 2003 were foraging on weed species several hundred metres from the coast.	No	No
Ninox strenua	Powerful Owl	V	-	Woodland, open sclerophyll forest, tall open wet forest and rainforest. It roosts by day in dense vegetation comprising species such as *Syncarpia glomulifera* (Turpentine), *Allocasuarina littoralis* (Black She-oak), *Acacia melanoxylon* (Blackwood), *Angophora floribunda* (Rough-barked Apple), *Exocarpus cupressiformis* (Cherry Ballart) and eucalypt species. The main prey items are medium-sized arboreal marsupials. Powerful Owls nest in large tree hollows in large eucalypts that are at least 150 years old. Nesting occurs from late autumn to mid-winter.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Numenius madagascariensis	Eastern Curlew	-	CE, M	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms. Breeds in Russia and north-eastern China, summer migrant to Australia August to May. Mainly forages on sheltered intertidal sandflats or mudflats, on salt flats and in saltmarsh, rockpools, coral reefs, and on ocean beaches. Roosts on sandy spits and islets, among saltmarsh or mangroves, on reef-flats, in the shallow water of near-coastal wetlands, and in trees.	Unlikely	No
Numenius minutus	Little Curlew	-	M	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, salt fields, sewage ponds. Breeds Arctic Siberia; migrates to Australia September to April. Mostly feeds in dry grassland and sedge land with scattered, shallow freshwater pools or areas seasonally inundated.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Pandion cristatus	Eastern Osprey	V	-	Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Unlikely	No
Petroica boodang	Scarlet Robin	V	-	Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps. Feed on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Mainly breed between July and January. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	No	No
Petroica phoenicea	Flame Robin	V	-	Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herb fields, heathlands, shrublands and sedge lands at high altitudes. Feeds on small invertebrates which they take from the ground or off tree trunks, logs and other course woody debris. Breeds in spring to late summer.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs.		
Phascolarctos cinereus	Koala	V	V	Eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Females breed at two years of age, with mating occurring between September and February.	No	No
Pluvialis fulva	Pacific Golden Plover	-	M	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields. Breeds north-east Siberia and west Alaska, regular summer migrant to Australia (August-April).	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January and single young is born in October or November. Can travel up to 50 km from the camp to forage. Feed on the nectar and pollen of *Eucalyptus, Melaleuca* and *Banksia* species, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.	Likely	Yes
Ptilinopus superbus	Superb Fruit-Dove	V	-	Rainforest and closed forests. May also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Forages high in the canopy, eating the fruits of many tree species such as figs and palms. Part of the population is migratory or nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Rhipidura rufifrons	Rufous Fantail	-	M	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands. The southern subspecies *Rhipidura rufifrons rufifrons* is migratory, being virtually absent from south-east Australia in winter. Departure from the breeding areas is usually March to early April, most moving to coastal lowlands and off-shore islands in south-east Queensland, north to Cape York Peninsula and Torres Strait Island. Birds arrive back in south-east Australia mostly in September to November, and breed September to February.	No	No
Rostratula australis	Australian Painted Snipe	E1	E	Swamps, dams and nearby marshy areas. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally, occurs from September to December. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Stagonopleura guttata	Diamond Firetail	V	-	Grassy eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas and lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects. Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.	No	No
Sterna hirundo	Common Tern	-	M	Offshore waters, ocean beaches, estuaries, large lakes. Less commonly freshwater swamps, floodwaters, sewage farms and brackish and saline lakes. Breeds across the northern hemisphere. Regular non-breeding migrant to Australia (September to April).	Unlikely	No
Sternula albifrons	Little Tern	E1	M	Sheltered coastal environments, harbours, inlets and rivers. Migrates from eastern Asia. It breeds in spring and summer along the entire east coast from Tasmania to northern Qld and is seen until May. Nests in small, scattered colonies in low dunes or on sandy beaches.	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles. Forages for small fish, crustaceans, insects, worms and molluscs.		
Synemon plana	Golden Sun Moth	E1	CE	Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by *Austrodanthonia* spp. (wallaby grasses). Adults are short-lived (one to four days) and do not feed - having no functional mouthparts; the larvae are thought to feed exclusively on the roots of wallaby grasses. Eggs are laid at the bases of wallaby grass tussocks. The flight period typically lasts from six to eight weeks (during November and December in the ACT region). Males fly only in bright sunshine during the warmest part of the day (1000 - 1400 hrs).	No	No
Tringa brevipes	Grey-tailed Tattler	-	M	Sheltered coasts with reefs and rock platforms or intertidal mudflats; intertidal rocky, coral or stony reefs; shores of rock, shingle, gravel or shells; embayment's, estuaries and coastal lagoons; lagoons and lakes; and ponds in sewage farms and saltworks. Breeds Siberia migrates to Australia from September to April. Forages in shallow water, on reefs and rock platforms, in rock pools, on exposed intertidal mudflats and intertidal sandflats. Roosts in the branches of mangroves, on snags or driftwood,	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				on rocks, beaches and reefs.		
Tringa glareola	Wood Sandpiper	-	M	Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes; inundated grasslands; floodplains; irrigated crops; sewage ponds; reservoirs; large farm dams; bore drains; rarely brackish wetlands and saltmarsh. Breeds throughout Eurasia. Migrates to Australia September to April. Forages on moist or dry mud at the edges of wetlands. Recorded roosting low in trees and on fences.	Unlikely	No
Tringa incana	Wandering Tattler	-	M	Rocky coasts with reefs and platforms, offshore islands, shingle beaches or beds; occasionally coral reefs or beaches. Breeds in Siberia, Alaska and north-west Canada. Migrant to Australia September to March. Forages among rocks or shingle, or in shallow pools at edges of reefs or beaches. Recorded roosting or perching on top of boulders surrounded by or close to water.	No	No
Tringa nebularia	Common Greenshank	-	M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, salt flats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves,	Unlikely	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				embayment's, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms). Breeds Scotland to Siberia. Summer migrant to Australia September to April. Forages at edges of wetlands, mudflats, in channels, in shallows and on exposed seagrass beds. Roosts and loafs around wetlands, in shallow pools and puddles, or on rocks, sandbanks or small muddy islets.		
Tringa stagnatilis	Marsh Sandpiper	-	M	Swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. Breeds in east Europe, southern Siberia and northern China. Summer migrant to Australia August to May. Forages in shallow water at the edge of wetlands. Recorded roosting or loafing on tidal mudflats, near low saltmarsh, and around inland swamps.	Unlikely	No
Varanus rosenbergi	Rosenberg's Goanna	V	-	Heath, open forest and woodland. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
				Lays up to 14 eggs in a termite mound.		
Xenus cinereus	Terek Sandpiper	V	M	Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally, roosts communally amongst mangroves or dead trees, often with related wader species. The diet includes worms, crabs and other crustaceans, small shellfish and the adults and larvae of various flies, beetles and water-bugs.	Unlikely	No
Flora						
Acacia bynoeana	Bynoe's Wattle	E1	V	Heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstory species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	No	No
Acacia prominens	Gosford Wattle, Hurstville and Kogarah Local Government Areas	E2	-	Open situations on clayey or sandy soils. Flowers from July to September and pods are produced in September-October.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Acacia pubescens	Downy Wattle	V	V	Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones. Flowers from August to October. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low.	No	No
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	E1	E	Coastal scrub and dry sclerophyll woodland on sandy soils. Flowers in autumn. Seeds mature in November and are dispersed by ants. Seed viability is high, and recruitment occurs mainly after fire. A fire temperature of 60 degrees is required for optimum germination. Although plants are killed by fire, they have been recorded sprouting from the base.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Caladenia tessellata	Thick Lip Spider Orchid	E1	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	No	No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Coastal heathlands, margins of coastal swamps and sedge lands, coastal forest, dry woodland, and lowland forest. The larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla* (Scribbly Gum), *E. sieberi* (Silver top Ash), *Corymbia gummifera* (Red Bloodwood) and *Allocasuarina littoralis* (Black She oak); appears to prefer open areas in the understorey of this community. Being leafless it is expected to have limited photosynthetic capability and probably depends upon a fungal associate to meet its nutritional requirements from either living or dead organic material. In addition to reproducing from seed, it is also capable of vegetative reproduction and thus forms colonies which can become more or less permanent at a site.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Genoplesium baueri	Bauer's Midge Orchid	E1	E	Dry sclerophyll forest and moss gardens over sandstone. Flowers February to March.	No	No
Maundia triglochinoides	-	V	-	Swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay. Diaspore is the seed and root tubers, which are probably dispersed by water. Spreads vegetatively, with tufts of leaves arising along rhizome. Populations expand following flood events and contract to more permanent wetlands in times of low rainfall. Flowers November-January.	No	No
Melaleuca biconvexa	Biconvex Paperbark	V	V	Damp places, often near streams or low-lying areas on alluvial soils. Flowering occurs over just 3-4 weeks in September and October. Re-sprouts following fire.	No	No
Melaleuca deanei	Deane's Paperbark	V	V	Heath on sandstone. Flowers appear in summer, but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	No	No
Persicaria elatior	Tall Knotweed	V	V	Beside streams and lakes, swamp forest or disturbed areas.	No	No

Scientific Name	Common Name	BC Act status	EPBC Act status	Habitat and Ecology	Likelihood of Occurrence on site	Impact assessment required
Persoonia hirsuta	Hairy Geebung	E1	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. It is usually present as isolated individuals or very small populations. It is probably killed by fire (as other Persoonia species are) but will regenerate from seed.	No	No
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely	No
Tetratheca juncea	Black-eyed Susan	V	V	Low open forest/woodland, heathland and moist forest, mainly on low nutrient soils associated with the Awaba Soil Landscape. It usually spreads via underground stems which can be up to 50 cm long. Consequently, individual plants may be difficult to identify. It also reproduces sexually but this requires insect pollination.	No	No
Thesium australe	Austral Toadflax	V	V	Grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with *Themeda australis* (Kangaroo Grass). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. Flowers in spring.	No	No

Test of Significance under the NSW *Biodiversity Conservation Act 2016*

Pteropus poliocephalus (Grey-headed Flying-fox)

Pteropus poliocephalus (Grey-headed Flying-fox) is listed as a vulnerable threatened species under the BC Act. There are 649 records for this species within a 10 kilometre radius of the subject site (OEH 2019).

The Grey-headed Flying-fox is found within a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). Camps are often located in gullies, typically close to water, within vegetation with a dense canopy (Churchill 2008).

There are a number of recognised threats impacting the Grey-headed Flying-fox. These include, loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (OEH 2019b).

There is one single interbreeding population of Grey-headed Flying-fox, and as such, any colony or individual of this species forms part of the population. Grey-headed Flying-fox are highly mobile and seasonal movements occur across large areas within the entire range for this species. Grey-headed Flying-fox have been found to disperse more than 2000 kilometres over a nine-month period and the population distribution for this species fluctuates along the entire NSW coast in response to food availability or breeding (OEH 2019b). Grey-headed Flying-fox are known to forage up to 50 kilometres nightly from roosting sites (camps) to feed on fruit, flowers, pollen and nectar (Churchill 2008). Food sources for this species includes, *Eucalyptus* sp., *Ficus* sp. and mangrove tree species (Churchill 2008).

The nearest known camp is located around 4.5 kilometres north of the subject site, camp number 488 occurs at Wolli Creek and is classified as a category 2 camp (between 500 – 2, 499 individuals) (DE 2018). A second nearby camp occurs in Oatley, (camp number 483) and is categorised as a category 1 camp (between 1 – 499 individuals) and is located less than 10 kilometres away from the subject site (DE 2018). Four other active flying fox camps are found further away than camps 488 and 483 but are within a 50 kilometre radius of the subject site, these include Kurnell (camp 245), Centennial Park (camp 487), Kareena Park (camp 942) and Kareela (camp 364) (DE 2018).

- in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed activity will take place less than 5 kilometres away from the closest camp but will not result in the removal or modification of any supporting vegetation within close proximity to camps within a 50 kilometre radius. No camps will be directly affected by the proposed work through removal of native vegetation.

Sudden and loud noises that are often made during construction could be the only factor that may affect the nearby camps. However, it is expected that any noise created during the proposed work will be moderated by the distance between the sites and the closest camps.

Because of these reasons, the proposed works are unlikely to have an adverse effect on the life cycle of the population of Grey-headed Flying-fox to such an extent that will place the viable local population at risk of extinction.

- in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
  - is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
  - is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable.

- in relation to the habitat of a threatened species or ecological community:
  - the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity.

The proposed work will remove a small area of Grey-headed Flying-fox foraging habitat. No roosting habitat will be affected or removed by the proposed work. Several *Banksia integrifolia*, a single *Grevillea robusta* and several exotic trees would be removed as part of the work. These trees would form only a small portion of the total area required for foraging by the local population. Removal of this small portion of foraging habitat is unlikely to increase the risk of extinction of this species.

  - whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The proposed work will not result in habitat fragmentation or the isolation of Grey-headed Flying-fox habitat from other areas of habitat. The proposed work does not involve the removal of camps. A small area of potential foraging habitat would be removed as part of the work. This potential habitat is present in two parkland settings and their removal would not cause the foraging habitat to become fragmented or isolated.

  - the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The potential foraging habitat to be removed would comprise a small portion of the total habitat required to support the local population of Grey-headed Flying-fox. The potential foraging habitat is not secured in the long term, is of relatively poor quality, being isolated from larger patches of native vegetation and existing in the context of park settings. The area of potential foraging habitat is not likely to be important for the Grey-headed Flying-fox population's long-term survival as it would rely on multiple sites and would have access to larger areas of foraging habitat. Further the areas to be removed are not occupied as camps.

- whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

There are no areas of outstanding biodiversity value in the subject site.

- whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

No key threatening processes are associated with this proposal.

Conclusion

It is unlikely that the proposed development will result not result in a significant impact on the life cycle, foraging activities and survival of the Grey-headed Flying-fox.

Matters of National Environmental Significance and Commonwealth land

Guidance:

To satisfy these requirements, complete the matters of national environmental significance table included below. The table should be completed by the primary author of the REF.

Provide a discussion of the proposal in relation to each matter of national environmental significance heading in the table. Identify the level of impact under the "impact" column of the table. If an impact is likely, state whether it is likely to be minor or significant. If no impact is likely, write 'no impact'. If there is likely to be a significant impact on any matters of national environmental significance or direct or indirect impacts on the environment of Commonwealth land, contact the LEA immediately.

The discussion of the proposal in respect of the matters of national environmental significance and the environment of Commonwealth land should be a summary of the impacts and mitigation already provided in the REF. There should be no new or additional impacts in the tables that have not been addressed in the main body of the REF.

What is a significant impact under the EPBC Act?

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not the proposal is likely to have a significant impact depends upon the sensitivity, value and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors need to be considered when deciding whether the proposal is likely to have a significant impact on the environment. The significance of impacts should be decided in accordance with the ***Matters of National Environmental Significance Significant Impact Guidelines 1.1*** and the ***Actions on, or impacting upon Commonwealth land and Actions by Commonwealth Agencies Significant Impact Guidelines 1.2***.

Roads activities and Nationally listed biodiversity matters

Roads activities assessed as likely to have a significant impact on nationally listed threatened species, endangered ecological communities or migratory species will require detailed consideration to address requirements of the EPBC Act strategic assessment approval. Further information is provided in the ***EPBC Act – Strategic Assessment Practice Note EIA-N07***.

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy.

A referral is not required for proposed actions that may affect nationally listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
i) Any impact on a World Heritage property?	Nil

Factor	Impact
j) Any impact on a National Heritage place?	Nil
k) Any impact on a wetland of international importance?	Nil
l) Any impact on a listed threatened species or communities?	Significant Impact Criteria test (EPBC Act) *Pteropus poliocephalus* (Grey-headed Flying-fox) The Grey-headed Flying-Fox is listed as a vulnerable species under the EPBC Act, 649 records for this species occur within a 10 kilometre radius of the subject site (OEH 2019). While no Grey-headed Flying-Fox camps are known to occur within the area of the proposed action, Grey-headed Flying-Fox disperse up to 50 kilometres nightly from roosting sites to forage (Churchill 2008). The area of the proposed action is within a 50 kilometre radius of six known Grey-headed Flying-Fox camps and potential food tree species are found within the study area. There is one single interbreeding population of Grey-headed Flying-Fox, and as such, any colony or individual of this species forms part of the population. Consequently, the viable local population is considered to be any Grey-headed Flying-Fox individuals within Australia. Criterion a: lead to a long-term decrease in the size of an important population of a species The project study area does not support a Grey-headed Flying-Fox breeding population (camp) and no potential foraging habitat would be removed as part of the proposed action. Therefore, the proposed action is unlikely to lead to a long-term decrease in the size of the population. Criterion b: reduce the area of occupancy of an important population There is one single interbreeding population of Grey-headed Flying-Fox in Australia. Therefore, any colony or individual of the species is considered part of an important population of the species. The proposed action is unlikely to reduce the area of occupancy of an important population given that no campsites have been recorded within the subject sites. Criterion c: fragment an existing important population into two or more populations There is one single interbreeding population of Grey-headed Flying-Fox in Australia. Therefore, any colony or individual of the species is considered part of an important population of the species. Grey-headed Flying-Fox disperse along the east coast of Australia and no known camps would be affected, therefore the proposed action is highly unlikely to fragment the Grey-headed Flying-Fox population the population into two or more populations. Criterion d: adversely affect habitat critical to the survival of a

Factor	Impact
	species Habitat critical to the survival of the Grey-headed Flying-fox is any habitat within of a known camp with over 20,000 roosting individuals. There are six camps within 50 kilometres of the study area, none of these camps are currently known to support more than 20,000 individuals (DE 2018). Therefore no habitat critical to the survival of this species is present. Criterion e: disrupt the breeding cycle of an important population The proposed action will not disturb any roosting habitat, as such it is unlikely that the breeding cycle of an important population would be disrupted. Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; No roosting habitat will be disturbed by the proposed action. Grey-headed Flying-Fox are known to forage over large areas in response to seasonal changes in flower and fruiting events. Taking these factors into consideration, habitat critical to the survival of Grey-headed Flying-Fox will not be modified, destroyed, removed or isolated and the availability or quality of habitat will not be decreased to an extent that the Grey-headed Flying-Fox population would be likely to decline. Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; The proposed action will not result in the establishment of an invasive species which is harmful to Grey-headed Flying-Fox becoming established within foraging habitat at the subject site. Criterion h: Introduce disease that may cause the species to decline; The proposed action will not result in the introduction of a disease that is harmful to Grey-headed Flying-Fox. Criterion i: Interfere substantially with the recovery of the species; The Draft National Recovery Plan for the Grey-headed Flying-fox was developed in 2009 (DECCW). Specific objectives to be met in the 5-year timeframe of the recovery plan relevant to this project include: • to identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range • to protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes

Factor	Impact
	The proposed action does not remove or modify any potential Grey-headed Flying-Fox roosting habitat, therefore it is unlikely to interfere substantially with the recovery of Grey-headed Flying-Fox. A very small area of potential foraging habitat would be removed, however this habitat is not considered critical to the survival of the species. Conclusion Based on the above assessment, the proposed action is considered unlikely to have a significant effect on the Grey-headed Flying-Fox population in Australia. Therefore, a referral to the Commonwealth Department of the Environment for assessment and approval by the Environment Minister is not recommended.
m) Any impacts on listed migratory species?	Nil
n) Any impact on a Commonwealth marine area?	Nil
o) Does the proposal involve a nuclear action (including uranium mining)?	Nil
p) Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix D

Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) Clearance Letter and AHIMS Search Results

Transport
Roads & Maritime
Services

3 may, 2019

Mark Levy
Project Manager
Roads and Maritime Services

Dear Mark,

Preliminary assessment results for the F6 Extension Stage 1: Early works at McCarthy Reserve/Ador Park Precinct, Rockdale and Brighton Memorial Fields (East), Brighton Le Sands based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as indicated in the checklist attached was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places (AHIMS sites).
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Roads and Maritime Services' procedure, and the cultural heritage potential appears to be reduced due to past disturbances in the form of the recreation fields mentioned above.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff to reassess any potential impacts on Aboriginal cultural heritage.

RMS staff and/or contractors should be aware of the potential of Aboriginal objects (including skeletal remains) being discovered during the course of the project, if this occurs all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' *Unexpected Archaeological Finds Procedure*.

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : McCarthy Reserve

Client Service ID : 424780

Matthew Kerr-Ridge

420 George Street
Sydney 1230

Attention: Matthew Kerr-Ridge

Email: matthew.kerr-ridge@aecom.com

Date: 03 June 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.9608, 151.1379 - Lat, Long To : -33.9504, 151.1544 with a Buffer of 1000 meters, conducted by Matthew Kerr-Ridge on 03 June 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

Office of Environment & Heritage

AHIMS Web Services (AWS)

Search Result

Purchase Order/Reference : Memorial Playing Fields

Client Service ID : 424786

Matthew Kerr-Ridge

420 George Street

Sydney 1230

Attention: Matthew Kerr-Ridge

Email: matthew.kerr-ridge@aecom.com

Date: 03 June 2019

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.9692, 151.14 - Lat, Long To : -33.9588, 151.1566 with a Buffer of 1000 meters, conducted by Matthew Kerr-Ridge on 03 June 2019.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

rms.nsw.gov.au/

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Customer feedback
Roads and Maritime
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