



Greater Sydney Parklands Shadow Modelling Study

Greater Sydney Parklands Trust Bill 2021

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Acknowledgment of Country

The Department of Planning, Industry and Environment acknowledges the Traditional Owners and Custodians of the land on which we live and work and pays respect to Elders past, present and future.

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1 Introduction

The establishment of Greater Sydney Parklands, a city-wide parks agency within the NSW Government, will support the *50-Year Vision for Greater Sydney's Open Space and Parklands*.

This means that, for the first time, there is a metropolitan-wide vision for open space across the city, including the 6,000 ha of NSW Government parklands known as the Parklands Estate – Centennial Parklands (Centennial, Moore and Queens parks), Callan Park, Parramatta Park, Western Sydney Parklands and Fernhill Estate – and a 50-year vision for Greater Sydney to be a ‘a city in a park’, underpinned by a sustainable network of green space.

The new agency and 50-Year Vision recognise the importance that the NSW Government places on parks from an ecological, social, cultural and economic context and the importance of diverse types of open spaces for people and city life.

The Greater Sydney Parklands Trust Bill 2021 confirms the role of Greater Sydney Parklands. It sets out the planning functions of the new Greater Sydney Parklands Trust and solidifies the NSW Government's ambition to protect and enhance the parklands estate.

Among other things, the Greater Sydney Parklands Trust Bill 2021 focuses on protecting the Parklands Estate from overshadowing, recognising the importance of these iconic parks, the level of visitation each receives, and the benefits of sunlight to park users, environment and heritage.

1.1 About this study

The legislation introduces a new requirement for any consent authority determining an application for a development that will or may overshadow the Parklands Estate to consider the impacts of that potential overshadowing, including considering the principles set out in a Greater Sydney Parklands shadow modelling study.

For the purposes of that requirement – set out in section 25 of the Act – this document is the *Greater Sydney Parklands shadow modelling study*. It draws from the best available data available at the time of the publication and may evolve over time as required.

The study guides a long-term approach to ensuring that these iconic parks are not unduly overshadowed. This is a pragmatic approach to minimising the amount of overshadowing of these parks to protect and enhance how people enjoy parks, and to benefit vegetation and heritage assets, in the context of nearby development that meets the planning controls in place at the time of the study's analysis.

Consistency with this approach means not allowing additional overshadowing in areas of significance as determined through the Objectives (noted in 3.1 of this study), and particularly in the areas that have been mapped as no additional overshadowing.

This ensures that the parks that form the Parklands Estate today – and those that will be incorporated into the estate in the future – can continue to be used and enjoyed by people from across the metropolitan region. These are the most significant urban open spaces and parklands where people come to dwell and seek respite from city life in a diversity of landscapes, recreational areas and sunny green spaces. These spaces also perform important environmental functions including protecting ecological communities and providing urban cooling.

These parks have the regional scale and reputation that attracts high numbers of visitors. As iconic parks, they are the lungs of the city and the foundation for Greater Sydney's blue and green grid. Minimising the potential impacts of overshadowing is essential to their continued use, value to local communities and ongoing enhancement.

The study sets out how the potential impacts of overshadowing can be determined and assessed, and how this work should guide consent authorities when assessing development.

1.1.1 When to use this study

The study is intended to be a matter of consideration when evaluating development applications that require consent under the *Environmental Planning and Assessment Act 1979* (EP&A Act) that will or may overshadow the Parklands Estate.

1.1.2 Limits of this study

This study does not preclude a consent authority from considering other potential impacts when assessing the suitability of a proposed development application.

The determination of development applications should consider all impacts on the Parklands Estate – not only solar access – such as views, heritage items, curtilages, ecological values and cultural significance.

Additionally, the study is not intended to limit the ability of Greater Sydney Parklands to undertake works on land zoned RE1 that will enhance the Parklands Estate, such as facilities for recreation, tree planting or picnic shelters that will by default cause minor overshadowing. The study also does not apply to minor encroachments classified as exempt development, such as aerials, antennae, masts and flagpoles.

1.1.3 Assessing consistency with this study

A potential development must not have an unacceptable overshadowing impact on the Parklands Estate. The considerations by which the consent authority can determine whether the level of overshadowing is acceptable or unacceptable is detailed in **Part 3. Solar Protection Framework**.

2 The Shadow Modelling Study

The Parklands Estate comprises more than 6,000 hectares of Sydney's most iconic urban open spaces and parklands attracting over 40 million visits each year.

The vision for Greater Sydney as a city in a park requires policies and decisions that allow more people to enjoy the Parklands Estate for the long term within the context of a growing and changing city. In this regard, the study aims to sustain the qualities of the Parklands Estate as:

- sunlit places where people can enjoy nature
- places that provide green infrastructure for urban cooling and relief
- homes to remnant ecological communities
- places that provide facilities and space for recreation.

These qualities need to be balanced against the reality of changing urban environments. Urban parks are surrounded by – and should be complementary to – the adjacent urban form. As these urban areas change, the study aims to ensure that these large parklands, which currently enjoy high degree of sun access, broadly retain sun access over the long term.

Some transient shading may be acceptable where it is minor and the parkland on which the shadow falls has a partly shaded nature – for example, where there are bike tracks or landscape areas at park edges, where people are likely to be moving through and into the wider park and where dappled light might be appropriate. Generally, however, shading is likely to have a major impact on parkland areas, particularly areas of high value.

The study determines the future baseline from which overshadowing assessments should be made when determining potential impacts on Centennial Parklands or Parramatta Park (or other parks in the Parklands Estate, as appropriate in the future).

2.1 Study aims

The study aims to:

- assess the existing solar amenity condition for parks within the Parklands Estate
- understand the valued qualities and diverse characteristics this affords each park
- understand the solar access and amenity currently afforded to diverse spaces and places of significance within the parks
- understand the planned growth and change surrounding the parks
- determine how susceptible the solar amenity condition is to change as a result of planned growth and change
- establish enduring solar protection controls to maintain the health, amenity and characteristics of these iconic, metropolitan scale parks ensuring they can continue to be used and enjoyed by people from across the metropolitan region for the long term in the context of a growing and changing city
- develop a solar protection framework, based on the established principles within the enduring controls, for protecting additional parklands that may be incorporated into the estate in the future.

2.2 Approach

Of the 5 parks within the Parklands Estate, Centennial Parklands and Parramatta Park are most susceptible to overshadowing due to their proximity to city centre locations, adjacency to high density locations and/or the proposed level of change in areas surrounding the parklands.

In Parramatta Park, this analysis also included the building heights under consideration in the Parramatta CBD Planning Proposal at the time of the study.¹

Callan Park, Western Sydney Parklands and Fernhill Estate are considered less susceptible to new overshadowing due to physical constraints, the character of surrounding areas, planning constraints and adjacent open space.

As such, we determined to undertake detail investigations for the 2 susceptible parklands to establish:

- **A Solar Protection Framework:** includes aims, objectives and processes to ensure solar protection for all parks within the Parklands Estate – now and into the future
- **Solar Protection Controls:** detailed and site-specific controls for Centennial Parklands and Parramatta Park.

2.3 Methodology

To identify appropriate solar protection framework and controls this study considered:

- existing overshadowing impacts on these parks
- potential overshadowing impacts from permitted development on the parks and whether they are acceptable considering environmental, social and cultural objectives
- how to develop an appropriate solar protection framework that balances the need to maintain existing high levels of amenity within the parklands with the need to accommodate development intensification to support population growth.

The study process included:

- **Research:** Desktop research into existing policy settings and solar protection controls across Greater Sydney, an assessment of the existing and planned future context of the parklands and identifying existing industry best practice approaches.
- **Digital modelling and analysis:** An interactive GIS model of the parklands was developed to determine existing overshadowing and maximum potential overshadowing from permitted development.
- **Investigations:** Analysis of potential overshadowing impacts of permitted development and the characteristics and significance of the locations that are overshadowed.
- **Workshops:** held with Greater Sydney Parklands, Government Architect NSW and the Department of Planning, Industry and Environment to understand impacts and determine what is considered acceptable and unacceptable overshadowing impacts.
- **Stakeholder engagement:** Discussions and feedback with stakeholders including the Greater Sydney Commission and adjoining councils.

2.4 Findings

The study used the Winter solstice (21st June) from 9am-3pm to determine existing conditions and an assessment period for solar protection controls. It considered 3 categories to assess existing solar impacts and how susceptible these will be to change:

¹ The Parramatta CBD Planning Proposal relates to the CBD land to the east of Parramatta Park, which was used for analysis rather than currently permitted heights to avoid constraining the ability for this planning proposal to be assessed in its current form. The impacts of the planning proposal were compared with the current permitted heights, with impacts considered acceptable.

- **Category 1: High levels of sunlight access** - almost the whole park is in sunlight for most of the year, and where marginal overshadowing occurs at the perimeter of the park, it is generally limited to a maximum of one hour between 9am and 3pm on the winter solstice.
- **Category 2: Partial overshadowing** - overshadowing extends to parts of the interior of the park for a portion of time between 9am and 3pm on the winter solstice.
- **Category 3: Significant overshadowing** - large portions of the interior of the park are overshadowed between 9am and 3pm on the winter solstice.

The study characterised Centennial Parklands and Parramatta Park as Category 1: High levels of sunlight access. Given the scale and context of the remaining parks within the Parklands Estate, it determined these would also be characterised as Category 1.

The study also determined the baseline from which overshadowing assessments should be made when determining potential impacts all parks in the Parklands Estate as *additional overshadowing above what is currently permissible*. Further analysis of the fine grain conditions of the parklands considered their environmental, cultural and social significance.

The study identified the methodology and considerations for determining the sensitivity and therefore acceptability of local overshadowing impacts on key areas and features of the parklands.

For Centennial Parklands and Parramatta Park, the study identified specific solar protection controls to determine acceptable and unacceptable overshadowing impacts.

3 Solar Protection Framework

This Solar Protection Framework applies to all parks in the Parklands Estate – existing and future. It involves a 3-phase approach to assessing whether a proposed development will have an acceptable or unacceptable overshadowing impact on the Parklands Estate:

- Phase 1: Identify whether a site-specific overshadowing study is required
- Phase 2: Undertake a site-specific shadow study to determine if additional overshadowing occurs within the assessment period. If required, undertake additional site specific built form testing to determine the extent and impact of additional overshadowing
- Phase 3: Determine whether the overshadowing is acceptable or unacceptable.

Phases 1 and 2 may be undertaken by applicants or consent authorities and may be validated by the consent authority. Phase 3 is to be undertaken by the consent authority.

Under phase 3, the determination of whether the impact is acceptable falls within two considerations:

- Solar Protection Controls: For ‘mapped’ parklands (being Centennial Parklands and Parramatta Park at the time of this study): Assessment of the additional overshadowing impacts are to be in accordance with the provisions for that parkland as set out in in the park specific solar protection controls within section 3.3.1 of this study.
- Solar Protection Objectives: For ‘unmapped’ parklands: Assessment of the additional overshadowing impacts are to be undertaken against the established environment, cultural and social objectives identified in section 3.1.

3.1 Solar Protection Objectives

The sunlit character of both Centennial Parklands and Parramatta was assessed as Category 1: High levels of sunlight access. As such, the solar protection controls for each of these parks are based on the objective of protecting and maintaining this high level of sunlight access.

A high-level review of the remaining parks identified that due to the scale and surrounding context of these spaces, they were determined as likely to have the same sunlit character; at a finer grain, understanding the many diverse environmental, cultural and social values of specific spaces, places and features within the parks is required to determine the significance of these and their sensitivity in maintaining existing levels of sunlight access.

The following considerations are to be the subject of detailed investigations as part of any site-specific shadow study to determine the values and significance of any part of the parklands, as a basis for discussion on the acceptability or not of additional overshadowing impacts of these areas.

Key understanding of these considerations is available through the plans of management for each of the parks in the Parklands Estate, heritage registers, heritage conservation management plans, parklands master plans and analysis of existing conditions.

Where possible, the objectives should be used to determine the significance of an entire functional unit (such as a whole field or vegetation community), so that subsequent analysis of the extent of overshadowing can be made by reference to that functional unit.

3.1.1 Environmental objectives

All parts of the park need a minimum number of hours of sunlight to support vegetation growth. Due to the nature and size of the parks, this is unlikely to be a major constraint to development as the park itself will provide setbacks to overshadowing for some of the day.

However, small, irregular edges to the parklands, and the northern edges of parklands, may require better protection if there is a risk that they would be in shadow for extended periods, or in permanent shadow for parts of the year.

Greater sunlight (or constant sunlight) may also be required for certain ecological communities such as Eastern Suburbs Banksia scrub, which may require special protections to specific sites in the parklands.

3.1.2 Social objectives

Surveys and analysis indicate that people's use and enjoyment of parks has a direct relationship with the extent of direct sunlight. People typically seek the sun throughout most of the year, only seeking shade – beyond that provided from shelter structures – in warmer months.

Maintaining the amount of sunlight that people can enjoy while spending time in Greater Sydney's iconic public parks will maximise the amenity of the parks and bring more joy to park user, while also supporting the growth and health of vegetation and ground cover.

We can achieve these ambitions while also allowing for a small amount of overshadowing in a park's perimeter, where allowed from existing or permissible development. This reflects prevailing conditions and may help to create a physical and virtual park edge that could attract more activity and make an area a more desirable place to live and the park a desirable place to spend time.

In this respect, social impacts may differ depending on activities in different parts of the park:

- We need to avoid additional overshadowing in the places where people gather, which are by their nature sunlit, such as ovals, play and picnic grounds and lawns.
- We need to protect areas where people gather in dappled light, such as running paths, to ensure this dappled character is not replaced with permanent or extensive shadow for parts of the year, so that any new shadowing is either minor or fast-moving, rather than an unbroken shadow.

3.1.3 Cultural objectives

Some parts of the park have great significance to the people of Australia or the world, including World Heritage-listed sites at Parramatta Park, the Federation Pavilion in Centennial Park and evidence of Aboriginal settlement and use prior to colonisation. These areas have a unique character that should be protected.

Other areas have local and state significance – these may be heritage buildings or landscaped areas – or represent an educational experience for people to learn more about ancient Aboriginal practices. The character of these areas may be more amenable to transient impacts like shading, depending on the nature of their listing, but should not be so impacted as to render them unusable.

3.2 Phase 1: Identify requirement for a site specific shadow study

Developments that will or may overshadow the parkland between 9am and 3pm on winter solstice (21 June) are likely to exhibit one or more of the following characteristics:

- located within one kilometre of the boundary of a parkland, on the west, north or eastern sides
- exceeds the permitted maximum height controls at the date of this study
- in the case of Parramatta CBD, exceeds the planning proposal heights on exhibition at the date of this study
- are not subject to permitted maximum height controls
- in the case of mapped parklands, on a site designated for site-specific shadow studies.

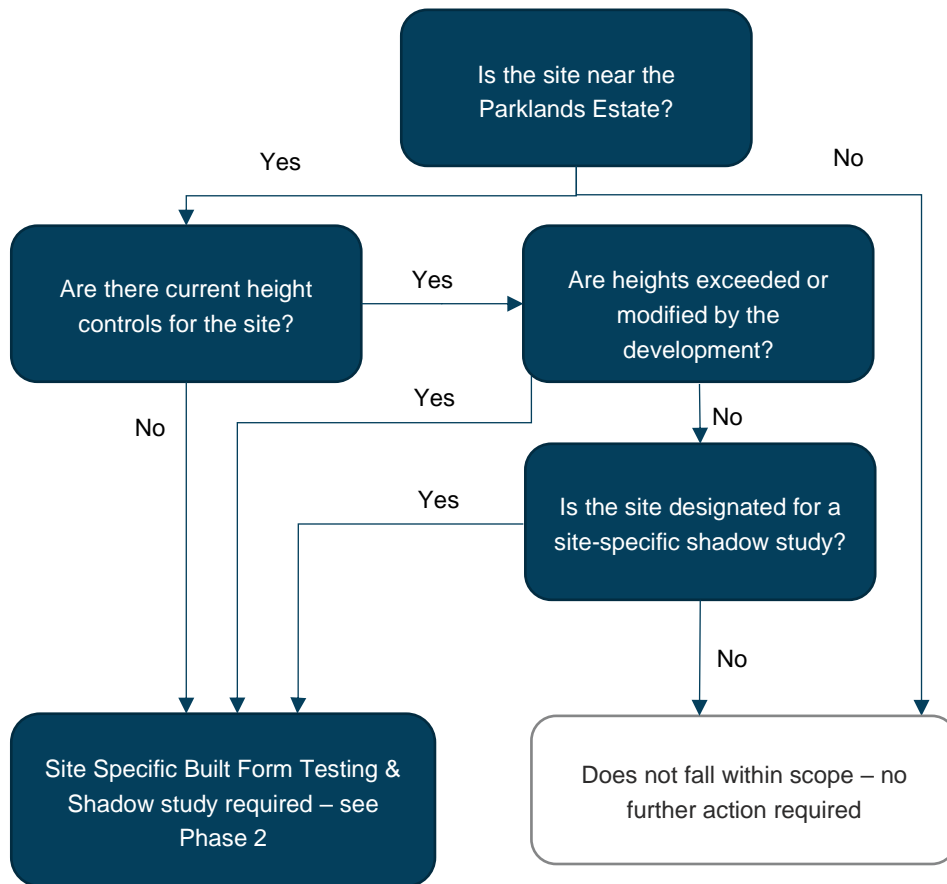


Figure 1: Decision tree for Phase 1

3.3 Phase 2: Undertake site-specific shadow study

A site-specific built form testing and shadow study will determine the extent and significance of any *additional* overshadowing impact by testing, at a minimum:

- A compliant development as permitted under current development controls (including applicable design excellence bonus)
- Hourly assessment of the shadow impacts depicted on aerial (birds eye) views between the hours of 9am and 3pm on June 21 (the assessment period) indicating:
 - shadows cast by existing built form (grey)
 - extent of maximum possible shadow cast by permitted built form (outline in red)
 - additional shadow (blue) cast compared to the existing shadow from the:
 - proposed development, in the case of development applications or
 - maximum permissible height and massing (including bonuses), in the case of planning proposals.
- Composite analysis of the cumulative shadow impacts depicting:
 - Existing shadows
 - Proposed shadows
 - Comparative difference between the two

If there is *additional* shadow cast on the parkland in the assessment period, or the site is identified as requiring a site specific built form testing the study must also:

- Prepare 2 alternative built form options:
 - Alternative 1 – that demonstrates a reduction in or reallocation overshadowing
 - Alternative 2 – that also demonstrates a reduction in or reallocation of overshadowing
- Assess the additional overshadowing in accordance with:
 - For ‘mapped’ parklands, the Solar Protection Controls in 3.3.1.
 - For ‘unmapped’ parklands, the solar protection framework objectives in 1.3. The applicant should make an initial assessment of significance in the shadow study, for the consent authority to validate and determine whether impacts are acceptable.

If the shadow study finds that no additional shadow is cast over the parklands within the assessment period, and it is not identified as requiring site specific built form testing, then the overshadowing impact on the parklands is deemed acceptable.

A GIS map of the Solar Protection Controls will be made available through the NSW Planning Portal shortly after publication of this study and should be used as a base layer for the assessment.

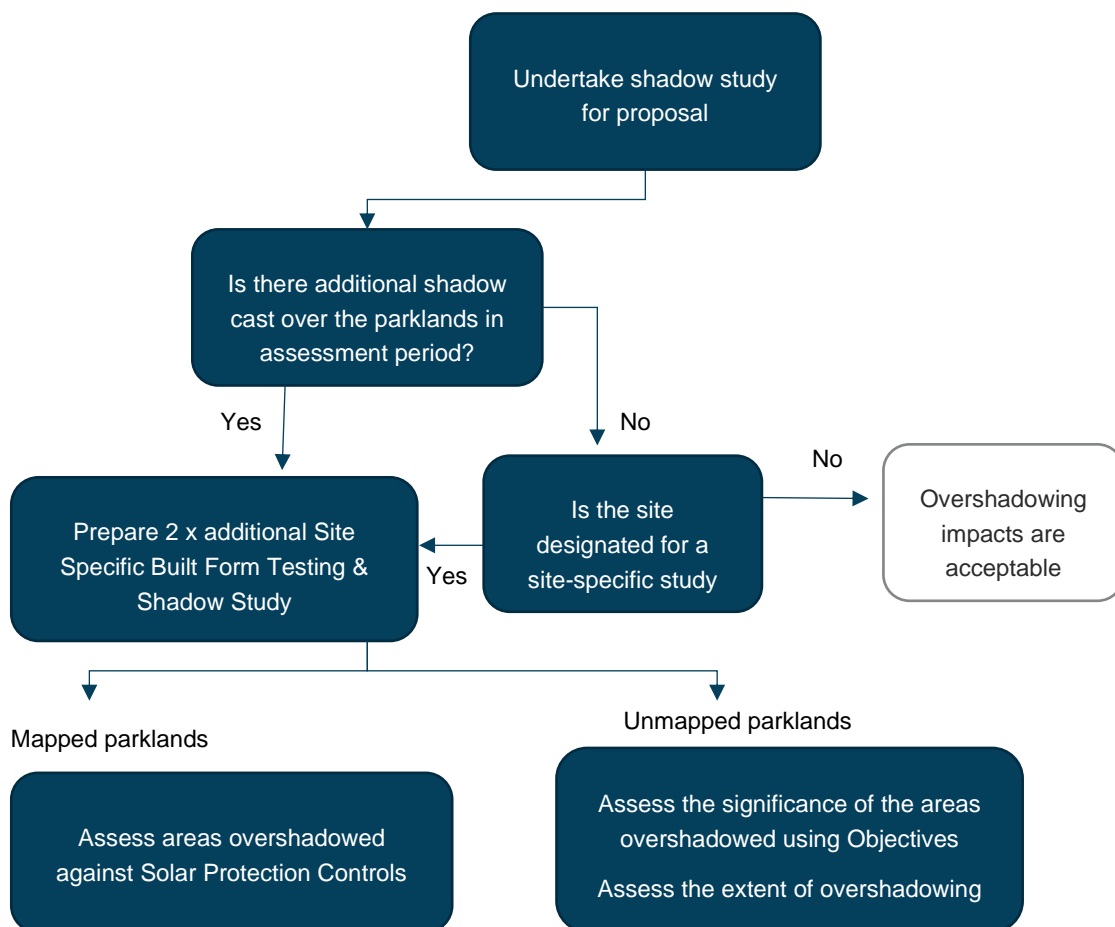


Figure 2: Phase 2 - Pathway for shadow studies

3.3.1 Solar Protection Controls

In assessing the current permissible building heights surrounding Centennial Parklands and Parramatta Park, this study has identified land:

- that must explore options to minimise the potential impacts of shadowing of permitted future development on the park within the permissible envelope and determine
- where there will be no additional overshadowing to the currently permissible envelope
- where minor additional overshadowing is acceptable.

These areas are noted on maps 1 and 2.

These maps identify specific areas in Centennial Parklands and Parramatta Park that consent authorities should have regard for in determining whether the overshadowing impact is acceptable (minor or permissible), or unacceptable.

Specifically:

- **Area 1: No Additional Overshadowing** is shown on the maps in black hatching. No additional overshadowing is permitted in these areas, where 'additional overshadowing' is defined as overshadowing that would occur in addition to that overshadowing permitted under current planning controls and those as proposed under the Parramatta CBD Planning Proposal. These are:
 - Parramatta LEP 2011
 - Parramatta Harmonisation LEP
 - Parramatta DCP 2011
 - Holroyd LEP 2013
 - Cumberland LEP 2020
 - Cumberland DCP 2020
 - Sydney LEP 2012
 - Central Sydney Planning Strategy
 - Sydney DCP 2012
 - Woollahra LEP 2014 & Woollahra DCP 2015
 - Randwick LEP 2012 & Randwick DCP 2013
 - Waverley LEP 2012 & Waverley DCP 2012 (Amendment no. 9)
- **Area 2: Site-Specific Study Required** is shown as 4 sites in Parramatta Park and 5 sites in Centennial Parklands. These sites are development sites located within or adjoining the park where acceptable or areas of the park impacted by shadows where the impacts may be significant.

Area 3: Minor Additional Overshadowing Permitted applies to areas identified as accommodating a degree of shadowing due to their nature and location, usually on park perimeters, and to the nature and location of existing buildings and development controls.

SOLAR PROTECTION CONTROLS














Solar Protection Controls	Requirements
 Area 1: No Additional Overshadowing	No Additional Overshadowing of Parramatta Park is permitted within Area 1
 Area 2: Site Specific Study Required	Site Specific Studies are: <ul style="list-style-type: none"> Identified for both development sites adjoining or within the park or areas of the park impacted by shadows where the impacts were considered significant. Required to identify and test options to minimise shadow impacts to areas of the park within the Permitted Development Controls. For site where there are no maximum building heights identified within the Permitted Development Controls: <ul style="list-style-type: none"> Baseline investigations are required to identify if there are any areas within the site that require solar access protection. For these internal areas, individual solar protection controls are to be identified as appropriate to their size, purpose and character. Development options are to be prepared in accordance with the solar access protection controls for the park and these internal areas.
Centennial Parklands	
 1 Moore Park Showgrounds	
 2 Sydney Girls and Boys High Schools	
 3 Supa Centa Moore Park	
 4 Waverley Bus Depot	
 5 Moriah College	
 6 Sydney Cricket Ground	
Parramatta Park	
 1 Parramatta Leagues Club	
 2 Stadium Forecourt Playground	
 3 The block bound by Eels Place, O'Connell and Fennell Street	
 4 CommBank Stadium	
 Area 3: Minor Additional Overshadowing Permitted	Minor Additional Overshadowing is: <ul style="list-style-type: none"> Permitted in Area 3. Is limited to a maximum cumulative impact of 1 hour in shadow within the area and nominated distances on the map. Is restricted to overshadowing between the hours of: <ul style="list-style-type: none"> 2pm - 3pm for Parramatta Park 9am - 10am for Centennial Parklands. Is located at the perimeter of the park to balance the requirement to accommodate planned growth identified at the time of this study whilst maintaining very high levels of amenity within the parks. Is required to undertake site specific investigations to identify and test options to minimise shadow impacts within these areas.
XXM Maximum distance within which Minor Additional Overshadowing is permitted for Area 3	

Figure 3: Solar Protection Controls for Parramatta Park

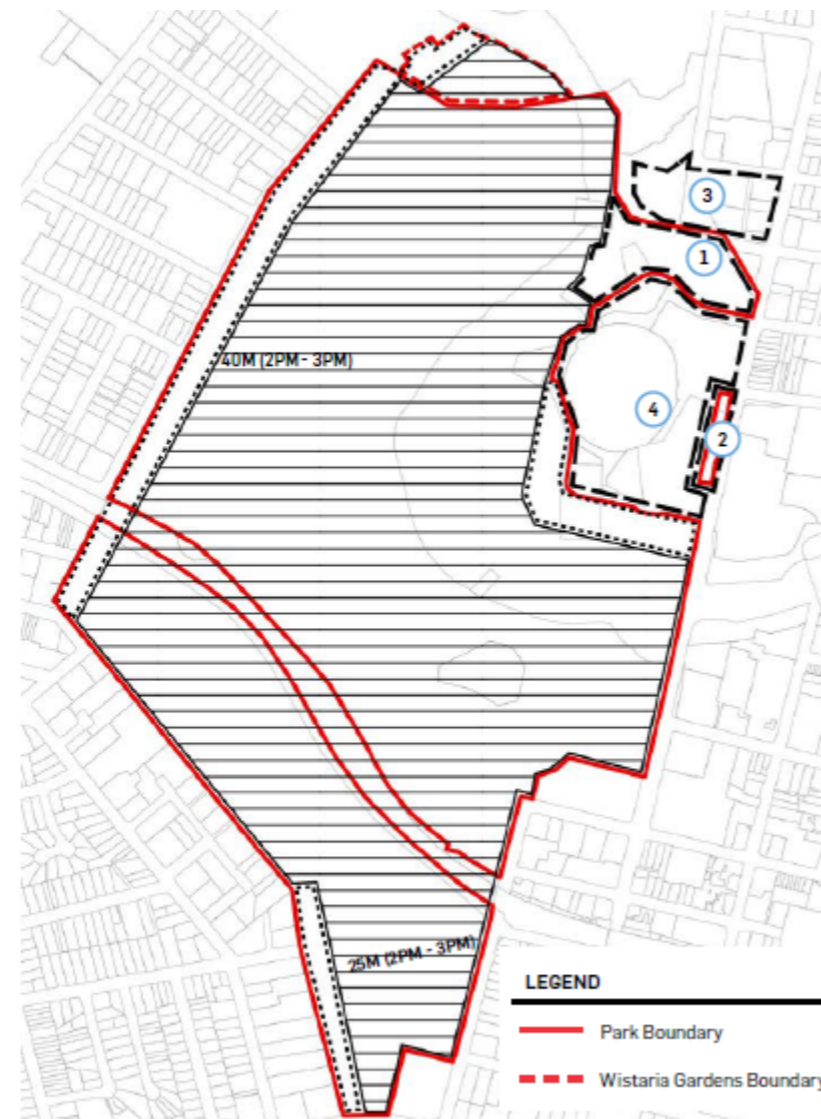


Figure 40 Solar Protection Controls - Parramatta Park

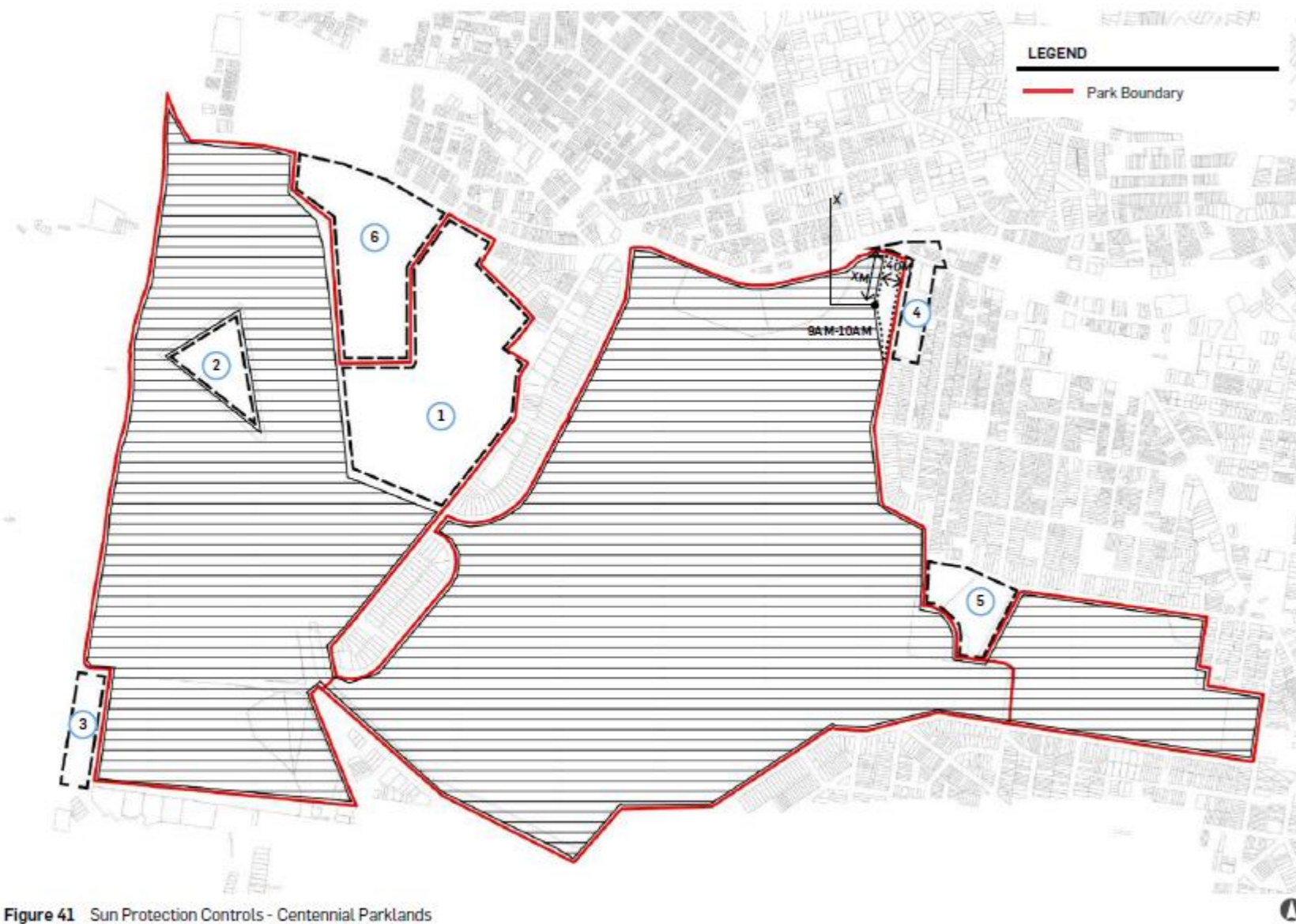


Figure 41 Sun Protection Controls - Centennial Parklands

Figure 4: Solar Protection Controls for Centennial Park

3.4 Phase 3: Assessing overshadowing impacts

Phase 3 applies to development that may result in overshadowing impacts on parks. It will be followed by consent authorities to determine whether impacts are acceptable, by:

- considering the potential impact of development on Centennial Parklands or Parramatta Park, by reference to the Solar Protection Controls
- considering the potential impact of development on the remainder of the Parklands Estate, by reference to the objectives established in 1.3 Objectives.

Phase 3 may also be relevant to other decision-makers, including developers who need to understand the viability of development options in areas surrounding the Parklands Estate.

Consent authorities will apply their understanding of the parameters in which they are working; that is, the relevant parkland boundaries, those areas of higher value (as assessed against the objectives or maps) and existing and permissible overshadowing. These parameters are essentially the baseline against which future impacts can be measured.

Impacts can be characterised as follows:

- **Unacceptable** overshadowing is defined as that which negatively impacts the parklands:
 - in mapped parklands, additional overshadowing occurring in areas designated as 'no additional overshadowing'
 - in unmapped parklands, additional overshadowing occurring:
- **Acceptable** overshadowing is:
 - overshadowing outside the assessment period
 - overshadowing permitted by current planning controls as at the date of this study, and those proposed under the Parramatta CBD Planning Proposal
 - in mapped parklands, where a site-specific study demonstrates that overshadowing has been minimised or reallocated to the least sensitive areas, or in areas where minor additional overshadowing is permitted, and the overshadowing is minor (see below)
 - in unmapped parklands, where the overshadowing does not affect areas determined significant in accordance with the Objectives that is minor (see below) or does not change the overall categorisation of the park.
- **Minor** overshadowing depends on the degree of shadowing due to its nature and location, and the nature and location of existing buildings and development controls, including:
 - areas of dappled light such as running trails, where an active, built parkland edge exists (marked as Area 3 for the mapped parklands)
 - where shadows are confined to these areas and does not extend into areas where no additional overshadowing is sought
 - where proposed shadow impacts cumulative increase the time of overshadowing by only 1-2 hours between 9am and 3pm in midwinter and/or small additional areas of overshadowing
 - In the case of planning proposals for large sites or precincts, where the cumulative impact of all proposed controls creates a continuous area of shadow for more than 1 hour then this may not be a minor impact, even if the individual buildings within the proposal would each individually be minor.
- **Exempt** overshadowing includes architectural features classed as exempt development such as antennae, and development by or on behalf of Greater Sydney Parklands within the Parklands Estate, such as picnic shelters, irrespective of where they occur.