Western Parkland City Authority

Bradfield City Centre Master Plan Application

Earthworks

Prepared by AECOM

October 2023

wpca.sydney

NSW GOVERNMENT

Acknowledgement of Country

Aboriginal people have had a continuous connection with the Country encompassed by the Western Parkland City (the Parkland City) from time immemorial. They have cared for Country and lived in deep alignment with this important landscape, sharing and practicing culture while using it as a space for movement and trade.

We Acknowledge that four groups have primary custodial care obligations for the area: Dharug/Darug, Dharawal/Tharawal, Gundungurra/Gundungara and Darkinjung. We also Acknowledge others who have passed through this Country for trade and care purposes: Coastal Sydney people, Wiradjuri and Yuin.

Western Sydney is home to the highest number of Aboriginal people in any region in Australia. Diverse, strong and connected Aboriginal communities have established their families in this area over generations, even if their connection to Country exists elsewhere. This offers an important opportunity for the future of the Parkland City.

Ensuring that Aboriginal communities, their culture and obligations for Country are considered and promoted will be vital for the future of the Parkland City. A unique opportunity exists to establish a platform for two-way knowledge sharing, to elevate Country and to learn from cultural practices that will create a truly unique and vibrant place for all.

Garungarung Murri Murri Nuru
(Beautiful Grass Country)
Artwork created by Dalmarri artists Jason Douglas and Trevor Eastwood for the Western Parkland City Authority

Version	Status	Date	Prepared By	Reviewer	Comments
1	DRAFT	25/11/2022	AH	GAR	
2	DRAFT	29/06/2023	AH/AL	GAR	
3	Final	31/07/2023	AL	GAR	
4	Final	03/08/2023	JA (WPCA)	JA (WPCA)	
5	Final	17/08/2023	----	JA (WPCA)	
6	Final	12/09/2023	----	HG (WPCA)	
7	Final	19/10/2023	----	HG (WPCA)	

Executive Summary

The new Bradfield City Centre is located within the Western Sydney Aerotropolis, complementing the metropolitan cluster of centres including Penrith, Liverpool and Campbelltown and will be a diverse, dynamic and sustainable global city precinct supporting a curfew free airport, delivering attractive places for workers, residents and visitors. It has the potential to deliver 50,000 – 60,000 jobs, leveraging the positive economic impact of the Western Sydney International (Nancy-Bird Walton) Airport, creating Greater Sydney's next global gateway.

The Western Parkland City Authority (WPCA) is the NSW Government agency responsible for delivering, coordinating and attracting investment to the Western Parkland City. A key component of the WPCA's work is the delivery of the Bradfield City Centre. The WPCA has been granted permission by the NSW Department of Planning and Environment (DPE) to prepare a master plan for the Bradfield City Centre.

The Bradfield City Centre precinct is a greenfield site with no existing road infrastructure to materially inform overall precinct grading. As such AECOM has prepared the preliminary grading design of the site that considers existing topography, environmental controls (protected communities and flooding) and future infrastructure (Metro).

The purpose of this report is to present the proposed earthworks design strategy for the Bradfield City Centre and demonstrate an option for conformance with performance outcomes.

The works completed on this project provide a high-level assessment of the requirements of the masterplan grading of the Bradfield City Centre. This work has focused on vertical and horizontal geometry and earthworks staging. AECOM has prepared a 12D model to coordinate with existing and future environmental constraints.

Contents

Figures

Tables

Glossary of Terms

AS	Australian Standard
Aerotropolis	Western Sydney Aerotropolis
AGRD	Australian Guide to Road Design
BC Act	Biodiversity Conservation Act 2016
CIV	Capital Investment Value
DA	Development Application
DP	Deposited Plan
DPE	Department of Planning and Environment
ENZ	Environment and Recreation
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
LEP	Local Environmental Plan
LGA	Local Government Area
NRAR	Natural Resources Access Regulator
NSW Government	State Government for NSW
SEPP	State Environmental Planning Policy
WPCA	Western Parkland City Authority
WSAP	Western Sydney Aerotropolis Plan
VENM	Virgin Excavated Natural Material
VRZ	Vegetated Riparian Zone

References

Ref	Title	Author	Date
1	*Biodiversity Conservation Act 2016*	*NSW Government*	*2016*
2	*Environment Protection and Biodiversity Conservation Act 1999*	*Commonwealth Government*	*1999*
3	*Detailed Site Investigation Report*	*ERM*	*2022*
4	*Dryland Salinity Map*	*ERM*	*2022*

1 Introduction

1.1 Purpose of this Report

This report accompanies the Master Plan Application for the Bradfield City Centre submitted to the Department of Planning and Environment (DPE).

The Western Parkland City Authority (WPCA) is seeking to secure a Master Plan approval for the Bradfield City Centre comprising of a 114.6-hectare site centred around a new Sydney Metro station.

Part 4.7 of the Western Parkland City SEPP sets out the statutory requirements for Master Plans in the Aerotropolis. In particular, Division 2, Section 4.41 of the Western Parkland City SEPP states that a Master Plan must:

> *(a) apply to an area of 100 hectares or more of contiguous land with at least 70% of the land owned by one person, and*
>
> *(b) specify the particular development that may be carried out as complying development on the land to which the master plan applies, and*
>
> *(c) contain development controls for the complying development, and*
>
> *(d) contain the matters required by the master plan guidelines.*

The proposed Master Plan for mixed-use development of the Bradfield City Centre comprises industrial, commercial, open space and residential uses surrounding a new Sydney Metro station.

The following sections introduce the site, context and nature of the Bradfield City Centre Master Plan.

All matters were considered to have been adequately addressed within the Master Plan Application or in the accompanying appendices.

1.2 The Western Sydney Aerotropolis

The Western Sydney Aerotropolis is an 11,000-hectare region set to become Sydney's third city (the Western Parkland City), and the gateway and economic powerhouse of Western Sydney.

The Aerotropolis comprises of the new international airport surrounded by ten (10) precincts which focus on advanced manufacturing, technology, research, training, education, freight and logistics, agribusiness, and mixed-use development.

The first phase of the Western Sydney Aerotropolis Planning Package was finalised in September 2020, and includes the *Western Sydney Aerotropolis Plan* (WSAP), *Western Sydney Aerotropolis (Aerotropolis) State Environmental Planning Policy* (Aerotropolis SEPP), Western Sydney Aerotropolis Precinct Plan (Precinct Plan) and the *Western Sydney Aerotropolis Development Control Plan (DCP) Phase 1*. The Initial Precinct Plans

released in November 2020 followed by the release of the Draft Phase 2 DCP in 2021.

On 1 March 2022, the Aerotropolis SEPP was consolidated into the State Environmental Planning Policy (Precincts – Western Parklands City) 2021 (Western Parkland City SEPP). The Aerotropolis Planning Package and supporting technical studies for the initial precincts was finalised on 25 March 2022. The Planning Package included amendments to the Western Parkland City SEPP and Aerotropolis Precinct Plan.

The proposed Master Plan Application for the Site has been formed by the requirements of the WSAP, Western Parkland City SEPP, Final Precinct Plan and the Draft Phase 2 DCP, as required by the Master Plan Guidelines.

2 Bradfield City Centre

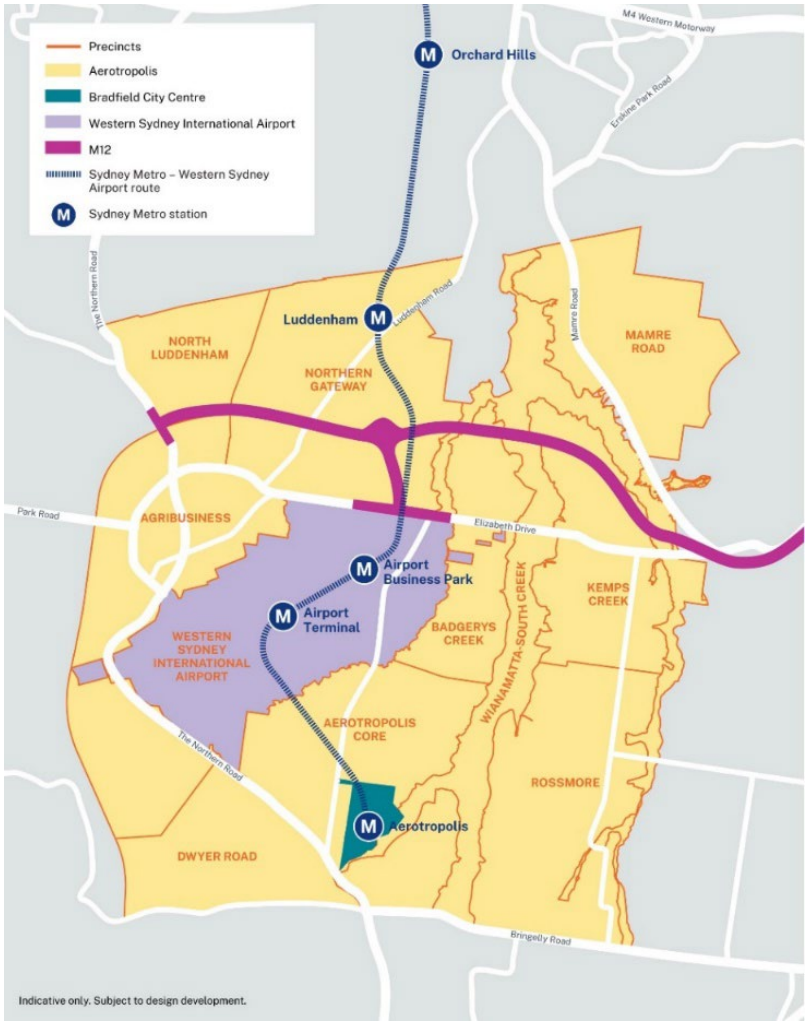
2.1 Strategic Context

The Bradfield City Centre is located to the south-east of the new Western Sydney International (Nancy-Bird Walton) Airport at the intersection of Badgerys Creek Road and The Northern Road (see **Figure 1** below).

The Sydney Metro Western Sydney Airport line runs through the site, providing connections from the key centre of St Marys through to stations at Orchard Hills, Luddenham, Airport Business Park, Airport Terminal and the Aerotropolis which is located within the site.

The site is surrounded by several key roads and infrastructure corridors including Bringelly Road, Badgerys Creek Road, Elizabeth Drive, M12 and The Northern Road.

Figure 1 - Strategic Context



Set on natural waterways, Bradfield City Centre presents a rare opportunity to showcase the best urban design and to create a thriving, blue and green, connected City in which Australians will want to live, learn and work. The Bradfield City Centre will be a beautiful and sustainable 22nd Century City. It will foster the innovation, industry and technology needed to sustain the broader Aerotropolis and fast track economic prosperity across the Western Parkland City.

2.2 The Master Plan Site

The street address for Bradfield City Centre is 215 Badgerys Creek Road, Bradfield (the Site) within the Liverpool Council Local Government Area (LGA). The site is legally described as Lot 3101 DP 1282964 and has an area of 114.6 hectares, with road access to Badgerys Creek Road located at the north-western corner. The site spans across the Aerotropolis Core and Wianamatta-South Creek Precinct, within Western Sydney Aerotropolis. The Site is outlined in **Figure 2** below.

The Site is predominantly zoned Mixed Use under the Western Parkland City SEPP, with a small portion of Enterprise zoned land located on the north-western corner of the site. The site also includes Environment and Recreation zoned land mostly along Thompsons Creek.

Figure 2 - Master Plan Site

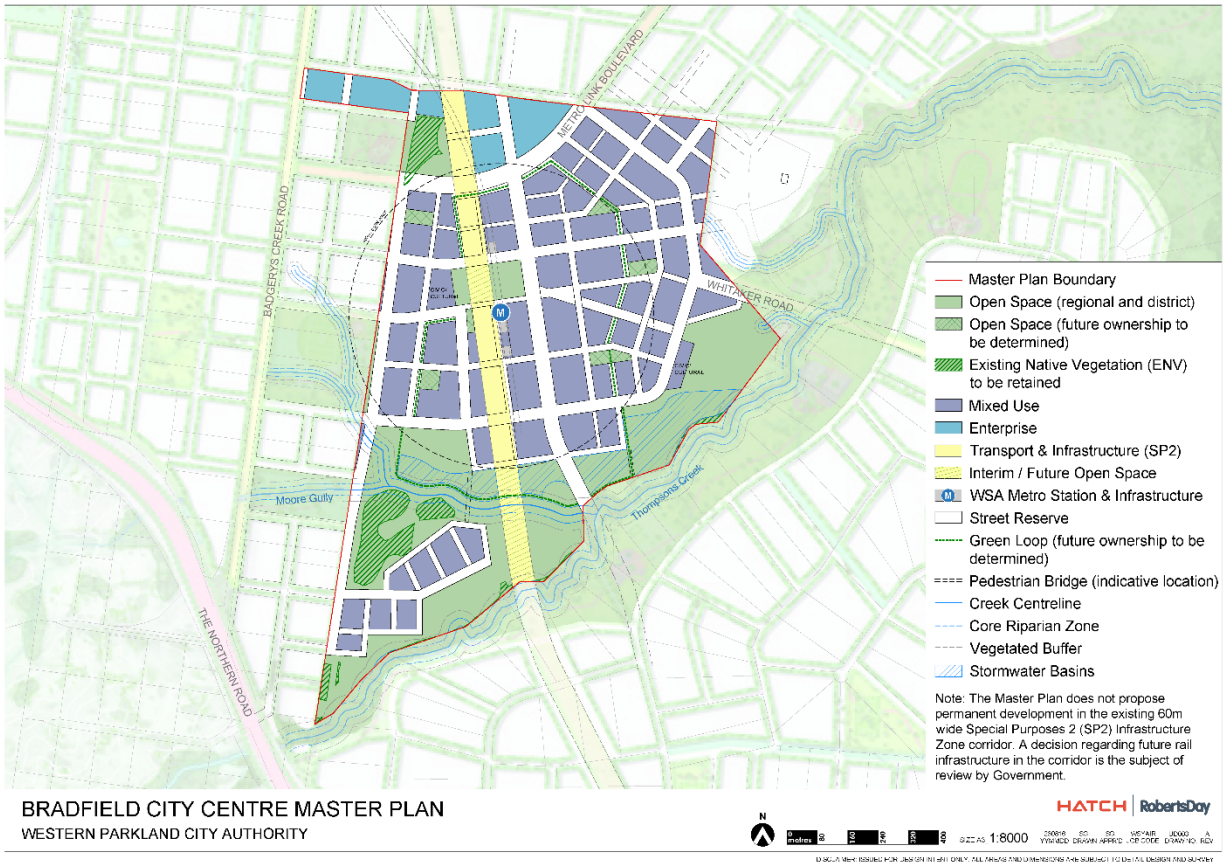
2.3 The Bradfield City Centre Master Plan

The Western Parkland City Authority has prepared a Master Plan (**Figure 3** below) in accordance with the DPE Master Plan Requirements.

The Master Plan sets out a framework for future development within the Bradfield City Centre which includes:

- Road network, key connectors to adjoining land and the regional road network (existing and future)
- Block structure
- Indicative open space network
- Sustainability strategy
- Social and infrastructure strategy
- Arts and culture strategy
- Infrastructure servicing strategy

Figure 3 - Master Plan



2.4 The Proposal

The Bradfield City Centre Master Plan is intended to facilitate the growth of the centre over time. The Master Plan has established the following three planning horizons for technical assessments.

Table 1 - Planning & Development Horizons

Phase	Indicative Timeframe	Estimated employment	Estimated residential population	Estimated Gross Floor Area (cumulative)
Immediate	2026	1,000 - 1,200 jobs	0 residents	48,500 sqm
Medium-term	2036	8,000 - 8,300 jobs	3,000 - 3,100 residents	341,000 sqm
Long-term	2056	20,000 – 24,000 jobs	15,000 – 15,200 residents	1,258,000 sqm

Note: The table above is an estimate of the population and employment forecast used for the purposes of modelling only.

The master plan has the capacity to accommodate ~10,000 residential dwellings. In accordance with NSW Government policy a proportion of the residential dwellings will be affordable housing. The timing and delivery of residential dwellings will be subject to market demand and future master plan reviews that consider the impact of additional population on the scope and timing of social and physical infrastructure.

3 Baseline Investigations

3.1 Technical Baseline Site Consideration

Various site investigations and studies by external parties are also considered in the civil design of the Bradfield City Centre Master Plan as summarised in **Table 2.**

Table 2 – Baseline Site Considerations

Document	File Names	File Date	Date Received
Detail & Lidar Survey By RPS	PR146456-DET_001a.pdf PR146456-DET_001a.dwg PR146456-DET_001a.12daz	25 May 2020	03 Nov 2020
Land Tenure Mapbook – The Commonwealth Land By RPS	PR146456-1-LTMB.pdf and miscellaneous attachments	30 Jul 2020	03 Nov 2020
Lidar Survey – Extraction of Embankments, Thompsons Creek Bringelly By RPS	PR146456-DET_004a.pdf	25 Aug 2020	03 Nov 2020
Masterplan Cross Sections By Hatch | Roberts Day	Bradfield Street Sections.pdf L-0S- 001 -1 to 13 (.dwg)	04 Aug 2022 & 18 Aug 2022	18 Aug 2022
Masterplan Update By Hatch | Roberts Day	230605_WSY AIR_Master Plan-A3L_1_8000230605_WSY AIR_Master Plan - for issue	6 June 2023	6 June 2023
Ecological Community Mapping By Biosis	Biosis31717_HydroFeatures_Exported20201006.shp.zip Biosis31717_Veg_Exported20201006.zip Exported 20201006 DWGs.zip	06 Oct 2020	17 Mar 2022
Sydney Metro Western Sydney Airport Aerotropolis Station Concept Design by Architectus	Work Package 06	10 Dec 2021	01 Mar 2022
Detailed Site Investigation Report - draft	0571466_DSI_WPCA Bradfield_City Centre_DRAFT2 (1).pdf	29 Jul 2022	11 Nov 2022

3.2 Area of Focus

Key areas of focus for this report include:

- Site topography and natural grading
  - Mitigation of ecological impacts
  - Adjacent site and site boundaries
  - Creek crossing levels
  - Metro Station Access
- Earthworks Strategy
  - Required earthworks for each stage
  - Contamination and Salinity Assessment

4 Assessment Requirements and Policy Context

4.1 Master Plan Requirements

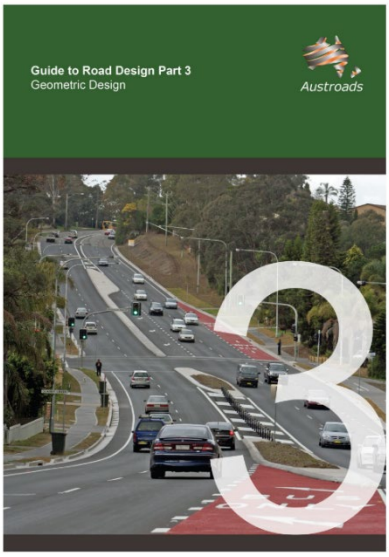
The DPE have issued the Master Plan Requirements (MPRs) to the WPCA for the preparation of a Master Plan for Bradfield City Centre. This report has been prepared to address the following MPRs.

Table 3 – Master Plan Requirements

Reference	Master Plan Requirement	Where Addressed
Key Issues to be Addressed - Section 19	Identify and quantify the required earthworks necessary to support the proposed development, and calculate the cut and fill for each relevant stage, zone, or area as necessary to support relevant planning applications, including the provision of a cut and fill plan	Section 6.2
	Demonstrate that cut and fill levels are not excessive and beyond that which may be required to facilitate the development, having regard to streetscape amenity	Section 6.2
	Discuss the earthworks strategy for any retention, import or export of materials, including the use of Virgin excavated natural material (VENM), including soil quality assessments	Section 0
	Address clause 4.9 of the Transport and Infrastructure SEPP for earthworks adjacent to protected transport corridors.	Section 6.5

4.2 State Government Plans / Policies

4.2.1 Austroads Guide to Road Design (AGRD)



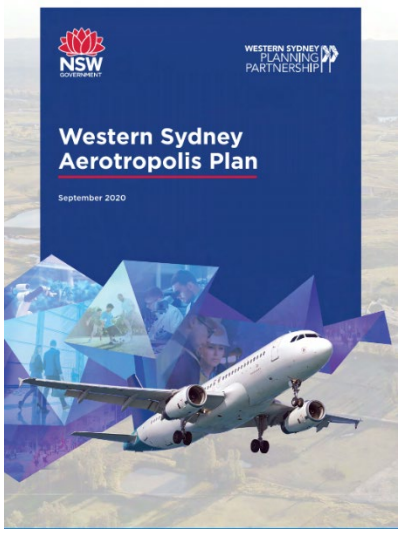
The Austroads Guide to Road Design (AGRD) provides the designer with information necessary to develop safe and coordinated road alignments that cater for the traffic demand at the chosen speed. Transport for New South Wales (TfNSW) issued a supplement to AGRD Part 3 to clarify, add to, or modify the AGRD. The following AGRD and applicable TfNSW supplements have been considered in the preliminary civil design of the Bradfield City Centre Masterplan:

- Section 4.2.2 - Road Crossfall
- Section 7.4 - Horizontal Alignment Circular Curves
- Section 8 - Vertical Alignment

Refer to Section 6 of this Report for further assessment.

4.3 Western Sydney Aerotropolis

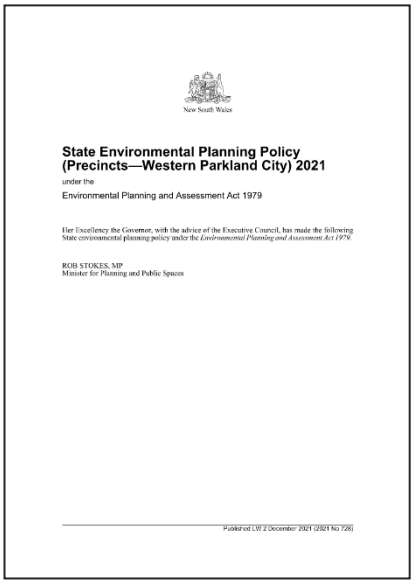
4.3.1 Western Sydney Aerotropolis Plan (WSAP), September 2020



The WSAP is a government strategic planning framework for the Western Sydney Aerotropolis and developed by the Western Sydney Planning Partnership, a local government-led initiative that brings Blacktown, Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly councils together with key State agencies. The plan includes landscape, urban design and planning principles to give effect to the objectives to promote productivity, sustainability, infrastructure and collaboration, and liveability.

The proposed landscape-led approach recognises the importance of blue and green infrastructure – major waterways, parks or green spaces – by retaining water in landscape, preserving and restoring the green, locating transit corridors within walking distance to landscape amenity, orientating urban development towards landscape amenity and transit corridors, and adopting urban typologies that ensure urban development retains water in landscape. The WSAP also emphasises Connecting with Country approach to sustainably manage Aboriginal culture and heritage in the built environment.

4.3.2 State Environmental Planning Policy (SEPP) (Precincts – Western Parkland City) 2021



New South Wales

State Environmental Planning Policy (Precincts—Western Parkland City) 2021

under the

Environmental Planning and Assessment Act 1979

Her Excellency the Governor, with the advice of the Executive Council, has made the following State environmental planning policy under the *Environmental Planning and Assessment Act 1979*.

ROB STOKES, MP
Minister for Planning and Public Spaces

Published LW 2 December 2021 (2021 No 726)

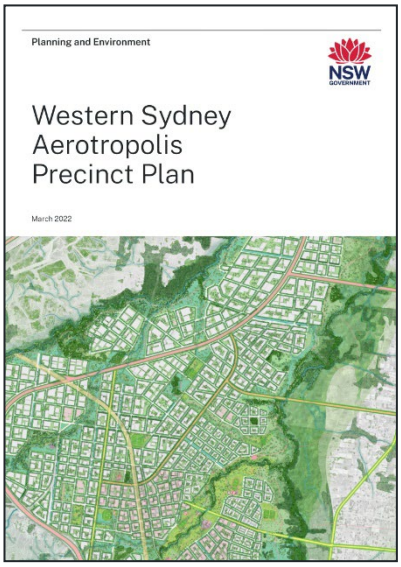
The SEPP (Precincts – Western Parkland City), an environmental planning instrument created under the Environmental Planning and Assessment Act 1979, commences on 1 Oct 2020. Chapter 4 Western Sydney Aerotropolis aims to facilitate development in the Western Sydney Aerotropolis in accordance with the objectives and principles of the Western Sydney Aerotropolis Plan, to promote sustainable, orderly and transformational development in the Western Sydney Aerotropolis, to protect, maintain and enhance, and to minimise the impact of development on, trees and vegetation, soil quality and the health of waterways and to contribute to the conservation of biodiversity, to recognise and protect the ecological and cultural value of Wianamatta–South Creek etc.

The following sections of the SEPP have been incorporated in the Civil design of the Bradfield City Centre Masterplan.

Part 4.4 Development Controls – General:

- Section 4.24 – Flood Planning
- Section 4.25 – Preservation of trees and vegetation in Environment and Recreation Zone and Cumberland Plain

4.3.3 Western Sydney Aerotropolis Precinct Plan, March 2022 and Technical Reports



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Western Sydney Aerotropolis Precinct Plan

March 2022

The Precinct Plan is required under Part 4.7 of the SEPP (Precinct Western Parkland City). Any masterplan or development application must be consistent with the Precinct Plan objectives and requirements and demonstrate consistency with the DCP.

The following sections of the Precinct Plan have been incorporated in the Civil design of the Bradfield City Centre Master Plan:

- Section 2.4 – *provide for a mix of land uses that are compatible with the environmental characteristics of the Precinct and development constraints including flooding*.
- Section 4.5.4 – Biodiversity and Vegetation Corridors to protect the Cumberland Plain Woodland present across the Aerotropolis. It is critically endangered under *Biodiversity Conservation Act 2016* (NSW) and under *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

4.3.4 Western Sydney Aerotropolis Development Control Plan 2022 Phase 2 (DCP2), November 2022

The DCP2 provides controls to supplement the WSAP, Aerotropolis SEPP, Aerotropolis Precinct Plan, and inform the preparation and assessment of master plans and development applications. The DCP2 was endorsed by the Department of Planning and Environment in November 2022.

The DCP2 uses a flexible performance-based approach, by providing objectives, performance outcomes and benchmark solutions. Specific benchmarks incorporated into the Civil Masterplan design include:

- Section 2.1.1 (P01) - Starting with Country to retain and connect existing topography as much as possible
- Section 2.5.3 (P01 – P04) - Salinity outlines performance benchmark solution to minimise disturbing high-risk saline soils to minimise movement of salt in the landscape, increase soil health and prevent soil structural decline

Table 4 – DCP2 Performance Outcomes: Recognise Country

Numeric Section	Performance Outcome	Benchmark Solution	Master Plan Consideration and Comment
	2.1.1 Starting with Country		
P01	The cultural values and heritage, waterways and landscapes of Country form a key structuring element of development. Development retains and connects and provides access to landscape elements including ridgelines, waterways and native vegetation.	1. For development where the Recognise Country Guidelines apply and in conjunction with Aboriginal heritage assessment requirements, cultural values research is to be undertaken by a qualified Aboriginal heritage consultant (with experience in Aboriginal heritage and cultural values research). Cultural values research must be undertaken in consultation with Traditional Custodians (including through an on-site review). Cultural values research must identify within the proposed development site and any adjoining areas: a. Cultural values and heritage significance, particularly within moderate to high areas of Aboriginal heritage sensitivity; b. Significant cultural landscape elements, as they relate to cultural values; and c. Significant waterways or bodies and areas of surrounding riparian vegetation as they relate to cultural values. 2. Development proposals must outline how findings of the cultural values research have informed the planning and design, including the spatial layout of the site and the public domain, including areas used for open space, stormwater management and or biodiversity conservation and outline any potential impacts and mitigation measures.	Proposed road topography seeks to retain natural topography as much as possible while integrating with key infrastructure features such as Aerotropolis Metro Station.

Numeric Section	Performance Outcome	Benchmark Solution	Master Plan Consideration and Comment
		3. Development is to respect and respond to: a. Identified significant sites, places, views, traditional movement corridors and narratives of Country; b. The natural landscape, including topography and native vegetation by providing clear and legible links (within the road network and public domain) between ridgetops and creek lines and retaining native vegetation clusters and corridors through the siting of buildings; and c. Natural systems, including significant tributaries and waterways in the Wianamatta-South Creek catchment by avoiding significant impacts to ecological condition and the function of ecosystems as well as protect and restore native riparian vegetation. 4. Development proposal design must ensure water management infrastructure and processes are responsive to Country and prioritise natural solutions that enhance the overall waterway systems condition, function and connections.	
	2.5.3 Salinity		
P01	The extent and location of salinity in the landscape and hydrogeologic regimes are accurately identified.	1. Undertake salinity investigations prior to development and prepare a Salinity Management Plan. 2. Where required, the Salinity Management Plan considers water application rates, size of the block and timing and management of irrigation to ensure overwatering and salt movement is minimised. 3. A detailed salinity analysis, to be prepared by a qualified expert, will be required if: a. An initial investigation shows the site as saline or affected by salinity; or b. The site of the proposed development has been identified as being a moderately saline area on the Western Sydney Potential Salinity Map.	Initial definition of site salinity risks are defined in **Section 6.3.2.** It is anticipated a more in depth assessment will be undertaken as part of future design stages.
P02	Development avoids disturbing high-risk saline soils to minimise the movement of salt in the landscape, increase soil health and prevent soil structural decline.	1. Demonstrate that disturbance to the natural hydrological system is minimised by: a. Maintaining effective drainage, or where modification occurs, the modification provides effective drainage systems; b. Reducing waterlogging on the site and the potential for waterlogging via landscape-led design; c. Having minimal impact on the water table; and d. Having minimal impact on the hydrogeologic regime for sub soils, lateral flows, and deep groundwater systems.	Initial definition of site salinity risks are defined in **Section 6.3.2.** It is anticipated a more in depth assessment will be undertaken as part of future design stages.
P03	Salinity management and codes of practise are adhered to and based on NSW and	1. Implement the following salinity management guidelines and codes of practise (or updates thereto) for land development (not limited to): a. Western Sydney Salinity Code of Practice (Western Sydney Regional Organisation of Councils, 2003).	Where appropriate it is anticipated a salinity management plan will form part of any

Numeric Section	Performance Outcome	Benchmark Solution	Master Plan Consideration and Comment
	local government guidelines.	b. Western Sydney Hydrogeological Landscapes: May 2011 (First Edition) data package. c. Relevant Australian Standards, including AS 2159, AS 2870, AS 3600, AS 3700 and AS 2870; and d. Local Government salinity initiative documents, including: i. Site Investigations for Urban Salinity; ii. Land Use Planning and Urban Salinity; iii. Building in a Saline Environment; and iv. Roads and Salinity. 2. Where soil sampling is required to be undertaken as part of salinity investigations, provide the following details: a. Location of investigation soil samples and bores on plan; b. Electrical conductivity (EC) and texture profiling down the soil profile; c. Density of sampling; d. Use of electromagnetic (EM) survey; and e. Preliminary block layout to allow for development plans to address salinity issues.	future earthworks strategy following evaluation of the site specific constraints
P04	Achieve healthy ecosystems by supporting soil ecology and support water retention in the clay landscape of the Cumberland Plain.	1. Retain undisturbed soil networks that occur in riparian corridors, parks, nominated streets and specially designed natural soil corridors	Works in riparian corridors are anticipated to consider site specific salinity risks where identified.

4.3.5 Western Sydney Streets Design Guidelines, September 2020

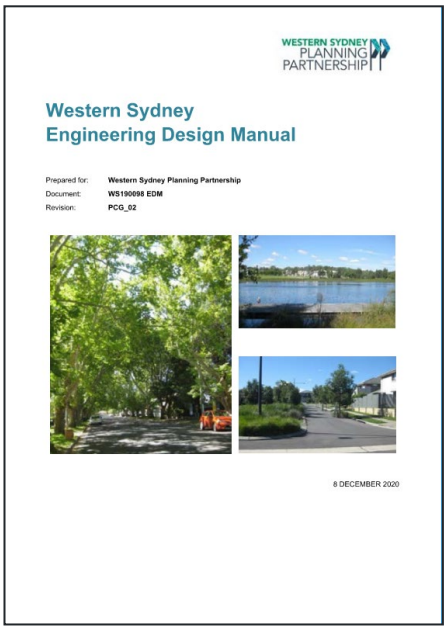
The Western Sydney Street Design Guidelines have been developed for the Western Sydney Planning Partnership as part of the Uniform Engineering and Design Standards project.

Specific requirements incorporated in the Civil Masterplan design include:

- Part B.3 – Street Types
- Part B.4 – Indicative Intersections
- Part C5 – Utilities

Refer to Section 6 of this Report for further assessment.

4.3.6 Western Sydney Engineering Design Manual, December 2020



The Western Sydney Engineering Design Manual, along with the Western Sydney Street Design Guidelines, have been developed as part of the Uniform Local Engineering and Design Standards project. It has been prepared to enable designers, councils, and consultant teams to prepare compliant designs for civil infrastructure work, including landscaping of streets.

Specific requirements incorporated in the Civil Masterplan design include:

- Section 3 – Landform
- Section 4 – Streets
- Section 8 – Integrated Stormwater Management
- Section 9 – Flow Management
- Section 10 – Water Sensitive Urban Design
- Section 11 – Stormwater Drainage
- Section 12 – Trunk Drainage

Refer to Section 6 of this Report for further assessment.

5 Technical Approach / Framework

The Technical Baseline Site Consideration noted in **Section 3.1 Table 2** includes various site investigations and studies by external and internal parties that were considered in the preliminary civil design of the Bradfield City Centre Master Plan. Further details on the Technical Baseline Site Considerations:

- Detail and Lidar surveys with existing topography were used to serve as baseline for the new road vertical geometry in the focus area.
- Road layout, cross sections and hierarchy, as well as lot boundaries and open space allocations are based on the Masterplan Update and Masterplan Cross Sections provided by Hatch | Roberts Day – with the latest version being dated 05/06/2023 and 09/06/2023 respectively.
- Ecological Community Mapping, prepared by Biosis and dated the 6/10/2020, provided information on areas zoned as Environment and Recreation (ENZ) under Chapter 4 of the SEPP (Precinct Western Parkland City). Areas that are zoned as ENZ do not have biodiversity certification. As such – vegetation within these areas should not be removed without further tests of significance or triggering of the Biodiversity Offset Scheme.
- Further, the Sydney Metro Aerotropolis Station design (Sydney Metro – 15/07/2022) set the proposed finished floor level of the new Aerotropolis Metro Station plaza, which forms an important design input for the surrounding road levels.
- The draft Detailed Site Investigation (ERM 29/07/2022) has described existing soil conditions and notes that the groundwater within the Bringelly Shale is often saline and may be unsuitable for beneficial uses.

Based on the MPRs (Master Plan Requirements) and policy context summarised in Section 5, there are several considerations that have been made in the proposed masterplan grading and earthworks design. It is noted that design of main roads is subject to further detailed design as part of the next stage of works.

- In response to Connecting with Country, the design starts with existing site topography as the basis. This include establishing desired road high points and sag points based on existing drainage pattern and coordinating infrastructure with existing flood levels in Moore Gully and Thompsons Creek.
- The proposed Metro plaza finished floor levels have been set by Metro. These provide the primary access to the Metro station and in doing so form an input for the design of surrounding roads. Master Plan road centrelines have been developed to tie-in with ‘gate line’ levels.
- Road centrelines and major/minor roads are established based on Master Plan provided by Hatch | Roberts Day. Road vertical alignments are designed to relevant policy and technical controls for minimum and maximum longitudinal grades, vertical curves and alignments.
- Road crossing of creeks and streams have been based on achieving freeboard to existing flood level conditions. It is assumed these will be developed further based on detailed flood modelling and refinement through detailed design.
- Road centreline gradings must also align with policy and technical controls and to allow harmonious connection to the existing public infrastructure (Badgerys Creek Road).

There are several limitations and assumptions that must be noted in this report.

- A detailed lot grading has not been considered in this report. Instead, the lot gradings are a product of grading between road verges. This presents an opportunity to further refine the site cut/fill.
- Building footprints are also yet to be considered, except for Metro Station box and the AMRF First Building, for which development approvals have been obtained. Further design refinement will need to consider known building footprints and design levels to ensure that the proposed grading and drainage design is appropriately coordinated.
- At time of preparation of this Report, a detailed design for the Badgerys Creek Road update has not been completed. It is anticipated this should be reviewed in the context of road connections into the Bradfield City Centre Master Plan area as part of the future design refinement.

The following reviews are recommended as part of the next stage of works:

- Redefine lot gradings based on future detailed building designs.
- Coordination of bus stops, driveways, and individual tree plantings to ensure they will coordinate with the suggested stormwater pit placement.
- Future intersection signal designs must also be considered as well as kerb return radii to suit design and check vehicles.
- Intersections, driveways and pedestrian crossings will require sight distance checks taking into account landscaping and street furniture placements.
- Property/lot boundary splays to minimise obstructions within drivers' sight triangle.
- A review of bridge crossing levels will be undertaken following a detailed flood analysis to ensure that the crossing levels are adequate for flood events.
- Interface with road networks beyond the Bradfield City Centre Master Plan area to be further refined.
- Design for shared zones, shared paths and cycleway intersection treatments to be further developed.

6 Technical Assessment

6.1 Road Geometry

6.1.1 Design Criteria / Standards

The design criteria for the road geometry have been taken from the standards provided in **Section 4.2.**

Posted speed limits have also been assigned to roads in the precinct as shown in **Figure 4** below. These speed limits have also been considered in the design of the road geometry.

Table 5 in the next page summarises the road geometry standards adopted and associated design criteria.

Figure 4 - Posted Speed Limits (Source: Turf Design Studio)

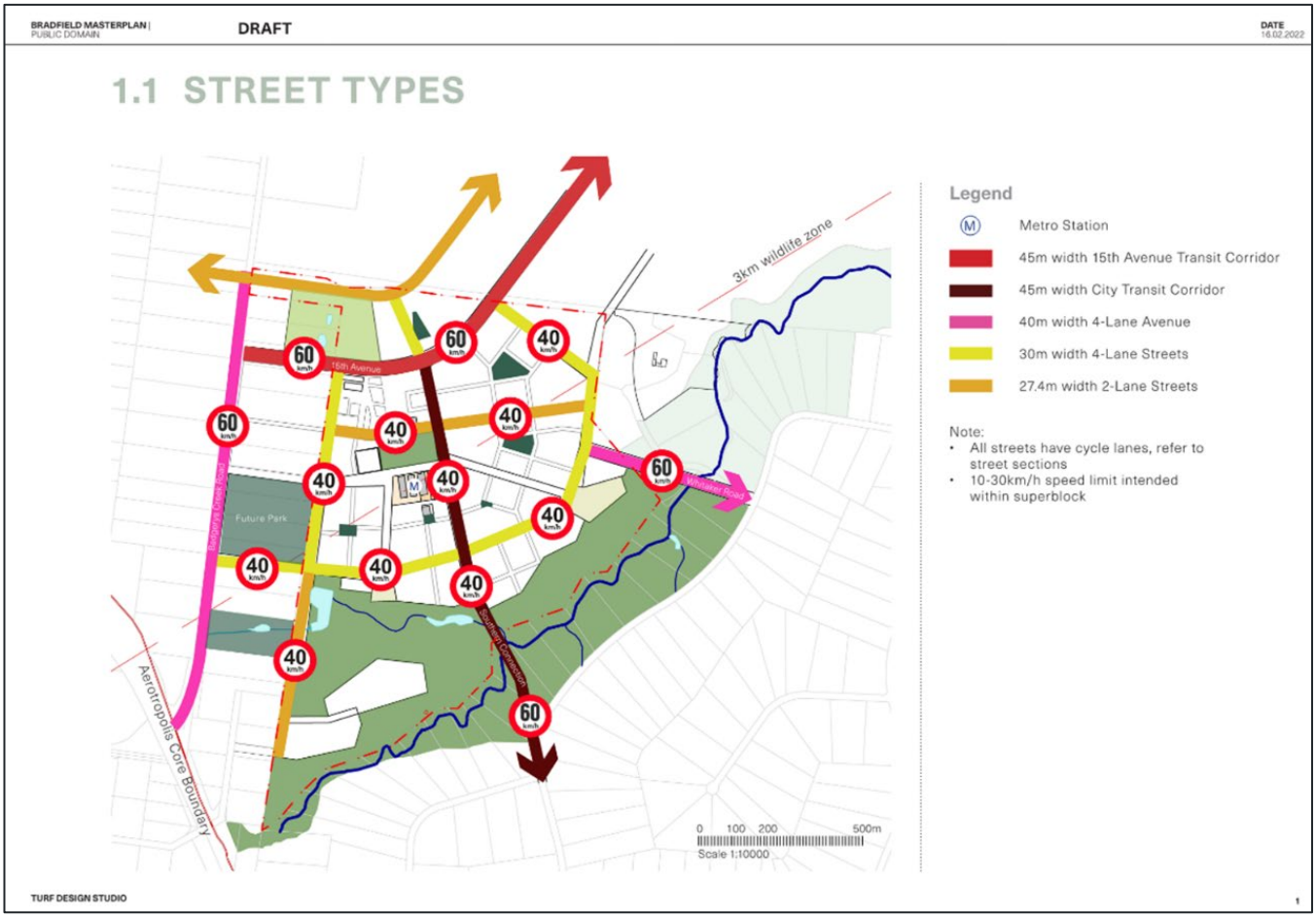


Table 5 – Road Geometry Design Criteria

Design Element	Masterplan Stage	Standards Adopted	Design Criteria Adopted	Comment
Horizontal Alignment				
Posted Speed	Long-term	Based on Figure 1.1 Street Types prepared by Turf Design Studio		
Design Speed	Long-term	AGRD03-16 Section 3.3	Operating speed 10 km/h higher than posted speed limit	
Horizontal Curve	Long-term	Liverpool City Council Design Spec Table D1.2(a)	40 km/h Desired Speed: 40 m 60 km/h Desired Speed: 80 m	Minimum horizontal curve of 40 m is provided.
Minimum Lane / Median Width	Long-term	Western Sydney Street Design Guidelines Table B.3	High Street / Innovation East and West, Innovation North, Whitaker - Travel lane width = 3.2m – 3.5m - Parking lane width = 2.0m – 2.4m Industrial Street / Centre Loop South - Travel lane width = 3.5m - Parking lane width = 2.0m – 2.4m Retail Laneway / Shared Street / Pedestrian Street - Travel lane width = 3.2m – 3.5m - Parking lane width = 2.0m – 2.4m	
Design Vehicle	Long-term	Western Sydney Street Design Guidelines Table B.3	High Street / Innovation East and West, Innovation North, Whitaker Rear-loaded: B85 Car Front-loaded: 8.8m Service Vehicle Industrial Street / Centre Loop South 19m Prime Mover and Semi Trailer Retail Laneway / Shared Street / Pedestrian Street 8.8m Service Vehicle	Future works: kerb return radii to be refined to suit design and check vehicles
Check Vehicle	Long-term	Western Sydney Street Design Guidelines Table B.3	High Street / Innovation East and West, Innovation North, Whitaker 12.5m Single unit truck/bus Industrial Street / Centre Loop South 25m B-Double Retail Laneway / Shared Street / Pedestrian Street 11m Garbage Truck	Future works: kerb return radii to be refined to suit design and check vehicles
Vertical Alignment				
Longitudinal Grade	Long-term	Western Sydney Planning Partnership Engineering	A general minimum gradient of 1.0 per cent should be adopted.	Minimum and maximum longitudinal

Design Element	Masterplan Stage	Standards Adopted	Design Criteria Adopted	Comment
		Design Manual (WSEDM) Section 4.3.1 (table 7)	Absolute minimum of 0.5% can be accepted for short distances (up-to 50m) Local Desirable maximum = 6.5% Absolute maximum = 16% Collector Desirable maximum = 6.5% Absolute maximum = 16%	slopes of 1% and 5% respectively are provided
Vertical Curve	Long-term	Liverpool City Council Design Spec Table D1.3	Local Minimum VC = 25 m Absolute minimum VC to be applied at road junctions only = 6 m Collector Minimum VC = 35 m Absolute minimum VC to be applied at road junctions only = 12 m	Minimum vertical curve of 200 m is provided.
Cross Fall	Long-term	WSEDM Section 4.3.1	Minimum at intersections = 1% Maximum at intersection = 5% Carriageway crossfall to WSUD or kerb line = 3%	3% cross fall provided
Batters	Long-term	Liverpool City Council Design Spec D1.16	Desirable minimum 3:1 Absolute minimum Cut 2:1 Fill 3:1 Rock batters ¼:1	Batters between 4:1 and 6:1 provided
Miscellaneous				
Property Splays	Long-term	WSEDM Section 4.3.1	Laneway Splay = 3m x 3m Street Splay = 4m x 4m Industrial Street Splay = 12m x 12m	Future Works: Boundary lines as per Roberts Day (splays not adopted)
Approach Sight Distance (ASD)	Long-term	WSEDM Section 4.3.1	Design Speed = 50 km/h Reaction Time = 2 sec	Future Works: Sight distance checks to be undertaken upon further refinement of intersections design and locations of driveways and pedestrian crossings
Safe Intersection Sight Distance (SISD)	Long-term	WSEDM Section 4.3.1	Design Speed = 50 km/h Reaction Time = 2 sec	

6.1.2 Opportunities and Constraints

The Master Plan extents form the boundary of the site (and the limit of works). While reviews have been undertaken to extend or connect into surrounding road networks – we acknowledge this coordination should be ongoing as design for surrounding infrastructure further develops.

The Moore Gully and Thompsons Creek flood levels as well as the Sydney Metro Aerotropolis Station plaza levels have dictated the level of the roads. These will ultimately be adjusted as the flood modelling is more refined and the public realm around the station develops.

6.2 Earthworks Strategy

AECOM has separated the earthworks volumes to be consistent with the staging plan included in the Master Plan Report. The breakdown of bulk earthworks quantities has been provided in **Table 6** below. Existing contours have been followed where possible to minimise the cut and fill required. The preliminary design indicates that the Bradfield City Centre development is in net import. As part of design refinement and the detailed design of the infrastructure, a detailed earthworks strategy should be prepared to optimise the movement of material to limit 'double handling' of spoil and avoid import of fill in favour of using onsite fill.

Table 6 presents a difference between proposed design and existing surfaces only. The following has been excluded from the calculated earthworks volumes. As the design progresses, inclusion of these elements will result in a reduction in overall import requirements and will bring the overall earthworks more into balance.

- Bulking
- Trenching
- Detailed grading of superlots
- Basement excavation
- Different earthworks streams (e.g. topsoil or contamination if found)
- Interface treatments (e.g. batters)

The detailed grading for Stage 4 will be heavily dependent on a post-development flood study and has not been developed at this point in time. The design for Ridgeline Park generally needs to maintain existing levels for vegetation retention. As such any earthworks are negligible in this area.

Box-out has been allowed as a nominal 500mm depth pavement and OSD Basin volumes are storage volumes only. It is anticipated that with considered grading of the superlots the precinct could get much closer to balanced.

General site grading has been conducted in favour of containing surface runoff to on-site infrastructure and basins, avoiding negative impacts to adjacent land.

Table 6 – Earthworks Cut / Fill Volume Breakdown

Stage	Cut	Fill	Balance	Import/Export
1	113,154	68,969	44,185	Export
2a	13,572	13,761	-189	Import
2b	11,496	6,415	5,081	Export
2c	0	20,682	-20,682	Import
3	3,388	392,659	-389,271	Import
Allowance for box-out stages 1-3*	98954	0	98,954	Export
Stage 4 to be developed in coordination with detailed flood assessment				
TOTAL	240,564	502,486	-261,922	**IMPORT**

** allowance only assuming 500mm depth excavation across road reserve for stages 1-3. Final volume to be confirmed during detailed design*

6.3 Soil Quality

6.3.1 Contamination

The *Detailed Site Investigation Report* (ERM, 2022) notes that no potential Asbestos Containing Materials (ACM) was identified within the majority of fill materials with the exception of those located in the area around the former married quarters. It is recommended that the Unexpected Finds Protocol from the Detailed Site Investigation Report and approved through the Site Audit Statement be included with all earthworks contracts to ensure its implementation in the event that ACM is encountered.

6.3.2 Salinity

High saline soils can have a very destructive effect on masonry and can impact the durability of concrete structures. The *Detailed Site Investigation Report* (ERM, 2022) identifies that the Bringelly Shale is brackish / saline through the field parameters collected during ground water sampling works.

The *Dryland Salinity Map* (ERM, 2022), refer to **Appendix 2**, shows that the majority of the site is of moderate salinity potential with areas near the Moore Gully increasing to high salinity potential. The site is also defined as high hazard or risk for all years.

It is recommended that the site-specific soil salinity extents be quantified and development site specific Salinity Management Plans be prepared prior to construction commencement of each section of the Bradfield City Centre.

6.3.3 Acid Sulphate

According to the Atlas of Australian Acid Sulfate Soils (ASS), the Bradfield City Centre and within the search buffer have an extremely low probability of occurrence. There is a 1-5% chance of occurrence, with any occurrences likely to be in small, localised areas.

6.4 Ecology Preservation

The earthworks design has generally followed the existing contours as far as reasonably practicable to minimise the cut and fill required. This also include areas zoned as ENZ Environment and Recreation where impacts to native vegetation have been minimised in order to reduce impacts on the biodiversity. The following areas have been retained based on the Ecological Community Mapping By Biosis:

- Ridgeline Park – Existing levels have been maintained for vegetation retention. As such any earthworks are negligible in this area
- Thompsons Creek – considered to be a key fish habitat and is likely to have a key fish habitat buffer of 50m. Liaison with DPI Fisheries and NSW Department of Natural Resources Access Regulator (NRAR) is required if works are to be undertaken within the inner 50% of the 40m riparian buffer on both sides of the watercourse.

6.5 Transport SEPP

Table 7 – Transport and Infrastructure SEPP Clause 4.9 Requirements

Reference	Master Plan Requirement	Response
Clause 4.9	Excavation in, above, below or adjacent to future infrastructure corridors	**Title**
(1)	This section applies to development that involves the penetration of ground to a depth of at least 2 metres below ground level (existing) on land (a) within, below or above a future infrastructure corridor, or (b) within 25 metres (measured horizontally) of a future infrastructure corridor, or (c) within 25 metres (measured horizontally) of the ground directly below a future infrastructure corridor, or (d) within 25 metres (measured horizontally) of the ground directly above an underground future infrastructure corridor.	Earthworks within 25m of the future infrastructure corridor are shown in **Appendix 1**
(2)	Before determining a development application (or an application for modification of a consent) for development to which this section applies, the consent authority must — (a) within 7 days after the application is made, give written notice of the application to Transport for NSW, and (b) take into consideration — (i) any response to the notice that is received within 21 days after the notice is given, and (ii) any guidelines issued by the Planning Secretary for the purposes of this section and published in the Gazette.	This application relates to approval of a Master Plan. Future DAs should be referred to TfNSW as defined
(3)	The consent authority must not grant consent to development to which this section applies without the concurrence of Transport for NSW.	Noted – to be established during DA approval
(4)	In deciding whether to provide concurrence, Transport for NSW must take into account — (a) the potential effects of the development (whether alone or cumulatively with other development or proposed development) on — (i) the safety or structural integrity of existing or proposed infrastructure in the future infrastructure corridor, and (ii) the safe and effective operation of existing or proposed future infrastructure in the future infrastructure corridor, and (b) what measures are proposed, or could reasonably be taken, to avoid or minimise those potential effects.	The earthworks in this report typically align with existing topography and levels set by Sydney Metro. The earthworks are not considered to negatively impact safety and integrity of the infrastructure corridor. Impacts of individual developments within or adjacent to the future infrastructure corridor will be referred and assessed as part of future works approvals.
(5)	Despite subsection (3), the consent authority may grant consent to development to which this section applies without the concurrence of Transport for NSW if 21 days have passed since	To be reviewed with subsequent DA approvals

Reference	Master Plan Requirement	Response
	the consent authority gave notice under subsection (2)(a) and Transport for NSW has not granted or refused to grant concurrence.	

7 Impacts and Mitigation Assessment

Below summarises the recommendations for future actions to further develop the integrated water approach and optimise the strategy proposed in this report.

Table 8 – Recommendations

Ref	Recommendation	Timeframe	Responsible
Road Design			
1	Detailed review against post-development flood constraints	As part of DA submission	WPCA
2	Bus stops, driveways and street furniture location and coordination	As part of DA submission	WPCA
3	Preparation of Salinity Management Plan	As part of DA submission	WPCA
4	Coordination on design of major roads (such as Metro Link Road) and all traffic signals with TfNSW	As part of DA submission	WPCA
5	Preparation of Erosion and Sediment Control plan that considers staging as well as long and short term impacts (such as sediment basins, dust suppression and coordination with other earthworks)	As part of DA submission	WPCA

8 Conclusion

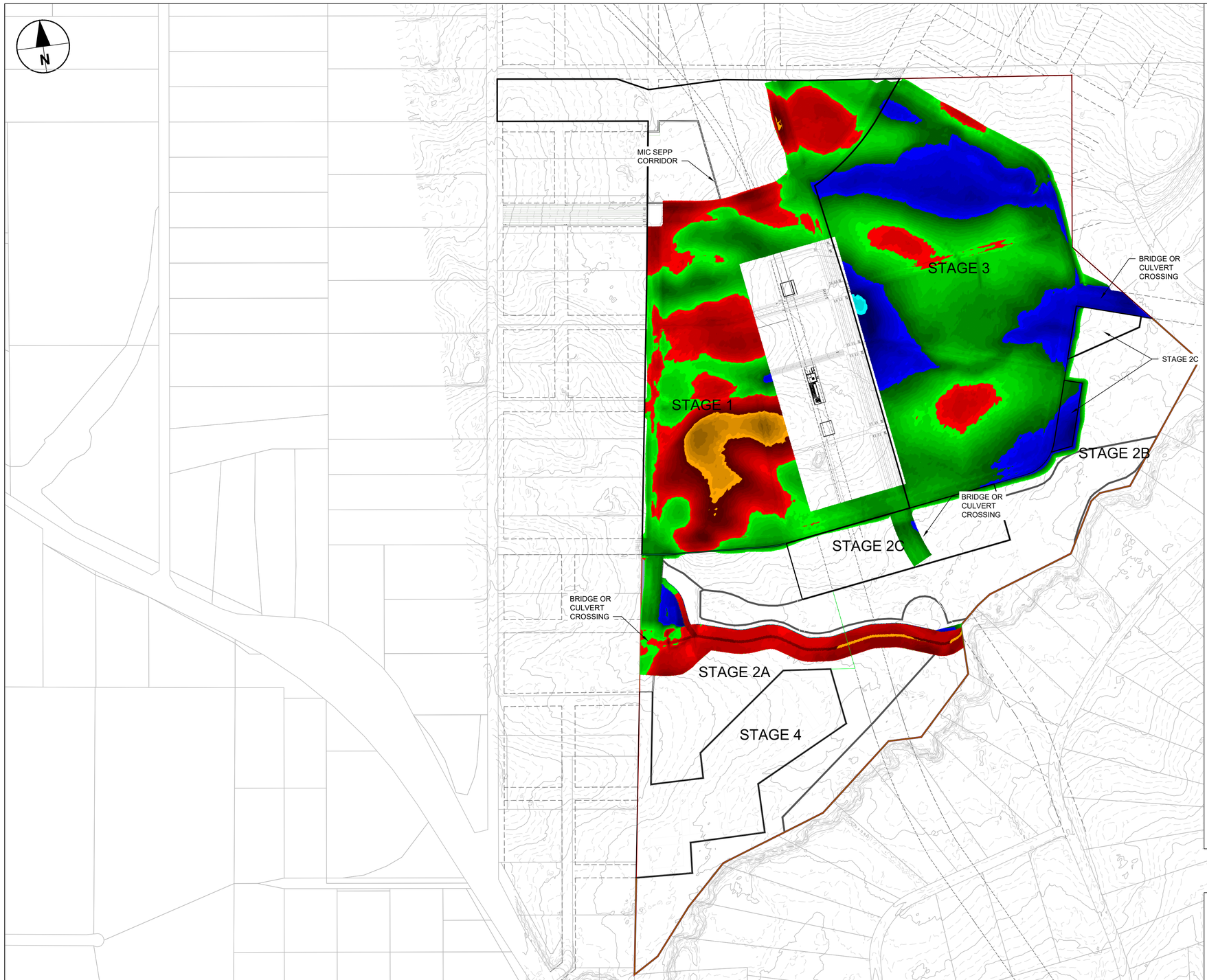
The works completed on this project provide a high-level assessment of the requirements of the masterplan grading of the Bradfield City Centre. This work has focused on vertical and horizontal geometry and earthworks staging. AECOM has prepared a 12D model to coordinate with existing and future environmental constraints.

The proposed earthworks design approach has based its design input on the new Sydney Metro station finished levels to provide consistency between designs.

The earthworks strategy aligns with Recognising Country principals while also providing an interface to the new Sydney Metro station.

Appendix 1 – Earthworks ISOPAC

ISO A1 594mm x 841mm



DEPTH: SURVEY TO DESIGN SURFACE

LOWER VALUE		UPPER VALUE		COLOUR
-30.0 m	to	-5.8 m		
-5.8 m	to	-5.6 m		
-5.6 m	to	-5.4 m		
-5.4 m	to	-5.2 m		
-5.2 m	to	-5.0 m		
-5.0 m	to	-4.8 m		
-4.8 m	to	-4.6 m		
-4.6 m	to	-4.4 m		
-4.4 m	to	-4.2 m		
-4.2 m	to	-4.0 m		
-4.0 m	to	-3.8 m		
-3.8 m	to	-3.6 m		
-3.6 m	to	-3.4 m		
-3.4 m	to	-3.2 m		
-3.2 m	to	-3.0 m		
-3.0 m	to	-2.8 m		
-2.8 m	to	-2.6 m		
-2.6 m	to	-2.4 m		
-2.4 m	to	-2.2 m		
-2.2 m	to	-2.0 m		
-2.0 m	to	-1.8 m		
-1.8 m	to	-1.6 m		
-1.6 m	to	-1.4 m		
-1.4 m	to	-1.2 m		
-1.2 m	to	-1.0 m		
-1.0 m	to	-0.8 m		
-0.8 m	to	-0.6 m		
-0.6 m	to	-0.4 m		
-0.4 m	to	-0.2 m		
-0.2 m	to	0.0 m		

LOWER VALUE		UPPER VALUE		COLOUR
0.0 m	to	0.2 m		
0.2 m	to	0.4 m		
0.4 m	to	0.6 m		
0.6 m	to	0.8 m		
0.8 m	to	1.0 m		
1.0 m	to	1.2 m		
1.2 m	to	1.4 m		
1.4 m	to	1.6 m		
1.6 m	to	1.8 m		
1.8 m	to	2.0 m		
2.0 m	to	2.2 m		
2.2 m	to	2.4 m		
2.4 m	to	2.6 m		
2.6 m	to	2.8 m		
2.8 m	to	3.0 m		
3.0 m	to	3.2 m		
3.2 m	to	3.4 m		
3.4 m	to	3.6 m		
3.6 m	to	3.8 m		
3.8 m	to	4.0 m		
4.0 m	to	4.2 m		
4.2 m	to	4.4 m		
4.4 m	to	4.6 m		
4.6 m	to	4.8 m		
4.8 m	to	5.0 m		
5.0 m	to	5.2 m		
5.2 m	to	5.4 m		
5.4 m	to	5.6 m		
5.6 m	to	5.8 m		
5.8 m	to	300 m		

NOTES

1. FOR GENERAL NOTES REFER TO DRAWING SERIES 1000-CI-0005.
2. THE THREE DIMENSIONAL TERRAIN MODELLING SOFTWARE, 12D HAS BEEN UTILISED IN THE PREPARATION OF THE ESTIMATED EARTHWORKS QUANTITIES FOR THIS LAYOUT.
3. THE ESTIMATED EARTHWORKS QUANTITIES ARE SOLID INSIDE BASED ON DESIGN LEVELS AND EXISTING LEVELS.
4. NO ALLOWANCE FOR THE REMOVAL OF EXISTING PAVEMENTS, STRUCTURES, TOP SOIL ETC HAS BEEN INCLUDED.
5. NO ALLOWANCE FOR BULKING OR SHRINKAGE OF SPOIL HAS BEEN INCLUDED.
6. NO ALLOWANCE FOR REMOVAL OF UNSUITABLE MATERIAL THAT HAS BEEN INCLUDED IN THIS ESTIMATE INCLUDING CONTAMINATED MATERIAL. THE ESTIMATED NET VOLUME ASSUMES ALL CUT MATERIAL IS SUITABLE FOR REUSE AS FILL ON THE SITE.
7. NO ALLOWANCE HAS BEEN MADE FOR TRENCHING OF SERVICES INCLUDING DRAINAGE INFRASTRUCTURE.

CONSULTANT

AECOM Australia Pty Ltd
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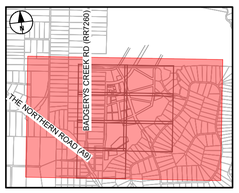
PROJECT

AEROTROPOLIS
CORE PRECINCT
BRINGELLY

CLIENT

NSW GOVERNMENT | Western Parkland City Authority

KEY PLAN



SCALE BAR

0 50 100 m
1:2000

SAFETY IN DESIGN INFORMATION

ARE THERE ANY ADDITIONAL HAZARDS / RISKS NOT NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING?

☐ NO
☐ YES

PROJECT MANAGEMENT INITIALS

JS	CR	GAR
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM		SURVEY	

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	29-06-2023	FOR INFORMATION
01	24-11-2022	FOR INFORMATION

PROJECT NUMBER

60646285

SHEET TITLE

BULK EARTHWORKS PLAN

SHEET NUMBER

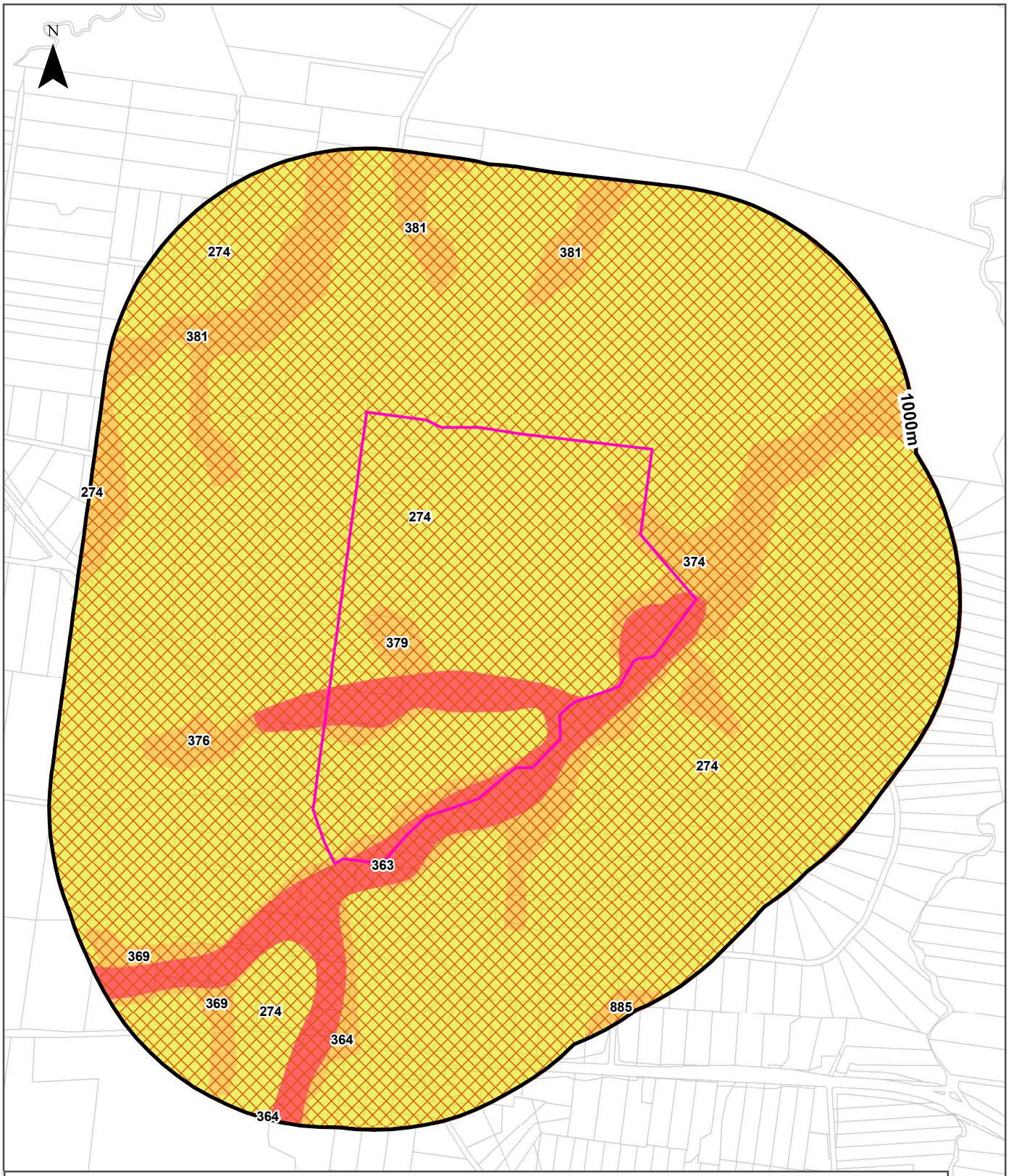
60646285-SHT-00-0000-CI-0061

Last saved by: DANIELR1 (2023-08-02) Last Plotted: 2023-08-02
Filename: C:\USERS\DANIELR1\ONEDRIVE - AECOM\DOCUMENTS\NEW FOLDER\60646285-SHT-00-0000-CI-0061.DWG

Appendix 2 – Salinity Map

Dryland Salinity

Badgerys Creek Road, Bringelly, NSW 2556



Legend

- Site Boundary
- Report Buffer
- Property Boundary

Dryland Salinity - National Assessment

- Delineated risk area but no high hazard or risk rating for either 2000, 2020, 2050
- High hazard or risk in 2050 only
- High hazard or risk defined for 2050, but no assessment made for 2000 or 2020
- High hazard or risk in 2020 and 2050
- High hazard or risk in 2000 and 2050. 2020 not defined as high hazard
- High hazard or risk defined for all years: 2000, 2020, 2050

Salinity Potential of Western Sydney

- Area of Known Salinity
- Area of High Salinity Potential
- Area of Moderate Salinity Potential
- Area of Very Low Salinity Potential
- Area of Water

Scale: 0 100 200 400 600 800 1,000 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2020

Coordinate System: GDA 1994 MGA Zone 56

Date: 28 October 2020

Western Parkland City Authority

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NSW GOVERNMENT