



9.0 APPENDIX C _SITE ANALYSIS



9.1 BUSHFIRE

The majority of the site area is minimally impacted by bushfire risk, with required buffers concentrated along outer interfaces.

Much of the site remains unaffected by potential bushfire, with further management of surrounding bushland possible to reduce likelihood.

Vulnerability of surrounding bushland to bushfire is subject to wind-direction and wind speed, the BFPL metric based on existing vegetation types and sizes.

Development is most appropriate throughout Lot 2 North and Lot 2 South's central span, with Lot 8 suitable for management of the existing woodland for recreational use

Along the site's western boundary edge and throughout its centre, development is unconstrained by bushfire risk.

Vegetation Risk Category

Vegetation Category 1 - forest, woodlands, heath and wetlands.

Vegetation Category 2 - open woodlands, malle, grasslands, and pockets of Category 1 vegetation of less than one hectare in size. Requires a 30m vegetation buffer.

Variable Buffer - areas in which developments and people are most likely to be affected by bushfire in the adjacent area.

Opportunity

- Locate residential areas adjacent to open grassland, ensuring residents have access to safe open space nearby.
- Concentrate low-rise typology of built form at the edges of the master plan.
- A ring road surrounding the master plan will ensure that emergency vehicles maintain access to at-risk vegetation, while separating residential built form from vegetation buffers.
- A sparse tree canopy throughout ecological areas will reduce potential impact from bushfire, ensuring that internal open space remains safe/

Open Space

Lots

Water

Vegetation Category 2

Vegetation Category 1 Use Highest Risk





Scale 1:15,000 @ A3

9.2 HERITAGE AND CULTURE

Evidence of midden sites have been identified within the site boundary, displaying strong links to Country.

Yerrabingin has been engaged to ensure that the design process considers Country in an accurate, sensitive, and meaningful way.

Extensive investigation and analysis of the site has been undertaken over time to understand the archaeological and historical significance of the peninsula, including its shared cultural value to both its Indigenous and post-settlement histories.

This includes an archaeological assessment of the site undertaken by EMM Consulting in 2020 and a subsequent assessment of Lot 8 in 2023 which revealed the location and extent of Indigenous middens.

These will inform the development of the master plan spatial framework, sensitively integrating middens into the landscape strategy,

A number of artefacts including hillocks middens have been uncovered on the site, evidence of extensive historic use. No evidence of sensitive uses have been identified within the site boundary, lacking evidence of burial grounds or cultural spaces that may impact the master plan.

An understanding of the site's archaeological context has been united with input from Yerrabingin to inform a cohesive approach to Country, uniting cultural narratives with the site's physical conditions.

Food Sources

Giving rich insight into the traditional food diet of the Dharawal community, animal bones were collected from excavations. Large quantities of fish bones, with smaller representations of mammal (seal, dolphin and wallaby) and bird bone were represented.

Both ocean and estuarine species of fish, including bream, snapper, leatherjacket, flathead and groper, were represented in the assemblage.

At least 15 shellfish species were identified. Both ocean and estuarine species, including Sydney cockle, Hercules whelk, mud oyster, Sydney rock oyster, hairy mussel, turban shell, and triton were found.

Hunting

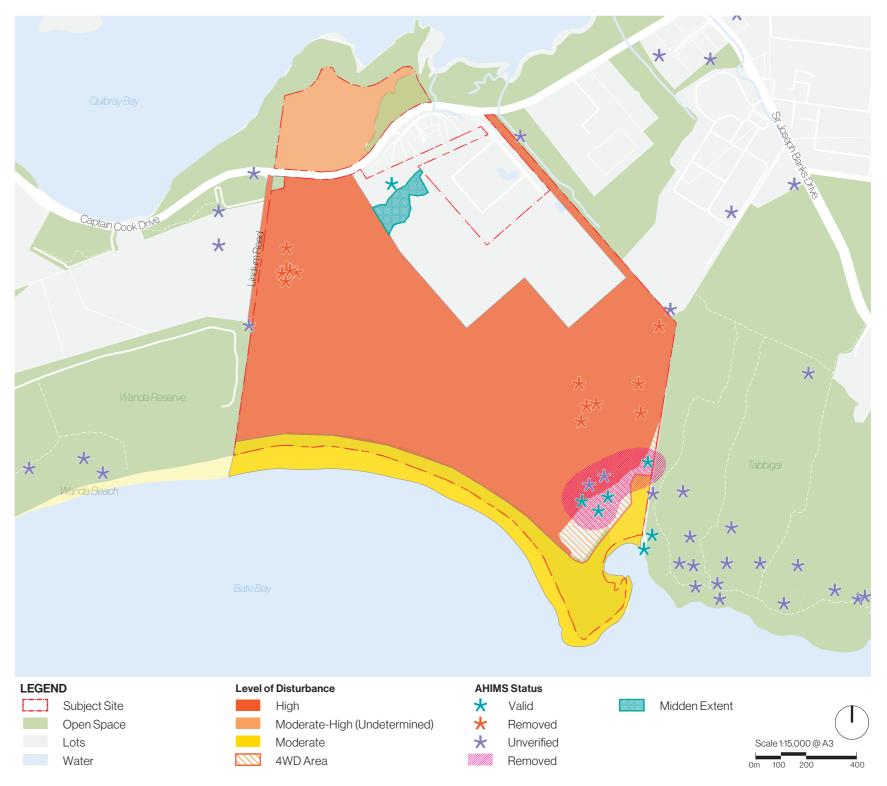
Stone artefacts, largely made from quartz, silcrete and chert, were limited in the midden deposit and consisted primarily of debitage. Only a small number of formal tools were identified including several eloueras and backed blades representing traditional hunting and collecting methods

Radiocarbon dates were obtained from the excavated deposit, representing use of the site for the past 1,800-2,000 years.

Opportunity

There is opportunity to engage with Country on-site understanding its place amidst the shared history of Sydney:

- Ensure that the open space strategy includes elements that celebrate the country's narrative. Include storytelling points, signage, and art installations that highlight the history, culture, and significance of the original landscape, such as hillocks and middens.
- Incorporate Indigenous names, cultural symbols, and relevant artwork in the design of the master plan and open space strategy.
- Integrate educational opportunities into the master plan through workshops, guided tours, and educational programs that focus on Indigenous history, traditions, and sustainable land practices.
- Encourage partnerships with local Indigenous communities to develop these programs, fostering a deeper understanding and appreciation of the culture.
- Integrate the midden extent identified within Lot 8 into future landscape strategy, preserving it as a cultural space while also sustaining the area's cultural spaces allowing for visitors to engage with them.



9.3 ACOUSTIC

There is opportunity to create a diverse town centre precinct within Lot 2 South which can accommodate an array of land uses.

Residential, commercial, and tourism land uses are suitable throughout the site extent, with minimal acoustic impacts.

Industrial noise from the Kurnell refinery, desalination plant and other industry to the east and west is minimal and is unlikely to impact internal development.

Monitoring of existing ambient noise was conducted at four separate locations within the site. The Ambient noise environment was found to be negligible from local and distant traffic with infrequent aircraft noise contributions.

A large portion of the southern part of Lot 2 is deemed 'Conditionally Acceptable' for residential, hospitals and schools.

In cases where the Site is 'conditionally acceptable', AS 2021 recommends that buildings include specific acoustic design to achieve appropriate internal noise levels, based on maximum noise levels during representative operations.

Overall, the developable areas of the Site is acceptable or conditionally acceptable for the full range of land use building types included in the Site's master plan.

Opportunity

- Situate town centre precinct within the AS2021
 Acceptable region to minimise potential noise and vibrational impacts on the public domain.
- In future, ensure that acoustic softening measures be integrated into the architecture of built form within the 'Conditionally Acceptable' region of the site.
- Improve quality of built form, material selection and details of future buildings in the consideration of acoustic minimisation.





9.4 BIODIVERSITY

The Kurnell Peninsula is host to a significant and varied ecosystem, home to a variety of critical native ecological communities.

In proximity to the site, Kamay Botany Bay National Park features rich ecological communities of Banksia Scrub, Bloodwood Forest, Coastal Freshwater Wetland, Littoral Forest and Sandplain Heath.

The existing native ecological communities comprise of a retained or regenerating riparian or coastal vegetation with marine communities along the coastal reserves.

Small restored wetlands are present in Lot 2 North representative of the peninsula's original ecology.

As mapped by the The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016), four plant community types occur within project boundary:

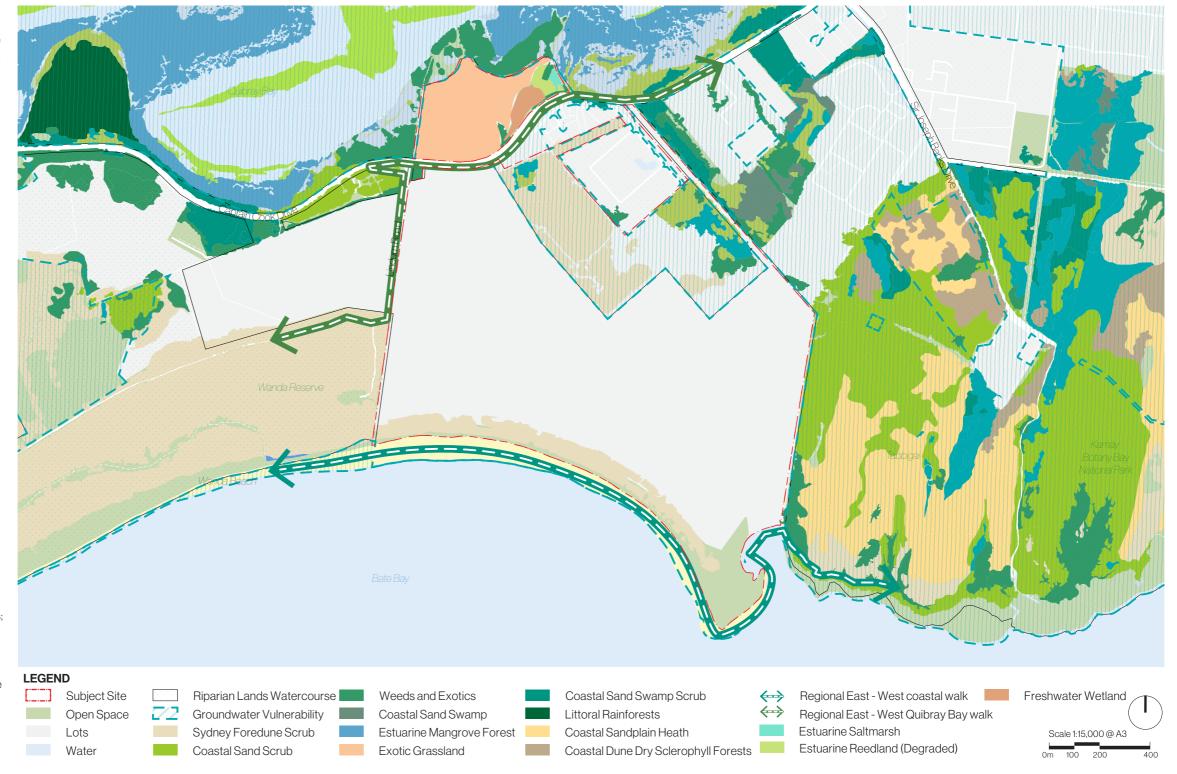
- Coastal Foredune Wattle Scrub
- Coastal Sand Littoral Forest
- Coastal Swamp Paperbark Swamp Oak Scrub
- Coastal Freshwater Wetland

Vegetation community (CE)

- Estuarine Reedland (Degraded)
- Exotic Grassland with Scatter Tuckeroo
- Weeds and Exotics

Opportunity

- A diversity of ecological responses to drive the character, and outcomes of sub precincts;
- Reinforcing the east-west biodiversity corridor along the Bate Bay coastline, and preservation of coastal vegetation along the southern interface;
- Regeneration of riparian corridors and coastal vegetation, promoting the return of threatened species;
- Re-establishing native and Indigenous vegetation communities from surrounding areas to create north south ecological links;
- Regeneration of lost ecological communities within the site to strengthen north-south green grid connections;
- Introduce native species to the site whilst removing invasive species and weeds to provide habitat for native fauna and wild flora.



9.5 TRANSPORT

A network of active and public transport opportunities surround the site, linking to nearby urban centres and throughout the adjacent bushland.

The proposed transport network suggests a high degree of connectivity to the wider context, with opportunity to integrate proposed cycle and pedestrian routes.

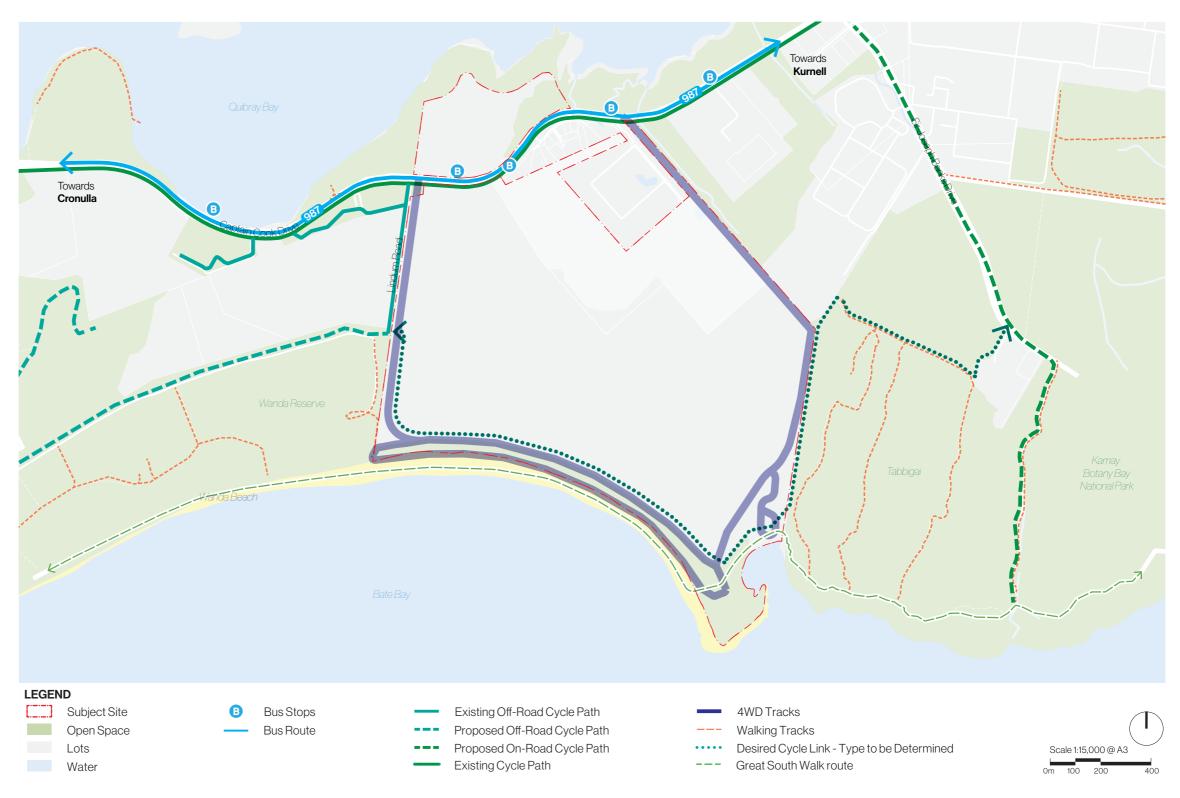
The bus route 987 links Cronulla to Kurnell via Captain Cook Drive, with multiple existing bus stops scattered along the site's primary frontage, connecting residents to Cronulla train station and to the future Kurnell ferry wharf.

There is an existing cycle route which runs the length of Captain Cook Drive connecting to Cronulla and Kurnell.

Strengthening through-site connectivity is desired to improve the overall interconnectivity of the region and provide alternative pedestrian/cycling routes off of Captain Cook Drive.

Opportunity

- Enhance the east-west connections by aligning pedestrian pathways with existing walking tracks to encourage more seamless movement and expanding upon pedestrian desire lines.
- Incorporate Sutherlandshire Council's and wider Sydney's planned cycle routes into the master plan, exceeding the envisioned cycle network, offering added convenience for residents.
- Expand the current bus route from Captain Cook
 Drive through the site, ensuring that bus stops are
 conveniently accessible on foot from major residential
 areas and key amenity.





9.6 STORMWATER AND WETLANDS

The site is minimally effected by tide flooding, with some wetland proximity and coastal use buffers along boundary interfaces.

Buffers apply from SEPP (Resilience and Hazards) 2021 which manage land use planning in coastal areas.

SEPP (Resilience and Hazards) 2021: Chapter 2 Coastal Management, introduces controls within coastal proximity areas which require management of developments to reduce potential hazards.

The Coastal Use Area which extends approximately 150m into the site at its greatest extent applies along the site's southern and northern boundaries. Within the Coastal Use Area, future development must retain access, visibility, and use of the foreshore.

This applies to a small proportion of the site's south, while future residential development will likely be concentrated within its central span.

The Coastal Wetland Area includes ecological communities which are seasonally inundated with water, and a key habitats for native coastal species.

Within the Wetland Proximity Area, development will not be granted unless it will not significantly impact on the biophysical, hydrological, or ecological integrity of the adjacent area, or impact the flow of groundwater.

There is opportunity to maintain areas to which the SEPP applies, and integrate them into the master plan landscape strategy, while situating coastal uses (community, tourism, open space) within the Coastal Use

Opportunities

- Take advantage of the unique landscaped area of the Coastal Use Area for community and tourism, strategically locating amenity that preserves the foreshore's views and accessibility.
- Foster the rehabilitation of the sensitive wetlands as identified in the SEPP and enriching the larger ecological network through a thoughtful landscape strategy.



9.7 INTERFACES

There is opportunity to re-establish the contextual topography of the peninsula, seamlessly reintegrating the site into its contextual landform.

A. Western Interface

Wanda Reserve is located on the western side of the site.

The land form is low-lying, providing opportunity to create a seamless transition between the site and the adjacent parkland with generous internal planting and east-west pedestrian connectors.

B. Captain Cook Drive Interface

Captain Cook Drive is the site's primary road with access to Lot 2 north, Lot 2 south and Lot 8. The landscape is relatively flat, descending gradually towards Quibray Bay.

On both sides of Captain Cook Drive, mounds of rehabilitated planting screen from the road corridor.

C. Eastern Interface

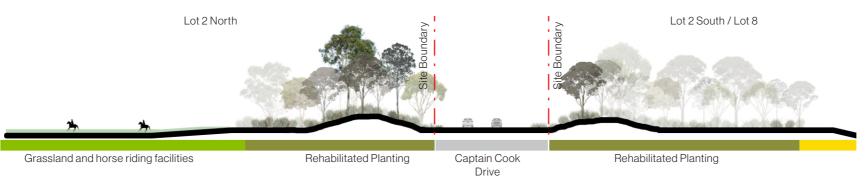
The site's eastern boundary is defined by the dynamic landforms of Kamay Botany Bay National Park which features mounds up to 12m taller than the site's existing topography. Vegetation within the national park along this edge consists of Coastal Banksia Scrub.







Cronulla Skate Park Interface

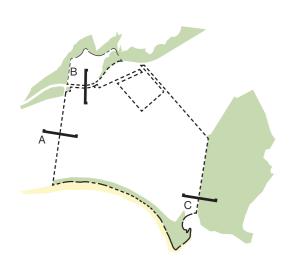


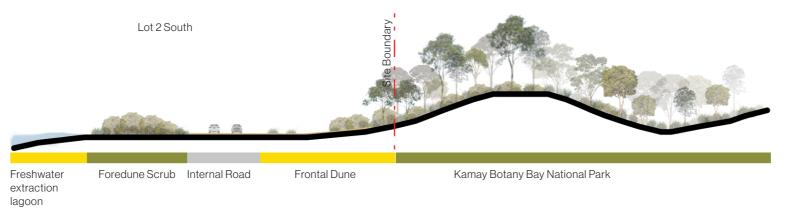
Section B Entry on Captain Cook Drive

Section C Eastern interface with Kamay Botany National Park



Existing grassland (Lot 2 North)





Kamay Botany Bay National Park Interface



9.8 OPPORTUNITIES

There is significant opportunity to re-integrate the site into its existing natural context, and develop an urban community which will benefit from the unique location and prominence of the Kurnell Peninsula.

A landscape led approach to design and planning of the project will be a key to celebrate the significant ecosystem in Kurnell Peninsula and reinforce the rehabilitation efforts undertaken by the Holt Estate. The establishment of ecological corridors will blend recreational and ecological spaces within an urban grid that restores green links, the original landscape of the site, and the peninsula's connection to the wider Sutherland Shire region.

Ecological

- Promote rehabilitation efforts to allow free movement of fauna throughout the peninsula, aligned to the aspirations of the Kurnell 2020 Corridor Delineation strategy.
- Strengthen the east-west biodiversity corridor within the Coastal Use Area along the southern interface of the site, featuring public open space and ecological spaces.
- Continue ecological 'Green Web' by introducing a green network that connects Kamay Botany Bay National Park across the site, through to Tabbigai, and beyond to Bate Bay and Boat Harbour;
- Remediate significant ecological areas concentrating on extant bushland within Lot 8 continuing the Holt Estate's rehabilitation efforts currently under way.

Open Space

- Orient open space and built form towards predominant contextual views facing Botany Bay and Sydney CBD skyline to the site's north, and Cronulla Beach to the site's south.
- Complement existing characters and uses of surrounding parklands to facilitate a smooth transition between the ecological and recreational corridors.
- Re-establish relationship to Country and delineate clear relationships to the Aboriginal past by engaging with midden sites, blending them into the overall landscape strategy.
- Extend the predominant landform through the site, introducing a new topography which appropriately interfaces with the surrounding landscape.



The master plan will accommodate a diverse urban community, featuring an active town centre framed by residential precincts which respond to their unique location within the site.

Connectivity through the site unites the four resulting precincts into a single coherent master plan, while maintaining connectivity to the adjacent coastline and bushland that defines the character of the peninsula.

Land Use and Built Elements

- Situate a mixed-use community at the primary gateway to the master plan, which will benefit from high levels of activation and visibility.
- An eco-tourism precinct adjacent to the national park maintains strong views of Boat Harbour and is distinct from the wider residential master plan.
- Activate the foreshore with community infrastructure and opportunity for retail offers, taking advantage of the site's sweeping coastal views and access to the beach front.

Connectivity

- Introduce a separate pedestrian connection linking Lot 2 North to Lot 2 South ensuring a coherent movement network, with the possibility for an eco-bridge.
- An understanding of comfortable pedestrian walking distances suggests the master plan be distinguished into four precincts, interconnected by a site-wide movement network, but containing an distinct road hierarchy.
- A site-wide arterial through-road which links all four precincts into a single master plan community will ensure legible wayfinding and improve overall connectivity.
- Provide pedestrian links to Cronulla Beach to take maximise utilisation of the site's unique coastal location.





9.9 CONSTRAINTS

Environmental and Cultural Assets

The site includes Coastal Wetlands which are to be retained and protected. They contribute to the ecological assets of the peninsula and can be integrated into the site landscape and ecological corridors.

Coastal Use Area and Wetland Proximity Area constitute a small proportion of the site at its boundary extents.

- A midden extent identified within Lot 8. Place design opportunity to highlight and celebrate Aboriginal midden sites as significant cultural areas with accompanying buffer zones.
- A bushfire vegetation buffer of 30m-100m is required alongside Vegetation Category 1 & 2 growth along the boundary interfaces, in which urban development is not recommended. Establishing managed land will reduce bushfire risk as well as serve as large open space for recreation uses.
- Coastal Wetland Areas identified within the site by SEPP (Resilience and Hazards) 2021 require a Wetland Proximity Area in which development will not be granted that impacts the wetlands. The identified area presents great opportunity to regenerate of riparian corridor and integrate with stormwater management petwork
- A 'Coastal Use Area' identified in SEPP (Resilience and Hazards) 2021, whereby development proposals must not adversely impact access to the foreshore or views. The Area will complement existing characters and uses of surrounding parklands to facilitate a smooth transition between the ecological and recreational corridors.



Built Form Constraints

The site is subject to minimal built form constraints, with some acoustic mitigation required throughout its east.

Acoustic issues arising from flight paths only require mitigation for certain development types, with residential and urban development acceptable throughout the entirety of the site.

Constraints:

- The approximate arrivals flight path towards Sydney Kingsford Smith Airport passes north-south over the site, is a contained area. The master plan can develop outside of these areas without impact the proposal of residential or commercial built form.
- There is a proposed land dedication which represents an appropriate development setback for management of future coastal processes in which coast-adjacent open space is best proposed.
- Ensure proposed residential built form is set back from Captain Cook Drive to ensure dwellings remain quiet and undisturbed by potential vehicular noise.
- A small easement which extends along the site's northern boundary in which development is restricted for development. The area can contribute to the wider ecological corridor and landscaping can pass underneath without constraint.









10.0 APPENDIX D _COMPLIANCE

10.1 SOLAR ACCESS

79.0%

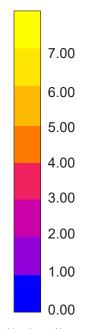
of facades receive 2 or more hours of sunlight across all site on 22/06.

Solar access analysis has been performed on winter solstice 22/06 from 9:00am - 3:00pm. The output is visualised to represent the number of hours façades receive solar access during this time period.

Apartment Design Guide

Section 4A Solar and Daylight Access Objective 4A-1.

- Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid winter in the Sydney Metropolitan Area and in the Newcastle and Wollongong local government areas.
- 3. A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter



Number of hours facades receive solar access from 09:00am - 3:00pm on winter solstice 22/06.





7.00 6.00 5.00 4.00 3.00 2.00 1.00 0.00

Number of hours façades receive solar access from 09:00am - 3:00pm on winter solstice 22/06.

10.2 SHADOW ANALYSIS

Communal Open Space

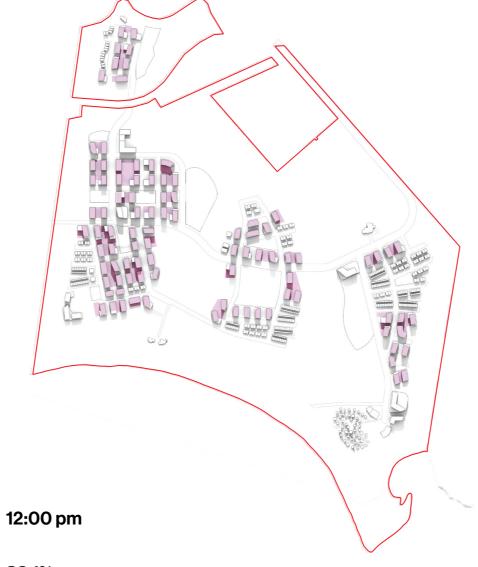
NSW Apartment Design Guide:

Section 3D Communal and Public Open Space Objective 3D-1.

2. Developments achieve a minimum of 50% direct sunlight to the principal usable part of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid winter).



 $\textbf{72.3}\% \ \text{of communal open space receiving direct sunlight.}$

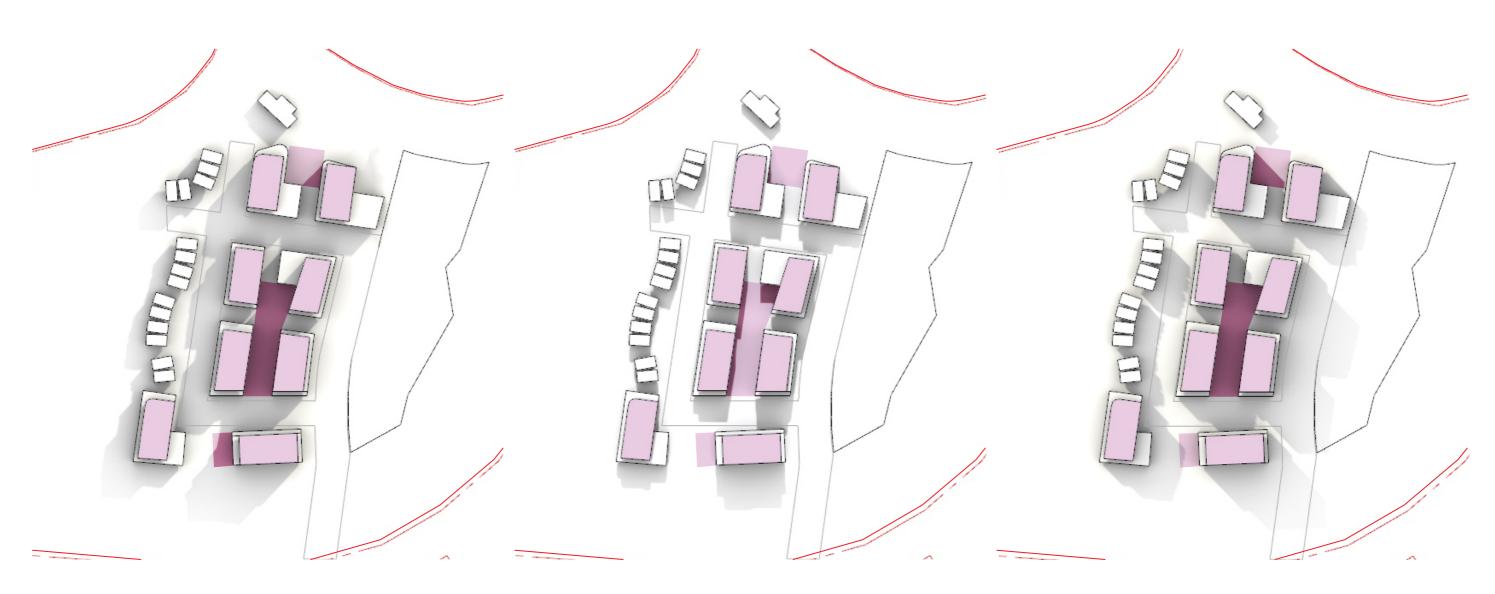


89.1% of communal open space receiving direct sunlight.



 $73.7\%\,\text{of communal open space receiving direct sunlight.}$

Quibray Bay Precinct



9:00 am

 $\textbf{77.3}\% \ \text{of communal open space receiving direct sunlight.}$

12:00 pm

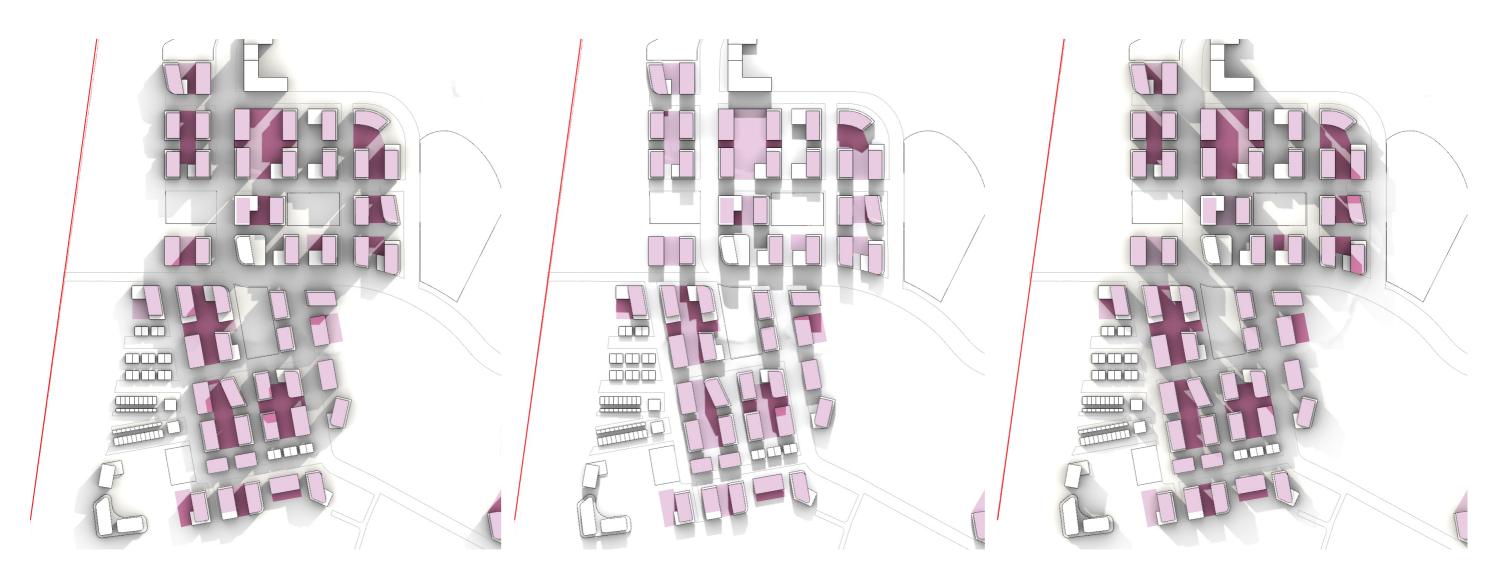
98.1% of communal open space receiving direct sunlight.

3:00 pm

78.1% of communal open space receiving direct sunlight.



Town Centre Precinct



9:00 am

68.4% of communal open space receiving direct sunlight.

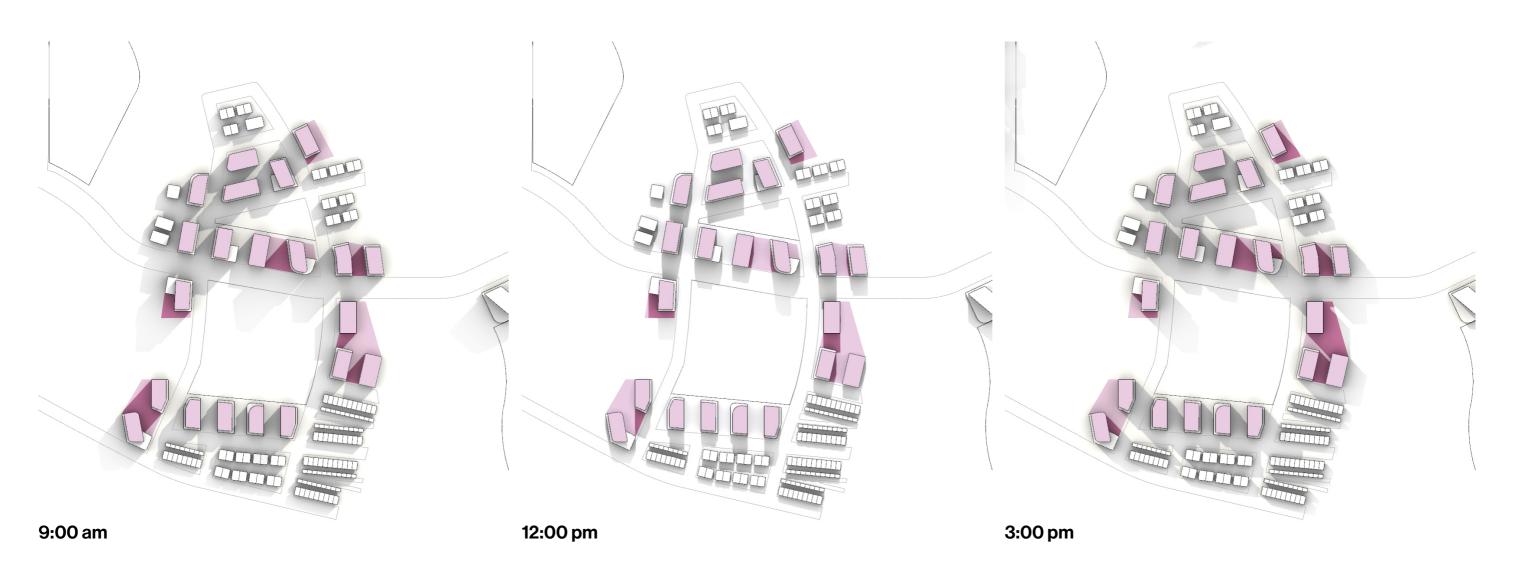
12:00 pm

87.6% of communal open space receiving direct sunlight.

3:00 pm

70.1% of communal open space receiving direct sunlight.

Bate Bay Precinct

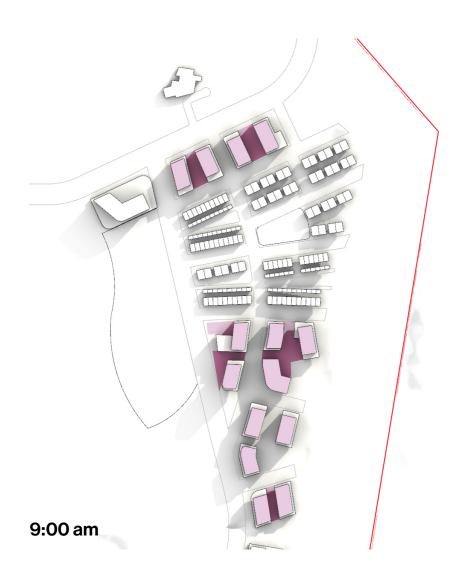


82.6% of communal open space receiving direct sunlight.

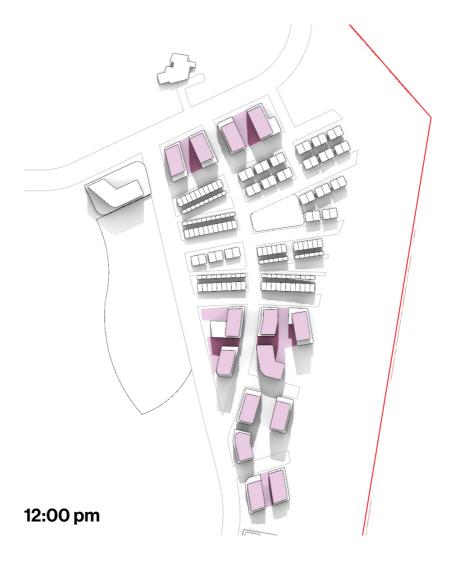
91.7% of communal open space receiving direct sunlight.

78.6% of communal open space receiving direct sunlight.

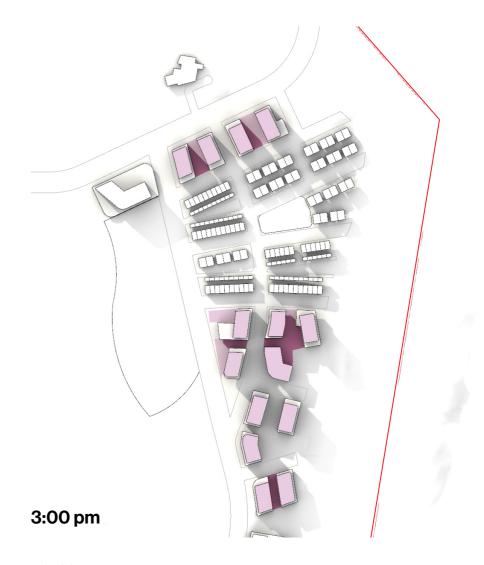
Boat Harbour Precinct



 $\textbf{70.6}\% \ \text{of communal open space receiving direct sunlight.}$



86.3% of communal open space receiving direct sunlight.



78.8% of communal open space receiving direct sunlight.

Public Open Space

NSW Apartment Design Guide:

Section 3D Communal and Public Open Space Objective 3D-4.

 Solar access should be provided year round along with protection from strong winds.

Sutherland Shire DCP 2015

Chapter 6 Residential Flat Buildings Section 6 Solar Access, Objective 6.1.4.

 Ensure development retains reasonable levels of solar access to the neighbouring properties and the public domain.



84.3% of public open space receiving direct sunlight.

95.2% of public open space receiving direct sunlight.

82.9% of public open space receiving direct sunlight.

Built Form



10.3 YIELD ASSUMPTIONS

Efficiency Rates	GROU	PGSA	
Land Use	GBA/GFA	GFA/NSA	
Retail	80%	95%	
Townhouses	70%	90%	
Residential	70%	75%	
Seniors - ILUs	70%	75%	
Seniors - RACF	70%	75%	
Hotel/Tourism	70%	85%	
Cultural	70%	85%	
Education	70%	85%	

GFA Mix

Land Use	Studio/1 bed 2 bed		3 bed	4 bed
Townhouses			50%	50%
Residential	25%	45%	30%	
Seniors - ILUs	20%	50%	30%	
Seniors - RACF	70%	30%		
Hotel/Tourism				

Unit Size (sqm/GFA)

Land Use	Studio/1 bed 2 bed		3 bed	4 bed
Townhouses			178	200
Residential	73	111	160	
Seniors - ILUs	87	127	187	
Seniors - RACF	73	127		
Hotel/Tourism	41			
Cabins	141		•	

Parking

Other Uses								
Use	Requirement							
Retail	45	m²/GFA						
Hotel	0.25	per 4 rooms						
Hotel Staff	1	per 2 employees						
Cultural	xx	m²/GFA						
Education	10	OS per students						
Seniors	0.5	per dwelling						

Parking

Retail	45	m²/space
Tourism	40	m²/space
Residential	40	m²/space

Floor to Floor Heights

Tioor to ricor riciginto	
Use	Height (m)
Retail frontages	4.5
Retail Podium	5.5
Residential - Groundfloor	4.5
Residential	3.2
Cultural	6
Hotel	3.3
Eco tourism	3.3

Unit Size (sqm/NSA)

Land Use	Studio/1 bed	2 bed	3 bed	4 bed
Townhouses			160	180
Residential	55	83	120	
Seniors - ILU	65	95	140	
Seniors - RACF	55	95		
Hotel/Tourism	35			



YIELD SUMMARY

GFA

GFA										
Precinct	Retail (GFA)	Medium Density Residential (GFA)	Residential (GFA)	Townhouses (GFA)	Seniors - ILUs (GFA)	Seniors - Indigenous (GFA)	Seniors - RACF (GFA)	Tourism (GFA)	Cultural (GFA)	TOTAL GFA (sqm)
Precinct A - Town Centre North	6,885	0	125,997	0	19,970	0	0	15,226	0	168,077
Precinct B - Town Centre South	0	30,478	56,457	11,810	21,699	0	10,385	13,639	610	145,078
Precinct C - Bate Bay North	1,057	4,745	38,270	2,881	13,875	0	0	0	0	60,828
Precinct D - Bate Bay South	1,395	5,305	24,917	13,194	10,434	0	0	0	0	55,244
Precinct E - Boat Harbour	0	8,339	40,448	21,167	10,618	0	0	33,479	453	114,504
Precinct F - Quibray Bay	469	12,727	16,804	0	0	2,520	0	0	262	32,782
TOTAL GFA (sqm)	9,806	61,594	302,892	49,052	76,595	2,520	10,385	62,344	1,324	576,512
	9,806		413,538			89,501		62,344		575,188
Targets	20,000		350,000			110,000		70,000		550,000

Open Space

Precinct	Local Parks	District Parks	Managed Land (Private)	Land to be dedicated	Total Open Space (incl. local parks,district parks, managed land, land to be dedicated)	Total Open Space %	Communal Open Space (Private)	Privately owned Public Space (Private)	Developable Area
Precinct A - Town Centre North	10,986	25,065	184,438				12,874		
Precinct B - Town Centre South	7,657	,	149,573	224,412			16,732		326,535
Precinct C - Bate Bay North	4,576		79,792				7,295		
Precinct D - Bate Bay South	0	26,170	129,860				8,964		175,564
Precinct E - Boat Harbour	2,734	27350	425017				8375		219792
Precinct F - Quibray Bay	11,257		64,989	40,809			3,457		55,142
TOTAL Area(sqm)	37,210	78,585	1,033,669	265,221	1,414,685	67.3%	57,697	11,772	777,033

Total Site Area		2,102,123	m2
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Dwellings

Precinct	Medium Density Residential	Residential	Townhouses	Seniors - ILUs	Seniors - Indigenous	Seniors - RACF	Tourism (Hotel rooms/ Eco cabins)	TOTAL NO. of Dwellings
Precinct A - Town Centre								
North	0	1,177	0	158	0	0	98	1,335
Precinct B - Town Centre								
South	293	469	62	172	0	122	115	1,118
Precinct C - Bate Bay								
North	42	350	16	106	0	0	0	514
Precinct D - Bate Bay								
South	48	222	72	80	0	0	0	422
Precinct E - Boat								
Harbour	79	372	108	82	0	0	374	641
Precinct F - Quibray Bay	120	153	0	0	30	0	0	303
TOTAL NO. of Dwellings	582	2,743	258	598	30	122	587	4,333
Unit numbers rounded to		adjusted for us Seniors		Including Tourism	4,920			

STAGING SUMMARY

GFA

Stage	Retail (GFA)	Medium Density Residential (GFA)	Residential (GFA)	Townhouses (GFA)	Seniors - ILUs (GFA)	Seniors - Indigenous (GFA)	Seniors - RACF (GFA)	Tourism (GFA)	Cultural (GFA)	TOTALS
Stage 1A	469	12,727	16,804	0	0	2,520	0	0	262	
Stage 1B	0	30,478	56,457	11,810	21,699	0	10,385	13,639	610	
Stage 2	6,162	0	95,422	0	8,428	0	0	14,911	0	
Stage 3A	0	0	0	0	0	0	0	4,042	0	
Stage 3B	0	8,339	40,448	21,167	10,618	0	0	29,437	453	
Stage 4	723	0	30,575	0	11,542	0	0	315	0	
Stage 5A	1,395	5,305	24,917	13,194	10,434	0	0	0	0	
Stage 5B	1,057	4,745	38,270	2,881	13,875	0	0	0	0]
TOTAL GFA (sqm)	9,806	61,594	302,892	49,052	76,595	2,520	10,385	62,344	1,324	576,512
	9,806			89,501		62,344		575,188		



