

Precinct boundary

Sub-Precinct Boundaries

Landscape Risk - Current (IntCurSWN100 - FFDI100)

Fire intensity - bushfire hazard area

Bushfire attack contours

Flame contact 0 - 50m buffer

Radiant heat exposure 0 - 70m buffer

Ember attack 0 - 100m buffer

Primary loss extent and extent of statutory planning and building controls 100m buffer

Secondary loss extent 700m buffer

Cadastral boundary

Original bushfire intensity modelling supplied by Ecological Australia, May 2018

3/09/2018

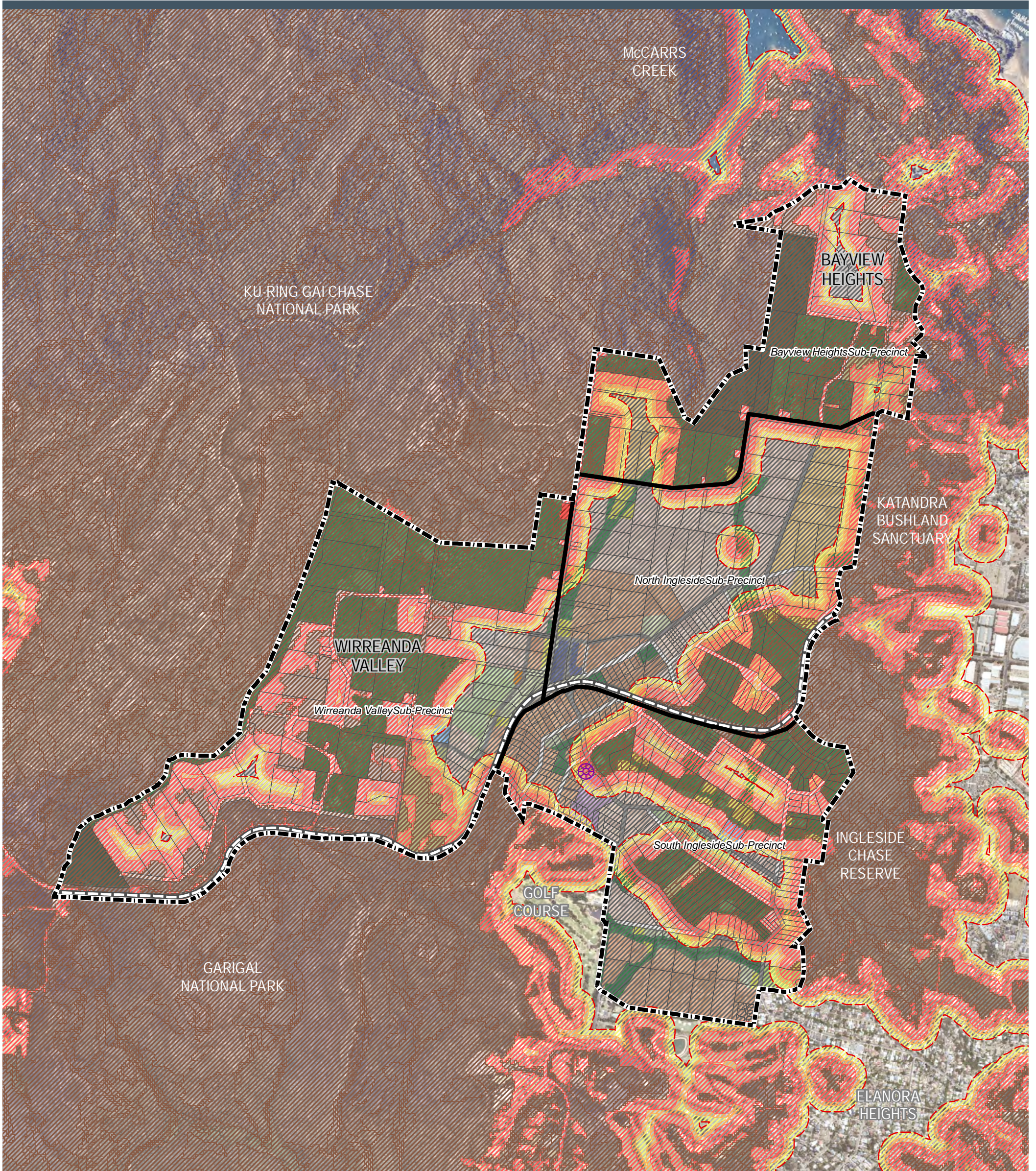
GDA 94 Zone 56

Data Source: Cadastre sourced from NSW State Government 2018, Nearmaps 20/1/18

0 0.45 0.9 km
1:18,000

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- Precinct boundary
- Sub-Precinct Boundaries
- Preferred Location for Neighbourhood Shops
- Proposed Mona Vale Road Corridor
- Structure Plan - Land use**
- Houses on Larger Lots
- Houses
- Low Rise Apartment /

- Village Centre
- Community Centre
- Proposed School
- Park
- Sporting Fields
- Environmental Management
- Environmental Conservation
- National Park
- Rural
- Rural Fire Service Station
- Sewer Pump Station
- Water Management
- Water Reservoir
- Existing Road
- Major Road

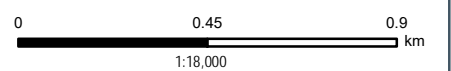
- Landscape Risk - Proposed (IntPropSWN100 - FFDI100)**
- Bushfire hazard area
 - Flame contact 0 - 50m buffer
 - Radiant heat exposure 0 - 70m buffer
 - Ember attack 0 - 100m buffer
 - Cadastral boundary
 - Primary loss extent and extent of statutory planning and building controls 100m buffer
 - Secondary extent loss 700m buffer

Bushfire intensity modelling supplied by Ecological Australia, May 2018

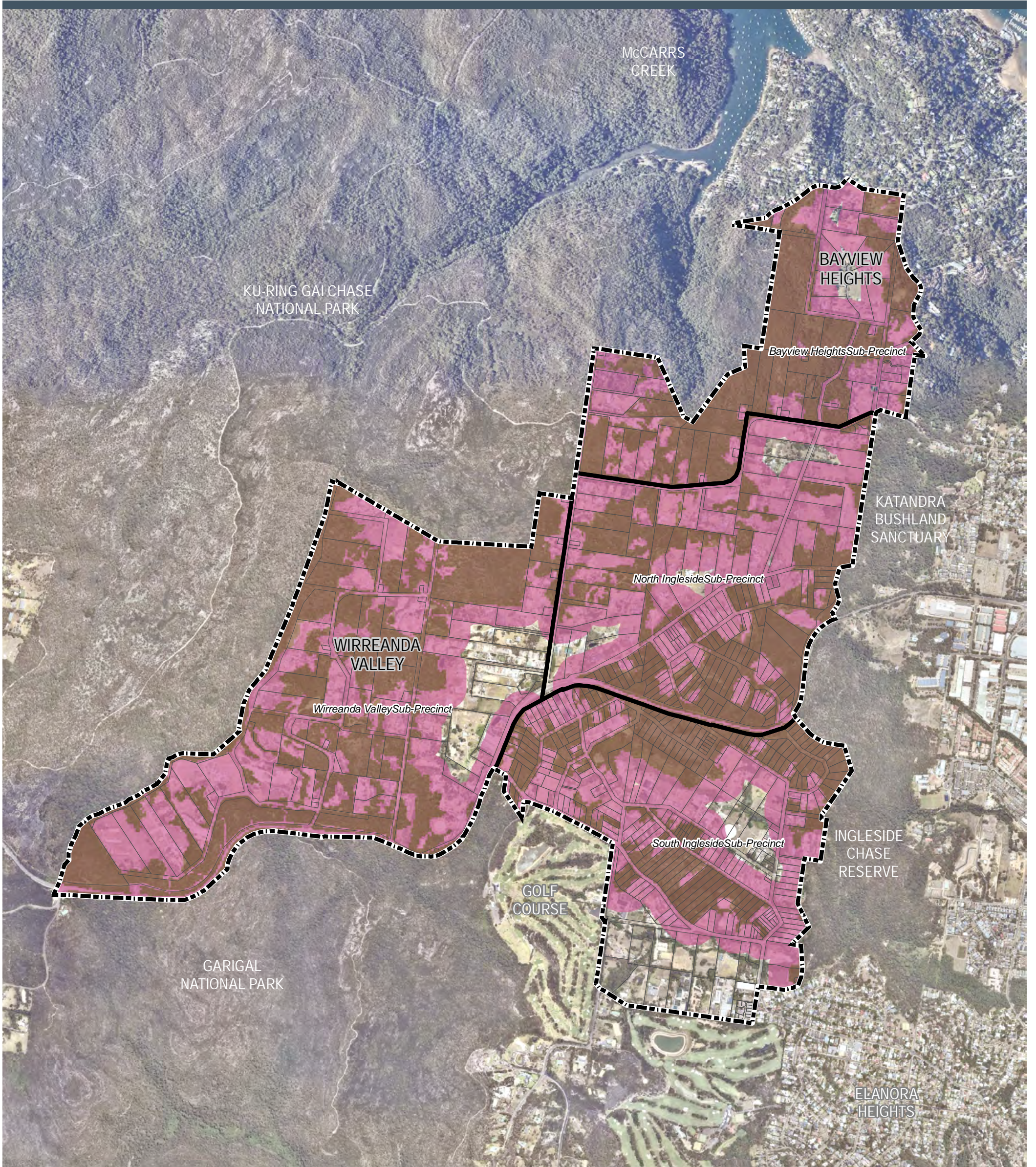
3/09/2018






GDA 94 Zone 56

Data Source: Cadastre sourced from NSW State Government 2018, Nearmaps 20/1/18



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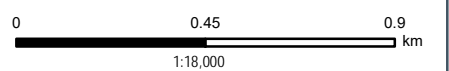
-  Precinct boundary
-  Sub-Precinct Boundaries
- Localised Risk - Current (IntCurSWN100 - FFDI100)**
-  Bushfire hazard area
-  Primary loss extent
-  Cadastral boundary

Original bushfire intensity modelling supplied by Ecological Australia, May 2018

15/05/2018

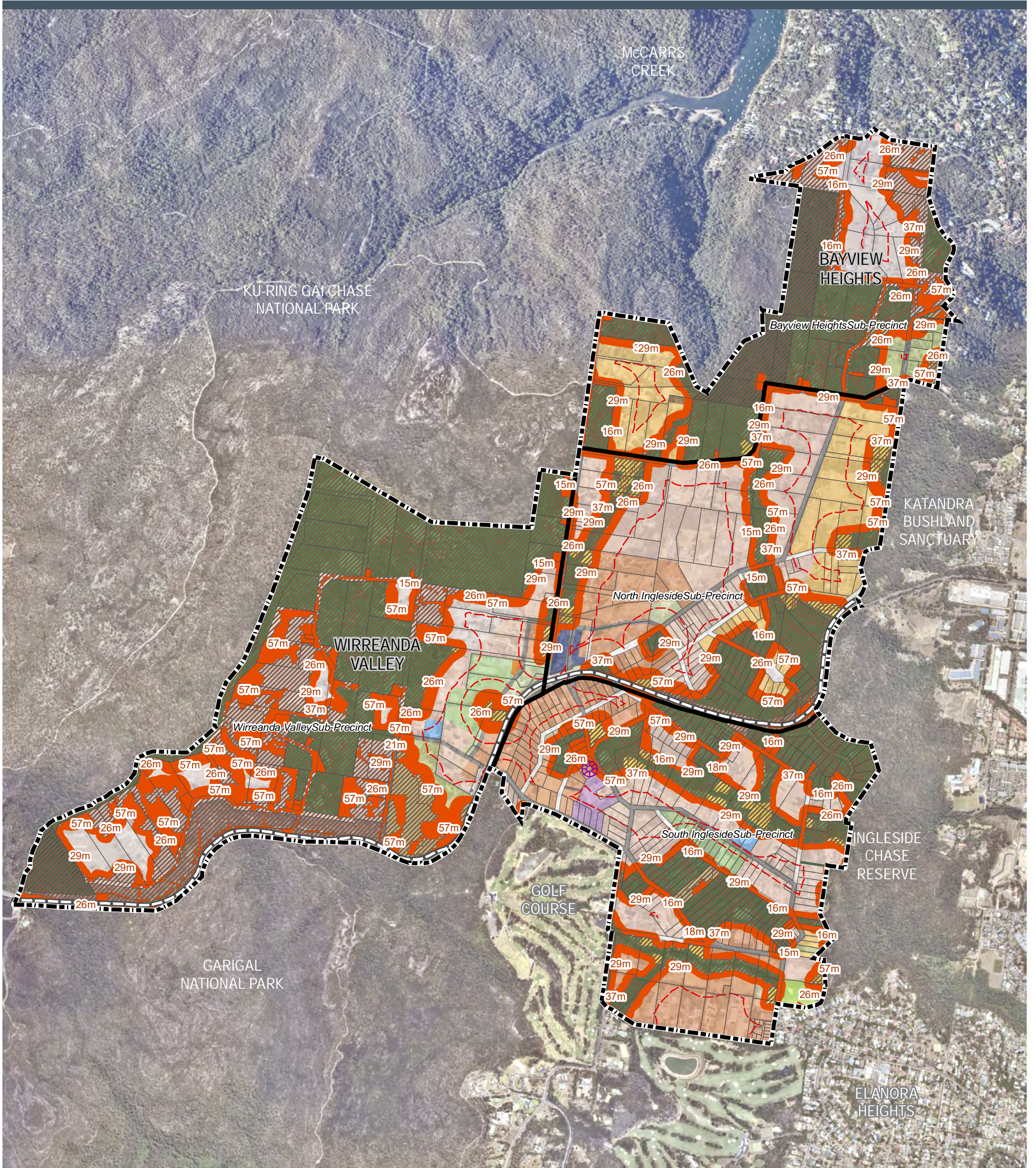
GDA 94 Zone 56

Data Source: Cadastre sourced from NSW State Government 2018, Nearmaps 20/1/18



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	Precinct boundary		Environmental Conservation
	Sub-Precinct Boundaries		National Park
	Bushfire hazard area		Private Open Space
	Minimum asset protection zone (indicative only)		Rural
	Primary loss extent & extent of statutory planning & building controls		Rural Fire Service Station
	Cadastral boundary		Sewer Pump Station
	Preferred Location for Neighbourhood Shops		Water Management
	Proposed Mona Vale Road Corridor		Water Reservoir
			Park
			Sporting Fields
			Environmental Management
			Major Road
			Houses on Larger Lots
			Houses
			Low Rise Apartment / Townhouses
			Village Centre
			Community Centre
			Proposed School

**INDICATIVE ONLY
NOT FOR
STATUTORY PURPOSES**
Buffer labels provide a sample distance only

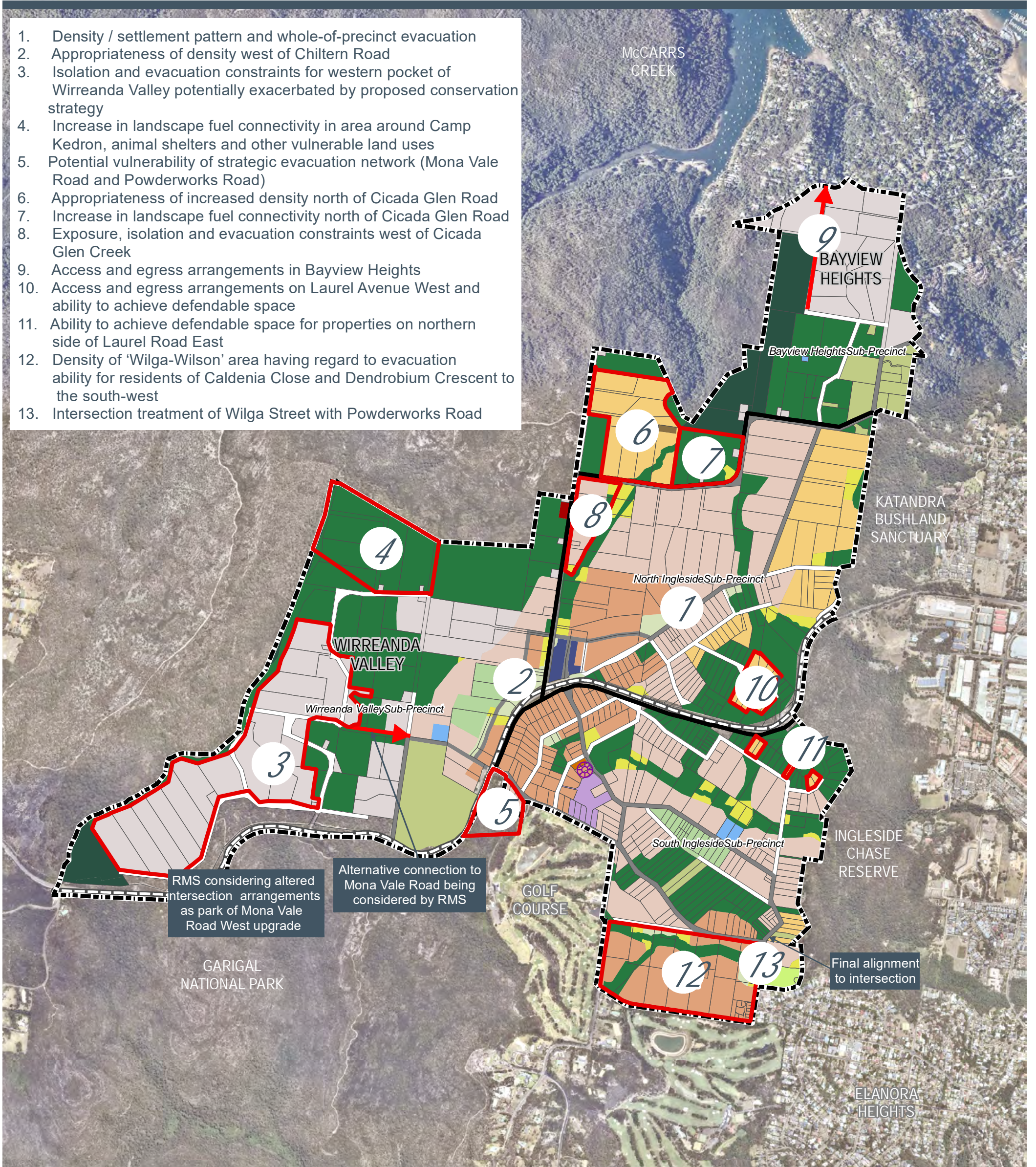
10/05/2018
GDA 94 Zone 56
Data Source: Cadastre sourced from NSW State Government 2018, Nearmaps 20/1/18
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Original bushfire intensity modelling supplied by Ecological Australia, May 2018

Appendix E Strategic Bushfire Issues Map

1. Density / settlement pattern and whole-of-precinct evacuation
2. Appropriateness of density west of Chiltern Road
3. Isolation and evacuation constraints for western pocket of Wirreanda Valley potentially exacerbated by proposed conservation strategy
4. Increase in landscape fuel connectivity in area around Camp Kedron, animal shelters and other vulnerable land uses
5. Potential vulnerability of strategic evacuation network (Mona Vale Road and Powderworks Road)
6. Appropriateness of increased density north of Cicada Glen Road
7. Increase in landscape fuel connectivity north of Cicada Glen Road
8. Exposure, isolation and evacuation constraints west of Cicada Glen Creek
9. Access and egress arrangements in Bayview Heights
10. Access and egress arrangements on Laurel Avenue West and ability to achieve defensible space
11. Ability to achieve defensible space for properties on northern side of Laurel Road East
12. Density of 'Wilga-Wilson' area having regard to evacuation ability for residents of Caldenia Close and Dendrobium Crescent to the south-west
13. Intersection treatment of Wilga Street with Powderworks Road



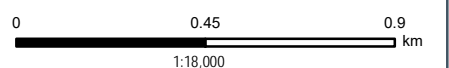
Precinct boundary	Village Centre	Private Open Space
Sub-Precinct Boundaries	Community Centre	Rural
Strategic Exposure and Risk Areas	Proposed School	Rural Fire Service Station
Structure Plan - Land use	Park	Sewer Pump Station
Houses on Larger Lots	Sporting Fields	Water Management
Houses	Environmental Management	Water Reservoir
Low Rise Apartment / Townhouses	Environmental Conservation	Existing Road
	National Park	Major Road

Preferred Location for Neighbourhood Shops
Proposed Mona Vale Road Corridor
Cadastral boundary

28/05/2018

GDA 94 Zone 56

Data Source: Cadastre sourced from NSW State Government 2018, Nearmap 20/1/18



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Appendix F Development Scenario Analysis

Development scenario analysis – Ingleside Planned Precinct

Scale of Risk Tolerance/Appetite	Type of Risk Treatment	Potential Development Scenario	Combined Risk Reduction Mitigation/Treatment Measures	Contribution to Risk 'Acceptability'	Complexity of Implementation	Likely Transfer of Residual Risk
Lower exposure options	Avoid	No further development but implement full suite of strategic mitigation measures to mitigate existing risk	To avoid any increase in life or property risk exposure, avoid future development of Ingleside by arresting development and maintaining current settlement pattern but with the consideration of relevant measures contained at Section 10. This represents the strongest form of risk treatment, by avoiding any further population or property risk exposure whilst seeking to mitigate existing risk.	Existing risk is acknowledged and sought to be mitigated to that extent possible by physical intervention (i.e. land management and land use measures), without introducing additional population, property and infrastructure exposure.	<ul style="list-style-type: none"> • Immediate and ongoing costs of implementation of mitigation measures • Physical limitation in implementation (i.e. topographical constraints etc. which preclude certain treatments from taking place) • Collaborative approaches between land managers and emergency management representatives • Annual mitigation implementation, reliant on government budgets, resources and suitable weather windows of opportunity • Strong reliance on community responsibility 	Existing settlement pattern which has emanated since Ingleside was first established is subject to certain vulnerabilities from bushfire. Without change to the existing settlement pattern, the onus is on community awareness, transferring risk considerations on to local government, NSWRFs, local residents and the insurance industry to mitigate and recover from an event.
	Mitigate	Avoid further development north of Mona Vale Road and assuming evacuation traffic study supports, development of South Ingleside but not North Ingleside and with property-based mitigation measures and consideration of suite of measures contained at Section 10	Assuming support from an evacuation traffic study, development of South Ingleside is subject to comparably lower risk exposure than other Sub-Precincts and can be mitigated via: <ul style="list-style-type: none"> • Settlement pattern • Evacuation route network options provided by Mona Vale Road (fully upgraded as a precondition to any development), Powderworks, Manor and Ingleside Roads • Suitable intersection treatments at the above intersections as well as Powderworks Road and Wilga Street • Investigation into potential use of new school for evacuation centre purposes • Reduction of fuel in proximity to Powderworks Road intersection with Mona Vale Road 	These measures, in combination, contribute to a land use rationale for South Ingleside which logically extends upon existing development in Elanora Heights, addressing primary fire run risk and establishing the primary evacuation route network, including the address of its vulnerabilities as relevant to the Sub-Precinct. In combination, these measures seek to mitigate the life and property loss risk exposure to Ingleside as low as reasonably practicable whilst balancing the desire for development in this location. A level of risk is acknowledged and accepted by stakeholders, which subject to additional mitigation measures (i.e. implemented by NSWRFs, Council, etc.) is identified as representing 'acceptable' risk.	<ul style="list-style-type: none"> • Process to undertake evacuation traffic modelling likely to require stakeholder workshopping and agreement • Determination of fit-for-purpose evacuation window is required (i.e. based on bushfire behaviour modelling) • Cost-benefit equation of infrastructure provision based on density of South Ingleside alone • Immediate and ongoing costs of implementation of mitigation measures • Physical limitation in implementation (i.e. topographical constraints etc. which preclude certain treatments from taking place) • Collaborative approaches between land managers and emergency management representatives • Annual mitigation implementation, reliant on government budgets, resources and suitable weather windows of opportunity 	Other agencies will be required to implement mitigation measures including fuel and land management annually – with budget and resourcing available to do so, increased exposure to people, infrastructure and property for which Council, emergency services, the community, infrastructure providers and insurance industry are required to mitigate. Should the new school be identified as an evacuation centre, its ability to operate as such may require annual maintenance, etc. Ember attack is unlikely to be mitigated beyond that required by AS3959 which may not reflect the extent of property loss/damage which occurred in 1994 when the Cottage Point fire breached the golf courses. Interim risk may be higher than the completed risk exposure level, which will also require appropriate mitigation.
Moderate exposure options	Mitigate	Assuming evacuation traffic study supports, development of South Ingleside and eventually North Ingleside, but only to a doubling of existing density (i.e. one into two lot expansion) and with property-based mitigation measures and consideration of suite of measures contained at Section 10	Assuming support from an evacuation traffic study, development of South and North Ingleside (to an extent) can be mitigated via: All of the dot points above, plus – <ul style="list-style-type: none"> • Settlement pattern 	These measures, in combination, contribute to a land use rationale for South Ingleside which logically extends upon existing development in Elanora Heights, addressing primary fire run risk and establishing the primary evacuation route network, including the address of its vulnerabilities as relevant to the Sub-Precinct. In combination, these	<ul style="list-style-type: none"> • Process to undertake evacuation traffic modelling likely to require stakeholder workshopping and agreement • Determination of fit-for-purpose evacuation window is required (i.e. based on bushfire behaviour modelling) 	A moderate level of risk is transferred to Council, emergency services, community and infrastructure and insurance providers. This is largely associated with ongoing management processes and suppression and evacuation requirements during events.

			<ul style="list-style-type: none"> • Land use allocation • Density limited to an approximate one into two lot subdivision (i.e. double in density) • Upgrade to design of existing evacuation route network • Revision of the re-vegetation intent internal to the Precinct 	<p>measures seek to mitigate the life and property loss risk exposure to Ingleside as low as reasonably practicable whilst balancing the desire for development in this location.</p> <p>For North Ingleside, the capacity of the road network in times of evacuation is not overloaded by the doubling of existing density. The settlement pattern and land use rationale of the Sub-Precinct are revised to reduce landscape risk exposure and limit potential urban fire intrusion. Density is deliberately limited a) in response to evacuation network capacity and b) to adequately separate dwellings and reduce risk of house-to-house ignition.</p> <p>A level of risk is acknowledged and accepted by stakeholders, which subject to additional mitigation measures (i.e. implemented by NSWRFSS, Council, etc.) is identified as representing 'acceptable' risk.</p>	<ul style="list-style-type: none"> • Cost-benefit equation of infrastructure provision based on density of South Ingleside and only marginal increase in density in North Ingleside • Immediate and ongoing costs of implementation of mitigation measures • Physical limitation in implementation (i.e. topographical constraints etc. which preclude certain treatments from taking place) • Collaborative approaches between land managers and emergency management representatives • Annual mitigation implementation, reliant on government budgets, resources and suitable weather windows of opportunity 	<p>If an alternative evacuation model is selected, potential to perpetuate a cycle of reliance upon all levels of government before, during and after and event rather than individual or household responsibility.</p> <p>Ember attack is unlikely to be mitigated beyond that required by AS3959 which may not reflect the extent of property loss/damage which occurred in 1994 when the Cottage Point fire breached the golf courses.</p> <p>Evacuation networks may become a single point a failure, if no other options for resident safety can be provided.</p>
	Mitigate	<p>Assuming evacuation traffic study supports, development of South Ingleside and eventually North Ingleside, but only to a maximum density of 10 dwellings per hectare and with property-based mitigation measures and consideration of suite of measures contained at Section 10</p>	<p>Assuming support from an evacuation traffic study, development of South and North Ingleside (to an extent) can be mitigated via:</p> <p>All of the dot points above, plus –</p> <ul style="list-style-type: none"> • Settlement pattern • Land use allocation • Density limited to an approximate 10 dwellings per hectare (circa 900m² per lot) • Upgrade to design of existing evacuation route network • Revision of the re-vegetation intent internal to the Precinct 	<p>These measures, in combination, contribute to a land use rationale for South Ingleside which logically extends upon existing development in Elanora Heights, addressing primary fire run risk and establishing the primary evacuation route network, including the address of its vulnerabilities as relevant to the Sub-Precinct. In combination, these measures seek to mitigate the life and property loss risk exposure to Ingleside as low as reasonably practicable whilst balancing the desire for development in this location.</p> <p>For North Ingleside, the capacity of the road network in times of evacuation is not overloaded by the very low urban residential density. The settlement pattern and land use rationale of the Sub-Precinct are revised to reduce landscape risk exposure and limit potential urban fire intrusion. Density is deliberately limited a) in response to evacuation network capacity and b) to adequately separate dwellings and reduce risk of house-to-house ignition.</p> <p>A level of risk is acknowledged and accepted by stakeholders, which subject to additional mitigation measures (i.e. implemented by</p>	<ul style="list-style-type: none"> • Process to undertake evacuation traffic modelling likely to require stakeholder workshopping and agreement • Determination of fit-for-purpose evacuation window is required (i.e. based on bushfire behaviour modelling) • Cost-benefit equation of infrastructure provision based on density of South Ingleside and very low urban residential density of North Ingleside • Immediate and ongoing costs of implementation of mitigation measures • Physical limitation in implementation (i.e. topographical constraints etc. which preclude certain treatments from taking place) • Collaborative approaches between land managers and emergency management representatives • Annual mitigation implementation, reliant on government budgets, resources and suitable weather windows of opportunity 	<p>A moderate level of risk is transferred to Council, emergency services, community and infrastructure and insurance providers. This is largely associated with ongoing management processes and suppression and evacuation requirements during events.</p> <p>If an alternative evacuation model is selected, potential to perpetuate a cycle of reliance upon all levels of government before, during and after and event rather than individual or household responsibility.</p> <p>Ember attack is unlikely to be mitigated beyond that required by AS3959 which may not reflect the extent of property loss/damage which occurred in 1994 when the Cottage Point fire breached the golf courses.</p> <p>Evacuation networks may become a single point a failure, if no other options for resident safety can be provided.</p>

				NSWRFS, Council, etc.) is identified as representing 'acceptable' risk.		
Higher exposure options	Transfer	Develop the Precinct with property-based mitigation measures (including evacuation centres and NSPs)	Limited to relevant measures which include: <ul style="list-style-type: none"> • Fire trail and fire break network • Changes to land use intents in specific locations • Static water supply opportunities • Road network access and egress options to enhance evacuation resilience • Revision to corridor network and extent of environmental management • Intersection treatments • Land management in Garigal National Park. 	The level of risk is considered acceptable by relevant stakeholders without any discernible need for further investigation with regard to the performance of the road network using an event scenario-based approach.	Focus is placed on mitigation measures which are demonstrated by the attached report to be insufficient to lower risk profile to a tolerable level. The measures may incorporate cost implications both immediate and long term. Longer term management may also be required from relevant lead agencies.	Majority of risk is transferred to Council, emergency services, the community and infrastructure and insurance providers on the assumption the road network will facilitate evacuation as required and evacuation centres will perform as desired. If an alternative evacuation model is selected, potential to perpetuate a cycle of reliance upon all levels of government before, during and after and event rather than individual or household responsibility.
	Transfer	Development of the current draft Structure Plan with no changes	Nil	The level of risk is considered acceptable by relevant stakeholders without any discernible need for land use planning mitigation measures.	Negligible, reliance on existing measures in place (i.e. fire management strategies and emergency management strategies is considered sufficient to accommodate increased development and population.	Majority of risk is transferred to Council, emergency services, the community and infrastructure and insurance providers.

