



Penrith City Council

**Cooling the City:
Planning for Heat Issues Paper**

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Executive Summary

Penrith City Council (Council) is committed to improving the liveability outcomes of urban development within the Penrith Local Government Area (LGA) to address the urban heat island (UHI) effect and a changing climate.

Planning can play an important role in the mitigation and reduction of the UHI effect, particularly for new developments. However, the NSW planning system currently limits Councils' ability to enable improved outcomes on certain types of development. In many cases, councils are only able to encourage and recommend good practice. The State Government plays a significant role in developing policy and legislation that mandates better liveability outcomes within developments.

This paper identifies two key issues and five actions which have the potential to make a significant difference in ensuring that urban heat is addressed in new urban development across Western Sydney, that is guided and approved using policy and legislative instruments managed by the State Government.

These issues and associated actions are:

Issue 1: Greenfield subdivisions in Western Sydney are being built with minimal provision for tree canopy cover, exacerbating the urban heat island effect

- Action 1.1: Mandating tree canopy cover targets
- Action 1.2: Enforcing larger verge widths for street tree plantings
- Action 1.3: Amending the Exempt and Complying Code

Issue 2: Existing planning legislation managed by the NSW Government is facilitating development which contributes to the cumulative urban heat island effect in Western Sydney

- Action 2.1: Revising BASIX
- Action 2.2: Revising industry design guides

In preparing this issues paper, the project team engaged with 147 community and stakeholder representatives including town planners, architects, property developers, scientists and sustainability experts. Overall, the results of this consultation clearly demonstrate these issues are common across Western Sydney, and State Government leadership is necessary to improve community outcomes and address the UHI effect within developments.

Introduction

Penrith City Council Initiatives

In 2015, Council released the **Cooling the City Strategy**¹. The strategy states, 'The urbanisation of our cities, along with predicted changes to our climate and an ageing population mean that urban heat is becoming an increasingly significant issue for cities right across the world.' Its purpose is 'To identify strategies to cool our City and region in a way that improves liveability and prioritises protection from heat for people and communities.'² Six key strategy areas were identified to manage urban heat including: policy and planning, social, community engagement, green infrastructure, water sensitive urban design and increased reflectivity.

The following are examples of Council's actions to help Cool the City:

- In February 2020, Council convened the **Cooling the City Masterclass**. Around 350 built environment professionals attended to be inspired and challenged by leading experts to work together to create cooler and more liveable cities.
- The findings of the **Benchmarking Summer Heat Across Penrith, New South Wales**³ report were published in August 2020. A joint project of Council and Western Sydney University undertaken over the summer months of 2019-20, the study found that temperatures over 35°C were recorded over 39 days in Penrith during the summer. Temperatures over 50°C were recorded at six locations on 4 January 2020.
- Contemporising and **reviewing Councils planning controls** within its **Development Control Plan** to assist with urban heat mitigation such as requirements for shade, tree planting including tree canopy requirements and building materials.
- Development of a **Green Grid Strategy** to create a network of green corridors and green space connecting urban centres, hubs, residential areas and our waterways whilst providing benefits of increased tree canopy cover to cool the city and enhance biodiversity.
- Since the adoption of the Cooling the City Strategy, Council has undertaken Tree planting projects in reserves, parks, streets and bushland, planting over 186,000 trees. Over 5,500 plants have also been given away to residents at community events.
- Council's **Nursery** has been developed and has prepared its own sustainability plan. The Nursery will provide appropriate species for tree planting projects to cool the city.
- **Playground shade** project – to provide shade structures and tree canopy at playgrounds across the Penrith area.
- Cooling the city principles and attributes are being incorporated into the planning and design of large capital projects including the development of **City Park** as a new green space in the heart of the Penrith CBD, Regatta Park and Soper Place.

Council is also a proud **Resilient Sydney** member and has actively contributed to The **Resilient Sydney Strategy: A Strategy for City Resilience**. In turn, Council has also developed a **Resilient Penrith Action Plan** (adopted in June 2021) to build the resilience of Penrith and its community at the local level.

¹ Penrith City Council 2015, 'Cooling the City Strategy'

² Penrith City Council 2015, 'Cooling the City Strategy', p.6

³ Western Sydney University (2020) Benchmarking summer heat across Penrith, New South Wales

Our Community

Extreme heat has been identified as a key climate risk and priority shock facing the Penrith community. Council is committed to addressing this shock and supporting its community to achieve a cool, liveable city by undertaking action and advocating for change within the state planning system to ensure that adaptation to heat and cooling principles and practices are incorporated into the planning, design and development of our City and Western Sydney as a whole.

Penrith's population continues to grow and also continues to age. Between 2011 and 2020 the number of people aged over 60 is expected to increase by more than 30%. Those over 65 in the community are considered to be one of the most vulnerable age groups to extreme temperatures. Residents within the Penrith LGA are concerned about the impacts that growth and development may have on the urban heat island effect, with urban areas and new development areas becoming hotter with the increase of buildings and hard surfaces, potentially affecting thermal comfort and health. There can be misperceptions that Council is responsible for all development that occurs within our LGA, this issues paper will highlight the responsibilities of the state government in planning and development, and advocate for change to ensure new developments are designed to adapt to heat.

Impacts on Feasibility

The Penrith LGA is an attractive location for new homeowners due to its affordability⁴, availability of housing, and proximity to future key infrastructure such as the Western Sydney Aerotropolis and metro stations. These factors have contributed to a projected 120,600 additional residents to be living within the LGA between 2021 and 2041⁵. To support this new population, tens of thousands of new dwellings are required, ranging from detached dwellings to high density apartments.

Balancing the impacts of extreme heat on the health and safety of Penrith while ensuring that development remains feasible to meet demand and forecast population growth, has been a key consideration of this paper. Input from the consultation process has helped refine and curate the actions to ensure they consider development feasibility and where possible, limit impacts on future residents and prioritise low-cost interventions to the current development pattern.

Engagement with the property development industry has identified that the proposed actions will have a limited impact on development feasibility. To manage impacts on feasibility, all the individuals engaged with stated that flexibility in the application of any action or development standard was important. It was agreed that improved outcomes can be achieved through a variety of ways, and that not every action will be appropriate for every development. Accordingly, achieving a qualitative outcome or principle (such as responding to the identified issues in this paper) was preferred over achieving strict targets or development standards.

Strategic Context

Planners are required to work within the planning system and regulations. Ideally these should be responsive to new technologies, changing community expectations and legislative shifts. However, there can be a lag between these changes and revisions to the planning system, leaving planners with limited capacity to address new challenges as they arise.

⁴ Western Sydney suburb Penrith named the most affordable area to buy in Sydney (2018) - realestate.com.au - <https://www.realestate.com.au/news/western-sydney-suburb-penrith-named-the-most-affordable-area-to-buy-in-sydney/>

⁵ Department of Planning, Industry and Environment (2019) Population Projections

In its Urban Heat Planning Toolkit, WSROC details the actions Councils and their planners can undertake to improve sustainability within the areas over which they have influence, including Local Strategic Planning Statements (LSPS), Local Environment Plans (LEP) and Development Control Plans (DCP).⁶

This issues paper seeks to take the next step, drawing on the working knowledge and expertise of building professionals across Western Sydney to identify where changes to the planning system, that lie outside of council control, are required to address urban heat. These proposed changes have the potential to improve liveability for our communities.

Importantly, this issues paper seeks to compliment work already undertaken in this space, while also positioning Council as a leader and an advocate for change.

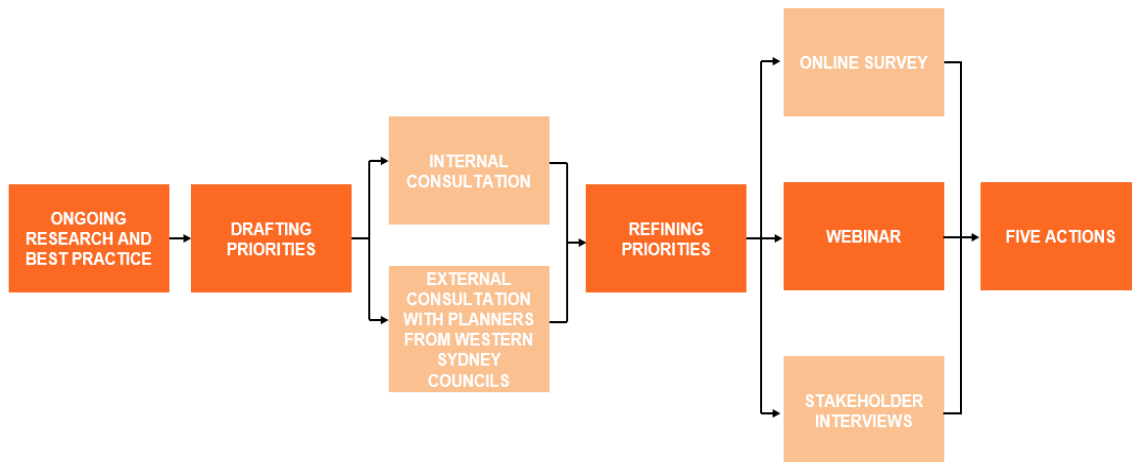
The overarching objective of this paper is for the NSW State Government to undertake a holistic review of the planning system including planning policies and other instruments to ensure they are addressing urban heat across NSW.

⁶ Western Sydney Regional Organisation of Councils (2020) Urban Heat Planning Toolkit, p.36

Engagement

The actions outlined within this issues paper have been developed and refined based on a two-phase stakeholder engagement process (see Figure 1).

Figure 1: Engagement Phases 1 and 2



In the first phase of engagement, internal experts were engaged through a workshop session to discuss issues and opportunities for proposed changes to the planning system to better address urban heat. Feedback on the issues and opportunities was then sought externally from planners across Western Sydney Council’s.

The second round of engagement sought feedback from development, construction and building professionals with experience within Western Sydney. Consultation and feedback was sought through an online Webinar, Survey and Stakeholder Interviews with property developers and professionals. A total of nine priorities were presented to participants, which have now been refined into five actions. A summary is provided in Figure 2 below.

Figure 2: Phase 2 Engagement Summary

OVERWHELMINGLY SUPPORTIVE	WIDE REACH	HIGHLY ATTENDED
On average, 87% of respondents supported the proposed actions	Feedback was received from Property developers , Architects, Engineers, Policy Officers , Arborists, Asset Managers , and Sustainability Officers	75 Webinar Attendees 60 Surveys Completed 5 Stakeholder Interviews

Issues and Actions

The following pages discuss the key actions which have resulted from background research and engagement. These actions have been designed to respond to two key issues which are felt in Western Sydney, being:

1. Greenfield subdivisions in Western Sydney are being built with minimal provision for tree canopy cover, exacerbating the urban heat island effect
2. Existing planning legislation managed by the NSW Government is facilitating development which contributes to the cumulative urban heat island effect in Western Sydney

Issue 1: Greenfield subdivisions in Western Sydney are being built with minimal provision for tree canopy cover, exacerbating the urban heat island effect

Despite recommendations from industry bodies such as the Greater Sydney Commission⁷ and WSROC⁸ to establish tree canopy cover targets, urban release areas and greenfield subdivisions facilitated by the NSW Government do not require the consideration of tree canopy cover as part of the masterplanning and development process. This has resulted in low levels of canopy cover within greenfield release areas, often falling below a coverage of 10% across the total precinct.⁹

For the Penrith Local Government Area, and many other Western Sydney Council's, greenfield subdivision (as opposed to urban infill) is forecasted to be the primary form of urban growth for the next 15 years^{10 11}. It is therefore vital that a collaborative approach is taken between Penrith, Western Sydney Council's, and the NSW Government if an effective solution is to be achieved to mitigate the urban heat island effect.

The Greater Sydney Commission states every 10 percent increase in tree canopy cover can reduce land surface temperatures by 1.13°C¹². In Phoenix Arizona it was found that 0.14 °C cooling is provided for every percentage increase in tree cover. Canopy trees that provide shade to building facades, walls and roofs are therefore very effective at addressing the UHI effect¹³.

Trees need a dedicated portion of uninterrupted soil and landscaped area to reach maturity and be effective in creating shade.¹⁴The best opportunity to ensure canopy tree planting is at the beginning of the master planning process where dedicated landscaped and deep soil areas can be identified early on and mandated as part of any future revisions.

Setting targets and expectations early within the planning process that a minimum tree canopy cover must be met, will significantly shape the way development occurs within the release areas. There is no 'silver bullet' in addressing the UHI effect in greenfield areas, and a combined approach from both private and public land is required to meet these targets.

Action 1.1: Advocate to the NSW Government to mandate urban tree canopy cover targets in any future release areas. These should be embedded in the master planning process.

Action 1.2: Advocate for the mandating of larger verge widths or alternate street designs within Department led DCP's of new greenfield subdivisions to facilitate canopy tree planting.

Action 1.3: Advocate for the Department of Planning, Industry & Environment to amend the Exempt & Complying Code, requiring higher landscaped areas for smaller lot residential development, which is supported by a tree selection guideline.

Three actions are recommended to address Issue 1.

⁷ Greater Sydney Commission (2018), A Metropolis of Three Cities

⁸ Western Sydney Regional Organisation of Councils (2020) Urban Heat Planning Toolkit, p.36

⁹ NSW Government Spatial Services (2021) – Spatial Digital Twin (Accessed 07 October 2021)

¹⁰ Penrith City Council (2020) Local Strategic Planning Statement

¹¹ Greater Sydney Commission (2018), Western City District Plan

¹² Greater Sydney Commission 2021, Urban tree canopy is decreased

¹³ Western Sydney Regional Organisation of Council's (2020), Urban Heat Planning Toolkit

¹⁴ Department of Planning, Industry and Environment (2021) – All about trees

(<https://www.dpie.nsw.gov.au/premiers-priorities/register-your-tree/All-about-trees>)

Action 1.1: Advocate to the NSW Government to mandate urban tree canopy cover targets in any future release areas. These should be embedded in the master planning process

The NSW Government and Councils are the primary facilitators and proponents of identifying and rezoning land for new urban release areas. With the ongoing construction of the Aerotropolis and associated infrastructure such as the Sydney Metro and new motorways, Penrith City Council and several other Western Sydney Councils are likely to see the identification of new urban release areas in places that are currently zoned rural land which have existing higher levels of tree and vegetation coverage.

Setting targets from the inception at a precinct level will ensure developers are considering tree canopy cover at the time of subdivision and construction, and embedding additional landscaped areas in properties, as well as planning for additional tree canopy in street verges and public areas including parks and green space. In turn, this will set expectations from the beginning on development feasibility, including a review of minimum lot sizes that currently limits options for adequate landscaped area for tree canopy cover.

Increased tree canopy and green cover across Greater Sydney is the primary aim of the Premier's Priority to green our city by planting one million trees by 2022. Councils across Greater Sydney have begun setting tree canopy cover targets, and the Greater Sydney Commission has a target of 40%¹⁵. The City of Sydney and Wollondilly Shire Council also have set targets for 40%, recognising the demand from residents.^{16 17}

It is noted that any target implemented, there should be a degree of flexibility, with the overall aim to improve amenity outcomes and thermal comfort. Not all sites may be suitable for achieving tree canopy cover, but instead could reduce potential urban heat through other mitigation methods (such as reflective roofs, HVAC system location, water in the landscape etc).

Tree canopy cover targets will need to be supported by research into the species of trees to ensure the most suitable species of trees are planted in a precinct, and an agreement would be required on who will maintain trees planted in public and private land.

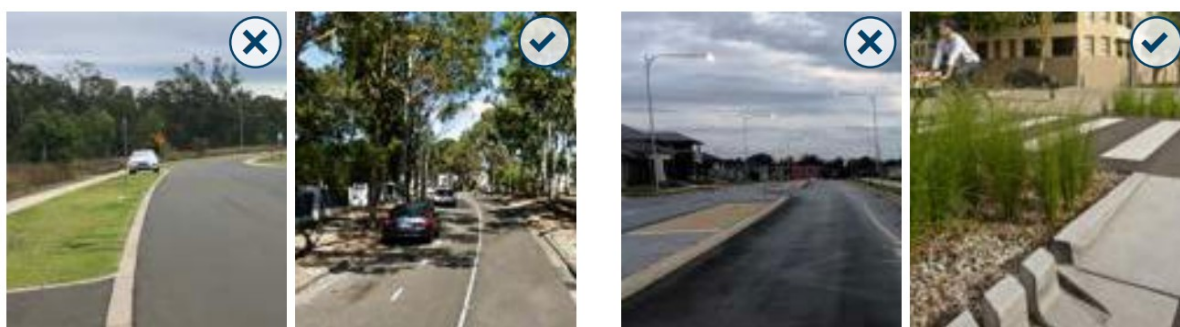
¹⁵ Greater Sydney Commission (2018), A Metropolis of Three Cities

¹⁶ City of Sydney (2021) DRAFT Greening the City Strategy

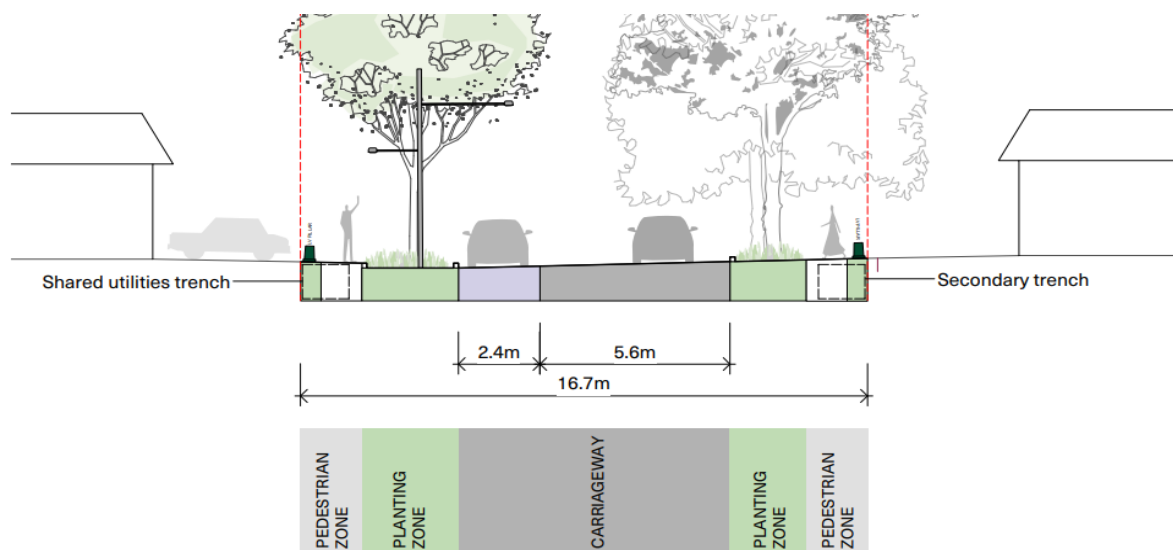
¹⁷ Wollondilly Shire Council (2020) Wollondilly Urban Tree Canopy Plan and Landscape Strategy

Action 1.2: Advocate for the mandating of larger verge widths or alternate street designs within Department led DCP's of new greenfield subdivisions to facilitate canopy tree planting

Street verges in new release areas are often not large enough to provide deep soil area for a large canopy tree while also leaving enough space for services¹⁸. In circumstances where canopy trees cannot be planted on private properties, further emphasis should be made by the Department to ensure trees are planted in street verges to help mitigate urban heat. This can be implemented through a variety of formats besides just widening the street, such as through in-kerb extensions, in the carriageway or even within median strips, as shown in Figure 4 below taken from the Western Sydney Street Design Manual (2020).¹⁹



Ensuring canopy cover is achieved on both sides of the street, and that Water Sensitive Urban Design (WSUD) is integrated on every street



A cross-section of a potential street layout, achieving 76% tree canopy cover after 20 years, permeable surfaces, WSUD and dual footpaths

Figure 4: Potential Street Layouts

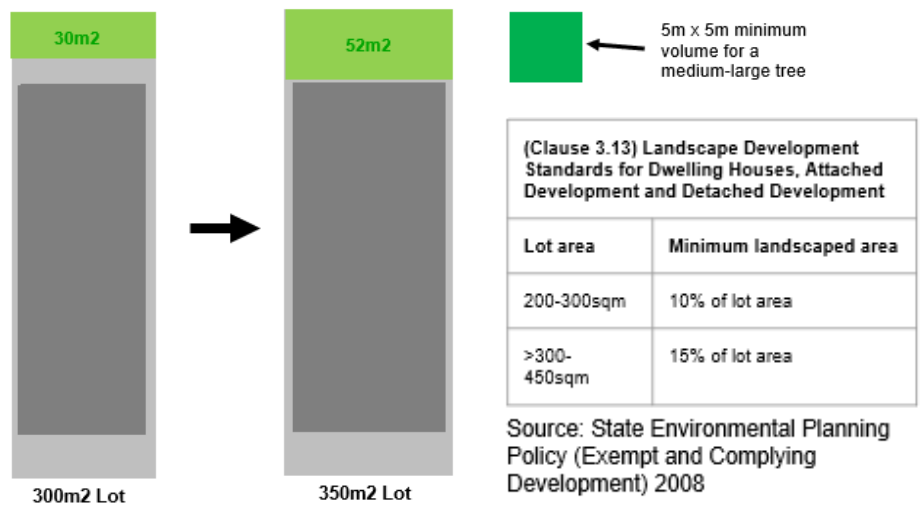
18 Western Sydney Street Design Manual, Western Sydney City Deal (2020)
19 ibid

Action 1.3: Advocate for the Department of Planning, Industry & Environment to amend the Exempt & Complying Code, requiring higher landscaped areas for smaller lot residential development, which is supported by a tree selection guideline

The overwhelming majority of applications for new residential dwellings within urban release areas (such as Glenmore Park South and Jordan Springs) are approved under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (Codes SEPP), therefore bypassing the planning requirements of Council. The Codes SEPP prescribes minimum landscaped areas on a sliding scale dependent on the lot area.

For properties with a lot area between 200m² - 300m² the minimum landscaped area required is only 10% of the total lot area (or 20m² - 30m²), which can be dispersed within the front, side and rear setbacks, provided it has a minimum width of 1.5m.

Figure 5: Small lot landscaped areas



Demonstrated in Figure 5, under the current minimum landscaped area requirements, it is not possible to provide enough landscaped area for a canopy tree to be planted. As this requirement is so low, residents are unlikely to want to keep a medium-large canopy tree to maturity as it may compete with limited private open space and potentially impact on the solar access they receive in this space.

The NSW Government should amend the minimum landscaped area for residential properties to ensure a canopy tree of a medium-large size²⁰ can be accommodated on top of the current minimum landscaped area.

This amendment should be complimented by a tree selection guideline, to assist in choosing the right medium-large canopy tree for a property based on local soil and climate conditions, the associated maintenance of the tree, and potential risks.

Any loss of building footprint could be offset by encouraging two and three storey development instead. This would allow future land owners to still enjoy a similar amount of usable floor space, while improving thermal comfort outcomes.

²⁰ Department of Planning, Industry and Environment (2015) Apartment Design Guide

Issue 2: Existing planning legislation managed by the NSW Government is facilitating development which contributes to the cumulative urban heat island effect in Western Sydney

Energy efficiency and heat stress resistance can be achieved through the design process, but only if both are embedded within regulatory requirements. Embedding heat stress resistance would increase the thermal safety of the buildings themselves²¹, reducing the need to run air conditioning systems as frequently, or enabling air conditioners to be run at a more efficient temperature, thereby increasing energy efficiency and saving on home energy costs.

Alongside NatHERS, assessments for energy efficiency in residential buildings in NSW are undertaken under the Building Sustainability Index (BASIX)²². BASIX also sets minimum standards for emissions and water use²³. To be effective, both tools need to be updated to consider extreme heat.

Studies show a more stringent standard for building envelopes, including a design standard for thermal autonomy (not currently required under BASIX) would deliver more homes for Western Sydney that are significantly safer and more thermally comfortable during extreme heat²⁴.

Homes with low thermal protection become hotter than the temperature outside when insulation is poor and there is no draught sealing²⁵. Detached houses can be especially susceptible to overheating during heatwaves as they have a high surface to volume ratio and usually have windows on all sides. Highly glazed multi-unit dwellings can respond to heatwaves like solar ovens, heating quickly during the day and failing to cool very much at night²⁶.

Cool materials have high emissivity value as well as high diffuse solar reflectivity or albedo. Large scale change in albedo has a significant impact on local peak ambient temperature, and an increase of albedo helps to prevent the absorption of solar radiation²⁷.

Homes that are designed and built as cool homes are crucial in addressing urban heat as they enable people to cope better during heatwaves, particularly where seeking refuge in a cooler space is impossible or in situations where the option of running mechanical cooling throughout the duration of a heatwave is unavailable or cost prohibitive²⁸.

²¹ The Senate Environment and Communications References Committee, 2018, Current and future impacts of climate change on housing, buildings and infrastructure. Commonwealth of Australia, Canberra, p. 87

²² The Senate Environment and Communications References Committee, 2018, Current and future impacts of climate change on housing, buildings and infrastructure. Commonwealth of Australia, Canberra, p. 76

²³ Australian Government Your Home webpage accessed 16/09/2021 yourhome.gov.au/you-begin/building-rating-tools

²⁴ McAuley, A, Osmond, P, Bartesaghi Koc, C and Stoller, P, 2021 Urban heat planning toolkit. Western Sydney Regional Organisation of Councils, Blacktown, p. 28

²⁵ Victorian Council of Social Services, 2021, Feeling the heat. VCOSS, Victoria p. 11

²⁶ McAuley, A, Osmond, P, Bartesaghi Koc, C and Stoller, P, 2021 Urban heat planning toolkit. Western Sydney Regional Organisation of Councils, Blacktown, p. 29

²⁷ Santamouris, M, Storey, M and Prasad, D, 2017, Cooling Western Sydney: A strategic study on the role of water in mitigating heat in Western Sydney. Sydney Water Corporation, Sydney. P. 13

²⁸ McAuley, A, Osmond, P, Bartesaghi Koc, C and Stoller, P, 2021 Urban heat planning toolkit. Western Sydney Regional Organisation of Councils, Blacktown, p. ix

Modelling shows even conservative improvements to energy efficiency requirements in the National Construction Code could reduce household energy bills. In Sydney for example, moving to achieving a 7-star NatHERS rating for an all-electric building would have a 5-year payback period on the initial investment with these households being \$85 better off per month, save 12 months off a 25-year mortgage, and save an estimated \$1,681 annually on energy bills compared to the business as usual building standard²⁹.

Action 2.1: Advocate for the Department of Planning, Industry & Environment to undertake a holistic review of BASIX and the Building Code of Australia, ensuring urban heat is addressed to improve liveability outcomes.

Action 2.2: Advocate for the Department of Planning, Industry & Environment to amend industry design guides to embed mitigation of the UHI effect in new developments.

Two actions are recommended to address Issue 2.

²⁹ Renew, 2021. Households Better Off: Lowering Energy Bills with the 2022 National Construction Code, Renew Melbourne, P. 24

Action 2.1: Advocate for the Department of Planning, Industry & Environment to undertake a holistic review of BASIX and the Building Code of Australia ensuring urban heat is addressed to improve liveability outcomes

A number of sections within BASIX are not responding to the localised and increasingly warmer climate in Western Sydney. Gaps within policy are allowing new development, particularly in greenfield release areas, to be constructed in a way that contributes to the cumulative impacts of the UHI effect.

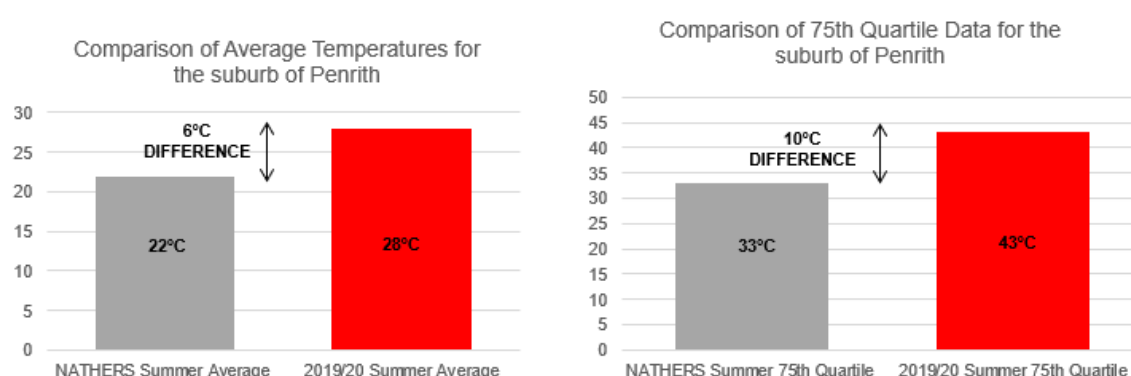
While there have been several amendments to BASIX since its inception in 2004, the NSW Government should consider a holistic review of the policy to ensure it is responding to new challenges. The current BASIX model for modelling thermal resilience uses outdated data and does not require proactive responses to a changing climate³⁰. BASIX should provide a baseline which ensures current development responds to future conditions.

A review and update of BASIX should be undertaken to:

- Require buildings to be designed based on future climate projections (e.g. 2050 - 2070), particularly for NATHERS and NCC Section J Thermal Performance Modelling
- Standards are updated to include new criteria for passive survivability, so that buildings are designed to maintain habitable conditions even during extreme heat and blackout events
- Changes to BASIX & the Building Code of Australia (BCA) to ensure roofs are to be constructed or cladded with materials of a higher albedo (reflectivity)

Detailed in Figure 6 on the following page, the existing NATHERS climate data is already out of data and inconsistent with recent climate studies. With data collected over the 2019 and 2020 summer, Penrith was shown to be 6 degrees hotter on average during the daytime, and 10 degrees hotter when identifying the 75th Quartile.^{31 32}

Figure 6: Current NATHERS data versus recent study for the Penrith LGA



³⁰ Waverley Council (2021) Future Proofing Residential Development to Climate Change

³¹ Benchmarking Summer Heat Across Penrith – Western Sydney University (2020)

³² NATHERS 2022 (accessed September 2021)

Action 2.2: Advocate for the Department of Planning, Industry & Environment to amend industry design guides to embed mitigation of the UHI effect in new developments

The Department of Planning, Industry & Environment manages multiple guidelines which provide consistent planning and design standards for various forms of development such as apartments³³ and low-rise housing³⁴ across the state. Design guides are aimed at improving amenity outcomes in development.

The guidelines are highly detailed documents which outline the minimum built form requirements a new development must achieve. Despite being a minimum requirement, developers often view these as targets to be achieved and do not aim for a higher standard or level of amenity in new developments.

Because these guidelines are mandated state-wide, it is difficult for councils to demand higher standards in local DCP's and LEP's without having significant impacts on feasibility and development demand.

The current set of guidelines do not require developers to consider the impacts generated by the UHI effect in new developments. Yet development facilitated by these guidelines arguably makes some of the largest contributions to the UHI effect. These guides also do not require consideration for human thermal comfort and liveability during very hot conditions and heatwaves.

The NSW Government should amend the various industry design guides to ensure the UHI effect is addressed as part of new development, through interventions such as increased landscaped area for canopy tree planting, requirement of reflective facades and roofs, and providing water in the landscape. This change could potentially be integrated as part of the proposed consolidation of the industry design guides for the Draft Place and Design SEPP³⁵.

³³ NSW Department of Planning, Industry and Environment (2015), Apartment Design Guide

³⁴ NSW Department of Planning, Industry and Environment (2020), Low Rise Housing Diversity Design Guide

³⁵ NSW Department of Planning, Industry and Environment (2021), Draft Design and Place SEPP

Next Steps

Council continues to undertake research at a local level to understand the impact of heat and other shocks and stressors faced by its community. This local expertise should be recognised by the State Government when releasing land for housing development.

Advocacy Strategy

As per Council's Advocacy Strategy, 'Advocacy is the process of influencing others to create change'.

The Strategy's Vision is to 'Influence the decisions made by Government and others to the benefit of our Penrith community and create a more liveable, productive and successful City.'

The purpose of this issues paper is to identify issues and recommend solutions to form the basis of an Advocacy Plan and program that aims to influence other levels of government to amend and update the planning system to improve planning outcomes and create cooler and more liveable communities.

Councils rely on NSW Government guidelines and policies to ensure improved outcomes are delivered. It is vital that urban heat mitigation and adaptation is embedded within the planning system to ensure improved community outcomes across NSW.

APPENDIX A - Background & Context

What is the Urban Heat Island Effect (UHI)?

The UHI effect is a phenomenon where cities and urban spaces become much hotter than surrounding, less urbanised areas. This is primarily because buildings and hard surfaces absorb heat and radiate it back out into the immediate atmosphere. Other factors include the use of air conditioning, which emits heat into the local environment further perpetuating the UHI in a locality³⁶.

The Greater Sydney Commission (GSC) has set out a series of updated measures to indicate levels of urban heat, including:

- Number of hot days (at or above 35C)
- Urban heat impacts on human health
- Proportion of permeable surface cover
- Investment in tree planting³⁷

Who is most vulnerable to the UHI effect?

The UHI effect exacerbates illness, placing pressure on communities, emergency services and the health system. Low-income households are most vulnerable to the UHI effect as they are regularly concentrated in areas with the highest land surface temperatures, and as a result, highest heat exposure and lowest levels of vegetation.

Within the Penrith Council LGA, social service providers identified groups most vulnerable to heat as determined by a combination of personal, social and environmental factors. Groups include:

- People living with mental illness and dementia
- Homeless people
- Victims of domestic violence
- People living with Motor Neuron Disease & Multiple Sclerosis
- Babies and toddlers
- Social housing residents (especially those in Cranebrook)³⁸

³⁶ Penrith City Council 2015, 'Cooling the City Strategy'

³⁷ Greater Sydney Commission 2021, A Metropolis of Three Cities 'PI 4: Addressing urban heat'

³⁸ Penrith City Council 2015, 'Cooling the City Strategy'

What trends are we seeing to combat this?

Trends to combat the UHI effect focus on enhanced, more sustainable urban design. More broadly, these initiatives include:

- Increased albedo (reflectivity) - using building materials including lighter coloured roofs and permeable paving to deflect heat.
- Water Sensitive Urban Design (WSUD) - managing water in urban areas through integrated design, including technologies such as rainwater tanks, wetlands and bioretention systems.³⁹
- Green Infrastructure - creating a network of planned and unplanned green spaces such as parks and private gardens, or more engineered options such as green roofs, green walls and rain gardens.⁴⁰

Within NSW, 'Greening our city' is identified as a Premier's Priority which aims to increase tree canopy cover by planting one million trees by 2022⁴¹. The GSC also identifies a set target to increase tree canopy cover to 40 per cent, up from the current 23 per cent across Greater Sydney.⁴²

³⁹ Penrith City Council 2015, 'Cooling the City Strategy'

⁴⁰ Norton et al. 2014, 'Planning for cooler cities: A framework to prioritise green infrastructure to mitigate high temperatures in urban landscapes'

⁴¹ NSW Government 2021, 'Greening our city'

⁴² Greater Sydney Commission 2021, 'Urban tree canopy cover is increased - Objective 30'

APPENDIX B - Acronyms

CI	Community Indicators Framework
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Codes SEPP	State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
CSP	Penrith Community Strategic Plan
DCP	Penrith Development Control Plan 2014
DPIE	NSW Department of Planning, Industry and Environment
EP&A Act	Environmental Planning and Assessment Act 1979
FSR	Floor Space Ratio
GSC	Greater Sydney Commission
LEP	Penrith Local Environmental Plan 2010
LGA	Local Government Area
LHS	Penrith Local Housing Strategy
LSPS	Penrith Local Strategic Planning Statement
OSO	Outer Sydney Orbital
SEPP	State Environmental Planning Policy
STEM	Science, Technology, Engineering and Math
UIA	Urban Investigation Areas
URA	Urban Release Areas
WSROC	Western Sydney Regional Organisation of Council's

APPENDIX C - References

- Australian Government Your Home webpage accessed 16/09/2021 yourhome.gov.au/you-begin/building-rating-tools
- Benchmarking Summer Heat Across Penrith – Western Sydney University (2020)
- City of Sydney (2021) DRAFT Greening the City Strategy
- Department of Planning, Industry and Environment (2015) Apartment Design Guide
- Department of Planning, Industry and Environment (2019) Population Projections
- Department of Planning, Industry and Environment (2021) – All about trees (<https://www.dpie.nsw.gov.au/premiers-priorities/register-your-tree/All-about-trees>)
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APPENDIX D –Priorities used for Engagement

- **Priority 1:** Department of Planning, Industry & Environment to undertake a holistic review of BASIX and the Building Code of Australia to ensure improved sustainability outcomes.
- **Priority 2:** Department of Planning, Industry & Environment to amend the Exempt & Complying Code, requiring higher landscaped areas for smaller lot residential development, which is supported by a tree selection guideline.
- **Priority 3:** The NSW Government to mandate urban tree canopy cover targets in any future release areas. These should be embedded in the master planning process.
- **Priority 4:** The NSW Government must work collaboratively with councils early in the design stage to help deliver sustainable transport options and infrastructure.
- **Priority 5:** Department of Planning, Industry & Environment to amend industry design guides to embed mitigation of the UHI effect in new developments.
- **Priority 6:** Requiring the use of recycled water to ensure water in the landscape in BASIX and state policies.
- **Priority 7:** Providing flexibility in state policy to achieve desired urban heat outcomes.
- **Priority 8:** Preparation of a guidance document to assist developers in urban heat mitigation and adaptation in developments through sustainable design and climate adapted buildings.
- **Priority 9:** Mandating of larger verge widths or alternative street designs within Department led DCPs of new greenfield subdivisions to facilitate canopy tree planting.