

North Head Sanctuary - Planning for Bushfire Protection Master Planning

**For
Sydney Harbour Trust**

10 September 2023

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Overview

Blackash has been engaged by Sydney Harbour Trust (SHT) to assist in the master planning for North Head Sanctuary. SHT are undertaking a master planning exercise for North Head Sanctuary (NHS) which will be commencing the process of updating the strategic land use plans for the site. The SHT will be investigating options for the adaptive reuse of existing buildings within the site. As existing assets, the adaptive reuse will need to be considered on a risk and merit-based case by case review, balancing the bushfire risk, vulnerability of occupants, lease and licence controls and the emergency management arrangements that can be utilised within the site and for the intended purpose.

Adaptive reuse is a process that changes a disused or ineffective building into a refreshed item that can be used for a different purpose. The adaptive reuse of a historic building and buildings within the NHS should have minimal impact on the heritage significance of the building and its setting (including minimising environmental impacts). Sometimes, adaptive reuse is the only way that the building's fabric will be properly cared for, revealed or interpreted, while making better use of the building itself and activating greater utilisation of the NHS by the community. Where a building can no longer function with its original use, a new use through adaptation may be the only way to preserve its heritage significance and provide utilization of the asset within NHS.

The SHT is in a unique position that all operators within the site are under a common management arrangement executed by SHT in terms of access to the site and utilisation of facilities within the site. These arrangements are governed by leases and licences that provide legal weight by the SHT to execute management arrangements associated with bushfire and emergency management.

SHT decisions regarding the future mix of uses at the site will be informed by a range of issues, including Commonwealth and national heritage values, rare ecosystems, aboriginal heritage and bushfire risk. Getting the balance right and recognising the tension between these aspects requires consideration of the bushfire risk, risk tolerance and management options for each of the buildings and activities within the site.

This report outlines the methodology, assessment, and outcomes for a detailed bushfire attack level (BAL) analysis on the site and for each of the buildings. The report tests the following types of uses for each building/key area of open space at NHS:

- Residential such as long term or student accommodation
- Special Fire Protection Purpose including:
 - Childcare
 - Education and Schools

- Tourist or visitor accommodation
- Other uses including:
 - Class 5-8 buildings such as offices, consulting rooms, cafes and workshops
 - Commercial uses such as function centres, gymnasiums, museums and education centres
 - Class 10 structures such as storage
 - Outdoor events

The Commonwealth is exempt from certain state laws, including those related to town planning which do not apply on SHT land and the Harbour Trust is the planning and consent authority for its land. However, the SHT will utilise the NSW framework provided by the NSW Rural Fire Service (RFS) document Planning for Bushfire Protection 2019 (PBP) for the consideration of bushfire risk and the adaptive reuse of the existing buildings within the site.

The assessment has been provided in a series of maps that show the required level of vegetation management to achieve certain BALs for each of the buildings. The utilisation of the BAL and a range of other bushfire mitigation strategies for each of the buildings will provide opportunity for an integrated approach with the surrounding land management and Fire Management Plans and strategies to ensure a cohesive approach is achieved in the management of the unique Sydney Harbour foreshore bushland areas.

This assessment has been prepared by Lew Short, Principal Blackash Bushfire Consulting (Level 3 FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the RFS as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a suitably qualified consultant to undertake alternative solution proposals. A site inspection was completed on the 3 February 2022.

1. The Site

North Head Sanctuary is an area of approximately 74 hectares located on the highest part of North Head. Approximately 58ha of the total site is bushland. North Head Sanctuary is shown at Figure 1 (the site) and the buildings are shown at Figure 2. The site is within Lot 2764 in Deposited Plan 752038 (formerly Portion 2764 in Crown Plan Catalogued C10630-2030) and was formally transferred to the SHT from the Department of Defence in December 2006.

North Head Sanctuary is listed as 'The North Head Artillery Barracks, North Head Scenic Drive, Manly', Historic Place No. 105431 on the Commonwealth Heritage List (Place File No. 1/13/024/0005). The North Head Sanctuary is surrounded by Sydney Harbour National Park on three sides. The site and surrounding land are designated as Bushfire Prone Land (Figure 3) by the NSW Rural Fire Service (RFS).

Vehicular access (Figure 4) to the North Head Sanctuary is available via North Head Scenic Drive which is the primary access into and out of the site. Secondary access is provided by Bluefish Drive, and North Fort Road with a number of internal formed roads, fire trails and walking tracks.

The North Head Sanctuary has three distinct precincts. The largest group of buildings is the Parade Ground Precinct, a collection of art deco buildings arranged around the parade ground built in 1936. The Sheds Precinct comprises the utilitarian buildings to the south of the Parade Ground Precinct along North Fort Road. The North Fort Precinct is located at the southernmost end of the site. These buildings have varying existing uses from residential, commercial and special fire protection purpose (SFPP).

The site and surrounding areas have high visitation rates with high numbers of tourists who may not be familiar with the area or bushfire risk and actions. The site and surrounding area have remote walking tracks and fire trails within bushfire prone land.

All of the houses on North Head Scenic Drive, St Barbara's Ave and in Artillery Drive are former Defence housing that are managed by the SHT for residential purposes.

Various artillery weapons, both full calibre and sub-calibre, have been fired at North Head since the 1930s, with all full calibre firings being conducted seawards. The Department of Defence lists the site on its unexploded ordnance (UXO) register. The Department of Defence assessed NHS as having no significant residual UXO contamination.

The NPWS have prepared a Plan of Management that applies to the whole of Sydney Harbour National Park including North Head. SHT have received a draft *Bushfire Management Plan* for North Head Sanctuary (dated 12 March 2021) which outlines a five (5) year plan (2021–2026) and identifies the bushfire protection strategies to be undertaken by SHT in a manner that recognises the site's ecological and environmental values and places this in the context of the need to protect life and property from bushfire.

SHT have received a detailed *Bushfire Emergency Management and Evacuation Plan* (BEMP) for NHS that is designed to assist management to make informed decisions regarding bushfire safety and management actions for NHS. The BEMP outlines procedures for a scaled response to manage the NHS commensurate with increased bushfire danger or active bushfire within North Head. The BEMP also provides guidance for both sheltering (remaining on site) and evacuation to manage bushfire exposure and risk to enhance the protection of occupants from the threat of a bushfire.



Figure 1 Location

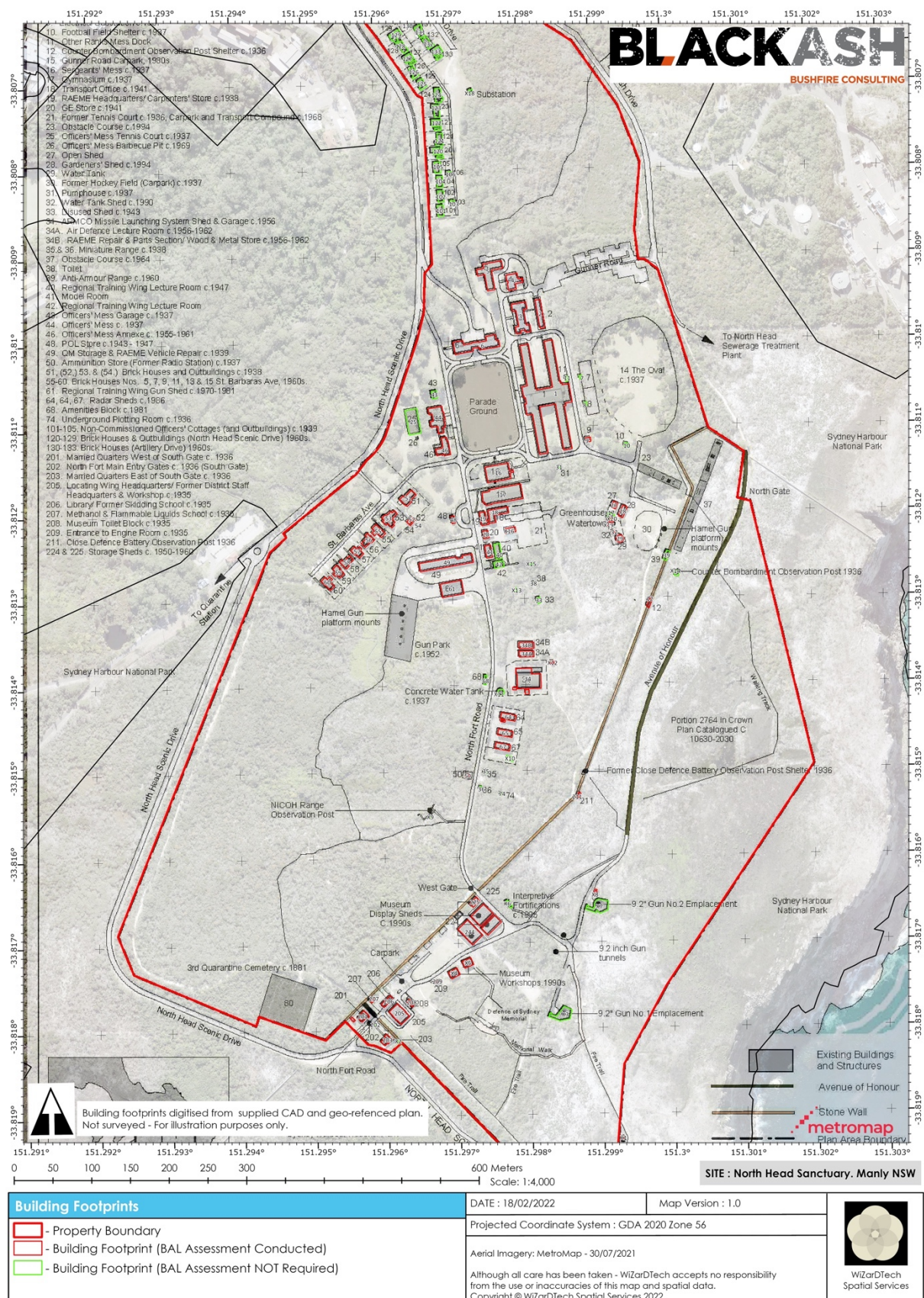


Figure 2 Building Footprints

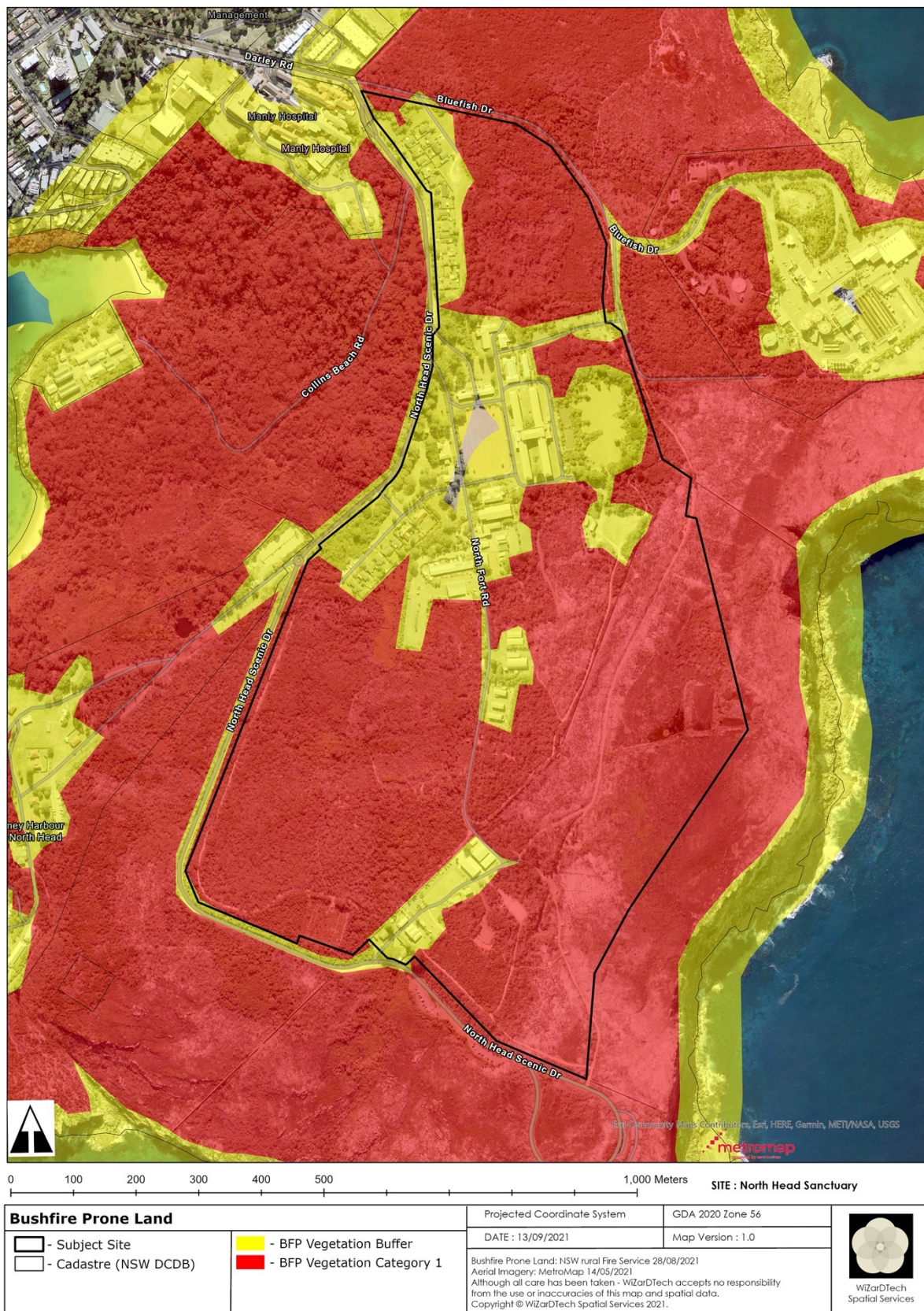
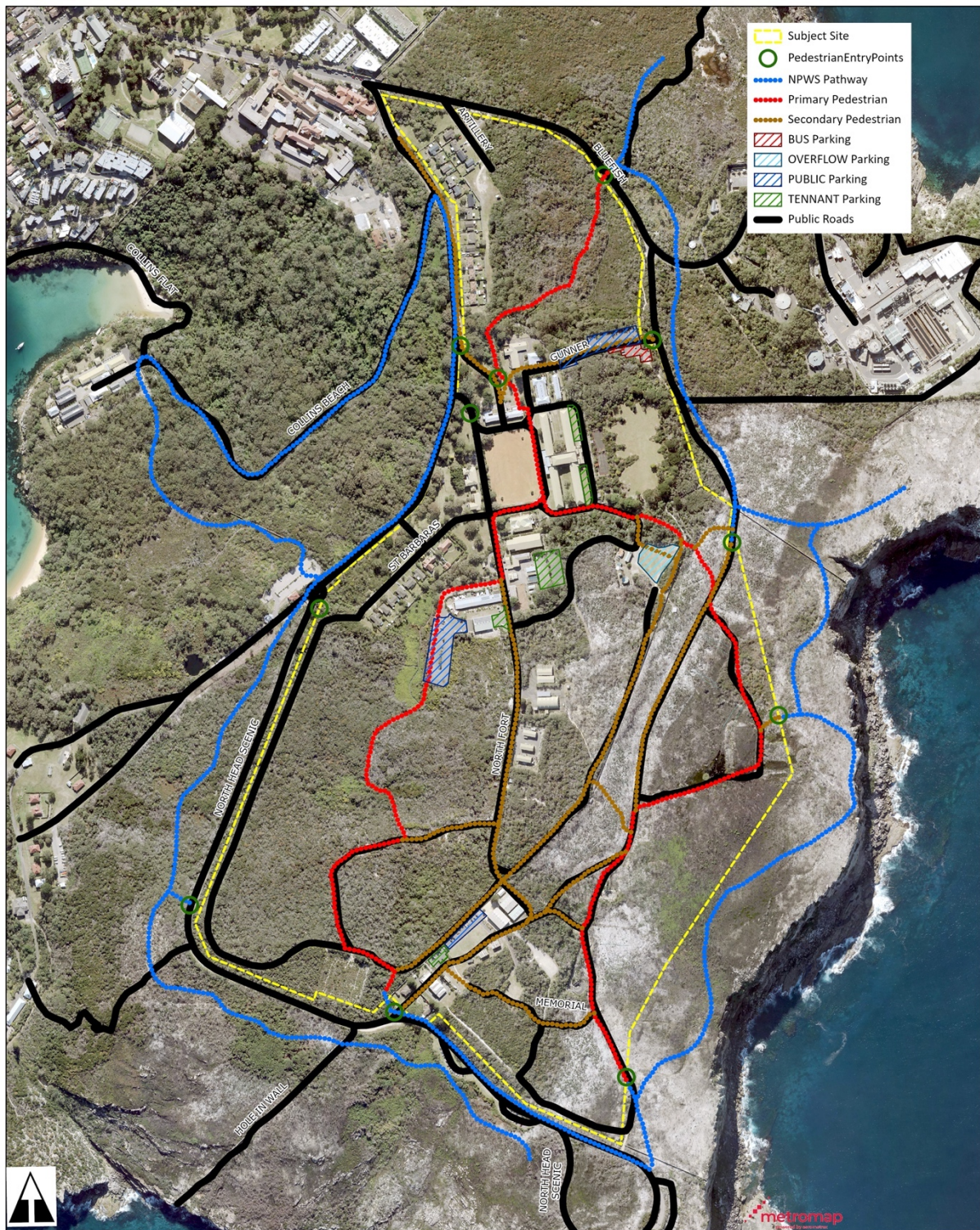


Figure 3 Bushfire Prone Land




| | | | |
|------------------------------------|--|--|-------------------|
| 0 100 200 300 400 500 1,000 Meters | | SITE : North Head Sanctuary | |
| Access Map | | Projected Coordinate System | GDA 2020 Zone 56 |
| | | DATE : 13/09/2021 | Map Version : 1.0 |
| | | Access Details digitised from Fig. 21 Access and Parking Map. Aerial Imagery: MetroMap - 14/05/2021 Although all care has been taken - WIZardTech accepts no responsibility from the use or inaccuracies of this map and spatial data. Copyright © WIZardTech Spatial Services 2021. | |
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Figure 4 Site Access

2. Legislative and Assessment Framework

Under Section 71 of the *Sydney Harbour Federation Trust Act 2001*, certain state laws, including those related to town planning, do not apply on Harbour Trust land. The Harbour Trust is the planning and consent authority for its land and planning approval from the NSW Government, including the NSW Rural Fire Service or the local council are not required. However, in some circumstances, the Harbour Trust may consult with local councils and NSW Government agencies, in respect of proposal or issues.

The Harbour Trust have requested that the NSW bushfire framework be utilised for the assessment of bushfire risk and the BAL assessment. The bushfire requirements are outlined in the RFS document *Planning for Bushfire Protection 2019* (PBP). PBP provides a framework for the consideration of new and existing development. PBP does not articulate a clear position in relation to adaptive reuse of existing buildings but recognises infill or existing development and change of use for buildings and activities within building.

In circumstances where new building projects, change of use or adaptive reuse of existing buildings are proposed, PBP requires that an appropriate combination of Bushfire Protection Measures (BPM) are provided commensurate with the bushfire risk and vulnerability of occupants. The types of BPM include asset protection zones (APZ), access, landscaping, water supply, building design and construction and emergency management arrangements. These measures assist building survival during a bushfire. They also contribute to the safety of firefighters and members of the community occupying buildings during the passage of a bushfire front¹. The range of different BPMs which should be applied in combination based upon the development type, adaptive reuse and the level of bushfire risk.

The intention for any adaptive reuse of building work occurring within an existing building is to achieve a better bushfire outcome than if the development or use did not proceed. Achieving this may require a combination of BPM including improved construction standards, APZs and evacuation management. This may result in a level of retrofitting of existing buildings and managing other portions of the site (i.e. APZs) to ensure an improved level of bushfire protection. In some circumstances the bushfire risk and vulnerability of potential occupants may be too high and alternative locations should be sought.

¹ Planning for Bushfire Protection 2019 p. 25

Intensification of the use, increase in occupancy or change of use/ adaptive reuse must consider the risk to the asset, occupants and firefighters. Where practically achievable, full compliance with PBP should be provided before variations to the required BPMs are considered. Proposals that involve internal alterations only to an existing building are not subject to any specific requirements².

All adaptive reuse must meet the aim and objectives of PBP (p. 10):

The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.

The objectives are to:

- *afford buildings and their occupants protection from exposure to a bushfire*
- *provide for a defensible space to be located around buildings*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings*
- *ensure that appropriate operational access and egress for emergency service personnel and occupants is available*
- *provide for ongoing management and maintenance of Bushfire Protection Measures*
- *ensure that utility services are adequate to meet the needs of firefighters.*

The SHT will utilise the framework provided by PBP for the consideration and assessment of new development and adaptive re-use of existing buildings within the site. The Trust accepts the performance-based approach for new and infill development and adaptive reuse within PBP which provides for a risk-based approach for the intended use and established minimum standards.

As part of this approach, the SHT could provide minimum standards such as:

² Planning for Bushfire Protection 2019 p. 52

- For new residential development, APZ requirements are based on radiant heat level exposure to buildings not exceeding 29kW/m² (calculated on a flame temperature of 1090 Kelvin).
- For new Special Fire Protection Purpose (SFPP) developments, 10kW/m² (calculated on a flame temperature of 1200 Kelvin) is the maximum exposure at any point of the building wall or facade and where emergency services may be supporting or evacuating occupants from the building.
- Adaptive reuse for residential and SFPP development are on a merit and case by case basis.
- If use of a building is excluded (and so excluded in a lease or license) above a certain fire danger index (FDI), the assessment for BAL and risk should be undertaken on the maximum FDI that the building is occupied.
- The Parade Ground provides a 10kW refuge for buildings within the immediate vicinity. This can be used as a key off set measure when considering the BPM particularly in relation to emergency management and evacuation.

For commercial uses:

- Meet the aim and objective of PBP
- provide a defensible space to enable unimpeded access for firefighting around the building
- provide better bushfire outcomes on the existing building that may include retrofitting and building upgrade for ember protection, commensurate with the scale of works proposed
- the leasee provides suitable insurance
- the site is not occupied on Catastrophic Fire Danger Rating or when out of control or scheduled hazard reduction burns are within NHS.
- If use of a building is excluded (and so excluded in a lease or license) above a certain fire danger index (FDI), the assessment for BAL and risk should be undertaken on the maximum FDI that the building is occupied.

3. Adaptive Reuse Considerations

Adaptive reuse is a process that changes a disused or ineffective building into a refreshed item that can be used for a different purpose. Adaptive reuse is an effective strategy for optimizing the operational and commercial performance of built assets.

The adaptive reuse of a historic building and buildings within the NHS should have minimal impact on the heritage significance of the building and its setting (including minimising environmental impacts). Sometimes, adaptive reuse is the only way that the building's fabric will be properly cared for, revealed or interpreted, while making better use of the building itself. Where a building can no longer function with its original use, a new use through adaptation may be the only way to preserve its heritage significance and provide utilisation of the asset within NHS.

The Australian Government Department of Environment and Heritage Adaptive Reuse (2004) provides a framework for the consideration of existing buildings and their adaptive reuse noting (p. 5):

Recycling has become second nature to modern communities as we strive for environmental sustainability. Aiming to reduce, reuse and recycle waste, we find new life in everything from bottles and boxes to clothes, vehicles and buildings. Adaptive reuse is a process that changes a disused or ineffective item into a new item that can be used for a different purpose. Sometimes, nothing changes but the item's use.

The adaptive reuse of a historic building should have minimal impact on the heritage significance of the building and its setting. Developers should gain an understanding of why the building has heritage status, and then pursue development that is sympathetic to the building to give it a new purpose. Adaptive reuse is self-defeating if it fails to protect the building's heritage values.

The most successful built heritage adaptive reuse projects are those that best respect and retain the building's heritage significance and add a contemporary layer that provides value for the future. Sometimes, adaptive reuse is the only way that the building's fabric will be properly cared for, revealed or interpreted, while making better use of the building itself. Where a building can no longer function with its

original use, a new use through adaptation may be the only way to preserve its heritage significance.

Applications for development and adaptive reuse within the NHS should include a bushfire assessment report. This report should demonstrate that the proposal satisfies the requirements of PBP and considers the risk of bushfire to the occupants. All applications must meet the Aim and Objectives of PBP. PBP uses acceptable solutions and a performance based approach and identifies objectives and detailed performance criteria to satisfy desired outcomes for development types.

Given the existing assets, the control that the SHT applies through leases and licences and the potential adaptive reuse, a key BPM will be the emergency management arrangements to provide for occupant and fire fighter safety. The risk posed to the buildings will be considered on a case by case basis by the SHT to reduce risk to tolerable levels. This should link in with the existing BEMP and control arrangements.

For existing buildings that are infill development, an appropriate combination of Bushfire Protection Measures (BPMs) are required contingent on the risk, proposed use and the availability of other mitigation measures, including emergency management and evacuation planning.

The intention for any building work occurring within an existing development or for an adaptive use, is to achieve a better bushfire outcome than if the development did not proceed. Achieving this may require a combination of measures including improved construction standards, APZs and evacuation management. This may result in a level of retrofitting of existing buildings and managing other portions of the site (i.e. APZs) to ensure an improved level of bushfire protection. The degree of works should balance the vulnerability of the occupants and intended use with the ability to control exposure to any bushfires.

Balancing development with the risk of bushfires is a complex and critical endeavour. On one hand, the expansion of utilisation within the site is essential for activation of the site and sharing NHS with the broader community. On the other hand, it is imperative to carefully consider the ecological context and the increased vulnerability to bushfires and what can be implemented (ie through the NHS Bushfire Management Plan and by NSW National Parks and Wildlife Service (NSW NPWS) to conserve biodiversity while also mitigating bushfire risk to people and assets. Striking this balance requires comprehensive planning and stringent regulations that prioritise fire-resistant building materials, defensible spaces, and emergency preparedness while

discouraging exposure of people in high-risk areas. It also necessitates ongoing monitoring and adaptation to evolving fire risks, emphasising sustainable practices and community education to foster resilience in the face of an ever-present threat. Ultimately, achieving this equilibrium is essential to safeguard both lives and the environment within the NHS.

The SHT have tight control over the use of the NHS. The NHS has a *Bushfire Emergency Management and Evacuation Plan* that prioritises the protection of life, through active management and closure of the site on days of elevated fire danger or if fires are in the vicinity of NHS. Closing areas prone to bushfire risk within NHS is a prudent and necessary measure to protect people from potential disasters and aligns with strategies employed by NSW NPWS for North Head. By restricting access to high-risk zones during periods of elevated fire danger, the SHT can minimise the threat to human lives and property. These closures not only prevent the accidental ignition of fires by human activities such as arson, cigarettes etc but also ensure that emergency responders can focus on containing the blaze without risking additional lives during rescue operations. While such closures may inconvenience recreational and economic activities in the short term at the NHS, they are crucial for the long-term safety and well-being of people within the NHS, allowing for effective fire management strategies and the preservation of lives.

4. Methodology for Bushfire Risk Assessment

The assessment of buildings has been undertaken in accordance with the framework and assessment methodology outlined by the PBP and the *Australian Standard for Construction of Buildings in Bushfire Prone Areas* (AS3959) to determine the Bushfire Attack Level (BAL). PBP identifies the methodology to BAL based on calculated radiant heat levels at a site. This assessment is based on mapping of vegetation formations and slope assessment in accordance with PBP. This assessment is based on the site inspection and desktop assessment of the site utilising the following resources:

- *Planning for Bushfire Protection* (NSW RFS, 2019)
- Aerial mapping
- Detailed GIS analysis
- Site inspection

Bushfire Hazard

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as likely radiant heat and APZ. The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site, and which determine the Bushfire Attack Level (BAL) of PBP 2019.

Fire weather

The fire weather is dictated by PBP and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The site has a Fire Danger Index (FDI) of 100 as per PBP. As existing assets, a risk based approach can be taken with regard to the FDI and the consideration of likely bushfire weather and fire scenarios. If use of a building is excluded (and so excluded in a lease or license) above a certain FDI, the assessment for BAL and risk should be undertaken on the maximum FDI that the building is occupied. A reduced FDI of 50 has been used for the modelling of buildings: 1, 2, 5 and 244 as it is likely that these buildings will have restricted use at FDI 50 and when a Total Fire Ban is declared.

Vegetation

Predominant Vegetation is classified by structure or formation using the system adopted by Keith (2004) and by the general description using PBP. Vegetation types give rise to radiant heat and fire behaviour characteristics. There are 12 vegetation formations (with sub-formations) identified in PBP. The predominant vegetation has been determined over a distance of at least 140 metres in all directions from the proposed property boundary or building footprint on the site. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

The background information, mapping and site inspection determined vegetation formations of Forest, Tall Heath (majority) and Short Heath (for Wetland Areas) as shown in Figure 5.

Slopes influencing bushfire

The 'effective slope' influencing fire behaviour has been assessed in accordance with the methodology specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 metre transect measured outwards from the development boundary as shown in Figure 5.



Figure 5 Vegetation and Slope Assessment

5. Impact Assessment - Bushfire Attack Levels

The BAL is a means of measuring the ability of a building to withstand attack from bushfire. The form of bushfire attack and the severity will vary according to the conditions (FDI, vegetation, slope and setback) on the site. The BAL assesses the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per square metre, which is the basis for establishing the requirements for construction to improve protection of a building from potential attack by a bushfire, as defined in AS 3959-2018.

As required by PBP, each interface area was divided and classified accordingly by vegetation type, slope class and associated distances for BAL Flame Zone, BAL 40, BAL 29, BAL 19 and BAL 12.5. This enabled 'BAL IN' to be calculated very precisely for all the individual vegetation groups with aspect/slope along the interface. The existing boundary between managed and unmanaged vegetation was used as the basis for determining the starting point for the BAL IN maps. The BAL or radiant heat received at each of the buildings for the Parade Ground and Sheds Precinct is shown in Figure 6 and Figure 7 for the North Fort Precinct. This provides the radiant heat at the buildings which can be used as a key consideration in the adaptive reuse of buildings.

Each building footprint was then used as a basis for identifying the required APZ to achieve a specific radiant heat at a building. The BAL OUT maps are detailed and included at Attachment 1. Where vegetation is existing, it can be managed to the BAL Out distances to achieve a required radiant heat level.

The BAL ratings are used as the basis for establishing the requirements for construction and APZ to improve protection of a building or to determine the vulnerability of a building to potential bushfire attack.

Figure 8 shows the intended uses associated with the master plan. Careful consideration of adaptive uses and spaces in the context of bushfire impact is essential for promoting resilience and minimising the consequences of bushfires. Adaptive uses at NHS involves designing and planning structures and landscapes with the understanding that they will be exposed to bushfire risk. This approach includes selecting fire-resistant building materials, creating defensible zones around properties, and incorporating safe evacuation routes. Furthermore, it extends to land-use planning that avoids constructing in high-risk areas and encourages sustainable practices like controlled burns and vegetation management.

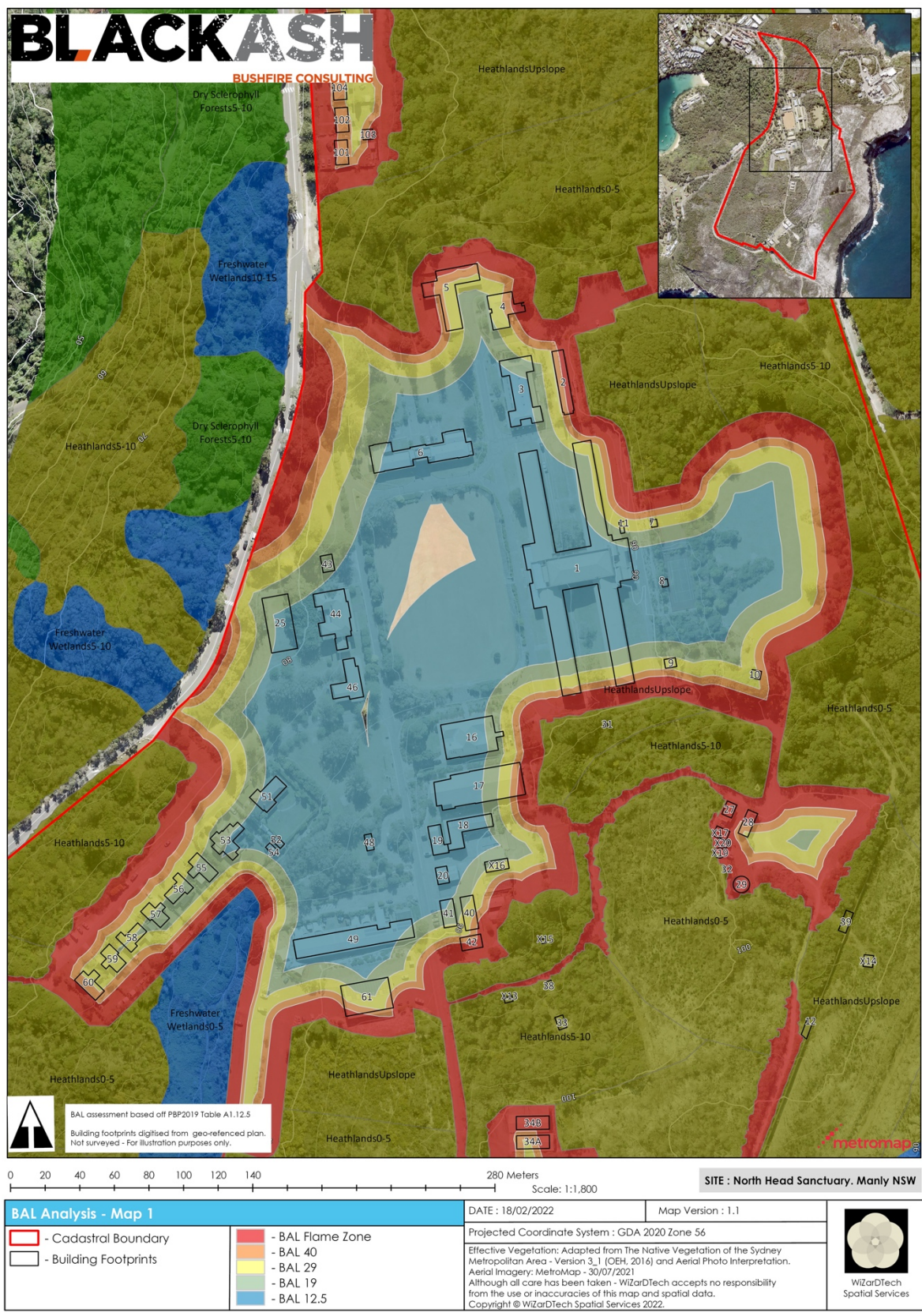


Figure 6 BAL In Parade Ground & Shed Precinct

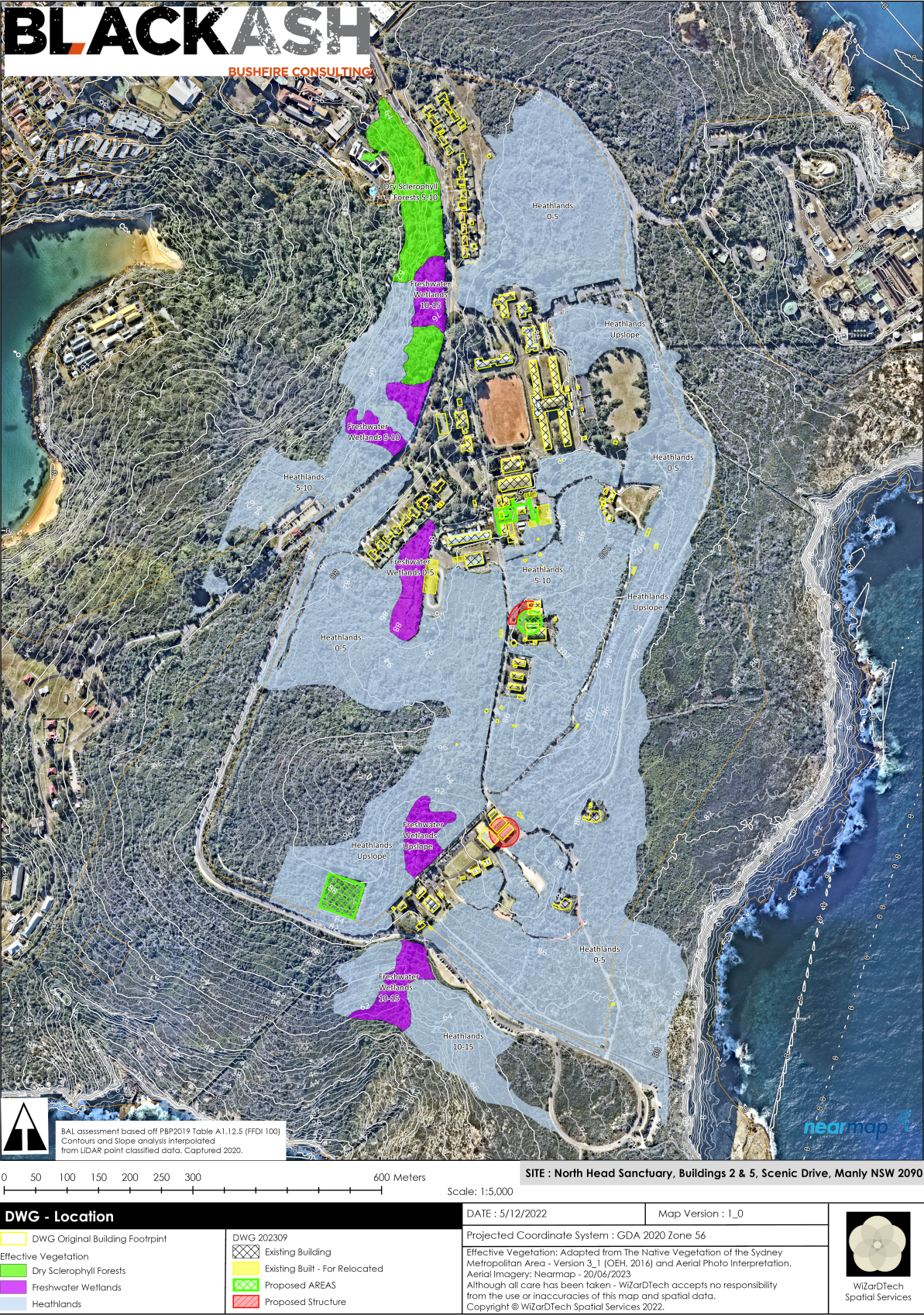


Figure 8 Master plan consideration

6. Conclusion

The NHS provides significant opportunity for the adaptive reuse of existing buildings. The SHT will be investigating options for the adaptive reuse of existing buildings within the site. As existing assets, the adaptive reuse will need to be considered on a risk and merit-based case by case review, balancing the bushfire risk, vulnerability of occupants, lease and licence controls and the emergency management arrangements that can be utilised within the site. A key part of this process is understanding the bushfire risk presented in this report by the BAL in and BAL out assessments to determine the radiant heat at the existing buildings and potential asset protection zones for specific uses or to reduce radiant heat at the buildings.

Adaptive reuse is a process that changes a disused or ineffective building into a refreshed item that can be used for a different purpose. Given the potential adaptive reuse for the existing assets and the control that the SHT applies and can apply through leases and licences, a key BPM will be the emergency management arrangements within the BEMP to provide for occupant and fire fighter safety. The risk posed to the buildings can be considered on a case by case basis by the SHT to reduce risk to tolerable levels. This should link in with the existing BEMP and control arrangements.

The SHT is in a unique position that all operators within the site are under a common management arrangement executed by SHT in terms of access to the site and utilisation of facilities within the site. These arrangements are governed by leases and licences that provide legal weight by the SHT to execute management arrangements associated with bushfire and emergency management. As such, the SHT can attribute certain FDI for occupation which can cap or limit the use at or above certain FDI levels. This is a highly effective management arrangement that can be exercised by SHT.

The utilisation of the BAL and a range of other bushfire mitigation strategies for each of the buildings will provide opportunity for an integrated approach with the surrounding land management and strategies to ensure a cohesive approach is achieved in the management of NHS for the adaptive reuse of existing buildings.