38. Greater Blue Mountains World Heritage Area

38.1. Introduction

This chapter considers the potential impacts of an indicative long term development of the proposed airport on the Greater Blue Mountains World Heritage and National Heritage values. The chapter builds on the consideration of potential impacts associated with the proposed Stage 1 development presented in Chapter 26 of Volume 2 and draws on detailed environmental and social assessments undertaken for the proposed airport which are included in Volume 4.

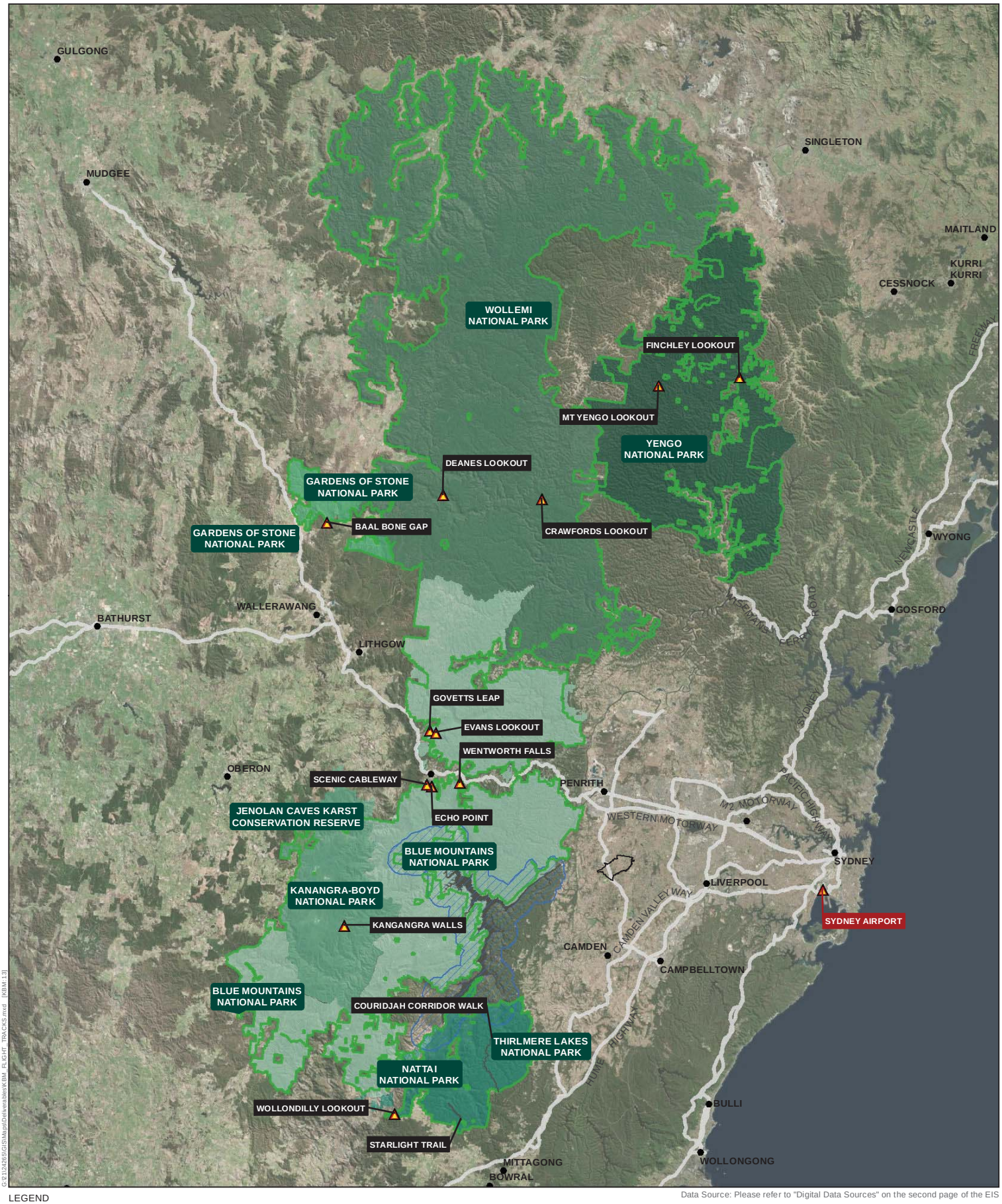
The assessment of the long term airport development recognises the uncertainty in predicting impacts that may occur nearly 50 years into the future. Flight paths and airport operating procedures that may be used in the long-term are subject to further consideration. All future development would be subject to further assessment and approval requirements under the Airports Act.

38.2. Environmental values

The Greater Blue Mountains Area (GBMA) covers 1.03 million hectares of sandstone plateaus, escarpments and gorges dominated by temperate eucalypt forest (UNESCO 2015). The site constitutes one of the largest and most intact tracts of protected bushland in Australia and is noted for its representation of the evolutionary adaption and diversification of eucalypts in post-Gondwana isolation on the Australian continent (UNESCO 2015).

The GBMA comprises eight protected areas (refer Figure 38-1):

- Blue Mountains National Park;
- Wollemi National Park;
- Yengo National Park;
- Nattai National Park;
- Kanangra-Boyd National Park;
- Gardens of Stone National Park;
- Thirlmere Lakes National Park; and
- Jenolan Caves Karst Conservation Reserve.



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

- Airport site
- Greater Blue Mountains World Heritage Area
- Drinking Water Catchment – No Entry Area

Figure 38-1 - Greater Blue Mountains World Heritage Area

0 5 10 20
Kilometres

N

The GBMA provides a significant representation of Australia's biodiversity, containing 10 percent of the country's vascular flora as well as significant numbers of rare or threatened species (UNESCO 2015). In addition to its outstanding eucalypts, the area also contains ancient, relict species of global significance including the Wollemi pine (*Wollemia nobilis*), one of the world's rarest species that was thought to have been extinct for millions of years (DoE 2015d). The few surviving trees are known only from three small populations located in remote, inaccessible gorges within the Greater Blue Mountains (DoE 2015d).

The GBMA was inscribed on the World Heritage List in 2000 because it satisfies two of the criteria for natural values of outstanding universal value: representative examples of the evolution of Eucalyptus species (Criterion ix) and diversity of habitats and plant communities (Criterion x). Further detail of the outstanding universal value recognised in the World Heritage listing is presented in Chapter 26 of Volume 2.

In addition to meeting the criteria for outstanding universal value, a world heritage property listed for natural values also needs to meet conditions of integrity. Integrity is a measure of the 'wholeness and intactness' of the natural heritage and its attributes (UNESCO 2015). The Statement of Outstanding Universal Value for the GBMA states that the eight protected areas that comprise the GBMA are of sufficient size to protect the biota and ecosystem processes, although the boundary has several anomalies that reduce the effectiveness of its one million hectare size. These anomalies are explained by historical patterns of clearing, private land ownership and topography such as escarpments that act as barriers to potential adverse impacts from adjoining land (UNESCO 2015).

A number of historical land uses have had an impact on the past integrity of the area including Warragamba Dam, cattle grazing, logging, land clearing, coal mining, oil shale mining, military activities and fire regimes (IUCN 1999). However, active management has reduced these impacts and the landscape is in recovery (IUCN 1999).

Aboriginal people from six language groups continue to have a custodial relationship with the area through ongoing practices that reflect both traditional and contemporary presence (UNESCO 2015). Aboriginal sites including important rock art sites provide physical evidence of the longevity of the strong Aboriginal cultural connections with the land. The conservation of these associations contributes to integrity of the GBMA (UNESCO 2015).

All properties inscribed on the World Heritage List must have adequate protection and management mechanisms in place, the nature of which can vary so long as they are effective (DSEWPC 2012). The GBMWHA is protected and managed under legislation of both the Commonwealth of Australia and the State of New South Wales:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Cth);*
- *National Parks and Wildlife Act 1974 (NSW); and*
- *Wilderness Act 1987 (NSW).*

Other relevant legislation includes the NSW *Threatened Species Conservation Act 1995*, *Environmental Planning and Assessment Act 1979, Sydney Water Catchment Management Act 1998* and *Heritage Act 1977*.

The GBMWHA Strategic Plan (DECC 2009c) provides a framework for the property's integrated management, protection, interpretation and monitoring.

The key management objectives set out in the Strategic Plan provide the philosophical basis for the management of the area and guidance for operational strategies, in accordance with requirements of the World Heritage Convention and its Operational Guidelines (UNESCO 2015). These objectives are also consistent with the Australian World Heritage management principles, contained in regulations under the *EPBC Act* (UNESCO 2015).

The Strategic Plan identifies the following threats to the integrity of the area:

- uncontrolled and inappropriate use of fire;
- inappropriate recreation and tourism activities, including development of tourism infrastructure;
- invasion by pest species including weeds and feral animals;
- loss of biodiversity and geodiversity;
- impacts of human enhanced climate change; and
- lack of understanding of heritage values.

The Greater Blue Mountains National Heritage Area was included on the National Heritage Register in 2007. The National Heritage Area is the same as that listed for the World Heritage Area and the values identified for the listing are the same as those for the World Heritage Area. As such the following assessment against the heritage values is taken to address both the National and World Heritage values of the GBMA.

The GBMA has a number of other important values which complement and interact with the World Heritage values of the area (DECC 2009c). Protection of these values is considered to be integral in managing individual protected areas and the GBMA as a whole (DECC 2009c). Table 38–1 provides a summary of the values identified by the NPWS in the GBMWHA Strategic Plan which contribute to the overall values of the area.

Table 38–1 – Other important values of the GBMA

Value	Description
Geodiversity and biodiversity	In addition to the outstanding biodiversity of the GBMA, the area also has a diversity of landscapes and geological features including the most extensive sandstone canyon system in eastern Australia. The site also contains karst landscapes with several cave systems including Jenolan Caves, the world's oldest open cave system. Other features include prominent basalt-capped peaks, quaternary alluvial deposits and perched perennial freshwater lakes.
Water catchment	The GBMA protects a large number of pristine and relatively undisturbed catchment areas, some of which make a substantial contribution to maintaining high water quality in a series of water storage reservoirs supplying Sydney and adjacent rural areas.
Indigenous heritage values	Although no comprehensive surveys have been taken, known Aboriginal sites within the area are widespread and diverse including landscape features of spiritual significance and rock art sites. Given the wilderness nature of the area and the limited survey to date, there is high potential for the discovery of further significant Aboriginal sites.
Historic heritage values	The GBMA includes numerous places of historic significance some of which date back to the early years of European settlement and exploration in Australia. Recorded sites demonstrating post-1788 human use are associated with rural settlement, pastoral use, timber getting, mining, transport routes, tourism and recreation. The sites include small graziers' huts, logging roads, stock routes and the ruins of mines.

Value	Description
Recreation and tourism	The GBMA has high recreational values due to the areas' intrinsic beauty, natural features and accessibility from major population centres. Recreational opportunities are wide ranging and include canyoning, bushwalking, rock climbing, nature observation, caving, picnicking, camping and photography. The regional economy surrounding the GBMWHA is increasingly supported by tourism with the area contributing directly and indirectly to the employment, income and output of the region.
Wilderness	The high wilderness quality of much of the GBMA constitutes a vital and highly significant contribution to its World Heritage value and has ensured the integrity of its ecosystems and the retention and protection of its heritage value (DoE 2015). The wild and rugged landscapes, diverse flora and fauna, and opportunities for solitude, self-reliant recreation and reflection are attributes that promote inspiration, serenity and rejuvenation of the human mind and spirit. Such experiences are valued by individuals and society.
Research and education	The GBMA is ideal for research and educational visits due to the variety of ecological communities, landscape and associated cultural sites. The high scientific value reflects what has been discovered and what remains to be discovered as large gaps in knowledge remain in regard to Aboriginal use and occupation of the area and the ecological needs of threatened species and communities.
Scenic and aesthetic	Dramatic scenery within the GBMA includes striking vertical cliffs, waterfalls, ridges, escarpments, uninterrupted views of forested wilderness, extensive caves, narrow sandstone canyons and pagoda rock formations.

Source: NSW NPWS 2009

The following areas within the GBMA were identified as sensitive tourism and recreation areas in relation to potential impacts of the proposed long term development of the airport on noise, air quality and amenity:

- Jamison Valley south of Echo Point lookout and the Scenic Cableway at Katoomba and Wentworth Falls lookout;
- Grose Valley east of Evans lookout and Govetts Leap lookout;
- the wilderness area between Deanes lookout and Crawfords lookout within Wollemi National Park;
- the wilderness area between Mt Yengo lookout and Finchley lookout within Yengo National Park;
- Nattai wilderness area;
- Kanangra Walls and wilderness area east of Kanangra-Boyd lookout; and
- Baal Bone Gap within Gardens of Stone National Park.

38.3. Assessment of impacts during operation

38.3.1. Direct operational impacts

There would be no direct impacts on the GBMA and its associated World Heritage values due to the long term operation of the proposed airport.

38.3.2. Indirect operational impacts

The long term operation of an airport at the Badgerys Creek site may have a number of potential indirect impacts on the GBMA primarily from the overflight of aircraft. Potential impacts include:

- noise;
- air quality impacts from aircraft emissions including fuel jettisoning; and
- amenity impacts.

As noted in Chapter 30, flight paths for the long term development of the airport are indicative and were developed by Airservices Australia to demonstrate a proof of concept. As such, flight paths and airport operating procedures that may be used in the long term would be subject to detailed development and approval prior commissioning the second runway. The potential impacts on the GBMWHA would be one consideration in the development of final flight paths for the proposed airport.

38.3.2.1. Noise

Noise levels from specific aircraft have been modelled as detailed in Appendix E in Volume 4. Noise modelling methodology is described in detail in Appendix E, in regard to the GBMA the model incorporates the topography of the areas and as such the height of aircraft as they overpass the GBMA. This captures the variance in noise across peaks and valeys within the GBMA. The highest predicted noise levels are associated with a departing Boeing 747, while 'average' noise levels are represented by a departing Airbus 320.

The Boeing 747 represents the maximum noise event for all aircraft arriving at and departing from the proposed airport. In comparison to Stage 1 operations, noise events would be experienced over a wider area due to the additional flight paths associated with the long term development. Indicative noise exposure levels for these aircraft operations are shown in Figure 38-2 and Figure 38-3. In particular, a Boeing 747 aircraft operating on certain departure paths would be expected to produce noise levels exceeding 60 dBA over a large area of the GBMWHA. In some areas, primarily within the Warragamba exclusion zone, the maximum noise level would exceed 70 dBA. A south west departure by an Airbus A320 is predicted to produce noise levels of 60 to 65 dBA in the southern area of the Blue Mountains National Park.

It should be noted that aircraft technology is continually evolving to improve the noise performance of aircraft with the new generation of aircraft about 75 per cent quieter than those designed 40 years ago. Given that the full operating capacity of the long term development is not anticipated to be achieved for close to 50 years, it is likely that older generation aircraft, including the Boeing 747, would be replaced in this time period by quieter and more efficient aircraft as technology continues to improve.

Noise has been shown to have a variety of impacts on fauna, including changing foraging behaviour, impacting breeding success and changing species occurrences. Low-flying aircraft can give rise to flight response in some species, causing them to abandon nests, and other species are known to avoid higher elevation areas where noise levels are higher, potentially resulting in fragmentation of habitat (Ellis, Ellis, & Mindell, 1991). Most of these impacts occur when noise levels are high (greater than 65 dB).

Given the height at which flights to and from the airport site are likely to be over the GBMA, these impacts are unlikely. While noise would increase marginally above background levels on an intermittent basis directly under the flight paths, fauna are likely to become habituated to the elevated noise levels in the long term (Conomy et al 1998), particularly as aircraft would not be flying at low altitudes over the GBMA. Operation of aircraft in the long term is highly unlikely to permanently alter foraging or breeding behaviour of any fauna species. Any impacts would be localised, with impacts occurring under the main flight paths. The majority of fauna within the vast GBMA would not be impacted by aircraft noise. As such, noise would not result in a loss of biodiversity and would not interfere with the ecological viability and capacity for ongoing evolution of species within the GBMA.

38.3.2.2. Air quality

Regional air quality impacts relevant to the GBMA have been assessed in regard to three principle elements:

- regional air quality (ozone);
- contribution to climate change; and
- emissions from fuel jettisoning.

Regional air quality (ozone)

Regional air pollutants including ozone formed by the photochemical reaction of precursor emissions from the proposed airport can contribute to regional photochemical smog which may have an impact on the amenity of the GBMWHA. The National Environment Protection Measure (NEPM) ambient air quality standard for ozone is 0.10 parts per million for a one hour period (equivalent to 100 parts per billion) and 0.08 parts per million for a four hour period (equivalent to 80 parts per billion).

Future projected emissions for sources other than the proposed airport (background emissions) are not available for the 2063 scenario, therefore, assessment of the air quality impacts of the long term development becomes a hypothetical scenario of long term airport development occurring within the context of 2030 base case emissions. To assess the impact from the addition of airport emissions, 12 days were selected for detailed analysis to represent the meteorological conditions that have historically led to peak ozone formation and with strong model calibration with existing monitoring data.

The maximum predicted one hour ozone concentration was unchanged between the 2030 base case and the 2063 airport case for eight of the 12 analysis days. On four days, the peak predicted one hour ozone concentration increased by a maximum of 0.2 parts per billion.

The peak predicted four-hour ozone concentration was unchanged on seven days and increased on five days by a maximum of 0.2 parts per billion. The highest predicted change in daily maximum four-hour ozone concentration, from the addition of 2063 airport emissions, was 6.3 parts per billion, while the average of the second to fourth highest modelled increase in daily maximum four-hour ozone was 3.7 parts per billion.

The background levels for Western Sydney regularly exceed NEPM guidelines. The modelled contribution of emissions from the airport would represent an increase of less than five per cent on 2030 values in the long term. While projected emissions for other sources are not available, the modelled contribution of the airport is unlikely to be significant in the context of regional emission sources.

Contribution to climate change

In the absence of a projected greenhouse gas emissions inventory for 2063, greenhouse gas emission estimates for the long term development represent approximately 0.59 per cent of Australia's projected 2030 transport-related greenhouse gas (GHG) emission inventory. For this reason, it is concluded the GHG emissions from the airport would not be material in terms of the national inventory, or contribution to climate change.

Emissions from fuel jettisoning

Potential emissions from fuel jettisoning are assessed in Chapter 26 of Volume 2.

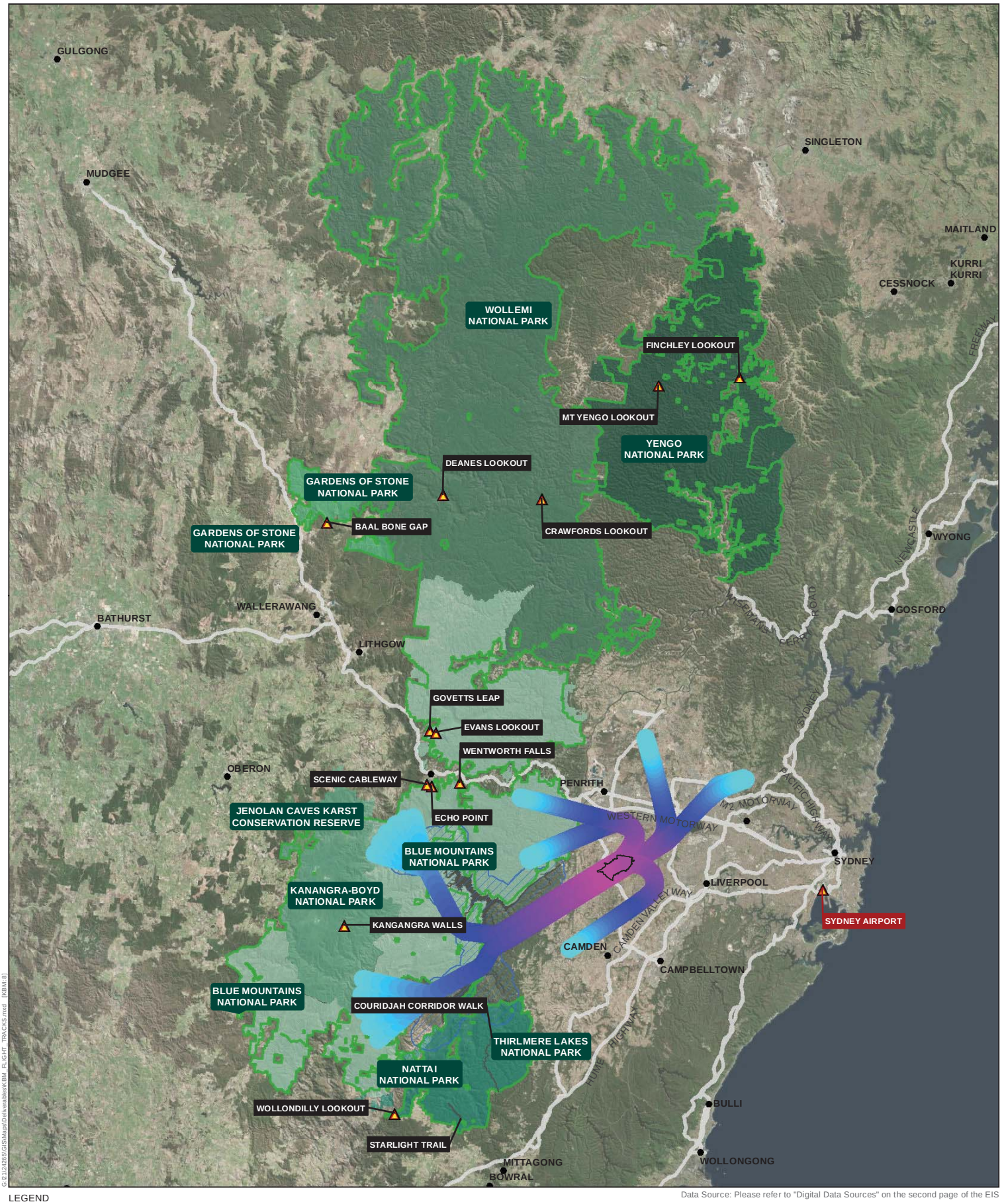
The findings of the assessment indicate that fuel jettisoning is very unlikely to have a significant impact on the GBMWHA due to the rarity of such events, the inability of many aircraft to perform fuel jettisons, the rapid vaporisation and wide dispersion of jettisoned fuel and the strict guidelines on fuel jettisoning altitudes and locations. Fuel jettisoning is not anticipated to become more prevalent during the long term operation of the airport.

38.3.2.3. Amenity

As for the indicative Stage 1 flight paths, almost all aircraft departures and arrivals in the long term would occur at an altitude of more than 5,000 feet and most would occur at more than 10,000 feet above sea level over the GBMWHA. The predicted altitudes of arriving and departing flights in the long term are shown in Figure 38-2 and Figure 38-3.

The altitude of key sensitive areas and the average altitude above ground level relevant to the sensitive areas are shown in Table 38–2. No flights are expected to occur less than 6,000 feet from ground level in the vicinity of sensitive areas.

The altitude levels for each sensitive area relate to lookout locations at high elevations within the GBMA. Some areas frequented by tourists and recreational users are at significantly lower altitudes such as the Jamison Valley walking tracks (1570 feet), the Starlights trail within the Nattai wilderness area (305 feet at Nattai River) and Wollemi Creek within the Wolllemi wilderness area (450 feet).



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

- Airport site
- Greater Blue Mountains World Heritage Area
- Drinking Water Catchment – No Entry Area

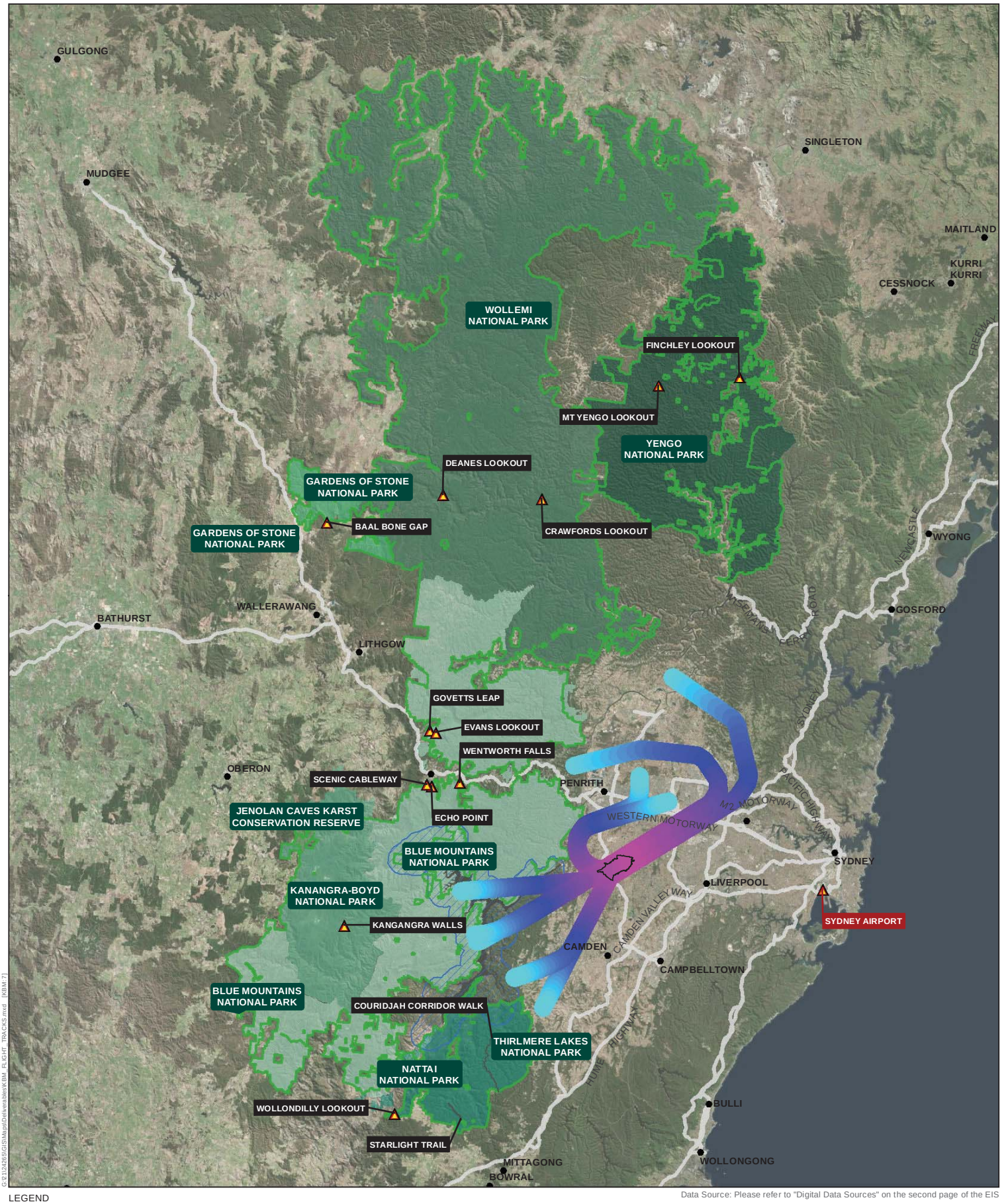
Flight track altitude below 10,000 feet

- 10,000 ft
- 5,000 ft
- 0 ft

0 5 10 20
Kilometres

N

Figure 38-2 - Flight track altitude below 10,000 feet above sea level, prefer 05 dual parallel runways



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Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

LEGEND

- Airport site
- Greater Blue Mountains World Heritage Area
- Drinking Water Catchment – No Entry Area

Flight track altitude below 10,000 feet

- 10,000 ft
- 5,000 ft
- 0 ft

0 5 10 20
Kilometres

N

Figure 38-3 - Flight track altitude below 10,000 feet above sea level, prefer 23 dual parallel runways

Table 38–2 – Flight levels above sensitive areas

Area	Site altitude (~ above sea level)	Flight altitude	Flight above ground level
Jamison Valley south of Echo Point lookout and the Scenic Cableway at Katoomba and Wentworth Falls lookout	3,350 feet	> 10,000 feet	> 6,650 feet
Grose Valley east of Evans lookout and Govetts Leap lookout	3,350 feet	> 10,000 feet	> 6,650 feet
Wilderness area between Deanes lookout and Crawfords lookout within Wollemi National Park	3,000 feet	> 10,000 feet	> 7,000 feet
Nattai wilderness area	2,150 feet	> 10,000 feet	> 7,850 feet
Kanangra Walls and wilderness area east of Kanangra-Boyd lookout	3,550 feet	> 10,000 feet	> 6,450 feet
Baal Bone Gap within Gardens of Stone National Park	3,050 feet	> 10,000 feet	> 6,950 feet

As shown in Photograph 38–1, aircraft at 3,000 feet are not prominent visual features although they are visible from the ground. Aircraft viewed from a distance of between five and 10 kilometres from the airport would be at an altitude of more than 5,000 feet, increasing to more than 10,000 feet above sea level. When viewed from the key sensitive areas, this equates to approximately 6,000 feet above ground level. At 6,000 feet, aircraft are likely to be difficult to discern from ground level and are not considered to be visually obtrusive.

Photograph 38–1 – Aircraft at approximately 3,000 feet at a distance of 2.75 kilometres

The proposal may potentially be visible from Nepean lookout and Mount Portal Lookout both located at Glenbrook and between 13 and 14 kilometres from the airport site. A detailed assessment of visual impact is included in Chapter 36. This assessment concluded that a moderate impact to visual amenity was likely at Nepean Lookout and a negligible impact at Mount Portal.

Amenity can also be influenced by light spill from the proposed development. With continued increases in urban development within the region expected over the development period the specific contribution of the proposed airport would be expected to diminish.

38.3.3. Outstanding universal value

Operation of the airport in the long term would have no direct impact on the outstanding universal value of the GBMA. Indirect impacts on the outstanding universal value would be expected to be limited to potential noise and air quality impacts. These potential impacts are described and their significance assessed in Table 38–3.

The assessment of significance is based on the requirements of the EPBC Act Significant Impact Guidelines 1.1, which state that an action is likely to have a significant impact on the World Heritage values of a declared World Heritage property if there is a real chance or possibility that it would cause:

- one or more of the World Heritage values to be lost;
- one or more of the World Heritage values to be degraded or damaged; or
- one or more of the World Heritage values to be notably altered, modified, obscured or diminished.

Table 38–3 – Operational impacts on Outstanding Universal Value of the GBMWHA – long term (2063)

Criterion/element	Attributes	Operational impacts	Assessment of significance
Criterion (ix) Ongoing evolutionary processes	• Outstanding and representative examples of: ▪ evolution and adaptation of the genus Eucalyptus and eucalypt-dominated vegetation on the Australian continent; and ▪ products of evolutionary processes associated with the global climatic changes of the late Tertiary and the Quaternary. • Centre of diversification for the Australian scleromorphic flora, including significant aspects of eucalypt evolution and radiation; and • Primitive species of outstanding significance to the evolution of the earth's plant life: ▪ Wollemi pine (*Wollemia nobilis*); and ▪ Blue Mountains pine (*Pherosphaera fitzgeralii*).	Impacts on these attributes would only occur if there were direct loss through ground disturbance or significant pollution resulting in loss of habitat or alteration to evolutionary processes. Noise and air emissions represent indirect impacts and given the distance from the airport, the predicted emission levels are not considered to pose a threat to these listed values. The assessment of these impacts indicates that noise from overflights would not impact evolutionary processes. Air emissions from the long term airport operations are not considered to represent a material contribution to global climate change which may impact on these processes. Direct emissions from fuel jettisoning are rare and fuel evaporates before reaching the ground. As such, this would not have an impact on evolutionary processes. Outstanding and representative examples of evolutionary processes relate to pre-historical processes associated with climatic, geological, biological and ecological factors which have shaped the development of the GBMA. Similarly the significant aspects of scleromorphic flora and the existence of primitive species present in the GBMA are representative of evolutionary processes. No direct or indirect operational activities would have an impact on these processes in the GBMA and, as such, no discernible impact to attributes under this criterion would likely occur as a result of operation of the proposed airport.	The operation of a long term airport would not result in direct impacts on the attributes demonstrated within the GBMA relevant to evolutionary processes. The indirect impacts of a long term airport would not result in a World Heritage value being lost, degraded or damaged, or notably altered, modified, obscured or diminished. Accordingly, the proposed long term airport development would not have a significant impact on the attributes of this World Heritage criterion.

Criterion/element	Attributes	Operational impacts	Assessment of significance
Criterion (x) biological diversity	• Outstanding diversity of habitats and plant communities; • Significant proportion of the Australian continent's biodiversity (scleromorphic flora); • Primitive and relictual species with Gondwanan affinities; • Plants of conservation significance including 114 endemic species and 177 threatened species; and • Habitat that supports 52 mammal species, 63 reptile species, over 30 frog species and about one-third of Australia's bird species.	Impacts on these attributes would only occur if there were direct loss through on ground impacts or significant pollution resulting in loss of habitat or alteration to biological diversity. Noise and air emissions represent indirect impacts and given the distance from the airport site, predicted emission levels are not considered to pose a threat to these listed values. The assessment of these impacts indicates that noise from overflights would not impact biological diversity values. While peak noise levels associated with overflights may disturb species close to operations, flights to and from a long term airport over the GBMA, would generally be more than 5,000 feet above ground level, and would not exceed 55 dBA. These intermittent noise levels are unlikely to disturb fauna within the GBMA. Air emissions from the operation of a longer term airport are not considered to represent a material contribution to climate change which may impact biodiversity and direct emissions from fuel jettisoning would not impact biological diversity values. An assessment of the potential for the proposed development to impact upon biodiversity is provided in Chapter 39. Based on that assessment, no direct or indirect operational activities would impact on biological diversity of the GBMWHA and as such no discernible impact on the attributes under this criterion would likely occur as a result of operation of a long term airport.	The operation of a long term airport would not result in direct impacts on the examples of biological diversity present within the GBMA. The indirect impacts of a long term airport would not result in a World Heritage value being lost, degraded or damaged, or notably altered, modified, obscured or diminished. Accordingly a long term airport would not have a significant impact on the attributes of this World Heritage criterion.

Criterion/element	Attributes	Operational impacts	Assessment of significance
Integrity	• Sufficient size to protect the biota and ecosystem processes; • Largely protected by adjoining public lands of state forests and state conservation areas; • Statutory wilderness designation over 83.5 per cent of the property; • Closed and protected catchment for the Warragamba Dam; • Plant communities and habitats occur almost entirely as an extensive, largely undisturbed matrix almost entirely free of structures, earthworks and other human intervention; and • Custodial relationship of Aboriginal people from six language groups through ongoing practices that reflect both traditional and contemporary presence	The operation of the airport in the long term would not directly affect the physical size of the GBMA or the adjoining lands. Statutory provisions which provide protection to wilderness areas and the Warragamba Dam would not be impacted as the project will not directly encroach upon wilderness areas and indirect impacts are not expected to alter the wilderness values for which these areas have been designated under the National Wilderness Inventory. The operation of the airport in the long term would have no direct or indirect impact on the plant communities and habitats within the property. The operation of the airport in the long term would not directly or indirectly impact on the maintenance of Aboriginal cultural practices within the GBMA.	A long term airport development would not result in the loss of any elements necessary for the property to express its outstanding universal value. A long term airport would not reduce the size or change the boundary of the GBMA and would not impact on any features and processes that convey the property's outstanding universal value. An airport would not exacerbate existing threats to the integrity of the GBMA in the long term.

38.3.4. Other values

Table 38–4 provides an assessment of the potential long term impacts of an airport on the additional values of the GBMWHA identified in the Strategic Plan. These values complement and interact with the property's World Heritage values but are not part of the defined natural values for which the property is listed. The assessment of these values is relevant to the National Heritage listing of the GBMA.

Table 38–4 – Operational impacts on other important values of the GBMA – long term (2063)

Value	Attributes	Operational impacts	Assessment of significance
Geodiversity and biodiversity	• Extensive dissected sandstone plateaus; • Karst landscapes with several cave systems; • Prominent basalt-capped peaks; and • Quaternary alluvial deposits.	Potential impacts on this value would only occur if there were direct loss through ground impacts or pollution resulting in loss of geodiversity and biodiversity. No direct or indirect operational activities would have an impact on these processes and as such no impact on this value would occur as a result of operation of an airport in the long term.	A long term airport would not have a significant impact on the geodiversity and biodiversity of values associated with the GBMWHA.
Water catchment	• Wild rivers; • Pristine and relatively undisturbed catchment areas; and • Substantial contribution to maintaining high water quality.	Potential impacts on this value would only occur if there were direct loss through ground impacts or pollution resulting in harm to a water catchment. A portion of the GBMWHA fronts the Nepean River downstream of its confluence with Duncans Creek. The Duncans Creek catchment only covers approximately 11 percent of the airport site, the majority of which is outside of the footprint of the proposed works. In addition with the implementation of the proposed water quality control measures the impact to this creek and therefore changes to water quality and hydrology have very low potential to impact water quality in the Creek and the Nepean River. The remainder of the site discharges to the South Creek catchment with discharges to the Nepean River downstream of the GBMA. No direct or indirect operational activities would have an impact on these catchments and waterways and, as such, no impact on these values would occur as a result of operation of a proposed airport in the long term.	A long term airport would not have a significant impact on the water catchment values associated with the GBMA.
Indigenous heritage values	• Prominent landscape features with spiritual significance: ▪ Mount Yengo; and ▪ Coxs and Wollondilly River valleys. • Aboriginal rock art; and • Potential for uncovering further significant sites.	Operation of an airport in the long term would not directly impact on sites within the GBMWHA that have Indigenous heritage values. The only forms of indirect impact on cultural heritage values that can be reliably anticipated by this assessment are the temporary loss of contextual value from the periodic intrusion of low levels of aircraft noise. Mount Yengo is located in the north eastern extent of the GBMWHA and is not expected to be impacted by overflights or noise from aircraft. Similarly the Coxs River and Wollondilly River valley are located in areas of little to no noise impact.	An airport would not have a significant impact on the Indigenous heritage values associated with the GBMWHA in the long term.

Value	Attributes	Operational impacts	Assessment of significance
Historic heritage values	• Small graziers' huts; • Cedar logging roads and stock routes; • Ruins of oil shale mines and coal/shale mines; • Road and transport routes; and • Recreation and tourism.	Operation of an airport in the long term would not directly or indirectly impact on sites of historic cultural heritage within the GBMA. Indirect impacts on recreation and tourism are considered below.	A long term airport is not expected to have a significant impact on the historic heritage values associated with the GBMA.
Recreation and tourism	• Canyoning, bushwalking, rock climbing, nature observation, scenic driving, photography; • Picnic sites and basic camping facilities; • Catering, tours, accommodation; and • Direct and indirect contribution to the employment, income and output of the regional economy.	Key areas of recreation and tourism have been identified and assessed in regard to potential impacts from operation of a long term airport. While some areas are expected to experience intermittent noise levels above 50 dBA, such areas are limited in the context of the entire property. Similarly visual and lighting impacts are not considered to represent a significant change to existing conditions for recreation and tourism. The major tourism areas around Katoomba and Wentworth Falls would not be impacted by aircraft noise. Potential impacts may occur associated with increased traffic due to increased tourism in the region. However, these are expected to be limited to existing traffic routes and be limited to minor increases. Some increases in tourism development and infrastructure may occur, as a result of the increased tourism numbers, in the longer term result in an increase in regional traffic and economic development associated with tourism in the region. However, potential impacts from these facilitated developments can be effectively managed through the implementation of existing management plans for the region.	A long term airport would not have a significant impact on the recreation and tourism values associated with the GBMWHA.

Value	Attributes	Operational impacts	Assessment of significance
Wilderness	• Extensive natural areas; • Absence of significant human interference; • Opportunity to maintain integrity, gradients and mosaics of ecological processes; • Opportunities for solitude and self-reliant recreation; and • Aesthetic, spiritual and intrinsic value.	The wilderness areas of the GBMA are generally associated with the Nattai National Park and the Wollemi National Park. With lower noise levels potentially also affecting Blue Mountains and Kanangra Boyd National Parks (e.g. effects on Grose and Kanangra Boyd Wilderness Areas. Access to these areas is generally limited to hikers and low impact tourism. These limitations restrict the number of people within the area and as such limits the number of people potentially affected. Some areas of Nattai National Park and Wollemi National Park would be affected by maximum noise levels associated with infrequent overflights of Boeing 747 aircraft, an aircraft type gradually being phased out by airlines. The majority of aircraft using the airport such as the A320 have minimal noise impacts on the GBMA and it is expected that future generations of aircraft would continue to develop quieter technologies which would reduce noise impact further. A small proportion of the wilderness areas may be impacted by visual and lighting changes; however these are considered to be insignificant for the vast majority of wilderness areas. A potential increase in tourism numbers in the longer term may impact the wilderness experience of some areas.	A long term airport is not expected to have a significant impact on the wilderness values associated with the GBMA.
Research and education	• High scientific value discovered and undiscovered; • Scientific research into the identification, conservation and rehabilitation of World Heritage values, best management practice and threat abatement; and • Education value for schools and universities.	Operation of the proposed airport is not expected to have an impact on the biological diversity of the GBMA in the long term and, as such, the availability of the area for scientific investigation and research would not be limited.	An airport would not have a significant impact on the research and education values associated with the GBMA in the long term.

Value	Attributes	Operational impacts	Assessment of significance
Scenic and aesthetic	• Vertical cliffs, waterfalls, ridges, escarpments; • Outstanding vistas, uninterrupted views of forested wilderness; • Extensive caves; and • Sandstone canyons and pagoda rock formations.	Aircraft overflying the key lookouts that take advantage of the unique scenic qualities of the GBMA would be more than 6,000 feet above the relevant ground level and at this altitude would have limited visual intrusion. Similarly visual and lighting impacts are not considered to represent a significant change to existing conditions for scenic and aesthetic amenity.	Based on the altitude of aircraft overflying scenic areas, it is not expected that a significant impact would occur as a result of the operation of an airport in the long term.

38.3.5. Influence on existing threats

Table 38–5 provides a description of a long term airport's influence on existing threats identified for the GBMWHA in the Strategic Plan (DECC 2009c).

Table 38–5 – Operational impacts on other important values of the GBMA – long term (2063)

Threat	Project influence
Uncontrolled and inappropriate use of fire	The only risk of fire associated with the operation of an airport in the long term would be as a result of an aircraft crash. This would be a very rare and unlikely event and is not considered to be a contributory factor in the overall threat of uncontrolled and inappropriate use of fire.
Inappropriate recreation and tourism activities, including development of tourism infrastructure	A long term airport would provide increased aviation capacity in the Sydney region, which could also parallel a growth in tourism and visitation for the GBMA. Such an increase in tourism may influence potential for inappropriate tourism development. However it is very unlikely that an airport would directly contribute to inappropriate development or uncontrolled visitor access particularly within the context of strong management plans which are in place for the GBMWHA. Other factors such as Sydney's expanding population are likely to drive the need for any new management responses to threats posed by increased visitations.
Invasion by pest species including weeds and feral animals	No direct impacts on biodiversity are expected as a result of airport operations in the long term. It is very unlikely that the proposal would contribute to threats associated with weed and pest species.
Loss of biodiversity and geodiversity	Loss of biodiversity and geodiversity would only occur as a direct loss through ground impacts or significant pollution resulting in loss of habitat or alteration to evolutionary processes. Noise and air emissions from overflying planes are not expected to adversely impact biodiversity or geodiversity. As such the indirect impacts associated with an airport are not considered to be a contributing factor to this threat in the long term.
Impacts of human enhanced climate change	An airport is expected to have a marginal contribution to overall transported related GHG emissions for 2030. A predicted overall contribution of 0.59 percent of GHG emissions is considered to be negligible. As such an airport is not considered to be a contributing factor to this threat in the long term.
Lack of understanding of heritage values	This threat would be relevant if no assessment of potential impacts was undertaken. An assessment of heritage values has been undertaken and as such a long term airport development is not considered to be a contributing factor to this threat.

38.4. Considerations for future development stages

Mitigation and management of potential noise impacts on the GBMA would be achieved through the planning and implementation of appropriate flight paths, airspace design and airport operating procedures to support long term airport operations. A future design process would include consideration of noise abatement opportunities and would require extensive consultation with airlines, the community and other stakeholders as part of a separate regulatory approvals process under the *Airspace Act 2007*.

The current assessment based on indicative long term airspace management arrangements shows that the level of impact on the Greater Blue Mountains, including the World Heritage and National Heritage values of the GBMA is likely to be low. The potential to further reduce the noise and visual impact from aircraft flying over wilderness and other areas of the GBMA would be important considerations in determining formal airspace and operational arrangements prior to the commencement of dual runway operations at the airport site.

38.5. Summary of findings

At its closest point, the GBMA is approximately eight kilometres from the airport site. As such, no direct impacts are expected on the World Heritage values from future construction activities or operation of an airport at Badgerys Creek. Potential indirect impacts on World Heritage and National Heritage values from the long term operation of an airport were assessed having regard to the attributes identified in the Statement of Outstanding Universal Value for the GBMWHA and the complementary values of the area as defined in the GBMA Strategic Plan. The assessment considered noise, air emissions and amenity impacts from overflight of aircraft.

The assessment's findings are that a long term airport would not have a significant impact on the GBMA. In particular, the indirect impacts of airport operation in the long term would not result in an attribute of the property being lost, degraded or damaged, or notably altered, modified, obscured or diminished.