



# **Chapter 9**

## **Airport Options**



# Chapter 9

## Airport Options

*This chapter describes the three airport options under consideration. The probable design, staging, construction and operation of each option is discussed. Further details about the airport options can be obtained from studies undertaken by the Second Sydney Airport Planners (1997a, 1997b and 1997c).*

### 9.1 Characteristics of the Airport Sites

The area containing the three airport sites under consideration is located about 15 kilometres west of Liverpool town centre, 12 kilometres south of Penrith town centre and 46 kilometres west of the Sydney Central Business District (Figure 9.1). Aerial photographs of the sites are shown on Figures 9.2 to 9.4.

The airport sites are situated in a transitional area between the relatively flat Cumberland Plain and the foothills of the Blue Mountains. The general area is undulating, with rolling hills and valleys, large areas of grassland, and some areas of flat land. The sites have an average elevation of approximately 80 metres above sea level, ranging from approximately 45 metres in the north-east to 120 metres in the north-west.

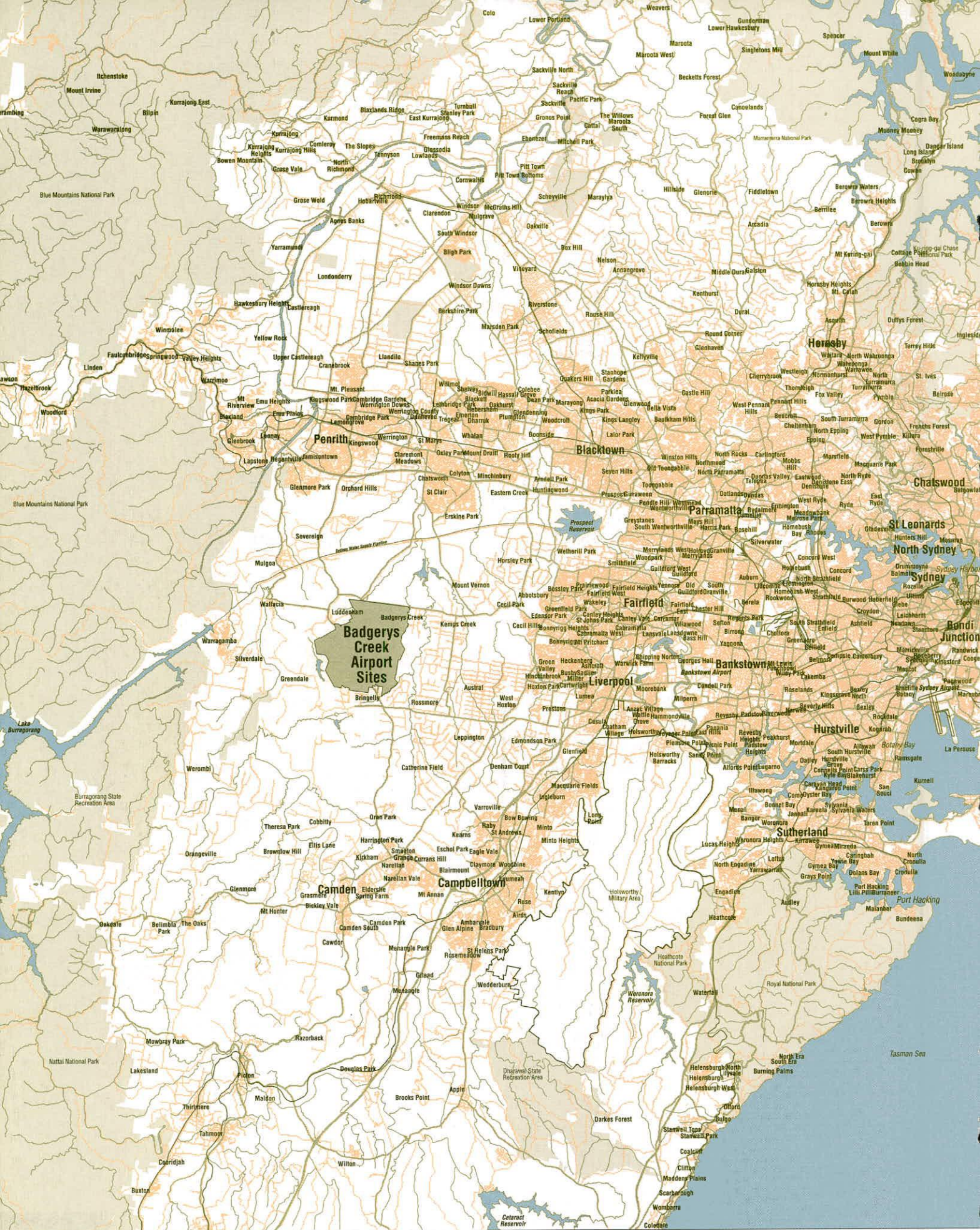
Numerous farm dams are located within the sites, as well as sections of Badgerys, Oaky and Cosgrove creeks. These creeks flow into South Creek which ultimately flows into the Hawkesbury River. Streams in the Badgerys Creek area are generally nutrient enriched but they support a diverse ecosystem. Algal growth is excessive and macroinvertebrate levels suggest poor ecological water quality.

The three-sites area contains substantial native vegetation, although it is scattered and generally in poor condition. Remnants of Cumberland Plain Woodland exist, but these are considered to be too small and altered to be assigned State significance. Generally, fauna habitats have been highly altered and the invasion of introduced plants and animals is evident. Overall, the airport sites are considered to have regional significance for nature conservation.

The airport sites are used for agricultural purposes and low density rural residential development. About 1,700 hectares of the sites were purchased by the Commonwealth following the decision to proceed with an airport at Badgerys Creek in 1986.

There are major aviation activities existing in the surrounding region including Hoxton Park airport which is located approximately nine kilometres to the east. It is a major general aviation airport, accommodating about 100,000 aircraft movements a year. Camden airport is located approximately 16 kilometres to the south; it serves about 118,000 aircraft movements a year.

Badgerys Creek village is located within the three-sites area. Luddenham village is located to the north-west and Bringelly village to the south. Other surrounding villages and communities include Kemps Creek, Wallacia, Mulgoa, Sovereign, Warragamba, Silverdale, Greendale, Rossmore, Austral, West Hoxton, Leppington, Catherine Field, Oran Park, Cobbitty, Theresa Park and Werombi. The nearby rural residential communities of Mount Vernon and Horsley Park have expanded over recent years through the construction of a substantial number of new rural residential



Urban Areas (indicated by local roads)



Figure 9.1  
Location of Airport Sites



0Km

10Km



Approximate Boundary of  
Badgerys Creek Airport Site

Runways and Taxiways



0Km

4Km

Figure 9.2  
**Aerial Photograph of Option A**



Approximate Boundary of  
Badgerys Creek Airport Site

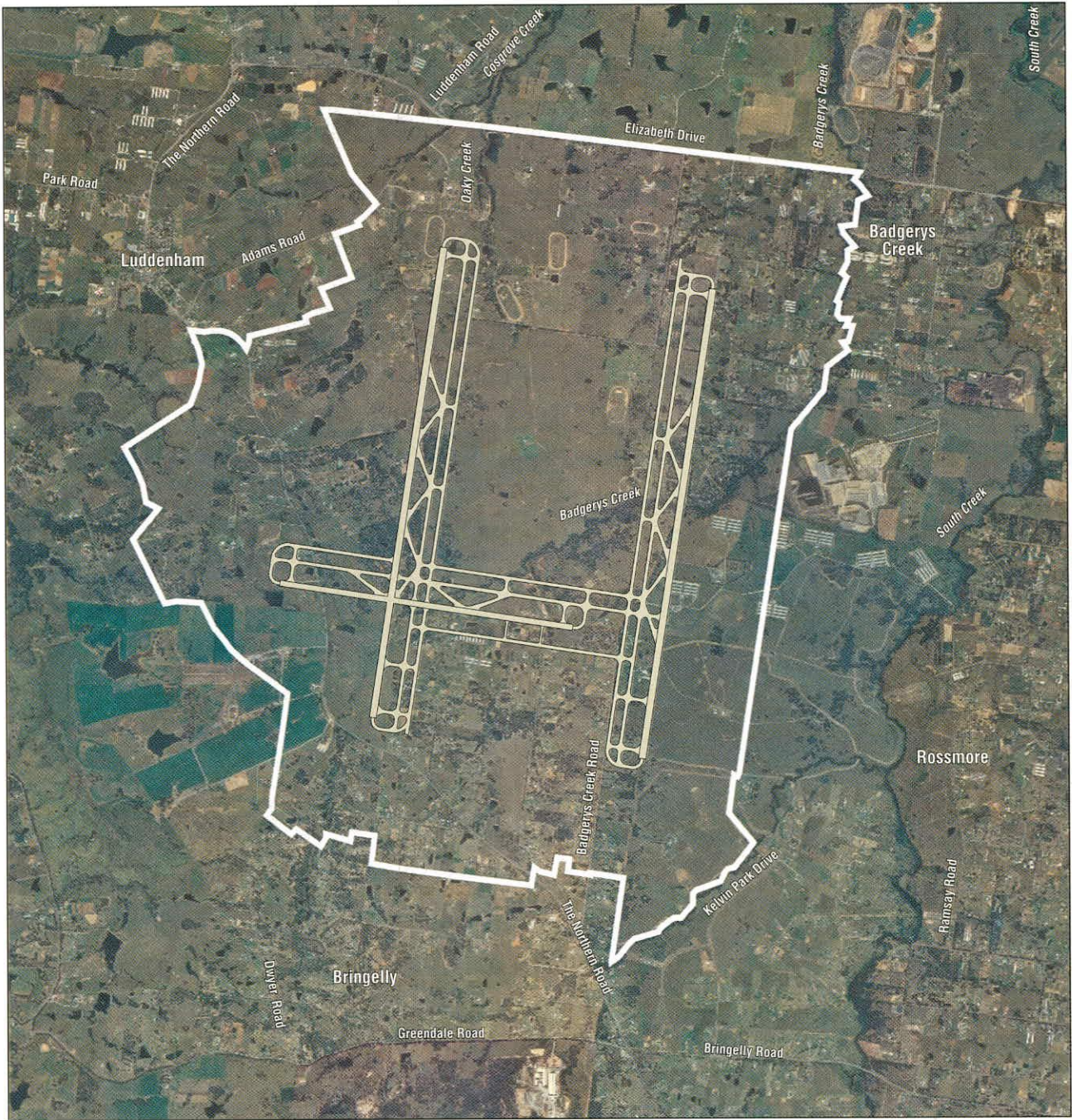
Runways and Taxiways



0Km

4Km

Figure 9.3  
Aerial Photograph of Option B



Approximate Boundary of  
Badgerys Creek Airport Site

Runways and Taxiways



0Km 4Km

Figure 9.4  
**Aerial Photograph of Option C**

dwelling. Further away from the sites are the urban areas of Glenmore Park (10 kilometres), St Clair (eight kilometres), Erskine Park (eight kilometres), Bossley Park (10 kilometres), Abbotsbury (nine kilometres), Cecil Hills (eight kilometres), Carnes Hill (nine kilometres) and Harrington Park (13 kilometres away).

At different points in the surrounds of the airport sites are the Telstra Bringelly High Frequency Radio Station, the RAAF Bringelly Remote Receiving Station, the Department of Defence Orchard Hills weapons storage facility, the University of Sydney research farms, several commercial poultry farms, and the Elizabeth Drive landfill. Land to the north of the sites was previously used by CSIRO; it was sold in 1996.

The potential closure of Defence Establishment Orchard Hills, a weapons storage and maintenance facility, is mentioned in the *Secretarial Papers* of the recent Defence review *Future Directions for the Management of Australia's Defence* (Department of Defence, 1997a). Its possible closure will be the subject of further Government consideration following detailed studies of the feasibility and benefits of such a closure.

The Northern Road, Badgerys Creek Road and a 330 kilovolt electricity transmission line pass through the sites.

## 9.2 Option A Proposal

### 9.2.1 Major Elements

Option A would be located on the land already owned by the Commonwealth, an area of about 1,700 hectares, and on a portion of The Northern Road that crosses the airport site. The option is generally based on the original runway layout developed for the *Second Sydney Airport Site Selection Program Draft Environmental Impact Statement* (Kinhill Stearns, 1985), which considered locating an airport at Badgerys Creek. Figure 9.5 shows the proposed Stage 1 development of the site and Figure 9.6 shows the master plan for longer term development.

The master plan would provide all the facilities required for an airport accommodating about 30 million passengers a year. Two parallel runways would have approximate north-east to south-west orientation and be separated by 1,670 metres. The south-eastern runway would be 4,000 metres long. Typically it would be used for take offs by aircraft operating fully laden on long haul sectors.

The north-western runway would be 3,000 metres, an increase in length of 500 metres over the runway proposed in 1985. A longer runway could not be provided within the site boundaries. It would, however, provide sufficient runway length for operations by all anticipated aircraft types, except when fully laden and/or on the hottest days. Option A would not have a cross wind runway.

The runway separation distance of 1,670 metres is consistent with the planning for the site since 1985. This separation distance places restrictions on the flexibility of the site for development of terminals and associated aprons. Consequently, the configuration of the terminal would be different for Option A compared with that for Options B and C. A linear terminal configuration with car parking and commercial areas is proposed.

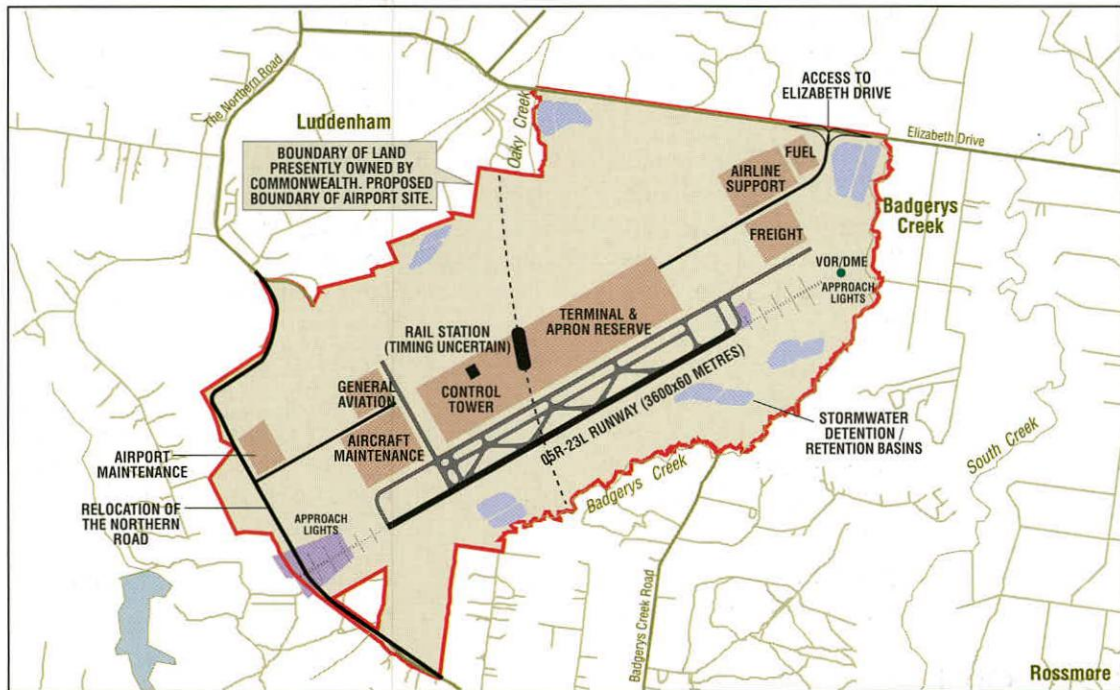


Figure 9.5

**Stage 1 Development of Option A**

Source: Second Sydney Airport Planners, 1997a

Land presently owned by Commonwealth  
 Area which would require clearing and/or earthworks  
 to comply with Obstacle Limitation Surfaces



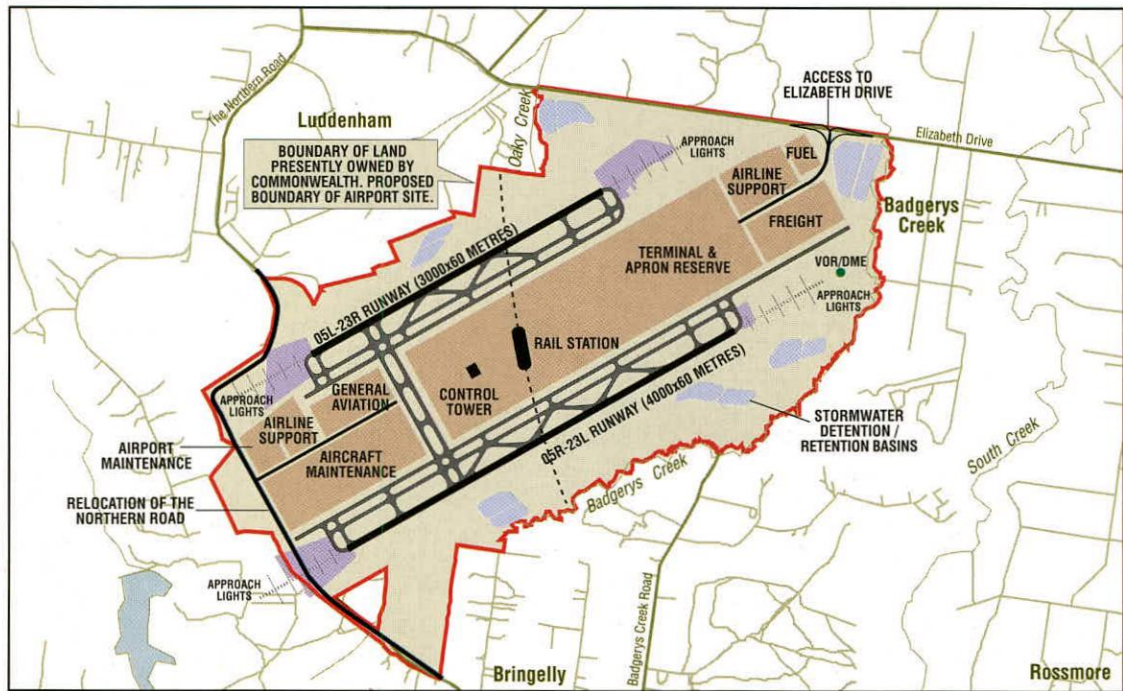
0Km 4Km

No acquisition of land would be required for Option A except the portion of The Northern Road that crosses the airport site. Acquisition would occur after realignment of The Northern Road.

The proposed road access would be similar for all three options. It is anticipated that the principal access for passengers, meeters and greeters, freight and some commercial traffic would be from Elizabeth Drive. A second access could be provided by upgrading Bringelly and The Northern Roads; this would provide access to the maintenance and general aviation facilities proposed for the southern areas of the airport. Further details of road access to the airport sites are discussed in Chapter 22.

The Northern Road would be relocated within the airport site to allow the construction of runways and other airport facilities; Badgerys Creek Road would be closed at the airport boundary.

Alternatives for providing rail access to the airport have been the subject of investigation by the State and Commonwealth Governments over recent years. A connection to the airport is proposed from the Cumberland and East Hills lines, taking off at Glenfield; this is discussed in Chapter 22.



Land presently owned by Commonwealth

Area which would require clearing and/or earthworks to comply with Obstacle Limitation Surfaces

Figure 9.6  
**Master Plan of Option A**

Source: Second Sydney Airport Planners, 1997a



0Km 4Km

### 9.2.2 Operation

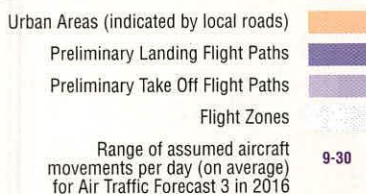
The preliminary flight paths and flight zones for Option A are shown in Figures 9.7 and 9.8. Each figure shows a different way the airport may operate; for example, Figure 9.7 shows the flight paths and zones when aircraft are landing from the south-west and taking off to the north-east. Figure 9.8 shows the flight paths when the airport is operating in the reverse mode, that is, with aircraft landing from the north-east and taking off to the south-west. With the runways orientated 048/228 degrees magnetic, complex airspace management procedures for arriving and departing aircraft would need to be established to ensure the safety and regularity of operations. This is because of potential interactions with aircraft operating from Sydney Airport.

The two operating scenarios adopted for the environmental assessment of Option A are explained in Section 8.6. The forecasts of air traffic that may operate from the Second Sydney Airport in 2006 and 2016 are described in Section 7.3. The estimated number of flights that would occur on each flight path on an average day in 2016 are also shown on Figures 9.7 and 9.8. These are provided as a range of movements representing the two operating scenarios modelled as explained in Section 8.6.

## 9.3 Option B Proposal

### 9.3.1 Major Elements

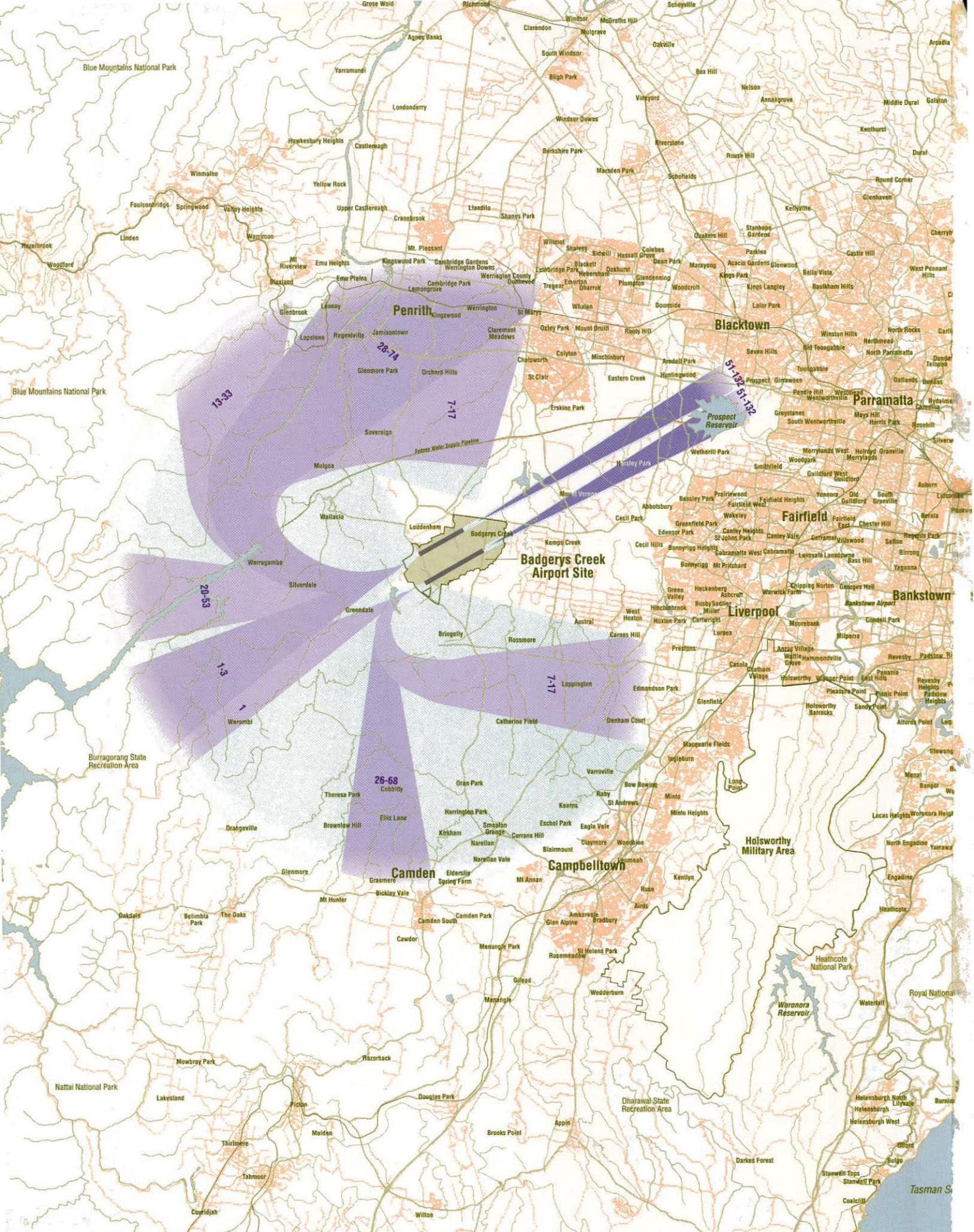
Option B would have the same north-east to south-west orientation for the parallel runways as Option A, but would provide two 4,000 metre parallel runways with a separation distance of 2,300 metres. Additionally, a cross wind runway 2,500 metres



### **Preliminary Flight Paths for Option A: Landings From the South-West and Take Offs to the North-East**

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.





Urban Areas (indicated by local roads)

Preliminary Landing Flight Paths

Preliminary Take Off Flight Paths

Flight Zones

Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016

26-68

### Figure 9.8 Preliminary Flight Paths for Option A: Landings From the North-East and Take Offs to the South-West

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.



long with a north-north-west to south-south-east orientation would be provided. Figure 9.9 shows Stage 1 of the development and Figure 9.10 shows the master plan for longer term development of the site.

The site for Option B incorporates the area described for Option A, but requires the acquisition of an additional 1,200 hectares of land to the south, south-west and south-east of the site of Option A.

Surface access would be similar to that proposed for Option A, with Elizabeth Drive forming the main vehicular access route to the passenger terminal and other public facilities. The Northern Road would be diverted further to the south and west of the airport than the route identified for Option A. The diverted road would provide access to the airport's commercial areas located to the west of the cross wind runway in a similar manner to that described for Option A, with no public access provided from this area to the terminal or other public facilities. Badgerys Creek Road would be closed at the airport boundary.

A future rail connection could be provided as described for Option A.

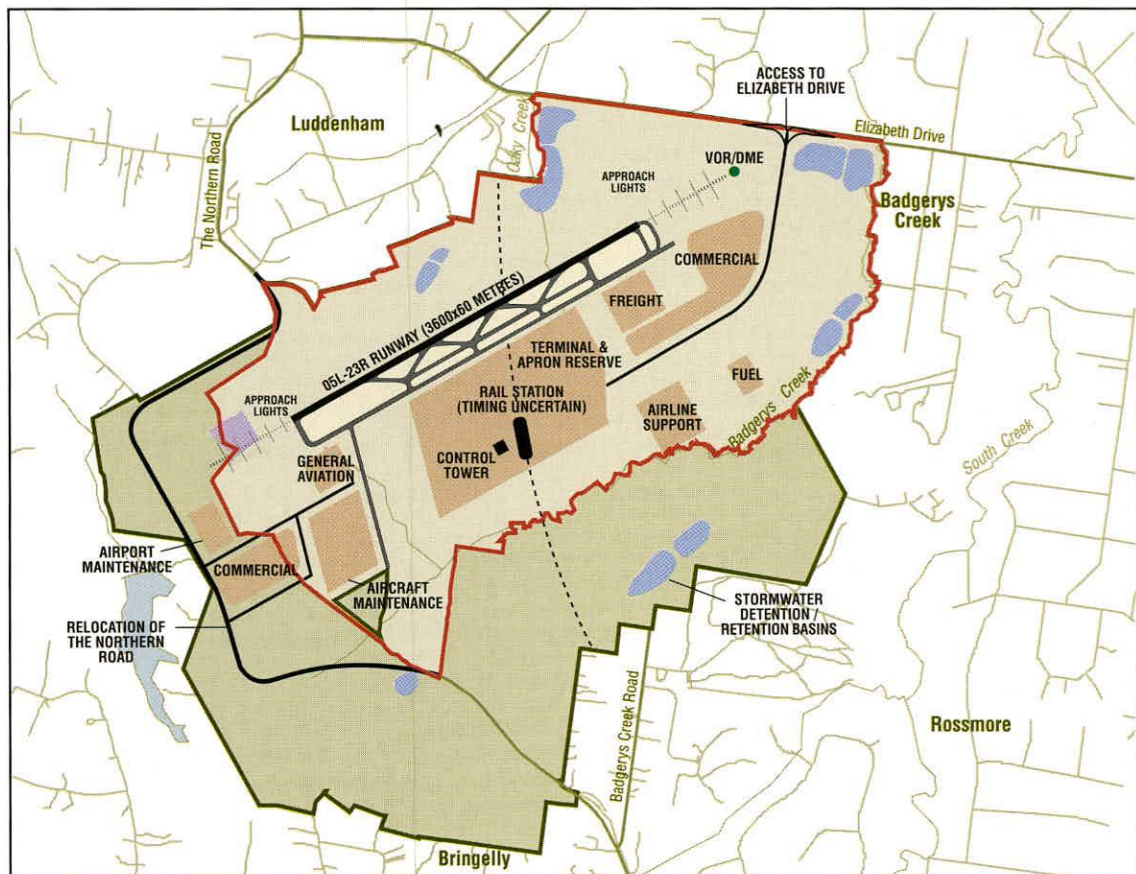
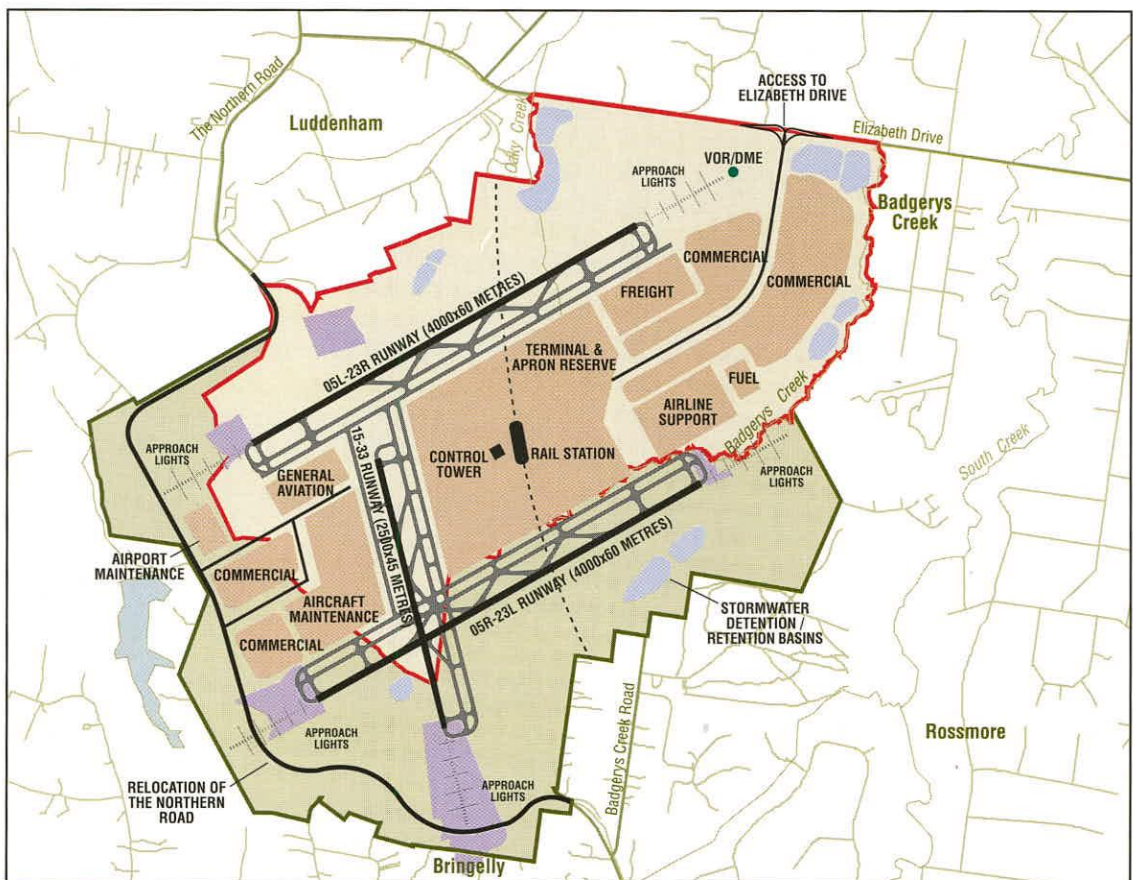


Figure 9.9

### Stage 1 Development of Option B

Source: Second Sydney Airport Planners, 1997a



Land presently owned by Commonwealth  
 Additional land required for Airport Option  
 Area which would require clearing and/or  
 earthworks to comply with Obstacle  
 Limitation Surfaces

Figure 9.10  
**Master Plan of Option B**  
 Source: Second Sydney Airport Planners, 1997a

### 9.3.2 Operation

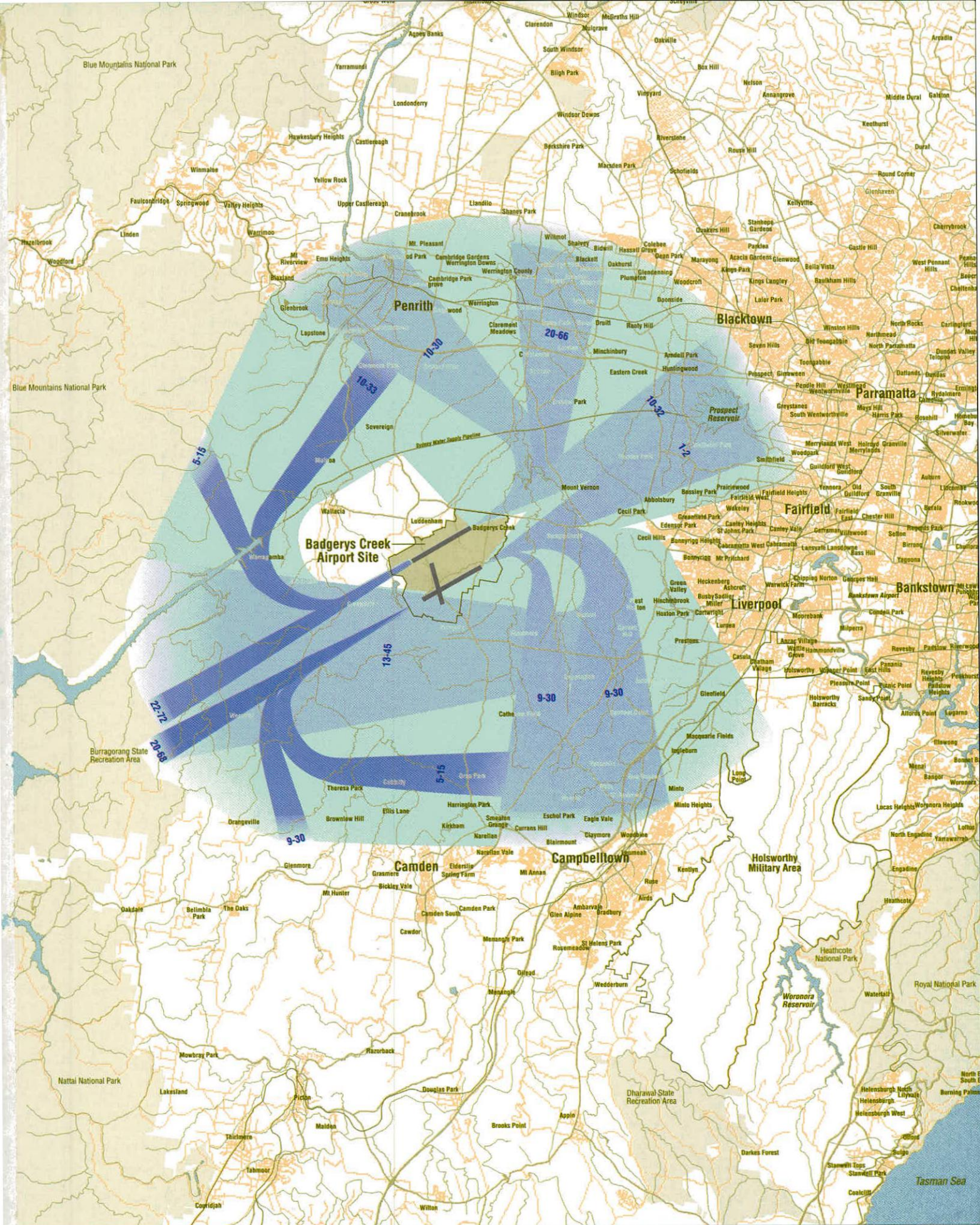
The preliminary flight paths for Option B are shown on Figures 9.11 to 9.14. This option is a modification of Option A and incorporates more widely spaced parallel runways, with the same orientation, and a cross wind runway. The cross wind runway would be used when wind conditions restricted the use of the parallel runways or for noise management purposes.

The three operating scenarios adopted for the environmental assessment of Option B are explained in Section 8.6. The forecasts of air traffic that may operate from the Second Sydney Airport in 2006 and 2016 are described in Section 7.3. The estimated number of flights that would occur on each flight path on an average day in 2016 are also shown on Figures 9.9 to 9.12. These are provided as a range of movements representing the three operating scenarios modelled as explained in Section 8.6.

## 9.4 Option C Proposal

### 9.4.1 Major Elements

Option C would be similar to Option B, save that it proposes a north to south orientation for the main parallel runways. This orientation would be more similar to the orientation of the parallel runways at Sydney Airport than Options A and B. A



Urban Areas (indicated by local roads) ■

Preliminary Landing Flight Paths ■

Preliminary Take Off Flight Paths ■

Flight Zones ■

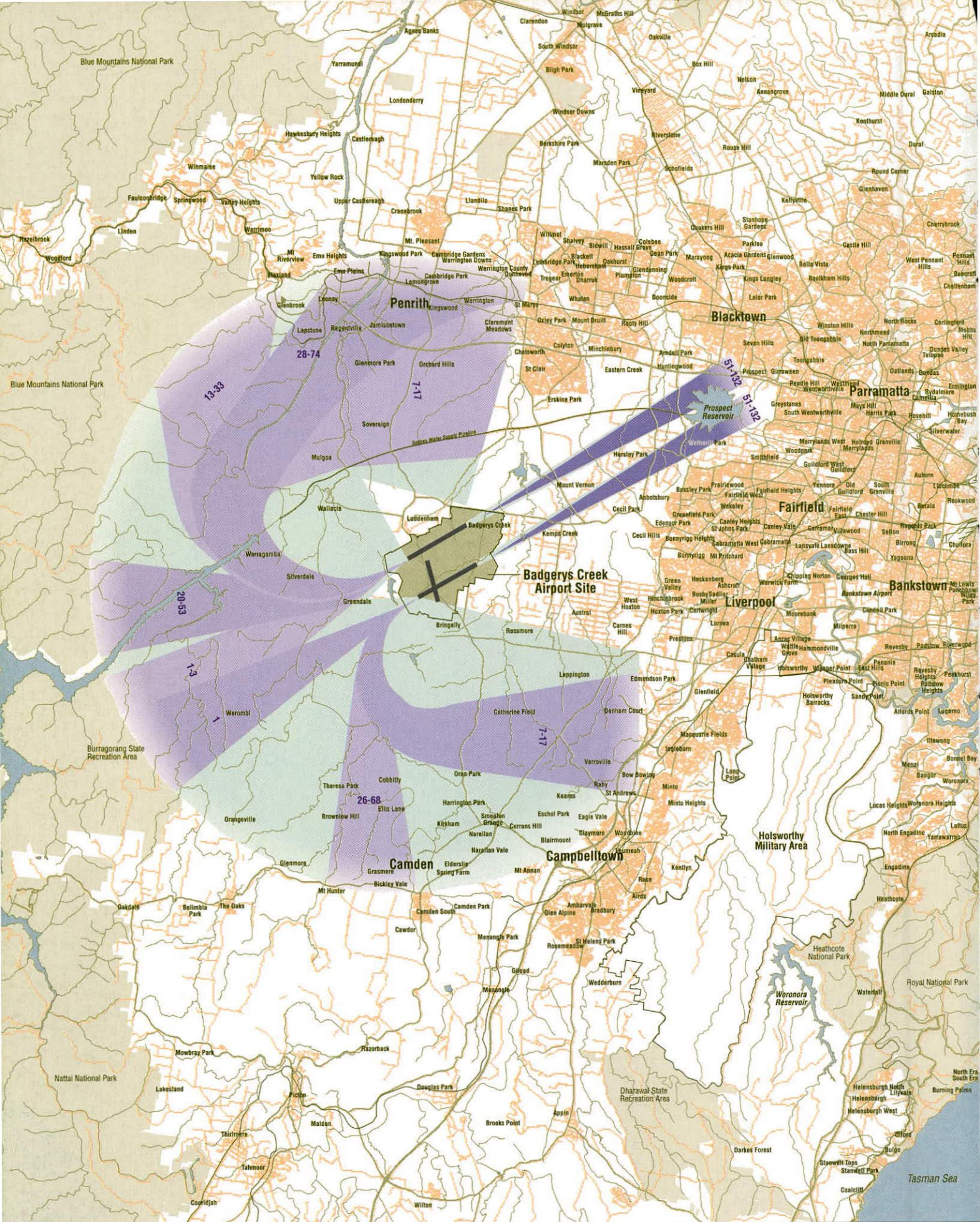
Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016 9-30

**Figure 9.11**  
**Preliminary Flight Paths for Option B:**  
**Landings From the South-West and Take Offs to the North-East**

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.





Urban Areas (indicated by local roads)   
Preliminary Landing Flight Paths   
Preliminary Take Off Flight Paths   
Flight Zones   
Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016

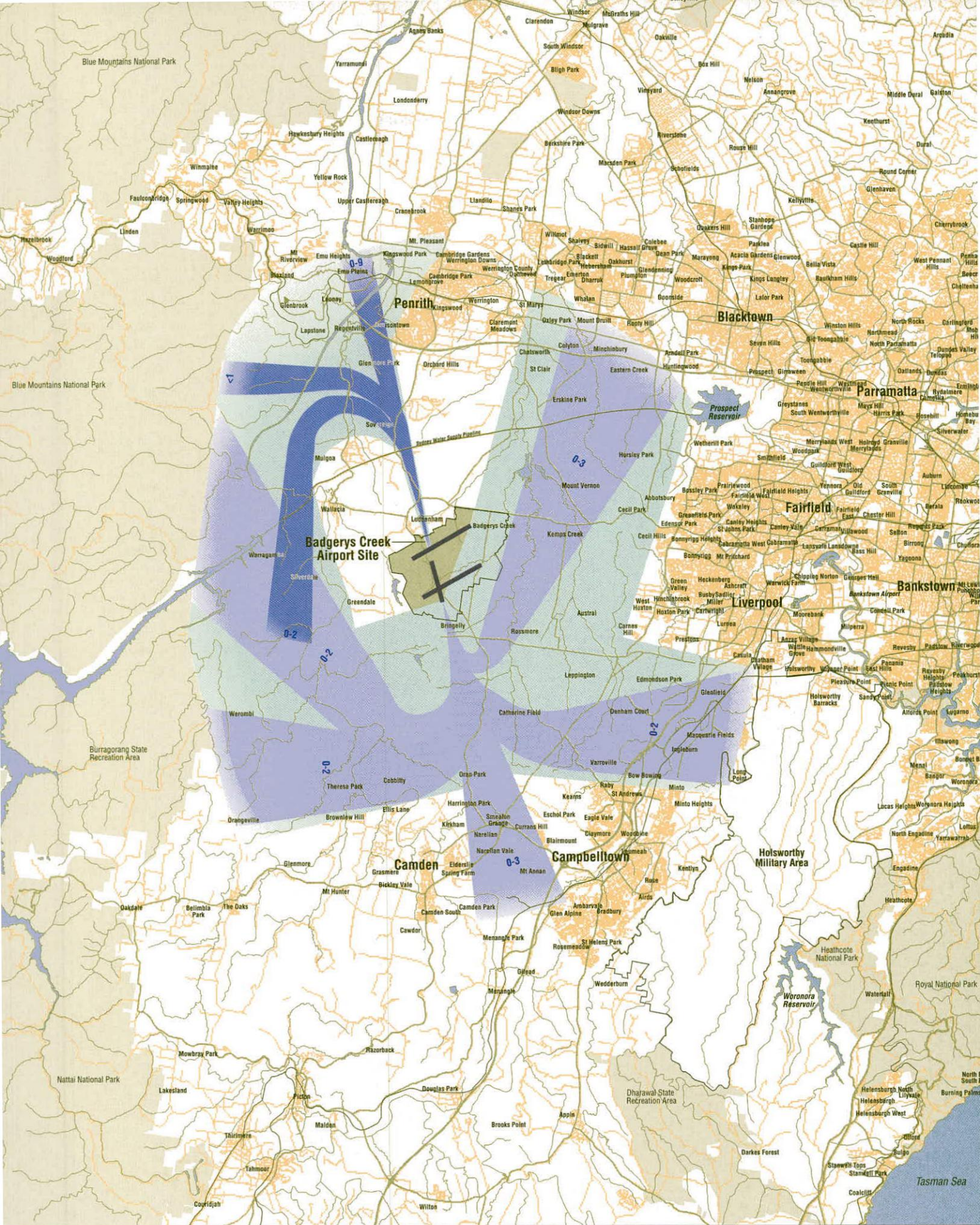
51-132

**Figure 9.12**  
**Preliminary Flight Paths for Option B:**  
**Landings From the North-East and Take Offs to the South-West**

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.





Urban Areas (indicated by local roads) ■

Preliminary Landing Flight Paths ■

Preliminary Take Off Flight Paths ■

Flight Zones ■

Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016 (< 1 means less than one on average)

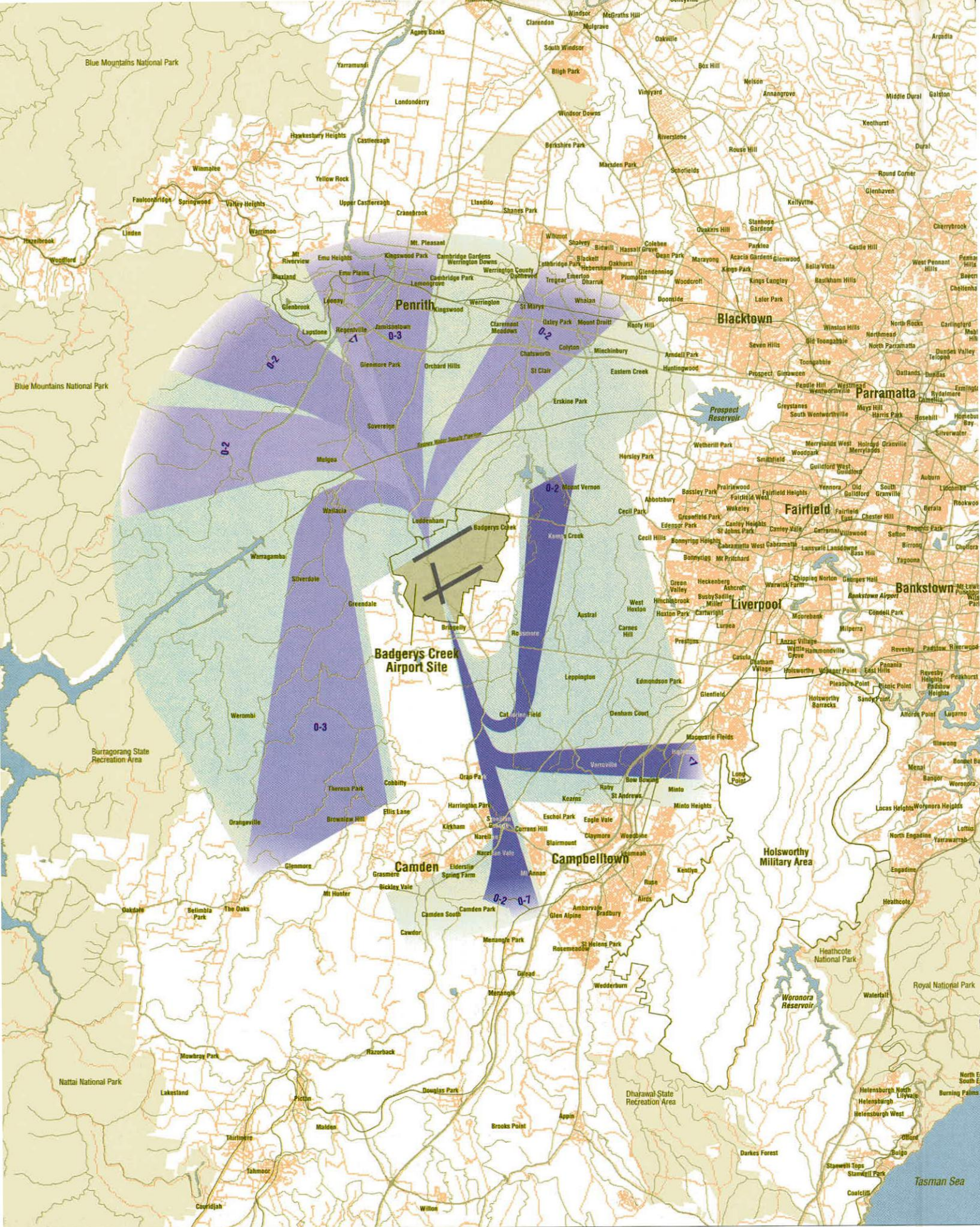
**0-3**

**Figure 9.13**  
**Preliminary Flight Paths for Badgerys Creek Option B:**  
**Landings From the North and Take Offs to the South**

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.





Urban Areas (indicated in local roads)

Preliminary Landing Flight Paths

Preliminary Take Off Flight Paths

Flight Zones

Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016 (<1 means less than one on average)

Figure 9.14  
**Preliminary Flight Paths for Option B:  
 Landings From the South and Take Offs to the North**

Source: Second Sydney Airport Plan, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.



2,500 metre cross wind runway with an east to west orientation would also be provided. Figure 9.15 shows Stage 1 of development of the site and the longer term master plan is shown in Figure 9.16. The layout differs from Options A and B because of the different runway orientation, although facilities would be similar.

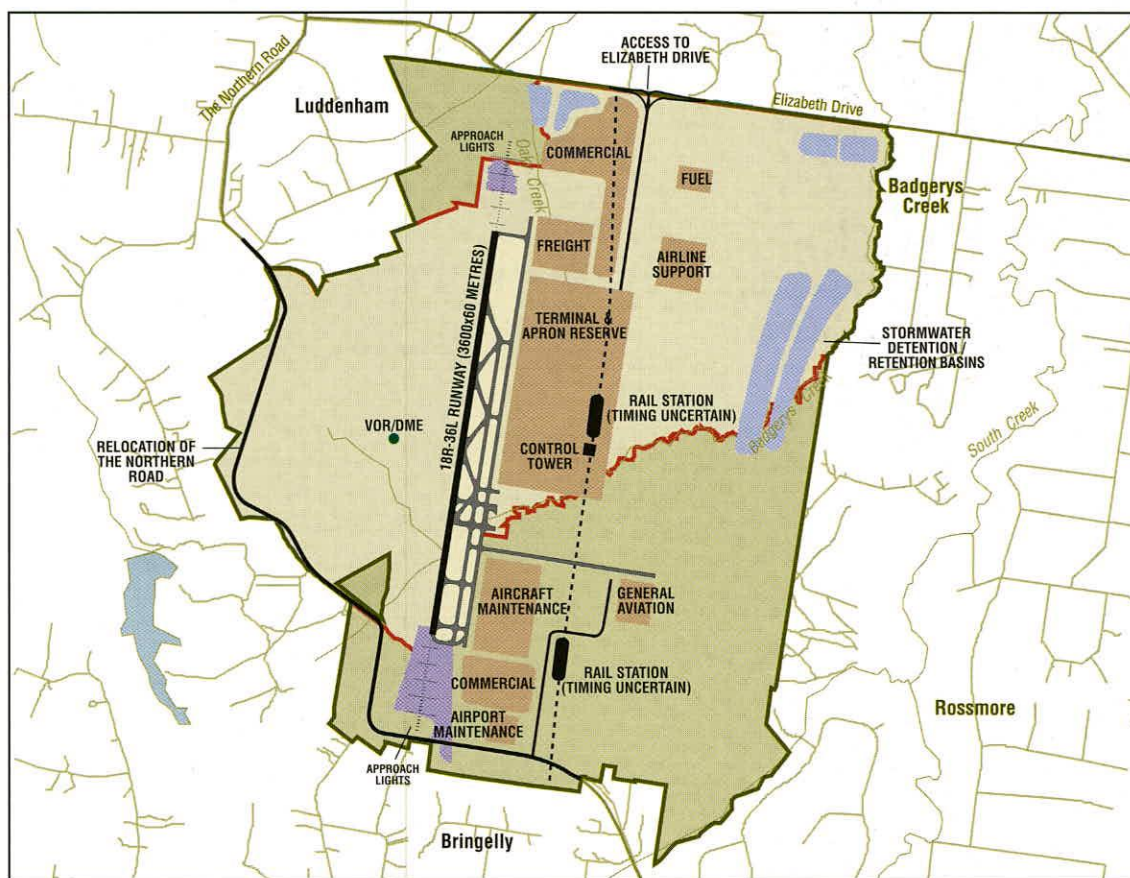
The site incorporates the area of Option A, but requires the acquisition of a further 1,150 hectares of land to the south and south-east.

Road access would be similar to that for Options A and B, with primary road access from Elizabeth Drive; once again a substantial diversion of The Northern Road would be required. Badgerys Creek Road would be closed at the airport boundary.

Rail access would be similar to that for Options A and B; however, for urban planning reasons an alternative rail corridor through Rossmore may be more appropriate. The rail alternatives are discussed further in Chapters 10 and 22.

#### 9.4.2 Operation

The preliminary flight paths for Option C are shown on Figures 9.17 to 9.20. The cross wind runway would be used when wind conditions restricted the use of the parallel runways or for noise management purposes.



Land presently owned by Commonwealth  
Additional land required for Airport Option  
Area which would require clearing and/or  
earthworks to comply with Obstacle  
Limitation Surfaces

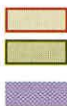
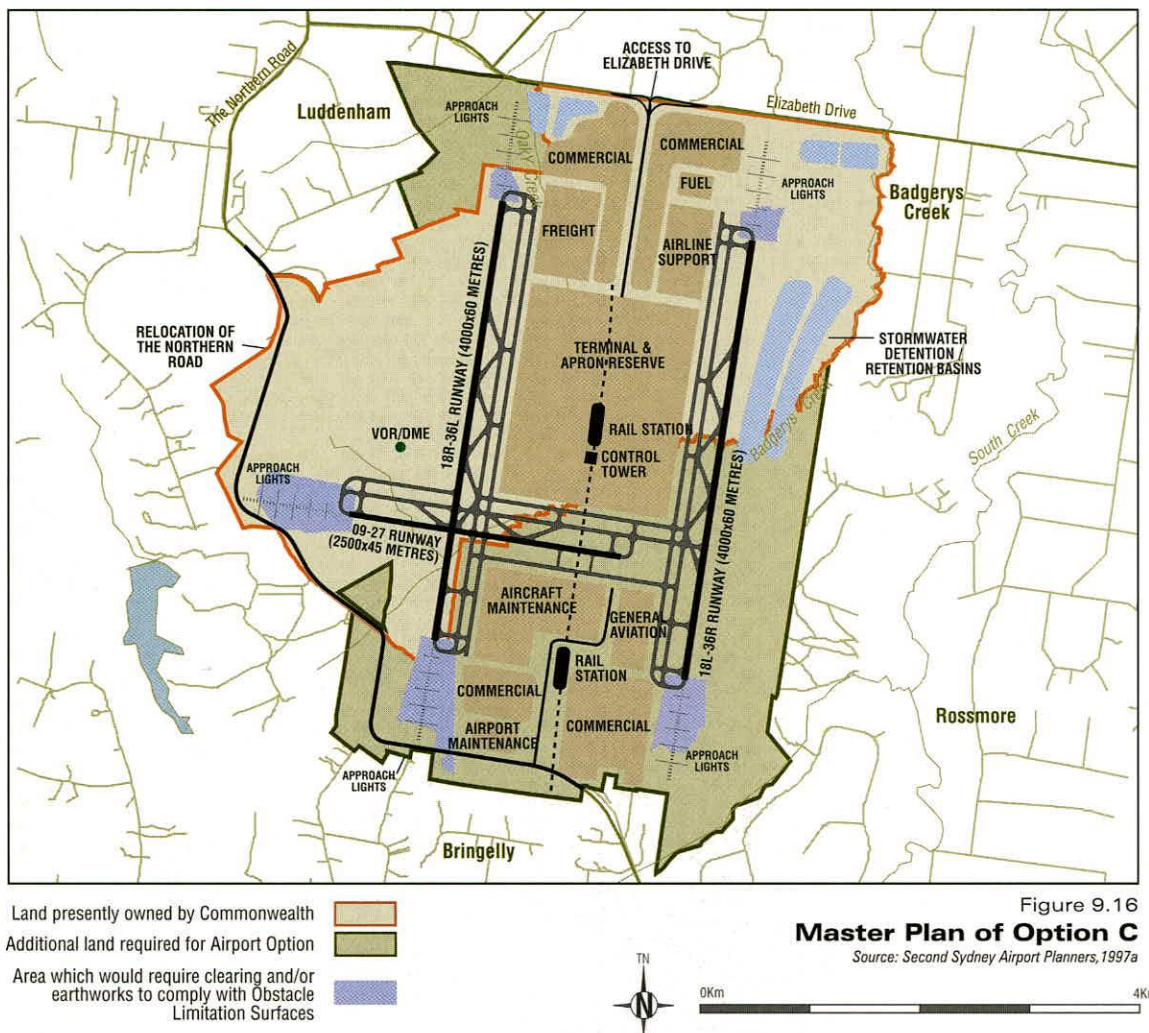


Figure 9.15  
**Stage 1 Development of Option C**

Source: Second Sydney Airport Planners, 1997a



0Km 4Km



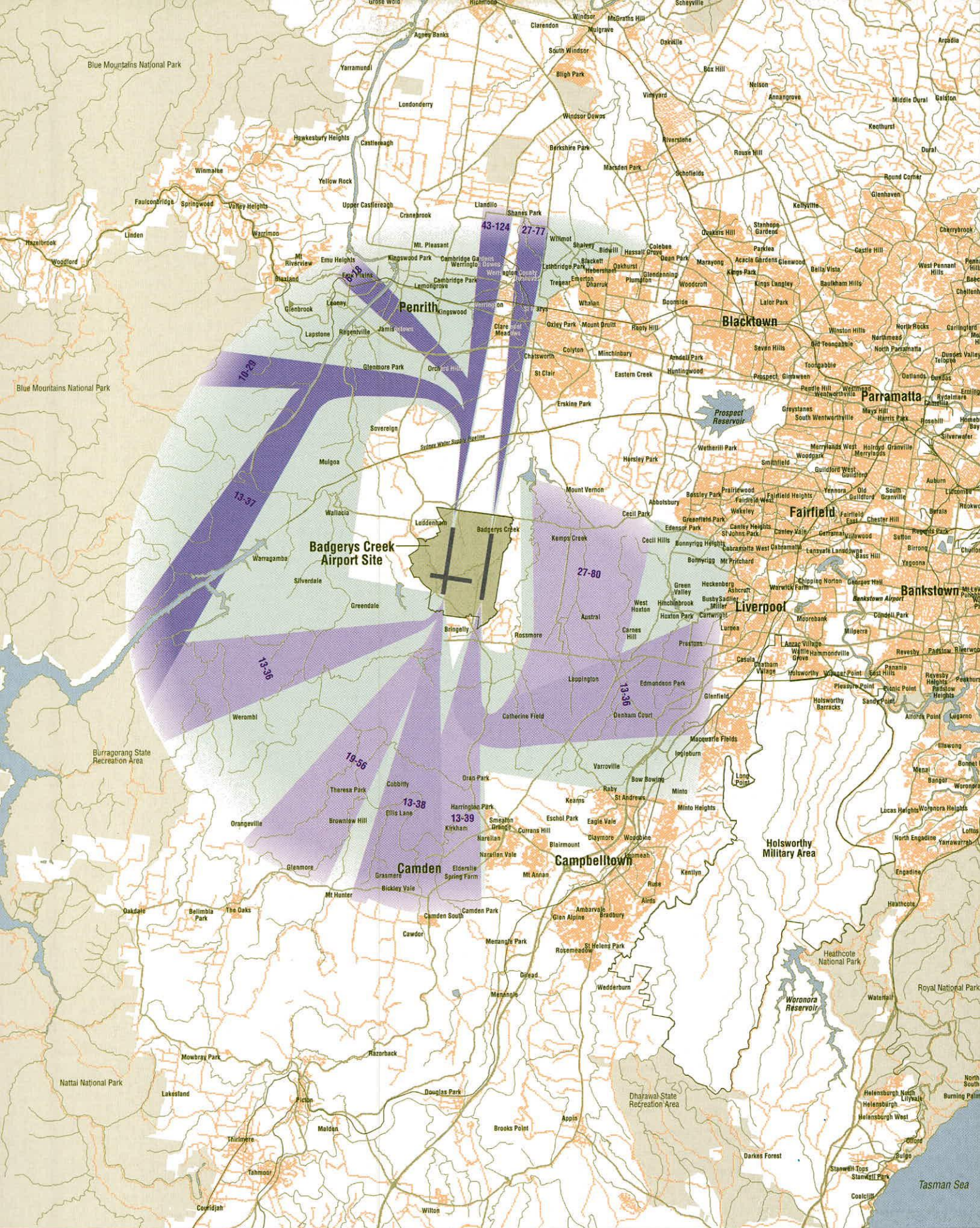
The three operating scenarios adopted for the environmental assessment of Option C are explained in Section 8.6. The forecasts of air traffic that may operate from the Second Sydney Airport in 2006 and 2016 are described in Section 7.3. The estimated number of flights that would occur on each flight path on an average day in 2016 are also shown on Figures 9.17 to 9.20. These are provided as a range of movements representing the three operating scenarios modelled as explained in Section 8.6.

## 9.5 Airport Construction

The construction processes, equipment usage, management and programming that would be necessary to construct the Second Sydney Airport at Badgerys Creek are outlined below (Second Sydney Airport Planners, 1997a). This description relates to construction within the area of the airport sites. It does not address infrastructure external to the sites.

Two construction scenarios are discussed, namely:

- construction of a first stage development (typically, one runway and associated facilities capable of handling about 10 million passengers a year); and
- construction of the airport to its master plan configuration (two or three runways and associated facilities capable of handling about 30 million passengers a year) in one continuous construction effort.



Urban Areas (indicated by local roads) ■  
Preliminary Landing Flight Paths ■  
Preliminary Take Off Flight Paths ■  
Flight Zones ■  
Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016 13-36

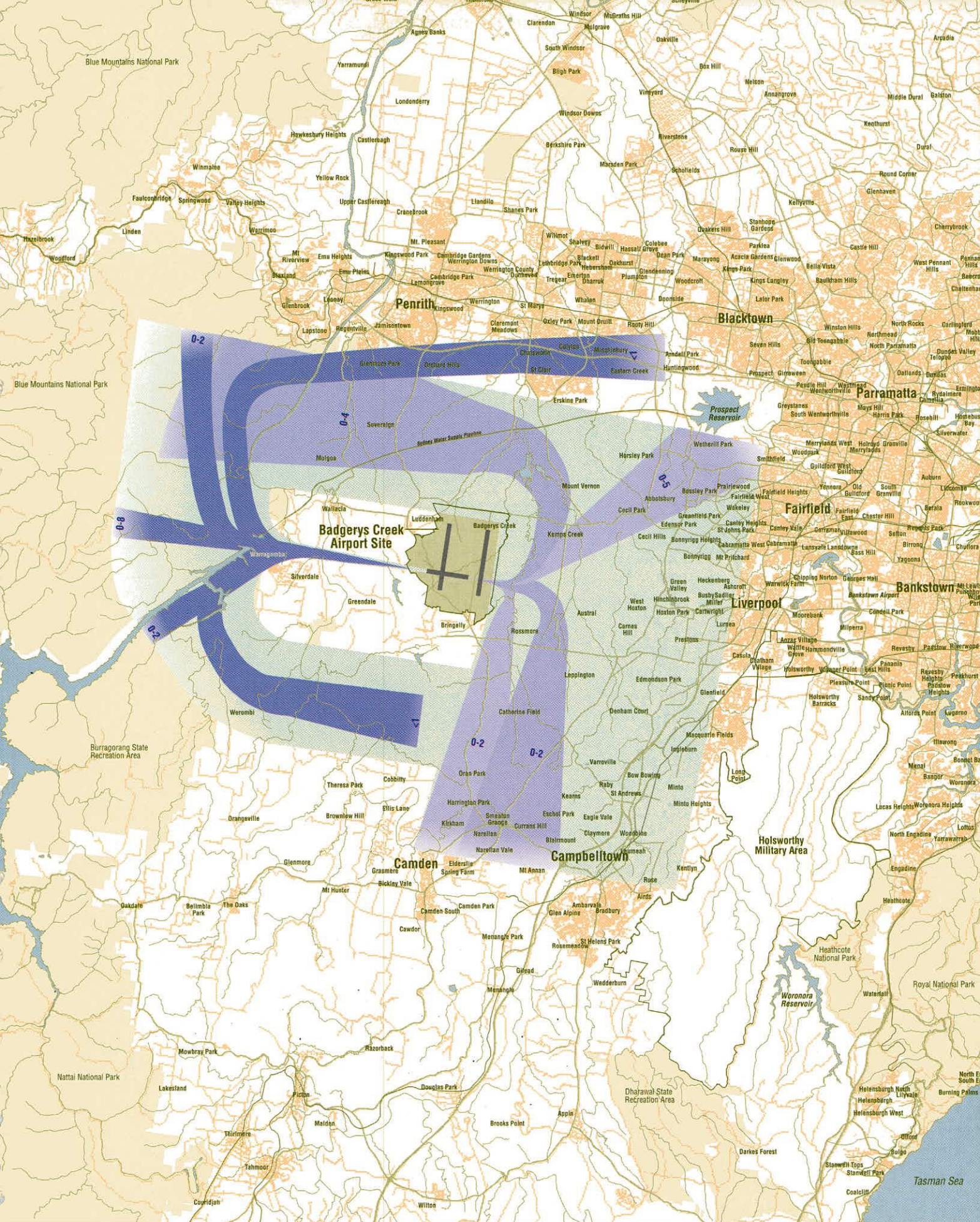
**Figure 9.17**  
**Preliminary Flight Paths for Option C:**  
**Landings From the North and Take Offs to the South**

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.







Urban Areas (indicated by local roads) ■

Preliminary Landing Flight Paths ■

Preliminary Take Off Flight Paths ■

Flight Zones ■

Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016 (<1 means less than one on average)

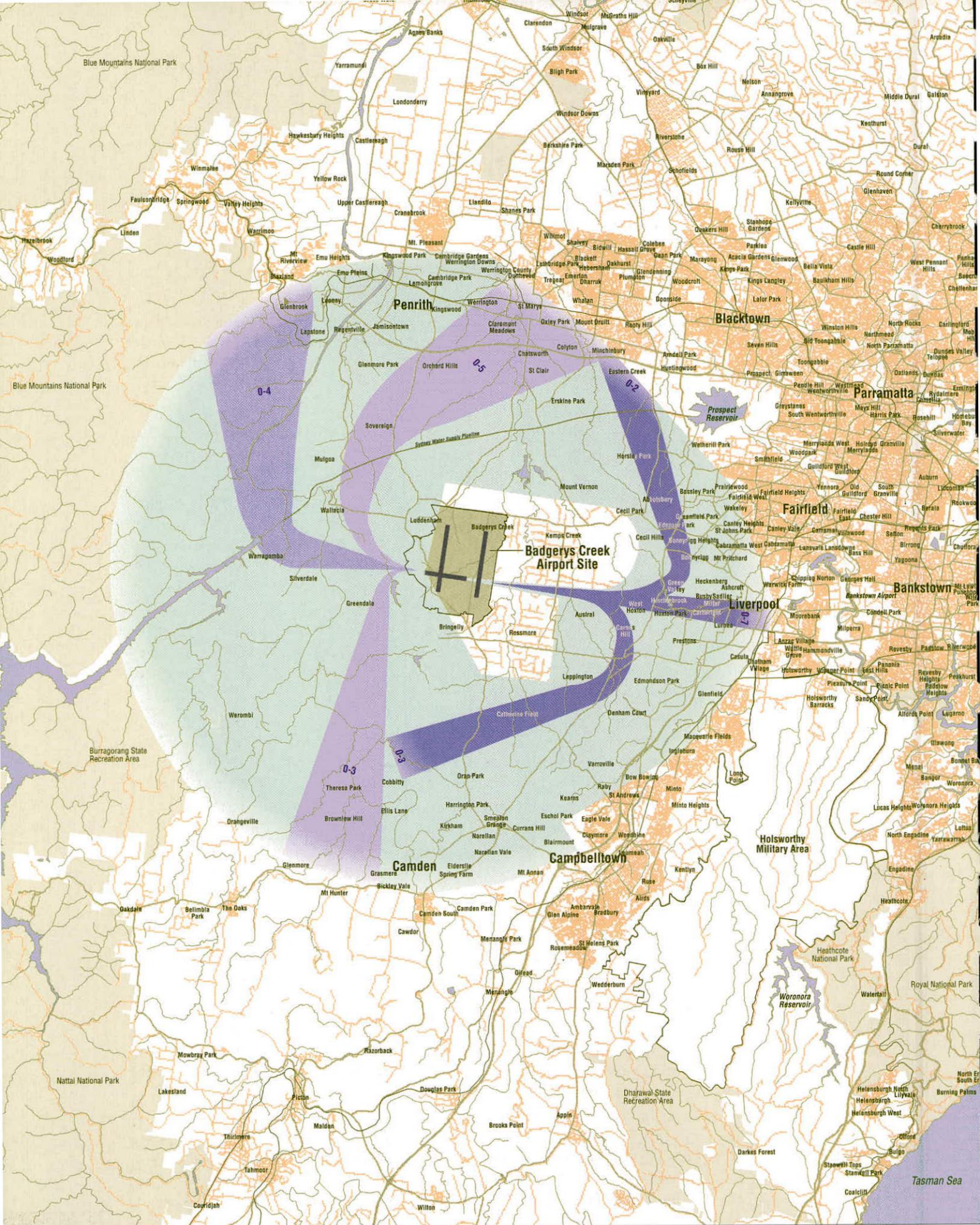
0-2

Figure 9.19  
**Preliminary Flight Paths for Option C:  
Landings From the West and Take Offs to the East**

Source: Second Sydney Airport Planners, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.





Urban Areas (indicated by local roads)   
 Preliminary Landing Flight Paths   
 Preliminary Take Off Flight Paths   
 Flight Zones   
 Range of assumed aircraft movements per day (on average) for Air Traffic Forecast 3 in 2016  0-3

**Figure 9.20**  
**Preliminary Flight Paths for Option C:**  
**Landings From the East and Take Offs to the West**

Source: Second Sydney Airport Plans, 1997a

Note: Flight Paths and Zones provided to a distance of about 19 kilometres. Aircraft would be seen and heard beyond that distance.



The approach to construction would be generally consistent between airport options, apart from a few differences that are based solely on the variation in specific site characteristics.

### **9.5.1 Preconstruction and Site Preparation Activities**

Early in the construction process, a secure contractors' compound would be established to contain facilities such as site offices, storage, vehicle and equipment parking and repairs. Appropriate services would be connected including power and telephone. Deliveries and access to the site would be made on approved access routes.

Temporary potable water supplies would be obtained from the existing mains, which source water from reservoirs at Cecil Park, and reticulated to the project office and contractors' areas.

Substantial quantities of water would be required for concrete batching operations. During the months of peak construction, one to two megalitres per day would be required for compaction of bulk earthworks. About 60 to 90 days supply of water would be collected on site in dams from runoff from the site prior to bulk filling operations. The dams would be located around the perimeter of the site and may form part of the permanent drainage system.

Site clearing and building demolition work would commence after land acquisition (if required). Initially a building inventory would be prepared, which would also identify buildings containing asbestos. The demolition would involve the complete removal of each building including footings and services.

Some materials salvaged from the demolition effort would be reused and/or recycled, while other material would be transported off site and deposited at local landfills. Existing building sites would be graded following removal of the structures to ensure drainage and to avoid ponding and erosion of top soils. Over 2,000 metres of existing pipes, 21 kilometres of roadway and four to five drainage culverts would also be removed.

Local areas of vegetation would be cleared other than areas not affected by the airport development. Merchantable timber would be sold. All other trees and bushes would be felled, chipped and stockpiled to provide woodchip and bark mulch for landscaping and revegetated areas.

Topsoil stripping would be undertaken by bulldozer or scrapers and stockpiled adjacent to the woodchips. Mulch and woodchip stockpiles would be covered or treated to prevent erosion, and topsoil stockpiles would be sown with grasses.

The site would require careful management of stormwater during construction to prevent soil erosion and sedimentation. Permanent stormwater management would be established in the very early stages of development. Earthworks would be constructed to be self draining as far as practicable to ensure all-weather accessibility for earth moving equipment.

Extensive on site creek works would be required, involving culverting or diversion into channels, temporary diversions, the use of detention basins and permanent storage. Badgerys Creek would be the most demanding in terms of water flow, followed by Oaky Creek and Cosgrove Creek. It may not be necessary to fill all the creeks for the first stage of development, depending on the particular option adopted.

Following clearing and initial drainage works, excavation and earthworks would commence and consist of:

- cut and fill to create the graded areas for runways, taxiways and aprons, airport facilities and associated infrastructure;
- trench excavation for utility services, fuel pipelines, airfield lighting and communications conduits and stormwater drainage; and
- additional cut (if required) to achieve the terrain profiles required for obstacle limitation surfaces.

Figure 9.21 illustrates typical sections proposed for runways for the airport options. Table 9.1 provides estimated quantities and duration of the earthworks.

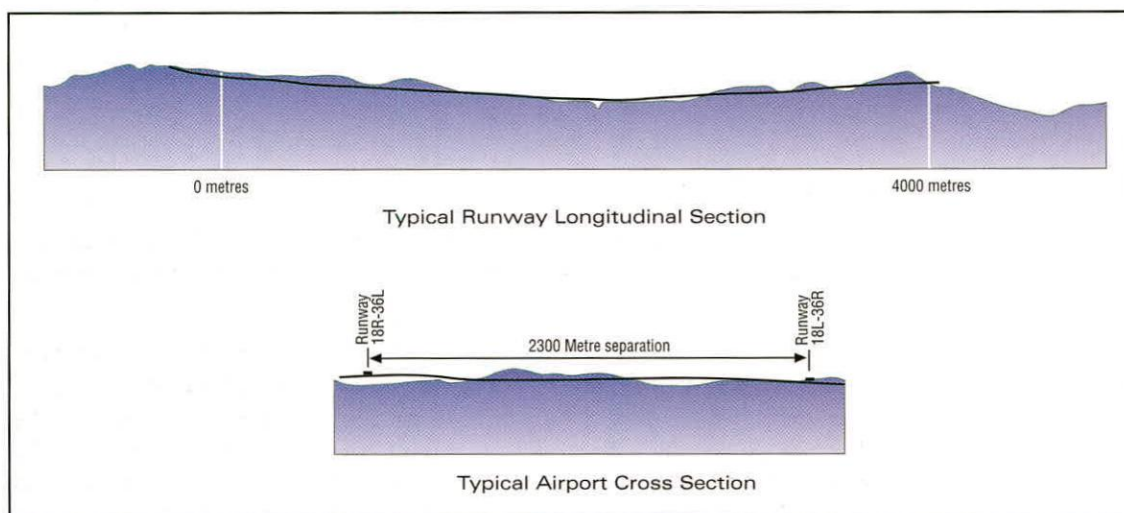


Figure 9.21

### Typical Sections of Airport Site

Note: Longitudinal section has 10:1 vertical to horizontal exaggeration, cross section has 5:1 vertical to horizontal exaggeration.

Source: Second Sydney Airport Planners, 1997a

**Table 9.1** Estimated Quantities and Duration of Earthworks for the Airport Options

		Option A		Option B		Option C	
		Stage 1	Master Plan	Stage 1	Master Plan	Stage 1	Master Plan
Volume of earthworks (million cubic metres)	Cut	11	24	26	36	13	27
	Fill	14	27	7	36	15	29
Time		1.5 years	2.2 years	2.2 years	2.8 years	1.5 years	2.3 years

Source: Second Sydney Airport Planners, 1997a.

Bulk earthworks would be designed where possible to achieve a balanced cut to fill, as most site material would be suitable for fill in non-structural areas. Finished slopes would not exceed one in four, so that rubber tyred earth moving equipment could be used. Bulldozers and motor scrapers, with spreading and compaction by bulldozers, graders and tamping foot compacters would be used. Vibrating smooth drum rollers and motor graders would be used for final surface compaction and grading. Loaders and haulers would shift material as required. The need for drilling and blasting would be minimal.

### 9.5.2 Main Construction Activities

Construction activities would be undertaken in accordance with appropriate standards such as those specified by the *Building Code of Australia* (White et al, 1996), the NSW Roads and Traffic Authority, Sydney Water and WorkCover Authority of NSW.

The main construction activities would comprise major drainage works, laying pavements, and construction of the terminals and other facilities.

#### **Drainage**

Creeks would be disrupted during construction from the start of site preparation through to the completion of airport infrastructure; initially creeks may be temporarily diverted.

Stormwater drainage flow generated on the airport site would be mainly from passenger terminals and the airfield into detention ponds, which would be designed to accommodate up to two hours' drainage flows before releasing water into the creeks. Additional means of separating contaminants from local water would be installed in drainage infrastructure around the passenger terminals, support facilities and airfield structures. The permanent drainage lines and structures would be constructed progressively following the completion of bulk earthworks and would take approximately two years to complete.

#### **Aircraft Pavements**

For each of the airport options a combination of pavement types would be used, taking into account functional requirements as well as future maintenance and economics. The aprons, except the general aviation apron, and most of the taxiways would be constructed as concrete pavements. The runways, some taxiways and the general aviation apron would consist of flexible pavements surfaced with asphalt. The areas of different pavement types that would be required for the three options are shown in Table 9.2.

Both the pavement types, concrete and flexible pavement, would be constructed on densely compacted earthworks. The top surface of the earthworks, called the sub-grade would be specially prepared by proof rolling and trimmed close to level and smoothness tolerances.

Concrete pavements would require construction of a crushed rock base course. Stockpiles of high quality, durable aggregates, crushed rock and sand would be established on site together with a concrete batching plant, cement silos and a pugmill, which would be supplied by rubber tyred front end loaders.

Predetermined patterns of contraction, construction and expansion joints would be cut using large concrete cutting saws; curing would then be completed over an extended period, and the forms removed, cleaned and reused.

**Table 9.2 Areas of Pavement Types for the Airport Options**  
(square metres x 1,000)

	Option A		Option B		Option C	
	Stage 1	Master Plan	Stage 1	Master Plan	Stage 1	Master Plan
High Strength Flexible	232	459	225	690	248	693
High Strength Concrete 475 mm thick	433	1,056	461	1,372	479	1,362
High Strength Concrete 450 mm thick	583	1,242	662	1,621	662	1,621
High Strength Concrete 400 mm thick	0	246	143	395	143	395
General Aviation and Shoulder	402	851	371	1,050	390	988

Source: Second Sydney Airport Planners, 1997a

The flexible pavements would be made up of a number of layers of high quality durable crushed rock. Stockpiles of material would be established on site together with a pugmill.

Similarly, stockpiles of materials used in the manufacture of asphalt would be established on site together with the asphalt batch plant and supporting equipment.

#### ***Passenger Terminal***

The passenger terminal building would be a large structure, designed and equipped with a variety of complex systems. It would be constructed in the following stages:

- foundations and floor slabs, structural framing and intermediate floors;
- roofing;
- exterior wall systems;
- vertical circulation and interior fit out;
- automated systems and security systems; and
- commissioning.

Following completion of the main structure, the building would be fitted out; this would include installation of baggage and communication systems, closed circuit television, vertical transport, and electrical, mechanical and hydraulic services. The airport owner, the airlines and other operators and tenants such as customs/immigration and retail outlets, would be responsible for fitting out their own areas.

#### ***Surface Access and Parking***

Temporary roads would be established early during the construction process to serve construction traffic; in some cases these would be built on the alignment of permanent roads. Main roads would generally be constructed of flexible pavements, but in some areas concrete pavements may be more appropriate. The design and type

of construction of airport roads would depend on the volume and loads they are expected to carry.

During construction, sections of The Northern Road and Badgerys Creek Road would be diverted or closed, temporarily or permanently. Adams Road would be improved.

A ground level carpark would be constructed using flexible pavements. Should it need enlarging to a multi-level structure, it would probably be constructed with concrete floor slabs and ramps. Techniques and equipment would be similar to that used for pavement and/or terminal buildings.

The anticipated rail link would be built when demand warrants. Provision has been made in the airport master plans for a rail link; however, the final route, number and location of stations and whether the line would be at ground level or underground cannot be determined at this stage. Should an underground rail link be provided, and depending on the option chosen, a tunnel for the rail line under the airport site would be up to three kilometres long. This and an airport station could take up to three years to complete. A double track would be provided and platforms would be 170 metres long. A ground level rail link would be considerably cheaper and could be constructed in a shorter time.

### ***Other Airport Facilities and Services***

Aircraft maintenance facilities would be constructed by airlines or third party maintenance operators. A graded site with engineering services and road access would be provided, and buildings constructed as required.

Permanent services such as water supply, electrical reticulation, sewerage and waste water recycling would be constructed as soon as service corridors were cleared. Trenching for services might require ripping, but to a large extent excavation would be undertaken with hydraulic equipment without the need for blasting. Usually the job is completed progressively, with sections/zones becoming operational prior to completion of the entire service.

Airservices Australia would be providing facilities for rescue and fire fighting services, air traffic control and navigation aids. These facilities would be coordinated with the construction program and installed progressively through the construction process. While these buildings are relatively simple to construct, some time is required for equipment installation and testing.

### ***Site Restoration and Landscaping***

Upon completion of each of the various stages of the construction program the surrounding areas would be prepared to final condition and landscaped. Sufficient topsoil would be available at Badgerys Creek to spread on the disturbed areas which would be protected with fencing or road barriers. Recycled effluent would be used to maintain the landscaping.

### **9.5.3 Materials**

Pavement materials for runways, taxiways and aprons would generally be imported from outside the site. Substantial volumes of high quality granular materials would be required for base and sub-base layers, and large volumes of asphaltic and concrete materials for surfacing.

Pavement sub-base is likely to be crushed sandstone from quarries at Glenfield or Camden, or else recycled concrete demolition materials. Alternative sources may

include processed blast furnace slag from Port Kembla, material from smaller sandstone quarries, or excavated sandstone from basements and foundations of large Sydney building projects.

Higher quality base course materials would be available in sufficient quantities from various quarries in the Kiama and Shellharbour areas. Materials from the same sources would also be used in the manufacture of concrete and asphalt surfacing products. These would be transported to the site using tip truck and trailer combinations or semi-tippers.

Concrete would be a major construction material for both structures and pavements. For Stage 1 development, the anticipated volume of concrete for building construction would be in the order of 100,000 cubic metres, while 600,000 cubic metres would be required for pavement construction. For construction of the master plan, 250,000 cubic metres and 1,400,000 cubic metres of concrete would be required respectively.

Batching and mixing would be undertaken within the airport site. At least two batching plants would be required, supplying large quantities of concrete of varying specifications. Soil aggregate cement mixes would be manufactured on site using a pugmill or laid using *in situ* stabilising equipment.

There are no known deposits of suitable concrete aggregates available at the site. Aggregates for quality concrete would probably be sourced from the South Coast area while local aggregate from quarries at Prospect may be used for lower strength grades. Aggregates from recycled crushed concrete from demolition work in Sydney could be used as an alternative source for other than the strongest quality mixes. Concrete aggregates would be delivered by truck and trailer combinations or semi-tippers carrying up to 40 tonnes.

Pulverised fly-ash would be sourced from power stations, generally to the north of Sydney, and slag aggregates would be delivered from Port Kembla. Bulk cement and fly-ash would be delivered to the site plants in 30 tonne bulk tankers.

Suitable concrete sand may be available from the Nepean area in the short term, but the main source would be the Penrith Lakes area. Cartage from these sources would likely be by road transport using truck and trailer combinations carrying up to 40 tonnes a load.

The principal use of cement would be in the manufacture of structural concrete. After delivery by bulk carrier, the cement would be transferred pneumatically into vertical steel storage silos at the batching or mixing site. A limited amount of bagged cement would also be required. Sources for cement would probably be Picton, Portland or Marulan, outside the Sydney region.

Reinforced concrete pipes and box culverts would probably be used for major drainage works. Precast concrete pipes and other materials such as galvanised steel or fibre reinforced cement would be manufactured off site at existing plants in Sydney or elsewhere.

In all, some three million tonnes of material would be transported to the airport site during the construction of the Stage 1 airport. Up to eight million tonnes would be needed for the construction of the master plan airport. Table 9.3 shows estimates of materials required to be transported to the site and total volumes of truck movements.

Where possible, the existing Badgerys Creek Road and The Northern Road alignments would be used to distribute materials to specific parts of the site during

**Table 9.3**      **Transport of Materials to the Airport Sites**  
**(approximate only)**

	<b>Option A</b>		<b>Option B</b>		<b>Option C</b>	
	<b>Volume (Tonnes)</b>	<b>Truck Loads<sup>1</sup></b>	<b>Volume (Tonnes)</b>	<b>Truck Loads<sup>1</sup></b>	<b>Volume (Tonnes)</b>	<b>Truck Loads<sup>1</sup></b>
<i>Stage 1</i>						
Base Course	840,000	24,000	850,000	24,000	860,000	24,000
Cement	230,000	8,000	240,000	8,200	240,000	8,200
Select Material	950,000	27,000	980,000	28,000	980,000	28,000
Aggregates	880,000	25,000	900,000	26,000	900,000	26,000
<i>Master Plan</i>						
Base Course	1,400,000	40,000	2,200,000	62,000	2,200,000	62,000
Cement	400,000	11,500	610,000	17,500	610,000	17,500
Select Material	1,700,000	48,000	2,600,000	75,000	2,600,000	75,000
Aggregates	1,600,000	45,000	2,400,000	68,000	2,400,000	68,000

Source: Second Sydney Airport Planners, 1997a.

Note: 1. Assumes 38 tonne loads which is considered a likely average load. Assumptions about truck movements used for traffic assessment (refer Chapter 25) adopted a worst case situation of relatively small trucks being used (18 tonne loads).

early parts of construction. Bringelly Road would provide access for transport from the south, and might be upgraded before major construction commenced. Elizabeth Drive and The Northern Road (realigned) would be used after some roads are closed and removed as part of the construction program.

Oversize and overweight load permits would be required. Also, the proximity of residential areas would require that deliveries to the sites should be between 6.00 am and 10.00 pm. Therefore most deliveries of construction materials would be made in the late afternoon or early evening to ensure materials were available at the site.

Table 9.4 indicates the estimated quantity of fuel that would be consumed, based on the quantity of work to be undertaken in Stage 1 and in the master plan development. This volume would require about 1,350 and 3,000 tanker loads over the construction period of Stage 1 and master plan respectively, mostly during the bulk earthworks operations. At any one time, no more than two to three days supply, or 200,000 litres, would be stored on site.

#### **9.5.4 Management**

Normal construction activity at the site would be undertaken between the hours of 7.00 am and 5.00 pm, Monday to Saturday. Sunday work might be required on occasions to maintain the construction schedule. Work periods might be extended during the summer months.

The major concrete and asphaltic paving operations for the runways, taxiways and aprons would very likely be carried out 24 hours per day, as they require intensive use of specialist construction equipment.

**Table 9.4** Estimates of Fuel Consumption for Construction of the Airport Options

Component	Fuel Consumption (litres)	
	Stage 1	Master Plan
Earthworks	20 million	50 million
Pavements	10 million	30 million
Building Works	5 million	5 million
Sundry Works	5 million	5 million
<b>Total</b>	<b>40 million</b>	<b>90 million</b>

Source: Second Sydney Airport Planners, 1997a

Fuelling of construction plant, servicing and parking, would be confined to designated hard stand areas surrounded by earth bunds and impervious ground treatment. Strict safety procedures would be instituted and appropriate medical equipment, personnel, ambulance service and treatment procedures would be available.

Fixed plant installations would be separately bunded and regularly inspected to identify and clean up any minor spillages. These areas would be drained to a suitable concrete flame/trap separator where hydrocarbons would be separated prior to discharge to the stormwater system. Traps would be cleaned regularly and any hydrocarbons collected by a sludge tanker.

Liquid and solid waste would be generated during construction, including waste building materials and packaging, discarded parts and lubricants from plant servicing and waste water from site amenities. The following disposal practices would be adopted:

- solid and putrescible material would be collected from the site and transported to a waste transfer station or landfill;
- recyclable materials would be sorted and removed from the waste;
- packaging material and dry waste would be transported to a landfill tip;
- trade waste not appropriate for a landfill site would be transported to the nearest NSW Environment Protection Authority designated disposal site; and
- a temporary on-site portable sewage treatment plant would be used for primary and secondary treatment of sewage generated by the large workforce on the site. Prior to establishment of the plant a regular raw-sewage tanker collection service would be used.

It would be essential to enforce dust control by:

- regular water spraying of large areas of the site;
- priming or sealing of the more heavily used construction roads;
- early establishment of permanent roads for construction traffic; and
- seeding bare areas as soon as practicable after excavation activities.

### 9.5.5 Estimated Construction Costs, Workforce and Construction Programs

#### Construction Costs

Tables 9.5 and 9.6 provide indicative cost estimates for each of the Stage 1 and master plan developments. The estimates include works within the airport boundary that would be the responsibility of the airport owner/developer, including all airport terminal buildings. The estimates do not include the cost of the commercial/support facilities to be developed by the airlines and other airport tenants, such as retail and dedicated airline facilities within the terminal buildings, freight facilities, ground handling and catering, and such developments as hire car services and airport hotels. All estimates are in current (1997) prices. Estimates for major items of external infrastructure are provided in Chapter 24.

**Table 9.5 Indicative Cost Estimates for Stage 1 Development of Airport Options<sup>1</sup>**

Item	Cost Estimates		
	Option A	Option B	Option C
<i>Land Acquisition</i>	\$0	\$255 million	\$240 million
<i>Airport Development</i>			
Project Development	\$175 million	\$180 million	\$175 million
Site Preparation	\$45 million	\$50 million	\$55 million
Construction Facilities and Preliminaries	\$15 million	\$15 million	\$15 million
Site Development	\$260 million	\$395 million	\$315 million
Site Services	\$110 million	\$110 million	\$110 million
Aircraft Pavements	\$255 million	\$275 million	\$285 million
Airfield Lighting	\$20 million	\$25 million	\$25 million
Buildings, Structures, Roads	\$620 million	\$635 million	\$630 million
Contingency	\$150 million	\$180 million	\$170 million
<b>Total Airport Development Costs</b>	<b>\$1,650 million</b>	<b>\$1,865 million</b>	<b>\$1,780 million</b>
Airservices Australia Facilities	\$40 million	\$40 million	\$40 million

Source: Second Sydney Airport Planners, 1997a.

Note: 1. Cost estimates prepared utilising a bottom up methodology and achieve an accuracy in the order of 10 percent below the final (actual) cost to 20 percent above the final (actual) cost total.

#### Workforce

The approximate annual workforce required for the construction of the Stage 1 and master plan developments of the airport options is shown in Table 9.7.

#### Estimated Construction Programs

A typical airport development constructed on a greenfield site would involve a wide range of connected activities implemented in a logical sequence to meet the programmed opening of the airport. Construction programs were prepared for the

**Table 9.6 Indicative Cost Estimates for Master Plan Development of Airport Options<sup>1</sup>**

Item	Cost Estimates		
	Option A	Option B	Option C
<i>Land Acquisition</i>	\$0	\$255 million	\$240 million
<i>Airport Development</i>			
Project Development	\$295 million	\$310 million	\$320 million
Site Preparation	\$55 million	\$55 million	\$55 million
Construction Facilities and Preliminaries	\$20 million	\$20 million	\$20 million
Site Development	\$520 million	\$685 million	\$595 million
Site Services	\$150 million	\$150 million	\$150 million
Aircraft Pavements	\$560 million	\$750 million	\$745 million
Airfield Lighting	\$45 million	\$60 million	\$60 million
Buildings, Structures, Roads	\$1,660 million	\$1,600 million	\$1,595 million
Contingency	\$340 million	\$410 million	\$390 million
<b>Total Airport Development Costs</b>	<b>\$3,645 million</b>	<b>\$4,040 million</b>	<b>\$3,930 million</b>
Airservices Australia Facilities	\$50 million	\$50 million	\$50 million

Source: Second Sydney Airport Planners, 1997a.

Note: 1. Cost estimates prepared utilising a bottom up methodology and achieve an accuracy in the order of 10 percent below the final (actual) cost to 20 percent above the final (actual) cost total.

Stage 1 and master plan development of the airport options. Major activities were identified, many of them common to all options. Indicative bar chart programs that illustrate time durations for the main activities for the construction of the options, assuming commencement is at the start of a financial year, are shown on Figures 9.22 and 9.23. Estimated total development times from the commencement of design to opening of Stage 1 and of the master plan for each airport option are shown in Table 9.8.

Indicative programs to provide the external infrastructure items for the airport for both the Stage 1 and master plan level of airport development have also been investigated. It is estimated that this infrastructure would take five years to complete.

## 9.6 Ultimate Airport Development

### 9.6.1 Purpose of Developing Conceptual Plans

The Commonwealth Government is proposing construction and operation of a major airport capable of handling up to 30 million passengers a year. The environmental assessment process has involved the further development of this proposal.

The Department of Transport and Regional Development (1997a) estimates that by 2025 over 63 million passengers may fly into and out of Sydney annually. Current planning assumes that Sydney Airport will ultimately handle about 30 million

**Table 9.7**      **Estimated Workforce for the Construction of Airport Options<sup>1</sup>**

Year	Stage 1			Master Plan		
	Option A	Option B	Option C	Option A	Option B	Option C
1	220	220	220	310	310	330
2	570	620	610	650	650	670
3	1,300	1,360	1,340	1,960	1,960	1,950
4	<b>1,330<sup>1</sup></b>	<b>1,400<sup>1</sup></b>	<b>1,370<sup>1</sup></b>	<b>2,150<sup>1</sup></b>	<b>2,200<sup>1</sup></b>	<b>2,200<sup>1</sup></b>
5	940	980	980	1,960	1,960	2,000
6	40	40	40	1,730	1,730	1,750
7					50	50

Source: Second Sydney Airport Planners, 1997a.

Note: 1. Highlighted figures indicate peak workforce.

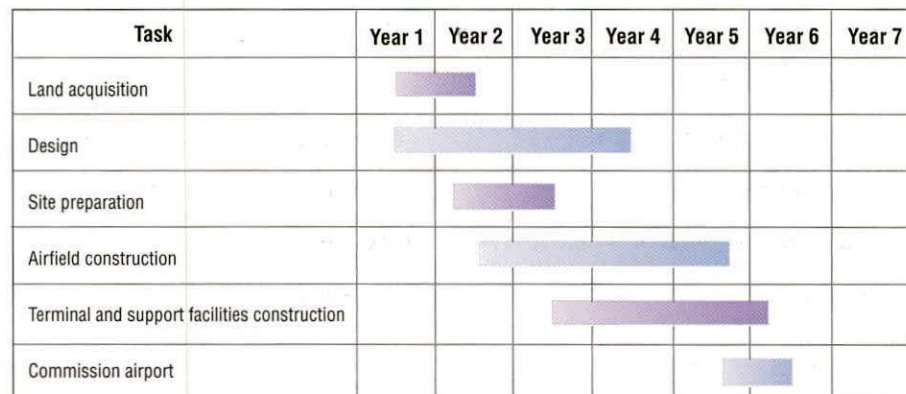


Figure 9.22

**Construction Program for Stage 1 Development of Airport Options**

Source: Second Sydney Airport Planners, 1997a

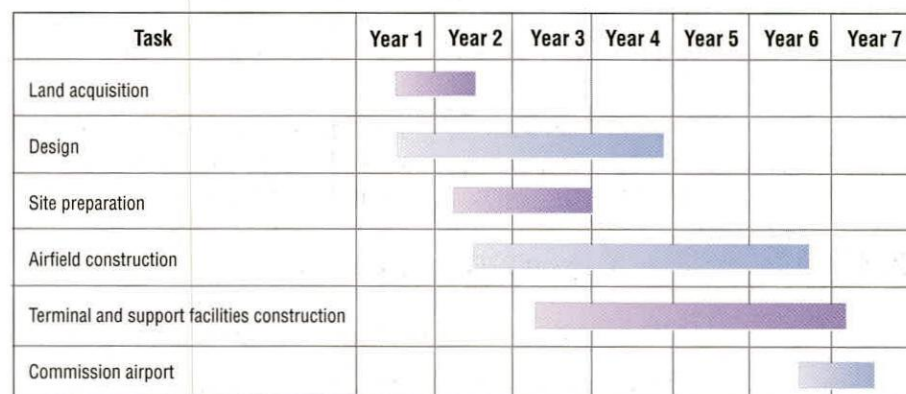


Figure 9.23

**Construction Program for Master Plan Development of Airport Options**

Source: Second Sydney Airport Planners, 1997a

**Table 9.8 Development Periods for the Airport Options**

	<b>Option A</b>	<b>Option B</b>	<b>Option C</b>
Stage 1 Development Period	4.5 years	5.0 years	4.5 years
Master Plan Development Period	6.0 years	6.5 years	6.0 years

Source: Second Sydney Airport Planners, 1997a.

passengers a year. Consequently, it is apparent that if the Second Sydney Airport proceeds the need may be felt to expand it, possibly in about 30 years time.

Planning needs to provide for possible expansion of facilities at some time well into the future. Conceptual planning provides the broad framework for considering potential impacts, even though concepts for ultimate development cannot be relied upon with any certainty.

It is not feasible for an EIS to examine potential impacts of a major airport within Sydney over a timeframe of more than 20 years into the future. Predictions about how the airport would operate and the extent of impacts would not be accurate. Nevertheless, this section provides some details about how the airport options might be expanded in the future. The potential environmental implications of such expansion are discussed in *Chapter 27*. The expansion could not proceed, however, unless a further detailed environmental assessment and decision making process were undertaken by the Government of the day.

Various master plan configurations used overseas were examined to develop the conceptual plans. It was evident that the most economical way to handle future traffic increase would be to add one or more parallel runways outside the initial wide spaced parallel runways. Conceptual plans developed for this type of expansion would allow for a double wide-space parallel runway system that could substantially increase aircraft handling capacity. Further, this growth might well be accompanied by increased seating capacity in the average aircraft of that time.

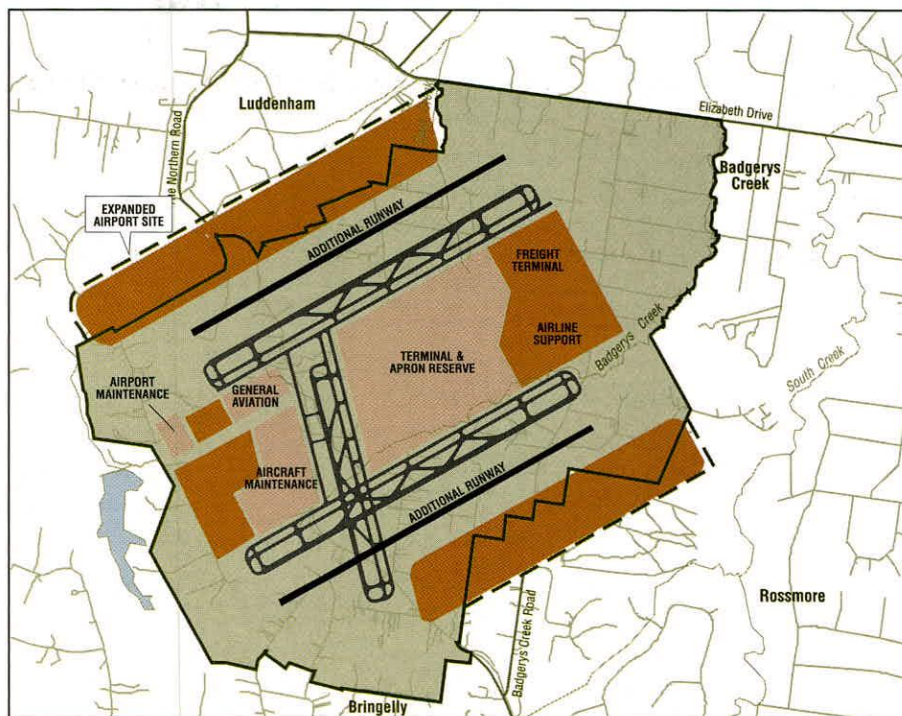
A generic airport layout was developed to illustrate the typical land area required for a double wide-spaced parallel runway configuration and requisite airport facilities. This indicated that a rectangular area, approximately six kilometres by five kilometres, would be required. The potential for increased capacity beyond the master plan airport design is possible with only small additional land requirements.

## **9.6.2 Conceptual Plans for Airport Options**

A conceptual plan was not prepared for Option A as the intention is to confine this option within the previously defined site boundaries. Conceptual plans were developed for the remaining two airport options. The sizes and locations of these plans are only indicative, as the actual plans would be dependent on actual air traffic growth. In general terms the conceptual plans would require:

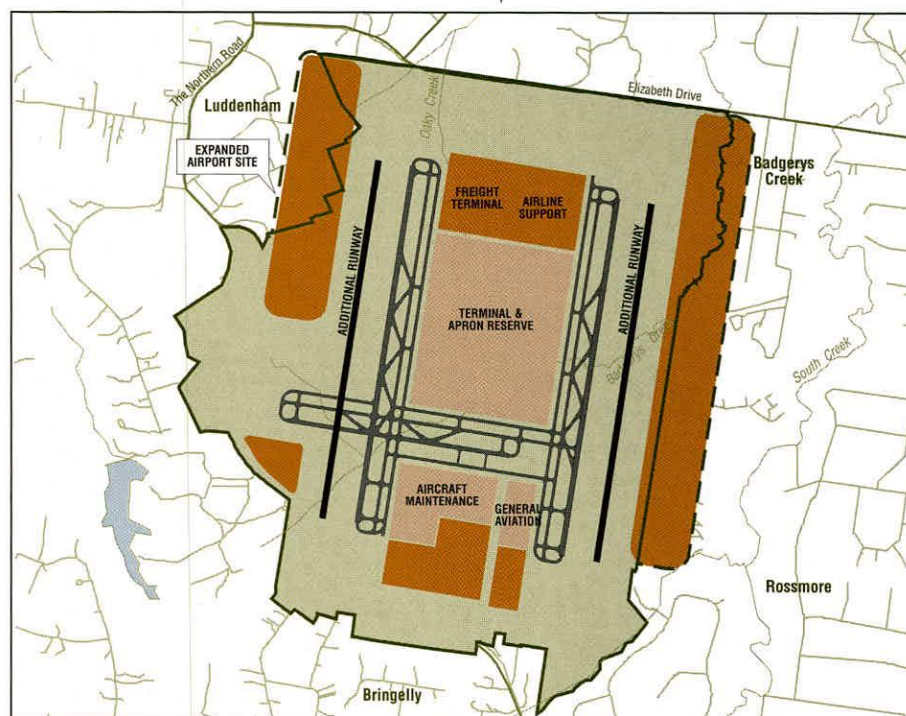
- an expanded site area beyond the master plan boundaries;
- two additional parallel runways;
- additional airport facilities and terminal areas; and
- provision for increased infrastructure services on site and increased access capacity.

Figures 9.24 and 9.25 illustrate the conceptual plans for Options B and C.



Expanded, relocated or additional airport facilities

Figure 9.24  
**Conceptual Plan for Option B**  
Source : Second Sydney Airport Planners, 1997a



Expanded, relocated or additional airport facilities

Figure 9.25  
**Conceptual Plan for Option C**  
Source : Second Sydney Airport Planners, 1997a



### **9.6.3 Potential Operating Scenarios for Conceptual Plans**

The development of airspace management arrangements for a double wide-spaced parallel runway system, as envisaged in the conceptual plans, would be influenced by factors similar to those affecting the development of arrangements for the operation of the master plan options. However, factors such as future aircraft types and technological developments in airspace and air traffic management can be expected to change substantially, given the long term timeframe associated with the conceptual plans. At this time only hypothetical operating scenarios can be considered for the conceptual plans.

One operating scenario might involve the use of the two inner parallel runways for aircraft departures with the outer two parallel runways being used for arrivals, assuming a uniform direction of traffic flow. This scenario would take advantage of independent operations made possible by the wide runway spacing. Aircraft movement capacity would be enhanced by enabling dedicated use of runways for either landings or take offs.

Another operating scenario could involve all aircraft take offs on one pair of closely spaced parallel runways and all landings on the other pair of runways. While this would be feasible, it might not achieve a suitable increase in overall aircraft movement capacity, due to the need to maintain appropriate separations between aircraft using a pair of closely spaced runways. This scenario would create some traffic management issues because of wake turbulence, but could be used for noise mitigation purposes.