GUIDELINE I

NATIONAL AIRPORTS SAFEGUARDING FRAMEWORK

MANAGING THE RISK IN PUBLIC SAFETY AREAS AT THE ENDS OF RUNWAYS

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Purpose of Guideline

1. To provide guidance to Australian Government, state, territory and local government decision makers on the assessment and treatment of potential increases in risk to public safety which could result from an aircraft incident or development proposal in areas near the end of an airport runway.
2. To inform a more consistent approach to the application of Public Safety Areas (PSAs) at and near Australian airports.

Why it is important

3. The *Principles for a National Airports Safeguarding Framework* acknowledge the importance of airports to national, state, territory and local economies, transport networks and social capital.
4. While Australia has an excellent aviation safety record, there will always be an inherent risk associated with flying and the operation of aircraft at or around airports. The use of PSAs in land use planning can further reduce the already low risk of an air transport accident affecting people who live, work or travel in close proximity to airports.
5. While air crashes are rare events, historically, the majority occur in the vicinity of airports during take-off or landing of aircraft. Analysis of commercial airliner crash data indicates that over 50% of aircraft accidents occur in the initial stages of take-off and climb, and the final stages of approach and landing, when aircraft are below 1,000ft elevation and aligned with the runway. In many cases, but not all, these areas extend beyond the boundaries of airports.
6. The way land use is managed at the end of runways, including beyond airport boundaries, can contribute to mitigating the risk of on-ground fatalities from aircraft incidents.
7. The consideration of public safety risks is not unique to airports. These risks are also considered for developments and emergency management in the vicinity of a range of existing or proposed industrial sites that can give rise to adverse public safety outcomes.

Roles and responsibilities

Department of Infrastructure, Regional Development and Cities

8. Twenty-two Australian airports are under Australian Government planning control administered by the Department of Infrastructure, Regional Development and Cities (Infrastructure) under the *Airports Act 1996* (the Airports Act).

9. Infrastructure is responsible for policy advice regarding public safety risks within the boundaries of these leased federal airports. The Minister responsible for the Airports Act considers this advice in the assessment of Airport Master Plans (MPs) and Major Development Plans (MDPs).

Department of Defence

10. The Department of Defence (Defence) is responsible for providing public safety advice in relation to military airfields and joint-user airports (see paragraphs 60-63 and Attachment 3). Military aircraft, although different in operational tempo, face the same risks in take-off and landing as civilian aircraft.

Civil Aviation Safety Authority (CASA)

11. CASA is Australia's safety regulator for civil air operations and the operation of Australian aircraft overseas. CASA is responsible for the implementation of International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPS). ICAO has not developed SARPS regarding PSAs.

12. CASA have a role in the regulation of ICAO mandated Runway End Safety Areas (RESA). RESAs are sometimes confused with PSAs. A RESA is a cleared ground area extending from the end of the runway strip for the purpose of minimising damage to an aircraft if it overruns or undershoots the runway.

State, territory and local governments

13. State, territory and local governments are responsible for land use planning outside the boundaries of leased federal airports and Defence airfields. Planning on and around other (non-federally-leased) airports is also undertaken by state, territory and local governments or private operators. This includes consideration of public safety risks at the end of airport runways.

14. For this Guideline to be effective, it is important that each jurisdiction considers how best to implement the Guideline within their respective planning systems. Off-airport development proposals within PSAs should be assessed in a consistent manner to those on-airport.

15. This Guideline does not prescribe in detail how state/territory and local governments should implement it into their planning systems. That is a matter for individual jurisdictions and it is appropriate that jurisdictions have some flexibility in implementation (including in the terminology used to reference PSAs) given the variability in planning approaches.

16. Once policies are put into place in planning schemes, state/territory/local governments are responsible for approving or refusing proposed developments based on those planning schemes.

Airport Operators

17. At leased federal airports, the Airport Lessee Company is responsible for preparing MPs and MDPs for the Minister's approval. The safety and amenity related guidelines (including this Guideline I) of the National Airports Safeguarding Framework form part of the Minister's consideration.

18. On-airport planning at non-federally-leased airports is undertaken by the airport operator – either a private owner/operator or, in some cases, the local council which owns and operates the airport. These airports are responsible for complying with relevant state/local planning regimes (including any safeguarding guidelines).

19. At non-federally-leased airports, this Guideline is useful in providing airport operators with guidance to avoid the incompatible use of land within a PSA. Examples of incompatible uses within a PSA are outlined in Table 1.

What is a PSA?

20. A PSA is a designated area of land at the end of an airport runway within which development may be restricted in order to control the number of people on the ground at risk of injury or death in the event of an aircraft accident on take-off or landing.

21. The purpose of a PSA is not, primarily, to reduce the severity of damage to an aircraft or injury to its occupants as a result of an aircraft incident. Unlike a RESA that seeks to address the risk to aircraft and passengers, the PSA seeks to address the risk to the community around an airport.

22. PSA models generally aim to limit land uses that increase the number of people living, working or congregating within the PSA.

23. The dimensions of a PSA are typically determined by reference to the levels of statistical chance of an accident occurring at a particular location. The number of aircraft movements and the distance of the location from the critical take-off and landing points can be used to model the total statistical likelihood of a fatal accident at the location over a one-year period. As discussed in paragraphs 32-43, this modelling work can be used to determine the extent of the PSA contours.

24. In some cases, the resultant shape of the PSA is that of an elongated isosceles triangle (see Figure 1). In others, the triangle has been truncated to form an elongated four-sided shape (see Figure 2 in Attachment 2). PSAs are based on the landing threshold for each end of the runway and in most cases taper away from the runway.

How the Guideline may be used

25. This Guideline provides guidance on planning-led and development-led approaches for the application of a PSA planning framework (discussed further in paragraphs 51-59) in Australian jurisdictions.

26. As discussed in paragraph 11, there is no current ICAO standard for PSAs nor is a single risk methodology recognised as the world's best practice.

27. Implementation of PSAs varies internationally and is not uniform. Some overseas jurisdictions have taken a specialised approach to the assessment and treatment of land use conflicts near airport runway ends and different models have been applied in the United Kingdom (UK), the Netherlands and the United States of America.

28. Within Australia, Queensland already has in place a proactive state planning policy and guidelines addressing public safety risks. Consequently, this document may provide guidance for their review and for policy updates. For those jurisdictions without existing policies, this Guideline may provide an objective basis for a policy response through strategic and statutory planning processes.

29. It is not intended that this Guideline will be applied retrospectively to existing development. Rather, it is intended to ensure there is no increase in risk from new development. New or replacement development, changes of use of existing buildings and rezoning of land are discouraged if it results in increasing the number of people living, working or congregating within the PSA. This Guideline can be used to inform strategic planning decisions about rezoning, development of greenfield sites and the opportunities for redevelopment of existing sites and urban infill.

30. There is a need to treat future development and existing development differently. Where there is no major existing or approved development, there is the opportunity to plan ahead to take account of potential public safety risk and, in particular, to minimise the zoning of land for incompatible land uses. Examples of incompatible uses within a PSA contour are outlined in Table 1.

31. This Guideline applies to land both on and off-airport.

Managing risk within a PSA

Public interest versus risk

32. Full implementation of PSAs in already developed areas requires a long-term policy commitment and consideration should be given to the appropriate nature of further development in PSAs and balancing this with the public interest. It is recognised that most state and territory governments have targets or policies that need to be met, for example, to support regional economic growth.

33. This Guideline acknowledges that the risk from an aviation incident is only one element of an overall public safety risk assessment that jurisdictions may be considering as part of their planning processes. Other types of PSAs are implemented in Australia for the protection of

the public from the risk created by a nearby site or activity, or the protection of the site itself. Commonwealth and state examples of legislation, regulation and planning documents that prescribe non-aviation buffer zones include those for the nuclear research facility in Lucas Heights, NSW and the protection of World Heritage sites.

34. When considering general approaches to public safety risk, the 'As Low As Reasonably Practicable' (ALARP) approach, which was developed by the UK Health and Safety Executive, is commonly used. In particular, the NSW Department of Planning has previously adopted this method of addressing societal concerns when there is a risk of multiple fatalities occurring in one event as detailed in the document *Hazardous Industry Planning Advisory Paper No.4 Risk Criteria for Land Use Safety Planning (January 2011)*.

35. The ALARP approach balances risk and societal benefit. Above a certain level a risk is regarded as intolerable and is forbidden irrespective of the potential benefit of a given project. The middle region is called the ALARP or Tolerability region, where risk is accepted if a benefit from continuing activities at that risk level exists. The bottom region exists where there is no need for detailed work to demonstrate ALARP, as it is the broadly acceptable region of negligible risk.

36. While there is no single agreed tolerable risk level defined in Australia or internationally, values in the range of 1 in a million to 1 in 10,000 are routinely adopted by various jurisdictions dependent on a range of circumstances.

37. At around the 1 in a million mark, the levels of individual risk begin to merge into the background risks from everyday life. Therefore, the range from 1 in a million to 1 in 10,000 per year is generally termed the ALARP region, within which risks should be 'as low as reasonably practicable'.

PSA risk contours

38. By considering PSA risk, planning authorities can identify, consider and address the extent of statistical risk to people's lives when located in proximity to runway ends, and undertake future planning appropriately.

39. The broad approach to the implementation of PSA policy at an airport runway is based on modelling carried out using appropriate aircraft data to determine the level of risk to people on the ground around airports. This determines the extent of individual risk contours, upon which a person remaining in the same location for a period of a year would be subjected to a particular level of risk of being killed as a result of an aircraft accident.

40. Noting that no single best practice model for estimating risk contours has been identified in Australia or internationally, different risk assessment models can be used to identify areas of differing dimensions. Each approach has its own strengths and weaknesses and it is a matter for individual jurisdictions or approval bodies to confirm the acceptable level of risk in the context of broader planning policies.

41. Two examples of most relevance to Australia (the UK and Queensland approaches) to developing PSA contours are presented in Attachments 1 and 2. The UK model is the most formalised approach to defining a PSA and has been applied at a number of international and Australian airports. The Queensland model is a modified version of the policy and research conducted in the UK. There are also a number of different models developed and used by other countries, which may be appropriate for Australian airports depending on their size and type of operations. The reasons for adopting a particular approach should be clearly justified and articulated to explain why a particular model is best suited to an airport's circumstances.

42. Consistent with the UK approach to PSAs, this Guideline suggests a balanced approach with the PSA made up of two different areas:

    - Outer area = 1 in 100,000 (1×10^{-5}) risk level per year

    This identifies the area (or risk contour) within which, any person living or working for a period of a year, has approximately a 1 in 100,000 chance per year of being killed as a result of an aircraft incident (see Figure 1).

    - Inner area = 1 in 10,000 (1×10^{-4}) risk level per year

    This identifies the higher risk area (or risk contour) immediately adjoining the end of the runway within which, any person living or working for a period of a year, has approximately a 1 in 10,000 chance per year of being killed as a result of an aircraft incident (see Figure 1).

    The dimensions of the two areas are dependent on a range of airport specific factors (such as forecasts about the numbers and types of aircraft movements).

43. A 1 in 100,000 individual risk is a relatively low level of risk compared with other risks of daily life more familiar to the community. For example, with an annual road toll of around 1,200 deaths, the risk to an individual of being killed in a road accident in Australia is about 5 in 100,000[1].

[1] Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2016, *Road trauma Australia, 2015 statistical summary* BITRE, Canberra ACT.

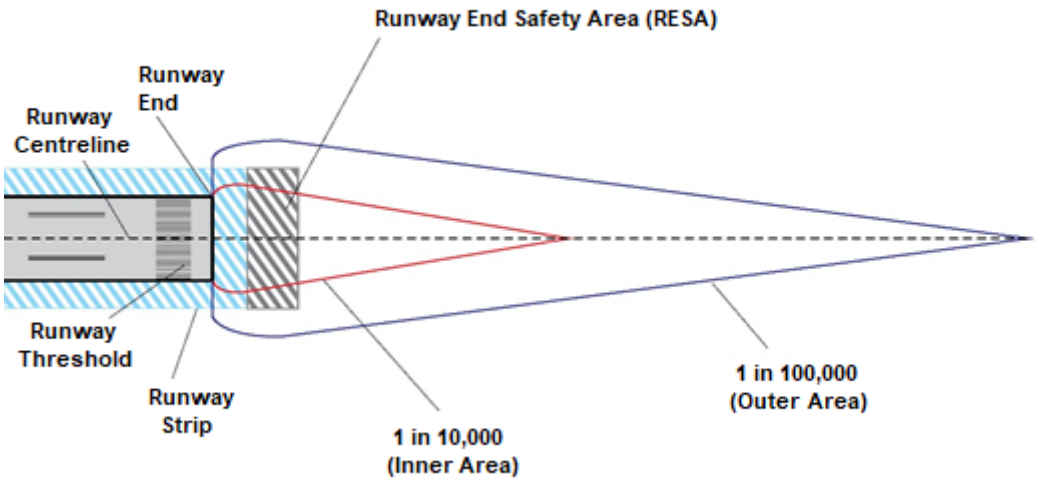

Figure 1: Example of PSA showing inner area and outer area (not to scale). Figure is for illustrative purposes only. Actual sizes of features shown will vary from airport to airport.

Compatible versus incompatible land uses

44. As a general guide, the types of new or changed development considered compatible and incompatible within the outer (1 in 100,000) and inner (1 in 10,000) areas include those listed in Table 1.

45. Within the outer area of a PSA there are potential safety benefits from preventing any new or replacement development, or change of land use, which would result in an significant increase:

    - in the numbers of people living, working or congregating within the PSA ; or
    - in the bulk storage of hazardous materials (eg. fuel depots, service stations).

46. There are stronger land use constraints for the inner area. The general principle in relation to buildings and land within this area is that people should not be expected to live or have their workplaces within such areas. Consequently, very few uses are considered potentially compatible within this risk contour.

47. Building and site uses that propose incompatible uses within the inner and outer areas (as listed in Table 1) should be actively discouraged. However, extensions to existing dwellings could be considered, as could development that involves a very low density of people.

48. Potentially incompatible land uses could be considered for approval in a PSA if a satisfactory safety case, prepared by a suitably qualified technical expert, is provided. The approval body could consider imposing conditions to development consent for this type of development and restricting future intensification of the land use without a further safety case. Where a proposed incompatible development is partially within a PSA, or where it is

unclear if the development is compatible, the proponent may put forward a safety case including detailed risk assessment and consideration of public interest.

Transport Infrastructure

49. The planning of new transport infrastructure within PSAs should also be carefully considered. While a particular section of transport infrastructure is generally used by individuals for only a short period of time, a large number of people may be using the transport link at any given time. The density of occupation of a main road or railway line averaged over a day is comparable to that of residential development. For this reason, transport links within the PSA should be assessed in terms of the average density of people that might be exposed to the risk.

50. Low intensity transport infrastructure such as minor or local roads could be considered acceptable within PSAs. Emergency vehicle access should be considered when planning transport infrastructure in and around a PSA.

Table 1: General guidance for new/proposed developments on compatible and incompatible activities within PSA risk contours

PSA	COMPATIBLE USES	INCOMPATIBLE USES/ACTIVITIES
OUTER AREA - 1 in 100,000	• **Long stay and employee car parking** (where the minimum stay is expected to be in excess of six hours) • **Shorter stay car parking** (with a safety case – depends on intensity of use) • **Built development for the purpose of housing plant or machinery** and would require **no people** on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water • **Golf courses, but not club houses** (provided appropriate mitigation measures are in place to reduce wildlife attraction risk - see NASF Guideline C) • **Open storage and types of warehouses with a very small number of people on site.** The planning authority could consider imposing conditions to prevent future intensification of the use of the site and limit the number of people to be present on the site • **Developments which require few or no people on site on a regular basis** such as buildings housing plant or machinery • **Low intensity public open space**	• **Accommodation activities:** This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings • **Community activities**: educational establishment, community centres, hospitals, theatres, child-care and playgrounds, detention facilities, place of worship • **Recreation activities:** This includes parks, outdoor recreation and sport, major sport and entertainment facilities • **Entertainment and centre activities:** Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres • **Industrial and commercial uses involving large numbers of workers or customers:** Intensive uses such as high impact, medium and low impact industry, warehousing, services industry • **Manufacture or bulk storage of flammable, explosive or noxious materials** • **Public passenger transport infrastructure:** This includes bus, train and light rail stations
INNER AREA – 1 in 10,000	• **Long stay and employee car parking** (where the minimum stay is expected to be in excess of six hours) • **Built development for the purpose of housing plant or machinery** and would require **no people** on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water • **Golf courses, but not club houses** (provided appropriate mitigation measures are in place to reduce wildlife attraction risk - see NASF Guideline C)	• **Accommodation activities:** This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings • **Community activities**: educational establishment, community centres, hospitals, theatres, child-care and playgrounds, detention facilities, place of worship • **Recreation activities:** This includes parks, outdoor recreation and sport, major sport and entertainment facilities • **Entertainment and centre activities:** Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres • **Industrial and commercial uses involving large numbers of workers or customers:** Intensive uses such as high impact, medium and low impact industry, warehousing, services industry • **Manufacture or bulk storage of flammable, explosive or noxious materials** • **Public passenger transport infrastructure:** This includes bus, train and light rail stations

Incorporating PSA into planning processes

51. Approval bodies are encouraged to consider the potential public safety risk, and hence the application of a potential PSA, in the vicinity of airport runways as a component of the development assessment process, taking into account the nature of the development and the balance of public interest in terms of an objective analysis of the costs and benefits.

52. There is more than one acceptable approach to assessing the public safety risk in the vicinity of airports. To provide flexibility and cater for potential sensitivities associated with PSAs as well as to enable the consideration of other site specific characteristics and hazards, this Guideline recommends incorporating PSA policies and modelling into the broader planning process through either a:

    - planning-led/proactive approach (e.g. UK and Qld models); or
    - development-led/reactive assessment process.

53. Individual jurisdictions or approval bodies may wish to draw on elements from both approaches and may wish to use different terminology for these areas.

Planning-led approach

54. A PSA planning-led approach involves the proactive identification of a PSA adjacent to an airport's runway ends, within which certain development is restricted on the basis of unacceptable risk to public safety from an aircraft incident. This approach is applied when a planning authority amends their planning system to incorporate either:

    - individual runway specific PSA contours (for the inner and outer area) using the UK NATS methodology[2] outlined in Attachment 1; or
    - an appropriate PSA template[3] as discussed in Attachment 2.

55. Both of the above options require supporting planning provisions to be reflected in the local planning instrument and draw upon the general guidance for new/proposed developments on compatible and incompatible activities within PSA risk contours from Table 1.

Development-led approach

56. A PSA development-led approach involves a reactive assessment process within a planning framework whereby public risk is assessed on a case-by-case basis where development is proposed within one kilometre of an airport runway end, or within an identified public safety assessment area.

[2] NATS R&D Report 9636 *Third Party Risk Near Airports and Public Safety Zone Policy* was released in 1997 and there have been updates to the model relating to the model parameters and underlying crash data since that time.

[3] In 2014, NASAG commissioned a consultant to undertake analysis in order to develop a suite of templates applicable to a range of Australian airports. The results of this work indicated that this multi-template approach was found to be difficult for some types of airports at that time.

57. Once a public risk has been identified as falling within one kilometre of an airport runway end, an assessment would be required to ascertain the level of risk to public safety by either:

    a) calculating the level of risk at all reference points in the proposed site using UK NATS methodology (outlined in Attachment 1); or

    b) determining individual runway specific PSA contours for the 1 in 10,000 and 1 in 100,000 contours using the UK NATS methodology (Attachment 1), or using an appropriate PSA template (Attachment 2).

58. Following the above process, the approval body could then draw upon the compatible/incompatible land use framework from Table 1.

59. An example of a development-led approach is the South Australian Department of Planning, Transport and Infrastructure's response to a rezoning proposal initiated by the City of Salisbury in June 2013. The proposal was for a $180 million entertainment and leisure development within one kilometre from the end of the runway at Parafield Airport. In this instance, the South Australian Minister for Planning required the Council to consider the fact that the proposed development potentially fell within a PSA. The City of Salisbury engaged an expert consultant to undertake a safety analysis to ascertain the level of risk to public safety to inform Council's decision.

Military Public Safety Areas

60. Approval bodies are encouraged to consider advice from the Department of Defence regarding PSAs in relation to military aerodromes. Military aircraft, although different in operational tempo, face the same risks in take-off and landing as civilian aircraft. The risk to people on the ground from a military aircraft accident is very low, however such an incident can have serious consequences in terms of the range and extent of its impact. Councils should maintain low-density land uses along flight paths close to military runways by ensuring that development is assessed in terms of its compatibility with minimising public safety risk.

61. The UK model (Public Safety Zones) is based on civil fixed wing aircraft and is not suited to the operation of some military aircraft. Military aircraft incidents differ from commercial air carrier and general aviation incidents because of the variety of aircraft used, the type of missions and the number of training flights. Due to the serious consequences associated with aircraft incidents, Defence seeks to address this safety issue from a land use planning perspective.

62. The only existing military public safety model that Defence is aware of is the United States Department of Defense (US DoD) Accident Prevention Zones (APZ) model. The US DoD model was specifically designed for military aircraft and was based on actual military crash data. A review of historic Australian military aircraft crash data found similar trends to that of US modelling.

63. In considering PSAs, state/territory and local government planning authorities should seek guidance from Defence as to which PSA model may be most appropriate around each military airfield. Defence's advice will be tailored to the level of risk associated with the aircraft types operating from a particular airfield. In some cases, Defence may recommend the US DoD APZ model. In other cases, Defence may recommend the Queensland PSA model or another appropriate model. Details on the US DoD model are provided in Attachment 3.

ATTACHMENT 1

UK Public Safety Zone (PSZ) Aviation Model

1. The administration of the equivalent policy in the UK (where PSAs are referred to as Public Safety Zones) is carried out by the UK Civil Aviation Authority. The UK PSZ policy is outlined in Department for Transport (DfT) Circular 01/2010[4]. The UK methodology is based on the principles set out in a study conducted by the Research and Development Directorate of NATS (formerly National Air Traffic Services Limited) on behalf of the DfT. The study is described fully in NATS R&D Report 9636 *Third Party Risk Near Airports and Public Safety Zone Policy* (NATS, London, June 1997)[5].

2. This methodology assesses the risk of an individual fatality in the vicinity of an airport as a result of an aircraft crash during landing or take-off determines potential crash locations in relation to a runway's extended centreline. Using this approach, NATS has calculated the individual runway specific PSZ contours for more than 35 UK Airports.

3. The UK work is based on modelling carried out using aircraft accident data to determine the level of risk to people on the ground around airports. The modelling determines the extent of individual risk contours upon which a person remaining in the same location for a year would be subjected to a particular level of risk of being killed as a result of an aircraft accident. The UK PSZ policy is based predominantly on individual risk, while extending it to consider particular types of development such as transport infrastructure and to temporary uses. The UK model maps the area that applies an individual risk calculation to 1 in 10,000 and 1 in 100,000 risk contours for that airport.

4. The areas of the PSZ correspond essentially to the 1 in 100,000 individual risk contours as calculated for each airport, based on forecasts about the numbers and types of aircraft movements fifteen years ahead.

5. The individual risk profile of an airport is determined by:

    - the statistical expectation that an aircraft crash occurs in the vicinity of the airport;
    - the probability, given a crash has occurred, that it affects a particular location;
    - the size of the area likely to be affected as a result of a crash; and
    - the probability of fatality for people on the ground within that area.

6. The UK policy for restricting new development within PSZs uses a constrained cost-benefit analysis (CBA) to determine specific land use restrictions. The CBA quantifies the benefits from reducing risk and compares these with the costs of removing or prohibiting activities at each point from outside the 1 in 10,000 contour to the edge of the 1 in 100,000 contour.

7. The UK model recommends that the PSZ risk contours around airports be remodelled at intervals of about seven years.

[4] UK Department for Transport Circular 1/2010 *Control of Development in Airport Public Safety Zones*.
[5] This report was released in 1997 and there have been updates to the model relating to the model parameters and underlying crash data since that time.

ATTACHMENT 2

EXAMPLES OF PSA TEMPLATES

Queensland State Planning Policy (SPP) - Public Safety Area (PSA) Model

1. In Australia, Queensland has had a planning framework covering PSAs since 1992. The 2017 State Planning Policy for PSA's and risk methodology, which is a modified version of research conducted in the UK on risk to third parties, is currently under review by the Queensland Government. The review is considering the suitability of moving to a more tailored airport-specific approach based on the UK methodology. However, Queensland's existing PSA model will remain in place for the foreseeable future.
2. Other Australian jurisdictions and the Australian Government (see Western Sydney Airport discussed below in paragraphs 8-10) have referenced the Queensland policy approach when assessing public safety cases for development near airports.
3. The Queensland PSA model, established by the Queensland State Planning Policy (SPP), applies a single defined PSA template to all runways that meet certain criteria in terms of aircraft movements. The dimensions of the Queensland PSA template were determined with reference to the UK methodology for determining third party risk.
4. A PSA forms the shape of an isosceles trapezoid—1000 metres long, 350 metres wide closest to the runway end, tapering to a width of 250 metres furthest from the runway (see Figure 2). It lies beneath the approach or take-off path where the aircraft is closest to the ground at the end of the runway.

Note: Applies to each runway end.

Figure 2: Queensland Public Safety Area

5. Queensland policy is that development within PSAs should not increase the risk to public safety from an aircraft accident near the ends of airport runways. Therefore, the following should be avoided:
    - increases in the numbers of people living, working or congregating in the public safety areas; or
    - the use of noxious or hazardous materials.
6. Existing development commitments within PSAs are allowed to remain. However, the scale of risk to the public should be reduced by appropriate conditions on future development approvals (e.g. a condition preventing the storage of hazardous materials in an industrial development). Some reduction in public risk by modifying current development uses might be achieved through negotiation with owners and developers.
7. An assessment of a development's compatibility with PSAs has to consider:
    - the direct impacts to people in the aircraft and on ground; and
    - the secondary incidents arising from damage to ground facilities, such as storage facilities for explosive, flammable or other hazardous materials.

Western Sydney Airport

8. An example of the Australian Government's approach to PSAs can be illustrated by the Western Sydney Airport. In line with the Queensland PSA template approach, and in the absence of a consistent national approach or accurate aircraft data to use in risk modelling, the Airport Plan nominally identified a 1,000m trapezoid-shaped clearance area, extending off the ends of each proposed runway to cover the area of highest anticipated safety risk. As detailed planning and design for the airport continues, there will be opportunities for the Airport Lessee Company, in consultation with the planning authority, to review which PSA model is most appropriate for Western Sydney Airport.
9. The PSAs have been identified in these early planning stages of the proposed new airport in order to encourage land use planning and development that does not pose a public safety risk and is compatible with the future development of the airport.

ATTACHMENT 3

EXAMPLE OF MILITARY PSA: UNITED STATES OF AMERICA DEPARTMENT OF DEFENSE ACCIDENT POTENTIAL ZONES

Background

1. The Accident Potential Zone (APZ) Guidelines were developed as a standard for public safety areas and quickly adopted by US Department of Defense to ensure the health, safety and welfare of those living near a military airport whilst sustaining airfield operations.
2. The US Department of Defense runways are split into two (2) types:
   - Class A Runways are usually less than 2438.4 metres long and are used primarily by light aircraft and do not have the potential for intensive use by heavy or high performance aircraft.
   - Class B Runways are all other fixed-wing runways.
3. These runways have defined public safety areas with three dedicated zones, as shown on Figure 3.

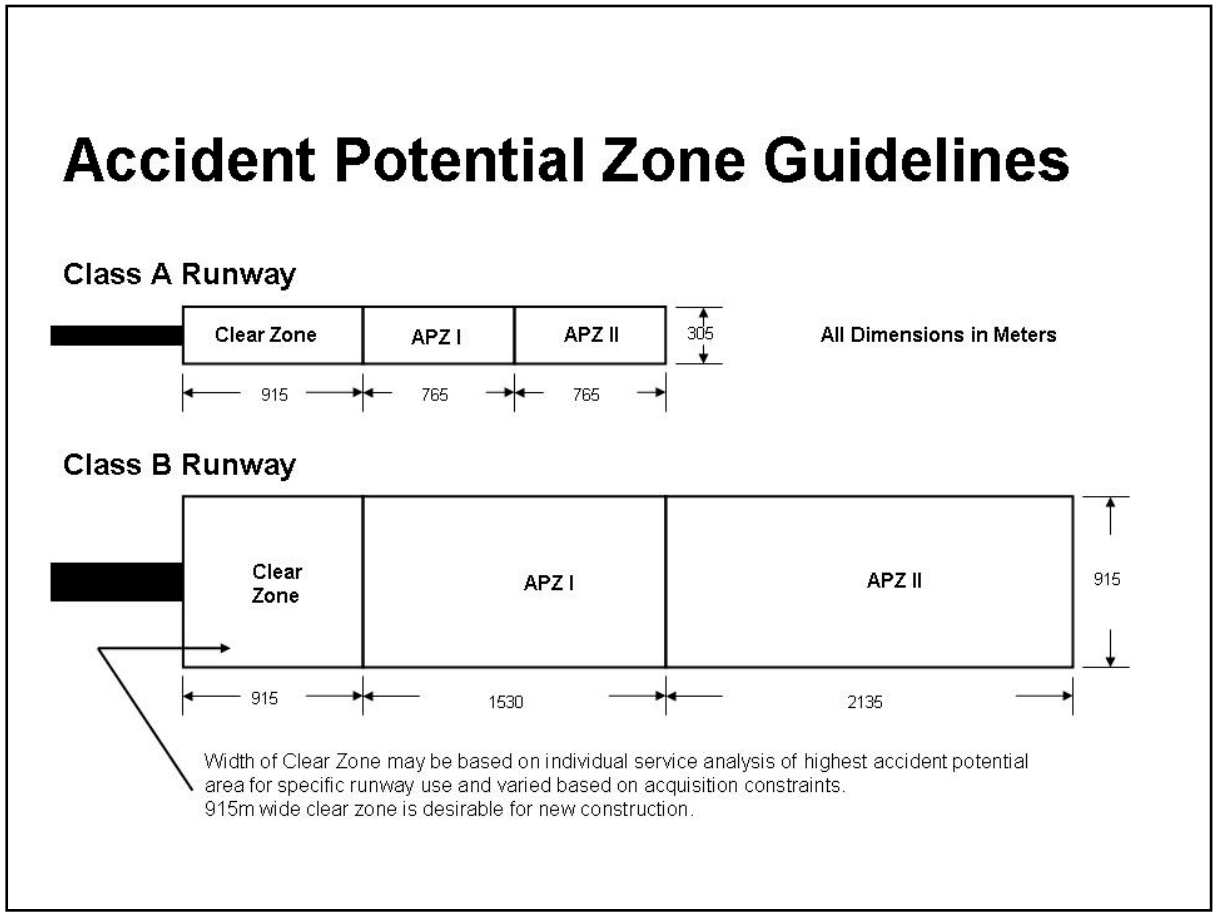

Figure 3: Adapted from US Department of Defense Accident Potential Zones. Source: Office of Economic Adjustment, *Practical Guide to Compatible Civilian Development Near Military Installations*, July 2005.

4. These APZs are areas where an aircraft accident is likely to occur, but they do not reflect the probability of an accident. APZs follow arrival, departure and pattern flight tracks and are based upon analysis of historical accident data.
5. The Air Installations Compatible Use Zones maps define three APZs – the Clear Zone, APZ 1 and APZ 2. The Clear Zone extends 914 metres beyond the runway and has the highest potential for accidents. APZ 1 extends 1524 metres beyond the Clear Zone, and APZ 2 extends 2134 metres beyond APZ 1.
6. If an accident were to occur, it is more likely to occur in APZ 1 than APZ 2, and more likely to occur in the Clear Zone than either APZ 1 or APZ 2.
7. As stated above, APZs follow arrival, departure, and pattern flight tracks. However, APZs are not 'roadways' in the sky. Weather conditions, wind, pilot technique, and other air traffic will typically cause some lateral deviation within the landing pattern around an airfield.
8. Under the US DoD Model certain land uses are not considered compatible with military flying operations. Within the clear zone (CZ), there should be no structures of any kind. Agriculture is the recommended land use, with the exception that there should not be horticultural activities.
9. Land uses applicable to the APZ 1 and APZ 2 areas are included at Annex A. Generally, development that encourages large congregations of people or involves the storage or handling of significant quantities of hazardous materials is prohibited (e.g. residential, shopping centres, places of assembly, hotels), while uses permitted tend to included structures that do not encourage permanent settlement or large congregations of people (e.g. bulk manufacturing and warehouses).

Implementation

10. The Australian Department of Defence is seeking to work collaboratively with state, territory and local governments to identify the appropriate model for military airfields within their planning jurisdiction. Defence is not seeking to have an adapted military or civil PSA model apply retrospectively to existing development or remove existing development rights, but rather the model should be used to inform future land use planning decisions in areas along the extended centre line of military airfields.
11. State, territory and local government planning authorities would need to consider the US Model land use compatibility tables (see Annex A), in consultation with Defence, in relation to their own land use definition schedules.

Annex A

Land Use Compatibility in Accident Potential Zones (Extract from USA Air Force Instruction AFI 32-7063 dated 18 December 2015).

LAND USE		SUGGESTED LAND USE COMPATIBILITY[1]			
SLUCM NO.	LAND USE NAME	CLEAR ZONE	APZ-I	APZ-II	DENSITY
10	Residential				
11	Household Units				
11.11	Single units: detached	N	N	Y[2]	Maximum density of 2 Du/Ac
11.12	Single units: semi-detached	N	N	N	
11.13	Single units: attached row	N	N	N	
11.21	Two units: side-by-side	N	N	N	
11.22	Two units: one above the other	N	N	N	
11.31	Apartments: walk-up	N	N	N	
11.32	Apartment: elevator	N	N	N	
12	Group quarters	N	N	N	
13	Residential hotels	N	N	N	
14	Mobile home parks or courts	N	N	N	
15	Transient lodgings	N	N	N	
16	Other residential	N	N	N	
20	Manufacturing [3]				
21	Food and kindred products; manufacturing	N	N	Y	Maximum FAR 0.56 IN APZ II
22	Textile mill products; manufacturing	N	N	Y	Maximum FAR 0.56 IN APZ II
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	N	N	
24	Lumber and wood products (except furniture); manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
26	Paper and allied products; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
27	Printing, publishing, and allied industries	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
28	Chemicals and allied	N	N	N	

LAND USE		SUGGESTED LAND USE COMPATIBILITY[1]			
SLUCM NO.	LAND USE NAME	CLEAR ZONE	APZ-I	APZ-II	DENSITY
	products; manufacturing				
29	Petroleum refining and related industries	N	N	N	
30	Manufacturing[3] (continued)				
31	Rubber and miscellaneous plastic products; manufacturing	N	N	N	
32	Stone, clay, and glass products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks	N	N	N	
39	Miscellaneous manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
40	Transportation, communication, and utilities[3, 4]				
41	Railroad, rapid rail transit, and street railway transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
42	Motor vehicle transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
43	Aircraft transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
44	Marine craft transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
45	Highway and street right-of-way	Y[5]	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
46	Automobile parking	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
47	Communication	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
48	Utilities[7]	N	Y[6]	Y[6]	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
48.5	Solid waste disposal (landfills, incinerators, etc.)	N	N	N	
49	Other transportation, communication, and utilities	N	Y[6]	Y	See Note 6 below
50	Trade				

LAND USE		SUGGESTED LAND USE COMPATIBILITY[1]			
SLUCM NO.	LAND USE NAME	CLEAR ZONE	APZ-I	APZ-II	DENSITY
51	Wholesale trade	N	Y	Y	Maximum FAR of 0.28 in APZ I & .56 in APZ II
52	Retail trade – building materials, hardware and farm equipment	N	Y	Y	See Note 8 below
53	Retail trade – including, discount clubs, home improvement stores, electronics superstores, etc.	N	N	Y	Maximum FAR of 0.16 in APZ II
53.	Shopping centers-Neighborhood, Community, Regional, Superregional[9]	N	N	N	
54	Retail trade – food	N	N	Y	Maximum FAR of 0.24 in APZ II
55	Retail trade – automotive, marine craft, aircraft, and accessories	N	Y	Y	Maximum FAR of 0.14 in APZ I & 0.28 in APZ II
56	Retail trade – apparel and accessories	N	N	Y	Maximum FAR of 0.28 in APZ II
57	Retail trade – furniture, home, furnishings and equipment	N	N	Y	Maximum FAR of 0.28 in APZ II
58	Retail trade – eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y	Maximum FAR of 0.16 in APZ II
60	Services[10]				
61	Finance, insurance and real estate services	N	N	Y	Maximum FAR of 0.22 in APZ II
62	Personal services	N	N	Y	Office uses only. Maximum FAR of 0.22 in APZ II.
62.4	Cemeteries	N	Y[11]	Y[11]	
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II
63.7	Warehousing and storage services[12]	N	Y	Y	Maximum FAR of 1.0 in APZ I; 2.0 in APZ II
64	Repair Services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Maximum FAR of 0.22 in APZ II
65.1	Hospitals, nursing homes	N	N	N	
65.1	Other medical facilities	N	N	N	
66	Contract construction services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
67	Government Services	N	N	Y	Maximum FAR of 0.24 in APZ II

LAND USE		SUGGESTED LAND USE COMPATIBILITY[1]			
SLUCM NO.	LAND USE NAME	CLEAR ZONE	APZ-I	APZ-II	DENSITY
68	Educational services	N	N	N	
68.1	Child care services, child development centers, and nurseries	N	N	N	
69	Miscellaneous Services	N	N	Y	Maximum FAR of 0.22 in APZ II
69.1	Religious activities (including places of worship)	N	N	N	
70	Cultural, entertainment and recreational				
71	Cultural activities	N	N	N	
71.2	Nature exhibits	N	Y[13]	Y[13]	
72	Public assembly	N	N	N	
72.1	Auditoriums, concert halls	N	N	N	
72.11	Outdoor music shells, amphitheaters	N	N	N	
72.2	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements – fairgrounds, miniature golf, driving ranges; amusement parks, etc.	N	N	Y	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y[13]	Y[13]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
75	Resorts and group camps	N	N	N	
76	Parks	N	Y[13]	Y[13]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
79	Other cultural, entertainment and recreation	N	Y[11]	Y[11]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
80	Resource production and extraction				
81	Agriculture (except live-stock)	Y[4]	Y[14]	Y[14]	
81.5-81.7,	Agriculture-Livestock farming, including grazing and feedlots	N	Y[14]	Y[14]	
82	Agriculture related activities	N	Y[15]	Y[15]	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
83	Forestry activities[16]	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives

LAND USE		SUGGESTED LAND USE COMPATIBILITY[1]			
SLUCM NO.	LAND USE NAME	CLEAR ZONE	APZ-I	APZ-II	DENSITY
84	Fishing activities[17]	N[17]	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
85	Mining activities[18]	N	Y[18]	Y[18]	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
89	Other resource production or extraction	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
90	Other				
91	Undeveloped land	Y	Y	Y	
93	Water areas[19]	N[19]	N[19]	N[19]	

KEY:

SLUCM – Standard Land Use Coding Manual, U.S. Department of Transportation

Y (Yes) – Land uses and related structures are normally compatible without restriction

N (No) – Land use and related structures are not normally compatible and should be prohibited.

Yx – Yes with restrictions. The land uses and related structures are generally compatible, structures should be located toward the edges wherever possible. However, see notes indicated by the superscript.

Nx – No with exceptions. The land uses and related structures are generally incompatible. However, see notes indicated by the superscript.

FAR – Floor Area Ratio. A floor area ratio is the ratio between the square feet of floor area of the building and the gross site area. It is customarily used to measure non-residential intensities.

Du/Ac – Dwelling Units an Acre. This is customarily used to measure residential densities.

NOTES:

1. A "Yes" or a "No" designation for compatible land use is to be used only for general comparison. Within each, uses exist where further evaluation may be needed in each category as to whether it is clearly compatible, normally compatible, or not compatible due to the variation of densities of people and structures. In order to assist air installations and local governments, general suggestions as to FARs are provided as a guide to density in some categories. In general, land use restrictions that limit occupants, including employees, of commercial, service, or industrial buildings or structures to 25 an acre in APZ I and 50 an acre in APZ II are considered to be low density.

Outside events should normally be limited to assemblies of not more than 25 people an acre in APZ I, and maximum assemblies of 50 people an acre in APZ II. Recommended FARs are calculated using standard parking generation rates for various land uses, vehicle occupancy rates, and desired density in APZ I and II. For APZ I, the formula is FAR = 25 people an acre/ (Average Vehicle Occupancy x Average Parking Rate x (43560/1000)). The formula for APZ II is FAR = 50/ (Average Vehicle Occupancy x Average Parking Rate x (43560/1000)).

2. The suggested maximum density for detached single-family housing is two Du/Ac. In a planned unit development (PUD) of single family detached units, where clustered housing development results in large open areas, this density could possibly be increased slightly provided the amount of surface area covered by structures does not exceed 20 percent of the PUD total area. PUD encourages clustered development that leaves large open areas.

3. Other factors to be considered: Labor intensity, structural coverage, explosive characteristics, air-pollution, electronic interference with aircraft, height of structures, and potential glare to pilots.

4. No structures (except airfield lighting and navigational aids necessary for the safe operation of the airfield when there are no other siting options), buildings, or above-ground utility and communications lines should normally be located in Clear Zone areas on or off the air installation. The Clear Zone is subject to the most severe restrictions.

5. Roads within the graded portion of the Clear Zone are prohibited. All roads within the Clear Zone are discouraged, but if required, they should not be wider than two lanes and the rights-of-way should be fenced (frangible) and not include sidewalks or bicycle trails. Nothing associated with these roads should violate obstacle clearance criteria.

6. No above ground passenger terminals and no above ground power transmission or distribution lines. Prohibited power lines include high-voltage transmission lines and distribution lines that provide power to cities, towns, or regional power for unincorporated areas.

7. Development of renewable energy resources, including solar and geothermal facilities and wind turbines, may impact military operations through hazards to flight or electromagnetic interference. Each new development should to be analyzed for compatibility issues on a case-by-case basis that considers both the proposal and potentially affected mission.

8. Within SLUCM Code 52, maximum FARs for lumberyards (SLUCM Code 521) are 0.20 in APZ-I and 0.40 in APZ-11; the maximum FARs for hardware, paint, and farm equipment stores, (SLUCM Code 525), are 0.12 in APZ I and 0.24 in APZ II.

9. A shopping center is an integrated group of commercial establishments that is planned, developed, owned, or managed as a unit. Shopping center types include strip, neighborhood, community, regional, and super-regional facilities anchored by small businesses, a supermarket or drug store, discount retailer, department store, or several department stores, respectively.

10. Ancillary uses such as meeting places, auditoriums, etc. are not recommended.

11. No chapels or houses of worship are allowed within APZ I or APZ II.

12. Big box home improvement stores are not included as part of this category.

13. Facilities must be low intensity, and provide no playgrounds, etc. Facilities such as club houses, meeting places, auditoriums, large classes, etc., are not recommended.

14. Activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded.

15. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.

16. Lumber and timber products removed due to establishment, expansion, or maintenance of Clear Zone lands owned in fee will be disposed of in accordance with applicable DoD guidance.

17. Controlled hunting and fishing may be permitted for the purpose of wildlife management.

18. Surface mining operations that could create retention ponds that may attract waterfowl and present bird/wildlife aircraft strike hazards (BASH), or operations that produce dust or light emissions that could affect pilot vision are not compatible.

19. Naturally occurring water features (e.g., rivers, lakes, streams, wetlands) are pre-existing, nonconforming land uses. Naturally occurring water features that attract waterfowl present a potential BASH. Actions to expand naturally occurring water features or construction of new water features should not be encouraged. If construction of new features is necessary for storm water retention, such features should be designed so that they do not attract waterfowl.