ARCHERFIELD AIRPORT PLANNING ISSUES

GRASS RUNWAY CLOSURE INVESTIGATION
1989 - 2008

OCTOBER 2009

CONTENTS

1. INTRODUCTION

The purpose of this report is to ascertain the number of days, or part thereof, that the grass secondary runways have been unserviceable due to rain events in the past 20 years.

This study is based on Notice To Airmen (NOTAM) reports issued by Airservices Australia (AsA) or Archerfield Airport Corporation (AAC) and recorded in AAC log books by Ground Staff between the years 1989 to 2008.

Archerfield Airport Corporation has been the airport operator since privatisation on 18th June 1998. Prior to this, the Federal Airports Corporation (FAC) operated the airport. A 20 year period was reviewed to determine if any differences in runway closures have occurred since the time of privatisation.

2. BACKGROUND

Archerfield Airport is Brisbane's metropolitan airport and has the largest number of general aviation movements of all Queensland airports. It has a multi-runway configuration comprising two parallel runways in two different directions. This multi-directional runway configuration has been designed to cater for landings, by smaller aircraft in particular, in just about all wind conditions that exist at Archerfield.

Parallel 10/28 runways and their complementing full-length taxiways have sealed pavements. The 04/22 secondary parallel runways and taxiways have sealed runway thresholds but the rest of the complex is comprised of natural, grass surfaces.

During rain events, the 04/22 runway complex may be unusable due to the surface being either too wet for aircraft to land safely, or too wet for emergency vehicles to attend the scene of an accident if an emergency situation arises. In this case, the AAC Ground Staff, or when Ground Staff are not present AsA, issue a NOTAM to inform pilots that a particular runway is not safe to land on.

When the 04/22 runway complex is unserviceable due to soft wet surface and wind patterns are such that these runways are required, a potentially dangerous situation may arise where a light aircraft is unable to land safely.

3. DATA

Table A - Summary of 04/22 runway complex closures due to rain events (1989 - 2008)

	Year	Number of days both runways have been closed	% / year both runways have been closed	Number of days at least one runway has been closed	% / year at least one runway has been closed	FAC compared to AAC Avg % / year both runways have been closed
FAC	1989	117	32.05%	120	32.91%	24.74%
	1990	133	36.35%	150	41.18%	
	1991	44	12.05%	45	12.38%	
	1992	107	29.23%	114	31.15%	
	1993	45	12.33%	45	12.33%	
	1994	106	28.96%	111	30.47%	
	1995	95	26.10%	102	28.00%	
	1996	74	20.22%	77	21.04%	
	1997	68	18.63%	71	19.45%	
	1998 (Jan - 17 June)	57.5	31.51%	57.5	31.51%	
AAC	1998 (18 June - Dec)	43.5	23.83%	43.5	23.83%	27.75%
	1999	167	45.75%	167	45.75%	
	2000	74	20.22%	74	20.22%	
	2001	71	19.45%	95	26.03%	
	2002	58	15.89%	65	17.81%	
	2003	112	30.68%	117	32.05%	
	2004	75	20.49%	77	21.04%	
	2005	83	22.74%	93	25.48%	
	2006	88	24.11%	93	25.48%	
	2007	123	33.70%	125	34.25%	
	2008	177	48.36%	194	53.01%	
	Total	**1918**	**26.25%**	**2037**	**27.88%**	

- The above table is a summary based on data from Appendix A
- Data was obtained from Airservices Australia NOTAM briefing reports kept in Ground Staff and Operational Staff log books
- Closures relate to days, or part thereof, that the runways have been unusable due to rain events.
- NOTAMS that were cancelled early in the day were excluded from this count.
- Actual runway closures may be greater than that recorded due to potential missing NOTAM data from log books

4. DISCUSSION

Table A shows the number of days (or part thereof) the secondary runways, 04R/22L and 04L/22R, have been unavailable during the years 1989 - 2008 as a result of rain events. As can be seen from the data, both runways have been closed for an average of 26.25% of each year during the 20 years sampled. Either one of the runways has been unavailable for an average of 27.88% of each year due to these rain events.

From 1989 through to June 1998, when the Airport was controlled by the FAC, both grass runways were closed for an average of 24.74% of each year. Anecdotal evidence from Ground Staff, who have worked at the airport during the 20 years the data was sampled, suggest that runway closures pre and post privatisation have been similar. A similar criteria for their closure has also been adopted during the previous 20 years. The closures recorded during privatisation from June 1998 through to December 2008 give credence to this notion. An average of 27.75% closure of both runways existed during this period, indicating a difference of approximately 3% between FAC and AAC operations.

The difference of 3% in closures between pre and post privatisation could be due to a number of factors, least of which involves the differing amount of rainfall that was experienced in each of the two periods.

Rainfall data at Archerfield, obtained from the Bureau of Meteorology, correlates with the runway closures to a certain degree but doesn't give a true indication of when an expected closure is likely to occur or for how long the closure will last. This could be due to a number of reasons including intensity and duration of rainfall, the condition of the ground and amount of grass coverage during the event, humidity, wind and sunshine intensity post event. A more detailed study on runway closures versus rainfall would need to be conducted to determine the future likelihood of a closure based on the expected conditions.

Other factors that could be contributing to the 3% difference in closures between pre and post privatisation include groundwater flow, methods of grass stabilisation and whether or not Ground staff issuing the NOTAMs have become more conservative and safety conscious over the years.

Figures 1 and 2 show the direction of groundwater and surface water flows at the airport. As can be seen, groundwater generally flows from the south-east corner of the airport, under the grass runways and towards the north-western end. Surface water that gathers within the vicinity of the 04/22 complex, typically flows and accumulates towards the lower lying middle section of runway 04L/22R.

These factors are the major contributors to the 04L/22R runways being unserviceable for a longer period of time when compared to the 04R/22L runways. It is thought that the increase in building activities to the east of the airport over the past couple of decades, could be contributing to an increase in groundwater flow across the airport and hence an increase in runway closures.

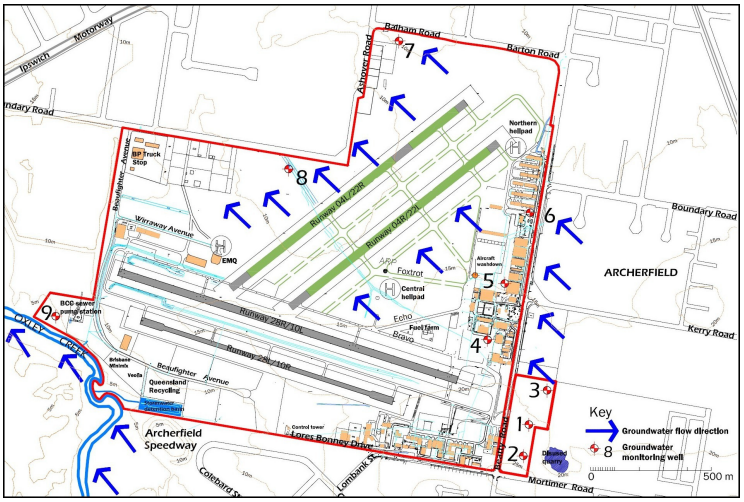

Figure 1 - Groundwater flow

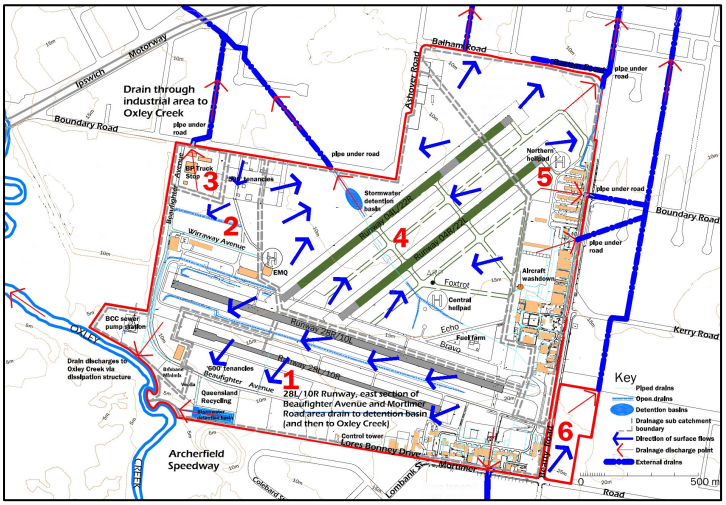

Figure 2 - Surface water flow

Various methods of grass stabilisation have also been used over the 20 year sampling period. Due to the nature of the unsealed runways, aircraft that are powering up to take-off scour out the soil directly underneath and adjacent to the propellers. Over time, this scouring reduces the amount of grass on the runways. A shoulder of displaced soil is also created which must be graded back to level, further reducing the opportunity for grass growth and ground stabilisation.

Soil replacements such as loam, crusher dust and decomposed granite have been trialled with varying success in an attempt to reduce this scouring and subsequent retreat in grassed areas. However, due to the significant slope towards a low point in the middle of the runways, this soil replacement is often 'washed-out' in heavy rain events. This 'wash-out' further exacerbates the problem and could contribute to the surface staying soggy for a longer period of time. A number of possible solutions to this problem would be to remove the low-point by levelling the runways, seal them, engineer sub-surface drainage around the eastern side of the runway complex to reduce the effects of groundwater and/or move them further to the east so they are no longer in a low lying area.

5. CONCLUSION

Archerfield Airport has a multi-runway configuration comprising two parallel runways in two different directions. The north/south runways are comprised of natural, grass surfaces and can become unavailable during rain events.

Data taken from Airservices Australia NOTAM reports indicate both grass runways have been closed an average of 26.25% of the time between 1989 to 2008. A difference of approximately 3% exists when comparing closures during FAC and AAC operations. This could be due to changes in weather patterns, different methods used to mitigate grass losses, changes in groundwater flow across the airport or changes in assessments of current runway conditions.

A number of potential solutions to alleviate the problem of runway closures involve levelling the runways, sealing them with asphalt, engineering sub-surface drainage around them and/or moving them to higher ground further to the eastern side of the airport. A combination of the aforementioned solutions would provide the highest possibility in reducing the likelihood of future closures due to rain events. However, an analysis of cost versus potential benefits would first need to be considered to determine the most appropriate course of action.

APPENDIX A

Closures of grass runways from 1989 - 2008

Summary (1989-2008)

		Total	Avg.
Closure of both runways		1918	26.25%
Closure of either runway		2037	27.88%
Closure of both runways / season			
	Summer	591	32.7%
	Autumn	577	31.3%
	Winter	363	19.7%
	Spring	387	21.3%

Number of days (or part thereof) the runways have been closed due to rain events*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Number of days that both runways have been closed	% days/year that both runways have been closed	Number of days that at least one runway has been closed	% days/year that at least one runway has been closed
1989																
Both	9	7	13	21	26	11	14	4	0	0	10	2	117	32.05%	120.12	32.91%
04R / 22L	0.06															
04I / 22R	0.12				1	2										
1990																
Both	5	14	15	27	14	21	2	4.88	5.39	5.61	8.5	10.28	132.66	36.35%	150.31	41.18%
04R / 22L										0.056	0.11	0.11				
04I / 22R				2		9	5	0.59	0.22	0.11	0.17	0.28				
1991																
Both	9	6	0	0	10	4	3	0	0	2	0	10	44	12.05%	45.18	12.38%
04R / 22L	0.06															
04I / 22R	0.12	1														
1992																
Both	2	20	16	17	17	7	8	0	3	0	6	11	107	29.23%	114	31.15%
04R / 22L												2				
04I / 22R								2				3				
1993																
Both	6	4	3	0	2	0	7	3	3	4	6	7	45	12.33%	45	12.33%
04R / 22L																
04I / 22R																
1994																
Both	6	15	23	3	10.78	7.11	6.17	4.88	5.39	5.61	8.5	10.28	105.72	28.96%	111.21	30.47%
04R / 22L		2			0.06		0.06			0.056	0.11	0.11				
04I / 22R					0.44	0.67	0.61	0.59	0.22	0.11	0.17	0.28				
1995																
Both	9	10.26	9.42	8.63	10.78	7.11	6.17	4.88	2	0	16	11	95.25	26.10%	102.19	28.00%
04R / 22L	0.06	0.32	0.53	0.53	0.06		0.06				2					
04I / 22R	0.12	0.58	0.21	0.16	0.44	0.67	0.61	0.59								
1996																
Both	10	4	1	5	17	0	4	3	6	5	6	13	74	20.22%	77	21.04%
04R / 22L										1						
04I / 22R		1							1							
1997																
Both	7	7	4	3	11	2	3	2	3	8	15	3	68	18.63%	71	19.45%
04R / 22L	1															
04I / 22R		2														
1998																
Both	4	13	1	18	21	1	6	8	15	0	9	5	101	27.67%	101	27.67%
04R / 22L																
04I / 22R																
1999																
Both	11	7	16	17	18	5	17	17	18	18	9	14	167	45.75%	167	45.75%
04R / 22L																
04I / 22R																
2000																
Both	15	3	10	3	2	6	3	5	0	9	11	7	74	20.22%	74	20.22%
04R / 22L																
04I / 22R																
2001																
Both	7	6	11	8	5	4	3	0	1	6	4	16	71	19.45%	95	26.03%
04R / 22L		4	10	8												
04L / 22R			2													
2002																
Both	4	4	3	2	8	8	0	12	1	0	2	14	58	15.89%	65	17.81%
04R / 22L				2												
04L / 22R				1	4											
2003																
Both	1	20	19	20	14	4	7	7	0	11	0	9	112	30.68%	117	32.05%
04R / 22L																
04L / 22R					2				1	2						
2004																
Both	10	14	9	4	4	0	0	4	6	5	9	10	75	20.49%	77	21.04%
04R / 22L																
04L / 22R			2													
2005																
Both	7	0	0	11	17	14	7	2	10	7	4	4	83	22.74%	93	25.48%
04R / 22L							1									
04L / 22R	2	4					3									
2006																
Both	14	9	14	5	2	14	4	6	11	0	3	6	88	24.11%	93	25.48%
04R / 22L					1											
04L / 22R					1	1			2							
2007																
Both	16	16	6	0	3	10	1	10	8	16	22	15	123	33.70%	125	34.25%
04R / 22L																
04L / 22R												2				
2008																
Both	28	26	15	0	3	17	22	0	7	10	21	28	177	48.36%	194	53.01%
04R / 22L																
04L / 22R		3					3	8			3					
	180	205.26	188.42	172.63	215.56	142.22	123.34	97.64	104.78	112.22	170	205.56	1917.63	**Average** 26.25%	2037.01	**Average** 27.88%

*Data obtained from Airservices Australia NOTAM briefing reports kept in Ground Staff and Operational Staff log books
*Actual runway closures may be greater than that recorded due to potential missing NOTAM data from log books
* Days where NOTAMs were cancelled folowing the initial inspection have been excluded
* Results in red are averages taken over the 20 year period due to missing NOTAM data for those months