OZONE DATA ANALYSIS

prepared for

National Environment Protection Council
– Ozone Standards Review

by

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Executive Summary

This report presents an analysis of ozone data from NEPM sites in Sydney, Melbourne, Brisbane and Perth for 1998-2001, and from Adelaide for 2002-2003. The analysis presents the data in three different ways, namely:

- Patterns of ozone exposure, i.e. time series of one-hour averages during period with elevated ozone levels.
- Peak times, i.e. time of day of occurrence of elevated ozone levels for one hour, 4-hour and 8-hour averages.
- Duration, i.e. the duration of periods with elevated ozone levels for one-hour, 4-hour and 8-hour averages.

A range of criteria are used to specify "elevated levels" based on current NEPMs of 0.10 ppm for 1-hour averages and 0.08 ppm for 4-hour averages. The first group includes the four criteria:

- 1-hour average ozone concentration greater than 0.10 ppm
- 1-hour average ozone concentration greater than 0.08 ppm
- 4-hour average ozone concentration greater than 0.08 ppm
- 8-hour average ozone concentration greater than 0.06 ppm

A second group of criteria set at concentrations of 75% of the above levels was also used:

Patterns The patterns of exposure vary from site to site with typical patterns including:

- a triangular pattern of an approximately linear increase to a maximum over a period of 5 to 10 hours and then a linear decrease to near zero
- a pattern with a brief period of 1 to 3 hours with concentrations elevated well above those existing during the rest of the day
- a pattern with a rapid increase in concentration and then elevated concentrations persisting for up to 8 – 10 hours
- patterns with multiple peaks
- patterns with sharp changes (increases or decreases) in concentration from one hour to the next.

Time of Day The time of day when the peak concentrations occur is earliest in Adelaide (12:00 – 13:00), Brisbane (12:00 – 14:00) and Perth (14:00 – 15:00). In Sydney, the most frequent peak times are between 14:00 and 16:00 at most sites, although the peak occurs earlier at Rozelle (13:00) and later at Oakdale (18:00). The peak is also much broader at Richmond than at other Sydney sites. The Melbourne peaks are most frequent between 15:00 and 16:00.

Duration The duration of exposure varies widely from site to site and state to state but some typical features of the period over which the 1-hour criteria are exceeded are:

- 25-50% of the durations are 1 hour
- 25-35% of the durations are 2 to 3 hours
- 10-20% of the durations are 4 to 5 hours
- up to 10% are 6 hours or longer.

Background

As part of the future actions of the Ambient Air Quality National Environment Protection Measure (NEPM), the National Environment Protection Council (NEPC) agreed to review the practicability of reducing the one hour ozone standard from 0.10 ppm to 0.08 ppm. A NEPC review team has been established and is conducting some preliminary work for the review of the standard, including considering the question of appropriate averaging periods for the ozone standards. The current ozone standards are 0.10 ppm for a one-hour averaging period and 0.08 ppm for a four hour averaging period.

The NEPC Review Team has requested an analysis of existing ozone data from NEPM sites in Sydney, Melbourne, Brisbane, Perth and Adelaide for one hour, four hour and eight hour averaging periods in order to consider the time of day when peak ozone levels occur and the time period that ozone levels are above background levels in the different cities (while background levels vary, it is estimated at around 0.03 ppm).

Data Analysis

This report presents an analysis of ozone data from NEPM sites in Sydney, Melbourne, Brisbane and Perth for 1998-2001, and in Adelaide for 2002-2003. The analysis presents the data in three different ways, namely:

- Patterns of ozone exposure, i.e. time series of one-hour averages during period with elevated ozone levels.
- Peak times, i.e. time of day of occurrence of elevated ozone levels for one-hour, 4-hour and 8-hour averages.
- Duration, i.e. the duration of periods with elevated ozone levels for one-hour, 4-hour and 8-hour averages.

A range of criteria are used to specify “elevated levels” based on current NEPMs of 0.10 ppm for 1-hour averages and 0.08 ppm for 4-hour averages of ozone concentrations. The first group includes the four criteria:

- 1-hour average ozone concentration greater than 0.10 ppm
- 1-hour average ozone concentration greater than 0.08 ppm
- 4-hour average ozone concentration greater than 0.08 ppm
- 8-hour average ozone concentration greater than 0.06 ppm

As there are relatively few exceedences of these criteria in some cities, a second group of criteria set at 75% of the above levels was used to reveal the characteristics of the ozone exposure even though ozone concentrations are usually well below current NEPM values:

- 1-hour average ozone concentration greater than 0.075 ppm (75% of 0.10 ppm)
- 1-hour average ozone concentration greater than 0.06 ppm (75% of 0.08 ppm)
- 4-hour average ozone concentration greater than 0.06 ppm (75% of 0.08 ppm)
- 8-hour average ozone concentration greater than 0.045 ppm (75% of 0.06 ppm)

This second group only includes events not captured in the first set of criteria.

Table 1 lists the sites and years for which ozone data were analysed. Only years with a data availability of 75% or more were included.

Data were supplied as 1-hour averages. Rolling 4-hour and 8-hour averages were calculated where more than 75% of the data for the preceding 4 or 8-hour period were available. (Compared to requiring 100% data availability, this produced less than a 1% increase in the number of days selected as meeting the various criteria.) The times of these averages were identified as the end of the averaging period.

Table 1. NEPM sites and ozone data availability. The figures indicate the percentage of 1-hour average ozone data available. The shaded cells indicate the sites/years with a data availability of 75% or more – these were analysed for this report.

Sites	1998	1999	2000	2001	2002	2003
New South Wales						
Blacktown	83.8%	95.1%	91.5%	93.6%		
Bringelly	74.5%	92.1%	94.9%	91.5%		
Lidcombe	89.5%	89.4%	94.7%	94.5%		
Liverpool	93.1%	83.6%	93.3%	94.7%		
Oakdale	54.5%	89.2%	90.1%	88.4%		
Richmond	91.1%	92.0%	89.7%	90.8%		
Rozelle	72.5%	89.9%	87.8%	93.4%		
St Marys	84.9%	88.3%	91.5%	90.3%		
Woolooware	81.9%	73.8%	88.4%	92.7%		
Victoria						
Alphington	92.1%	93.1%	94.1%	89.3%		
Footscray	91.4%	91.6%	86.4%	36.0%		
Pt Cook	91.5%	88.6%	83.9%	87.1%		
Brighton	91.7%	94.8%	91.7%	77.5%		
Dandenong	94.5%	94.3%	61.4%	74.0%		
Geelong South (2)	92.0%	94.2%	85.6%	89.0%		
Traralgon	86.1%	30.5%	93.4%	93.3%		
Moe	90.4%	78.8%	82.9%	94.7%		
Queensland						
Springwood	0.0%	74.2%	73.9%	99.5%		
Deception Bay	91.1%	95.3%	95.3%	85.2%		
Rocklea	91.6%	90.9%	92.6%	95.8%		
Western Australia						
Caversham	99.1%	99.4%	99.2%	99.5%		
South Lake	0.0%	0.0%	83.2%	99.5%		
Swanbourne	98.4%	96.6%	97.9%	98.6%		
South Australia						
Netley					98.1%	97.2%
Kensington					95.7%	94.9%
Northfield					97.4%	97.4%
Elizabeth					95.0%	96.6%

Task 1 - Patterns

Time series of one-hour ozone averages were generated for days when any of the first group of criteria was exceeded (namely 1-hour averages greater than 0.10 ppm or 0.08 ppm, 4-hour averages greater than 0.08 ppm, or 8-hour averages greater than 0.06 ppm) and for additional days when any of the second group of criteria was exceeded (namely 75% of the above concentrations). Table 2 lists the number of such occurrences at each site.

Table 2. Number of exceedences at each NEPM site of the various conditions set for selecting data to be analysed for patterns, peak times, and durations.

Site	**Years of Data**	**First Group Of Criteria Number of days with exceedences of: 1-hr avg > 0.10 ppm or 1-hr avg > 0.08 ppm or 4-hr avg > 0.08 ppm or 8-hr avg > 0.06 ppm**	**Second Group Of Criteria Additional number of days with exceedences of: 1-hr avg > 75% of 0.10 ppm or 1-hr avg > 75% of 0.08 ppm or 4-hr avg > 75% of 0.08 ppm or 8-hr avg > 75% of 0.06 ppm**
New South Wales			
Blacktown	4	38	68
Bringelly	4	62	88
Lidcombe	4	29	59
Liverpool	4	43	61
Oakdale	3	33	64
Richmond	4	33	97
Rozelle	3	1	15
St Marys	4	50	77
Woolooware	3	13	31
Victoria			
Alphington	4	1	20
Footscray	3	3	26
Pt Cook	4	9	37
Brighton	4	3	39
Dandenong	2	4	28
Geelong South (2)	4	2	19
Traralgon	3	0	7
Moe	4	0	9
Queensland			
Springwood	1	0	2
Deception Bay	4	2	18
Rocklea	4	10	62
Western Australia			
Caversham	4	15	44
South Lake	2	1	8
Swanbourne	4	6	39
South Australia			
Netley	2	1	9
Kensington	2	2	14
Northfield	2	0	13
Elizabeth	2	0	20

The time series plots are presented for 30-hour periods from midnight of one day to 06:00 the next day. This is sufficient to include the full daily pattern of 1-hour averages. It is a reduction on the suggested 48-hour period, but this was done to reduce the size of the document without reducing the value of the information presented. Each time-series plot includes the site, date, and criterion/criteria that were exceeded during the exposure.

Due to the very large number of exceedences of the first set of criteria at most of the New South Wales sites, a random selection of 21 time series (one page of plots) is included here for each NSW site. This gives a total of 162 time series plots (out of a total available of 311). Because of the large number of plots obtained from the first group of criteria, no second criteria plots have been included here for NSW. A full presentation of all time series plots for all sites (a total of 371) where at least one of the first group of criteria were exceeded is included in the separate document: "TimeSeriesOfAllFirstCategoryExceedences.doc".

For other states, all the time series plots from exceedences of the first group of criteria have been included as well as 21 plots for each state obtained when applying the second group of criteria. These plots were selected to provide the widest range of patterns.

Figure 1 shows the time series plots for NSW, Figure 2 for Victoria, Figure 3 for Queensland, Figure 4 for Western Australia, and Figure 5 for South Australia.

The plots show a range of patterns with some differences from site to site. Patterns include:

- a triangular pattern of an approximately linear increase to a maximum over a period of 5 to 10 hours and then a linear decrease to near zero
- a pattern with a brief period of 1 to 3 hours with concentrations elevated well above those existing during the rest of the day
- a pattern with rapid increases in concentration with the elevated concentrations persisting for up to 8 – 10 hours
- patterns with multiple peaks
- patterns with sharp changes (increases or decreases) in concentration from one hour to the next.

Task 2 - Peak times

The days identified in the above analysis were further analysed to determine the time of day of occurrence of elevated ozone levels for 1-hour, 4-hour and 8-hour averages. Representative examples of the results are shown in Figures 6, 7 and 8. Figure 6 shows bar charts for each NEPM site of the number of exceedences at each hour of the day of the criterion of 1-hour average ozone concentrations greater than 0.06 ppm (i.e. 75% of 0.08 ppm) but not greater than 0.08 ppm. Figure 7 is for 4-hour average ozone concentrations greater than 0.06 ppm (i.e. 75% of 0.08 ppm) but not greater than 0.08 ppm. Figure 8 is for 8-hour average ozone concentrations greater than 0.045 ppm (i.e. 75% of 0.06 ppm) but not greater than 0.06 ppm. The full set of bar charts and tables is not included in this document in order to limit the size of this document. The bar charts for the other criteria are presented in the document

"TimeOfDayOfOzonePeaks_Graphs.doc" and the tabulated data are listed in the spreadsheet "TimeOfDayOfOzonePeaks_Tables.xls".

Focussing on the results in Figure 6 for 1-hour averages, which indicate the times at which the peak concentrations occur, we note the following features.

- The results for the NSW sites show the most frequent peak times between 14:00 and 16:00 at most sites, although the peak occurs earlier (13:00) at Rozelle and later (18:00) at Oakdale. The peak is also much broader at Richmond than at other Sydney sites.
- The Victorian metropolitan results show peaks between 15:00 and 16:00, whereas the peaks at the Latrobe valley sites seem to occur earlier (12:00 to 14:00), although there are insufficient data to draw reliable conclusions.
- The Queensland sites show the most frequent peaks between 12:00 and 14:00 with a broader spread of times at Deception Bay than Rocklea.
- In Western Australia, the most frequent peak times are 14:00 to 15:00, and in South Australia 12:00 to 13:00.

The peak times for the 4-hour and 8-hour averages occur later in the day, typically at 18:00 to 20:00 due to the time stamp for these averaging periods being the end of the averaging period.

Task 3 - Duration

The days identified in the above analysis were further analysed to determine the duration (in hours) of the periods with elevated ozone levels for 1-hour, 4-hour and 8-hour averages. Representative examples are shown in Figures 9, 10 and 11. Figure 9 shows bar charts for each NEPM site of the duration of exceedences of the criterion of 1-hour average ozone concentrations greater than 0.06 ppm (i.e. 75% of 0.08 ppm), but not greater than 0.08 ppm. Figure 10 is for 4-hour average ozone concentrations greater than 0.06 ppm (i.e. 75% of 0.08 ppm) but not greater than 0.08 ppm. Figure 11 is for 8-hour average ozone concentrations greater than 0.045 ppm (i.e. 75% of 0.06 ppm) but not greater than 0.06 ppm. These criteria were chosen because they provide reasonable data from those sites that have relatively few exposure periods meeting the criteria.

The full set of bar charts and tables is not included in this document in order to limit the size of this document. The bar charts for the other criteria are presented in the document "DurationOfOzonePeaks_Graphs.doc" and the tabulated data are listed in the spreadsheet "DurationOfOzonePeaks_Tables.xls".

Comparison of results between different states is difficult because of the large differences in the exposure levels at different sites. However, as a broad generalisation, it can be seen that typically:

- 25-50% of the durations are 1 hour
- 25-35% of the durations are 2 to 3 hours
- 10-20% of the durations are 4 to 5 hours
- up to 10% are 6 hours or longer.

The maximum duration observed for this criterion was 10 hours at Oakdale and Richmond (exceedence of 1-hour average of 0.06 ppm).

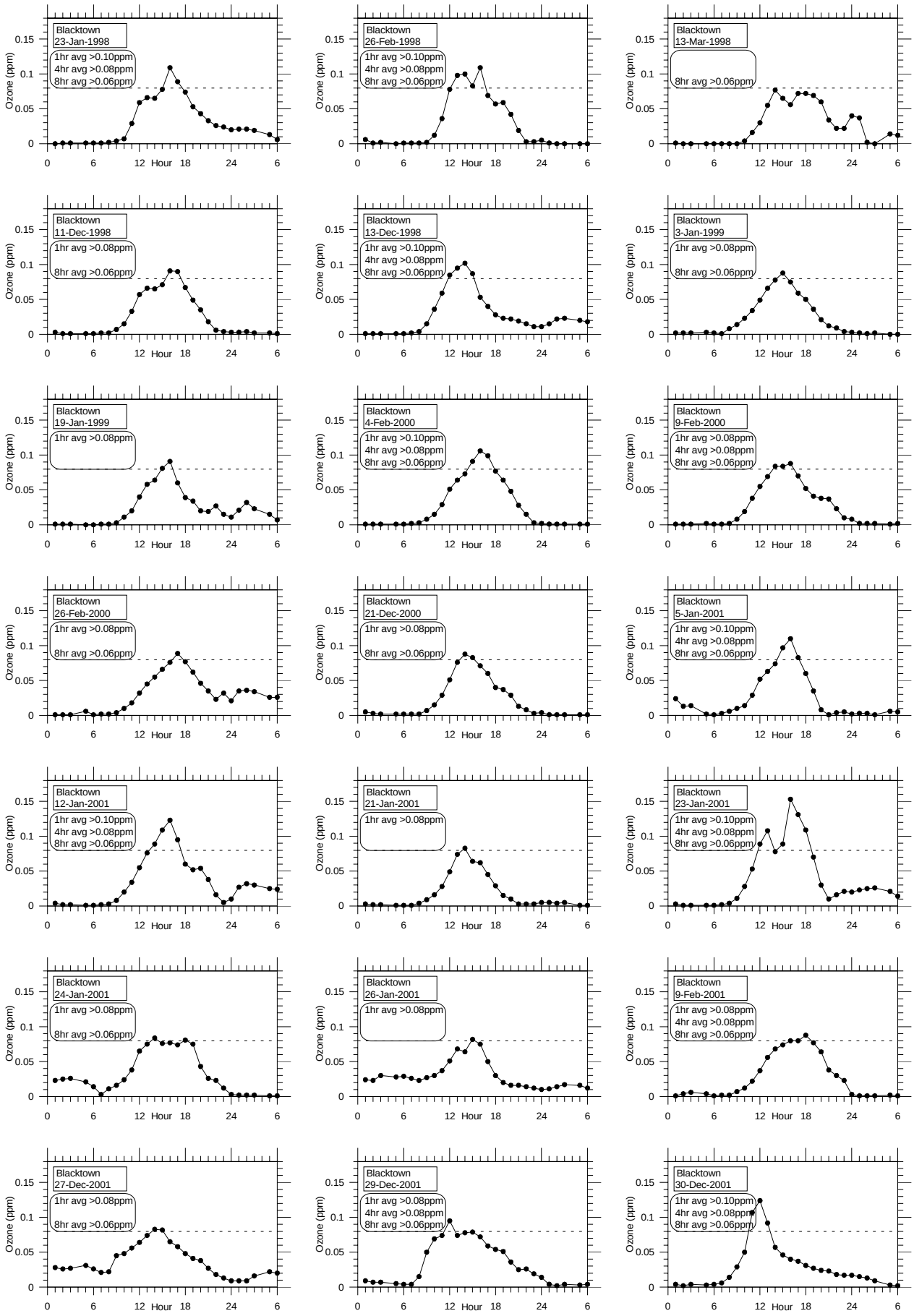


Figure 1a. Patterns of 1-hr average ozone concentrations at Blacktown, NSW

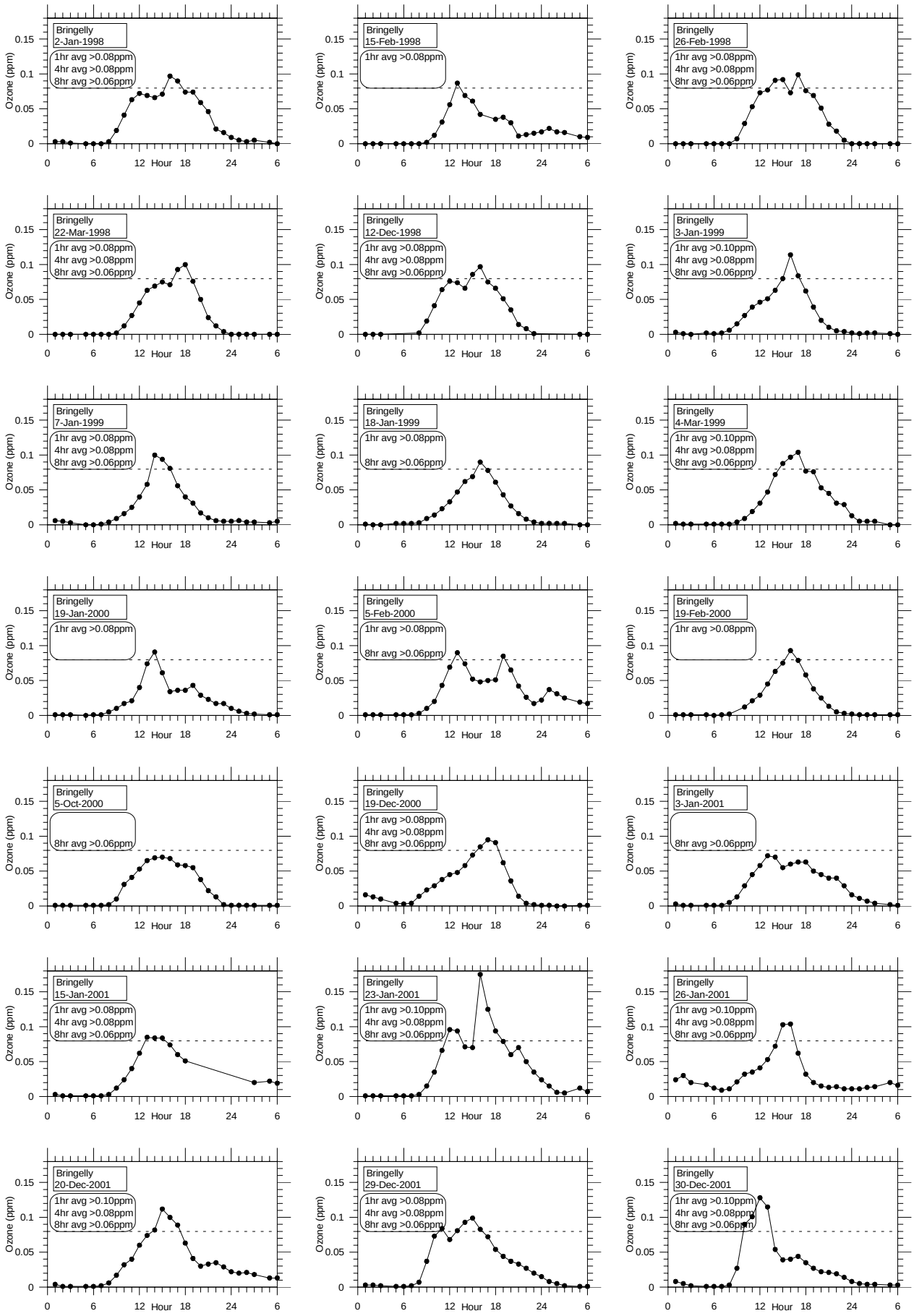


Figure 1b. Patterns of 1-hr average ozone concentrations at Bringelly, NSW

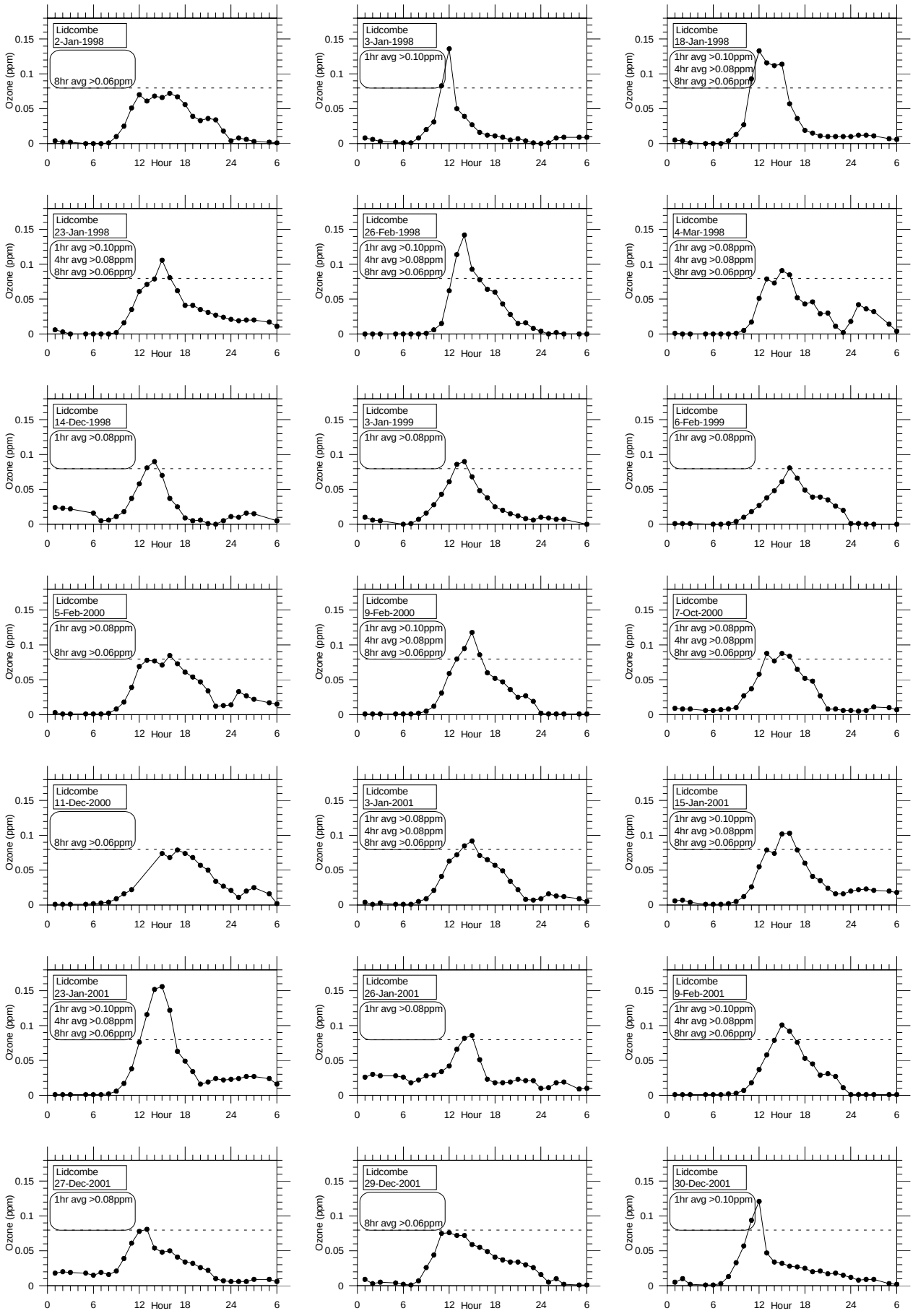


Figure 1c. Patterns of 1-hr average ozone concentrations at Lidcome, NSW

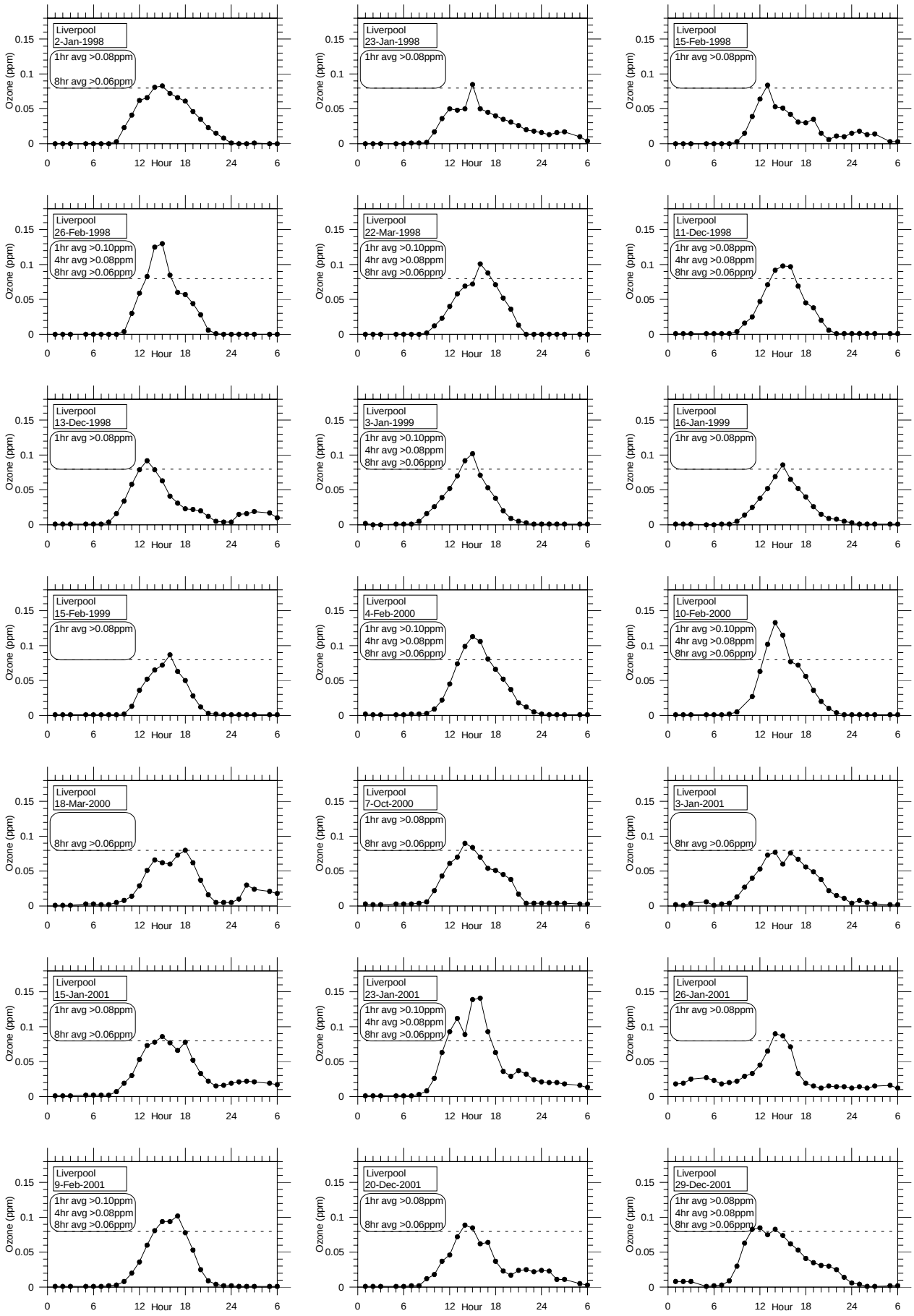


Figure 1d. Patterns of 1-hr average ozone concentrations at Liverpool, NSW

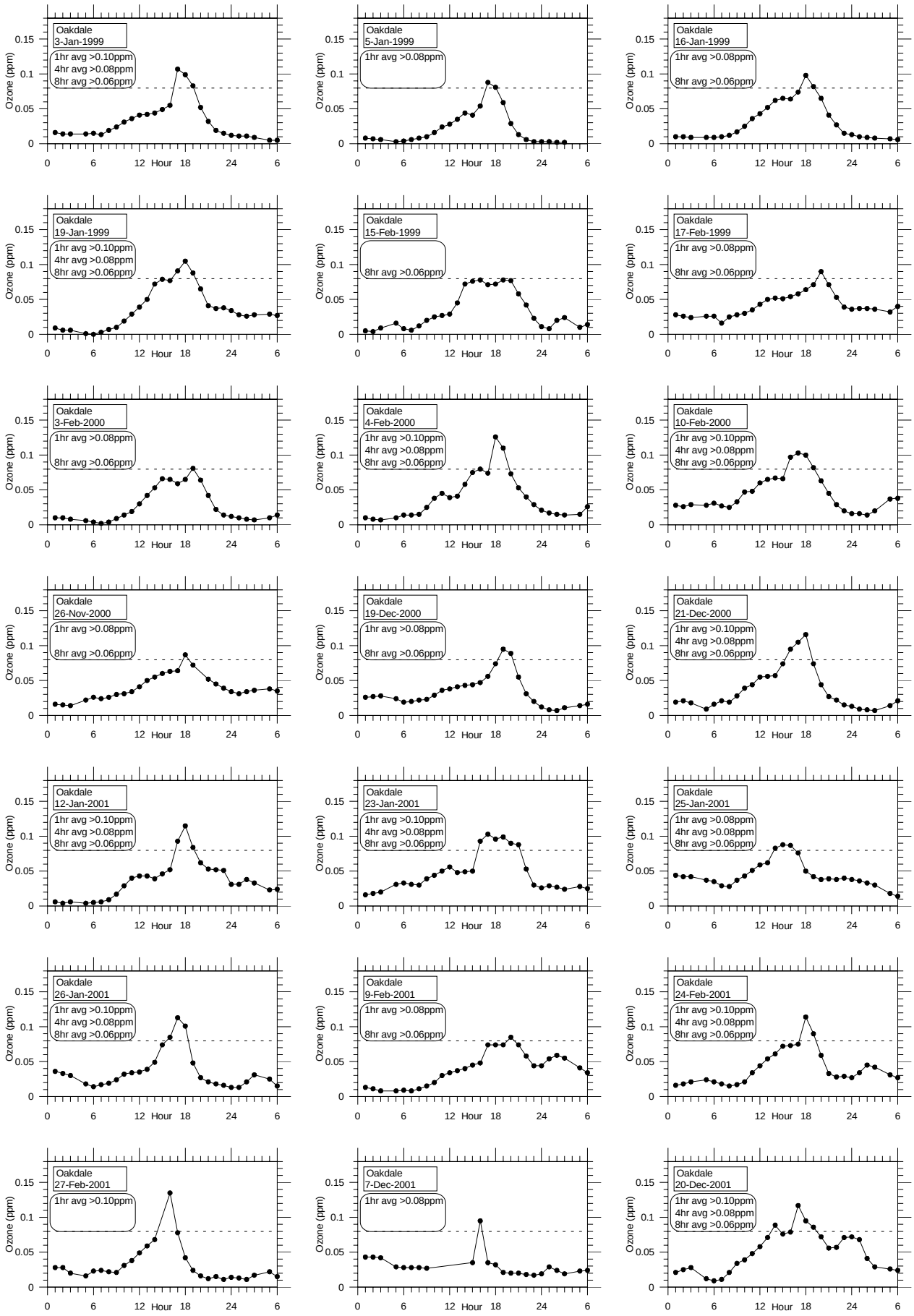


Figure 1e. Patterns of 1-hr average ozone concentrations at Oakdale, NSW

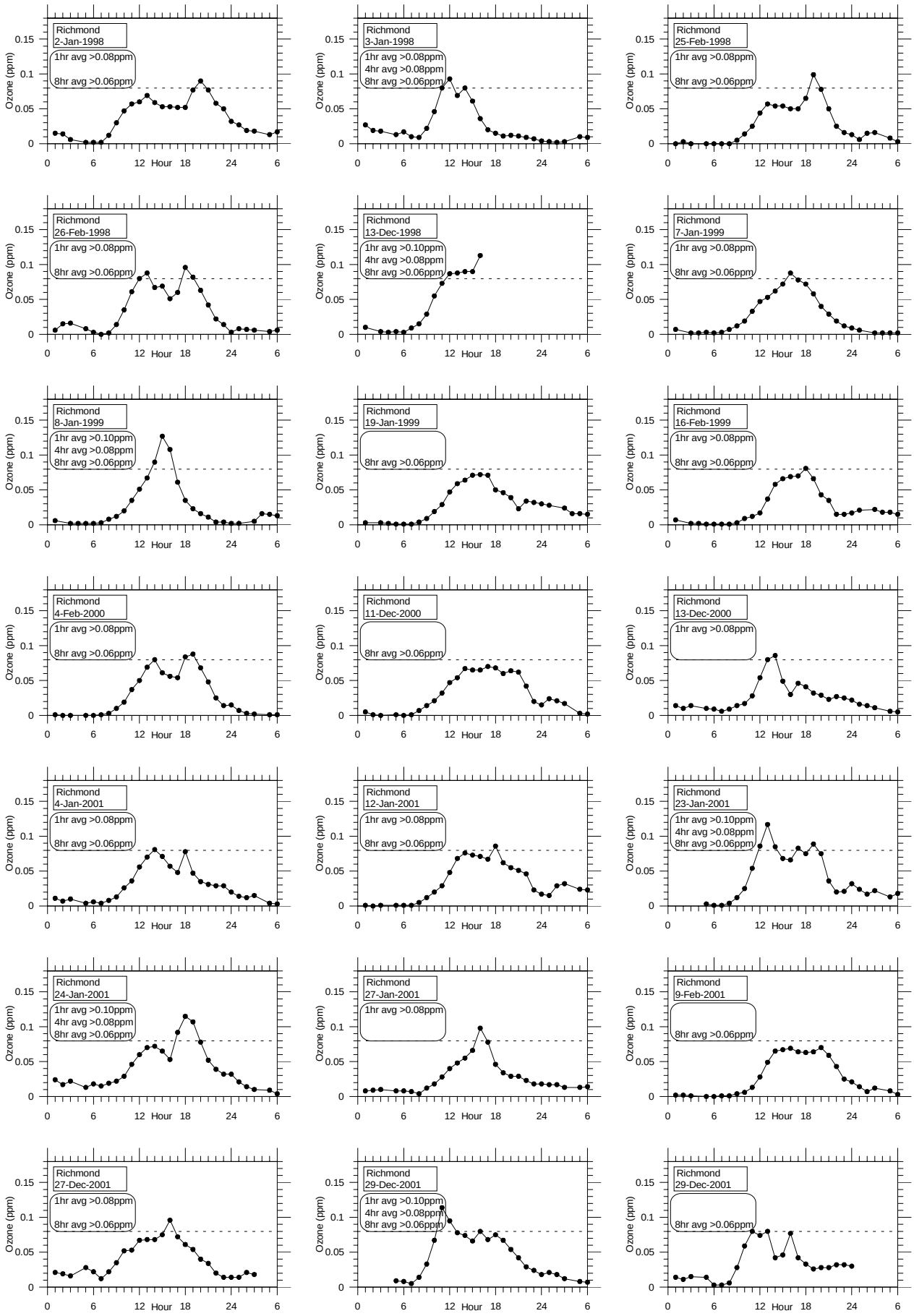


Figure 1f. Patterns of 1-hr average ozone concentrations at Richmond, NSW

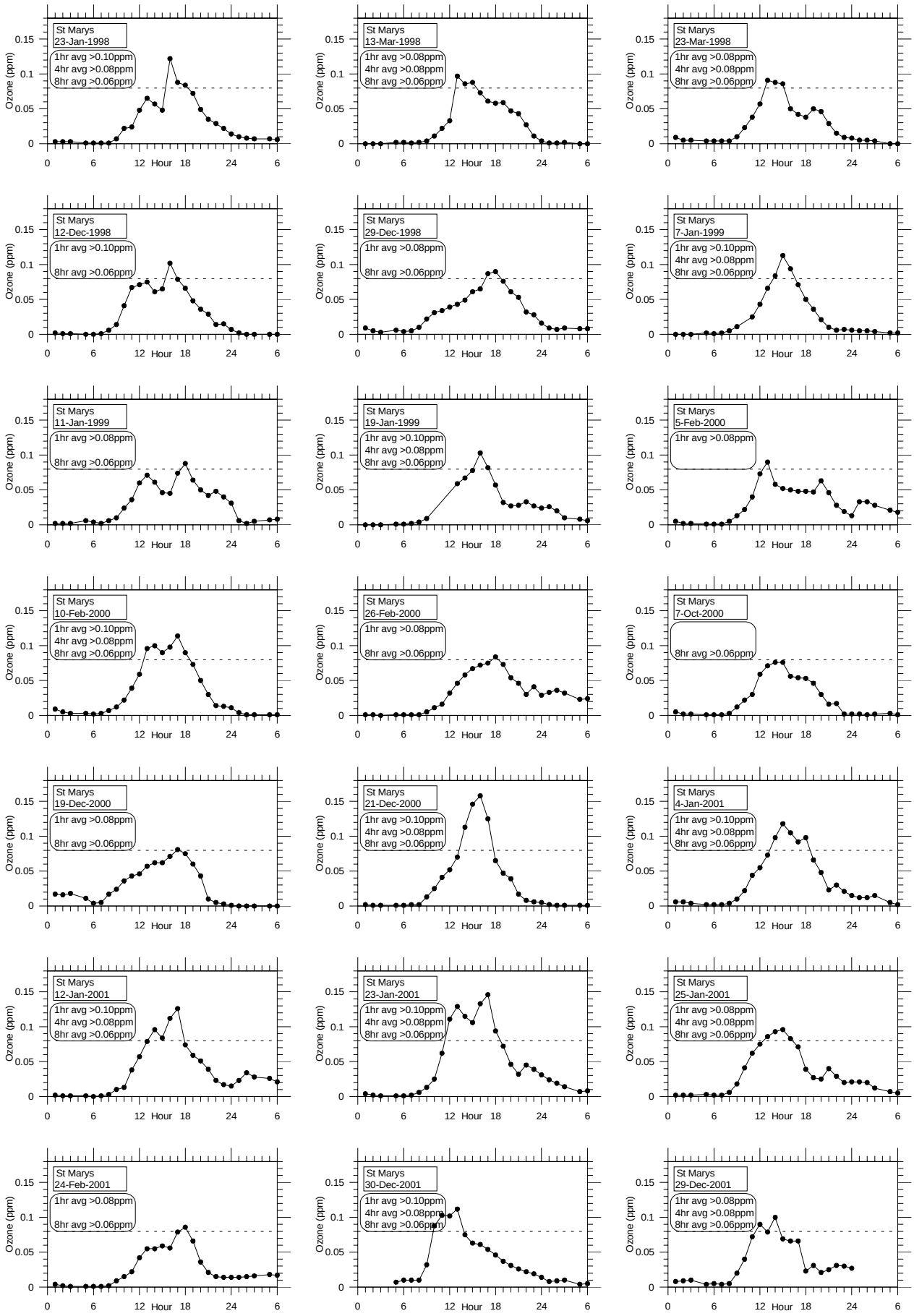


Figure 1g. Patterns of 1-hr average ozone concentrations at St Marys, NSW

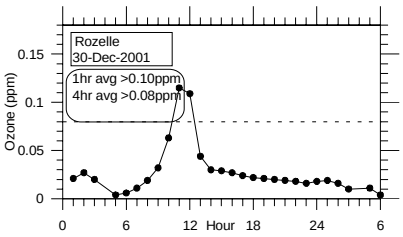


Figure 1h. Patterns of 1-hr average ozone concentrations at Rozelle, NSW

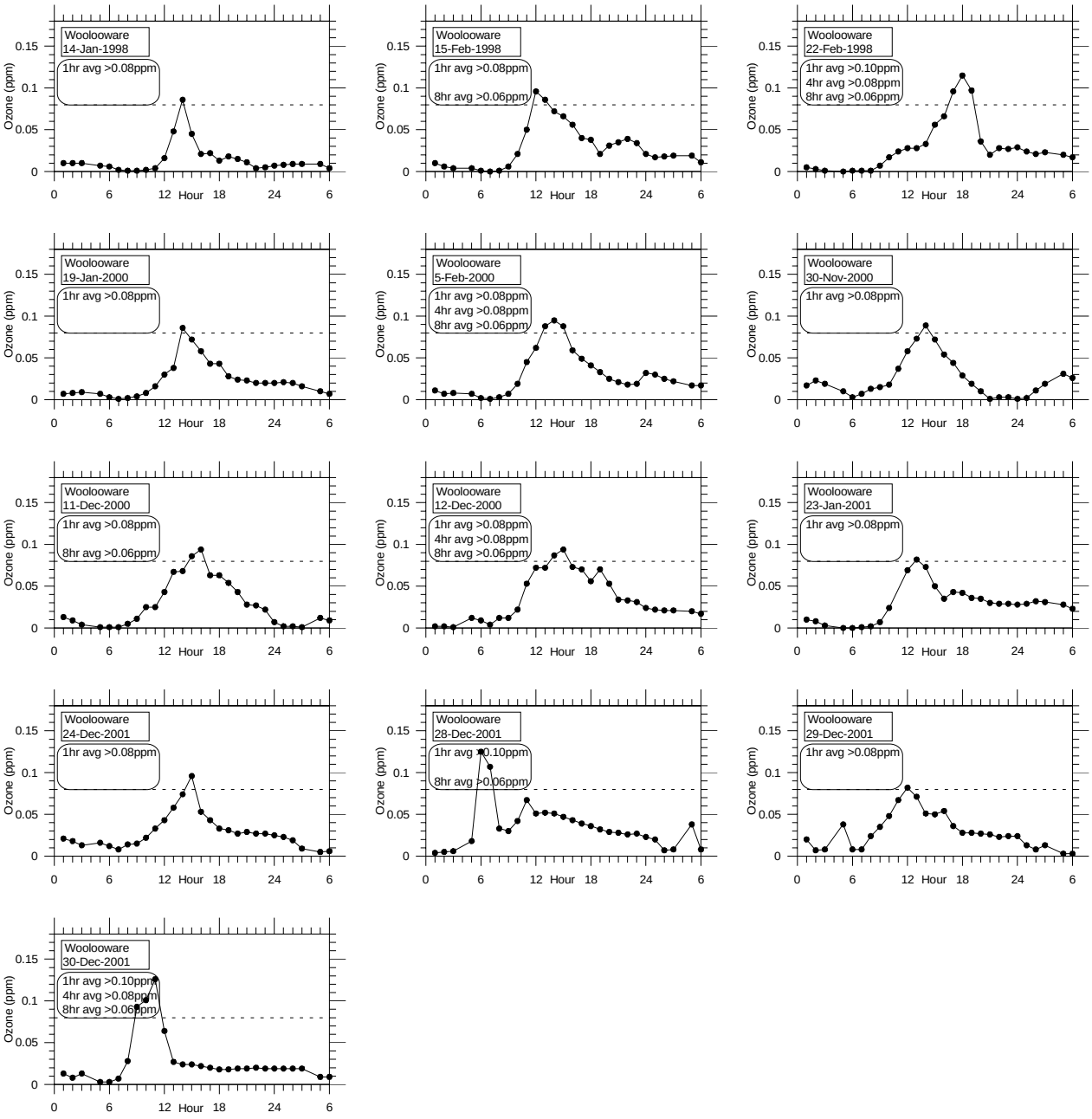


Figure 1i. Patterns of 1-hr average ozone concentrations at Woolooware, NSW

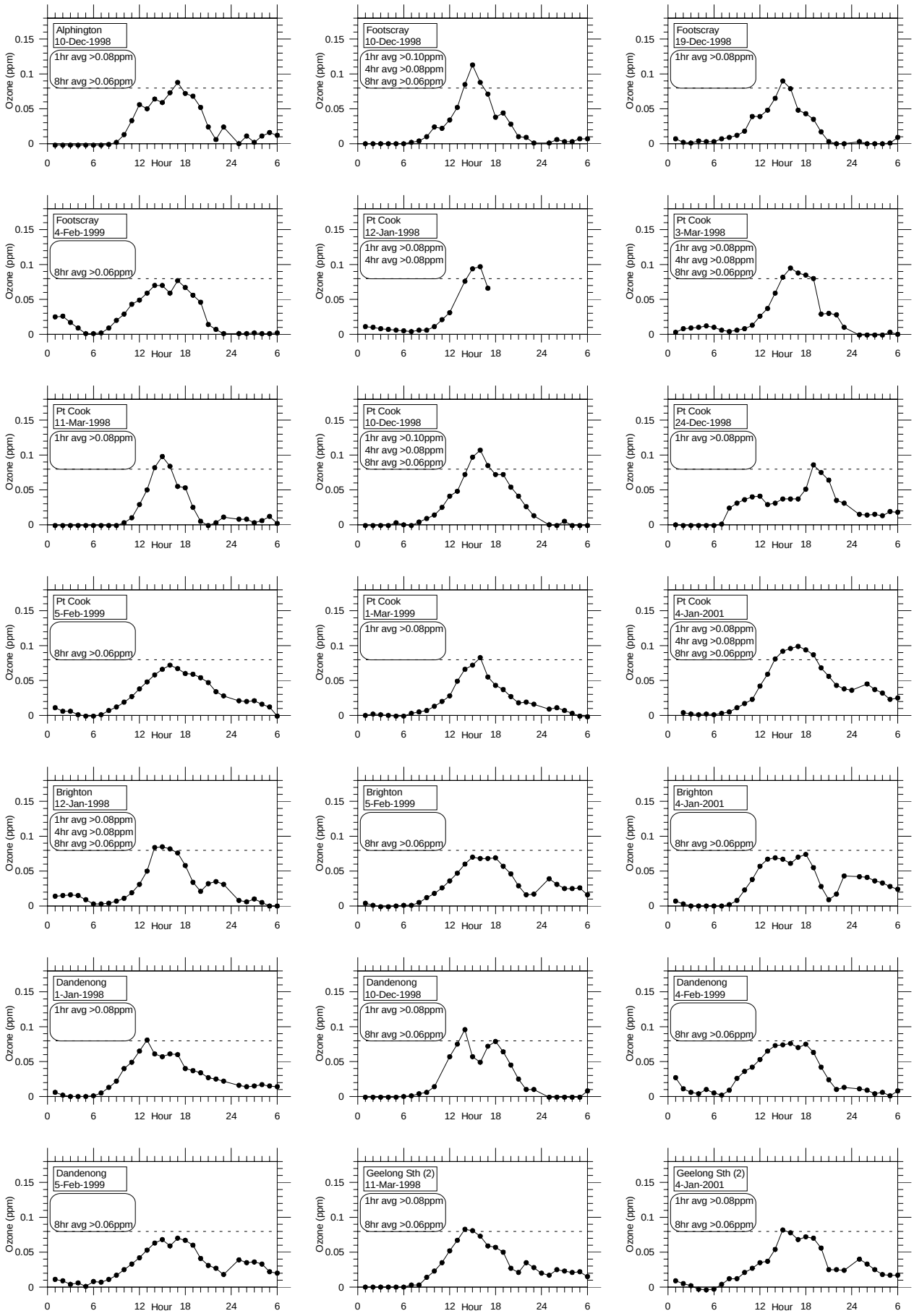


Figure 2a. Patterns of 1-hr average ozone concentrations at Victorian NEPM sites (with exceedences of first set of criteria)

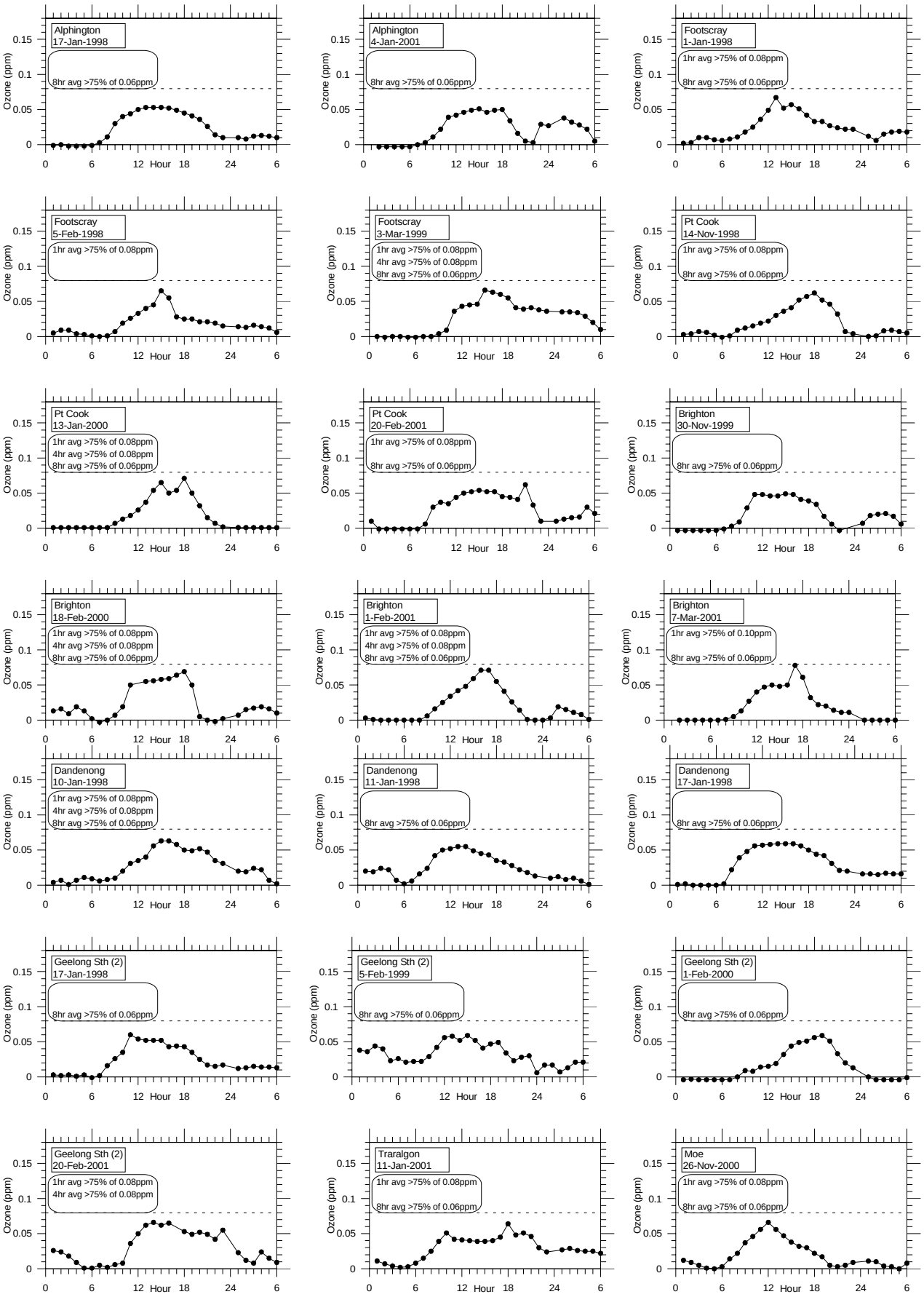


Figure 2b. Patterns of 1-hr average ozone concentrations at Victorian NEPM sites (with exceedences of second set of criteria)

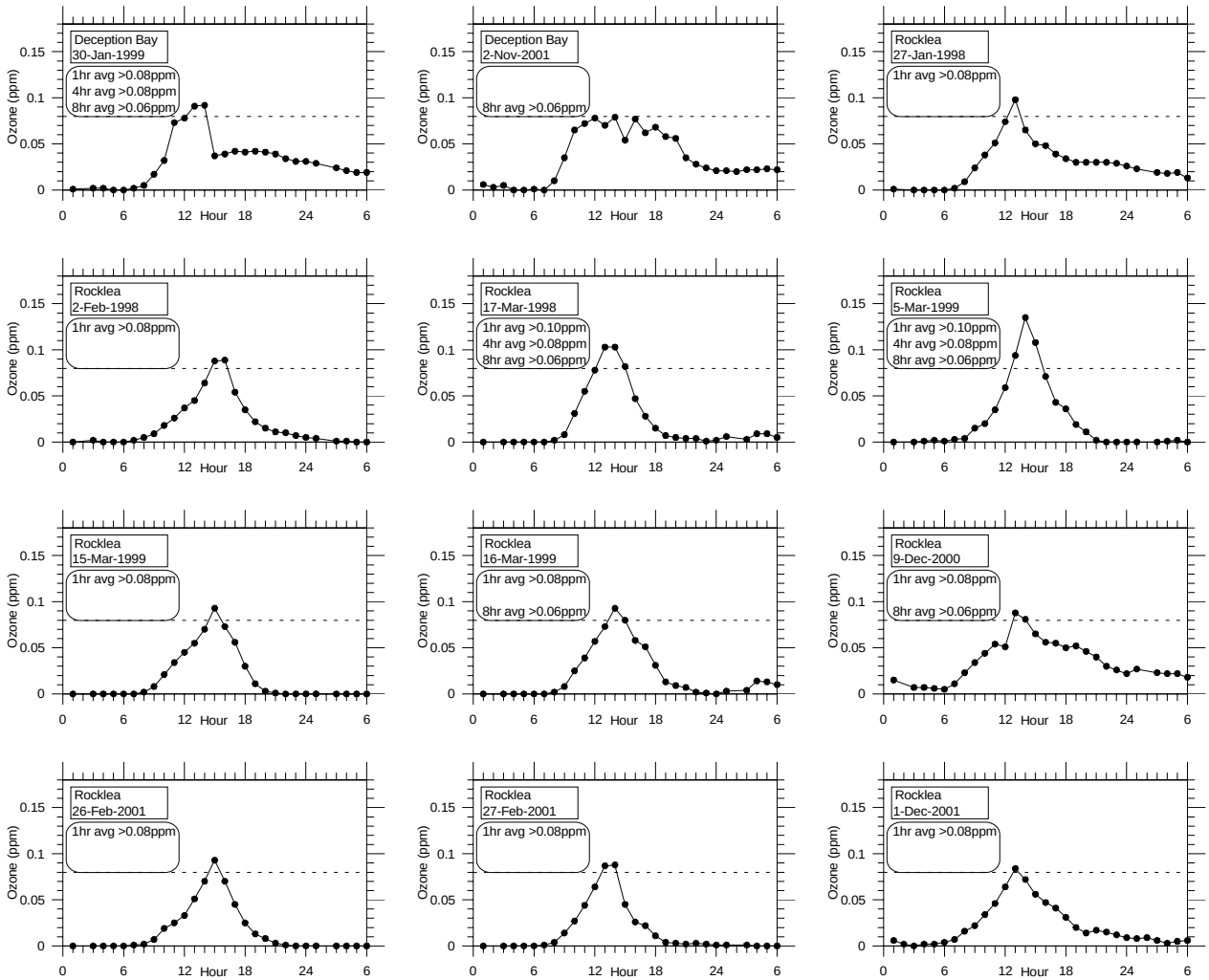


Figure 3a. Patterns of 1-hr average ozone concentrations at Queensland NEPM Sites (with exceedences of first set of criteria)

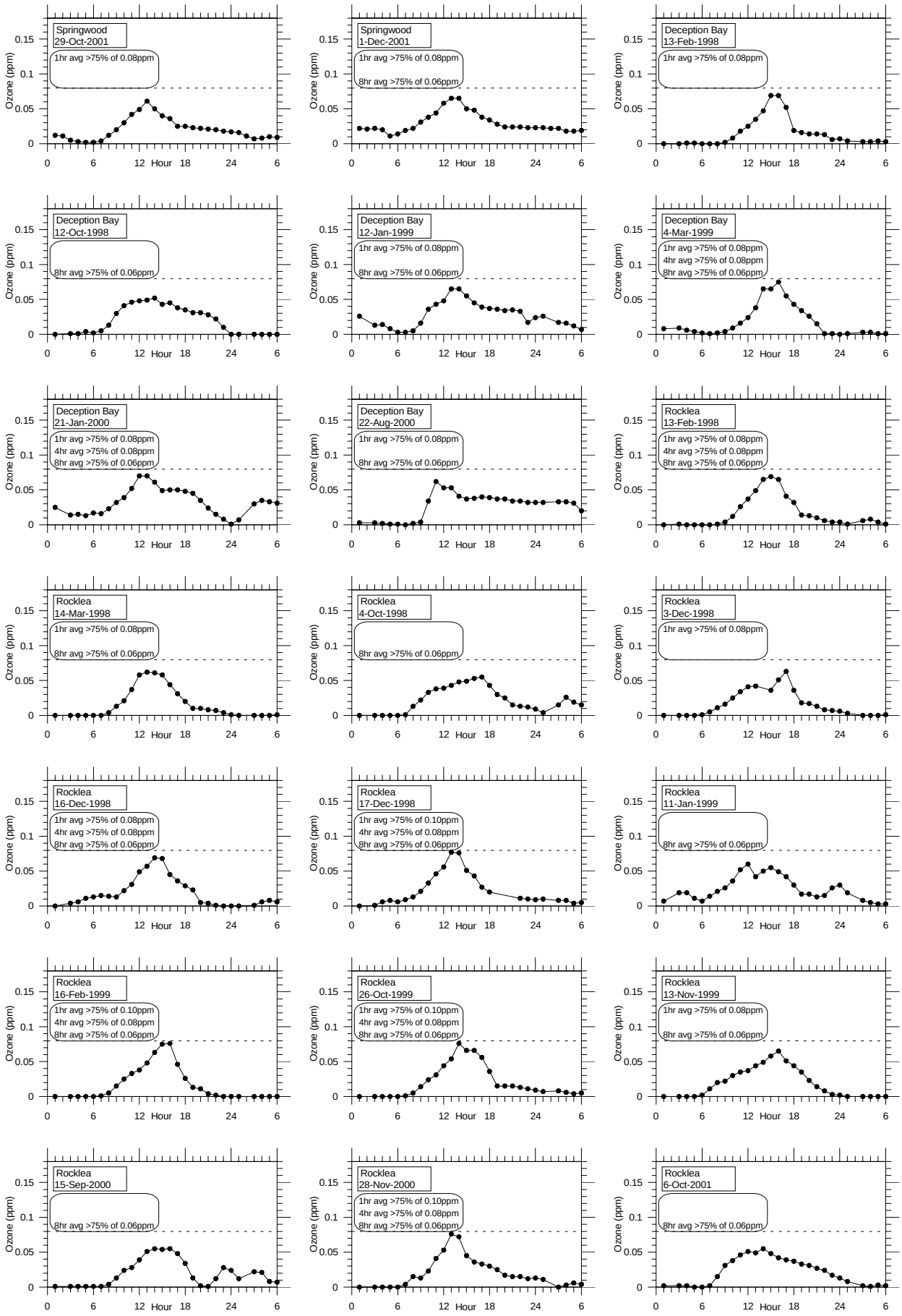


Figure 3b. Patterns of 1-hr average ozone concentrations at Queensland NEPM Sites (with exceedences of second set of criteria)

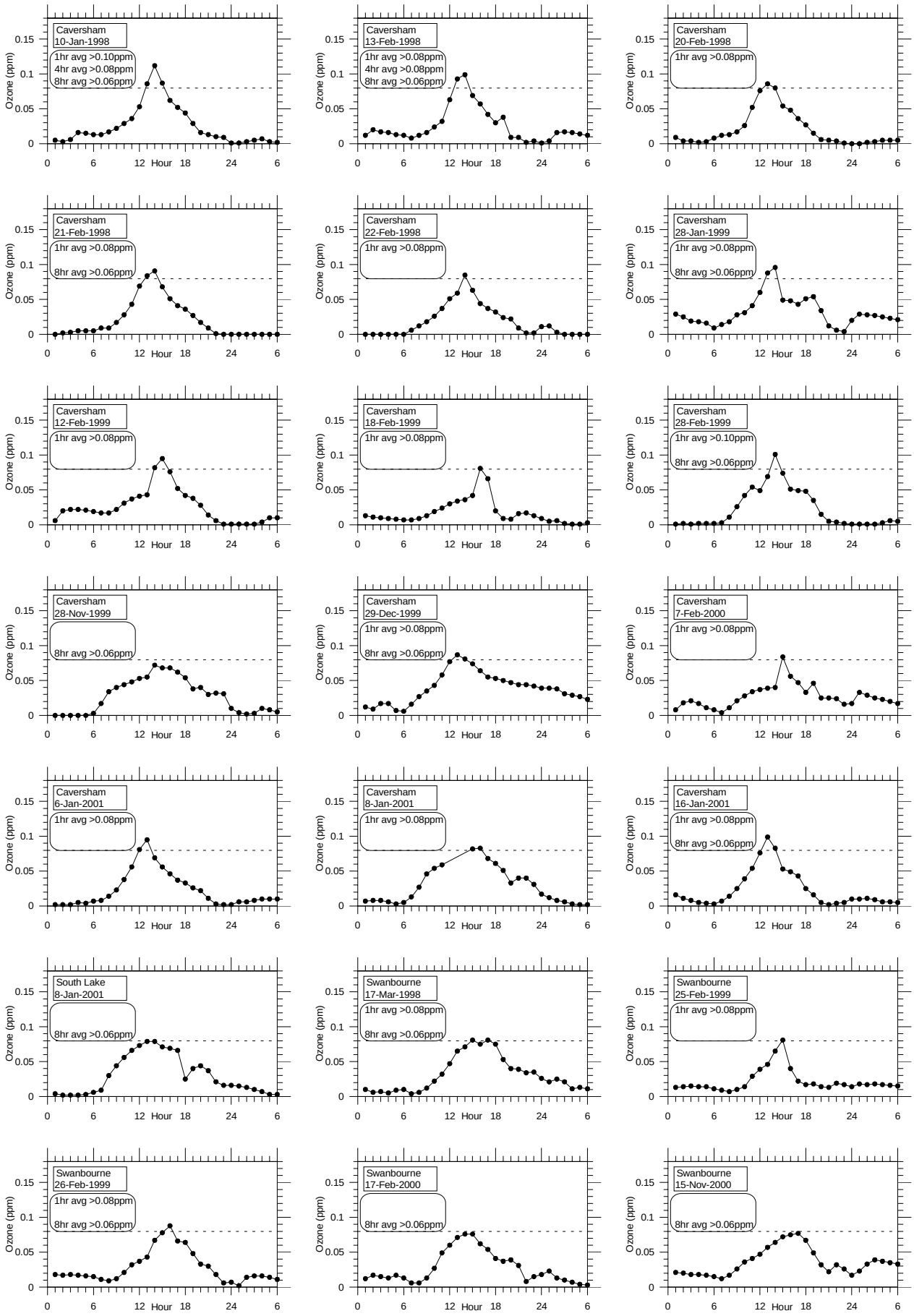


Figure 4a. Patterns of 1-hr average ozone concentrations at Western Australian NEPM sites (with exceedences of first set of criteria)

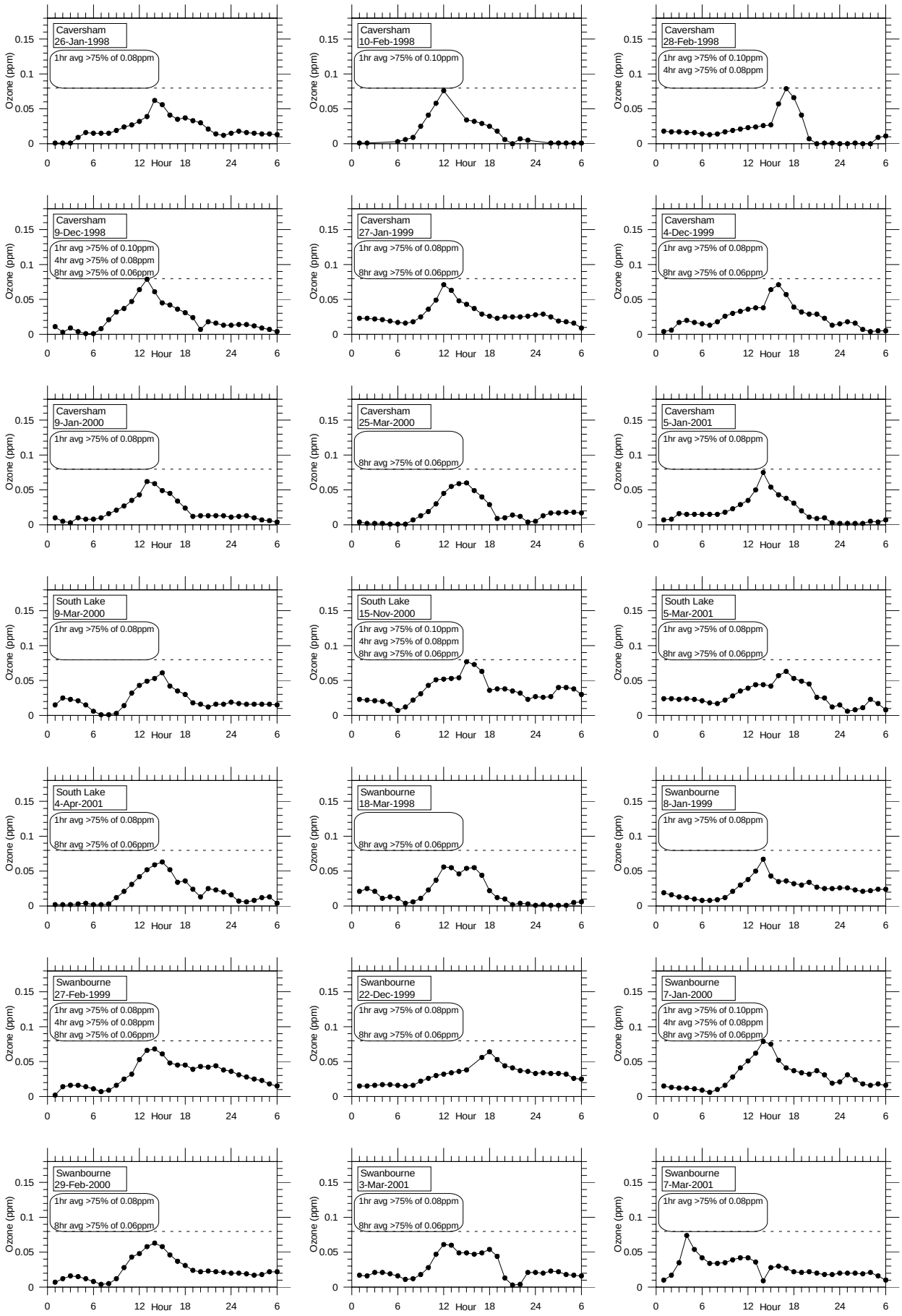


Figure 4b. Patterns of 1-hr average ozone concentrations at Western Australian NEPM sites (with exceedences of second set of criteria)

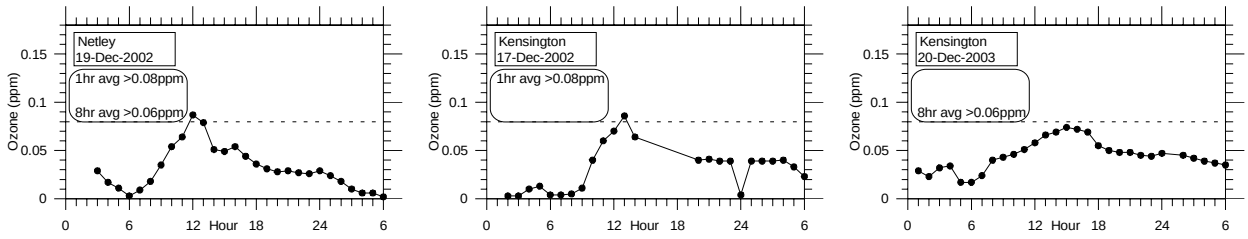


Figure 5a. Patterns of 1-hr average ozone concentrations at South Australian NEPM sites (with exceedences of first set of criteria)

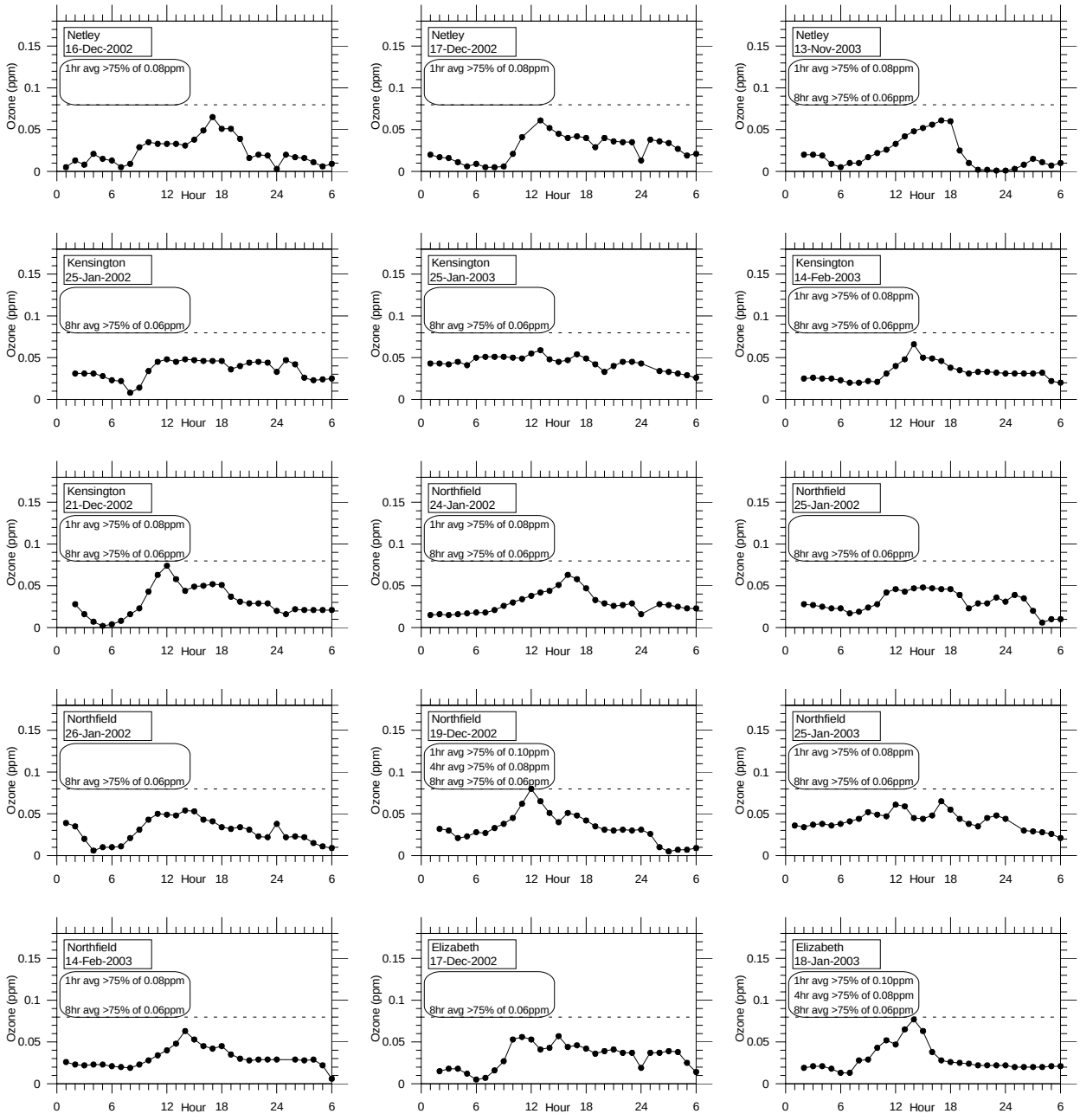


Figure 5b. Patterns of 1-hr average ozone concentrations at South Australian NEPM sites (with exceedences of second set of criteria)

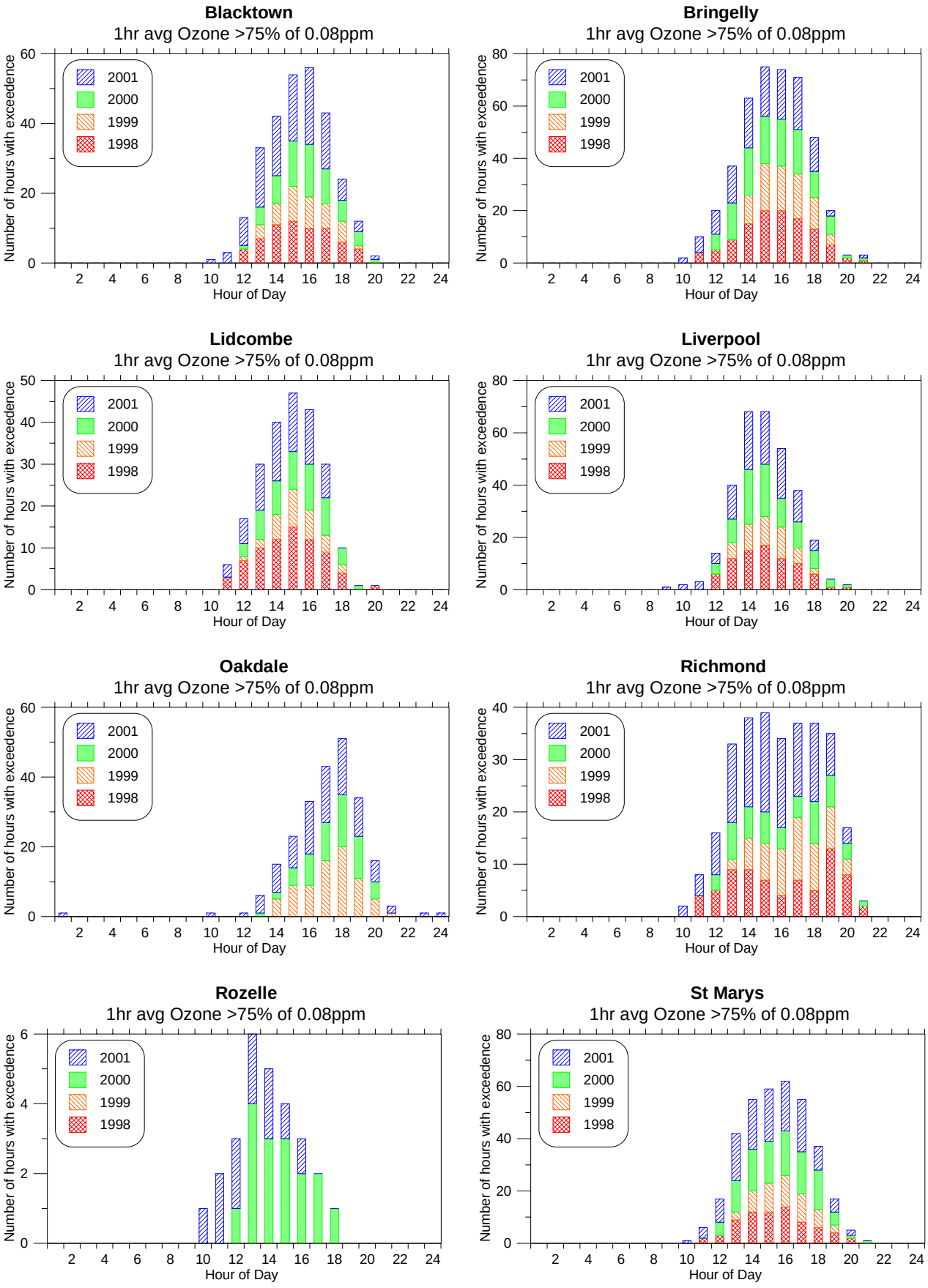


Figure 6. Time of day of exceedences of the "1-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed. The patterns are similar for other 1-hr criteria but the numbers are smaller.

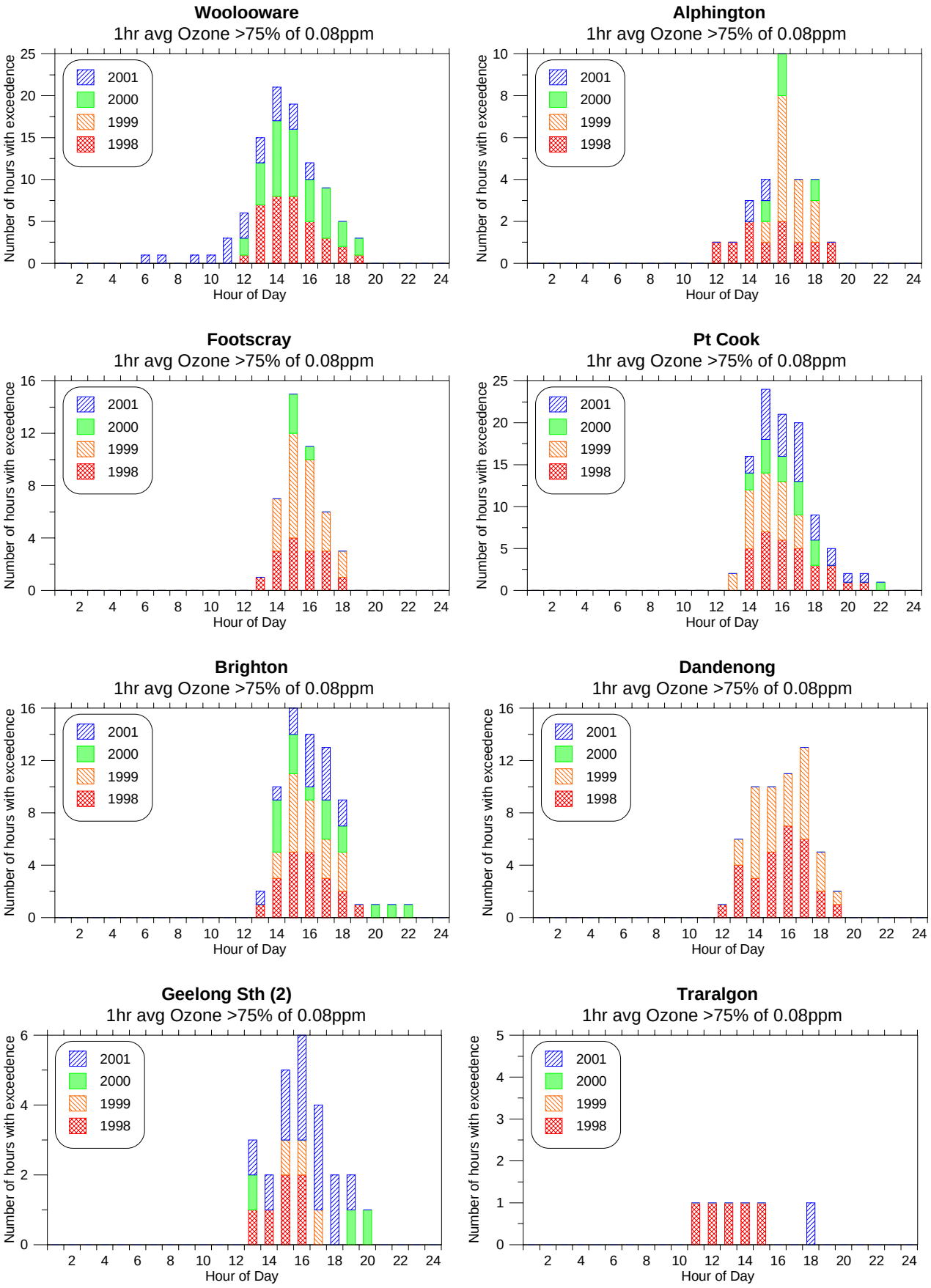


Figure 6 (continued). Time of day of exceedences of the "1-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed. The patterns are similar for other 1-hr criteria but the numbers are smaller.

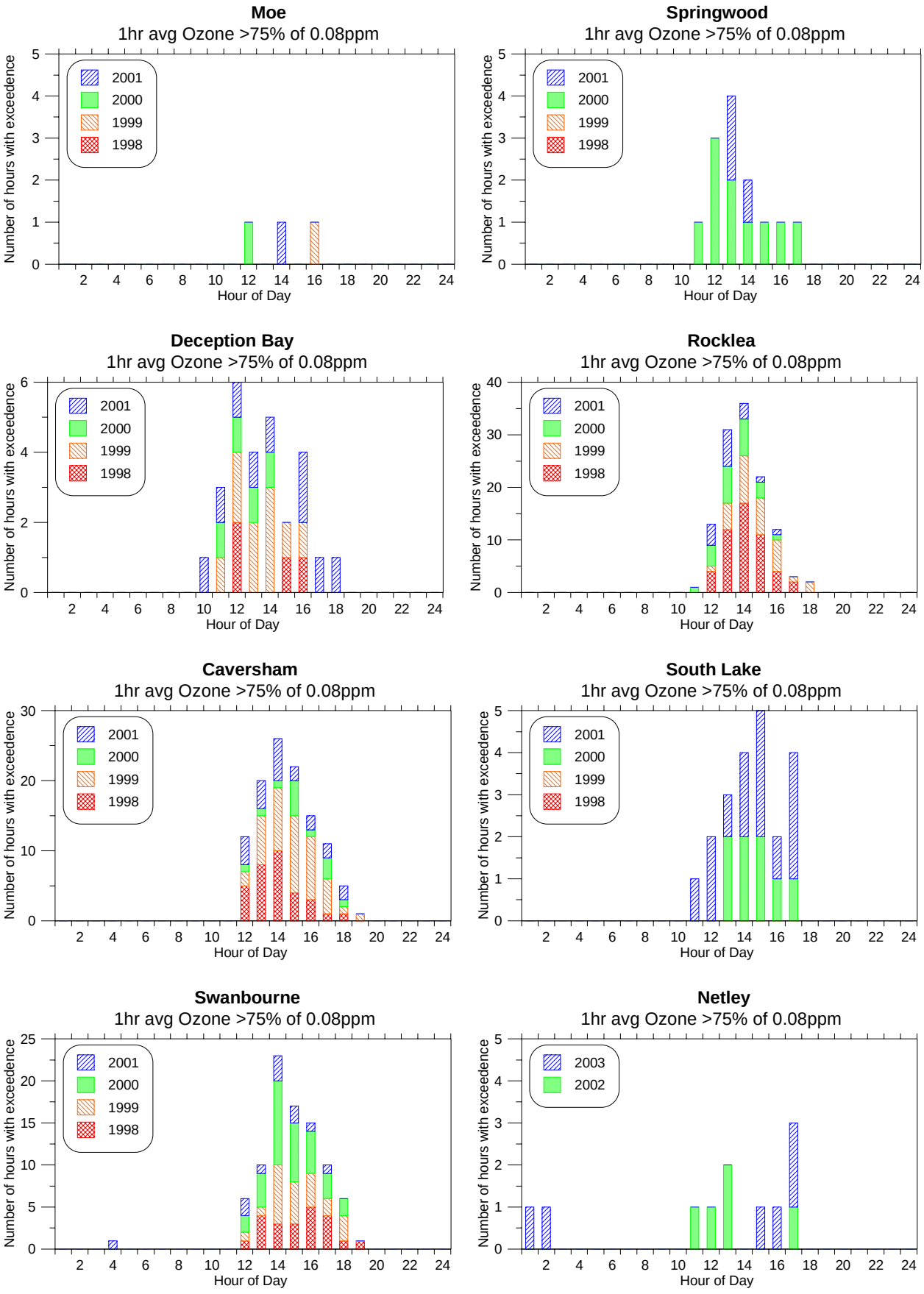


Figure 6 (continued). Time of day of exceedences of the "1-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed. The patterns are similar for other 1-hr criteria but the numbers are smaller. Note that the exceedences around midnight at Netley are likely to be due to spurious calibration data left in the record.

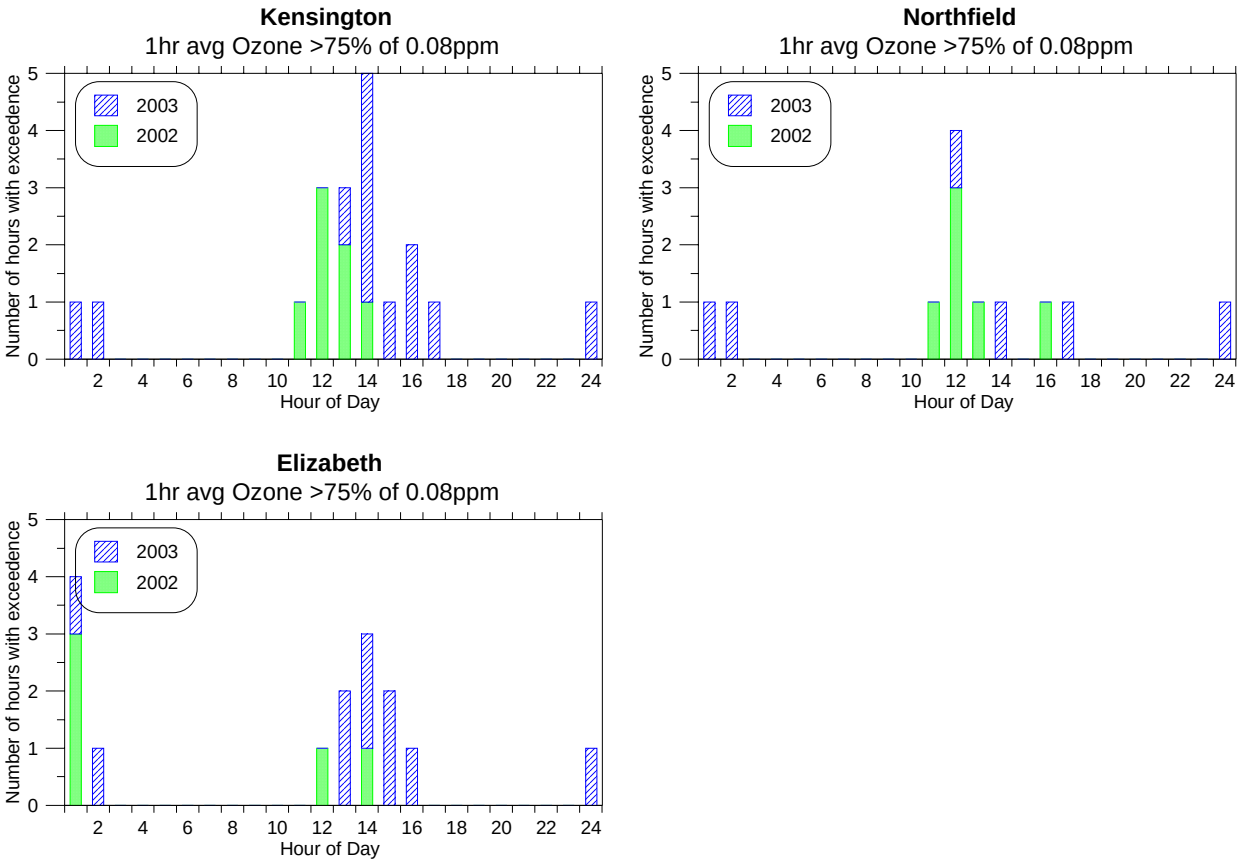


Figure 6 (continued). Time of day of exceedences of the "1-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed. The patterns are similar for other 1-hr criteria but the numbers are smaller. Note that the exceedences around midnight are likely to be due to spurious calibration data – the ozone data were used as supplied by the SA EPA.

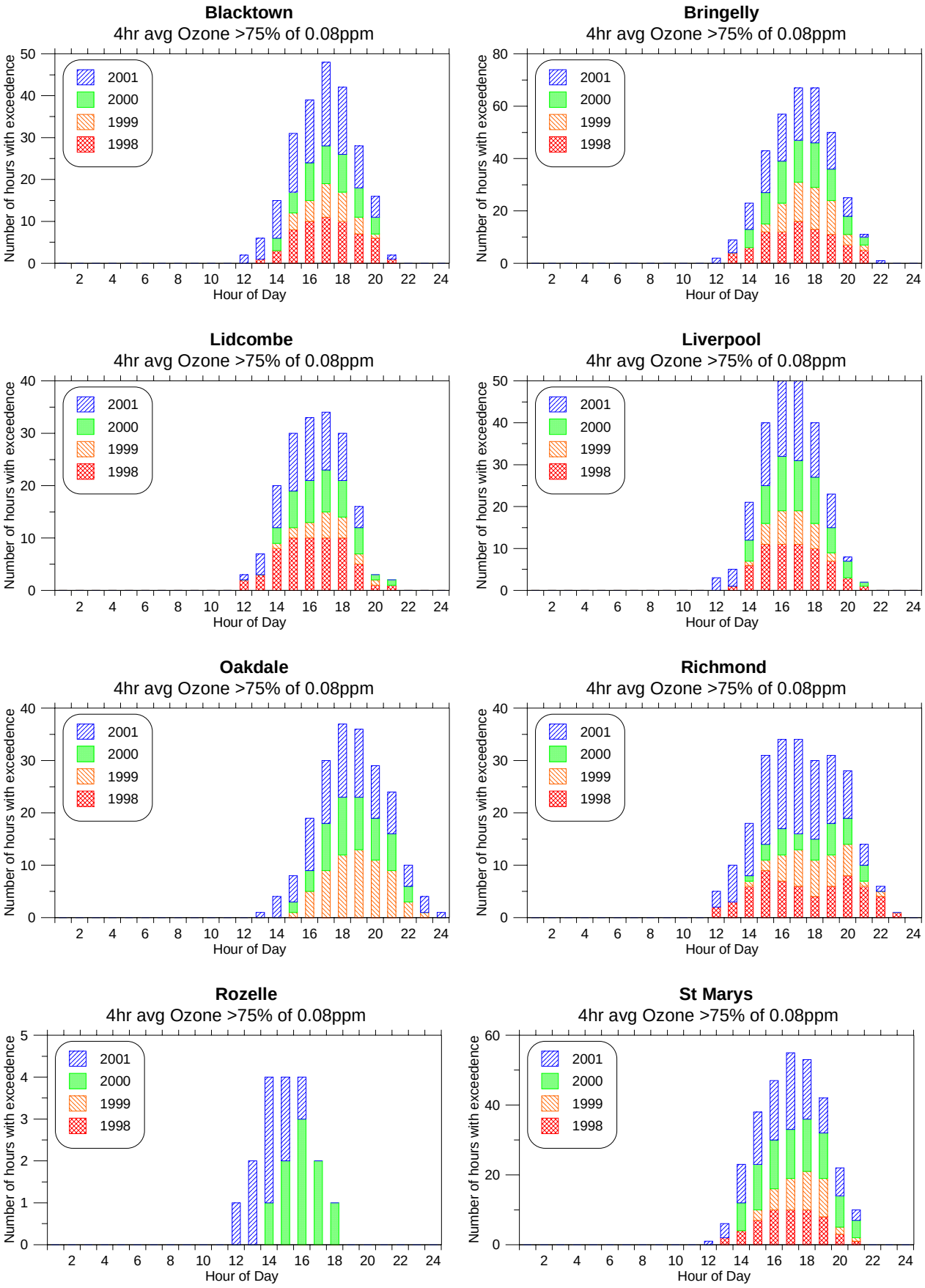


Figure 7. Time of day of exceedences of the "4-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed.

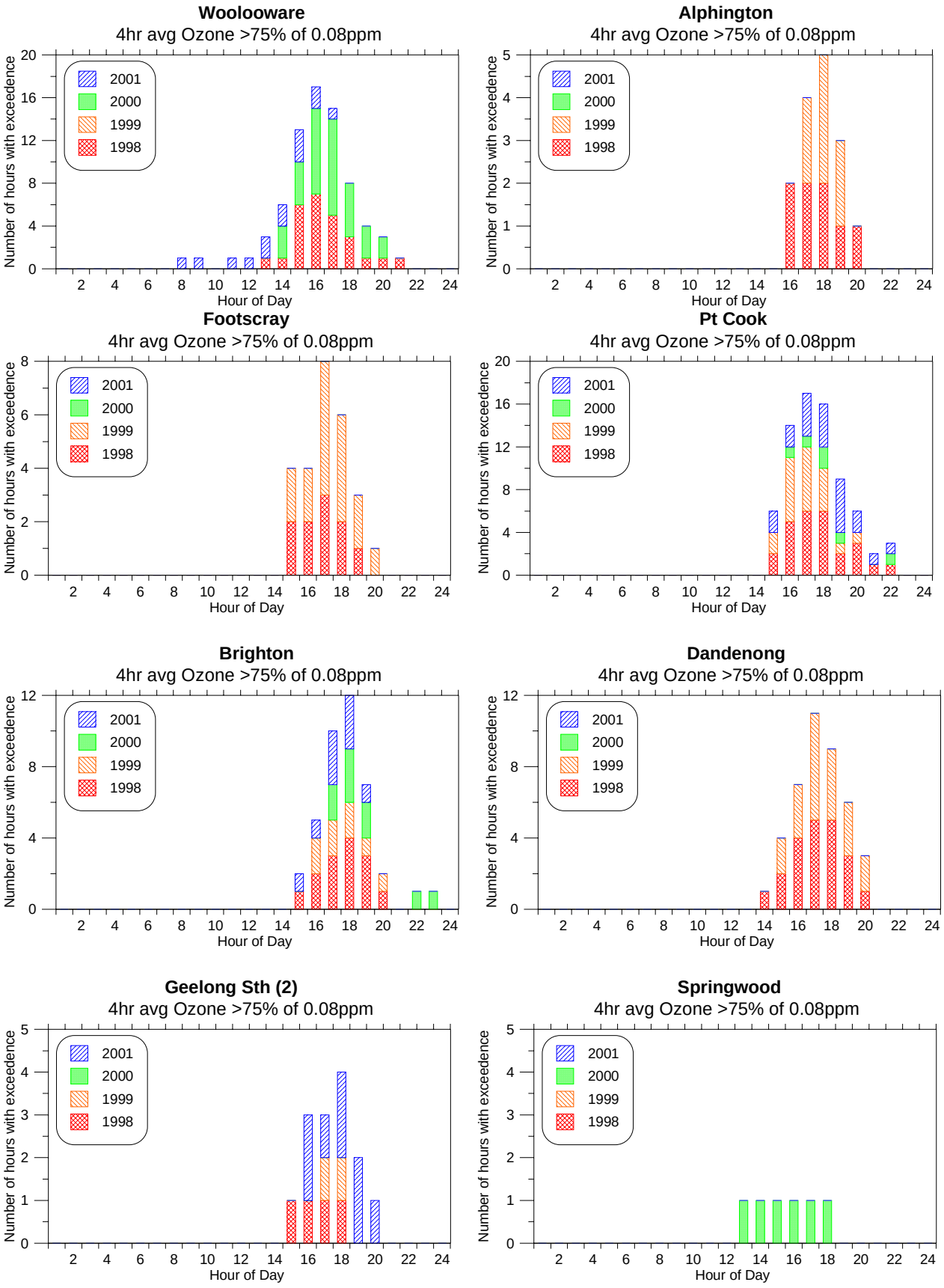


Figure 7 (continued). Time of day of exceedences of the "4-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed.

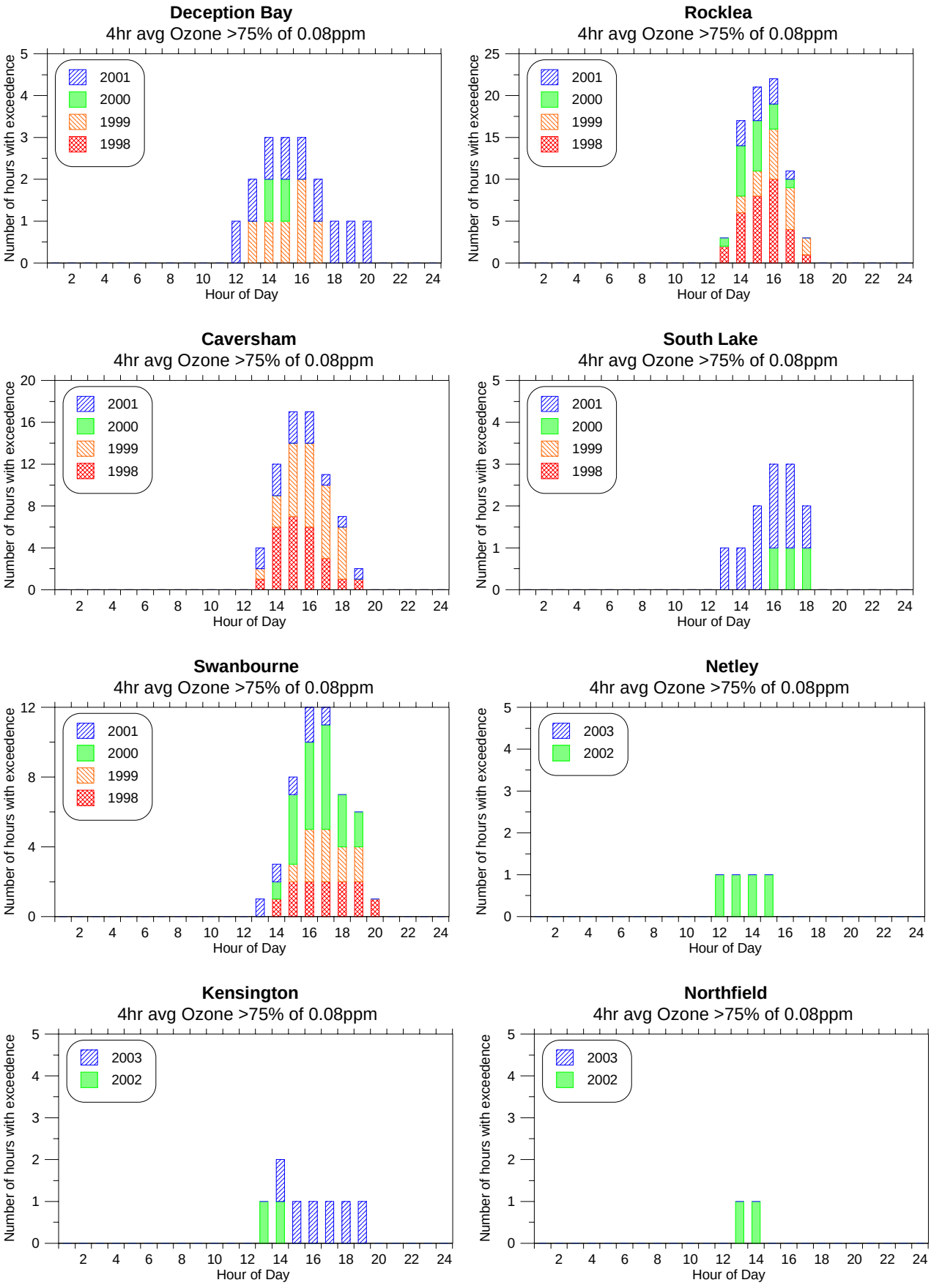


Figure 7 (continued). Time of day of exceedences of the "4-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed.

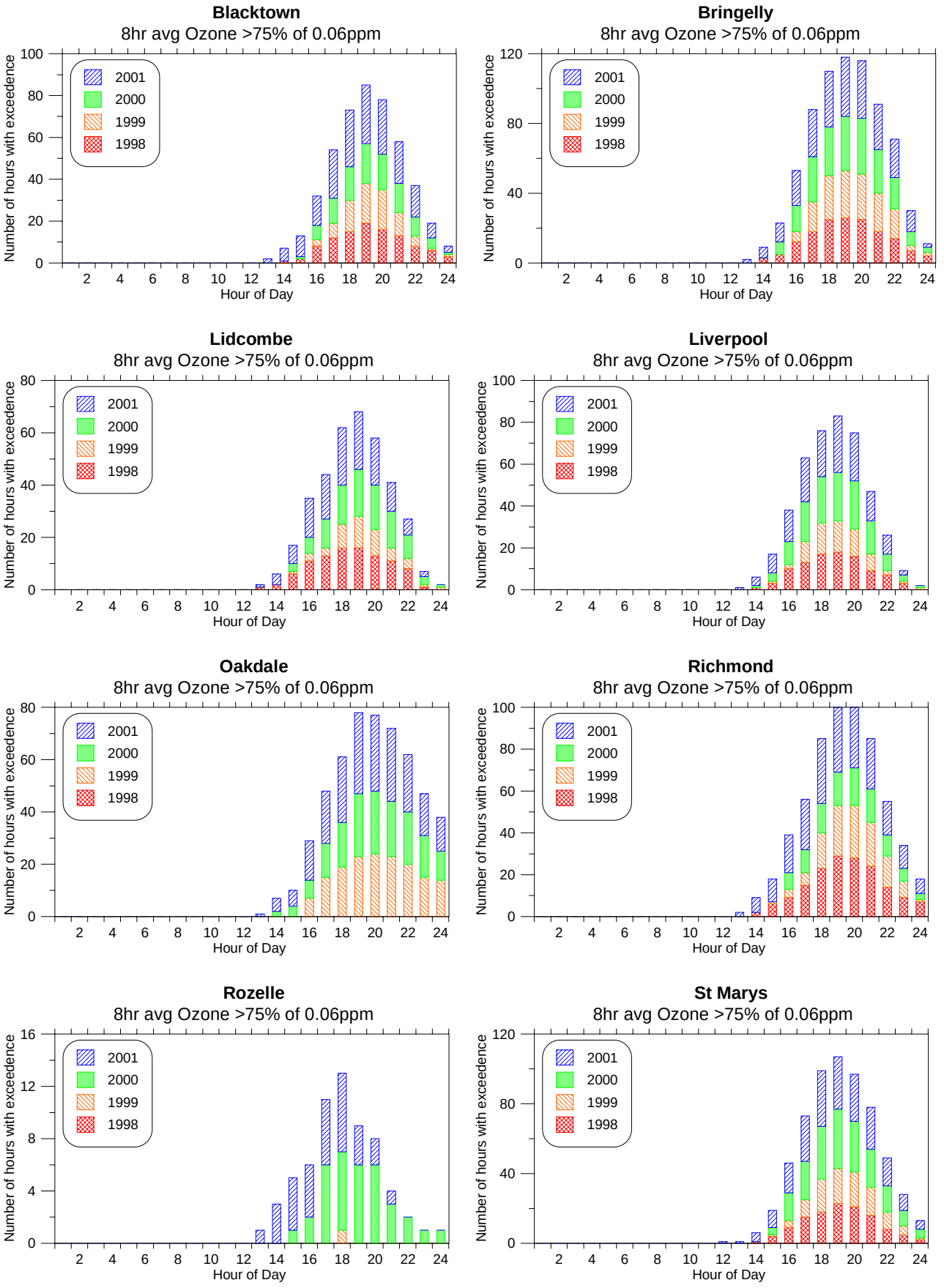


Figure 8. Time of day of exceedences of the "8-hr average ozone concentration greater than 0.045 ppm, but not greater than 0.06 ppm" criterion at each site analysed.

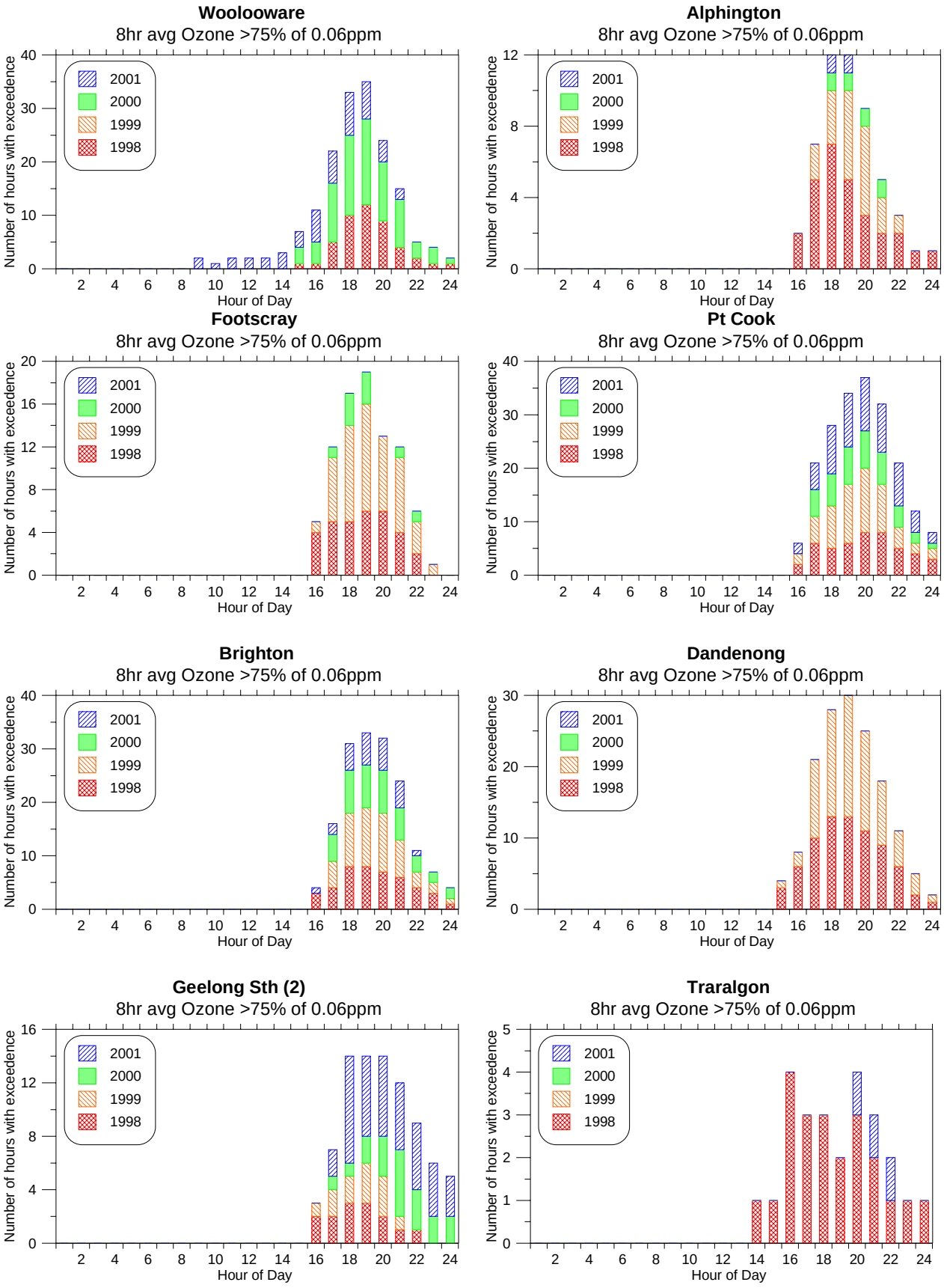


Figure 8 (continued). Time of day of exceedences of the "8-hr average ozone concentration greater than 0.045 ppm, but not greater than 0.06 ppm" criterion at each site analysed.

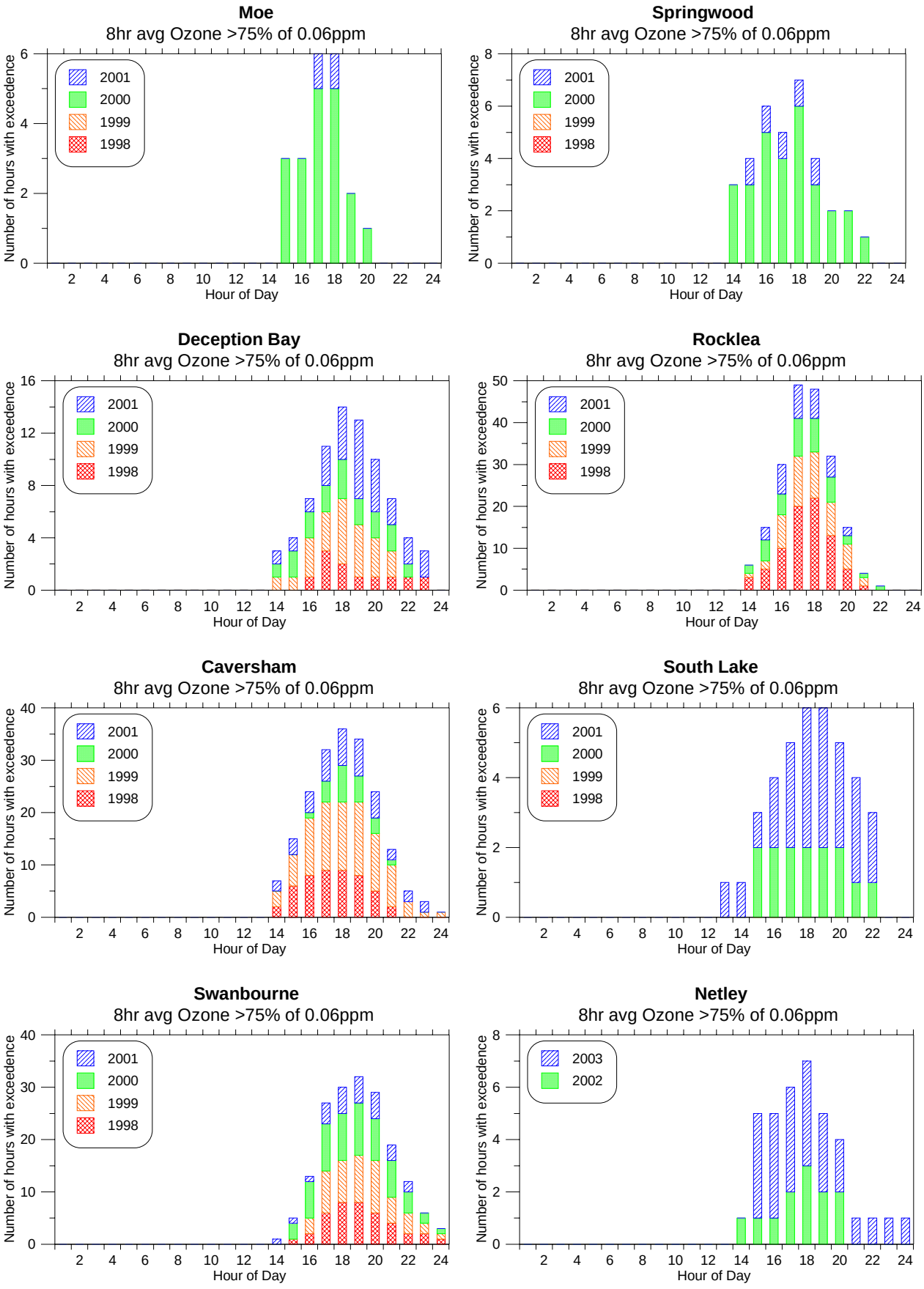


Figure 8 (continued). Time of day of exceedences of the "8-hr average ozone concentration greater than 0.045 ppm, but not greater than 0.06 ppm" criterion at each site analysed.

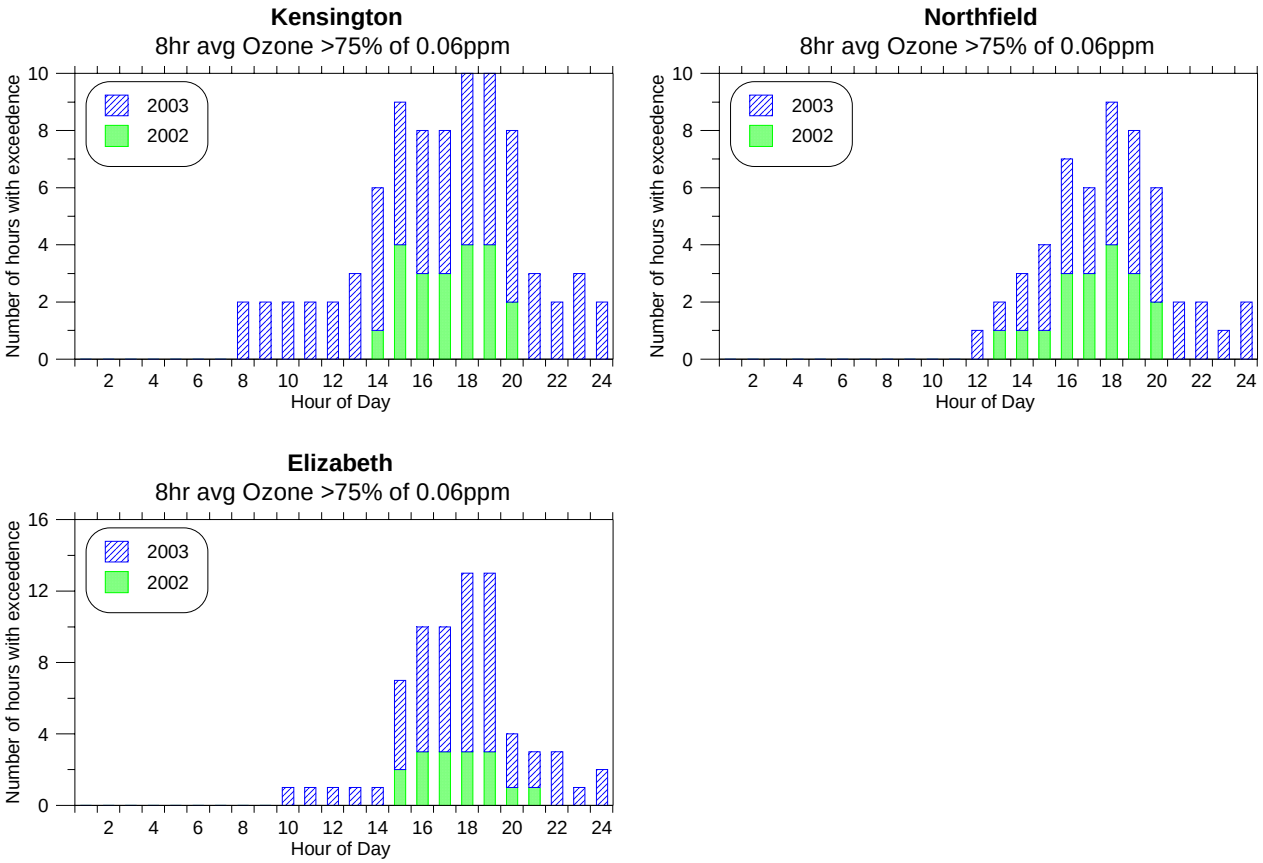


Figure 8 (continued). Time of day of exceedences of the "8-hr average ozone concentration greater than 0.045 ppm, but not greater than 0.06 ppm" criterion at each site analysed.

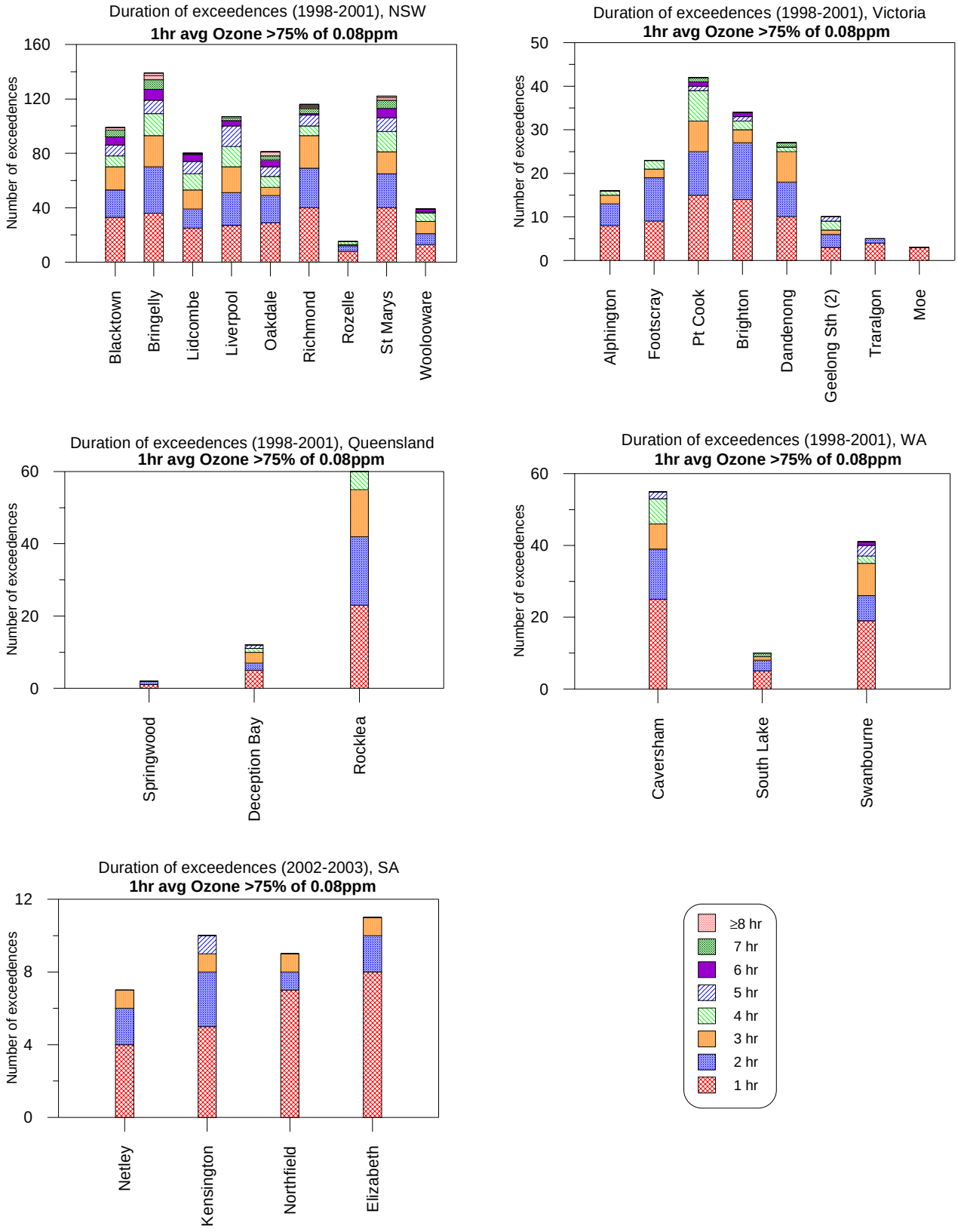


Figure 9. Duration of periods with exceedences of the "1-hr average ozone concentration greater than 0.06 ppm, but not greater than 0.08 ppm" criterion at each site analysed. The patterns are similar for other 1-hr criteria but the numbers are smaller.

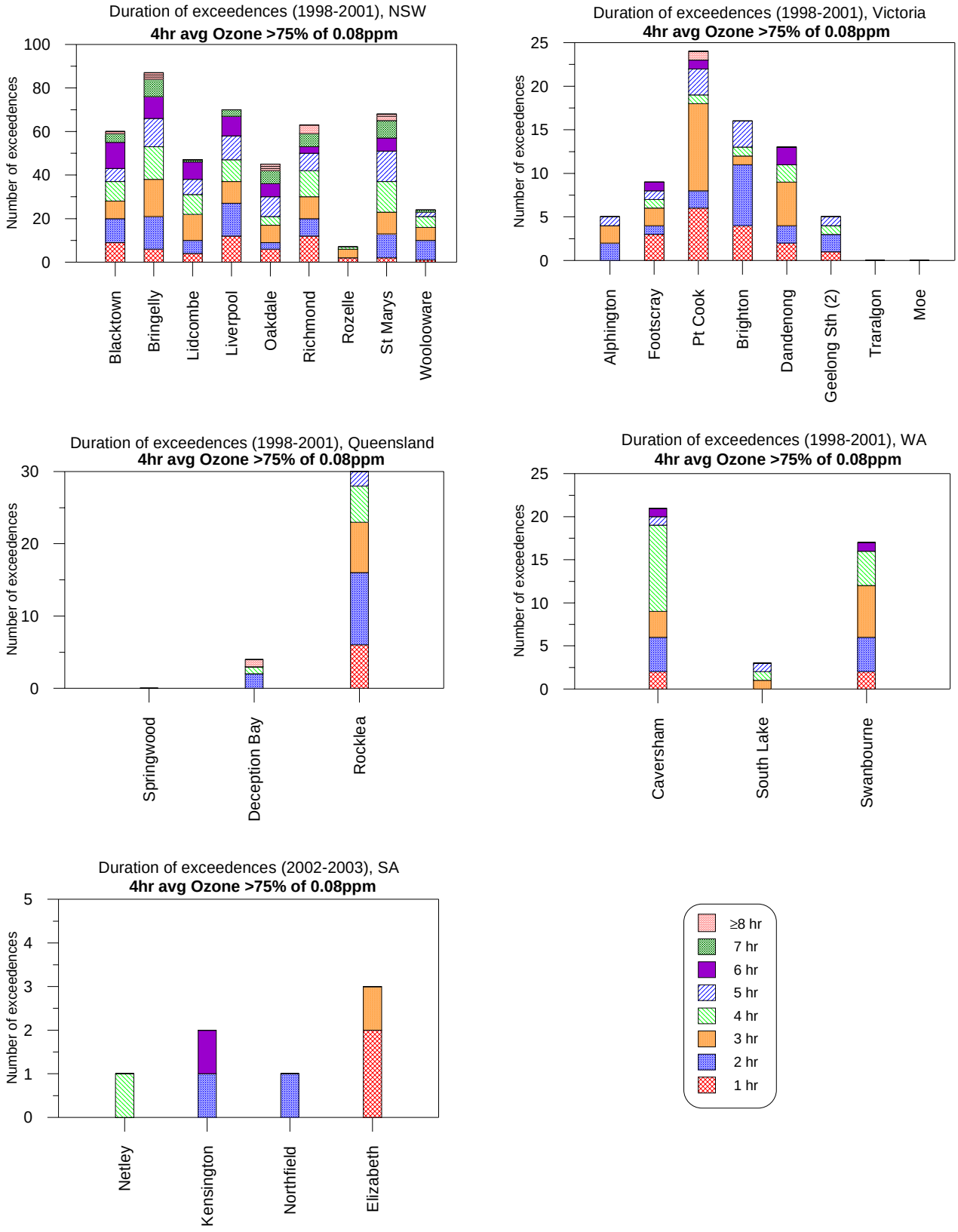


Figure 10. Duration of periods with exceedences of the "4-hr average ozone concentration greater than 0.06 ppm but not greater than 0.08 ppm" criterion at each site analysed.

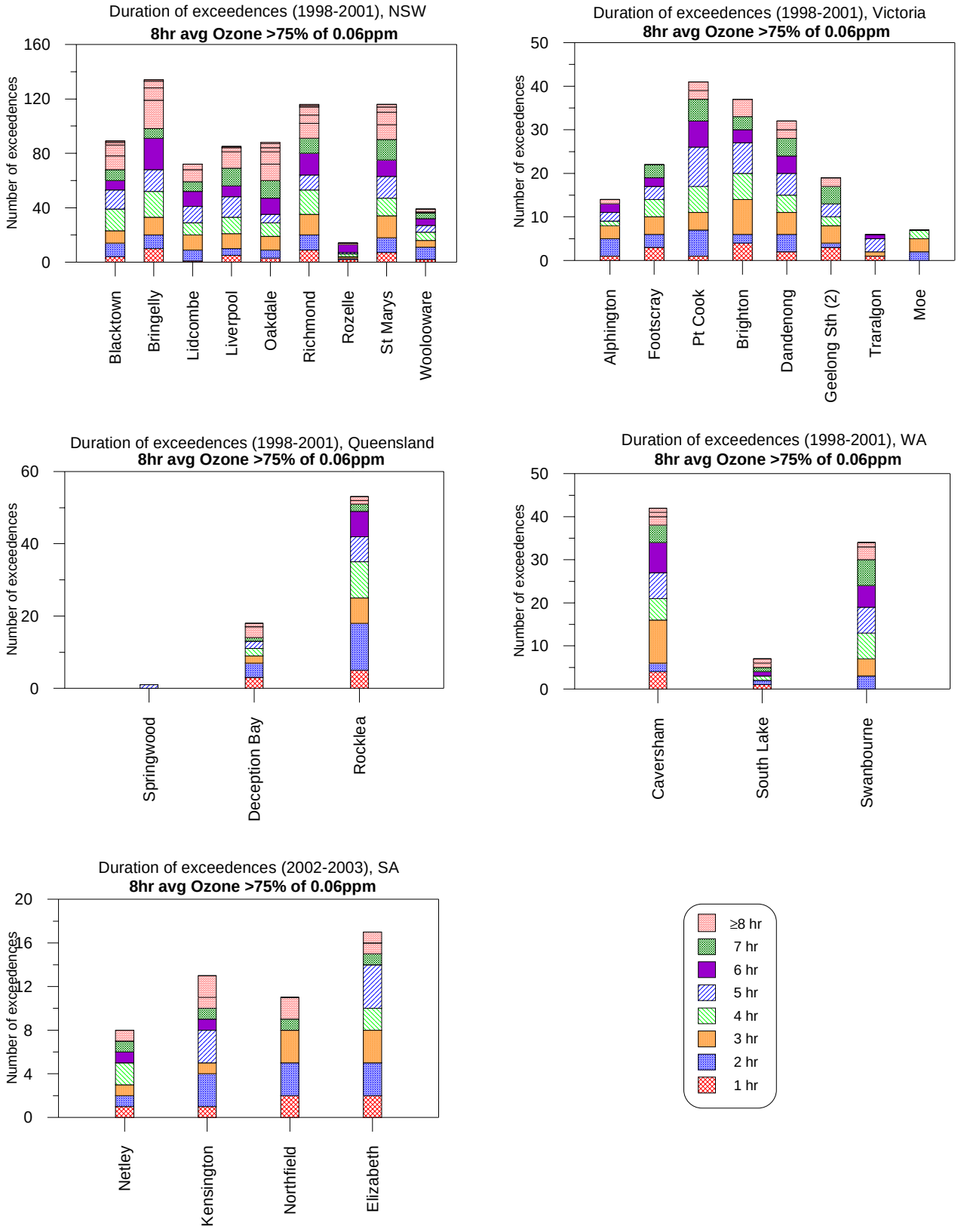


Figure 11. Duration of periods with exceedences of the "8-hr average ozone concentration greater than 0.045, but not greater than 0.06 ppm" criterion at each site analysed.

National Environment Protection Council – Ozone Standards Review

OZONE DATA CONSULTANCY BRIEF

Background

As part of the future actions of the Ambient Air Quality National Environment Protection Measure (NEPM), the National Environment Protection Council (NEPC) agreed to review the practicability of reducing the one hour ozone standard from 0.1ppm to 0.08ppm. A NEPC review team has been established and is conducting some preliminary work for the review of the standard, including considering the question of appropriate averaging periods for the ozone standards. The current ozone standards are 0.10ppm for a one hour averaging period and 0.08ppm for a four hour averaging period.

As background to this work the group is examining ozone formation patterns in Australian cities.

Purpose

The group is seeking to analyse existing ozone data from NEPM sites in Sydney, Melbourne, Brisbane, Perth and Adelaide for one hour, four hour and eight hour averaging periods in order to consider the time of day when peak ozone levels occur and the time period that ozone levels are above background levels in the different cities (while background levels vary it is estimated at around 0.03ppm).

Task

The data set to be analysed is the ozone data from NEPM sites in Sydney, Melbourne, Brisbane and Perth for 1998-2001. As data are not available from Adelaide for this period, the data set includes data from Adelaide for 1983 and 2001-2003. The data will be provided to the consultant by the NEPC Service Corporation to undertake the analysis.

4 and 8 hour averages are to be identified by the end hour of the averaging period. Rolling averages based on one hour averages should be used for the 4 and 8 hour averages. A list of NEPM sites to be analysed is found at Attachment A. The consultant should only include analysis for NEPM sites/years with >75% data capture

1. Patterns – Time series of one hour averages during periods with elevated ozone levels

Provide a 48 hour time series plot of one hour ozone averages (with time on the x axis and concentration on the y axis) for the following conditions. In each graph indicate which criteria (levels and averaging times) have been exceeded, (eg 0.10ppm 1 hour average and 0.08ppm 4 hour average):

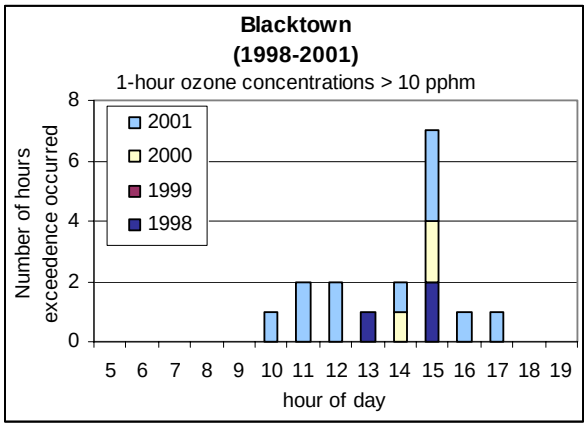
(a) All days and all NEPM sites in the above cities on which ozone levels exceed 0.8ppm or 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period or 0.06ppm for an 8 hour averaging period.
(b) All days and all NEPM sites in the above cities, additional to those in (a) above, on which ozone levels are greater than 75% of 0.08ppm or 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period or 0.06ppm for an 8 hour averaging period. If the number of days on which this occurs is more than 25 in any city, select 25 days that provide the widest range of levels.

2. Peak times – Time of day of occurrence of elevated ozone levels for one hour, 4 hour and 8 hour averages

Tables and graphs which summarise the time of day at which peak values occurred from 1998 to 2001 for each of the one hour, 4 hour and 8 hour averaging periods should be provided for:

(a) each city;
(b) each NEPM site at which ozone levels exceeded any or all of the following: 0.08ppm and 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period and 0.06ppm for an 8 hour averaging period; and
(c) each NEPM site, additional to those in (b) above, at which ozone levels were greater than 75% of any or all of the following: 0.08ppm and 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period and 0.06ppm for an 8 hour averaging period.

A separate graph should be prepared for each averaging period and level (ie the 4 hour, 8 hour and two one hour averaging periods) for each site. An example from the Blacktown NEPM site is provided below. The data should also be presented in tabular form for each year and with the combined total using the format shown in the example below.



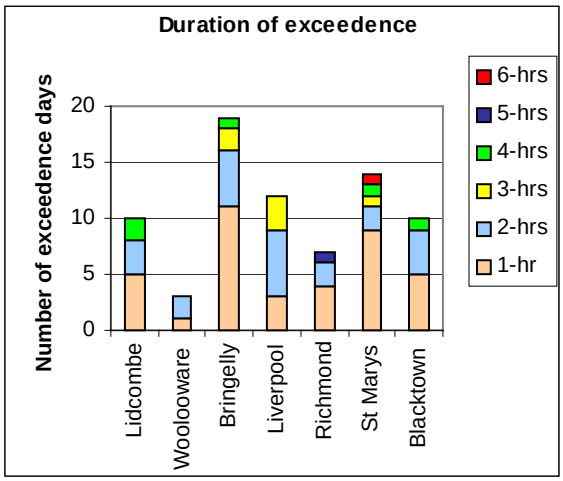
Exceedences of 1-hr ozone (10 pphm)	Hour 5	Hour 6	Hour 7	Hour 8	Hour 9	Hour 10	Hour 11	Hour 12	Hour 13	Hour 14	Hour 15	Hour 16	Hour 17	Hour 18	Hour 19
1998															
1999															
2000															
2001															
Total 1998-2001	0	0	0	0	0	1	2	2	1	2	7	1	1	0	0

3. Duration – Duration of periods with elevated ozone levels for one hour, 4 hour and 8 hour averages

Tables and graphs which summarise the frequency of the duration of the exceedences for the one hour, 4 hour and 8 hour averaging periods for the whole period 1998 to 2001 should be provided for:

(a) NEPM sites at which ozone levels exceed any or all of the following: 0.08ppm and 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period and 0.06ppm for an 8 hour averaging period;
(b) NEPM sites, additional to those in (a) above, at which ozone levels were greater than 75% of: 0.08ppm and 0.1ppm for a one hour averaging period, 0.08ppm for a 4 hour averaging period and 0.06ppm for an 8 hour averaging period.

A separate table and graph should be prepared for each averaging period. An example is provided below.



Duration of exceedence of 1 hour ozone (0.10ppm) *Blacktown*	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1998						
1999						
2000						
2001						
Total 1998-2001	5	4	0	1	0	0

Output

The report provided by the consultant will consist of the time series plots, tables and summary graphs outlined above and some explanatory text outlining the methodology and a summary of the results.

Conditions

Permission has been sought from States for the use of their data for this analysis. The data are not to be used for any purpose other than that outlined above.

All intellectual property produced in this work, except data which has the prior ownership of individual States, will be vested in the NEPC Service Corporation, whose authorization will be required for any uses, including publication in any form, by the consultant or other parties.

Contact

The contact in the NEPC Service Corporation is Ian Newbery on 08 8419 1210, inewbery@ephc.gov.au.

Attachment A

NEPM sites and years for ozone data to be analysed

Data are not to be analysed for years with less than 75% data availability. Shading indicates that data are sufficient to allow analysis.

Sites	1998	1999	2000	2001	Other
New South Wales					
Sydney region					
Blacktown					
Bringelly					
Lidcombe					
Liverpool					
Oakdale					
Richmond					
Rozelle					
St Marys					
Woolooware					
Victoria					
Port Phillip region					
Alphington					
Footscray					
Pt Cook					
Brighton					
Dandenong					
Geelong Sth 1					
Geelong Sth 2					
Latrobe Valley region					
Traralgon					
Moe					
Queensland					
S/E Qld / Brisbane sub-region					
Springwood					
DeceptionBay					
Rocklea					

South Australia					
Adelaide region					
Elizabeth					2001-03[1]
Kensington					2001-03[1]
Netley					1983 2001-03[1]
Northfield					1983 2001-03[1]
Western Australia					
Perth region					
Caversham					
South Lake					
Swanbourne					

[1] Data to be obtained from SA EPA.