Australian Government
Bureau of Meteorology

Severe Tropical Cyclone *Rachel*

3 - 8 January 1997

Darwin and Perth Tropical Cyclone Warning Centres
Bureau of Meteorology

A. Summary

Rachel formed off the Northern Territory coast near Melville Island on 3 January and moved along a general southwest track weakening as it moved over the north Kimberley. *Rachel* then slowly intensified once it moved off the west Kimberley coast on 5 January reaching category three intensity prior to making landfall on the Pilbara coast. The eye of the cyclone passed directly over Port Hedland at 0830 UTC with reported average winds of 65 knots. The cyclone then continued to move southward, weakening overland overnight and was downgraded to below cyclone strength.

Damage to property at Port Hedland was mostly minor.

B. Meteorological Description

Intensity
A tropical low was first analysed within the monsoon trough over northern Australia on 31 December. Convective activity was focussed around a well-developed middle-level circulation. Outflow over the system was enhanced by interaction with an upper trough and *Rachel* was named on 3 January (CST). The cyclone intensified, then weakened as it moved across the northern Kimberley, before moving out to sea again on 5 January near Cape Leveque and subsequently re-intensifying. The intensification was slow due to its proximity to land as it moved down the coast.

Rachel reached an estimated peak intensity of 70 knots prior to crossing the coast. The eye of the cyclone passed directly over Port Hedland at 0830 UTC with reported average winds of 65 knots. The cyclone then continued to move southward, weakening overland overnight and was downgraded to below cyclone strength.

Motion
A low-level easterly surge associated with a developing ridge over southern Australia pushed the tropical low northwest towards Melville Island on 2 January. After reaching cyclone intensity Rachel moved to the southwest crossing over the north Kimberley before moving out to sea again on 5 January near Cape Leveque.

The cyclone continued the southwest track under the influence of a trough to the southeast and a high north of the NT until midday on 7 January. It then slowed and

abruptly changed course towards the south as a meridional ridge developed to the east of the cyclone.

The dominant 500 hPa circulation features in the environment were the high to the northeast of the cyclone centre and the high to the southwest with the ridge to the south. The role of the trough was important initially in displacing the northeastern anticyclone northwards of the latitude of the cyclone. As the Indian Ocean high at 500 hPa became mobile and moved across southern WA during 7 January the flow over central WA shifted from southeast to easterly. As the flow to the south of the cyclone tipped further around towards the northeast by the morning of 8 January the cyclone path became south southeasterly.

Structure
Although observed wind shear values were not large the satellite imagery showed an elongation of the high level cloud towards the northwest during 6 January. The imagery showed a more symmetrical shape by early on the 7th. During 7 January, the deepest convection was located near the southern side.

The radar structure of *Rachel* in the period during the change of motion from southwest to south showed all of the intense rainfall echoes on the southern side, with only weak sporadic echoes on the northern side. The wind trace from Port Hedland showed a marked asymmetry with the winds on the southern side (associated with the intense convection) almost double those on the northern side. There is a school of thought suggesting that the more meso-scale dynamics of the eye wall structure during this period may also have had an influence on changing the motion more towards the south.

C. Impact

Damage to property at Port Hedland was mostly minor. Power was lost in parts of the town and numerous trees were blown over.

D. Observations

Wind
Bedout Island AWS: Average wind 69 knots 2200 UTC 6 January.
Port Hedland Airport AWS: Average wind 65 knots (119 km/h) gusting 91 knots (169 km/h) at 0703 UTC 7 Jan.

Pressure
Port Hedland Airport AWS: 971 hPa at 0830 UTC 7 December.

Storm Surge
1.25 m at Port Hedland Harbour at 1500 WST.

Rainfall
Yarrie, 196 mm in 24 hours to 0900 WST on 8 Jan.
Wittenoom, 170 mm in 24 hours to 0900 WST on 8 Jan.
Broome, 194 mm in 48 hours to 0900 WST on 7 January.

Table 1. Best track summary for *Rachel 2 – 10 January 1997.*

Note: Add 8 hours to convert to WST. Refer to best track database for complete track details.

Year	Month	Day	Hour (UTC)	Position Latitude S	Position Longitude E	Max wind 10min knots	Central Pressure hPa	Rad. of Gales nm
1997	01	2	2100	11.7	129.9		992	55
1997	01	3	0000	12.1	129.5		990	65
1997	01	3	0600	12.9	128.3		988	80
1997	01	3	1200	13.4	127.3		986	65
1997	01	3	1500	13.7	127.4		984	55
1997	01	3	1800	13.9	127.1		982	55
1997	01	3	2200	13.9	126.5	45	985	
1997	01	4	0000	14.2	126.3		988	65
1997	01	4	0100	14.3	126.2	45	988	
1997	01	4	0600	14.7	125.5		992	65
1997	01	4	0900	15.0	125.0		994	65
1997	01	4	1300	15.7	124.6	35	995	80
1997	01	5	0100	16.4	122.8	40	992	80
1997	01	5	0400	16.8	122.4	40	992	80
1997	01	5	0700	17.0	122.1	40	990	80
1997	01	5	1000	17.1	121.9	40	990	80
1997	01	5	1300	17.2	121.7	45	988	80
1997	01	5	1600	17.3	121.5	45	986	80
1997	01	5	1900	17.5	121.3	45	985	80
1997	01	5	2200	17.7	121.1	55	980	80
1997	01	6	0100	17.8	120.7	60	975	80
1997	01	6	0400	18.0	120.4	65	970	90
1997	01	6	0700	18.2	120.2	70	965	90
1997	01	6	1000	18.3	120.0	70	965	90
1997	01	6	1300	18.5	119.8	70	965	90
1997	01	6	1600	18.8	119.5	70	965	90
1997	01	6	1900	19.1	119.3	70	965	90
1997	01	6	2200	19.4	119.0	70	965	90
1997	01	7	0100	19.6	118.6	70	965	90
1997	01	7	0400	19.8	118.5	70	965	90
1997	01	7	0700	20.1	118.6	65	970	90
1997	01	7	0800	20.3	118.6	65	970	90
1997	01	7	1000	20.6	118.6	60	975	90
1997	01	7	1300	21.0	118.6	55	978	90
1997	01	7	1600	21.4	118.6	55	980	80
1997	01	7	1900	21.8	118.6	45	985	55
1997	01	7	2200	22.1	118.7	45	988	40
1997	01	8	0100	22.5	118.8	40	990	
1997	01	8	0400	22.9	118.9	40	990	
1997	01	8	0700	23.3	119.0	35	993	
1997	01	8	1000	23.8	119.1	35	995	
1997	01	8	1300	24.3	119.2	35	995	
1997	01	8	1600	24.7	119.4	35	995	
1997	01	8	1900	25.1	119.6	35	995	

1997	01	8	2200	25.4	119.9	30	997	
1997	01	9	0100	25.7	120.3	30	997	
1997	01	9	0700	26.1	121.0	30	998	
1997	01	9	1300	26.6	121.7	25	1002	
1997	01	10	0100	27.5	123.0	20	1003	

Figure 1. Track of Tropical Cyclone *Rachel*, 3-10 January 1997.
All times in WST.