Australian Government

Bureau of Meteorology

Tropical Cyclone *Vance*

18 – 24 March 1999

Perth Tropical Cyclone Warning Centre
Bureau of Meteorology

A. Summary

Severe tropical cyclone *Vance* was one of the strongest cyclones ever to affect mainland Australia. After developing off Darwin on 17-18 March, *Vance* gradually intensified as it tracked to the west southwest then to the south before crossing the coast near Exmouth on 22 March as a category 5 system. *Vance* caused severe structural damage to about 10 per cent of buildings in the town though many more experienced less obvious damage due to intrusion of rainwater. A high storm tide caused coastal erosion and damage between Exmouth and Onslow - the estimated peak storm surge west of Onslow was estimated at over 5 m.

In addition to damage in the far west Pilbara, water and power supplies throughout the Gascoyne and Goldfields were disrupted and many homesteads sustained wind or flooding damage. The main rail and road links to the eastern states were cut.

B. Meteorological Description

As the circulation associated with tropical cyclone *Elaine* moved slowly west, another low within the monsoon trough, which persisted over the north coast of Australia near Darwin for several days, moved into the Timor Sea. The low-level circulation, favourably situated beneath the upper ridge in a region of weak wind shear quickly intensified to cyclone intensity. *Vance* moved quite steadily west-southwest at first, then towards the southwest during 20-21 March. It intensified steadily and was declared a severe Category 3 cyclone late on 19 March. It was further upgraded to a Category 5 overnight on 20 March. The Perth TCWC posted the first cyclone warning for the Exmouth/Onslow area at 10 am WST on Saturday 20 March.

Late on 21 March the cyclone changed track to a due southerly course towards the Exmouth/Onslow area. The eye of the cyclone passed across Exmouth Gulf, approximately 25 kilometres to the east of Exmouth and 80 kilometres to the west of Onslow during Monday morning 22nd March. A record wind gust speed for the Australian mainland of 267 kilometres per hour was measured at the Learmonth Meteorological Office, 35 kilometres south of Exmouth shortly before midday. At Onslow the maximum gust recorded was 174 kilometres per hour. The combination of very high seas and high tides caused severe erosion of the beachfront at Exmouth. At Onslow the storm tide left 3 large barges stranded on the edge of Beadon Creek. The cyclone crossed the southern part of Exmouth Gulf around 1pm then moved further inland and began to weaken. By the morning of 23 March it was near the town of Mount Magnet and was moving southeast at 50 kilometres per hour. There was damage to property in the town of Cue when winds struck the town at around 4 am WST.

Vance was downgraded to a Cat.1 and passed to the northeast of Kalgoorlie around 3 pm WST. Rain from the decaying cyclone caused flooding in the southern Goldfields. The main highway and the rail link to the eastern states were both cut by floodwaters. It moved into waters of the Great Australian Bight in the early hours of the 24th. The remnants of *Vance* caused gale force winds over parts of South Australia and Victoria later that day.

Motion
The movement of *Vance* was dominated by a mid-level anticyclone over central Australia. *Vance* moved around the shoulder of the ridge, then into the north-westerlies south of the ridge. *Vance* was located in a region of low deep tropospheric shear during the period prior to landfall.

C. Impact
About ten percent of the buildings in Exmouth suffered severe structural damage, though many more experienced less obvious damage due to intrusion of rainwater. Structural damage was also evident at Onslow.

The storm surge associated with *Vance* caused severe erosion of the beachfront and marina at Exmouth and stranded three large barges on the edge of Beadon Creek at Onslow. The storm surge at Exmouth was measured at 3.5m which resulted in a storm tide of 4.9m at 10:20am (see Fig. 5). Had the peak surge occurred at high tide a few hours later the storm tide could have reached 6.1m. The greatest storm surge occurred in the uninhabited part of the coast west of Onslow near Tubridgi Point where the severe coastal erosion and widespread denudation of vegetation completed transformed the landscape (see Figs. 9-11). A post-event survey estimated the storm surge at more than 5 metres.

Water and power supplies throughout the Gascoyne and Goldfields were disrupted and many homesteads sustained wind or flooding damage. The main rail and road links to the eastern states were cut. The distribution of rainfall in Fig. 6 shows widespread cumulative falls of 100-150 mm with some areas receiving 200-300 mm. It is also likely that rainfall near the coast was underestimated given the strong winds.

D. Data
Winds
Gust to 267 km/h at Learmonth (recorded on Dynes anemometer).
Gust to 174 km/h at Onslow.

Storm surge
3.6 metres at Exmouth
3.5 to 4.0 metres at Onslow

Table 1. Best track summary for *Vance 14 – 23 March 1999*
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
1999	03	14	1800	12.4	131.9	25	1003	
1999	03	15	0000	12.3	132.0	20	1004	
1999	03	15	0600	12.0	131.9	25	1001	
1999	03	15	1200	11.9	132.0	25	1003	
1999	03	15	1800	11.8	132.2	25	1001	
1999	03	16	0000	11.8	132.3	25	1002	
1999	03	16	0600	12.0	131.5	25	1001	
1999	03	16	1200	12.2	131.1	25	1003	
1999	03	16	1800	12.3	130.7	25	1002	
1999	03	17	0000	12.3	130.2	25	1002	
1999	03	17	0600	12.3	129.7	25	1000	
1999	03	17	1200	12.4	129.0	25	1000	
1999	03	17	1800	12.5	127.8	30	998	
1999	03	18	0000	12.6	126.7	35	994	15
1999	03	18	0300	12.6	126.2	40	990	20
1999	03	18	0600	12.6	125.7	45	988	30
1999	03	18	0900	12.5	124.9	45	986	45
1999	03	18	1200	12.5	124.3	50	984	55
1999	03	18	1600	12.8	123.8	55	980	65
1999	03	18	1900	13.1	123.2	60	975	70
1999	03	18	2200	13.3	122.3	65	970	75
1999	03	19	0100	13.4	121.7	70	965	80
1999	03	19	0400	13.5	121.1	75	960	80
1999	03	19	0700	13.7	120.5	75	960	85
1999	03	19	1000	14.0	120.1	80	955	85
1999	03	19	1300	14.3	119.7	80	955	90
1999	03	19	1600	14.6	119.2	85	950	95
1999	03	19	1900	14.9	118.7	85	950	95
1999	03	19	2200	15.3	118.3	90	945	105
1999	03	20	0100	15.6	117.8	90	945	105
1999	03	20	0400	15.8	117.4	95	940	110
1999	03	20	0700	16.0	117.1	95	935	110
1999	03	20	1000	16.3	117.0	100	930	110
1999	03	20	1300	16.6	116.8	105	925	110
1999	03	20	1600	17.0	116.5	105	920	110
1999	03	20	1900	17.3	116.2	115	910	110
1999	03	20	2200	17.6	115.9	115	910	110
1999	03	21	0100	18.0	115.6	110	915	110
1999	03	21	0400	18.2	115.3	110	915	110
1999	03	21	0700	18.5	115.0	105	920	110
1999	03	21	1000	18.9	114.9	105	920	110
1999	03	21	1100	19.0	114.8	105	920	110
1999	03	21	1200	19.2	114.8	105	920	110
1999	03	21	1300	19.4	114.7	105	920	110

1999	03	21	1400	19.5	114.6	105	920	110
1999	03	21	1500	19.6	114.6	105	920	110
1999	03	21	1600	19.7	114.5	105	920	110
1999	03	21	1700	19.9	114.5	105	920	110
1999	03	21	1800	20.0	114.5	105	920	110
1999	03	21	1900	20.3	114.5	105	920	110
1999	03	21	2000	20.5	114.5	105	920	110
1999	03	21	2100	20.7	114.5	105	920	110
1999	03	21	2200	20.9	114.5	105	920	110
1999	03	21	2300	21.1	114.5	105	920	110
1999	03	22	0000	21.4	114.5	105	920	110
1999	03	22	0100	21.6	114.4	105	920	110
1999	03	22	0200	21.9	114.4	105	920	110
1999	03	22	0300	22.1	114.4	105	920	110
1999	03	22	0400	22.4	114.3	105	925	110
1999	03	22	0500	22.7	114.4	100	930	110
1999	03	22	0600	22.9	114.4	95	935	110
1999	03	22	0700	23.2	114.4	95	935	110
1999	03	22	0800	23.4	114.5	95	940	105
1999	03	22	0900	23.7	114.6	95	940	105
1999	03	22	1000	24.0	114.8	90	945	95
1999	03	22	1100	24.2	114.9	90	945	95
1999	03	22	1200	24.5	115.1	85	950	95
1999	03	22	1300	24.8	115.3	85	950	90
1999	03	22	1400	25.1	115.5	80	955	90
1999	03	22	1500	25.4	115.7	80	955	90
1999	03	22	1600	25.7	116.0	75	960	90
1999	03	22	1900	26.3	116.5	65	970	85
1999	03	22	2200	27.1	117.3	60	975	85
1999	03	23	0100	28.1	118.3	55	980	80
1999	03	23	0400	29.4	120.0	50	985	80
1999	03	23	0700	30.6	122.0	45	988	80
1999	03	23	1000	31.5	124.0	40	990	80
1999	03	23	1300	32.3	126.1	40	990	80
1999	03	23	1600	33.2	128.3	40	990	80
1999	03	23	2200	35.2	133.0	40	990	80

Figure 1. Track of Severe Tropical Cyclone *Vance*, 16 – 24 March 1999
All times in WST.

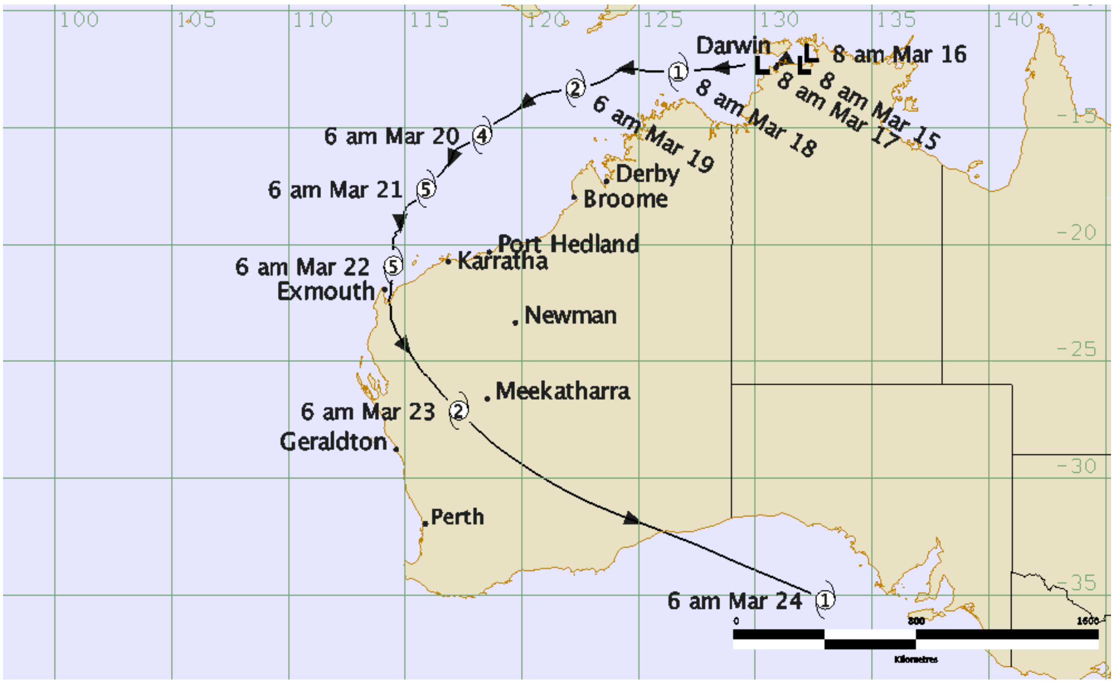

Fig. 2. Satellite image at 10:30 am 22 March 1999 showing the eye of TC Vance in Exmouth Gulf.

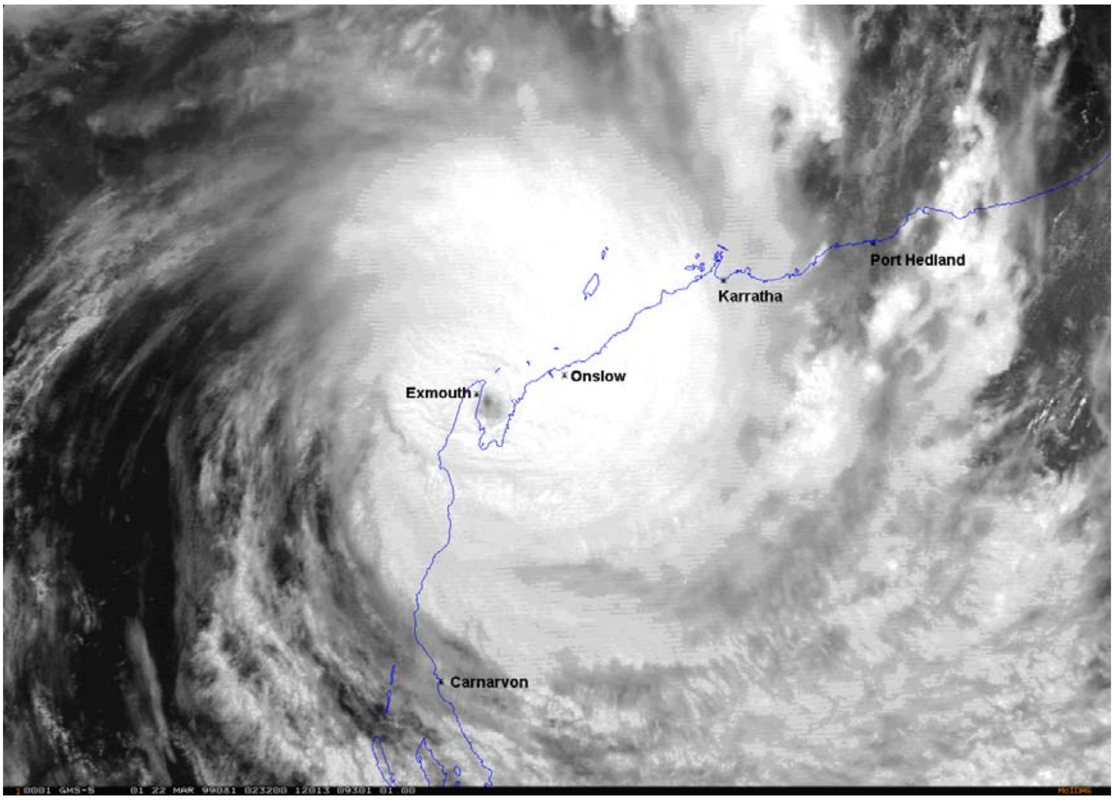

Fig. 3. Learmonth radar image at 10:10 am 22 March 1999 showing the eye of Vance entering Exmouth Gulf.

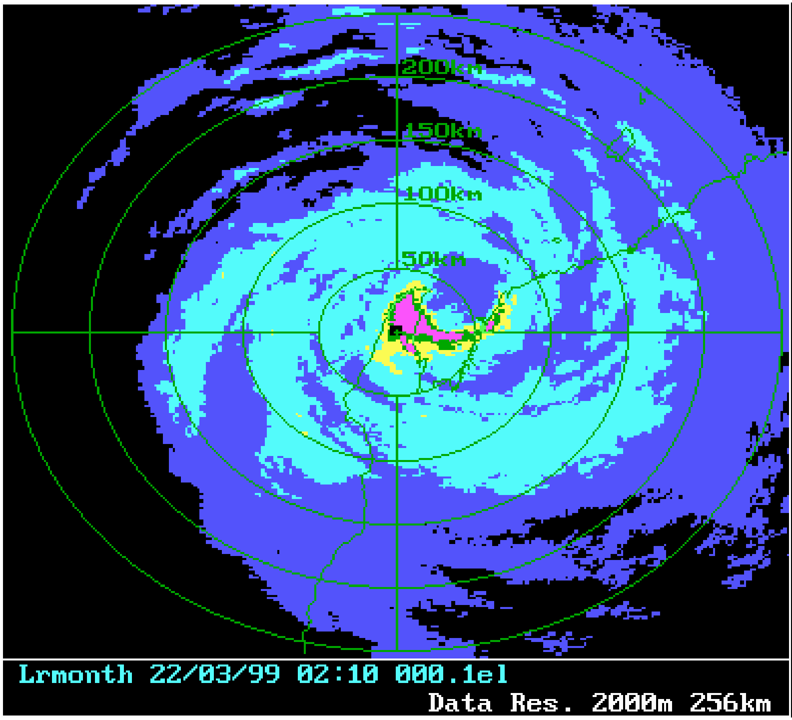

Fig. 4. Graph showing the wind speed and direction at Learmonth from 2:25 am to 9:40 pm on 22 March 1999.

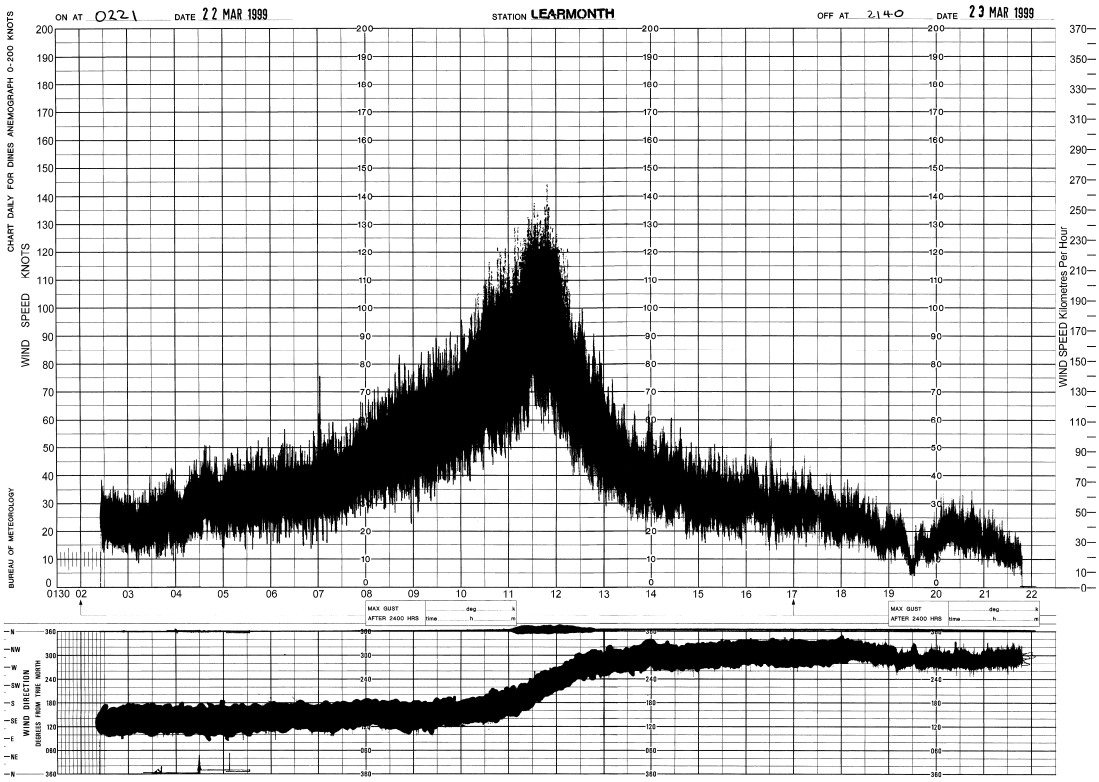

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Fig. 5. Graph of the storm surge and storm tide at Exmouth 22 March 1999.

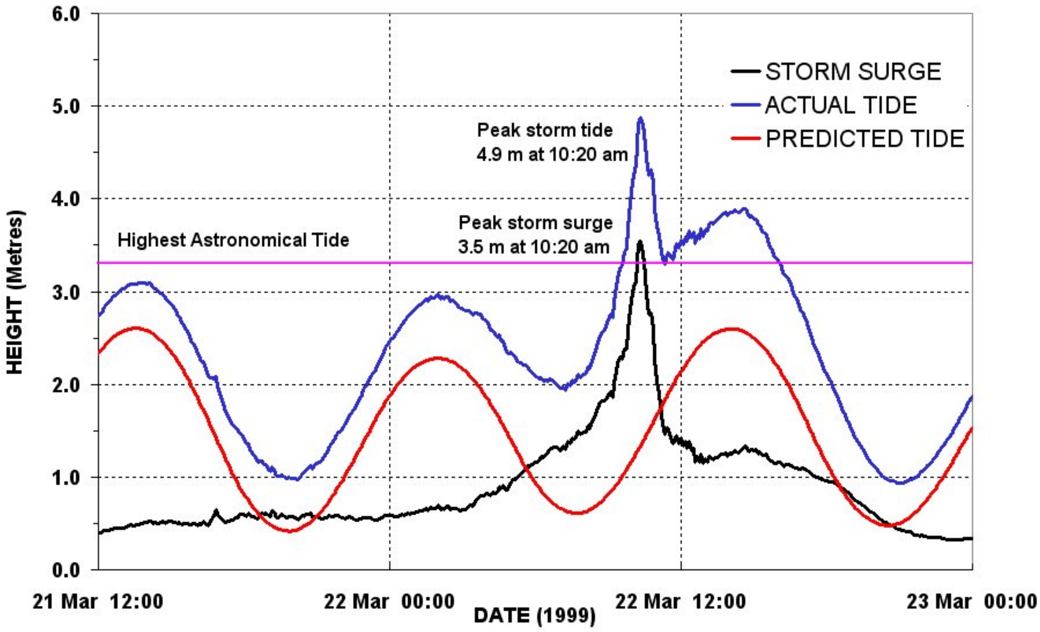

Fig. 6. Rainfall distribution 22 -25 March 1999.

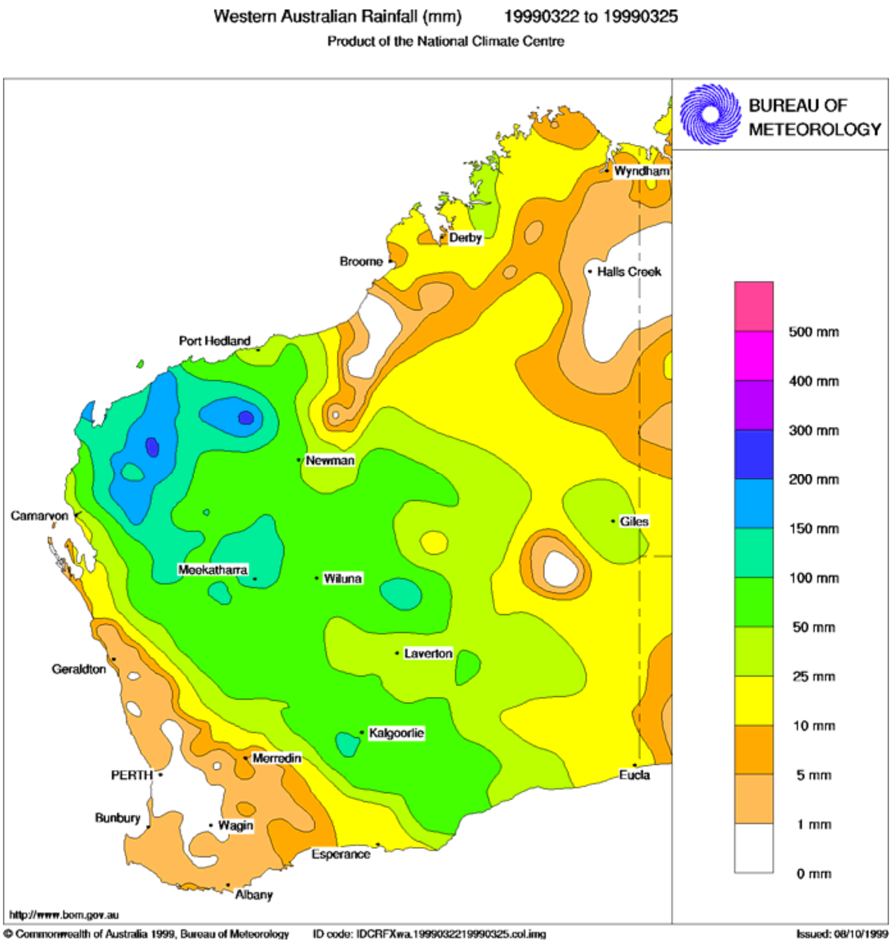

Fig. 7. Photo of Beadon Creek at Onslow showing barges stranded inland from the coast. Photo courtesy of Barry Hanstrum.

Fig. 8. Photo of Onslow town and foreshore. Photo courtesy of Barry Hanstrum.

Fig. 9. Coastal erosion following the storm surge west of Onslow. Photo courtesy of Barry Hanstrum.

Fig. 10. Coastal erosion following the storm surge near Tubridgi Point, west of Onslow. Photo courtesy of Barry Hanstrum.

Fig. 11. Evidence of storm surge near Tubridgi Point west of Onslow. Photo courtesy of Barry Hanstrum.

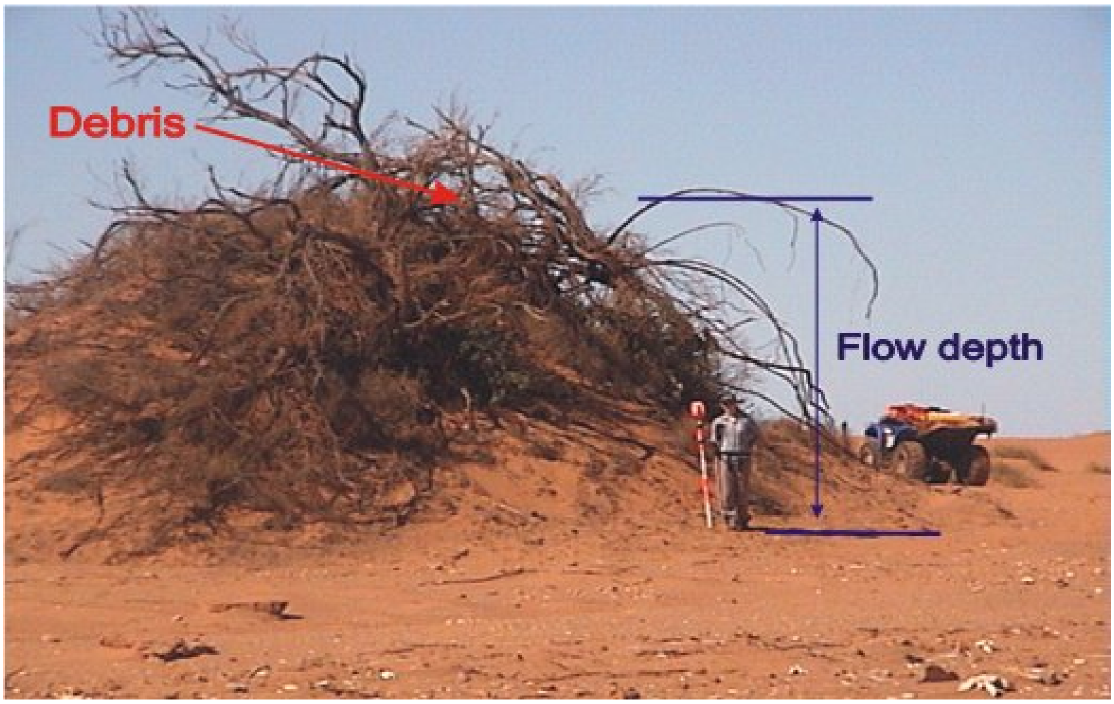

Fig. 12. Looking inland to the southeast from Exmouth Gulf showing extent of flooding and seawater inundation. Photo courtesy of Barry Hanstrum.

Fig. 13. Typical house and tree damage in Exmouth. Photo courtesy of Barry Hanstrum.

Fig. 14. Capsized boats at Exmouth marina. Photo courtesy of Barry Hanstrum.

Fig. 15. Bent steel power poles, Exmouth. Photo courtesy of Barry Hanstrum.

Fig. 16. Road washaways near the Exmouth marina. Photo courtesy of Barry Hanstrum.

Fig. 17. Damage to communications mast near Learmonth. Photo courtesy of Matt Gould.