= Cyclone Emma (2006) =

Tropical Cyclone Emma was a weak but unusually large tropical cyclone that affected a substantial portion of Western Australia during the 2005 ? 06 Australian region cyclone season . Forming out of an area of low pressure on 25 February , the precursor to Emma slowly tracked southward . Although classified tropical , the structure of the system represented that of a monsoonal storm . However , low wind shear and well @-@ developed outflow gradually allowed convection to develop near the centre of circulation . As the system approached the Pilbara coastline of Western Australia on 27 February , it intensified into a Category 1 cyclone and attained peak 10 @-@ minute sustained winds of 75 km / h (45 mph) . After moving inland near Mardie , Emma weakened to a tropical low but became exceedingly large ; its cloud cover obscured most of Western Australia . The remnants of the weak storm persisted until 1 March , at which time they dissipated over the Great Australian Bight .

Although a weak storm , rainfall from Emma caused flooding in numerous parts of Western Australia . In Karratha , six people required rescue after their cars became stranded in floodwaters . The most significant damage took place along the Murchison River which swelled to roughly 20 km (12 mi) in width . Although only one town was threatened by the river , large areas of farmland were inundated by the expanding river , leading to substantial agricultural losses . Despite the extensive flooding , no fatalities were reported as a result of Emma .

= = Meteorological history = =

Tropical Cyclone Emma originated from an area of low pressure that formed to the southeast of Java on 22 February 2006 . Over the following few days , a monsoonal trough developed over the Timor Sea , leading to an increased likelihood of tropical cyclone formation from the initial low within several days . On 25 February , the Australian Bureau of Meteorology began monitoring the system as a tropical low . The low tracked slowly towards the south throughout the day and the centre of circulation relocated farther south late on 26 February . By this time , the Bureau of Meteorology anticipated the low to develop into a tropical cyclone and attain winds of 95 km / h (60 mph 10 @-@ minute sustained) before moving over land in Western Australia .

Early on 27 February , the Joint Typhoon Warning Center (JTWC) classified the system as a tropical depression . During the day , a QuikSCAT pass revealed a broad low @-@ level circulation with the highest winds located around the periphery of the storm , a characteristic of monsoonal systems . Although it was situated within a region of low wind shear and underneath an anticyclone , convective activity was mostly present in the system 's large outer bands . Later that day , the Bureau of Meteorology upgraded the system to a Category 1 cyclone on the Australian intensity scale and named it Emma . At this time , Emma was located roughly 305 km (190 mi) north of Onslow , Western Australia . Several hours later , the JTWC classified Emma as Tropical Storm 15S following the development of convection near the centre of circulation .

The storm continued to track southward in response to a strong mid to upper @-@ level ridge situated over central Australia . Emma attained its peak wind speed of 75 km / h (45 mph 10 @-@ minute sustained) late on 27 February as it neared landfall . However , the JTWC assessed Emma to have been slightly weaker , peaking with winds of 65 km / h (40 mph 1 @-@ minute sustained) . The storm maintained this intensity through its landfall early on 28 February near Mardie along the Pilbara coastline . Shortly after moving over land , the JTWC declared Emma extratropical and issued their final advisory on the storm . The Bureau of Meteorology , however , continued to monitor the cyclone as it rapidly tracked over Western Australia . Over land , the storm became unusually large , with outer bands from the storm covering most of Western Australia . Late on 28 February , the lowest barometric pressure in relation to Emma , 988 mbar (hPa ; 29 @.@ 18 inHg) , was recorded . The remnants of Emma persisted through most of 1 March before the system moved over the Great Australian Bight and dissipated .

The Australian Bureau of Meteorology uses 10 @-@ minute sustained winds , while the Joint Typhoon Warning Center uses one @-@ minute sustained winds . The Bureau of Meteorology 's

peak intensity for Emma was 75 km / h (45 mph) 10 @-@ minute sustained , or 85 km / h (50 mph) one @-@ minute sustained . The JTWC 's peak intensity for Emma was 65 km / h (40 mph) one @-@ minute sustained , or 55 km / h (35 mph) 10 @-@ minute sustained .

= = Preparations and impact = =

Ahead of the storm , oil and mining operations in threatened regions were temporarily shut down . Already suffering from the impacts of Cyclones Clare and Daryl , residents were warned about the likelihood of flooding due to the already saturated grounds . The Bureau of Meteorology also issued tropical cyclone warnings for most of the Pilbara coastline on 28 February . The same day , the Fire and Emergency Services of Australia issued a Yellow Alert for Point Samson , Roebourne , Wickham , Dampier , Karratha , and Mardie . Residents in these areas were advised to evacuate if necessary and ensure that all cyclone preparations had been completed . Shelters were also opened for residents who sought need for one . Schools throughout the Pilbara region were also closed for several days as a result of the storm .

Due to the low intensity of the storm at landfall , little or no wind damage took place from Emma . On land , sustained winds were recorded up to 78 km / h (48 mph) and gusts up to 95 km / h (59 mph) . A storm surge of 0 @.@ 8 m (2 @.@ 6 ft) was recorded at Dampier but , no damage resulted from it . Heavy rains produced by the storm caused moderate to severe flooding in Western Australia . In Karratha , six people were rescued from two cars after they became stranded on a flooded road . Total rainfall from the storm was recorded at 308 mm (12 @.@ 1 in) in the city . Localised flooding was reported in Pannawonica . Some buildings reported minor flooding but overall structural damage was minimal . The 190 mm (7 @.@ 5 in) of rain that fell in a 24 @-@ hour span in Karratha pushed the city above its annual average rainfall totals in the first two months of the year . Near the Yarraloola Station , the Robe River overflowed its banks , inundating the area and forcing the evacuation of everyone in the homestead . In the Gascoyne region 30 cattle drowned after flood waters rapidly overtook a pasture .

In the Murchison region , rainfall exceeding 100 mm (3 @.@ 9 in) brought the worst floods in decades , inundating numerous farms and causing substantial agricultural losses . Two weeks after the storm passed , the mouth of the Murchison River was closed after a ship became stranded in the swollen river . By 14 March , the river had broadened to roughly 20 km (12 mi) in places normally 500 m (1 @,@ 600 ft) in width . These values marked the largest flood ever recorded in the river 's history . Officials distributed sandbags to build temporary levee to protect low @-@ lying areas . The largest operation took place at Kalbarri , near the mouth of the river , where 60 firefighters and 18 volunteers worked to put up 9 @,@ 000 sandbags . The Billabalong and Twinpeaks stations were also isolated from surrounding areas after the Murchison River inundated the area . Several stations in the area remained under water for over a month and farmers requested urgent assistance from the government to help alleviate losses . Initial damage from the storm was placed at A $ 1 million ($ 706 @,@ 580 USD) .

Flood waters from the Murchison River finally began to recede on 17 March ; however , it took several weeks for the river to return to its normal level . Although Emma had only minor effects in Carnarvon , the town enacted a A $ 14 million ($ 10 million USD) flood protection plan in the wake of the storm . The plan would lead to the construction of new levees in areas surrounding the town and keep flood waters within Nicol Bay Flats . Additionally , four sections of the North West Coastal Highway were set to be upgraded for similar reasons . Due to the combined effects of Cyclones Clare , Darryl , Jim , Emma , Kate and Glenda , gold production in Australia fell by 8 percent , resulting in earnings losses of A $ 130 million .