= Cyclone Rusty =

Severe Tropical Cyclone Rusty was a strong , slow @-@ moving tropical cyclone that produced record duration gale @-@ force winds in Port Hedland , Western Australia in late February 2013 . Originating as an area of low pressure on 22 February well to the northwest of the Kimberley region of Western Australia , the precursor to Rusty steadily developed within a favourable environment . Gradually decreasing surface pressures in the region signaled intensification and the low was classified as Tropical Cyclone Rusty on 23 February . Although a large , sprawling system , near @-@ record high sea surface temperatures enabled Rusty to quickly deepen . Becoming essentially stationary on 25 February , the system acquired hurricane @-@ force winds as its core improved in structure . The cyclone achieved its peak intensity two days later with maximum ten @-@ minute sustained winds of 165 km / h (105 mph) and a barometric pressure of 945 mbar (hPa ; 27 @.@ 91 inHg) . Thereafter , interaction with land caused its core to collapse before the system made landfall near Pardoo Station . Rusty weakened below cyclone strength on 28 February . Its remnants persisted over Western Australia for several more days before being absorbed into an extratropical cyclone on 5 March .

Owing to the slow @-@ moving nature of Rusty , a large swath of coastal Western Australia saw heavy rains from the storm with a storm peak of 374 mm (14 @.@ 7 in) at De Grey Station . Substantial flooding took place accordingly ; the De Grey River crested just shy of its all @-@ time record at 17 @.@ 23 m (56 @.@ 5 ft) . Some structural damage took place , but the predominant effects of the storm were sustained by agriculture and infrastructure . Economic losses related to the storm were estimated to be as high as A $ 500 million (US $ 480 million) . The name Rusty was later retired and replaced with Rubina .

= = Meteorological history = =

In late February 2013 , a monsoon trough combined with the Madden ? Julian oscillation to produce an area of low pressure on 22 February well to the northeast of the Kimberley region . Upon its formation , the Bureau of Meteorology (BoM) began monitoring the system as Tropical Low 10U . Low to moderate upper @-@ level wind shear and favorable diffluence supported tropical cyclogenesis as the system moved slowly south along the edge of a subtropical ridge . By 23 February , deep convective banding features were wrapping into a well @-@ defined circulation . This prompted the Joint Typhoon Warning Center (JTWC) to issue a Tropical Cyclone Formation Alert at 0300 UTC and subsequently initiate advisories on the storm as Tropical Cyclone 17S at 0000 UTC on 24 February . Surface pressures around the cyclone had significantly decreased by this time , with an automated weather station on Rowley Shoals , roughly 130 km (80 mi) southeast of the storm 's centre , recording a 7 mbar (hPa ; 0 @.@ 21 inHg) drop to 993 mbar (hPa ; 29 @.@ 33 inHg) in 24 hours . The BoM similarly classified the system as a tropical cyclone hours later as gale @-@ force winds were observed on Bedout Island . They consequently assigned it the name Rusty , at which time the cyclone was situated roughly 360 km (220 mi) north of Port Hedland , Western Australia .

A large monsoonal cyclone , Rusty featured an expansive cloud mass with a relatively cloud @-@ free centre spanning 160 km (100 mi) . Under normal circumstances , cyclones of this nature tend to develop slowly due to their sprawling nature ; however , near @-@ record high sea surface temperatures of 31 to 32 ° C (88 to 90 ° F) fueled an unusually quick organization . The high temperatures were linked to a record warm January across the entirety of Australia . Additionally the warmth extended to a great depth , resulting in a high tropical cyclone heat potential of 90 kJ / cm2 . Throughout 24 February , convective bands steadily consolidated around the circulation as it intensified . The strongest winds continued to be displaced well to the south of the centre , however , within the most persistent convective band . This large , intense band extended westward from Broome to Port Hedland and into the western portion of Rusty 's circulation . Areas within this band experienced gale @-@ force winds despite being more than 200 km (120 mi) away from the cyclone . Increasingly rapid strengthening took place later in the day with a 35 km (25 mi) wide eye

developing . Rusty became virtually stationary late on 25 February as a trough to its south weakened the ridge previously steering the cyclone south .

Throughout 25 February , the storm 's eye expanded to an asymmetrical 95 by 185 km (60 by 115 mi) diameter . By 1200 UTC , Rusty had intensified into a severe tropical cyclone ? a Category 3 or higher on the Australian cyclone intensity scale ; this was supported by measurements of sustained 125 km / h (78 mph) at Rowley Shoals . The large circulation began contracting later that day and into 26 February . Intensification resumed later that day and into 27 February . Favorable outflow , enhanced by a mid @-@ latitude trough to the south , allowed for deep convection to form around the eyewall . Rusty attained its peak strength early on 27 February with sustained winds of 165 km / h (105 mph) , with gusts up to 230 km / h (145 mph) , and an estimated central pressure of 945 mbar (hPa ; 27 @.@ 91 inHg) . The JTWC estimated one @-@ minute sustained winds at this time to have been 185 km / h (115 mph) , equivalent to a Category 3 hurricane on the Saffir ? Simpson hurricane wind scale . Shortly thereafter , the ridge over Australia began to rebuild and prompted Rusty to drift south @-@ southeast . Interaction with the Australian mainland incited weakening of the cyclone . As it approached the Pilbara coastline , the eastern eyewall collapsed and its eye became increasingly cloud @-@ filled . Bedout Island , which took a direct hit from the eyewall , only recorded 98 km / h (61 mph) sustained winds with gusts to 119 km / h (74 mph) .

Around 0900 UTC on 27 February Rusty made landfall near Pardoo Station , roughly 110 km (70 mi) east of Port Hedland , with winds of 130 km / h (80 mph) . Once onshore , steady weakening ensued . Within six hours , the eye dissipated and deep convection diminished , becoming more confined to the southern side of the circulation . A combination of increasing shear and land interaction ultimately caused the storm to weaken below cyclone strength early on 28 February , at which time it was situated roughly 70 km (43 mi) southeast of Nullagine . The remnants continued southward over Western Australia , eventually opening up into a trough on 3 March . The system subsequently moved back over water that day before being absorbed by an approaching extratropical cyclone by 5 March .

= = Preparations = =

The Port of Port Hedland was shut down for 86 hours as the cyclone slowly moved by , causing significant disruptions to shipping . Twenty @-@ six ships were evacuated from the port prior to the storm 's arrival . Onshore mining was suspended for similar durations nearby . BHP Billiton , Rio Tinto Group , and Fortescue Metals Group temporarily shut down or scaled back all operations in the area . The prolonged closure of the port resulted in a 2 @.@ 4 % drop in iron ore prices . Losses from lack of productivity and revenue associated with the port closures were estimated to be as high as A $ 500 million (US $ 480 million) .

Coastal areas of Pilbara were placed on red alert on 26 February , meaning residents were on full lock down until the cyclone 's passage . Approximately 500 people sought refuge in public shelters during the storm . As a preventative measure , a 60 km (37 mi) stretch of the Great Northern Highway between Port Hedland and Sandfire was shut down for several days . The road closures caused food and gas shortages in some areas ; however , police eventually let trucks with supplies through the closed roads . As the remnants of Rusty moved south , flood warnings were raised across the Goldfields @-@ Esperance region by 2 March and flood @-@ prone roads were shut down . A local race was cancelled due to the storm in Esperance .

= = Impact and aftermath = =

Owing to the slow movement of Rusty , many areas along coastal Pilbara experienced prolonged periods of gale @-@ force winds and heavy rain . Sustained gales affected Port Hedland for a record @-@ breaking 39 hours straight . Gusts reached 124 km / h (77 mph) on Bedout Island before the anemometer failed . Port Hedland International Airport recorded gusts up to 119 km / h (74 mph) . A large swath of Western Australia experienced heavy rains from the cyclone , with accumulations of at least 200 mm (7 @.@ 9 in) stretching from northwestern areas of Kimberley to

central areas of the state . A storm maxima rainfall of 374 mm (14 @.@ 7 in) was measured at De Grey Station ; however , an unofficial report of 428 @.@ 5 mm (16 @.@ 87 in) was received from Pardoo Station . Another report from Pardoo stated that the area received 520 mm (20 in) of rain in three days . Over five days , 276 mm (10 @.@ 9 in) fell at the Anna Plains Station , accounting for 65 % of its seasonal rainfall . Many farmers in Western Australia considered the rain to be beneficial as it caused little damage outside Pardoo . Farther south in the Goldfields @-@ Esperance region , accumulations peaked at 117 mm (4 @.@ 6 in) in Lorna Glen . Kalgoorlie experienced its wettest March day ever , with a 24 ? hour total of 88 @.@ 2 mm (3 @.@ 47 in) ; it was also on track to be the fourth wettest March on record in just two days .

Major flooding took place along the De Grey River as it rose to 17 @.@ 23 m (56 @.@ 5 ft) , just short of the all @-@ time record of 17 @.@ 76 m (58 @.@ 3 ft) set in 2000 . Discharge also reached a tremendous 7 @,@ 843 m3 / s (276 @,@ 973 ft3 / 2) . Between 26 February and 2 March , an estimated 1 @.@ 4 million megalitres (370 billion gallons) of water flowed the river . The effects of flooding from the river were mainly confined to Pardoo Station , where significant cattle loss took place . Many of the station 's buildings were flooded and roughly 300 km (190 mi) of roads were washed away . The Nullagine , Oakover , and Coongan rivers rose above flood levels . Only minor damage took place in Port Hedland while some flooding took place in Kalgoorlie and Kambalda , with some homes damaged . Downed tree limbs and power lines in Port Hedland left 55 homes without power . Along the beach , a dolphin was washed ashore during the storm . It was brought to a tidal pool by Department of Environment and Conservation officers and cared for five hours before being released back into the ocean .

The storm also weakened the seasonal monsoon trough over southern areas of the country in early March , triggering an intense heat wave across the region . Areas recently affected by the cyclone in Pilbara experienced temperatures up to 45 ° C (113 ° F) , the highest temperatures in six years . Melbourne , Victoria , saw a record nine days of high temperatures above 30 ° C (86 ° F) as the air mass moved east . Records in the city began in 1856 . The city subsequently broke its record for continuous days with minimum temperatures of at least 20 ° C (68 ° F) , reaching seven on 13 March . The Australian Energy Market Operator reported record electrical demands across the state of Victoria , with usage reaching more than 9 @,@ 500 MW on 12 March . Owing to the prolonged heat , incidents requiring paramedics increased by 25 percent from the previous week .

Immediately following Rusty 's landfall , the Department of Fire and Emergency Services placed 30 personnel on standby and began aerial surveys to determine if residents needed aid . Residents in Pilbara were warned of the dangers of asbestos in damaged or destroyed structures in early March as they were allowed to return home . A week after Rusty passed through Pilbara , an algal bloom the size of Tasmania appeared offshore . Unprecedented turbidity from the storm stirred up a large column of nutrients from the seafloor and brought it to the surface , causing the rapid increase in algae . Despite its size , it was not expected to have any lasting effects in the region .

Later in 2013 , Rusty was retired from the list names in the Australian Basin . During November 2014 the name Rubina was chosen to replace Rusty .