Covered Area Rainfall Event (14/08/2024 to 16/08/2024)

Excess Rainfall

Event Briefing

British Virgin Islands

23 August 2024

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1 INTRODUCTION

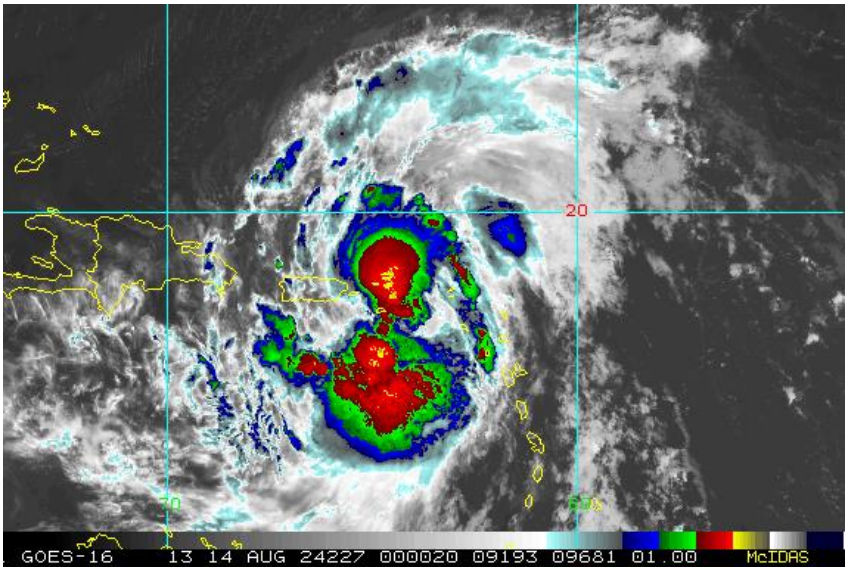
This event briefing describes the impact of rainfall on the British Virgin Islands, which was associated with a Covered Area Rainfall Event (CARE) starting on 14 August 2024 and ending on 16 August 2024. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of the British Virgin Islands Excess Rainfall policy, and therefore no payout is due to the Government.

2 EVENT DESCRIPTION

On 13 August at 0000UTC, the US National Hurricane Center (NHC) reported that a tropical storm formed in the western tropical Atlantic Ocean, named Ernesto. Its centre was sited near latitude 16.0° North, longitude 58.5° West, about 230 mi (370 km) ESE of Antigua. The system proceeded with estimated forward velocity of 28 mph (44 km/h) westward, along the southern periphery of a strong ridge situated just north of the system over the subtropical Atlantic Ocean. The minimum central pressure was 1009 mb and the maximum sustained winds were estimated at 40 mph (65 km/h).

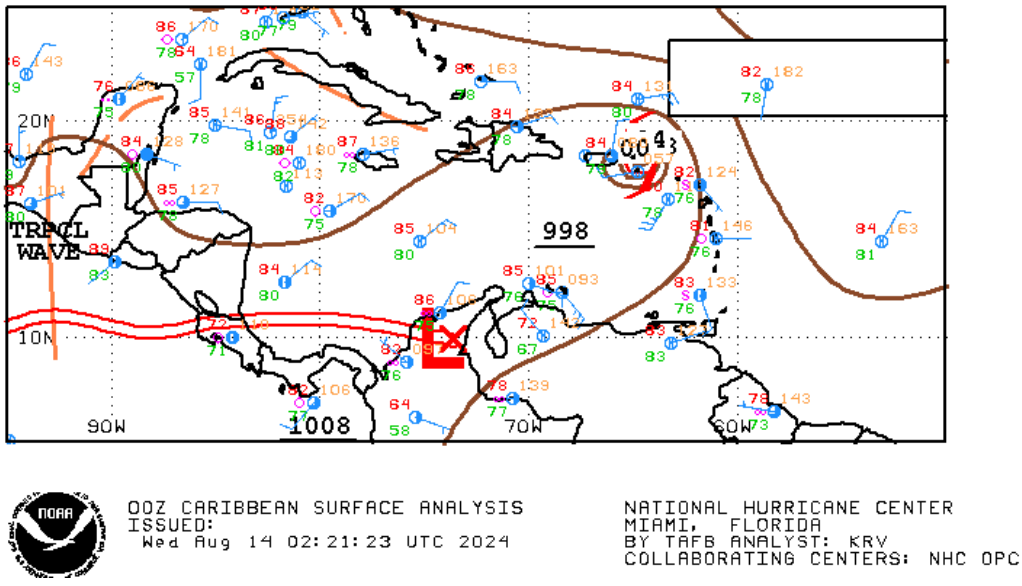
After passing over the Leeward Islands on 13 August as a tropical storm, Ernesto proceeded westward. On 14 August at 0000UTC, Tropical Storm Ernesto crossed the British Virgin Islands, with its centre located near latitude 18.4° North, longitude 64.7° West, about 6 mi (9 km) WSW of Road Town, the capital city (Figures 1 and 2). Scattered to numerous showers associated with the rainbands of the tropical storm began spreading over the territory from the afternoon of 13 August, producing persistent, torrential rainfall.

As Ernesto turned northwestward, it maintained its convective structure, with rainbands continuously affecting the British Virgin Islands with moderate to heavy precipitation until the afternoon of 14 August (Figures 3a and 3b). The system then left the Caribbean Sea and turned toward the north Atlantic Ocean, where environmental conditions supported quicker strengthening. By 1500UTC, Ernesto had become a Category 1 hurricane, with its centre positioned north of Puerto Rico. Although the storm moved further away from the British Virgin Islands on 16 August, an approaching tropical wave brought moisture and instability over the northeastern Caribbean Sea, causing scattered showers. This activity was driven by the interaction between Ernesto’s remnants and the approaching tropical wave, prolonging adverse weather conditions in the region



14 August at 0000UTC

Figure 1. Satellite imagery on 14 August 2024 at 0000 UTC. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, Data and Information Service[1].

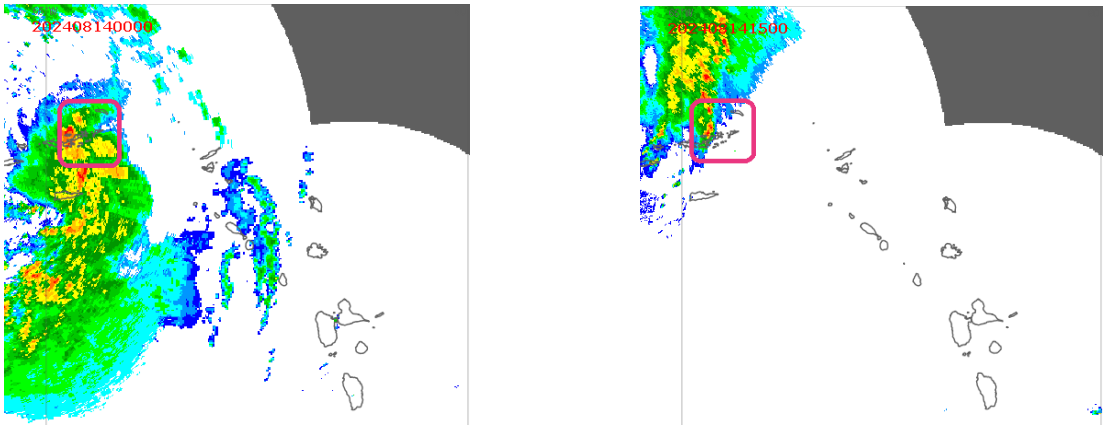


14 August at 0000UTC

Figure 2. Surface analysis over the Caribbean area on 14 August 2024 at 0000UTC. Source: US National Hurricane Center[2]

1 RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifier=al052024

2 National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review dates: 14 August 2024, available at: https://www.nhc.noaa.gov/tafb/CAR_00Z.gif



a) 14 August at 0000UTC b) 14 August at 1500UTC

Figure 3. Radar imagery on 14 August at different times as indicated by the labels from the radar composite over the Caribbean and Central America region. Blue/green colours represent low to moderate rainfall, while the yellow/red colours represent intense and very intense precipitation. A pink square indicates the British Virgin Islands. Source: Barbados Radar Composite[3].

3 REPORTED IMPACTS

At the time of writing this report, local news as BVI News, reported damages in the British Virgin Islands due to this Covered Area Rainfall Event during the indicated period.

During the passage of the Tropical Storm Ernesto, the National Emergency Operation Centre reported rainfall of up to eight inches in some areas, causing downed trees and other damage across the country.[4]

The following images show the weather conditions around the Virgin Islands.

3 Barbados Radar Composite, available on 14 August 2024 at: https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php
4 BVI News: Ernesto left serious damage — Premier (bvinews.com)

Figure 4 Tropical Storm Ernesto brought scattered to moderate to heavy precipitation associated with the rainbands of the tropical storm. / Copyright 2024 BVI News

Figure 5 Flooding in Baughters Bay, Tortola on August 14, 2024. / Photo: Team of Reporters[5]

4 RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15[6], detected the occurrence of precipitation over the British Virgin Islands and the

5 V irgin Islands news online: TS Ernesto pounds VI with heavy rains & winds | Virgin Islands News Online

6 CMORPH Model: the satellite-based rainfall precipitation estimates provided by the NOAA Climate Prediction Center (CPC) using the so-called Morphing Technique *http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html*. Further details are provided in the Definitions section of this report

IMERG Model: The satellite-based rainfall estimation model developed by NASA, expressed in mm, derived by aggregating the IMERG 30-minute Rainfall Data at 10km spatial resolution and available at *https://jsimpsonhttps.pps.eosdis.nasa.gov/imerg/late*. Further details in the Definitions section of this reportWRF5,

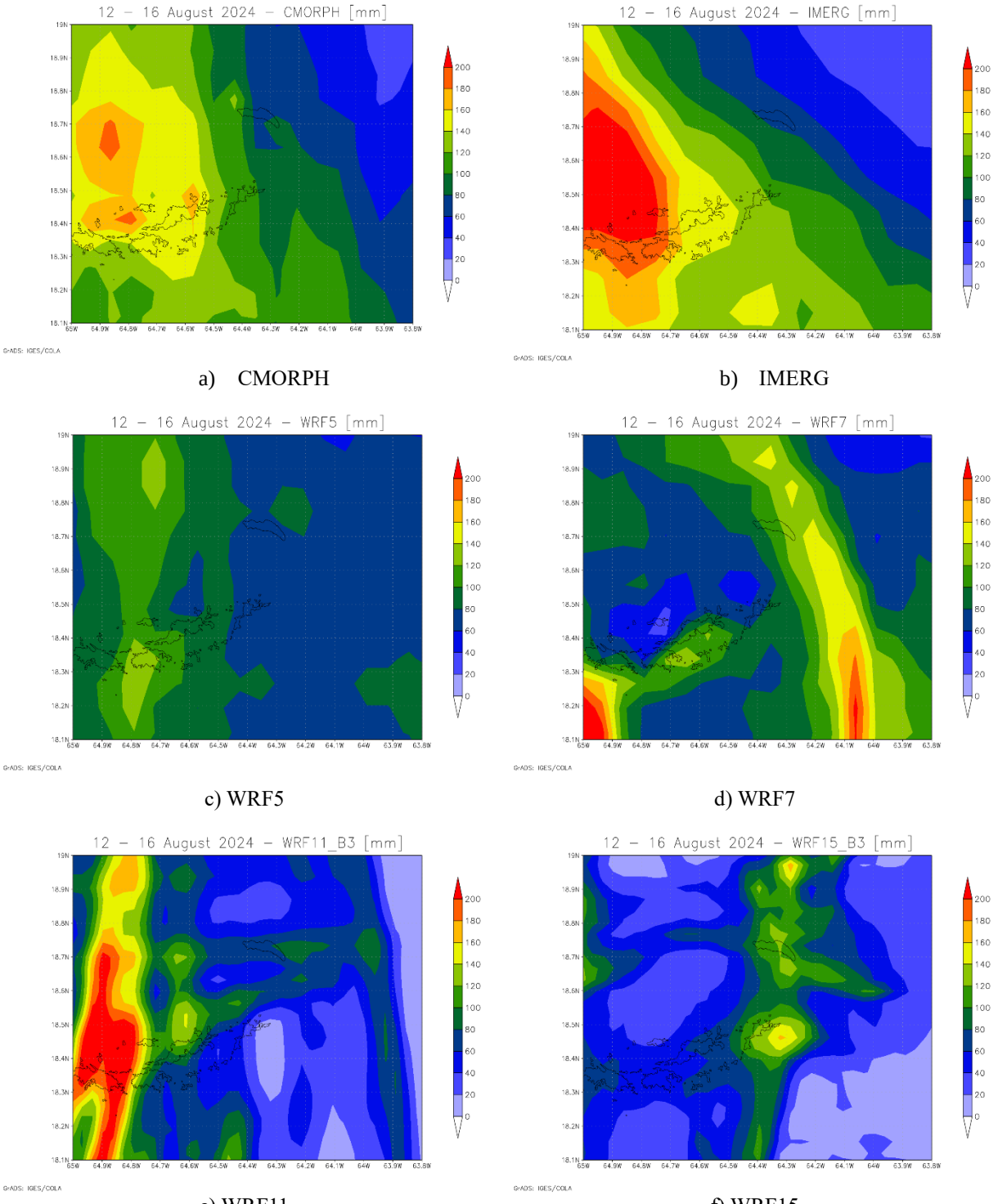
WRF7, WRF11 and WRF15 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data *https://www.mmm.ucar.edu/weather-research-and-forecasting-model*. These data are

surrounding waters during the period 14 to 16 August 2024. However, each data source reported a specific distribution and accumulation of rainfall, as shown in the table below and Figure 5. The CARE for the British Virgin Islands was activated on 14 August and lasted until 16 August. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[7] and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in the British Virgin Islands was 12 to 16 August.

Data Source used by CCRIF XSR Model	Accumulated Values of Precipitation Reported
CMORPH	Total accumulated values of precipitation higher than 80 mm were reported over the entire British Virgin Islands. The maximum values, between 160 mm and 180 mm, were shown over a localized area on the island of Tortola, while the rest of the island reported values exceeding 140 mm. Lower values, between 80 mm and 140 mm, were reported over the islands of Virgin Gorda and Anegada.
IMERG	Total accumulated values of precipitation higher than 180 mm were reported over the island of Jost Van Dyke. On Tortola, values higher than 140 mm were shown, with a localized area in the southwest showing values between 160 mm and 180 mm. Precipitation values between 100 mm and 140 mm were reported on Virgin Gorda, while lower values, below 80 mm were reported on Anegada.
WRF5	Total accumulated values of precipitation between 80 mm and 120 mm were reported over the islands of Jost Van Dyke and Tortola, while lower values were reported in the rest of the country.
WRF7	Total accumulated values of precipitation between 80 mm and 140 mm were reported over both Anegada and the southeastern part of Tortola. Lower values, between 20 mm and 100 mm, were shown over the remainder of the country.
WRF11	Total accumulated values of precipitation higher than 80 mm were reported over Tortola and Jost Van Dyke, with the latter showing values between 140 mm and 200 mm in the western part. Lower accumulated values were reported across the rest of the country.
WRF15	Total accumulated values greater than 100 mm were reported over the islands of Virgin Gorda and Anegada, while accumulated values below 80 mm were reported over the rest of the country.

initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [*http://rda.ucar.edu/datasets/ds083.2/*]). Further details are provided in the Definitions section of this report.

7 The two aggregation periods correspond to the Rainfall Aggregation Period #1 and Rainfall Aggregation Period #2, as indicated in the Schedule. Further details in the Definitions section of this report.



a) CMORPH

b) IMERG

c) WRF5

d) WRF7

e) WRF11

f) WRF15

Figure 6. Total accumulated precipitation during the period 12-16 August, 2024 estimated by CMORPH (a), IMERG (b), WRF5 (c), WRF7 (d), WRF11 (e), WRF15 (f). Source: CCRIF SPC

Daily rainfall maps by CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15 over the exposure map of XSR 3.0 are not included here and they can be downloaded at the following links for 24-hour aggregation and 48-hour aggregation respectively:

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/VGB/CARE_2_2024/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/VGB/CARE_2_2024/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for the British Virgin Islands' Excess Rainfall policy for four of the data sources used by XSR3.0: CMORPH, IMERG, WRF5 and WRF7. The RIL is the highest for WRF7.

The final RIL (RIL_{FINAL}) was calculated as the average of the four RILs above the threshold: CMORPH, IMERG, WRF5, and WRF7. The RIL_{FINAL} was below the attachment point of the Excess Rainfall policy for the British Virgin Islands, and therefore the policy was not triggered. Therefore, the Government of the British Virgin Islands is not due a payout under its Excess Rainfall policy for this event.

The Wet Season Trigger (WST) endorsement of the XSR3.0 model did not identify this CARE as a "Wet Season" event[8]. Therefore, no payout is due under the Wet Season Trigger endorsement of the Excess Rainfall policy for the British Virgin Islands.

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) for the British Virgin Islands was below the attachment point of the Excess Rainfall policy, and therefore no payout is due. This CARE did not activate the Wet Season Trigger endorsement of the Excess Rainfall policy and therefore no payout under this endorsement is due.

For additional information, please contact CCRIF SPC at: pr@ccrif.org

8 The WST endorsement is designed to provide a predetermined payout for rainfall events occurring amidst already saturated soil conditions, effectively capturing the heightened risk of flooding and landslides. It is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and Wet Periods (the period of time where the Wet Index exceeds 1, which indicates that the soil is wetter than its long-term average and serves as an indicator of soil saturation). The WST policy endorsement provides a payment when one or more CAREs with a modelled loss greater than zero occur within a Wet Period and the corresponding value of the Wet Index during the Wet Period exceeds a predetermined threshold.

DEFINITIONS

Active Exposure Cell Percentage Threshold	The percentage of the total number of XSR Exposure Grid Cells within the Covered Area of the Insured, that must be exceeded to trigger a Covered Area Rainfall Event.
Active Exposure Grid Cells	The XSR Exposure Grid Cells for which in the same single day the Aggregate Rainfall #1 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #1 or the Aggregate Rainfall #2 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #2.
Aggregate Rainfall #1	The rainfall amount accumulated over the Rainfall Aggregation Period #1 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #1 of n hours, the Aggregate Rainfall #1 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Aggregate Rainfall #2	The rainfall amount accumulated over the Rainfall Aggregation Period #2 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #2 of n hours, the Aggregate Rainfall #2 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Calculation Agent	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
CMORPH-based Maximum Aggregate Rainfall #1	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #1 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
CMORPH-based Maximum Aggregate Rainfall #2	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #2 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
CMORPH-based Covered Area Rainfall Parameters	The CMORPH Model information provided on a continuous basis by the XSR Model Data Reporting Agency used by the

	Calculation Agent to obtain the CMORPH-based Rainfall Estimates using the XSR Rainfall Model. Parameters are drawn from XSR Exposure Grid Cells within the Covered Area of the Insured, by their respective latitude and longitude. Measurement units and precision of data ingested by the XSR Rainfall Model are identical to those provided by the XSR Model Data Reporting Agency and are further elaborated in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
CMORPH Model	The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.
Covered Area	The territory of the Insured as represented in the XSR Rainfall Model.
Covered Area Rainfall Event	Any period of days, with an interruption less than or equals to the Event Tolerance Period, during which the number of Active Exposure Grid Cells is greater than or equal to the product of (a) Active Exposure Cell Percentage Threshold multiplied by (b) the total number of XSR Exposure Grid Cells within the Covered Area.
Country Disaster Alert	An official disaster alert issued by ReliefWeb (*http://reliefweb.int/*) for the country in question for one of the following types of events: tropical cyclone, flood, flash flood and severe local storm. Any disaster alert issued later than seven (7) days after the completion of the Covered Area Rainfall Event (CARE) event will not be considered. The Disaster Alert description issued by ReliefWeb and/or its attached documentation must include specific reference to the CARE dates with a tolerance period of 2 calendar days.
Maximum Aggregate Rainfall #1	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #1 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Maximum Aggregate Rainfall #2	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #2 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Rainfall Event Threshold #1	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

Rainfall Event Threshold #2	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
Rainfall Aggregation Period #1	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Aggregation Period #2	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Index Loss	For any Covered Area Rainfall Event affecting the Insured, the US Dollar loss calculated by the Calculation Agent using the XSR Rainfall Model, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'. The Rainfall Index Loss can only be calculated once the Covered Area Rainfall Event is completed.
WRF5 Model	The weather research and forecasting rainfall model by NOAA with Configuration #5 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
WRF7 Model	The weather research and forecasting rainfall model by NOAA with Configuration #7 data initialized with and assimilating the data provided by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of this Attachment.
XSR Rainfall Model	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'.
XSR Exposure Grid Cells	The 30 arc-second by 30 arc-second grid of cells each of which is attributed with an XSR Grid Cell Exposure Value greater than zero.
XSR Grid Cell Exposure Value	The value, used to calculate the CMORPH-based Exposure Grid Cell Loss, the WRF5-based Exposure Grid Cell Loss, and the WRF7-based Exposure Grid Cell Loss.