



# Covered Area Rainfall Event (10/11/2022 to 10/11/2022)

## Excess Rainfall

### Event Briefing

## The Bahamas - Extreme North

**17 November 2022**

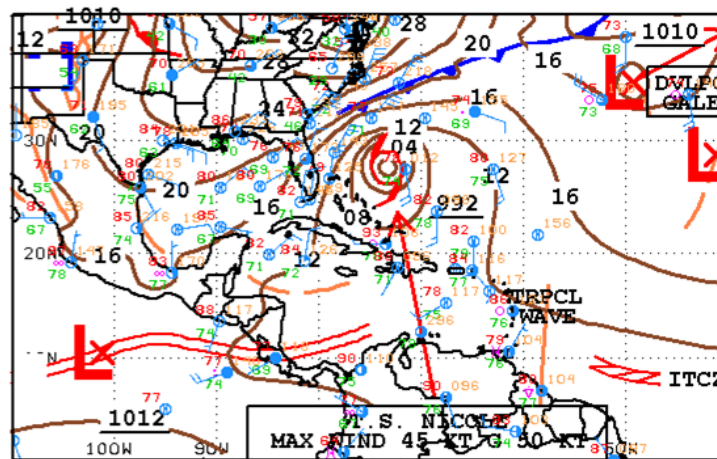
## 1 INTRODUCTION

The Bahamas was affected by Tropical Cyclone Nicole, resulting in adverse weather conditions from 8 to 10 November, 2022. During this period, the heaviest rainfall occurred particularly over the extreme northern area.

This event briefing describes the impact of rainfall covered by The Bahamas' Excess Rainfall policy for the Extreme North<sup>1</sup>, which was associated with a Covered Area Rainfall Event (CARE), starting and ending on 10 November 2022. The Rainfall Index Loss (RIL) was below the attachment point of The Bahamas - Extreme North excess rainfall policy and therefore no payout is due.

## 2 EVENT DESCRIPTION

On 8 November at 1500 UTC, the US National Hurricane Center (NHC) indicated that the subtropical storm Nicole, which formed northeast of The Bahamas, became a tropical storm. Its centre was approximately sited near latitude 27.8° North, longitude 72.7° West, about 350 mi (560 km) NE of the northwestern Bahamas (Figure 1). The maximum sustained winds were estimated at 50 mph (85 km/h) and the minimum central pressure was 994 mb. The system then strengthened gradually but steadily, on one side favoured by the warm sea surface temperature in the vicinity of The Bahamas (about 27 to 28°C) and on the other side hindered by the intrusion of dry air into the circulation.



18Z SOUTHWEST NORTH ATLANTIC SFC ANALYSIS NATIONAL HURRICANE CENTER  
ISSUED: MIAMI, FLORIDA  
Tue Nov 8 20:40:07 UTC 2022 BY TAFB ANALYST: AREINHART  
COLLABORATING CENTERS: NHC OPC

8 November at 1800UTC

<sup>1</sup> The Government of Bahamas has four excess rainfall policies: one for The Bahamas Central; one for The Bahamas Extreme North; one for The North and one for The Bahamas South East. This heavy rainfall, did not affect the Central, North and South East areas.

Figure 1 Surface analysis over the Caribbean area on 8 November 2022 at 1800UTC. Source: US National Hurricane Center<sup>2</sup>

On 9 November at 0600 UTC, tropical storm conditions spread across the northwestern Bahamas, with the first showers associated with Nicole’s rainbands affecting these islands intermittently. At this time, Nicole’s centre was located near latitude 26.9° North, longitude 75.4° West, about 110 mi (180 km) ENE of Great Abaco Island, The Bahamas. The minimum central pressure was 985 mb and the maximum sustained winds were estimated at 70 mph (110 km/h).

Afterwards, Nicole steered west-southwestward due to a deep-layer ridge over the southeastern United States, thus heading for the northwestern Bahamas. While approaching The Bahamas, the precipitation associated with Nicole gradually intensified over the northwestern Bahamas and at 1800UTC, it became moderate to heavy (Figure 2a). At this time, the centre of Tropical Storm Nicole made landfall on Great Abaco Island, The Bahamas, with almost unchanged intensity.

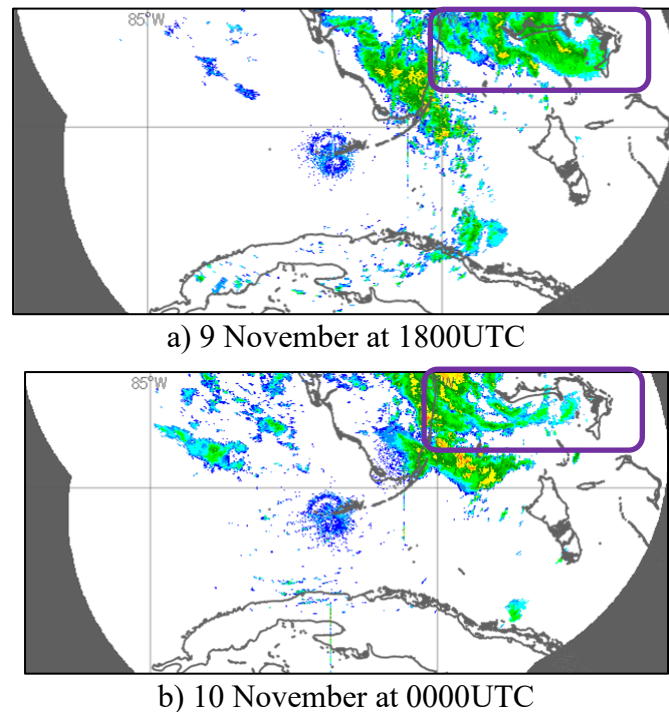


Figure 2. Radar imagery on 9 and 10 November at different times as indicated in the labels, from the radar composite over the Caribbean region. Blue/green colours represent low to moderate rainfall, while the yellow/red colours represent intense and very intense precipitation. The purple square highlights the location of The Bahamas – Extreme North. Source: Barbados Radar Composite<sup>3</sup>.

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<sup>2</sup>National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 8 November 2022, available at: [https://www.nhc.noaa.gov/tafb/CAR\\_18Z.gif](https://www.nhc.noaa.gov/tafb/CAR_18Z.gif)

<sup>3</sup> Barbados Radar Composite, available on 9 and 10 November at: [https://www.barbadosweather.org/BMS\\_Radar\\_Composite\\_Resp.php#](https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php#)

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During the next 6 hours, the rainfall intensity persisted over northwestern Bahamas (Figure 2b). In the meanwhile, at 2300 UTC, Nicole made landfall on Grand Bahama. The high oceanic heat content in the vicinity of The Bahamas favoured the intensification of the system and the NHC reported that Nicole was upgraded to a Category 1 hurricane. Nicole had a large eye of 57 mi (92km) in diameter, with curved bands of convection wrapped around much of the circulation (Figure 3).

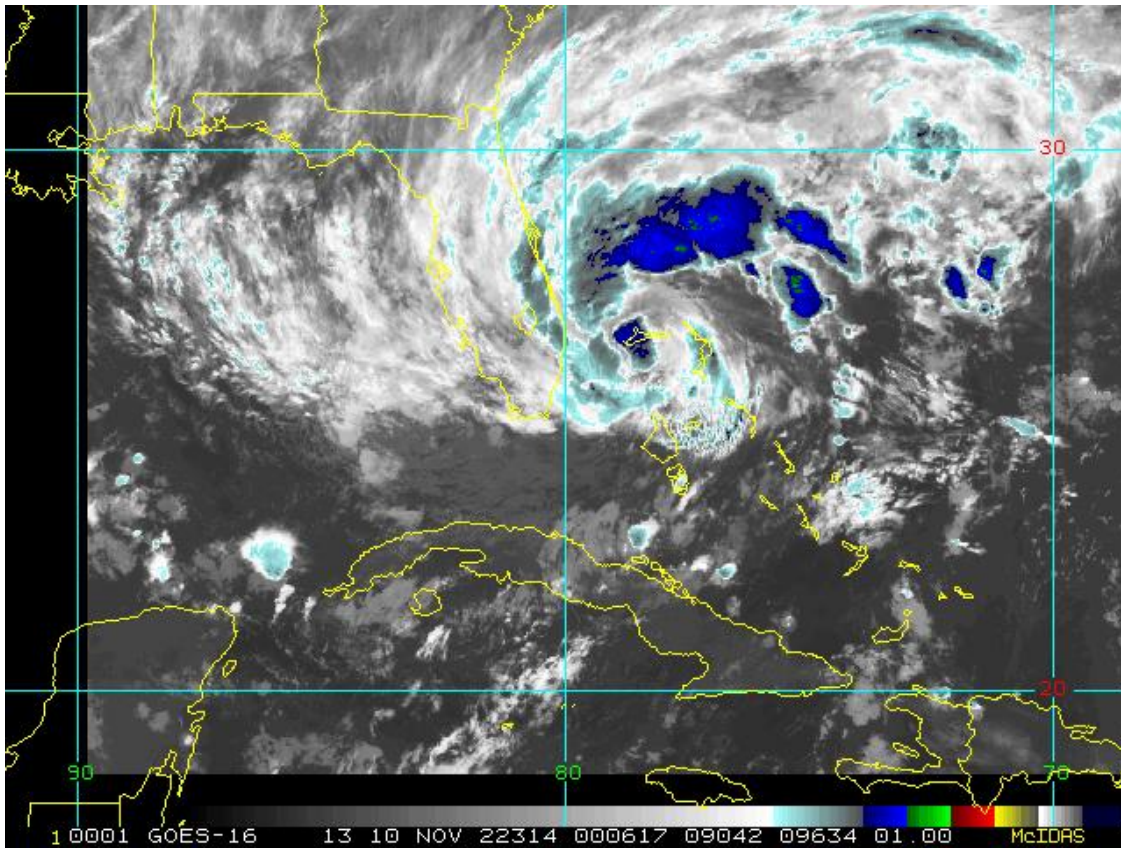


Figure 3 Satellite imagery on 10 November 2022 at 0000UTC from thermal infrared channel enhanced with colour. Blue/green colours represent high altitude clouds (top cloud temperature between  $-50^{\circ}\text{C}$  and  $-70^{\circ}\text{C}$ ), while the red/yellow colours represent very high altitude clouds (top cloud lower than  $-70^{\circ}\text{C}$ ). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, Data and Information Service<sup>4</sup>.

While passing over the northwestern Bahamas, Nicole moved towards the north-northwest, as it proceeded along the southwestern periphery of the high pressure system located over the southern United States, and during the following hours, Nicole moved away from The Bahamas toward the Florida coast, United States. From 10 November at 0000UTC, the precipitation intensity over northwestern Bahamas gradually decreased and completely ceased at about 0600UTC, while

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<sup>4</sup>RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: [https://rammb-data.cira.colostate.edu/tc\\_realtime/storm.asp?storm\\_identifier=al172022](https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifier=al172022)

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Nicole was nearing the Florida coast. After landfall on Florida, Nicole lost intensity while crossing the United States inland, and dissipated on 11 November over Georgia, United States.

### 3 IMPACTS

At the time of writing this event briefing, according to CDEMA<sup>5</sup>, Eleuthera, Abaco, New Providence and Bimini suffered minimal damage and some flooding. Also, regional media reported extensive flooding, downed trees and power and water outages in the archipelago's northwest region<sup>6</sup>.

### 4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH<sup>7</sup>, WRF5 and WRF7<sup>8</sup>, detected the occurrence of precipitation over area covered by The Bahamas - Extreme North excess rainfall policy and the surrounding waters during the period of 8 to 10 November 2022. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below. The CARE for The Bahamas - Extreme North was activated on 10 November and lasted for one day. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation<sup>9</sup> and thus the period considered by the XSR 2.5 model for the loss estimate based on the accumulated precipitation in The Bahamas - Extreme North was 8 - 10 November.

CMORPH reported total accumulated amounts of precipitation higher than 60 mm over most of The Bahamas - Extreme North. Over Grand Bahama, values increased from west to east ranging between 40 mm and 100 mm. Over Great Abaco, the maximum values, between 100 mm and 140 mm, were shown over the central portion of the island, while values between 40 mm and 100 mm were reported over the rest of the island.

WRF5 showed total accumulated values of precipitation ranging between 40 mm and 100 mm over Grand Bahama, increasing from the west to the east of the island. Over Great Abaco, the reported total accumulated rainfall values were higher than 100 mm over the northern portion of the island, with a maximum between 160 mm and 180 mm, while they ranged between 40 mm and 100 mm over the southern part of the island.

WRF7 simulated total accumulated values of rainfall with a similar geographical pattern as

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<sup>5</sup> [FINAL - CDEMA Situation Report Hurricanes Nicole & Lisa - Trough System\\_14 Nov 2022.pptx](#)

<sup>6</sup> [Hurricane Nicole forces hundreds to flee homes in Bahamas, heads toward Florida | CBC News](#)

<sup>7</sup> 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](http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html). Further details in the Definitions section of this report.

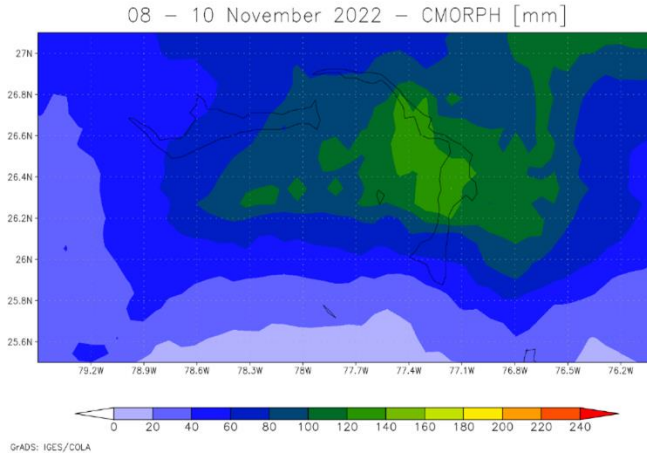
<sup>8</sup> WRF5 and WRF7 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data <https://www.mmm.ucar.edu/weather-research-and-forecasting-model>. These data are initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [<http://rda.ucar.edu/datasets/ds083.2/>]). Further details in the Definitions section of this report.

<sup>9</sup> 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.

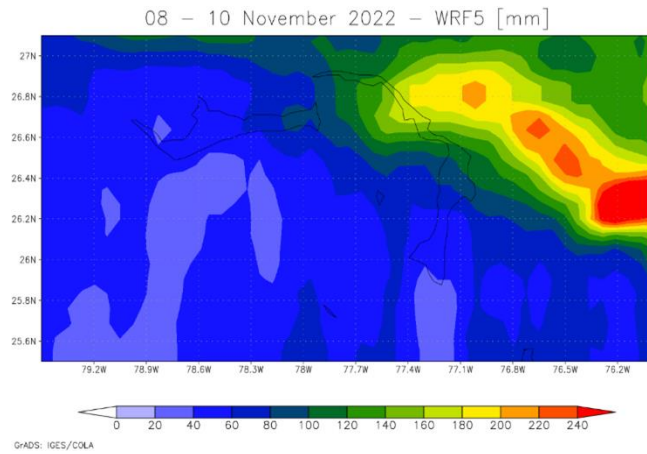
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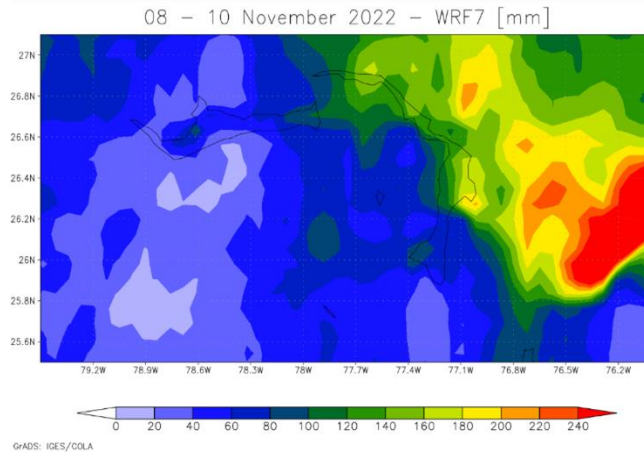
that of WRF5. The reported values were slightly lower over Grand Bahama (ranging between 20 mm and 100 mm), while over Great Abaco the area interested by total accumulation values higher than 100 mm was more extended, including both the north and the central sectors of the island.



a) CMORPH



b) WRF5



c) WRF7

Figure 4 Total accumulated precipitation during the period 8-10 November, 2022 estimated by CMORPH (a), WRF5 (b) and WRF7 (c). Source: CCRIF SPC

Daily rainfall maps by CMORPH, WRF5 and WRF7 over the exposure map of XSR 2.5 are not included here and they can be downloaded at the following links for 12-hour aggregation and 48-hour aggregation respectively:

[https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS\\_EN/CARE\\_2\\_2022/daily\\_prec\\_short.mp4](https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS_EN/CARE_2_2022/daily_prec_short.mp4)

[https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS\\_EN/CARE\\_2\\_2022/daily\\_prec\\_long.mp4](https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/BHS/BHS_EN/CARE_2_2022/daily_prec_long.mp4)

The Rainfall Index Loss (RIL) was above the loss threshold for The Bahamas -Extreme North area for all the data sources used by XSR2.5, with a similar RIL for all the three data sources.

The final RIL ( $RIL_{FINAL}$ ) was calculated as the average of the RILs from CMORPH, WRF5 and WRF7. The  $RIL_{FINAL}$  was greater than zero and therefore this CARE qualified as a loss event. However, the  $RIL_{FINAL}$  was below the attachment point of The Bahamas - Extreme North excess rainfall policy and therefore it did not trigger a policy payout.

## 5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for this Covered Area Rainfall Event (CARE) was below the attachment point of The Bahamas - Extreme North Excess Rainfall policy and therefore no payout is due.

For additional information, please contact CCRIF SPC at: [pr@ccrif.org](mailto:pr@ccrif.org)

## DEFINITIONS

<b><i>Active Exposure Cell Percentage Threshold</i></b>	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.
<b><i>Active Exposure Grid Cells</i></b>	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.
<b><i>Aggregate Rainfall #1</i></b>	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.
<b><i>Aggregate Rainfall #2</i></b>	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.
<b><i>Calculation Agent</i></b>	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
<b><i>CMORPH-based Maximum Aggregate Rainfall #1</i></b>	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.
<b><i>CMORPH-based Maximum Aggregate Rainfall #2</i></b>	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.
<b><i>CMORPH-based Covered Area Rainfall Parameters</i></b>	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

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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.

<b><i>Rainfall Aggregation Period #1</i></b>	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<b><i>Rainfall Aggregation Period #2</i></b>	The number of hours over which the Aggregate Rainfall #2 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
<b><i>Rainfall Index Loss</i></b>	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.
<b><i>WRF5 Model</i></b>	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.
<b><i>WRF7 Model</i></b>	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.
<b><i>XSR Rainfall Model</i></b>	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’.
<b><i>XSR Exposure Grid Cells</i></b>	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.
<b><i>XSR Grid Cell Exposure Value</i></b>	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.