



Covered Area Rainfall Event (05/11/2022 – 07/11/2022)

Excess Rainfall

Event Briefing

British Virgin Islands

16 November 2022

1 INTRODUCTION

This event briefing describes the impact of rainfall in the British Virgin Islands, which was associated with a Covered Area Rainfall Event (CARE), starting on 5 November and ending on 7 November 2022. The Rainfall Index Loss (RIL) was below the attachment point of The Virgin Islands' excess rainfall policy and therefore no payout is due.

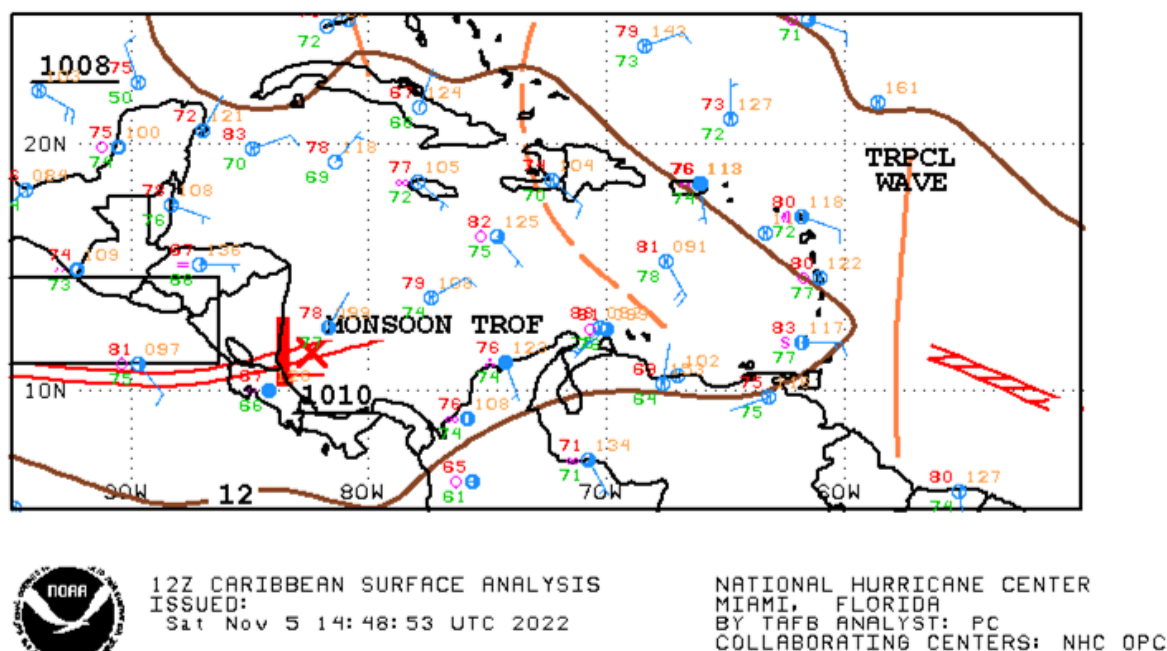
2 EVENT DESCRIPTION

On 5 November, a surface trough extended from the southeastern Bahamas across Hispaniola into the Caribbean Sea to near latitude 12° North and longitude 68° West (Figure 1a). Moreover, the presence of wind divergence in the upper levels resulted in a large area of scattered showers and isolated thunderstorms east of the trough axis, which extended from latitude 15° to 20° North and from longitude 63° to 70° West. On the same day at 1800UTC, under the effect of the wind divergence aloft, a low pressure system developed within the surface trough. This yielded to an intensification of the convection activity on the same broad area, in particular over Puerto Rico and the Leeward Islands, where thunderstorms and heavy rainfall were observed starting from 1800UTC for 12 hours (Figure 2a and Figure 3).

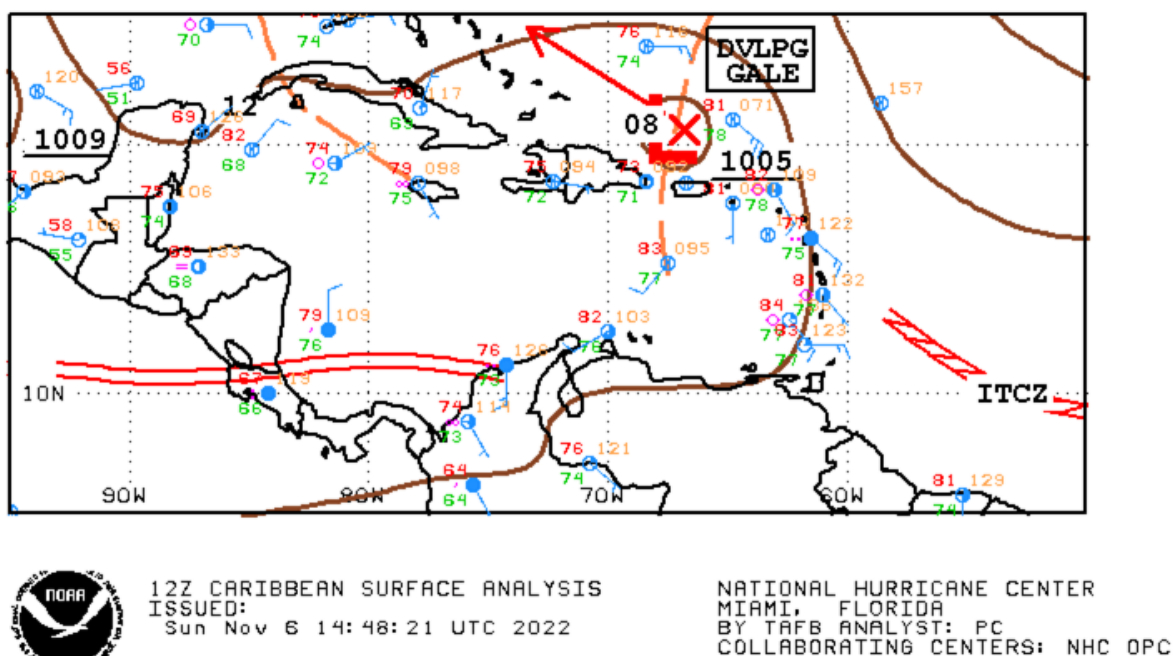
On 6 November, the low pressure system that was initially located SE of Hispaniola moved north-northeastward, crossing the Mona Passage and at 1800UTC, it was sited about 160 mi (257 km) N of Puerto Rico (Figure 1b). It presented an estimated minimum pressure of 1005 mb. During the first six hours of 6 November, heavy precipitation was still ongoing over the Leeward Islands (Figure 2b), and then ceased, due to the shift of the low pressure system into the southwestern Atlantic Ocean.

On 7 November, the low pressure system became gradually better organized, developing into a subtropical storm and it was named Nicole. At 0900UTC, the NHC started to monitor the storm, since it presented the potential to acquire tropical characteristics and to transform into a tropical storm. With the development of Nicole over the southwestern north Atlantic Ocean, a broad low pressure system prevailed over the northern Caribbean, without any significant precipitation event over the Leeward Islands during the first half of the day. Afterwards, starting from 1200UTC, the activation of convergent southerly winds toward Subtropical Storm Nicole produced scattered showers and isolated thunderstorms over the northeastern Caribbean Basin in a large band, including Puerto Rico, the Virgin Islands and the Leeward Islands. Moderate to locally heavy precipitation affected the British Virgin Islands and the northern Leeward Islands from 1200UTC to 8 November at 0000UTC (Figure 2c).

On the next day, 8 November, Nicole transformed into a tropical storm and moved toward northwestern Bahamas, while the area of disturbed weather moved out of the northeastern Caribbean Basin.



a) 5 November at 1200UTC



b) 6 November at 1200UTC

Figure 1 Surface analysis over the Caribbean Sea on 5 and 6 November 2022 at 1200UTC as indicated in the label.
Source: US National Hurricane Center¹

¹ National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, available on 5-6-7 November 2022 at: https://www.nhc.noaa.gov/tafb/CAR_12Z.gif

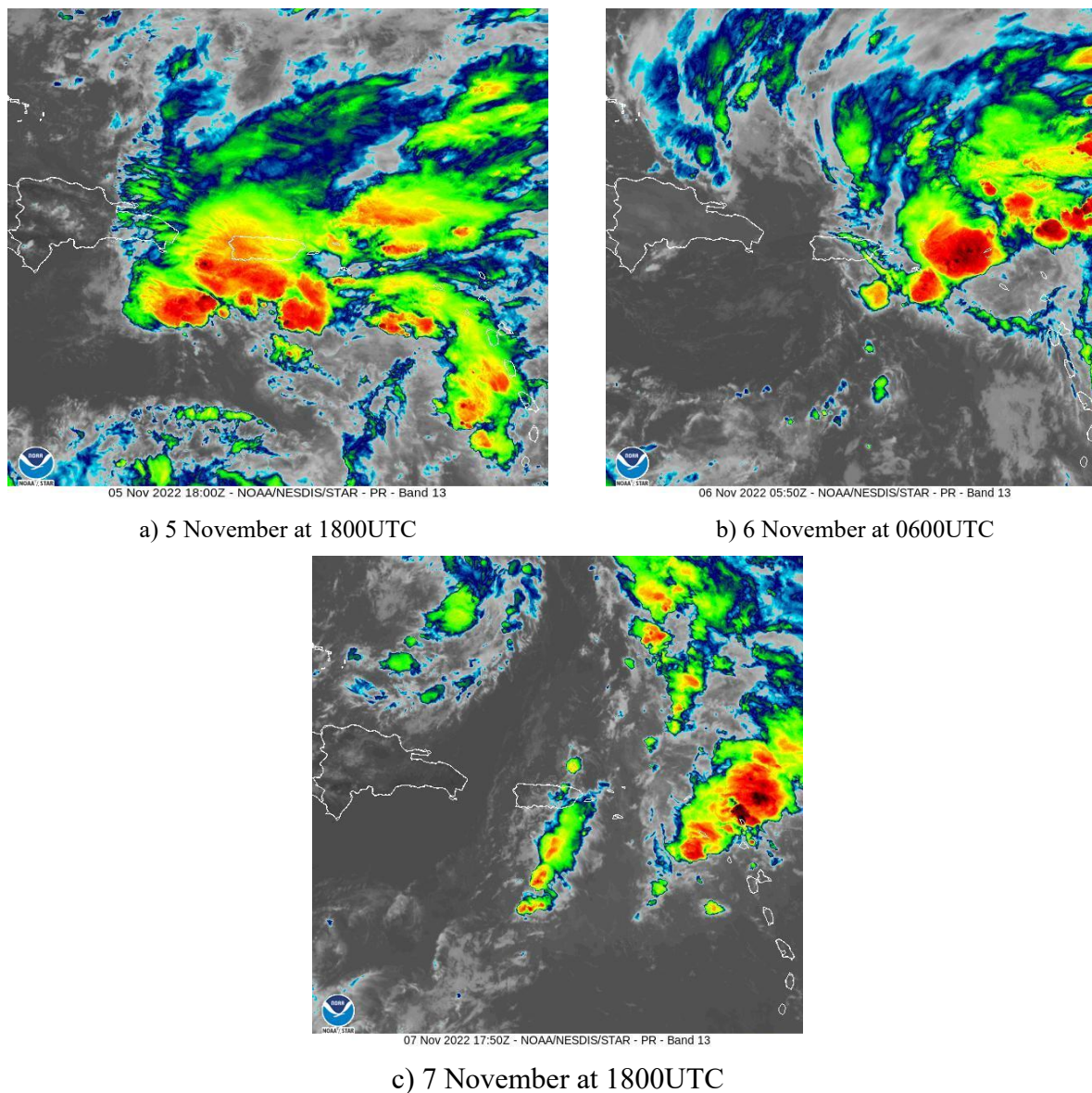
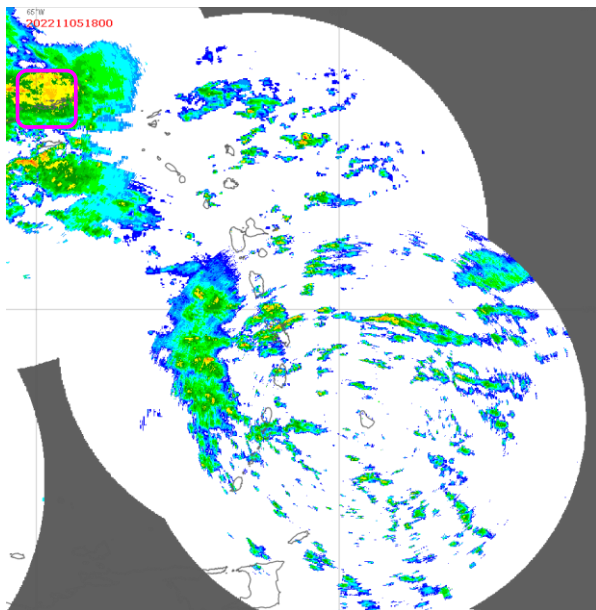
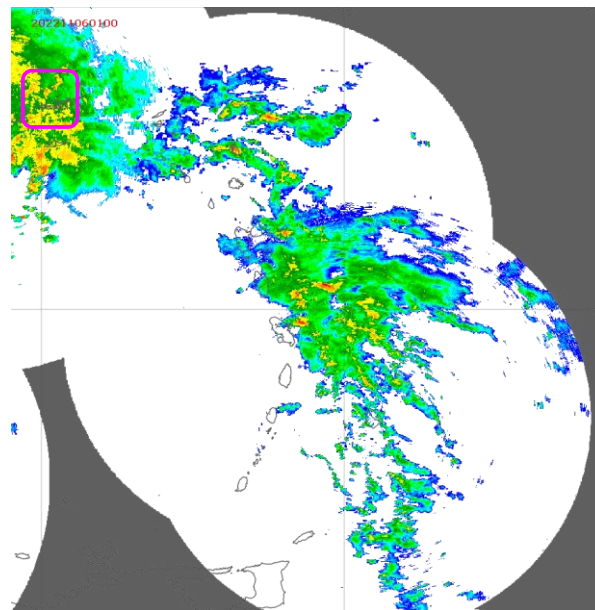


Figure 2 Satellite imagery at different times as indicated by the labels, from thermal infrared channel enhanced with colour. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, GOES Image View2.

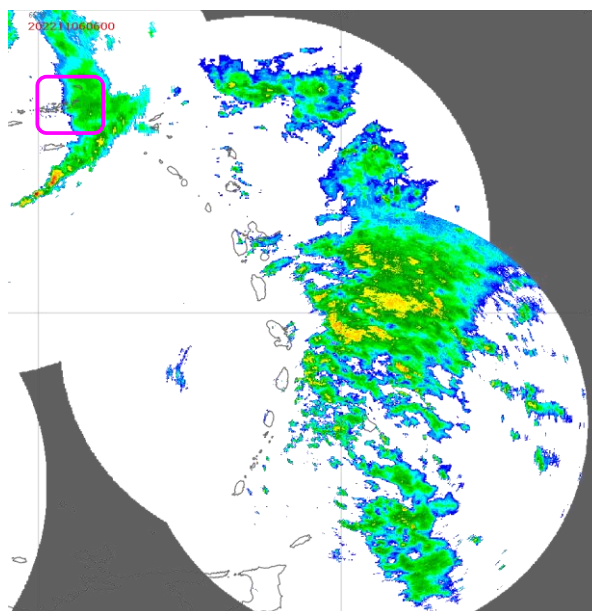
² NESDIS Online Archive, NOAA National Environmental Satellite, GOES Image View, available at: <https://www.star.nesdis.noaa.gov/GOES/sector.php?sat=G16§or=cam>



a) 5 November at 1800UTC



b) 6 November at 0000UTC



c) 6 November at 0600UTC

Figure 3 Radar imagery on 5 and 6 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 British Virgin Islands. Source: Barbados Radar Composite³.

³ Barbados Radar Composite, available on 5 and 6 November at:
https://www.barbadosweather.org/BMS_Radar_Composite_Resp.php#

3 IMPACTS

At the time of writing this event brief and according to local news⁴, floods and sporadic landslides occurred in the islands of Tortola and Jost Van Dyke. In Jost Van Dyke, the heavy rainfall resulted in flooding of low-lying areas across the territory and damaged roads, particularly between Little Harbour and White Bay.



Figure 4 Flooded yard in Towers, Tortola (figure at the left), flooded road in Jost Van Dyke (figure at the right)⁴

4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH⁵, WRF5 and WRF7⁶, detected the occurrence of precipitation over the British Virgin Islands and the surrounding waters during the period of 5 to 7 November 2022. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below. The CARE for the British Virgin Islands was activated on 5 November and lasted for the period 5-7 November 2022. The CARE was activated due to the use of the 12-hour and 48-hour aggregation intervals for precipitation⁷ and thus the period considered by the XSR 2.5 model for the loss estimate based on the accumulated precipitation in the British Virgin Islands was 3-7 November.

CMORPH reported total accumulated values of precipitation between 120 mm and 140 mm over most of the British Virgin Islands. Lower values, between 100 mm and 120 mm, were

⁴ [Heavy rainfall drenches VI; Damages roads & pipeline in JvD | Virgin Islands News Online](#)

⁵ 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 in the Definitions section of this report.

⁶ 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.

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.

shown over the western portion of Anegada.

WRF5 showed total accumulated values of precipitation higher than 100 mm over the islands of Tortola and Virgin Gorda, with a maximum between 120mm and 140mm over the eastern edge of Tortola. Lower values, between 80 mm and 100 mm, were shown on Anegada.

WRF7 simulated total accumulated values of rainfall higher than 100 mm over most of the British Virgin Islands. The maximum values, between 140 mm and 160 mm, were reported on Anegada, in the north of the country. Lower values, between 120 mm and 140 mm, were shown over most of Virgin Gorda, with a peak between 140 mm and 160 mm on the eastern edge of the island. Over the southernmost island Tortola, the precipitation values varied between 80 mm and 140 mm, with the highest values in the east of the island.

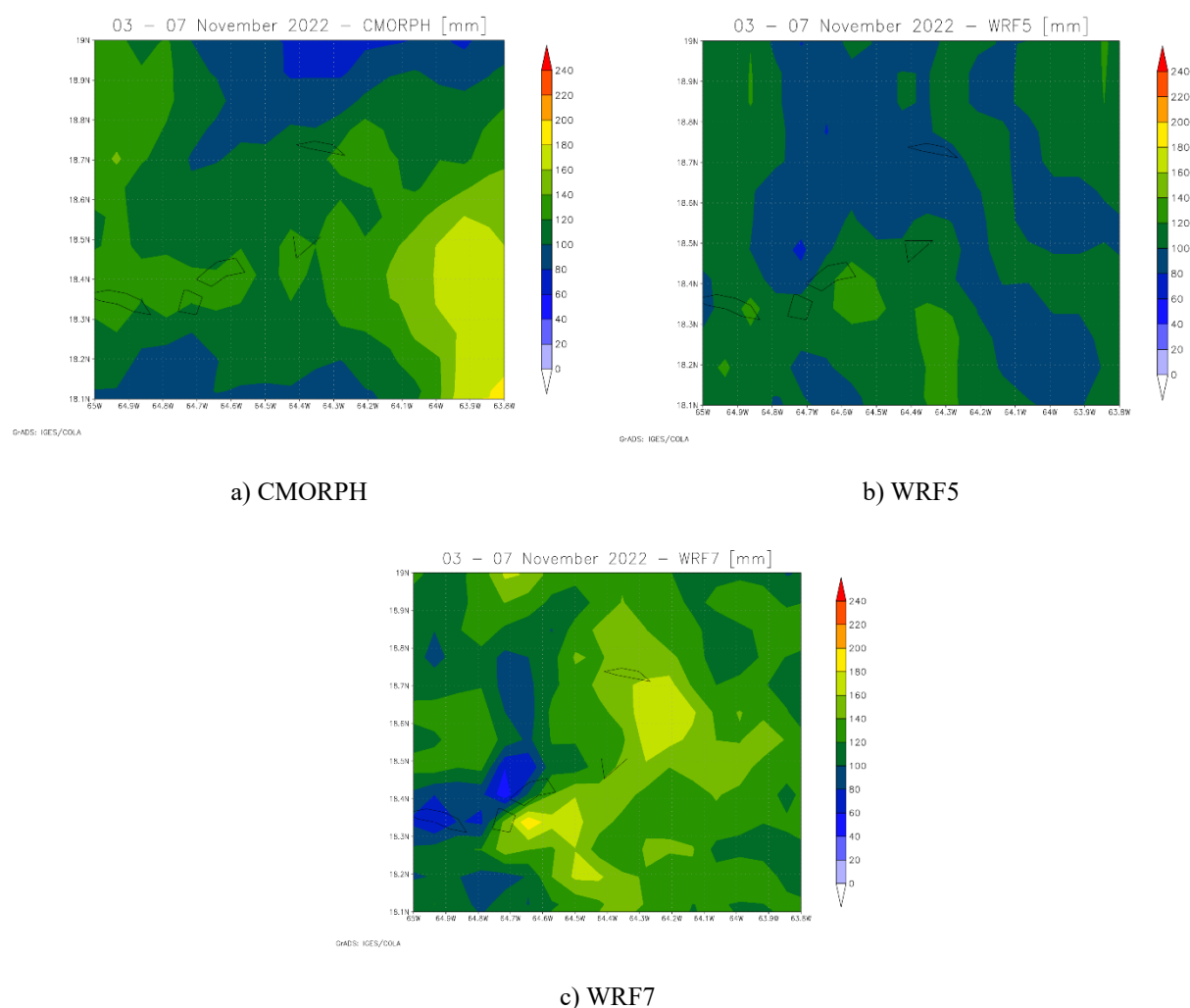


Figure 5 Total accumulated precipitation during the period 3 -7 November, 2022 estimated by CMORPH (a), WRF5 (b) and WRF7 (c). Source: CCRIF SPC

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/VGB/CARE_4_2022/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/VGB/CARE_4_2022/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for the British Virgin Islands for two of data sources used by XSR2.5: CMORPH and WRF7. The RIL was the highest for CMORPH, due to the larger amount of accumulated precipitation presented in the vicinity of the capital, Road Town, the area characterized by the highest exposure for the British Virgin Islands.

The final RIL (RIL_{FINAL}) was calculated as the average of the RILs from CMORPH 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 British Virgin Islands' 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) for the British Virgin Islands was below the attachment point of the country's Excess Rainfall policy and therefore no payout is due.

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

DEFINITIONS

<i>Active Exposure Cell Percentage Threshold</i>	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.
<i>Active Exposure Grid Cells</i>	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.
<i>Aggregate Rainfall #1</i>	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.
<i>Aggregate Rainfall #2</i>	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.
<i>Calculation Agent</i>	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
<i>CMORPH-based Maximum Aggregate Rainfall #1</i>	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.
<i>CMORPH-based Maximum Aggregate Rainfall #2</i>	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.
<i>CMORPH-based Covered Area Rainfall Parameters</i>	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’.
<i>CMORPH Model</i>	The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.
<i>Covered Area</i>	The territory of the Insured as represented in the XSR Rainfall Model.
<i>Covered Area Rainfall Event</i>	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.
<i>Country Disaster Alert</i>	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.
<i>Maximum Aggregate Rainfall #1</i>	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.
<i>Maximum Aggregate Rainfall #2</i>	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.
<i>Rainfall Event Threshold #1</i>	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
<i>Rainfall Event Threshold #2</i>	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

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