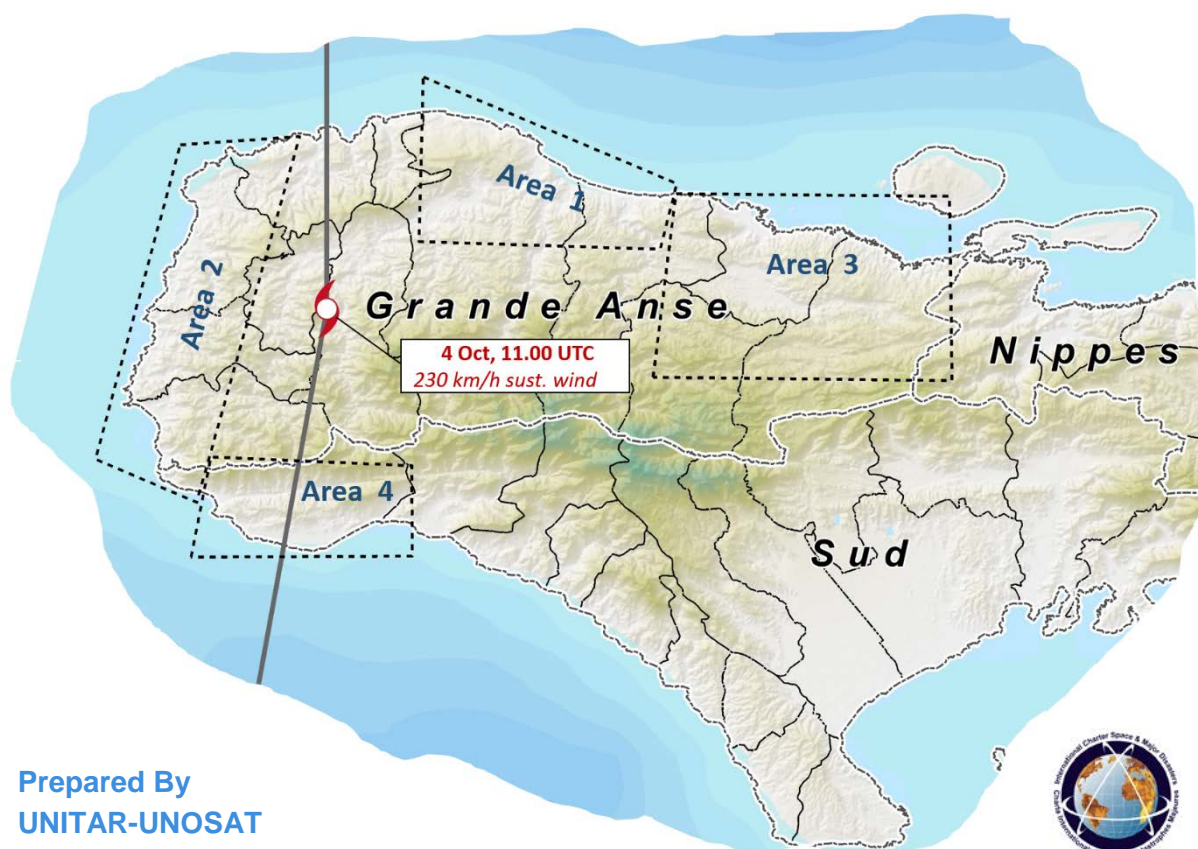


# Hurricane Matthew Preliminary Satellite Based Damage Assessment Report: Grand South departments (Grand'Anse, South and Nippes), Haiti

Update 1 (as of 18 Oct. 2016): Area 1 & Area 2



Prepared By  
UNITAR-UNOSAT

**UNOSAT Contact:**  
Email: [unosat@unitar.org](mailto:unosat@unitar.org)  
T: +41 22 767 4020 (UNOSAT Operations)  
24/7 hotline: +41 75 411 4998

**Postal Address:**  
UNITAR – UNOSAT, IEH  
Chemin des Anémones 11,  
CH-1219, Genève, Suisse



## Overview

The first Category 5 Atlantic Hurricane since 2007, Hurricane Matthew caused widespread destruction along its wake in several countries including Lesser Antilles, Jamaica, Haiti, Cuba, the Bahamas and the United States. Formed near the Windward Islands on 28 September 2016, the hurricane continued over the Caribbean resulting in catastrophic damages including loss of human lives and an estimated overall damage of over 5 Billion USD.

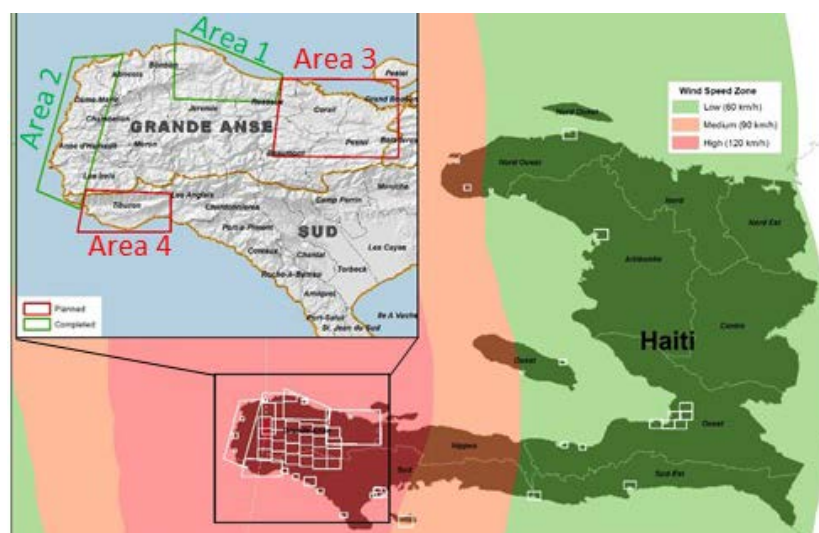
On 4 October 2016, Matthew made a landfall on the Tiburon Peninsula of Haiti. With over 1000 people dead, Haiti has been one of the most impacted countries with an estimated loss of over a billion USD. Preliminary assessment has shown devastating damages to houses, roads and bridges disrupting aid movement in several departments in the Tiburon Peninsula. It has been reported that 2,128,700 people, or 12% of Haiti's population, have been affected and ~1.5 million people are in need of humanitarian aid ([OCHA Haiti Flash Appeal](#)). This report provides a summary of satellite analysis with a focus on one of the most affected areas in Haiti, Grand'Anse Département, with over 80% of population identified to be in need of humanitarian aid.

## UNOSAT's Satellite Support Analysis

[UNITAR-UNOSAT](#) on behalf of UN OCHA activated the [International Charter on Space and Major Disasters](#) on 05 October 2016 to support planning and coordination of emergency response operations with satellite analysis covering areas affected by Hurricane Matthew. Project Manager (PM) nominated for this Charter Call is Pacific Disaster Center while UNOSAT along with other satellite mapping groups (Copernicus EMS, USGS) are supporting the Charter Call by providing (satellite-derived) value-added analysis & mapping products.

Priority Areas of Interest (AOIs) for satellite imagery acquisition submitted by UNOSAT to the Charter have been requested by UN OCHA and UNCT based on operational requirements to assist most affected communities living in rural and urban areas in Grand South departments (Grand'Anse, Nippes, and South). To support planning and coordination of emergency response operations, UNOSAT has released a [Preliminary Population Exposure Analysis Report](#) based on spatial demographic, cyclone track & wind speed data available as well a [Preliminary Satellite Based Damage Assessment Report](#) based on analysis carried out in Jeremie Commune and surrounding areas (Area 1).

UNOSAT is also supporting UNOCHA, UNCT and UNDAC team deployed to hurricane affected areas in Haiti with the overall coordination of satellite analysis. All completed, current and planned analysis areas covered by UNOSAT as well as by other mapping groups can be viewed through [GDACS' Satellite Mapping and Coordination System \(SMCS\)](#).



Overview Map showing areas covered with satellite analysis by all organizations along with Hurricane wind speed; Inset map shows the Areas of Interest (AOIs) completed and in-progress by UNOSAT.

Note that for AOI 3 covering Corail and Pestel communes, UNOSAT has undertaken flood analysis based on Radarsat-2 image acquired on 08 Oct. 2016 : Map produced (Area 3) can be accessed [here](#)

All the maps and products from UNOSAT are available at: <https://www.unitar.org/unitar/maps/HTI> and from Copernicus are available at: <http://emergency.copernicus.eu/mapping/list-of-components/EMSR185>. Combined satellite based damaged assessment is also available through a [LIVE WEB MAP](#).

## UNOSAT’s satellite derived analysis

This report describes preliminary building damage analysis carried out by UNITAR-UNOSAT covering Area 1 (Jeremie and Roseaux Commune) and Area 2 (Abricot, Dame-Marie, Anse d’Hainaults and Les Irois Communes) for a total area of approximately 650 Km<sup>2</sup>.

Building damage analysis, including a rapid assessment of transportation network conditions and locations of spontaneous people gathering sites, was conducted by comparing the post-disaster satellite images (Pleiades acquired on 7/10/2016 for AOI1 and 12/10/2016 for AOI2) with available pre-disaster images (WorldView-1 on 01/05/2015, 09/05/2015 and 08/12/2014; Worldview-2 on 17 July 2016).

UNOSAT’s preliminary analysis shows a total of **22,926 buildings/structures** with visible damages and approximately **264** locations with visible roads obstacles and/or access constraints. In addition, **1,250 temporary people gathering sites** have been identified within the analysed areas (Area 1 and Area 2).

### Analysis Summary: Area 1 and Area 2



**22,926**

*Buildings/structures damages*



**1250**

*People gathering sites*



**264**

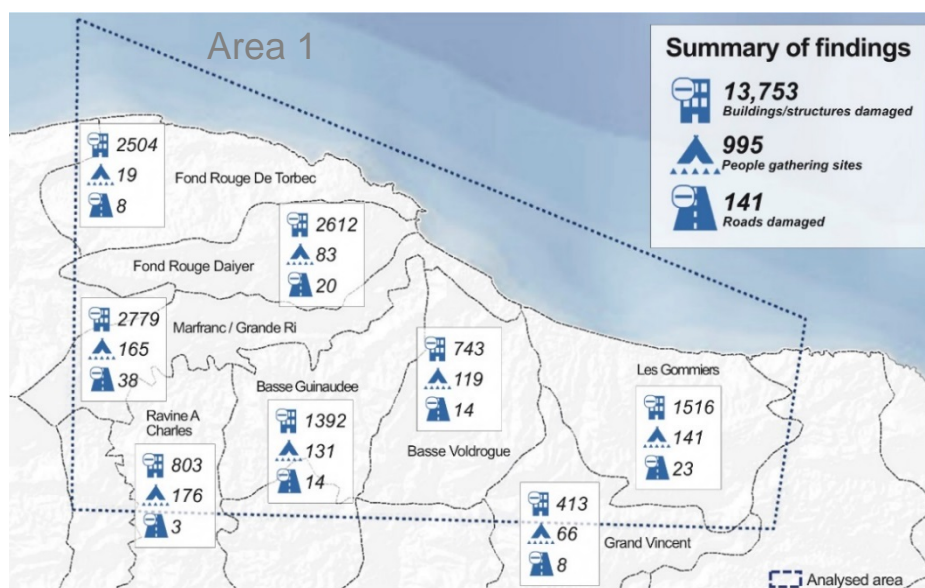
*Road obstacles*



## UNOSAT's satellite derived analysis: Area 1

Satellite analysis for Area 1 covering approximately 290 Km<sup>2</sup> in Jérémie and Roseaux Communes was conducted by comparing the post-disaster satellite images (Pleiades acquired on 7/10/2016) with available pre-disaster images (WorldView-1 on 01/05/2015 and 08/12/2014).

UNOSAT's preliminary analysis shows a total of **13,753 buildings/structures** with visible damages and approximately **141 locations with visible roads obstacles and/or access constraints**. In addition, **995 temporary people gathering sites** have been identified within the analysed Area 1.



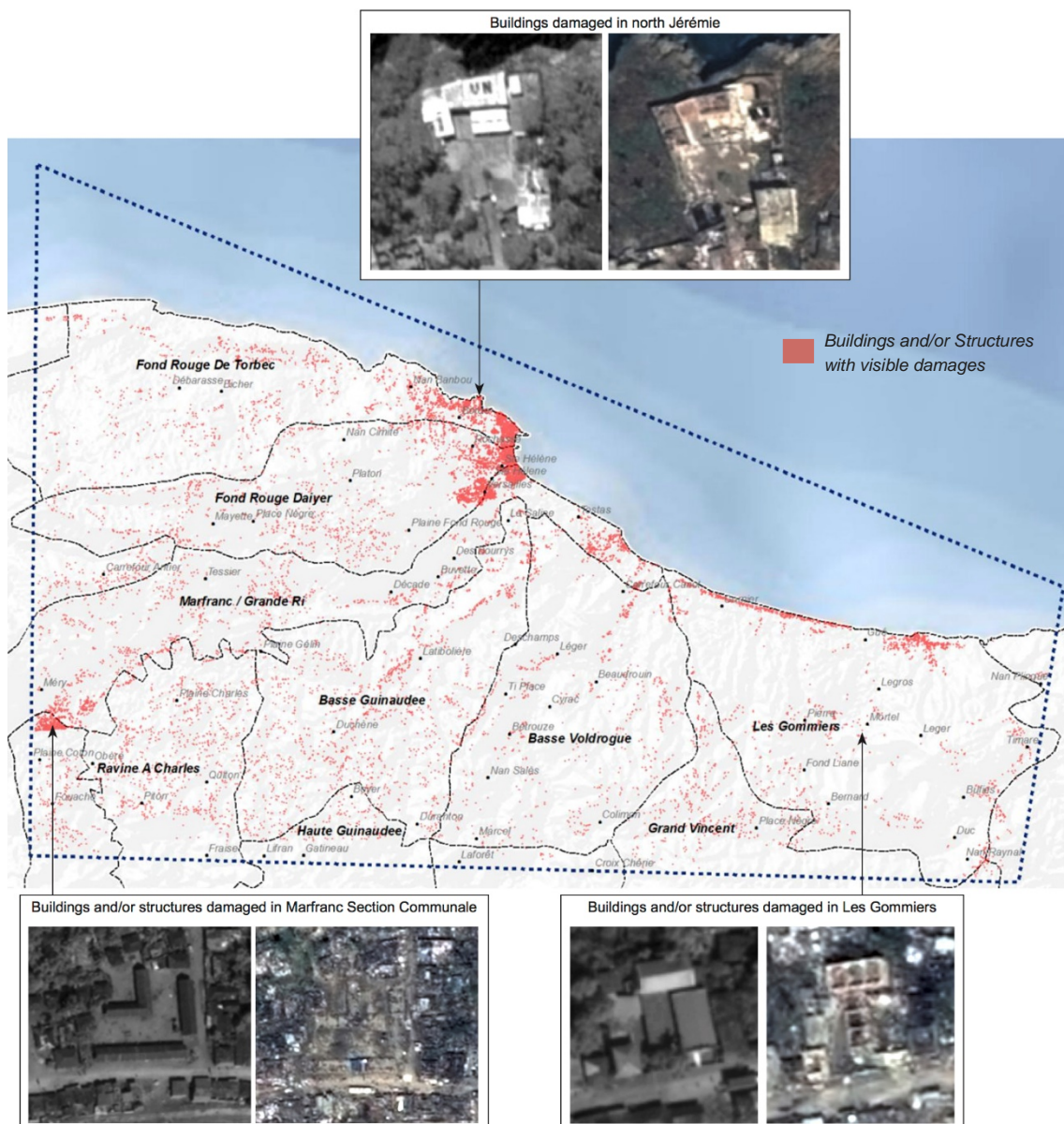
| Département  | Commune                 | Sections Communales         | Damaged Buildings | Road Obstacles | People Gathering Sites |
|--------------|-------------------------|-----------------------------|-------------------|----------------|------------------------|
| Grand'Anse   | Bonbon                  | <i>Desormeau</i>            | 190               | 5              | 34                     |
|              | Jérémie                 | <i>Basse Guinaudee</i>      | 1,392             | 14             | 131                    |
|              |                         | <i>Basse Voldrogue</i>      | 743               | 14             | 119                    |
|              |                         | <i>Fond Rouge Daiyer</i>    | 2,612             | 20             | 83                     |
|              |                         | <i>Fond Rouge De Torbec</i> | 2,504             | 8              | 19                     |
|              |                         | <i>Haute Guinaudee</i>      | 98                | 4              | 7                      |
|              |                         | <i>Haute Voldrogue</i>      | 15                | 2              | -                      |
|              |                         | <i>Iles Blanches</i>        | 617               | 2              | 47                     |
|              |                         | <i>Marfranc / Grande Ri</i> | 2,779             | 38             | 165                    |
|              | <i>Ravine A Charles</i> | 803                         | 3                 | 176            |                        |
|              | Roseaux                 | <i>Carrefour Charles/Ja</i> | 71                | -              | 7                      |
|              |                         | <i>Grand Vincent</i>        | 413               | 8              | 66                     |
|              |                         | <i>Les Gommiers</i>         | 1,516             | 23             | 141                    |
| <b>TOTAL</b> |                         |                             | <b>13,753</b>     | <b>141</b>     | <b>995</b>             |

Table showing analysis summary by different administrative levels (Départements, Communes, Sections Communales). There are a total of 13,753 affected buildings, 141 roads obstacles and 995 people gathering sites.

## Building/Structure damage assessment: Area1

Preliminary building/structure damage assessment was conducted through visual interpretation by UNITAR-UNOSAT utilizing before and after very high resolution satellite imageries. The post-disaster satellite images were acquired from Pleiades on 7/10/2016 with available pre-disaster images from WorldView-1 on 01/05/2015 and 08/12/2014).

A total of 13,753 buildings were identified to have suffered prominent visual damages within the analyzed areas. Marfranc (section communale) has been identified to have the highest number of affected buildings with over 2,700 detected damaged buildings.



Map showing the buildings/structures identified (red dots) with visual damage using pre- and post- satellite imageries

**Excel table** with building damage statistics summarized by Administrative Levels for Area1 can be downloaded [here](#)

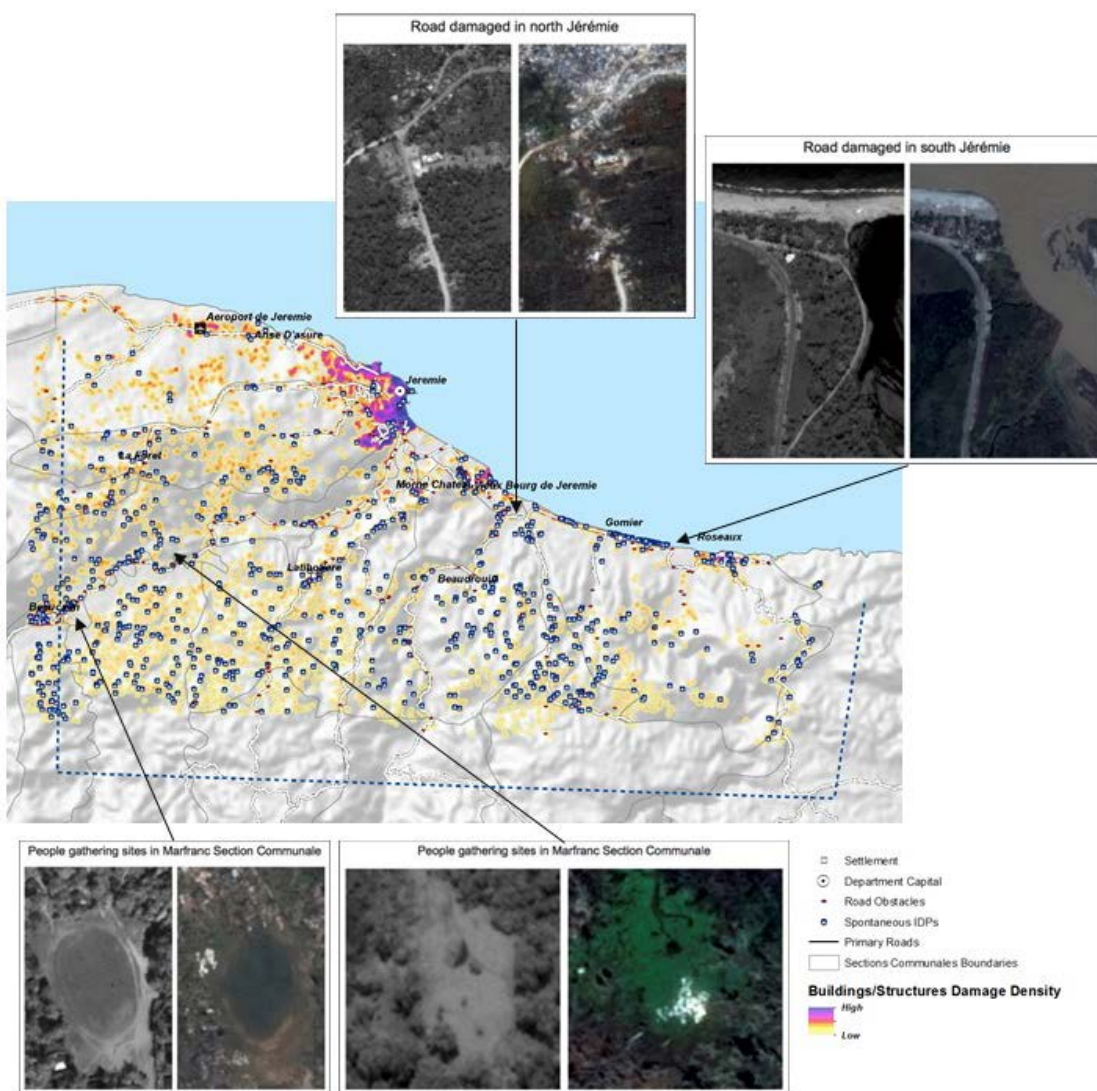
Note that damage statistics are derived from UNOSAT&Copernicus damage points and OSM building footprints (as of 17 Oct. 2016).

# Rapid assessment of transport networks and people gathering sites: Area 1

Preliminary damage assessment of transport network with main focus on primary roads and bridges was conducted throughout Area 1. The Conditions of roads are crucial in terms of access to humanitarian aid and rescue teams.

Within Area 1, a total of 141 locations with visible roads obstacles and/or access constraints have been identified with most affected Section Communale being Ravine A Charles in Jérémie Commune.

According to a recent UN OCHA report (12/10/2016), at least 175,500 have been evacuated or displaced and housed in 224 temporary shelters across Haiti. Within the analyzed extent in the Communes of Jérémie, Bonbon and Roseaux, UNOSAT has identified a total of 995 temporary people gathering sites.

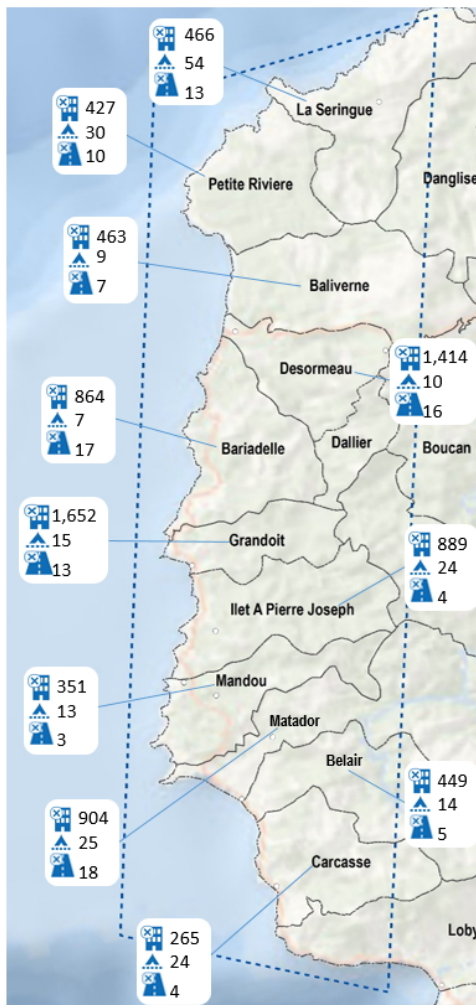


Map depicts the location of road blocks and people gathering sites overlaid on building damage density within Area 1. Note the increase in the number of temporary people gathering sites where the level of damage is high.


## UNOSAT's satellite derived analysis: Area 2

Satellite analysis for Area 2 covering approximately 360 Km<sup>2</sup> in Abricots, Dame-Marie, Anse d'Hainault and Les Irois communes was conducted by comparing the post-disaster satellite images (Pleiades acquired on 12/10/2016) with available pre-disaster images (WorldView-1 on 09/05/2015 and WorldView-2 on 17/07/2016).

UNOSAT's preliminary analysis shows a total of **9,173 buildings/structures** with visible damages and approximately **255 locations with visible roads obstacles and/or access constraints**. In addition, **123 temporary people gathering sites** have been identified within the analysed Area 2.



### Analysis Summary: Area 2

-  **9,173**  
Buildings/structures damages
-  **255**  
People gathering sites
-  **123**  
Road obstacles

| Département  | Commune         | Section Communale    | Damaged Buildings | Road Obstacles | People Gathering Sites |
|--------------|-----------------|----------------------|-------------------|----------------|------------------------|
| Grand' Anse  | Abricots        | Danglise             | 51                | -              | 2                      |
|              |                 | La Seringue          | 566               | 13             | 54                     |
|              | Anse d'Hainault | Boudon               | 366               | 3              | 12                     |
|              |                 | Grandoit             | 1652              | 13             | 15                     |
|              |                 | Ilet A Pierre Joseph | 889               | 4              | 24                     |
|              |                 | Mandou               | 351               | 3              | 13                     |
|              | Chambellan      | Boucan               | 173               | -              | 3                      |
|              |                 | Dame-Marie           | Baliverne         | 563            | 7                      |
|              | Bariadelle      |                      | 864               | 17             | 7                      |
|              | Dallier         |                      | 151               | 2              | 3                      |
|              | Desormeau       |                      | 1414              | 16             | 10                     |
|              | Les Irois       | Petite Riviere       | 427               | 10             | 30                     |
|              |                 | Belair               | 449               | 5              | 14                     |
|              |                 | Carcasse             | 265               | 4              | 24                     |
|              |                 | Matador / Jorgue     | 904               | 18             | 25                     |
|              | Sud             | Tiburon              | Loby              | 88             | 8                      |
| <b>TOTAL</b> |                 |                      | <b>9,173</b>      | <b>123</b>     | <b>255</b>             |

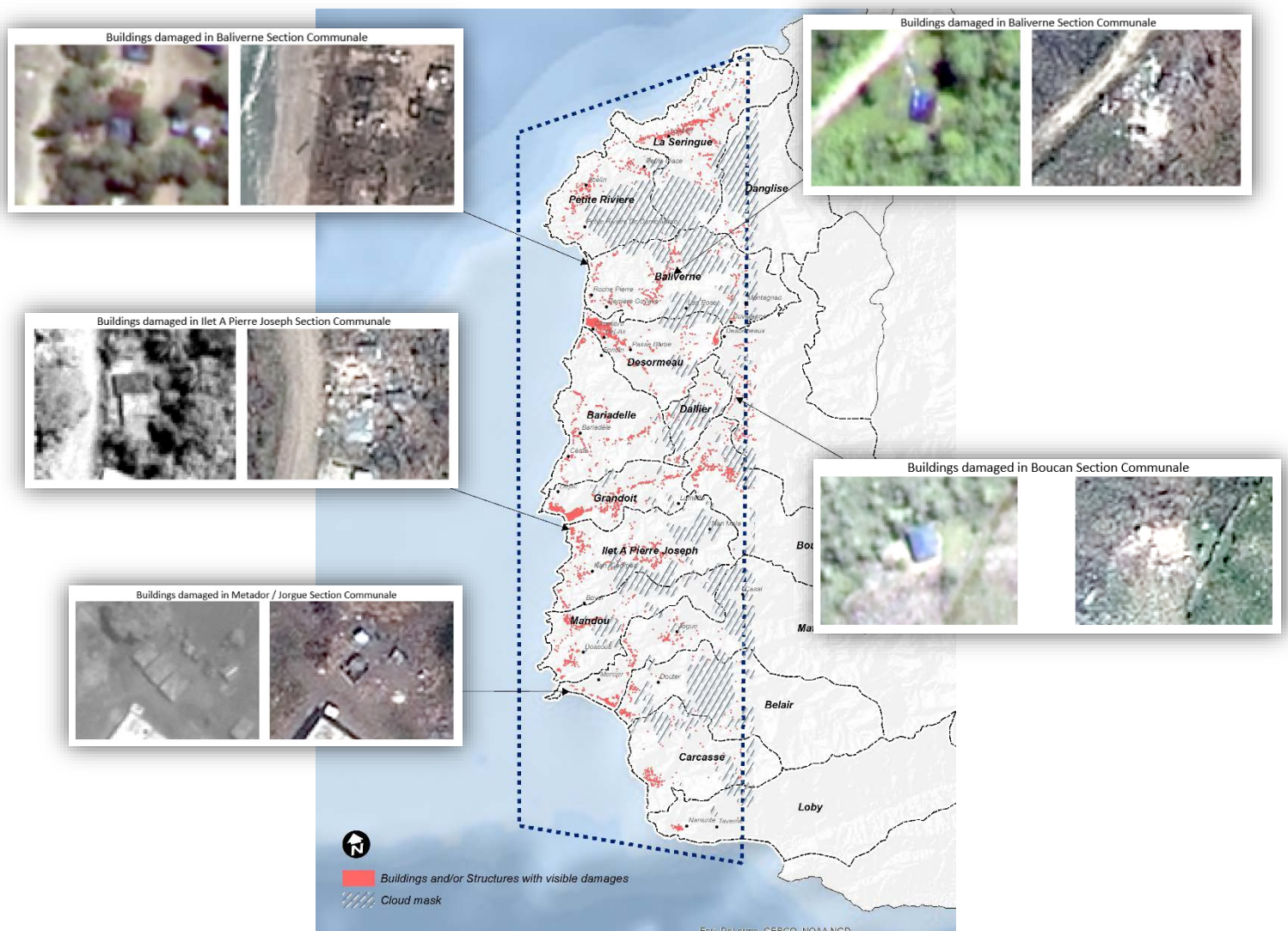
Table showing analysis summary by different administrative levels (Départements, Communes, Sections Communales)  
There are a total of 9,173 affected buildings, 123 roads obstacles and 255 people gathering sites.

## Building/Structure Damage Assessment: Area 2

Preliminary building/structure damage assessment was conducted through visual interpretation by UNITAR-UNOSAT utilizing before and after very high resolution satellite imagery. The post-disaster satellite images were acquired from Pleiades satellite on 12/10/2016 with available pre-disaster images from WorldView-1 on 09/05/2015 and WorldView-2 on 17/07/2016.

A total of 9,173 buildings were identified to have suffered prominent visual damages within Area 2.

Grandoit (section communale) has been identified to have the highest number of affected buildings with over 1,650 detected damaged buildings.



Map showing the buildings/structures identified (red dots) with visual damage using pre- and post- satellite imagery. Note that due to cloud cover in post-disaster satellite imagery (~20%) not all buildings/structures in Area 2 have been assessed.

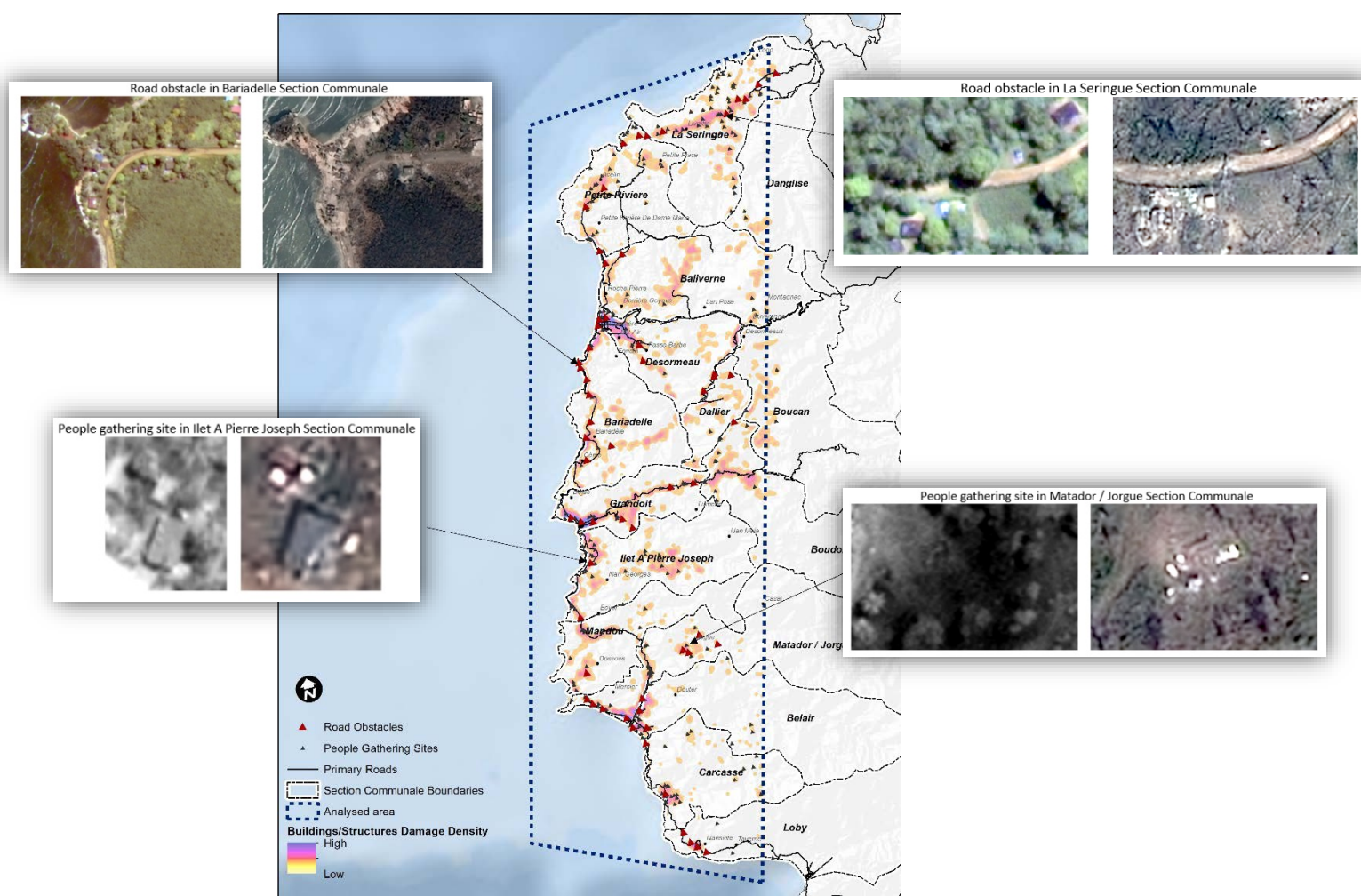
**Excel table** with building damage statistics summarized by Administrative Levels for Area 2 can be downloaded [here](#)

Note that damage statistics are derived from UNOSAT&Copernicus damage points and OSM building footprints (as of 17 Oct. 2016).

## Rapid assessment of transport networks and people gathering Sites: Area 2

Preliminary damage assessment of transport network with main focus on primary roads and bridges was conducted throughout Area 2.

Within the Area 2, a total of 123 locations with visible roads obstacles and/or access constraints have been identified. Most affected Section Communale is Matador / Jorgue in Les Irois Commune. Also, within the analysed Area 2, UNITAR-UNOSAT has identified a total of 255 temporary people gathering sites.



Map depicts the location of road blocks and people gathering sites overlaid on building damage density within the analysed area. Note the increase in the number of temporary people gathering sites where the level of damage is high.

All the maps and products from UNOSAT are available at: <https://www.unitar.org/unosat/maps/HTI>  
Combined satellite damaged assessment done by UNITAR-UNOSAT and Copernicus are also available through the UNOSAT [LIVE WEB MAP](#).  
More info regarding satellite analysis plan by different groups is available on [GDACS' Satellite Mapping and Coordination System \(SMCS\)](#).

*The depiction and use of boundaries, geographic names and related data shown here are not warranted to be error-free nor do they imply official endorsement or acceptance by the United Nations. UNOSAT is a program of the United Nations Institute for Training and Research (UNITAR), providing satellite imagery and related geographic information, research and analysis to UN humanitarian & development agencies & their implementing partners. This work by UNITAR-UNOSAT is licensed under a CC BY-NC 3.0.*

*The analysis has not been verified in the field yet; please send your comments and feedback to [unosat@unitar.org](mailto:unosat@unitar.org).*

**UNOSAT Contact:**

Email: [unosat@unitar.org](mailto:unosat@unitar.org)

T: +41 22 767 4020 (UNOSAT Operations)

24/7 hotline: +41 75 411 4998

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