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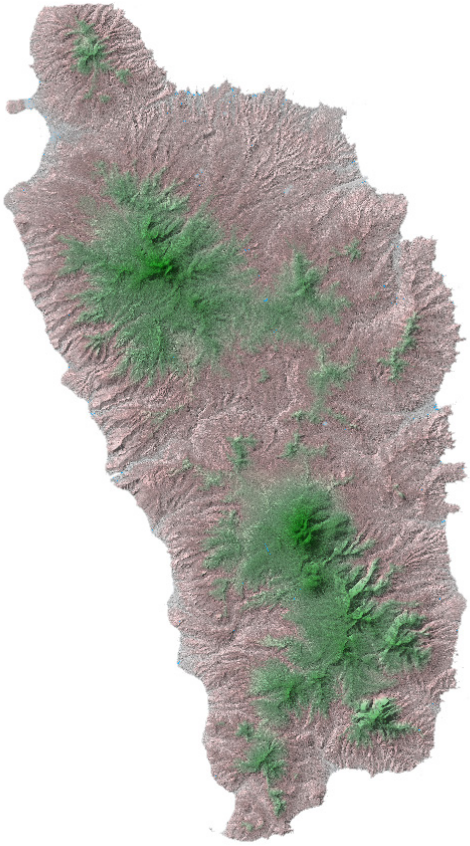
CASE STUDY

Dominica: Fusing NEXTMap One™ with LiDAR for Complete Island Coverage

Introduction

The Commonwealth of Dominica is an island located in the Caribbean. The oblong-shaped land is 750 square kilometers in area and the highest peak is Morne Diablotins at 1,447m in elevation. Dominica has one of the most rugged landscapes of the Caribbean islands and is largely covered by multi-layered rainforest. The island is made of various volcanic rock formations and has mountainous regions in the interior that are sparsely populated due to the rocky terrain. The island experiences almost continuous cloud cover in higher elevations and is particularly vulnerable to hurricanes from June to September.

In March 2020, Intermap teamed with McElhanney Consulting Services Ltd. to provide NEXTMap One data to fill in areas on the island where LiDAR data was difficult to collect. This initiative is part of the Disaster Vulnerability Reduction Project set out by the Government of Dominica through the Ministry of Health and Environment. The purpose is to leverage geospatial data to improve disaster response and climate resilience. The fusion of LiDAR and NEXTMap One provides a complete and seamless island-wide dataset necessary to effectively plan and manage flood control, drainage, land stability, and potential landslide areas. The completed island dataset can also be used to assist with future use development planning by analyzing spatial information such as roads, vegetation, buildings, and rivers.

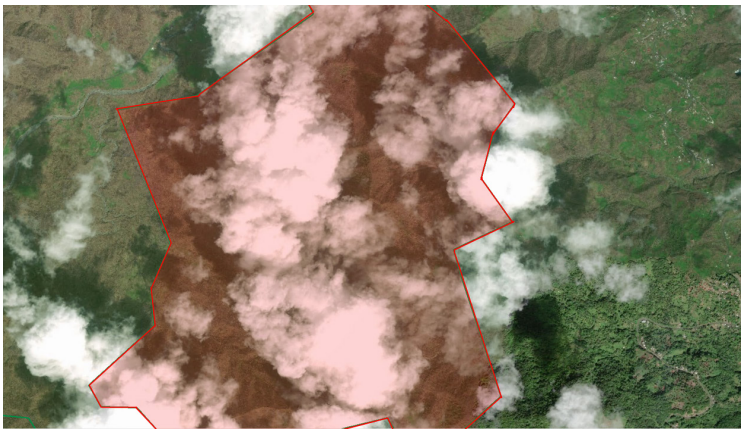


The terrain on the island of Dominica.

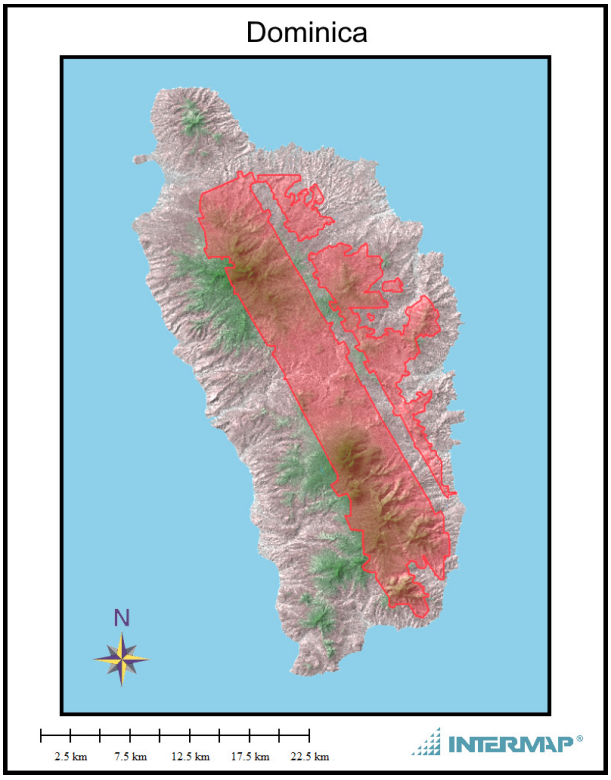
The Project

The interior mountainous region of Dominica is perpetually cloud covered, making complete LiDAR acquisition impossible. LiDAR requires clear, cloud-free flights for the sensor to image the terrain and provide quality data. Intermap was brought in to utilize multi-sensor technology to mitigate cloud cover and fill in the 235 square kilometers of missing LiDAR data.

The image on the next page shows a cloud-covered area where LiDAR collection was impossible to perform within the project duration. NEXTMap One data was processed for the area inside the red polygon to complete the missing areas.



A terrain profile through the LiDAR and NEXTMap One data, resulting in only minor differences in spatial detail

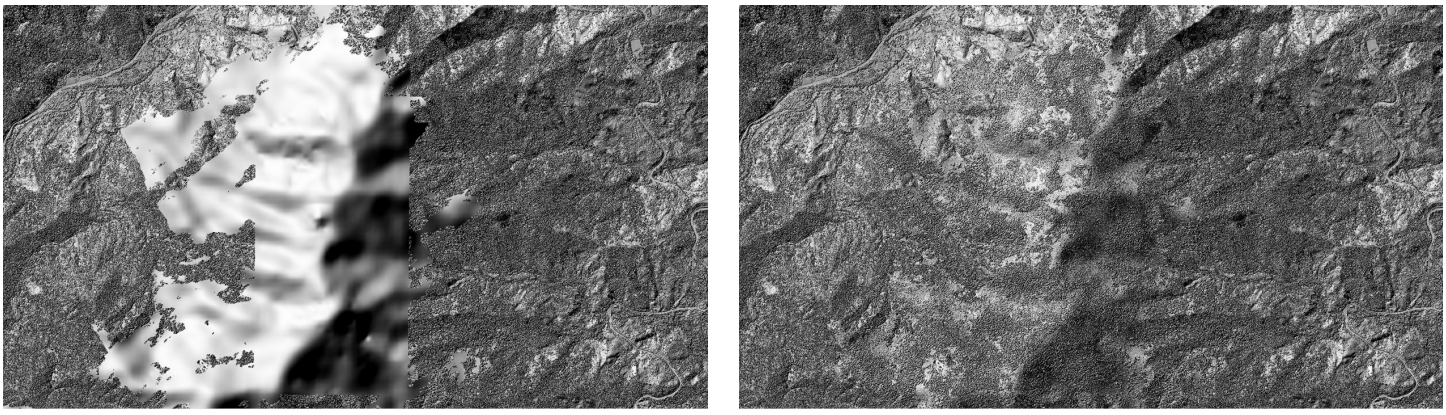


The red shaded area represents the 235 square kilometers where NEXTMap One was used to fill the gaps in the LiDAR coverage.

After providing samples of NEXTMap One to McElhanney, Intermap was awarded the project and got to work. Using patented IRIS™ technology, Intermap created NEXTMap One over the missing areas and seamlessly fused it with the LiDAR data collected by McElhanney. IRIS is specifically designed to increase vertical accuracy, enhance spatial detail and reduce noise of the input DEM.

Intermap's NEXTMap One processing approach is scalable and lightweight, allowing a digital surface model (DSM) and a digital terrain model (DTM) for the area to be collected, processed and delivered in just one month. The DSM contains natural terrain elevations as well as vegetation and cultural features such as buildings and roads. The DTM provides bare Earth elevations where the surface features and other infrastructure have been removed.

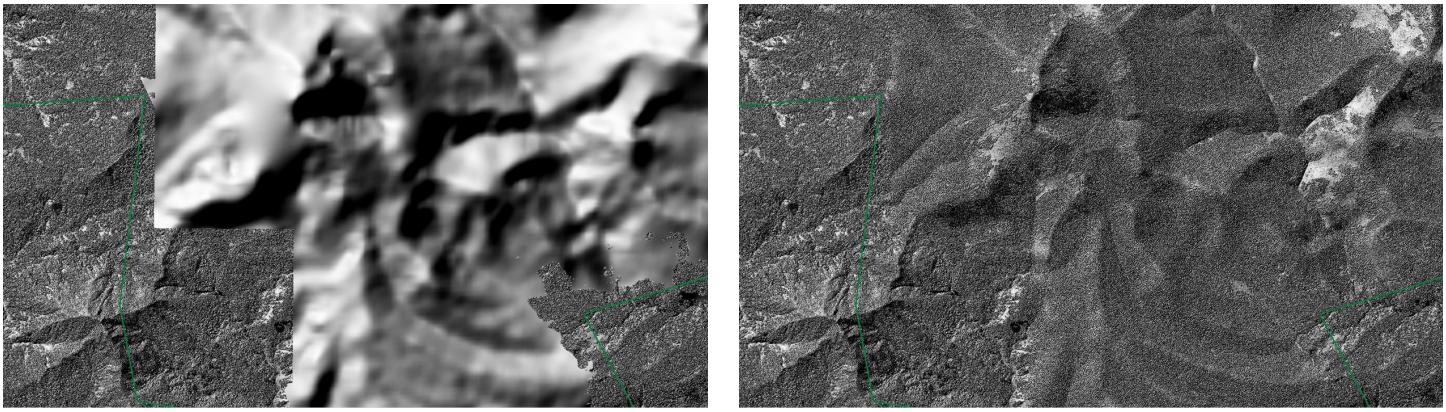
The two images below show a comparison of the best available data relative to the surrounding LiDAR. Note how smooth and generalized the data are. The spatial detail is lacking and simply could not be used to meet the project's objectives. Now look at the same area after fusing the LiDAR with NEXTMap One. The fusion of NEXTMap One with LiDAR creates a seamless, homogenous product that is accurate and maximizes value and cost efficiency.



Comparison between the best available DEM (left) and NEXTMap One fused with the surrounding LiDAR (right). The spatial detail of NEXTMap One closely matches the detail of the LiDAR.

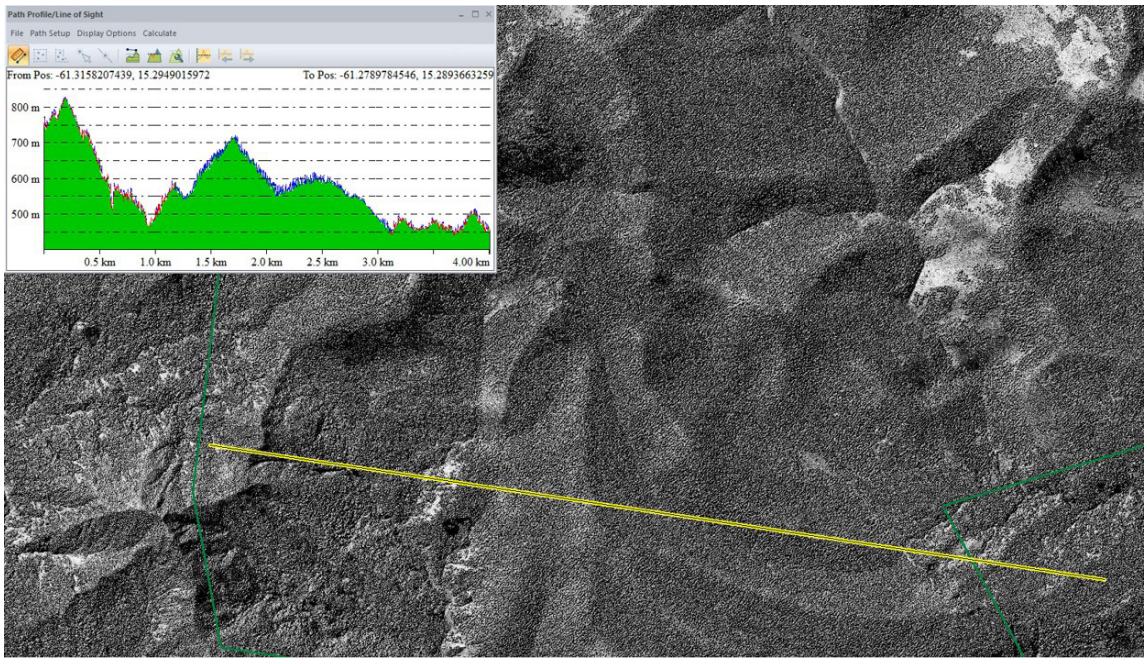
The Result

Intermap's fusion of NEXTMap One DSM and DTM with LiDAR provides the solution McElhanney needs to fulfill their contractual obligation with the Government of Dominica. The contrast between the existing best available data and the NEXTMap One fusion is stunning.



The left image shows an area using the best publicly available DEM and surrounding LiDAR. There is a significant spatial detail difference between the two datasets. The right image shows the same area with NEXTMap One data fused with the LiDAR.

Using terrain profile tools to traverse across the LiDAR and adjoining NEXTMap One, it is clear that the NEXTMap One data closely matches and is seamlessly blended with the LiDAR terrain. The image below demonstrates a terrain profile in the same area as the images above. The profile graph shows terrain starting from LiDAR data on the left, passing through NEXTMap One data, and back into LiDAR data. The red line on the graph represents the LiDAR data and the blue line represents the NEXTMap One data.



A terrain profile through the LiDAR and NEXTMap One data, resulting in only minor differences in spatial detail.

Conclusion

The highlands of Dominica have proven to be historically challenging to collect LiDAR data due to almost continuous cloud cover. Despite concerted effort for more than two years, the LiDAR collection campaign could only provide data for two thirds of the island area. Intermap's multi-sensor NEXTMap One approach, combined with its DEM fusion technology, was needed to provide a seamless, high-quality dataset for McElhanney. This resulted in complete coverage of the island at a higher quality and higher spatial resolution than what existed previously.