

THE REALITY CAPTURE OF ELLIS ISLAND

For 62 years, New York Bay's small Ellis Island was the United States' first and primary immigration inspection centre, processing more than 12 million immigrants from 1892 to 1954. Today, the island with its Main Immigration Building and many ancillary structures is a U.S. National Monument and receives 3.5 million plus visitors annually as part of the U.S. National Park Service (NPS).



HURRICANE TAKES A HIT ON HISTORY

In 2012, Hurricane Sandy bombarded the East Coast of the United States and swept over Ellis Island with fierce winds and tidal surges upward of nearly 4.3 metres. Damage was sustained throughout the National Monument, including the already dilapidated Georgian Revival hospital buildings from 1900-1909, the Main Immigration Building and the 1950s park housing. Basements of nearly every structure were flooded.

The historic park housing is now slated for demolition due to the extent of the damage. Basic infrastructure like electric, sewer and phone systems was destroyed while brick pedestrian pathways were ripped up from the ground.

It was a year before the park could reopen to the public.

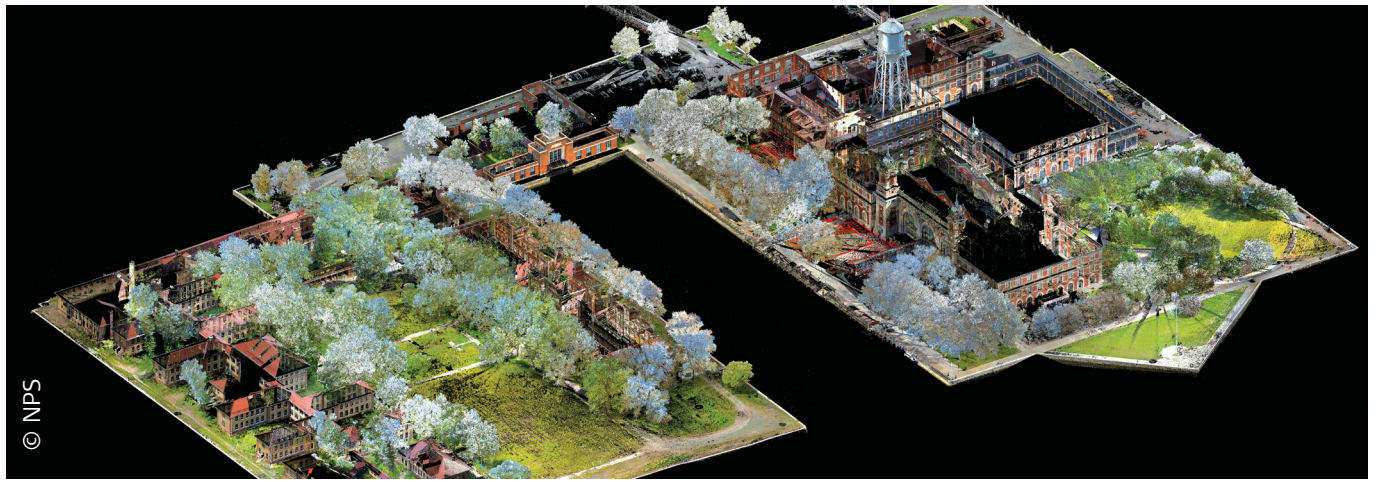


REALITY CAPTURE FOR REHABILITATION AND INTERPRETATION

The NPS has an on-going preservation project focused on rehabilitating and interpreting the hurricane-damaged hospital buildings and support structures that were once crucial to the daily operation of Ellis Island, yet had been closed for decades to the public during stabilisation efforts of these endangered structures. This multi-year effort, largely funded by Ellis Island (part of the Statue of Liberty National Monument) through its visitor and concession fees, is being carried out by the NPS' Heritage Documentation Program (HDP), which is tasked by the NPS with creating guidelines and standards for the documentation of the United States' architectural, engineering and landscape heritage.

Historically these documents consisted of copyright-free permanent records, like architectural drawings, photographs and written histories. Today, these traditional archival materials are supplemented with laser scan point clouds, photogrammetric models and virtual tours derived from reality capture technologies. This digital data, according to Dana Lockett, architecture project manager for the HDP, is "extremely useful to the project sponsors and a public that thrives on virtual access."

The NPS has been using Leica Geosystems' laser scanning solutions for reality capture since 2006 as part of the HDP. The terrestrial laser scanning technology is incorporated extensively into the HDP's workflows, and Ellis Island has seen the technology's evolution, having been scanned with a Leica



ScanStation II, ScanStation C10, and now the flagship ScanStation P40 over the course of this multi-year effort.

Additionally, by using the external camera kit for the C10 and P40 as part of its reality capture workflow at Ellis Island, the HDP has provided its first online virtual tour to the public. Composed of panoramic photography, embedded with hyperlinked point cloud animations, 3D meshes, and other interpretive multimedia, the tour creates an educational and immersive virtual experience of an otherwise restricted area of the National Monument.

"The evolution of this laser scanning technology has paralleled the complexity of the structures surveyed at Ellis Island," said Paul Davidson, Historic American Buildings Survey architect for the HDP. "As that complexity has increased, the Leica Geosystems scanners have risen to meet that challenge in speed, accuracy and efficiency."

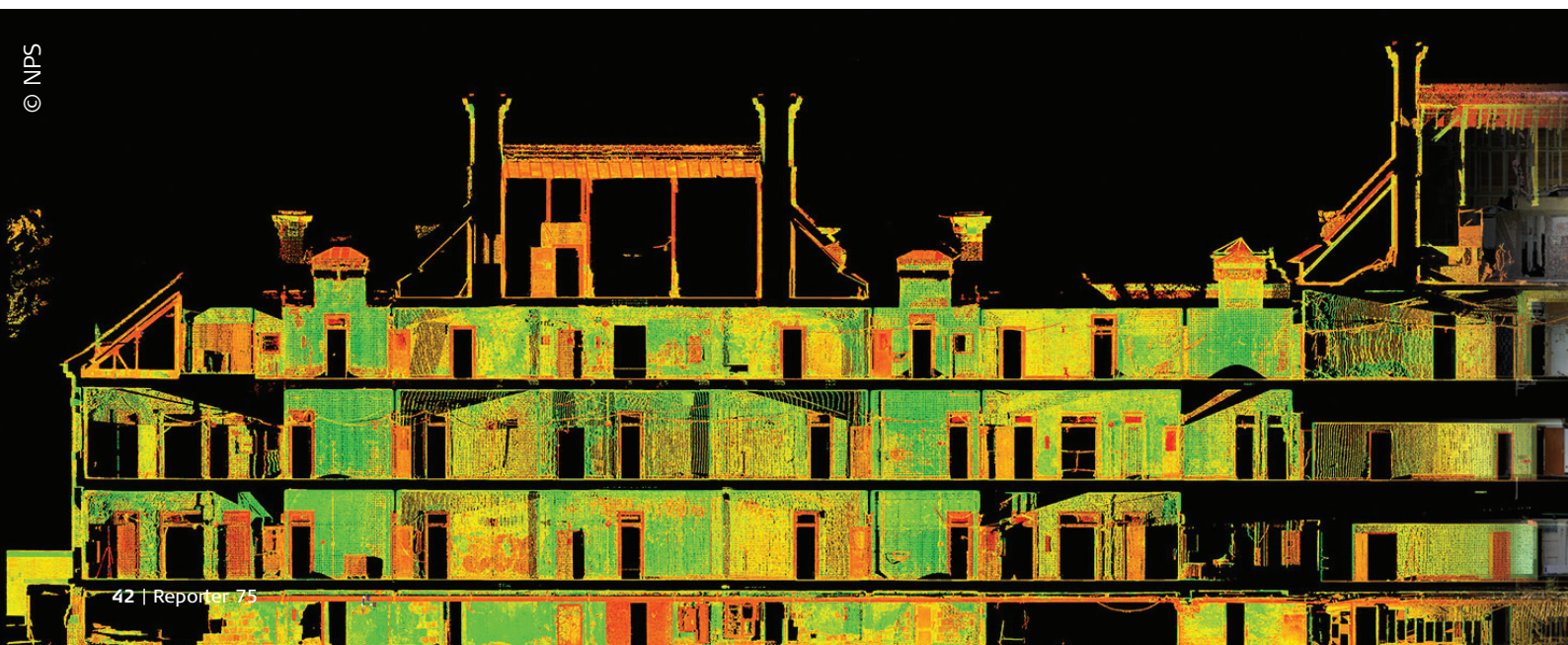
FROM FIELD TO OFFICE TO ARCHIVE

The challenges of digitally capturing the three sizeable, interconnected hospital buildings of Ellis Island from the exterior included the structures' irregular footprints; large aged trees in close proximity; inadequate exterior

sight lines to rooftops due to a nearby sea wall; and ongoing construction to repair damaged infrastructure from Hurricane Sandy.

The interior spaces' also had challenges, including the hospitals' four floors and complex attics totaling 11,148 metres of complicated, disconnected maze-like corridors and spaces. Adding to the challenge, decades of deterioration needed to be worked around, including collapsed walls, unpassable stairs, and no working lighting despite boarded windows, which lead to an extensive setup of interior lighting rigs being used throughout scanning.

In years past, the 11,148 metres of interior floor space and complex exterior footprint was a daunting scope. The ScanStations' extended target acquisition ranges were pushed to the limits to keep a tight, accurate control network around the large structures while interior efforts focused on major corridors, large spaces and stairwells to build out the key interior spaces and link the floors in the digital point cloud model.



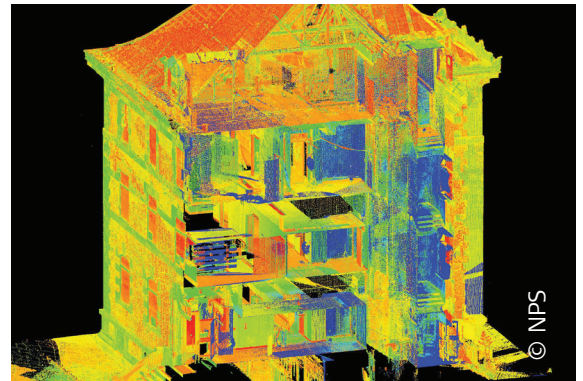
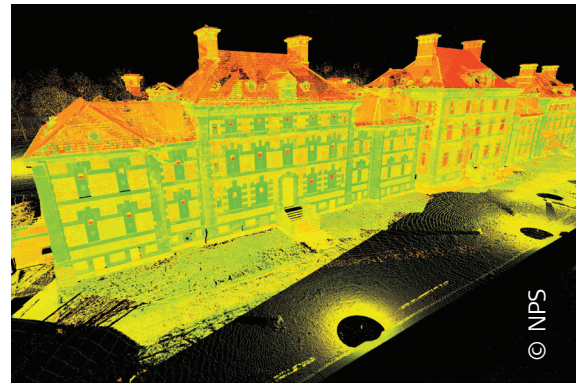
"In the hundreds of surveys I have performed for the NPS, I would deem this the most challenging due to this disjointed nature of interiors and the few access points and sight lines to the exterior," said Davidson.

With the newest ScanStation P40 in the HDP's arsenal, blazing fast scanning speeds are providing an opportunity to capture a far greater amount of the 250 interior rooms. Leica Cyclone, the 3D modelling software, continues to be the backbone of data processing for photo-texturing and the registration of years' worth of HDS data, controlled in a survey network.

From Cyclone, in addition to the virtual tours and other interpretive media, the data is migrated to AutoCAD via Leica CloudWorx software in order to create one of the pillars of the HDP - 2D measured architectural drawings of great accuracy and detail. Such drawings were historically created entirely by hand-measurements. Although hand methods are still used by the HDP to create complete parametric 2D drawings by filling in data gaps ("shadows") in the scans (for example, where the details of window frames were blocked by boarding), the laser scans create the baseline of accuracy key to archival records that will guide future rehabilitation or mitigation against possible damage.

Davidson concludes, "It would have been next to impossible to accurately map the interior spaces, let alone the complicated roof lines with traditional survey methods. While creating the final archival drawings and records to be delivered by the HDP, knowing the precise relationship of building components to one another eliminated guesswork and saved valuable time in the field and office, allowing us to focus our energy on the significant and unique detailing of the Hospital Buildings. To me, laser scanning rocks!"

Editor's Note: See the HDP's online virtual tour of Ellis Island at https://www.nps.gov/hdp/exhibits/ellis/Ellis_Index.htm.



HxGN LIVE

Don't miss Dana Lockett present this project and more in Session 9127
Commemorating the 100th Anniversary
of the US National Parks Service - HDS
at Ellis Island 10:30 a.m. Thursday, 16
June in Covention Centre 204B.

