



Arecibo Observatory William E. Gordon Radio Telescope (305-Meter Radio Telescope) Collapse Emergency Cleanup Update



December 2021



Roles

- National Science Foundation- Federal Owner, and provides funding and oversight

- Caroline Blanco, Federal Preservation Officer and Assistant General Counsel
- Kristen Hamilton, Environmental Compliance Officer
- Roman Makarevich, Program Director, Atmospheric and Geospace Sciences
- Alison Peck, Program Director, Arecibo Observatory
- Elizabeth Pentecost, Project Management Administrator

- Jacobs- NSF Environmental Consultant

- Michelle Rau, Program Director
- Madeline Almodovar, Project Manager
- Lori Price, Cultural Resources Lead
- Jessica Wobig, Cultural Resources Planner



Roles

- University of Central Florida (UCF)- Arecibo Operations and Management
 - Julie Brisset, Principal Investigator
 - Francisco Cordova, Director

- Thornton Tomasetti (TT)- Engineer of Record and Site Manager
 - John Abruzzo, Managing Principal

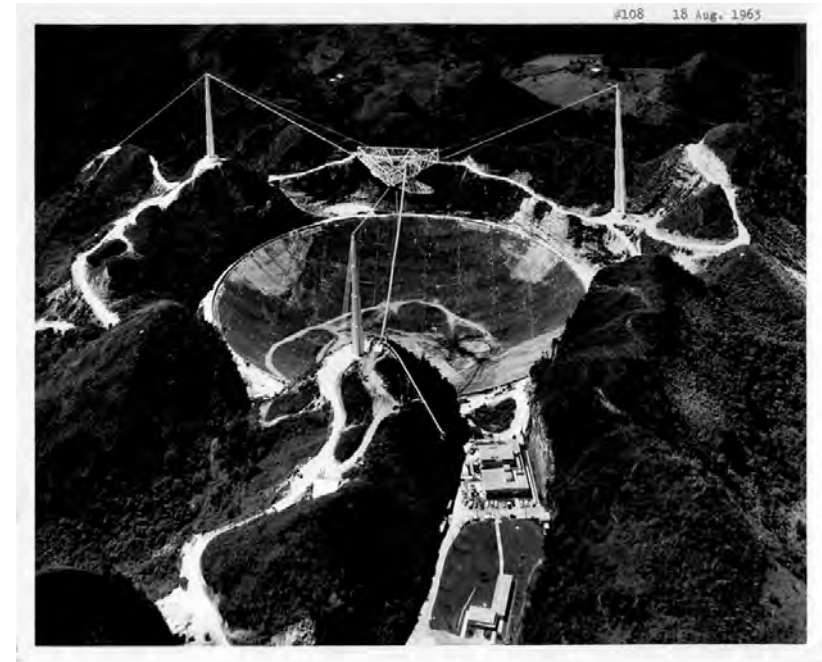
 - D.H. Griffin (DHG)- Cleanup contractor and Site Manager

 - Environmental and construction subcontractors



Objectives

- Provide a brief overview about the Historic Property, Section 106, and Programmatic Agreement (PA)
- Provide a status update on the Emergency Cleanup during the period of June to December 2021
- Discuss Path Forward
- Questions and Answers





Overview

- NSF recognizes the importance of preserving the contributing resources of the historic district consistent with its preservation plan
- Safety is consistently prioritized
- Cleanup was limited to the removal of debris that presented a safety threat to life and property and is now nearing completion
- Damage was limited to a small portion of the overall historic district
- Observatory is not closed and remains in operation



https://www.nsf.gov/news/special_reports/arecibo/



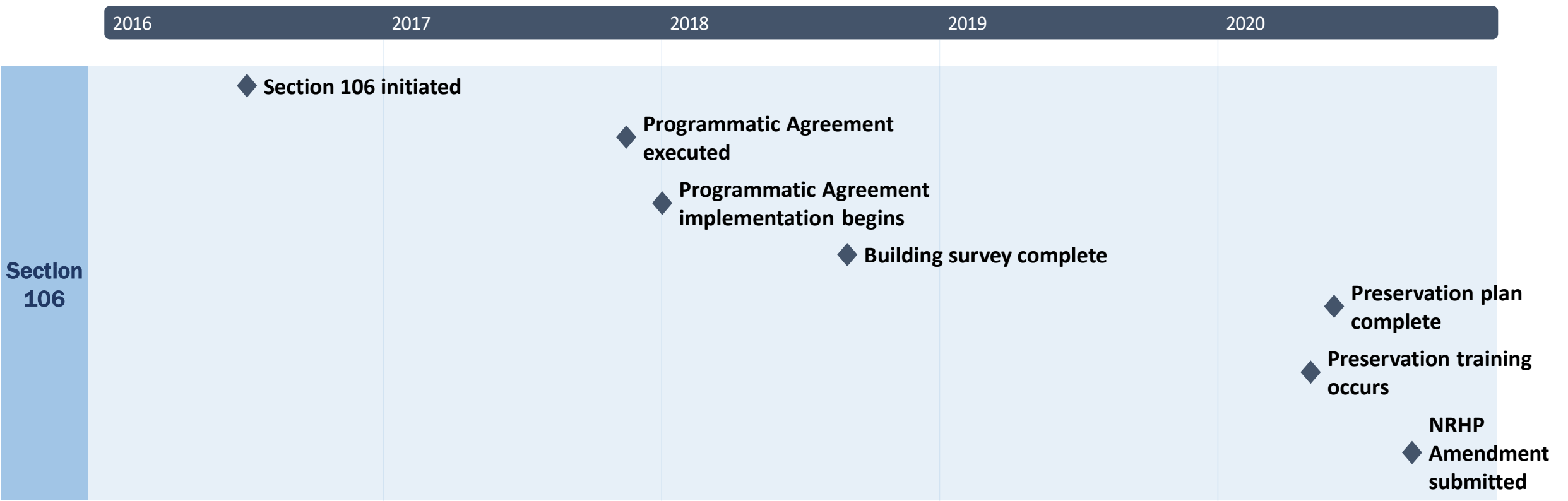
National Astronomy and Ionosphere Center (NAIC) Historic District – Arecibo Observatory

- Listed in the NRHP in 2008, Amended in 2020
- Criteria A and C with Criterion Consideration G
- Period of significance from 1963 to 2017
- 118-acre observatory with 15 contributing resources
- Significant Engineers William E. Gordon and Thomas C. Kavanaugh





Section 106 Overview





Unforeseen Events

2017 2018 2019 2020

Unforeseen Events

- ◆ Hurricane Maria severely impacted Arecibo
- ◆ \$14.3 million appropriation for hurricane repairs

Dec 28 ◆ Series of earthquakes begin

Aug 10 ◆ Auxiliary cable failure

Nov 6 ◆ Main cable failure

Dec 1 ◆ Collapse of 305 meter telescope platform



August 10, 2020



November 6, 2020



December 1, 2020



Emergency Response and Cleanup

2020

2021

Sep

Nov

Jan

Mar

May

Jul

Sep

Nov

◆ Planned stabilization

◆ Proposal for full repair

◆ NSF announces planned decommissioning

◆ NSF, SHPO, and ACHP meeting

◆ NSF and SHPO site visit

Emergency Clean-up underway

◆ NSF follow-up with SHPO

◆ NSF updates SHPO and ACHP

◆ ACHP agrees with emergency cleanup approach

◆ SHPO requests additional information

◆ NSF, ACHP, SHPO meeting held, and consensus reached

Today ►

Response



Emergency Cleanup

June to December 2021





Emergency Cleanup Efforts

- Damage identification
- Mapping of removed reflector dish panels for future repair
- Debris removal
- Salvage of important objects
- Soil removal from platform impact area
- Erosion control measures
- Planned revegetation
- Temporary stabilization and repair measures occurred on buildings, structures, and the site (list of involved contributing resources provided on Slide 12)
- Concrete core testing and patching with like material
- Concrete repair with like design and material
- Scaffolding erected and safety systems added to towers
- Waterproof coating applied to exposed concrete on towers
- Secured cable processing in parking lot
- Secured scrap processing area in storage yard (not within historic district boundaries) with processing area near Tower 4
- Regrading of Rim Road and installation of Tower 4 Recovery Road



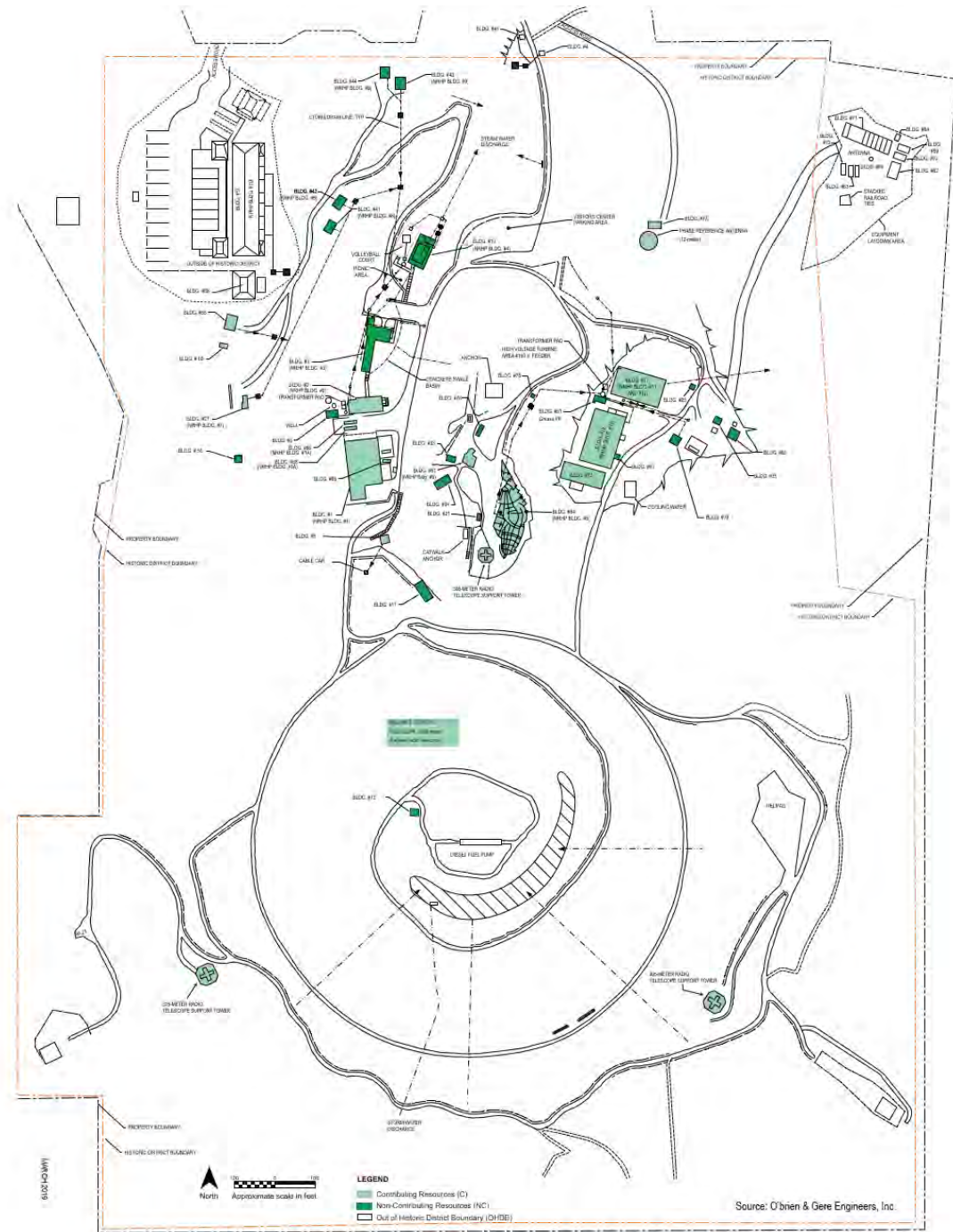
Collapse and Damaged Resources

Noncontributing Resources

- Lewis Rigging Building (Building 11) (Removed)
- Inspiration for Science Officer Trailer (Building 76) (Removed)

Contributing Resources

- William E. Gordon (305-meter) Radio Telescope and Three Support Towers (includes reflector area and rim wall)
- Operations Building (Building 1)
- Cable Car House (Building 5)
- Visitor's Center (Building 54)
- Learning Center (Building 61)





Contributing Resource – Operations Building (Building 1)

No changes or updates since last meeting. Minor roof damage was previously discussed.



Operations Building (Building 1)
Before

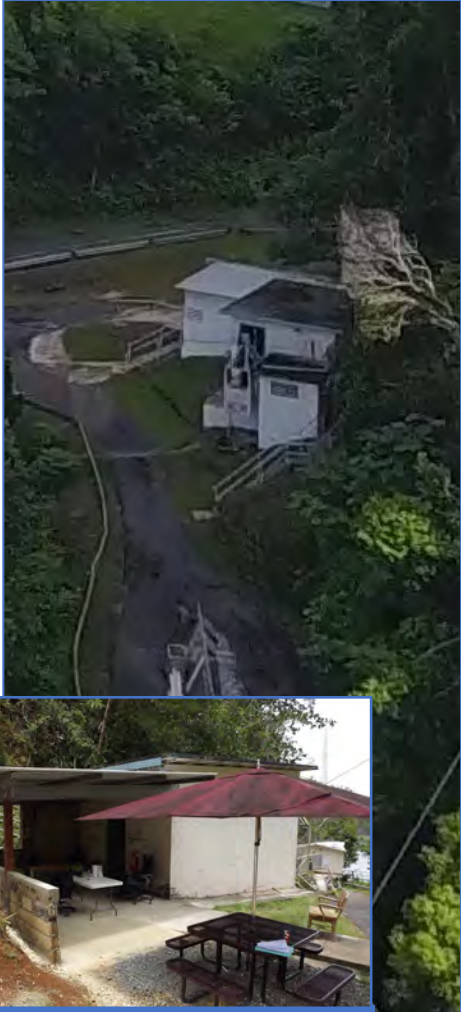


Operations Building (Building 1)
After Minor Roof Damage



Contributing Resource – Cable Car Building (Building 5)

Damaged material removed from retaining wall and temporary concrete blocks installed since last meeting. Removal of front awning (nonsignificant element) was previously discussed. Blocks to temporarily remain in place.



Cable Car Building (Building 5)
Before



Cable Car Building (Building 5)
After



Cable Car Building (Building 5)
During Clean-up



Cable Car Building (Building 5)
Damaged Retaining Wall



Cable Car Building (Building 5)
Temporary Retaining Wall

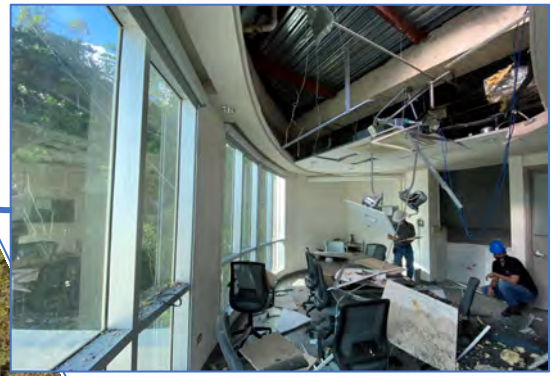
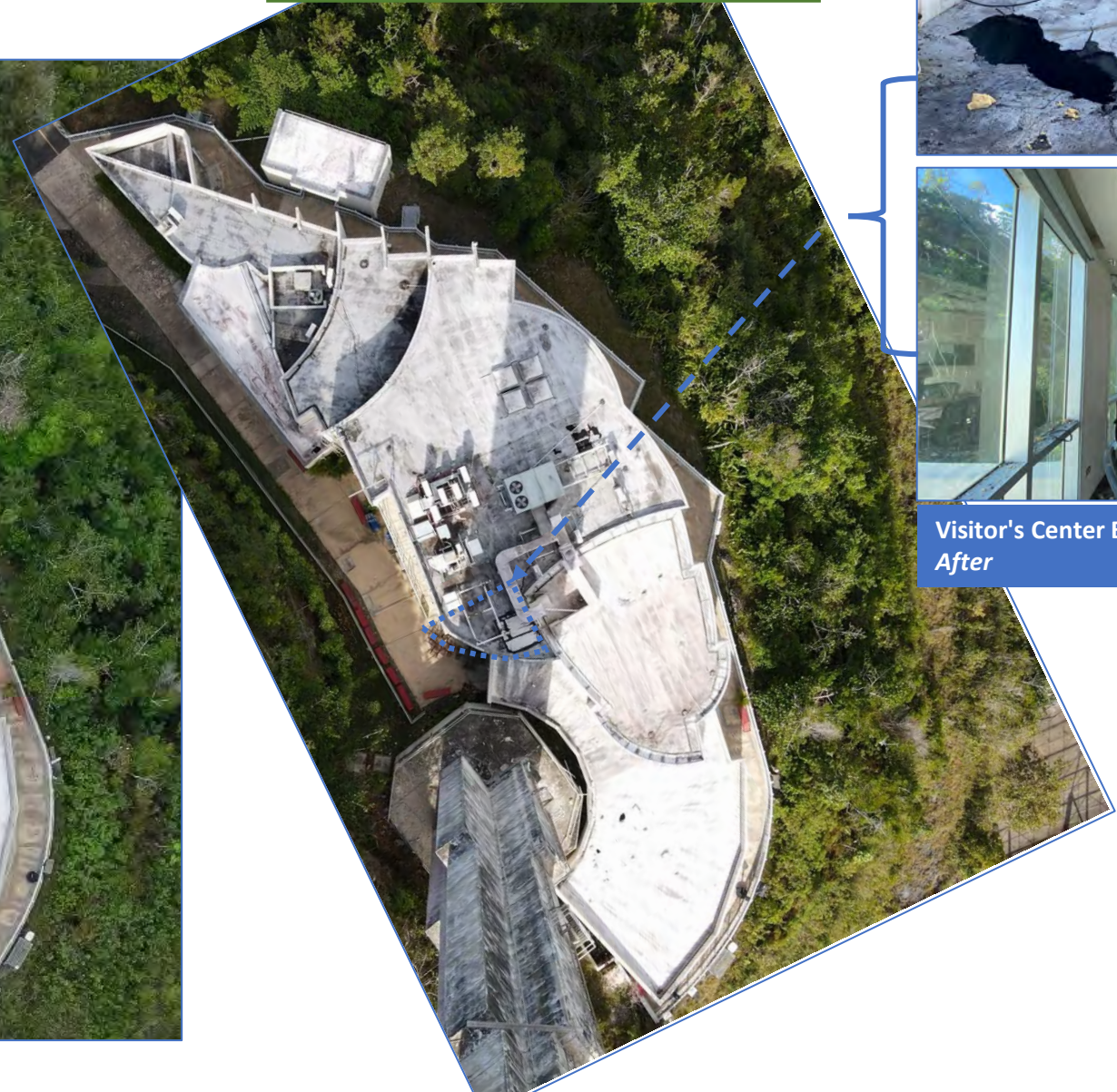


Contributing Resource – Visitor's Center (Building 54)

No changes or updates since last meeting. Roof damage was previously discussed.



Visitor's Center (Building 54)
Before

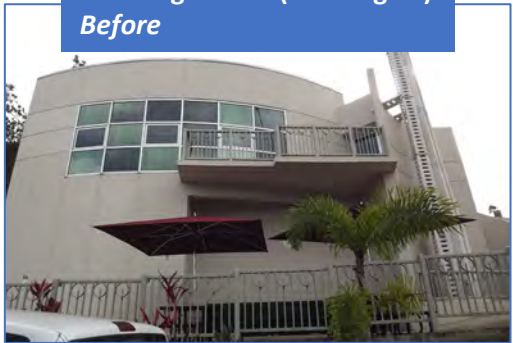


Visitor's Center Building (Building 54)
After

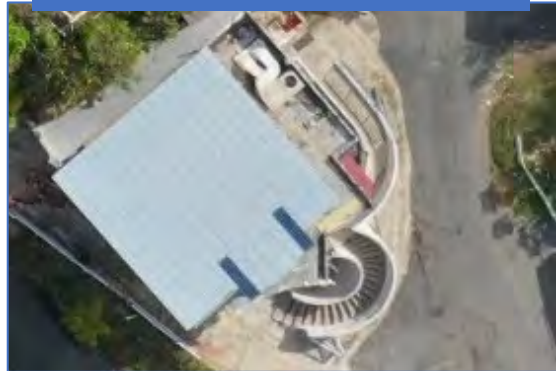


Contributing Resource – Learning Center (Building 61)

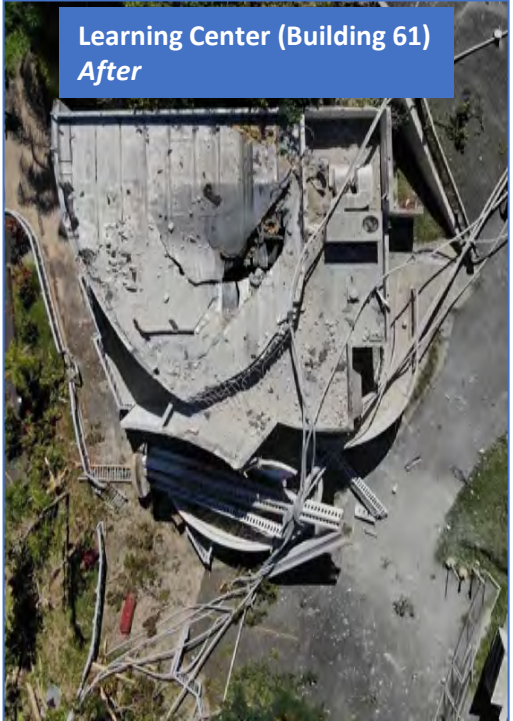
Learning Center (Building 61)
Before



Learning Center (Building 61)
After Temporary Roof



Learning Center (Building 61)
After



Weatherproofing installed to protect temporary wall under temporary roof. Temporary roof was previously discussed.

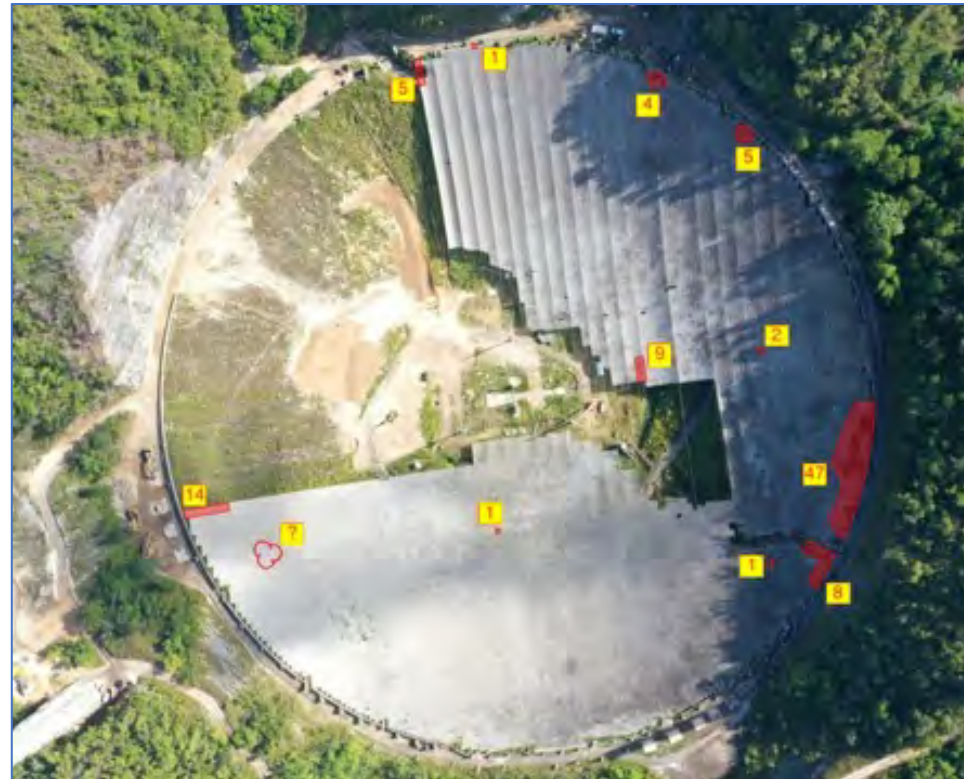


Learning Center (Building 61)
After Temporary Weatherproofing, August 25, 2021



Contributing Resource – 305-meter Radio Telescope Reflector Area

Cleanup identified additional damaged panels that required mapping and removal. Reflector area damage was previously discussed.



Reflector Area after collapse (left) and during clean-up (bottom right). Additional panels identified indicated in red with panel amount noted. Example of damaged panels (top right).



Contributing Resource – 305-meter Radio Telescope Rim Wall

Cleanup identified additional damaged segments of the rim wall for removal and repair. Repairs made in-kind in compliance with Preservation Principles and Management Plan.

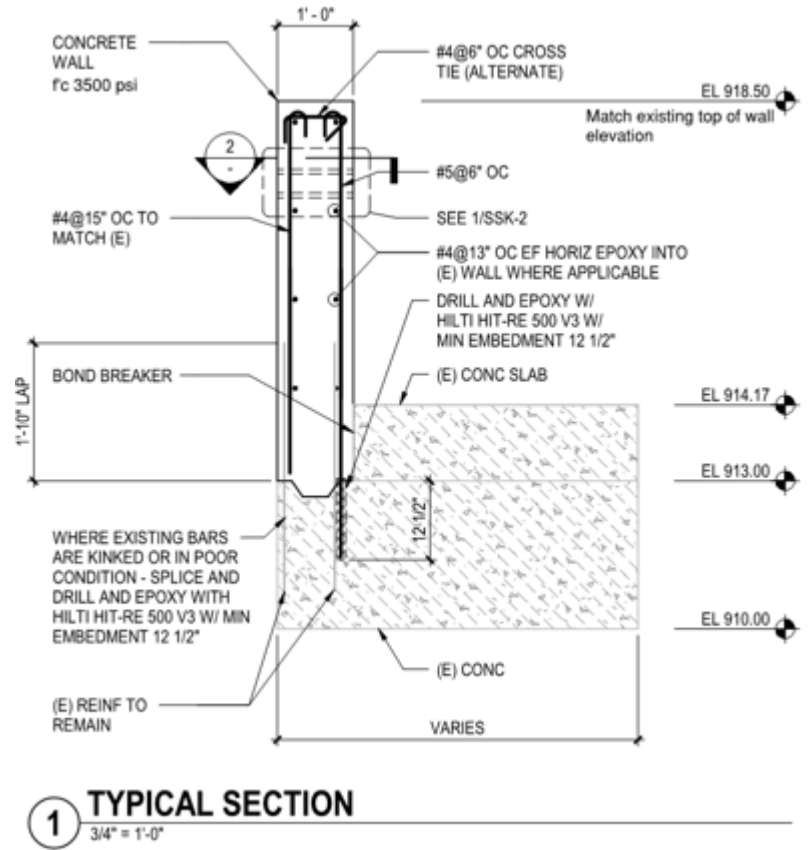


William E. Gordon (305-meter) Radio Telescope – Rim Wall – 9 concrete cores taken from rim wall for testing. Cores are red circled areas.



Contributing Resource – 305-meter Radio Telescope Rim Wall

Cleanup identified damaged segments of the rim wall for debris removal and repair. The repaired wall retains the same material and dimension (height and width) as the original wall.



Rim Wall – Segment for repair (top and bottom at left) and repair detail (above right)



Contributing Resource – 305-meter Radio Telescope Ground Screen Column Removal

Cleanup identified damaged ground screen columns for removal as part of the rim wall (removed due to structural concerns).



Ground Screen
Columns



Contributing Resource – 305-meter Radio Telescope Rim Road at Tower 8

Cleanup regraded rim road
after debris was removed.





Contributing Resource – 305-meter Radio Telescope Three Support Towers (T4, T8, T12)

Cleanup progressed with scaffolding, debris removal, test cores, concrete repair, and waterproof membrane applied to top of exposed towers.





Contributing
Resource –
305-meter
Radio
Telescope
Tower 4 (T4)



Tower 4 – Scaffolding



Cleanup progressed with scaffolding, safety system installation, debris removal, test cores, and concrete repair.



Debris Retrieval Road to Tower 4 and Erosion Control Plan

Cleanup required a temporary road to retrieve the two fallen tower pieces. An erosion control plan was prepared to address the steep incline and site water management concerns.





Tower 8 – Coring sample



Tower 8 – Waterproof Coating



Cleanup progressed with scaffolding, safety system installation, debris removal, test cores, concrete repair, and waterproof coating application.

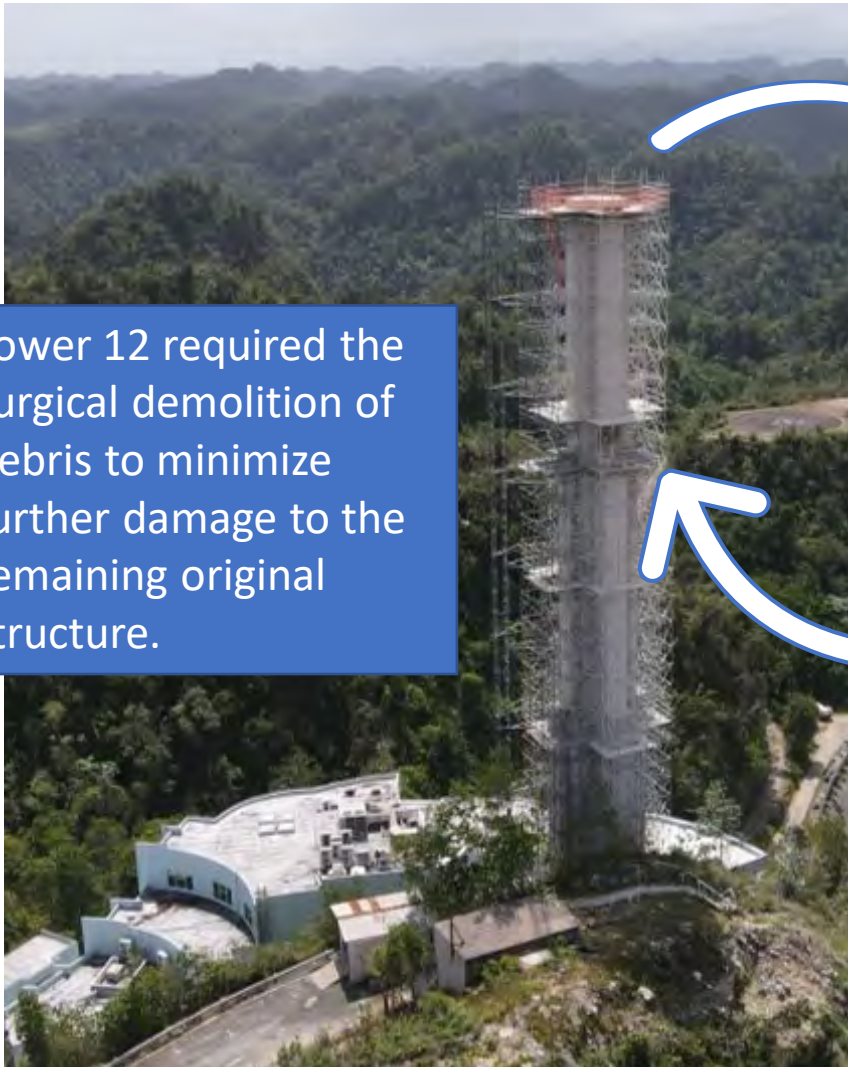
Contributing
Resource –
305-meter
Radio
Telescope
Tower 8 (T8)



Contributing Resource – 305-meter Radio Telescope Tower 12 (T12)

Cleanup progressed with scaffolding, safety system installation, debris removal, test cores, concrete repair, and waterproof coating application.

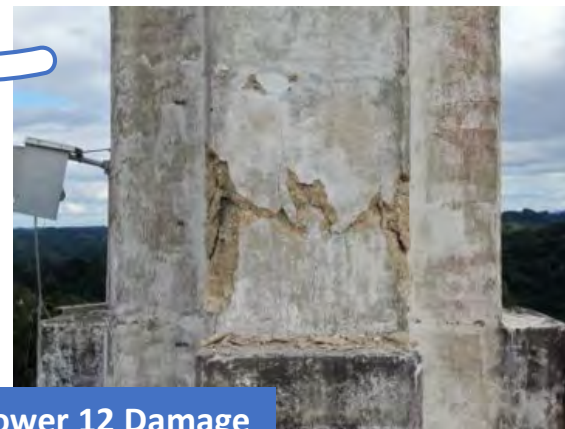
Tower 12 required the surgical demolition of debris to minimize further damage to the remaining original structure.



Tower 12 Scaffold



Tower 12 Waterproof Coating



Tower 12 Damage



Tower 12 Repair Underway



Platform Impact Area – Soil Removal and Erosion Control

Cleanup involved soil removal and erosion control measures.



Reflector Area and Rim Wall at Platform Impact Area



Erosion control underway within the Reflector Area



Cable Processing



Cleanup gathered 114 bundles equaling 35 miles of cable. Cable segments were removed, processed, and stored.



Cable processing underway (top and bottom left). Tented cable storage on parking lot (above left and right)



Scrap Staging Yard and Processing Area

Cleanup required processing of metals within the Storage Yard (not within historic district). Important objects identified by the Salvage Survey Committee were sorted and stored separately. Crushed concrete was placed, and the scrap yard was regraded.

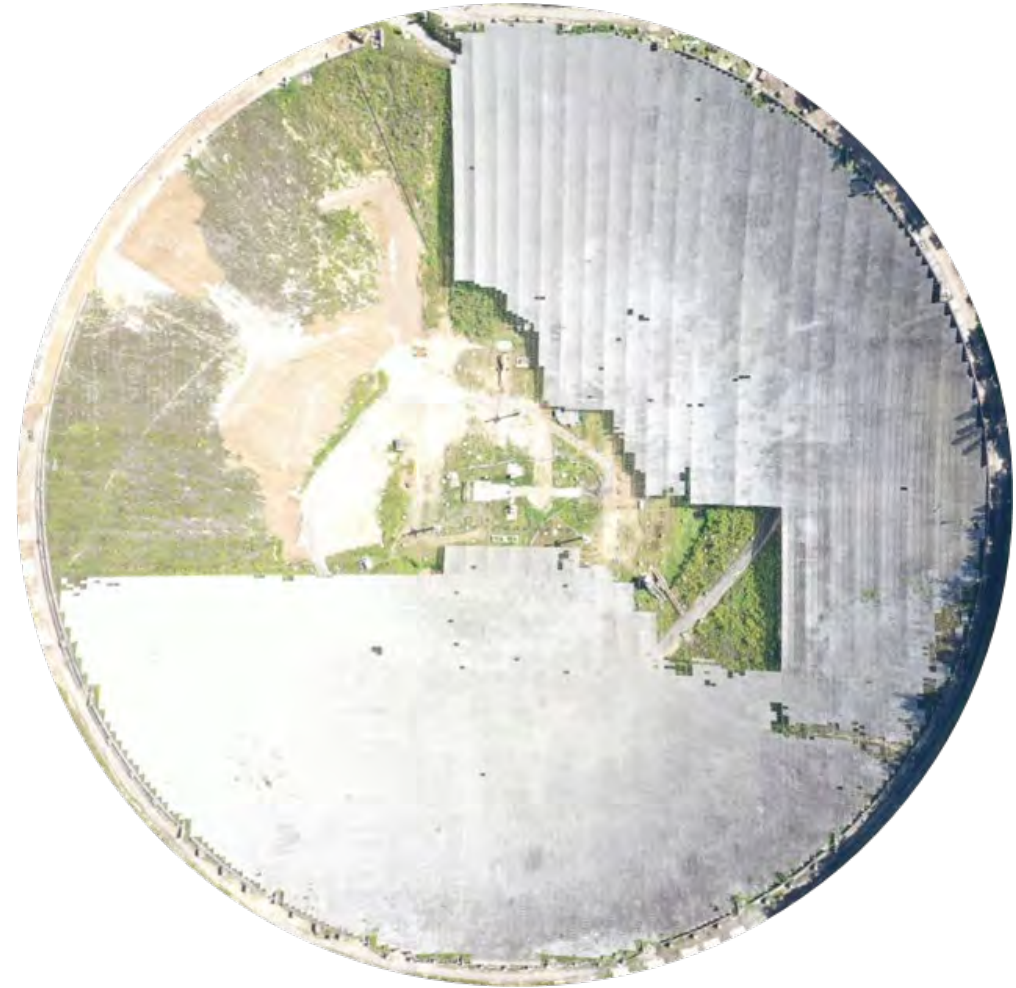


Scrap staging yard and temporary salvage area is marked off and shown with yellow outline (left). Processing area near Tower 4 in June 2021 (right)



Emergency Cleanup Outcome

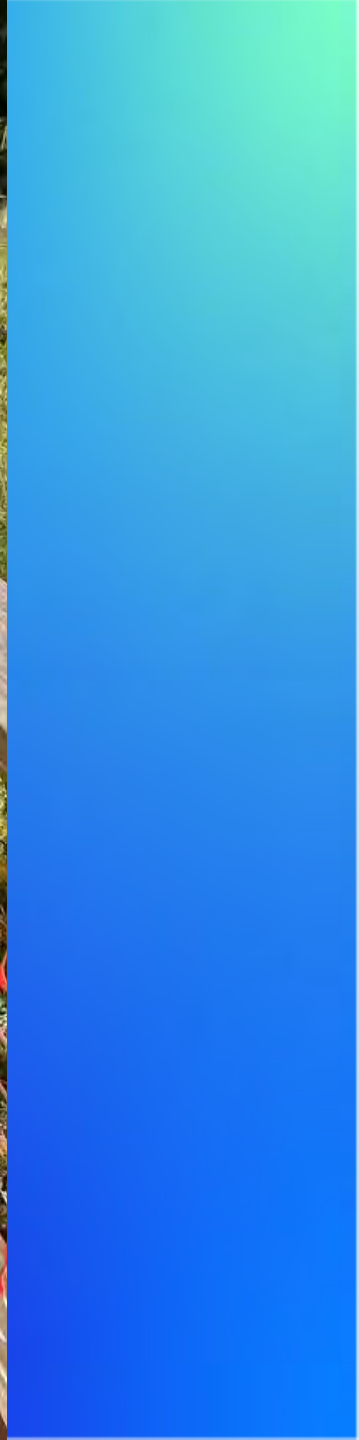
- Removed approximately 35% of the reflector area or about 14,000 damaged panels out of an estimated 39,000 total panels
- All panels that required cleanup were mapped, removed, and safely stored or taken to recycling center if not repairable
- Contributing resources in better condition than anticipated, and three towers remain except for the upper segments that fell during the collapse
- Cable and steel processing is complete
- Debris removal is complete
- Scaffolding coming down for Tower 4 and Tower 8
- Final emergency cleanup elements nearing completion (site stabilization and revegetation, and Tower 12 repair continue)





Path Forward

Opportunities for Science and Preservation





Path Forward

- Future plans for the site to be determined
- NSF continues oversight of emergency cleanup operations
- UCF continues operations
- Site safety and worker access remains a priority
- Educational and scientific programs continue
- Historic preservation remains a priority
- Preservation Plan and avoidance measures continue to protect contributing resources





Path Forward

- SHPO and ACHP will be invited to future Section 106 actions once future planning commences, as appropriate
- Public updates are available at the Media Resources page https://www.nsf.gov/news/special_reports/arecibo/
- Objects identified by the Salvage Survey Committee under consideration to be preserved for potential display at the site or other museums
- NSF and UCF plan to retain instrumentation, hardware and reflector panels for potential reuse and/or public display where possible, and use recycling proceeds for cleanup costs and the continued operation of the Arecibo Observatory



Salvaged items include cables, platform structures, receiver, and other elements from the 305-meter radio telescope.





Path Forward – Preservation

- Continue to monitor and avoid potential impacts to historic properties and implement mitigation measures

Resources in Place

- Programmatic Agreement
- Salvage Survey Committee
- Technical Preservation Bulletins
- Preservation Plan
- Cultural Resources Experts
- Secretary of the Interior's Standards and Guidelines
- ACHP involvement
- SHPO engagement
- AO Preservation Training



Path Forward – Section 106

- Should new construction or major repairs or upgrades to contributing resources (such as the 305-meter radio telescope or other scientific equipment) need to occur, the NSF Federal Preservation Officer (FPO) will proceed with determining if a new Section 106 undertaking is warranted (PA Stipulation I.A.7)

Note: Any changes to noncontributing resources, or maintenance, minor repair, and any required changes that are necessary to the operation of the telescopes or scientific equipment are allowable without further review (PA Stipulation I.A.1; I.A.5[b], I.A.8[b])

Resources in Place

- Historic Preservation Program
- Programmatic Agreement
- Communication and Work Plan
- NSF oversight, ACHP and SHPO engagement



Question and Answer

- To ask an additional question—either raise virtual hand to speak or add your question into the chat
- Remember—keep questions brief to afford everyone a chance to speak and mute yourself once finished

Thank You for Your Participation!

Additional information:

https://www.nsf.gov/news/special_reports/arecibo/

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