

TECHNICAL EXHIBIT  
APPLICATION FOR CONSTRUCTION PERMIT  
WERR FM BOOSTER STATION  
MAYAGUEZ, PUERTO RICO

December 23, 2009

CH 281 2.5 KW (MAX-DA) 360 M AMSL

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Table of Contents

Technical Statement

Figure 1	Proposed Operating Parameters
Figure 2	Predicted Coverage Contours
Appendix 1	Notification to the National Astronomy and Ionosphere Center
Appendix 2	Antenna Manufacturer's Pattern Data
Appendix 3	TOWAIR Determination

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Engineering Statement

This Technical Exhibit was prepared on behalf of Radio Redentor, Inc., licensee of FM station WERR, Vega Alta, Puerto Rico, in support of an application for construction permit for an FM booster station at Mayaguez, Puerto Rico. The instant application proposes an effective radiated power (ERP) of 2.5 kW using a directional antenna. The proposed booster facility will operate on Channel 281 (104.1 MHz) with an antenna radiation center height above mean sea level of 360 m. The proposed facility will employ two vertically stacked Scala, CA5-FMCP directional transmitting antennas, with the antenna elements oriented at 170° True. The proposed operating parameters are shown in Figure 1.

Tower Registration

It is proposed to side mount the FM booster antenna in the existing tower of TV station W49CZ-D. The overall height above ground of the existing tower is 35 m and according to the TOWAIR program, it does not require registration (Appendix 3). There will be no change in the overall height of the existing structure.

Notification of FCC Monitoring Station and Arecibo Observatory

FCC rules, Section 73.1030(c), requires that the proposed facility do not produce a field strength greater than 10 mV/m at the FCC stations. The closest FCC monitoring station to the proposed operation is located at Santa Isabel, Puerto Rico, at a distance of 91.2 kilometers on a bearing of 112.7° True. The proposed operation will produce field strengths much lower than 10 mV/m at the FCC Santa Isabel, PR station. Therefore, notification to the FCC monitoring station is not deemed necessary.

FM Booster Application for WERR  
Mayaguez, Puerto Rico

Page 2 of 3

The Arecibo Observatory located near Arecibo, Puerto Rico was notified of the proposed facility pursuant to Section 73.1030 of the FCC Rules. Copies of the notification and letter of consent from the Observatory are included in Appendix 1.

### Environmental Considerations

The proposed facility is categorically excluded from environmental processing pursuant to Section 1.1306 of the FCC Rules. With respect to the potential for human exposure to radio frequency (RF) radiation, a conservative calculation of the FM energy in the downward direction indicates an RF level for the FM Booster of no greater than 4.3 % of the FCC uncontrolled standard.\* Therefore, since the RF exposure is predicted not to exceed 5.0% of the FCC limit for uncontrolled environments, the proposal complies with the FCC limits for human exposure to RF radiation and it is categorically excluded from environmental processing. The applicant shall reduce power or cease operation as necessary to protect persons having access to fenced area around the tower from RF energy in excess of the FCC guidelines.

### Predicted Coverage Contour

The predicted 54 dBu coverage contours were calculated in accordance with Section 73.313 of the FCC Rules. The average terrain elevations from 3 to 16 km from the proposed site were computed using the U.S.G.S. 30-second terrain database. The distances to the predicted 54 dBu coverage contour for the proposed booster was determined using the average elevations of radials spaced every 5-degree of azimuth. The antenna radiation center height above average terrain and the ERP in each radial direction were used in conjunction with the propagation prediction curves of Section 73.333 to determine the distances to the contour. Figure 2 is a map showing the predicted 54 dBu coverage contours of the WERR(FM) main facility and the proposed booster. As indicated in Figure 2, the proposed predicted 54 dBu contour of the booster will be contained within the WERR main facility

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\* This is based on the proposed FM booster antenna radiation center height above ground of 30 m, effective radiated power in each polarization plane of 2.5 kW, and a downward relative field factor of 0.20 for any antenna depression angle greater than 60 degrees. Calculations were made at 2-m AGL according procedures outlined in FCC OET Bulletin No. 65. Calculated combined RF energy will not exceed 8.52 uW/cm<sup>2</sup> according to these assumptions. This is 4.26% of the FCC limit of 200 uW/cm<sup>2</sup> for uncontrolled environments.

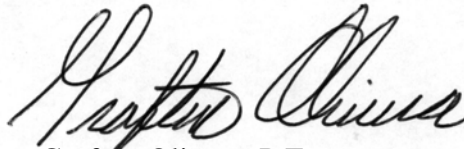
FM Booster Application for WERR  
Mayaguez, Puerto Rico

Page 3 of 3

predicted 54 dBu contour over land. The proposed maximum ERP for the booster is well within 20% of the licensed ERP of the primary station, WERR(FM).

Allocation Considerations

There are no adjacent-channel FM facilities to the proposed booster on Channel 281 in Puerto Rico. Therefore, the proposed facility meets the adjacent-channel protection requirements outlined in the FCC Rules. The proposed booster facility meets the other allocation requirements in all respects.

A handwritten signature in black ink, appearing to read 'Grafton Olivera', is centered on the page.

Grafton Olivera, P.E.  
Consulting Engineer

du Treil, Lundin & Rackley, Inc.  
201 Fletcher Ave.  
Sarasota, FL 34237-6019

December 23, 2009

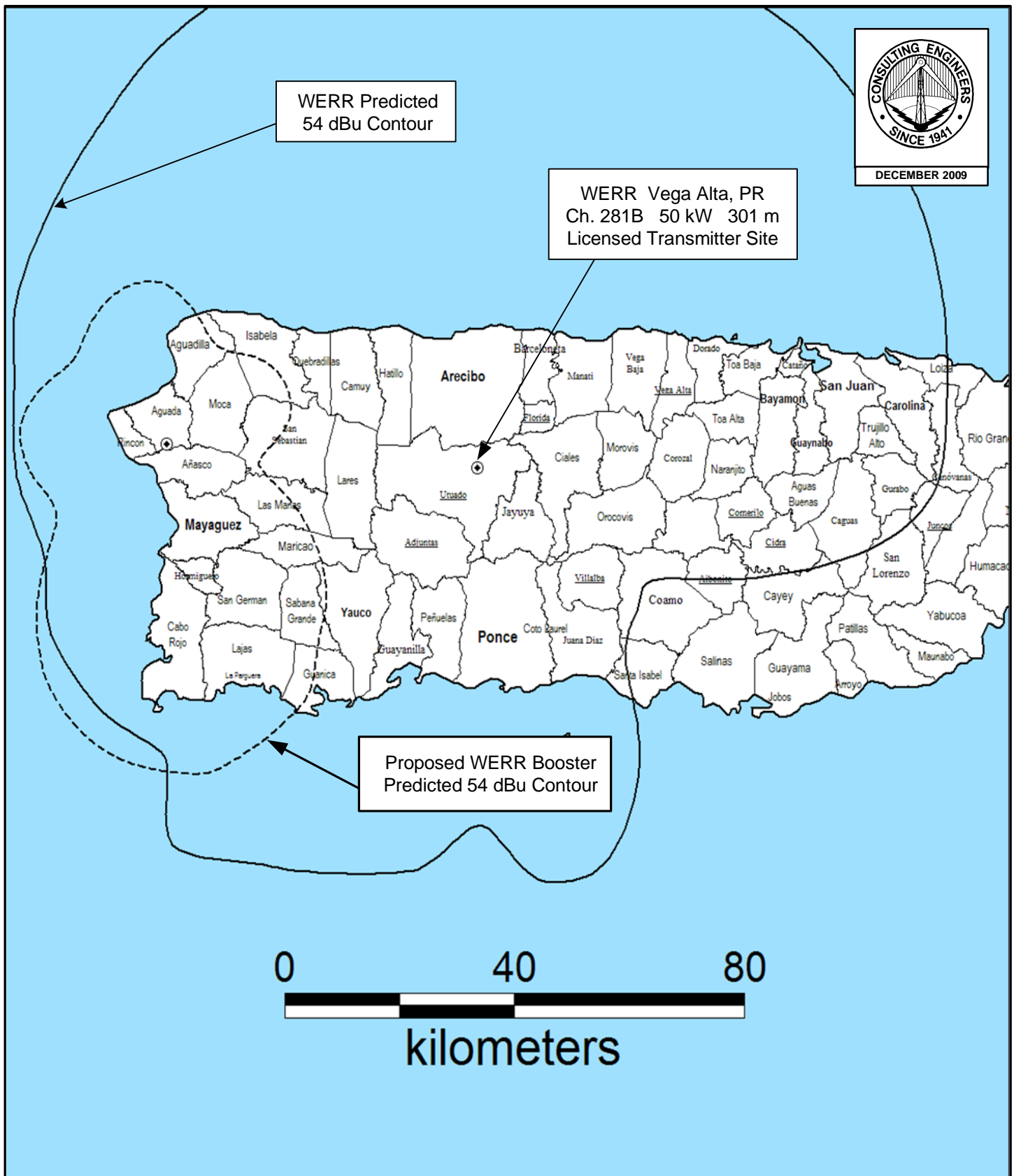
Figure 1

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MAYAGUEZ, PUERTO RICO  
CH 281 2.5 KW(MAX-DA) 360 M AMSL

Engineering Specifications

Channel / Frequency	281 / 104.1 MHz
Site Coordinates	18°19'31" North Latitude 67°10'13" West Longitude
Site elevation	330 m AMSL
Overall height of existing structure	35 m AGL / 365 m AMSL
Height of antenna radiation center	30 m AGL / 360 m AMSL
Transmitter	Bext, XT20/FS500
Transmitter power output	0.40 kW
Transmission line	Andrew, LDF5-50A
Transmission line length	45 m
Transmission line efficiency	88.0%
Antenna	Scala, CA5-FMCP Stacked Array
Polarization	Circular
Power gain	7.08
Antenna input power	0.353 kW
Effective radiated power (H & V)	2.5 kW

Figure 2



**PREDICTED COVERAGE CONTOURS**  
**FM BOOSTER STATION FOR WERR(FM)**  
**MAYAGUEZ, PUERTO RICO**  
**CH 281 2.5 KW (MAX-DA) 360 M AMSL**  
 du Treil, Lundin & Rackley, Inc. Sarasota, Florida

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Notification and Letter of Consent - National Astronomy and Ionosphere Center

*{2 sheets follow}*





201 Fletcher Ave.  
Sarasota, FL 34237-6019  
941-329-6000  
941-329-6031 FAX

**Grafton Olivera**  
Direct Dial 941-329-6001  
e-mail: [grifton@dlr.com](mailto:grifton@dlr.com)

December 8, 2009

Via email ([prcz@naic.edu](mailto:prcz@naic.edu))

Dr. Tim Hankins, Director  
Mr. Reinaldo Velez, Spectrum Manager  
National Astronomy and Ionosphere Center  
Arecibo Observatory  
HC3 Box 53995  
Arecibo, PR 00612

Gentlemen:

On behalf of our client, Radio Redentor, Inc., applicant of an FM booster station in Mayaguez, Puerto Rico, in accordance with Section 73.1030 of the FCC Rules, we are hereby notifying of the facility. The particulars of the proposal are as follows:

Proposed Facilities

Geographical coordinates of antenna location (NAD83): 18-19-23.8 / 67-10-11.7  
Antenna radiation center height: 30m AGL; 360 m AMSL  
Antenna directivity: see attached antenna pattern  
Operating channel: 281 (104.1 MHz)  
Type of emission: F3E  
Effective isotropic radiated power: 4.1 kW (Circular Polarization)

Please review this proposal and if you find any cause of concern, let us know immediately, so appropriate action can be taken.

Please feel free to communicate via email (<mailto:Grafton@dlr.com>), telefax (941-329-6030) or regular mail.

Very truly yours,

Grafton Olivera, P.E.

NATIONAL ASTRONOMY AND IONOSPHERE CENTER  
ARECIBO OBSERVATORY



December 21, 2009

Mr. Grafton Olivera P.E.  
du Treil, lundin & Rackley, Inc.  
201 Fletcher Ave.  
Sarasota, Fl. 34237-6019

Re: New FM Booster Station for Werr(FM)  
Cerro Atalaya de Rincon para WERR

Dear Grafton Olivera:

Thank you very much for the copy of your FCC application sent to us in accordance with the Puerto Rico Coordination zone agreements. We have considered the technical aspects of your application and find that your installation is unlikely to cause harmful interference to the passive use of the Radio Astronomy bands at the Observatory. We therefore have no objection to your proposed installation.

Sincerely yours,

Reinaldo Vélez  
Spectrum Manager

RV:ws

Cc: FCC  
PRCZ files [File #009012026]

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Antenna Manufacturer's Pattern Data

*{2 sheets follow}*

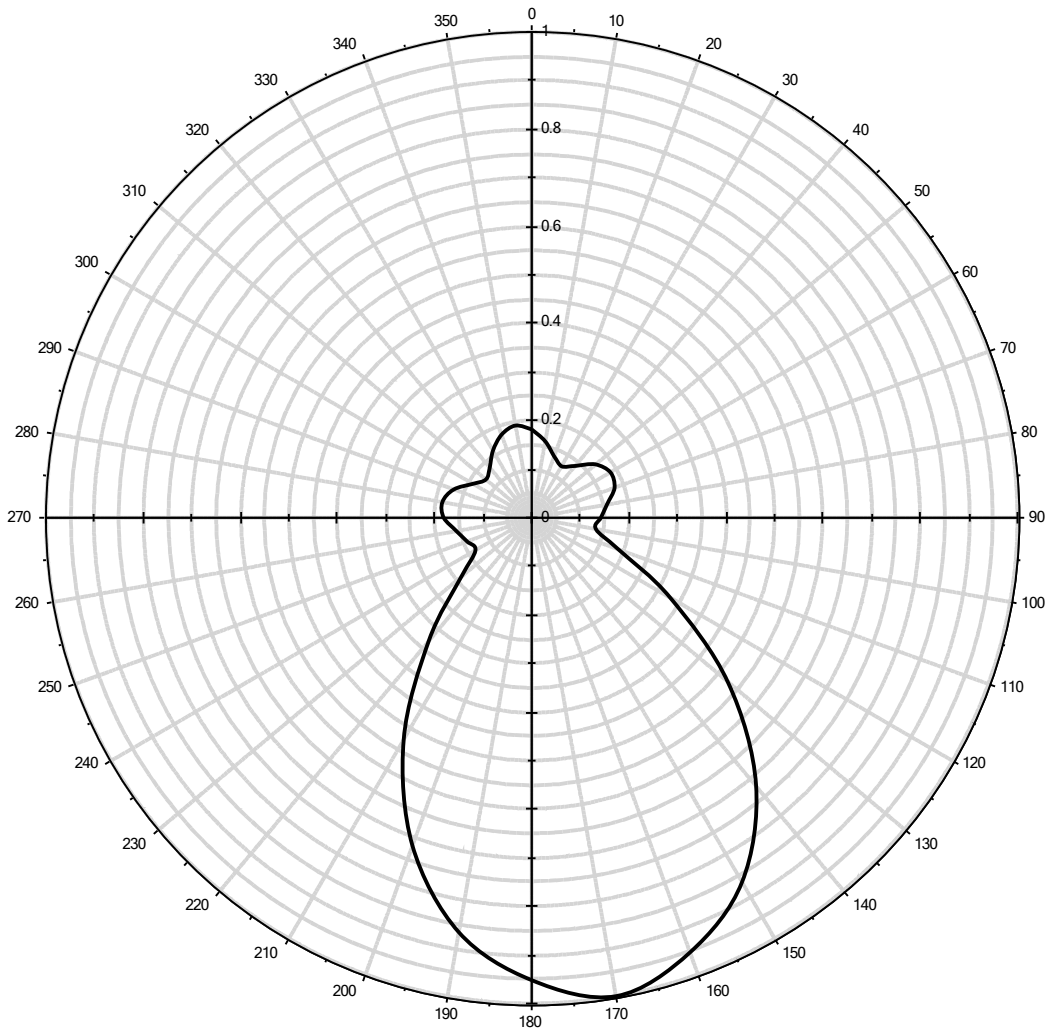
# DA Inquiry

du Treil, Lundin, & Rackley, Inc., Sarasota, Florida



**Antenna Pattern:** Antenna ID: 800256

**FM BOOSTER FOR  
WERR, MAYAGUEZ, PR  
(2) CA5-FMCP at 170°  
GAIN = 8.5 dBd**



Antenna ID: DLR-800256 Rotation: 0.00° —

## Antenna Details:

0°	0.182	60°	0.187	120°	0.329	180°	0.952	240°	0.134	300°	0.140
10°	0.160	70°	0.181	130°	0.528	190°	0.866	250°	0.142	310°	0.123
20°	0.135	80°	0.157	140°	0.718	200°	0.718	260°	0.157	320°	0.135
30°	0.123	90°	0.142	150°	0.866	210°	0.528	270°	0.181	330°	0.160
40°	0.140	100°	0.134	160°	0.952	220°	0.329	280°	0.187	340°	0.182
50°	0.171	110°	0.190	170°	1.000	230°	0.190	290°	0.171	350°	0.193

**Antenna Make:** Scala

**Standard Pattern:**

**Antenna Model:** CA5-FMCP

**Last Change Date:**

# CA5-FM/CP/RM

## FM YAGI ANTENNA

6 dBd gain  
88 to 108 MHz  
Circularly polarized

The Scala CA5-FM/CP/RM is a ruggedly built yagi antenna, designed for professional FM transmit and receive applications.

Like all Scala antennas, the CA5-FM/CP/RM is made of the finest materials resulting in superior performance and long service life.

The CA5-FM/CP/RM may be used stand-alone or in stacked arrays for higher gain, increased side-lobe suppression, or custom azimuth patterns.

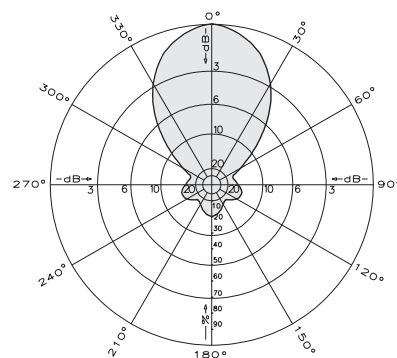
### Specifications:

Frequency range	Any specified FM channel 88 to 108 MHz
Gain	6 dBd
Impedance	50 ohms
VSWR	< 1.5:1
Polarization	Circular
Front-to-back ratio	>14 dB
Maximum input power	250 watts
Azimuth pattern	61 degrees (half-power)
Elevation pattern	61 degrees (half-power)
Connector	N female
Weight	35 lb (15.9 kg)
Dimensions	79 x 56 x 50.8 inches maximum (2007 x 1422 x 1290 mm)
Equivalent flat plate area	2.84 ft <sup>2</sup> (0.264 m <sup>2</sup> ) maximum
Wind survival rating*	120 mph (194 kph)
Shipping dimensions	84 x 13 x 8 inches maximum (2134 x 330 x 203 mm)
Shipping weight	38 lb (8.2 kg) maximum
Mounting	For masts of 2.375 inches (60 mm) OD.

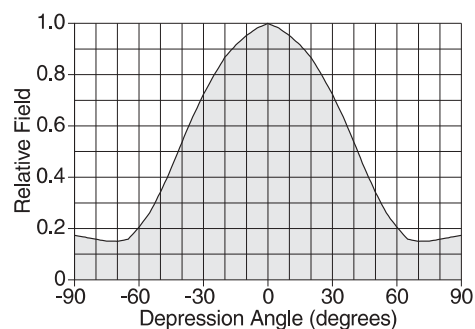
\* Mechanical design is based on environmental conditions as stipulated in EIA-222-F (June 1996) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

### Order Information:

Contact Scala Customer Service for detailed order information.



**Azimuth pattern (E-plane)**



**Elevation pattern (H-plane)**



10748-B

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TOWAIR Determination

*{1 sheet follows}*

## TOWAIR Determination Results

A routine check of the coordinates, heights, and structure type you provided indicates that this structure does not require registration.

### \*\*\* NOTICE \*\*\*

TOWAIR's findings are not definitive or binding, and we cannot guarantee that the data in TOWAIR are fully current and accurate. In some instances, TOWAIR may yield results that differ from application of the criteria set out in 47 C.F.R. Section 17.7 and 14 C.F.R. Section 77.13. A positive finding by TOWAIR recommending notification should be given considerable weight. On the other hand, a finding by TOWAIR recommending either for or against notification is not conclusive. It is the responsibility of each ASR participant to exercise due diligence to determine if it must coordinate its structure with the FAA. TOWAIR is only one tool designed to assist ASR participants in exercising this due diligence, and further investigation may be necessary to determine if FAA coordination is appropriate.

#### DETERMINATION Results

**PASS SLOPE(100:1): NO FAA REQ-RWY MORE THAN 10499 MTRS & 7794.65 MTRS (7.79469 KM) AWAY**

Type	C/R	Latitude	Longitude	Name	Address	Lowest Elevation (m)	Runway Length (m)
AIRP	R	18-15-15.00N	067-09-20.00W	EUGENIO MARIA DE HOSTOS	--PUERTO RICO MAYAGUEZ, PR	4.7	1523.4000000000001

#### Your Specifications

##### NAD83 Coordinates

Latitude	18-19-23.8 north
Longitude	067-10-11.7 west

##### Measurements (Meters)

Overall Structure Height (AGL)	35
Support Structure Height (AGL)	0
Site Elevation (AMSL)	330

##### Structure Type

TOWER - Free standing or Guyed Structure used for Communications Purposes

#### [Tower Construction Notifications](#)

Notify Tribes and Historic Preservation Officers of your plans to build a tower.

CLOSE WINDOW