

## **ENGINEERING EXHIBIT**

### **Application for Post-Transition Digital Television Station Construction Permit**

prepared for

#### **Gray Television Licensee, Inc.**

WCAV-DT Charlottesville, VA

Facility ID 363

Ch. 19 50 kW 326 m

*Gray Television Licensee, Inc.* (“Gray”) is the licensee of television station WCAV(TV), analog Channel 19, Charlottesville, VA. WCAV was originally authorized after April 3, 1997 and therefore does not have a companion digital channel. *Gray* herein proposes construction of the WCAV-DT post-transition digital facility on Channel 19 and intends to “flash cut” at the end of the transition. This channel was established in Appendix B of the Seventh Report and Order in MB Docket 87-278.

The instant proposal specifies an effective radiated power (“ERP”) of 50 kW at 326 meters antenna height above average terrain (“HAAT”), with a directional antenna. The proposed coverage extends beyond that of the Appendix B parameters of 50 kW ERP and 326 meters HAAT due to differences in the directional antenna pattern. The Appendix B facility incorporates a hypothetical directional pattern for WCAV which corresponds generally to the pattern associated with the authorized analog operation, but the pattern has become distorted with the FCC’s “carry over” procedure to digital operation due to the impact of non-uniform terrain and differences in the F(50,50) and F(50,90) propagation curves.

The proposed digital Channel 19 operation will employ the existing directional antenna system licensed for WCAV’s analog Channel 19. The antenna is top-mounted on the existing WCAV antenna supporting structure. The overall structure elevation is less than 61 meters above ground and passes the FCC’s TOWAIR program for the transmitter location, thus FCC antenna structure registration is not necessary. No change to the overall structure height and no tower work are required to carry out this proposal.

The proposed WCAV-DT antenna system is an ERI model ATW18H4-HTCX-19H. The directional antenna's azimuthal patterns are depicted in **Figure 1**. **Figures 2** and **2A** provide the theoretical vertical plane (elevation) pattern<sup>1</sup>.

A map is supplied as **Figure 3**, which depicts the standard predicted coverage contours. This map includes the boundaries of Charlottesville, WCAV-DT's principal community. As demonstrated thereon, the proposed facility complies with §73.625(a)(1), as the entire principal community will be encompassed by the 48 dB $\mu$  contour.

The proposed WCAV-DT facility's predicted service population provides a 103.8 percent match of the Appendix B facility, as detailed in the table below.

**Post-Transition Population Summary**

Population Summary (2000 Census) OET Bulletin 69 method	Appendix B	Proposed
Within Noise Limited Contour	513,399	551,855
Not affected by terrain losses	386,401	401,217
Lost to all interference	4,598	5,066
Net DTV Service	<b>381,803</b>	<b>396,151</b>
Match of Appendix B	---	<b>103.76%</b>

### **Freeze Waiver Request**

A waiver of the Commission's August 3, 2004 "freeze" concerning expansion in service area<sup>2</sup> is requested. The proposal complies with the criteria for a freeze waiver request outlined in the Report and Order in the Third Periodic Review.<sup>3</sup> WCAV-DT will utilize its analog channel for post-transition operation and will employ the existing analog antenna.

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<sup>1</sup> These patterns are supplied in terms of relative field. In recent years, FCC Staff have not required pattern data in dBk format however such patterns are available upon request.

<sup>2</sup> Public Notice "Freeze on the Filing of Certain TV and DTV Requests for Allotment or Service Area Changes," DA 04-2446, released August 3, 2004.

<sup>3</sup> *Third Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television*, MB Docket No. 07-91, FCC 07-228, released December 31, 2007.

The map attached as **Figure 4** supplies a comparison of the 41 dB $\mu$  digital service contours corresponding to the proposed WCAV-DT facility and the Appendix B parameters. As shown thereon, the amount of contour extension does not exceed five miles at any azimuth.

Absent the waiver, the WCAV-DT directional ERP would have to be reduced to 17.3 kW to avoid a contour extension. At this power level, the resulting DTV service contour would not cover 10,124 persons within an area of 338.2 sq. km that are presently within the WCAV analog Grade B contour. The potential loss area is depicted in **Figure 4A**. The interference-free service population for WCAV-DT operation at 17.3 kW ERP would be 320,793 persons, which is an 84.0 percent match of the WCAV-DT Appendix B population and would fail to satisfy the Commission's goal of at least a 95 percent population match.

A detailed interference study per OET Bulletin 69<sup>4</sup> shows that the proposal complies with the 0.5 percent limit of new interference caused to other stations' Appendix B facilities, as summarized in the table on the following page.

Protection requirements towards authorized Class A stations are also satisfied. The only potentially affected Class A station is WAHU-CA (Ch. 27, Charlottesville, VA, 0.3 km distant) and an OET Bulletin 69 interference analysis with a 1 km cell size shows that there would be no additional interference caused to WAHU-CA. The interference-free WAHU-CA service population is 122,921 persons (1990 census) and would remain unchanged when the proposed WCAV-DT facility is considered.

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<sup>4</sup>FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). The implementation of OET-69 for this study followed the guidelines of OET-69 as specified therein. A standard cell size of 2 km was employed. Comparisons of various results of this computer program (run on a Sun Sparc processor) to the Commission's implementation of OET-69 show excellent correlation.

**Post-Transition Interference Analysis Summary**

Ch	Call Sign	State/City Facility ID	Power (kW) HAAT (m)	Dist (km) Bear (°T)	Appendix B	New Interference	
					Baseline Population (2000 Census)	From Proposal Population	Percent
18	WDBJ-DT	VA ROANOKE 71329	460 606	171.9 239.8	--- no interference caused ---		
18	WFXB-DT	SC MYRTLE BEACH 9054	1000 459	425.9 188.7	--- no interference caused ---		
19	WTWB-DT	NC LEXINGTON 35385	800 576	263.6 207.3	4,288,077	0	0.00%
19	WVAH-DT	WV CHARLESTON 417	475 514	303.5 280.0	--- no interference caused ---		
19	WUNM-DT	NC JACKSONVILLE 69444	66.6 561	335.5 162.0	--- no interference caused ---		
20	WJPR-DT	VA LYNCHBURG 24812	400 500	125.5 234.3	972,071	162	0.02%

**Other Allocation Considerations**

The site is not located within the areas requiring coordination with “quiet” zones specified in §73.1030(a) and (b). However, in MM Docket 86-440<sup>5</sup> the Commission acknowledged a settlement agreement (as supplemented June 1, 1998) between the National Radio Astronomy Observatory (“NRAO”) at Green Bank, WV and the competing applicants for the Channel 19 facility underlying WCAV. The settlement provided the NRAO with “equivalent protection” from the full power Channel 19 facility based on the former operation of a television translator station on Channel 19 at Charlottesville. WCAV was subsequently authorized and licensed under these terms, and operates with 1000 kW using a directional antenna which provides suppression towards the NRAO. Since the proposed WCAV-DT facility will operate with 50 kW ERP (*i.e.*, only five percent of the analog

<sup>5</sup>See Memorandum Opinion and Order in Applications of Acheran Broadcasting Company, Lindsay Television, For Construction Permit for a New UHF TV Station on Channel 64 at Charlottesville, Virginia, MM Docket 86-440, FCC 00-149, released April 29, 2000.

ERP) using the licensed analog antenna, signal levels towards the NRAO will be reduced from the licensed operation and therefore the proposal complies with the “equivalent protection” settlement.

WCAV is located 163.7 km from the reference coordinates for the Washington, DC region use of Land Mobile facilities within television Channel 18’s spectrum, first adjacent to Channel 19. Ordinarily, §73.623(e) requires 176 km separation for digital operation, and the WCAV site is 12.3 km short of that requirement. The distance requirement for the current WCAV 1000 kW ERP analog operation is more stringent, at 225.3 km, and as an analog facility WCAV is currently 61.6 km “short spaced” to the Channel 18 Land Mobile operational area. WCAV’s underlying authorization contained a condition related to Channel 19 transmitter filtering requirements and the acceptance of incoming interference from Land Mobile operations. The instant proposal for 50 kW ERP digital operation involves significant reductions in ERP and the amount of short-spacing distance when compared to the licensed analog facility. Accordingly, no additional impact to Channel 18 Land Mobile operations is expected as a result of this proposal.

The nearest FCC monitoring station is 195 km distant at Laurel, MD. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. There are no AM stations within 3.2 kilometers of the site, based on information contained within the Commission’s database. The site location is beyond the border areas requiring international coordination.

### **Human Exposure to Radiofrequency Electromagnetic Field (Environmental)**

The proposal will involve use of an existing transmitting antenna. The use of existing transmitting locations has been characterized as being environmentally preferable by the Commission, according to Note 1 of §1.1306 of the FCC Rules. No tower construction or change in structure height is proposed. Therefore, it is believed that this application may be categorically excluded from environmental processing pursuant to §1.1306 of the Commission’s rules.

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the Commission's OET Bulletin Number 65. Based on OET-65 equation (10), and considering 10 percent antenna relative field in downward elevations (pattern data shows less than 10 percent relative field at angles 15 to 90 degrees below the antenna), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is  $7.7 \mu\text{W}/\text{cm}^2$ , which is 3.9 percent of the general population/uncontrolled maximum permitted exposure limit. This is below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from RF electromagnetic field exposure in excess of FCC guidelines.

## **Certification**

The undersigned hereby certifies that the foregoing statement and associated attachments were prepared by him or under his direction, and that they are true and correct to the best of his knowledge and belief.

Joseph M. Davis, P.E.  
March 18, 2008

**Chesapeake RF Consultants, LLC**  
11993 Kahns Road  
Manassas, VA 20112  
703-650-9600

### List of Attachments

- Figure 1      Antenna Horizontal Plane Pattern
- Figure 2, 2A    Antenna Vertical Plane (Elevation) Pattern
- Figure 3      Proposed Coverage Contours
- Figure 4      Coverage Contour Comparison
- Figure 4A     Potential Loss Area Without Waiver
- Form 301      Saved Version of Engineering Sections from FCC Form at Time of Upload

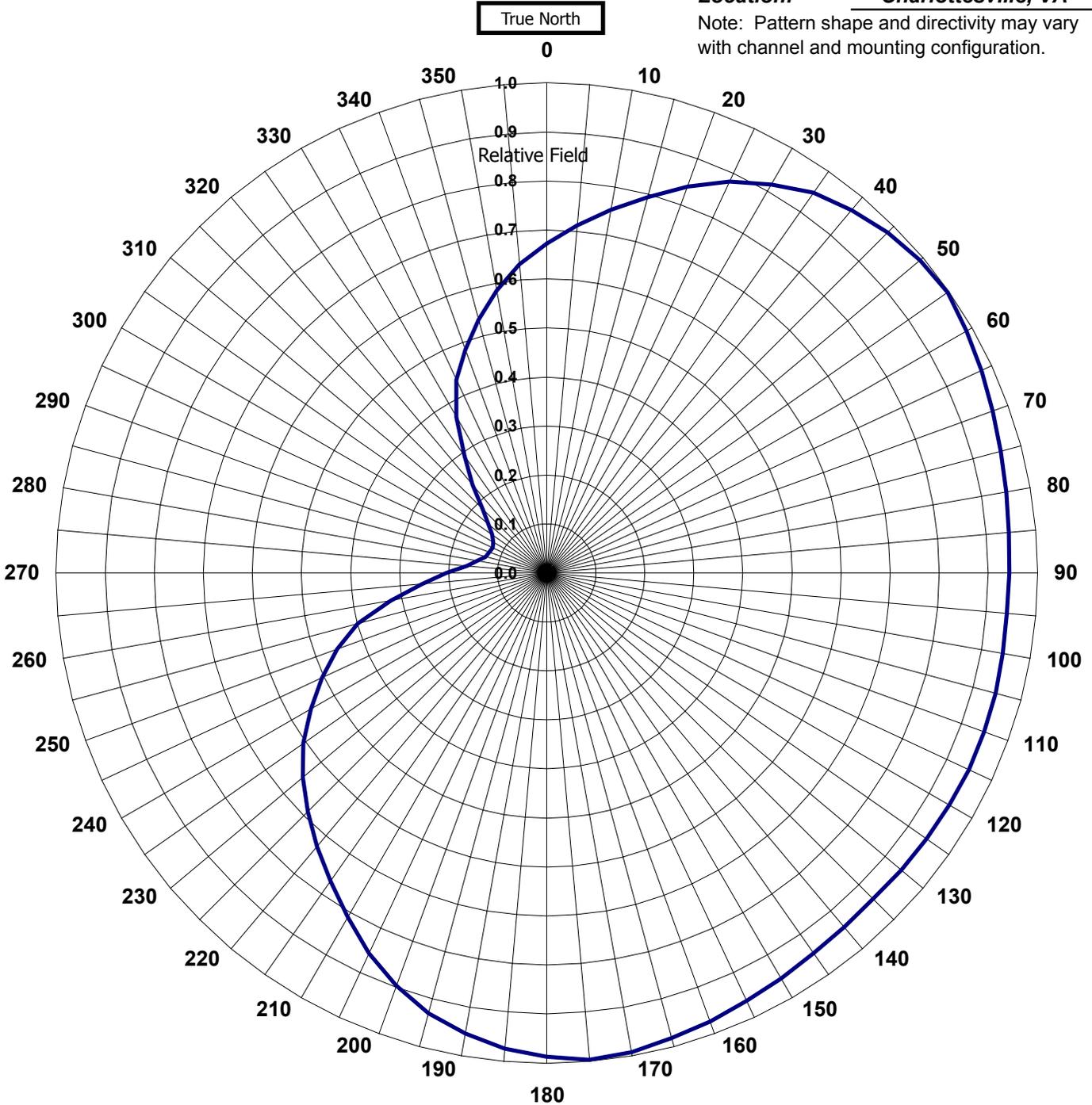
*This material was entered March 18, 2008 for filing electronically. Since the FCC's electronic filing system may be accessed by anyone with the applicant's name and password, and electronic data may otherwise be altered in an unauthorized fashion, we cannot be responsible for changes made subsequent to our entry of this data and related attachments.*

**AZIMUTH PATTERN**

**Figure 1  
Antenna Horizontal  
Plane Pattern**

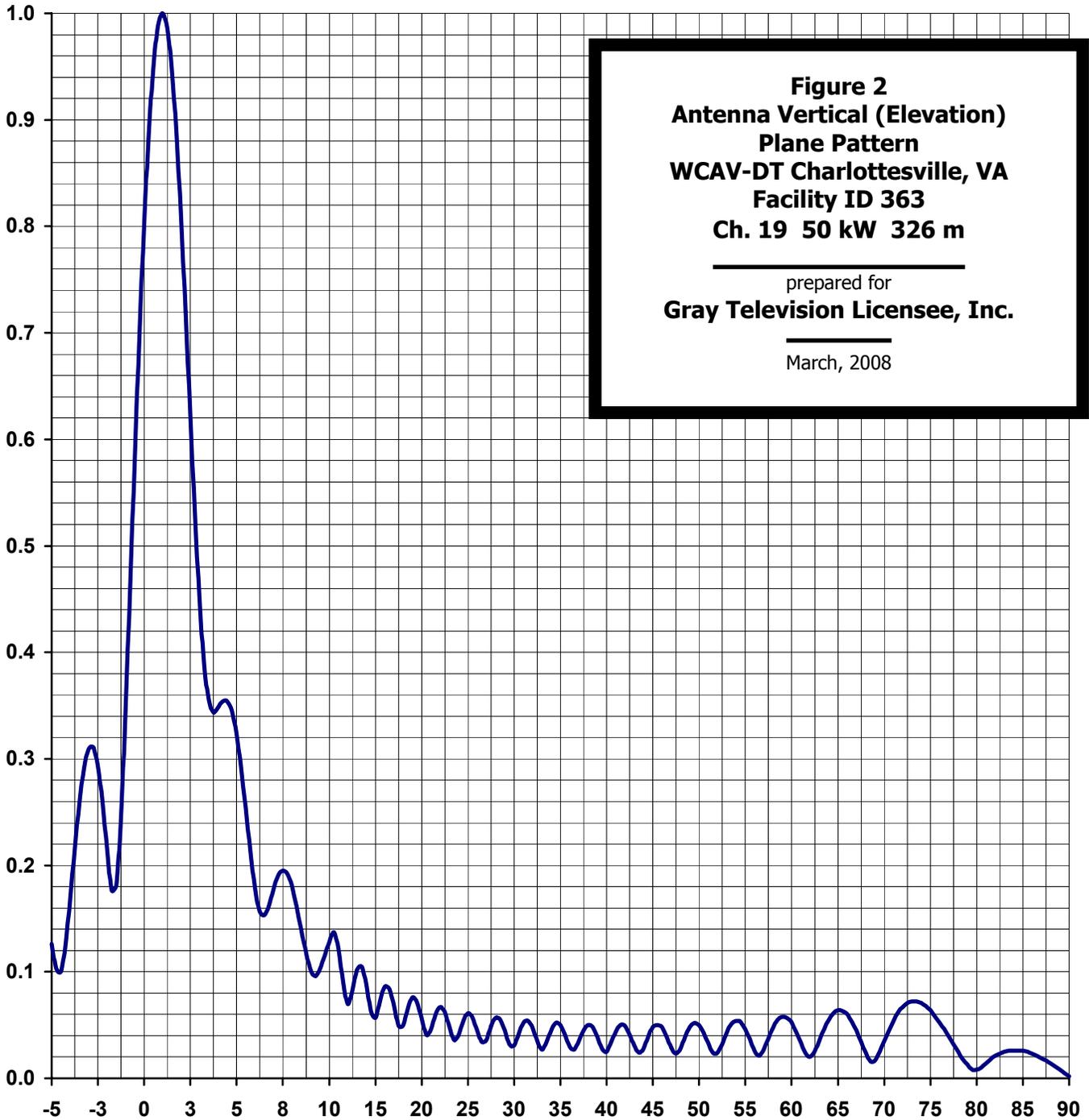
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	<b>Numeric</b>	<b>dB</b>
<b>Directivity:</b>	<b>1.69</b>	<b>2.27</b>
<b>Peak(s) at:</b>		
<b>Polarization:</b>	<b>Horizontal</b>	
<b>Frequency:</b>	<b>19 (Analog)</b>	
<b>Location:</b>	<b>Charlottesville, VA</b>	

Note: Pattern shape and directivity may vary with channel and mounting configuration.



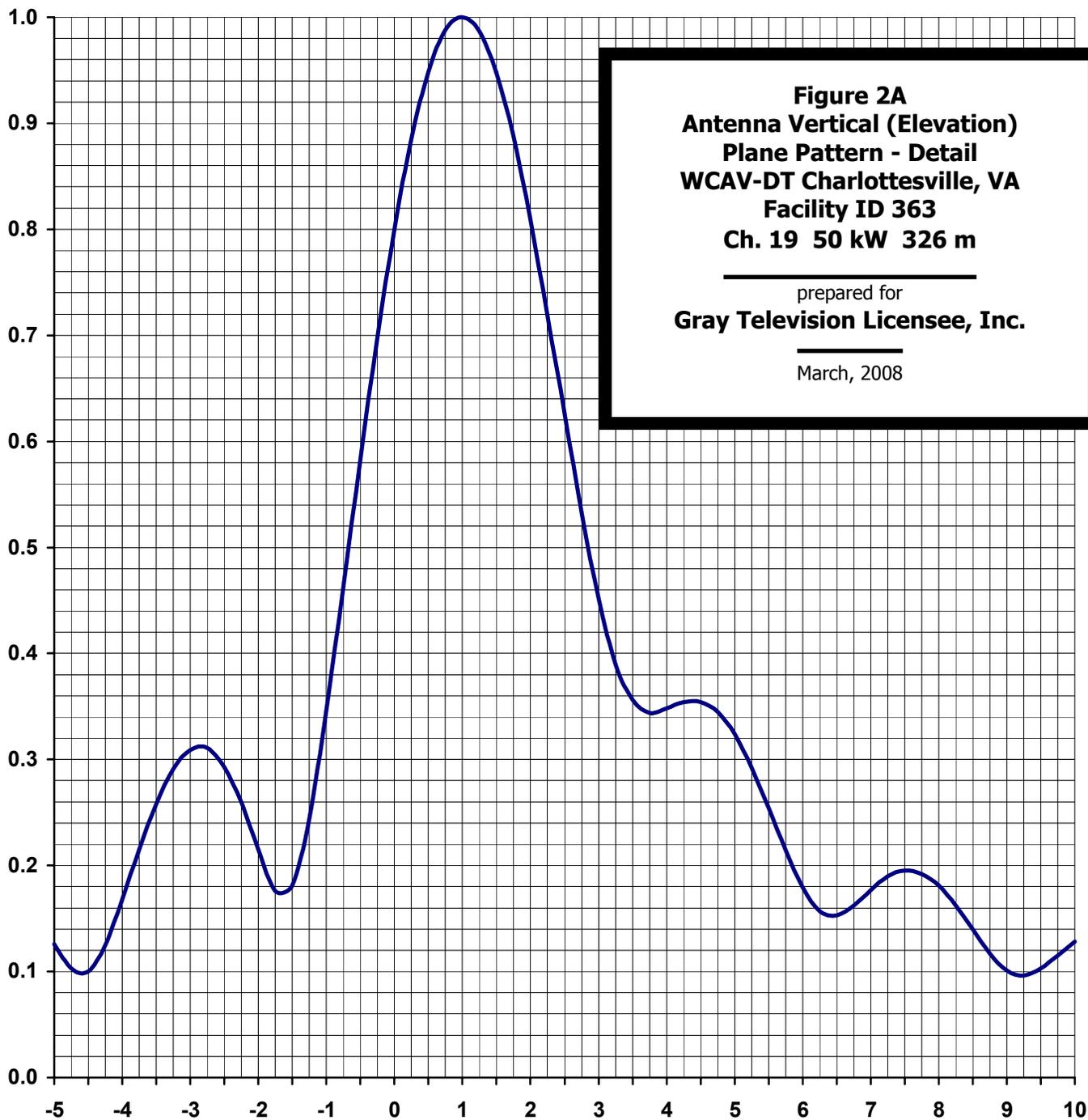
**ELEVATION PATTERN**

<b>TYPE:</b>	<b>ATW18H4H</b>	
<b>Directivity:</b>	<b>Numeric</b>	<b>dBd</b>
<b>Main Lobe:</b>	<b>18.00</b>	<b>12.55</b>
<b>Horizontal:</b>	<b>11.49</b>	<b>10.60</b>
<b>Beam Tilt:</b>	<b>1.00</b>	
<b>Polarization:</b>	<b>Horizontal</b>	
<b>Frequency:</b>	<b>19 (Analog)</b>	
<b>Location:</b>	<b>Charlottesville, VA</b>	



**ELEVATION PATTERN**

<b>TYPE:</b>	<b>ATW18H4H</b>	
<b>Directivity:</b>	<b>Numeric</b>	<b>dBd</b>
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<b>Beam Tilt:</b>	<b>1.00</b>	
<b>Polarization:</b>	<b>Horizontal</b>	
<b>Frequency:</b>	<b>19 (Analog)</b>	
<b>Location:</b>	<b>Charlottesville, VA</b>	



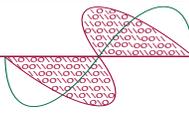
**Figure 2A**  
**Antenna Vertical (Elevation)**  
**Plane Pattern - Detail**  
**WCAV-DT Charlottesville, VA**  
**Facility ID 363**  
**Ch. 19 50 kW 326 m**

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prepared for  
**Gray Television Licensee, Inc.**

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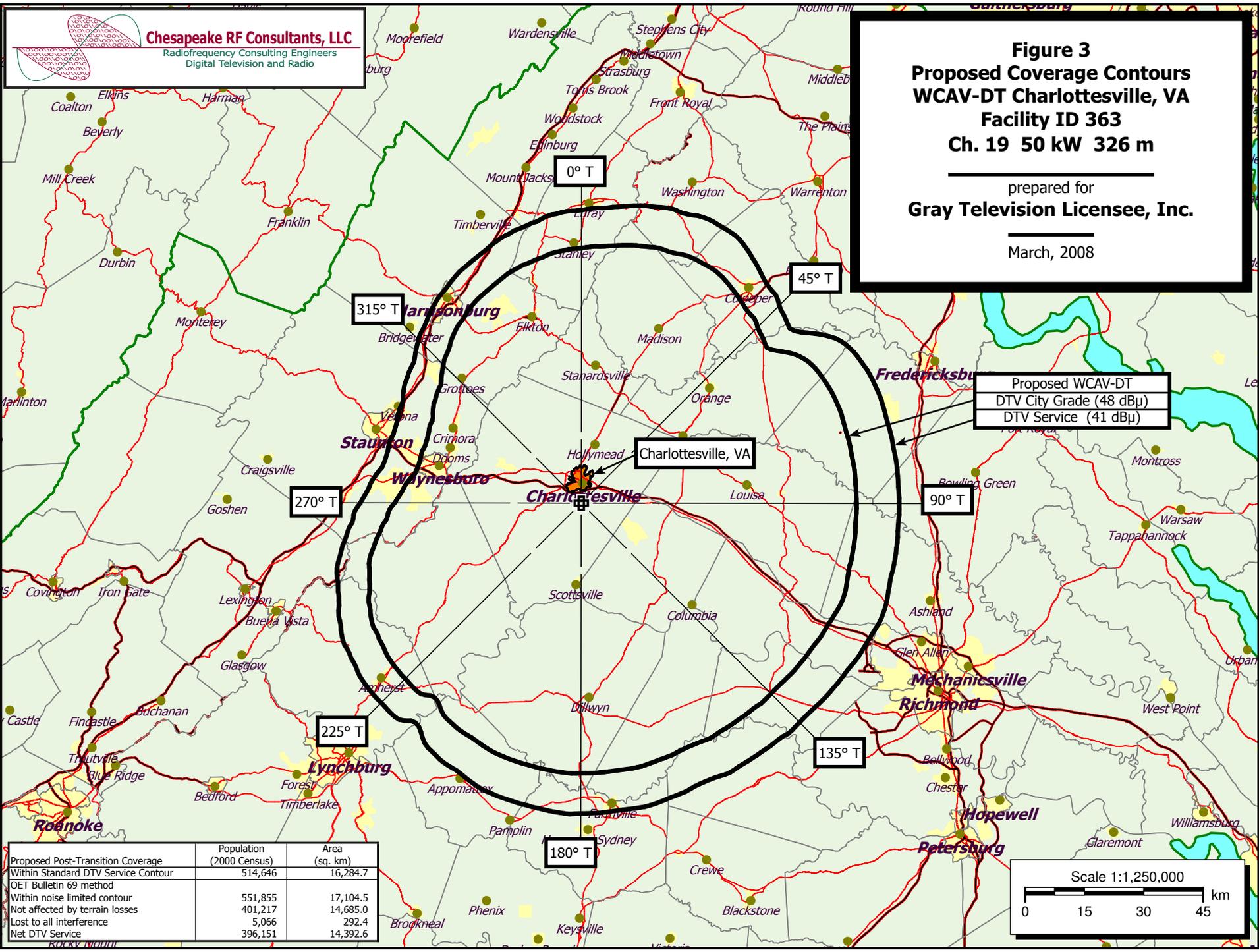
March, 2008



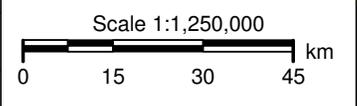
**Chesapeake RF Consultants, LLC**  
 Radiofrequency Consulting Engineers  
 Digital Television and Radio

**Figure 3**  
**Proposed Coverage Contours**  
**WCAV-DT Charlottesville, VA**  
**Facility ID 363**  
**Ch. 19 50 kW 326 m**

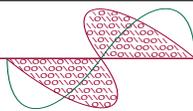
prepared for  
**Gray Television Licensee, Inc.**  
 March, 2008



Proposed Post-Transition Coverage	Population (2000 Census)	Area (sq. km)
Within Standard DTV Service Contour	514,646	16,284.7
OET Bulletin 69 method		
Within noise limited contour	551,855	17,104.5
Not affected by terrain losses	401,217	14,685.0
Lost to all interference	5,066	292.4
Net DTV Service	396,151	14,392.6







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Radiofrequency Consulting Engineers  
Digital Television and Radio

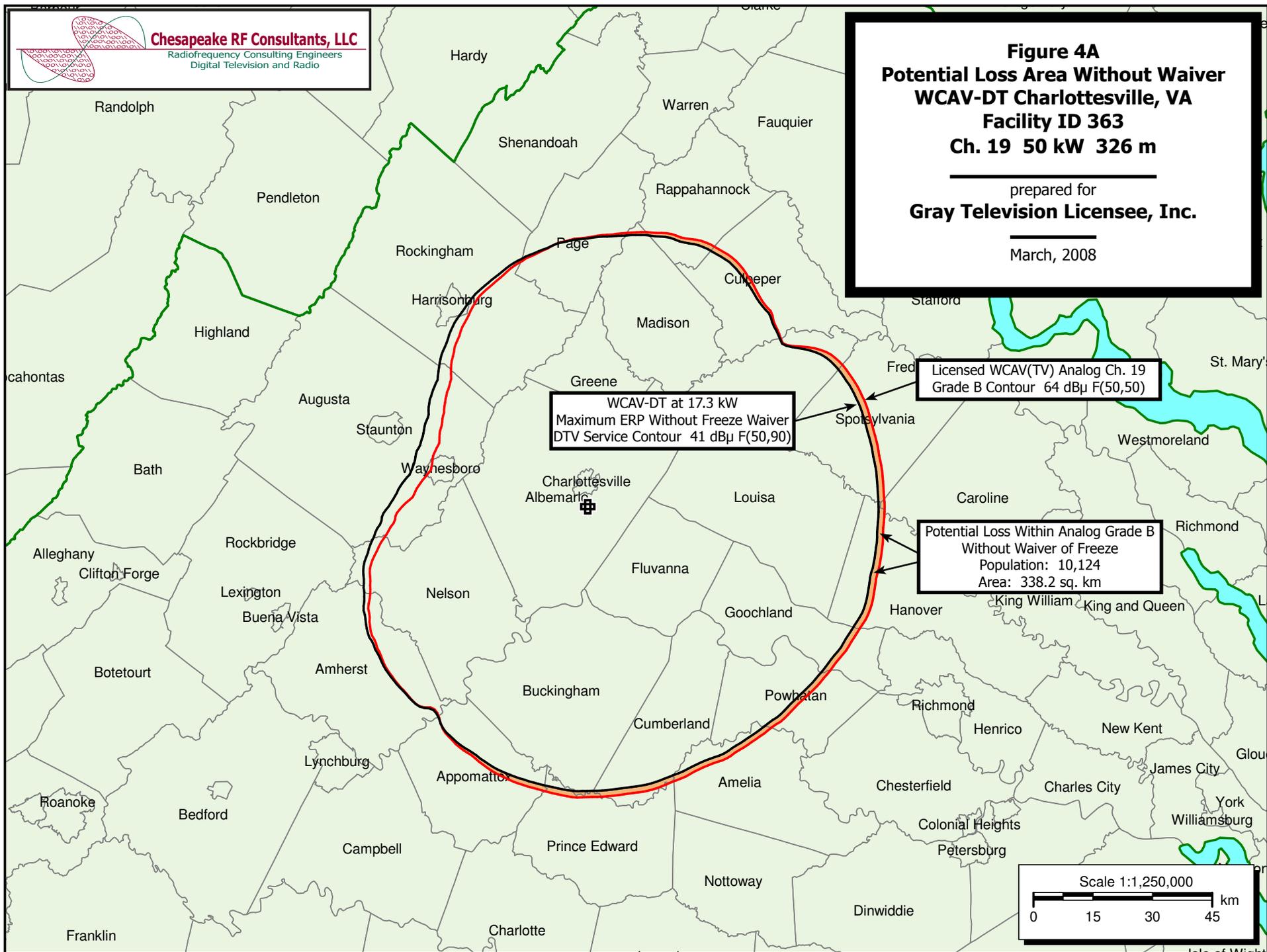
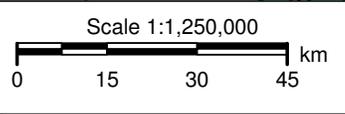
**Figure 4A**  
**Potential Loss Area Without Waiver**  
**WCAV-DT Charlottesville, VA**  
**Facility ID 363**  
**Ch. 19 50 kW 326 m**

prepared for  
**Gray Television Licensee, Inc.**  
March, 2008

WCAV-DT at 17.3 kW  
Maximum ERP Without Freeze Waiver  
DTV Service Contour 41 dBμ F(50,90)

Licensed WCAV(TV) Analog Ch. 19  
Grade B Contour 64 dBμ F(50,50)

Potential Loss Within Analog Grade B  
Without Waiver of Freeze  
Population: 10,124  
Area: 338.2 sq. km



SECTION III-D - DTV Engineering	
<b>Complete Questions 1-5, and provide all data and information for the proposed facility, as requested in Technical Specifications, Items 1-13.</b>	
<p><b>Pre-Transition Certification Checklist:</b> An application concerning a pre-transition channel must complete questions 1(a)-(c), and 2-5. A correct answer of "Yes" to all of the questions will ensure an expeditious grant of a construction permit application to change pre-transition facilities. However, if the proposed facility is located within the Canadian or Mexican borders, coordination of the proposal under the appropriate treaties may be required prior to grant of the application. An answer of "No" will require additional evaluation of the applicable information in this form before a construction permit can be granted.</p> <p><b>Post-Transition Expedited Processing.</b> An application concerning a post-transition channel must complete questions 1(a), (d)-(e), and 2-5. A station applying for a construction permit to build its post-transition channel will receive expedited processing if its application (1) does not seek to expand the noise-limited service contour in any direction beyond that established by Appendix B of the Seventh Report and Order in MB Docket No. 87-268 establishing the new DTV Table of Allotments in 47 C.F.R. § 73.622(i) ("new DTV Table Appendix B"); (2) specifies facilities that match or closely approximate those defined in the new DTV Table Appendix B facilities; and (3) is filed within 45 days of the effective date of Section 73.616 of the rules adopted in the Report and Order in the Third DTV Periodic Review proceeding, MB Docket No. 07-91.</p>	
1. The proposed DTV facility complies with 47 C.F.R. Section 73.622 in the following respects:	
(a) It will operate on the DTV channel for this station as established in 47 C.F.R. Section 73.622.	<input checked="" type="radio"/> Yes <input type="radio"/> No
(b) It will operate a pre-transition facility from a transmitting antenna located within 5.0 km (3.1 miles) of the DTV reference site for this station as established in 47 C.F.R. Section 73.622.	<input type="radio"/> Yes <input type="radio"/> No
(c) It will operate a pre-transition facility with an effective radiated power (ERP) and antenna height above average terrain (HAAT) that do not exceed the DTV reference ERP and HAAT for this station as established in 47 C.F.R. Section 73.622.	<input type="radio"/> Yes <input type="radio"/> No
(d) It will operate at post-transition facilities that do not expand the noise-limited service contour in any direction beyond that established by Appendix B of the Seventh Report and Order in MB Docket No. 87-268 establishing the new DTV Table of Allotments in 47 C.F.R. § 73.622(i) ("new DTV Table Appendix B").	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
(e) It will operate at post-transition facilities that match or reduce by no more than five percent with respect to predicted population from those defined in the new DTV Table Appendix B.	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A
2. The proposed facility will not have a significant environmental impact, including exposure of workers or the general public to levels of RF radiation exceeding the applicable health and safety guidelines, and therefore will not come within 47 C.F.R. Section 1.1307. Applicant must <b>submit the Exhibit</b> called for in Item 13.	<input checked="" type="radio"/> Yes <input type="radio"/> No
3. Pursuant to 47 C.F.R. Section 73.625, the DTV coverage contour of the proposed facility will encompass the allotted principal community.	<input checked="" type="radio"/> Yes <input type="radio"/> No
4. The requirements of 47 C.F.R. Section 73.1030 regarding notification to radio astronomy installations, radio receiving installations and FCC monitoring stations have either been satisfied or are not applicable.	<input checked="" type="radio"/> Yes <input type="radio"/> No
5. The antenna structure to be used by this facility has been registered by the Commission and will not require registration to support the proposed antenna, OR the FAA has previously determined that the proposed structure will not adversely effect safety in air navigation and this structure qualifies for later registration under the Commission's phased registration plan, OR the proposed installation on this structure does not require notification to the FAA pursuant to 47 C.F.R. Section 17.7.	<input checked="" type="radio"/> Yes <input type="radio"/> No

SECTION III-D - DTV Engineering	
<b>TECHNICAL SPECIFICATIONS</b>	
Ensure that the specifications below are accurate. Contradicting data found elsewhere in this application will be disregarded. All items must be completed. The response "on file" is not acceptable.	
<b>TECH BOX</b>	
1. Channel Number: DTV 19 Analog TV, if any 19	
2. Zone: <input checked="" type="radio"/> I <input type="radio"/> II <input type="radio"/> III	
3. Antenna Location Coordinates: (NAD 27) Latitude: Degrees 37 Minutes 59 Seconds 03 <input checked="" type="radio"/> North <input type="radio"/> South  Longitude: Degrees 78 Minutes 28 Seconds 52 <input checked="" type="radio"/> West <input type="radio"/> East	
4. Antenna Structure Registration Number: <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Notification filed with FAA	
5. Antenna Location Site Elevation Above Mean Sea Level:	443.5 meters
6. Overall Tower Height Above Ground Level:	57.9 meters
7. Height of Radiation Center Above Ground Level:	50 meters
8. Height of Radiation Center Above Average Terrain :	325.6 meters

9. Maximum Effective Radiated Power (average power): 50 kW

10. Antenna Specifications:

a. Manufacturer ERI Model ATW18H4-HTCX-19H

b. Electrical Beam Tilt:  
1 degrees  Not Applicable

c. Mechanical Beam Tilt:  
degrees toward azimuth  
degrees True  Not Applicable  
Attach as an Exhibit all data specified in 47 C.F.R. Section 73.625(c). [Exhibit 42]

d. Polarization:  
 Horizontal  Circular  Elliptical

e. Directional Antenna Relative Field Values:  Not applicable (Nondirectional)

[For a composite directional (not off-the-shelf) antenna, press the following button to fill in the relative field values subform.]  
[Relative Field Values]

**10e. Directional Antenna Relative Field Values**

[Fill in this subform for a composite directional (not off-the-shelf) antenna, only.]

e. Directional Antenna Relative Field Values:  
Rotation (Degrees):  No Rotation

Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value	Degrees	Value
0	0.672	10	0.752	20	0.838	30	0.915	40	0.966	50	0.993
60	0.987	70	0.967	80	0.951	90	0.942	100	0.943	110	0.949
120	0.947	130	0.942	140	0.943	150	0.955	160	0.973	170	0.993
180	0.987	190	0.954	200	0.895	210	0.811	220	0.728	230	0.648
240	0.555	250	0.455	260	0.323	270	0.205	280	0.144	290	0.124
300	0.126	310	0.156	320	0.235	330	0.367	340	0.485	350	0.585
Additional Azimuths		53	1	54	1	173	1	174	1		

Relative Field Polar Plot

If a directional antenna is proposed, the requirements of 47 C.F.R. Sections 73.625(c) must be satisfied. **Exhibit required.** [Exhibit 43]

11. Does the proposed facility satisfy the pre-transition interference protection provisions of 47 C.F.R. Section 73.623(a) (Applicable only if **Certification Checklist** Items 1(a), (b), or (c) are answered "No.") and/or the post-transition interference protection provisions of 47 C.F.R. Section 73.616?  Yes  No [Exhibit 44]

If "No," attach as an Exhibit justification therefor, including a summary of any related previously granted waivers.

12. If the proposed facility will not satisfy the coverage requirement of 47 C.F.R. Section 73.625, attach as an Exhibit justification therefore. (Applicable only if **Certification Checklist** item 3 is answered "No.") [Exhibit 45]

13. **Environmental Protection Act. Submit in an Exhibit** the following: [Exhibit 46]  
If **Certification Checklist** Item 2 is answered "Yes," a brief explanation of why an Environmental Assessment is not required. Also describe in the Exhibit the steps that will be taken to limit RF radiation exposure to the public and to persons authorized access to the tower site.  
  
By checking "Yes" to **Certification Checklist** Item 2, the applicant also certifies that it, in coordination with other users of the site, will reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic exposure in excess of FCC guidelines.  
  
If **Certification Checklist** Item 2 is answered "No," an Environmental Assessment as required by 47 C.F.R Section 1.1311.

**PREPARERS CERTIFICATION ON SECTION III MUST BE COMPLETED AND SIGNED.**

**SECTION III - PREPARER'S CERTIFICATION**

I certify that I have prepared Section III (Engineering Data) on behalf of the applicant, and that after such preparation, I have examined and found it to be accurate and true to the best of my knowledge and belief.

Name JOSEPH M. DAVIS, P.E.	Relationship to Applicant (e.g., Consulting Engineer) CONSULTING ENGINEER	
Signature	Date 3/18/2008	
Mailing Address CHESAPEAKE RF CONSULTANTS, LLC 11993 KAHNS ROAD		
City MANASSAS	State or Country (if foreign address) VA	Zip Code 20112 -
Telephone Number (include area code) 7036509600	E-Mail Address (if available) JOSEPH.DAVIS@RF-CONSULTANTS.COM	

WILLFUL FALSE STATEMENTS ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. CODE, TITLE 18, SECTION 1001), AND/OR REVOCATION OF ANY STATION LICENSE OR CONSTRUCTION PERMIT (U.S. CODE, TITLE 47, SECTION 312(a)(1)), AND/OR FORFEITURE (U.S. CODE, TITLE 47, SECTION 503).

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Any specified rotation has already been applied to the plotted pattern.  
Field strength values shown on a rotated pattern may differ from the listed values because intermediate azimuths are interpolated between entered azimuths.

