SEPTEMBER 3, 1992

CIRCULARLY POLARIZED DIRECTIONAL ANTENNA SYSTEM
PROPOSED FOR RADIO STATION WRXT
LOCATED IN ROANOKE, NC

Electronics Research Inc. proposes to provide a custom fabricated directional antenna system that is specially designed to meet the F.C.C. requirements and the general needs of radio station WRXT.

The antenna is the E.R.I. 1094-1CP-DA configuration. The proposed circularly polarized system consists of one bay using 4 driven elements attached to 4 panels. The approximate panel dimensions will be 10 feet in height and 7 feet in width. The pattern is based on data assuming a panel with a driven element orientated at north 80 degrees east, a panel with a driven element orientated at north 170 degrees east, a panel with a driven element orientated at north 260 degrees east and a panel with a driven element orientated at North 350 degrees East. The antenna will mount on the triangular tower with faces at North 200 degrees East, North 320 degrees East and North 80 degrees East.

The antenna will be tested on a 5' face tower, which is the structure recommended to support the proposed array. All tests will be performed on a frequency of 90.3 megahertz which is the center of the FM broadcast channel assigned to WRXT.

Pattern measurements will be made on a fifty-acre antenna pattern range which is owned and operated by Electronics Research, Inc. The tests will be performed under the direction of Thomas B. Silliman, president of Electronics Research, Inc. Mr. Silliman has both the Bachelor of Electrical Engineering and the Master of Electrical Engineering degrees from Cornell University, and is also a registered professional engineer in the states of Indiana, Maryland and Minnesota.

DESCRIPTION OF THE TEST PROCEDURE

The test antenna will consist of the complete circularly polarized system. The power distribution and phase relationship to the antenna will be adjusted in order to achieve the directional radiation pattern for both horizontal and vertical polarization components.

The proof-of-performance will be accomplished using a

supporting structure of identical dimensions and configuration as the proposed 5' face tower, including all braces, ladders, conduits, coaxial lines and other appurtenances that are included in the actual aperture at which the proposed antenna will be installed. The 5' face tower will be erected vertically on a turntable mounted on a non-metalic building with the antenna centered vertically on the structure, making the center of radiation of the test approximately 25 feet above ground. The turntable is equipped with a motor drive and azimuth indicating mechanism, resolution of this azimuth measuring system is one-tenth of a degree.

The antenna under test will be operated in the transmitting mode and fed from a Wavetek Model 3000 signal generator. The frequency of the signal source will be set at 90.3Mhz and will be constantly monitored by an Anritsu Model ML521B measuring receiver.

A broad-band horizontal and vertical dipole system, located approximately 628 feet from the test antenna, and mounted at the same height above terrain as the center of the antenna under test, will be used to receive the emitted test signals. The signals received by the dipole system will be fed to test building by way of two buried Heliax cables to an Anritsu Model ML521B measuring receiver. This data will be interfaced to a Hewlett-Packard Model 9872C plotter by means of a Hewlett-Packard Model 86 computer system. Relative field strength will be plotted as a function of azimuth.

The measurements will be performed by rotating the test antenna in a counter-clockwise direction and plotting the received signal on polar co-ordinated graph paper in a clockwise direction. Both horizontal and vertical components will be recorded separately.

CONCLUSIONS

The proposed circularly polarized system consists of one bay using 4 driven elements attached to 4 panels. The approximate panel dimensions will be 10 feet in height and 7 feet in width. The power distribution and phase relationship will be fixed when

SEPTEMBER 3, 1992

CIRCULARLY POLARIZED DIRECTIONAL ANTENNA SYSTEM
PROPOSED FOR RADIO STATION WRXT
LOCATED IN ROANOKE, NC

(Continued)

the antenna is manufactured. Proper maintenance of the elements should be all that is required to maintain the pattern in adjustment.

The pattern shown on figure # 1 is based on measured data with a similar array orientated on a similar structure with a face and the antenna at a bearing of north 80 degrees east. Actual antenna orientation will be determined when the antenna is tested. Blue prints provided with the antenna will show the proper antenna orientation alignment. The antenna alignment procedure should be directed by a licensed surveyor as prescribed by the FCC.

Deicers are not supplied and are not available. The use of radomes is recommended if icing conditions will exist at the proposed site.

Figure #1 represents the maximum value of either the horizontal or vertical component at any azimuth. The attached horizontal plane relative field pattern shown on Figure #1 represents the maximum achievable radiation at any azimuth. The actual pattern when measured will not exceed that of Figure #1 at any azimuth. The composite horizontal and vertical maximum relative field envelope pattern obtained from the measured data will have an R.M.S. that is equal to, or no less than 85% of the R.M.S. of the pattern shown on Figure #1. A calculated vertical plane relative field pattern is shown on Figure #3 attached. The power in the maximum will reach 5.5 kilowatts (7.4036 DBK).

The RMS of the vertically polarized horizontal plane component does not exceed the RMS of the horizontally polarized horizontal plane component.

The envelope pattern obtained from the maximum individual horizontal or vertical components will not exceed a rate of change of 2 DB per any ten degree change in azimuth as measured in the horizontal plane.

The approximate weight of the antenna minus the mounting structure is 1000 lbs. The approximate windload of the antenna minus the mounting structure is 1730 lbs based on 50/33 PSF(112

SEPTEMBER 3, 1992

CIRCULARLY POLARIZED DIRECTIONAL ANTENNA SYSTEM
PROPOSED FOR RADIO STATION WRXT
LOCATED IN ROANOKE, NC

(Continued)

MPH wind) with no ice build up. The clear vertical length of the structure required to support the antenna is 15 feet if the antenna is to be top mounted.

The directional antenna should not be mounted on the top of an antenna tower which includes a top-mounted platform larger than the cross-sectional area of the tower in the horizontal plane. No other obstructions other than those that are specified by the blue prints supplied with the antenna are to be mounted at the same tower level as the directional antenna. No obstruction of any type is to be within 75ft horizontally of the antenna system. The vertical distance to the nearest obstruction should be a minimum of 10ft from the directional antenna.

The calculated maximum power gain of the envelope pattern as shown on figure # 1 is .74692 (-1.2673dB), which would require an input power of 7.3636 kilowatts. A calculated power gain of an antenna that has a horizontal and vertical R.M.S. that is equal to 85% of the R.M.S. of the envelope would have a power gain of 1.0338 and would require an input power of 5.3202 kilowatts. The input flange to the antenna is 1 5/8 inch male.

Tom Schaf

ELECTRONICS RESEACH, INC.
108 Market Street
Newburgh, In 47630

FOR FIGURE: 1 SEPTEMBER 3, 1992
HORIZONTAL PLANE RELATIVE FIELD & DBK LIST
FOR RADIO STATION WRXT 90.3MHz

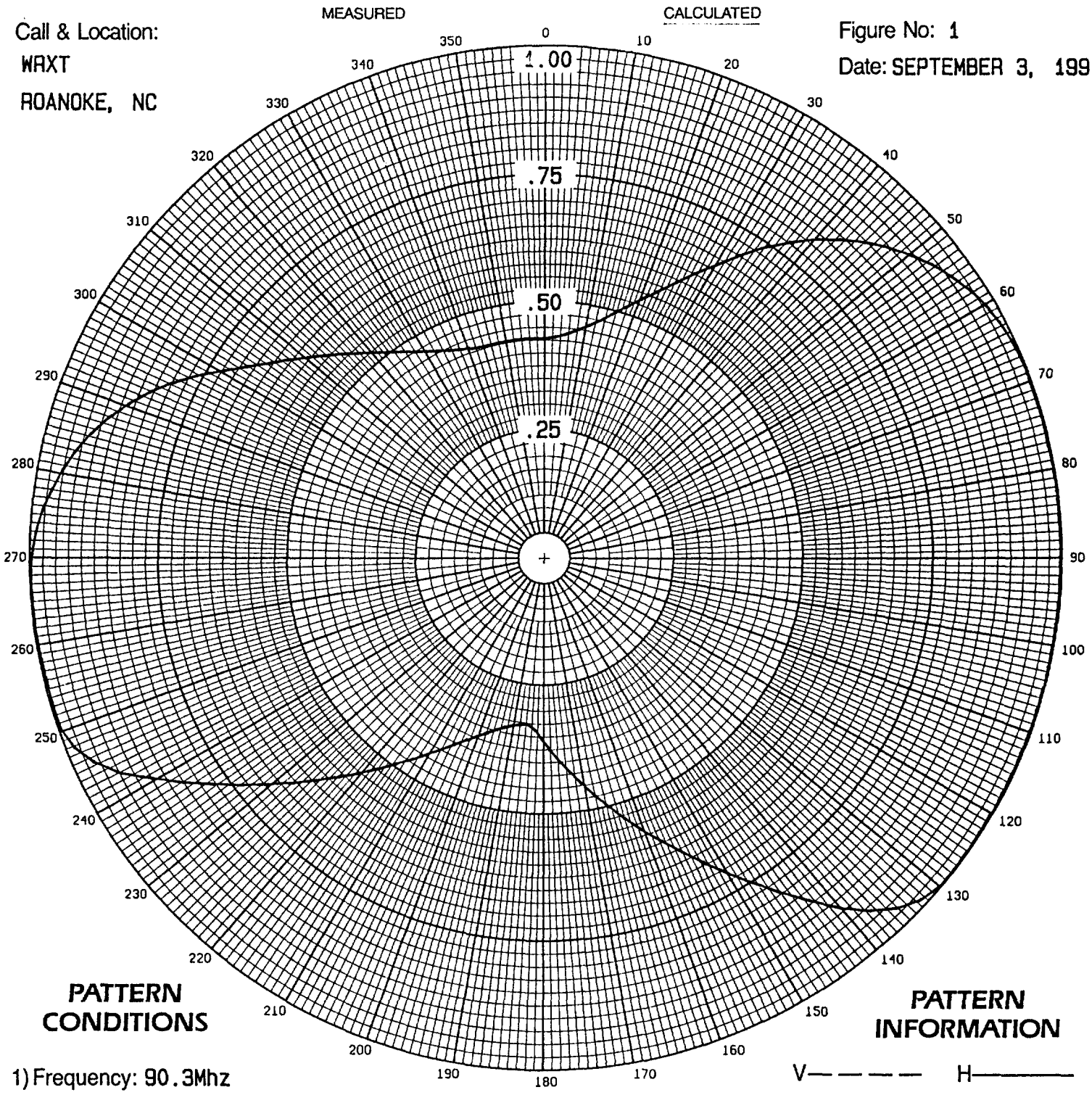
AZIMUTH	H POL RELATIVE FIELD	H POL DBK	H POL POWER KW	V POL RELATIVE FIELD	V POL DBK	V POL POWER KW	AZIMUTH	H POL RELATIVE FIELD	H POL DBK	H POL POWER KW	V POL RELATIVE FIELD	V POL DBK	V POL POWER KW
0.0	.426	-.01	.998	.426	-.01	.998	180.0	.361	-1.46	.715	.361	-1.46	.715
5.0	.435	.17	1.041	.435	.17	1.041	185.0	.330	-2.22	.600	.330	-2.22	.600
10.0	.456	.58	1.144	.456	.58	1.144	190.0	.337	-2.05	.624	.337	-2.05	.624
15.0	.489	1.19	1.315	.489	1.19	1.315	195.0	.352	-1.67	.680	.352	-1.67	.680
20.0	.534	1.95	1.568	.534	1.95	1.568	200.0	.375	-1.11	.774	.375	-1.11	.774
25.0	.591	2.84	1.921	.591	2.84	1.921	205.0	.407	-.40	.913	.407	-.40	.913
30.0	.660	3.79	2.396	.660	3.79	2.396	210.0	.448	.43	1.104	.448	.43	1.104
35.0	.739	4.78	3.005	.739	4.78	3.005	215.0	.497	1.33	1.360	.497	1.33	1.360
40.0	.811	5.58	3.616	.811	5.58	3.616	220.0	.555	2.29	1.694	.555	2.29	1.694
45.0	.871	6.20	4.173	.871	6.20	4.173	225.0	.622	3.28	2.128	.622	3.28	2.128
50.0	.920	6.68	4.653	.920	6.68	4.653	230.0	.697	4.27	2.672	.697	4.27	2.672
55.0	.957	7.02	5.037	.957	7.02	5.037	235.0	.781	5.26	3.354	.781	5.26	3.354
60.0	.983	7.25	5.312	.983	7.25	5.312	240.0	.875	6.24	4.211	.875	6.24	4.211
65.0	.997	7.38	5.469	.997	7.38	5.469	245.0	.963	7.07	5.095	.963	7.07	5.095
70.0	1.000	7.40	5.500	1.000	7.40	5.500	250.0	1.000	7.40	5.500	1.000	7.40	5.500
75.0	1.000	7.40	5.500	1.000	7.40	5.500	255.0	1.000	7.40	5.500	1.000	7.40	5.500
80.0	1.000	7.40	5.500	1.000	7.40	5.500	260.0	1.000	7.40	5.500	1.000	7.40	5.500
85.0	1.000	7.40	5.500	1.000	7.40	5.500	265.0	1.000	7.40	5.500	1.000	7.40	5.500
90.0	1.000	7.40	5.500	1.000	7.40	5.500	270.0	.997	7.38	5.466	.997	7.38	5.466
95.0	1.000	7.40	5.500	1.000	7.40	5.500	275.0	.982	7.24	5.299	.982	7.24	5.299
100.0	1.000	7.40	5.500	1.000	7.40	5.500	280.0	.954	6.99	5.005	.954	6.99	5.005
105.0	1.000	7.40	5.500	1.000	7.40	5.500	285.0	.914	6.62	4.594	.914	6.62	4.594
110.0	1.000	7.40	5.500	1.000	7.40	5.500	290.0	.862	6.11	4.084	.862	6.11	4.084
115.0	1.000	7.40	5.500	1.000	7.40	5.500	295.0	.797	5.43	3.495	.797	5.43	3.495
120.0	1.000	7.40	5.500	1.000	7.40	5.500	300.0	.720	4.55	2.854	.720	4.55	2.854
125.0	1.000	7.40	5.500	1.000	7.40	5.500	305.0	.654	3.72	2.356	.654	3.72	2.356
130.0	1.000	7.40	5.500	1.000	7.40	5.500	310.0	.602	3.00	1.996	.602	3.00	1.996
135.0	.968	7.12	5.156	.968	7.12	5.156	315.0	.557	2.32	1.706	.557	2.32	1.706
140.0	.894	6.43	4.396	.894	6.43	4.396	320.0	.518	1.70	1.478	.518	1.70	1.478
145.0	.798	5.44	3.501	.798	5.44	3.501	325.0	.486	1.14	1.302	.486	1.14	1.302
150.0	.712	4.45	2.788	.712	4.45	2.788	330.0	.461	.68	1.170	.461	.68	1.170
155.0	.635	3.46	2.220	.635	3.46	2.220	335.0	.443	.33	1.078	.443	.33	1.078
160.0	.567	2.48	1.768	.567	2.48	1.768	340.0	.431	.09	1.022	.431	.09	1.022
165.0	.506	1.49	1.410	.506	1.49	1.410	345.0	.426	-.01	.998	.426	-.01	.998
170.0	.452	.51	1.124	.452	.51	1.124	350.0	.426	-.01	.998	.426	-.01	.998
175.0	.404	-.48	.896	.404	-.48	.896	355.0	.426	-.01	.998	.426	-.01	.998

CITY OF LICENSE: ROANOKE, NC
MOUNTING STRUCTURE: 5' FACE TOWER
ANTENNA TYPE: 1094-1CP-DA NUMBER OF BAYS: 1
HORIZONTAL MAXIMUM RELATIVE FIELD= 1.00000 AZIMUTH 68
HORIZONTAL MINIMUM RELATIVE FIELD= .33028 AZIMUTH 185
VERTICAL MAXIMUM RELATIVE FIELD= 1.00000 AZIMUTH 68
VERTICAL MINIMUM RELATIVE FIELD= .33028 AZIMUTH 185
HORIZONTAL R.M.S.=.76249 VERTICAL R.M.S.=.76249
MAXIMUM HORIZONTAL E.R.P.= 5.5000KW MAXIMUM VERTICAL E.R.P.= 5.5000KW
TOTAL POWER INPUT= 7.3636KW
MAXIMUM HORIZONTAL GAIN OF COMPLETE ARRAY= .75 (-1.267dB)
MAXIMUM VERTICAL GAIN OF COMPLETE ARRAY= .75 (-1.267dB)
ANTENNA ORIENTATION: NORTH 80 DEGREES EAST
PATTERN REFERENCE #WRXTE3376

HORIZONTAL PLANE RELATIVE FIELD PATTERN

Call & Location:
WAXT
ROANOKE, NC

Figure No: 1
Date: SEPTEMBER 3, 199



PATTERN CONDITIONS

1) Frequency: 90.3Mhz
2) Antenna Type: 1094-1CP-DA
3) Antenna Orientation: North 80 Deg. East
4) Antenna Mounting: CUSTOM
5) Tower Type: 5' face tower

PATTERN INFORMATION

V— — — — H————

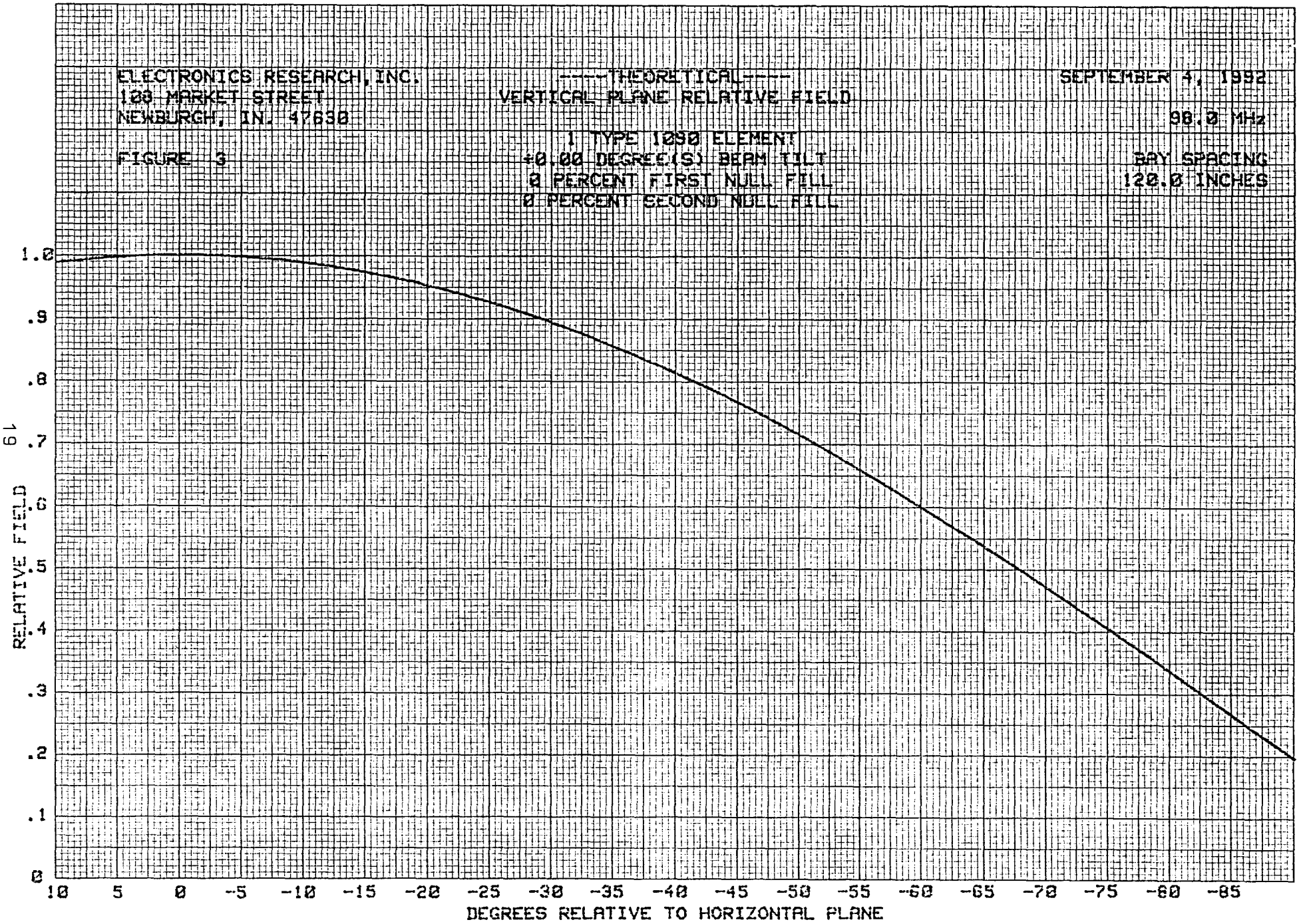
VERTICAL	HORIZONTAL
Rms: .76249	Rms: .76249
Maximum: 1 N68°E	Maximum: 1 N68°E
Minimum: .33028 N185°E	Minimum: .33028 N185

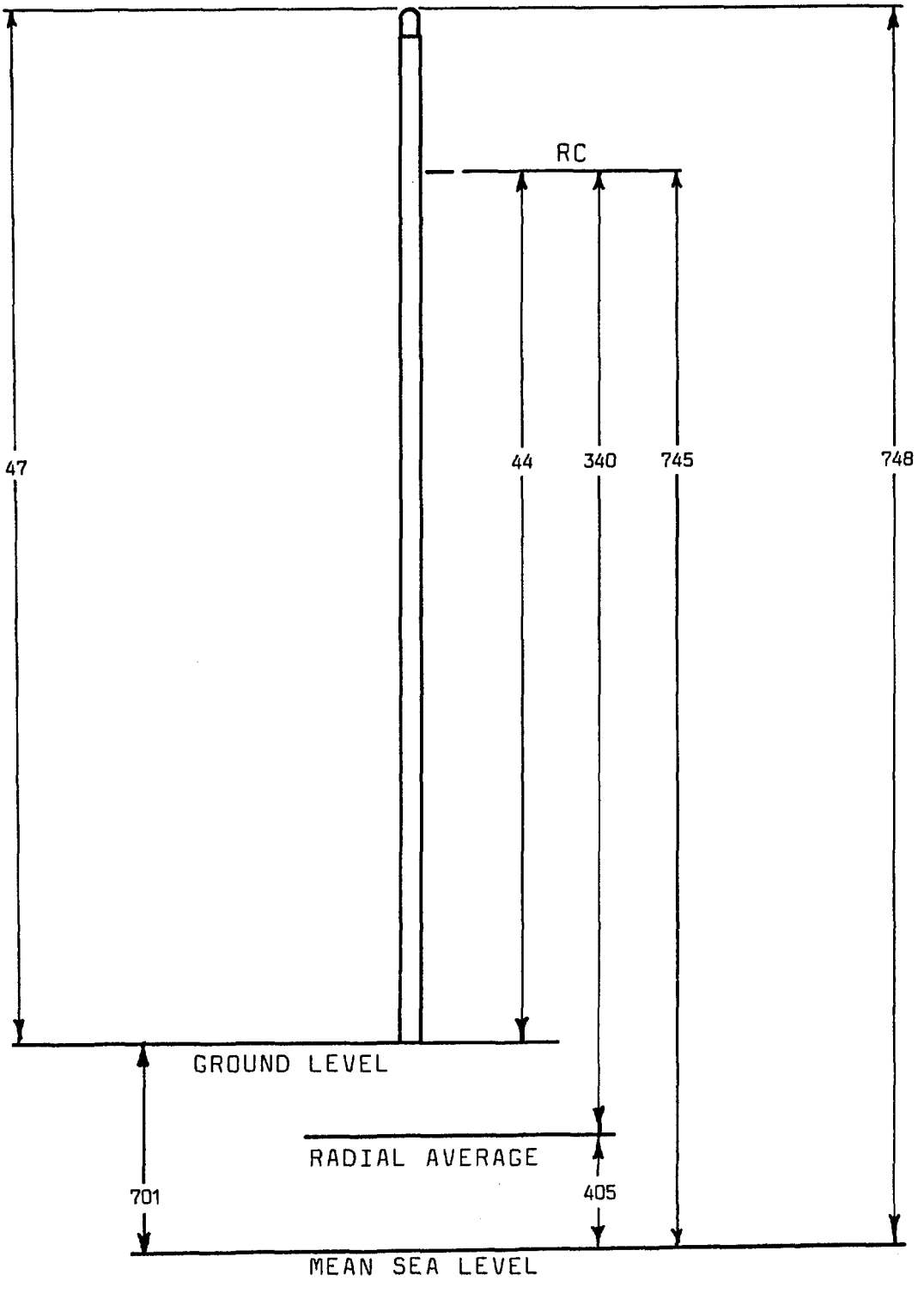
6) Comments: CALCULATED DATA- The composite maximum achievable value of either horizontal or vertical component.

Electronics Research Inc.
108 Market St. • Newburgh, In. 47630 • Phone (812) 853-3318 • FAX (812) 853-5706

Form No. 547-P

KEUFFEL & ESSER CO. MADE IN U.S.A.





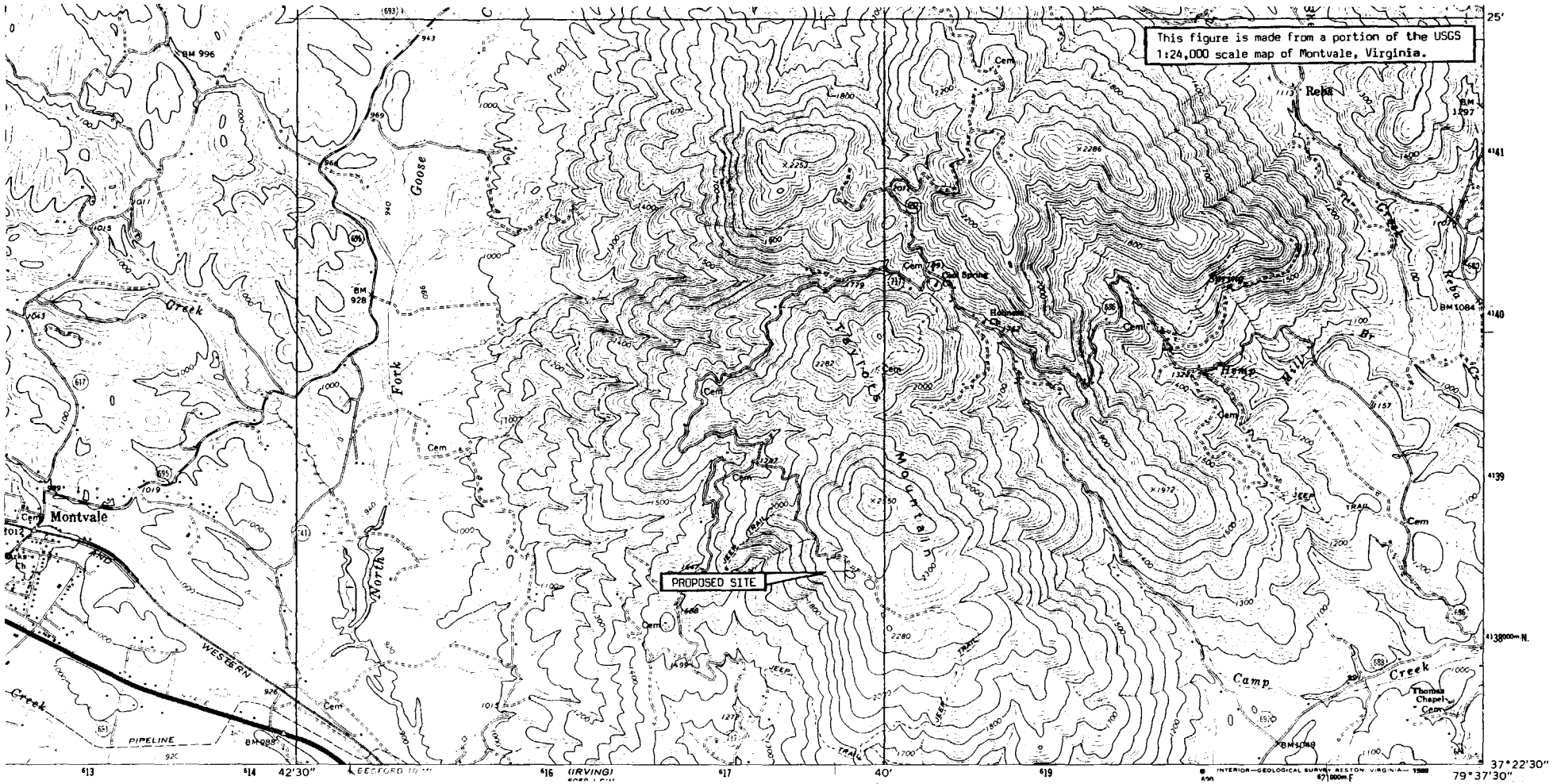
Tower is to be guyed.

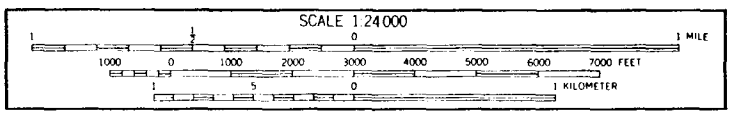
WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 1

ANTENNA AND TOWER ELEVATIONS

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA





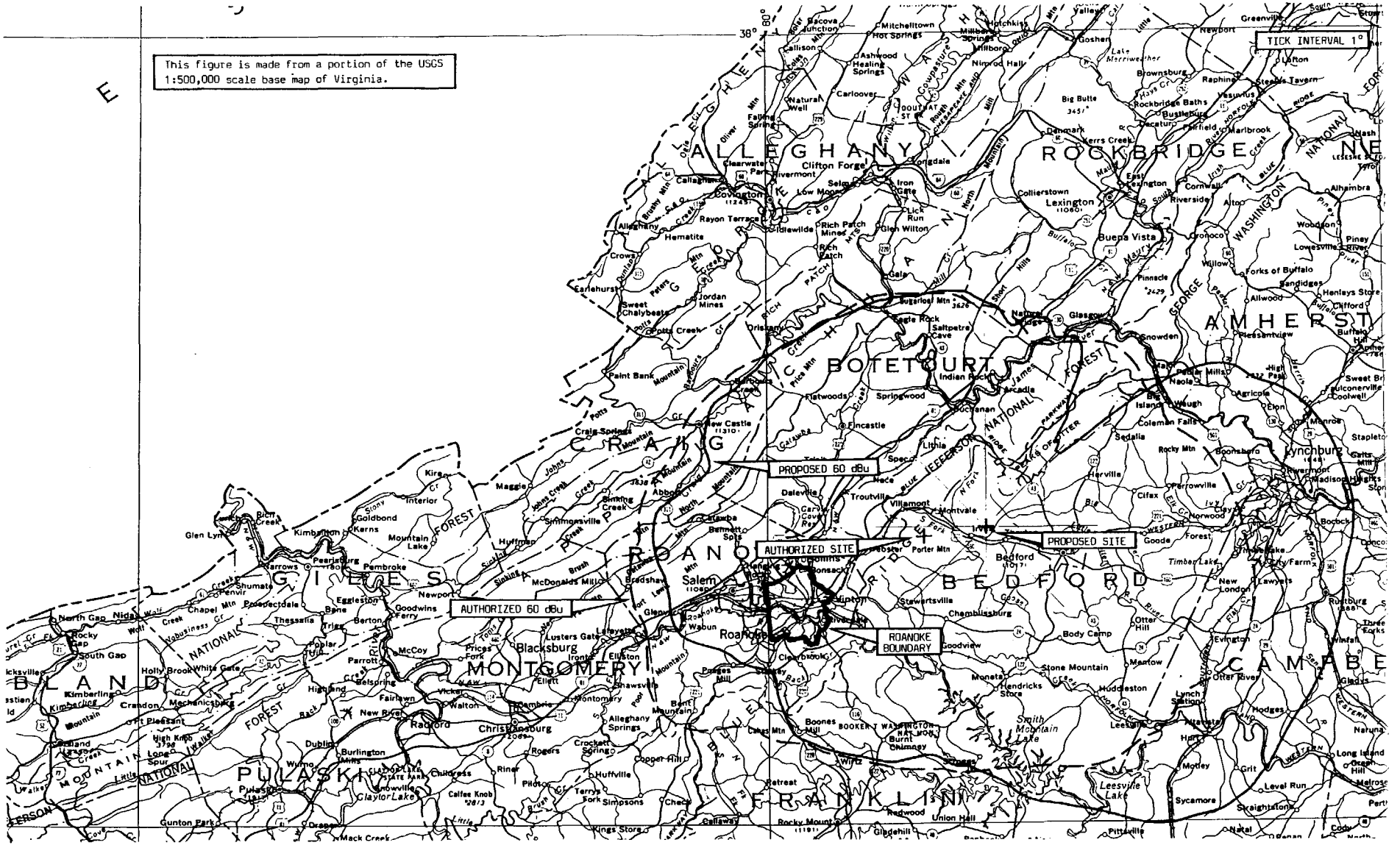
WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 2

TOPOGRAPHIC SITE MAP

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA

This figure is made from a portion of the USGS 1:500,000 scale base map of Virginia.



Scale in km

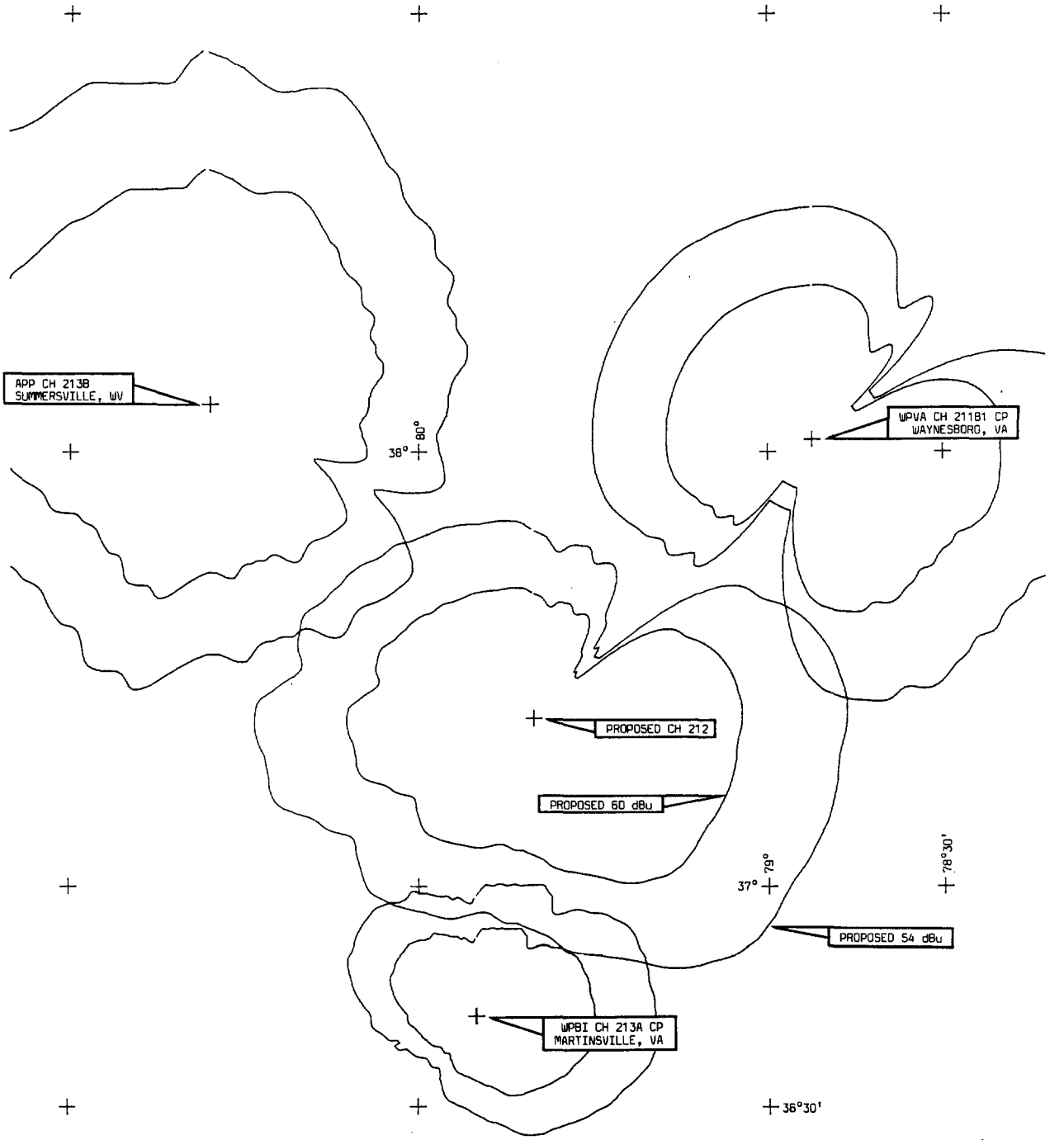
0 10 20 30 40 50 60 70 80 90

WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 3

MAP OF THE PRESENT AND PROPOSED SIGNAL STRENGTH CONTOURS

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA



Scale in km

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

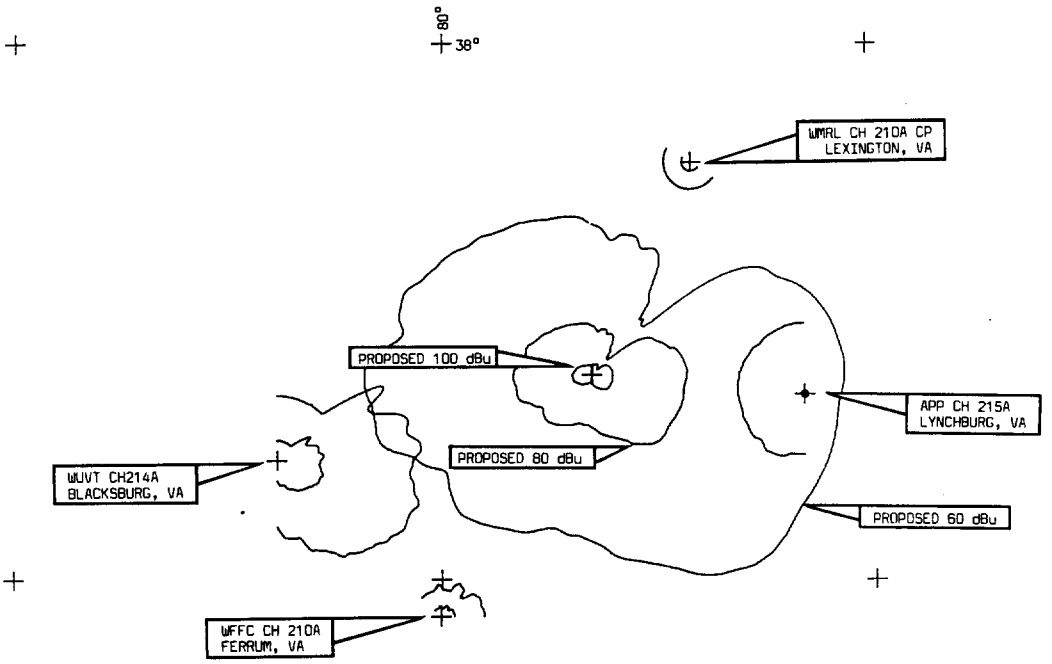
This figure shows the 54 dBu and 60 dBu contours of first adjacent stations. The scale is 1:1,000,000.

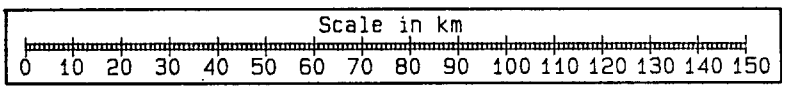
WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 4

FIRST ADJACENT CHANNEL ALLOCATION STUDY

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA





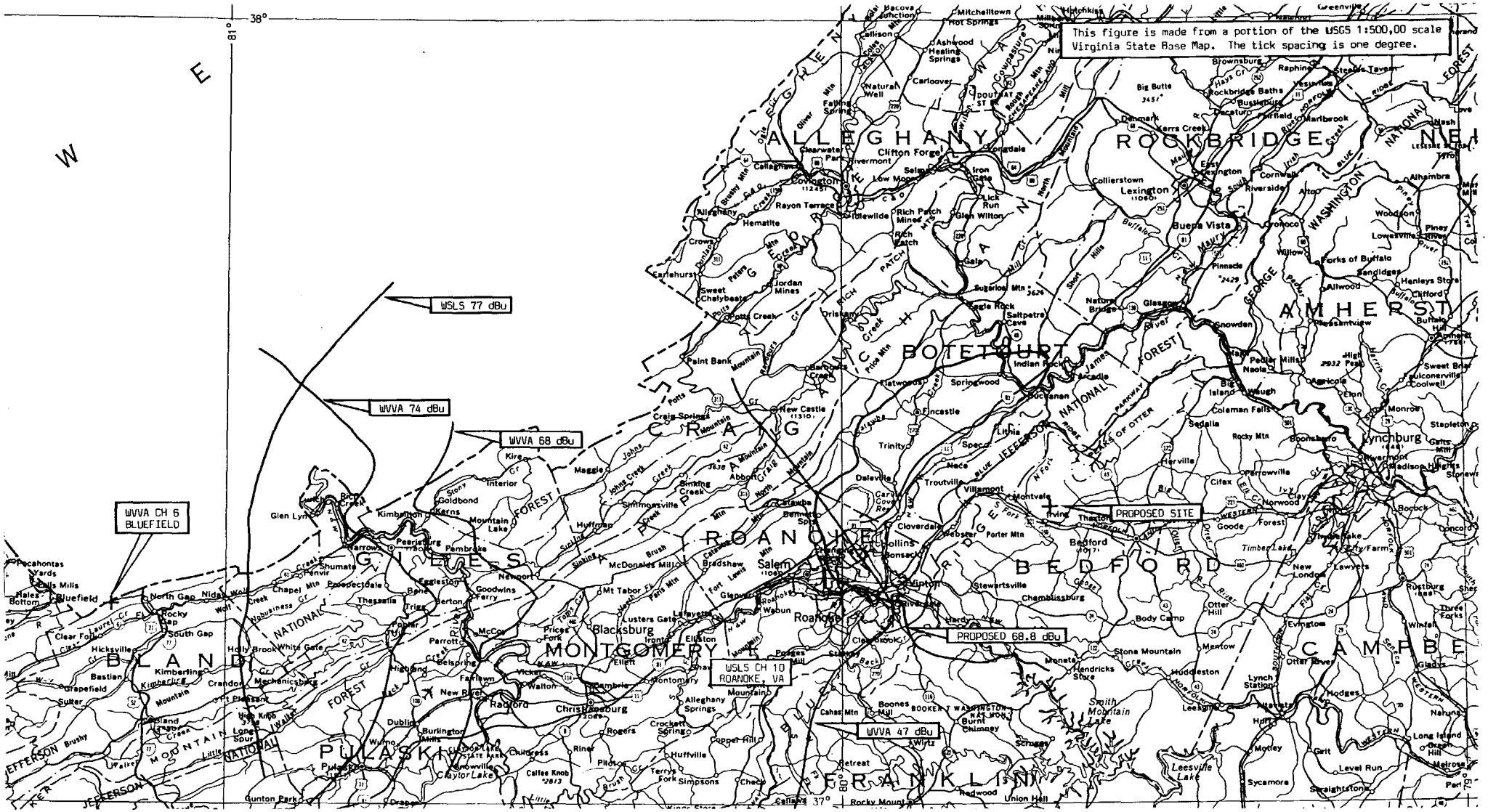
This figure shows the 60 dBu and 80 dBu contours of second adjacent stations and the 60 dBu and 100 dBu contours of third adjacent stations. The scale is 1:1,000,000. The tick interval is 1 degree.

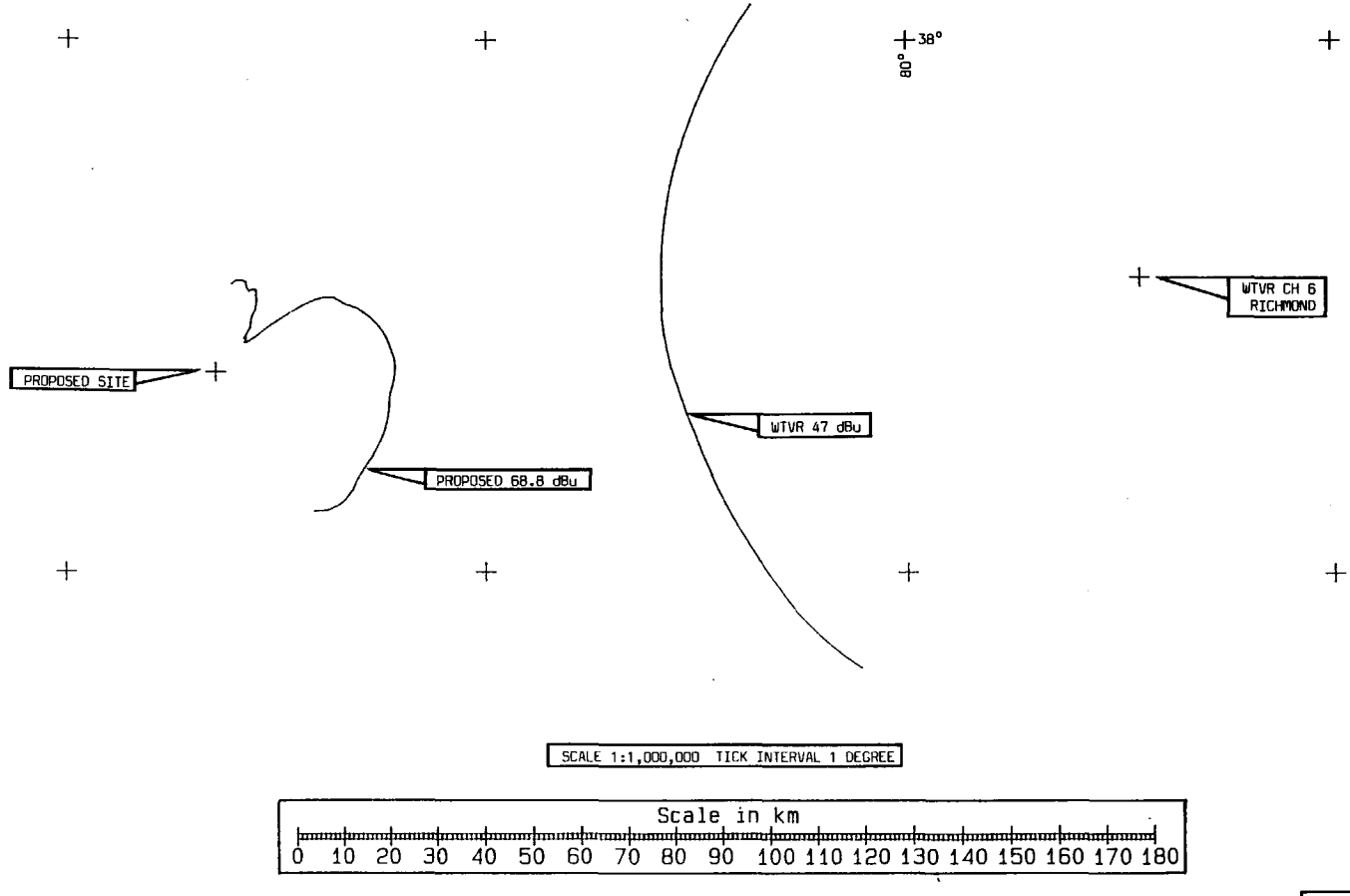
WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 5

SECOND AND THIRD ADJACENT CHANNEL ALLOCATION STUDY

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA


This figure is made from a portion of the USGS 1:500,00 scale Virginia State Base Map. The tick spacing is one degree.
WSLS 77 dBu
WVVA 74 dBu
WVVA 68 dBu
WVVA CH 6 BLUEFIELD
PROPOSED SITE
PROPOSED 68.8 dBu
WSLS CH 10 ROANOKE, VA
WVVA 47 dBu
ALLEGHANY
ROCKBRIDGE
BOTETOURT
AMHERST
ROANOKE
BEDFORD
MONTGOMERY
BLAND
PULASKI
FRANKLIN
CAMPBELL
GILES
Lexington
Buena Vista
Lynchburg
Bedford
Salem
Roanoke
Blacksburg
Radford
Christiansburg
Smith Mountain Lake
Leesville Lake
Claytor Lake
Bluefield
Pocahontas
Pulaski
Gunton Park
Rocky Mount
Union Hall
Redwood
Sycamore
Straightstone
Leesville
Hardy
Stewartsville
Chamblissburg
Body Camp
Stone Mountain
Huddleston
Lynch Station
Otter River
Evington
Forest
Timber Lake
Thaxton
Montvale
Villamont
Troutville
Cloverdale
Daleville
Buchanan
Fincastle
Arcadie
Springwood
Flatwoods
Indian Rock
Natural Bridge
Glasgow
Snowden
Pedlar Mills
Naola
Big Island
Wash
Coleman Falls
Sedalia
Rocky Mtn
Boonsboro
Madison Heights
Stonewall
Monroe
Stapleton
Gaits Mill
Sweet Briar
Paulconerville
Coolwell
Amherst
Clifton Forge
Covington
Iron Gate
Glen Wilton
Rich Patch Mines
Rich Patch
Sugarloaf Mtn
Eagle Rock
Saltpetre Cave
Paint Bank
New Castle
Craig Springs
Kire
Interior
Goldbond
Kerns
Mountain Lake
Pembroke
Pearisburg
Narrows
Glen Lyn
Rich Creek
Shumate
Penvir
Chapel Mtn
Prospect Dale
Thessalia
Bane
Eggleston
Goodwins Ferry
Newport
Mt Tabor
McDonalds Mills
Bradshaw
Fort Lewis
Glenvar
Roanoke
Wabun
Lusters Gate
Lafayette
Ironto
Ellison
Pratts Fork
Elliott
Vicker
Walton
Cambria
Montgomery
Alleghany Springs
Rogers
Crockett Springs
Copper Hill
Huffville
Riner
Pilot
Terrys Fork
Simpsons
Cheese
Callaway
Retreat
Cahas Mtn
Boones Mill
Burnt Chimney
Schaeffer
Wirtz
Hardy
Smith Mountain Lake
Leesville Lake
Hendricks Store
Monetta
Meadow
Hodges
Leesville
Hale
Motley
Grit
Level Run
Long Island
Gretna
Melrose
Nahunta
Glades
Three Forks
Winfall
Rustburg
Concord
Boxwood
Lawyers
New London
Evington
Otter River
Lynch Station
Huddleston
Stone Mountain
Meadow
Hendricks Store
Monetta
Body Camp
Chamblissburg
Stewartsville
Hardy
Thaxton
Montvale
Villamont
Troutville
Cloverdale
Daleville
Buchanan
Fincastle
Arcadie
Springwood
Flatwoods
Indian Rock
Natural Bridge
Glasgow
Snowden
Pedlar Mills
Naola
Big Island
Wash
Coleman Falls
Sedalia
Rocky Mtn
Boonsboro
Madison Heights
Stonewall
Monroe
Stapleton
Gaits Mill
Sweet Briar
Paulconerville
Coolwell
Amherst
Lynchburg
Bedford
Salem
Roanoke
Blacksburg
Radford
Christiansburg
Smith Mountain Lake
Leesville Lake
Claytor Lake
Bluefield
Pocahontas
Pulaski
Gunton Park
Rocky Mount
Union Hall
Redwood
Sycamore
Straightstone
Leesville
Hardy
Stewartsville
Chamblissburg
Body Camp
Stone Mountain
Huddleston
Lynch Station
Otter River
Evington
Forest
Timber Lake

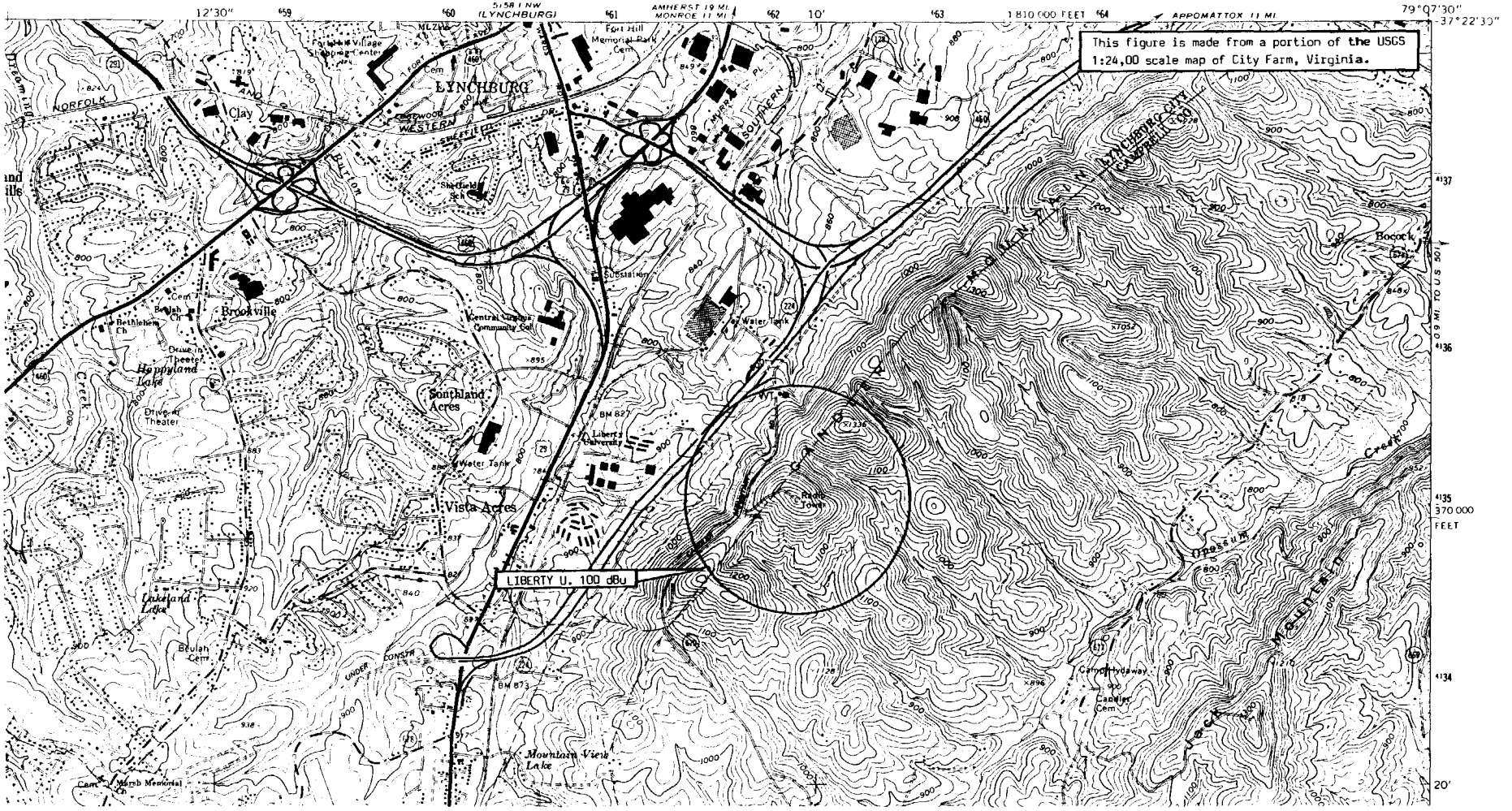


WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 7

WTVR-TV INTERFERENCE STUDY

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA



SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

WILLIAM CULPEPPER & ASSOCIATES, INC.
Consulting Communications Engineers
900 Jefferson Drive • Charlotte, North Carolina 28270
704-365-9995

FIGURE 8

MAP OF THE LIBERTY UNIVERSITY 100 dBu CONTOUR

VISION COMMUNICATIONS, INC.
ROANOKE, VIRGINIA