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1.1 City of Fort Worth System Design Overview

1.1.1 Background

The City of Fort Worth began the transition from analog two-way radio to P25 digital operation in the fourth quarter of 2010. The first step in the migration process was designed to provide the City with a master site, and one remote site. This initial step allowed the City to begin operating and testing the features of a P25 voice system.

The second step established the build out of a two-layer simulcast system. Region 40 studies for this step were presented and conditionally approved in 2012. The conditional approval required Fort Worth to obtain letters of concurrence from five adjacent channel users.

The third and final step in the transition was the addition of the Roanoke ATC site near the Texas Motor Speedway. This site was designed and implemented as a 4 channel site. The Region 40 study for this step was presented and approved in 2013.

1.1.2 Current Situation

As the project has been implemented the City of Fort Worth has noticed some areas of less than desirable coverage on the East Side of the City. These areas were predicted in the original coverage studies, however, during usage by the Police and Fire Departments of the City it was discovered that these “less than optimum” coverage areas proved to be an “officer safety” issue because of their location.

System users such as North Richland Hills, the City of Watauga, Haltom City and others also experienced some degradation in coverage from the analog system coverage to the P25 digital coverage.

As a result the City of Fort Worth looked at alternatives to improve the coverage reliability on the east side of Fort Worth. After looking at many alternatives including additional sites, changing antenna pattern, and the use of BDAs the City determined that the best solution is to change the style of antennas used at the Bergh 2 [Eules 2 ATC] site. The current antennas on the site are highly directional to avoid some predicted simulcast phasing issues shown in the original design. Through field testing with an Omni style antenna the City of Fort Worth has determined that the simulcast phasing issues predicted are not as significant as the predictions indicated. The City of Fort Worth also determined that areas where they experienced some



coverage loss by changing antennas are not as significant as the coverage issues resolved by using an Omni antenna instead of a directional antenna.

Currently the Bergh 2 (Eules 2 ATC) site uses Antel WPA-700102-8CF-EDIN-3-25-850 antennas with an azimuth of 80 degrees mounted at 420'. These antennas have 14.5 dBd of gain and a horizontal beamwidth of 102 degrees. The City of Fort Worth is proposing to replace these antennas with Omni directional SC412-HF2LDF antennas mounted at 440'. The reason for proposed height change in mounting is because of tower spacing issues. The proposed antenna takes up more vertical space than is available with the antennas mounted at the current height.

1.2 The Region 40 Analysis Goals

The goal of this Region 40 study is to change the antennas used at the Bergh 2 [Eules 2] site from directional antennas to Omni antennas to improve "officer safety" in the eastern part of the City of Fort Worth. The purpose of this study is to demonstrate that the revised antenna pattern proposed to be used on this site is in compliance with the Region 40 plan which delineates the following criteria:

- The Service Area of this system is provided as part of this document.
- A combination of all of the 41dBu contours from all the sites are shown with relationship to the service area in this system.
- A search of the FCC database for the proposed frequency plan was conducted, and a list of the possible co-channel and adjacent channel interferers was obtained. The raw data from this search was evaluated with relationship to the 50 mile criteria contained in the "Public Safety Radio Communications Plan For Region 40 Plan" (800 MHz) obtained from NTCOG web site. This study did not show an exact frequency for frequency interference, and only Region 40 contours for adjacent channel interference was performed.
- The Region 40 Plan indicates there should be a minimum of 15dBu separation in signal strength between the Fort Worth sites and the interfering sites within 50 miles for either adjacent or co-channel interference.
- The Region 40 Plan states the 15dBu separation hold between sites. Therefore overlaps between 26dBu contour maps at the Fort Worth sites along with 41dBu contour maps at the interfering sites as well as maps showing the 41dBu contours at Fort Worth sites with 26dBu contour maps at other agency sites are included.

1.3 Service Area

The City of Fort Worth Public Safety Radio System serves numerous public safety agencies throughout Tarrant County. The City of Fort Worth service area is shown in Figure 1.



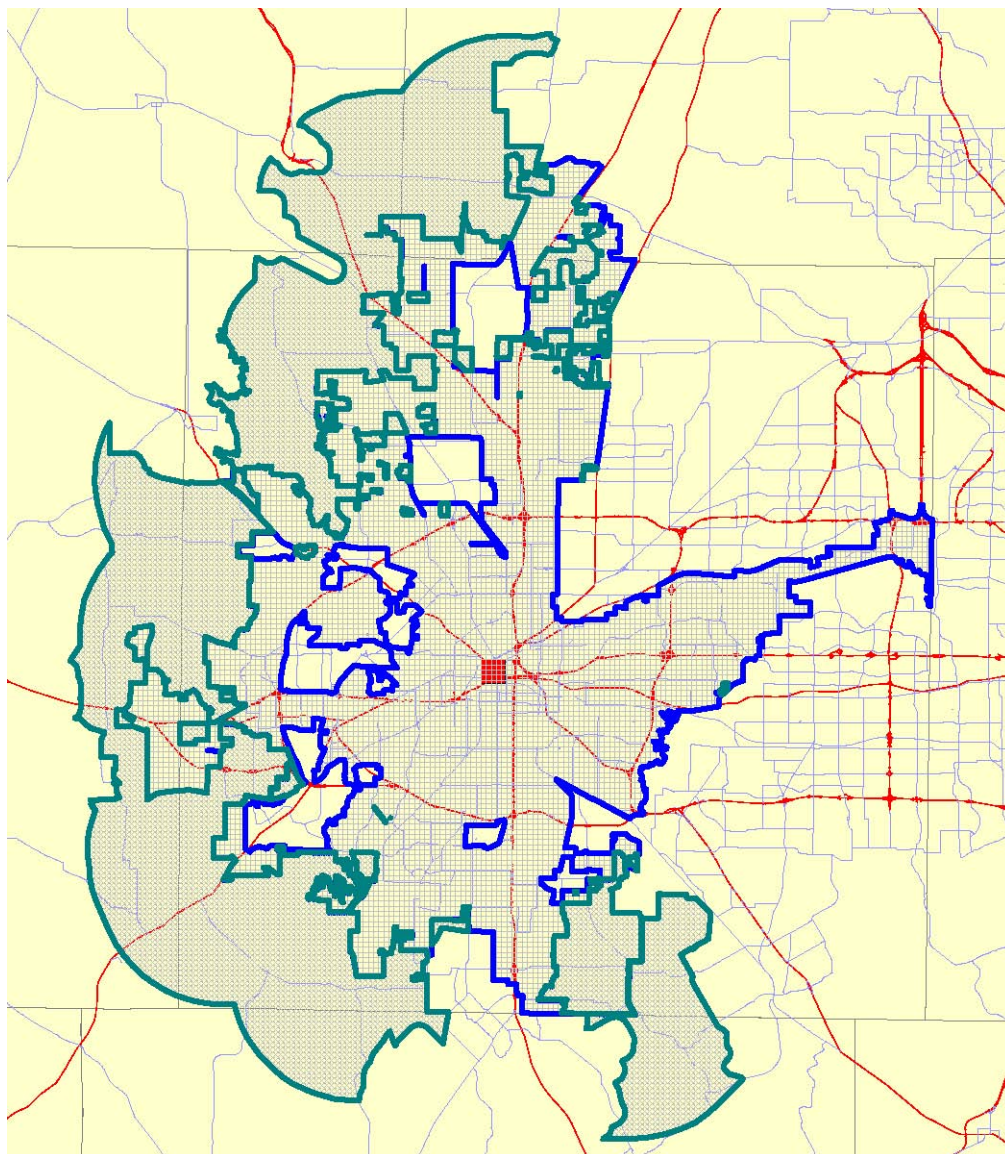


Figure 1: City of Fort Worth Service Area

Figure 1 Note:

1. The maps in this document were prepared using Directional HAAT along 72 radials, calculated using FCC approved methods. The average ground elevation for each radial was obtained from USGS 3-second map data. The distance to the 41dBu contour was automatically calculated as prescribed in Appendix 12 of the Region 40 Public Safety Radio Communications Plan using Carey propagation data by Motorola's Hydra propagation program.



Table 1 shows the cities/municipalities with which the City of Fort Worth holds inter-local agreements or for which the City of Fort Worth provides radio services.

Table 1: City of Fort Worth Service Partners

Public Safety Agency	County	Inter-local Agreement	Comments
Bureau of Engraving	Tarrant	Yes	
Burlington Northern Santa Fe (BNSF)	Tarrant	Yes	
Care Flight	Tarrant	Yes	
City of Forest Hill	Tarrant	Yes	
Fort Worth ISD	Tarrant	Yes	
Haltom City	Tarrant	Yes	
Kennedale	Tarrant	Yes	
Medstar	Tarrant	Yes	
North Richland Hills Fire Department	Tarrant	Yes	
North Richland Hills Police Department	Tarrant	Yes	
City of Richland Hills	Tarrant	Yes	
Tarrant County	Tarrant	yes	
TCU Police Department	Tarrant	Yes	
State of Texas ABC	Tarrant	Yes	
University of North Texas Police Department	Denton	Yes	
City of Watauga	Tarrant	Yes	
White Settlement	Tarrant	Yes	

1.4 City of Fort Worth Site Details

The following table shows the location of the Bergh 2 (Eules 2 ATC) Tower site and the proposed antenna heights and site power information

Table 2: Fort Worth TX P25 Bergh 2 (Eules 2 ATC) Tower Site Details

Site Name	Coordinates	AMSL	Tower Height	Transmit Antenna Height	Transmit Antenna Type	HAAT	ERP	Azimuth	Electrical Down Tilt
Bergh 2 (Eules 2 ATC) Tower	32° 48' 30.3"N 97° 07' 50.5"W	523'	493'	440'	SC412-HF2LDF	396.49'	147.91 Watts	0°	0°



1.4.1 Bergh 2 (Eules 2 ATC) Tower

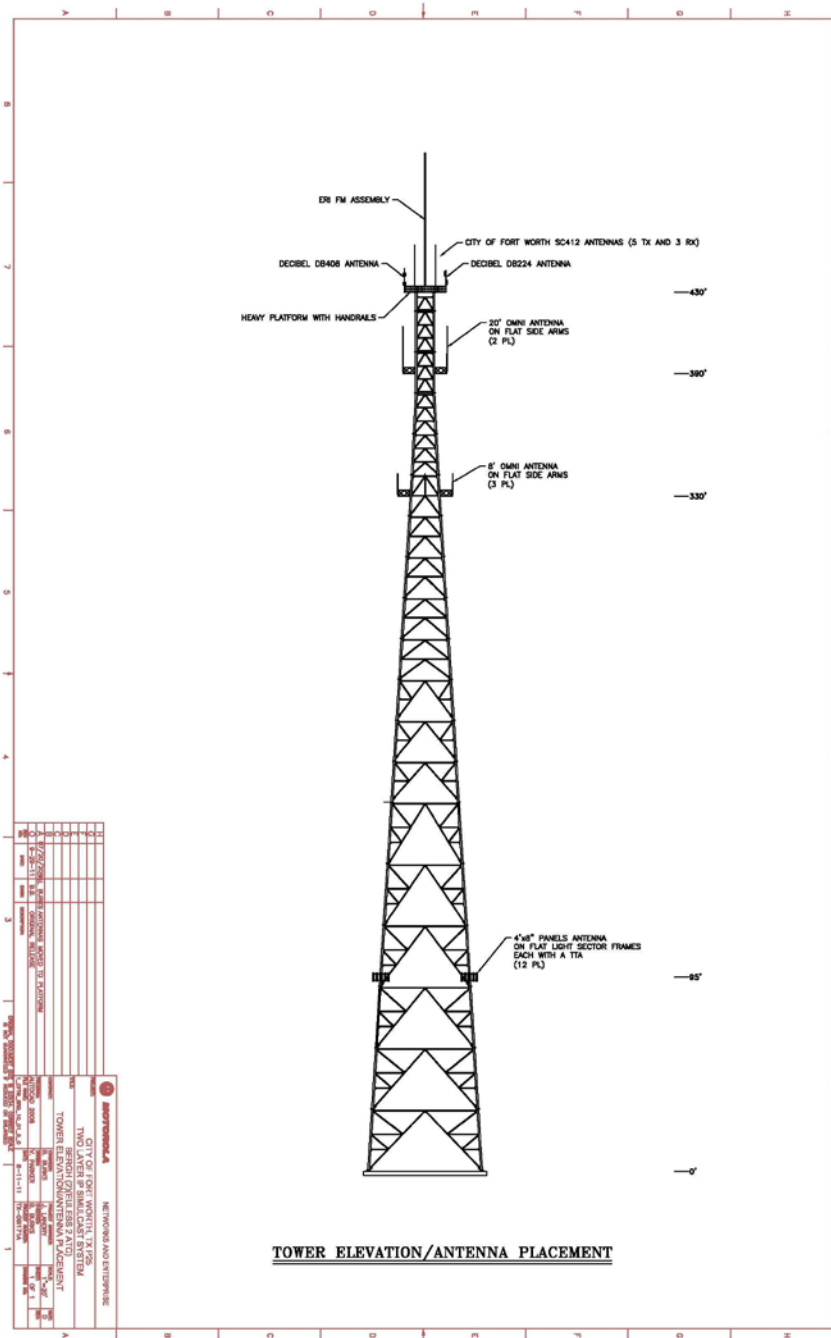


Figure 2: Bergh 2 (Eules 2 ATC) Tower

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1.5 Frequency Usage

The City of Fort Worth currently has the frequencies for the City of Fort Worth Layer 01 and 02 P25 Simulcast System (license WNXE704) on six sites. The City of Fort Worth will continue to use the 40 frequencies licensed at these sites for the two layer simulcast system. This includes the simulcast site located at the Bergh 2 (Eules 2 ATC) Tower. The only change proposed to the current configurations will be at Bergh 2 and this is only related to the type of antenna used at this site and the mounting height, not the frequency plan for the City of Fort Worth.

Table 3: Bergh2 (Eules 2 ATC) Tower Frequencies

LAYER 01			LAYER 02		
TX FREQ	RX FREQ	LAY1 CH	TX FREQ	RX FREQ	LAY2 CH
858.4375	813.4375	1	858.1375	813.1375	1
857.4625	812.4625	2	852.8625	807.8625	2
858.4625	813.4625	3	859.4375	814.4375	3
857.4375	812.4375	4	852.7375	807.7375	4
856.4375	811.4375	5	852.7125	807.7125	5
852.6625	807.6625	6	852.3625	807.3625	6
856.4625	811.4625	7	852.8875	807.8875	7
852.6875	807.6875	8	852.2375	807.2375	8
852.3125	807.3125	9	852.2125	807.2125	9
852.1625	807.1625	10	851.8625	806.8625	10
852.3375	807.3375	11	852.3875	807.3875	11
852.1875	807.1875	12	851.7375	806.7375	12
851.8125	806.8125	13	851.7125	806.7125	13
851.6625	806.6625	14	851.3625	806.3625	14
851.8375	806.8375	15	851.8875	806.8875	15
851.6875	806.6875	16	851.2375	806.2375	16
851.3125	806.3125	17	851.2125	806.2125	17
851.1625	806.1625	18	851.3875	806.3875	18
851.3375	806.3375	19	851.7625	806.7625	19
851.1875	806.1875	20	851.2625	806.2625	20



1.6 Detail Analysis Possible Region 40 Interference

During the previous Region 40 study the FCC database was searched for all possible interferences to the six Fort Worth sites.

As a result of that research it was discovered that the relationships between Bergh 2 (Eules 2 ATC) and 10 other sites needed to be researched further. These 10 site relationships were:

Table 4: Bergh2 (Eules 2 ATC) Tower to Other Licensee Sites Needing Further Review

LIM	Fort Worth Site	Interference Site	Entity
1	Bergh 2 Tower	Ave N	Plano
2	Bergh 2 Tower	Doghouse	Plano
3	Bergh 2 Tower	School House	Plano
4	Bergh 2 Tower	Communication Parkway	Plano
5	Bergh 2 Tower	Rowlett Rd	Garland
6	Bergh 2 Tower	Commerce	Garland
7	Bergh 2 Tower	Farmersville	Collin County
8	Bergh 2 Tower	CCSO	COLLIN CO S.O.
9	Bergh 2 Tower	BHCS	Baylor Health Care System
10	Bergh 2 Tower	WAXAHACHIE SITE	East Texas Medical

As established by the Region 40 study done in 2012 the relationship between Bergh 2 and these sites has not significantly changed from the days of the analog SmartNet system. The 41 dBu and 26 dBu contours for Bergh 2 and these sites had some overlap in the P25 two layer simulcast system. This same relationship existed between the Bergh analog simulcast and these users prior to the beginning of the transition from analog to digital.

The change in height for the TX antennas at Bergh 2 is only 20 feet in height and has no impact on the previously established relationships. The ERP of the new antennas is less than the ones previously approved by Region 40 for the P25 digital system.

The antenna change proposed at Bergh 2 is a lower gain Omni directional antenna than was used previously on the analog SmartNet system that was located less than a half mile away at approximately the same height prior to the establishment of the P25 infrastructure.



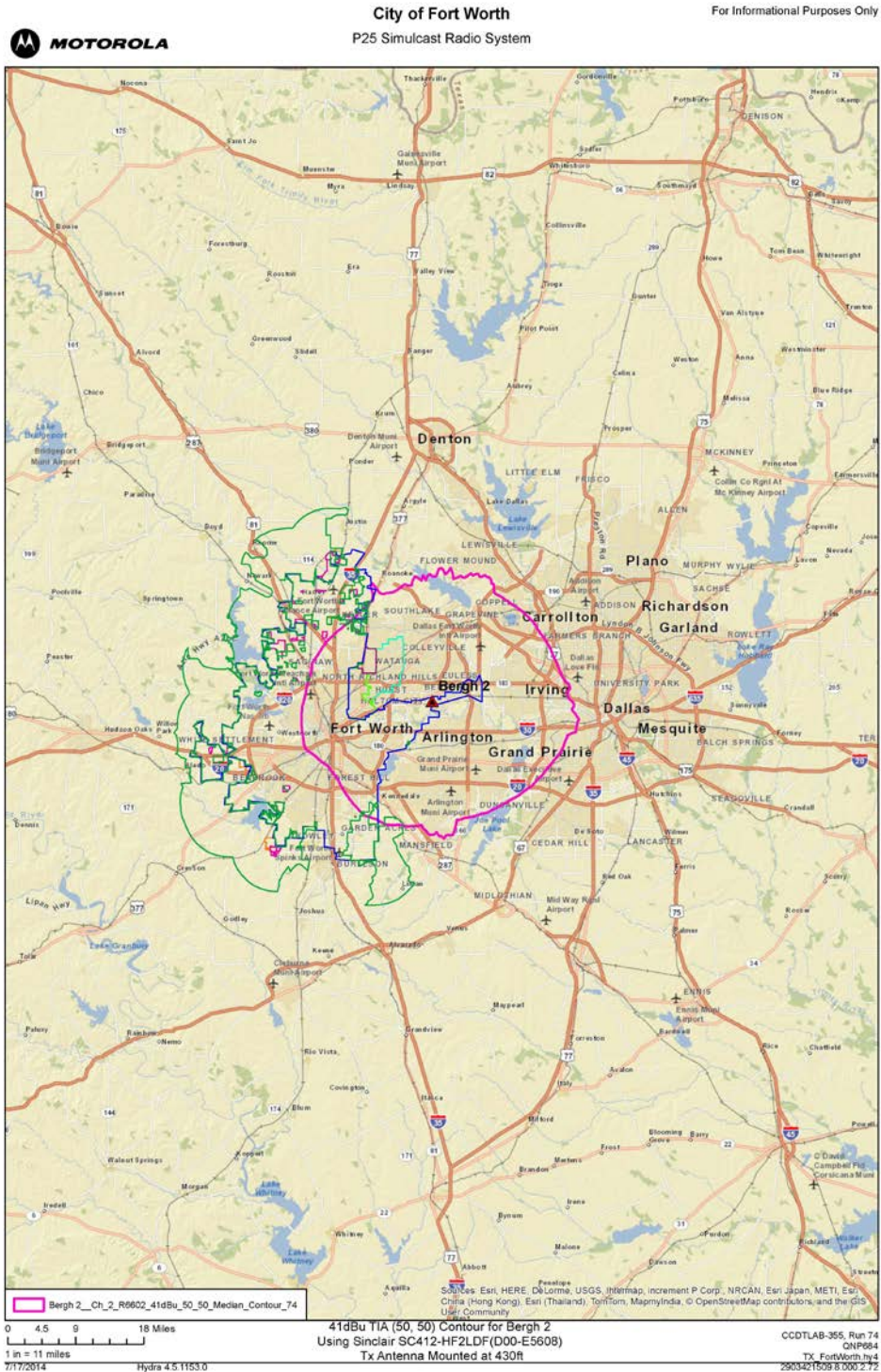
1.6.1 41dBu and 26dBu contour maps:

The possible adjacent channel/co-channel interference relationship with the City of Garland sites, City of Plano sites, Collin County sites, the Baylor Health Center site, and the East Texas Medical Waxahachie site was further examined. The following maps were created:

- A 41dBu Contour Map for Bergh 2 (Euless 2 ATC)
- A 26 dBu Contour Map for Bergh 2
- Two comparison maps to Bergh 2 for each other user sites that were seen as possible interference candidates
 - ❖ Bergh 2 41 dBu contour with Other User sites 26dBu contour
 - ❖ Bergh 2 26 dBu contour with Other User sites 41 dBu contour.
- These maps include maps for:
 - ❖ The City of Garland – for all sites within 50 miles of the Bergh 2 site
 - ❖ The City of Plano – for all sites within 50 miles of Bergh 2
 - ❖ The two Collin County sites within 50 miles of Bergh 2
 - ❖ The Baylor Health System site within 50 miles of Bergh 2
 - ❖ The East Texas Medical at Waxahachie site within 50 miles of Bergh 2



1.6.1.1 Bergh 2 (Eules 2 ATC) 41dBu Contour Map

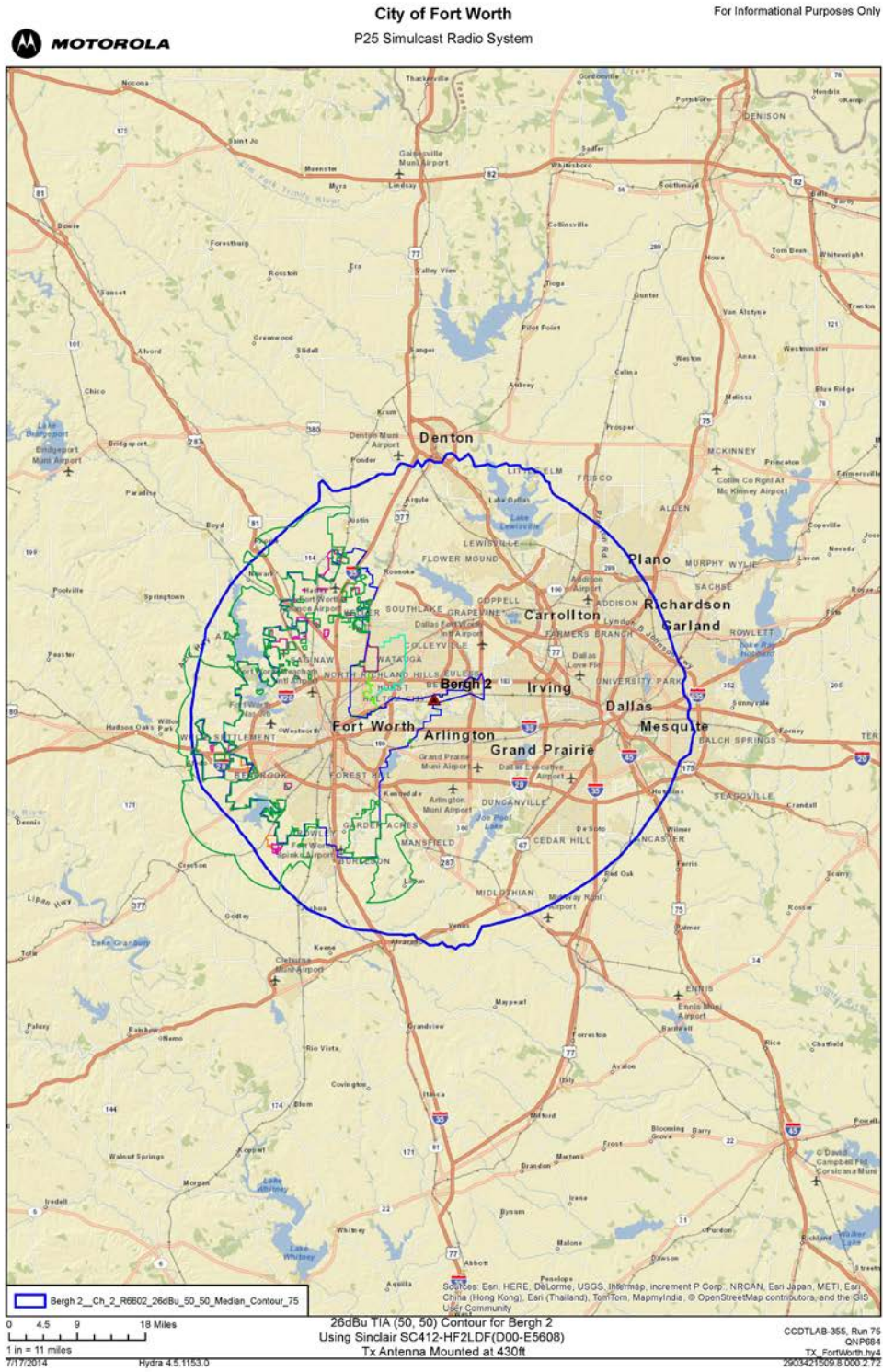


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1.6.1.2 Bergh 2 (Euleless 2 ATC) Site 26 dBu Contour



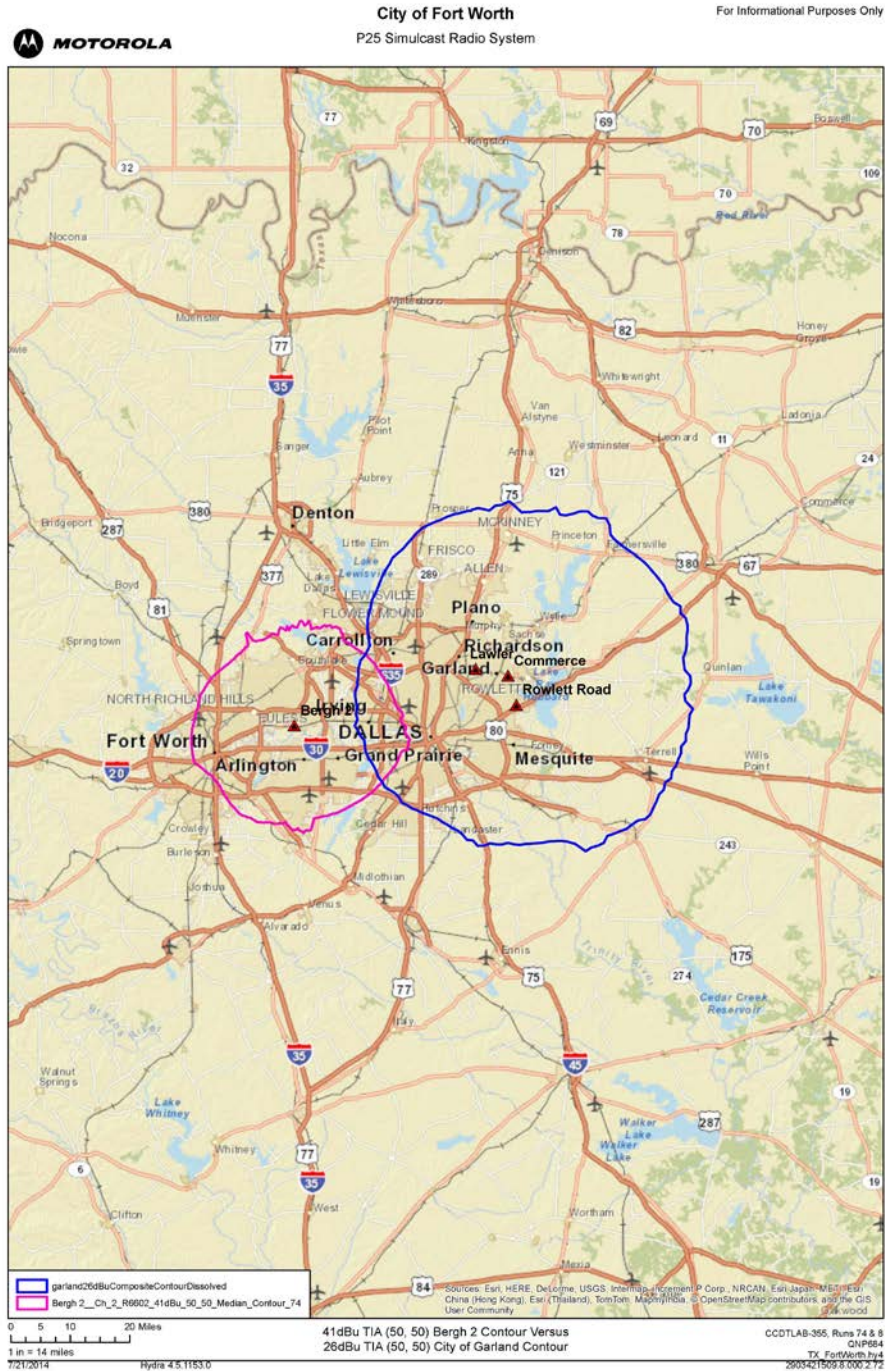
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1.6.1.3 City of Garland Sites within 50 miles

1.6.1.3.1 Bergh 2 (Euless 2 ATC) 41 dBu Contour – Garland Sites 26 dBu Contour

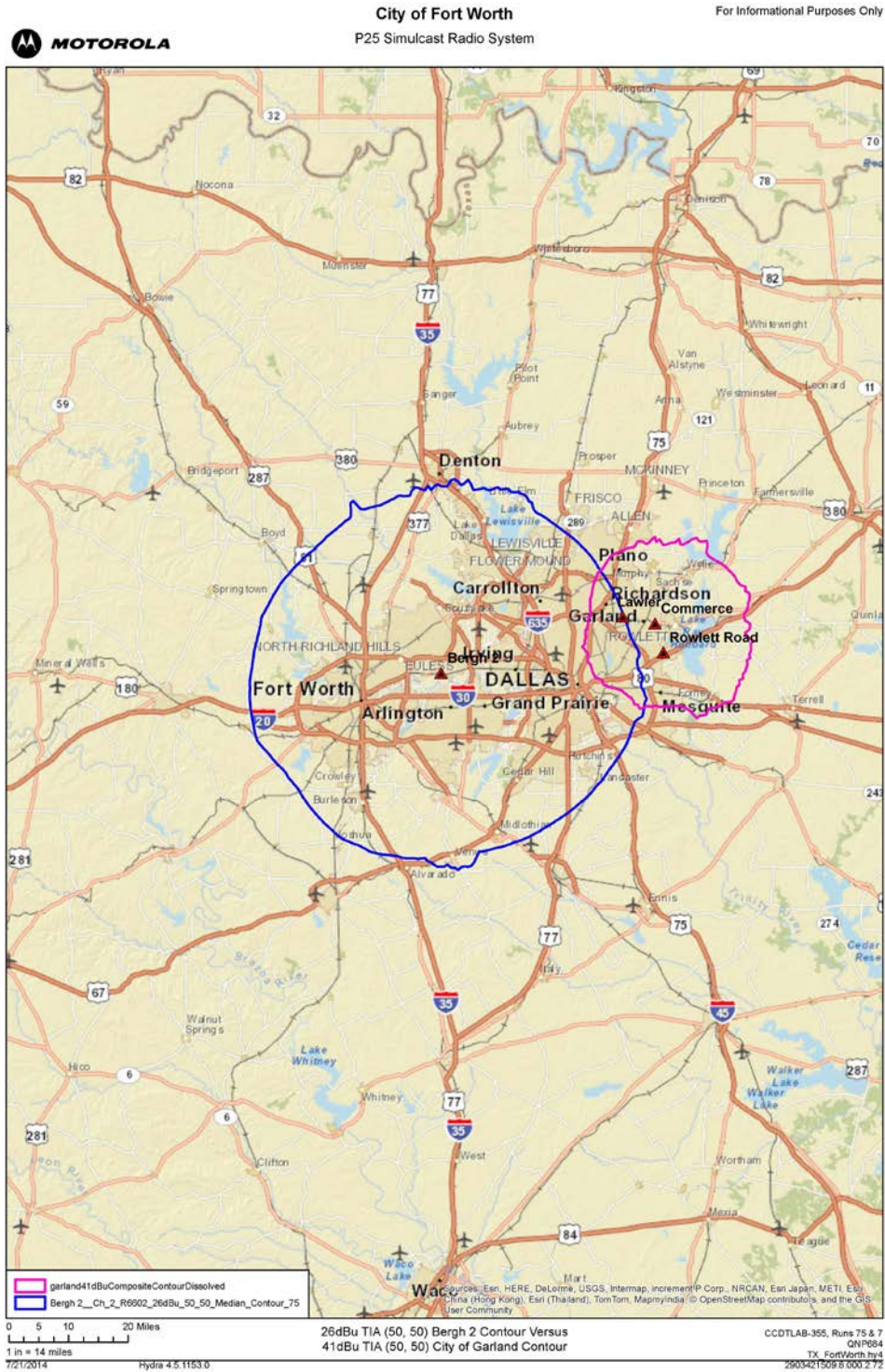


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1.6.1.3.2 Bergh 2 (Eules 2 ATC) 26 dBu Contour – Garland Sites 41 dBu Contour



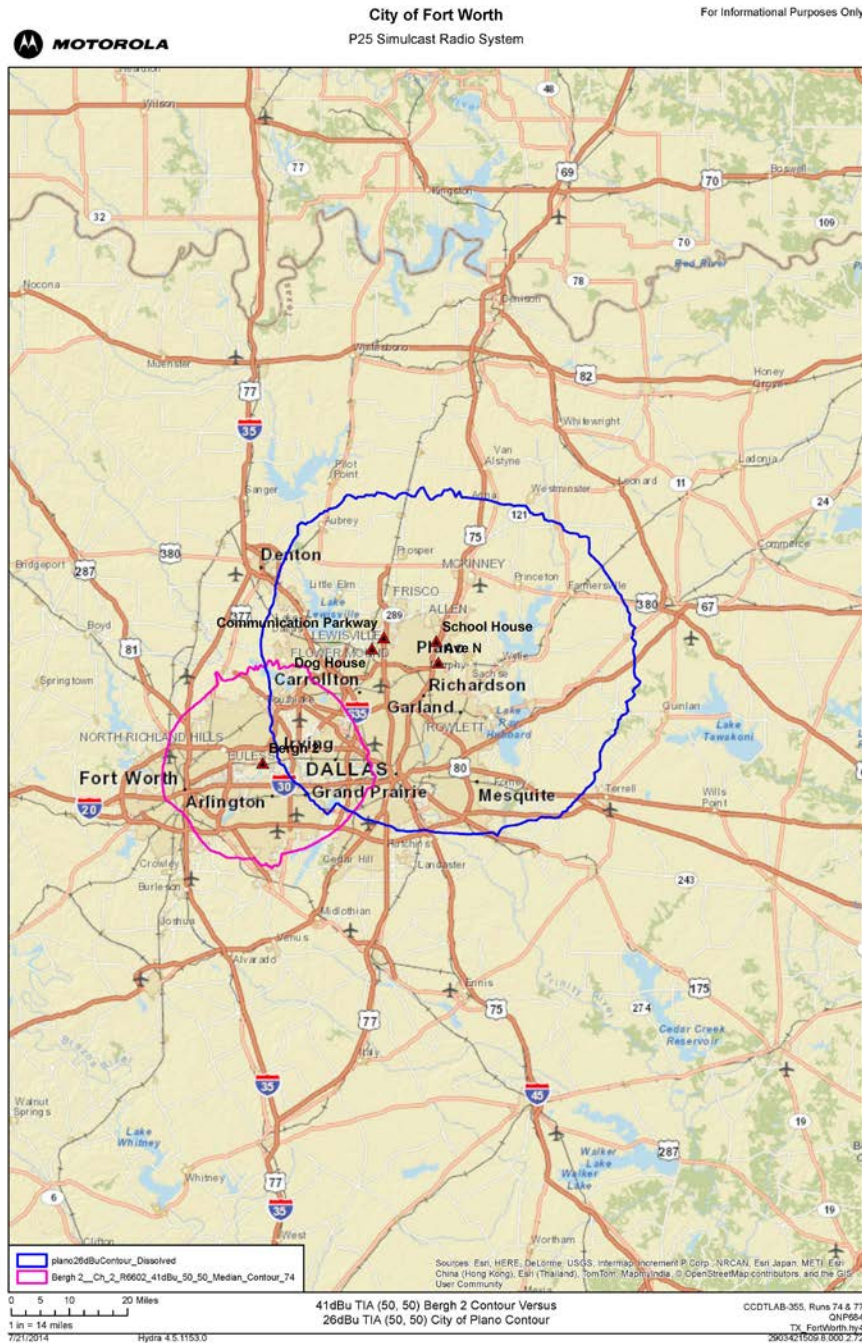
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1.6.1.4 City of Plano sites within 50 miles

1.6.1.4.1 Bergh 2 (Eules 2 ATC) 41 dBu Contour – Plano Sites 26 dBu contour

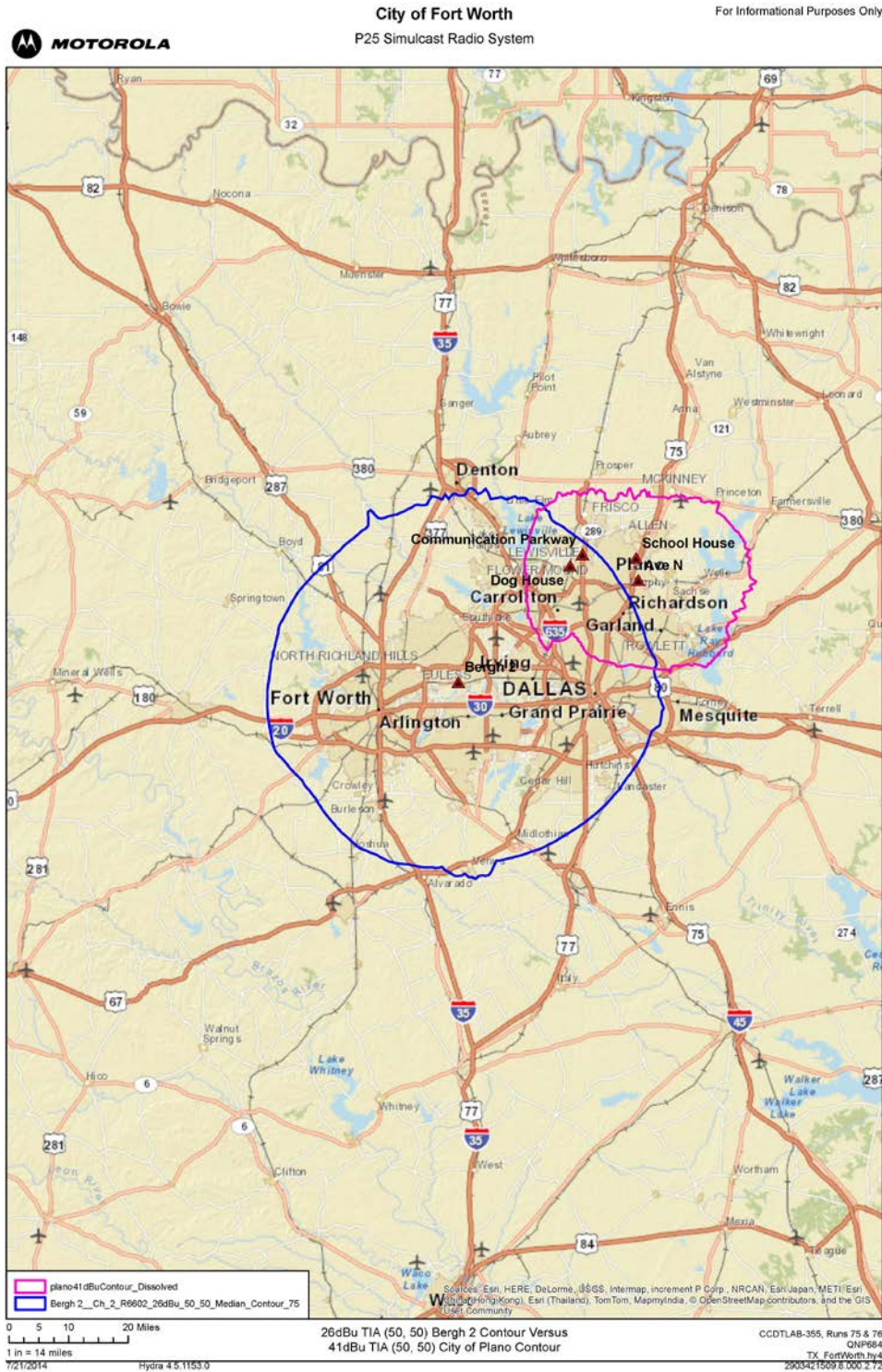


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1.6.1.4.2 Bergh 2 (Eules 2 ATC) 26 dBu Contour – Plano Sites 41 dBu Contour



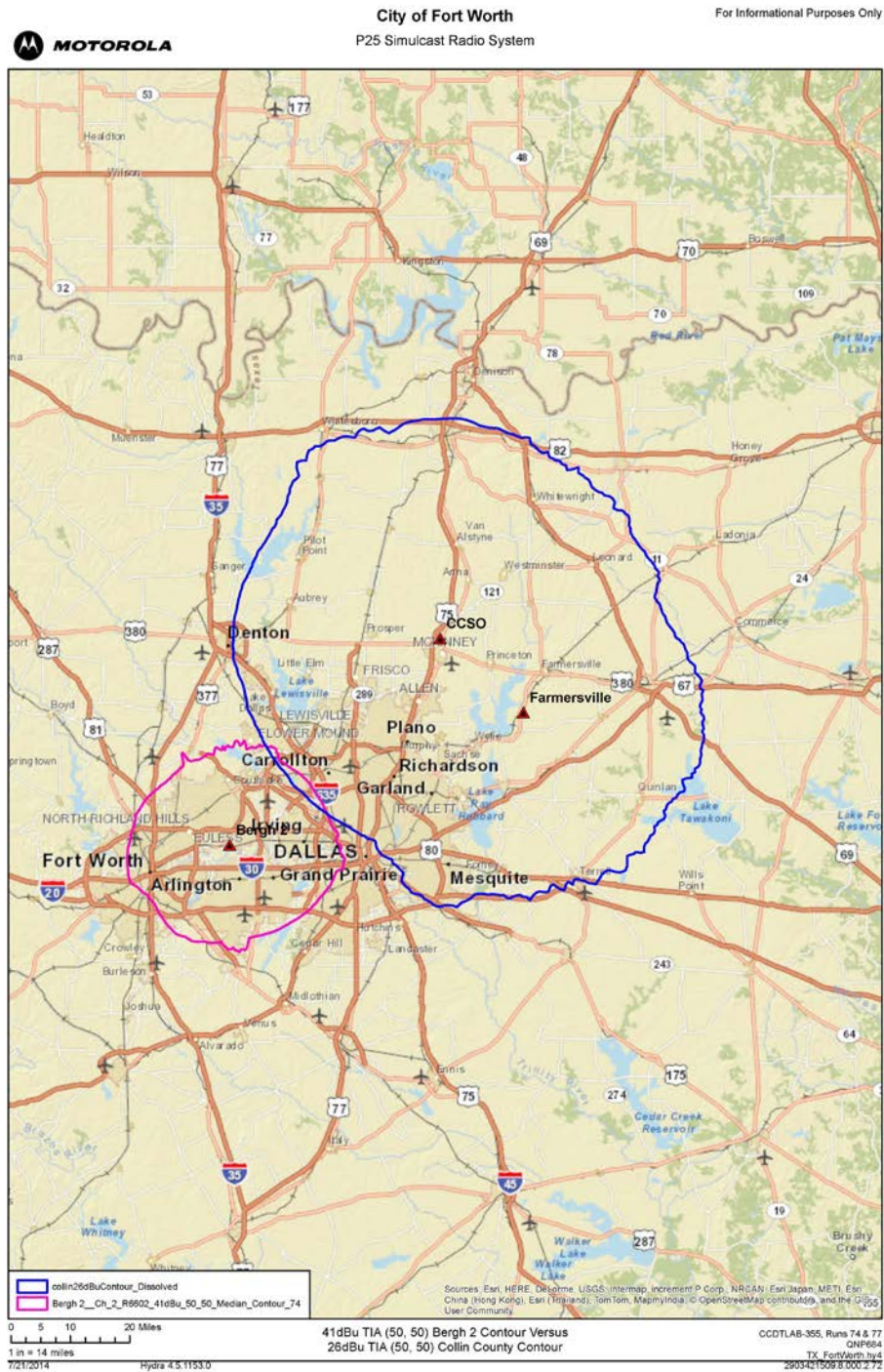
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1.6.1.5 Collin County Sites within 50 miles

1.6.1.5.1 Bergh 2 (Euleless ATC) 41 dBu Contour – Collin County Sites 26 dBu Contour

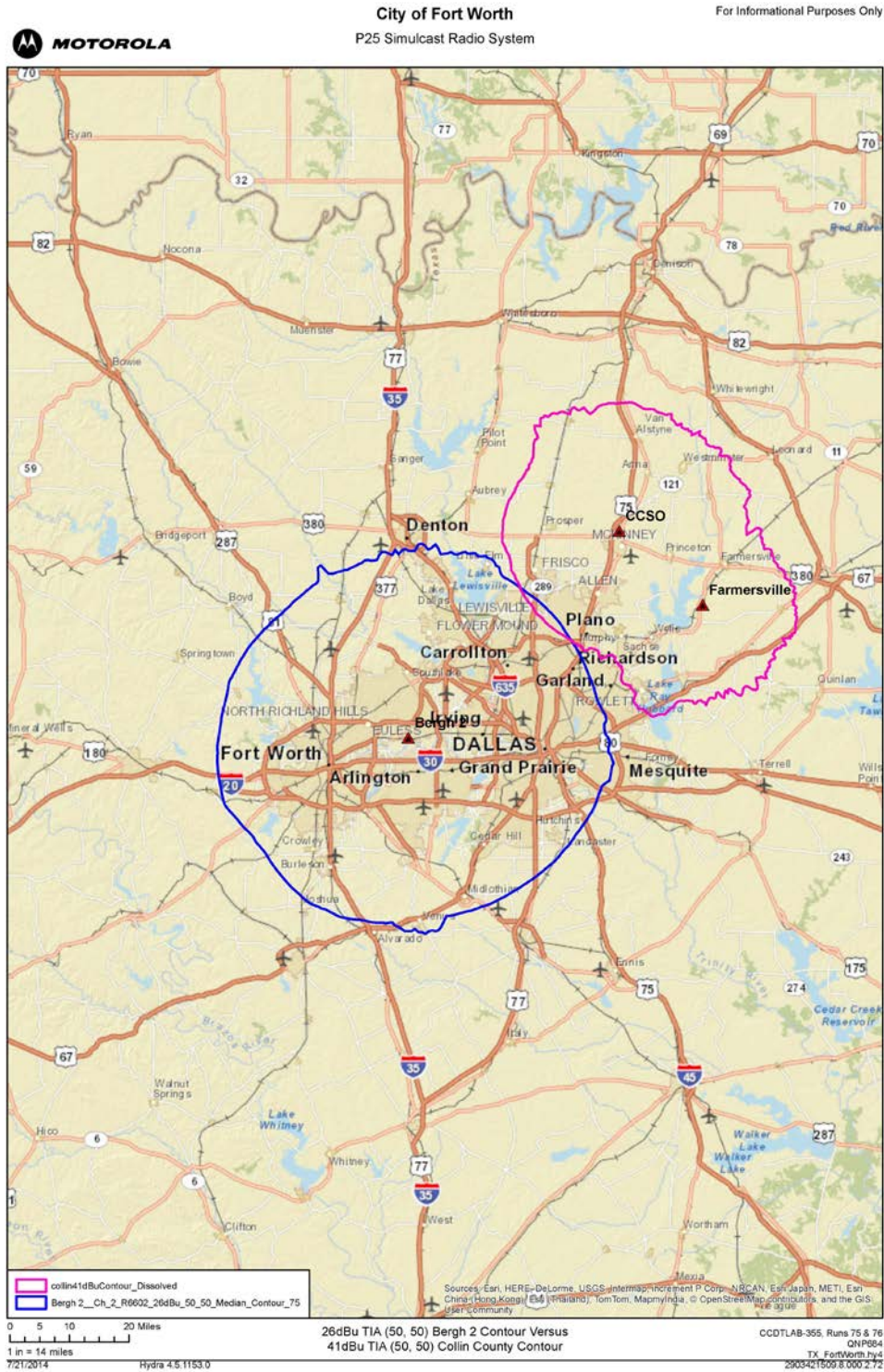


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1.6.1.5.2 Bergh 2 (Euless 2 ATC) 26 dBu Contour – Collin County 41 dBu Contour



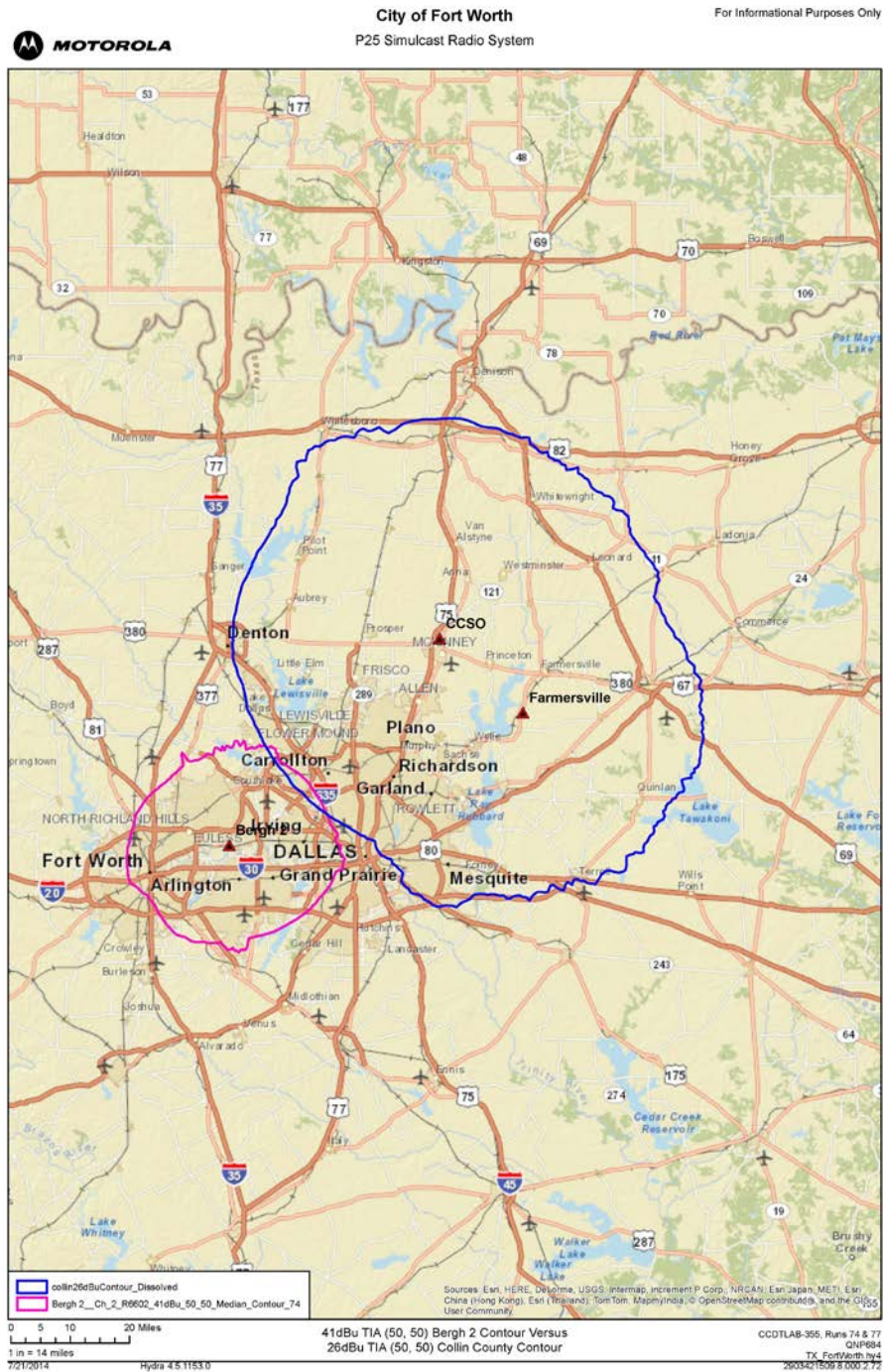
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1.6.1.6 Baylor Health Center site within 50 miles

1.6.1.6.1 Bergh 2 (Euless 2 ATC) Site 41 dBu Contour – Baylor Health Center Site 26 dBu Contour

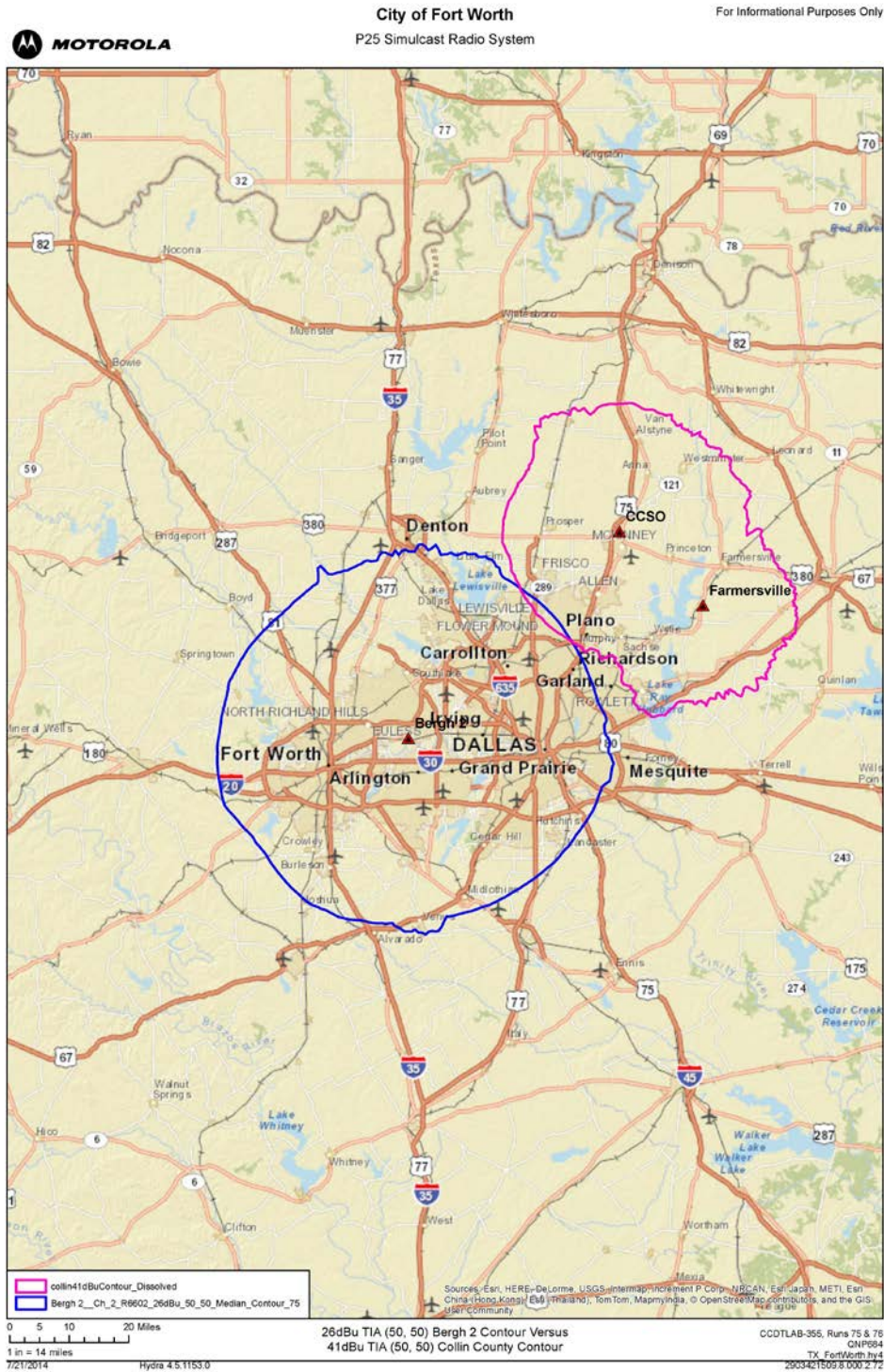


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1.6.1.6.2 Bergh 2 (Eules 2 ATC) Site 26 dBu Contour – Baylor Health Center Site 41 dBu Contour



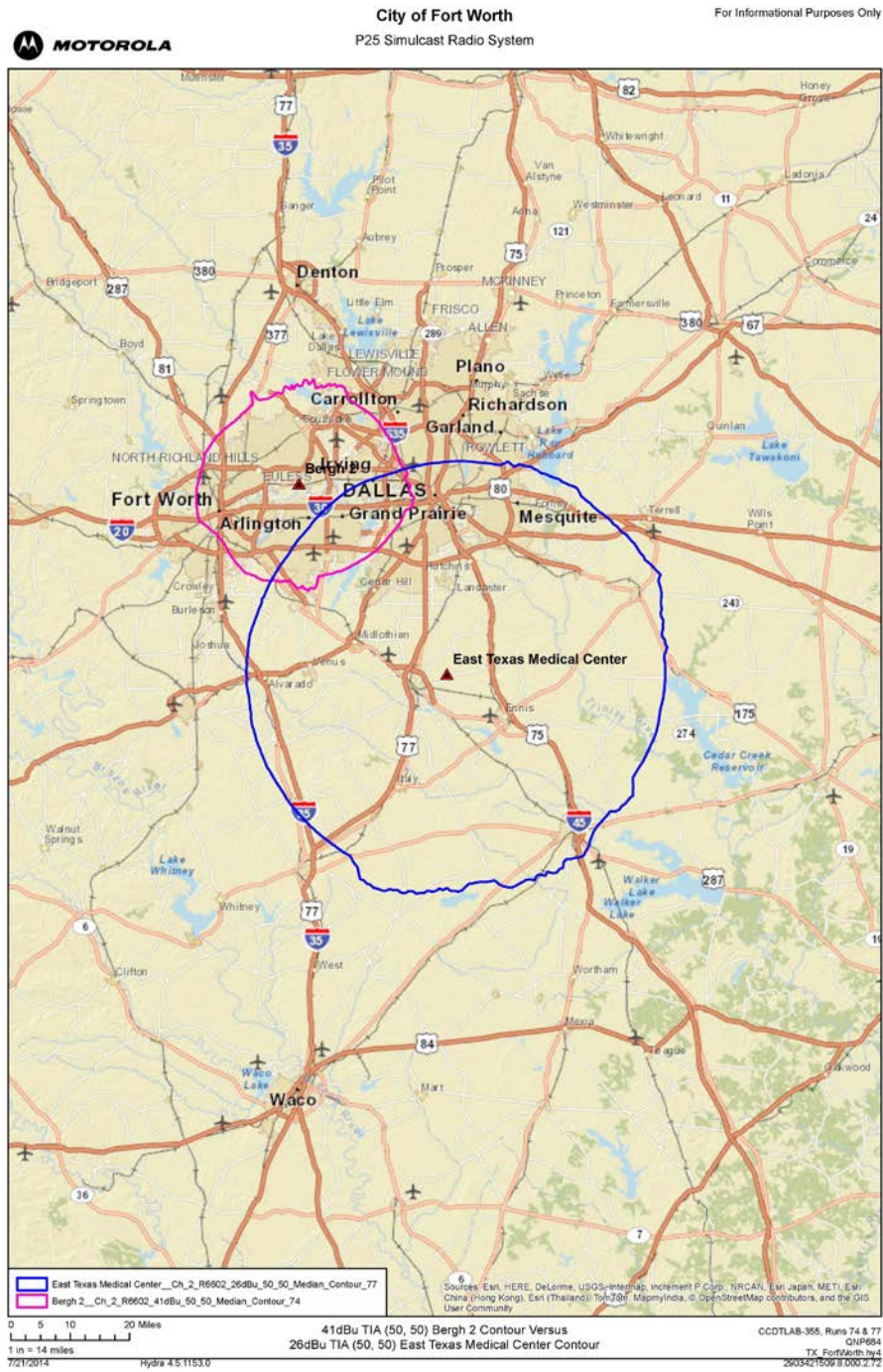
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1.6.1.7 East Texas Medical Site within 50 miles

1.6.1.7.1 Bergh 2 (Eules 2 ATC) Site 41 dBu Contour – East Texas Medical Site 26 dBu Contour

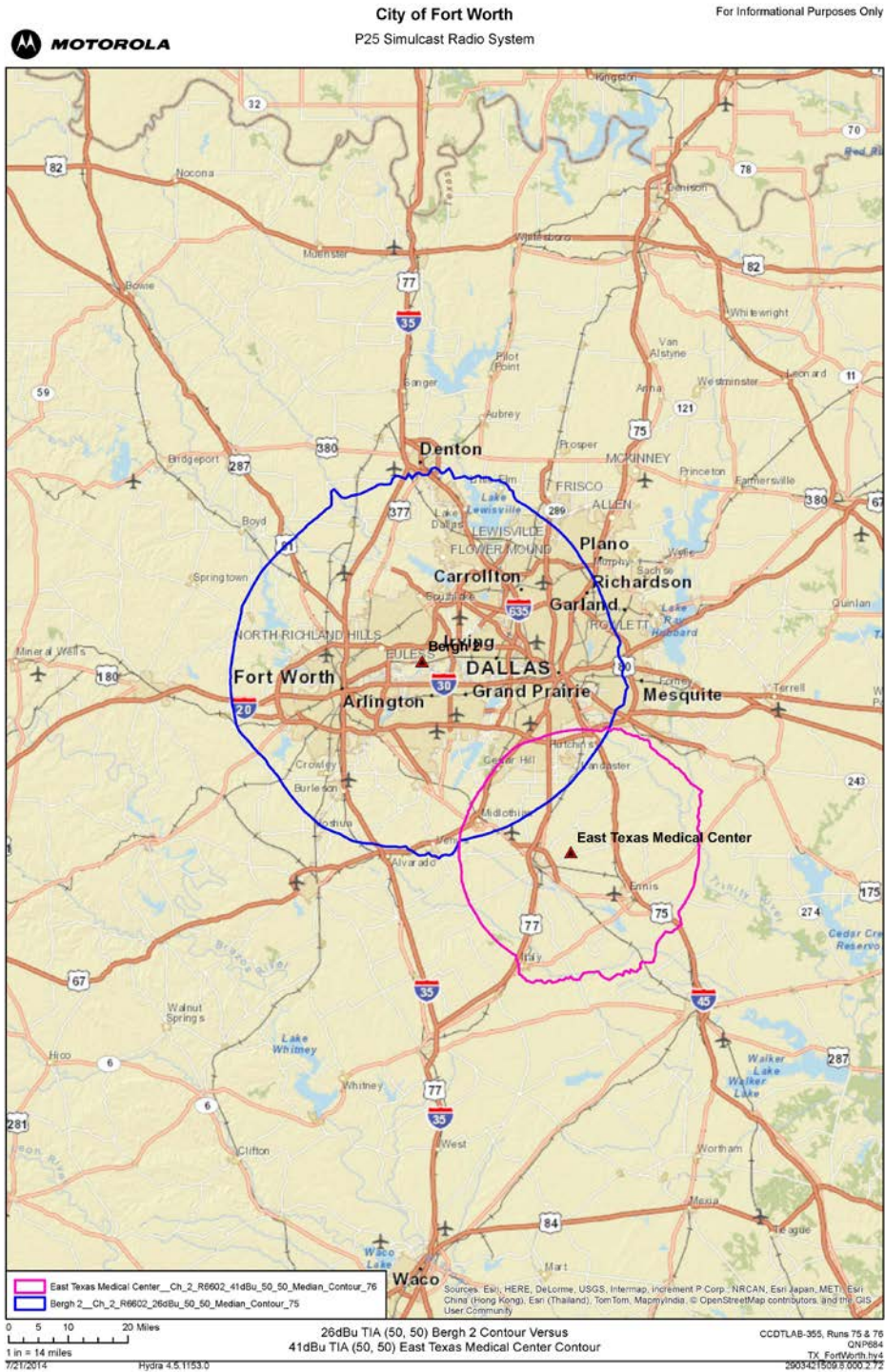


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1.6.1.7.2 Bergh 2 (Euleless ATC) Site 26 dBu Contour – East Texas Medical Site 41 dBu Contour



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1.7 Summary

This Region 40 study reviews all of the possible interference contours for the City of Fort Worth Bergh 2 (Eules 2 ATC) site. This study demonstrates that the proposed modification from a directional antenna to an Omni antenna system at Bergh 2 will not affect the existing contour relationships between the Bergh 2 (Eules 2 ATC) site and other users. This review of the proposed change to the antenna system at Bergh 2 shows that this change fits within the constraints of the previous Region 40 studies conditionally approved by the Region 40 Committee for this system.

