Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	MM Docket 99-25
Creation of a Low	)	
Power Radio Service	)	RM-9208
	)	RM-9242

To: The Commission

CONSOLIDATED COMMENTS
OF
106.1 INC.
BLUE DOLPHIN COMMUNICATIONS, INC.
BLUE DOLPHIN COMMUNICATIONS OF NC, L.L.C.
WTZY-AM, INC.
RADIO WOODVILLE, INC.
COLORADIO, INC.

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Comments

106.1 Inc. ("FM106"), Blue Dolphin Communications, Inc. and Blue Dolphin Communications of North Carolina, L.L.C., WTZY-AM, Inc., Radio Woodville, Inc., and Coloradio, Inc. (collectively "Blue Dolphin"), by Engineering Counsel, pursuant to the *Notice of Proposed Rule Making* ("NPRM"), *FCC 99-6 (released February 3, 1999),* hereby submit these Comments in the above-captioned rule making proceeding regarding the proposal to create a new low power radio service ("LPFM").

FM106 is the permittee of WASQ, Jefferson, North Carolina, with a pending request to change the call sign to WMMY. Edward F. Seeger is President, Director, and 33.33% shareholder in

Blue Dolphin Communications, Inc., licensee of FM stations WMXF, Old Fort, North Carolina, and KBIL (FM), Grand Isle, Louisiana; Blue Dolphin Communications of North Carolina, L.L.C., licensee of WQNS (FM), Waynesville, North Carolina, and WHCC (AM), Waynesville, North Carolina; WTZY-AM, Inc., licensee of WTZY (AM), Fairview, North Carolina; Radio Woodville, Inc., licensee of KVLL-FM, Woodvile, Texas; and Coloradio, Inc., permittee of KKIK (FM) La Junta, Colorado, KAVD-FM, Limon, Colorado, and KOOO (FM) Rocky Ford, Colorado.

FM106 and Blue Dolphin urge the Commission (1) not to adopt rules which permit LP1000 class stations; (2) to utilize contour protection rather than spacings for any LPFM allocations; (3) to make any LPFM services secondary to full service FM facilities to continue to permit such stations to upgrade service to the public; (4) to grant existing facilities including FM translators and boosters primary status with respect to LPFM services; (5) to carefully consider and not permit any preclusionary impact of LPFM on possible future digital in band aural services; (6) to require that any LPFM services to comply with sections of the FCC Rules pertaining to public safety, public service, and technical operations.

The nature of existing environment: In the introduction to the NPRM, the Commission states that it intends to "ensure that the new LPFM stations do not cause interference to existing full service FM radio stations."[1] That is a necessary and laudable goal and consistent with both regulatory and legislative history. However, as we will show, the methods proposed to allocate LP1000 stations do not accomplish this goal. Moreover, the methods proposed do not produce a service which is sufficiently free from incoming interference to serve the public.

The NPRM also cautions that it will "be wary of any provisions that would limit the development of future terrestrial digital radio services.[2]" There are at least three active proponents of digital In Band On Channel ("IBOC") digital terrestrial broadcasting. Each of the systems aggressively exploits the spectrum available in the existing spectral mask for FM broadcasting as described in 47 C.F.R. §73.317. The IBOC systems also depend on adherence to the separations in 47 C.F.R. §73.207 in order to provide service to the existing analog service areas. Any reductions in spacings, including new LPFM stations on co-channel, first adjacent channel, or in some cases second adjacent channels, would result in a reduction of digital service area.

Pre-existing short-spaced allocations: The existing FM spectrum is not in compliance with the spacings required by current rules. Studies prepared for IBOC proponent USA Digital Radio show significant incoming interference when contours studies are prepared for existing stations. Many stations have multiple instances of incoming interference. One station has 7 interference cases, but it actually has more usable service area than some other stations with fewer, but more obtrusive, interference cases.

In addition to the full service stations whose protection is envisioned by the NPRM, many areas of the country receive service via FM Translators. While FM translators are defined as a secondary service, the Commission has recognized that they provide valuable service. In certain

[1] *Notice of Proposed Rule Making, FCC 99-6 (released February 3, 1999)* at 1.
[2] *Ibid* at 1.

remote areas translators provide the only aural services. While many translators are owned by the primary station which is rebroadcast and serve to fill in terrain shielded areas, other translators are owned by non-station entities whose goal is to provide service to underserved areas. The Commission has recognized

FCC methodologies: Separations and Prohibited Overlap: New Commercial FM stations are allocated based on separation distance tables in 47 C.F.R. §73.207 with limited flexibility for actual site location provided by §73.215. Noncommercial stations are allocated based on lack of overlap of contours provided in §73.509. The proposed rules for LPFM are analogous to the commercial FM rules, with distance tables. The separation distances are administratively simpler than the contour overlap method used for noncommercial stations. The separation tables are based on nearly flat terrain. There are serious limitations with the use of tables. The discrepancies stem in large part from actual terrain deviating from the average terrain along the eight cardinal radials. Statistically, there is a 50% chance that the terrain elevation along a radial between the LPFM station and an existing station will be lower than the average, resulting in contours which exceed the average.

The tables provide, in general, better protection to the larger station in any two station study than actual contour overlap separations would provide. For co-channel protection, for instance, the distance between the service contour and the interference contour which is 20 dB lower increases with antenna height and with effective radiated power. For a LP100 station, the protected service contour is 14.2 kilometers while the co-channel interference contour is 50.8 kilometers, for a margin of 36.6 kilometers. For a Class A station at maximum facilities, the service contour is 28 kilometers and the co-channel interference contour is 86.8 kilometers for a margin of 58.8 kilometers. For Class C the distances are 92 kilometers and 197.8 kilometers, for a difference of 105.8 kilometers. As the height above average terrain increases, the differential increases. Since the LPFM stations will be the smaller station in all initial allocations, they are likely to experience significant incoming interference from stations whose height above average terrain in the direction of the proposed LPFM service is greater than the standard eight radial average HAAT.

Non-commercial stations operating on reserved band channels 201 through 220, 88.1 MHz through 91.9 MHz, are already allocated based on lack of prohibited contour overlap provided in §73.509. A spacings table is inappropriate in the reserved portion of the band because it has the potential to require existing noncommercial stations to protect LPFM stations based on more stringent spacings

Service beyond Primary Service Area is normal and acknowledged in the secondary nature of FM translators. The rules for translators include:

> (a) An authorized FM translator or booster station will not be permitted to continue to operate if it causes any actual interference to:
>
> (1) the transmission of any authorized broadcast station; or

(2) the reception of the input signal of any TV translator, TV booster, FM translator or FM booster station; or

(3) the direct reception by the public of the off-the-air signals of any authorized broadcast station including TV Channel 6 stations, Class D (secondary) noncommercial educational FM stations, and previously authorized and operating FM translators and FM booster stations. Interference will be considered to occur whenever reception of a regularly used signal is impaired by the signals radiated by the FM translator or booster station, regardless of the quality of such reception, the strength of the signal so used, or the channel on which the protected signal is transmitted.[3]

Note that the rule requires translators to resolve interference with any regularly used service, whether within the primary contour or not and whether or not there is a direct frequency relationship described in §73.207, §73.215 or §73.509.

Desired to Undesired signal strength ratio requirements ("D/U Ratios") to protect receivers are codified in sections of the FCC Rules which date to 1962.[4] Receiver manufacturers have relied upon the protection ratios to design equipment. Not all consumer receiving equipment is capable of satisfactory operation even within the existing environment. Electronic technology has certainly advanced since 1962. Tuning accuracy and frequency stability are greatly enhanced. However, selectivity is controlled primarily by the Intermediate Frequency ("IF") bandwidth of receiver. Wider IF bandwidths produce lower distortion for a given parts count and filter cost. Therefore manufacturers design for the widest bandwidth consistent with the existing allocations.

New inexpensive "one chip" radios are now on the market. New data must be obtained to determine if inexpensive radios are capable of operation in the proposed loosened standards. Any relaxation of separation requirements must fully acknowledge the implications for existing receivers. While it is not be possible to fully protect all possible receivers in all possible conditions, the record does not yet show current receiver requirements. Any changes should fully consider the range of mass market receivers as well as the state of the art.

Blanketing interference: The absence of a minimum height for LPFM stations serves the laudable goal of keeping the cost of construction within reason and reducing problems with local appearance zoning and Federal Aviation Administration air navigation standards. However, a low antenna will exacerbate blanketing problems. As FCC Rules 47 CFR 73.318 acknowledges, the blanketing contour is based on Effective Radiated Power and distance of the observer from the antenna. The calculation is based on free space path loss without considering the height of the transmitting antenna.

If LPFM stations are to realize their potential to serve neighborhoods and communities of interest, their antennas must be located in relatively densely populated areas. The blanketing contour will therefore encompass a relatively large population as a proportion of the total service area population. The burden of complying with blanketing rules must be clearly articulated to

[3] 47 C.F.R. §74.1203.
[4] *See First Report and Order* in Docket 14184, 40 FCC 662, 685 (1962).

applicants for any LPFM service. Such requirements can be difficult enough for full service FM stations and could be difficult for a service designed to be technically simpler. It is unlikely, for instance, that any LPFM stations would employ full time engineers who would be trained to resolve blanketing complaints. The Commission has held full service stations responsible for their responsiveness to blanketing complaints, even ordering stations to cease operations at sites where blanketing complaints have not been resolved.

Interference Protection Standard Reductions: Lack of 3rd adjacent and 2nd adjacent protection for LPFM stations could cause difficulty in the immediate vicinity of the LPFM station. Some of the very areas which could benefit the most from LPFM are likely to have a high proportion of low cost receivers which have been shown to be particularly sensitive to adjacent channel interference. Absent testing which demonstrates that a substantial portion of the exiting receiver base can tolerate the elimination or reduction of 3rd adjacent and 2nd adjacent channel interference, any such reduction of interference protection is premature and potentially detrimental to the public's ability to listen to either existing stations or any additional LPFM stations.

NCEFM stations, translators and boosters must protect Channel 6 television stations under §73.525 and §74.1205. All LPFM stations should also be required to provide protection to Channel 6 television stations, although such protection was not described in the allocation standards described in the appendices of the NPRM.

In §73.525, the benefits of directional television receive antennas are limited to areas where the proposed FM station is not in a direct or nearly direct line between the desired television station and the receiver location. Very little FM reception has the benefit of directional receive antennas. Any LPFM rules, especially for LP100 and microradio services, must consider their impact on distant listenership.

Using separations will in fact create situations where LPFM stations can apply for facilities which may accept substantial interference including co-channel and first adjacent. The applicant will not be aware of the potentially severe limits on service unless contours or other more sophisticated methods of coverage prediction are used.

Technical Standards: Bandwidth and deviation must be the same to serve existing receivers. A new analog LPFM service cannot be authorized with different modulation characteristics and still serve the same receiver population.

The emission mask could be tightened while still serving existing receivers. Any changes in the emission mask, however, must carefully consider the proposed IBOC systems. A tighter mask for LPFM could reduce the interference into IBOC systems, but at the same time could prevent LPFM stations from later migrating to digital service. If LPFM is created, its listeners must not then be restricted from the benefits which digital broadcasting may bring. Such second class status would not be in the long term interests of the audience groups served.

LPFM stations at all levels should be required to receive, decode, and where appropriate retransmit alerts and tests through the Emergency Alert System ("EAS"). The audiences of

LPFM stations deserve the protection that early notification provides in the event of weather or other emergencies. It would be unconscionable to deprive those audiences of the life saving potential of early tornado warnings, for instance.

Non-ionizing radio frequency radiation ("RFR") standards must be rigorously enforced for LPFM stations. Because there is no minimum height specified, antennas are likely to be mounted at low elevations on roofs where the public and non-technical maintenance personnel may be exposed to excessive levels without their knowledge. Roof top locations are consistent with the goal of providing low entry cost. Antenna mounting structures can reduce the radiation to acceptable levels.[5] However, without specific requirements, radiation exposure will probably exceed acceptable limits.

There is no justification for exempting LPFM from other environmental requirements. Most sites that are likely to serve the population centers for which the service seems designed are likely to be categorically excluded,[6] but failure to verify site conditions could appear to give federal (FCC) condonation to environmentally unsound practices.

Primary or Secondary Status: Clearly the Commission faces a difficult task in trying to allocate a new service within an existing allocations framework. Considering LPFM stations as primary services and requiring protection from existing full service stations would restrict the ability of full service stations to modify facilities in the future. The Commission has recognized that tower siting is a difficult task which has been complicated by the transition of television to digital television. There are numerous instances of full class C FM stations being forced to relocate when a television station which is typically the primary tenant of 600 meter (2,000 feet) towers. Finding a suitable location for an additional 600 meter (2,000 foot) tower is difficult and expensive. Adding restrictions by allocating LPFM stations could produce gridlock. LPFM must clearly be secondary with respect to full service stations Class A and above.

FM106 holds a construction permit for a Class C3 station at Jefferson, North Carolina, as a replacement allocation for a Class A facility at Saltville, Virginia. The upgrade will allow service to a greater population and a greater underserved population than that provided by a Class A facility. There is no way to accurately predict what preclusionary effect LPFM stations might have had on the authorized construction permit. As we will show *infra* there are multiple LPFM allocations possible at Jefferson, North Carolina. Prior to the move of WASQ to Jefferson there would have been other possibilities. Any of several other possible allocations could have prevented FM106 from providing the additional service and deprived Jefferson, North Carolina, of its first aural service.

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[5] *See Evaluating compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65 (August 1997)* which provides a worst case distance for circularly polarized LP1000 stations of 18.3 meters (60 feet) and a worst cast distance for LP100 stations of 5.8 meters (19 feet). Providing such elevations above standard head height of 1.8 meters (6 feet) will require engineered structures in most building codes. The lowest cost solution of bolting an antenna to a pipe would most likely create an exposure which exceeds the limits in OET-65.

[6] *See 47 C.F.R. §1.1306* which lists qualifications for categorical exclusion.

Areas with irregular terrain, including Western North Carolina, place multiple site constraints on FM stations.[7] In addition, many communities have adopted restrictive tower siting ordinances as a reaction to the proliferation of cellular and Personal Communication Services towers. Many such ordinances have no differentiation between broadcast and other types of towers.

FM translators and boosters should also not be dismissed out of hand. If LPFM is granted primary status with respect to FM translators and boosters, the course of least resistance for potential LPFM operators is to search for an existing translator, claim primary status, and force the translator off the air, thus depriving the existing translator audience of regularly used programming. Translators clearly have secondary status with respect to full service stations. However, granting LPFM primary status with respect to translators could cause needless disruption in service to the public. Translators are most frequent in rural areas. Those areas are most likely to have multiple potential channels for LPFM services. LPFM operators should be required to certify that they have exhausted all other possible channels before they are permitted to displace a translator which was authorized prior to the application of the LPFM station.

If LPFM stations can rebroadcast existing stations, then they become a new class of higher powered translators. Lack of local programming requirement could easily produce a class of satellite-fed stations. Off the shelf technology is available to comply with local identification rules. There are existing organizations such as churches or any nationally franchised enterprise that could mobilize resources to claim a disproportionate share of available spectrum. If a national restaurant chain were to file applications in the name of its franchise holders, typically local groups with no media ownership, then aggressively use non-commercial underwriting rules to acknowledge the national source of funds for programming, we could have a quite legal national radio service providing promotion and local directions to travelers for a specific fast food chain, hotel chain, or service station chain. If commercial operation is permitted, the service would be even more attractive to national franchise operations.

Station identification is critical in a service where new stations will be inserted into the existing fabric of listenership, at the very least disrupting distant listening.

Minimum operating hours should be required to make efficient use of the spectrum. Operators must be required to inform the FCC if they cease operations, even temporarily for periods exceeding the time period permitted for other services. The Telecommunications Act of 1996 requires the FCC to cancel licenses for stations that have been silent for 12 consecutive months, and the Commission cannot shirk that responsibility for LPFM. Unless the Commission retains minimum operating standards and notification requirements for silent periods, it cannot enforce its statutory obligations.

It is difficult to envision a non-discriminatory basis for providing different license term, ownership transfer, of construction term that would distinguish LPFM from other services which share either primary or secondary status.

[7] *See 47 C.F.R. §73.317* which requires transmitter sites to provide unobstructed city grade service to the community of license.

Electronic filing of applications is likely to produce significant errors in the location of stations. The FCC Antenna Structure Registration process identified numerous errors in existing broadcast facilities which were created under a far more rigorous set of filing rules. Using a simplified form without accompanying maps will restrict the Commission's ability to verify even the simplest technical information.

Determining site coordinates which can then be used to determine HAAT is not a matter to be undertaken lightly. In uneven or rough terrain minor errors in positional accuracy such as those produced by consumer grade GPS receivers could produce errors in site elevation and in HAAT of hundreds of feet. Sites which are significantly over the standard height are likely to be under-reported, leading to effective radiated powers which produce primary signals extending well beyond the permitted average. The resulting interference could well deprive listeners of existing signals.

Short filing windows would certainly reduce the potential backlog of mutually exclusive applications. However, some balancing mechanism should be found between dismissing applications with minor correctable technically deficiencies or, on the other hand, allowing grossly unacceptable applications from blocking an applicant with a later filed perfect application.

Interference Case Studies

Four individual markets were studied for the potential to add LP100 stations. In each case multiple LP100 stations were possible using the spacings in the NPRM. For each market, practical communications sites were chosen to provide to service to a substantial portion of the population within the market.

Once the LP1000 allocations were identified, each channel was studied for incoming and outgoing interference. Service and interference contours were calculated based on Height Above Average Terrain extracted from a 3 arcsecond database at one (1) degree horizontal increments. The figures identifying the interference follow the text of these comments.

Case 1: Evansville, Indiana
Evansville, Indiana, was studied using the proposed spacings for 1,000 watt Low Power FM stations. The following channels (frequencies) are available at Evansville, Indiana, when studied under the proposed spacing rules with third adjacent protection removed. Note that additional frequencies would be possible with the elimination of the second adjacent prohibition. After the channels were identified by spacings, the potential allocations were studied by overlap of prohibited contours. The number of co-channel, first adjacent channel and second adjacent channel facilities which would create interference to the proposed low power facilities are indicated.

Channel	Frequency	Co-channel Interference Cases	First Adjacent Channel Interference Cases	Second Adjacent Channel Interference Cases
238	95.5	0	1	0

245	96.9	0	0	1
254	98.7	1	0	0
261	100.1	0	1	0
264	100.7	0	1	0
266	101.1	1	0	0
273	102.5	0	0	0

Of the seven (7) channels identified by spacings, only one (1) is free from incoming interference. In four cases involving Class B or B1 stations, the LPFM both receives and causes interference.

Note that the terrain around Evansville, Indiana, is gently rolling. Terrain roughness is not a significant issue. There are few anomalies which would obstruct the signals. The co-channel and first adjacent channel interference would significantly reduce the area in which the LPFM can provide useful service. The LPFM stations will also create interference to existing FM service areas.

Case 2: Boone, North Carolina

Boone, North Carolina, was studied using the proposed spacings for 1,000 watt Low Power FM stations. An existing communications site was utilized for coordinates and elevation. The following channels (frequencies) are available at Boone, North Carolina, when studied under the proposed spacing rules with third adjacent protection removed. Note that additional frequencies would be possible with the elimination of the second adjacent prohibition. After the channels were identified by spacings, the potential allocations were studied by overlap of prohibited contours. The number of co-channel, first adjacent channel and second adjacent channel facilities which would create interference to the proposed low power facilities are indicated.

Channel	Frequency	Co-channel Interference Cases	First Adjacent Channel Interference Cases	Second Adjacent Channel Interference Cases
222	92.3	2	0	0
225	92.9	0	0	0
233	94.5	2	0	0
237	95.3	0	1	0
242	96.3	0	1	0
259	99.7	1	1	0
261	100.1	0	1	0
279	103.7	1	0	0
282	104.3	0	2	0
298	107.5	1	0	0

Of the ten (10) channels identified by spacings, only one (1) is free from incoming interference. Four of the channels experience interference from multiple existing facilities. Maps are included showing that the interference in most cases extends beyond the proposed transmitter site. The proposed low power FM stations would be subject to interference over substantially all of their intended service areas.

The terrain around Boone, North Carolina, is significantly different from that at Evansville, Indiana, studied as Case 1. Terrain roughness at Boone would produce areas where the LPFM signal is obstructed within the area of the predicted 60 dBu contour and areas where the predicted interference signal would be obstructed. Where there are multiple facilities predicted to cause interference, the signals arrive from different directions. It is unlikely that two interference sources would both be blocked by terrain.

Case 3: Jefferson, North Carolina
Jefferson, North Carolina, was studied using the proposed spacings for 1,000 watt Low Power FM stations. An existing communications site was utilized for coordinates and elevation. The following channels (frequencies) are available at Jefferson, North Carolina, when studied under the proposed spacing rules with third adjacent protection removed. Note that additional frequencies would be possible with the elimination of the second adjacent prohibition. After the channels were identified by spacings, the potential allocations were studied by overlap of prohibited contours. The number of co-channel, first adjacent channel and second adjacent channel facilities which would create interference to the proposed low power facilities are indicated.

Channel	Frequency	Co-channel Interference Cases	First Adjacent Channel Interference Cases	Second Adjacent Channel Interference Cases
223	92.5	1	0	0
225	92.9	0	1	0
227	93.3	1	0	0
234	94.7	0	1	0
238	95.5	1	0	0
242	96.3	0	0	0
256	99.1	1	0	0
259	99.7	0	0	0
262	100.3	1	0	0
274	102.7	0	1	0
276	103.1	0	0	0
286	105.1	0	1	0
299	107.7	1	1	0

Of the 13 channels available at Jefferson, North Carolina, by spacings, three (3) appear to have no incoming interference. Note that some of the frequencies listed for Jefferson, North Carolina, have second adjacent relationships with other frequencies which are also listed. A maximum of 11 stations could be allocated simultaneously at the study site.

Case 4: Asheville, North Carolina
Asheville, North Carolina, was studied using the proposed spacings for 1,000 watt Low Power FM stations. An existing communications site was utilized for coordinates and elevation. The following channels (frequencies) are available at Asheville, North Carolina, when studied under the proposed spacing rules with third adjacent protection removed. Note that additional frequencies would be possible with the elimination of the second adjacent prohibition. After the

channels were identified by spacings, the potential allocations were studied by overlap of prohibited contours. The number of co-channel, first adjacent channel and second adjacent channel facilities which would create interference to the proposed low power facilities are indicated.

Channel	Frequency	Co-channel Interference Cases	First Adjacent Channel Interference Cases	Second Adjacent Channel Interference Cases
239	95.7	1	0	0
249	97.7	0	1	0
264	100.7	1	1	0
277	103.3	1	1	0
290	105.9	1	0	0

Of the five (5) channels available at Asheville, North Carolina, by spacings, all have incoming interference from co-channel or first adjacent channel stations. Two (2) of the channels have both co-channel and first adjacent channel interference.

For the reasons stated above, FM106 and Blue Dolphin oppose the creation of a low power FM service.

Respectfully submitted

Timothy L. Warner, P.E, Engineering Counsel

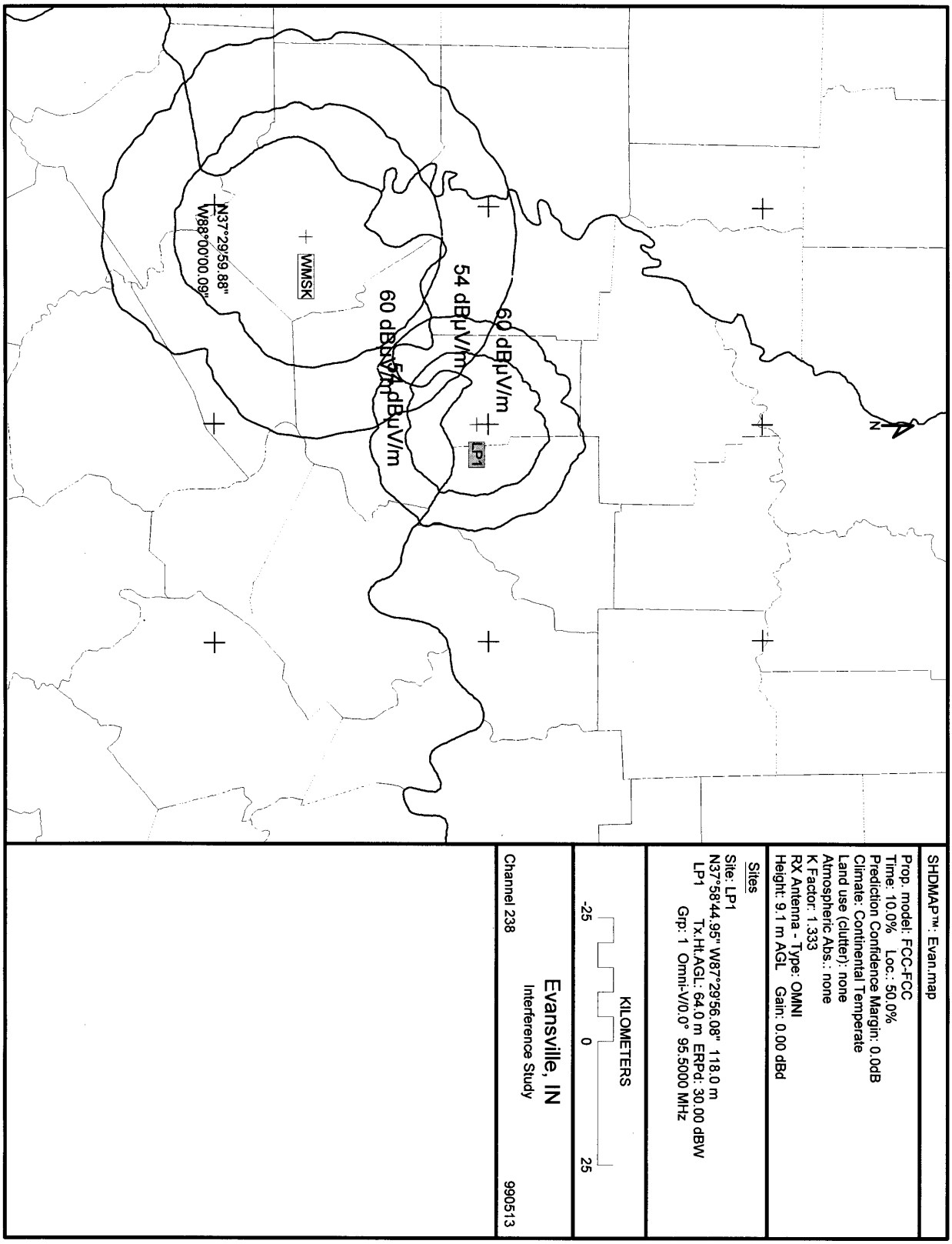

Figure 1: Evansville Channel 238

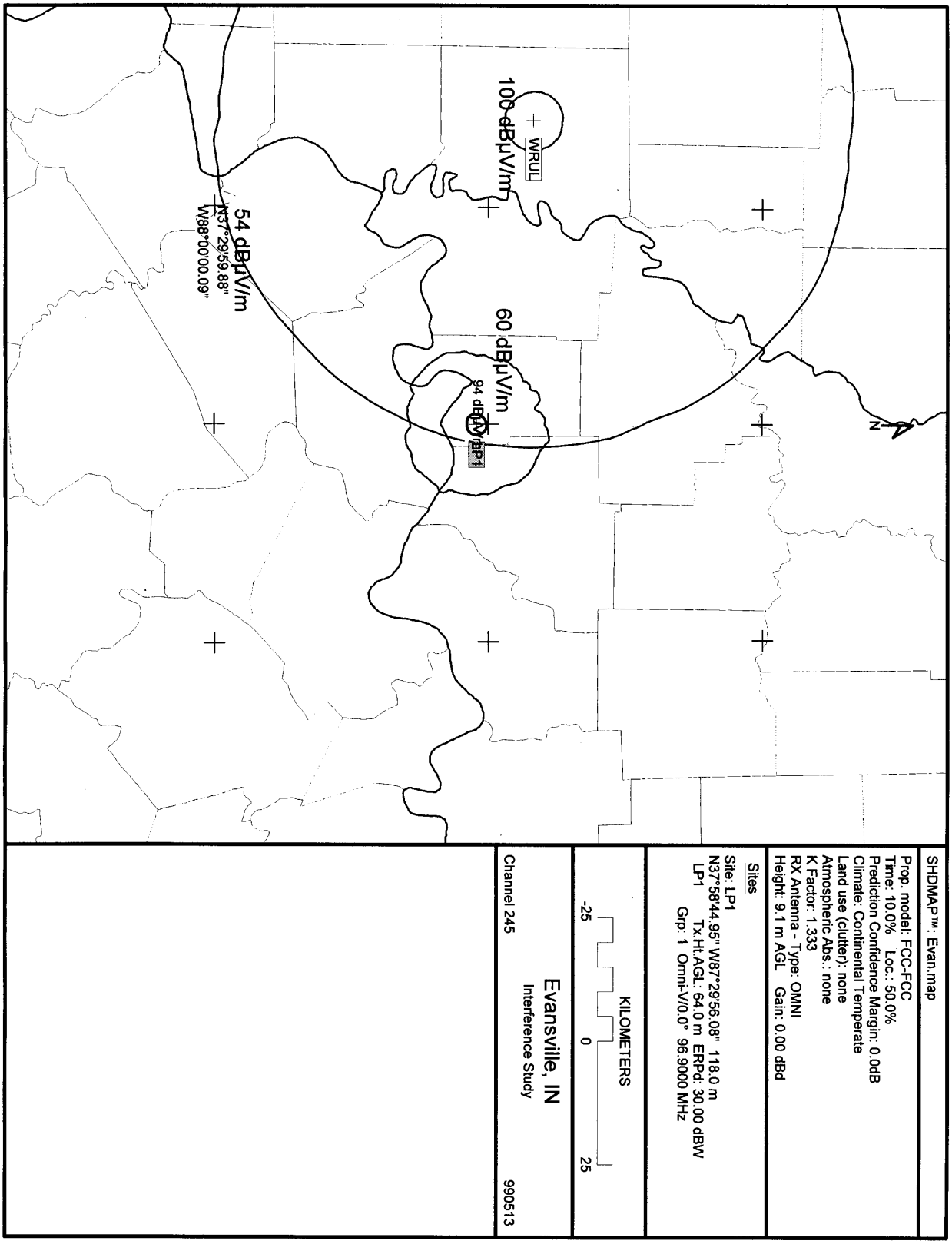

Figure 2: Evansville Channel 245

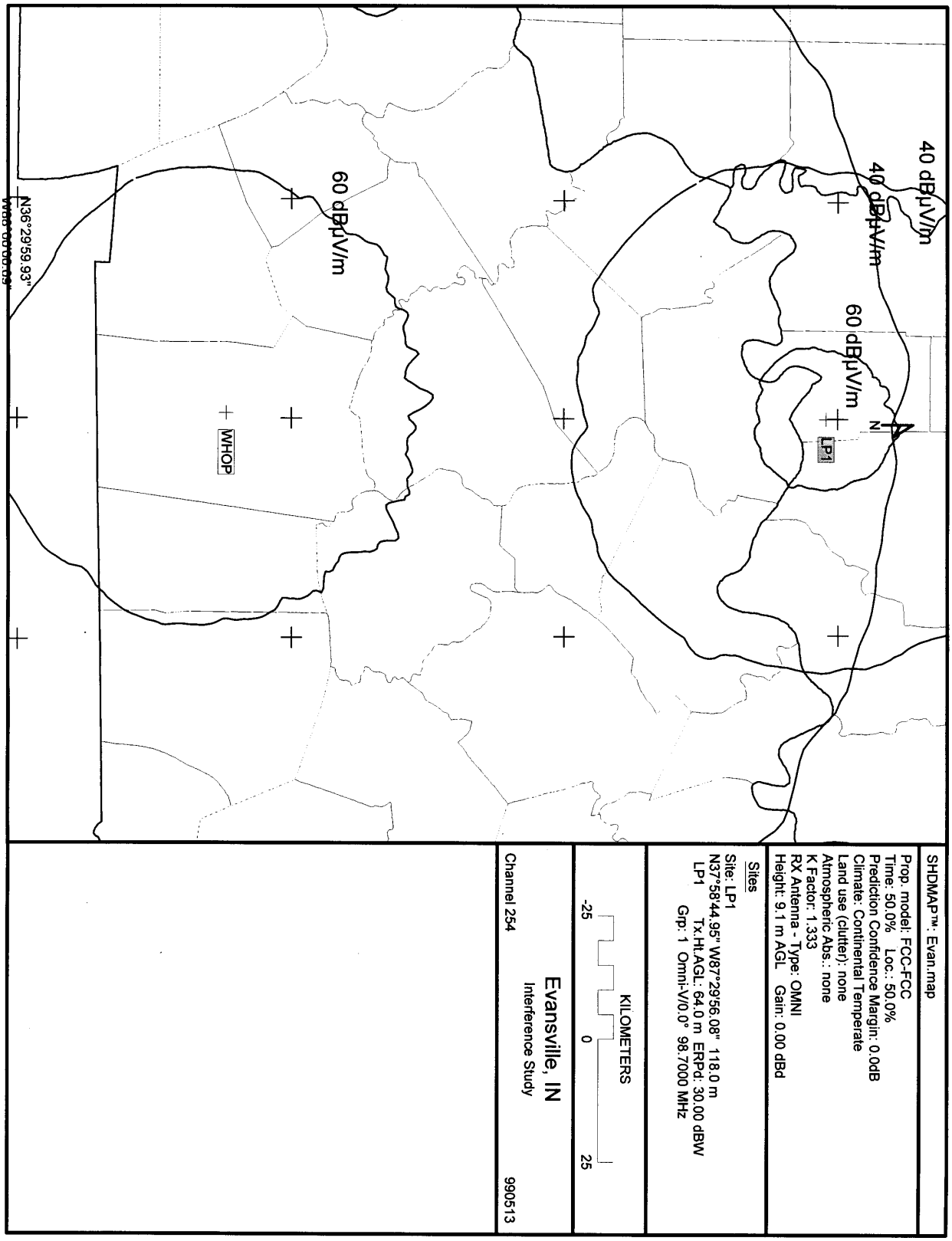

Figure 3: Evansville Channel 254

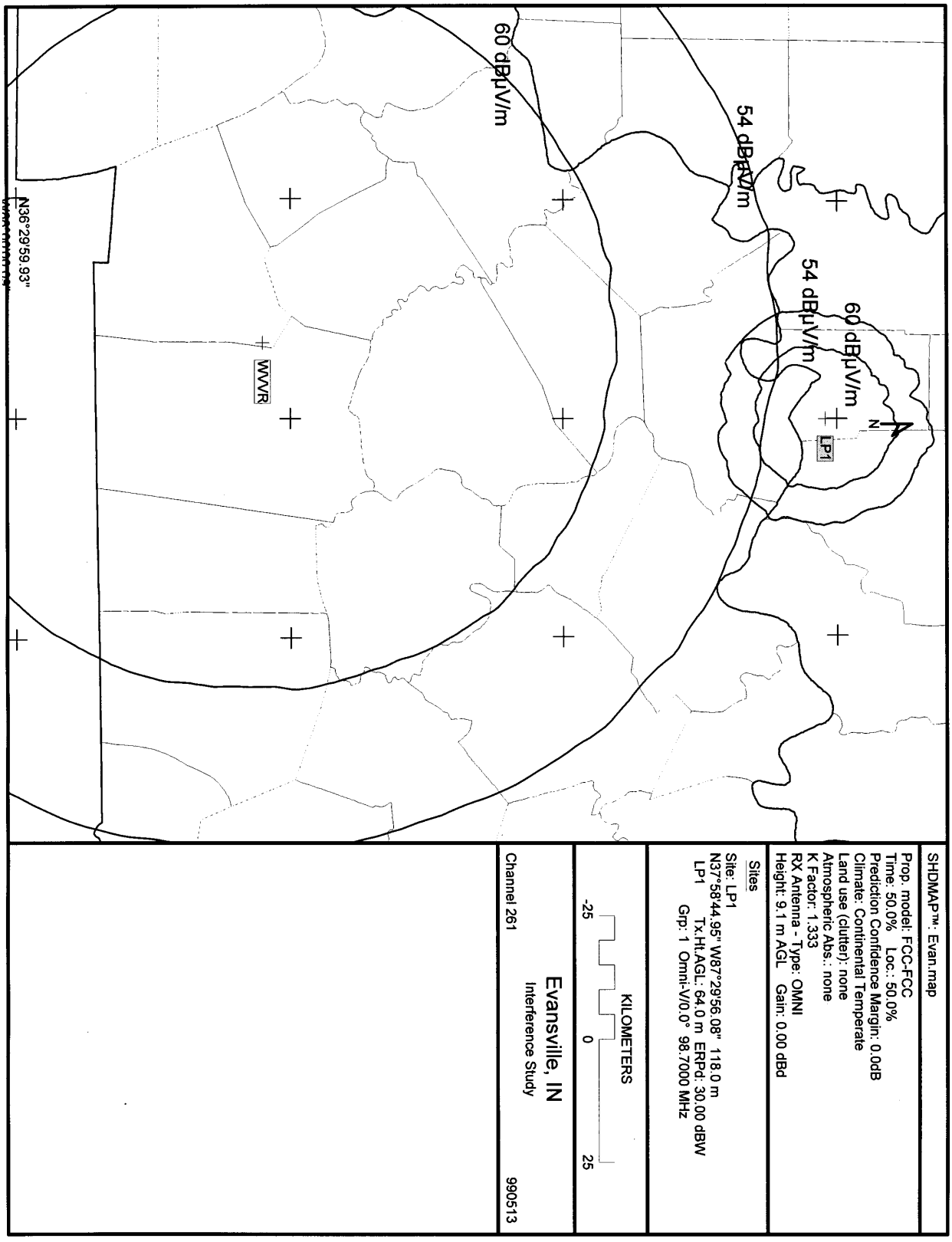

Figure 4: Evansville Channel 261

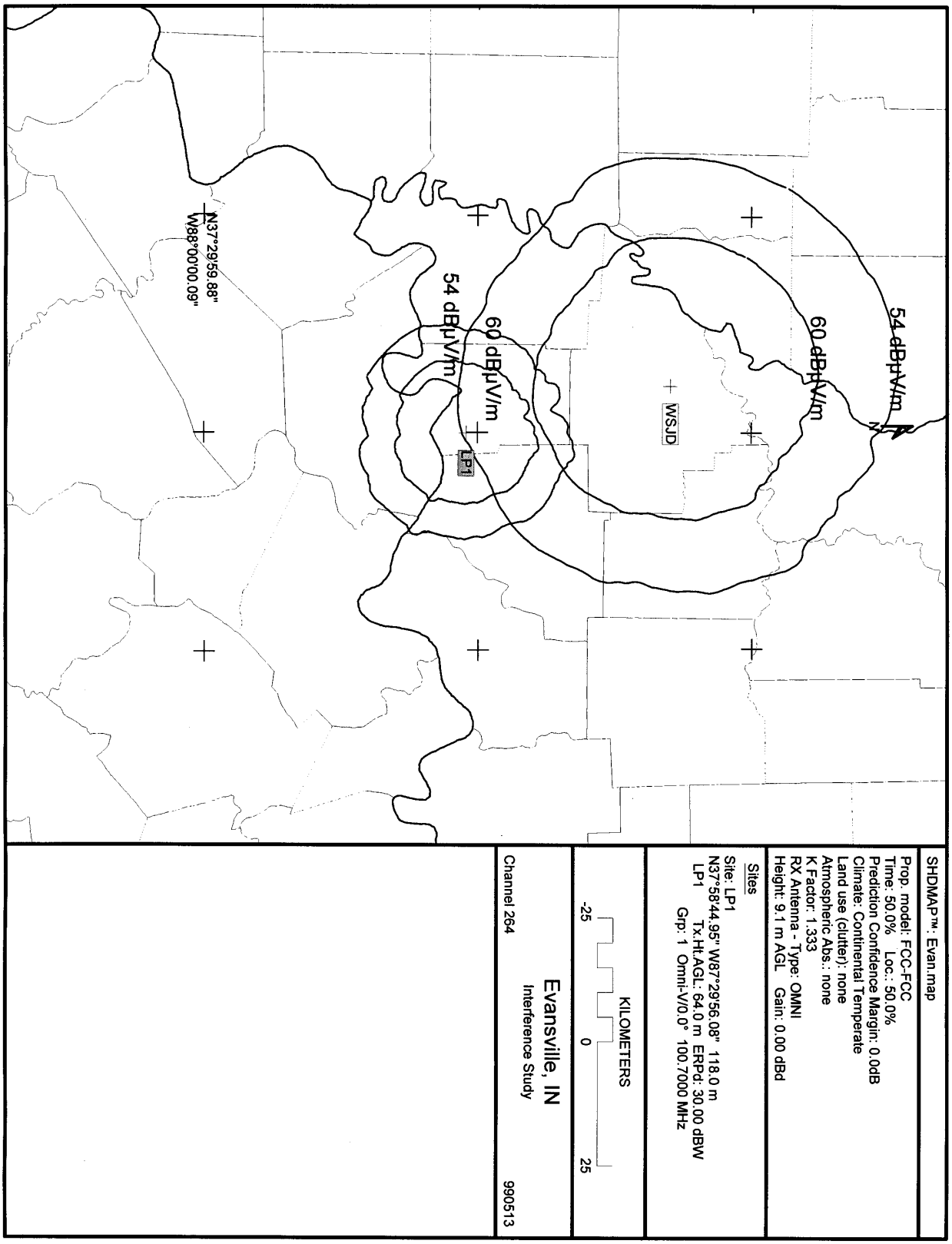

Figure 5: Evansville Channel 264

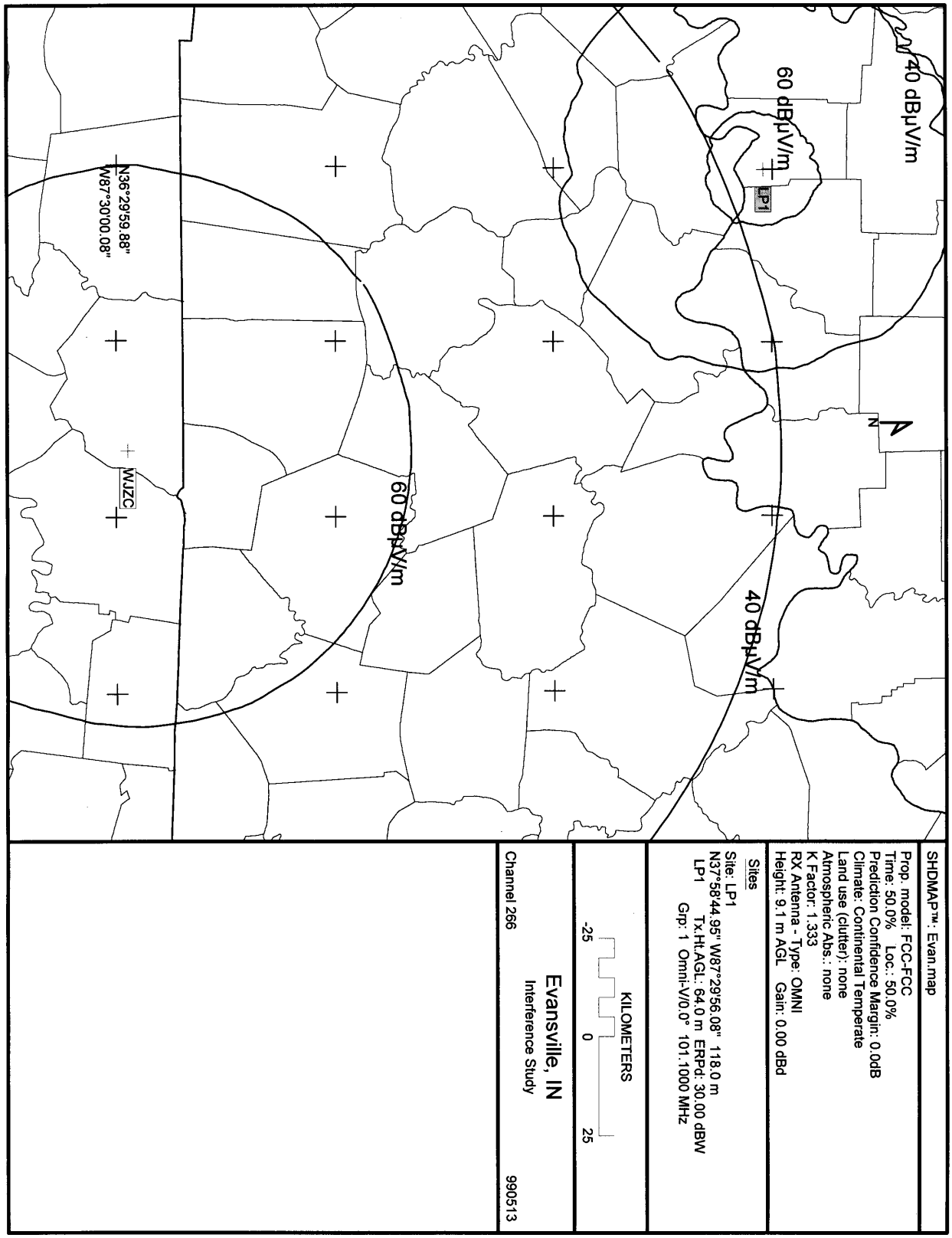

Figure 6: Evansville Channel 266

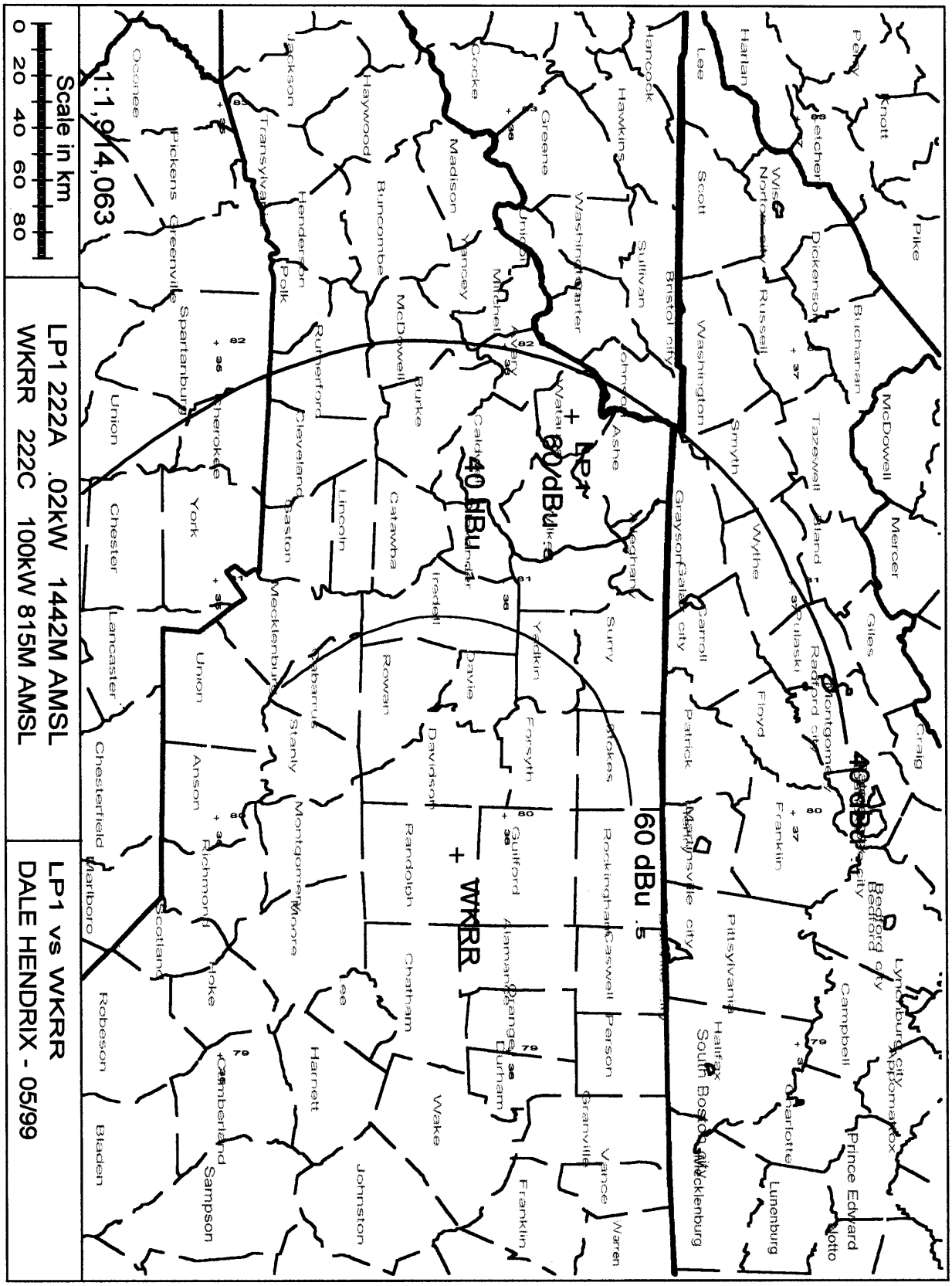

Figure 7: Boone Channel 222, 1 of 2

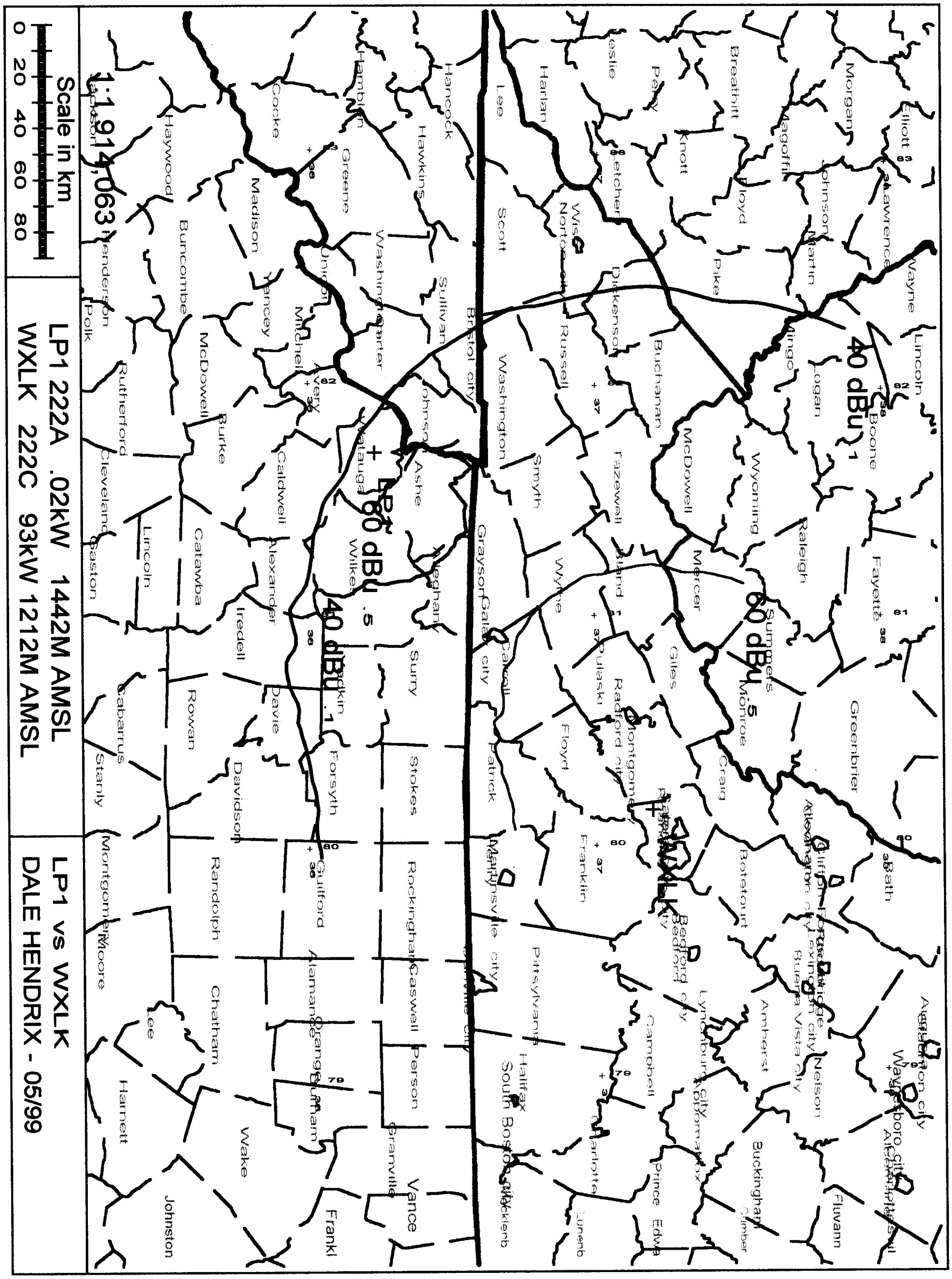

Figure 8: Boone Channel 222, 2 of 2

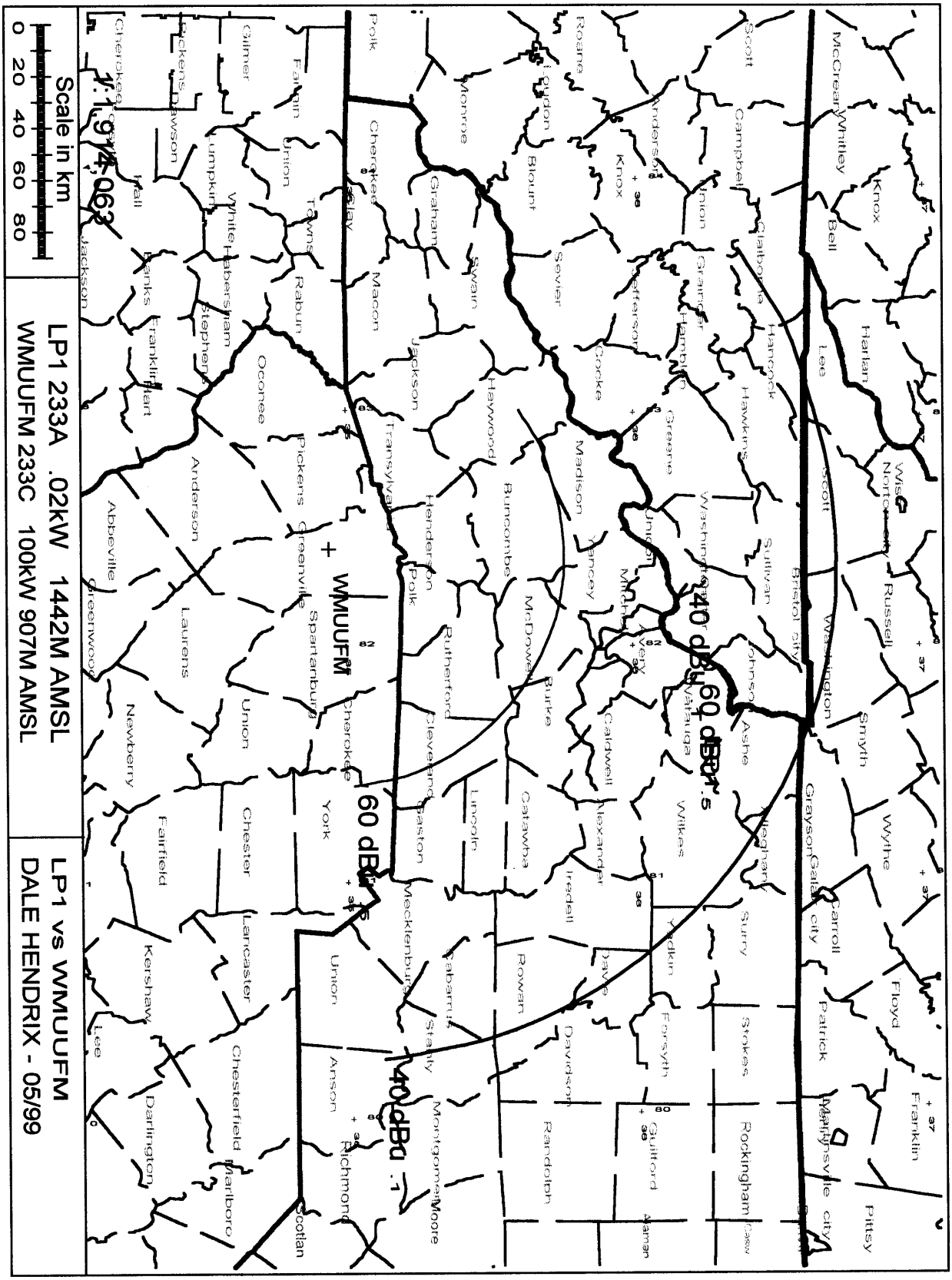

Figure 9: Boone Channel 233, 1 of 2

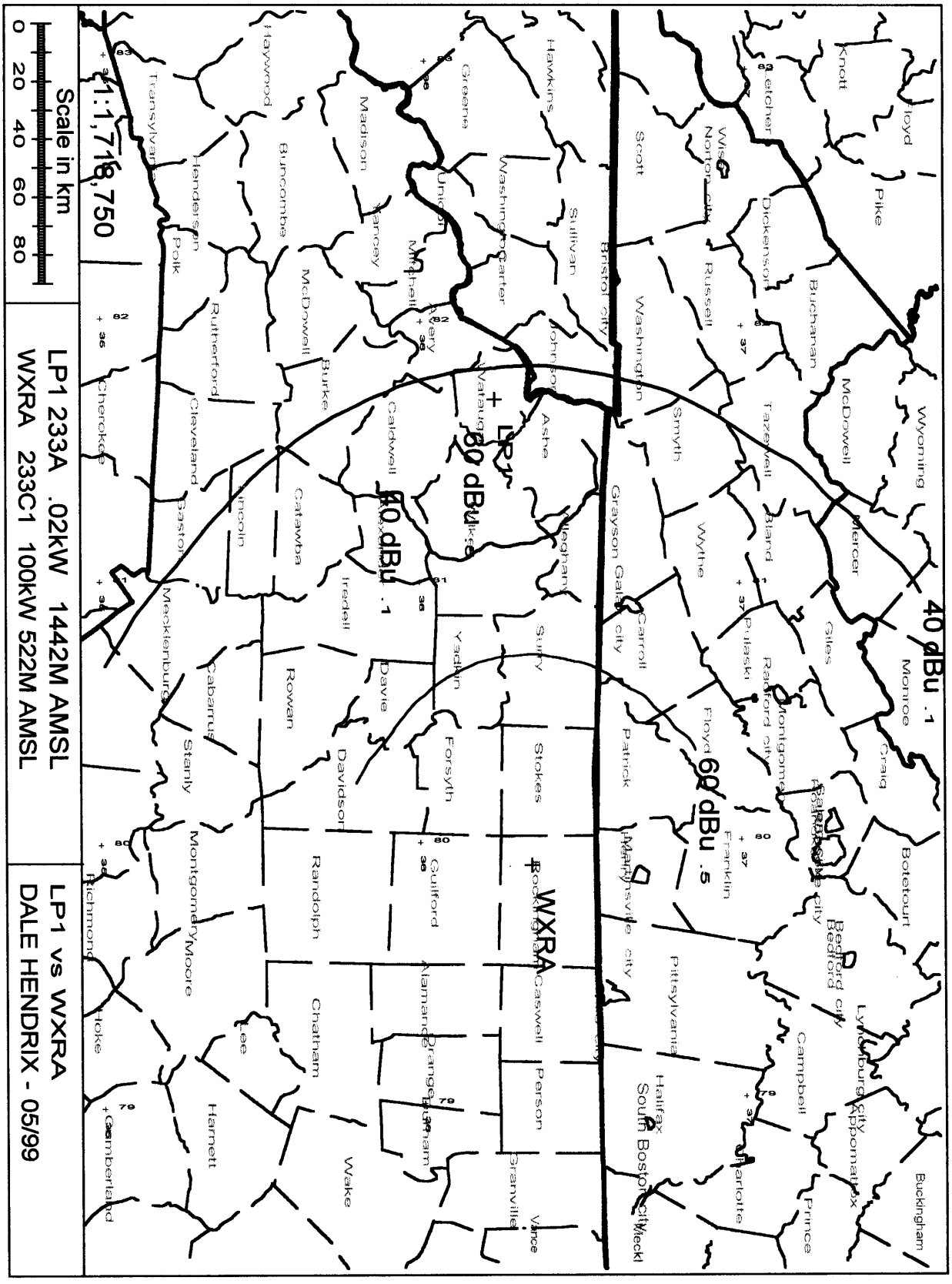

Figure 10: Boone Channel 233, 2 of 2

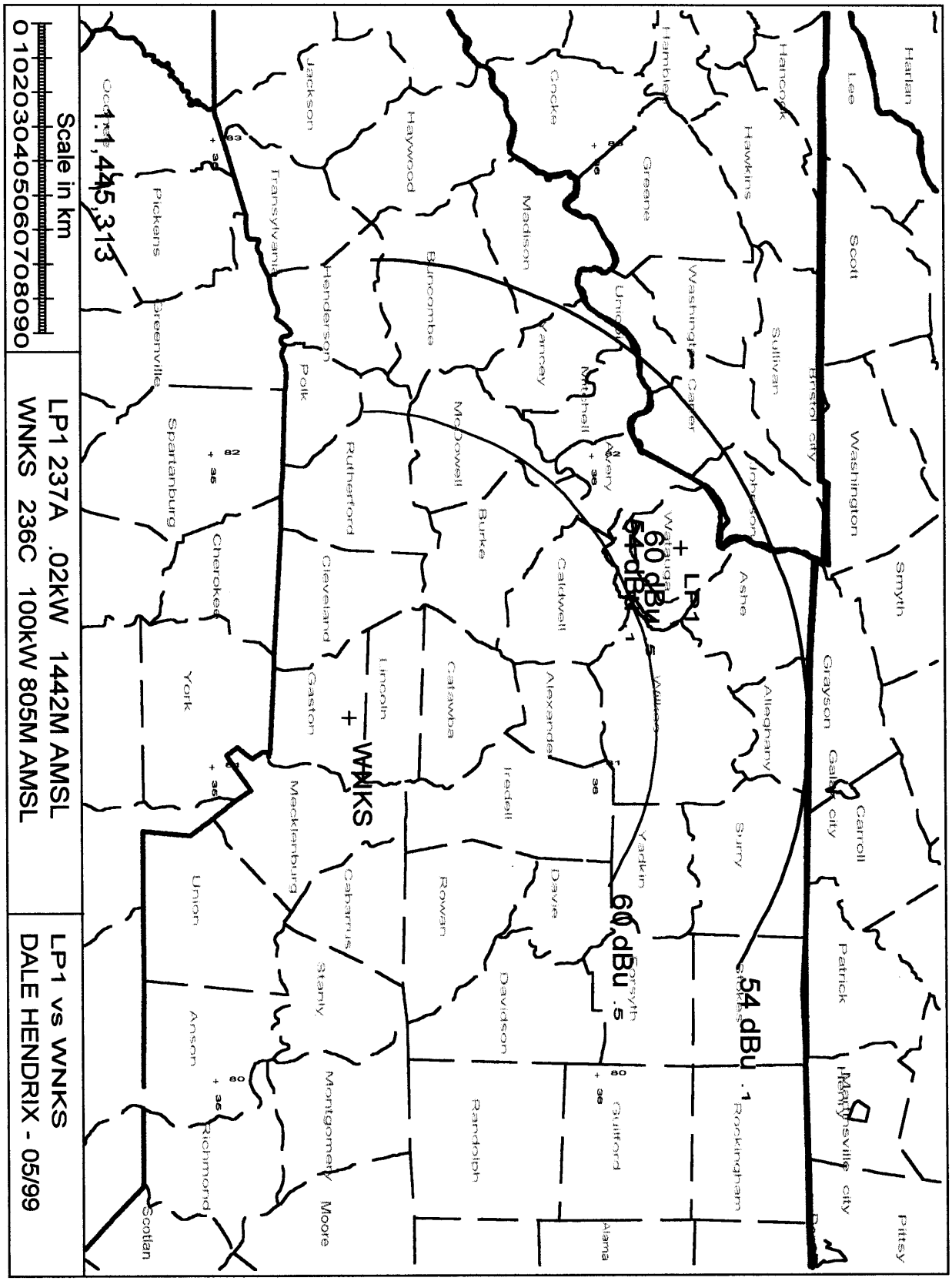

Figure 11: Boone Channel 237

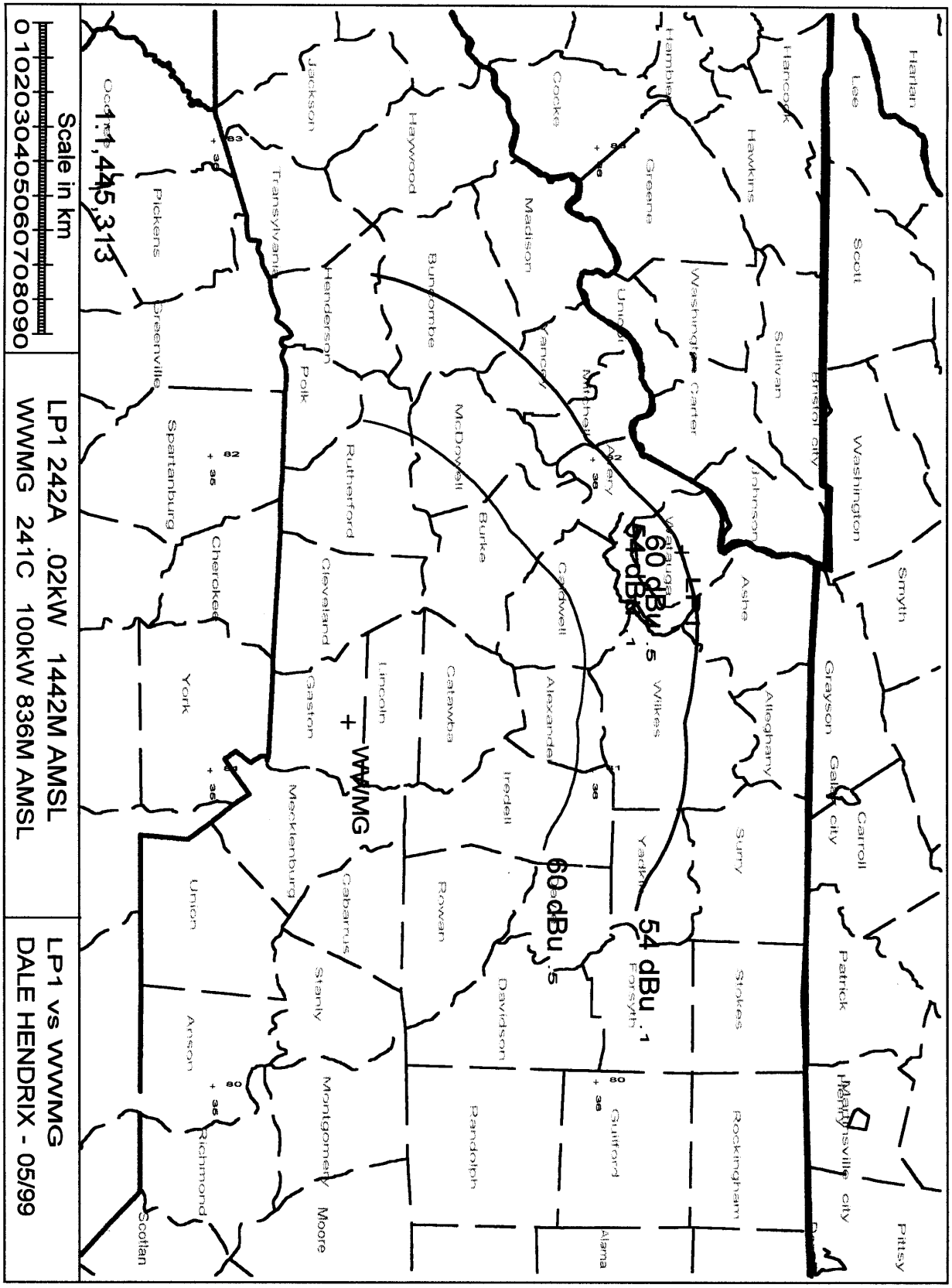

Figure 12: Boone Channel 242

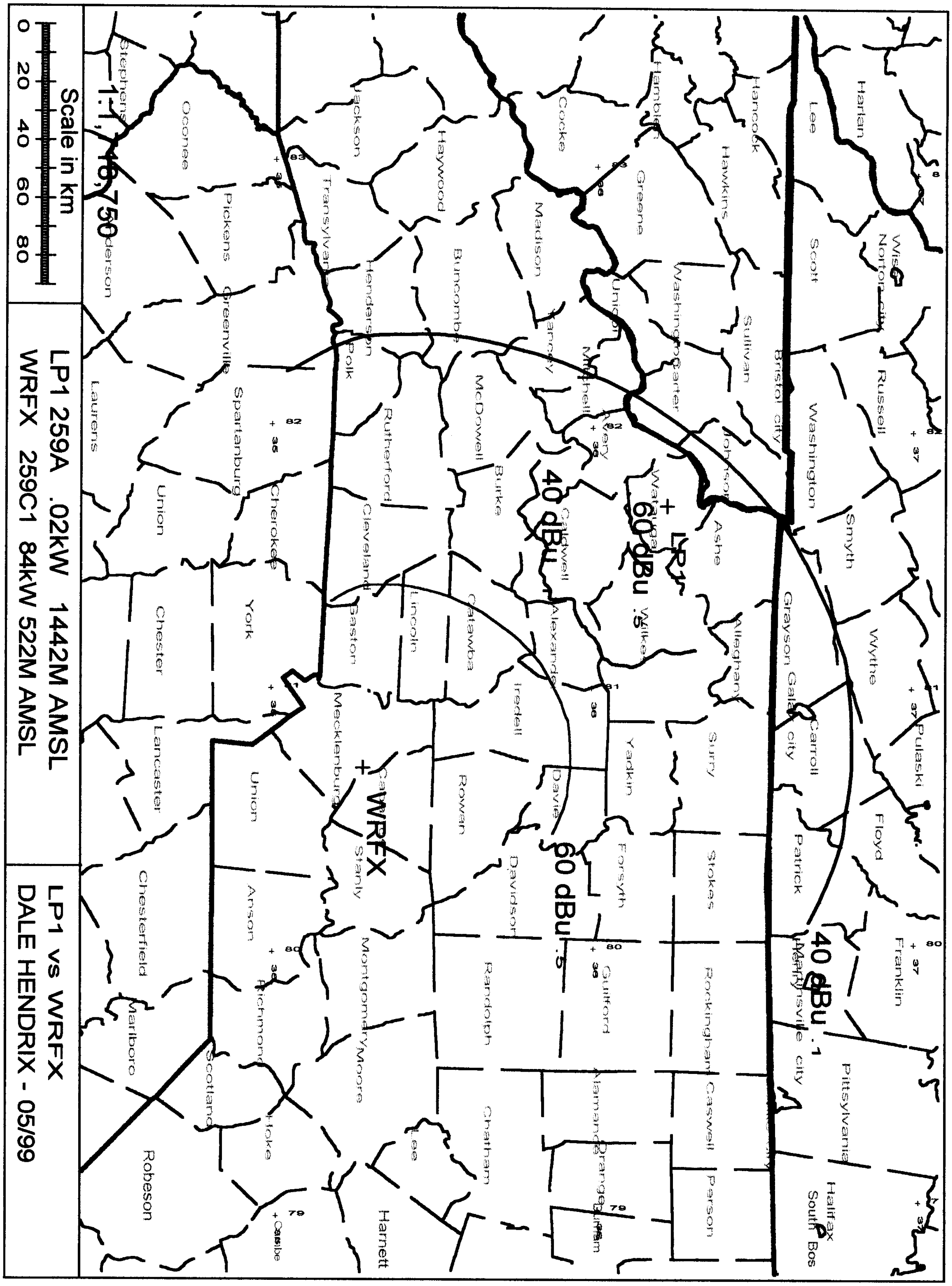

Figure 13: Boone Channel 259, 1 of 2

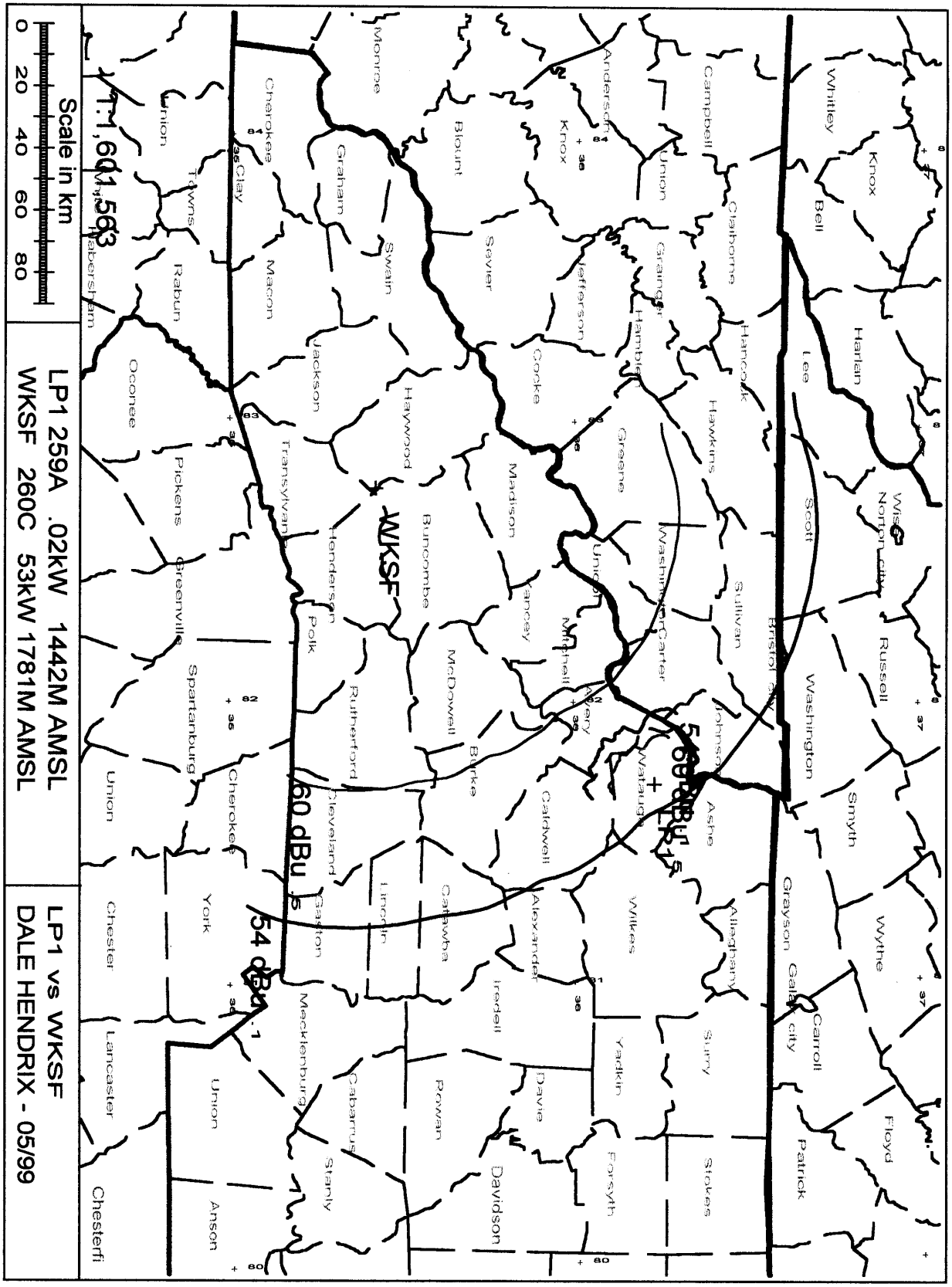

Figure 14: Boone Channel 259, 2 of 2

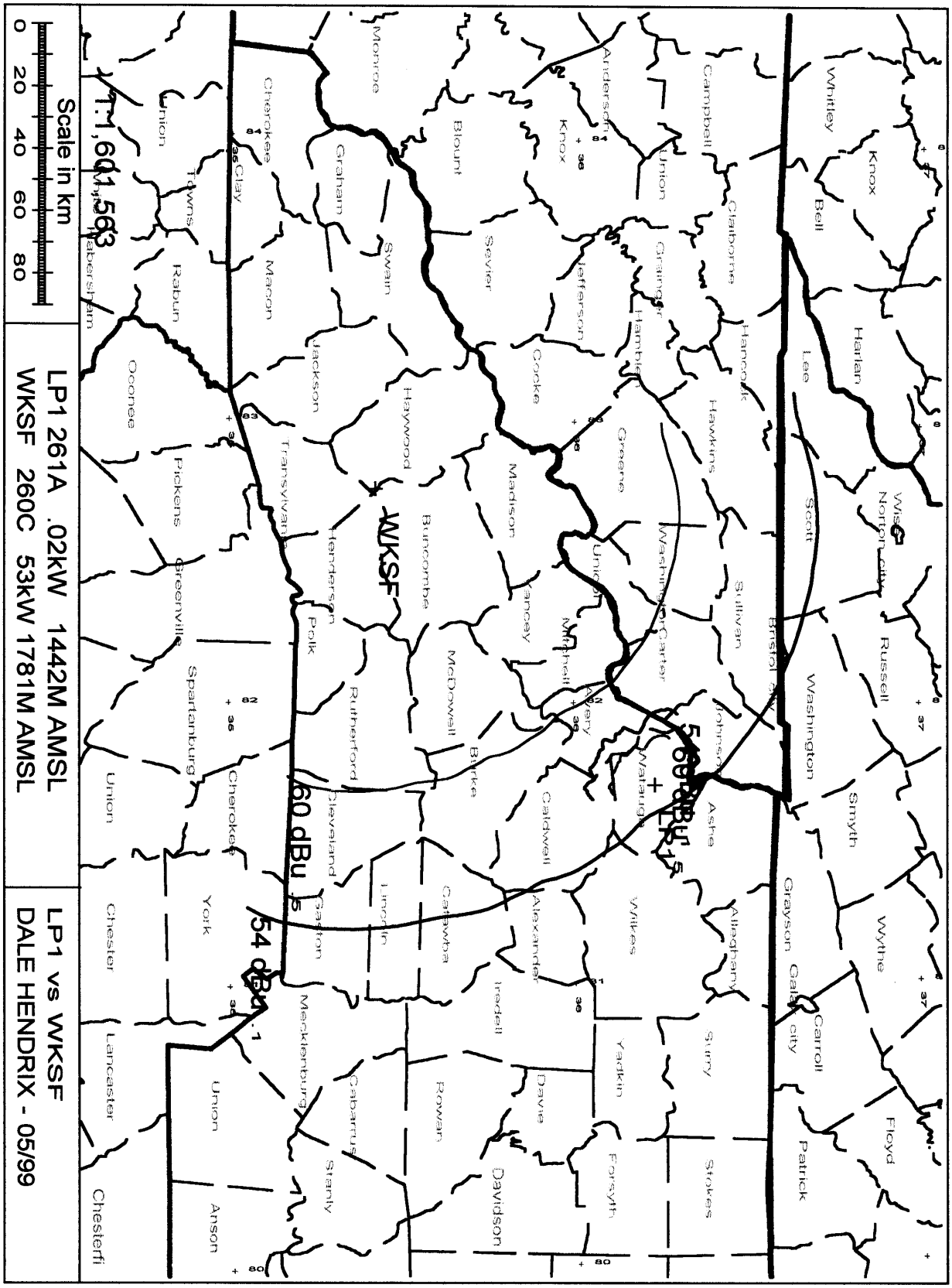

Figure 15: Boone Channel 261

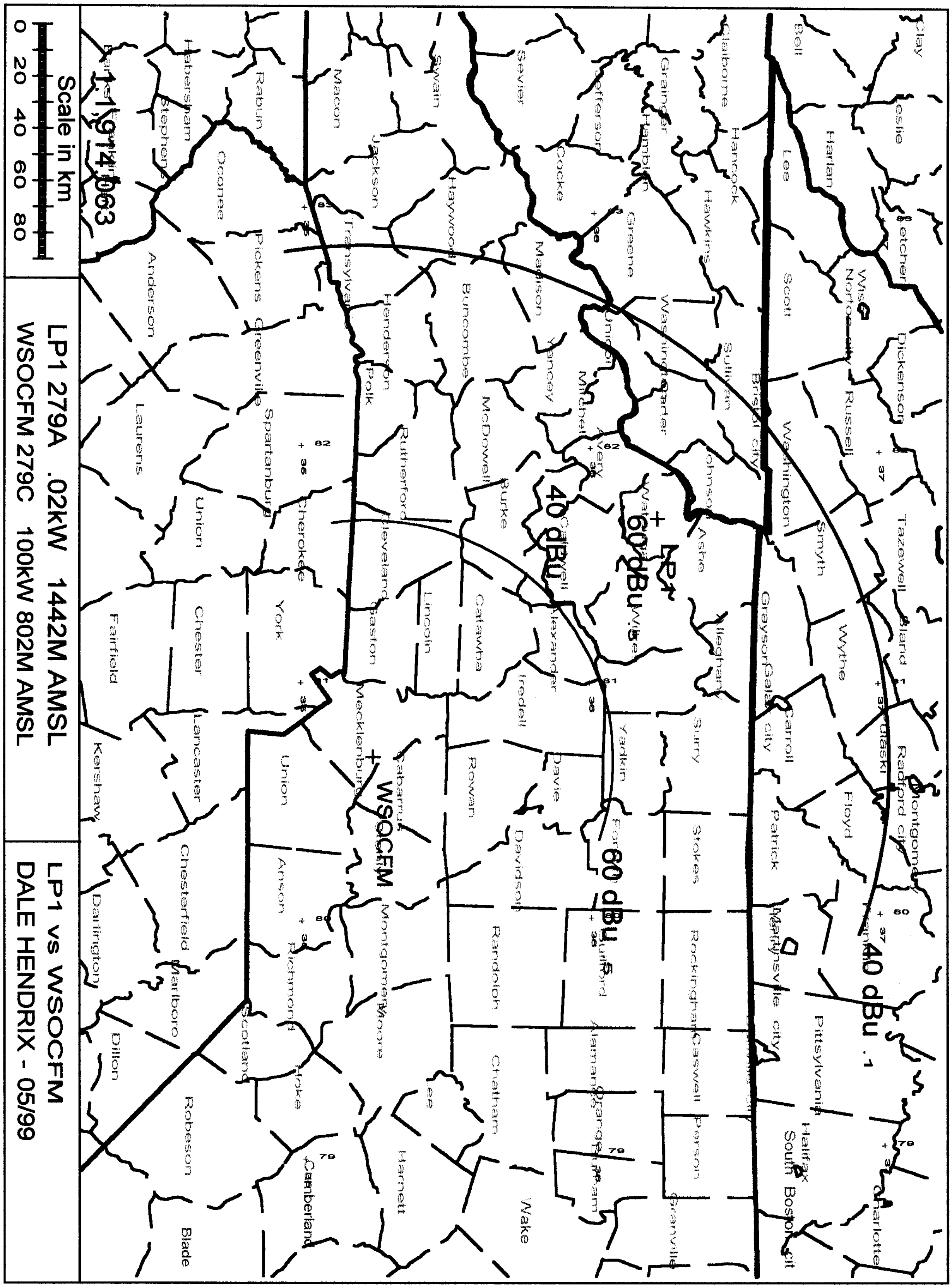

Figure 16: Boone Channel 279

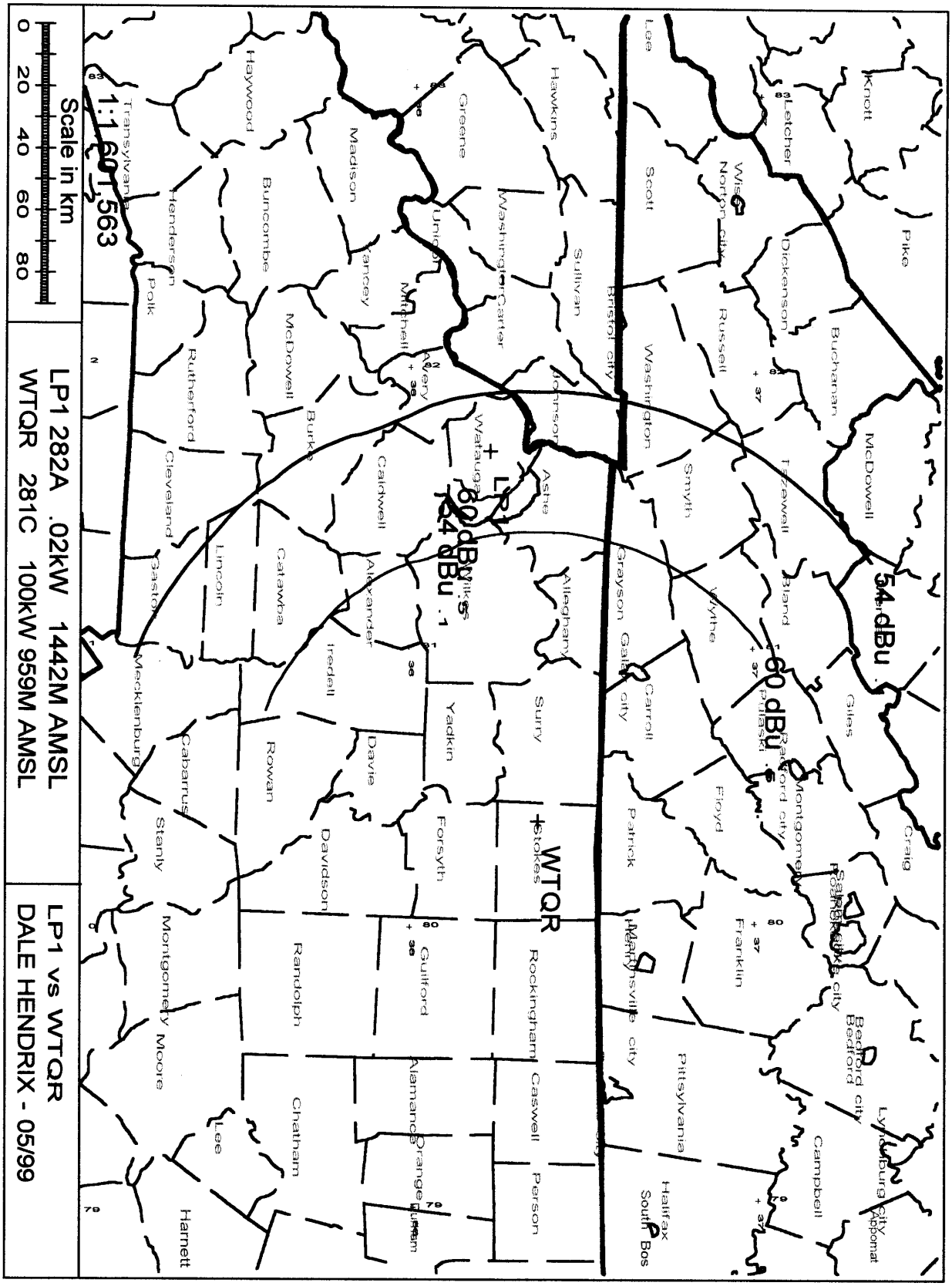

Figure 17: Boone Channel 282, 1 of 2

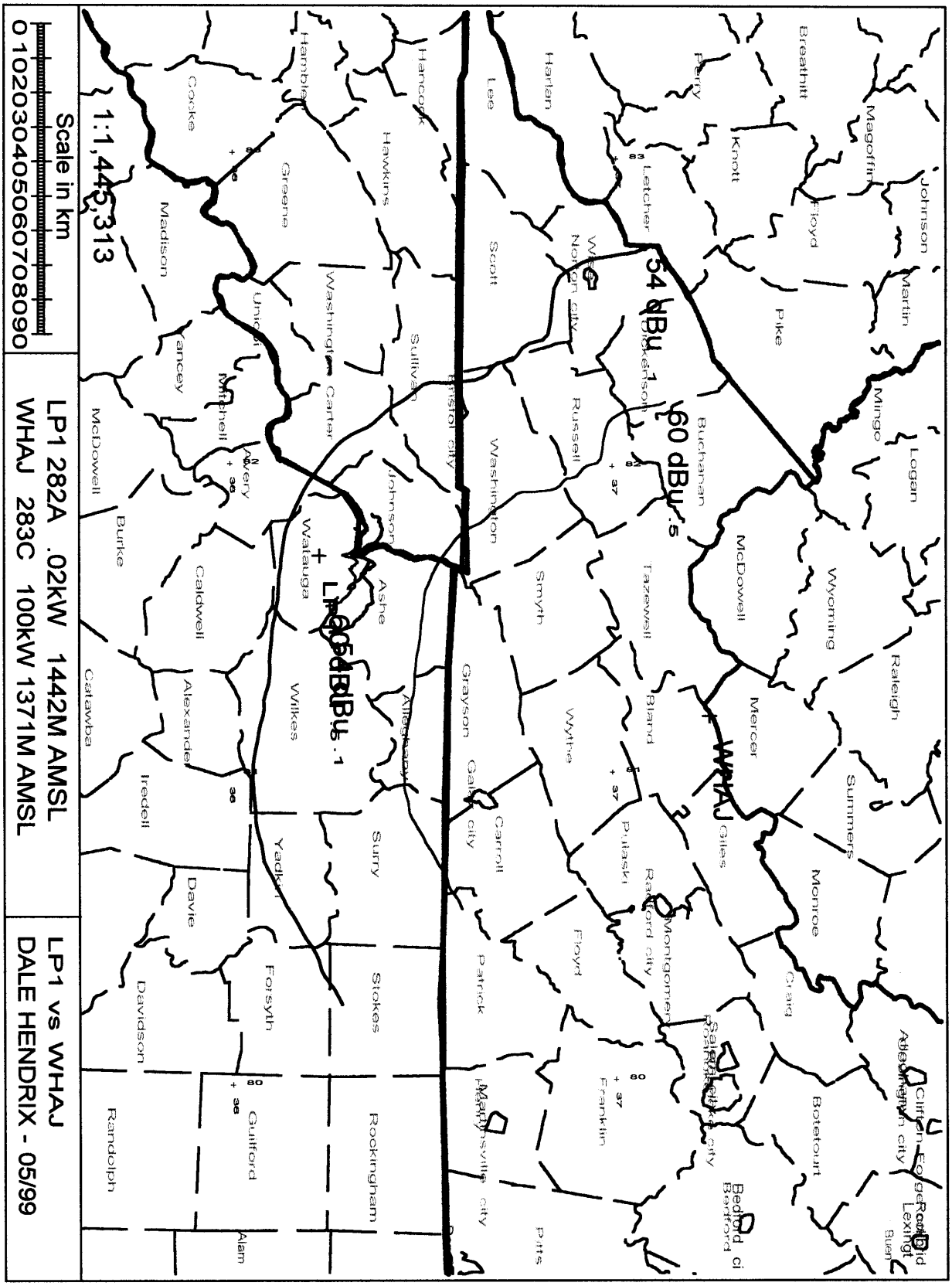

Figure 18: Boone Channel 282, 2 of 2

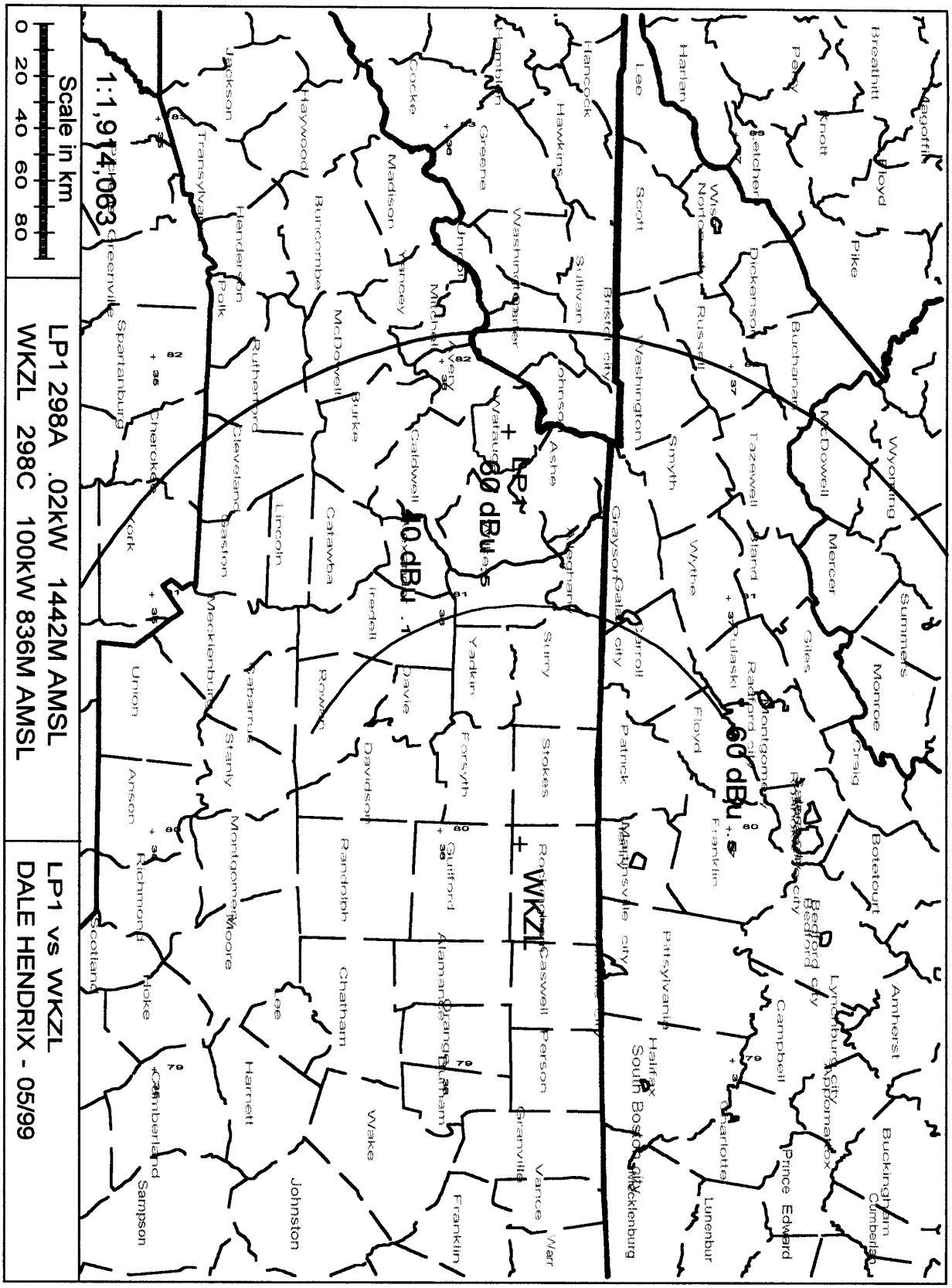

Figure 19: Boone Channel 298

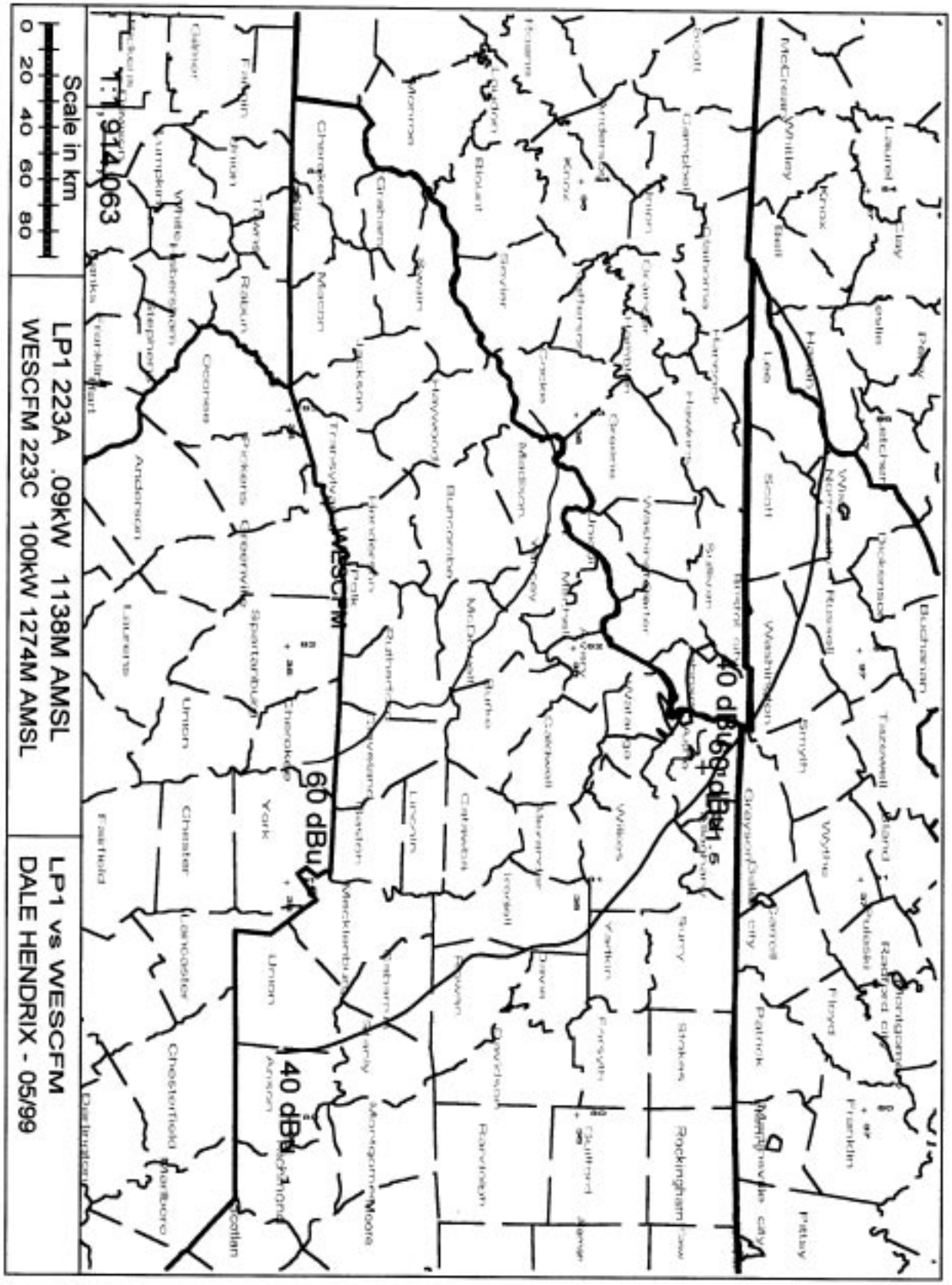

Figure 20: Jefferson Channel 223

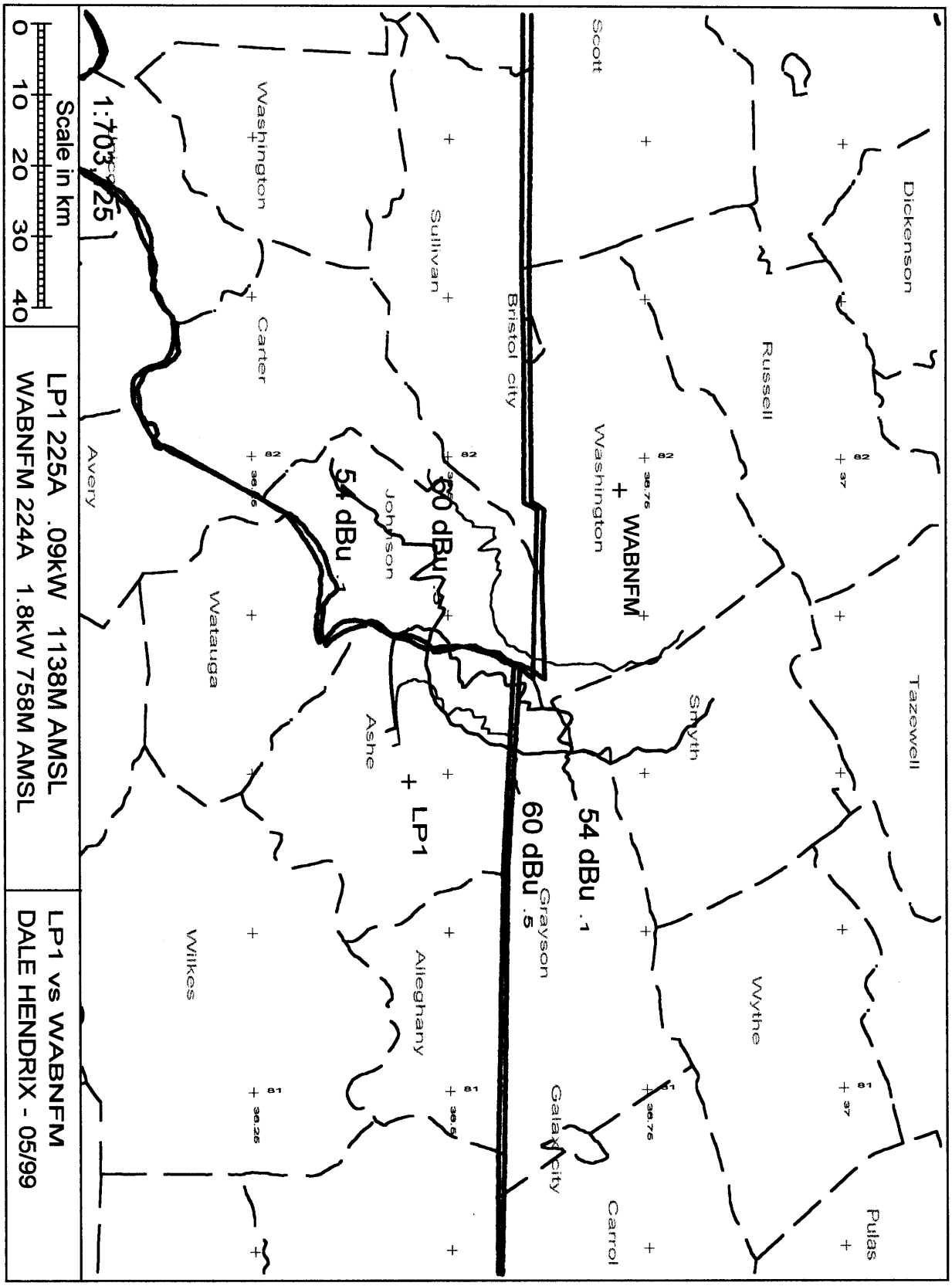

Figure 21: Jefferson Channel 225

Figure 22: Jefferson Channel 227

Figure 23: Jefferson Channel 234

Figure 24: Jefferson Channel 238

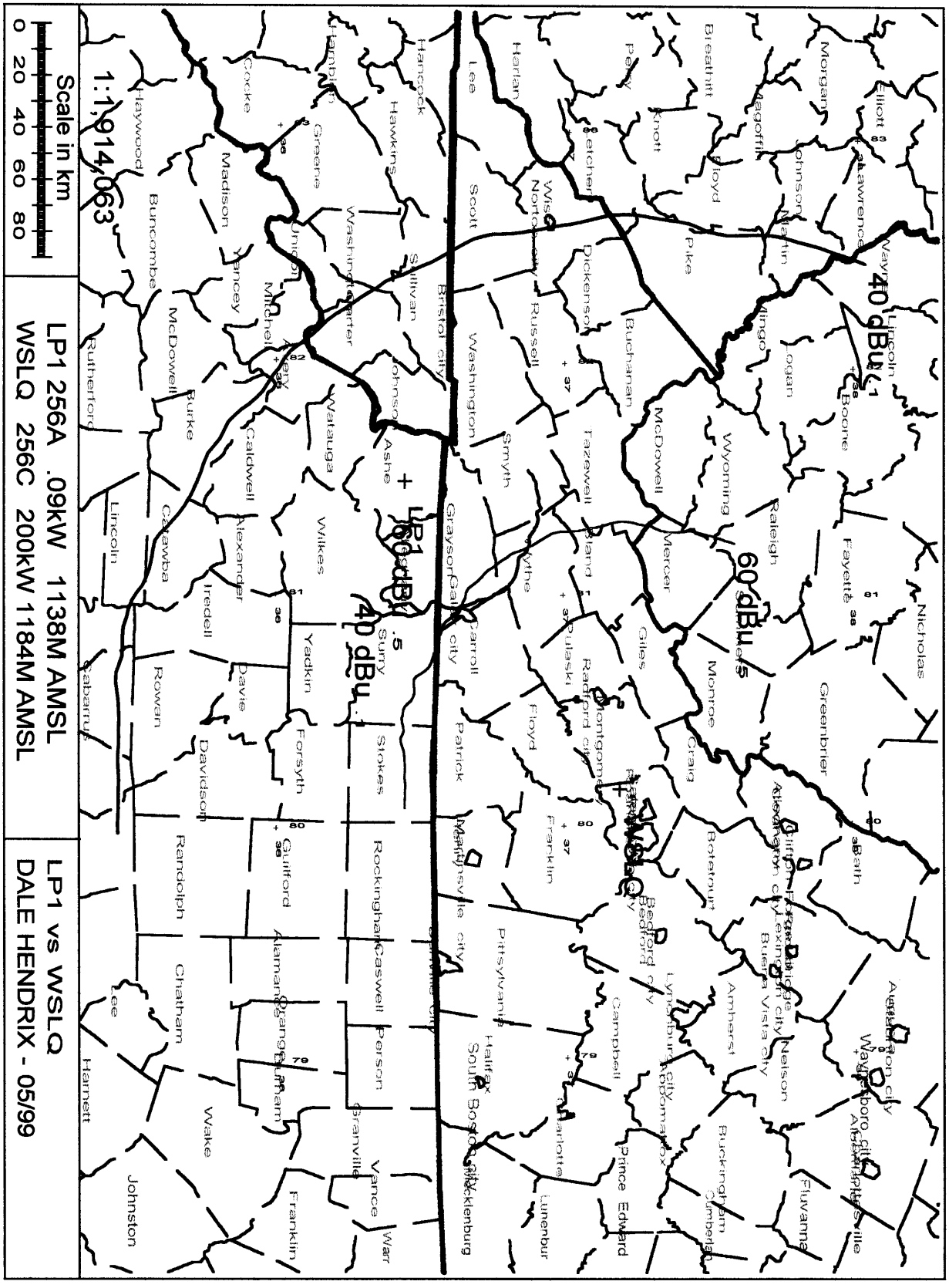

Figure 25: Jefferson Channel 256

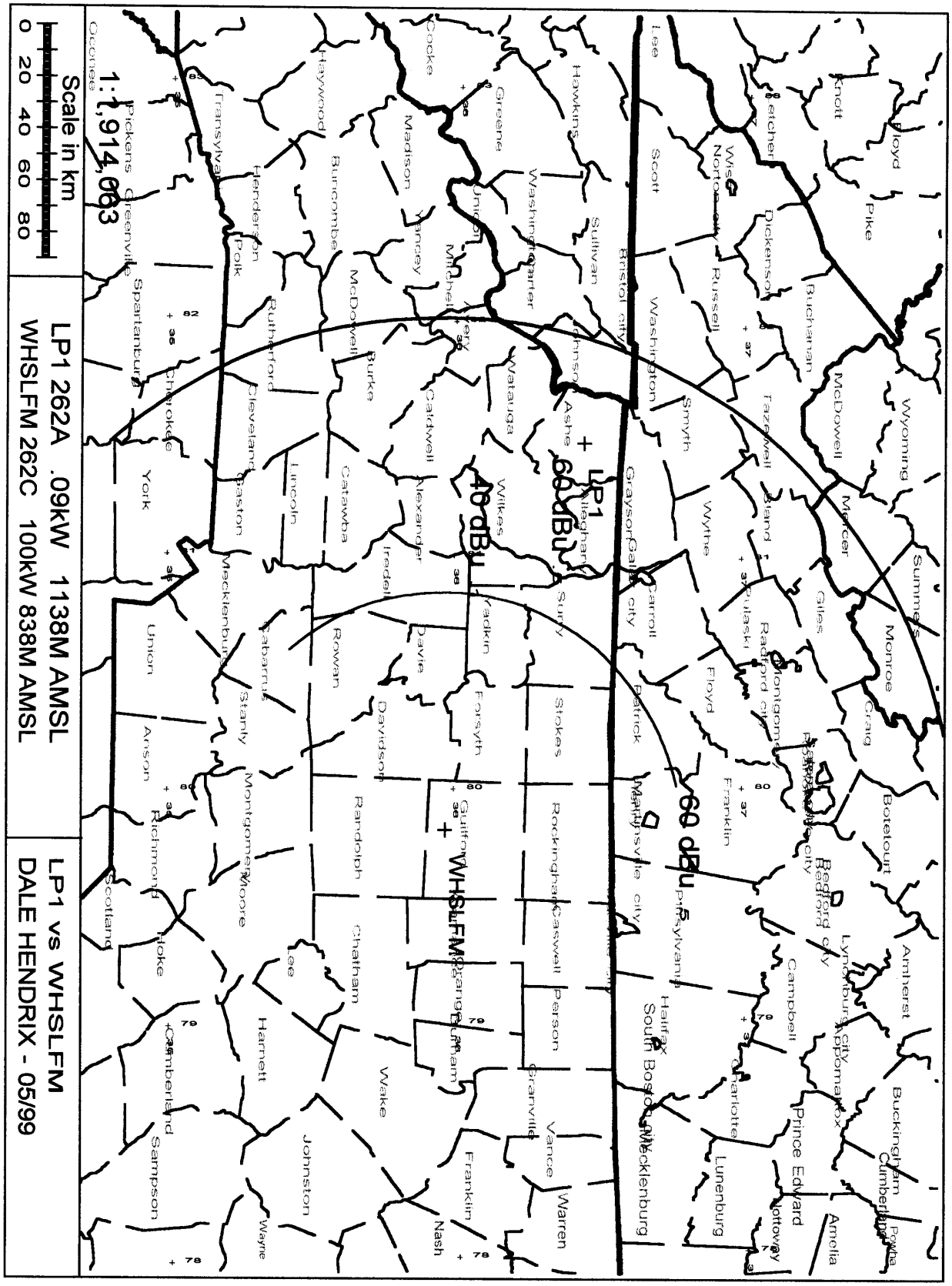

Figure 26: Jefferson Channel 262

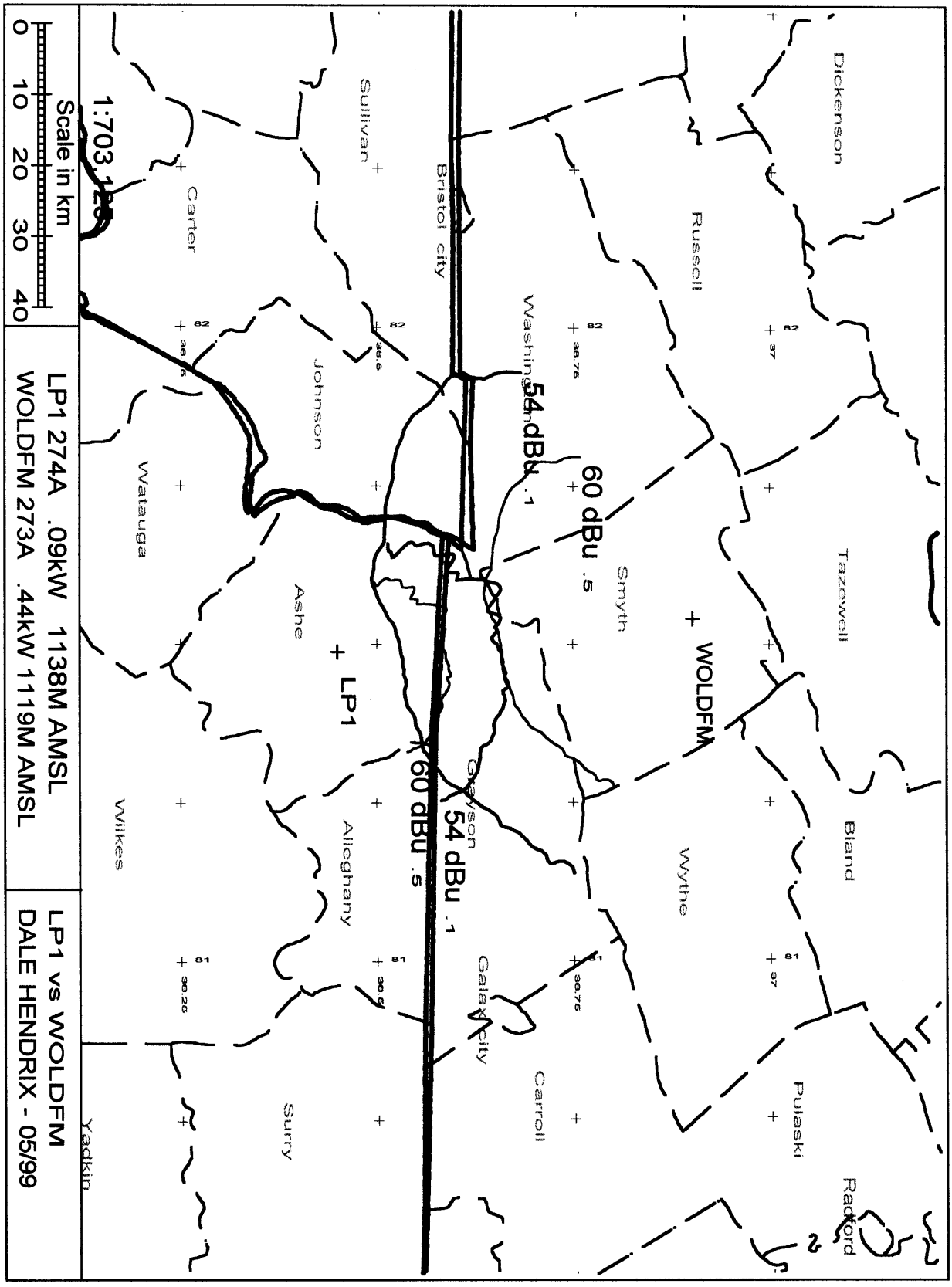

Figure 27: Jefferson Channel 274

Figure 28: Jefferson Channel 286

Figure 29: Jefferson Channel 299, 1 of 2

Figure 30: Jefferson Channel 299, 2 of 2

Figure 31: Asheville Channel 239

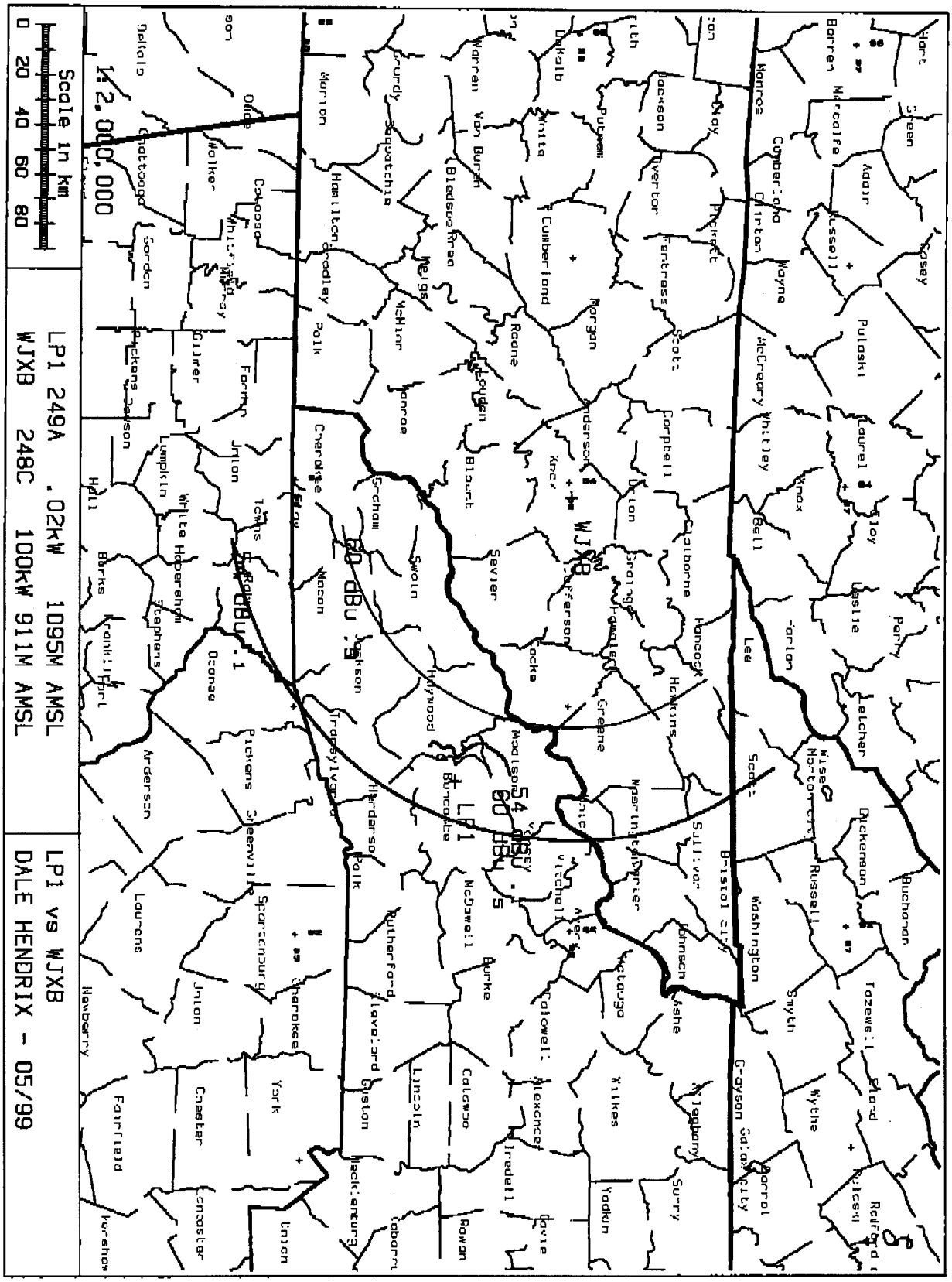

Figure 32: Asheville Channel 249

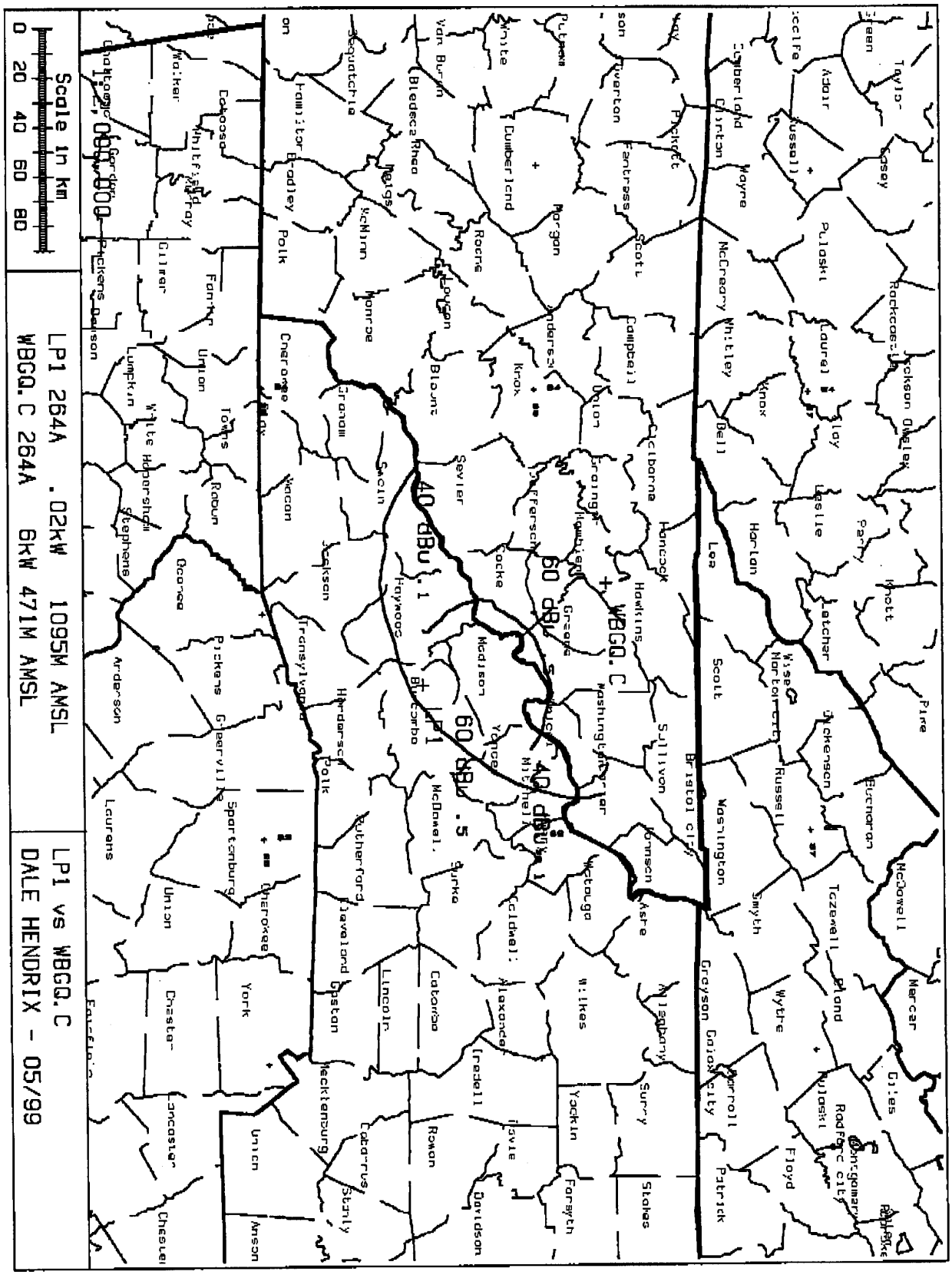

Figure 33: Asheville Channel 264, 1 of 2

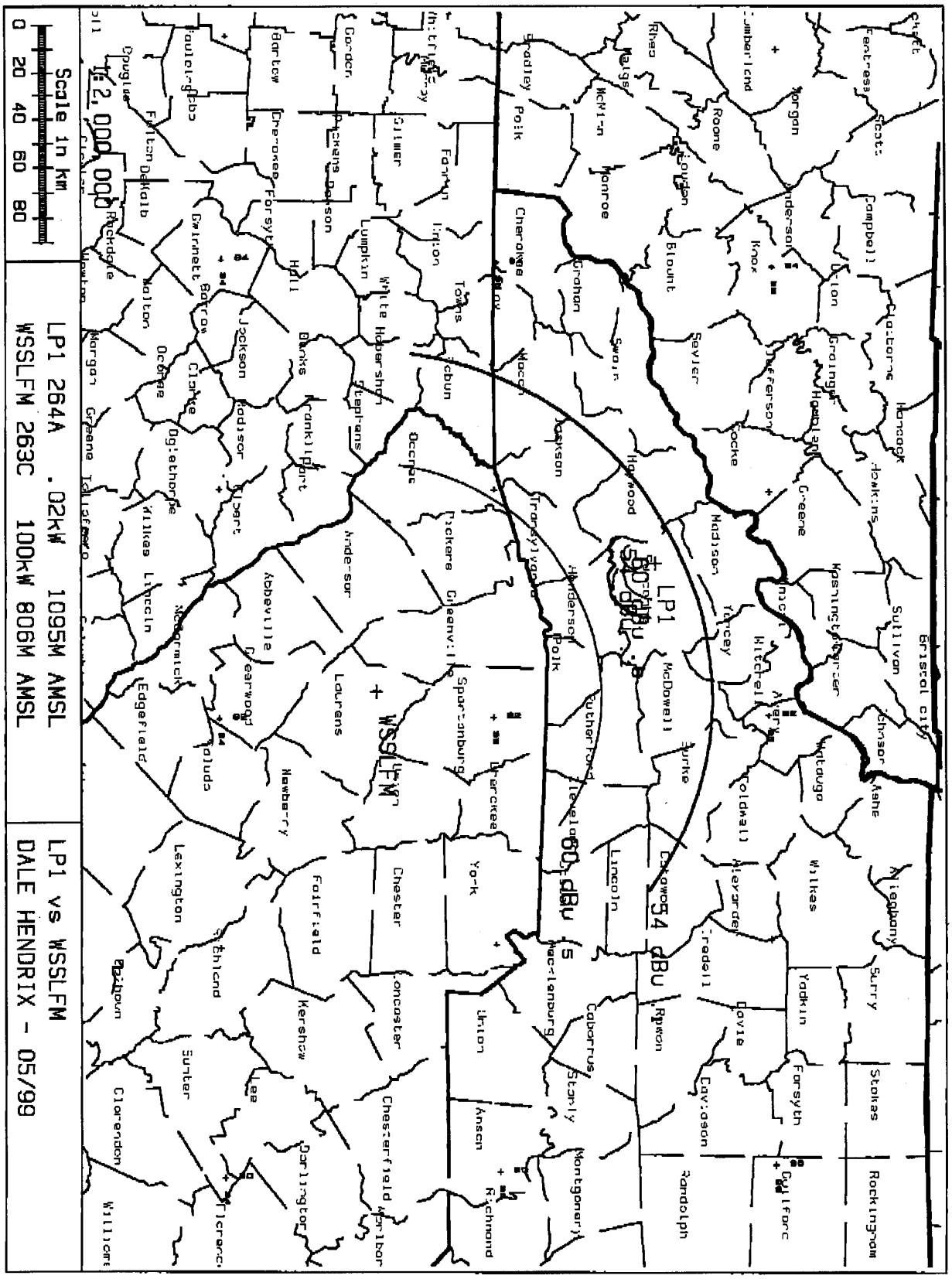

Figure 34: Asheville Channel 264, 2 of 2

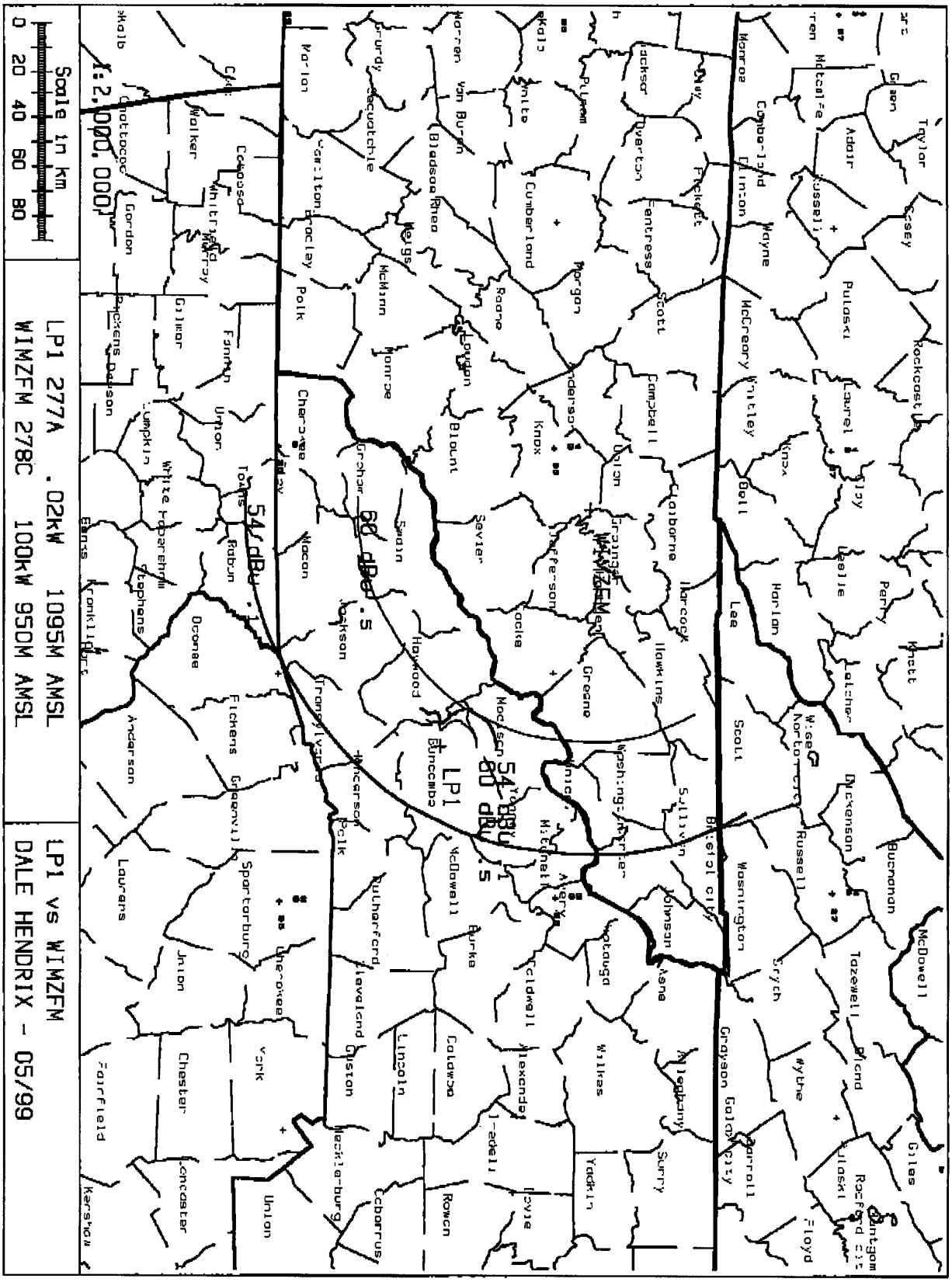

Figure 35: Asheville Channel 277, 1 of 2

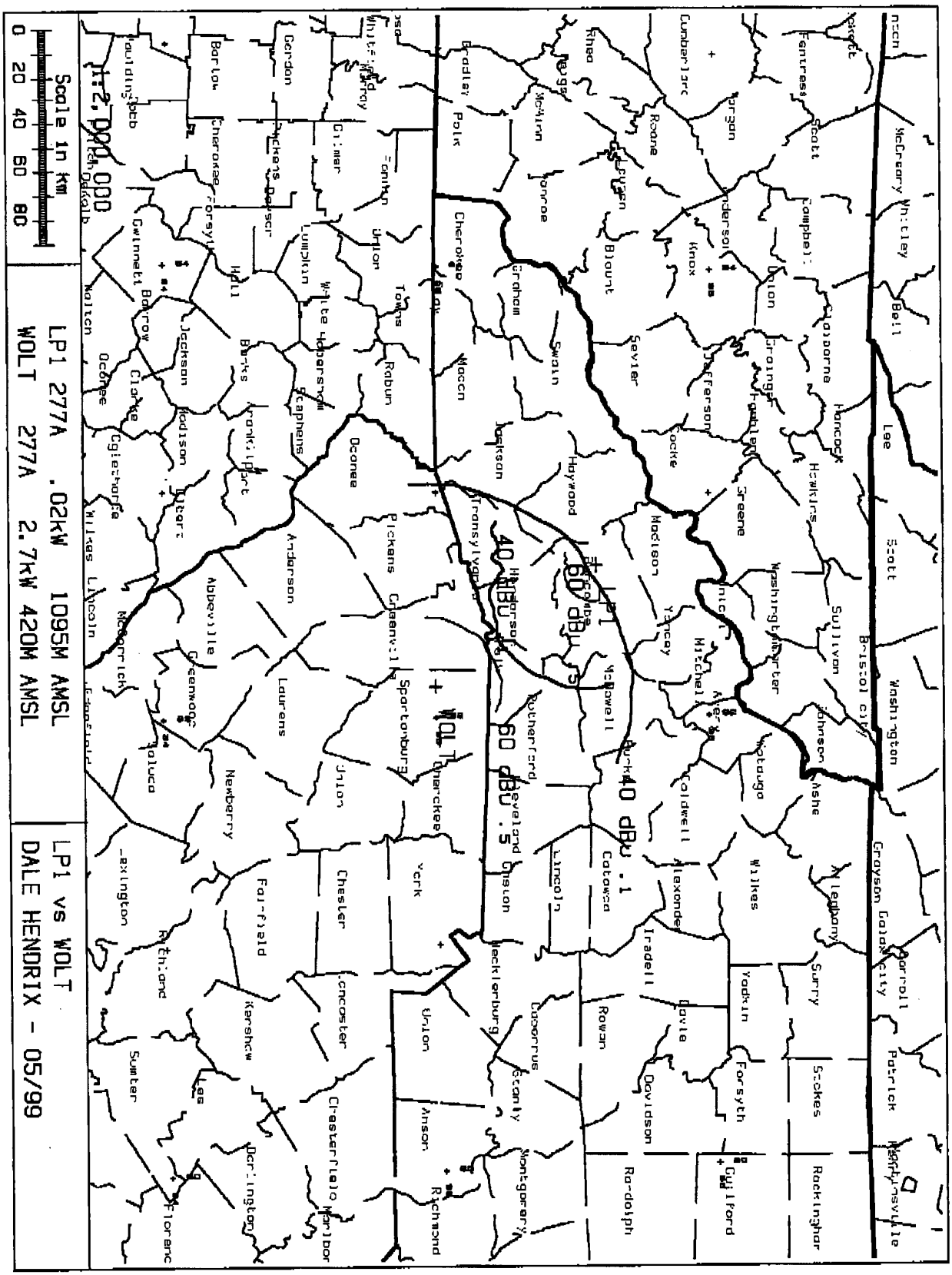

Figure 36: Asheville Channel 277, 2 of 2

Figure 37: Asheville Channel 290