government, the FCC does not always defer to local regulation, as discussed *infra* at note 22 (citing to examples of FCC preempting local authority). The fact that the Chairman of the FCC wrote a letter indicating the nature of the FCC's general policy does not have a binding effect on this matter. The Chairman and the other Commissioners will consider the record before them in this proceeding and act in furtherance of the public interest.

B. Only the FCC Has the Technical Expertise to Issue a Decision Because the Technical and Legal Issues Involved are Inextricably Linked.

The County Commission denied the rezoning application for failure to comply with the Zoning Regulations in the following respects: (1) alternate developed telecommunications sites exist for the tower; (2) failure to demonstrate that the NIER emission levels are met; and (3) failure to have sufficient setbacks. Each of these alleged failures involve highly technical subject matters. Unfortunately, much of the testimony before the County Commission on these issues was, at best, inaccurate or, at worst, wrong. The FCC is in the best position to review the specifics of these technical matters and be assured that the LCG proposal complied with these aspects of the zoning regulations. After a review of the technical issues, the FCC will understand that the denial of the zoning application by the County puts LCG in a position of being unable to comply with federal law and regulations.

1. Alternate Sites.

The County's staff report to the County Commission summarizing the tower proposal stated the following about alternate telecommunications sites: (1) that the alternate site of Mt. Morrison did not have a tower that could accommodate the

equipment and did not have the approval from the County for a new tower;[20] (2) that Squaw Mountain (in another county) has no tower which could accommodate the equipment; and (3) that the facilities at Eldorado Mountain were at maximum capacity and an additional tower would need to be constructed. The County's own staff acknowledged that alternate sites would entail the construction of a new tower, as the proposed equipment could not be accommodated on an existing facility. County staff report at 18. In spite of the staff finding and expert testimony that alternate sites were not suitable, the County Resolution stated that "the proposal does not meet minimum standards for telecommunications facilities . . . because it does not demonstrate that no alternative existing site is available to accommodate the equipment at a reasonable cost or other business terms . . . ." County Resolution ¶ 5.

In addition to the fact that no existing telecommunications facility is available to accommodate the DTV transmission facilities, is the companion issue of whether an adequate level of service to the public could be provided from an alternate location. Testimony before the County Commission showed that LCG was unable to provide the requisite service from an alternate location. The highly technical issue of whether comparable service can be provided to the public from an alternate location and the significance of loss of service should be reviewed by the FCC. Jefferson County argues in its Comments, page 15-17, that LCG made certain "assumptions" about the inability to locate the tower at alternate locations.

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[20] A contemporaneous application for zoning for a new tower on Mt. Morrison was denied by the Jefferson County Board of County Commissioners. *See,* Comments filed by Bear Creek Development Corporation.

As set forth, *supra* at pages 7 – 17, these "assumptions" were made on the basis of technological issues and regulations such as collocation, interference, Table Mountain, shadowing, translators, and repeaters. The FCC is the proper party to review the technological evidence and coverage issues associated with the alternate sites.[21] After such a review, the FCC will understand that Broadcasters are unable to utilize an existing developed alternate site and continue to meet their Section 307(b) obligations.

As noted in *Southwestern Bell Wireless, Inc. v. Johnson County, Kansas,* 17 F. Supp. 2d 1221, 1225 (D. Kansas 1998), *aff'd* 199 F.3d 1185 (10th Cir. 1999), the Supreme Court "has interpreted the [Communications Act] to vest the FCC with exclusive jurisdiction over "technical" issues such as radio frequency." The FCC has previously dealt with cases where federal regulations on technical matters conflicted with local government decisions inconsistent with the federal aims. In these prior instances, the Commission has enacted a wide-range of orders preempting local government decisions.[22] As in the cited cases where courts have

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[21] It is for the Commission to assess the significance of the quantity of loss of service under Section 307(b) of the FCA, 47 U.S.C. § 307(b), as it has done many times. *See* cases cited, *supra,* at pages 16-17.

[22] *See, Ortho-O-Vision, Inc.*, 69 F.C.C.2d 657 (1978), *recon.*, 82 F.C.C.2d 178 (1980), *aff'd sub nom. New York State Commission on Cable Television v. FCC,* 669 F.2d 58 (2nd Cir. 1982) (the FCC preempted state entry regulation of multi-point distribution systems); *Capital Cities Cable, Inc. v. Crisp,* 467 U.S. 691, 104 S.Ct. 2694 (1984) (the FCC retained exclusive authority and preempted regulation of the carriage of television broadcast signals); *Town of Deerfield, New York v. F.C.C.,* 992 F.2d 420 (2nd Cir. 1993)(FCC regulations prohibit enforcement of local zoning ordinances that unduly interfere with the installation of individual satellite antennas); 47 C.F.R. §25.104 (regulation explicitly preempts all zoning ordinances that improperly trammel an individual's right to satellite reception); *Freeman v. Burlington Broadcasters, Inc.*, 204 F.3d 311, 320 (2nd Cir. 2000) (the FCC enjoys exclusive jurisdiction over RFR interference complaints; "Congress intended the FCC to possess exclusive authority over technical matters related to radio broadcasting"*); In re 960 Radio, Inc.*, FCC 85-578 (1985)(FCC preempts area of RF interference and local zoning board preempted from imposing RFR requirements in conditional use permit); *In re Federal Preemption of State and Local Regulations Pertaining to Amateur Radio Facilities,* 101 F.C.C. 2d 952 (1985) (preempts local

upheld exclusive jurisdiction of the FCC to render decisions on technical issues, the FCC can determine the technical issue of whether DTV service for the Denver market can be adequately provided from a location aside from the Lookout Mountain Antenna Farm. The testimony and exhibits submitted by LCG demonstrate that, technically speaking, this is the only viable site for the tower. The FCC is the appropriate party to evaluate the relationship between this technical data and the federal regulations and policies guiding LCG's activities.

2. RFR Emissions

The testimony before the County on RFR levels was complex and misleading.[23] In spite of assurances from the FCC that the emissions from the proposed tower would fall within the RFR guidelines[24], the Resolution denying the zoning was based in part on the alleged failure of the proposal to meet emission levels. The RFR denial was based on public outcry and conjecture, rather than a reasoned determination of whether the emissions would fall within the FCC

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restrictions on amateur radio towers) (upheld by *Pentel v. City of Mendota Heights,* 13 F.3d 1261 (8th Cir. 1994); *Williams v. City of Columbia,* 906 F.2d 994 (4th Cir. 1990)).

23 One individual commenter noted that "I attended many of the Jefferson County hearings on the siting issue. I was disappointed that the opposition to the new transmission tower was more hysterical and irrational than research-based arguments like dangerous irradiation of persons and pets, or falling icicles from the tower." Comments of Mr. And Mrs. Fred Birdsall

24 The FCC establishes RFR emissions guidelines in 47 C.F.R. § 1.1307. These guidelines were recently upheld in Cellular Phone Taskforce v. FCC, 205 F.3d 82 (2nd Cir. 2000). Compliance by LCG with the FCC's RFR guidelines constitutes a de facto threshold for obtaining FCC approval to operate a station or transmitter. See, "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance", released by the FCC's Local and State Government Advisory Committee on June 2, 2000. As Jefferson County has adopted the same RFR guidelines as has the FCC, compliance by LCG therewith constitutes a de jure threshold for obtaining County approval, notwithstanding the County's conclusion to the contrary.

guidelines.[25] The emissions from the proposed tower will meet the RFR guidelines and the FCC can review the technical data demonstrating this compliance.

A review of the County proceedings illustrates that the proposed facility will meet RFR restrictions, but that public outcry over RFR led the Commission to deny the zoning on this basis. The Jefferson County Planning Commission approved the tower proposal on January 13, 1999, making a specific finding that "results of recent monitoring and changes in operating practices have brought the RFR exposure into compliance with existing standards, and that evaluations by the County have indicated that the emissions from the additional towers will not result in those standards being exceeded." The Planning Commission imposed a condition of approval requiring a monitoring plan to include citizen involvement for RFR emissions. The County staff report presented to the County Commission prior to the hearing indicates that "NIEF levels have been resolved to the satisfaction of the federal government and the County." Staff report at 1. The staff report, however, notes for the commission the increasing pressure from the public on the RFR issues: "[I]t should also be noted that the community has strong concerns about an increase in interference levels from this proposal that will affect their quality of life. The community also believes this proposal will expose the residents to EMR levels running 100,000 – 400,000% above the national average. The community has petitioned elected officials in Congress to delay the outcome of this proposal . . ." Staff report at 3. In the "1/19/99 Update" to the staff report, the staff once again

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[25] Witnesses at the hearing testified as to the interference caused by RFR. RFR interference has been preempted by the FCC and local governments cannot regulate or impose RFR interference requirements in zoning regulations. *See, supra,* note 22.

states: "the Lookout Mountain area currently meets compliance with FCC guidelines for exposure to the general public to RF electromagnetic energy." This Update then continues: "[d]uring the public hearings before the Planning Commission, the community expressed concerns about elevated rates of brain cancer . . . . The State Health Department conducted a survey . . . the results at that time did not show a statistically significant increase in brain cancer on Lookout Mountain." Staff report at 3. The "2/26/99 Update" in the staff report notes that another State Health Department survey showed no direct correlation between cancer and the existing towers on Lookout Mountain, and that The Center for Disease Control and Prevention in Atlanta also concluded "that there is not a cancer cluster in this population and that no further local studies need to be conducted." Staff report at 3. In a nod to the continuing controversy, the staff "Update" notes that "CARE has requested a continuance of this proposal to allow for additional research and study" and that the City of Golden passed a resolution expressing concern about interference.[26]

As is obvious from a review of the staff report, studies showed that RFR levels were in compliance and had no correlation to cancer in the area but that the

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[26] The City of Golden Resolution No. 975, which was part of the record before the County Commission, states, in Section 1: "The Golden City Council respectfully requests that the Jefferson County Board of County Commissioners not approve any new broadcast towers on Lookout Mountain until competent studies of all potential interference is completed." Regulation of RFR interference is preempted by federal law. *See, Freeman v. Burlington Broadcasters, Inc.*, 204 F.3d 311 (2nd Cir. 2000)(federal preemption of RF interference preempted town zoning board of adjustment from voiding zoning permit on grounds of RF interference); *In re 960 Radio, Inc.*, FCC 85-578 (1985)(power in the area of radio frequency interference is exclusive [to the FCC]; "to the extent that any state or local government attempts to regulate in this area, their regulations are preempted."). As the field of RFR interference is preempted by federal law, the County cannot deny zoning approval on the basis of interference.

public was still concerned over the RFR emissions. At the hearing, arguments were made that the FCC's guidelines were inadequate and the monitoring ineffective, although the only issue before the County Commission was whether the RFR emissions from operations from the proposed tower would remain within existing guidelines. Even CARE, in its Comments, sets forth a lengthy history of RFR levels at the Lookout Mountain Antenna Farm and argues the inadequacies of the FCC's current system of granting permits and the RFR reporting system. [27] *See* CARE Comments pages 32 – 39. CARE argues that the levels of RFR emissions rose and "that the RF contribution of the proposed supertower when added to the existing RF levels would exceed County standards." CARE Comments at 34-35.[28] This argument was made at the hearing below and is based on inaccurate testimony by a County employee and was rebutted by an expert.

Immediately prior to the final day of the hearing, a County planner (Tim Carl) took readings of RFR levels and found a *de minimis* increase over the standard – 101.4%. The planner advised the County Commission at the hearing that this level, combined with an estimated 5% increase of RFR caused by the proposed LCG tower, would result in noncompliance with the RFR standards. LCG's expert advised the Commission that the staff person's testimony was mathematically and technically incorrect: that by adding the 5% levels from the

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[27] Although this is not the proper forum for CARE to argue that the FCC should change the system of ensuring compliance with RFR standards, it does have other methods of recourse. The licensees are still responsible for compliance, and an interested person can petition the FCC to review a site believed to violate the exposure levels. *See* 47 C.F.R. § 1.1307(c).

[28] Although CARE makes a lengthy argument as to RFR emissions, Jefferson County does not address this point in its Comments. See CARE Comments pages 32 – 39.

proposed tower to the existing tower RFR count was "double-counting" because several of the antennas were to be relocated to the LCG tower and were counted twice. This testimony was unrebutted. In spite of the findings of compliance by the FCC and the testimony by the expert on the County's improper method of measuring RFR emissions, the County Commission denied the proposal. The only mention of RFR levels during the County's discussion on Commissioner Sheehan's motion to deny was that "some kind of an ultimate study on the RF levels, a long term study of some kind would be worthwhile." Transcript at 6415. The Commission's Resolution denying the zoning petition (written after the hearing) states that "the proposal does not meet minimum standards for telecommunications facilities . . . because the proposal does not demonstrate that the NIER emission levels set forth in the Zoning Resolution are met." It is apparent that the Commission concluded that the tower did not meet the RFR guidelines on the basis of public speculation and lay testimony, rather than on a review of the technical merits by an expert. It is also apparent that the Commission ignored the RFR compliance conditions imposed by the FCC on Broadcasters' DTV construction permits. The FCC, which has had staff measure RFR levels at the Lookout Mountain Antenna Farm, has the expertise to calculate RFR compliance utilizing FCC Bulletin OET-65, and has conditioned Broadcasters' construction permits on RFR compliance, is the appropriate agency to determine that the proposed facility will not increase the RFR levels and that the proposal falls within federal guidelines.

3. Setbacks

The issue of "sufficient setbacks" was also the subject of convoluted testimony and conjecture. The Zoning Regulations require that "all new structures must be set back from the property line sufficient to prevent all ice-fall materials and debris from tower failure or collapse from falling onto occupied dwellings other than those occupied by the tower owner. . . ." Zoning Regulations, § 15.F.b(2). The evidence showed that the nearest occupied dwelling not owned or under option to LCG was over 700 feet from the base of the tower.[29] LCG's expert, Howard Hill, testified that ice fall was not an issue in Colorado because of the humidity and, if ice were to fall, it would fall within the debris radius of the tower. Mr. Hill also opined that the debris radius would be only 15 to 25% of the tower height because the tower was going to exceed strength standards in the building code (built to sustain peak wind velocities in excess of 200 miles per hour) and because the tower was being constructed so that it would fall in on itself in the event of failure. In spite of this evidence, the County staff report summarily concluded that the proposal could not comply with the zoning regulation. The report stated that the debris radius "does not meet the intent [of §15.F.b(2)] . . . which makes no distinction on fall radius, but rather concludes that a sufficient setback must be met. Sufficient in this case, must

[29] CARE states in its Comments that the tower is 350 feet from the "nearest neighbor that will not give LCG an option on their property." CARE Comments at 30. However, only a rustic summer cabin without indoor plumbing sits 350 feet from the tower and under the County's health and sewage disposal regulations may not be legally occupied. The proposed LCG tower will be further from occupied dwellings than is the present Channel 4 tower of the same height which will be removed under the LCG tower consolidation proposal.

meet the worst case scenario, which in the applicant's report assumes 110% of the tower's height. . . . Staff has attempted to contact a competent structural engineer to perform an independent analysis. As of this writing, we have not hired an individual to assist us in this analysis." Staff report at 21-22. The staff then recommended denial of the tower project because "the minimum standards related to debris from tower failure or collapse cannot meet the minimum standard established in the Zoning Resolution." Staff report at 23. Thus, the staff effectively rewrote the zoning regulation to require a setback greater than the height of the tower and greater than that needed to prevent debris from falling on occupied dwellings.

The testimony at the Commission hearing in opposition to the LCG proposal was equally full of conjecture and speculation.[30] County staff did not even have the benefit of an engineer in opining that a setback greater than the height of the tower was required and did not retain the services of an engineer to review its calculations. As there was no engineer or competent testimony on the technical requirement of a 110% fall radius, the County Commission should not have concluded that a 110% setback was necessary. Transcript pages 5965 – 5974; 6329 – 6356. The County Commission did not even refer to the issue of setbacks in the brief discussion on the motion to deny the zoning, although the Resolution written after the fact includes setbacks as a reason for denial. The Resolution

[30] A witness for CARE even argued that the setback needed to be 1800 feet – 1000 feet of cable plus a 800 foot tower. This was rebutted by Howard Hill, the expert for LCG. See CARE Comments at 31; Transcript page 6334 – 6340.

stated that "the proposal fails to meet [the Zoning Resolution] . . . because the proposal does not contain sufficient setbacks . . . ." County Resolution ¶ 5.

LCG demonstrated to the County that it was providing setbacks sufficient to protect occupied dwellings in the unlikely event of a tower collapse. Although this is a highly technical issue requiring engineering studies, the County summarily reached a conclusion on the issue without any expert evaluation. The FCC has the technical expertise to review the proposal and evidence and determine that LCG's proposal met the local regulations, and that the arbitrary and capricious denial of zoning on the basis of setbacks results in the Broadcasters' inability to comply with federal regulation.

C. The Pressing Nature of DTV Transition, Mandated by the FCC and Congress, Requires that All Legal Remedies Be Pursued Simultaneously.

Several commenting parties argue that the Jefferson County District Court is the sole appropriate venue for this matter and that preemption would usurp the exclusive jurisdiction of the courts. (*See*, Jefferson County Initial Comments at 2-3, CARE Comments at 2, 12). Pending before the Jefferson County District Court is LCG's appeal by Writ of Certiorari of the denial of zoning by the County. The Court's jurisdiction in such a proceeding is limited and the sole issues for the Court to determine, under Colorado law, are whether competent evidence in the record supports the Commission's decision or whether the Commission misapplied or misconstrued the applicable regulation. Based upon this limited jurisdiction, the court does not make any *de novo* findings of fact such as whether the tower

application did or did not meet the zoning code, whether an alternate site exists for the tower, whether the RFR levels are within the guidelines, or the extent of the impact of technological requirements on the tower location. The Court's review is limited and simply goes to the competency of evidence presented to the Commission. The Court cannot entertain the underlying issue of whether the denial of the zoning conflicts with federal regulation.

The proper party to determine the underlying issue – whether the County's denial conflicts with federal law and regulation – is the FCC. Even if LCG had filed suit in federal district court on the issue of preemption, the FCC would have pursued this additional avenue of declaratory ruling to resolve the issue. *Town of Deerfield v. F.C.C.*, 992 F.2d 420 (2nd Cir. 1993) (FCC policy requiring exhaustion of judicial remedies and declining to become involved in controversy over preemption until conclusion of court proceedings was impermissible).

The Broadcasters hold licenses issued by the FCC and are required to comply with FCC regulation. At the present time, certain Broadcasters have not constructed DTV facilities in accordance with the FCC directives.[31] LCG must pursue all avenues of relief, expeditiously, in order to resolve this matter. The filing of an appeal before the state court in Colorado will not afford the relief which LCG

[31] LCG member Rocky Mountain Public Broadcasting Network, Inc. is the licensee of KRMA-TV, a noncommercial television station operating on analog Channel 6. As a noncommercial station, KRMA-TV is not obligated to construct DTV facilities until May 1, 2003 and thus is presently in compliance with FCC directives regarding DTV. LCG member Twenver Broadcast, Inc. is the licensee of KTVD, a commercial station operating on analog Channel 20, and is not obligated to construct DTV facilities until May 1, 2002 and thus is presently in compliance with FCC directives regarding DTV.

seeks and thus LCG concurrently seeks preemption of the zoning decision by the FCC.

D. LCG Only Asks the Commission to Rule with Respect to the Specific Facts Presented and Not to Adopt a Rule of General Applicability.

Local government has authority to regulate and zone for the public health, safety and welfare. However, the arbitrary application of local government regulations cannot serve to frustrate the federal objective of achieving development of advanced broadcast technology. Applications of regulations, such as the denial of zoning for transmission towers by Jefferson County when no alternative is available, that have the purpose or effect of restricting the ability of broadcasters to provide digital services to the public clearly conflict with the regulations and policies articulated by the FCC and, therefore, are a proper subject of preemption.

1. The Requested Preemption is Limited in Scope and Required by the Set of Unique Circumstances.

The circumstances in Jefferson County are unique and require the FCC to take the requested action. The unique circumstances are as follows:

a. The affected market is a top-30 market requiring the most-expedited construction of DTV towers. Certain LCG members have failed to comply with a November 1, 1999 deadline, the earliest construction deadline imposed by the FCC. [32]

[32] Certain Broadcasters are currently in compliance with FCC regulations because their respective deadlines for providing DTV service have not passed. *See, supra,* note 31.

b. The LCG proposal was planned in cooperation with the County and in conformance with the County's Telecommunication Land Use Plan and Zoning Regulations. Furthermore, during the zoning review process, LCG did everything possible to accommodate the County. The Planning Commission imposed a set of conditions of approval on the project, and LCG agreed to all conditions except for one to which it was unable to agree.[33] The project had substantial restrictions on lighting, landscaping and access. LCG paid for the County's RFR expert and agreed to post bond for removal of the towers. In short, LCG took all possible steps to meet the County's demands and requests.

c. This case is procedurally unique insofar as the County Commission, after days of hearings (April 27, 1999, May 27, 1999, June 29, 1999 and July 13, 1999) with numerous persons testifying, had a very brief and limited discussion on the record before making a motion to deny. In fact, the discussion on the record by the County Commission constitutes just three pages of the record, out of a record totaling more than 6,400 pages. The County Commissioners passed the motion with little discussion and no findings of fact or reasons for the denial, instead making

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[33] The Planning Commission asked LCG to agree to remove the antennas for Channel 7 and Channel 9 by a time certain in 2006, but LCG explained that it could not agree to a specific deadline for removal of the two antennas should the transition date be extended beyond 2006. LCG agreed to remove the antennas when the transition is completed and analog transmissions are terminated.

only a vague reference to the fact that a "win/win scenario" was needed.

d. LCG's proposed tower would actually benefit the local community. LCG's multi-use tower would reduce the number of towers at the Lookout Mountain Antenna Farm. The Jefferson County Planning Commission even found that "[t]he proposed land use is compatible with existing and allowable land uses in the surrounding area in all directions because construction of a consolidated tower will reduce the overall visual impact of broadcast facilities on Lookout Mountain by eliminating several towers." Planning Commission Resolution, ¶ 2(e). The LCG tower will also result in an improvement of the RFR environment in the vicinity of the Lookout Mountain Antenna Farm.

e. The geography of the Denver area is distinctive. As discussed *supra* at pages 8-18, the geography of the area has an impact on where the tower can reasonably in order not to result in a substantial loss of service to the Denver market, as issues such as shadowing and interference are a concern due to the terrain. Such geographic restraints are particular to this case.

f. The tower is to be constructed at the Lookout Mountain Antenna Farm, an area which has housed antennas since the

1950's. As the FAA has noted, the grouping of antennas in one location increases air safety. It is difficult to imagine a surrounding use more compatible with the proposed tower consolidation than that of an antenna farm. This unique feature requires FCC intervention – a local government finding a tower incompatible with surrounding uses when it is to be located in an existing antenna farm.

LCG is not asking the FCC to preempt the zoning code of Jefferson County, or to make any ruling with respect to any other county or municipality, but rather to limit its ruling to the denial of the specific zoning application in this particular case based upon these unique circumstances.

III. CONCLUSION

For the foregoing reasons, LCG asks the FCC to preempt the County Commission's denial of zoning and issue an order rendering the denial of zoning ineffective and directing that the zoning application be deemed approved by the County, provided that: (1) LCG complies with the conditions of approval imposed by the Jefferson County Planning Commission;[34] (2) the LCG tower is constructed as set forth in the application as presented to the County and approved by the

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34 As stated *supra* at note 33, LCG has previously indicated that it cannot agree to remove two of the existing towers by a certain deadline in 2006. The FCC has imposed May 1, 2006 as the transition deadline for the conversion from analog service to digital service. Should the FCC revise this deadline, the Broadcasters are will continue to provide analog service until such revised transition date. LCG has agreed to remove the specific towers from Lookout Mountain at the deadline for the transition from analog to digital service.

Planning Commission; and (3) the tower is constructed in accordance with the applicable building plans, building codes and building permits.

Respectfully submitted,

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June 8, 2000

ATTACHMENT

ENGINEERING STATEMENT

OF

JOHN F.X. BROWNE, P.E.

Engineering Statement
of
John F.X. Browne, P.E.
Response to CARE Filing
on behalf of
Lake Cedar Group, LLC
Denver, CO

Introduction

Lake Cedar Group, LLC (LCG) commissioned this firm to prepare a report summarizing some of the work which was performed, under my direction, with regard to DTV site selection activities in Denver. These activities were directed towards identifying potential alternatives to the Lookout Mountain "antenna farm" site proposed by the LCG consortium of Denver area TV stations.

A report entitled Alternative Analysis of DTV Tower Sites in the Denver Area [1/] was included as part of a more comprehensive filing with the Commission by the CARE organization (a group of Denver area residents opposed to any new construction on Lookout Mountain). The CARE filing takes issue with the report prepared by this firm (hereinafter, the Browne Report). This Engineering Statement has been prepared to provide additional technical details and rebuttal to the CARE filing.

1/ This report was prepared by Alfred R. Hislop, Ronal W. Larson and James A. Martin and is dated May 7, 2000.

Purpose of Report

The subject Browne Report was intended to provide comparisons of various sites considered as possible locations for DTV transmission facilities. It was intended to be read and evaluated by persons not necessarily familiar with radio transmission, propagation and reception issues which can be of a highly technical nature. Coupled with the nuances of broadcast antenna designs, mutual interference considerations, FCC requirements and radio frequency environmental concerns, the scientific / engineering details are interdependent and complex. Thus, when preparing such a report for a primarily "lay" audience, it is necessary to leave out much of the foundational engineering calculations and narrative in order to produce a document whose conclusions can be readily comprehended in a "readable" fashion. In fact, a draft version of the report was re-written at the request of LCG because it was "too technical" for the intended readers. One assumes that those schooled in engineering and science can "fill-in-the-blanks" and verify, challenge and / or produce rebuttal calculations.

It is not clear in whose behalf Alternative Analysis of DTV Tower Sites in the Denver Area was prepared. Taken at face value, since it makes no reference to its commissioning, it appears that the "undersigned" (Messrs. Hislop, Larson and Martin) have undertaken to prepare the rebuttal to the "Browne Report" on their own initiative. Throughout the remainder of this statement the subject report will be simply referred to as the HLM report (filing). The authors of the HLM filing do not appear to fit this description as demonstrated by an apparent lack of understanding of many of the technical issues, compounded by erroneous assumptions, which lead to inappropriate conclusions. It should also be noted that the authors are not dispassionate experts who can be objective by virtue of having no personal interest in the outcome of the proceeding but rather are residents of the Lookout Mountain area and members of the citizen–activist group CARE. The objectivity of these technical experts must be considered in light of these facts.

Table Mountain

At 2.6.1 [Eldorado Mountain], HLM presents a discussion of the "Table Mountain quiet zone". The Table Mountain facility is not a "quiet zone" but rather is designated as a "radio receiving zone". This is not a trivial distinction as further defined in the FCC Rules and Regulations. The FCC rules specify the maximum field strength that can be placed over the Table Mountain site by broadcast and other radio facilities.

(*) states that *"...by using either directional antennas or canceling [sic] techniques that are already being used on Lookout Mountain and Mt. Morrison (or a combination of both), signal levels at the quiet zone due to transmitters at the Eldorado Mountain site could be made lower than those presently negotiated as acceptable..."*.

It is not known whether the author of that statement has had any direct contact with the cognizant technical staff at NIST responsible for the Table Mountain facility but it is clear that the statement indicates a lack of understanding of the issues and what NIST has found "acceptable". I can state that I am very familiar with these problems as I was instrumental in framing the issues and calling for interagency discussions between the FCC and the Department of Commerce / NIST. I prepared a "white-paper" describing the issues and possible solutions in May,1998; subsequently, NIST agreed to "grandfather" the Lookout Mountain DTV stations as allotted by the FCC (1,000 kW ERP). An underlying condition of this "grandfathering" is the assumption that the facilities would be sited at Lookout Mountain. HLM has included with its filing a copy of the letter from Dennis Friday of NIST to the FCC regarding the NIST position on the issues. That letter clearly states that any changes that would result in an increase in signal levels cannot be accommodated. This is our understanding of the "agreement" and this has been confirmed by personal contact with NIST.

At 2.1 HLM states that (NIST) *"...determined that the proposed transmitters would exceed the allowable signal levels at the quiet zone, some by as much as 14.6 dB (28.8 times too high)..."*. HLM correctly quotes the NIST letter with regard to the 14.6 dB but incorrectly calculates the ratio. NIST is clearly referring to field strength (dBμV/m or dBu, in FCC parlance), a voltage term. Therefore, the ratio is the anti-log of 14.6/20 or a factor of 5.4 not 28.8 as stated by HLM.

HLM refers (at 2.61) to the statement on page 7 of the Browne Report and states, out-of-context, as follows:

> *"[B]rowne's suggestion on Page 7 that the solution to excess signal level at the quiet zone from Eldorado Mountain is to reduce power from 1,000 kW to 11.5 kW with an omnidirectional antenna shows an unwillingness to address solutions to technical problems in a rational manner. A diligent engineer would certainly address techniques to reduce power in the direction of the quiet zone without reducing power in all directions."*

Aside from the fact that this ad hominem remark has no place in a technical discourse, the author of the Browne Report was diligent and, more importantly, understood the topic and the underlying engineering principles and their practical application. As noted above, HLM's simplistic assumptions are totally without merit. Significantly, the reference to the statement regarding the 11.5 kW ERP (omnidirectional) was taken out-of-context from the Browne Report. The full text is as follows (Browne Report, pages 6-7):

> *"[F]or example, a DTV facility sited at Eldorado Mountain and operating with an FCC authorized power of 1,000 kW would exceed the maximum power permitted over Table Mountain by a factor of 87 times; stated another way, the operating power would have to be reduced from 1,000 kW to 11.5 kW in order to comply with the basic FCC rules as presently formulated. Even if DOC / NIST would permit a grandfathering status (whereby the power might be reduced to provide an equivalent signal over Table Mountain), the power would have to reduced from 1,000 kW to approximately 300 kW."*

The elements of this statement are factually correct and, it is noted that in the above discussion above. a reduction to 295 kW would be appropriate for equivalence (295 kW is "approximately" equal to 300 kW by any engineer's rounding). Aside from attempting to intentionallv mislead. HLM conveniently leaves out anv reference to the uncertaintv over whether operation at any reduced power level would be acceptable to NIST (i.e., greater than 11.5 kW). There is not one word in the referenced statement from the Browne Report which is not factual and correct.

Appendix A – NIST Letter

At the request of John F.X. Browne, P.E., acting on behalf of Lake Cedar Group (LCG), the FCC began informal conferences with NIST and the Department of Commerce regarding the problems associated with the build-out of DTV facilities in the Denver area given the restrictive nature of the regulations regarding maximum signal levels over the Table Mountain Radio Receiving Zone. It should be noted that all of the VHF stations referenced in Mr. Friday's [2/] letter (Channels 4, 7, 9) were allotted 1,000 kW facilities (UHF) by the FCC as were Channels 2 and 6; in fact, Channel 6 (KRMA) had applied for such power from the newly proposed LCG tower and a construction permit was subsequently granted.

As a participant in the discussions and negotiations with NIST, I am keenly aware of the understanding between the agencies; the October, 1998, letter does not fully reflect the current understanding and its practical application. In essence, NIST has agreed to "grandfather" the allotted and maximized facilities assuming that they operate from Lookout Mountain (or allotment site); any relocations would be considered on a case-by-case basis and

[2/] This letter from Dennis Friday of NIST and Fred Thomas of the FCC dated October, 1998, is appended to the HLM filing ostensibly to support the contention that all Denver DTV stations are grandfathered with respect to DTV operations on channels allotted to them by the FCC. Extrapolated from this overly simplistic conclusion is the assumption that these facilities can be relocated anywhere as a matter of right; nothing could be further from the real meaning of that letter.

there is no implied warranty that approval will be forthcoming. This is, perhaps, best summarized in the concluding paragraph of Mr. Friday's letter which states *"[H]owever, we cannot accommodate any other exceptions to the Quiet Zone restrictions below 1 GHz and if any future power increases are requested by these DTV stations or other stations, NIST should be consulted before any FCC approvals are given."*

Thus, to assume that a relocation to Eldorado Mountain would be permissible is highly speculative. Using the HLM references as to the distances involved between Table Mountain and the two sites (Lookout and Eldorado – 42.5 km and 23 km, respectively), HLM suggests that the signals would "only" be 5.3 dB higher; to a broadcast station permitted to operate with 1,000 kW (from Lookout), reducing its power to 295 kW (a 5.3 dB reduction) is not a trivial matter and no broadcast station would be inclined to accept this reduction; as HLM states (at 2.6) *"[O]ne of the most important considerations is coverage area. The ideal site would have line-of-site to all intended viewers"* (sic); for a given antenna height and terrain scenario, the size and extent of the coverage area is determined by the power being radiated.

HLM suggests [at 2.61] that *"...by using either directional antennas or canceling* (sic) *techniques that are already being used at Lookout Mountain and Mt. Morrison (or a combination of both), signal levels at the quiet zone due to the transmitters at the Eldorado Mountain site could be made lower than those presently negotiated as acceptable when transmitting from Lookout Mountain."* This statement disregards fundamental broadcast engineering concepts and their application to such situations.

Perhaps, it would be best to begin with directional antennas. It is true that a directional antenna can be designed to reduce field strengths in desired directions. However, the penalty that usually accompanies this approach – when the desired arc of reduced field is relatively small, as in this case – is that a much broader arc must be used which, of course, affects a more expansive area where signal levels are reduced; this translates to reduced service and lost viewers over a much wider area than just the few degrees of arc which encompass the radio receiving zone. In this regard, the protected arc for a facility located on

Eldorado would have to be over twice as large (7.5°) as that from Lookout since, by simple geometry, the Lookout site is half the distance from Table Mountain [3/] thus further complicating the directional antenna approach to a solution. HLM provides no estimates of the losses the stations would suffer when using a directional antenna to reduce signal levels over Table Mountain. [HLM also does not take cognizance of differences between its free-space propagation assumptions and the propagation model used by NIST in computing the signal levels from Lookout, if any. Any such differences could only serve to increase the signal level disparity between the two sites as there is no doubt that [the] Eldorado site has line-of-sight and near free-space path conditions to the entire Table Mountain site.]

Next is the observation that "cancellation" antennas are used in the two Mt. Morrison facilities cited. The relatively narrow beam-width (6 degrees) of the 15 ft. diameter parabolic antennas employed limits the size of cancellation zone, in theory, to a very narrow "sliver" leaving the remaining portion of the coverage arc relatively unaffected; clearly, if desired performance is achievable, this approach would affect the least area and population from a coverage perspective.

The application of the "cancellation" technique "works" for the stations cited precisely because they are analog stations. The transmitting spectrum of analog TV stations has the highest concentration of energy at the visual carrier frequency where, in typical operation – in the ±100 kHz band centered around the visual carrier – the peak energy is 10 dB or more greater than the aural carrier and 20 dB or more greater than energy in any other portion of the six megahertz spectrum. Thus, the analog cancellation task is essentially a very narrow band problem, and fortunately so.

[3/] Table Mountain is an 1,800 acre site which is approximately 5 km on its North-South dimension; its East-West dimension is approximately 1.5 km. This area subtends an arc of 3° from Lookout Mountain. From Mt. Morrison, where two "cancellation" antennas are installed (Channel 14 and Channel 20), an arc of only 2.5° is subtended by the site because of its location (essentially due south) and distance from Table Mountain.

"Cancellation" is, in reality, a field strength reduction by creation of an interfering signal at a desired point (in space); this interfering signal must be of the proper phase and amplitude to "cancel" the direct signal (ideally, a signal of equal amplitude and opposite phase [-180°] would provide "total" cancellation). The relative phase of the interfering and direct signals is determined by the electrical (time) phases at the antenna input ports and the space-phases determined for the specific frequency by the lengths of the paths between the two transmitting antennas and the receiver.

The path lengths for the direct and interfering signals are not identical since the apertures of main and cancellation antennas are not common and, in fact, are separated by more than 10 wavelengths at the visual carrier frequencies. In practice, the cancellation antenna input signal phase and amplitude are varied while monitoring the field strength at the visual carrier frequency on the Table Mountain site to find the relatively "sharp" nulling of the signal; under conditions of visual carrier nulling, the effect on the aural carrier level (4.5 megahertz removed) is very small. While reducing a narrow-band (200 kHz) analog TV carrier by 10 dB or so is feasible with this technique, it does not follow that the technique is applicable to the task of uniformly cancelling a wideband signal.

However, our concern in this proceeding is the transmission of wideband digital signals. The digital energy is uniform throughout its 6 MHz spectrum with the exception of a narrow pilot signal which has a peak power of approximately 6 dB greater than the average power of the broadband signal [the effective radiated power (ERP) for a DTV station is specified in terms of average power while the ERP for an analog station is expressed in terms of peak power at the visual carrier]. It is impossible to provide an across-the-band uniform reduction of the wideband DTV signal using "cancellation antennas" because of the complex variations of phase vs. frequency and these techniques have no applicability to the DTV signal problem.

Thus, for DTV purposes, only directional antennas can be employed for this purpose and, because of the nature of such antenna designs, the arc over which signal reduction must be applied in order to achieve the desired reduction in the relatively small null area is significant enough to cause large areas to be affected by the reduced signal (loss of coverage) and, further, these effects will be significantly greater from a site which is closer to Table Mountain (e.g., Eldorado Mountain) resulting in a significant increase in the affected area. By overlooking these "technical details" HLM has come to the clearly inappropriate conclusion that there is no difference between the LCG Lookout Mountain site and Eldorado Mountain with respect to Table Mountain issues. The earlier conclusion of the Browne Report is appropriate and is based on scientific fact.

In summary, the Table Mountain issues are significant and cannot be dismissed by off-hand references to the use of techniques which either are ineffective for a broadband signal (cancellation antennas) and / or which involve significantly more adverse effects to coverage / service when the use of practical antenna systems are assumed by HLM.

Coverage / Service

In section 2.6 of its filing HLM introduces several "coverage maps" which it purports will demonstrate the superiority of sites other than Lookout Mountain and, in particular, the merits of Squaw Mountain (a site conveniently located outside of Jefferson County). While HLM dutifully identifies the source of these maps (prepared by Jay Jacobsmeyer, P.E., on behalf of a client unsuccessfully seeking approval of yet another site in Jefferson County, Mt. Morrison), HLM neglects to relate the context in which the maps were originally prepared and presented. In fact, Mr. Jacobsmeyer was, in that proceeding, using the maps to support his contention that Squaw Mountain is an inferior site. Mr. Jacobsmeyer has further advised me that he did not give permission to HLM to use his materials (prepared on behalf of his client) in the instant proceeding nor was such permission sought by HLM. Attached hereto is Mr.

Jacobmeyer's statement to this effect. Since HLM neither prepared this "supporting" documentation nor caused it to be prepared in its behalf, it cannot attest to the underlying parameters, assumptions and methodologies and the Commission should, therefore, disregard these unsupported documents as baseless in the context of this proceeding.

HLM demonstrates a lack of understanding of the nature of a broadcast service when it implies (at p-5) that the size of the coverage area is the most important factor. While area served is, of course, meaningful, an equal or more important factor is the population served. The Browne Report provided the results of applying FCC prediction methodologies to determine the population served from sites under consideration. HLM, rather disingenuously, ignores this data which clearly shows that the Squaw Mountain site is significantly poorer than the Lookout Mountain site in terms of service to the public.

Using the Commission's 41 dBu signal contour requirement as the definition of coverage, the Browne Report provided data showing that the principal counties of the Denver ADI would suffer a loss of 131,000 viewers if the DTV stations were operating from Squaw Mountain. The 41 dBu service contour is also referred to as the noise limited contour by the FCC. This means, statistically speaking, that the limit of reception will occur at this signal level at 50% of the locations 90% of the time; the cliff-edge effect will result in a "crash" of the receiver at this point. The FCC currently requires that the principal city (city of license) be encompassed by the 41 dBu contour.

Since the date of preparation of the Browne Report, the Commission has proposed in MM Docket 00-39 [Biennial Review of Commission's Rules and Policies Affecting the Conversion to Digital Television] to require that each DTV station provide a higher minimum signal level to its city of license in order to increase the probability of providing reliable service to the public. For UHF stations the proposed field strength is 57 dBu. We have computed the coverage in the Denver Metro Counties [4/] for the sites under consideration using the proposed

[4/] The Metro Counties are defined by Arbitron, the TV rating service.

57 dBu criterion. Table 1 provides a tabulation of the results and a comparison of the 57 dBu vs. a 77 dBu estimate for indoor reception requirement (see below). The results are clear and convincing and do not alter the previous conclusions as to the best sites. HLM provides no data or projections of any sort other than the previously discounted maps lifted from an unrelated proceeding.

In the analog TV environment, broadcasters have learned from years of field experience that a 100 dBu signal strength is desirable to assure a high probability of "indoor" reception, i.e., reception using small, inexpensive indoor (set-top) antennas such as "bow-tie" and loop devices. This field strength is 20 dB higher than the so-called "city-grade" signal level of 80 dBu and is required to overcome building attenuation which ranges between 15 and 30 dB. If it is determined that 57 dBu is an equivalent principal city field strength in the digital environment, then it can be assumed that 77 dBu (57 dBu + 20 dB) would be an appropriate level to assure sufficient signal for general indoor DTV reception [5/].

Transmitters at the Lookout Mountain site will put the best signals where the population density is highest – a traditional broadcast concept and requirement. Perhaps, another way of looking at the "wasted signal" concept attendant to the use of Squaw Mountain will help demonstrate this conclusion. The predicted signal level at the boundary of the unshadowed coverage area (i.e., western boundary of the eastern plain) from a Squaw Mountain based facility is 104 dBu [F(50,90)]. The population served from Squaw Mountain within this high level contour is predicted to be just 32,670 persons. Comparatively, the population within the 104 dBu contour of a Lookout Mountain-based facility is 559,400 persons. The higher signal level, of course, increases the probability of service, particularly indoors, and clearly the Lookout Mountain site is vastly superior by making efficient use of the spectrum and power radiated. The HLM discussion of this (p-7) does not recognize this concept. The point is that high signal level areas improve the statistical probability of service and, as noted above, a Squaw Mountain location "wastes" most of this high signal level area.

[5/] Initial field experience indicates that adequate signal level is not the only requirement for reception of the 8VSB digital signal as multipath and other distortions may affect reception. Adequate signal level is a necessary condition but not guarantor of reception.

Denver Metro Counties

	Households	Lookout Mountain		Eldorado Mountain		Squaw Mountain		Sedallia		Ramstetter	
	dBu	57	77	57	77	57	77	57	77	57	77
Adams	106,947	106,910	106,730	106,914	106,822	106,924	106,897	106,899	103,406	106,914	106,775
Boulder	94,621	88,554	82,605	92,374	84,850	30,634	16,027	82,281	36,320	56,596	44,052
Denver	239,636	239,636	239,636	239,636	239,636	239,636	237,586	239,636	239,636	239,636	239,636
Douglas	22,291	21,872	20,680	21,456	20,402	20,882	19,226	22,121	22,000	21,171	20,521
Jefferson	178,611	174,365	168,238	170,965	163,350	163,647	116,154	168,997	158,066	173,531	158,197
Total	642,106	631,337	617,889	631,345	615,060	561,723	495,930	619,934	559,428	597,848	569,181
%	100	98.3	96.2	98.3	95.8	87.5	77.2	96.5	87.1	93.1	88.6

Δ				
	Lost Households *	2,829	121,959	58,461	48,708
	Lost Population **	6,903	297,580	142,645	118,848

* Households lost for indoor reception relative to Lookout Mountain

** Households times 2.44

Co-location

HLM (at 2.2, page 3) attempts to discount the Browne Report finding that a high degree of co-location is desirable. HLM is correct in its assumption that a factor in arriving at this conclusion is economic; clearly, a joint-use site serving multiple licensees and housing analog and DTV facilities has many obvious economic advantages. However, HLM errs by disregarding the technical issues attendant to co-location as discussed in the Browne Report; there are many technical factors which out-weigh the economic considerations; in addition, consolidating most of the FM and TV stations on a common site / tower would improve aesthetic impact by causing at least three towers to be removed (with another likely) and, further, the consolidation will greatly improve the RFR environment.

A principal technical concern is with adjacent-channel facilities which are not co-located and which have the potential for creating mutual interference; this potential increases as the separation (distance) of the facilities increases [6/] and is exacerbated by differences in operating power levels and differences in antenna elevation patterns. Of particular concern is the relationship between adjacent-channel analog and DTV facilities where the potential for adjacent-channel interference is particularly high. As noted in the Browne Report, there are several adjacent-channel relationships in the Denver scenario proposed for Lookout Mountain:

Channel	
16	DTV
17	DTV
18	DTV
19	DTV
20	NTSC (analog)
34	DTV
35	DTV

[6/] The interference occurs when one signal is significantly stronger (26 dB) than the other at the receiver. Co-location promotes delivery of relatively equal signal levels at all receivers.

There are also significant "taboo" interference issues related to image frequency interference which can be caused to Channel 20 (analog) by the DTV stations on Channels 34 and 35. Furthermore, KTVJ operates from Mt. Morrison on Channel 14 and has been allotted Channel 15 for DTV use; moving Channel 16 any farther away from Channel 15 (Mt. Morrison) than presently contemplated will greatly increase the potential for adjacent-channel interference between Channel 15 and Channel 16.

Related co-location problems include the necessity to keep KUVO-FM co-located with Channel 6 (KRMA-TV) because of FCC regulations regarding interference. While it is acknowledged that there is no need to relocate Channel 6 or the FM stations occasioned directly by the DTV build-out, attention is directed to the section of this report (below) dealing with RFR issues.

No site was "eliminated", as suggested by HLM, because of a co-location issue. In fact, FM co-location was given a weighting factor of only 2 as compared to a maximum possible of 5 (and this is a multiplier) whereas environmental factors were given the highest weighting; the maximum point difference, between the worst rated FM co-location scenario and the best, is 8 points (compared to a median score of 374) accounting for approximately 2% of the total score. Regardless of one's perspective, this was hardly a major issue in arriving at the final recommendation and certainly was not the cause of the "elimination" of any site.

Shadowing & Multipath

The HLM document makes light of reflection phenomena (multipath propagation) and its authors clearly have not studied the geometry of multipath reflection scenarios; had they done so the would have realized the importance of factors such as angle of incidence, the ratio of the transmitter / reflector / receiver path length to the direct distance between the receiver and the transmitter, and delay spread. In the case of transmitting antennas sited at

Lookout, there will be minimal reflected energy reaching the lower elevation "eastern plains" because of the propagation geometry; also, LCG proposed to use directional antennas to limit RFR to the west of Lookout Mountain which would also reduce reflected energy from "main beam" illumination by over 10 dB. Conversely, use of a relatively low antenna in eastern plains – of necessity, well removed from the Denver metro area because of FAA constraints – will result in very strong reflections being a significant problem on the west side of Denver. (This phenomenon is already being experienced in connection with a temporary DTV broadcast installation sited on the tallest building in downtown Denver. Furthermore, at any transmission site east of Denver, it would be unacceptable to reduce radiation to the West (i.e., back towards to the city) in order to minimize reflections from the mountains as this would reduce the signal levels available to the most populous areas and, for a given static reflection scenario, would have no impact on the desired (direct) and undesired (reflected) signal ratio which would remain constant.

Given all of the reflection scenario issues involved, it is clear that a site on and near the terminus of the higher terrain to the West of Denver is the best place to site a DTV transmitter. Lookout Mountain meets this requirement.

On-Channel Repeaters

HLM states that Browne "*... does not consider the availability of On-Channel-Repeaters [3] that may give even superior performance, with a minor increase in costs to sites such a Squaw Mountain ....*". Before addressing the technical question posted, attention should be given to the precise engineering terminology used in this statement; in particular, consider "may", "superior performance" (to what?) and "minor increases in cost." HLM infers throughout its filing that the Browne Report lacks specificity yet it resorts to dismissal of a major finding of the report with such equivocation on this and other topics.

Nevertheless, the Browne Report did consider alternative technologies (see Shadowing Mitigation, p13,14) and concluded that on-channel repeater technology is not applicable to the solution of shadowing problems which would result from the use of a westerly site such as Squaw Mountain. HLM makes reference to a report [Z/] prepared under the sponsorship of the ATTC which describes the use of an On-Channel Repeater to repeat the signals of WETA-DT (Washington, DC) into a West Virginia valley formed by the Blue Ridge Mountains.

The scenario discussed in this ATTC report is that of an area totally isolated by terrain which is served by a repeater [which radiates no signals into populated areas which are served by the main (originating) transmitter]. In other words, there is no possibility that the repeater signals will interfere with the direct off-air reception of the station in areas where line-of-sight exists. The principal problem with digital on-channel repeaters operating inside the service areas to provide signals for terrain shadowed areas is precisely this type of self-interference. These areas are not "terrain isolated" and restricting the repeater's radiated signals to the area within the shadowed locales is a daunting task; likewise, signals received from the main transmitter which are reduced (but not totally blocked) by terrain anomalies will interfere with reception of the repeaters particularly in the partially shadowed areas.

In the digital realm, this interference appears as delayed signals (ghosts) which the receiver equalizer must eliminate in order to permit decoding of the signal; if the delay is beyond the equalization range, destructive intersymbol interference results. This is the same effect as caused by multipath propagation which, as field experience is now demonstrating, is the nemesis of 8VSB signal reception. While it is granted that other modulation schemes would be more robust under these conditions, the 8VSB system was the system (and still is) adopted by the FCC to the exclusion of others (such as COFDM, which performs acceptably under these conditions and, in fact, is used in single frequency network applications in the European DVB implementation).

[Z/] On Channel Repeaters for Digital Television Implementation and Field Testing, a presentation given at the 1999 NAB Broadcast Engineering Conference.

In conclusion, on-channel repeaters are not a solution to shadowing effects and have the potential for diminishing service rather than improving it in the specific Denver scenario (particularly in Boulder). The ATTC paper attached to the HLM filing sums it up nicely in its "Conclusions" where, in the first sentence it is stated *"The On Channel Repeater works in a terrain isolated scenario"* (emphasis added) [8/]. This is not the shadowing scenario present in the Denver case.

The Browne report also considered the use of translators. Assuming a DTV co-location site, all stations would have essentially equal needs for translators or repeaters; for just the LCG group needs, 5 new channels would be required at each translator site; the number of translator sites that would be required cannot be easily predicted but it is estimated that 3-5 such sites might be required to replicate service if a site such as Squaw Mountain were employed. This means that 15-25 new TV channels would be needed. In the already crowded spectrum to be occupied by twice as many broadcast stations (analog and DTV) as at present and where the total available spectrum is being reduced by 18 channels (a 27% reduction) in FCC reallocation schemes, it is unlikely that sufficient spectrum would be available to accommodate translators. Finally, the translator service is secondary, i.e., a translator has no status or permanent protection relative to the primary broadcast purpose of the spectrum and long-term availability of the channels for this purpose is not guaranteed.

Radio Frequency Radiation (RFR)

There is a pre-existing RFR problem at the Lookout Mountain antenna farm due, in large part, to the FM stations located on the site; low gain, wavelength element-spacing antennas at relatively low elevations are the major contributors to this problem. As part of its project, LCG had proposed to construct a master antenna system with reduced element spacing at a significantly higher (above ground) elevation; doing so would have eliminated the

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[8/] supra, page 6

ground level RFR problems near the tower base and significantly reduced the overall RFR levels generally. The resulting RFR environment would have improved by an order of magnitude in many locations.

HLM states (at 2.4) that this improvement claim *"... is based on the assumption that many of the FM stations on Lookout Mountain would move to the proposed LCG tower. LCG has never presented evidence that any of the FM stations have agreed to move to the proposed LCG tower."* This latter statement refers to a non-technical issue but HLM must include it because it knows well that the premise is correct: the proposal would significantly improve the overall RFR situation. The County did not cite the lack of signed agreements with the FM stations as a reason for turning down the LCG proposal rather, it cited the fact that a few areas to the West of the proposed tower (approximately 4-5 miles away on higher terrain) would have RFR levels increased to 1% of the public exposure MPE. HLM states *"[O]bviously it is more sensible to place the new DTV transmitters at a site that is not already subject to excessive RFR."* In other words, HLM wants to keep the present sources of high level RFR where they are (at measured levels approaching the allowable limit), and prevent the construction of a new facility which would dramatically reduce maximum RFR levels and improve the overall RFR scenario because a nearby area would experience an increase in RFR levels to 1% of the allowable limit. Yet, HLM argues for placement of any new source of RFR in someone else's backyard as the preferred solution.

This brings into focus the methodology that should be used in determining whether a site is acceptable in terms of RFR exposure. If one assumed that the RFR issue is health related, then it seems reasonable to further assume that there must be a threshold level above which a risk to health is presented by RFR. Given this assumption, it does not seem valid to consider the number of persons (residents) exposed to levels less than the threshold value as a criterion for evaluation because this assumes that there is an undesirable effect at levels below the threshold which, of course, is antithetical to the concept of a threshold. Thus, statements such as *"... even though the number of residences is extremely small compared to the number near the Lookout Mountain site, the presence of these residences*

tends to detract from the desirability of this site as a high power broadcast site" (HLM @ p-9) have no place in a scientific discussion.

HLM would leave the casual reader to believe that the broadcast users of the Lookout Mountain Antenna Farm intentionally ignored established design criteria to produce a hodge-podge of RF emitters which were non-compliant with the FCC RFR requirements. In fact, the facilities on Lookout Mountain pre-date any RFR regulation and, in fact, were in compliance with the Commission's initially adopted non-ionizing radiation limits; non-compliant conditions were created by a subsequent change in the Commission's rules in recognition of ANSI C95.1-1992 and NCRP [9/] recommendations. Also, upon being advised of non-compliant "hot-spots", the offending stations have reduced power to effect compliance.

Furthermore, HLM disingenuously ignores the fact that the proposed LCG's facility would have reduced RFR levels significantly, mainly as a result of consolidating most FM antennas on a master antenna located substantially higher than present antennas and designed to reduce "downward" radiation. These antenna systems were described in filings made to Jefferson County and during the public hearing in connection with the zoning matter. Included were the results of studies which demonstrated that only very small non-controlled areas were predicted to have RFR levels in excess of 5% of the public MPE. This compares very favorably with the existing situation where levels approaching the FCC and Jefferson County limit are present.

Residential and Business Interference

HLM (at 2.5) claims that there is significant existing "interference" to the high-tech community, the Colorado School of Mines and residences located in the area surrounding Lookout Mountain. What is interesting about this statement is the fact that the TV broadcast environment on Lookout Mountain has been relatively static for over 40 years with no major

[9/] National Council on Radiation Protection

changes in the VHF TV facilities and the FM broadcast stations have been in-place for approximately 25 years. The development around Lookout Mountain has, in large part, occurred subsequent to the installation of broadcast facilities on Mt. Morrison.

HLM's claims of "interference" are supported only by vague references to garage door opener types of problems with no data or analysis to identify source(s) or interference mechanisms being presented. The broadcasters, of course, agree to comply with all FCC requirements regarding interference to other users of the spectrum.

Specific Site Comparisons

The Browne Report, while essentially eliminating only a few of the sites evaluated, attempts to rank the remaining sites and suggest a site which best meets the need of the LCG group of stations; it concluded that the Lookout Mountain site is the best. This conclusion is, of necessity, based on the assessment of many criteria and the author's opinion as to the appropriate magnitude and weighting assigned to each criterion. In attempt at providing a foundation for objectivity a scoring system was devised. HLM also believes in use of a scoring system but, in an attempt to roll weighting and attribute magnitudes into one value, dilutes the importance of having a common weighting applied to the same criterion for each site. This only proves to be a convenient methodology for skewing the results of the analyses to yield a favorable outcome from its perspective.

HLM proposes two – previously not considered – sites for comparison purposes but presents no coverage / service data other than that "borrowed" from a filing prepared by another party. The "Ramstetter" site proposed by HLM is very close to "Site D" referenced in the Browne Report as surmised by HLM. Also proposed by HLM is a site referred to as "Sedallia". Therefore, it must be assumed that the coverage comparisons in the Browne Report are unchallenged with respect to area and population statistics.

Methodology

The Browne Report presented a methodology for ranking the attributes of the sites under consideration. A significant part of this effort was based on the opinion of the author as to the relative importance of each of the evaluation criteria, on a weighting scale of 1-5, with 5 implying a very important requirement. For example, the probability of FM co-location (a desirable feature) was given a weighting of only "2" while Table Mountain, Environmental and Zoning issues rated a "5" (an essential feature / requirement). The degree to which a particular site attribute complied with the requirement (status) was estimated on a scale of 0-9 (9 being most compliant). The products of weighting and status factors were summed to provide a total score. While there are arguably many other methodologies available to arrive at an overall "rating" for a particular site, this approach was selected because it is straightforward and incorporates a weighting system such that less important factors are not given the same weight as critical elements. Any approach involves a fair amount of subjectivity coupled with (objective) facts but the author of the report was properly charged with rendering an opinion as to the best site for the LCG partners.

HLM challenges the methodology and proposes an alternative approach. Its opinions, however, are not necessarily based on professional objectivity given the relationship between CARE and HLM as noted above. Equally significant is the HLM effort to "simplify" the ranking process by having all weights equal to 10% which is explained-away as a "standard scoring methodology."

By combining RFR (a health and safety of life issue) with interference (an inconvenience issue) the HLM report trivializes the importance of RFR concerns. How do you equate garage door opener problems with RFR exposure? Or, stated differently, if for a particular site / configuration garage door openers work perfectly but RFR is greater than desirable, how do you rate this category?

HLM devotes much space to the issue of RFR so such an approach is puzzling. Given its emphasis on RFR, it would not have been unexpected if a weighting of 30% or more had been applied to its analysis; since its combining methodology (algebra) is not explained, one would have to assume either a 5% weighting (30% less than the weighting used in the Browne Report) was used or that there is yet another, undefined, weighting system internal to the now-combined 10% weighting factor.

This approach is used again to lump disparate considerations "FCC Issues" (relating to station separation or other FCC constraints), "DTV Interference" (relating to interference which would be caused to other DTV or analog stations because of siting changes [10/]), and FM Co-location (as noted above, a desirable feature but not as important as the other considerations now lumped in this single category). Does this mean each of these sub-categories contribute 3.33% of the total? If not, what?

The reworked ranking system proposed by HLM is incomprehensible and does not appear to be based on sound engineering or mathematical principles. It is a good example of adjusting the methodology to produce the desired results. HLM has gerrymandered the weighting and rating methodology to achieve the outcome it desires. It has inexplicably and unscientifically combined various disparate considerations by effectively assigning equal weight (importance). This is particularly difficult to understand in its treatment of perceived RFR concerns; some of its other weightings are equally puzzling and appear to be based on a lack of understanding of the underlying issues.

10/ Such interference could limit the maximum power used by a station or require use of a directional antenna, either of which would cause a reduction in service.

Miscellaneous Matters

When discussing the Green Mountain site HLM contends that the Browne Report assignment of a "3" in its ranking of FAA issues should have been a "0" thus eliminating it from discussion. A "0" would only be apropos if a study had been conducted by the FAA and a "Determination of No Hazard to Air Navigation" issued. It cannot be predicted with any precision whether such a determination will be issued by that agency since the FAA has some degree of discretionary latitude in making aeronautical studies.

HLM states that the County denied the LCG proposal for Lookout Mountain based on *"...a safety issue associated with tower fall."* While this statement is correct, HLM totally ignores the testimony and filings made as part of the record in the proceeding:

- there are thousands of towers in the US which, if they fell full-length (i.e., as an intact monolithic structure), would exceed the property boundaries and many of these are in what are now residential areas;
- guyed structures, such as the proposed tower, do not collapse full-length and, in fact, typically collapse within a radius equal to 25% of the height;
- LCG proposed to design the tower in a "fail-safe" manner and to incorporate features which would control the collapse area;
- LCG presented expert testimony from the foremost consulting structural engineers in the field of tower design which confirmed all of the above;
- neither CARE nor the County introduced any expert testimony regarding tower collapse issues.

There is no safety issue and the County – whose planning department originally recommended approval – found a convenient factor on which to base a denial.

Certification

This statement with associated exhibits was prepared by me or under my direction. All assertions contained in the statement are true of my own personal knowledge except where otherwise indicated and these latter assertions are based on information from sources known to be reliable and are believed to be true.

John F.X. Browne, P.E.
June 6, 2000

Pericle Communications Company

June 1, 2000

Via Fax & Federal Express

Mr. John F.X. Browne
John F.X. Browne & Associates, P.C.
500 N. Woodward Avenue
Bloomfield Hills, MI 48304-2964

Subject: Alternative Analysis of DTV Tower Sites in Denver Area

Dear Mr. Browne:

I have read the report entitled "Alternative Analysis of DTV Tower Sites in Denver Area," authored by Alfred Hislop, Ronal Larson and James Martin. I noticed that the authors used several coverage maps prepared by me to support their claims. These coverage maps were prepared for an entirely different proceeding in Jefferson County, Colorado. I did not give permission for their use in this proceeding.

The coverage maps are presented in a way that is grossly out of context. The maps show predicted signal strength only and do not indicate the amount of delay spread. In other words, some areas with relatively strong signal strength might have delay spread that would preclude adequate DTV reception. This is especially true for Squaw Mountain because of the substantial shadowing that occurs along the front range for signals transmitted from this site. It is also true to a lesser extent for Eldorado Mountain because the site is located well north of the metropolitan area.

In short, these coverage maps were not prepared for this proceeding, were used without permission, and are not appropriate exhibits for the purpose the authors are trying to accomplish. If I can be of further help, feel free to contact me at (719) 548-1040.

Sincerely,

Jay M. Jacobsmeyer, P.E.
President

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Denver Area TV Stations
Issues Relating to Table Mountain
in the
Transition to Digital Television
Prepared by
John F.X. Browne, P.E.

The Federal Communications Commission (FCC) has promulgated new Rules and Regulations requiring the television broadcast industry to convert to a new system of digital television transmission (DTV). A timetable has been established which requires the major network affiliates in TV markets 11-30 to have initial DTV operations on-air by November 1999. This mandate includes Denver.

The stations must construct completely new transmission facilities including transmitters, antennas and towers; these will be major undertakings. Part of the process will be to design and specify the transmitting antennas so that the coverage of every DTV station replicates the coverage achieved by the existing analog stations. These antennas will be custom built to meet each individual station's requirements and, therefore, an unusually long lead-time between ordering and delivery is necessary. The Denver stations are now at the point in their time lines where orders should be placed so that FCC mandated timetables can be met.

The aforementioned March meeting with FCC/Commerce was not the start of this process. In fact, correspondence and telephone calls were exchanged as early as October 1997 with the FCC and December 1997 with Commerce. It would appear that Commerce is not inclined to consider this proposal in a timely fashion.

While this paper is intended to set forth the technical issues in layman's terms, it should be noted that detailed technical explanations have been provided by the broadcasters to the FCC and Commerce. It should also be noted that significant questions have been raised regarding the need for "protecting" a major portion of the broadcast spectrum when Commerce apparently is able to describe neither the research activities actually underway at Table Mountain nor the standards governing the performance of receivers under test. Thus, broadcasters are left with only an archaic requirement designed to address a completely different problem when, clearly, a new standard is required.

John F.X. Browne, P.E.
May 15, 1998

Table Mountain Measurements

FIM-71 Field Strength Meter

Measuring TV Signal

Bandwidth Spec: 450 kHz

- If one assumed power uniformly dispersed throughout 6 MHz bandwidth, total power would be increased by

$$10 \log \frac{6000}{450} = 11.25 \text{ dB}$$

- Thus, "field strength" of 30 mV/m is 89.5 dBu is measured at single frequency and is equal to

$$\left[\frac{.03 \text{ v}}{\text{m}}\right]^2 \times \frac{1}{377} = 2.387 \times 10^{-6} \text{ W/m}^2$$

$$= -60 + 3.78 \text{ dBw/m}^2$$

$$= -56.2 \text{ dBw/m}^2$$

- With uniform distribution of 12 such carriers placed 500 kHz apart in 6 MHz bandwidth, the total power would be 10.8 dB higher or -45.4 dBw/m^2.

- If one assumed that the DTV signal measured in 500 kHz bandwidth = -56.2 dBw/m^2, the total power would be 11.25 dB higher or -44.95 dBw.

- Stated another way, the DTV signal should be measured the same way as the analog signal is now being measured, i.e., in (approximately) a 500 kHz bandwidth.

A 1,000 kW DTV station at Lookout Mountain would have a power flux density over Table Mountain of

$$\frac{1 \times 10^6 \times 1.64}{12} = \frac{1}{4\pi(43.1 \times 10^3)^2}$$

$$\frac{0.137 \times 10^{-6}}{4\pi(1.86 \times 109)} = \frac{5.9 \times 10^3}{10^9} = 5.9 \times 10^{-6}\ w/m^2$$

$$= [-60 + 7.7]\ dBw/m^2$$

$$= -52.3\ dBw/m^2$$

Reducing power towards Table Mountain by 4 dB would produce the same PFD in 500 kHz as the present NTSC TV signal.

CERTIFICATE OF SERVICE

I, Joseph C. Fezie, a secretary in the law firm of Holland & Knight, LLP, do hereby certify that on June 8, 2000, caused to be mailed by first class mail, postage prepaid, copies of the REPLY COMMENTS OF LAKE CEDAR GROUP, LLC on its Petition for Expedited Special Relief and Declaratory Ruling.

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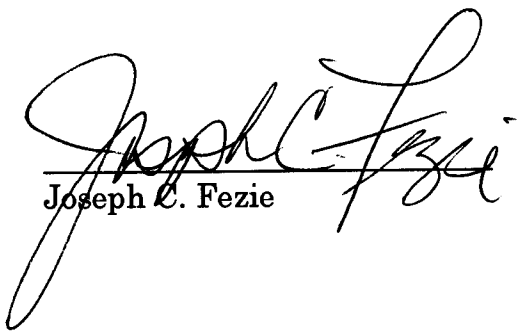

Joseph C. Fezie

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