

**DECISION of the SNOHOMISH
COUNTY HEARING EXAMINER**

DATE OF DECISION: October 15, 2008

PLAT/PROJECT NAME: **CAAM PARTNERSHIP, LLC**

APPLICANT/
LANDOWNER: CAAM Partnership, LLC

FILE NO.: 07-109195-000-00-LU

TYPE OF REQUEST: Major Revision to a Conditional Use Permit (CUP)

DECISION (SUMMARY): **DENIED**

BASIC INFORMATION

GENERAL LOCATION: 11304 132nd Street SE. At the SW corner of the intersection of Short School Road and 132nd Street SE, in the NE ¼ Sec:31 Twp: 28 Rge: 6

ACREAGE: 39.75 acres

ZONING: Agriculture-10 Acre (A-10)

COMPREHENSIVE PLAN DESIGNATION:

General Policy Plan Designation: Riverway Commercial Farmland

UTILITIES:

Water: N/A
Sewer: N/A

SCHOOL DISTRICT: Snohomish SD No. 201

FIRE DISTRICT: No. 4

PDS STAFF RECOMMENDATION: Approve with conditions

INTRODUCTION

The applicant filed the Master Application on July 31, 2007. (Exhibit 1)

The Department of Planning and Development Services (PDS) gave proper public notice of the open record hearing as required by the county code. Exhibit 15 (Affidavit of Mailing); Exhibit 16 (Affidavit of Notification by Publication); Exhibit 17 (Posting Verification).

PDS adopted the environmental documents on September 12, 2007 from the original CUP proceeding with an addendum.

Deputy Examiner Ed Good held open record hearings on October 30, November 1, and November 2, 2007 on the major revision, and the undersigned Examiner held further hearings limited to evidence and argument concerning the cumulative health effects of the electromagnetic radiation from the six towers on April 1, 2, and 3, 2008. Witnesses were sworn, testimony was presented, and exhibits were entered at the hearing.

NOTE: The oral transcript is hereby made a part of the record in this matter. For a full and complete record, a verbatim recording of the hearing is available in the Office of the Hearing Examiner. Copies of verbatim transcripts are also exhibits in this matter.

This is a request for a major revision to a CUP. The criteria are exactly the same as an application for an original application for a CUP. SCC 30.42.110(1)(b). They are:

1. The hearing examiner may approve, approve with conditions, or deny a conditional use permit only when all the following criteria are met:
 - (a) The proposal is consistent with the comprehensive plan;
 - (b) The proposal complies with applicable requirements of this title;
 - (c) The proposal will not be materially detrimental to uses or property in the immediate vicinity; and
 - (d) The proposal is compatible with and incorporates specific features, conditions, or revisions that ensure it responds appropriately to the existing or intended character, appearance, quality of development, and physical characteristics of the site and surrounding property.

2. As a condition of approval, the hearing examiner may:
 - (a) Increase requirements in the standards, criteria, or policies established by this title;
 - (b) Stipulate the exact location as a means of minimizing hazards to life, limb, property damage, erosion, landslides, or traffic;

- (c) Require structural features or equipment essential to serve the same purpose set forth in 30.42C.100 (2)(b);
- (d) Impose conditions similar to those set forth in items 30.42C.100 (2)(b) and 30.42C.100 (2)(c) as may be deemed necessary to establish parity with uses permitted in the same zone in their freedom from nuisance generating features in matters of noise, odors, air pollution, wastes, vibration, traffic, physical hazards, and similar matters. The hearing examiner may not in connection with action on a conditional use permit, reduce the requirements specified by this title as pertaining to any use nor otherwise reduce the requirements of this title in matters for which a variance is the remedy provided;
- (e) Assure that the degree of compatibility with the purpose of this title shall be maintained with respect to the particular use on the particular site and in consideration of other existing and potential uses, within the general area in which the use is proposed to be located;
- (f) Recognize and compensate for variations and degree of technological processes and equipment as related to the factors of noise, smoke, dust, fumes, vibration, odors, and hazard or public need;
- (g) Require the posting of construction and maintenance bonds or other security sufficient to secure to the county the estimated cost of construction and/or installation and maintenance of required improvements; and
- (h) Impose any requirement that will protect the public health, safety, and welfare.

SCC 30.42C.100.

PROCEDURAL RULING

1. The Applicant filed a motion to strike an attachment to the Day's brief and all references in the Day's brief related to it. Exhibit 450. The motion is granted.
2. The Examiner takes official notice of the final decision by the Federal Communications Commission (FCC) in *In Re* KRKO (AM), Finding of No Significant Impacts informal objection, DA 08-1272 (May 30, 2008), as requested by Applicant.

FINDINGS OF FACT

Based on all of the evidence of record, the following Findings of Fact are entered.

I. Background

1. The master list of exhibits and witnesses which is a part of this file and which exhibits were considered by the Examiner is hereby made a part of this file as if set forth in full herein.

2. Summary of Proposal: The applicant, CAAM Partnership LLC, is requesting approval of a major revision to approved CUP 00-107495 LU to add two 199-foot tall Medium Wave AM Radio Antennas to the currently approved facility. The existing CUP is for operation of four AM radio antennas (KRKO), the tallest of which is 349 feet. The other three are 199 feet. Per FAA regulations the antennas are not required to have warning lights. The antennas will be a dull gray in color. The antennas will be elevated approximately sixteen (16) feet in the air, to be above the 100 year base flood elevation. The overall antenna height includes the height required to elevate the antenna above the 100 year base flood elevation. The project site is illustrated at Exhibit 13.38. (Exhibit 81)

The antenna will be serviced by the equipment building that was approved in the original CUP. There is no new or additional equipment building associated with this project. The antennas will be supported by foundations which will sit on piles that are driven into the ground down to bearing. Ground wires will be placed up to 18 inches below the ground, in a circular pattern around each antenna, similar to the spokes of a bicycle wheel. (Exhibit 81) Although the applicant stated that 99% of the site would be available for agricultural production, there is no requirement or specific plans indicated in the record that it would be placed in agricultural production. (Exhibit 451, TR. Vol. 1 p.15-16 (10/30/07); Exhibit 451, TR. Vol. 1 p.86-87 (10/30/07)).

In the United States, no Medium Wave or AM station may operate with antenna input powers exceeding 50,000 watts. (Exhibit 13.69. p.1) Thus, each of the two stations that would exist if the requested revision is granted would operate at the maximum power authorized by federal law.

3. Site Description: The site is located in the Upper Snohomish River Valley (the Valley) between Fiddler's Bluff on the west (the Kenwanda neighborhood) and Lords Hill on the east. The site is 39.75 acres and is undeveloped farmland that is currently being developed with the four antennas and equipment building approved under the original S-R Broadcasting CUP (Exhibit 13.5). The topography of the site is generally flat. The site is located slightly east of the Snohomish River. The property between the site and the river is undeveloped and has an earthen berm that extends north and south through and beyond the property borders. (Exhibit 81)
4. Adjacent Zoning/Uses. The Valley area around the subject site is zoned A-10 and is made up predominantly of large undeveloped parcels devoted almost exclusively to agricultural use. Mostly agricultural fields, it contains several farm building complexes typical of dairy farms and crop production as well as associated residential dwellings. The Craven Farm lies directly to the southeast across Short School Road. Craven Farm has converted from traditional agriculture to direct marketing efforts, a trend in agriculture also known as agro-tourism and destination agriculture. Some of the uses that Craven Farm offers are a Pumpkin Patch with a corn maze, weddings/receptions, company and organizational retreats and antique sales and shows. (Exhibit 81)

The Zylstra Farm lies further to the south, with the main farm buildings located just prior to the Short School Road meeting up with the Snohomish River's east bank. There are a couple of separate dwelling/small farm building groups located to the south of the subject property. Several other farm building groups lie to the north where the Valley starts to broaden out into the main Valley. The small property adjacent to the southeast corner of the subject property used to be a Christmas tree farm (Deb's U-Cut) and the property now appears to be used solely as a single-family residence. The other farms in the Valley and northward to the main Valley are more traditional operations. (Exhibit 81)

The Bob Heirman Wildlife Park (BHWP) is located mostly on the west side of the River south of the subject property. The BHWP is a daytime park that does not allow camping and is used as a wildlife viewing area for recreationists, outdoor education and nature studies and is also used by fishermen for access to the river. The park extends from the wooded lower portions of the steep bank of Fiddler's Bluff to mostly prairie-like lowlands and channeled gravel bars and islands in the River outside of the dikes. Shadow Lake lies in the west portion below the steep bank. The BHWP has an extensive pedestrian trail system for park users, and a small parking lot and picnic tables on a bench on the west bank. Access is from Connelly Road. (Exhibit 81)

Fiddler's Bluff is located across the River to the west. The Kenwanda Golf Course and Kenwanda neighborhood are the predominant developments on Fiddler's Bluff. The Kenwanda neighborhood is on the east side of the bluff and is made up of single-family homes on small lots. The golf course is west of the development on top of the bluff. Lord Hill is to the east and is made up of mainly large parcels with single-family homes and outbuildings. (Exhibit 81)

There are 19 schools within 3.7 miles of the antennas. (Exhibit 437) Valley View Middle School sits upon Fiddler's Bluff in the Kenwanda neighborhood approximately $\frac{3}{4}$ of a mile west of the towers. (Exhibit 460, TR Vol. IV p. 321 (4/2/08); Cathcart Elementary (2 miles); Totem Falls Elementary; Snohomish High School (3 miles). (Exhibit 452, TR II at 185-86 (10/30/07)). According to one of the citizens who testified, there are approximately 29,000 citizens who reside within a 3.7 mile radius of the antennas. (Exhibit 464, TR Vol VIII p. 572 (4/2/08)).

5. Historical Chronological Background on the original CUP and SEPA Review for 00-107495 LU

The original CUP and shoreline management permit applications under file number 00-107495 LU & SM were submitted to PDS on October 11, 2000. The original application was for 8 AM antennas and 2 equipment buildings. Phase 1 was to be one equipment building and five 466-foot antennas. Phase 2 was to be the second equipment building and three 425-foot antennas. All antennas were to be supported by guy wires, and have safety lighting and orange and white safety painting. Based on comments received, PDS requested changes and the applicant redesigned the project to eliminate the guy wires by making the antennas self supporting and reducing the five 466-foot antennas to one 425-foot and the 7 other antennas from 425-feet to 199-feet. The 425-foot antenna was still painted orange and white and the 199-foot antennas were painted gray. A SEPA Threshold Determination of Nonsignificance (DNS) was issued on October 18, 2001. Two appeals of the DNS were filed, one by Citizens to Preserve the Upper Snohomish River Valley (CPUSRV) and Pilchuck Audubon Society (PAS) on November 1, 2001 and the other by Kandace A. Harvey dba Harvey Airfield and Harvey Airfield, Inc. (Harvey) on November 5, 2001. By Order issued December 24, 2001, the CPUSRV/PAS appeal was partly accepted for consideration and partly summarily dismissed, with the accepted topical issues specifically delineated. The applicant subsequently reduced the height of the single tall antenna from 425-feet to 349-feet thereby reducing the visual impact and the number of safety lights required. The Harvey appeal was later dismissed by stipulation on March 7, 2002. During the hearing, the applicant orally requested that the CUP and shoreline permit review be limited to Phase 1. However both Phase 1 and Phase 2 continued to be included in the environmental SEPA review. (Exhibit 81)

On July 31, 2002, the Deputy Hearing Examiner (Peter Donahue) issued a decision denying the CUP application¹. Concurrently by separate decision the Examiner, affirmed in part, the DNS, thus requiring preparation of a limited scope environmental impact statement². On December 2,

¹ Exhibit 8

² Exhibit 13.5

2002, the applicant, S-R Broadcasting, appealed the denial of the CUP to the Snohomish County Council.

On February 26, 2003 the Snohomish County Council, by unanimous vote (Motion 03-130)³, granted S-R Broadcasting's appeal in part as follows:

"The council hereby grants the appeal, in part, and the July 31, 2002 decision of the Deputy Hearing Examiner is reversed and the matter is remanded to the Examiner with instruction to grant the Conditional Use Permit, subject to the conditions stated in the PDS Staff Recommendation (Ex. 919), as may be modified by PDS staff to reflect changes in the proposal made by the applicant, and subject to SEPA. Should PDS conclude revisions are needed, the Examiner shall receive and incorporate revised conditions into his decision. Should the Examiner determine it is necessary, the hearing may be reopened for the limited purpose of considering comment on the revised conditions from the representatives of the Appellant/Applicant and CPUSRV before accepting the PDS recommendations."

On January 30, 2005, PDS issued the Final Environmental Impact Statement (FEIS)⁴. On February 11, 2005, CPUSRV filed an appeal challenging the adequacy of that FEIS.

On June 14, 2005 (and ending on July 13, 2005) an appeal hearing was held before Deputy Hearing Examiner Ed Good (the Deputy Examiner) on a single issue, the adequacy of the FEIS issued on January 30, 2005. On August 17, 2005 the Deputy Examiner issued an initial decision on this matter. Thereafter, petitions for reconsideration were timely filed by the appellant, the applicant, and Snohomish County. On October 4, 2005 the Deputy Examiner issued a revised decision remanding this matter to the Snohomish County Department of Planning and Development Services for further visual impact analysis with specific consideration of (1) a minimum of 50,000 recreational visitors annually to (2) a river valley of statewide significance.

On February 3, 2006, PDS issued an addendum to the FEIS⁵ and recommended conditions be added to the approval of the CUP for the facility.

On March 16, 2006 the Deputy Examiner issued a supplemental decision⁶ determining the adequacy of the FEIS with Addendum, approving the CUP denying the SEPA appeal.⁷

On March 30, 2006 CPUSRV filed an appeal of the CUP to the Snohomish County Council. A closed record appeal hearing was held on May 15, 2006. On June 7, 2006 the Snohomish County Council issued a decision (Motion 06-248) upholding the CUP approval and denying the appeal.⁸

On June 9, 2006 PDS issued a new Shoreline Permit PFN 00-107495-001 SM. On June 27, 2006 CPUSRV filed a LUPA appeal in King County Superior Court of the Council's June 7, 2006 decision approving the CUP and challenging the adequacy of the environmental review and

³ Exhibit 13.8

⁴ Exhibit 13.9

⁵ Exhibit 13.11

⁶ Exhibit 13.5

⁸ Exhibit 13.12

documents i.e. the DNS and FEIS with addendum. On June 27, 2006 CPUSRV also filed an appeal with the State Shorelines Hearing Board challenging the Shoreline Permit and the adequacy of the environmental review and documents i.e. the DNS and FEIS with addendum.

Hearings on the shoreline and environmental appeal were held on October 20, 23, 25, 30, 31 and November 1, 2006. On December 26, 2006 the State Shorelines Hearings Board issued a decision affirming the County's issuance of the Shoreline Permit and the adequacy of the DNS and FEIS with addendum.⁹ This decision was appealed to the Washington State Court of Appeals and was subsequently withdrawn by the appellant.

On January 18, 2007 the King County Superior Court issued a decision affirming the Council's approval of the CUP and denial of CPUSRV's appeal in the S-R Broadcasting application.¹⁰ This decision was appealed to Superior Court and was subsequently withdrawn by the appellant.

On April 6, 2007 permits were issued for the four antennas and the equipment building.

II. Public Comment/Issues of Concern.

6. During preparation of this application for public hearing, PDS received a number of comments and documents from the public. To provide a summary of what occurred in the file, the Examiner will simply quote the staff report (Exhibit 81):

As of the date of this staff report [October 23, 2007] PDS has received 40 comment letters¹¹, of which 23 expressed comments in opposition to and 17 expressed comments in support of the proposed revision to the Conditional Use Permit. Of the 23 comments in opposition 13 were the same letter signed by different people. Of the 17 comments in support 2 were the same letter signed by different people. The issues raised were; the environmental review completed under SEPA¹² has been inadequate; the project does not meet the county's criteria for granting a CUP; health effects from the RF emissions; the Council's appeal decisions were unlawful, impacts to avian species; effects on property values and interference with electronic devices.

Jennifer Dold of Bricklin Newman Dold, LLP, the attorney for the appellants CPUSRV in the original S-R Broadcasting CUP proceedings, submitted comments dated September 4, 2007 (Exhibit 23) with numerous attachments. The following are the five main issues she raised and a brief response to each issue:

1. Both the major modification to the CUP and the Shoreline Substantial Development Permit (SSDP) should be decisions made by the county hearing examiner after a hearing on the merits.

⁹ Exhibit 13.7

¹⁰ Exhibit 13.6

¹¹ Exhibits 23a through 23e and 26 through 65

¹² For the instant proposal and the original CUP under 00-107495 LU for S-R Broadcasting
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- PDS RESPONSE: The major revision to the CUP is before the Examiner and the Examiner will make the decision. The SSDP will be issued administratively by PDS and is not before the Examiner.
2. CAAM has the burden to demonstrate it meets all state and County requirements.
 - PDS RESPONSE: PDS concurs with this and believes the applicant has met this burden.
 3. Existing SEPA documents do not adequately identify and evaluate all of the significant impacts to be caused by CAAM's proposal for two additional antennas.
 - PDS RESPONSE: See the Project Chronology/Background section above and the Environmental Policy [in the PDS Staff Report].
 4. The applicant does not meet the requirements for a major modification to the existing CUP.
 - It is the position of PDS that the applicant has met its burden and the requirements for approval of the requested major revision to the existing CUP.
 5. The CAAM proposal does not meet all county and state requirements to obtain a SSDP.
 - The SSDP will be issued administratively by PDS and is not before the Examiner and therefore no analysis of the SSDP is included in this staff report. Analysis of the SSDP will be in the County's decision on the SSDP and sent to the Washington State Department of Ecology.

The following are the three main issues raised in the letters submitted and a brief response:

1. Newly documented, peer-reviewed studies which confirm earlier studies associating radio frequency radiation with increase risk of Leukemia in a radius as large as 6-10 kilometers.
 - PDS RESPONSE: The applicant has demonstrated that the proposed project will meet FCC standards and guidance for protection of human exposure to radio frequency radiation exposure. (Exhibit 13-68). With both KRKO 1380 AM and 1520 AM operating from the co-location facility there are no areas that are accessible from ground level that exceed the FCC exposure guidelines. After construction the site will be measured to assure that the FCC guidelines are met. A condition will be added that requires the applicant to submit, within 3 months of the 1520 facility going operational, the results of a supplemental RF emissions study showing compliance with FCC regulations.
 - PDS RESPONSE: FCC guidance to local governments advises that the "limits in the guidelines are designed to protect the public health with a very large margin of safety. The limits have been endorsed by federal

health and safety agencies such as the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA).¹³

- PDS RESPONSE: It is the position of PDS that the County defers to the FCC as the agency with expertise in regulations and guidance in the matters of radio frequency radiation. In rebuttal to the information submitted by Angela Day (Exhibit 35) the applicant has submitted evidence, (Exhibit 13-78) by Dr. Linda S Erdreich Ph.D, stating the new studies cited in the Angela Day comments are inconclusive as to the risk of exposure to radio frequency radiation and should not affect appropriate reliance on federal exposure standards.
2. Extensive flooding on the project site and in the Upper Snohomish River Valley in the past year.
- PDS RESPONSE: PDS is well aware that the site floods. That is the reason it has been designated as a Flood Hazard Area. A Flood Hazard Permit has been issued for the S-R Broadcasting antennas and equipment building and will be required for the proposed antennas. The structures are to be elevated approximately 16-feet above the ground level to be above the flood elevation.
3. Increased numbers of Trumpeter Swans and other avian species in the Upper Snohomish River Valley and new patterns of use – directly in the path of the proposed antenna structures – in the past year.
- PDS RESPONSE: It is the position of PDS that these arguments are the same made in the S-R Broadcasting CUP hearings before the Examiner, the County Council, Superior Court and the State Shorelines Hearings Board. In these prior hearings and decisions it was demonstrated that the proposed antennas will not present a collision danger to Trumpeter Swans or other avian species.

III. Compliance with Conditional Use Permit Criteria

A. Introduction

One issue is dispositive for the Examiner in this case, and that is in reviewing the third of the CUP criteria, the Examiner finds that the cumulative effects of the antennas are materially detrimental to uses and property in the immediate vicinity. There are no mitigating conditions that can ameliorate the impacts. In weighing the severity of the possible harm to the possible benefit of the project, the Examiner cannot conclude that risking possible adverse health effects to humans, especially children, is worth the potential benefit of another AM radio station. The Examiner recognizes that there may be many sources of radiofrequency radiation that are beyond the jurisdiction of the County, but this one is not. This is a situation where exercise of the precautionary principle is particularly appropriate. It is true that the science is not clear: the Examiner agrees that there is no clear evidence of adverse effects from radio frequency radiation (RFR). On the other hand, even the most skeptical scientist cannot rule them out. A group of credible scientific studies indicates that has been an association with an elevated risk of leukemia within 2-6 kilometers of AM transmitters. Dr. Samuel Milham, an epidemiologist with the Washington State Department of Health (DOH) for over 20 years and author of over 50 peer reviewed articles, recommended denial of the project based on its proximity to schools

¹³ Exhibit 13.78

and residences because of the potential health effects, and suggested that AM transmitters be located a minimum of five kilometers from residences to avoid adverse health effects to humans.

B. Background

1. State Environmental Policy Act (SEPA) Determination (Chapter 30.61 SCC)

The following is a complete summary of all of the SEPA history for this project. This project's SEPA review was covered by the first application for a CUP. However, the EIS was limited to the issue of aesthetic visual impacts. The Determination of Nonsignificance issued by the County for the original CUP discusses environmental health, but discusses only a concern with proximity to the antenna itself. The document states that per FCC regulations the antenna will be elevated 16 feet and surrounded by a six foot tall fence with barbed wire on top. There was no discussion of low level effects of nonionizing radiation.

2. A DNS was issued on October 18, 2001 pursuant to SEPA guidelines. Two appeals were filed. The first appeal was filed on November 1, 2001 by the Citizens to Preserve the Upper Snohomish River Valley (CPUSRV) and the Pilchuck Audubon Society (PAS) (CP). The second appeal was filed on November 5, 2001 by Kandace Harvey of Harvey Airfield Inc.¹⁴
3. Pursuant to an "Order of Partial Summary Dismissal", issued on December 24, 2001 by Deputy Examiner Donahue, the issues of appeal by appellants CP were limited to the topical areas discussed below:
 - a) Visual aesthetic impacts on the scenic resources of the Valley in general and those of BHWP, Lord Hill Regional Park, Craven Farm and Deb's U-Cut Trees specifically, caused by the antennas' visual appearance and their hazard lighting.
 - b) Wildlife migration, foraging and roosting habits caused by the antennas' comprising a physical and perceptual barrier to wildlife.
 - c) Parks and land use impacts to BHWP, limited to its own viability as wildlife habitat.
 - d) Radio frequency interference with the following electrical/electronic devices used in residential activity and commercial agricultural communications systems: telephones, computers, intercoms, walkie-talkies, public address systems, and hearing aids; and radio emissions/electromagnetic radiation causing physical hazard through electrical shock to humans; and
 - e) Recreation, limited to displacement of recreational ballooning and skydiving activities.
4. In his July 31, 2002 decision on the "Appeal from Determination of Nonsignificance (DNS) issued pursuant to the State Environmental Policy Act (SEPA) for the conditional use and shoreline management substantial development permits for eight-antenna medium wave AM radio transmission antenna tower facilities" Deputy Examiner Donahue granted the appeal in part, vacated the DNS and remanded environmental review to PDS for issuance of a limited scope Environmental Impact Statement (EIS) on the following issue of Aesthetic Visual Impact. This decision was NOT appealed by the appellant CPUSRV. In his decision the Deputy Examiner Donahue made the following Findings of Fact:

Impact by Radio Frequency Interference (RFI)

¹⁴ The Harvey appeal was withdrawn by the appellant and dismissed by stipulation on March 7, 2002
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55. Communications are elements of the built environment. [WAC 197-11-444(2)(d)(vi)]
- A. RFI or “blanket interference” can be generated by radio transmitting equipment. Measured on a horizontal field strength basis, the FCC standard of the likelihood and discernable effect of RFI is the one Volt/meter (1V/m) threshold, although discernable interference can occur at level as low as .5V/m. The anticipated 1V/m contour for the Phase 1 50kW transmitter has been mapped; approximately 270 parcels, 170 residences and 330 persons are projected to be affected by the 1V/m level or greater. The Phase 2 1V/m RFI contour is not determined given the lack of signal shape and power information, but is asserted to be not dissimilar in extent to the Phase 1 1V/m contour. There is disputation (which cannot be resolved based on the record) as to whether the Phase 2 RFI effect would be additive or merely overlapping on different frequencies without an additive effect.
 - B. The applicant is required by the FCC to maintain an RFI mitigation program for one year after commencement of operation. The applicant has voluntarily offered to extend the mitigation commitment to two years, has produced a handbook outlining the mitigation commitments and procedures (Exhibit 202N), and contends that RFI will be addressed comprehensively and effectively by its mitigation program, with approaches including the addition of filtering devices, shielding, and appliance replacement. The preponderance of the persuasive evidence in the record is that the mitigation would tend to be effective in addressing RFI problems. Even the appellants’ expert RFI witness acknowledges that most RFI effects would be “eminently solvable.”¹⁵
 - C. The appellants contend that because Federal law¹⁶ preempts the regulation¹⁷ by the County of the RFI of the proposed transmitter facilities, the Examiner cannot consider the applicant’s mitigation plan to be enforceable and therefore reliable as mitigation of adverse RFI impacts. The argument is unpersuasive. The mitigation plan, and its extension to two years post-commencement rather than the one year required by the FCC, is voluntary and can be considered part of the “action” reviewed under SEPA. Also since it is a voluntary offer, the offer can be accepted by the County and incorporated into a condition attached to any approval of the requested conditional use permit.
 - D. The appellants’ assertions that parachute automatic-activation devices (AAD) could be affected by RFI, which are anecdotal and speculative in nature anyway, are refuted effectively by testimony that the devices are now effectively shielded.
 - E. The evidence in the record is not persuasive that any significant RFI caused by the proposed transmitting facility would not tend to be resolved by the applicant’s mitigation plan.
 - F. Although the Examiner would otherwise be concerned that there is a gap in the record regarding probable RFI effects of the proposed additional Phase 2 four

¹⁵ (This footnote is from the original July 31, 2002 decision by Deputy Examiner Donahue) Much of the appellants’ “evidence” of adverse RFI impact is anecdotal, general and/or speculative in nature, regularly using terminology such as “may,” “could be,” “suspect” and “can’t be sure.” Although the appellants’ expert witness averred at first that the applicant’s mitigation plan “probably wouldn’t help,” he later conceded that it would help in many cases.

¹⁶ (This footnote is from the original July 31, 2002 decision by Deputy Examiner Donahue) 47 CFR 73.88 and 47 CFR 73.318.

¹⁷ In an Order issued January 8, 2002, Deputy Examiner Donahue ruled that the federal regulatory preemption does not transfer to SEPA’s requirement of the *disclosure* of any probable significant RFI impact.

towers, since the signal power, frequency and shaping generated are not identified and the 1V/m RFI contours therefore not disclosed, such issue is rendered moot by the above finding that the mitigation plan would likely reduce RFI impact below a level of significance, and such benefit is not limited areally to the currently known 1V/m contour for the Phase1 transmitting facility, but would also apply to the one applicable to the Phase 2 facility. In summary, although there has not been clear disclosure of the Phase 2 RFI contour, the issue is moot given the effectiveness of the mitigation approach.

56. Given the effectiveness of the applicant's mitigation plan, the Examiner is not left with the firm conviction that adverse RFI impacts will be probably be more than moderate.
57. No evidence is offered to support the contention that radio emissions/electromagnetic radiation will probably cause physical hazard through electrical shock to humans.

5. Deputy Examiner Donahue in his July 31, 2002 decision denying the CUP and SSDP permits for eight, antenna medium wave AM radio transmission antenna tower facilities made the following Finding of Fact:

Radio Frequency Interference Impact

23. The County is barred by Federal law from reviewing the proposal on a regulatory basis for radio frequency interference. [47 CFR 73.318] The Examiner therefore cannot consider the possibility of such interference in deciding the compatibility and parity of the proposed development.
6. On February 3, 2006 PDS issued a FEIS and Addendum in connection with the S-R Broadcasting proposal, File No. 00 107495. This FEIS covered the eight antennas and equipment buildings proposed in both Phase 1 and Phase 2 of the original application¹⁸. The FEIS was appealed by CPUSRV via a LUPA appeal to King County Superior Court challenging the County Council's approval of the CUP, denial of their appeal and the adequacy of the environmental review.
7. On January 18, 2007 the Court issued a decision upholding the County's decision approving the CUP and ruled the appeal on the adequacy of the environmental review was within the sole jurisdiction of the State Shorelines Hearing Board¹⁹.
8. On December 26, 2006 the State Shorelines Hearings Board issued a decision affirming the County's environmental review under SEPA and the issuance of the shoreline permit.
9. Environmental review i.e. DNS, DEIS, FEIS and FEIS with addendum, for both Phase 1 and Phase 2 of the original S-R Broadcasting application for up to eight medium wave AM radio antennas (one at 349-feet and seven at 199-feet) and associated equipment, was completed in conformance with the State Environmental Policy Act (SEPA), state law and county code as evidenced by the extensive reviews, appeals, hearings and decisions by the Snohomish County Hearing Examiner, the Snohomish County Council, King County Superior Court and the State Shorelines Hearing Board.

C. *The Issue of Radiofrequency Radiation and Adverse Health Effects*

¹⁸ The original CUP decision was for Phase 1. The environmental review covered Phase 1 and Phase 2.

¹⁹ The following is from the January 18, 2007 Order on Motion to dismiss SEPA Adequacy Issues; Under RCW 43.21C.075(7), the Shorelines Hearings Board has sole and exclusive jurisdiction over the SEPA appeal, including the SEPA appeal raised by Petitioner in this LUPA action. Consequently, this Court does not have jurisdiction over the SEPA appeal issues.

1. The issue of RFR and adverse health effects was not addressed during the previous hearing on the original CUP. In fact, the issue was only raised when Party of Record Angela Day raised it as a part of the proceedings before Deputy Examiner Good on the major revision to the CUP. Deputy Good made the following finding in his November 30, 2007 Order:

The Examiner finds that the procedural mandate of SEPA is met concerning Phase 2 but so finding does not limit the Examiner's authority or duty to fully consider anew in the instant proceeding whether Phase 2, alone or cumulatively with Phase 1, will be materially detrimental or otherwise fail to meet the criteria of SCC 30.42C.100.

It was not, therefore, a SEPA issue, but an issue raised by parties to the proceeding: Angela and Robert Day, and joined by CPUSRV.

2. A great deal of testimony, at least 4-5 days, was devoted to the effects of RFR and electromagnetic fields on human health. Experts were called by the applicant and by Angela Day and the CPUSRV. The Examiner appreciates all of the excellent testimony, articles, and effort put into trying to educate her in this matter. She also appreciates the patience the parties have shown in the time it has taken to write this decision.

D. Staff Recommendation

1. Eric Olsen was the PDS staff person assigned to this project. Eric Olsen was also the staff person assigned to the KRKO Towers (S-R Broadcasting) permit application, which was the CUP application for the four radio antenna structures. His *Curriculum Vitae* is in the record at Exhibit 14.
2. Mr. Olsen assisted in drafting Chapter 30.28A of the Unified Development Code relating to Wireless Communication Facilities. Mr. Olsen was the planner that has been primarily responsible for applications relating to siting of wireless communication towers in PDS.
3. Mr. Olsen explained in testimony that the standard for wireless communication facilities for radiofrequency (RF) energy emissions is contained in the UDC at SCC 30.28A.140(3), which states:

All antennas, wireless communications support structures, and facilities must meet or exceed current standards and regulations of the Federal Aviation Administration (FAA), the Federal Communication Commission (FCC) and any other agency of the federal government with the authority to regulate personal wireless telecommunication service facilities. If the standards and regulations are changed, then the personal wireless telecommunication services providers governed by this chapter shall bring the antennas and wireless communications support structures into compliance within the timelines provided by the revised standards and regulations. The revised standards and regulations are not retroactively applicable to existing providers unless otherwise provided or permitted by federal law. Failure to bring personal wireless telecommunications service facilities into compliance with the revised standards and regulations shall constitute grounds for the county to require removal or remove the provider's facilities at the provider's expense subject to the enforcement regulations and procedures set forth in Chapter 30.85 SCC.

Emphasis added.

This code section, adopted in November 2005, requires wireless telecommunication towers sited in Snohomish County to meet the FCC Guidelines for RF exposure. (Exhibit 457 TR Vol. I p. 16 (4/1/08))

4. Mr. Olsen determined that although the county had no adopted technical standards for AM radio, the FCC Guidelines would be a logical surrogate. He required the applicant to demonstrate compliance with the FCC Guidelines. The applicant submitted Exhibit 306 demonstrating their RF emissions were far below the standards set by the FCC; in fact, by applicant's measure, 0.05% of the FCC Guideline limit at the edge of the property.
5. After Party of Record Angela Day raised the concern about adverse health effects from RF radiation exposure, Mr. Olsen did further research. He spoke with the director of the Snohomish Health District, who himself is an epidemiologist. He had no information and the Health District had no position, policy or regulation concerning health effects from RF radiation exposure, but directed Mr. Olsen to the State Department of Health. (Exhibit 457, TR Vol I p. 18 4/1/08))
6. Mr. Olsen contacted Lillian Bensley at the Washington Department of Health. Ms. Bensley holds a Ph.D in epidemiology, and is the Acting State Epidemiologist for Non-Infectious Conditions, but apparently has no particular expertise in RF radiation exposure. (See Exhibit 404) She provided Mr. Olsen with an eleven year-old paper entitled "Washington State Department of Health Wireless Communication Facilities Position Paper" (Exhibit 405) and cites to another article, which is in the record. (See Exhibit 407 ("The Royal Society of Canada" Study)). Dr. Bensley noted that the wireless report is dated 1997 and "[t]hus, as far as we can tell the most recent DOH position doesn't require anything additional to the FCC guidelines." From that statement, it is apparent that the record does not support any contention that the state has formed a position or policy based on recent research, data, or meaningful review that would inform this hearing. Dr. Bensley did indicate that she did a "quick medline search". She states:

Although there are many deficiencies in the research to date that make it difficult to draw strong conclusions, I didn't uncover anything alarming from recent research. For example, one article stated "All of the authoritative reviews completed within the last 2 yr have concluded there is no clear evidence of adverse health effects associated with RF fields."

Exhibit 404.

Mr. Olsen put both the DOH Position Paper and the Royal Society of Canada Study in the record. (See Exhibits 405 and 407)

E. The Proposal

1. This is a proposal for a new AM radio station at 1520 kHz. The other radio station already approved is at 1380 kHz. Output for the two combined stations will be 55 kilowatts during the day and 100 kilowatts at night. (TR. Vol. 1 p.88 (10/30/07)) As stated above, they each will be operating at the maximum extent allowed by law. (Exhibit 13.69)
2. AM radio must cover the city of license (in this case Snohomish), and must protect signals of other radio stations. Ground conductivity is critical to coverage and the transmitter location

permanently defines the coverage potential. (Exhibit 451 TR. Vol. I p.16 (10/30/07)) Therefore, AM transmitters must be placed in low conductive soils.

3. CAAM made this application to the FCC in 2004. The FCC chose CAAM in part because the "Marysville Urbanized Area", which includes the City of Snohomish, does not have a radio license of any kind. Most others have multiple licenses, but the Marysville urbanized area has none. (Exhibit 451 TR. Vol. I p.50 (10/30/07))
4. In site investigation, the applicant looked at five possible sites. Three were already permitted AM transmitter sites and two were brand new. Three sites failed because they did not cover the city of Snohomish. Another location, just east of Lord Hill in the Valley, would require a new 40-acre site and four new radiators. The applicants felt they did not need to create a whole new set of opponents. The co-location site covers the most population of any of the five locations and requires only two additional radiators. (Exhibit 451 TR. Vol. I p.29-31 (10/30/07)) In Mr. Skotdal's opinion, the proposal reflects the minimum height to produce an efficient signal, covering the city of license (Snohomish), with the necessary conductivity on-site, with the least amount of radiators, and no new 40-acre site. Mr. Skotdal stated that the proposal for the Short School transmitter site meets the County goal of encouraging co-location. He also stated that the city of license, coverage, conductivity, and agency involvement all play important factors in the site selection process and they're among the reasons why the site has been chosen. (Exhibit 451 TR. Vol. I p.47 (10/30/07))
5. Stephen Lockwood, an engineer working for the applicant, stated he was responsible for the Table of alternative sites in the Site Selection Report (Exhibit 13-34). In further questioning about the site selection (Exhibit 13-34), Mr. Lockwood admitted that the Map 4 alternative site was deemed to be without electric power because either Mr. Skotdal or Mr. Lockwood drove down the road and did not see electric poles. Mr. Lockwood did not check with the power company, and he didn't know whether Mr. Skotdal did. (Exhibit 451 TR. Vol. I p.163-64 (10/30/07)) Map 4 states that it also fails for lack of access. Mr. Lockwood stated that it failed because "[i]t did not seem like there was any reasonable access to that area because it's all from what my recollection is one large parcel.. . That area there just did not seem accessible." (Exhibit 451 TR. Vol. I p.165 (10/30/07)) Map 4 also failed because of wetlands, but Mr. Lockwood acknowledged that the applicant had only focused on the area by putting an "x" on the map. It failed because the area generally shows a lot of wetlands. (TR. Vol. 1 p.165 (10/30/07)) Mr. Lockwood also indicated he had no idea why it failed in terms of a willing landowner (whether or not Mr. Skotdal ever contacted anyone) or why it failed in terms of historic preservation. He also stated that it failed because of being too close to Harvey Airfield and Monroe air strip, but could not state how close. (Exhibit 451 TR. Vol. I p.164-66 (10/30/07)) This testimony raises questions about how thorough the site selection process really was, given the fact that CAAM already owned the existing site.
6. AM radio uses the entire length of the radiator for its antenna. To create protection for other radio stations (or to eliminate interference) the operator has to directionalize or change the signal to prevent that from happening. In order to directionalize a signal, the operator must have more than one radiator. The more radiators, the better the signal can be shaped. (Exhibit 451 TR. Vol. I p.19-20 (10/30/07)) The CAAM proposal requires four total radiators, but is sharing two of its radiators with the existing proposal.
7. The closest residential property to this proposal is in the Kenwanda neighborhood, approximately ½ mile away from the 349-foot radiator. (Exhibit 451 TR. Vol. I at p. 77 (10/30/07))

8. There are four schools in the vicinity of the proposed radio towers, as identified in Exhibit 113 prepared by the applicant's expert Stephen Lockwood. The closest is Valley View Middle School, in the Kenwanda neighborhood, that is approximately $\frac{3}{4}$ of a mile away. The farthest away is Snohomish High School, which is approximately three miles away. The other two schools are Cathcart Elementary and Totem Falls Elementary School. (Exhibit 452, TR. Vol II TR II at pp. 185-86 (10/30/07)) Another exhibit, Exhibit 437, identifies 19 schools in a 3.7 mile radius.
9. More exposure and energy absorption occurs higher up and closer to the antenna, according to Dr. Ziskin, applicant's expert. (Exhibit 465 TR Vol. IX at p. 776, 786 (4/3/08)) This would indicate the susceptibility of the Kenwanda neighborhood and Valley View Middle School, since it is up on the bluff and closest to the antennas.

F. Public Testimony

1. The Examiner received a number of thoughtful letters in the record, as well as very thoughtful testimony from citizens, both for and against the proposal. The overwhelming written testimony in the record was in opposition to the proposed towers because of concerns of health effects.
2. Exhibit 437 demonstrates that within a 3.7 mile range, there are approximately 19 schools, with Valley View Middle School being the closest at $\frac{3}{4}$ of a mile. It also shows, based on the census, approximately 29,000 people living in the area within 3.7 miles of the proposed towers, and approximately 9000 children.
3. Exhibit 437 shows that there are nine parks within 3.7 miles of the proposed towers.
4. The Examiner received a letter from a former state senator, Rick Reed, (Exhibit 421) and from a member of a fifth generation farm family, Barbara Bailey, whose farm is across the river from the proposed towers. The Examiner found her testimony, which was very similar to her written testimony, compelling:

My family and I live and work on a 400 acre farm about a mile from the proposed tower site. . .

My neighbors have been fighting this radio tower proposal the past 7 years and I agree with all the concerns regarding this proposal, but I did not get personally involved until recently, when I learned of the possible ill effects that radiofrequency radiation has on human health. To me, that puts this issue in a completely different arena. Aesthetics is one thing; protecting human health is another.

I am not a scientist, but I do have some medical background. My father was a physician in Snohomish and I am a registered nurse.

I have great respect for the rigors of the scientific process that Ms. Erdreich elaborated on. A scientific conclusion is obviously not an easy thing to come by. The bar is set high. That's a good thing. It leaves it up to our personal discretion whether we choose to engage in a behavior that may or may not be harmful to our health.

I believe this is a matter of choice. Cigarette smoking is legal, but I can choose not to smoke. As Mr. Olsen commented, he's a little nervous about constant cell phone use, so he chooses to use a land line whenever possible. He is exercising a little extra precaution of voluntary choice.

In this case, I don't have that choice. We are farmers, so where we live is also where we work. Unless we sell our house and our 5th generation family farm, my family and I will be exposed to low levels of radiofrequency radiation 24 hours, 7 days a week.

...

I don't want to wait ten years for the scientific process to prove causation on this issue. I understand that the studies to date show only a possible association between radiofrequency radiation and leukemia, but it's what I call a red flag. To me, it's a warning I choose to heed right now.

Exhibit 423.

G. The FCC Guidelines

1. The Federal Communications Commission (FCC) has issued standards or guidelines with respect to radiofrequency (RF) emissions. Those standards are found at 47 CFR § 1.1310. (Exhibit 13.70)
2. The parties agree that the towers, as proposed, will not cumulatively exceed the standards set by the FCC. Rather, the issue in this proceeding is whether the antenna structures either alone or in combination with the four already approved KRKO antennas, present a type of hazard that the FCC has declined to address through rulemaking. More precisely, the issue is whether the FCC Guidelines address nonthermal effects of RFR.
3. The FCC has produced a handbook entitled "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance." (Exhibit 71) It addresses the issue of compliance with RF exposure limits established by the FCC.
4. As Exhibit 71 explains, RF signals may be transmitted over a wide range of frequencies. The frequency of an RF signal is expressed in terms of cycles per second or "hertz". AM radio frequencies are at the medium to low end of the spectrum. (See Exhibit 71, Illustration 1 at 3)
5. AM radio signals are at the lower end of the RF spectrum, while other radio services such as analog and digital television, cellular, and point-to-point microwave services are much higher in frequency. (Exhibit 71 at 3)
6. The FCC Guidelines establish "Maximum Permissible Exposure" or MPE Limits for "general population/uncontrolled exposure" and for "occupational/controlled exposure." This group includes the general public not associated with installation and maintenance of transmission equipment. *Id.* Occupational limits are set at a higher level for technicians and engineers working in the industry, but both levels incorporate a substantial margin of safety, at least for thermal effects of RF radiation.

7. The MPE limits vary by frequency because of the different absorptive properties of the human body at different frequencies when exposed to whole-body RF fields. The FCC Guidelines establish MPE limits in terms of “electric field strength,” “magnetic field strength” and “far-field equivalent power density” (power density). For most frequencies used by wireless services and by AM radio, the relevant measurement is power density, which is measured in terms of “milliwatts per square centimeter” or “mW/cm².” In terms of power density, for a given frequency, the FCC MPE limits can be interpreted as specifying the maximum rate that energy can be transferred (*i.e.*, the power) to a square centimeter of a person’s body over a period of time (either 6 or 30 minutes). (Exhibit 13-71 at 4)
8. The FCC’s limits apply cumulatively to all sources of RF emissions in a given area. *Id.* at 6.
9. The FCC standard is set at 1/50th of the level where deleterious health effects (thermal effects) actually have been observed to occur, to provide a wide safety margin. (Exhibit 451, TR. Vol. I p.152 (10/30/07)) The FCC explained this in a footnote in OET Bulletin 56, published in 1996:

These exposure limits are based on criteria quantified in terms of specific absorption rate (SAR). SAR is a measure of the rate at which the body absorbs RF energy. Both the ANSI/IEEE and NCRP exposure criteria are based on a determination that potentially harmful biological effects can occur at an SAR level of 4 W/kg as averaged over the whole-body. Appropriate safety factors have been incorporated to arrive at limits for both whole-body exposure (0.4 W/kg for “controlled” or “occupational” exposure and 0.08 W/kg for “uncontrolled” or “general population” exposure, respectively) and for partial-body (localized SAR), such as might occur in the head of the user of a hand-held cellular telephone. The new MPE limits are more conservative in some cases than the limits specified by ANSI in 1982. However, these more conservative limits do not arise from a fundamental change in the SAR threshold for harm, but from a precautionary desire to add an additional margin of safety for exposure of the public or exposure in “uncontrolled” environments.

Exhibit 343 at 13.

10. The FCC rule encourages location of AM transmitters in rural areas because it requires location in areas of lower populations. (Exhibit 451 TR. Vol. I p.43 (10/30/07))

H. How Are the FCC Guidelines Set?

1. In the 1996 Telecommunications Act, Congress directed the FCC to come up with a human exposure limit for all radiofrequency devices. (Exhibit 451 Vol. II p. 147 (10/30/07))
2. The Institute of Electrical and Electronics Engineers (IEEE) is an international volunteer group that looks at all types of studies, including epidemiological, animal and environmental, having to do with RFR. According to the testimony presented by the applicant, the standard adopted by the FCC was derived from an IEEE recommendation. Applicant’s expert Stephen Lockwood testified that the FCC came up with the rule regulating human exposure to radiofrequency as a result of the 1996 Telecommunications Act. He testified that Congress directed the FCC to come up with a guideline of exposure limit. Mr. Lockwood testified that his partner, Jim Hatfield, served on the IEEE committee that reviews the papers for the FCC. As stated by Mr. Lockwood, the committee is made up of a number of different individuals of different expertise from biologists to statisticians to varying people of wide varying disciplines. The committee came to a consensus and a recommendation, which comprises the IEEE standard. (Exhibit 451

TR. Vol. I p.147-48 (10/30/07)) Mr. Lockwood testified that there are at least 115 people on the IEEE committee. (Exhibit 451 TR. Vol. I p.161 (10/30/07))

3. Most of applicant's witnesses chaired or participated in the IEEE. Dr. Erdreich, Dr. Foster, Mr. Petersen, Dr. Foster, and Dr. Ziskin all were members at the time the 2005 standard was approved, as was Jim Hatfield, (who was listed as a witness but did not testify and is a partner of Stephen Lockwood who did testify). (Exhibit 319 at viii) As stated by the IEEE itself:

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops standards through a consensus development process, approved by the American National Standards Institute [ANSI], which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any information contained in its standards.

Exhibit 319 at iii.

4. There was conflicting testimony regarding the extent to which the IEEE is really an "industry" group. Mr. Ron Petersen, another expert testifying for the applicant who is an electrical engineer and has been involved in the IEEE for many years, testified that there are very rigid rules within the IEEE that ensure openness and due process and transparency at every level. (Exhibit 458 TR. Vol. II p.208 (4/1/08)) He also testified that the subcommittees are open to anybody with an expressed interest, but less than half of the members of the IEEE are just interested people with some expertise.
5. Ms. Angela Day testified that although the IEEE process is an inclusive process, only 25% of the people sitting on the committee are not from industry. (Exhibit 459 TR. Vol. VIII p.553-54 (4/3/08)) Seventy-five percent are industry people. In voting on standards, a standard must be adopted by a 75% vote.
6. Criticizing the IEEE, the 2007 BioInitiative Report states that:

Much of the criticism of the existing standard-setting bodies comes because their contributions are perceived as industry-friendly (more aligned with technology investment and dissemination of new technologies) rather than public health oriented. The view of the Chair of the latest IEEE standard-setting ICES Eleanor Adair is made clear by Osepchuk and Petersen (2003) who write in the abstract of their paper "*her goal and the goal of the ICES is to establish rational standards that will make future beneficial applications of RF energy credible to humanity.*" Authors Osepchuk and Petersen note that "*(I)t is important that safety standards be rational and avoid excessive safety margins.*" The authors specifically dismiss the body of evidence for low-intensity effects with "*(A)lthough the literature reporting 'athermal' bioeffects of exposure to microwave/RF energy (other than electrostimulation) is included in the review process, it has been found to be inconsistent and not useful for purpose of standard-setting.*"

Exhibit 409-4 Section 2 at 7-8.

7. Mr. Petersen also testified that the 2005 IEEE process did result in at least two dissenting opinions regarding the outcome of the report. (Exhibit 459 TR. Vol. III p. 230-32 (4/1/08)) The dissenters, citing scientific studies, felt that there should be a statement at the front of the study warning people that there may be effects that we don't know about. (Exhibit 459 TR. Vol. III p.234 (4/1/08)) The names of the dissenters were David Fichtenberg and Marnie Glazer. (Exhibit 459 TR. Vol. III p.233 (4/1/08))
8. Applicant's experts who are current or former members or participants of the IEEE are Ron Petersen, Kenneth Foster, Marvin Ziskin, and Jim Hatfield (who was listed as a witness but did not testify- his partner, Stephen Lockwood testified).

A. Ron Petersen

1. Ron Petersen is an electrical engineer who spent 41 years at Bell Laboratories, mostly in the Radiation Protection Department and later the Wireless and Optical Technologies Safety Department, the division of the company with corporate responsibility for all facets of non-ionizing radiation protection. (Exhibit 458, TR. Vol. II p.195 (4/1/08)); (Exhibit 302 (Resume)) He is presently a private consultant.
2. Ron Petersen has been a member of the Institute of Electrical and Electronics Engineers (IEEE) International Committee on Electromagnetic Safety (ICES) since 1973 and has served many leadership roles on the committee, including Chair. At the time of the hearing he held the position of Executive Secretary. He chaired the ICES, which did the 2005 review of the standards that presently constitute the FCC Guidelines. (Exhibit 319 at viii)
3. Ron Petersen's pre-filed testimony is at Exhibit 300.

B. Kenneth Foster

1. Dr. Kenneth Foster is a professor of bioengineering at the University of Pennsylvania. His *curriculum vitae* is Exhibit 303. He has a PhD in physics and has been doing research on interaction of electromagnetic fields with biological systems including medical applications, basic biophysical aspects of the problems and implications of electromagnetic fields including radiofrequency energy. He has been a president of one of the IEEE societies on social implications and technology. He has published over 100 articles in peer review journals which are roughly divided between biophysics subjects involving mechanisms of interaction of electromagnetic field with tissue and more engineering subjects involving human exposure to radiofrequency energy. He has done a sabbatical to work with the World Health Organization. He also has a private consulting business. (Exhibit 464, TR Vol. VIII pp. 619-20 (4/3/08))
2. Dr. Foster's pre-filed testimony is at Exhibit 301.

C. Marvin Ziskin

1. Dr. Marvin Ziskin is currently the Director of the Center for Biomedical Physics at Temple University and has served in that capacity since 1992. He is at present

the co-chairman of the International Committee on Electromagnetic Safety (ICES) of the IEEE. His *Curriculum Vitae* is in the record at Exhibit 368.

D. Stephen Lockwood

1. Stephen Lockwood is a registered professional electrical engineer and has a BS both in engineering physics and electrical engineering. He has more than 25 years of experience in the field of telecommunications engineering, and has provided expert testimony in land use hearings on telecommunications engineering. His resume is in the record at Exhibit 101-B.

I. Do the IEEE Standards for Safety, adopted as the FCC Guidelines, regulate for nonionizing radiation, or nonthermal effects to human health?

1. Nonionizing radiation occurs from electromagnetic fields (ELFS) from electrical and electronic appliances and power lines and (2) radiofrequency radiation (RFR) from wireless devices such as cordless phones, cellular antennas and towers, and broadcast transmission towers. (Exhibit 409-4, Section 1 at 3) Nonionizing radiation does not have sufficient energy to break off electrons from their orbits around atoms and ionize (charge) atoms, as do x-rays, CT scans, and other forms of ionizing radiation. (Exhibit 409-4, Section 1 at 3)
2. The debate concerning the adequacy of using the FCC Guidelines as a regulatory standard for this proposal is whether the standard adequately measure potential human health effects from the transmitters. There is no question that there is a debate not only in the scientific community, but in broader society, about the potential health effects of nonionizing radiation.
3. It is undisputed that the FCC Guidelines primarily address thermal effects of RFR, which causes tissue heating, the health effects of which are harmful and very well known. Occupational standards are very important, especially for those who work around radar facilities, wireless antenna towers, or other like facilities, because thermally-based limits are necessary to prevent damage from heating. (Exhibit 409-4, Section 1 at 6)
4. More controversial has been nonthermal effects defined as an effect which can only be explained in terms of mechanisms other than increased molecular motion (i.e. heating), that occurs at absorbed power levels so low, that a thermal mechanism seems unlikely, or displays so unexpected a dependence upon some experimental variable that it is difficult to see how heating could be the cause. (Exhibit 409-4, Section 18 at 3)
5. For purposes of explaining the debate (not for the truth of the statement) about whether there should be a different standard for nonthermal effects than the FCC Guidelines, the Examiner will quote from the BioInitiative Report (Exhibit 409-4, Section 1, pp. 6-7):

In the last few decades, it has been established beyond any reasonable doubt that bioeffects and some adverse health effects occur at far lower levels of RF and ELF exposure where no heating (or induced currents) occurs at all; some effects are shown to occur at several hundred thousand times below the existing public safety limits where heating is an impossibility.

Effects occur at non-thermal or low-intensity exposure levels thousands of times below the levels that federal agencies say should keep the public safe. For many new devices operating with wireless technologies, the devices are exempt from

any regulatory standards. The existing standards have been proven to be inadequate to control against harm from low –intensity, chronic exposures, based on reasonable, independent assessment of the scientific literature. New standards need to take into account what we have learned about the effects of ELF and RF (all demonstrated effects that are important to proper biological function in living organisms). It is vital to do so because the explosion of new sources has caused unprecedented levels of artificial electromagnetic fields that now cover all but remote areas of the habitable space on earth. Mid-course corrections are needed in the way we accept, test and deploy new technologies that expose us to ELF and RF in order to avert public health problems of a global nature.

6. Based on the record, these views are the minority in the scientific community, however. The 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (Exhibit 319) states that it does not attempt to regulate for low level effects. The study states:

Despite more than 50 years of RF research, low-level biological effects have not been established. No theoretical mechanism has been established that supports the existence of any effect characterized by trivial heating other than microwave heating. Moreover, the relevance of reported low-level effects to health remains speculative and such effects are not useful for standard setting.

Exhibit 319 at 81.

As Mr. Peterson indicated in his testimony, that does not mean that the IEEE did not consider studies including associations of RFR and health effects; (Exhibit 459 TR. Vol. III p.247 (4/1/08)) they just did not think that any of these studies are relevant or useful for standard setting, as stated in the text above.

7. Mr. Petersen testified that the basic assumption of the IEEE standard is essentially that if you are protecting against thermal effects you are also protecting against nonthermal effects, because the IEEE has no way of relating nonthermal effects to human health. (Exhibit 459 TR. Vol. III p.260-61(4/1/08)) However, he stated that if that assumption is incorrect, then the FCC regulations, which are focused on thermal effects, will not be protective against nonthermal effects to human health. (Exhibit 459 TR. Vol. III p.261 (4/1/08))
8. The Examiner finds that the IEEE Standards, and therefore the FCC Guidelines, do not regulate for nonthermal effects of low level RFR. The question is whether or not nonionizing radiation that is too weak to have thermal effects that will be emitted from these AM radio transmitters is of concern, such that the proposal will be materially detrimental to surrounding uses or property.

J. *Epidemiological Testimony and Studies*

1. During the hearing, two epidemiologists testified: Dr. Linda Erdreich for the applicant and Dr. Samuel Milham for the Days and CPUSRV.
2. Dr. Linda Erdreich is an epidemiologist who testified on behalf of the CAAM Partnership. She has a Ph.D in epidemiology and a master's in epidemiology and biostatistics. (*Curriculum Vitae* at Exhibit 101D) She works for a national company called Exponent with offices in New York City, New York. (Exhibit 451 TR. Vol. I p. 193 (10/30/07)) Dr. Erdreich has been an epidemiologist for over 30 years focusing on environmental epidemiology or environmental

exposure. Dr. Erdreich is on the committee of the Institute of Electric and Electronic Engineers (IEEC) and reviewed scientific data used to develop the standard in 1995 and in 2005.

3. Dr. Erdreich is a consultant who works primarily for private clients (over 80%). Sometimes she works for government agencies. (Exhibit 451 TR. Vol. I p. 217 (10/30/07)) She does not perform original research, but does reviews of other epidemiologists' research. She also focuses on risk assessment.
4. Dr. Milham is an epidemiologist trained in public health. He served as the Section Head of the Chronic Epidemiology Section of the Washington State Department of Health from 1988-1992, and as a Chronic Epidemiologist from 1968-1988. (Exhibit 409-c (*Curriculum Vitae*)) He is the author or co-author of 52 peer reviewed articles, according to his *Curriculum Vitae*. His entire career has been devoted primarily to original research.

A. What is Epidemiology and How Does it Assess Risk?

- (i) Epidemiology is the study of the distribution of diseases in populations and the causes of diseases. (Exhibit 451 TR. Vol. I p. 193 (10/30/07)) Because it is the study of people, it tends to be rather imprecise, according to Dr. Erdreich:

You can imagine when you study a population of people, how do you get the very similar people to act as controls? People do what they want. They have different behaviors that affect their health. They eat what they want. They work in different places. And sometimes they don't even want to participate in epidemiology studies. We used to be able to call people up to participate. You can imagine trying to call people now.

So epidemiology studies have some strength because they're in people and limitations in precision. To overcome these limitations, scientists and risk assessors all around the world rely on three different sources of information. You get different ways of looking at information.

So one of the things you do is laboratory studies. Small laboratory mammals are exposed over their entire lifetime. You expose them to several different levels of exposure so that – and there's good evidence that laboratory animals are quite predictive of chronic diseases in humans and of adverse health effects in humans. So you can't expose humans over their whole lifetime. You can't expose them to high levels on purpose. But you can do this in the laboratory and carefully evaluate the results.

The other approach to assessing risk on human health is to go into the laboratory and study cells and tissues where you can manipulate a lot of different ways. And sometimes if you can have a clue about a hazard, this guides you to how to look at cells and you can find out the mechanism. Why does the exposure affect our health?

...

The real key here is that to do a health risk assessment what you need to do is a systematic evaluation of the entire body of the scientific evidence. You don't pick and choose to support your end point. You don't pick and

choose because you happen to like epidemiology better than laboratory studies. The idea is to evaluate all the relevant research on its quality and weigh the results.

So epidemiology is only part of the story. The whole story is when you put it all together, you get – you get more than each one individually when you look at them together. Because their limitations and strengths kind of counter balance each other out.

...

What we are doing when we do epidemiology studies. We're using statistics to describe patterns of disease. We use a measure of association. We call this association an odds ratio. And what we're doing is we're comparing exposure in cases to exposure in controls, and if it's the same, it's 1. So if the exposure is less than 1, it means that cases are less likely to have been exposed.

If the exposure is – if the odds ratio, the measure of association, is 1, exposure is the same as in cases – same in cases as it is in controls. So certainly that's not a positive association.

A positive association is when the odds ratio is greater than 1. It means the cases are more likely to have been exposed. And you can have any odds ratio. You can go below 1. You might find that if you're studying vegetables or exercise. That may mean – if it's a valid study, it may mean the exposure is beneficial.

A weak association is sometimes a little harder to interpret than a strong association because there's always intervening variables and uncertainties in epidemiology and difficulty in assessing exposure even. On studies of diet and health it's a little difficult to get someone's exposure by questionnaire. Do you remember what you ate ten years ago?

So if we have good studies where we can rule out a chance by some confounding, the moderate strong associations are more convincing. This is Epi 101. You just had it.

Bottom line, the important message here is the association, which is measured by the odds ratio, is not the same as causation. It's an important message.

Exhibit 138. Vol. I p.71-75 (4/1/08) (emphasis added)

- (ii) Dr. Milham stated with regards to odds ratios that an elevated odds ratio says there is probably a connection, an association between RF exposure and a cancer. His belief is that there is no magic number that is commonly accepted in the scientific community. He has to look at the study. He has to look how it was done. If it's based on a huge population and it's statistically significant, it tells him there is an association. If it is based on a few cases and it is not significant, he doesn't pay as much attention to it.

- (iii) Another measure of the certainty of a test is known as the “95% Confidence Interval (CI)”. It is a statistical measure of sampling error. Dr. Kenneth Foster explained it this way:

The Gallup poll tries to guess how many people are going to vote republican versus democratic, they don't look at the whole population. They call 1000 people. And because of sampling variations, their estimates are going to be only approximate as for how the whole country will vote because they didn't ask everybody. So the sampling error then is indication of how much uncertainty is simply because of the size of the sample.

The association that's positive is something greater than 1. We say in science it's statistically significant if the confidence level does not include 1, which is no change in risk. If it is not statistically significant, we would say there is an uncomfortably high chance that this is just a random fluke because of sampling. (Exhibit 465, Vol. IX p. 724 (4/3/08))

- (iv) Dr. Erdreich indicated that even though there may be some evidence in study of an increased risk of cancer due to RF, that does not prove a causal link between RF and cancer. (Exhibit 451 TR. Vol. I p.240 (10/30/07)) Although there have been statistical associations reported in epidemiological studies, as a epidemiologist, she focuses her opinion on the weight of the scientific evidence. (Exhibit 451 TR. Vol. I p.242 (10/30/07))
- (v) Dr. Erdreich co-authored a chapter in the textbook Expert Witness Fee and Explaining and Understanding Science entitled, *Using Epidemiology to Explain Disease Causation to Judges and Juries*. (Exhibit 409-12) In it she provides strategies to judges in particular on how to instruct juries to use epidemiological studies, particularly not to rely on one study alone. She also reviews the Hill Criteria, and include three more criteria than she did in her testimony: plausibility, experimental, and analogy. (Exhibit 409-12 at 180) Experimental means that if taking preventative steps by removing the exposure works, then it can support the causation hypothesis. Biological plausibility means there is evidence from the scientific research that supports the hypothesis of cause and effect. (Exhibit 457 Vol. I p.132 (4/1/08))
- (vi) Dr. Erdreich explained the criteria used by epidemiologists and others to assess risk of disease as first expressed by Sir Bradford Hill in his article *The Environment and Disease: Association or Causation?* (Exhibit 310) These ideas have been used worldwide in evaluating research to determine whether an association really means there is cause and effect. The United States Surgeon General developed these principles into guidelines to evaluate the research on cigarette smoking.

The more the data conforms to the criteria, the more likely it is you have an association that is cause and effect. Dr. Erdreich described the criteria this way:

So the strength. The association between the exposure and the disease should be strong. Strong – high number, reliable data, consistency. Multiple studies by different investigators within different groups of people come to the same finding. That would mean consistency.

Dose—response. If you find that the risk of disease increases with more exposure, then you have dose- response or exposure- response. And that

strengthens the idea that it's cause and effect, because that's how biological – that's how exposures work biologically.

Timing of exposure. This is something that's important in certain epidemiology studies like case control studies where you study people who already have the disease. You have to establish that the exposure came before the disease developed.

And biological plausibility is very important. This means think about whether the association or the link fits together with what we know in general from other research, what we have seen.

Exhibit 457 Vol. I p.61-62 (4/1/08)

- (vii) There are a number of variables at play in the risk assessment piece of the puzzle, not the least of which is the inherent difficulty in determining causes of cancer. Dr. Erdreich co-authored a paper entitled *Weak Electromagnetic Fields and Cancer in the Context of Risk Assessment*. (Exhibit 409-14) The article states:

Epidemiology (analysis of health records of human populations) provides the most direct information about human health but suffers from important limitations related to the high variability of human populations. These limitations include the difficulty of quantifying exposure to an agent, difficulties of controlling confounding variables (e.g., other personal and environmental factors that affect health), bias or systematic errors (e.g., errors introduced by nonrandom selection of subjects), and other problems that affect the validity of a study.

...

These difficulties cause the greatest problems when one is interpreting epidemiology findings of weak associations (small relative risks) that are close to the edge of statistical significance. Such studies can raise socially contentious issues that are difficult to resolve by later studies.

The article also looks at the risk of severity of harm versus the quality of the information. The article states:

The epidemiologic evidence ranges from almost nonexistent (environmental exposure to RF fields) to extensive and inconclusive (power lines and childhood leukemia). . . .

It is sometimes stated that the risks from electromagnetic fields, if real, are too small to be of public health significance. However, if any of the reported risks discussed above are real, electromagnetic fields could be one of the more significant environmental causes of cancer. For example, a doubling of risk for childhood leukemia from residential exposure of one-third of the U.S. population to 60-Hz magnetic fields corresponds to absolute risk, over the 15 years of childhood, that is nearly two orders of magnitude greater than the EPA goals for regulating carcinogens in the environment. Lilienfeld and Stolley maintain in a standard epidemiology textbook that "repeated findings of a weak association in well-conducted studies can still lead to effective public health action. When an

exposure affects many people and the outcome is extremely adverse, a small increase in risk can be of major concern to public health officials.” On the other hand, small increases in the risk for rare diseases (and childhood leukemia is fortunately a rare disease) have little consequence for individuals who have to face much larger risks in everyday life. Unless one develops the disease.

The issue however, remains one of hazard identification, i.e., whether there is an increase in risk associated with exposure to electromagnetic fields. As Lilienfeld and Stolley explain, “when a weak association is found . . . other information is needed to support causality.” We believe that the information, taken collectively, does not support causality for the three issues discussed above.

...

In part, the endless controversy about cancer and electromagnetic fields reflects intrinsic difficulties in cancer risk assessment, and indeed risk assessment in general. Given the lack of a simple “cause” of cancer, the identification of weak carcinogens becomes problematic; and it is impossible to prove incontrovertibly that something is not a carcinogen.

Exhibit 409-14 at 740-43 (emphasis added)

The paper also acknowledges that public concern about this issue will concern until the time there is clear cut evidence that a hazard is established or the public concludes there is scant likelihood of a real hazard.

B. Types of Studies

- (i) There are many different studies out, but only three pertain to AM transmitters. However, both experts agree that the data from studies of different types of RF energy is transferable or applicable to the question of health risks from RF energy emitting from AM transmitters.
- (ii) Dr. Erdreich opined that even though cell phones and base stations are at a different frequency than AM radio stations, the research is still considered relevant. Radiofrequency research at different frequencies is applied and an adjustment is made for the different ways it couples and interacts with the body. (Exhibit 456 TR. Vol. VI p.802 (11/2/07))

C. Literature Review on Epidemiological Studies

- (i) In this section, the Examiner will provide findings on studies pointed out by both Dr. Erdreich and Dr. Milham as significant in discussion of the issue of RFR and nonthermal effects. Dr. Erdreich pointed out that reading an abstract is not an appropriate way to evaluate a scientific study. (Exhibit 459 Vol. I. p. 100 (4/1/08)) The Examiner has read these studies and listened to expert testimony about them, not just the abstracts, but in the interest of relating their general conclusions in this decision has relied upon the abstract to provide a succinct explanation of the study and its conclusions.
- (ii) Dr. Erdreich has published reviews of standards worldwide on RF in 1999, and a risk assessment of all of the research that was available in 2005 to determine potential health risks and the limitations and strengths of the data, which is in the record as

(Exhibit 138. Exhibit 459 Vol. I p.58 (4/1/08)) That abstract indicates that the review summarizes the current state of evidence concerning whether the RF energy used for wireless communications might be carcinogenic. The abstract states:

Where there were multiple studies, preference was given to recent reports, to positive reports of effects and to attempts to confirm such positive reports. Biophysical considerations indicate that there is little theoretical basis for anticipating that RF energy would have significant biological effects at the power levels used by cancer and RF energy is weak and limited. Animal studies have provided no consistent evidence that exposure to RF energy at non-thermal intensities causes or promotes cancer. Extensive *in vitro* studies have found no consistent evidence of genotoxic potential, but *in vitro* studies assessing the epigenetic potential RF energy are limited. Overall, a weight-of evidence evaluation shows that the current evidence for a causal association between cancer and exposure to RF energy is weak and unconvincing. However, the existing epidemiology is limited and the possibility of epigenetic effects has not been thoroughly evaluated, so that additional research in those areas will be required for a more thorough assessment of the possibility of a causal connection between cancer and the RF energy from mobile telecommunications.

Exhibit 138, pg. 1.

- (iii) The International Commission for Non-Ionizing Radiation Protection (ICNIRP) *Epidemiology of Health Effects of Radiofrequency Exposure*, a review of epidemiologic studies, is contained in the record as Exhibit 309. The abstract states:

We have undertaken a comprehensive review of epidemiologic studies about the effects of radiofrequency fields (RFs) on human health in order to summarize the current state of knowledge, explain the methodologic issues that are involved, and aid in the planning of future studies. There have been a large number of occupational studies over several decades, particularly on cancer, cardiovascular disease, adverse reproductive outcome, and cataract, in relation to RF exposure. More recently, there have been studies of residential exposure, mainly from radio and television transmitters, and especially focusing on leukemia. There have also been studies of mobile telephone users, particularly on brain tumors and less often on other cancers and on symptoms. Results of these studies to date give no consistent or convincing evidence of a causal relation between RF exposure and any adverse health effect. On the other hand, the studies have two many deficiencies to rule out association. A key concern across all studies is the quality of assessment of RF exposure. Despite the ubiquity of new technologies using RFs, little is known about population exposure from RF sources and even less about the relative importance of different sources. Other cautions are that mobile phone studies to date have been able to address only relatively short lag periods, that almost no data available on the consequences of childhood exposure, and that published data largely concentrate on a small number of outcomes, especially brain tumor and leukemia.

Exhibit 309 at 1741.

Under General Conclusions and Recommendations, the review states:

Results of epidemiologic studies to date give no consistent or convincing evidence of a causal relation between RF exposure and any adverse health effect. On the other hand, these studies have too many deficiencies to rule out an association.

- (iv) Dr. Erdreich also discussed Exhibit 333. (Exhibit 459 Vol. I p.66-67 (4/1/08)) She describes the overall conclusion as “the exposure from transmitters is unlikely to be a health risk.” Exhibit 334 published in 2006 by the Swedish Radiation Protection Authority states that in relation to recent genotoxicity studies on RF fields:

The effects of RF fields on many different genotoxicity endpoints have been evaluated both in vitro and in vivo using a wide range of exposure levels, and most of the studies have reported no effects. The most recent studies reviewed for the present report do not appear to strengthen the evidence of any genotoxic effects of RF fields. The results from the REFLEX project, reporting increased DNA strand breaks in cell cultures exposed to RF fields, needs to be better understood before conclusions can be drawn.

Exhibit 334 at pg. 4.

Further, with respect to research priorities, the report states: “Important research needs remain within all EMF frequencies as identified by the WHO EMF programme and more recently by EMF-NET and by SCENIHR (European Commission Scientific Committee).”

Exhibit 334 at pg. 6.

- (v) The 1999 “Elwood” Study reviewed three cluster investigations and five studies relating to general populations assessing associations between likely exposure to radiofrequency transmissions and various types of cancer. (Exhibit 119-16) All of the studies consider place of residence at the time of cancer diagnosis in regard to proximity to radio or television transmitters. The abstract concludes:

These studies assessed a large number of possible associations. Several positive associations suggesting an increased risk of some types of cancer in those who may have had greater exposure to RF emissions have been reported. However, the results are inconsistent: there is no type of cancer that has been consistently associated with RF exposures. The epidemiologic evidence falls short of the strength of consistency of evidence that is required to come to a reasonable conclusion that RF emissions are a likely cause of one or more types of human cancer. The evidence is weak in regard to its inconsistency, the design of the studies, the lack of detail on actual exposures, and the limitations of the studies in their ability to deal with other likely relevant factors. In some studies there may be biases in the data used.

Exhibit 119-16 at 155.

The Elwood study dismissed cluster studies as nothing more than a “public relations effort to allay a community concern.” (Exhibit 119-16 at 156) The clusters investigations included a cluster of 12 cases of acute leukemia of children in Hawaii which showed an excess among those living within 2.6 miles of radio towers. The odds ratio was termed “not significant at 2.0, 95% confidence interval by Elwood et al., but they noted that the authors of the Hawaii study concluded that “the clustering may have been a chance event, but because of its particular characteristics, we feel it should be noted.” (Exhibit 119-16 at 156-57)

Another cluster investigation followed what appeared to be a high number of cancers of the testis (six cases) among 340 U.S. policemen who used radar guns and often kept them in their lap in their patrol car. The study showed a positive association, but because it was based on a cluster association, according to Elwood it cannot be interpreted as showing anything further such as a causal interpretation. (Exhibit 119-16 at 157)

Another cluster study mentioned in the article is one done in the United Kingdom close to the Sutton Coldfield TV and radio transmitter near Birmingham. The authors used data over a 12-year period to compare the residential postal code with patients with cancer and the census number of residents in that postal code area (allowing adjustments for age, gender, regional variations within the country, and an index of socioeconomic level). For the types of cancer suspected on the initial cluster, there was an excess of total adult leukemia within 2 km, with the risk declining from there out to the edge of a 10 km circle. In lymphomas, however, there was an excess risk within the 10 km circle, but the risk was less in those within the inner 2 km circle. The authors concluded that no causal implications can be drawn, since the study was based on a single cluster investigation. (Exhibit 119-16 at 155)

Elwood did a follow-up to the 1999 review in 2003 entitled, *Epidemiological Studies and Radio Frequency Exposures and Human Cancer*. The abstract states:

Epidemiological studies of radio frequency (RF) exposures and human cancers include studies of military and civilian occupational groups, people who live near television and radio transmitters, and leukemia and brain tumors. The epidemiological results fall short of the strength and consistency of evidence that is required to come to a conclusion that RF emissions are a cause of human cancer. Although the epidemiological evidence in total suggests no increased risk of cancer, the results cannot be unequivocally interpreted in terms of cause and effect. The results are inconsistent, and most studies are limited by lack of detail on actual exposures, short follow-up periods, and the limited ability to deal with other relevant factors. In some studies, there may be substantial biases in the data used. For these same reasons, the studies are unable to confidently exclude any possibility of an increased risk of cancer. Further research to clarify the situation is justified. Priorities include further studies of leukemia in both adults and children, and cranial tumors in relationship to mobile phone use.

Exhibit 308.

- (vi) Exhibit 409-4 is the *BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard For Electromagnetic Fields (ELF and RF)* dated August 31, 2007, authored by a number of doctors from around the world. Chapter 11, authored by Dr. Michael Kundi, Professor at the Institute of Environmental Health, Medical University of Vienna Austria, deals with Evidence for Childhood Cancers, and provides a synopsis of more than two dozen epidemiological studies of childhood cancer and residential

exposure to power-frequency EMFs. The paper indicates that there is ongoing controversy about whether observed relationships between exposure to power-frequency EMF's and childhood cancer (in particular leukemia) can be causally interpreted. The paper relies on two specific studies (Ahlbom et al., 2000) and Greenland 2000; (Greenland 2003) as having appropriate parameters and both having the same result: monotonously increasing risk with increasing power-frequency (50 Hz/60 Hz) magnetic field levels. The paper indicates that as a consequence, the International Agency for Research on Cancer (IARC) concluded in 2001 that power-frequency EMFs are a possible human carcinogen. After looking at these studies in some detail and the results that have been derived, the authors state their conclusions:

The only endpoint studied so far in sufficient detail is childhood leukemia. Brain and nervous system tumors were also studied in some detail but due to the diversity of these tumors no conclusions can be drawn.

Childhood leukemia is the most frequent childhood malignancy that peaks in the age group of 2 to about 5 years. This peak seems to have been newly evolved in the early quarter of the 20th century and may be due to electrification. This assumption is supported by the absence of this peak or it being much less pronounced in developing countries.

An overview of existing evidence from epidemiological studies indicates that there is a continuous increase of risk with increasing levels of average magnetic field exposures. Risk estimates reach statistical significance at levels of 3 to 4 mG. A low number of children are exposed at these or higher levels.

Considering the possibility that aspects of exposure to power frequency EMFs that have not yet been detected may account for a great proportion of cases there are two necessary steps to be taken: Concerted efforts must be undertaken to scrutinize existing data and collect new ones that should reveal whether or not exposure metric exist that show the necessary conditions for an effective exposure metric; and second, precautionary measures must be delineated that result in a reduction of all aspects of exposure to power frequency EMFs.

Exposure guidelines of IEEE and ICNIRP are solely derived from immediate effects such as nerve and muscle excitations. These guidelines are indeed sufficient to protect from such acute effects (although indirect effects from contact currents cannot be ruled out). Evidence for long-term chronic effects has been collected in the past decades and has reached a state that it cannot longer be denied that these effects are real. . . .

- The balance of evidence suggests that childhood leukemia is associated with exposure to power frequency EMFs either during early life or pregnancy.
- Considering only average MF flux densities the population attributable risk is low to moderate, however, there is a

possibility that other exposure metrics are much stronger related to childhood leukemia and may account for a substantial proportion of cases. The population attributable fraction ranges between 1-4% (Kheifets et al. 2007) 2-4% (Greenland & Kheifets 2006), and 3.3% (Greenland 2001) assuming only exposures above 2 to 4mG are relevant. However, if not average MF flux density is the metric causally related to childhood leukemia the attributable fraction can be much higher. Up to 80% of childhood leukemia may be caused by exposure to power frequency EMF.

- Other childhood cancers except leukemia have not been studied in sufficient detail to allow conclusions about the existence and magnitude of the risk.
- IEEE guideline levels are designed to protect from short-term immediate effects, long-term effects such as cancer are evoked by levels several orders of magnitude below current guideline levels.
- Precautionary measures are warranted that should reduce all aspects of exposure, because at present we have no clear understanding of the etiologically relevant aspect of the exposure.

Exhibit 409-4 at 14-15.

D. Original Research

1. **AM Transmitters**

(i) As stated earlier, there are only three studies that relate specifically to AM transmitters. Both Dr. Erdreich and Dr. Milham testified regarding those studies.

(ii) **The Ha Study.**

Dr. Ha's study, *Radio-Frequency radiation Exposure from AM Radio Transmitters and Childhood Leukemia and Brain Cancer*, was a peer-reviewed study published in *The American Journal of Epidemiology*, published in 2007. (Exhibit 409-16) Dr. Ha's original findings are quoted in her abstract:

Leukemia and brain cancer patients under age 15 years, along with controls with respiratory illnesses who were matched to cases on age, sex, and year of diagnosis (1993-1999) were selected from 14 South Korean hospitals using the South Korean Medical Insurance Data System. Diagnoses were confirmed through the South Korean National Cancer Registry. Residential addresses were obtained from medical records. A newly developed prediction program incorporating a geographic information system that was modified by the results of actual measurements was used to estimate radio-frequency radiation (RFR) exposure from 31 amplitude modulation (AM) radio transmitters with a

power of 20 kW or more. A total of 1928 leukemia patients, 956 brain cancer patients, and 3082 controls were analyzed. Cancer risks were estimated using conditional logistic regression adjusted for residential area, socioeconomic status, and community population density. The odds ratio for all types of leukemia was 2.15 (95% confidence interval (CI):1.00, 4.67) among children who resided within 2 km of the nearest AM radio transmitter as compared with those resided more than 20 km from it. For total RFR exposure from all transmitters, odds ratios for lymphocytic leukemia were 1.39 (95% CI:1.04, 1.86) and 1.59 (95% CI: 1.19, 2.11) for children in the second and third quartiles, respectively, versus the lowest quartile. Brain cancer and infantile cancer were not associated with AM RFR.

(Emphasis added)

The study also estimated two types of RFR exposure from AM radio transmitters: peak RFR exposure and total RFR exposure. They found in the first study that

Since there has not been an established plausible biologic mechanism for interpreting the association between RFR exposure and childhood cancer, the use of different metrics for RFR exposure could provide different findings regarding a potential mechanism. In this study, total RFR exposure seemed more likely to be associated with childhood leukemia than peak RFR exposure, possibly suggesting that RFR exposure acts as a promoter rather than an instigator of the carcinogenic process.

The study concludes by stating:

The results of this study suggest a possible carcinogenic effect of AM RFR exposure on children, particularly with regard to lymphocytic leukemia. More studies will be needed to confirm this finding using a validated RFR exposure metric, as well as to elucidate possible biologic mechanisms. Furthermore, prospective studies with long-term birth cohorts will be needed to investigate the effect of fetal exposure to RFR.

- (iii) The Ha Study was preceded and precipitated by another study, an ecological study by Park, et al., entitled *Ecological Study on Residences in the Vicinity of AM Radio Broadcasting Towers and Cancer Death: Preliminary Observations in Korea*. (Exhibit 119A-13) The abstract states:

Methods: We calculated cancer mortality rates using Korean death certificates over the period of 1994-1995 and population census data in ten RF-exposed areas, defined as regions that included AM radio broadcasting towers of over 100 kW, and in control areas, defined as regions without a radio broadcasting tower inside and at least 2 km away from the towers.

Results: All cancers-mortality was significantly higher in exposed areas [direct standardized mortality rate ratio (MRR) = 1.29 95% CI =1.12-1.49]. When grouped by each exposed area and by electric power, MRRs for two sites of 100 kW, one site of 250 kW and one site of 500 kW, for all

subjects, and for one site of 100 kW and two sites of 250 kW, for male subjects, showed statistically significant increases without increasing trends according to the groups of electric power. Leukemia mortality was higher in exposed areas (MRR = 1.70, 95% CI = 0.84-3.45), especially among young adults aged under 30 years (0-14 years age group, MRR=2.29, 95% CI = 1.05-5.98; 15-29 age group, MRR = 2.44, 95% CI = 1.07-5.24).

Conclusions: We observed higher mortality rates for all cancers and leukemias in some age groups in the areas near AM radio broadcasting towers. Although these findings do not provide a causal link between cancer and RF exposure from AM radio broadcasting towers, it does suggest that further analytical studies on this topic are needed in Korea.

Exhibit 119A-13 at 387.

The study did acknowledge certain limitations, including the fact that the address on the mortality records may not reflect the person's real address, because in the Korean culture, most people tend to return to their hometown to die. (Exhibit 119A-13 at 393)

(iv) In February 2008, Ha published a reply that altered one of the tables in her study. As Dr. Erdreich testified, this is not uncommon and is part of the process of scientific studies as they are reviewed and questioned by other scientists. The published reply, called the Five Authors' Reply, was made in response to comments on the study made by a group of European scientists. (Exhibit 370) The authors acknowledged a technical error and presented corrected estimates "that show a significantly higher risk of lymphocytic leukemia in the highest quartile of exposure for peak RFR, not for the total RFR." In the corrected table, the revised odds ratio for lymphocytic leukemia at peak RFR exposure is 1.4 and is statistically significant. Therefore, the authors replaced part of Table 2 analysis with new Table 1 data in the Five Authors Reply. Their conclusion from this new data is that "Therefore, although the overall conclusion would not be materially changed, that is, a significantly increased risk of lymphocytic leukemia in children for radio-frequency exposure from AM transmitters, the discussion on the roles of the peak or total RFR among the 31 transmitters should be altered."

(v) Prior to the Five Authors Reply, Dr. Erdreich characterized the Ha Study as follows:

Because the study has --- is an improvement over previous studies, which in a way is good news. When you do a better design study, you feel more confident in it and you feel that the results are more reliable; this has some improvements. It still has some problems with the exposure assessment.

With all the improvements which – with using hundreds and hundreds of cases that they compiled over the years which should give you a better answer, they don't show a strong link with leukemia at all. This study is still weak in design and the basic conclusion is it's not conclusive. So it can't weigh in very strongly. It has internal inconsistencies in it. And you can look at it and pick out a few numbers that might make you feel that it was important, but it's not.... It failed to find any effect.

Exhibit 451 TR. Vol. I pp.204-205 (10/30/07)

Dr. Erdreich also testified that she did not believe that the Ha study (prior to the Five Authors Reply) compelled a revisiting of the FCC standards for RF exposure for the general public. She stated:

The reasons that I feel that it doesn't compel it is that it doesn't show a dose response. It doesn't show the children with leukemia were in general more exposed to high levels of exposure than children without leukemia. It has a control group. It has very large numbers of cases and controls, which is convincing which is useful in a study.

And although at these low levels of exposure, it's very difficult to really distinguish among the different groups. They assess exposure for every individual child. And in the highest exposed group there wasn't any clear evidence of increase in leukemia, or the kids with leukemia didn't have more exposure at the high levels. So it's not really even an overall positive study.

Exhibit 451TR. Vol. I p.206-07 (10/30/07)

- (vi) In testimony after the Five Authors Reply, Dr. Erdreich indicated that in her opinion, the 2.15 odds ratio for lymphocytic leukemia was a weak association. She also criticized using distance as a surrogate for exposure, indicating that it is used when there is nothing better available. (Exhibit 451 Vol. I p.88 (4/1/08))

She was also critical of the fact that the Five Authors Reply showed no dose-response, in other words, there is no trend of disease downward as you get farther away from the antennas. She stated: "So I feel that it is a misuse of epidemiological data to take that association as indicative of any kind of a risk." (Vol. I p.88-89 (4/1/08))

With respect to the Five Authors Reply she stated she did not think that using the Peak Exposure was valid because she believed the authors were looking at data from only one antenna. She also indicated that the only number over one they did get in terms of odds ratios was a very weak number, 1.4. (Exhibit 457 Vol. I p.89-90 (4/1/08)) However, if one reads the Five Authors Reply closely, it is apparent that the peak exposure data is based on 31 transmitters, not just one.

- (vii) Dr. Milham testified that in the Ha study, there were 109 AM stations with 144 antennas. In describing his opinions of the study, and the Five Authors Reply, he stated:

The power was above --- they had a very few powerful ones. They had one that was 1, 500,000 kilowatts, but most of them were just above 20, you know, the --- and they had 1,298 leukemia cases, 36 in kids under 15 who lived within 2 kilometers of a station, and they had a significant odds ratio of 2.2 compared to children who lived 20 kilometers from it. They didn't find any brain cancer or other cancer excesses.

...

I remembered her other two [studies], and it was just more of the same. I say, bigger numbers. I thought it was better done.

...

I read the letter [the Five Authors Reply], I don't think it detracts at all from the original study and that--- well, she didn't think it did. She came up with the same conclusion. . . .

Exhibit 463 TR Vol. VII at p. 479-80 (4/2/08)

Applicant's counsel repeatedly referred to the Five Authors Reply as a retraction of the 2007 study. The Days' counsel questioned Dr. Milham about that point:

Q: Just to be clear, are you saying that the Ha letter in 2008 responding to a criticism was not a retraction?

A: Absolutely not.

Q: Why not?

A: She said right there that this doesn't change anything. Doesn't change her findings or her results or interpretation. And actually, if you look at the letter – if you look at the trend tests, it's significant in the letter, where it wasn't in the other study, this dose response business.

Exhibit 463 TR Vol. VII at p. 480 (4/2/08) Even Dr. Foster indicated that the term “retraction” was an overstatement”. (Exhibit 465 Vol. IX at p. 730 (4/3/08)

(viii) **The Michelozzi Study.** The Michelozzi study, published in 2002, is entitled, “*Adult and Childhood Leukemia near a High-Power Radio Station in Rome, Italy*”. The abstract states:

Some recent epidemiologic studies suggest an association between lymphatic and hematopoietic cancers and residential exposures to high-frequency electromagnetic fields (100kHz to 300 GHz) generated by radio and television transmitters. Vatican Radio is a very powerful station located in a northern suburb of Rome, Italy. In the 10-km area around the station, with 49,656 residents (in 1991), leukemia mortality among adults (aged >14 years; 40 cases) in 1987-1998 and childhood leukemia incidence (eight cases) in 1987-1999 were evaluated. The risk of childhood leukemia was higher than expected for the distance up to 6 km from the radio station (standardized incidence rate = 2.2, 95% confidence interval:1.0, 4.1), and there was a significant decline in risk with increasing distance both for male mortality($p = 0.03$) and for childhood leukemia ($p = 0.036$). The study has limitations because of the small number of cases and the lack of exposure data. Although the study adds evidence of an excess of leukemia in a population living near high-power radio transmitters, no causal implication can be drawn. There is still insufficient scientific knowledge, and new epidemiologic studies are needed to clarify a possible leukemogenic effect of residential exposure to radio frequency radiation.

Dr. Erdreich testified that this study also concluded that the association could not be interpreted as causal, and depending on the analysis, they had only one case of childhood leukemia. (Exhibit 457 Vol. I p.95 (4/1/08)) Dr. Milham testified that the new cases of childhood leukemia on a population basis were 2.2 times what you would have expected up to six kilometers from the station, and they also noted a declining risk with distance (close response). (Exhibit 463 TR. Vol. VII p.478 (4/2/08)) He testified that was a significant increase.

- (xi) **The Maskarenic Study.** Maskarenic is “*Investigation of a Childhood Leukemia Cluster Near Low-Frequency Radio Towers in Hawaii*” done by the Department of Health, Office of Health Status Monitoring. This was a case control study (14 cases and 56 controls, matched for sex and age) which explored risk factors such as the parents’ occupation, x-ray exposure, smoking in the home, cancers in the family, medical history, and distance to the low frequency radio towers of the children’s last residence before diagnosis. The abstract states:

The odds ratio for having lived within 2.5 miles of the radio towers was 2.1 (95% confidence interval (CI) 0.6-7.2). The odds ratio for cancer in the family was 3.4 (95% CI 0.7-16.4). No other associations were found. Closeness to the station may be confounded by other socioeconomic status or exposure to hazardous chemicals. Although the possibility remained that clustering was a chance event, the unusual sex, age and type of leukemia pattern reduces the likelihood of that explanation.

Exhibit 409-26 at 666.

Dr. Erdreich commented that the authors of this study did not conclude there was evidence of a convincing association with the AM radio towers. She noted that the variation was followed up and the leukemia rate did go back down to baseline rates after a couple of years. (Exhibit 457, TR Vol. I p. 94-95 (4/1/08))

2. Short Wave Radio Transmitters

- (i). Dr. Milham did a study of amateur radio operators in the American Radio Relay League published in 1985 and 1988. He did a proportionate mortality ratio study in 1985 using 1691 death records from Washington and California amateur radio operators. This study showed myeloid and unspecified leukemia had increased mortality. (Exhibit 407-31 at 96) In a Standardized Mortality Ratio Study (SMR) using FCC records of radio operators, the results show increased mortality due to the “other lymphatic diseases” code and a SMR of 124 for leukemia. Acute myelogenous leukaemia has significant increases while the lymphatic leukaemias showed no increase. Dr. Milham’s hypothesis for the explanation for the lack of dose response in EMF studies is that unlike smoking studies, the controls are exposed. According to Dr. Milham, the EMF equivalent of non-smokers does not exist in the industrial world. (Exhibit 407-31 at 96)

3. FM and TV Broadcasting Towers

- (i) Exhibit 409-10 is a study entitled *Cancer Incidence near Radio and Television Transmitters in Great Britain*, published in the American Journal of Epidemiology in 1997. Helen Dolk carried out a study of cancer incidences in 1974 to 1986 to investigate an unconfirmed report of a “cluster” of leukemias and lymphomas near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in the West Midlands England. The abstract states:

The study used a national database of postcoded cancer registrations, and population and socioeconomic data from the 1981 census. Selected cancers were hematopoietic and lymphatic, brain, skin, eye, male breast, female breast, lung, colorectal, stomach, prostate, and bladder. Expected numbers of cancers in small areas were calculated by indirect standardization, with stratification for a small area socioeconomic index.

The study area was defined as a 10 km radius circle around the transmitter, within which 10 bands of increasing distance from the transmitter were defined as a basis for testing for a decline in risk with distance, and an inner area was arbitrarily defined for descriptive purposes as a 2 km circle. The risk of adult leukemia within 2 km was 1.83 (95% confidence interval 1.22-2.74) and there was a significant decline in the risk with distance from the transmitter ($p = 0.001$). These findings appeared to be consistent over the periods 1974-80 and 1981-86, and were probably largely independent of the initially reported cluster, which appeared to concern a mainly later period. In the context of the variability of leukemia risk across census wards in the West Midlands as a whole, the Sutton Coldfield findings were unusual. A significant decline in risk with distance was also found for skin cancer, possibly relating to residual socioeconomic confounding, and for bladder cancer. Study of other radio and TV transmitters in Great Britain is required to put the present results in wider context. No causal implications can be made from a single cluster investigation of this kind.

The author notes in a reply that while further studies by Cooper et al. found a lower excess risk within two kilometers of the mast (at 1.32), no generalizations could be drawn. She states:

Given the small numbers and therefore imprecise risk estimates involved, it is difficult to make any unequivocal statements as to whether these results are consistent with or contradict our findings. Further monitoring beyond 1994 is warranted to clarify the situation still further.

Exhibits 409-9 at 205.

- (ii) Bruce Hocking and Ian Gordon did a study in Australia entitled "*Decreased Survival for Childhood Leukemia in Proximity to Television Towers*" in the *Archives of Environmental Health* involving the risks of childhood leukemia in proximity to television towers. The summary section states:

Childhood leukemia rates (i.e., in the 0-14 yr age group) were reported previously as being increased in municipalities proximate to very high-frequency (VHF) television (TV) transmission towers in North Sydney, Australia. This was a 'greenfield' study, with no prior reports of clusters of leukemia. This finding was part of an assessment of health effects in communities exposed to low levels of radio frequency radiation (RFR). In the previous study, an increased risk of childhood leukemia was identified among children who resided in an inner ring (radiuses of ~ 4-12 km) of 6 municipalities surrounding but farther away from the TV towers, which are situated in North Sydney, Australia . . . In this study, it was determined that the inner ring of municipalities immediately surrounding the towers experienced an exposure of 8.0-0.2 $\mu\text{W}/\text{cm}^2$, compared with the outer ring (exposure: 0.2-0.02 $\mu\text{W}/\text{cm}^2$). Comparison of the inner ring with the outer ring produced an incidence rate ratio (RR) for lymphatic leukemia of 1.55 (95% confidence interval ICII= 1.00,2.41); the RR for mortality was 2.74 (95% CI = 1.42, 5.27). This greater mortality risk intimated a decrease in survival.

. . .

The groups of municipalities proximate and more distal to the TV towers differed with respect to the survival experience of children with leukemia: the inner ring had a worse survival rate than the outer ring. Very early deaths made a substantial contribution to this difference, but the gap in survival increased from 5 yr (more than 20% worse) to 10 yr (more than 40% worse)—suggesting that distance from the towers had an ongoing major influence on survival.

...

The data presented here do not establish a causal relationship between cancer and RFR. However, our observations of increased incidence and decreased survival, which worsens during the period of follow-up among children who reside near TV transmitters, are congruent with the possibility that RFR acts as a facilitator of cancer.

Exhibit 409-20.

Dr. Erdreich indicated you could not consider Hocking without considering the criticism that the McKenzie leveled at the report.

- (iii) Hocking and Gordon responded to criticism leveled at the study by McKenzie and Morrill, who had suggested that their original report did not give consideration to basic criteria for causation. Hocking and Gordon state:

A proper reading of the paper shows that we did consider temporal and spatial relationships within the limitations of the available data, as well as alternative explanations. Also given that our original data were basic in construction and constrained by the LGA boundaries—which are arbitrary from an epidemiological viewpoint—it seems likely that any true association underlying the one we sought to estimate is likely to be greater than that observed, due to non-differential misclassification.

...

McKenzie and Morrell allude to our report causing unwarranted public health fears. They appear to be unaware that the study arose in 1994 when we were seeking to assess if there were risks from low level radio-frequency radiation from the then new mobile phone towers. The TV towers were used as a surrogate because they had been in use for many years and relevant cancer data were available. It is bizarre to suggest studies for purposes of due diligence should not be reported in peer-reviewed journals lest the results raise public health fears. We previously stated that we have found an association and have proposed a case-control study to provide stronger evidence regarding causality. We have carried out an extensive pilot study to establish measurement protocols, but have not been funded for a full study. Promptly conducting such a study would be the best way of establishing whether there is any association and of addressing public fears.

Exhibit 409-21.

Dr. Milham fixed some measurements of the exposure in the various circles in which Hocking and Gordon did their study. In the inner town it was .2, at four kilometers it was .0002 . (Exhibit 459 TR. Vol. III p.476 (4/2/08))

- (iv) A study in the record called *Malignant Melanoma of the Skin—Not a Sunshine Story!* published in a medical journal by two scientists in Sweden looked at a possible correlation between skin cancer and the advent of FM and TV broadcasting in Sweden. Their published results and conclusions state the following:

A good correlation in time was found for the rollout of FM/TV broadcasting networks while the increased amount of 'sun travel' by air (charter) did not start until 7 years after the melanoma trend break in 1955. Counties that did not roll out their FM-broadcasting network until several years after 1955 continued to have a stable melanoma mortality during the intervening years.

The increased incidence and mortality of melanoma of skin cannot solely be explained by increased exposure to UV-radiation from the sun. We conclude that continuous disturbance of cell repair mechanisms by body-resonant electromagnetic fields seems to amplify the carcinogenic effects resulting from cell damage caused e.g., by UV-radiation.

Exhibit 409-17 at 336.

Figure 3 at 338 in Exhibit 409-17 shows the increase of mortality from malignant melanoma in the Swedish population relative to the time since or before the start of FM broadcasting in the different countries. The authors indicate that:

Our hypothesis . . . is simply that full body resonance effects, which easily occur in the 100 MHz frequency range, cause electric currents to pass through the body, sometimes for prolonged periods, e.g., during sleep at night. These currents may interfere with cell repair mechanisms that normally are supposed to clean up the body and repair damaged cells.

Exhibit 409-17 at 339.

Dr. Erdreich opined that it is important to look at other things that have increased over time (like increasing leisure time and going into the sun), and to look at what is known about melanoma. She felt that Figure 3 doesn't provide convincing cause and effect information. She failed to recognize that the authors did look at the advent of the charter travel industry.

4. Cellular Phones

- (i) Exhibit 407 was submitted by PDS and is entitled *Recent Advances in Research on Radiofrequency Fields and Research 2001-2003, A Follow-up to the Royal Society of Canada Report on the Potential Health Risks of Radiofrequency Fields from Wireless Communication Devices, 1999*. It was published in the *Journal of Toxicology & Environmental Health*. In the abstract, the report concludes that while there is no clear evidence of adverse health effects associated with RF fields, these same reviews support the need for further research to clarify the possible associations between RF fields and adverse health outcomes that have appeared in some reports. (Exhibit 407 at 1)

Despite the overall conclusion of the report, it contains many reviews of studies that contain disturbing evidence, as pointed out by the Days. A study by Paulraj and Behari (2002) described the effect of low level CW microwaves (2.45 GHz) on the developing rat brain. A significant decrease in the calcium-dependent protein kinase activity was observed. The results indicated that this type of radiation affects the membrane bound enzymes, which are associated with cell proliferation and differentiation, thereby pointing out its possible role as a tumor promoter. (Exhibit 407 at 6)

A section of the report deals with studies of the blood brain barrier (BBB). RF-induced breakdown of the blood brain barrier have been studied alone or in combination with magnetic fields.

Most of the studies have concluded that high-intensity RF fields are required to alter the permeability of the BBB. Recently, Salford, et al. (2003) have shown that extremely low doses of GSM radiation can cause brain damage in rats. The authors reported nerve damage following a single two-hour exposure at a SAR of 2 mW/kg. They showed that the RF energy can impair the BBB, but they added that the chemicals that leak through the BBB probably damage the neurons of the cortex, the hippocampus and the basal ganglia of the brain. The cortex is close to the surface of the skull, while the basal ganglia are much deeper.

Recently, D'Andrea et al. (2003a), in a study called *Microwave Effects on the Nervous System*²⁰ reviewed this subject and concluded: "Effects of RF exposure on the BBB have been generally accepted for exposures that are thermalizing. Low level exposures that report alterations of the BBB remain controversial. Exposure to high levels of RF energy can damage the structure and function of the nervous system. Much research has been focused on the neurochemistry of the brain and the reported effects of RF exposure. Research with isolated brain tissue has provided new results that do not seem to rely on thermal mechanisms.

Exhibit 407 at 10.

The study also looks at effects on melatonin. It has been suggested that RF fields may have a cancer-promoting effect by altering circadian rhythms of pineal activity and melatonin release. RF field effect on melatonin has been conducted in several human and animal studies. Most human studies did not find significant effects, except for a study conducted by Burch, et al. (2002) of male electric utility workers. A repeated measures analysis was used to assess the effects of cellular telephone use, alone and combined with MF exposures, after adjustment for age, participation month and light exposure. They reported that cellular phone use of greater than 25 minutes per day was associated with a drop in melatonin. That effect was only seen the third day of the study. The author concluded that prolonged use of cellular phones may lead to reduced melatonin production, and elevation 60-Hz MF exposures may potentiate the effect.

Exhibit 407 at 11.

In the Genotoxicity Studies, under the heading of Toxicological Effects, a number of laboratory studies are discussed that assessed possible genotoxic effects of a broad range of different RF

²⁰ Nonetheless, this review was one of 12 specifically named and relied on by the IEEE in finding that "A review of the extensive literature on biological effects . . . reveals no adverse health effects that are not thermally related." Exhibit 319 at 34-35. *

frequencies at a variety of levels of biological complexity. The findings reporting by d'Ambrosio et al. (2002) and Tice et al. (2002) that RF fields from phones at an average SAR of at least 5 W/kg, can cause strand breaks or other damage to DNA, as well as chromosomal damage in human lymphocytes. In a study by Sykes et al. (2001), a group of pKZ1 mice were exposed to pulsed 900 MHz RF radiation (4 W/kg) daily for 30 minutes. The exposure employed plane-wave field with a pulse repetition frequency of 217 Hz and a pulse width of 0.6 ms for 1, 5, and 25 days. Three days after the last exposure, spleen sections were screened for DNA inversion events. No significant differences were observed between the control and the exposed groups in the 1-, and 5-day exposure groups. In a 25-day exposure group, they observed a significant reduction in the inversions below the spontaneous frequency. The observation suggests that exposure to a RF field can lead to a perturbation in the recombination frequency which may have implications for recombination repair of DNA. (Exhibit 407 at 13-14)

Under the heading "Carcinogenicity", the paper indicates that "[r]epeated exposures to mobile phone radiation was found to act as a repetitive stress leading to continuous expression of Hsps in exposed cells and tissues, which in turn affects their normal regulation, and cancer results." A study by Di Carlo et al. (2002) exposed chicken embryos to ELF-EM fields (8 μ T) continuously for 4 days, or to ELF or RF exposures (3.5 mW) incident power repeated daily for 4 days.

Several of the exposure protocols yielded embryos that had statistically significant decrease in protection against hypoxic stress. Following 4 days of ELF-EM exposure, Hsp 70 levels declined by 27% as compared to controls. The superposition of ELF -EM noise inhibited hypoxia de-protection cause by long term, continuous ELF fields or daily, RF exposures. The authors concluded that this EM-induced decrease in HSP70 levels and resulting decline in cytoprotection suggests a mechanism by which daily exposure could enhance the risk of cancer and other adverse health outcomes.

Exhibit 407 pp.14-15.

In a review of Epidemiological Studies, a population-based control study of 1617 cases of brain tumor identified and still alive in Sweden from January 1997 to June 2000 (Hardell et al., 2002a), a 30% increased risk was observed among users of analog phones, which rose to 80% for those with greater than 10 years' use. (Exhibit 407 at p. 19)

Dr. Erdreich testified that Hardell is one of about 20 studies on mobile phone use, which she has reviewed. She stated that most all the studies are consistent, and Hardell sticks out as the only one with levels of the statistical associations with cancer. She testified that Hardell's methods have been critiqued or questioned in reviews by Elwood, as well as by her own review. (Exhibit 457 Vol. I p.113 (4/1/08))

Under the heading Neurological and Behavioral Effects (page 22), Sandstrom et al. conducted studies to test if GSM phone users experience more symptoms than NMT users. In Sweden, 6379 GSM users and 5613 NMT900 users were enrolled, and 2500 from each category in Norway. The adjusted OR did not indicate any increased risk for headache, warmth around/behind the ear, or discomfort, for GSM users compared with NMT users. However, a statistically significant association between calling time/number of calls per day and the prevalence headache, discomfort, and warmth was reported.

Navarro et al. (2003) carried out a health survey in Murcia, Spain, in the vicinity of a cellular phone base station working in DCS-1800 MHz. The survey contained items related to "microwave sickness" or "RF syndrome." The microwave power density was measured at the respondents' homes. Statistical analysis showed a significant correlation between the declared severity of symptoms and measured power density.

- (ii) PDS also submitted Exhibit 405 to the record, a position paper by the Washington State Department of Health on Wireless Communication Facilities (1997). It provides a layperson's view to the issues surrounding RFR and possible nonthermal effects to human health. Although it states that in 1986 the NCRP concluded there was no well-documented evidence that exposure to RF radiation increases the risk of cancer induction in humans or experimental animals, it further states:

Recent *in vivo* studies have provided some indication that DNA damage may occur at athermal specific absorption rates. . . In a recent study, single and double strand DNA breaks observed in previous studies were blocked with the use of free radical scavengers. . . One interesting finding in this series of studies is that the observed single and double strand breaks continued to be observed for up to four hours after exposure, indicating a possible continuing effect from the source of the damage and/or inhibition of the normal enzymatic repair mechanism; however, replication of these studies is needed before definitive conclusions can be drawn.

Exposure to RFR has been reported to cause a variety of effects on biochemical, neurologic, immunologic, hematologic, genetic, developmental, neuroendocrine and cellular endpoints in mammals. . . Although sufficient evidence clearly exists to clearly demonstrate both the detrimental and beneficial effects of RF radiation under thermal conditions, it has not been ruled out that some may be caused by athermal mechanisms, as well.

Exhibit 405 at 7.

It finds that there is no conclusive evidence to suggest that exposure to RF radiation at the levels produced by wireless communication facilities poses a risk to human health. It does acknowledge, however, that very little research has focused on wireless communications, and no research has been completed on the long-term effects of animal or human exposure to RFR from wireless communication. (Exhibit 405 at 9)

5. Radar and RFR Exposure at Military Installations

- (i) Exhibit 409-37 is a study entitled, *Cancer Morbidity in Subjects Occupationally Exposed to High Frequency (Radiofrequency and Microwave) Electromagnetic Radiation* published in 1996 in the *Science of the Total Environment*. The abstract states in part:

Cancer morbidity was registered in the whole population of military career personnel in Poland during a period of 15 years (1971-1985). Subjects exposed occupationally to radiofrequencies (RF) and microwaves (MW) were selected from the population based on their service records and documented exposures at service posts. The population size varied slightly from year to year with a mean count of about 128,000 persons each year; each year about 3700 of them (2.98%) were considered as occupationally exposed to RF/MW. All subjects (exposed and non-exposed to RF/MW) were divided into age groups (20-29, 30-39, 40-49, and 50-59). All newly registered cases of cancer were divided into 12 types of localization of the malignancy; for neoplasms of the haemopoietic

system and lymphatic organs an additional analysis based on diagnosis was performed. Morbidity rates (per 100,000 subjects annually) were calculated for all of the above localizations and types of malignancies both for the whole population and for the age groups.

Exhibit 409-37 at 9.

The study indicated that the exposures were almost all limited to pulse-modulated high frequency EM fields (150- to 35000-MHz RF/MW radiation), and that exposure to continuous waves and lower frequencies were marginal. The conclusions of the study stated:

The main results obtained in the present study were a double incidence of all neoplasms with a threefold increase of cancers of the alimentary tract and a sixfold increase of malignancies of the haemopoietic system and lymphatic organs in 20 to 59-year-old career military servicemen exposed occupationally to pulse-modulated 150- to 3500-MHz RF/MW radiation. However, this does not prove a causal link between development of neoplastic diseases and direct interaction of EM fields, since retrospective analysis cannot provide convincing evidence of such links. Nevertheless, the high incidence of certain forms of neoplasms in personnel exposed to pulse-modulated RF/MW radiation clearly shows a need for urgent identification of causal factors present in the occupational environment.

Exhibit 409-37 at 16.

- (ii) Dr. Milham discussed the Navy radio submarine antenna outside Arlington. A paper in the record, Exhibit 409-42, indicates that orbiting satellites found that powerful lead based antennas such as the Arlington antennas, which broadcast at a million watts, have punched holes in the inner radiation belt that could be picked up by an orbiting satellite. He testified that there had been cancer clusters around these big antennas in base housing in Guam and other places. (Exhibit 463 TR. Vol. VII p.481-82 (4/2/08)); Exhibit 409-45 (Article describing cancer cluster at Guam))
- (iii) Exhibit 409-24 is a paper entitled *Motor and Psychological Functions of School Children Living in the Area of the Skrunda Radio Location Station in Latvia* by Kolodynski, et al. in 1996. The study involved looking at the chronic effects of electromagnetic radiation on the population of Skrunda, Latvia, whether there has been an early warning military radio location station operating for more than 25 years in a populated region at frequencies of 154-162 MHz. It is a pulse radar station, and the duration of pulses is 0.8 ms and time between pulses is 41 ms, i.e. the pulses occur at a frequency of 24.4 Hz. (Exhibit 409-24 at 87) The study showed that children living in front of the Skrunda RLS have less developed memory and attention, slower reaction times and decreased endurance of neuromuscular apparatus, slower reaction time and less developed memory and attention as a result of chronic electromagnetic field exposure to the radar station. The authors stated that the children that lived in front of the radar performed worse than those who lived behind the radar and even worse again when compared with the control group. (Exhibit 409-24 at 91)

6. RFR Exposure in Industrial Settings

- (i) Dr. Milham testified that he won the Strom Foundation Humanitarian Award in 1990 for discovering that an electromagnetic pulse radiation that workers from Boeing were

exposed to probably caused chronic granulocytic leukemia. The workers were working on hardening missile silos and flight decks to protect them from blasts. In a workplace in Cascade, Montana, big Vandergraph generators, which were big capacitors suspended from helicopters, were used to “zap” missiles to see if workers could see what they needed to do to make the guidance systems on the missiles work despite the “zap”. (Exhibit 462 TR. Vol. VI p.444 (4/208)) According to Dr. Milham, the day after Boeing attorneys deposed Dr. Milham about his study of this issue, they settled the case and gave the plaintiff about a million dollars. The plaintiff used the money to set up the foundation to take care of his sick co-workers and gave Dr. Milham the award. The conclusion of Dr. Milham’s study was that the electromagnetic pulse radiation caused cancer. (Exhibit 462 TR. Vol. VII p.445 (4/2/08))

- (ii) Dr. Milham did a study of workers in Washington state who he posited would have higher than normal exposure to electromagnetic fields – those included electronic technicians, radio and telegraph operators, electricians, linemen, power company workers, substation people, Columbia River dam operators and aluminum workers. Dr. Milham testified that he did a study of Kaiser Aluminum in Spokane and Tacoma, and found that there was an increased incidence of non-Hodgkin’s lymphoma and leukemias. It is a disease tied to the immune system. He took blood samples from 20 of the potroom workers (an area with high electromagnetic fields) and found highly elevated TA counts. TA cells are a special kind of white cell that is a type of immune defense cell. He replicated the test and found the same thing. (Exhibit 462 TR. Vol. III p.465-66 (4/2/08))
- (iii) Dr. Milham also provided a rat study done at the University of Washington involving 100 germ free rats and 100 germ free controls that were exposed to 2450 megahertz RF. The exposed rats had high counts of T and B cell counts compared to the shams, basically the same kind of relative relationship the aluminum workers had to the controlled population. (Exhibit 462 TR. Vol. III p.465-67 (4/2/08)) His interpretation of these studies is that the human body interprets electromagnetic fields as an invader and tries to mount an immune attack on it. (Exhibit 462 TR. Vol. III p.467 (4/2/08); Exhibit 409-31) In the rat study, 18 of the exposed rats died of cancer while only 5 of the controls did. (Exhibit 462 TR. Vol. III p.469 (4/2/08); see Exhibit 409-38; Exhibit 409-31)
- (iv) Exhibit 409-36 is entitled *The Possible Role of Radiofrequency Radiation in the Development of Uveal Melanoma*, authored by Stang, et al. in 2001. This study has to do with uveal melanoma of the eye, which is the most common primary intraocular malignancy in adults, with an incidence rate of up to 1.0 per 100,000 person-years (age standardized, world standard) in Europe. (Exhibit 409-36 at 7) The abstract states:

There are few epidemiologic studies dealing with electromagnetic radiation and uveal melanoma. The majority of these studies are exploratory and are based on job and industry titles only. We conducted a hospital-based and population-based case-control study of uveal melanoma and occupational exposure to different sources of electromagnetic radiation, including radiofrequency radiation. We then pooled these results. We interviewed a total of 118 female and male cases with uveal melanoma and 475 controls matching on sex, age, and study regions. Exposure to radiofrequency–transmitting devices was rated as (a) no radiofrequency radiation exposure (b) possible exposure to mobile phones, or (c) probable/certain exposure to mobile phones. Exposures were rated independently by two of the authors who did not

know case or control status. We used conditional logistic regression to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs). We found an elevated risk for exposure to radiofrequency-transmitting devices (exposure to radio sets, OR = 3.0, 95% CI = 1.4-6.3; probable/certain exposure to mobile phones, OR = 4.2, 95% CI = 1.2-14.5). Other sources of electromagnetic radiation such as high-voltage lines, electrical machines, complex electrical environments, visual display terminals, or radar units were not associated with uveal melanoma. This is the first study describing an association between radiofrequency radiation exposure and uveal melanoma. Several methodologic limitations prevent our results from providing clear evidence on the hypothesized association.

With respect to nonionizing radiation, the authors specifically stated:

It is still unclear whether RFR exposures too weak to increase temperature measurably could have biological effects. Biological interaction mechanisms are not necessarily thermal; however, many studies have suggested that RFR exposure at low levels that do not challenge thermoregulation or produce any change in cell temperature may have biological effects, but they have either not been consistently replicated or else their relevance for human health cannot be adequately assessed using information currently available. A hypothesized mode of action is that RFR might promote (that is, speed up) the development of cancer that has been caused by other agents.

How could RFR act as a promoter for uveal melanoma? Ocular melatonin is synthesized in the retina and the ciliary body and is also found in the aqueous humor. Experimental studies on cultured human uveal melanoma cells indicate that melatonin inhibits the growth of melanin cell lines in a dose-dependent manner and therefore has an antiproliferative effect. The following explanation is speculative: if RFR decreased the amount of ocular melatonin, it would promote the development of uveal melanoma.

Exhibit 409-36 at 11.

- (v) Exhibit 401 is an animal study by Chou et al. subjecting them to RF radiation at 2450 MHz. The abstract states:

Statistical analyses by parametric and non-parametric tests of 155 parameters were negative overall for effects on general health, longevity, cause of death, or lesions associated with aging and benign neoplasia. Positive findings of effects on corticosterone level and immune system at 13 months exposure were not confirmed in a follow-up study of 20 exposed and 20 control rats. Differences in O₂ consumption and CO₂ production were found in young rats. A statistically significant increase of primary malignancies in exposed rats vs. incidence of controls is a provocative finding, but the biological significance of this effect in the absence of truncated longevity is conjectural. The positive findings need independent experimental evaluation. Overall, the results indicate that

there were no definitive biological effects in rats chronically exposed to RF radiation at 2450 MHz.

Despite this conclusion, their study showed a fourfold increase of primary malignancies in the exposed animals. (Exhibit 401 at 492) They also showed highly elevated T-cell counts over controls. Dr. Milham indicated in his testimony that he disputed this study strenuously, and did so at a meeting where they presented their findings. (Exhibit 462 TR. Vol. VII p.513 (4/2/08))

7. Studies of Electrical Power/Current

- (i) Exhibit 409-33 is an article entitled *Historical Evidence that Residential Electrification Caused the Emergence of the Childhood Leukemia Peak* by Dr. Milham and E.M. Osslander. The summary states:

A peak in childhood leukemia, ages two through four, emerged de novo in the 1920's in the United Kingdom and slightly later in the United States (US). Electrification in US farm and rural areas lagged behind urban areas until 1956. In recent year, childhood leukemia has been associated with residential electromagnetic fields. During 1928-32, in states with above 75% of residences served by electricity, leukemia mortality increased with age for single years 0-4, while states with electrification levels below 75% showed a decreasing trend with age ($P=0.009$). During 1949-51, all states showed a peak in leukemia mortality at ages 2-4. At ages 0-1 mortality was not related to electrification levels. At ages 2-4, there was a 24% (95% confidence interval (CI) 8%-41%) increase in leukemia mortality for a 10% increase in percent of homes served by electricity. The childhood leukemia peak of common acute lymphoblastic leukemia may be attributable to electrification.

Exhibit 409-33 at 290.

The peak in leukemia was first noticed by Court Brown and Doll, who did the physician study nailing the link between cigarette smoking and cancer. In 1961, they suggested “. . .a new leukemogenic agent” had been introduced first into Britain around 1920 and later into the United States and other countries. They noted that the peak was not present in the mortality data for US blacks or in Japanese children. Up until 1960, childhood leukemia was uniformly fatal to all children who contracted it. (Exhibit 409-33; Exhibit 463 TR. Vol. VII p.496 (4/2/08)) The leukemia peak is still not present in Sub-Saharan Africa and other places without electricity. (Exhibit 463 TR. Vol. VII p.498 (4/2/08))

- (ii) Dr. Milham currently has a paper under review with the *American Journal of Independent Medicine* entitled *A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated with Increased Cancer Incidence in Teachers in a California School*. The study was a retrospective study of cancer incidence in the teachers' cohort in relationship to the school's electrical environment. The authors found that sixteen teachers in a cohort of 137 teachers hired from 1988-2005 were diagnosed with 18 cancers. The abstract states:

The observed to expected (O/E) risk ratio for all cancers was 2.78 ($p=0.000098$), while the O/E risk ratio for malignant melanoma was 9.8 ($p=0.0008$). Thyroid cancer had a risk ratio of 13.3 ($p=0.0098$), and uterine cancer had a risk ratio of 9.2 ($p=0.019$). Sixty Hertz magnetic

fields showed no association with cancer incidence. A new exposure metric, high frequency voltage transients, did show a positive correlation to cancer incidence. A cohort cancer incidence analysis of the teacher population showed a positive trend . . . of increasing cancer risk with increasing cumulative exposure to high frequency voltage transients on the classroom's electrical wiring measured with a Graham/Stetzer (G/S) meter. The attributable risk of cancer associated with this exposure was 64%. A single year of employment at this school increases a teacher's cancer risk by 21%.

Conclusion: The cancer incidence in the teachers at this school is unusually high and is strongly associated with high frequency voltage transients, which may be a universal carcinogen, similar to ionizing radiation.

Exhibit 409-32.

K. Standards in Other Countries

1. Ms. Day tried to introduce evidence of lower standards in other countries, which she could not substantiate in the record. Dr. Erdreich co-authored a review article entitled *Radio Frequency Radiation Exposure Standards: Considerations for Harmonization* (Exhibit 311) in which she addresses this topic:

The most salient aspect of the standards reviewed in this report is the common basis that the most sensitive effect (critical effect) is the disruption of ongoing behaviors in laboratory animals. This effect is thermoregulatory and has been observed at an SAR of 4 W kg⁻¹ attendant to 1 [degree] C rise in temperature. We understand that standards developed over the years in China and Eastern Europe, including the Former Soviet Union, have been much lower than those reviewed here. We were unable to locate any original standard in English, but available information indicates that these standards have been based on reports of subjective symptoms in humans at levels well below 4 kg⁻¹ (e.g., Chiang 1999; Szimigielski and Obara 1989). The standards that we reviewed did not consider these reports to be a suitable basis for exposure limits.

2. The Examiner finds that there are much lower standards for exposure in other countries, specifically China and Eastern Europe, based on this article by applicant's expert. The Examiner finds the authors' discussion of the validity of the standards without foundation and somewhat pejorative, given the fact that they admit they were not able to translate the standard in English and they don't seem to have attempted to do any in-depth review behind these standards. The Examiner has no reason to believe that other countries' standards aren't based on valid science and rational decision making.

L. The Precautionary Principle and Public Health Policy

1. Dr. Erdreich testified that the Precautionary Principle says that the precautions you take should depend on the kind of evidence that you have. (Exhibit 452 TR. Vol. II p.231 (10/30/07))

The Precautionary Principle is a policy that arose in Europe. And the idea being if you have reason to believe that there's great – that there's harm from something, but you really don't know for sure, you might want to take precautionary measures to measure it with your amount of uncertainty to protect

the public's health in the interim. And it doesn't mean you take all kinds of precautions no matter what. And there's also some cost benefit discussions in the Precautionary Principle.

Exhibit 452 TR. Vol. II p.231 (10/30/07)

2. Exhibit 409-15 is a commentary written by Dr. John R. Goldsmith, who works in the Department of Epidemiology at Ben Gurion University in Israel, entitled *TV Broadcast Towers and Cancer: The End of Innocence for Radiofrequency Exposures*. The article reviews Hocking (1996), and two studies by Helen Dolk. The author interprets the data together, stating:

Each study, alone, has its limitations. The Australian authors conclude that they have found an association between residences near TV towers and increased incidences of childhood leukemia. Increased childhood leukemia was found in both of the other studies, although statistically not significantly so. There is stronger evidence for increased adult than for childhood leukemia in the British studies, and suggestive evidence of bladder and skin cancer excess is also found.

Taken together, these studies tend to support one another, as does the unpublished Honolulu study, which also shows increased cancer and leukemia near towers.

The findings of these four sets of data mean that carcinogenicity of RF can occur in community populations living near broadcast towers, and at much lower exposures than had previously been thought to be of biological relevance. Precisely how much increase and how close to the facilities can one consider the increase absent or of trivial consequence are subjects for legitimate debate and additional studies.

A REASONABLE COURSE OF ACTION

The principle of prudent avoidance would suggest that the following procedures be debated and possibly applied:

1. For new installations, of high power, restricting residential use to a distance of greater than 5 km should reduce the risk to an undetectable level.
2. Existing housing units within a 5-km radius should be monitored for exposure, both inside and outside of the unit. Cancer surveys in the vicinity of such broadcast facilities would be useful, if exposures have been for long enough to accommodate the latency usual with such cancers.
3. The availability and effectiveness of screening and shielding from RF needs to be greatly increased for such housing units are found to be exposed to 'elevated levels of radiation.'
4. Further attention is needed for design of directional antennae which can avoid exposures of dwelling units.
5. Credible information sources will be needed, so that members of the public can make reasonable decisions.

6. Public health, communications industry, community and academic groups all can contribute through a consortium to a sensible program to reduce any appreciable risk to affected individuals and communities.
 7. The relevance of these findings to other uses of RF as in cellular telephones will need to be worked out, possibly also on the basis of a consortium. The reported doubling of the frequency of lymphoma in transgenic mice exposed to radiation resembling that of cell phones [Repacholi et al., 1997] adds to our concern.
- [sic]9. The notion that non-ionizing radiation, and in particular radiofrequency radiation, was harmless---the assumption of innocence--- is no longer tenable.

Exhibit 409-15 at 690-91.

3. Angela Day is a student in the doctoral program at the Department of Political Science at the University of Washington. She has completed the master's degree program in public administration at the University of Washington. She is also a former Snohomish County Planning Commissioner. One of her research topics is regulatory issues and how science is involved in the regulatory process. (Exhibit 464 TR. Vol. VIII p.550 (4/3/08).) The Examiner finds that Ms. Day qualifies as an expert witness in public policy.
4. Ms. Day testified regarding some of the organizations that are recommending a re-examination of the standards. She pointed out that the stakes are very high for doing an objective risk assessment of the standards and allowing for new regulatory standards. She stated:

It's not just applicable to AM radio antennas but, in fact, all broadcast antennas. As we've heard today, it's hard to separate out one segment of the electromagnetic spectrum without talking about others, which means that if an organization or a regulatory agency is to re-examine the standards, you will likely have to venture into the area of cellular telephones, cordless telephones, video displays, microwaves, two-way radios and local and global satellite communication systems.

So as you can see, there's a lot at stake and I think it leads to some amount of inertia in re-examining those standards and perhaps promulgating a new regulatory standard.

Exhibit 464 TR. Vol. VIII p.557 (4/3/08)

5. Ms. Day also testified that concerns have been raised by the EPA, the US Food and Drug Administration, the National Toxicology Program, the UK Parliament, and the World Health Organization. (Exhibit 464 TR. Vol. VIII p.558 (4/3/08)) Ms. Day pointed out that in the BioInitiative Report, Section 4 at pg. 8, the authors indicate that the United States Radiofrequency Interagency Working Group (RFIAWG), discussed by Dr. Erdreich in her testimony, and a group that participates in the IEEE voluntary standard setting process, issued the following statement in 1999:

Studies continue to be published describing biological responses to nonthermal ELF-modulated RF radiation exposures that are not produced by CW (unmodulated) radiation. These studies have resulted in a cancer that exposure guidelines based on thermal effects, and using information and concepts (time-

averaged dosimetry, uncertainty factors) that mask any differences between intensity-modulated RF radiation exposure and CW exposure, do not directly address public exposures, and therefore may not adequately protect the public.

Exhibit 409-4 at Section 4 pg.8

At Page 10 of the same report are quotes from the National Toxicology Program at the National Institute of Health. In February 2000, the U.S. Food and Drug Administration made a recommendation to test RFR as a carcinogen. The recommendation stated in part: "FCC radiofrequency radiation guidelines are based on protection from acute injury from thermal effects of RF exposure and may not be protective against any non-thermal effects of chronic exposures." In March 2003 the National Toxicology Program issued a fact sheet regarding its toxicology and carcinogenicity testing, stating: "The existing exposure guidelines are based on prevention from acute injury from thermal effects of RF exposure. Current data are insufficient to draw definitive conclusions concerning the adequacy of these guidelines to be protective against any non-thermal effects of chronic exposures."

6. Ms. Day testified that when a regulatory agency sets standards based on science, they generally go through a two-step process. First is a risk assessment, based on scientific studies, conducted with stakeholders, including experts, industry, public interest advocates, and academics. Second, they then decide how to manage the risk, based on the scientific evidence as well as normative considerations such as the potential for harm and the severity of the potential harm. (Exhibit 464 TR. Vol. VIII p.552-53 (4/3/08).
7. Ms. Day indicated that the FCC did not follow this type of process. The FCC adopted the IEEE standards, which in her view is essentially an industry group coming together voluntarily and setting the standard.
8. The FCC adopted the IEEE standards, and they were then adopted by letter by the EPA. Ms. Day testified:

So this was a little bit different process that was originated, for example by the EPA, which has a mandate to protect public health, running a process by which they consult with industry, scientists and other advocates.

This was something that was promulgated and came up – came forward from an industry based process. So in this way, this was a little bit of a different process in that the industry basically did the risk assessment as well as the risk management policies and helped make a determination about what levels of risk we would accept as in the U.S. standards, what would be an acceptable risk to help make that judgment.

Exhibit 464 TR. Vol. VIII p.556 (4/3/08)

9. The idea behind the precautionary principle is to take precautionary actions to avoid plausible and serious threats to health or the environment, especially when the impacts are irreversible and likely to be much more costly to society than the precautionary measures. (Exhibit 409-4, Section 16 at 8)
10. Many international treaties have included the precautionary principle, including the Treaty of the European Union and the North Sea Ministerial Conference in 1990. The North Sea declaration had to do with reducing chemical pollution in the North Sea and called for "action to avoid

potentially damaging impacts of substances, even where there is no scientific evidence to prove a causal link between emissions and effects.” (Exhibit 409-4, Section 16 at 9-10) David Gee (European Environment Agency) cautions, however, that all serious applications of the precautionary principle require some scientific evidence of a plausible association between exposure and current, or potential, impacts. (Exhibit 409-4, Section 16 at 10)

11. The Communication from the European Union in 2000 specifies that there must be “reasonable grounds for concern” to justify action under the precautionary principle. Since that time, a judgment from the European Court of Justice provides a general definition which authoritative commentators think contain many of the necessary elements of the precautionary principle that are applicable to all areas of the EC law:

Where there is uncertainty as to the existence or extent of risks to human health, the institutions may take protective measures without having to wait until the reality and seriousness of those risks become fully apparent (Christoforou 2002).

Exhibit 409-4, Section 16 at 11.

12. In addition, the World Health Organization Declaration from the Fourth Ministerial Conference on the Environment and Health (WHO 2004a) refers explicitly to the precautionary principle with the recommendation:

That it should be applied where the possibility of serious or irreversible damage to health or the environment has been identified and where scientific evaluation, based on available data, proves inconclusive for assessing the existence of risk and its level but is deemed to be sufficient to warrant passing from inactivity to policy alternatives.

Exhibit 409-4, Section 16 at 11.

13. The American Public Health Association (APHA) affirmed endorsement of the precautionary principle as a cornerstone of public health for the protection of children’s health. In a 2000 policy statement, APHA encouraged governments, the private sector and health professionals to promote and use the precautionary principle to protect the health of developing children (APHA, 2001). (Exhibit 409-4, Section 16 at 11)

14. Dr. Foster wrote an article *Risk Management: Science and the Precautionary Principle*. (Exhibit 374) The article states:

Clear guidelines are still lacking for the weight of evidence needed to trigger the principle, and for deciding which of the large range of precautionary measures should be applied in given circumstances. Different standards of proof seem to be needed to invoke the principle than for other regulatory actions—but how different are they? Can one justify using the principle to limit public exposure to RF energy to levels far below the threshold for established hazards to address public concerns on the basis of scientific data that major scientific committees find unpersuasive of a hazard? Conversely, how much evidence of safety should proponents of a new technology be required to provide? Such issues will generate endless controversy and, indeed, may only be settled by litigation.

Although some standard of proof is needed, it need not be as high as scientists themselves might wish.

Exhibit 374 at 3.

15. Dr. Foster opined that the precautionary principle is already incorporated into the FCC Guidelines. (Exhibit 469 TR. Vol. IX p.720 (4/03/08))

M. Expert Opinions on the Ultimate Question

1. Dr. Erdreich provided a letter to Erik Olsen in this proceeding discounting information submitted by Angela Day regarding health effects of RF exposure. (Exhibit 13.78) Her summary conclusion states that:

I find that the materials submitted, including the recent study by Ha et al., do not provide scientific evidence that RF from radio antennas area cause of cancer or other adverse health effects in people who live or work in the vicinity of radio antennas. The three studies submitted by Ms. Day are but a fraction of thousands of studies that are relevant to assessing potential health effects and developing exposure limits for RF. Selecting a few studies from the entire body of research is contrary to the standard methods scientists use to obtain objective information on the effect of any exposure on health.

...

The FCC limits are consistent with the recommendations of many other scientific studies included in Ms. Day's submissions. The Ha et al. Study is inconclusive, as it did not show a clear increased risk with higher RF exposure from AM transmitters, despite an improved exposure assessment and larger population. Consequently, the Ha et al. study would not affect the RF exposure limits that are included in the relevant standards, and used to assess compliance with FCC Guidelines.

Exhibit 13.78 at 2

2. Dr. Erdreich stated her ultimate conclusion this way:

My opinion is that there are no established risks below the FCC guidelines.

...

My opinion is based on what the research can properly tell us to date. . . . Epidemiological research alone has not established even a statistical association between radiofrequency exposure and human health. That is if you use a standard criteria for evaluating and reviewing this.

Independent reviews of this research as published in peer review journals and found in the standards have consistently concluded that the research does not support findings of adverse effects. They do indicate that the studies are weak and inconclusive.

The study that was admitted in evidence in the previous hearing, Ha et al. 2007 and their reply letter in 2008. These studies do not contradict the conclusions of

those panels. The Has study does not establish an association with risk if you use accepted criteria to review the study.

3. Dr. Erdreich's opinion is that 1520 AM radio stations alone or in combination with the KRKO AM radio station will not create a health risk to the people who live near or in the vicinity of the project site. (Exhibit 456 TR. Vol. VI p.792 (11/2/07)) She testified that the basis of her answers is as follows:

This site is not only in compliance with the standard—and compliance means it does not exceed the limit that they said—but any possible exposure is many, many times lower. I figure it's about a couple hundred times – 400 times lower at the schools for example.

Then I've read – I've been reading the literature and following the thought processes for years of scientific organizations that have deliberated over what the research means. And I've spoken with other scientists and I've reviewed the material in this book. And other organizations --- more importantly, other organizations have reviewed the research as well. Past – up until, you know, 2006 and 2007.

Based on this research, I feel the standard is solid. And that means I'm standing behind the FCC standard. And always it's important to understand that actually this site's exposures to the population are lower than the standard will allow.

Exhibit 456 TR. Vol. VI p.793 (11/2/07)

With regard to her opinion that there is no increased risk for pregnant women and their children, Dr. Erdreich stated:

There have been quite a lot of studies in animals, which are a very important model. Animals react to RF the same way humans react, by the heating. They study the animals and they expose them at a level just below what makes the mothers be overheated and a little above it and they – and well below it.

The only time there are damage to the offspring is if the exposure is above the exposure limit or the equivalent of the standard. There have been a few human studies of physical therapists because they use microwave short wave radiofrequency equipment. Those studies are not particularly good, because it's very hard to measure people's exposure. You're just using their occupation. But they also – taken together those few studies don't show any indication of any effect to pregnant women.

I also heard a very competent scientist, who is also a physician as well as an epidemiologist, talk a few years [ago] about how he's done calculations. The occupational standard is a little bit higher, and so the – the general public exposure is even lower than the occupational standard. So basically the laboratory research and – no human research suggests a concern. The laboratory – no human research supports a concern. The laboratory research clearly suggests that the standard is on solid ground.

Exhibit 456 TR. Vol. VI p.794 (11/2/07)

4. Dr. Martin Ziskin opined that the two AM radio stations will not cause adverse health effects. He stated:

Well, gee whiz, it's an awful lot of background information we are talking about. I mean, this is AM radio. This is radio that everybody experiences. It's everywhere we go. Anyone who can listen to a radio is exposed to this radiation. What we're talking about is a small increment to something that already exists everywhere. How much concern is there for radio waves in general? It's been around for a long time. And medically speaking, there is no medical condition due to – known to be – come from these AM energy. There's no medical disease.

Exhibit 465 TR Vol. IX p. 739 (4/2/08)

5. Dr. Milham testified that in his professional opinion, AM radio transmitters should be located 5-6 kilometers away from residential areas to be at a safe distance in terms of public health. His opinion is:

I believe that an increase in human morbidity and mortality are being caused by the rapid rise in RF exposures in the last 30 years, especially in urban areas.

The entire electromagnetic spectrum seems to be bioactive and carcinogenic. Most EMF risks are elevated – I showed that it was about six to one – and I think a lot of the low risk ratios are due to exposed controls, bad exposure assessment, and poor study design. My advice is that you deny the application based on my testimony.

Exhibit 463 TR Vol. VII at p. 495 (4/2/08)

6. Dr. Milham described how he reached his conclusion of 5-6 kilometers as a safe distance from an AM radio transmitter:

And I summarized here in the Ha study if you look [at] Figure 3 you come up with six kilometers as a safe distance. Michelozzi, six kilometers in that one. That's from Table 2. Hocking, there wasn't any table, but I just took a ruler and made measurements from this inner zone and this outer zone and from Figure 1 and came up with five kilometers.

Maskarinec says that 2.6 miles, which I translated to kilometers to be consistent. And Goldsmith, looking at Dolk's data, he comes up to the conclusion of five, and I agree with him.

Exhibit 463 TR Vol. VII at p. 493-94 (4/2/08)

N. Credibility of the Expert Witnesses

1. The BioInitiative Report states:

Professional bodies from technical societies like IEEE and ICNIRP continue to support "thermal-only" guidelines routinely defend doing so a) by omitting or ignoring study results reporting bioeffects and adverse impacts to health and wellbeing from a very large body of peer-reviewed, published science because it

is not yet “proof” according to their definitions; b) by defining proof of “adverse effects” at an impossibly high...bar (scientific proof of causal evidence) so as to freeze action; c) requiring a conclusive demonstration of both “adverse effect” and risk before admitting low-intensity bioeffects should be taken into account; [no d] e) by ignoring low-intensity studies that report bioeffects and health impacts due to modulation; f) by conducting scientific reviews with panels heavily burdened with industry experts and under-represented by public health experts and independent scientists with relevant low-intensity research experience; g) by limiting public participation in standard-setting deliberations; and other techniques that maintain the status quo.

Exhibit 409-4 Section 3 at p. 7

2. The Examiner was struck by how very carefully Dr. Erdreich worded her opinions. She was always careful to almost parrot exactly what the quote from the BioInitiative above states: there is no scientific evidence that RFR “causes adverse effects” or “the standard is on solid ground”. While the Examiner appreciated her expertise in the field of epidemiology, the Examiner was given no confidence based on her testimony that she was doing anything but defending an industry standard as an expert witness. She also reviewed the standard from a pure risk management/tort litigation point of view, not as a scientist or even from a policy perspective. Every single study that was discussed regarding possible athermal effects, she completely discounted. To the Examiner, that further diminished her credibility.
3. Dr. Ziskin was not a credible witness. As an academic, he claimed he was “offended” by Ms. Day’s testimony that she characterized the IEEE as an “industry” group. The Examiner found his claim of offense emotional and unprofessional. His explanations tended to be less than clear and not based on science; his opinion on the ultimate question was based on the fact that essentially AM radio has been around for a long time. (See Finding, above) Finally, Dr. Ziskin maligned Dr. Milham’s character to a point that is proven by the record to be absolutely untrue and libelous. When pressed on his opinions, he could not back them up. (Exhibit 465 TR Vol. IX at 756-57 (4/3/08)) Finally, he termed the citizens’ concern over the health effects from the antennas in this case “unreasonable”. (Exhibit 465 TR Vol. IX at 776 (4/3/08))
4. Dr. Foster did a very good job of clearly explaining his opinions and the reasons for his opinions. His opinions regarding epidemiological studies were not particularly convincing, because he is not an epidemiologist, he is an engineer. But, his testimony on the precautionary principle and the European Union was very interesting.
5. The Examiner found Dr. Milham to be a credible witness. Dr. Milham has spent a lifetime doing original epidemiological research, unlike Dr. Erdreich, who simply reviews research. While he may not be a part of the IEEE, or what Dr. Ziskin regarded as the “mainstream”, his CV indicates he has written over 50 peer reviewed articles and his testimony indicated he has made important discoveries that have helped many people. He spent over 20 years at the Washington State Department of Health, a part of that as the Chief Epidemiologist. His entire career has been spent as an epidemiologist in the public health field.

CONCLUSIONS OF LAW

1. The Examiner has original jurisdiction over conditional use permit applications pursuant to Chapter 30.72 SCC and Chapter 2.02 SCC.

2. **Jurisdiction.**

A. Deputy Examiner Good made Conclusion of Law No. 9 in his November 30, 2007 Order, which the Examiner adopts as a part of this decision. For clarification, given Examiner Donahue's Order reproduced above, it will be reproduced in full below:

Examiner Donahue found as fact that the Radio Frequency Interference (RFI) of a potential second station also operating at 50,000 watts would be fully mitigated by the KRKO 1380-AM mitigation plan required by the FCC. (Exhibit 8) That finding applies only to interference with electronic equipment, including that common to residential households. (See Exhibit 257, File 00-107495) That finding does not apply to human exposure to Radio Frequency (RF) electro-magnetic energy. That matter is properly before this Examiner unless preempted by federal law. (Exhibits 119, 140, 142, 143-A) Examiner Donahue found that the County's jurisdiction to protect the public health, safety and welfare is not preempted by federal law. The parties in opposition to this proposed revision concur. The applicant argues to the contrary. The Examiner has thoroughly reviewed the briefs of the parties on that preemption issue. The Examiner concludes from those documents that federal law provides for preemption of local authority as to cellular personal telecommunication antenna and amateur radio towers but does not preempt local review and regulation of the effects of RF radiation from commercial AM transmission antennas. The Examiner finds particularly persuasive the argument of attorney Erlichman (Exhibit 119) concerning the four prongs of federal preemption and his points that (1) the federal human exposure standard of 614 V/m is a minimum standard for public safety and (2) a higher local standard does not make meeting the federal standard impossible and (3) thus, no preemption conflict exists in this instance. The Examiner concurs.

(Emphasis added)

B. This legal conclusion is buttressed by the testimony of Steve Lockwood, a professional engineer testifying on behalf of the applicants. He testified very clearly that the Radio Frequency Interference (RFI) testing has nothing whatsoever to do with testing for potential effects to human health. The FCC requires the volt per meter contours of the directional antennas be tested because they generally receive many complaints about interference every time a new radio station comes on line, so they have created a federal rule requiring the licensing to do testing and create filters to eliminate interference with existing uses like telephones, other radio stations, etc. Mr. Lockwood stated:

And they [the FCC] want to have some idea of the number of people that live close to the facility. And this is only for a radiofrequency interference issue. This really has nothing to do with exposure, human exposure, to

radiofrequency fields. This is only so the FCC has some idea of where this facility is and what – will there be likelihood of many complaints from radiofrequency interference.

. . . .
[The blanketing interference rule] was a reactionary policy that the FCC embarked on after having a number of situations where people had sited radio stations in high density areas and, you know, particularly in East Coast cities and various other things and have had lots of radiofrequency interference complaints.

Exhibit 451 TR. Vol. I p.146 (10/30/07)

- C. Further, applicant's engineer, Mr. Lockwood and his partner, Mr. Hatfield of the firm Hatfield & Dawson Consulting Engineers (Seattle), discuss the jurisdictional question of regulation of broadcasters' emissions of RF fields in an article called, "*RFR: Fads and Fallacies*" (Exhibit 409-19 at 5):

In the Telecommunications Act of 1996, the U.S. Congress required the FCC to "prescribe and make effective rules regarding the environmental effects of radio frequency emission." Included in this Act was a prohibition against state and local government from regulation of wireless facilities (typically cellular telephone base stations) based on the "environmental effects of RF emissions." Broadcasters are not a "Wireless Facility" under the definitions of this Act. Some local governments have regulated broadcasters' emissions of RF fields, setting emissions limits lower than FCC guidelines and demanding additional reporting.

Emphasis added.

- D. The Examiner notes that two exhibits in the record involve two different courts affirming the use of a local jurisdiction's police power to deny a conditional use permit for FM broadcast antennas. (Exhibit 119A-20 and -21)
- E. The Examiner agrees with the Deputy Examiner and concludes as a matter of law that federal law does not preempt local review and regulation of the effects of RF radiation from commercial AM transmission antennas.
3. The Proposal Is Materially Detrimental to Uses and Property, SCC 30.42C.100(3)
- A. The Examiner is not faced with the burden of developing a new regulatory standard, or reviewing a petition for rulemaking. The Examiner must decide whether, based on the record, the testimony of the experts and their credibility, she concludes that the cumulative effects of these antennas will be materially detrimental to uses and property in the immediate vicinity. (SCC 30.42C.100(3)) The applicant bears the burden of proving they will not be.
- B. The Ha study was not considered by the IEEE in developing its 2005 standard. The testimony of select professional witnesses testifying for the applicant regarding the Ha study does not represent the opinion of the IEEE or reflect whether or not the standard

would be revised in light of the study. The Examiner believes that based on all the evidence in the record, the Ha Study, as corrected by the February 2008 letter, provides credible peer-reviewed findings that post-date any of the professional and industry group reviews submitted in this case. Dr. Ehrleich misread the reply which diminished the credibility of her testimony. She indicated she thought that the peak radiofrequency data relied on one transmitter only, when in fact, it relies on all 31 transmitters.

- C. Moreover, the Examiner has already addressed the issue of whether the IEEE Standards and therefore the FCC Guidelines address nonthermal effects. The Examiner found that they do not, because as indicated by the IEEE, “the relevance of reported low-level effects to health remains speculative and such effects are not useful for standard setting.” (Exhibit 319 at 81) Irregardless of their usefulness for “standard setting”, the Examiner is convinced by the record that there is a justifiable health concern. The Examiner has cited in the findings at least a dozen studies indicating the bioactivity at a nonthermal level of various frequencies of the electromagnetic spectrum. The three studies on AM transmitters all indicated increased mortality or increased cases of childhood leukemia within a range of 2 km to about 6 km. The evidence is not as precise as one would like it to be, but that, is apparently the nature of epidemiology, as testified by Dr. Erdreich. Since it is the study of humans, it deals in human error, both in behavior and in doing the scientific study.
- D. Other countries including China and some in eastern Europe have set lower standards. The Examiner presumes that those countries had a rational basis for doing so. Clearly, scientists and policy makers in other countries have found a need to take protective measures.
- E. The framework of the Precautionary Principle is useful in this debate. It is a basic risk assessment tool of whether the possible benefit of the proposal outweighs the possible risk. In doing that risk assessment, one must address both the remoteness and the possible severity of the possible harm. As Dr Erdreich and Dr. Foster stated in their article, small increases in childhood leukemia or cancer may seem insignificant, unless it happens to you or your child:

It is sometimes stated that the risks from electromagnetic fields, if real, are too small to be of public health significance. However, if any of the reported risks discussed above are real, electromagnetic fields could be one of the more significant environmental causes of cancer. For example, a doubling of risk for childhood leukemia from residential exposure of one-third of the U.S. population to 60-Hz magnetic fields corresponds to absolute risk, over the 15 years of childhood, that is nearly two orders of magnitude greater than the EPA goals for regulating carcinogens in the environment. Lilienfeld and Stolley maintain in a standard epidemiology textbook that “repeated findings of a weak association in well-conducted studies can still lead to effective public health action. When an exposure affects many people and the outcome is extremely adverse, a small increase in risk can be of major concern to public health officials.” On the other hand, small increases in the risk for rare diseases (and childhood leukemia is fortunately a rare disease) have little consequence for individuals who have to face much larger risks in everyday life. Unless one develops the disease.

Exhibit 409-14 at 741-42.

- F. The benefit of this proposal would be to allow an AM radio station which would have civil service facilities and emergency contact. (TR Vol. IX at 751 (4/3/08)) Although those services are benefits, the record does not make clear that those services are not already provided out in the community. In fact, the uncontroverted evidence in the record is that a citizen in the Lord's Hill neighborhood has access to 18 AM radio stations and 22 FM radio stations. (Exhibit 100)
 - G. There is no doubt that cancer, and particularly childhood cancer, is an extremely severe harm to balance in the equation, even if the risk of a causal link is not proven, or if the evidence is "less than solid". There are multiple studies showing associations between RFR frequency and cancers of different types related to nonionizing radiation. Based on the record, the Examiner concludes that there is scientific evidence of plausible association between exposure and potential impacts. (See Exhibit 409-4, Section 16 at 10)
 - H. The Examiner concludes that this is a situation where this permit should be denied based on health impacts because it is important to take protective measures now without having to wait until the reality and seriousness of the risks become fully apparent.
 - I. The Examiner concludes that the permit should be denied because of the possibility of serious or irreversible damage to health and where scientific evaluation, based on the data, has proved inconclusive for assessing causation, but is sufficient to merit protective measures.
 - J. The Examiner believes that county government should respect the American Public Health Association (APHA) resolution, which urges governments to use the precautionary principle to protect the health of children. This seems to be particularly applicable in this situation. There is a middle school sitting on the bluff approximately $\frac{3}{4}$ of a mile away to the west of these towers. The Examiner believes that denial of the CUP is particularly appropriate based on the call of APHA to use the precautionary principle to protect the health of children.
 - K. The Examiner concludes that the risks of the proposal cannot outweigh the benefits. Moreover, this is a risk of potential harm that citizens who live in the area cannot choose to avoid, like smoking (unless they move!). That point was made over and over again in the citizen testimony. Families who are fifth generation farmers are now afraid to live in this area because of potential health effects from these towers. (See letter from Barbara Bailey, Exhibit 423)
 - L. The applicant failed to meet its burden to demonstrate that the proposal will not be materially detrimental to uses and property in the immediate vicinity.
- 4. In view of the above Findings and Conclusions, the Examiner need not reach the other issued in this case.
 - 5. Any conclusion in this decision, which should be deemed a finding of fact, is hereby adopted as such.

DECISION

Based on the Findings of Fact and Conclusions of Law entered above, the decision of the Hearing Examiner on the application is as follows:

The request for a **CONDITIONAL USE MAJOR REVISION** is hereby **DENIED**.

Decision issued this 15th day of October, 2008.

Barbara Dykes, Hearing Examiner

EXPLANATION OF RECONSIDERATION AND APPEAL PROCEDURES

The decision of the Hearing Examiner is final and conclusive with right of appeal to the County Council. However, reconsideration by the Examiner may also be sought by one or more parties of record. The following paragraphs summarize the reconsideration and appeal processes. For more information about reconsideration and appeal procedures, please see Chapter 30.72 SCC and the respective Examiner and Council Rules of Procedure.

Reconsideration

Any party of record may request reconsideration by the Examiner. A petition for reconsideration must be filed in writing with the Office of the Hearing Examiner, 2nd Floor, County Administration-East Building, 3000 Rockefeller Avenue, Everett, Washington, (Mailing Address: M/S #405, 3000 Rockefeller Avenue, Everett WA 98201) on or before **OCTOBER 27, 2008**. There is no fee for filing a petition for reconsideration. **“The petitioner for reconsideration shall mail or otherwise provide a copy of the petition for reconsideration to all parties of record on the date of filing.” [SCC 30.72.065]**

A petition for reconsideration does not have to be in a special form but must: contain the name, mailing address and daytime telephone number of the petitioner, together with the signature of the petitioner or of the petitioner’s attorney, if any; identify the specific findings, conclusions, actions and/or conditions for which reconsideration is requested; state the relief requested; and, where applicable, identify the specific nature of any newly discovered evidence and/or changes proposed by the applicant.

The grounds for seeking reconsideration are limited to the following:

- (a) The Hearing Examiner exceeded the Hearing Examiner’s jurisdiction;
- (b) The Hearing Examiner failed to follow the applicable procedure in reaching the Hearing Examiner’s decision;
- (c) The Hearing Examiner committed an error of law;
- (d) The Hearing Examiner’s findings, conclusions and/or conditions are not supported by the record;

- (e) New evidence which could not reasonably have been produced and which is material to the decision is discovered; or
- (f) The applicant proposed changes to the application in response to deficiencies identified in the decision.

Petitions for reconsideration will be processed and considered by the Hearing Examiner pursuant to the provisions of SCC 30.72.065. Please include the County file number in any correspondence regarding this case.

Appeal

An appeal to the County Council may be filed by any aggrieved party of record. Where the reconsideration process of SCC 30.72.065 has been invoked, no appeal may be filed until the reconsideration petition has been disposed of by the hearing examiner. An aggrieved party need not file a petition for reconsideration but may file an appeal directly to the County Council. If a petition for reconsideration is filed, issues subsequently raised by that party on appeal to the County Council shall be limited to those issues raised in the petition for reconsideration. Appeals shall be addressed to the Snohomish County Council but shall be filed in writing with the Department of Planning and Development Services, 2nd Floor, County Administration-East Building, 3000 Rockefeller Avenue, Everett, Washington (Mailing address: M/S #604, 3000 Rockefeller Avenue, Everett, WA 98201) on or before **OCTOBER 29, 2008** and shall be accompanied by a filing fee in the amount of five hundred dollars (\$500.00); PROVIDED, that the filing fee shall not be charged to a department of the County or to other than the first appellant; and PROVIDED FURTHER, that the filing fee shall be refunded in any case where an appeal is dismissed without hearing because of untimely filing, lack of standing, lack of jurisdiction or other procedural defect. [SCC 30.72.070]

An appeal must contain the following items in order to be complete: a detailed statement of the grounds for appeal; a detailed statement of the facts upon which the appeal is based, including citations to specific Hearing Examiner findings, conclusions, exhibits or oral testimony; written arguments in support of the appeal; the name, mailing address and daytime telephone number of each appellant, together with the signature of at least one of the appellants or of the attorney for the appellant(s), if any; the name, mailing address, daytime telephone number and signature of the appellant's agent or representative, if any; and the required filing fee.

The grounds for filing an appeal shall be limited to the following:

- (a) The decision exceeded the Hearing Examiner's jurisdiction;
- (b) The Hearing Examiner failed to follow the applicable procedure in reaching his decision;
- (c) The Hearing Examiner committed an error of law; or
- (d) The Hearing Examiner's findings, conclusions and/or conditions are not supported by substantial evidence in the record. [SCC 30.72.080]

Appeals will be processed and considered by the County Council pursuant to the provisions of Chapter 30.72 SCC. Please include the County file number in any correspondence regarding the case.

Staff Distribution:

Department of Planning and Development Services: Erik Olson

The following statement is provided pursuant to RCW 36.70B.130: "Affected property owners may request a change in valuation for property tax purposes notwithstanding any program of revaluation." A copy of this Decision is being provided to the Snohomish County Assessor as required by RCW 36.70B.130.