

Dear Members of the Heath Select Board,

It has recently come to my attention that a matter of the utmost importance and potentially grave consequence is being quietly addressed by the Select Board without consulting the Planning Board, Heath residents, or Board of Health.

The Town of Hawley has asked the Town of Heath to place a giant 60 foot cell phone tower on the corner of Basset Road and South Road, in alarming close proximity to my family's place of residence. Not only is this an aesthetic blemish on one of the most stunning landscapes in Heath, but it has also raised our concerns for the following reasons:

- **Not aligned with Heath's Previous Stance:** The Town of Heath decided to borrow upwards of 1 million dollars to install fiber optic wiring through the town so that residents of the town will have access to internet. The Town of Heath decided against the more economical (both time wise and financially) cell phone tower route for issues surrounding preserving town aesthetic, health concerns, etc. Why would the Town of Heath allow the neighboring town to do what Heath itself decided not to? Heath gains nothing substantial from allowing this tower to be erected, and instead will suffer the consequences of what that would mean for Heath residents. In the past, the Town of Heath took very careful measures to assess the risks (both health and aesthetic) associated with a wind turbine. Wind turbines carry arguably lower risks and liabilities than cell towers, and yet the careful and transparent process that Heath went through to eventually decide a wind turbine was not in the town's best interest has been completely neglected in this process.
- **Lack of Transparency:** Heath residents, particularly those who live in close proximity to or adjunct to the property where this cell phone tower is supposed to go up, have not been informed of this. As we are the residents who will be living with the consequences of this, we are disappointed in the lack of transparency and information we have been offering concerning this matter.
- **Medically Proven Adverse Affects on Health:** As Heath residents who would be forced to live in close proximity to a radiating telephone pole, we would be subjected to the medically proven long term damaging affects done to our health. Numerous studies over many years have shown that living within close proximity to cell phone towers, or any tower that is radiating microwave or electro-magnetic rays, can cause long term damage to health. Most troubling, there is an overwhelming body of evidence that suggests radiation/electro magnetic emitting towers can cause radiation damage to DNA and can be a cancer causing carcinogenic. Numerous other studies have linked living in proximity to cell towers to cause brain tumors, infertility in both men and women, day-to-day cognitive dysfunction and many more adverse health effects. There is an enormous body of study that can be found from the medical community (<https://ehtrust.org/cell-towers-and-cell-antennae/compilation-of-research-studies-on-cell-tower->

**radiation-and-health/**), including journals of medicine, journals of public health, and medical associations such as the American Academy of Pediatrics. Please find print outs of the bibliographies of these studies attached. For example:

Biological Effects from Exposure to Electromagnetic Radiation Emitted by Cell Tower Base Stations and Other Antenna Arrays, Levitt & Lai, Environmental Reviews, 2010

*This review of 100 studies found approximately 80% showed biological effects near towers.*

*“Both anecdotal reports and some epidemiology studies have found headaches, skin rashes, sleep disturbances, depression, decreased libido, increased rates of suicide, concentration problems, dizziness, memory changes, increased risk of cancer, tremors, and other neurophysiological effects in populations near base stations.”*

- **Lower Property Value:** The presence of a cell phone tower in close proximity to homes and residential areas is proven to decrease property values and the value of home ownership. The Appraisal Journal of the Appraisal Institute published “The Impact of Cell Phone Towers on House Prices in Residential Neighborhoods”, a study that clearly indicated that prices of properties were reduced by around 21% after a cell phone tower was built in the neighborhood. James S. Turner, Esq., Chairman of the National Institute for Science, Law & Public Policy and Partner, Swankin & Turner in Washington, D.C., states:

*“The recent NISLAPP survey suggests there is now a high level of awareness about potential risks from cell towers and antennas. In addition, the survey indicates respondents believe they have personally experienced cognitive (57%) or physical (63%) effects from radio frequency radiation from towers, antennas or other radiating devices, such as cell phones, routers, smart meters and other consumer electronics. Almost 90% are concerned about the increasing number of cell towers and antennas generally. A study of real estate sales prices would be beneficial at this time in the United States to determine what discounts homebuyers are currently placing on properties near cell towers and antennas.”*

This study, among many others, clearly indicate that properties are adversely affected by the placement of a cell tower, or any other tower with radiating devices (such as those proposed for Heath). The placement of this pole in the proposed location would have a potentially serious negative impact on the adjacent properties.

- **Scientifically Proven Adverse Affects on Ecosystems and Environment:** Many of us have chosen to live in Heath because we can enjoy the close proximity and benefits of living in the pristine wilds of nature. In fact, many of us have taken legal measures to protect our land, environments, and ecosystems from development or any disturbance that may adversely affect the nature we are lucky enough to enjoy. There is an emerging scientific body of evidence that suggests that the radiation waves from any electromagnetic emitting tower has **adverse affects** on bees, pollinators, birds, trees, plants, insects, mammals and other aspects of our wilderness and wildlife that are absolutely integral to the function of our local ecosystems. In choosing to erect this tower you are choosing to potentially damage the ecosystem we live in and that we have worked hard to preserve. We **do not consent** to the potential damage to ecosystems that

could be hazardous to our livelihoods such as farming, hunting, and forestry, making this also an issue of personal damages. Again, please see attached body of scientific literature to support this.

- **Potential Legal Action.** There is a very substantial body of evidence that supports the claim that erecting a tower that emits any degree of electromagnetic, microwave, or radio waves causes:

1. **Personal Damage to Property Value**
2. **Personal Damage to Health and Wellbeing**
3. **Personal Damage to Livelihood that are Reliant on Functioning Ecosystems**

There is also a very large number of legal cases that have been decided in favor of those who have had a cell phone tower erected near their homes without their consent. Individuals and communities have taken legal action against cell phone companies, towns, and other entities that have been responsible for erecting these towers.

A close to home example is that **residents of the Town of Charlemont recently sued their Select Board, the Town of Charlemont and WiValley in 2019 for trying to erect a similar Wifi tower in Charlemont on the grounds that the tower would “adversely impact their safety and property values”** (<https://www.recorder.com/Legate-Hill-residents-file-lawsuit-over-WiFi-25706649>). According to the National Law Journal, dozens of legal cases involving cell towers are currently in Federal Courts. One only needs to look on the internet to see evidence of the thousands of legal cases involved with cell towers. The reality of lawsuits in response to irresponsibly erected cell towers is a worldwide reality and does not exclude Heath.

To avoid the future costs and chaos of lawsuits, it would be best that the town chooses to **NOT** erect this cell phone tower, **which clearly has NO benefit to the Town of Heath and carries with it a very large LIABILITY.**

Again, as residents of the Town of Heath and those who would be directly affected by the adverse repercussions of erecting this proposed tower for the Town of Hawley, with absolutely no substantial benefit for us or any other resident of Heath, **WE DO NOT CONSENT.** We suggest that the Town of Hawley perhaps reevaluates their decision making process in regards to making WiFi accessible to all of their residents without putting residents in neighboring towns at risk. As Heath decided to lay wire rather than erect poles, perhaps Hawley should consider the same.

Please find attached below substantial compiles of studies to support all of the above concerns.

Sincerely,

Alena Charow and Family

118 Royer Road

## **BODY OF EVIDENCE FROM LAWYERS, REAL ESTATE AGENTS, JOURNALISTS, GOVERNMENT, AND OTHER SOURCES REGARDING THE DECREASE IN PROPERTY VALUE OF HOMES LOCATED NEAR CELL TOWERS**

Research indicates that over 90% of home buyers and renters are less interested in properties near cell towers *and* would pay less for a property in close vicinity to cellular antennas. Documentation of a price drop up to 20% is found in multiple surveys and published articles as listed below.

The US Department of Housing and Urban Development (HUD) long considers cell towers as "Hazards and Nuisances."

See HUD webpage

*"With regard to new FHA originations, the guide provides that "the appraiser must indicate whether the dwelling or related property improvements are located within the easement serving a high-voltage transmission line, radio/TV transmission tower, cell phone tower, microwave relay dish or tower, or satellite dish," which is radio, TV cable, etc.*

*"If the dwelling or related property improvement is located within such an easement, the DE Underwriter must obtain a letter from the owner or operator of the tower indicating that the dwelling and its related property improvements are not located within the tower's engineered fall distance in order to waive this requirement."*

*"If the dwelling and related property improvements are located outside the easement, the property is considered eligible and no further action is necessary. The appraiser, however, is instructed to note and comment on the effect of marketability resulting from the proximity to such site hazards and nuisances."*

-THE IMPACT OF OVERHEAD HIGH VOLTAGE TRANSMISSION TOWERS AND LINES ON ELIGIBILITY FOR FEDERAL HOUSING ADMINISTRATION (FHA) INSURED MORTGAGE PROGRAMS, COMMITTEE ON FINANCIAL SERVICES U.S. HOUSE OF REPRESENTATIVES

**Once built. Cell towers can go up an additional 20 feet- without community consent.** Most people in the United States are unaware that once a tower is built, it can go *up to 20 feet higher* with no public process due to the passing of Section 6409(a) of the Middle

Class Tax Relief and Job Creation Act of 2012. In other words, a 100 foot tower can be increased to 120 feet after it is constructed and the community will have no input. Communities are largely unaware of this law.

The California Association of Realtors' Property Sellers Questionnaire specifically "cell towers" listed on the disclosure form for sellers of real estate. The seller must note "neighborhood noise, nuisance or other problems from.." and includes cell towers and high voltage transmission lines on the long list problems. Click here to see the California Association of Realtors' Property Sellers Questionnaire (p. 3-4 under K. Neighborhood) Scroll down this page for resources on property de-valuation.

Read the peer reviewed published science documenting the public health risk at this link. The realtor industry has written several articles documenting the property devaluation after communication towers are built near property.

Wireless Towers and Home Values: An Alternative Valuation Approach Using a Spatial Econometric Analysis (*Journal of Real Estate Finance & Economics*, May 1, 2018)

- For properties located within 0.72 kilometers of the closest tower, results reveal significant social welfare costs with values declining 2.46% on average, and up to 9.78% for homes within tower visibility range compared to homes outside tower visibility range; in aggregate, properties within the 0.72-kilometer band lose over \$24 million dollars.

"Impact of Communication Towers and Equipment on Nearby Property Values" prepared by Burgoyne Appraisal Company, March 7, 2017

- "In 32 years of experience as a Real Estate Appraiser specializing in detrimental conditions, takings, adverse impacts and right-of-way, I have found that aesthetics (or rather the adverse impact on aesthetics) of externalities routinely has the largest impact on property values. As a result, proximity to towers of all types (cell, wind turbine, and electric transmission) has an impact on property values. The same is true with all sorts of surface installations such as pump stations and communication equipment boxes. This would apply to new small cell and DAS equipment, although again, one would expect that the less intrusive the facility, the less significant the impact. Small cell and DAS installations can be unsightly, bulky, inconsistent, and even noisy."

The Cost of Convenience: Estimating the Impact of Communication Antennas on Residential Property Values (*Land Economics*, Feb. 2016)

- "Re a study on property in Kentucky- "The best estimate of the impact is that a property with a visible antenna located 1,000 feet away sells for 1.82% (\$3,342) less than a similar property located 4,500 feet away. The aggregate impact is \$10.0 million for properties located within 1,000 feet"

The Lo Down on Cell Towers, Neighborhood Values, and the Secretive Telecoms(link is external) (*The Dissident Voice*, Dec. 19, 2015)

Cell Towers: Not in My Back Yard (*Tedium Blog*, Aug. 5, 2015)

"Examining invisible urban pollution and its effect on real estate value in New York City" – by William Gati in *New York Real Estate Journal* September 2017

- "Understanding EMF values of business and residential locations is relatively new for the real estate industry. Cell phone towers bring extra tax revenue and better reception to a section of the city, but many are skeptical because of potential health risks and the impact on property values. Increasing numbers of people don't want to live near cell towers. In some areas with new towers, property values have decreased by up to 20%."

“Cell Tower Antennas Problematic for Buyers” published in REALTOR® Magazine:

- An overwhelming 94 percent of home buyers and renters surveyed by the National Institute for Science, Law & Public Policy (NISLAPP) say they are less interested and would pay less for a property located near a cell tower or antenna.
- The NISLAPP survey echoes the findings of a study by Sandy Bond of the New Zealand Property Institute and past president of the Pacific Rim Real Estate Society (PRRES). “The Impact of Cell Phone Towers on House Prices in Residential Neighborhoods,” which was published in The Appraisal Journal in 2006, found that buyers would pay as much as 20 percent less for a property near a cell tower or antenna.

2014 Survey by the National Institute for Science, Law and Public Policy (NISLAPP) in Washington, D.C., “Neighborhood Cell Towers & Antennas—Do They Impact a Property’s Desirability?”

- Home buyers and renters are less interested in properties located near cell towers and antennas, as well as in properties where a cell tower or group of antennas are placed on top of or attached to a building. 94% said a nearby cell tower or group of antennas would negatively impact interest in a property or the price they would be willing to pay for it.
- Read the Press Release: Survey by the National Institute for Science, Law & Public Policy

### **Lawyers Write About the Property Value Drop.**

Best Best and Krieger Letter to Ms. Marlene H. Dortch, Secretary Federal Communications Commission September 19, 2018 “RE” Smart Communities and Special Districts Coalition – Ex Parte Submission: Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment, WT Docket No. 17-79; Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment, WC Docket No. 17-84”

- “Further, the assumption that there is little to consider in a small cell application is belied by the definition the Commission adopts for “small wireless facility”: while it justifies its rules based on the assumption that many small cells are the size of a pizza box, a pizza box is about 1/2 cu. ft. in size, while the Commission proposes to expedite permitting of equipment cabinets 28 cu. ft. in size – a stack of 56 pizza boxes – on front lawns throughout the country. Considering that the Smart Communities’ prior filings show that the addition of facilities of this size diminish property values, it is strange for the Commission to assume that approval can be granted in the regulatory blink of an eye.”
- “A good example lies in the Commission’s discussion of undergrounding.<sup>62</sup> The Commission at once appears to recognize that communities spend millions of dollars on undergrounding projects, and that allowing poles to go up in areas where poles have been take down has significant impacts on aesthetics (not to mention property values).”

### **NEWS ARTICLES**

New York Times: “A Pushback Against Cell Towers” August 2010

*“If they have the opportunity to buy another home, they do.”*

*She said cell antennas and towers near homes affected property values, adding, “You can see a buyer’s dismay over the sight of a cell tower near a home just by their expression, even if they don’t say anything.”*

“Do neighborhood cell towers impact property values?” Pennsylvania Association of Realtors, 2014

- A recent survey by the National Institute for Science, Law & Public Policy (NISLAPP) found that 94 percent of homebuyers are “less interested and would pay less” for a property located near a cell tower or antenna.

“Appraiser: Cell Tower Will Affect Property Values” New Jersey Patch on T Mobile Cell Tower

- “Properties that are approximately close to the tower will suffer substantial degradation to their value based on the nature of the unusual feature in the residential neighborhood.”

## **STUDIES ON IMPACTS OF TOWERS**

Sandy Bond, Ph.D., Ko-Kang Wang, “The Impact of Cell Phone Towers on House Prices in Residential Neighborhoods,” The Appraisal Journal, Summer 2005; Source: Goliath business content website.

- “Overall, respondents would pay from 10%–19% less to over 20% less for a property if it were in close proximity to a CPBS.”

“Cellular Phone Towers: Perceived impact on residents and property values” University of Auckland, paper presented at the Ninth Pacific-Rim Real Estate Society Conference, Brisbane, Australia, January 19-22, 2003; Source: Pacific Rim Real Estate Society website,

A Field Guide to Cell Towers, The National Association of Realtors

The effect of distance to cell phone towers on house prices S Bond, Appraisal Journal, Fall 2007, Source, Appraisal Journal (Found on page 22) See also Using GIS to Measure the Impact of Distance to Cell Phone Towers on House Prices in Florida

Florida State University Law Review Volume 24 | Issue 1 Article 5 1996 The Power Line Dilemma: Compensation for Diminished Property Value Caused by Fear of Electromagnetic Fields

New Zealand Ministry for the Environment, “Appendix 5: The Impact of Cellphone Towers on Property Values” Source: New Zealand Ministry for the Environment website

Powers, turbines and transmission lines impacts on property value edited by Sally Bond Sally Sims and Peter Dent, 2014

**The US Department of Housing and Urban Development (HUD) considers cell towers as “Hazards and Nuisances.”**

- HUD requires its certified appraisers to take the presence of nearby cell towers into consideration when determining the value of a single family residential property.
- HUD guidelines categorize cell towers with “hazards and nuisances.” HUD prohibits FHA underwriting of mortgages for homes that are within the engineered fall zone of a cell tower.
- “The appraiser must indicate whether the dwelling or related property improvements is located within the easement serving a high-voltage transmission line, radio/TV transmission tower, cell phone tower, microwave relay dish or tower, or satellite dish (radio, TV cable, etc).”
- Read it here at the US Department of Housing and Urban Development.

Cell Towers are Discussed in the Written Testimony of Bobbi Borland Acting Branch Chief, HUD Santa Ana Homeownership Center Hearing before the Subcommittee on Insurance, Housing and Community Opportunity U.S. House of Representatives Committee on Financial Services on “The Impact of Overhead High Voltage Transmission Towers and

Lines on Eligibility for Federal Housing Administration (FHA) Insured Mortgage Programs”  
Saturday, April 14, 2012

- With regard to the new FHA originations, the guide provides that: “The appraiser must indicate whether the dwelling or related property improvements are located within the easement serving a high-voltage transmission line, radio/TV transmission tower, cell phone tower, microwave relay dish or tower, or satellite dish (radio, TV cable, etc).”

**ONCE BUILT, TOWERS COULD BE ALLOWED TO GO 20 FEET TALLER  
Middle Class Tax Relief and Job Creation Act of 2012, Sec. 6409(a)**

The Federal Communications Commission (FCC) has proposed and is currently considering rules to clarify and implement the requirements of Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012. Under section 6409(a), “a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station.” The FCC considers eligible facilities’ requests to include requests for carrier co-locations and for replacing existing antennas and ground equipment with larger antennas/equipment or more antennas/equipment.

The FCC has proposed, as part of these rules, applying a four-pronged test, which could lead to cell towers increasing in height by 20-plus feet beyond their approved construction heights.

Applying the test may also lead increases in the sizes of compounds, equipment cabinets and shelters, and hazardous materials used for back-up power supplies, beyond what was originally approved.

Under this test, a “substantial increase in the size of the tower” occurs if:

- 1) [t]he mounting of the proposed antenna on the tower would increase the existing height of the tower by more than 10%, or by the height of one additional antenna array with separation from the nearest existing antenna not to exceed twenty feet, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to avoid interference with existing antennas; or
- 2) [t]he mounting of the proposed antenna would involve the installation of more than the standard number of new equipment cabinets for the technology involved, not to exceed four, or more than one new equipment shelter; or
- 3) [t]he mounting of the proposed antenna would involve adding an appurtenance to the body of the tower that would protrude from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to shelter the antenna from inclement weather or to connect the antenna to the tower via cable; or
- 4) [t]he mounting of the proposed antenna would involve excavation outside the current tower site, defined as the current boundaries of the leased or owned property surrounding the tower and any access or utility easements currently related to the site.

<http://apps.fcc.gov/ecfs/document/view?id=7521070994>

<https://ehtrust.org/cell-phone-towers-lower-property-values-documentation-research/>

# BODY OF MEDICAL EVIDENCE TO SUPPORT ADVERSE HEALTH AND WELLBEING AFFECTS OF RADIO FREQUENCY TOWERS

## American Academy of Pediatrics Website

### “Electromagnetic Fields: A Hazard to Your Health?” on Cell Tower Radiation

“In recent years, concern has increased about exposure to radio frequency electromagnetic radiation emitted from cell phones and phone station antennae. An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing:

- Headaches
- Memory problems
- Dizziness
- Depression
- Sleep problems

Short-term exposure to these fields in experimental studies have not always shown negative effects, but this does not rule out cumulative damage from these fields, so larger studies over longer periods are needed to help understand who is at risk. In large studies, an association has been observed between symptoms and exposure to these fields in the everyday environment.”

–American Academy of Pediatrics

## Compilation of Research Studies on Cell Tower Radiation and Health

Anthony B. Miller, L. Lloyd Morgan, Iris Udasin, Devra Lee Davis, Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102), *Environmental Research*, Volume 167, 2018, Pages 673-683, ISSN 0013-9351

Radiofrequency radiation is emitted by cell towers. This review paper concludes that “Based on the evidence reviewed it is our opinion that IARC’s current categorization of RFR as a possible human carcinogen (Group 2B) should be upgraded to Carcinogenic to Humans (Group 1).”

Zothansiyama, et al. “Impact of radiofrequency radiation on DNA damage and antioxidants in peripheral blood lymphocytes of humans residing in the vicinity of mobile phone base stations.” *Electromagnetic Biology and Medicine* 36.3 (2017): 295-305.

- This study evaluated effects in the human blood of individuals living near mobile phone base stations (within 80 meters) compared with healthy controls (over 300 meters). The study found higher radiofrequency radiation exposures and statistically significant differences in the blood of people living closer to the cellular antennas. The group living closer to the antennas had for example, statistically significant higher frequency of micronuclei and a rise in lipid peroxidation in their blood. These changes are considered biomarkers predictive of cancer.

Meo, S. A., Almahmoud, M., Alsultan, Q., Alotaibi, N., Alnajashi, I., & Hajjar, W. M. (2018). Mobile Phone Base Station Tower Settings Adjacent to School Buildings: Impact on Students’ Cognitive Health. *American Journal of Men’s Health*.

- High exposure to RF-EMF produced by mobile phone base station towers was associated with delayed fine and gross motor skills, spatial working memory, and

attention in school adolescents compared to students who were exposed to low RF-EMF.

Long-term exposure to microwave radiation provokes cancer growth: evidences from radars and mobile communication systems. Yakymenko (2011) *Exp Oncology*, 33(2):62-70.

- Even a year of operation of a powerful base transmitting station for mobile communication reportedly resulted in a dramatic increase of cancer incidence among population living nearby.

Association of Exposure to Radio-Frequency Electromagnetic Field Radiation (RF-EMFR) Generated by Mobile Phone Base Stations (MPBS) with Glycated Hemoglobin (HbA1c) and Risk of Type 2 Diabetes Mellitus, Sultan Ayoub Meo et al, *International Journal of Environmental Research and Public Health*, 2015

- Elementary school students who were exposed to high RF-EMFR generated by MPBS had a significantly higher risk of type 2 diabetes mellitus relative to their counterparts who were exposed to lower RF-EMFR.

Neurobehavioral effects among inhabitants around mobile phone base stations Abdel-Rassoul et al, *Neurotoxicology*, 2007

- This study found that living nearby mobile phone base stations (cell antennas) increased the risk for neuropsychiatric problems such as headaches, memory problems, dizziness, tremors, depression, sleep problems and some changes in the performance of neurobehavioral functions.

Meo SA, Almahmoud M, Alsultan Q, Alotaibi N, Alnajashi I, Hajjar WM, Mobile Phone Base Station Tower Settings Adjacent to School Buildings: Impact on Students' Cognitive Health. *Am J Mens Health*. 2018 Dec 7:1557988318816914. doi: 10.1177/1557988318816914.

- This study investigated the impact of exposure to radiofrequency electromagnetic field (RF-EMF) radiation generated by mobile phone base station towers (MPBSTs) on cognitive functions. Two hundred and seventeen volunteer male students aged between 13 and 16 registered from two different intermediate schools: 124 students were from School 1 and 93 students were from School 2. The MPBSTs were located within 200 m from the school buildings. In School 1, RF-EMF was  $2.010 \mu\text{W}/\text{cm}^2$  with a frequency of 925 MHz and in School 2, RF-EMF was  $10.021 \mu\text{W}/\text{cm}^2$  with a frequency of 925 MHz. Students were exposed to EMFR for 6 hr a day, 5 days a week for a total period of 2 years. The Narda Safety Test Solution device SRM-3006 was used to measure RF-EMF in both schools, and cognitive functions tasks were measured by the Cambridge Neuropsychological Test Automated Battery (CANTAB). Significant impairment in Motor Screening Task (MOT;  $p = .03$ ) and Spatial Working Memory (SWM) task ( $p = .04$ ) was identified among the group of students who were exposed to high RF-EMF produced by MPBSTs. High exposure to RF-EMF produced by MPBSTs was associated with delayed fine and gross motor skills, spatial working memory, and attention in school adolescents compared to students who were exposed to low RF-EMF.

Biological Effects from Exposure to Electromagnetic Radiation Emitted by Cell Tower Base Stations and Other Antenna Arrays, Levitt & Lai, *Environmental Reviews*, 2010

- This review of 100 studies found approximately 80% showed biological effects near towers. "Both anecdotal reports and some epidemiology studies have found headaches, skin rashes, sleep disturbances, depression, decreased libido, increased rates of suicide, concentration problems, dizziness, memory changes, increased risk of cancer, tremors, and other neurophysiological effects in populations near base stations."

Mortality by neoplasia and cellular telephone base stations. Dode et al. (Brazil), *Science of the Total Environment*, Volume 409, Issue 19, 1 September 2011, Pages 3649–3665

- This 10 year study on cell phone antennas by the Municipal Health Department in Belo Horizonte and several universities in Brazil found a clearly elevated relative risk of cancer mortality at residential distances of 500 meters or less from cell phone transmission towers. Shortly after this study was published, the city prosecutor sued several cell phone companies and requested that almost half of the cities antennas be removed. Many antennas were dismantled.

Pearce, M., Limiting liability with positioning to minimize negative health effects of cellular phone towers, *Environmental Research*, Volume 181, 2020,

- “There is a large and growing body of evidence that human exposure to RFR from cellular phone base stations causes negative health effects including both i) neuropsychiatric complaints such as headache, concentration difficulties, memory changes, dizziness, tremors, depressive symptoms, fatigue and sleep disturbance, and ii) increased incidence of cancer and living in proximity to a cell- phone transmitter station.” The author recommends long-term planning “to minimize the risk of liability from unintended human harm due to cellular phone base station siting” including voluntary restrictions on the placement of cellular phone base stations within 500 m of schools and hospitals.”

Epidemiological Evidence for a Health Risk from Mobile Phone Base Stations Khurana, Hardell et al., *International Journal of Occupational Environmental Health*, Vol 16(3):263-267, 2010

- A review of 10 epidemiological studies that assessed for negative health effects of mobile phone base stations (4 studies were from Germany, and 1 each from Austria, Egypt, France, Israel, Poland, Spain) found that seven showed altered neurobehavioral effects near cell tower and three showed increased cancer incidence. The review also found that eight of the 10 studies reported increased prevalence of adverse neurobehavioral symptoms or cancer in populations living at distances < 500 meters from base stations. None of the studies reported exposure above accepted international guidelines, suggesting that current guidelines may be inadequate in protecting the health of human populations.

Health effects of living near mobile phone base transceiver station (BTS) antennae: a report from Isfahan, Iran. Shahbazi-Gahrouei et al, *Electromagnetic Biology Medicine*, 2013.

- This cross-sectional study found the symptoms of nausea, headache, dizziness, irritability, discomfort, nervousness, depression, sleep disturbance, memory loss and lowering of libido were statistically increased in people living closer than 300 m from cell antennas as compared to those living farther away. The study concludes that “antennas should not be sited closer than 300 m to people to minimize exposure.”

How does long term exposure to base stations and mobile phones affect human hormone profiles? Eskander EF et al, (2011), *Clin Biochem*

- RFR exposures significantly impacted ACTH, cortisol, thyroid hormones, prolactin for females, and testosterone levels for males.

Investigation on the health of people living near mobile telephone relay stations: Incidence according to distance and sex Santini et al, 2002 , Pathol Bio

- People living near mobile phone masts reported more symptoms of headache, sleep disturbance, discomfort, irritability, depression, memory loss and concentration problems the closer they lived to the installation. Study authors recommend that the minimal distance of people from cellular phone base stations should not be < 300 m.

Navarro EA, Segura J, Portoles M, Gomez-Perretta C, The Microwave Syndrome: A preliminary Study. 2003 (Spain) Electromagnetic Biology and Medicine, Volume 22, Issue 2, (2003): 161 – 169

- Statistically significant positive exposure-response associations between RFR intensity and fatigue, irritability, headaches, nausea, loss of appetite, sleeping disorder, depressive tendency, feeling of discomfort, difficulty in concentration, loss of memory, visual disorder, dizziness and cardiovascular problems.

### **Two Important Animal Studies on Radiofrequency Radiation**

These studies indicate that government limits are non protective. Government limits are based on the assumption that radiofrequency radiation is only harmful at thermal levels. However, the cancers developed in animals in these studies at radiation levels that were non thermal.

Belpoggi et al. 2018, “Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz base station environmental emission” Environmental Research Journal

- Researchers with the renowned Ramazzini Institute (RI) in Italy performed a large-scale lifetime study of lab animals exposed to environmental levels (comparable to allowable limits from cell towers) of RFR radiation and found the rats developed increased cancers- schwannoma of the heart in male rats. This study confirms the \$25 million US National Toxicology Program study which used much higher levels of cell phone radiofrequency (RF) radiation, but also reported finding the same unusual cancers as the Ramazzini- schwannoma of the heart in male rats. In addition, the RI study of cell tower radiation also found increases in malignant brain (glial) tumors in female rats and precancerous conditions including Schwann cells hyperplasia in both male and female rats.
- “Our findings of cancerous tumors in rats exposed to environmental levels of RF are consistent with and reinforce the results of the US NTP studies on cell phone radiation, as both reported increases in the same types of tumors of the brain and heart in Sprague-Dawley rats. Together, these studies provide sufficient evidence to call for the International Agency for Research on Cancer (IARC) to re-evaluate and re-classify their conclusions regarding the carcinogenic potential of RFR in humans,” said Fiorella Belpoggi PhD, study author and RI Director of Research.
- The Ramazzini study exposed 2448 Sprague-Dawley rats from prenatal life until their natural death to “environmental” cell tower radiation for 19 hours per day (1.8 GHz GSM radiofrequency radiation (RFR) of 5, 25 and 50 V/m). RI exposures mimicked base station emissions like those from cell tower antennas, and exposure levels were far less than those used in the NTP studies of cell phone radiation.
- Watch Press Conference

Wyde, Michael, et al. “National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body

Exposure). Statement on conclusions of the peer review meeting by NIEHS, released after external peer review meeting and the DNA damage presentation.

- This 25 million dollar study is the most complex study completed by the NTP and the world's largest rodent study on radiofrequency radiation exposure to date which found long term exposure at non thermal levels associated with brain cancer and schwannomas of the heart in male rats. In addition damage to heart was found in all exposure levels. The full report is expected to be released in Fall 2018.

### **More Important Studies on Cell Tower Radiation**

Cindy L. Russell, 5 G wireless telecommunications expansion: Public health and environmental implications, Environmental Research, 2018, ISSN 0013-9351

- Radiofrequency radiation (RF) is increasingly being recognized as a new form of environmental pollution. This article reviews relevant electromagnetic frequencies, exposure standards and current scientific literature on the health implications of 2G, 3G, 4G and 5G.
- Effects can also be non-linear. Because this is the first generation to have cradle-to-grave lifespan exposure to this level of man-made microwave (RF EMR) radiofrequencies, it will be years or decades before the true health consequences are known. Precaution in the roll out of this new technology is strongly indicated.

Noa Betzalel, Paul Ben Ishai, Yuri Feldman, The human skin as a sub-THz receiver – Does 5G pose a danger to it or not?, Environmental Research, Volume 163, 2018, Pages 208-216, ISSN 0013-9351,

- Researchers have developed a unique simulation tool of human skin, taking into account the skin multi-layer structure together with the helical segment of the sweat duct embedded in it. They found that the presence of the sweat duct led to a high specific absorption rate (SAR) of the skin in extremely high frequency band that will be used in 5G. "One must consider the implications of human immersion in the electromagnetic noise, caused by devices working at the very same frequencies as those, to which the sweat duct (as a helical antenna) is most attuned. We are raising a warning flag against the unrestricted use of sub-THz technologies for communication, before the possible consequences for public health are explored."

Mobile phone infrastructure regulation in Europe: Scientific challenges and human rights protection Claudia Roda, Susan Perry, Environmental Science & Policy, Volume 37, March 2014, Pages 204-214.

- This article was published in Environmental Science & Policy by human rights experts. It argues that cell tower placement is a human rights issue for children.
- "We argue that (1) because protection of children is a high threshold norm in Human Right law and (2) the binding language of the Convention on the Rights of the Child obliges States Parties to provide a higher standard of protection for children than adults, any widespread or systematic form of environmental pollution that poses a long-term threat to a child's rights to life, development or health may constitute an international human rights violation.
- In particular we have explained how the dearth of legislation to regulate the installation of base stations (cell towers) in close proximity to children's facilities and schools clearly constitutes a human rights concern according to the language of the Convention on the Rights of the Child, a treaty that has been ratified by all European States.

SAFETY ZONE DETERMINATION FOR WIRELESS CELLULAR TOWER Nyakyi et al, Tanzania (2013)

- This research looked at the radiation that cell towers emit and states a safety zone is needed around the towers to ensure safe sleeping areas. The authors state that “respective authorities should ensure that people reside far from the tower by 120m or more depending on the power transmitted to avoid severe health effect.”

A cross-sectional case control study on genetic damage in individuals residing in the vicinity of a mobile phone base station. Ghandi et al, 2014 (India):

- This cross-sectional case control study on genetic damage in individuals living near cell towers found genetic damage parameters of DNA were significantly elevated. The authors state, “The genetic damage evident in the participants of this study needs to be addressed against future disease-risk, which in addition to neurodegenerative disorders, may lead to cancer.”

Human disease resulting from exposure to electromagnetic fields, Carpenter, D. O. Reviews on Environmental Health, Volume 28, Issue 4, Pages 159172.

- This review summarizes the evidence stating that excessive exposure to magnetic fields from power lines and other sources of electric current increases the risk of development of some cancers and neurodegenerative diseases, and that excessive exposure to RF radiation increases risk of cancer, male infertility, and neurobehavioral abnormalities.

Signifikanter Rückgang klinischer Symptome nach Senderabbau – eine Interventionsstudie. (English-Significant Decrease of Clinical Symptoms after Mobile Phone Base Station Removal – An Intervention Study) Tetsuharu Shinjyo and Akemi Shinjyo, 2014 Umwelt-Medizin-Gesellschaft, 27(4), S. 294-301.

- Japanese study Showed Statistically Significant Adverse Health Effects from electromagnetic radiation from mobile phone base stations. Residents of a condominium building that had cell tower antennas on the rooftop were examined before and after cell tower antennas were removed. In 1998, 800MHz cell antennas were installed, then later in 2008 a second set of antennas (2GHz) were installed. Medical exams and interviews were conducted before and after the antennas were removed in 2009 on 107 residents of the building who had no prior knowledge about possible. These results lead researchers to question the construction of mobile phone base stations on top of buildings such as condominiums or houses.

Effect of GSTM1 and GSTT1 Polymorphisms on Genetic Damage in Humans Populations Exposed to Radiation From Mobile Towers. Gulati S, Yadav A, Kumar N, Kanupriya, Aggarwal NK, Kumar R, Gupta R., Arch Environ Contam Toxicol. 2015 Aug 5. [Epub ahead of print]

- In our study, 116 persons exposed to radiation from mobile towers and 106 control subjects were genotyped for polymorphisms in the GSTM1 and GSTT1 genes by multiplex polymerase chain reaction method. DNA damage in peripheral blood lymphocytes was determined using alkaline comet assay in terms of tail moment (TM) value and micronucleus assay in buccal cells (BMN). Our results indicated that TM value and BMN frequency were higher in an exposed population compared with a control group and the difference is significant. In our study, we found that different health symptoms, such as depression, memory status, insomnia, and hair loss, were significantly associated with exposure to EMR. Damaging effects of nonionizing radiation result from the generation of reactive oxygen species (ROS) and subsequent radical formation and from direct damage to cellular macromolecules including DNA.

Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations, Hutter HP et al, (May 2006), Occup Environ Med. 2006 May;63(5):307-13

- Found a significant relationship between some cognitive symptoms and measured power density in 365 subjects; highest for headaches. Perceptual speed increased, while accuracy decreased insignificantly with increasing exposure levels.

Oberfeld, A.E. Navarro, M. Portoles, C. Maestu, C. Gomez-Perretta, The microwave syndrome: further aspects of a Spanish study,

- A health survey was carried out in La Nora, Murcia, Spain, in the vicinity of two GSM 900/1800 MHz cellular phone base stations. The adjusted (sex, age, distance) logistic regression model showed statistically significant positive exposure-response associations between the E-field and the following variables: fatigue, irritability, headaches, nausea, loss of appetite, sleeping disorder, depressive tendency, feeling of discomfort, difficulty in concentration, loss of memory, visual disorder, dizziness and cardiovascular problems.

Bortkiewicz et al, 2004 (Poland), Subjective symptoms reported by people living in the vicinity of cellular phone base stations: review, Med Pr.2004;55(4):345-51.

- Residents close to mobile phone masts reported: more incidences of circulatory problems, sleep disturbances, irritability, depression, blurred vision and concentration difficulties the nearer they lived to the mast.
- The performed studies showed the relationship between the incidence of individual symptoms, the level of exposure, and the distance between a residential area and a base station.

Wolf R and Wolf D, Increased Incidence of Cancer Near a Cell-phone Transmitter Station, International Journal of Cancer Prevention, (Israel) VOLUME 1, NUMBER 2, APRIL 2004

- A significant higher rate of cancer (300% increase) among all residents living within 300m radius of a mobile phone mast for between three and seven years was detected.
- 900% cancer increase among women alone
- In the area of exposure (area A) eight cases of different kinds of cancer were diagnosed in a period of only one year. This rate of cancers was compared both with the rate of 31 cases per 10,000 per year in the general population and the 2/1222 rate recorded in the nearby clinic (area B). The study indicates an association between increased incidence of cancer and living in proximity to a cell-phone transmitter station.

Changes of Neurochemically Important Transmitters under the influence of modulated RF fields – A Long Term Study under Real Life Conditions(Germany), Bucher and Eger, 2011

- German study showing elevated levels of stress hormones (adrenaline, noradrenaline), and lowered dopamine and PEA levels in urine in area residents during 1st 6 months of cell tower installation. Even after 1.5 years, the levels did not return to normal.

The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer (Umwelt·Medizin·Gesellschaft 17,4 2004) Eger et al, 2004 (Germany)

- 200% increase in the incidence of malignant tumors was found after five years' exposure in people living within 400m radius of a mobile phone mast. The proportion of newly developing cancer cases is significantly higher among patients

who live within 400 meters of a cell phone transmitter. Early age of cancer diagnosis.

Microwave electromagnetic fields act by activating voltage-gated calcium channels: why the current international safety standards do not predict biological hazard. Martin L. Pall. Recent Res. Devel. Mol. Cell Biol. 7(2014).

- “It can be seen from the above that 10 different well-documented microwave EMF effects can be easily explained as being a consequence of EMF VGCC activation: oxidative stress, elevated single and double strand breaks in DNA, therapeutic responses to such EMFs, breakdown of the blood-brain barrier, cancer, melatonin loss, sleep dysfunction, male infertility and female infertility.”

Pall ML. 2015. Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression. J. Chem. Neuroanat. 2015 Aug 20.

- Non-thermal microwave/lower frequency electromagnetic fields (EMFs) act via voltage-gated calcium channel (VGCC) activation.
- Two U.S. government reports from the 1970s to 1980s provide evidence for many neuropsychiatric effects of non-thermal microwave EMFs, based on occupational exposure studies. 18 more recent epidemiological studies, provide substantial evidence that microwave EMFs from cell/mobile phone base stations, excessive cell/mobile phone usage and from wireless smart meters can each produce similar patterns of neuropsychiatric effects, with several of these studies showing clear dose–response relationships.
- Lesser evidence from 6 additional studies suggests that short wave, radio station, occupational and digital TV antenna exposures may produce similar neuropsychiatric effects. Among the more commonly reported changes are sleep disturbance/insomnia, headache, depression/depressive symptoms, fatigue/tiredness, dysesthesia, concentration/attention dysfunction, memory changes, dizziness, irritability, loss of appetite/body weight, restlessness/anxiety, nausea, skin burning/tingling/dermographism and EEG changes. In summary, then, the mechanism of action of microwave EMFs, the role of the VGCCs in the brain, the impact of non-thermal EMFs on the brain, extensive epidemiological studies performed over the past 50 years, and five criteria testing for causality, all collectively show that various non-thermal microwave EMF exposures produce diverse neuropsychiatric effects.

(<https://ehtrust.org/cell-towers-and-cell-antennae/compilation-of-research-studies-on-cell-tower-radiation-and-health/>)

## **BODY OF SCIENTIFIC EVIDENCE TO SUPPORT ADVERSE AFFECTS OF ELECTROMAGNETIC WAVES FROM CELL TOWERS ON ECOSYSTEMS**

Waldmann-Selsam, C., et al. “Radiofrequency radiation injures trees around mobile phone base stations.” Science of the Total Environment 572 (2016): 554-69.

Breunig, Helmut. “Tree Damage Caused By Mobile Phone Base Stations An Observation Guide.” (2017).

You can also download the Tree Observation Guide at: [Competence Initiative for the Protection of Humanity, the Environment and Democracy](#)

S Sivani, D Sudarsanam, [Impacts of radio-frequency electromagnetic field \(RF-EMF\) from cell phone towers and wireless devices on biosystem and ecosystem ? A review](#), Volume 4, Issue 4, Pages 202–216, 2012

Haggerty, Katie. [“Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings.”](#) International Journal of Forestry Research 2010.836278 (2010).

Halgamuge, M.N. [“Weak radiofrequency radiation exposure from mobile phone radiation on plants.”](#) Electromagnetic Biology and Medicine, vol. 36, no. 2, 2017, pp. 213-235.

Martin Pall. [“Electromagnetic Fields Act Similarly in Plants as in Animals: Probable Activation of Calcium Channels via Their Voltage Sensor”](#)Current Chemical Biology, Volume 10 , Issue 1 , 2016

Shikha Chandel, et al. [“Exposure to 2100 MHz electromagnetic field radiations induces reactive oxygen species generation in Allium cepa roots.”](#)Journal of Microscopy and Ultrastructure 5.4 (2017): 225-229.

Halgamuge MN, Skafidas E, Davis D. [A meta-analysis of in vitro exposures to weak radiofrequency radiation exposure from mobile phones \(1990–2015\)](#). Environ Res. 2020;184:109227. doi:10.1016/J.ENVRES.2020.109227

Halgamuge MN, Davis D. [Lessons learned from the application of machine learning to studies on plant response to radio-frequency](#). Environ Res. 2019. doi:10.1016/j.envres.2019.108634

Gustavino, B., et al. [“Exposure to 915 MHz radiation induces micronuclei in Vicia faba root tips.”](#) Mutagenesis 31.2 (2016): 187-92.

Halgamuge, Malka N., See Kye Yak and Jacob L. Eberhardt. [“Reduced growth of soybean seedlings after exposure to weak microwave radiation from GSM 900 mobile phone and base station.”](#) Bioelectromagnetics 36.2 (2015): 87-95.

[“Tree Damage from Chronic High Frequency Exposure Mobile Telecommunications, Wi-Fi, Radar, Radio Relay Systems, Terrestrial Radio, TV etc.”](#) by Dr. Volker Schorpp [Lecture](#) (about 31 MB)

Shepherd et al., [Increased aggression and reduced aversive learning in honey bees exposed to extremely low frequency electromagnetic fields](#). PLoS One. 2019 Oct 10

Balmori, Alfonso. [“Anthropogenic radiofrequency electromagnetic fields as an emerging threat to wildlife orientation.”](#) Science of The Total Environment 518–519 (2015): 58–60.

Balmori, A. “Electrosmog and species conservation.” Science of the Total Environment, vol. 496, 2014, pp. 314-6.

Cucurachi, C., et al. [“A review of the ecological effects of radiofrequency electromagnetic fields \(RF-EMF\).”](#) Environment International, vol. 51, 2013, pp. 116–40.

Kumar, Neelima R., Sonika Sangwan, and Pooja Badotra. "Exposure to cell phone radiations produces biochemical changes in worker honey bees." *Toxicol Int.*, 18, no. 1, 2011, pp. 70–2.

Favre, Daniel. "Mobile phone induced honeybee worker piping." *Apidologie*, vol. 42, 2011, pp. 270-9.

"Briefing Paper on the Need for Research into the Cumulative Impacts of Communication Towers on Migratory Birds and Other Wildlife in the United States." Division of Migratory Bird Management (DMBM), U.S. Fish & Wildlife Service, 2009.

"The potential dangers of electromagnetic fields and their effect on the environment." Council of Europe Parliamentary Assembly, resolution 1815, 2011.

Engels, S. et al. "Anthropogenic electromagnetic noise disrupts magnetic compass orientation in a migratory bird." *Nature*, vol. 509, 2014, pp. 353–6.

Balmori A. "Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork (*Ciconia ciconia*)." *Electromagn Biol Med*, vol. 24, no. 2, 2005, pp. 109-19.

Balmori, A. "Mobile phone mast effects on common frog (*Rana temporaria*) tadpoles." *Electromagnetic Biology and Medicine*, vol. 29, no. 1-2, 2010, pp. 31-5.

<https://ehtrust.org/research-studies-on-impacts-to-the-environment-from-wireless-trees-plants-pollinators-birds-and-wildlife/>