October 5, 2018
Mr. Matthew Marcou
Chair, Public Space Committee
District Department of Transportation
1100 4th Street SW, Third Floor
Washington, DC 20004
PublicSpace.Committee@dc.gov

RE: The DC Government's Draft Small Cell Design Guidelines

Dear Chair Marcou,

As a nonprofit research and policy organization dedicated to identifying and reducing environmental health hazards, Environmental Health Trust (EHT) writes to advise you of important scientific grounds for addressing major health and environmental concerns pertaining to small cell deployment in the District of Columbia (DC).

EHT carries out research on controllable environmental health hazards and works directly with local communities, teachers, parents, students, and policy makers to understand and mitigate these hazards through research, education and advocacy. EHT has offices in the DC region and elsewhere, and EHT President Dr. Devra Davis has been a DC resident for more than forty years. On April 10, 2013 Dr. Davis testified before the Washington DC Committee on Health about the health effects of cell phone radiation.[1] However no action was take to inform residents about this important environmental health issue.

Today, EHT writes to:

- ***Share technical information explaining why more than 200 expert scientists are urging a moratorium***[2,3] be imposed regarding the build-out of infrastructure necessary to implement 5G technology.
- ***Request that city officials halt the deployment of 5G "small cells" in DC***. Instead, the companies who will profit from this proposed technology should be required to implement a wired system using fiber optic cables. As explained in more detail below, wired systems are faster, cheaper, and safer than wireless systems.
- ***Emphasize that major changes are needed to the to the DC Draft Small Cell Design Guidelines to protect DC residents, visitors, and the environment***. We believe these guidelines are currently inadequate, as they will result in an unprecedented, large-scale increase in involuntary exposures to wireless radiation, a recognized environmental pollutant. Children, pregnant women, and other groups are particularly vulnerable to this pollutant, but everyone living in or traveling to DC would be impacted. DC should require a large setback of at least 500 feet (as is being done in other localities) of the installations from residences, parks and schools to protect the public.

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[1] Washington D.C Health Committee Council Hearing on Cell Phone Radiation April 10, 2013. See Testimony PDF Submitted for the Record; Video Link to Dr. Davis Testimony.
[2] 2017 Scientific Appeal on 5G to the European Commission
[3] Martin Blank et al., International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure, Eur. J. Oncol. (2015).

We understand that Washington, DC is a test city for 5G technology and the District Department of Transportation (DDOT) has issued draft guidelines on "small cells" that are intended to govern the installation of small cell wireless equipment on streetlight and utility poles throughout the city and facilitate 5G development. It is noteworthy that in developing guidelines for implementation of 5G, DDOT has not consulted with any public health or environmental experts, nor has DDOT considered potential impacts on the health of residents or their flora and fauna.

The telecommunications industry asserts that new technologies, such as the Internet of Things, will depend on 5G. However, currently neither 5G cell phones nor other 5G devices are available for public sale, nor have any prototypes been tested for their public health or environmental impact. Rather, before such technology can become widespread, the infrastructure necessary for its distribution must be built. Wireless installations called "small cells" are being proposed as part of the 5G rollout. Each of these "small cells" could include 1,000 simultaneously operating antennas capable of both sending and receiving signals. The proposed 5G rollout would entail placing thousands of these large antennas in neighborhoods within feet of homes, bedrooms, playgrounds, schools and children's recreational areas. These installations would pose an unprecedented threat to residents' health and visitors' health.

Wireless devices such as cell phones, cell towers, antennas, laptops, and routers emit microwave radiation. The U.S. National Toxicology Program this year reviewed results of its long-term bioassay of microwave radiation and found "clear evidence"[4] that wireless radiofrequency radiation causes significant increases in a rare and highly malignant form of cancer in animals[5] in addition to DNA damage.[6] Every agent known to cause cancer in humans also produces it in animals when adequately studied. Therefore, the World Health Organization and other public health bodies advise that evidence that an agent causes cancer in animals should be interpreted as evidence of risk to human health.

Microwave radiation is already considered environmental pollutant. 5G will add an extra layer — not replace — our current wireless technology. The frequencies to be used in 5G have been shown to have biological impacts on living systems, including acceleration of bacterial and viral cell growth.[7] **The 5G rollout currently proposed will thus dramatically increase the amount of environmental pollution we are exposed to on a daily basis.** Furthermore, 5G will use higher frequencies than currently available wireless technologies. At higher power, these submillimeter and millimeter wave frequencies are employed by the Pentagon as Active Crowd Denial non-lethal weapon systems, as they create the sensation that the skin is on fire.

> *"There is a substantial body of evidence that this technology is harmful to humans and the environment. The 5G millimeter wave is known to heat the eyes, skin and testes... Of particular concern are the most vulnerable among us — the unborn, children, the infirm, the elderly and the disabled. It is also expected that populations of bees and birds will drastically decline."* — Lennart Hardell MD & Colleagues

5G will utilize millimeter waves as well as the current radiofrequency microwaves used today for cell phone networks. In contrast to cell phone and wireless radiation that operates at around 2 billion cycles per second (1800 MHz to 2.4 GHz), millimeter wave technology of 5G will range from 5 billion to 100 billion cycles per second (5

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[4] "Clear Evidence of Cancer" Concludes U.S. National Toxicology Program Expert Panel on Cell Phone Radiation, Environmental Health Trust.

[5] Virginia Guidry, NTP cell phone studies — experts recommend elevated conclusions, National Institute of Environmental Health Sciences (Apr. 2018).

[6] Presentation by NIEHS on DNA damage found NTP study in rats and mice

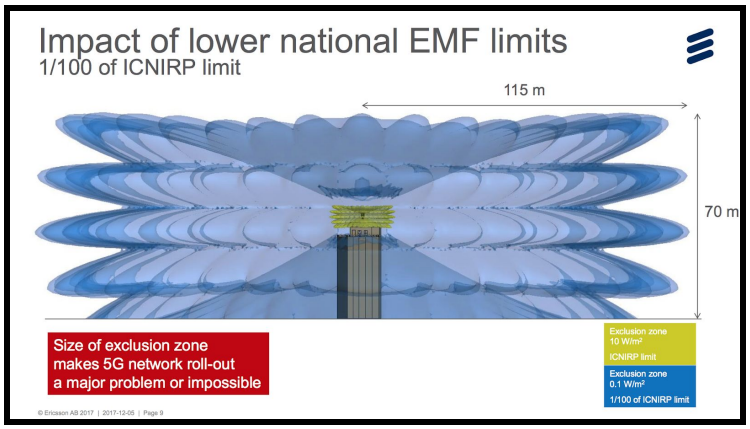
[7] Cindy L. Russell, 5G Wireless Telecommunications Expansion: Public Health and Environmental Implications, 165 Envt'l Res. 484 (2018).

GHz–100 GHz). Industry has stated that because these faster frequency waves cannot travel as far, there is a need to add thousands of new antennas to accommodate the new system. The telecommunications industry is effectively asking the city for access to public utilities so industry can employ these utilities to build or host new antennas that will transmit an untested technology for which the public will then be charged for access.

In addition to the health and environmental concerns, this massive increase in antennas could wreak havoc on D.C. property values. Studies show property values drop up to 20% on homes located near cell towers.[8] The current proposed 5G rollout would effectively put thousands of cell towers in front of DC homes, as it stipulates that up to 18 distinct towers can be constructed on a single large block and does not expressly require towers to be shared ("hoteling").

Contrary to assumptions that radiation from Small Cell 5th Generation Technology (5G) is "low," the radiation from 5G will increase overall radiation levels so high that the environmental exposures close to the antenna could exceed radiation limits in several countries. The DC Draft Small Cell Design Guidelines refer to *"a new lower-powered antenna technology...installed in closer proximity to the users on the ground...to improve the provider's ability to meet the public's current 4G (LTE) voice and data demands and the future 5th generation cellular needs."*[9]

Countries such as China, India, Poland, Russia, Italy, and Switzerland have far more protective and strict radiation limits than the United States has with one of the highest allowable radiation limits for networks in the world. Other countries' more protective radiation limits require larger distances for exclusion zones and will not allow the full deployment of 5G, because, according to industry reports, the increased radiation would exceed these governments' allowable limits. A recent Telecom Paper article[10] cites a new report by the International Telecommunications Union, *The impact of RF-EMF exposure limits stricter than the ICNIRP or IEEE guidelines on 4G and 5G mobile network deployment*, which states, "RF-EMF exposure limits below the ICNIRP or IEEE guidelines will further restrict upcoming 5G network deployment." In a 2017 presentation titled "Impact of EMF limits on 5G network roll-out," Ericsson stated, *"In countries with EMF limits significantly below the international science-based ICNIRP limits the roll-out of 5G networks will be a major problem."* The image below, which Ericsson included in its presentation, shows how radiation will emanate out from the antenna installations.



[8] Cell Phone Towers Lower Property Values: Documentation And Research on Cellular Base Stations Near Homes, Environmental Health Trust.
[9] District of Columbia, Draft Small Cell Design Guidelines 1, 3 (Aug. 24, 2018).
[10] ITU says strict electromagnetic radiation exposure limits may negatively impact 5G roll-out, Telecom Paper (July 2, 2018).

Consistent with public health concepts of preventing harm by reducing exposure to suspected and known carcinogens, EHT opposes placing wireless antennas on city utility poles, streetlights, and in close proximity to city workers, children, and families. Involuntary exposures to harmful wireless radiation are already at an all time high. **We urge the District of Columbia to prioritize the health and safety of residents and visitors to our nation's capital as well as the environment by choosing fiber optic cables, a realistic, safer, and more energy efficient alternative to 5G small cells.**

Wired Systems: Faster, Cheaper, and Safer

Worldwide, many regions are investing in wired fiber optic connections that are safer, faster, more reliable, provide greater capacity, and are more cyber-secure.

Speed and Reliability. Wired systems are more cost-effective and 100 times faster than wireless systems.[11] A report by Timothy Schoechle, PhD, of the National Institute for Science, Law and Public Policy asserts:

> *first and foremost the public needs publicly-owned and -controlled wired infrastructure that is inherently more future-proof, more reliable, more sustainable, more energy efficient, safer, and more essential to many other services. Wireless networks and services, compared to wired access, are inherently more complex, more costly, more unstable (subject to frequent revision and "upgrades"), and more constrained in what they can deliver.*[12]

Indeed, even the "ultra-fast speeds" 5G technology promises are made possible by relying on wired connections:[13]

> *5G can't and won't exist without an extensive, ubiquitous wired backbone.... In fact, the technology we know and experience as "wireless" is—and always has been—supported behind the scenes by wired infrastructure. This includes your cell phone's internet and your home's internet connection. Mobile cellular networks depend on wireline backhaul connections to cell sites, with nearly all wireless traffic traveling over a backbone of fixed networks. They are only wireless in the proverbial 'last mile.'*[14]

This "last mile" of wireless traffic opens up numerous reliability, capacity, cybersecurity, and health concerns that could be avoided in a wired system where fiber optic cables continue directly into businesses, homes, schools, and hospitals.

Cost-Effective and Energy-Efficient. Wired systems are significantly cheaper and better for the planet than wireless systems when all costs are considered. For instance, wired systems are more energy-efficient. Energy consumption in communication networks is "growing at an unsustainable rate—possibly doubling every two years—with the biggest culprits being data centers and (most significantly) wireless access networks."[15]

A 2017 report by Dr. Anders Andrae of Huawei, "Total Consumer Power Consumption Forecast," concludes that emissions from electricity consumption are predicted to increase significantly unless great efforts are put into

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[11] Frank M. Clegg, Forward, *in* Timothy Schoechle, Re-Inventing Wires: The Future of Landlines and Networks (2018).
[12] Timothy Schoechle, Re-Inventing Wires: The Future of Landlines and Networks 1, 5 (2018).
[13] Jonathan Spalter, 5G—It's All About the Wires, Multichannel News (Sept. 28, 2018).
[14] Jonathan Spalter, 5G—It's All About the Wires, Multichannel News (Sept. 28, 2018).
[15] Timothy Schoechle, Re-Inventing Wires: The Future of Landlines and Networks, 1, 3 (2018).

power-saving features. Without dramatic increases in efficiency, communications technology could use 20% of all electricity and emit up to 5.5% of the world's carbon emissions by 2025. This would be more than is currently emitted by any country except the U.S., China, and India. Dr. Andrae states:

> *The situation is alarming...We have a tsunami of data approaching. Everything which can be is being digitalised. It is a perfect storm. 5G [the fifth generation of mobile technology] is coming, IP [internet protocol] traffic is much higher than estimated, and all cars and machines, robots and artificial intelligence are being digitalised, producing huge amounts of data which is stored in data centres.*[16]

Safer. As discussed in further detail below, microwave radiation poses a host of health and environmental risks. Wired systems avoid these risks by transmitting information through cables instead of through microwave radiation.

Companies Warn Their Investors But Not The Public

For the past decade, a number of corporations have been advising their shareholders that they face serious financial risks from RF. For instance, the Crown Castle International 2016 10-K Annual Report states:

> *If radio frequency emissions from wireless handsets or equipment on our wireless infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues. The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us...If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters.*[17]

Most wireless companies, from AT&T to Nokia to T Mobile to Verizon Wireless, have issued similar warnings to their shareholders. For example, Verizon noted in its 2017 10-K Annual Report:

> *We are subject to a significant amount of litigation, which could require us to pay significant damages or settlements.... In addition, our wireless business also faces personal injury and wrongful death lawsuits relating to alleged health effects of wireless phones or radio frequency transmitters. We may incur significant expenses in defending these lawsuits. In addition, we may be required to pay significant awards or settlements.*[18]

Will the citizens of Washington, D.C. also be warned of the risks?

Most Secondary Insurance Companies Do Not Cover Harm from Pollutants Like Electromagnetic Fields

Due to the high risk posed by electromagnetic field (EMF) exposures, insurance authorities like Swiss Re, AM Best and Lloyd's of London have issued white papers and reports which state that the risk is "high" and could increase

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[16] Tsunami of data' could consume one fifth of global electricity by 2025, The Guardian (Dec. 11, 2017).
[17] Crown Castle, Form 10-K (2016).
[18] Verizon Communications Inc., Form 10-K (2017).

over the next two decades.[19,20,21] They address several aspects of risk and liability including risk not only to telecommunications workers but also other workers that would be ear transmitting facilities, property devaluation issues and harm to individuals (cancer) from the handsets and networks. For example:

> *"This report highlights 26 new emerging risk themes. It is meant to provide a first indication of what might lie beyond the horizon so that our readers can prepare for future challenges. Themes were identified through Swiss Re's SONAR process and have been reviewed by Swiss Re's emerging risk management experts. They draw on all areas of insurance, and many themes have cascading effects across areas and lines of business."*
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> *The section on Smart Cities (page 22) states that "an increasing level of interconnectivity and the growing prevalence of digital steering and feedback systems also give rise to new vulnerabilities. These could involve cascading effects with multiple damages as well as long-lasting interruptions if the problems turned out to be complex and/or difficult to repair. Interconnectivity and permanent data generation give rise to concerns about data privacy, and exposure to electromagnetic fields may also increase."*[22]- Swiss Re SONAR 2014 Report: New emerging risk insights.
>
> *"Unforeseen consequences of electromagnetic fields. Potential impact: High. Time Frame: >10 Years."*- Swiss Re SONAR 2013 Report: "Emerging risk insights."
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> *"Dangers to the estimated 250,000 workers per year who come in close contact with cell phone antennas, however, are now more clearly established. Thermal effects of the cellular antennas, which act at close range essentially as open microwave ovens can include eye damage, sterility and cognitive impairments. While workers of cellular companies are well trained on the potential dangers, other workers exposed to the antennas are often unaware of the health risks.The continued exponential growth of cellular towers will significantly increase exposure to these workers and others coming into close contact with high-energy cell phone antenna radiation."* AM Best Briefing[23]
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> *"The danger with EMF is that, like asbestos, the exposure insurers face is underestimated and could grow exponentially and be with us for many years."* Lloyd's of London [24]
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> *"Increased RF injuries may result from the proliferation of antennas to support expanding wireless activity. As workers and the medical community begin to better understand those RF injuries, the wireless industry could face increased RF safety awareness issues. Insurers no longer provide RF exposure coverage, so wireless providers may find property owners less willing to renew existing leases, or to lease space for antennas."* Gloria Vogel, Talk Markets [25]

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[19] Roseanne White Geisel, Insurers exclude risks associated with electromagnetic radiation. Business Insurance (June 3, 2007).
[20] Sarah Ryle, Insurers balk at risks of phones, Guardian (Apr. 10, 1999).
[21] Electromagnetic Field Insurance Policy Exclusions, Environmental Health Trust.
[22] Swiss Re SONAR 2014 Report: New emerging risk insights.
[23] Emerging Technologies Pose Significant Risks with Possible Long-Tail Losses, AM Best Briefing (2013).
[24] Electromagnetic fields from mobile phones: recent developments, Lloyd's Emerging Risks Team Report v 2.0, (Nov. 2010).
[25] Gloria Vogel, A Coming Storm For Wireless?, Talk Markets (July 27, 2017).

EMFs are classified as a "pollutant" alongside smoke, chemicals, and asbestos. Due to the high risk that EMF exposure poses, most insurance companies decline to cover health effects or damages from the emissions — even at levels compliant with FCC limits. They have an "Electromagnetic Fields Exclusion" as a General Insurance Exclusion which is applied across the market as standard.[26]

> *"Insurers often exclude the risk from commercial general liability policies, strictly limit the coverage or avoid policyholders in the wireless industry, brokers say."*-Roseanne White Geisel, Business Insurance

Some examples of the language used in these electromagnetic exclusions include:

> *"We will not pay anything under this policy, including claim expenses, in respect of: Electromagnetic fields any liability of whatsoever nature directly or indirectly caused by, in connection with or contributed to by or arising from electromagnetic fields (EMF) or electromagnetic interference (EMI)"* Zurich Community Care Liability Insurance[27]

> *"Health Hazard or Occupational Disease as defined in the original policy. In the absence of these terms being defined in the original policy, they shall be defined cumulatively as follows: C7.1. Any loss, damage, injury or expense directly or indirectly caused by or arising out of: asbestos; tobacco; coal dust; polychlorinated biphenyls; silica; silicosis; benzene; lead; talc; dioxin; mold; pesticides or herbicides; electromagnetic fields; pharmaceutical or medical drugs/products/substances/devices; or any substance containing such material or any derivative thereof."* REINS[28]

> *"Standard: Pollution, Asbestos, Electromagnetic fields*
> *Due to potentially catastrophic losses and high clean up costs, product liability insurance contracts frequently exclude, whether partially or completely, the insured's liability for asbestos, pollution and contamination, radiation and electromagnetic fields."* BIICL[29]

> *"GENERAL INSURANCE EXCLUSIONS: Electromagnetic fields directly or indirectly arising out of, resulting from or contributed to by electromagnetic fields, electromagnetic radiation, electromagnetism, radio waves or noise."*A&M Insurance for Medical Professionals[30]

Coverage for EMF-related damage typically requires purchasing an environmental policy enhancement for "pollution liability."

> *"Public health and toxic tort liabilities concerns surrounding EMFs have become contentious among utility companies, regulatory agencies, land owners and other affected stakeholders. While many studies have produced varying (and sometimes contradictory) results, many epidemiological studies suggest a possible human carcinogenic link in a classification group similar to, say – formaldehyde, DDT, dioxins and PCBs."*

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[26] CFC Underwriting LTD in London, the UK agent for Lloyd's, *available at* Electromagnetic Field Insurance Policy Exclusions, Environmental Health Trust.
[27] Zurich, Zurich Community Care Liability Insurance: Group Policy Wording.
[28] REINS American Institute of Marine Underwriters, Liability Exclusion Clause (2015).
[29] Alex Hamer, Reynolds Porter Chamberlain, BIICL Product Liability Forum: Insurance Perspectives on Product Liability.
[30] A&M Insurance for Medical Professionals, MedSurance A&M Policy Document (2013).

"From an insurance perspective, when considering the potential legal and toxic tort implications, a layer of defense against EMF liabilities and exposures could be found through an environmental insurance product. Among other coverage grants being provided, these environmental policies cover third-party bodily injury and property damage claims and legal defense associated with EMFs. Many carriers have EMF coverage built directly into their form via their definition of "Pollutants" (e.g.,…any solid, liquid, gaseous or thermal pollutant, irritant or contaminant including but not limited to…smoke, vapors, toxic chemicals, hazardous substances… electromagnetic fields…"). And, most environmental policies include "diminished third-party property value" in their definition of "property damage."[31] Electromagnetic Fields: More than Just an Eye Sore.

Insurance companies clearly recognize that the radiation emitted by wireless technologies is an environmental pollutant as clearly shown by this example of the language used in policies:

"Pollutant or pollutants mean any solid, liquid, gaseous or thermal irritant or contaminant, including:

1. *smoke, vapor, -soot, fumes, acids, alkalis, chemicals;*
2. *radioactive matter, including electromagnetic fields or electromagnetic radiation;*
3. *petroleum, or petroleum products in any form;*
4. *asbestos or substances containing asbestos;*
5. *lead or substances containing lead;*
6. *waste, including materials to be recycled, reconditioned or reclaimed."* Mutual of Enumclaw[32]

"EXCLUSIONS: The coverage under this Insurance does not apply to Damages or Claims Expenses incurred with respect to any Claim...Directly or indirectly arising out of or resulting from the existence, emission or discharge of any electromagnetic field, electromagnetic radiation or electromagnetism that actually or allegedly affects the health, safety or condition of any person or the environment, or that affects the value, marketability, condition or use of any property." AFB Staffing Services Professional Liability and Commercial General Liability Insurance[33]

Furthermore, now insurance company exclusions are taking it a step further. Newer policies are *not only* excluding mitigation and harm from electromagnetic radiation but also excluding paying for the defense of "*any supervision, instruction, recommendation, warning or advice given or which should have been given in connection with bodily injury, property damage, abatement and/or mitigation etc.*" as exemplified by the policy for the City of Ann Arbor Michigan.[34]

Placing thousands of EMF-emitting "small cells" throughout the District of Columbia would cause an unprecedented increase in EMF pollution. As insurers do not provide protection, who will be held liable? What insurance does DC have to address this risk?

"This is a unique situation in the history of the human kind when the whole human population will be exposed to man-made devices emitting non-ionizing radiation that was insufficiently tested before deployment. What is and what will be the responsibility of the scientists, decision-makers and industry

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[31] Electromagnetic Fields: More than Just an Eye Sore, Willis North America: Real Estate and Hotel Practice 11-12, (2012).
[32] Mutual of Enumclaw, Policy Changes, Edition 9-96: Pollution Exclusions.
[33] AFB Staffing Services Professional Liability and Commercial General Liability Insurance.
[34] City of Ann Arbor Michigan Insurance Policy: Electromagnetic Radiation Exclusion.

leaders who permit deployment of insufficiently tested technology that will affect us all?" — Dr. Darius Leszczynski, July 18th, 2018[35]

If antenna installations are mounted on buildings, what are the legal liability issues of which the building owner should be aware? The Wall Street Journal did an investigative report titled "Cellphone Boom Spurs Antenna-Safety Worries: Many Sites Violate Rules Aimed at Protecting Workers From Excessive Radio-Frequency Radiation" which states that, "one in 10 sites violates the rules, according to six engineers who examined more than 5,000 sites during safety audits for carriers and local municipalities, underscoring a safety lapse in the network that makes cellphones hum, at a time when the health effects of antennas are being debated world-wide" yet the FCC has issued only two citations to cell carriers since 1996 because "the FCC says it lacks resources to monitor each antenna." A CBS Atlanta investigation "Failure to follow cellular antenna regulations raises safety issue" also found radiation excesses up to 400 percent of the limit close up to the antennas on rooftops, posing serious health risks especially to any worker coming on the roof[36].

What safeguards does DC have in place to protect the health of building occupants and workers such as window washers, HVAC mechanics, etc. from the radiofrequency radiation emissions of small cell installations on buildings and rooftops?

> *"Historically, antennas have been placed at inaccessible, remote, or fenced locations to prevent accidental RF exposure. However, as the demand for better service has increased, antennas have continued to encroach into urban and residential areas. Wireless carriers now install antennas in the sides of buildings, on rooftops, or in faux-chimneys, many of which are disguised to the untrained eye. As such, a painter, roofer, or other contractor performing routine maintenance on the building is placed in immediate danger due to close proximity to transmitting antennas while remaining unaware of any potential hazard."* Investment Analyst Gloria Vogel, July 27, 2017 [37]

Has D.C. investigated these liability issues to protect city officials and taxpayers? Deployment of small cells must be halted until the answers to these questions are clarified.

The International Association of Firefighters has officially opposed cell towers on their stations since 2004 after a study found neurological damage in firefighters with antennas mounted on their station. Thus in 2017, when 5G "small cells were coming to California via a 5G streamlining bill (SB649), firefighter organizations came out in strong opposition to the bill and cited the many peer-reviewed studies indicating health effects. They requested that 5G towers ***not*** be installed on firehouses. They were successful and SB649 was amended to exempt their stations from the deployment due to their health concerns[38].

Conflicting Statements by Industry on the "Need" for Installations in Close Vicinity

On the one hand we are told by industry that small cells are needed for the latest technology. On the other hand, the cell phone companies themselves have confirmed that 5G "small" cell towers *do not* need to be placed every hundred feet (despite industry statements that densely placed small cells *are needed* in close vicinity to homes). For example, Verizon's CEO, Lowell McAdam stated on camera that 4G and 5G antennas will work from 3,000 feet

[35] Dr. Darius Leszczynski, July 18th, 2018 Assumption of Safety for 5G by Government Agencies, No Science.
[36] CBS News Report, (Nov. 20, 2014).
[37] Gloria Vogel, A Coming Storm For Wireless?, Talk Markets (July 27, 2017).
[38] Firefighter Unions Opposing Cell Towers, Environmental Health Trust.

away on Macro Towers. This statement indicates that Verizon does not need to place 5G small cells in residential areas every 500 to 1,000 feet:

> *"When [Verizon] went out in these 11 [5G test] markets, we tested for well over a year, so we could see every part of foliage and every storm that went through. We have now busted the myth that [5G frequencies] have to be line-of-sight — they do not. We busted the myth that foliage will shut [5G] down . . . that does not happen. And the 200 feet from a home? We are now designing the network for over 2,000 feet from transmitter to receiver, which has a huge impact on our capital need going forward. Those myths have disappeared."* — Lowell McAdam, CEO of Verizon

> *"[Verizon 5G] is really high frequency [28,000 MHz and 39,000 MHz], so everybody thinks it doesn't go very far, but it's a really big pipe and so that's what allows you to gain the super fast speeds . . We're 3,000 feet away from our radio node. the cool thing about this is that we did not move the radio node. . . here even 3,000 feet away, we're still getting 1,000 [Megabits per second] speeds . . . So now we've driven about 1/3 of a mile away [1,760 feet] from the radio node. we are still getting very good speeds even though we have foliage in between [800 Megabits per second]."* — Jason L., Verizon Field Engineer

In light of these statements by industry, it is not clear why the current proposal places small cells so close together in DC neighborhoods. Requiring larger setbacks would not affect voice service.

Hundreds of Scientists are Calling for a Moratorium on 5G

Experts are calling for regulatory action due to the health impacts posed by electromagnetic radiation, our current use of wireless technology and the new 5G technology, which includes these small cell installations. For example, in 2015, 215 scientists from 40 countries published a scientific appeal in the *European Journal of Oncology* about the dangers of exposure to non-ionizing electromagnetic fields.[39] A recent paper by the distinguished Canadian physician researcher Anthony B. Miller states that the complete body of scientific evidence indicates that radiofrequency is a human carcinogen.[40] EHT has compiled a list of scientific letters sent to government officials by scientists who are calling for a moratorium on the 5G small cell buildout.[41] Contrary to industry statements that allow the public to assume wireless technology is safe, independent scientists around the world are ringing the alarm bell.

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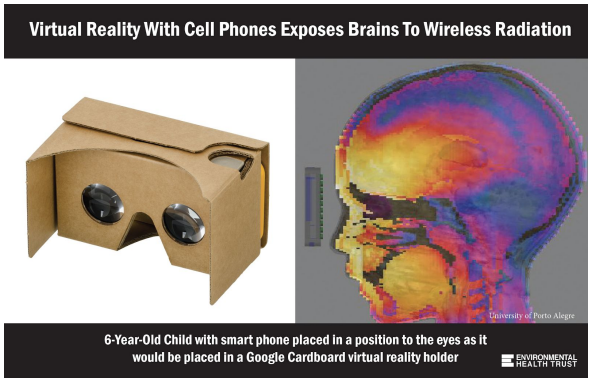
[39] Martin Blank et al., International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure, Eur. J. Oncol. (2015).
[40] Anthony B. Miller et al., Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102), 167 Envt'l Res. 673 (2018).
[41] Small Cells, Mini Cell Towers, Wireless Facilities and Health: Letters From Scientists on the Health Risk of 5G, Environmental Health Trust.



The American Academy of Pediatrics (AAP) is one of many medical organizations[42] that is calling for federal action to protect children in regards to radiofrequency radiation. The AAP not only instructs parents to reduce cell phone radiation exposure, they also have a webpage about cell towers that states:

> *An Egyptian study confirmed concerns that living nearby mobile phone base stations increased the risk for developing:*
>
> - *Headaches*
> - *Memory problems*
> - *Dizziness*
> - *Depression*
> - *Sleep problems*

The American Academy of Pediatrics is our largest organization of children's doctors, has repeatedly written to the U.S. government about current regulations on cellular radiation being outdated and non-protective for children and pregnant women[43, 44, 45, 46].

> *"Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use*

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[42] Statements by medical organizations on EMF and Wireless
[43] Time Magazine (2012): Pediatricians Say Cell Phone Radiation Standards Need Another Look
[44] 2012 AAP Letter to the FCC Chairman calling for the FCC to open up a review of RF guidelines
[45] 2012 AAP Letter to US Representative Dennis Kucinich in Support of the Cell Phone Right to Know Act
[46] 2013 AAP Letter to FCC Commissioner Mignon Clyburn and FDA Commissioner Margaret Hamburg calling for a review of RF guidelines

patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes." — 2013 AAP Letter to the FCC and FDA calling for a review of RF guidelines 8/29/2013

Peer Reviewed Studies Demonstrate Evidence of Harm

Peer reviewed studies have linked low-level wireless radiofrequency radiation exposures to a long list of adverse biological effects, including: DNA single and double strand breaks, oxidative damage, disruption of cell metabolism, increased blood-brain barrier permeability, melatonin reduction, disruption to brain glucose metabolism, and generation of stress proteins.[47]

Wireless radiation alters sleep patterns in replicated research in both animals and humans. For example, an animal study found a one-hour exposure to RFR caused a subsequent one-hour delay for rats to drift into REM or deep sleep.[48] Human studies have found exposure reduces REM sleep, alters the EEG signal, and results in altered performance. Published research finds the frequencies impact wildlife. For example, studies have found that the radiation alters bird navigation and disturbs honeybee colonies. Research also shows impacts on trees and plant growth.

A recent review of scientific literature on the health implications of electromagnetic frequencies states:

> *A growing body of scientific literature documents evidence of nonthermal cellular damage from non-ionizing wireless radiation used in telecommunications. This RF EMR has been shown to cause an array of adverse effects on DNA integrity, cellular membranes, gene expression, protein synthesis, neuronal function, the blood brain barrier, melatonin production, sperm damage and immune dysfunction.* [49]

More recently, research carried out in Israel by physicists Paul Ben-Ishai, Yuri Feldman, and colleagues has shown that the higher millimeter wave frequencies to be used in 5G applications uniquely interacts with sweat ducts of the human skin which can then function as antennas to amplify signals.[50,51] This work extends to studies first produced in 1986.[52] "The Modeling of the Absorbance of Sub-THz Radiation by Human Skin" by Noa Betzalel, Yuri Feldman, and Paul Ben Ishai was published in *IEEE Transactions on Terahertz Science and Technology* and documents how preferential absorption into the sweat duct results in higher SAR (specific absorption rate) values than otherwise expected. Currently accepted industry standard test systems for electromagnetic radiation's effect on humans are not sophisticated enough to measure the effect in the sweat gland, nor are they able to quantify the risk

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[47] For a compilation of published research studies, see Compilation of Research Studies on Cell Tower Radiation and Health, Environmental Health Trust.

[48] Haitham S. Mohammed, Non-thermal continuous and modulated electromagnetic radiation fields effects on sleep EEG of rats, 4 J. Adv. Res. 181 (2013).

[49] Cindy L. Russell, 5G Wireless Telecommunications Expansion: Public Health and Environmental Implications, 165 Envt'l Res. 484 (2018).

[50] Betzalel, Noa, Yuri Feldman and Paul Ben Ishai ,The Modeling of the Absorbance of Sub-THz Radiation by Human Skin, 99 IEEE Transactions on Terahertz Science and Technology 1-9 (2017).

[51] Yuri Feldman et al., Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range, 100 Physical Review Letters no. 128102 (2008).

[52] O.P. Gandhi and A. Riazi, Absorption of millimeter waves by human beings and its biological implications, 34 IEEE Transactions on Microwave Theory and Techniques 228-35 (1986)..

to human health from cumulative exposure. In 2017, Paul Ben-Ishai, PhD, delivered a lecture at the Israel Institute for Advanced Studies, Environmental Health Trust Expert Forum on this finding.[53, 54]

The biological effect of cumulative exposures to these frequencies must be considered in 5G development in order to ensure adequate public protection. The potential long-term impact of such stimulation on precancerous skin growths should be evaluated carefully, including potential super-growth of bacteria.[55]

The DC Government should initiate a large scale public education program to inform DC residents about this issue so they can reduce exposure to their personal devices as well. We have attached in our Appendix examples of educational materials that can be disseminated.

Wireless Radiation is a Human Carcinogen Not Tested for Long-Term Safety

Like its wireless predecessors, the widespread introduction of 5G wireless radiation frequency has never been tested for its impact on public health or the environment. In 2011, the microwave radiation fields emitted by cell phones and other wireless devices were classified as a 'possible carcinogen' by the International Agency for Research on Cancer. Since this date, the scientific evidence has increased to where scientists consider this radiation a human carcinogen. Dr. Lennart Hardell has multiple published reviews documenting that cellular radiation now meets scientific criteria for a Group 1 carcinogenic agent to humans.[56] Such conclusions are now corroborated by World Health Organization advisor Dr. Anthony Miller and experts who have published a literature review concluding the current body of evidence supports a classification for radiofrequency as a human carcinogen.[57,58]

The extensive scientific literature that has accumulated about the dangers of electromagnetic radiation speaks for itself. Additional investigations are required to determine the levels of involuntary radiation DC families and visitors would be exposed to on a daily basis if 5G small cells are installed throughout the area.

Wireless Radiation Produces Acute Health Symptoms

In addition to long-term health effects, radiofrequency radiation can cause acute symptoms, particularly in individuals with electromagnetic sensitivity or microwave sickness. When exposed to wireless radiation, these individuals experience acute symptoms such as "headache, difficulties with concentration or memory, dizziness, sleep disturbances, irritability, rashes, vision changes, heart palpitations, muscle twitching, fatigue, tinnitus, and others."[59] Even in the general population, however, acute symptoms such as fatigue, sleep disturbance, headaches,

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[53] Yuri Feldman and Paul Ben-Ishai, Potential Risks to Human Health Originating from Future Sub-MM Communication Systems, Conference on Wireless and Health (2017).

[54] Itai Hayut et al., Circular polarization induced by the three-dimensional chiral structure of human sweat ducts, 89 Physical Review E, no. 042715 (2014).

[55] Diana Soghomonyan et al., Millimeter waves or extremely high frequency electromagnetic fields in the environment: What are their effects on bacteria?, 100 Applied Microbiology and Biotechnology no. 11, 4761-71 (2016).

[56] Michael Carlberg and Lennart Hardell, Evaluation of Mobile Phone and Cordless Phone Use and Glioma Risk Using the Bradford Hill Viewpoints from 1965 on Association or Causation, BioMed Res. Int'l (2017).

[57] Michael Peleg et al., Radio frequency radiation-related cancer: assessing causation in the occupational/military setting, 163 Envt'l Res. 123–133 (2018).

[58] Anthony B. Miller et al., Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102), 167 Envt'l Res. 673 (2018).

[59] Electrohypersensitivity Overview, Physicians for Safe Technology.

memory loss, and nausea have been reported near cell towers, with significant increases in complaints closer to towers.[60]

Current Federal Regulations are Outdated and Insufficient

The only applicable FCC standards for radiofrequency radiation emissions were set in 1996, and they did not consider the use of modern wireless equipment like small cells that would be located close to residences. In 2012, the Government Accountability Office issued a report stating that current FCC limits needed to be updated because they were not based on current science.[61] The EPA's "activities related to electromagnetic fields" were defunded two decades ago, preventing it from setting proper safety limits.[62]

Thus, because the standards are out of date and do not reflect most recent science, mere compliance with the FCC's outdated standards does not assure safety.

Other Countries Have Enacted Far More Protective Regulation

Many countries such as China, India, Poland, Russia, Italy, and Switzerland have far more protective and stricter radiation limits than the United States. Governments are acting to minimize exposures, especially to vulnerable populations such as children. For example, the Supreme Court of India upheld the High Court of the State of Rajasthan's decision to remove all cell towers from the vicinity of schools, hospitals, and playgrounds because the radiation from these towers is "hazardous" and causes cancer, brain tumour, digestive disorder, and tachycardia.[63] In Chile, the 2012 "Antenna Law" prohibits cell antennas/towers in "sensitive areas" such as "educational institutions, nurseries, kindergartens, hospitals, clinics, nursing homes or other institutions of similar nature."[64] Please learn more about international policy actions such as these in our online briefing.[65]

The Maryland State Children's Environmental Health and Protection Advisory Council issued a 2017 Report advising the Department of Education to recommend local school districts reduce classroom wireless radiation exposures by providing wired — rather than wireless — Internet connections. Children will have a lifetime of exposure to wireless radiation, and public health authorities must limit this exposure as much as possible to protect their healthy future.

Cities Across the Country Are Opposing 5G With Protective Ordinances

Cities in California such as Petaluma, Mill Valley, Monterey, Hillsborough, Ross, and San Anselmo, as well as Sebastopol and Doylestown in Pennsylvania, have voted and passed policies to halt 5G and restrict the wireless rollout into neighborhoods.

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[60] R. Santini et al., Investigation on the health of people living near mobile telephone relay stations, 50 Pathol. Biol. 369-73 (2002). For a visual representation of these findings, see Neurobehavioral Symptoms Near Cell Towers.
[61] Exposure and Testing Requirements for Mobile Phones Should be Reassessed, Government Accountability Office (July 2012).
[62] Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 1996, Senate Report 104-140 at 91 (Sept. 13, 1995).
[63] Abhinav Sharma, Rajasthan HC orders relocation of mobile towers from schools, hospitals, Economic Times (Nov. 28, 2012).
[64] New communications antenna law in Chile, 20 Communications Law: Newsletter of the International Bar Association Legal Practice Division 14-16 (2013).
[65] International Policy Briefing: Cautionary Policy on Radiofrequency Radiation Actions by Governments, Health Authorities and Schools Worldwide, Environmental Health Trust (2017).

- Read "California City blocks 5G deployments over cancer concerns"
- Read "Tiny Doylestown Borough battled Verizon over 5G and won a big settlement" and "Tiny Town Rejects Verizon Small Cells and Wins in Court"
- Read Cell tower ordinance read for first time at (Booneville) council meeting
- Read San Rafael residents take pre-emptive strike against 5G installations
- Read "Official: Palm Beach exempt from 5G wireless law"
- Read "Petaluma 360: Petaluma sets cell phone tower policy"
- Read "Mill Valley blocks faster, smaller cell phone towers over cancer fears" and Urgent Ordinance from City of Mill Valley

The District of Columbia would thus not be alone in demanding safer infrastructure from the telecommunications industry. For example, setbacks of a minimum of 500 feet from residences would increase the distance to the antenna and decrease the radiation exposure to people in their homes.

"Hoteling" Is Realistic, Despite Industry Claims

Providers insist that they are unable to share towers because their antenna designs are not compatible. However, this industry is the most creative and productive in modern history. If mandated to develop shared facilities, there is no doubt that they will be able to do so. Granting companies' requests for separate towers would result in 18 towers per block — an unsightly and unnecessary blight on our city.

The history of technology and regulation is replete with instances where industry has innovated only after being required to do so. For example, after insisting that requiring automobiles to be equipped with catalytic converters would bankrupt the American automobile industry, that industry developed the most advanced environmentally sound engine systems in the world. We expect similar developments to occur in this instance.

Thus, if D.C. allows small cell installations, we urge that hoteling be required as a matter of sound public policy to enhance the physical environment and protect traditional neighborhood aesthetics.

Conclusion: Prioritize Wired Systems Over Wireless Systems

In summary, the assumption that all wireless technology is safe has been shown through numerous studies to be completely incorrect. In fact, ever-mounting scientific evidence produced by experts around the world shows that various forms of microwave radiation can have profoundly harmful effects on wildlife, including birds and bees, as well as on public health.

Sound public policy requires taking into account the latest technical information.

Because of the substantial health impacts posed by telecommunications networks that use microwave radiation, **EHT strongly opposes the widespread installation of new wireless antennas and 5G infrastructure until properly modernized safety testing has been done to assure the public is protected from long-term exposure and until safer, faster, and more secure wired systems are devised to minimize human and environmental impacts. We join with hundreds of scientific experts from around the world to urge that the District of Columbia instead support the installation of fiber optic cables buried in the ground to every business, home, school, and hospital.** This cabling system is the foundation for Korea's much higher rate of broadband access, while we continue to cope with inadequacies reflecting our continued reliance on antiquated wireless systems that have proven to be incapable of meeting growing demand.

Respectfully submitted on behalf of Environmental Health Trust,

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Appendix I Peer Reviewed Research on RF, Cell Towers and 5G
Appendix II Re-Inventing Wires: The Future of Landlines and Networks,"
Appendix III Briefing by Dr. Martin Pall: "5G: Great risk for EU, U.S. and International Health! Compelling Evidence for Eight Distinct Types of Great Harm Caused by Electromagnetic Field(EMF) Exposures and the Mechanism that Causes Them"
Appendix IV Letters from Scientists on Small Cell Deployment Warning of Health Effects
Appendix V Liability Letter on Small Cell Deployment
Appendix VI Public Awareness Materials on How to Reduce Exposure to Cell phone/wireless Radiation
Appendix VII Santa Clara Medical Association Articles on 5G, Small Cells and Wi-Fi.