Santa Cruz County Public Hearing Concerns Regarding Item No. 1. 201372

Correspondence from Hope Schachter, Nina Terrace Resident

Contact: hope.sch@gmail.com | 650.815.9292

My name is Hope and I am a resident of the Nina Terrace neighborhood in Boulder Creek. I am reaching out to you regarding growing concern our community has about a permit application that we recently found out about at the last minute, and which is to be reviewed for approval this Friday. There have been a number of legal cases between some neighbors up the road from us that has resembled a feud, and we came to find out about this when my family was displaced from the fires - the details were revealed to us in the disclosures for properties we looked at. It has come to our attention that a part of this ongoing saga between the parties has resulted in the property owners no longer living in this state, but seeking to place a cell tower/wireless facility on a parcel they have retained as an upstaging and final word toward the neighbors. Many in this community have concerns around this commercial permit in a residential zone, particularly the fact that due to the size of the structure, they were somehow able to bypass an environmental review on an area that has previously had slides from prior earthquakes, as well as within this previous court battle a directly adjoining neighbor performing intensive grading and land restructuring without professional geological consultation over the past few years.. The risk this poses for insurance purposes many of us find daunting, as we share private roads, etc.

see Joseph Hanna's slide report — work was not completed to remediate SC County Case No. 17CV01481 and 16-NV23610 erosion reports

This lawsuit is public record: case No. C18CV0226

This concern has also been raised around the fact that it allows this permit to potentially pass when many others in the neighborhood have not due to an endangered species of beetle known as the Mount Hermon June Beetle (one property was continually denied various permits due to this beetle, and it is just a few homes down from the proposed tower). Some further considerations about this lay within research that states the outcomes to invertebrates remain unknown:

> This research https://www.sciencedirect.com/science/article/abs/pii/S0013935118300161 is briefly summarized here: **Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We Don't Know, and What We Need to Know** (https://stopsmartmetersbc.com/wp-content/uploads/2021/02/Effects-of-Non-ionizing-Electromagnetic-Pollution-on-Invertebrates-including-Pollinators-such-as-Honey-Bees-What-We-Know-Dont-and-Need-to-by-Margaret-Friesen-and-Magda-Havas-February-09-2021.pdf)

We are uneasy about the safety of our wildlife with this new technology and the lack of oversight about how it will impact the ecosystem here, something our family's love for has been THE primary reason we had hoped to raise a family in this lovely mountain community and moved back after losing all of our belongings in the CZU Fire. This situation is causing a great deal of distress to the community members who care about the forest and the creatures that inhabit it as much as one another, and we are all feeling disheartened that since the parties of these issues have moved away from the community, they will certainly not endure the potential harmful ramifications of it but rather financially benefit from this continually escalating dispute. The people who prioritize the sanctity of these mountains will likely continue to leave and the ones who don't care will be those that just perhaps appreciate the backdrop of nature while enjoying

their high speed screentime. Many of us are well educated professionals, a number of whom like myself have worked extensively in research fields, and our concerns are legitimate.

The entirety of this permit appears predicated on the decommissioning of the current tower on one party's property, and that need being replaced with the new technology of another tower on the 675 Rebecca parcel. Unfortunately, we have word via a company coming to do an inspection for the "freed up space" on the original property that another wireless facility would potentially replace that one as well. Therefore, opening the door to one commercial permit could lead to a large Valley Telecom Site within the neighborhood, and I am unclear if since this original cell tower location has had prior installation, if we would even be notified of new structures on that [soon-to-be] decommissioned site that would add to the infrastructure load in our residential neighborhood. I have asked if documentation has been obtained IN WRITING to ensure that no other wireless facility components will be installed on the existing parcel 653 Rebecca once the decommissioning has taken place and the new one is installed at 675 Rebecca Drive. Otherwise, its misleading for Crown Castle to imply it would simply be moving slightly to the east.

While Crown Castle and the parcel owners are posing this wireless facility as providing crucial services to our neighborhood like 9-1-1 calls, it's critical to note that within the permit application there are at least two alternative proposed locations in NONRESIDENTIAL zones, so that those prioritizing these services from this telecom carrier would still have accessibility without allowing a commercial permit to be authorized in our residential neighborhood, and what that could lead to down the road. Additionally, for high speed internet service upgrades Starlink will be available in the San Lorenzo Valley in a matter of months, a service which as I understand it does not require commercial wireless communication facilities or towers, as Elon Musk has launched 60K satellites in the sky to provide the service.

Furthermore I'm not sure if you are aware, but there was a similar proposal for a lot downtown, but due to the concerns of parents and community members about the proximity to the elementary school, it was revoked based on evidence of potential risk. I noticed that within the permit application it specified that a written statement must be authorized by a school district representative, which I could not locate. I know that parents in the area and many school representatives would remember the concerns this previously raised and be equally alarmed with this current proposal, now in many of those original concerned community members backyards. Most people moving to the mountains wish to immerse themselves in nature and not in the "smart city" hubs over the hill. I think we can all agree this is worth preserving, having families here who love the mountains and living in the integrity of our wildlife environments. Some states and smaller localities have banned these wireless installations within a specific distance from schools, countries such as France and Belgium have banned them from being installed close to preschools, based on the research that becomes available as these rollouts continue, much of which is rooted in fertility and sterility, childhood cancers, learning disabilities, wildlife migration, the list goes on. California banned antennas from fire stations due to a significant increase in health claims with firefighters and their union demonstrating the correlation of the installments. Additionally, insurance providers are allowed to refuse claim coverage if there is some form of evidence noted that it is related to wireless radiation. Let's say you ask your medical provider if living close to this telecom facility could have played a role in your or your child's recent neurological diagnosis and that is noted somewhere that the insurance company

could access in reviewing the claim – how will that impact coverage over the course of a lifetime? Will that be considered a pre-existing condition with the justification that you CHOSE to reside by a structure, when in fact you may not have actually selected these circumstances knowingly? When the parcel owners for this facility have outright moved away from the property prior to signing up for this it speaks volumes about how they would not choose this for themselves but have far less regard for their neighbors.

Insurance and Coverage Concerns with Electromagnetic Radiation:
https://ehtrust.org/key-issues/reports-white-papers-insurance-industry/

I have included some further information on these emerging technologies below - there are many potential concerns but I aim to be concise, as well as photos to consider extracted from the permit application. One particular consideration discusses that the antennas to propagate the signals to subscribers are typically located at ground level, and that it only meets the maximum radiation standard if one is physically near them, so what about those of us walking dogs, babies in strollers or curious toddlers? We deserve clarification about whether these are directly on the facility's structure and not the greater grid - if this were 5G where new phased array/beam forming technology needs to be installed approximately every 3-400 feet or so in order to adequately penetrate structures and form somewhere around 900 "handshakes" or pulses per minute between the tower, antennae and people's smart devices [often which are installed on telephone poles] - the language feels intentionally elusive. Whether that's initially the case or not, another community member provided photos of the Crest Ranch cell tower's *initial* installment and what it is today to demonstrate that we as a community do not have a say once this is approved in additions to the wireless facility once it's approved. This means that even if it is not currently 5G, this permit would give that capability to the provider at any time they see fit without the community's consent. The doors this opens cannot be undone. I encourage you to review the photos of how this has occurred over time in other locations.

Lastly, as I shared, we discovered many details about the dynamics between the neighbors when we were looking for a replacement property after the fire last year, and a reason we chose not to pursue some of these homes was due to the circumstances combined with the already existing cell tower (as pertains to some of the risks I mention throughout this correspondence) and was notified by our realtor that we were absolutely not the first buyer to be turned off by this wireless facility. With the additional proposal and the potential of this telecom site in our neighborhood, who will be responsible for the property devaluation here should this occur, and how homeowners can be properly compensated? Will it be the parcel owners, Crown Castle, the Telecom Company, or is this something we have to take up against the County itself? Like the circumstances I described for insurance purposes, if we are not onboard with this change to our neighborhood, it seems unjust that the actions of a few can have such a detrimental impact on the many. The original Nina Terrace HOA intended to protect this neighborhood from such issues via document Instrument No. 26171 [Book 1564, Page 376] under Item 1. Land Use and Building Type for Neighborhood Restrictions by prohibiting any structures on parcels other than permanent dwellings, and that no lot or any part or rearrangement thereof shall be used for facilities or structures outside of residential purposes.

I implore you to think about the decision to allow the installation of this station in our neighborhood as it is causing distress in a season where people are trying to revitalize their family life and preserve the normalcy of childhood post-pandemic and after the CZU Fire, and the changes this would absolutely bring forth to the mountain community pose more harm than any form of its convenience could be balanced out by. Having spoken with busy mothers in tears and beloved neighbors who have been in this neighborhood since its inception, I'm reaching out hoping you will genuinely reconsider based on the breadth of information we have presented. Most families in our neighborhood are well aware of the property owners choosing not to live in this state any longer while reaping all the financial benefit without having to endure any of the potential risks, and are particularly discouraged that our representatives would put these types of corporate interests over the wellbeing of our wildlife and mountain community. I am hoping you will prove this inclination to be wrong.

This link from Scientific American has exceptional resources linked within it: https://blogs.scientificamerican.com/observations/we-have-no-reason-to-believe-5g-is-safe/

Of note in particular is the 5G Appeal which has nearly 500 signatories from the world's top specialists regarding the impact on all facets of life. I hope you will look through that here: http://www.5gappeal.eu including implications for concerns in residential settings here: https://arxiv.org/pdf/1711.03683.pdf

For Photos discussed above as well as Application Excerpts please see attached.

original Antennas at Crest Ranch, minimal.

Current installation at Crest Ranch, demonstrating additions made without consent/community input.

Lack of Environmental Review despite concerns. See discussion and cases:
C18CV0226, 17CV01480, 19-NV23910
prior slides, no remediation, etc.

Environmental Review

The California Environmental Quality Act (CEQA) provides exemptions for classes of projects which do not have a significant effect on the environment.

The attached CEQA Notice of Exemption (Exhibit A) states that the project is exempt under the Guidelines section 15303 (Class 3) exemption, which applies to "construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structure from one use to another where only minor modifications are made in the exterior of the structure".

Consistent with this section, commercial structures such as the proposed project not exceeding 2500 square feet and not involving significant amounts of hazardous substances and not located within a sensitive habitat are exempt.

If a project falls within a catergorical exemption, no formal environmental evaluation is made.

Furthermore, pursuant to CEQA Section 15300.2 (c), the project is categorically exempt from the requirements of CEQA unless there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances. The CEQA guidelines state that "Unusual circumstances" require showing that the project has some specific feature that distinguishes it from others in the exempt class, such as its size or location, and is not satisfied by a mere reasonable possibility that an activity will have a significant effect on the environment.

No unusual circumstances apply to the subject property.

This supports the determination that the project is categorically exempt from CEQA under section 15303 (Class 3) exemption (Exhibit A).

The County Code specifies the following basis for approval of a Commercial Development Permit for the proposed wireless facility:

> 13.10.220 Use Approvals.
> (A) Description. A use approval is a discretionary authorization of a land use allowed in accordance with the regulations of the governing zone district and issued as part of a development permit pursuant to Chapter 18.10 SCCC. A use approval shall be granted at the approval level specified by the governing zone district for the project property and may only authorize such development or use of the property as is allowed by the zone district or as otherwise provided in this chapter.

The use is allowed pursuant to the Residential Uses Chart in Santa Cruz County Code (SCCC) section 13.10.322. The chart indicates that wireless facilities are allowed within the Residential Agricultural (RA) zone district subject to a Level 5 review, with approval of a development permit by the Zoning Administrator, and subject to the wireless regulations. Further, the wireless regulations state:

> "Required Permits: All new wireless communication facilities shall be subject to a commercial development permit, and a coastal development permit if in the Coastal Zone. Additionally, a building permit will be required for construction of new wireless communication facilities"

Project Background

The proposed facility at 675 Rebecca Drive replaces an existing permitted WCF located at 653

Rebecca Drive. The project proposes to fill a significant gap created by demolition of this WCF. The proposed WCF project includes an alternative analysis evaluating potential facility locations in the Rebecca Drive neighborhood as well as other sites at a similar elevation as the existing facility to ensure that existing coverage provided to existing AT&T customers is not compromised by replacement of the current facility. Thus, the applicant identified the subject property as the only site available to fill the significant gap created by closure of the existing facility.

Zoning & General Plan Consistency

The subject property is a 3.1-acre lot, located on a split-zoned parcel, RA (Residential Agricultural) and R-1-20 (Residential Agriculture, single family residential, 20,000 square feet per unit). The proposed wireless communication facility is located in the portion of the property zoned RA located to the south of Rebecca Drive.

The Residential Agricultural Zone district is a restricted wireless zone district. In order for the wireless facility to be supported the applicant is required to prove that:

a) The proposed wireless facility would eliminate or substantially reduce one more significant gaps in the applicant carriers network; and

Closure of the existing facility will create a significant gap in current wireless coverage in AT&T's WCF network.

b) There are no viable, technically feasible, and environmentally equivalent or superior potential alternatives (i.e., sites and/or facility types and/or designs) outside the restricted areas that could eliminate or substantially reduce said significant gap.

The alternative analysis concludes that there are no viable, technically feasible,

Permit Application detailing its predication on decomissioning of Telecom facilities on current lot - intentionally misleading. Other non residential locations as alternatives are found in the full packet.

Fire Protection District.

G. Submit 3 copies of plan review letters prepared and stamped by the project Geotechnical Engineer.

H. Pay the current fees for Child Care mitigation for .23 per square foot of commercial space. Currently, these fees are $66.70.

I. Pay the current Affordable Housing Impact Fee. The fees are based on new square footage and the current fee for non-residential construction is $3 per square foot.

J. Provide required off-street parking for 1 car. Parking spaces must be 8.5 feet wide by 18 feet long and must be located entirely outside vehicular rights-of way.

EXHIBIT C

Parking must be clearly designated on the plot plan.

K. Submit a written statement signed by an authorized representative of the school district in which the project is located confirming payment in full of all applicable developer fees and other requirements lawfully imposed by the school district.

III. All construction shall be performed according to the approved plans for the Building Permit. Prior to final building inspection, the applicant/owner must meet the following conditions:

A. All site improvements shown on the final approved Building Permit plans shall be installed.

B. All inspections required by the building permit shall be completed to the satisfaction of the County Building Official.

C. The wireless communication facility may not be connected to a power source or operated until a final inspection and clearance from the Santa Cruz County Planning Department has been received.

D. The project must comply with all recommendations of the approved soils reports.

E. Pursuant to Sections 16.40.040 and 16.42.080 of the County Code, if at any time during site preparation, excavation, or other ground disturbance associated with this development, any artifact or other evidence of an historic archaeological resource or a Native American cultural site is discovered, the responsible persons shall immediately cease and desist from all further site excavation and notify the Sheriff-Coroner if the discovery contains human remains, or the Planning Director if the discovery contains no human remains. The procedures established in Sections 16.40.040 and 16.42.080, shall be observed.

IV. Operational Conditions

A. In the event that future County inspections of the subject property disclose noncompliance with any Conditions of this approval or any violation of the County Code, the owner shall pay to the County the full cost of such County inspections, including any follow-up inspections and/or necessary enforcement actions, up to and including permit revocation.

B. In order to screen the wireless facility from view of adjacent residences to the east

School district authorization? This issue has been brought up with the local school, and the permit request was revoked based on concerns with the community.

General Facility Requirements

Base stations typically consist of two distinct parts: the electronic transceivers (also called "radios" or "channels") that are connected to the traditional wired telephone lines, and the passive antennas that send the wireless signals created by the radios out to be received by individual subscriber units. The

EXHIBIT H

transceivers are often located at ground level and are connected to the antennas by coaxial cables. Because of the short wavelength of the frequencies assigned by the FCC for wireless services, the antennas require line-of-sight paths for their signals to propagate well and so are installed at some height above ground. The antennas are designed to concentrate their energy toward the horizon, with very little energy wasted toward the sky or the ground. This means that it is generally not possible for exposure conditions to approach the maximum permissible exposure limits without being physically very near the antennas.

Computer Modeling Method

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to

Questions Re: 5G & Antenna locations now or in the future [clarification needed]

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Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We Don't Know, and What We Need to Know

downloaded at http://pcesc.ca/media/45404/final-2019-pcesc-proceedings.pdf on February 9, 2021

Margaret Friesen[1] and Magda Havas[2]

[1] Independent Researcher, Winnipeg, MB; Email: friesenm.ehs@gmail.com
[2] Trent School of the Environment, Trent University

Abstract – Invertebrates, including pollinators such as honey bees, can be adversely affected by non-ionizing electromagnetic radiation (EMR). Sources contributing to common environmental EMR exposures include antennae (cell phone, broadcast, and radar), communications satellites, and power lines. Adverse biochemical changes and disorientation have been reported for honey bees and other invertebrates. Field studies have reported changes in abundance and composition of "key pollinator groups" (wild bees, hoverflies, bee flies, beetles, and wasps) that have been attributed to emissions from telecommunications towers. We take a close look at the biological effects on invertebrates of EMR reported in the scientific literature and a general look at evidence from studies on plants, birds, humans, and other animals (domestic, laboratory, wild). We discuss possible implications of excessive electromagnetic pollution on ecosystems and identify knowledge gaps and what we need to know before more electromagnetic pollution is added to the environment, especially in the form of 5G.

Introduction

Invertebrates (animals without backbones) are major components of most ecosystems. Insects are key to the integrity of many ecosystems in many roles including as pollinators. Honey bees play a role in pollination of domestic as well as wild plants and are often used as bio-indicator species and as a "model" to examine environmental problems. The global decline of pollinators is of grave concern and efforts are being made to identify the reasons (Potts *et al.* 2010; Sánchez-Bayo and Wyckhuys 2019). One factor not widely considered is the possible role of anthropogenic electromagnetic radiation (EMR).

Electromagnetic fields (EMFs) are invisible electric and magnetic fields of force. All living organisms have evolved in Earth's natural EMFs and depend on them to live. Natural sources include Earth's static magnetic field, and static electricity, including differences in charges among clouds and the earth that can lead to lightning. Electromagnetic radiation (EMR) originates when fields change.

Anthropogenic (human-made, artificial) EMR sources are sometimes referred to as electromagnetic pollution or electrosmog. The main frequency ranges of interest in this article are: 1) extremely low frequencies (ELF) of 50/60 to 90 Hz that emanate from sources such as power lines and building wiring; and 2) radiofrequency radiation (RFR) of 700 MHz to 6 GHz, commonly used for devices such as cell phones, radio and television, and their supporting infrastructure, e.g., cell towers, antennae on buildings, and orbiting communications satellites. Also discussed are frequencies currently being developed and deployed above 6 GHz for 5G (5th Generation) for faster and more pervasive connectivity, including the "Internet of Things".

There are no Canadian guidelines for non-ionizing EMR exposures for non-human organisms, including wildlife. Health Canada's safety guidelines, *Safety Code 6* (Health Canada 2015), set limits for human exposure to RFR (3 kHz to 300 GHz). In the commonly used frequencies, these guidelines are based only on thermal effects, i.e., if there is no heating, it is assumed that there is no harm. For "far field" exposures such as cell towers and Wi-Fi access points, the *Safety Code 6* power density safety limits are, depending on frequency, between 2 and 10 W/m^2 [at least 1,000,000,000,000 (= 10^{12}) x natural levels (Bandara and Carpenter 2018)]. For "near field" exposure, such as cell phones, the upper limit of the permissible Specific Absorption Rate (SAR) is set at 1.6 W/kg for the head, neck, and trunk.

What We Know

Relatively few EMR studies have been conducted on invertebrates. A 2011 report commissioned by the Indian Ministry of Environment and Forest found that of 919 publications identified in a comprehensive review of biological effects of RFR exposure, 81% (742) were on humans, about 3% (30) were on birds, and <1% (7) were on bees. "Other animals" made up about 12% (111), and <1% (8) were on plants (Expert Committee 2011). The majority of the studies in each of the categories showed impacts.

Invertebrates – Honey Bees

We conducted a comprehensive search for original (primary) peer-reviewed research studies on EMR (ELF and RFR) and honey bees using "EMF Portal", an online database of scientific studies on the effects of electromagnetic fields, created by Aachen University, Germany (EMF Portal 2019), as well as internet searches. Identified publications were further examined for relevant studies. A total of 26 studies were identified from 1976 to the end of January 2019. Research methods and descriptions varied widely in quality. No studies were conducted in Canada or by Canadian scientists. Some studies that found effects were noted as being conducted under "non-thermal" conditions.

Seven of the eight ELF frequency studies reported effects (Table 1). One paper concluded: "*The results suggest that 50 Hz ELF EMFs emitted from powerlines may represent a prominent environmental stressor for honey bees, with the potential to impact on their cognitive and motor abilities, which could in turn reduce their ability to pollinate crops.*" (Shepherd *et al.* 2018). For RFR studies, 13 of 18 (72%) showed effects (Table 2). Exposure conditions ranged from ambient levels (two studies) to very high levels.

Invertebrates - Other insects

Potential adverse effects have been reported in other invertebrates (Cucurachi *et al.* 2013), including fruit flies (Sagioglou *et al.* 2016) and ants (Cammaerts and Johansson 2013). A major field study on insect pollinators (excluding honey bees) was conducted on two islands in the Mediterranean with cell towers (Lázaro *et al.* 2016). Abundance and composition of beetles, wasps, and hoverflies were negatively affected, and underground-nesting wild bees and bee flies were positively affected. The authors conclude: "*... these changes ...associated with electromagnetic smog may have important ecological and economic impacts on the pollination service that could significantly affect the maintenance of wild plant diversity, crop production and human welfare.*"

TABLE 1. Publications studying extremely low frequency fields (ELFs) and honey bees.

Study: authors and year	Country of authors	Effects*
1. Altmann and Warnke (1976)	Germany	Yes
2. Altmann and Warnke (1987)	Germany	Yes
3. Bindokas *et al.* (1988)	US	Yes
4. Greenberg *et al.* (1981a)	US	Yes
5. Greenberg *et al.* (1981b)	US	Yes
6. Kirschvink *et al.* (1997)	US	Yes
7. Shepherd *et al.* (2018)	UK, Brazil	Yes
8. Wyszkowska *et al.* (2019)	Poland	No

* Effects included disturbed flying behaviour, metabolism abnormalities, queen loss, and decreased overwintering survival.

TABLE 2. Publications studying radiofrequency radiation (RFR) and honey bees.

Study: authors and year	Country of authors	Effects*
1. Dalio (2015)	India	Yes
2. el Halabi *et al.* (2013)	Lebanon	Yes
3. Favre (2017)	Switzerland	Yes
4. Favre (2011)	Switzerland	Yes
5. Gary and Westerdahl (1981)	US	No
6. Harst *et al.* (2006)	Germany	Yes
7. Kimmel *et al.* (2007)	Germany	Yes
8. Kumar *et al.* (2013)	India	Yes
9. Kumar *et al.* (2011)	India	Yes
10. Mall and Kumar (2014)	India	No
11. Mixson *et al.* (2009)	US	No
12. Odemer and Odemer (2019)	Germany	Yes
13. Patel *et al.* (2016)	India	No
14. Pattazhy (2012)	India	Yes
15. Sahib (2011)	India	Yes
16. Sharma and Kumar (2010)	India	Yes
17. Taye *et al.* (2017)	India	Yes
18. Westerdahl and Gary (1981)	US	No

* Effects included production of higher frequency sounds; induction of piper signal (announces the swarming process or is a signal of a disturbed colony); disruption of navigational skills of foragers; increased aggressiveness; reduction of numbers of returning foragers and in some cases, none returning (colony collapse). Other adverse effects included decreased colony strength, hatching success, queen egg-laying, honey storing ability, and pollen reserves.

An EKLIPSE project (a research initiative on biodiversity and ecosystem services, supported by the European Union Horizon 2020 research and innovation program) recently took an in-depth look at 39 peer-reviewed studies of effects of EMR exposure on invertebrates as part of a wider study on wildlife and exposure to EMR (Goudeseune *et al.* 2018). The EKLIPSE webinar presentation in January 2018 (Tscheulin and Vanbergen 2018) reported evidence that EMR provides environmental cues, can affect behaviour and reproduction, and poses a potential risk to some physiological mechanisms in invertebrates. Levels of confidence in the evidence were outlined in the webinar and in an EKLIPSE report (Malkemper *et al.* 2018) (Figure 1).

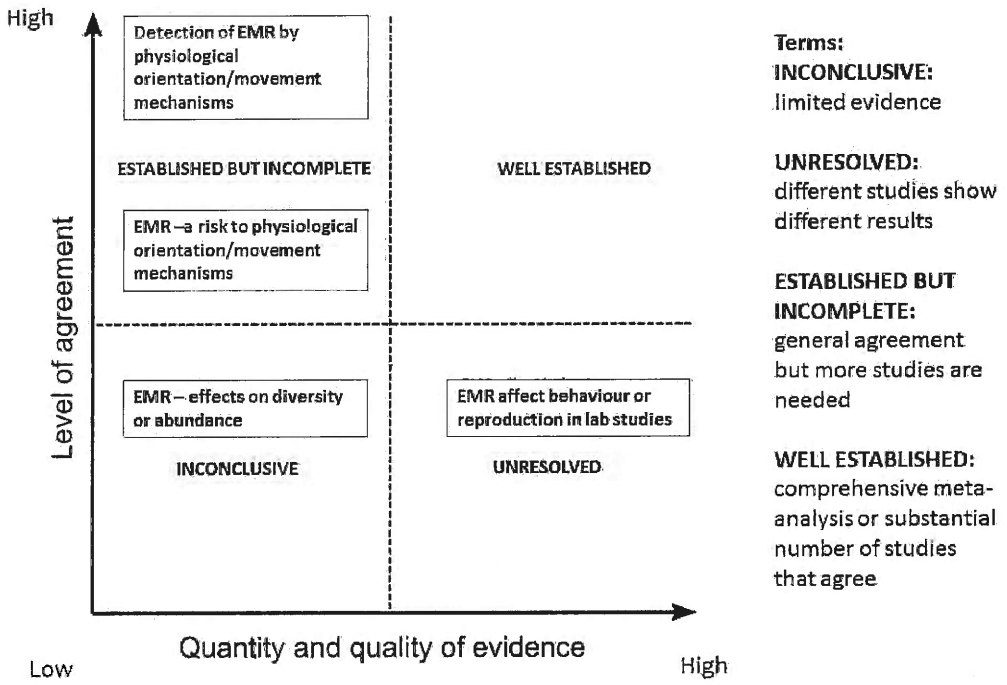

FIGURE 1. Levels of confidence of statements on invertebrates. Modified from EKLIPSE report (Malkemper *et al.* 2018).

Plants

A review by Halgamuge *et al.* (2017) identified 45 peer-reviewed publications (1996–2016), many conducted at non-thermal levels, where 90% showed physiological or morphological effects from exposure to RFR. Sensitivity varied with frequencies. Pea, tomato, and mungbean were very sensitive. In a partially replicated study, peas exposed to Wi-Fi frequencies had diminished growth compared with the controls after 30 days (Havas and Symington 2016). A study on trees concluded: "*EMR from mobile masts are harmful to trees*" (Waldmann-Selsam *et al.* 2016).

Vertebrates - Birds

Disorientation of some bird species due to exposure to ambient (non-thermal) RFR levels have been documented in a number of bird studies, most notably in the well-controlled, double-blinded work on European robins by a German research team (Engels *et al.* 2014). Weak

broadband fields disrupted the birds' magnetic compass orientation whereas relatively strong narrowband fields did not (Schwarze *et al.* 2016).

Domestic Animals

ELFs at low levels have been reported to affect behaviour in large mammals (Burda *et al.* 2009), and circadian rhythms and blood biochemistry in dairy cows (Stelletta *et al.* 2007).

Laboratory mammal studies

There are more than 1,000 studies showing potentially adverse effects at well below *Safety Code 6* levels. Recently, a $30 million US study, conducted at frequencies commonly used in 2G and 3G cell phones, found *"clear evidence of carcinogenic activity"* in male rats (National Toxicology Program 2018). We examined 20 laboratory mammal studies conducted at Wi-Fi frequencies of 2400 to 2450 MHz that reported DNA damage, oxidative stress, and other potentially adverse effects at and well below the *Safety Code 6* SAR level (Figure 2).

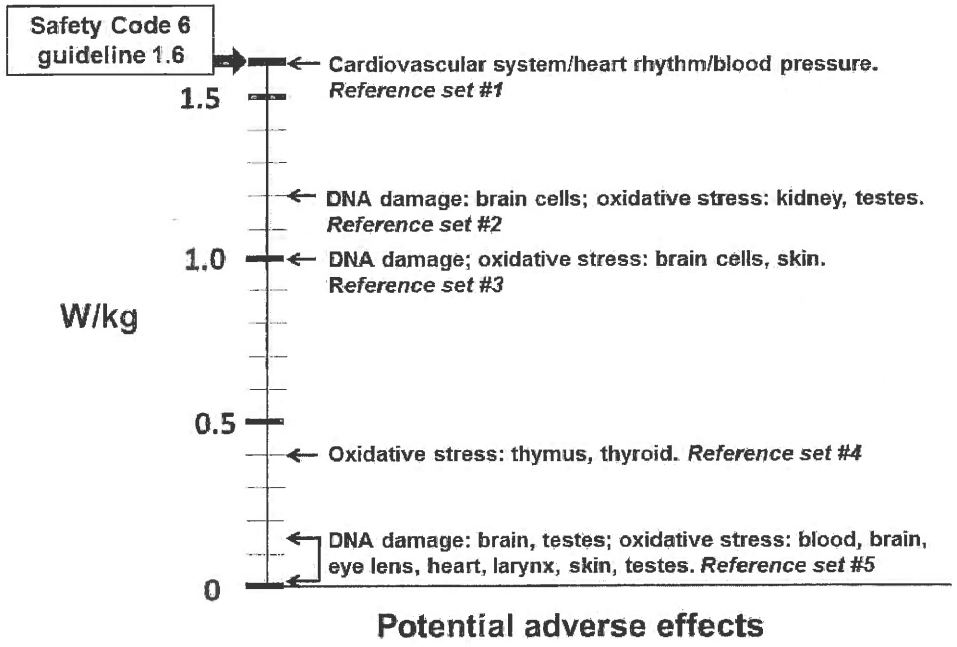

FIGURE 2. Potential harmful biological effects reported for Wi-Fi exposure in 22 studies with the corresponding Specific Absorption Rate (SAR) level indicated with arrows. Health *Canada's Safety Code 6* SAR safety guideline is 1.6 W/kg (head, neck, and trunk). References for the respective sets are:

Reference set #1: Saili *et al.* (2015)
Reference set #2: Lai and Singh (1996); Özorak *et al.* (2013)
Reference set #3: Ceyhan *et al.* (2012); Eser *et al.* (2013); Paulraj and Behari (2006)
Reference set #4: Misa Agustiño *et al.* (2012); Misa-Agustiño *et al.* (2015)
Reference set #5: Atasoy *et al.* (2013); Aynali *et al.* (2013); Deshmukh *et al.* (2013); Deshmukh *et al.* (2015); Gürler *et al.* (2014); Kesari *et al.* (2010); Meena *et al.* (2014); Nazıroğlu *et al.* (2012); Oksay *et al.* (2014); Shahin *et al.* (2014); Shahin *et al.* (2013); Tök *et al.* (2014)

Vertebrates - Humans

The International Agency for Research on Cancer of the World Health Organization (IARC-WHO) classified ELF magnetic fields as a Group 2B *possible* human carcinogen in 2001 (IARC 2002) and RFR (includes Wi-Fi frequencies) in 2011 (Baan *et al.* 2011). This latter classification was based mainly on human epidemiological studies showing an elevated risk of brain tumours (gliomas). Canadian data shows a doubling of risk for gliomas for those using cell phones for more than 558 lifetime hours (Momoli *et al.* 2017). More recent studies support upgrading the classification to a *probable* or *known* human carcinogen (the same classification group as asbestos and tobacco) (Coureau *et al.* 2014; Miller *et al.* 2018; Peleg *et al.* 2018).

Proposed mechanisms

Underlying mechanisms for the various effects have been proposed: 1) magnetic compass (orientation) is affected (Engels *et al.* 2014); 2) increased oxidative stress (therefore more susceptible to disease and other insults) (Reuter *et al.* 2010; Yakymenko *et al.* 2016); and 3) activation of voltage-gated calcium channels (Pall 2016).

5G (5th Generation: 6 GHz and higher frequencies)

Very few studies on any taxa have been conducted using higher frequencies in the millimeter-wave 5G range. These frequencies are of particular concern because the wavelengths are in the same range as some invertebrate body sizes and structures such as antennae. In insect modelling studies, all insect models absorbed from 3 to 370% more radiofrequency power at and above 6 GHz frequencies than at lower frequencies (Thielens *et al.* 2018). The proposed infrastructure will be dense with mini-antennae (microcells) required every 100 to 300 meters (FCC 2016a). Public health issues and environmental implications are discussed in Russell (2018).

RFR emissions from orbiting satellites

According to the United Nations Office for Outer Space, currently there are over 7,000 "objects" orbiting Earth (United Nations 2018), with numbers expected to increase. Many of these satellites are transmitting or receiving RFR signals. SpaceX alone has made applications to the US Federal Communications Commission (FCC) to position more than 300 satellites over the next few years (FCC 2016b)[1]. With emissions from orbiting satellites, there will no longer be "unexposed" groups of living organisms that can serve as controls in research field studies.

What We Don't Know

There are substantial gaps in knowledge regarding biological effects on ecosystems of the frequencies and modulations now commonly in use. In addition, there is little known about non-linear effects and "windows" of vulnerability (Marino *et al.* 2000; Sage 2015; Sagioglou *et al.* 2016) as well as synergistic effects (combined, co-exposures) (Kostoff and Lau 2013).

The following points to address knowledge gaps are largely taken from the EKLIPSE project (Goudeseune *et al.* 2018):

1) Develop standardization/methodologies/protocols to design better future studies and the ability to compare research results;
2) Set up more field and ecological studies, along with better corresponding laboratory studies;
3) Initiate research on more technologies;
4) Study the impacts of EMR at different biological organizations/levels;
5) Collect data on confounding/interfering factors and how multiple frequencies interact;
6) Develop more and better collaborations, especially interdisciplinary teams;
7) Include observations and knowledge from local people and consider citizen-science approaches.

What We Need to Know

We need a fuller understanding of the impacts of EMR on invertebrates specifically and how EMR effects could impact ecosystems in general. This includes knowledge regarding the frequencies and modulations already deployed and ahead of, or at least alongside, wide deployment of new technologies such as 5G.

In Canada we need:

1) Biologically based EMR exposure guidelines for wildlife based on thermal and, in particular, non-thermal biological effects;
2) Research as outlined by the EKLIPSE report; and
3) Adequate funding of independent scientists to conduct research.

A final consideration is that scientists who are conducting ongoing and future biological and ecological research, particularly field studies, should be supported with expert advice and equipment, so they can use the opportunity to include EMR measurements in research protocols.

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[1] According to an October 15, 2019 article (https://spacenews.com/spacex-submits-paperwork-for-30000-more-starlink-satellites/), "SpaceX...filed paperwork in recent weeks for up to 30,000 additional Starlink satellites on top of the 12,000 already approved by the US Federal Communications Commission."

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Human Exposure to RF Fields in 5G Downlink

Imtiaz Nasim and Seungmo Kim
{in00206, seungmokim}@georgiasouthern.edu
Department of Electrical Engineering, Georgia Southern University
Statesboro, GA 30460, USA

arXiv:1711.03683v1 [eess.SP] 10 Nov 2017

***Abstract*—While cellular communications in millimeter wave (mmW) bands have been attracting significant research interest, their potential harmful impacts on human health are not as significantly studied. Prior research on human exposure to radio frequency (RF) fields in a cellular communications system has been focused on uplink only due to the closer physical contact of a transmitter to a human body. However, this paper claims the necessity of thorough investigation on human exposure to downlink RF fields, as cellular systems deployed in mmW bands will entail (i) deployment of more transmitters due to smaller cell size and (ii) higher concentration of RF energy using a highly directional antenna. In this paper, we present human RF exposure levels in downlink of a Fifth Generation Wireless Systems (5G). Our results show that 5G downlink RF fields generate significantly higher power density (PD) and specific absorption rate (SAR) than a current cellular system. This paper also shows that SAR should also be taken into account for determining human RF exposure in the mmW downlink.**

***Index Terms*—5G; mmW; Downlink; Human RF exposure; PD; SAR.**

I. Introduction

It is acknowledged that exposure to RF has negative impacts on human body. The rapid proliferation of mobile telecommunications has occurred amidst controversy over whether the technology poses a risk to human health [1]. At mmW frequencies where future mobile telecommunications systems will likely operate, two changes that will likely occur have the potential to increase the concern on exposure of human users to RF fields. First, *larger numbers of transmitters* will operate. More base stations (BSs) will be deployed due to proliferation of small cells [2]-[4] and mobile devices accordingly. This will increase chance of human exposure to RF fields. Second, *narrower beams* will be used as a solution for the higher attenuation in higher frequency bands [3]-[7]. Very small wavelengths of mmW signals combined with advances in RF circuits enable very large numbers of miniaturized antennas. These multiple antenna systems can be used to form very high gains. Such higher concentration of RF energy will increase the potential to more deeply penetrate into a human body.

A. Related Work

This paper is motivated from the fact that prior work is not enough to address such potential increase in threats.

1) Measurement of Human RF Exposure: Being aware of the health hazards due to electromagnetic (EM) emissions in mmW spectrum, international agencies such as the Federal Communications Commission (FCC) [8] or the International Commission on Non-Ionizing Radiation Protection (ICNIRP) [9] set the maximum radiation allowed to be introduced in the human body without causing any health concern. Possibilities of skin cancer due to RF emissions at higher frequency spectrum are reported [10]. Heating due to EM exposure in mmW is absorbed within the first few millimeters (mm) within the human skin; for instance, the heat is absorbed within 0.41 mm for 42.5 GHz [11]. The mmW induced burns are more likely to be conventional burns as like as a person touching a hot object as reported in [1]. The normal temperature for the skin outer surface is typically around 30 to 35°C. The pain detection threshold temperature for human skin is approximately 43°C as reported and any temperature over that limit can produce long-term injuries.

One problem is that the literature on the impact of cellular communications on human health is not mature enough. The three major quantities used to measure the intensity and effects of RF exposure are SAR, PD, and the steady state or transient temperature [12][13]. However, selection of an appropriate metric evaluating the human RF exposure still remains controversial. The FCC suggests PD as a metric measuring the human exposure to RF fields generated by devices operating at frequencies higher than 6 GHz [8], whereas a recent study suggested that the PD standard is not efficient to determine the health issues especially when devices are operating very close to human body in mmW [14]. Therefore, this paper examines the human RF exposure by using both PD and SAR.

2) Reduction of Human RF Exposure: Very few prior studies in the literature paid attention to human RF exposure in communications systems [1][14]-[17]. Propagation characteristics at different mmW bands and their thermal effects were investigated for discussion on health effects of RF exposure in mmW radiation [14]. Emission reduction scheme and models for SAR exposure constraints are studied in recent work [15][16].

However, health impacts of mmW RF emissions in *downlink* of a cellular communications system have not been studied so far, which this paper targets to discuss.

B. Contributions

Three contributions of this paper can be highlighted and distinguished from the prior art.

Firstly, this paper analyzes the human RF exposure in the *downlink*. All the prior work studied an uplink only, while paid almost no attention to suppression of RF fields generated by access points (APs) and BSs in a 5G nor Release 9 network,

TABLE I
PARAMETERS FOR 5G AND RELEASE 9

Parameter	Value	
	5G	Release 9
Carrier frequency	28 GHz	1.9 GHz
System layout	RMa, UMa, UMi [18]	SMa, UMa, UMi [21]
Inter-site distance (ISD)	200 m	1,000 m
Cell sectorization	3 sectors/site	6 sectors/site
Bandwidth	850 MHz	20 MHz
Max antenna gain	5 dBi per element	17 dBi
Transmit power	21 dBm per element	43 dBm
AP's number of antennas ($\lambda/2$ array)	8×8 and 16×16	4×4
AP antenna height	10 m	32 m
Duplexing	Time-division duplexing (TDD)	
Transmission scheme	Singler-user (SU)-MIMO	
UE noise figure	7 dB	
Temperature	290 K	

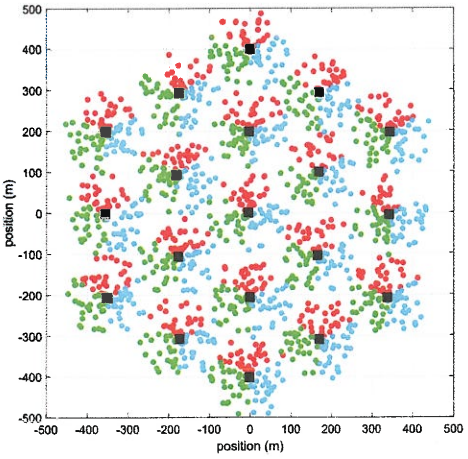

Fig. 1. A snapshot of one "drop" of 5G topology (19 sites, 3 sectors per site, and 30 UEs per sector)

respectively. In fact, APs generate even stronger RF fields compared to the concurrent systems, due to (i) higher transmit power and (ii) larger antenna array size leading to higher concentration of RF energy. Moreover, one important feature of the future cellular networks is small cell networks. The consequences of this change will be two-fold: (i) APs/BSs will serve smaller geographic areas and thus are located closer to human users; (ii) larger numbers of APs/BSs will be deployed, which will lead to higher chances of human exposure to the RF fields generated by downlinks.

Secondly, this paper finds that *SAR should also be considered* in determination of human RF exposure in mmW downlinks. Our simulations are performed for a 5G system based on the 3GPP Release 14 [18], one of the promising technical specifications for 5G. The results show that even considering a shallow penetration into a human body due to high frequencies, a downlink RF emission causes significantly higher SAR in mmW. This effectively highlights the elevation in potential harmful impact in human health, which can ignite higher interest in further research on design of future cellular communications systems considering the impacts on human RF exposure.

Thirdly, it explicitly *compares the human RF exposure in downlinks between 5G and Release 9*, highlighting the difference in the size of a cell. This will lead to clear understanding on how the technical evolution to 5G affects the human RF exposure. This paper calculates PD and SAR of a 5G [18] and a Release 9 [21] to highlight the change in human RF exposure according to the technical evolution.

II. SYSTEM MODEL

This section describes the system setting for a cellular communications network that forms the basis for the analysis of human RF exposure. Considering the frequency spectrum of 28 GHz as a potential candidate for 5G, we use a corresponding technical report [18] that was released by the 3GPP. Also, this paper compares the human RF exposure level in a 5G system to a legacy cellular communications system. For highlighting how much a SAR level can be increased compared to the current wireless services, this paper chose to compare the 5G to the Release 9 [21]. The parameters of both systems are summarized in Table I.

A. 5G

1) Path Loss: Our model for a 5G system is illustrated in Fig. 1. It consists of 19 sites each having 3 sectors. The inter-site distance (ISD) is 200 meters (m) and each sector is assumed to have 30 active user equipments (UEs). Also, as identified in Table I, for the terrestrial propagation between an AP and a UE, the following three path loss models are assumed: Rural Macro (RMa), Urban Macro (UMa), and Urban Micro (UMi) [18].

2) Antenna Beam Pattern: For a 5G AP, the attenuation patterns of an antenna element on the elevation and azimuth plane are given by [18]

$$A_a(\phi) = \min\left\{12\left(\frac{\phi}{\phi_{3db}}\right)^2, A_m\right\} \text{ [dB]} \quad (1)$$

$$A_e(\theta) = \min\left\{12\left(\frac{\theta - 90^\circ}{\theta_{3db}}\right)^2, A_m\right\} \text{ [dB]} \quad (2)$$

where ϕ and θ are angles of a beam on the azimuth and elevation plane, respectively; $(\cdot)_{3db}$ denotes an angle at which a 3-dB loss occurs. Then the antenna element pattern that is combined in the two planes is given by

$$A(\theta, \phi) = \min\left(A_a(\phi) + A_e(\theta), A_m\right) \text{ [dB]} \quad (3)$$

where A_m is a maximum attenuation (front-to-back ratio). It is defined $A_m = 30$ dB in [18], but it can be higher in practice. Finally, an antenna gain that is formulated as

$$G(\phi, \theta) = G_{max} - A(\phi, \theta) \text{ [dB]} \quad (4)$$

where G_{max} is a maximum antenna gain.

B. Release 9

1) Path Loss: A cellular network operating on Release 9 is designed to form a cell radius of 500 m, which results in an ISD of 1,000 m. This paper calculates the received power in a downlink, following the path loss models provided in [21]–Suburban Macro (SMa), UMa, and UMi.

2) Antenna Beam Pattern: The antenna radiation pattern for a Release 9 BS is also given as (1) and (2). However, unlike at a 5G AP, θ_{3db} and A_m for a Release 9 BS are given as 35° and 23 dB, respectively.

III. Performance Analysis

In this section, we present an analysis on the human RF exposure in a 5G communications and a Release 9 system. Though we chose 28 GHz frequency spectrum for 5G performance analysis, performance for any other frequency spectrum can be demonstrated following the same methodology. It is obvious that the higher number of elements used in the antenna give better signal power, the outcome also increases the cost and complication of the antenna design. The present technology has a large cell size where a single BS can provide coverage to more than thousands of meters, but the cell size of 5G is relatively small. In a model like Release 9, there may be one BS used to provide coverage to a wide area for providing service to UEs, but in 5G scenario, the same area is covered by a number of scattered APs to provide a better reliable service.

A. Data Rate

The downlink performance of a system is calculated from the Shannon's formula, which is given by

$$R = B\log(1 + \text{SNR}) \tag{5}$$

where R and B denotes a data rate and bandwidth, respectively. Signal-to-noise power ratio (SNR) is used to determine a data rate. Note that the inter-cell interference is not considered for simplicity in calculation as the focus of this paper is analysis of human exposure level, which is not influenced by the interference. In this paper, we calculate a SNR for the UEs considering all the possible locations in a sector that is formed by an AP in a 5G system and a BS in a Release 9 system. However, an accurate *three-dimensional distance* is considered with the exact heights of an AP, BS, and UE which are taken into account referred from [18]. In other words, although the horizontal axes of the results provided in Section IV present all the possible locations in a cellular system, they in fact demonstrate three-dimensional distances with the exact vertical distances accounted.

The core part in calculation of a SNR is a received power that is directly determined by a path loss model provided in the specifications [18][21]. Here we provide an analysis framework for the signal power that is received by a UE from either an AP or a BS in a single downlink, denoted by $P_{R,ue}$. It is noteworthy that with straightforward modifications, this framework can easily be extended to an uplink received signal power also. A received signal strength in a downlink transmission of a single sector is computed by averaging over all possible downlink directions according to position of the UE, which is given by

$$P_{R,ue}\left(\mathbf{x}_{ue}\right) = \frac{1}{\left|\mathcal{R}_k^2\right|}\int_{\mathbf{x}_{ue}^{(k)}\in\mathcal{R}_k^2}\frac{P_{T,ap}G_{ap}\left(\mathbf{x}_{ue}\right)G_{ue}\left(\mathbf{x}_{ue}\right)}{PL_{ap\to ue}}d\mathbf{x}_{ue} \tag{6}$$

where $\mathcal{R}_k^2$ is region of a sector and thus $\left|\mathcal{R}_k^2\right|$ is the area of a sector; $\mathbf{x}_{ue}$ is position of a UE in an $\mathcal{R}_k^2$; $P_{T,ap}$ is transmit power of an AP; G_{ap} and G_{ue} are the antenna beamforming gains of an AP and a UE, respectively, in a downlink transmission based on (4); $PL_{ap\to ss}$ is the path loss between the AP and the UE.

B. Human RF Exposure

To determine the deleterious impacts of RF emissions to the human body in mmW spectrum, SAR and PD are the most commonly used evaluation criteria so far. As there remains a controversy which method is more accurate one to be considered, whether it is a far-field or near-field case, we show both the analysis for SAR and PD for future technology.

The SAR is a quantitative measure that represents the power dissipated per body mass. It is one of the International System of Units (SI), which is measured in watts (W) per kilogram (kg) and is given by

$$\text{SAR} = \frac{P_{diss}}{m} = \frac{\sigma\left|E\right|^2}{\rho} \tag{7}$$

where P_{diss} represents dissipated power in tissue in the unit of W, m represents the exposed tissue mass in the unit of kg, ρ is the tissue mass density (kg/m^3), σ is the conductivity in siemens per meter (S/m) and E is a root mean square (rms) value of the electric-field strength which is given in the unit of voltage per meter (V/m). The SAR for a particular tissue in human body is different from the SAR for a tissue at different location. Also, SAR at the surface of the exposed tissue is different from the SAR deep within that exposed tissue.

The PD of a transmitting antenna for the far-field can be expressed as [1]

$$\text{PD} = \frac{\left|E_i\right|^2}{\eta} = \frac{\eta}{\left|H_i\right|^2} \tag{8}$$

where E_i (V/m) and H_i (A/m) are rms values of the electric and magnetic field strengths, respectively, incident on the tissue surface and η is the wave impedance in the unit of ohm (Ω). The SI unit of a PD is W/m^2, which indicates that a PD is a measurement of the power dissipated per area of the exposed tissue.

Our paper focuses on the downlink behaviors when performing the analysis and comparison of the two communications system. Incident PD for far-field communications is expressed as

$$S_i = \frac{P_T G_T}{4\pi d^2} \tag{9}$$

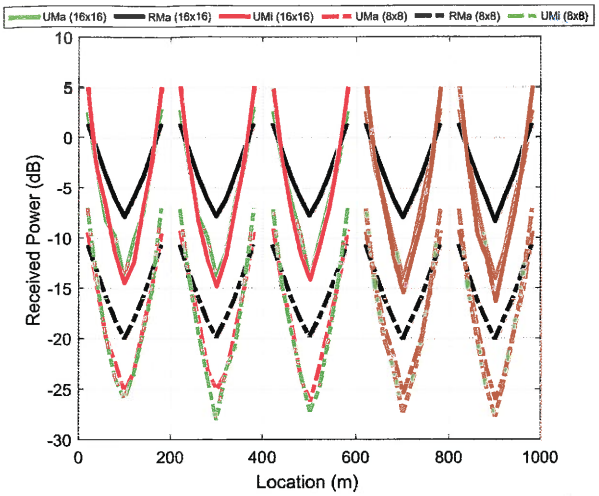

Fig. 2. Received signal power (6) versus UE location in a 5G system (APs are located at 0, 200, 400, 600, 800, and 1,000 m)

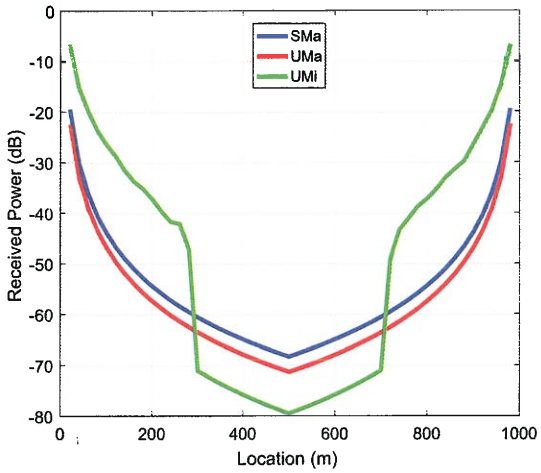

Fig. 3. Received signal power (6) versus UE location in a Release 9 system (BSs are located at 0 and 1,000 m)

where P_T is a transmit power; G_T is a transmit antenna gain; d is the AP-UE distance (m) as in (6).

Now, we can rewrite an SAR given in (7) in terms of d for calculation in a cellular communications system, which is also a function of ϕ [19][17], as

$$\mathrm{SAR}\,(d) = \mathrm{SAR}\,(\phi) = \frac{2S_i\,(\phi)\,T\,(\phi)\,m\,(\phi)}{\delta\rho} \qquad (10)$$

where T is the power transmission coefficient [16] and δ is the skin penetration depth (m) at 28 GHz [14]. The function $m\,(\phi)$ [16] is dependent on the tissue properties of dielectric constant (ϵ^*).

In order to accurately study a mmW signal propagation and absorption in a human body, investigation on the parameters related to dielectric measurements on human skin are necessary. Specifically the values of the parameters, ρ, ϵ^*, δ, T, and $m(\phi)$ are obtained from prior related work [13][14][18][20].

IV. Evaluation of Human RF Exposure

In this section, we analyze the results for the performance of 5G technology and make a comprehensive comparison of the model with present Release 9. First we show the performance for 5G in terms of service quality and then make a deeper interest in the health impacts due to exposure to EM emissions at mmW radiation.

A. Data Rate

We consider two antenna array sizes: 8 × 8 and 16 × 16 for 5G analysis. As we consider 3 sectors under each AP, it is adequate for each antenna to have the coverage of 120° capability to cover an entire 360° range of the cell.

Figs. 2 and 3 show the signal power received at a UE, $P_{R,ue}\,(\mathbf{x}_{ue})$, at different locations in 5G and Release 9 scenarios, respectively. The most significant factor that determines a received signal power is path loss that is in turn dominated by the LoS probability provided differently in each path loss model [18]. The received power decreases sharply with increasing distance in both systems, but as the APs are located at much closer positions for 5G, the received power bounces back to increase again while it keeps on decreasing with increasing distance in a Release 9 system. Also, it can be seen from Figs. 2 and 3 that even at the cell edges (at 100, 300, 500, 700, and 900 m), the received power is still remarkably higher for all 5G scenarios than the respective scenarios of the Release 9. One key rationale behind this outperformance can obviously be found as the higher antenna gain that an AP can form by adopting the larger phased arrays.

Figs. 4 and 5 show data rates that can be achieved in a 5G and a Release 9 system, respectively, to represent the downlink performances. One can obviously find that a higher received power directly leads to a higher data rate (as observed from comparison to Figs. 2 and 3), considering the data rate that is calculated from (5). Fig. 4 illustrates a comparison of data rates achieved in a 5G downlink system between different AP's phased array size–16 × 16 and 8 × 8. It can be seen that a UE in all 5G scenarios yields a downlink data rate above 13 Gbps even at a cell edge. Fig. 5 presents downlink data rates in a Release 9 system.

It should be emphasized from Figs. 4 and 5 that in spite of the disadvantage in the propagation due to the higher carrier frequency, a 5G system presents approximately 20-times higher downlink rates compared to a Release 9 system regardless of (i) the path loss model and (ii) an AP's phased array size. The main rationale behind such a significant outperformance is the smaller ISD in a 5G system. It is thus evident that the 5G mmW technology provides significantly better performance to the consumer as it provides better signal strength with higher data transmission capabilities at the user end.

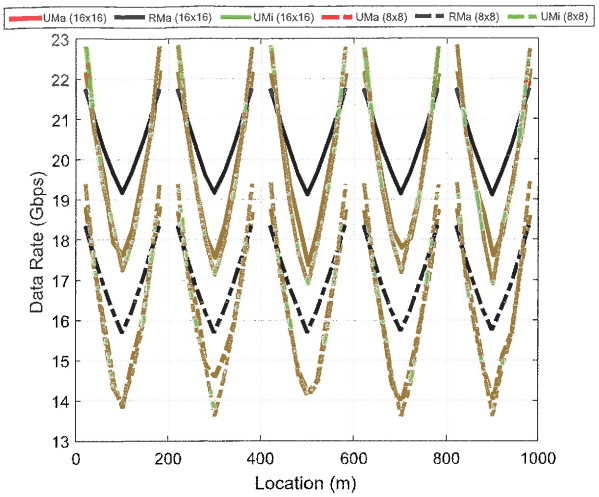

Fig. 4. Data rate (5) versus UE location in a 5G system (APs are located at 0, 200, 400, 600, 800, and 1,000 m)

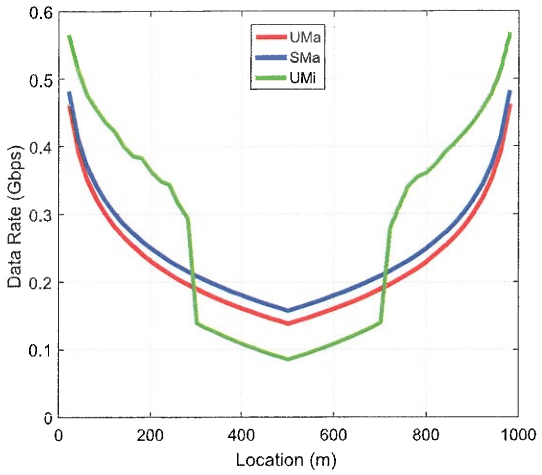

Fig. 5. Data rate (5) versus UE location in a Release 9 system (BSs are located at 0 and 1,000 m)

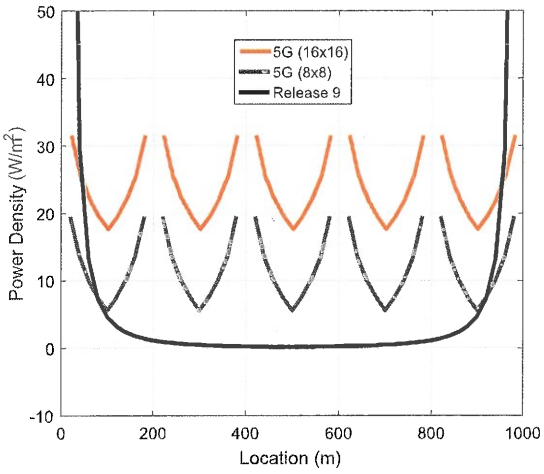

Fig. 6. Power density (8) versus UE location in a 5G and Release 9 system

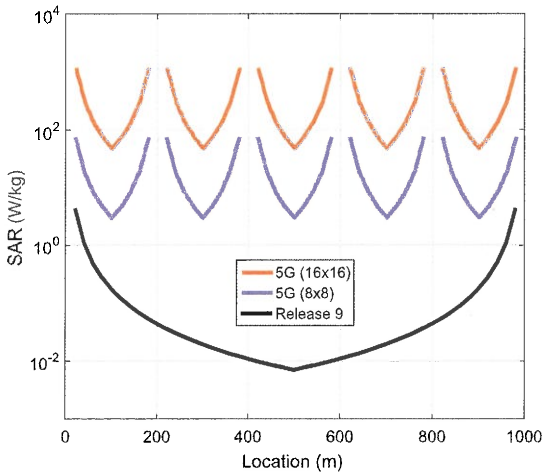

Fig. 7. SAR (7) versus UE location in a 5G and Release 9 system

B. Human RF Exposure

Now we show that even considering such shallow penetration depth due to high frequencies, a downlink RF emission causes significantly higher SAR in mmW. In this section, the PD and SAR are compared between a 5G and a Release 9 system. It still remains not concluded in the literature which of PD and SAR is more appropriate to represent the human RF exposure level in far-field RF propagations. We claim that *SAR should not be excluded* in measurement of human RF exposure in mmW downlinks. The rationale is that in spite of shallower penetration into a human body compared to lower frequencies, a mmW RF field causes a higher SAR due to (i) smaller cell radius and (ii) higher concentration of RF energy per beam via adoption of larger phased array.

Fig. 6 compares the PD between the downlinks of 5G and Release 9. One can find far higher PDs in 5G downlinks compared to those of a Release 9 system. The same rationale yields this higher PD in 5G downlinks: the PD in a 5G system bounces back up at a shorter distance compared to a Release 9 system due to the smaller ISD. In other words, the denser deployment of cell sites in 5G keeps PDs higher in more areas in a network than in a Release 9 network. At a distance about 50 m from the nearest AP for 5G, the user is exposed to a significant PD value when a 16 $\times$ 16 array is used. Thus, when a larger phased antenna is used or when a user moves closer to the AP, the PD value becomes a major health concern which inevitably requires more research about health effects of 5G before it is deployed successfully by strictly following the RF emission standards.

We show the comparison of SAR also between 5G and present existing scenario in Fig. 7 for far-field to have a better

understanding about the health impacts of RF emissions into human body. The SAR requirements for near-field is stated in [1], but to the best of our knowledge, there is no standard provided for SAR in far-field scenario so far as it is expected that SAR does not have a significant effect on human body in far-field. Our result in Fig. 7 presents that a 5G downlink does not allow a sufficient far-field propagation due to the small-cell topology. This yields a much higher SAR level than Release 9 that adopts a larger ISD that consequently yields a longer propagation that is sufficient fall down to a low enough SAR. This is resulted from the mmW radiations, antenna beam steering effects and smart antenna characteristics of 5G architecture.

The result provided in Fig. 7 has a significant implication. According to the ICNIRP guidelines [9], the maximum allowable SAR level for head and trunk is 2 W/kg and for limbs it is 4 W/kg for 10 g tissue over 6 minutes of exposure for frequencies up to 10 GHz for general public (ICNIRP and FCC [8] do not have SAR guidelines for mmW like 28 GHz far-field scenario yet, as it is expected to be less dangerous). But our result presented in Fig. 7 shows a significant increase in SAR in 5G downlinks compared to the Release 9, even in such far-field propagations. Considering the significance of a regulatory guideline in the societal endeavor to prevent injuries from over-exposure, this paper hereby strongly urges that it is not safe enough with the PD solely being considered as a basic restriction in human RF exposure in mmW operations. Our result suggests that the SAR should also be considered as a measuring parameter even for far-field, particularly in mmW communications due to its received signal strength remaining strong at an end user.

V. Conclusions

This paper has highlighted the significance of human RF exposure issue in downlink of a cellular communications system. This paper measured the exposure level in terms of PD and SAR, and compared them to those calculated in the Release 9 as a representative of the current mobile communications technology. Distinguished from the prior art that studied uplinks only, this paper has found that the downlinks of a 5G also yield significantly higher levels of PD and SAR compared to a Release 9. Our results emphasized that the increase stems from two technical changes that will likely occur in 5G: (i) more APs due to deployment of smaller cells and (ii) more highly concentrated RF energy per downlink RF beam due to use of larger phased arrays.

As such, unlike the prior work, this paper claims that RF fields generated in downlinks of 5G can also be dangerous in spite of far-field propagations. Therefore, we here urge design of cellular communications and networking schemes that force an AP to avoid generation of RF fields if pointed at a human user with an angle yielding a dangerous level of PD and SAR. To this end, this paper identifies as the future work proposition of techniques that reduces human exposure to RF fields in 5G downlinks.

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TUNINK
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November 18, 2021

VIA EMAIL
(Original to Follow via U.S. Mail)

Zoning Administrator
Santa Cruz County Planning Department
701 Ocean Street, Room 400
Santa Cruz, CA 95060
Email: c/o Michael Lam (Michael.Lam@santacruzcounty.us)

Re:	Application:	Commercial Development Permit Application No. 201372 [For Construction of Multi-Antenna Cell Tower Wireless Communication Facility ("WCF"), Consisting of Six 12-Foot Tall Antenna Mounts, 12 Antennas, and Ground Equipment]
	Applicants:	Crown Castle Towers 06-2 LLC and Jacob Sparks
	Subject Property:	090-251-22 (Site Address: 675 Rebecca Drive, Boulder Creek, CA 95006) Owner of Subject Property: Dana and Lynn Redington
	Objector:	David Robinson - Owner of Residential Real Property Adjacent to Subject Property Objector's Property: APN 090-251-22 (Site Address: 653 Rebecca Drive, Boulder Creek, CA 95006)
	Subject:	Objections to Zoning Administrator Level 5 Approval of Commercial Development Permit Application No. 201372
	Hearing Date:	November 19, 2021 at 9:00 AM (Zoning Administrator Public Hearing)

Dear Zoning Administrator:

My firm represents the above-referenced Objector, David Robinson ("Mr. Robinson"), who objects to the subject Commercial Development Permit Application No. 201372 (the "Application") for construction of a multi-antenna cell tower Wireless Communication Facility ("WCF"), which per the Application consists of six 12-foot tall antenna mounts (proposed to be constructed 4 to 4 feet above existing grade), 12 antennas, and ground equipment. The purpose of this letter is to memorialize Mr. Robinson's objections to the Application for consideration at the Zoning Administrator public hearing that is scheduled to be conducted on November 19, 2021, at 9:00 AM.

820 Bay Avenue, Suite 120 | Capitola, CA 95010 | Tel 831-477-2001 | Fax 831-462-0415 | mjtunink@pacbell.net

County Planning Department personnel advised me that these written objections are to be submitted via email to County Planning Department Planning Technician Michael Lam (Email: Michael.Lam@santacruzcounty.us), who, as indicated by the Planning Department, acts as clerk to the Zoning Administrator and is appointed as the person to receive objections and public comments related to Zoning Administrator Public Hearings. It is requested that these written objections - upon being transmitted via email to Mr. Lam the same date of this letter (November 18, 2021) - be provided to the Zoning Administrator and be entered into the record for the Zoning Administrator Public Hearing on the Application (scheduled to occur on November 19, 2021 at 9:00 AM).

BACKGROUND INFORMATION

Mr. Robinson's personal residence is located at 653 Rebecca Drive, Boulder Creek, CA, Santa Cruz County APN 090-251-22 (the "Robinson Property"). The residential Robinson Property shares a common boundary with, is located adjacent to, and is located directly east of the vacant land that is the subject of the Application where the WCF is proposed to be constructed pursuant to the Application, and which is owned by Dana and Lynn Redington ("Redingtons") - the vacant land that that is the subject of this Application is located at 675 Rebecca Drive, Boulder Creek, CA, Santa Cruz County APN 090-251-22 (the "Redington Property").

OBJECTIONS TO APPROVAL OF COMMERCIAL DEVELOPMENT PERMIT APPLICATION NO. 201372

Mr. Robinson and other neighborhood homeowners urge the Zoning Administrator to deny the subject Application. The reasons the Zoning Administrator should deny the Application for construction of the WCF include the following:

1) THE REDINGTONS NO LONGER LIVE IN THIS RESIDENTIAL NEIGHBORHOOD, AND THE RESIDENTS SHOULD NOT BE SUBJECTED TO THE HIGHLY INTRUSIVE WCF THE REDINGTONS NOW SEEK TO PROFIT FROM AFTER THEY ABANDONED THE NEIGHBORHOOD.

The Redingtons previously resided in the same neighborhood in the residential real property located at 655 Rebecca Drive, Boulder Creek, CA, Santa Cruz County APN 079-041-19 (the "Sold Redington Property"). On November 25, 2020, the Redingtons sold the residential Sold Redington Property for $1,495,000 and moved out of the neighborhood.

On November 16, 2020, the Redingtons filed the subject Application for the WCF. The Redingtons filed the Application after they were in escrow to sell the Sold Redington Property and only 9 days before escrow closed on that sale (sale date was 11/25/2020).

The Redington Property that is the subject of the Application and on which they propose the WCF be constructed was retained by them even though the Redingtons no longer live in the neighborhood. Accordingly, what the Redingtons have done is abandon the neighborhood, yet seek to subject their former residential neighborhood and former neighbors to the highly intrusive and inappropriate WCF that is proposed to have 12 separate antennas mounted on 6 separate 12-foot tall pole mounts constructed 4 to 8 feet above existing grade. The Redingtons' bad faith in subjecting the neighborhood they abandoned is demonstrated by the Redingtons filing the Application to construct the WCF just 9 days before they sold their residence and moved away.

2) APPLICANT AND REDINGTONS HAVE FAILED TO ADQUATELY DEMONSTRATE THERE ARE NO "VIABLE, TECHNICALLY FEASIBLE, AND ENVIRONMENTALLY EQUIVALENT OR SUPERIOR" POTENTIAL ALTERNATIVE SITES.

The Planning Department Staff Report recognizes the following:

a) The Redington Property on which the WCF is proposed to be constructed is located in a Residential Agricultural Zone;

b) In the Residential Agricultural Zone, the Applicant must prove "the proposed WCF would eliminate or substantially reduce one or more significant gaps in the applicant carriers network"; and

c) In the Residential Agricultural Zone, the Applicant must prove there are "no viable, technically feasible, and environmentally equivalent or superior potential alternatives (i.e., sites and/or facility types and/or designs) . . . that could eliminate or substantially reduce said significant gap."

(See Staff Report, at page 3.)

Applicant and Redingtons have failed to meet their above-referenced burdens of proof despite the Staff report wrongly presuming they have. There are already existing WCFs on the Robinson Property that provide adequate cell service to the neighborhood using WCF antennae that have existed on the Robinson Property for decades, one of which is owned and operated by Applicant Crown Castle pursuant to a long term lease between Mr. Robinson and Crown Castle.

The Staff Report wrongly states that Applicant Crown Castle's WCF on the Robinson Property will be closed and demolished, thus creating a gap in wireless phone service. To the contrary, Crown Castle has never informed Mr. Robinson that it intends to breach its long term lease with Mr. Robinson by closing or demolishing the Crown Castle WCF located on the Robinson Property. Mr. Robinson is amenable to engaging with both Crown Castle for it to upgrade the Crown Castle WCF if needed, and also engaging with neighbors to accommodate their concerns, with any such upgrade to be far less invasive than the new 6-tower, 12-antenna WCF proposed in the Application.

Because there is already an existing Crown Castle WCF in the neighborhood that is subject to being upgraded if necessary (again, with input from and accommodations to neighboring property owners and residents), Applicant and the Redingtons cannot meet the mandatory criteria that there are "no viable, technically feasible, and environmentally equivalent or superior potential alternatives."

3) THERE IS NO CEQA EXEMPTION FOR THE SUBJECT WCF PROJECT.

The Staff Report presumes there is no need for an Environmental Impact Report (EIR) under the California Environmental Quality Act (CEQA) on the grounds the Application's WCF project is subject to a categorical exemption from CEQA due to the project not having any "significant effect on the environment."

It is anticipated other objectors to the Application will submit evidence to the Zoning Administrator that the proposed WCF project is subject to CEQA and requires an EIR on various grounds, including the Redington Property being located in a sensitive environmental area, including habitat of the Mount Hermon June Beetle that has since January 1997 been listed on the Federal Register as an "Endangered Species" under the Endangered Species Act of 1973

4) COUNTY'S OWN OBJECTIONS TO APPROVAL OF APPLICATION.

It is anticipated other objectors to the Application will submit evidence to the Zoning Administrator that County Planning Department Resource Planner Logan Thompson has declared the Redington Property is not a suitable location for the proposed WCF due to various factors, including erosion control issues and the Redington Property's susceptibility to earthquake damage (the available information is that, before the 1989 Loma Prieta earthquake, there was a home on the Redington Property that suffered earthquake damage and was demolished).

Mr. Robinson reserves the right to submit further objections, briefing, and details regarding his opposition and objections to the subject Application, whether it be submitted at the Zoning Administrator Public Hearing or during subsequent appeals of any approval made to the Planning Commission, the Board of Supervisors, the California Coastal Commission, or other governmental agencies.

If further clarification or additional information is sought, I would be pleased to provide it upon request. Thank you.

Sincerely,

TUNINK LAW FIRM

Michael Tunink

Michael J. Tunink

cc: Client

Michael Lam

From: Hope Schachter <hope.sch@gmail.com>
Sent: Thursday, November 18, 2021 9:10 AM
To: Bruce McPherson; Sheila McDaniel; Planning ZoningInfo; Stephanie Hansen; Taichi Dean; Board Of Supervisors; Daisy Allen; Natisha Williams; Michael Lam; Logan Thompson
Subject: URGENT: Public Hearing Concerns Regarding Item No. 1. 201372

****CAUTION:This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

Hi There,

My name is Hope and I am a resident of the Nina Terrace neighborhood in Boulder Creek. I am reaching out to you regarding growing concern our community has about a permit application that we recently found out about at the last minute, and which is to be reviewed for approval this Friday. There have been a number of legal cases between some neighbors up the road from us that has resembled a feud, and we came to find out about this when my family was displaced from the fires - the details were revealed to us in the disclosures for properties we looked at. It has come to our attention that a part of this ongoing saga between the parties has resulted in the property owners no longer living in this state, but seeking to place a cell tower/wireless facility on a parcel they have retained as an upstaging and final word toward the neighbors. Many in this community have concerns around this commercial permit in a residential zone, particularly the fact that due to the size of the structure, they were somehow able to bypass an environmental review on an area that has previously had slides from prior earthquakes, as well as within this previous court battle a directly adjoining neighbor performing intensive grading and land restructuring without professional geological consultation over the past few years.. The risk this poses for insurance purposes many of us find daunting, as we share private roads, etc.

This concern has also been raised around the fact that it allows this permit to potentially pass when many others in the neighborhood have not due to an endangered species of beetle known as the Mount Hermon June Beetle (one property was continually denied various permits due to this beetle, and it is just a few homes down from the proposed tower). Some further considerations about this lay within research that states the outcomes to invertebrates remain unknown:

This research https://www.sciencedirect.com/science/article/abs/pii/S0013935118300161 is summarized here: Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We Don't Know, and What We Need to Know (Wireless Technologies Potential Impact on Invertebrates <https://stopsmartmetersbc.com/wp-content/uploads/2021/02/Effects-of-Non-ionizing-Electromagnetic-Pollution-on-Invertebrates-including-Pollinators-such-as-Honey-Bees-What-We-Know-Dont-and-Need-to-by-Margaret-Friesen-and-Magda-Havas-February-09-2021.pdf>)

We are uneasy about the safety of our wildlife with this new technology and the lack of oversight about how it will impact the ecosystem here, something our family's love for has been THE primary reason we had hoped to raise a family in this lovely mountain community and moved back after losing all of our belongings in the CZU Fire. This situation is causing a great deal of distress to the community members who care about the forest and the creatures that inhabit it as much as one another, and we are all feeling disheartened that since the parties of these issues have moved away from the community, they will certainly not endure the potential harmful ramifications of it but rather financially benefit from this continually escalating dispute. The people who prioritize the sanctity of these mountains will likely continue to leave and the ones who don't care will be those that just perhaps appreciate the backdrop of nature while enjoying their

high speed screentime. Many of us are well educated professionals, a number of whom like myself have worked extensively in research fields, and our concerns are legitimate.

The entirety of this permit appears predicated on the decommissioning of the current tower on one party's property, and that need being replaced with the new technology of another tower on the 675 Rebecca parcel. Unfortunately, we have word via a company coming to do an inspection for the "freed up space" on the original property that another wireless facility would potentially replace that one as well. Therefore, opening the door to one commercial permit could lead to a large Valley Telecom Site within the neighborhood, and I am unclear if since this original cell tower location has had prior installation, if we would even be notified of new structures on that [soon-to-be] decommissioned site that would add to the infrastructure load in our residential neighborhood. I have asked if documentation has been obtained IN WRITING to ensure that no other wireless facility components will be installed on the existing parcel 653 Rebecca once the decommissioning has taken place and the new one is installed at 675 Rebecca Drive. Otherwise, it's misleading for Crown Castle to imply it would simply be moving slightly to the east.

While Crown Castle and the parcel owners are posing this wireless facility as providing crucial services to our neighborhood like 9-1-1 calls, it's critical to note that within the permit application there are at least two alternative proposed locations in NONRESIDENTIAL zones, so that those prioritizing these services from this telecom carrier would still have accessibility without allowing a commercial permit to be authorized in our residential neighborhood, and what that could lead to down the road. Additionally, for high speed internet service upgrades Starlink will be available in the San Lorenzo Valley in a matter of months, a service which as I understand it does not require commercial wireless communication facilities or towers, as Elon Musk has launched 60K satellites in the sky to provide the service.

Furthermore I'm not sure if you are aware, but there was a similar proposal for a lot downtown, but due to the concerns of parents and community members about the proximity to the elementary school, it was revoked based on evidence of potential risk. I noticed that within the permit application it specified that a written statement must be authorized by a school district representative, which I could not locate. I know that parents in the area and many school representatives would remember the concerns this previously raised and be equally alarmed with this current proposal, now in many of those original concerned community members' backyards. Most people moving to the mountains wish to immerse themselves in nature and not in the "smart city" hubs over the hill. I think we can all agree this is worth preserving, having families here who love the mountains and living in the integrity of our wildlife environments. Some states and smaller localities have banned these wireless installations within a specific distance from schools, countries such as France and Belgium have banned them from being installed close to preschools, based on the research that becomes available as these rollouts continue, much of which is rooted in fertility and sterility, childhood cancers, learning disabilities, wildlife migration, the list goes on. California banned antennas from fire stations due to a significant increase in health claims with firefighters and their union demonstrating the correlation of the installments.Additionally, insurance providers are allowed to refuse claim coverage if there is some form of evidence noted that it is related to wireless radiation. Let's say you ask your medical provider if living close to this telecom facility could have played a role in your or your child's recent neurological diagnosis and that is noted somewhere that the insurance company could access in reviewing the claim – how will that impact coverage over the course of a lifetime? Will that be considered a pre-existing condition with the justification that you CHOSE to reside by a structure, when in fact you may not have actually selected these circumstances knowingly? When the parcel owners for this facility have outright moved away from the property prior to signing up for this it speaks volumes about how they would not choose this for themselves but have far less regard for their neighbors.

Insurance Coverage Concerns regarding Wireless Facility Proximity <https://ehtrust.org/key-issues/reports-white-papers-insurance-industry/>

I have included some further information on these emerging technologies below - there are many potential concerns but I aim to be concise, as well as photos to consider extracted from the permit application. One particular consideration discusses that the antennas to propagate the signals to subscribers are typically located at ground level, and that it only meets the maximum radiation standard if one is physically near them, so what about those of us walking dogs, babies in strollers or curious toddlers? We deserve clarification about whether these are directly on the facility's structure and not the greater grid - if this were 5G, which sounds like it is simply an upgrade from 3 & 4G when in actuality it adds the use of millimeter waves, and where new phased array/beam-forming technology needs to be installed approximately every 3-400 feet or so in order to adequately penetrate structures and form somewhere around 900 "handshakes" or pulses per minute between the tower, antennae and people's smart devices [often which are installed on telephone poles] - the language feels intentionally elusive. Whether that's initially the case or not, another community member provided photos of the Crest Ranch cell tower's initial installment and what it is today to demonstrate that we as a community do not have a say once this is approved in subsequent additions to the wireless facility once it's approved. This means that even if it is not currently 5G, this permit would give that capability to the provider at any time they see fit without the community's consent, including the upcoming 6 & 7G over the course of the next handful of years. The doors this opens cannot be undone. I encourage you to review the photos of how this has occurred over time in other locations.

Lastly, as I shared, we discovered many details about the dynamics between the neighbors when we were looking for a replacement property after the fire last year, and a reason we chose not to pursue some of these homes was due to the circumstances combined with the already existing cell tower (as pertains to some of the risks I mention throughout this correspondence) and was notified by our realtor that we were absolutely not the first buyer to be turned off by this wireless facility. With the additional proposal and the potential of this telecom site in our neighborhood, who will be responsible for the property devaluation here should this occur, and how homeowners can be properly compensated? Will it be the parcel owners, Crown Castle, the Telecom Company, or is this something we have to take up against the County itself? Like the circumstances I described for insurance purposes, if we are not onboard with this change to our neighborhood, it seems unjust that the actions of a few can have such a detrimental impact on the many. The original Nina Terrace HOA intended to protect this neighborhood from such issues via document Instrument No. 26171 [Book 1564, Page 376] under Item 1. Land Use and Building Type for Neighborhood Restrictions by prohibiting any structures on parcels other than permanent dwellings, and that no lot or any part or rearrangement thereof shall be used for facilities or structures outside of residential purposes.

I implore you to think about the decision to allow the installation of this station in our neighborhood as it is causing distress in a season where people are trying to revitalize their family life and preserve the normalcy of childhood post-pandemic and after the CZU Fire, and the changes this would absolutely bring forth to the mountain community pose more harm than any form of its convenience could be balanced out by. Having spoken with busy mothers in tears and beloved neighbors who have been in this neighborhood since its inception, I'm reaching out hoping you will genuinely reconsider the full breadth of these issues we are presenting. Most families in our neighborhood are well aware of the property owners choosing not to live in this state any longer while reaping all the financial benefit without having to endure any of the potential risks, and are particularly discouraged that our representatives would put these types of corporate interests over the wellbeing of our wildlife and mountain community. I am hoping you will prove this inclination to be wrong.

This link from Scientific American has exceptional resources linked within it: Scientific American addresses Concerns with Emerging Wireless Technologies <https://blogs.scientificamerican.com/observations/we-have-no-reason-to-believe-5g-is-safe/>

Of note in particular is the 5G Appeal which has nearly 500 signatories from the world's top specialists regarding the impact on all facets of life. I hope you will look through that here: Experts Urge to Delay Wireless Deployment <http://www.5gappeal.eu/> and here: Exposure Concerns in Residential Settings <https://arxiv.org/pdf/1711.03683.pdf>

Photos and Application Excerpts in Attachments Below

Correspondence from Hope Schachter, Nina Terrace Resident

Contact: hope.sch@gmail.com <mailto:hope.sch@gmail.com> | 650.815.9292

Michael Lam

From: Rob Mann <rob@robmann.org>
Sent: Thursday, November 18, 2021 7:53 PM
To: Michael Lam
Subject: Hearing on Nov 19th for item 201372 - issues to be raised

****CAUTION:This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

Hi Michael,
I understand that, with you, I can formally raise comments on adverse effects and impact on my property (655 Rebecca Dr) and person due to application number 201372, that will be heard on Friday the 19th at 9am. Please let me know if email is not acceptable, and if so I'll drop in a physical copy on Friday.

Can you please enter these into the record:

- I am concerned about the EMF levels in my new baby's room that is approximately 120' away, has a direct line of sight to, and is at the same altitude and plane as the proposed antenna array.
    - **I ask that the detailed radiation report and heat map be made available to assess health impact for all locations on 655 Rebecca, particularly given the context of a newborn**.
- Related, the antenna radiation patterns have not yet been made available to understand back and side lobe emissions and the effect on properties and people behind and beside the array.
    - **I ask that the specific model antenna radiation patterns be made available, to enable an independent RF engineer to comment on effects.**
- A visual impact assessment from property 655 Rebecca Dr was not done. The plans only discuss visual impact from 653 and 660. Once the staff report was released I asked Crown Castle for renders from 655 however they are still pending.
    - **I ask that a visual impact assessment and renders from 655 be done and are considered.**
- I asked for clarification on whether a backup generator would or could be installed, the answer from Crown Castle was that no, there was no room. However California assembly bill 2421 calls for backup generators to be installed, and this overrides the California Environmental Quality Act including any compensation for adverse impact.
    - **I ask for clarification on if, how and where such a generator would be installed, and how this would impact the neighborhood. I also ask if there are any other locations on 675 that such a generator may be installed upon, and how this would impact the neighborhood.**
- Crown Castle states that normally there are community meetings before the hearing date to address any concerns, due to Covid this did not happen.
    - **I ask that Crown Castle now hold community meetings to address concerns, even if they are virtual, given that is normal practice and we all have had to adapt to covid times. I also ask that such concerns be considered as input to what would usually be level 5 approval or subsequent appeal.**
- I do not understand why the existing cell facility must be decommissioned at 653. If I understand correctly, the neighbours and landowner all prefer that this remains status quo, and any technical, access and permit concerns can be addressed.
    - **I ask that the County, Crown Castle and Landowner of 653 clearly articulate the blocking reasons and consider a remediation plan, as moving an effective and community approved comms location is significantly more expensive and impactful than creating a new one.**

Please note, that as the new owners of 655 Rebecca, we have worked well with the Redingtions (former owners of 655, current owners of 675) and have done everything asked to help facilitate their application. My questions above are around neighborhood safety, reasonableness and due process. We have fully supported onsite Crown Castle and Santa Cruz teams doing geo-studies, given access 100% of the time and have positively engaged with all.

Finally, we are not against cell towers/platforms, they are essential for the broader community. However we are for the most reasonable result for the neighborhood that includes technology enablement, personal safety, mountain aesthetic, and a happy neighborhood where everyone is engaged and appreciates the outcome.

Regards,
Rob & Masha Mann
655 Rebecca Drive,
Boulder Creek, 95006
650.666.9412

Michael Lam

From: Devon Cattell <devon.cattell@gmail.com>
Sent: Thursday, November 18, 2021 11:20 PM
To: Michael Lam
Subject: Planning Department Application No. 201372 / Objections to Zoning Administrator Approval of Application / Zoning Administrator Public Hearing
Attachments: cell towers letter.docx

Follow Up Flag: Follow up
Flag Status: Completed

****CAUTION:This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

I am writing about my objections to the approval of Planning Department Application No. 201372 that is scheduled for consideration at the Zoning Administrator Public Hearing scheduled to occur tomorrow, November 19, 2021 at 9:00 AM. Attached are my written objections to Application No. 201372 to be considered by the Zoning Administrator at tomorrow's public hearing.

County Planning Department personnel advised me that – in your capacity as a County Planning Technician Michael Lam - you act as clerk to the Zoning Administrator and are appointed as the person to receive objections and public comments related to Zoning Administrator Public Hearings. Accordingly, the Planning Department instructed me to email the attached objections to you.

It is requested that these written objections be provided to the Zoning Administrator and be entered into the record for the Zoning Administrator Public Hearing on the Application (scheduled to occur tomorrow, November 19, 2021 at 9:00 AM).

Thank you,

Devon Cattell
Devon@cattell.net
650-888-5486

Dear Madam or Sir,

I am writing to express my concern that the Crown Castle company is applying for a COMMERCIAL permit to place 6 cell phone towers in the middle of our RESIDENTIAL neighborhood, even though their application states they have other locations not in residential neighborhoods where they could place these. Consider that Crown Castle has a very bad neighbor reputation nationwide. Santa Cruz County has a long and bad history with Crown Castle due to repeated disregard for Santa Cruz ordinances. Crown Castle is not accredited by the Better Business Bureau due to the number of unanswered complaints. Crown Castle has rapidly gaining a monopoly of cell sites including: Verizon, AT&T, T-Mobile, etc. Note the approved Crest Ranch tower photo below, before and then later after, when they enlarged it.

Not only here, this company has been grasping for a cell tower monopoly in other locations, gotten a permit for a small cell tower and then gone on to install HUGE ones, see imaes below.

They admit in their application that these towers will also need antennas every 300 feet which are only dangerous if you are close to them. This is a residential neighborhood. We ARE close to them.

Not only is it devaluing our property and endangering our health:
https://blogs.scientificamerican.com/observations/we-have-no-reason-to-believe-5g-is-safe/

but they have been using loopholes like somehow getting around having the environmental inspection that every other construction permit requires in our neighborhood, and since we have the endangered Mount Herman June Beetles on our hill this inspection would require not approving this permit.

Please look into our concerns about approving this permit which would endanger our neighborhood and lower our property values.

Sincerely,

Devon Cattell
Devon@Cattell.net

Crest Ranch antennas – BEFORE

Crest Ranch Antenna’s - AFTER

Michael Lam

From: Kayline Martinez <jkafka3@mac.com>
Sent: Thursday, November 18, 2021 11:33 PM
To: Michael Lam
Subject: Cell tower

****CAUTION:This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

Dear Sir,

I am writing about my objections to the approval of Planning Department Application No. 201372 that is scheduled for consideration at the Zoning Administrator Public Hearing scheduled to occur tomorrow, November 19, 2021 at 9:00 AM. Attached are my written objections to Application No. 201372 to be considered by the Zoning Administrator at tomorrow's public hearing.

County Planning Department personnel advised me that – in your capacity as a County Planning Technician Michael Lam - you act as clerk to the Zoning Administrator and are appointed as the person to receive objections and public comments related to Zoning Administrator Public Hearings. Accordingly, the Planning Department instructed me to email the attached objections to you.

It is requested that these written objections be provided to the Zoning Administrator and be entered into the record for the Zoning Administrator Public Hearing on the Application (scheduled to occur tomorrow, November 19, 2021 at 9:00 AM).

I am concerned about the proposed additions of cell towers at the south end of Rebecca. They are also trying to put a cell tower on the other end of Rebecca Dr. next to the 2 water tanks. My husband and I have been in communication about this with the water co. This could be the beginning of a much bigger project. I don't think there is substantial evidence on the effects of 5G this close to homes with multiple cell towers. Here is what the American cancer society says to make your own informed decision about what is safe for your health:

https://www.google.com/amp/s/amp.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phone-towers.html

We have had several developers looking around next to the water tank (which is next door to us). That's how we found out about the proposal. We spoke with Rick at SLV and he stated "they have been trying to do this for years, but who knows of it will happen". It is concerning to have more antennas near us. We already have the new radio tower that was placed and we get the radio reception in our speakers at times. We also have the fire department antenna and police radios. That's plenty! I am totally against a 5G because they work best when they are a few hundred feet from one another- that means more to come.

Please stop this!

Kayline Martinez- Registered Nurse in Critical Care at El Camino Hospital

1130 Rebecca Dr

Kayline Martinez

Michael Lam

From: Molly Bischoff <mollyandterry@gmail.com>
Sent: Friday, November 19, 2021 8:58 AM
To: Michael Lam
Subject: Cell towers on Rebecca Dr.

****CAUTION:This is an EXTERNAL email. Exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email.****

Michael,

I am next door to the proposed 2 sites of the 5G cell towers. My husband and I live at 650 Rebecca Dr.

I have done a lot of research on the effects of this technology and am dismayed that the county of Santa Cruz would approve this in our residential area.

This is a betrayal.

Molly Bischoff

mollyandterry@gmail.com

(831) 818-2330