



NOTICE OF PUBLIC HEARING

EUREKA PLANNING COMMISSION

NOTICE IS HEREBY GIVEN that the Eureka Planning Commission will hold a public hearing on **Tuesday, September 24, 2019**, at 5:30 p.m., or as soon thereafter as the matter can be heard, in the Council Chamber, Eureka City Hall, 531 “K” Street, Eureka, California, to consider the following application:

Project Title: Verizon Wireless Telecommunication Facility

Project Applicant: Epic Wireless Case No: C-19-0004/AA-19-0013/WTF-19-0005

Project Location: 1020 Wood Street APN: 011-182-001

Project Zoning and Land Use: P (Public)/PQP (Public/Quasi-Public)

Project Description: Verizon Wireless is proposing to install eight (8) panel antennas and 12 Remote Radio Heads (RRHs) at a height of 94 feet on the City’s existing 134-foot water tower in the northwest corner of the parcel at 1020 Wood Street.

A 23 x 14-foot equipment area with a 10 x 20-foot parking area will be located east of the water tower. The proposed equipment area will contain cabinets, equipment, a fire extinguisher and a service light with auto shut-off timer and surge suppressor on another H-frame. No generator is proposed on-site because the facility will use battery backup power.

“Wireless telecommunication facilities” is a conditionally permitted use in the P (Public) zone district where the project is located. A Use Permit and Design Review are required for the addition of the antennas and equipment area.

All interested persons are invited to comment either in person at the scheduled public hearing, or in writing. Written comments may be submitted prior to or during the hearing by mailing or delivering them to the Development Services Department, Third Floor, 531 K Street, Eureka. Appeals to the City Council of the action of the Planning Commission, may be made within 10 calendar days of the action by filing a written Notice of Appeal, along with the filing fees as set by the City Council, with the City Clerk.

If you challenge the nature of the proposed action in court, you may be limited to raising only those issues that you or someone else raised at the public hearing or written correspondence received during or prior to the public hearing. Accommodations for handicapped access to City meetings must be requested of the City Clerk, 441-4175, five working days in advance of the meeting. The project file is available for review at the Development Services Department. If you have questions regarding the project or this notice, please contact Raquel Menanno, Assistant Planner, rmenanno@ci.eureka.ca.gov or (707) 441-4113.



CITY OF EUREKA
DEVELOPMENT SERVICES DEPARTMENT

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MEMO

DATE: 09/24/2019

TO: Planning Commission

THRU: Kristen M. Goetz, Senior Planner

FROM: Raquel Menanno, Assistant Planner

SUBJECT: WTF-19-0005 Project Update

Following the Planning Commission public hearing held on August 12, 2019, Epic Wireless has held a second, correctly noticed, educational meeting. The meeting took place on September 4th at the Red Lion from 5:30-6:30 p.m. Noticing was mailed to property owners, as well as tenants within 500 feet of the project site, and signs advertising the meeting were placed on all four frontages of the site (see Figures 1-4 in Attachment 1).

Three community members attended the meeting where four representatives of the project, as well as City Staff, were available to answer questions. As required by Eureka Municipal Code §159.022, all of the educational materials from the meeting were provided to Staff on September 10, 2019, which is within the required 21 days following the educational meeting.

As a result of conversations with the attendees at the meeting, Verizon is proposing to add a Condition of Approval requiring them to provide a post construction/operating RF study. The study would be submitted to the City and available for review by the public. The following condition of approval has been added to the draft Resolution:

"The applicant will perform a post construction, onsite Radio Frequency evaluation and provide a report to certify compliance with all FCC requirements. This testing will be performed onsite in order to confirm current existing ambient levels combined with the additional emissions added by the new proposed equipment . The report will be performed by an independent, third party consultant, licensed to perform this type of analysis, and will be submitted to the City of Eureka within 30 days of building permit sign-off."

Staff also mailed notice of the Planning Commission public hearing to property owners, as well as tenants, within 500 feet of the project site. Public Hearing Notice signs were also placed on all four frontages of the site (see Figures 5-8 in Attachment 1).

Following the meeting on August 12, Staff received an e-mail posing a number of questions. To aid the Commission in their deliberation, and because the questions from this commenter are similar to those posed by other members of the public, Staff has provided the following response for the Commission:

1). [...] questions about the nature of the lease with the city were raised at the informational meeting. Was the lease exclusive? For what amount? What duration? When was it signed? These questions were not answered until the Planning Commission meeting when commissioners posed them. These questions have still not been answered fully. Only one informational meeting attendee who later sent an email to Raquel received a copy of the lease prior to the public hearing.

The Planning Commission's role is to determine whether the proposed use of the water tower site as a wireless facility will be compatible with the character, aesthetics, scenic qualities, and existing development in the surrounding neighborhood. The Commission cannot consider the effects of RF emissions in their decision.

The Commission's staff report did not contain information regarding the details of the lease because granting, or denying, a use permit to allow a WTF use at this site cannot be based on the lease process, or the lease rate. The decision to lease the water tower site and the details contained within the lease itself, are not within the purview of the Planning Commission, and basing their action on the decision to lease, or the lease terms, in any way, may create significant liability for the City.

The City Council has determined that the wireless telecommunication facility use is appropriate in the Public Facility (PF) zone district, provided a use permit is granted. The lease itself, and its content and terms, do not have an effect or impact on the use of the site for a wireless facility, or on the surroundings. The Commission's sole charge is to determine whether the use of this site for a wireless telecommunication facility as proposed by Verizon, or for any carrier, should be allowed at this site. Denial of this application effectively means the Planning Commission has determined WTF uses are not appropriate for this site.

The determination of whether or under what terms to lease City property for cellular facilities, or any other use, does not rest with the Planning Department or with the Planning Commission.

According to the Public Works Director, the lease is not exclusive and it is for \$1,100.00 per month for a year term, and was signed on January 31, 2019.

2) Questions raised on June 11th about the possibility of future cell towers at the 1020 Wood Street site or the possibility that Verizon could convert to 5G without an

additional conditional use permit were brought up and not definitively answered by Epic or the Planning Department.

The Federal Communications Commission (FCC) regulates modifications to existing cellular sites. If proposed modifications to existing facility sites comply with the regulations set by the FCC, a building permit may be the only requirement to modify the facility. There would be no hearing or other meeting or notification informing the public of possible changes.

For existing cellular sites, like Hebrew Christian, if a modification is proposed, the applicant would submit an “Eligible Facility Request” to the City, as defined by the Federal Communications Commission. If the proposed modification(s) conform to the FCC regulations, then modification of a use permit, or additional planning review is not required; the applicant would apply for a building permit.

A facility is an “Eligible Facility” if the modification of the existing tower or base station involves:

- (a) Collocation of new transmission equipment
- (b) Removal of transmission equipment
- (c) Replacement of transmission equipment; and

The modification complies with conditions associated with the original siting approval of the eligible support structure or base station equipment (except for conditions related to height, width, equipment cabinets, excavation/deployment or concealment elements); and

Provided the modification does not:

- (d) Entail any excavation or deployment outside the current site;
- (e) Defeat the concealment elements of the eligible support structure;
- (f) Conflict with conditions associated with the siting approval of the construction or modification of the eligible support structure or base station equipment;
- (g) Increase the height of the tower by more than 10% or by the height of one additional antenna array with separation from the nearest existing antenna twenty feet or less;
- (h) Add an appurtenance to the body of the tower that would protrude from the edge of the tower more than 20 feet, or more than the width of the tower structure at the level of the appurtenance;
- (i) Increase the height of the structure by more than 10% or more than ten feet;
- (j) Add an appurtenance to the body of the structure that would protrude from the edge of the structure by more than 6 feet; or

(k) Propose more than the standard number of new equipment cabinets for the technology involved, or more than four cabinets total.

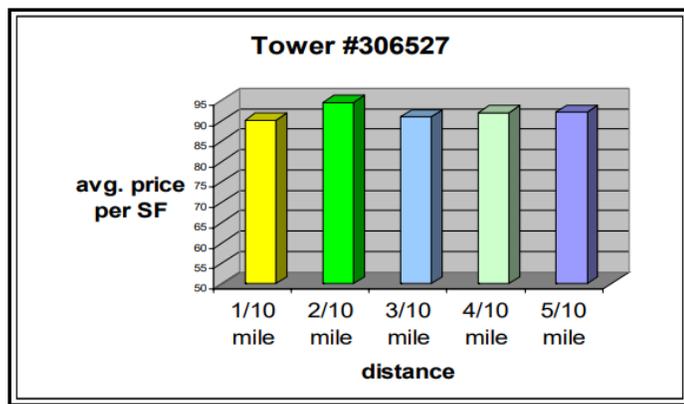
If the proposed modification does not qualify as an Eligible Facility Request, then a Wireless Telecommunication Facility permit and possibly modification of the facility's use permit may be required.

3) *Concerns about property value loss were raised (the response in the city report was simply "unlikely to decrease property values") How was this conclusion ascertained? It was also not addressed by Epic Wireless as required- only by Raquel Mennano in her staff report for the planning commission meeting last night on 8/12/19.*

Through researching online articles, the following information was ascertained:

According to the report, "Using GIS to Measure the Impact of Distance to Cell Phone Towers on House Prices in Florida," (Attachment 2) prepared by faculty at the University of North Florida in 2006, the effect of a wireless telecommunication facility on property values near a wireless telecommunication facility is minimal. On average the price of properties decreased by just over 2% for properties within 656 feet.

A report from Tom Keith & Associates, Inc., (Attachment 3) a business and real estate appraisers' company, states there is no direct relationship between wireless telecommunication facilities and declining property values based on the study. In other words, the study does not indicate a decrease in property values in relation to the proximity of a wireless telecommunication facility.



In a series of studies prepared by Valbridge Property Advisors for four different cities, including Boston, Dallas, Phoenix, and Raleigh¹, (Attachment 4) the studies conclude there was no significant difference in the home sale values for homes

¹ <https://www.valbridge.com/news-article/647/how-does-the-proximity-to-a-cell-tower-impact-home-values>

located within a 0.25-mile radius sphere of influence of a wireless telecommunication facility when compared with homes located within a 0.50-1.0-mile radius. No significant difference in these studies is defined as a difference of less than 1%.

Based on these studies and reports, Staff does not believe there is substantial evidence the proposed wireless telecommunication facility will have a significant, negative effect on property values.

4) Questions about the coverage gap in our area as well as the supposed "gap" on the map in Myrtle town were raised. Why no site proposal addressing the Myrtle town area as well? Coverage "gap" is misleading when the city acknowledges that we are talking about simply "enhancing" coverage, not filling in any real "gap" in coverage. Attendees commented that none had noticed any appreciable wireless service issues in the neighborhoods surrounding the water tower despite the stated "coverage gap". No one besides Verizon has actually shown that there is any real gap. Is this actually needed? We are basing this assumption solely on the map and data provided by Verizon, no outside sources. Several requirements of the city ordinance Chapter 159: Wireless Telecommunications Facilities were not met at the time of the public hearing. Why does this ordinance exist if the Planning Department staff are not following it nor holding the applicant accountable to follow it?

The proposed project will aid the coverage gap in Myrtle town, however, the goal of the project is to fill the identified gap adjacent to, but not necessarily within Myrtle town. Verizon wants to ensure that not only is there reliable cellular phone service, but that there is adequate equipment for the volume of data required by wireless users. Verizon has shown through their submitted analysis that location at this site is necessary, and will help alleviate the coverage gap adjacent to Myrtle town.

Whether and how Verizon chooses to address the gap in Myrtle town is up to them, and, unless a site within the city is needed to fill that gap, it is unlikely the City will have any involvement.

5) Several neighbors including ourselves can attest that there was no conspicuous public signage at the 1020 Wood Street property when we received notice by mail about the informational meeting to take place on 6/11/19. Personnel at the Humboldt Bay Fire training station when approached by our neighbor had no idea about the proposal although they are on site regularly and would have seen any posting. This lack of posting limited public awareness of the meeting only to those property owners who actually received the mailer and those who were made aware by us going door to door, contacting the press and making an announcement on the public forum "next door". (no renters were aware, and no one outside of the 500 feet who lives or works in the vicinity who would have likely seen the sign had it been posted). Additionally, two

of our neighbors who both live directly across the street from the tower who are owners did not receive the mailer at all. How many others in the 500 foot radius were not notified? We will never know. The city's ordinance is clear about the requirements.

Does this commission or the council care that the public was not properly notified as per the stated guidelines? Again, what is the point of the ordinance and the public process if it is not followed? (Raquel Mennano is trying to obtain proof from Epic Wireless that signage was posted-it is our word against their's at this time)

Humboldt Bay Fire (HBF) sent a written response stating they were not against the proposed WTF (Attachment 5).

Because the required educational meeting signage was not installed on the site prior to the educational meeting held on June 11, 2019, a second educational meeting was noticed and held on September 4, 2019. Epic Wireless provided mailed notice to all property owners and tenants within 500 feet of the proposed project and posted signs on all four sides of the site (see Figures 1-4).

There still has not been a report showing cumulative effects of all EMF emissions from the 1020 Wood Street site with the facility at the Hebrew Christian Church site located nearby. The Dtech engineer who spoke at the meeting yesterday brushed aside the concern about the cumulative effect saying that anything at 2000 feet away would not impact the neighborhood's radiation exposure. However, this site is within approximately 500 feet of the newly proposed facility, not 2000 feet. A report showing all emissions within 2000 feet of the proposed facility is what the ordinance requires and what the public and the commission needs to be informed of.

Additionally, it came up during the meeting that the Hebrew christian site has been altered since the original permit was issued. Have current measurements of EMF emissions at that site been taken or added to the predicted emissions from the newly proposed towers at 1020 Wood St? We would also like the Commission to look at how it is that the site was altered without awareness or approval by the Commission. Is this standard? Is this what we can expect at the 1020 Wood Street site?

*Lastly, the nature of the process by which the city came to be in partnership with Verizon on this project and lease is concerning. The report by Epic Wireless representing Verizon states, "In **March of 2017** the Epic Wireless Group was contracted to identify a wireless site location and design to serve a significant gap in wireless coverage identified by Verizon Wireless in a heavily residential area of Eureka, California centered around Buhne & P Streets. After conducting a thorough research and evaluation of existing buildings and structures in the area that would accommodate a collocation, **Verizon Wireless, in cooperation with the City of Eureka Planning Department determined that a collocating on the existing City of Eureka's water tank would adequately meet the coverage***

and capacity goals. *Epic Wireless investigated a total of four(4) potential sites and concluded that the presently proposed water tank collocation located on a public use zoned parcel (1020 Wood St.) is the least intrusive site that can offer the needed coverage to the area suffering from a significant gap in coverage”. (emphasis is [the authors’])*

The timeframe between the “cooperation with the planning department” and when the city was approached by Epic Wireless on behalf of Verizon about leasing the property at 1020 Wood Street is unknown, which came first? However, we do know that the lease was signed on 1/31/19 by Brian Gerving, Director of Public Works. We still do not know for sure the nature of this process by which he and/or other city staff determined that the amount offered by Verizon, \$1,100 per month, was fair market value for the lease. What we do know is that this was all done without public awareness or input. It is possible the city may have been able to receive a higher amount for the leasing of this unique and highly desirable property (Epic themselves state there were no other options that would have fulfilled their project objectives and zoning requirements, therefore making this site more valuable to them and others). We have concerns about this deal regardless of the city attorney’s claim at the public hearing that this is all within legal parameters. It does not seem to be in the best interest of the city nor it’s residents for this to be a non-transparent and non-public process.

Lastly, it has been difficult to find the time to make it to these meetings as we have an 11 month old son. We have hired babysitters and taken the time that is required to adequately inform ourselves regarding all the issues surrounding this decision as well as go door to door in our neighborhood. We hope you can appreciate how dispiriting it is to be involved in our community and this democratic process, only to find that there are processes outside of our control which are rendering our participation seemingly pointless. We ask that this commission, the City Council and the city staff to please consider the importance of including and informing it’s citizens more carefully, lest the public become discouraged from participating in local politics. For Verizon, a non local entity, this will just be a drop in the bucket. For us permanent residents of Eureka, we ask that you deny Verizon this permit on any one of the grounds of not satisfying the city ordinance, and reaffirm your allegiance to the many men, women and children here in our community who may be adversely affected by this decision. We thank you for your time and service to this community

Epic Wireless provided an update to their report with the cumulative effect on July 26, 2019 (Attachment 6).

Current planning staff is unaware of any discussions with Verizon until Verizon contacted the Department in March, 2019 to discuss submission of a Wireless Telecommunication Facility application for the water tower site.

The process for deciding to allow WTF on public property and negotiation and terms of a lease is not a topic for the Commission's deliberation or action on this application. The Commission is charged with determining whether a wireless telecommunication facility, any wireless facility, can be allowed on this site. The Commission's action must be supported by findings as required by State law, case law, and the Eureka Municipal Code. The Commission cannot base a denial on the potential adverse health impact of any RF emissions. The Commission's action must be based on a legally recognizable basis and on evidence in the record.

The towers at Hebrew Christian have been altered a number of times through the Eligible Facilities Request process, with the most recent approval in February, 2019. No modification of use permits, or new Wireless Telecommunication Facility Permits were required because the modifications were within the FCC standards for eligible facilities.

RESOLUTION NO. 19-_____

**A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF EUREKA APPROVING
SITE PLAN AND ARCHITECTURAL REVIEW (AA-19-0013) FOR THE WIRELESS
TELECOMMUNICATION FACILITY AT 1020 WOOD STREET; APN 011-182-001**

WHEREAS Verizon Wireless is proposing to install eight (8) panel antennas and 12 Remote Radio Heads (RRHs) at a height of 94 feet on the City's existing 134-foot water tower in the northwest corner of the parcel at 3030 L Street; and

WHEREAS a 23 x 14-foot equipment area with a 10 x 20-foot parking area will be located east of the water tower; and

WHEREAS The proposed equipment area will contain cabinets, equipment, a fire extinguisher and a service light with auto shut-off timer and surge suppressor on another H-frame; and

WHEREAS No generator is proposed on-site because the facility will use battery backup power; and

WHEREAS "Wireless telecommunication facilities" is a conditionally permitted use in the zone district where the project is located; and

WHEREAS a Use Permit and Design Review are required for the addition of the antenna facility; and

WHEREAS the parcel is approximately 58,800 square feet containing the City of Eureka's water tank, water tower, and the Humboldt Bay Fire Department Public Safety Training Classroom building and parking lot; and

WHEREAS the eight antennas will be façade-mounted on the side of the legs (two per leg) of the existing water tower in four approximately 7.5 x 1.25-foot sectors that will extend out approximately 1-2 feet from the water tower leg.; and

WHEREAS the antennas will be paired with four surge suppressors (one suppressor within each sector); and

WHEREAS three Remote Radio Heads (RRHs) will be installed near the antennas in each of the four sectors for a total of 12 RRHs.; and

WHEREAS per § 159.024, no conditional use permit for a wireless telecommunication facility shall be approved until the site plan and architectural review are approved by the Planning Commission.

WHEREAS the Planning Commission of the City of Eureka has reviewed the subject application in accordance with Eureka Municipal Code Chapters 155 and 159, and after due consideration of all testimony, evidence, and reports offered at the public hearing, does hereby find and determine the following facts:

1. The antennas and associated equipment will be placed on an existing structure and camouflaged by painting the equipment in each sector to match the existing water tower.
2. The ground equipment area is relatively small, at approximately 322 square feet and includes fencing to minimize adverse visual impacts on the surrounding neighborhood.
3. The project as proposed and conditioned is not ugly, inharmonious, monotonous, or hazardous.

WHEREAS, in the opinion of the Planning Commission of the City of Eureka, the proposed application should be approved subject to the following conditions:

- a. Mounted antennas, equipment, and hardware will be painted to match the existing legs of the water tower.
- b. A 6-foot-high chain link fence with "light brown" vinyl slats will surround the 23 x 14-foot equipment area.

c. The applicant will comply with all conditions of approval adopted for Use Permit C-19-0005.

NOW THEREFORE, BE IT RESOLVED that the Planning Commission of the City of Eureka does hereby approve the application, subject to the mitigation and conditions listed above.

PASSED, APPROVED AND ADOPTED by the Planning Commission of the City of Eureka in the County of Humboldt, State of California, on the 24th day of September, 2019 by the following vote:

AYES: COMMISSIONER
NOES: COMMISSIONER
ABSENT: COMMISSIONER
ABSTAIN: COMMISSIONER

Jeff Ragan, Chair, Planning Commission

Attest:

Kristen M. Goetz, Executive Secretary

RESOLUTION NO. 19-____

**A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF EUREKA APPROVING A
CONDITIONAL USE PERMIT (C-19-0004) FOR THE WIRELESS TELECOMMUNICATION
FACILITY AT 1020 WOOD STREET; APN 011-182-001**

WHEREAS Verizon Wireless is proposing to install eight (8) panel antennas and 12 Remote Radio Heads (RRHs) at a height of 94 feet on the City's existing 134-foot water tower in the northwest corner of the parcel at 3030 L Street; and

WHEREAS a 23 x 14-foot equipment area with a 10 x 20-foot parking area will be located east of the water tower; and

WHEREAS the proposed equipment area will contain cabinets, equipment, a fire extinguisher and a service light with auto shut-off timer and surge suppressor on another H-frame; and

WHEREAS no generator is proposed on-site because the facility will use battery backup power; and

WHEREAS "Wireless telecommunication facilities" is a conditionally permitted use in the zone district where the project is located; and

WHEREAS a Use Permit and Design Review are required for the addition of the antenna facility; and

WHEREAS the parcel is approximately 58,800 square feet containing the City of Eureka's water tank, water tower, and the Humboldt Bay Fire Department Public Safety Training Classroom building and parking lot; and

WHEREAS the project area, located in the northern portion of the parcel, was previously disturbed through the development of the existing water tower and demolition of a previous water tower; and

WHEREAS per § 159.024, no conditional use permit for a wireless telecommunication facility shall be approved until the site plan and architectural review are approved by the Planning Commission; and

WHEREAS the project is subject to environmental review in accordance with the California Environmental Quality Act (CEQA).

WHEREAS the Planning Commission of the City of Eureka has reviewed the subject application in accordance with Eureka Municipal Code Chapters 155 and 159, and after due consideration of all testimony, evidence, and reports offered at the public hearing, does hereby find and determine the following facts:

1. The City of Eureka as the Lead Agency has determined the project is exempt from CEQA pursuant to a Class 1 categorical exemption (Sections 15301), which exempts the minor alteration of existing public structures involving negligible or no expansion of use.
2. The project involves negligible additions to an existing public structure and minor land alterations to existing disturbed land.
3. The subject property is designated "Public/Quasi-Public" under the adopted general plan; this land use designation allows government facilities and services and uses determined to have a public benefit. The proposed WTF is consistent with this land use designation because it is a service which provides a public benefit through communication for government agencies, emergency personnel, and private citizens.

4. The surrounding land uses consist of Public/Quasi-Public directly west of the project site, Professional Office further west of the project site (approximately 330 feet), and Low Density Residential directly to the north, east, and south of the project site. The addition of the proposed WTF is a minor alteration that will not impact the existing relationship among the land uses.
5. The antennas will be façade-mounted on the legs of the existing water tower and the equipment will be located in a fenced enclosure on previously disturbed ground; therefore, the proposed development will not create a harmful intrusion or affect the stability of the existing land uses. Further, with conditions for installation of warning signs, the project complies with the Federal Communications Commission (FCC) Radiofrequency Safety Guidelines preventing the existing land uses from harmful intrusions.
6. The proposed WTF will provide improved mobile communications and serve as a backup to the existing landline services. This purpose appropriately serves the City as a whole because mobile communication has become part of daily commerce and recreation. Also, mobile communication has become increasingly important for public safety during times of emergency to serve as a method for immediate response, therefore, public land will continue to be used for an appropriate and beneficial purpose.
7. The proposed WTF does not provide for the possibility of excessive population densities as the project does not involve development that would allow for increased population. The antennas will be placed on top of an existing water tower and the equipment enclosure is 23 feet by 14 feet. Comparatively, the equipment enclosure covers a small area and will not overcrowd the land with structures.
8. Antennas and equipment will be accessed and serviced through an existing driveway with a recorded access easement on the parcel. During construction, which will take place during normal business hours for a period of 8-10 weeks, a boom lift truck and two standard-size work trucks will be used and parked on site. The vehicular usage during the construction period is temporary. Vehicular usage during operation will include a technician visiting the project site approximately once a month for maintenance. Based on the discussion above, the project will support a safe, effective traffic circulation system.
9. The proposed WTF provides one off-street parking space to be used by the technician during regular monthly maintenance.
10. No community facilities or institutions exist or are proposed.
11. The proposed WTF is not a commercial or industrial activity, however, it will provide improved coverage to an area identified by Epic Wireless that currently has a significant gap in coverage . Improved coverage will aid commercial activities that involve mobile communication, thus strengthening the city's tax base.
12. The proposed project, which will include minor alterations and ground equipment is unlikely to adversely affect real property values for residential properties in the vicinity of the proposed WTF.
13. The proposed project is subject to Design Review, which will review the project design and architecture to assure that the appearance is harmonious with the surrounding properties.
14. Since the project qualifies for a Class 1 categorical exemption (Sections 15301), the City of Eureka as the Lead Agency has determined the project will not have a significant effect on the environment. The antenna will be located 94 feet above the ground on the legs of the water tower. Safety signage will be installed to warn employees who access the tower about the effects

of the transmitting antennas in areas where the radio frequency exposure may potentially exceed Federal Communications Commission (FCC) safety limits. The ground equipment will be located within a fenced area, and the entire site is fenced. Therefore, Staff believes that the proposed project will not be detrimental to the public health, safety or welfare.

15. As discussed above, the project complies with the objectives and purposes of the Eureka Municipal Code. The 'P' zoning district specifically gives the Planning Commission the authority to establish limits to the height, bulk, and coverage as a condition of a use permit in order to ensure compatibility with adjoining uses. By acting to approve the project as submitted, the Planning Commission will be simultaneously establishing the limits to the height, bulk, and coverage and determining that the proposed project is compatible with the adjoining uses.
 16. The project site is not located in the coastal zone.
 17. According to the Radio Frequency Electromagnetic Fields Exposure Report prepared by Dtech Communications on December 21, 2018, the Verizon WTF will be in compliance with current Federal Communications Commission (FCC) and local rules regarding human exposure to radio frequency electromagnetic fields on the conditions that:
 - a. Access to the facility be kept locked to restrict access by the general public.
 - b. Install Warning Sign(s), NOC information Sign(s), and Guideline Sign(s) at antennas access points, gate entrances, or climbing access points.
- Therefore, as conditioned, the proposed WTF, will not generate electromagnetic or radio frequency radiation in excess of the Federal Communications Commission adopted standards for human exposure.
18. The site is currently developed with public-serving structures including the City of Eureka's low water tank, high water tower, and the Humboldt Bay Fire Department Public Safety Training Classroom building and parking lot. The proposed WTF is a compatible use because the addition of the antennas and the relatively small equipment area are minor alterations on an existing water tower structure, on an existing site, developed with public uses. Also, the antennas will be painted to match the existing water tower, acting as a camouflaging technique.
 19. The applicant held a meeting at 139 2nd Street, Eureka, California on June 11, 2019. Approximately eight citizens were in attendance, and the applicant provided the Department the information required by §159.022(C). Therefore, the finding can be made that the applicant has complied with the Education/Outreach requirements.
 20. Epic Wireless and Verizon Wireless considered four potential sites before concluding the water tower location at 3030 L Street as the least intrusive site that also closes the significant gap in coverage.
 21. One of the objectives of Chapter 159 of the Eureka Municipal Code, is to "maximize use of existing wireless telecommunication towers and alternative structures so as to minimize the need to construct new towers and minimize the total number of towers throughout the city." Although using an existing tower for co-location wasn't possible, placement of the WTF on the existing water tower structure eliminates the need for a new tower, thereby meeting the objective.

22. The 1996 Telecommunications Act prevents local jurisdictions from denying a WTF based on potential or perceived health hazards if the project meets radio frequency emission thresholds set by the FCC. With the condition of approval requiring installation of the warning signs as recommended in the Radio Frequency Electromagnetic Fields Exposure Report prepared by

Dtech Communications on December 21, 2018, the proposed WTF is compliant with the FCC's RF Safety guidelines.

WHEREAS, in the opinion of the Planning Commission of the City of Eureka, the proposed application should be approved subject to the following conditions:

- a. Access to the facility will be kept locked to restrict access by the general public.
- b. Warning Sign(s), NOC information Sign(s), and Guideline Sign(s) will be installed at antenna access points, gate entrances, and/or climbing access points prior to operation.
- c. If archaeological resources are encountered during construction activities, all onsite work shall cease in the immediate area and within a 50-foot buffer of the discovery location. A qualified archaeologist will be retained to evaluate and assess the significance of the discovery, and develop and implement an avoidance or mitigation plan, as appropriate. For discoveries known or likely to be associated with native American heritage (prehistoric sites and select historic period sites), the Tribal Historic Preservation Officers for the Bear River Band of Rohnerville Rancheria, Blue Lake Rancheria, and Wiyot Tribe are to be contacted immediately to evaluate the discovery and, in consultation with the project proponent, City of Eureka, and consulting archaeologist, develop a treatment plan in any instance where significant impacts cannot be avoided. Prehistoric materials may include obsidian or chert flakes, tools, locally darkened midden soils, groundstone artifacts, shellfish or faunal remains, and human burials. Historic archaeological discoveries may include 19th century building foundations; structure remains; or concentrations of artifacts made of glass, ceramic, metal or other materials found in buried pits, old wells or privies.
- d. If paleontological resources, such as fossilized bone, teeth, shell, tracks, trails, casts, molds, or impressions are discovered during ground-disturbing activities, work shall stop in that area and within 100 feet of the find until a qualified paleontologist can assess the nature and importance of the find and, if necessary, develop appropriate treatment measures in conformance with Society of Vertebrate Paleontology standards, and in consultation with the City of Eureka.
- e. In the event of discovery or recognition of any human remains during construction activities, the landowner or person responsible for excavation would be required to comply with the State Health and Safety Code Section 7050.5. Construction activities within 100 feet of the find shall cease until the Humboldt County Coroner has been contacted at 707-445-7242 to determine that no investigation of the cause of death is required. If the remains are determined to be, or potentially be, Native American, the landowner or person responsible for excavation would be required to comply with Public Resources Code Section 5097.98. In part, PRC Section 5097.98 requires that the Native American Heritage Commission (NAHC) shall be contacted within 24 hours if it is determined that the remains are Native American. The NAHC would then identify the person or persons it believes to be the most likely descendant from the deceased Native American, who in turn would make recommendations to the landowner or the person responsible for the excavation work for the appropriate means of treating the human remains and any associated grave goods within 48 hours of being granted access to the site. Additional provisions of Public Resources Code Section 5097.98 shall be complied with as may be required.
- f. The applicant will perform a post construction, onsite Radio Frequency evaluation and provide a report to certify compliance with all FCC requirements. This testing will be performed onsite in order to confirm current existing ambient levels combined with the additional emissions

added by the new proposed equipment . The report will be performed by an independent, third party consultant, licensed to perform this type of analysis, and will be submitted to the City of Eureka within 30 days of building permit final.

PASSED, APPROVED AND ADOPTED by the Planning Commission of the City of Eureka in the County of Humboldt, State of California, on the 20th day of September, 2019 by the following vote:

AYES: COMMISSIONER
NOES: COMMISSIONER
ABSENT: COMMISSIONER
ABSTAIN: COMMISSIONER

Jeff Ragan, Chair, Planning Commission

Attest:

Kristen M. Goetz, Executive Secretary

Attachment 1

Meeting Signage Photos

Figure 1 West side August 23, 2019



Figure 2 South side August 23, 2019



Figure 3 East side August 23, 2019



Figure 4 North side August 23, 2019



Figure 5 West side September 13, 2019



Figure 6 South side September 13, 2019



Figure 7 East side September 13, 2019



Figure 8 North side September 13, 2019



Attachment 2

Report

“Using GIS to Measure the Impact
of Distance to Cell Phone Towers
on House Prices in Florida,”

Thirteenth Pacific-Rim Real Estate Society Conference,
Perth, Western Australia 21-24 January 2007

Using GIS to Measure the Impact of Distance to Cell Phone Towers on House Prices in Florida

Draft: December 2006

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Using GIS to Measure the Impact of Distance to Cell Phone Towers on House Prices in Florida

Keywords: Cellular phone base stations – GIS - health risks – multiple regression analysis – property values – stigma

Abstract:

The siting of cellular phone transmitting antennas, their base stations and the towers that support them (*towers*) is a public concern due to fears of potential health hazards from the electromagnetic fields (EMFs) that these devices emit. Negative media attention to the potential health hazards has only fuelled the perception of uncertainty over the health effects. The unsightliness of these structures and fear of lowered property values are other regularly voiced concerns about the siting of these towers. However, the extent to which such attitudes are reflected in lower property values affected by tower proximity is controversial.

This paper outlines the results of a study carried out in Florida in 2004 to show the effect that tower proximity has on residential property prices. The study involved an analysis of residential property sales transaction data. Both GIS and multiple regression analysis in a hedonic framework were used to determine the effect of actual distance of homes to towers on residential property prices.

The results of the research show that prices of properties decreased by just over 2%, on average, after a tower was built. This effect generally reduced with distance from the tower and was almost negligible after about 200 meters (656 feet).

1. Introduction

This paper outlines the results of one of the first US-based cell-phone tower studies. The research was carried out in Florida in 2004 to show the effect that **distance** to a CPBS has on residential property prices. It follows on from several New Zealand (NZ) studies conducted in 2003.¹ The first of the earlier NZ studies examined residents' perceptions toward living near CPBSs, while the most recent NZ study adopted GIS to measure the impact that distance to a CPBS has on residential property prices using multiple regression analysis in a hedonic pricing framework. The current study was conducted to determine if US residents respond similarly to those in NZ towards living near CPBSs and hence, whether the results can be generally applied.

The paper commences with a brief literature review of the previous NZ studies for the readers' convenience as well as the literature relating to property value effects from other similar structures. The next section describes the research data and methodology used. The results are then discussed. The final section provides a summary and conclusion.

¹ Bond, S.G. and Wang, K. (2005). "The Impact of Cell Phone Towers on House Prices in Residential Neighborhoods", *The Appraisal Journal*, Volume LXXIII, No.3, pp.256-277, Bond, S.G., Beamish, K. (2005). "Cellular Phone Towers: Perceived Impact on Residents and Property Values", *Pacific Rim Property Research Journal*, vol. 11, no. 2, pp. 158-177 and Bond, S.G. and Xue, J. (2005). "Cell Phone Tower Proximity Impacts on House Prices: A New Zealand Case Study", *European Real Estate Society and International Real Estate Society Conference*, June 15-18, Dublin, Ireland.

2. Literature Review

2.1 Property Value Effects

First, an opinion survey by Bond and Beamish (2005) was used to investigate the current perceptions of residents towards living near CPBSs in a case study city of Christchurch, New Zealand and how this proximity might affect property values. Second, a study by Bond and Wang (2005) that analyzed property sales transactions using multiple regression analysis was conducted to help confirm the results of the initial opinion survey. It did this by measuring the impact of proximity to CPBSs on residential property prices in four case study areas. The Bond and Xue (2005) study refined the previous transaction-based study by including a more accurate variable to account for distance to a CPBS.

The City of Christchurch was selected as the case study area for all the NZ studies due to **the large amount of media attention** this area had received in recent years relating to the siting of CPBSs. Two prominent court cases over the siting of CPBSs were the main cause for this attention.² In summary, the Environmental Court ruled in each case that there is no established adverse health effects arising from the emission of radio waves from CPBSs as there is no epidemiological evidence to show this. However, in the court's decisions they did concede that while there is no proven health affects that there is evidence of **property values** being affected by both of the above allegations.

These court cases were only the start of the negative publicity surrounding CPBSs in Christchurch. Dr. Neil Cherry, a prominent and vocal local Professor, served only to fuel the negative attention to CPBSs by regularly publishing the health hazards relating to these structures.³ This media attention had an impact on the results of the studies, outlined next.

2.2 The Opinion Survey

The Bond and Beamish (2005) opinion survey study included residents in ten suburbs: five case study areas (within 100 feet of a cell phone TOWER) and five control areas (over 0.6 of a mile from a cell phone TOWER). The five the case study suburbs were matched with five control suburbs that had similar living environments (in socio-economic terms) except that the former are areas where a CPBS is located, while the latter are without a CPBS. Eighty questionnaires⁴ were distributed to each of the ten suburbs in Christchurch (i.e. 800 surveys were delivered in total). After sending out reminder letters to those residents who had not yet responded, an overall response rate of 46% was achieved. Over three-quarters (78.5%) of the case study respondents were homeowners compared to 94% in the control area.

The results were mixed with responses from residents ranging from having no concerns to being very concerned about proximity to a CPBS. Interestingly, in general, those people living in areas further away from CPBSs were **much more** concerned about issues from proximity to CPBSs than residents who lived near CPBSs.

² McIntyre and others vs. Christchurch City Council [1996] NZRMA 289 and Shirley Primary School vs. Telecom Mobile Communications Ltd [1999] NZRMA 66

³For example, Cherry, N. (2000), "Health Effects Associated with Mobil Base Stations in Communities: The Need for Health Studies," Environmental Management and Design Division, Lincoln University, June 8. Available from: <http://pages.britishlibrary.net/orange/cherryonbasestations.htm>.

⁴ Approved by the University of Auckland Human Subjects Ethics Committee (reference 2002/185).

Over 40% of the control group respondents were worried a lot about future health risks, aesthetics and future property values compared to the case study areas where only 13% of the respondents were worried a lot about these issues. However, in both the case study and control areas, the impact of proximity to CPBSs on future **property values** is the issue of **greatest concern** for respondents. If purchasing or renting a property near a CPBS, over a third (38%) of the control group respondents would **reduce price** of their property by more than **20%**. The perceptions of the case study respondents were again less negative with a third of them saying they would reduce price by only 1-9%, and 24% would reduce price by between 10 and 19%.

Reasons for the lack of concern shown by the case study respondents may be due to the CPBS being either not visible or only barely visible from their homes. Another reason may be that the CPBS was far enough away from respondent's property (as was indicated by many respondents, particularly in St Albans West, Upper Riccarton, and Bishopdale) or hidden by trees and consequently it did not affect them much. The results may have been quite different had the CPBS being more visually prominent.

2.3 Transaction-based Market Study

The Bond and Wang (2005) market transaction-based regression study included 4283 property sales in four suburbs that occurred between 1986 and 2002 (approximately 1000 sales per suburb). The sales data that occurred before a CPBS was built were compared to sales data after a CPBS was built to determine any variance in price, after accounting for all the relevant independent variables.

Interestingly, the effect of a CPBS on price (a decrease of between 20.7% and 21%) was very similar in the two suburbs where the towers were built in the year 2000, after the negative media publicity given to CPBSs following the two legal cases outlined above. The other two suburbs that indicated a CPBS was either insignificant or increased prices by around 12%, had towers built in them in 1994, prior to the media publicity. Also, given that the cell phone technology was relatively new to NZ in 1994 (introduced in late 1987) there may have been more desire then to live closer to a tower to receive better coverage than in later years when the technology became more common and the potential health hazards from these became more widely publicized.

The main limitation affecting this study was that there was no accurate proximity measure included in the model, such as GIS coordinates for each property. Instead, street name was included as an independent variable to help to control for the proximity effects. A study has subsequently been performed using GIS analysis to determine the impact that distance to a CPBS has on residential property prices. The results from this study are outlined next.

2.4 Proximity Impact Study

Bond and Xue study conducted in 2004 involved analysis of the residential transaction data using the same hedonic framework as the previous study as well as including the same data but added a further six suburbs to give a total of ten suburbs: five suburbs with CPBSs located in them and five control suburbs without CPBSs. In addition, the geographical {x, y} coordinates that relate to each property's absolute location were included. A total of 9,514 geo-coded property sales were used (approximately 1000 sales per suburb).

In terms of the effect that proximity to a CPBS has on price the overall results indicate that this is significant and negative. Generally, the closer to the CPBS a property is the greater the decrease in price. The effect of proximity to a CPBS **reduces price by 15%, on average**. This effect reduces

with distance from the CPBS and is negligible after 1000 feet.

2.5 High Voltage Overhead Transmission Line Research

CPBSs are very similar structures to high voltage overhead transmission lines (HVOTLs) and their supporting structure, the pylons. Therefore, despite the limited research relating to value effects from CPBS, it is worthwhile reviewing the body of literature on the property values effects from HVOTLs and pylons.

2.5.1 New Zealand HVOTL Research

The only recently published study in New Zealand on HVOTLs value effects is by Bond and Hopkins (2000).⁵ The case study area selected for the research was a low-middle income, predominantly single-family residential district in the northern Wellington suburb of Newlands that is crossed by two 110KV transmission lines with 85 foot high steel pylons **located on private land**.

The results of the sales analysis, comprising sales from 1989 to 1991 (330 of which were within 1000 feet, or 300 meters, of a HVOTL), indicate the effect of having a 'pylon' close to a particular property is statistically significant and has a **negative effect of 27%** at 33 feet (10 meters) from the pylon, 18% at 50 feet (15 meters), decreasing to 5% at 164 feet (50 meters). This effect diminishes to a negligible amount after 328 feet (100 meters). However, the presence of a 'transmission line' in the case study area has a minimal effect and is not a statistically significant factor in the sales price.

2.5.2 UK HVOTL Research

In England, the effect of HVOTLs on the value of residential property remains relatively unexplored due, in part, to the lack of available transaction data for analysis. The most recently published study is by Sims and Dent (2005).⁶ They compare the results of two parallel UK studies: the first is an analysis of transaction data from a case study in Scotland where sales data are available; the second is a national survey of property appraisers' perceptions (Chartered Surveyors and members of the National Association of Estate Agents) of the presence of distribution equipment in close proximity to residential property.

The data set for the Scotland study consisted of 593 single-family houses that sold between 1994 and 1996 near Glasgow. There is a 275 kV HVOTL running through the centre of the neighborhood in a corridor of land. (Note: This scenario is akin to the US situation where HVOTLs are also situated in easement corridors).

In summary, the analysis of prices at varying distances from the HVOTL showed no clear pattern. The presence of a pylon was found to have a more significant impact on value than the HVOTL and could **reduce price by up to 20.7%**. All negative impacts appeared to reduce with distance and were negligible at around 820 feet (250 meters).

The results from the survey of appraisers and real estate agents indicate they **reduce house price by around 5-10%** when valuing a property within close proximity to a HVOTL. Comparing the

⁵ Bond, S.G. & Hopkins, J. (2000). "The Impact of Transmission Lines on Residential Property Values: Results of a Case Study in a Suburb of Wellington, New Zealand". *Pacific Rim Property Research Journal*, Vol.6, No.2, pp.52-60.

⁶ Sims, S. and Dent, P. (2005), "High-voltage overhead power lines and property values: A residential study in the UK", *Urban Studies*, Vol.42, No.4, pp. 665-694.

results from both studies suggests that appraisers and real estate agents underestimate the impact of proximate HVOTLs on value.

2.5.3 US and Canadian Research

There have been a number of HVOTLs studies carried out in the US and Canada. A major review and analysis of the literature by Kroll and Priestley indicated that in about half the studies carried out, HVOTLs had not affected property values and in the rest of the studies there was a loss in property value between 2-10%.⁷

Kroll and Priestley were generally critical of most valuer type studies because of the small number of properties included and the failure to use econometric techniques, such as multiple regression analysis. They found that the Colwell study was one of the more careful and systematic analysis of residential impacts.⁸ This study was carried out in Illinois and found that the strongest effect of the HVOTLs was within the first 50 feet (15m) but with this dissipating quickly further away, disappearing beyond 200 feet (60m).

A Canadian study (Des Rosiers, 2002) based on a sample of 507 single-family house sales in the City of Brossard, Greater Montreal that sold between 1991-1996 showed that the severe visual encumbrance due to a direct view of either a pylon or lines exerts a significantly negative impact on property prices of between 5% to well in excess of 20%. The extent of value diminution depended on the degree of set back of the homes with respect to the HVOTL easement. The smaller the set back the greater the reduction in price (for example, with a setback of 50ft price was reduced by 21%).

However, the study also showed that a house located adjacent to a transmission corridor may increase values. The proximity advantages include enlarged visual field and increased privacy. The decrease in value from the visual impact of the HVOTLs and pylons (between, on average, 5-10% of mean house value) tends to be cancelled out by the increase in value from proximity to the easement.⁹

A study by Wolverton and Bottemiller¹⁰ utilized a paired-sale methodology of home sales occurring in 1989-1992 to ascertain any difference in sale price between properties abutting rights-of-way of transmission lines (subjects) in Portland, Oregon; Vancouver, Washington; and Seattle, Washington and those located in the same cities but not abutting transmission line rights-of-way (comparisons). Their results did not support a finding of a price effect from abutting an HVTL right-of-way. In their conclusion they warn that the results cannot and should not be generalized outside of the data. They explain that

“limits on generalizations are a universal problem for real property sale data because analysis is constrained to properties that sell and sold properties are never a randomly drawn representative sample. Hence, generalizations must rely on the weight of evidence

⁷ Kroll, C. and Priestley, T. (1992), “The Effects of Overhead Transmission Lines on Property Values: A Review and Analysis of the Literature”, Edison Electric Institute, July.

⁸ Colwell, P. (1990), “Power Lines and Land Value”, *The Journal of Real Estate Research*, American Real Estate Society, Vol. 5, No. 1, Spring.

⁹ Des Rosiers, F. (2002), Power Lines, Visual Encumbrance and House Values: A Microspatial Approach to Impact Measurement, *Journal of Real Estate Research*, Vol.23, No.3, pp. 275 – 301.

¹⁰ Wolverton, M.L. & Bottemiller, S.C., (2003), “Further analysis of transmission line impact on residential property values”, *The Appraisal Journal*, Vol.71, No.3, pp. 244.

from numerous studies, samples, and locations,” p. 250.

Thus, despite the varying results reported in the literature on property value effects from HVOTLs, each study adds to the growing body of evidence and knowledge on this (and similar) valuation issue(s).

2.5.4 Summary

This literature review shows that the price effect of proximity to a HVOTL-pylon is generally consistent between studies (i.e. negative and significant) ranging from between 12 to 27% depending on the distance to these. The closer the home is to a pylon, the greater the diminution in price. The effect diminishes to a negligible amount after 820 feet (250 meters), on average.

The effect of proximity to CPBSs is similar to that caused by proximity to HVOTL- pylons and **reduces price by around 21%**. Taking actual distance into account (using GIS analysis) the effect is a reduction of price of 15%, on average (but up to 25% depending on the neighborhood). This effect reduces with distance from the CPBS and is negligible after 1000 feet (300 meters).

The literature on property value effects from HVOTLs, pylons and cell phone towers adds to the growing body of evidence and knowledge on this (and similar) valuation issue(s). The study reported here is one such study.

3. Market Study

3.1 The Data

Part of the selection process for finding an appropriate case study area was to find one where there were a sufficient number of property sales in suburbs where a tower had been built for analysis to provide statistically reliable and valid results. Sales were required both before and after the tower was built to study the effect of the existence the tower had on the surrounding property’s sale prices.

Cellular phone tower information was obtained from the Federal Communication Commission (FCC). Approximately sixty-percent (60%) of the towers located in Orange County were constructed between the years 1990 and 2000. Additionally, twenty of the towers have the greatest potential for impact on the price of residential properties, based on the greatest number of residential properties close to each tower. These twenty towers were selected to construct a dataset for the study.

Residential properties that sold between 1990 and 2000, the years during which the towers were constructed and were closest to the twenty towers were selected. Parcel data was collected from the Office of the Property Appraiser for Orange County, Florida.¹¹ Overall, 5783 single-family, residential properties were selected from northeast Orange County (see Appendix I: Location Map).

The study investigates the potential impact of proximity to a tower on the price of residential property, as indicated by the dependant variable: SALE_PRICE.¹² The study controls for site and structural characteristics by assessing the impact of various independent variables. The independent data set was limited to those available in the dataset and known, based on other well-

¹¹ As reported to the Florida Department of Revenue.

¹² Model 1, Model 2, and Model 3 estimate the Log of the SALE_PRICE.

tested models reported in the literature and from valuation theory, to be related to property price. The independent variables selected include: lot size in square feet (LOT), floor area of the dwelling in square feet (SQFT), age of the dwelling in years (AGE), the time of construction (AFTER-TWR), the closest distance of each home to the associated tower (DISTANCE), and the dwelling's absolute location is indicated by the Cartesian coordinates (XCOORD) and (YCOORD).¹³

The effect of construction of a tower on price is taken into account by the inclusion of the dummy, independent variable AFTER_TWR. By including AFTER_TWR property prices prior to tower construction can be compared with prices after tower construction.¹⁴ Frequency distributions indicate that, among the residential properties that sold between 1990 and 2000, approximately eighty percent (80%) of the residential properties were sold after tower construction.

The mean SALE_PRICE of single-family, residential property that sold between 1990 and 2000 is \$113,830 for northeast Orange County. The mean square footage of a dwelling is 1535 sq. ft., the mean lot size is 8525 square feet and the mean age is 14 years. The mean DISTANCE from residential property to a tower is 1813 feet.¹⁵

Based on the parcel and tower data for Orange County, descriptive statistics for select variables are presented in Table 1, below.

VARIABLE	MEAN	STD. DEV.	MIN	MAX
SALE_PRICE	113830.6	58816.68	45000	961500
SQFT	1535.367	503.8962	672	5428
LOT	8525.193	4363.28	1638	107732
AGE	13.92755	10.03648	0	35
XCOORD	664108.9	6130.238	640460	671089
YCOORD	511489.4	2422.946	506361	531096
DISTANCE	1813.077	725.5693	133	6620

3.2 Methodology

The method selected for this study was a hedonic house price approach. GIS was also adopted to aid the analysis of distance to the towers. The null hypothesis states that tower proximity does not explain any variation in residential property sales price.

To address the many difficulties in estimating the composite effects of externalities on property price an interactive approach is adopted.¹⁷ To allow the composite effect of site, structural and

¹³ See Fik, Ling and Mulligan (2003) for further discussion of the significance of the absolute location in the form of {x, y} coordinates.

¹⁴ Dummy variables for each year of residential sales were also incorporated into each of the model specifications to control for the potential effects of time on the price of residential property.

¹⁵ Initially, the HEIGHT of the tower was also included among the explanatory variables. However, the HEIGHT variable provided no significant explanatory power.

¹⁶ Polynomial expansions of the independent variables, identified by the VARIABLE2 were included in the interactions in the three model specifications discussed in the methodology.

¹⁷ Externalities include influences external to the property such as school zoning, proximity to both amenities and disamenities, and the socio-economic make-up of the resident population.

location attributes on the value of residential property to vary spatially they are interacted with the Cartesian coordinates that are included in the model.

Unless the hedonic pricing equation provides for interaction between aspatial and spatial characteristics the effects of the explanatory variables on the dependant variable will likely be underestimated, misspecified, undervalued or, worse, overvalued. Including the Cartesian coordinates in the model is intended to increase the explanatory power of the estimated model, and reduce the likelihood of model misspecification (i.e. inaccurate estimates of the regression coefficients, inflated standard errors of the regression coefficients, deflated partial t-tests for the regression coefficients, false non-significant p-values, and degradation of the model predictability, etc.) by allowing the explanatory variables to vary spatially and by removing the spatial dependence observed in the error terms of aspatial, non-interactive models.

Adhering to the methodology proposed by Fik, Ling, and Mulligan (2003), empirical models were selected and progressively tested. The models were based on other well-tested hedonic housing price equations reported in the literature, to derive a best-fit model.

The methodology progresses from an interactive model specification which controls for site and structural attributes of residential property as well as the effects of absolute location and then proceeds to a model specification that measures the effects of discrete location characteristics based on distance intervals. The final model incorporates the impact of explicit location to measure the effects of the proximity to towers (as indicated by DISTANCE) on the sales price of residential property.

Preliminary tests of each model, proceeding from interactive aspatial and spatial estimates, were executed to identify an appropriate polynomial order, or a model that provided the greatest number of statistically significant coefficients and the highest adjusted R-squared value (Fik, et al., p. 633). Like the study by Fik, et al., sensitivity analyses suggested the use of a fourth-order model, at most. Similarly, the following model specifications are estimated with a stepwise regression procedure to ensure that the potential for model misspecification due to multi-collinearity is minimized and that only the independent variables offering the greatest explanatory power are included in the final model.

Model 1 was utilized as a benchmark for the remaining two models. The SALE_PRICE is estimated using the following independent variables: lot size (LOT), square footage of the dwelling (SQFT), age of the dwelling in years (AGE), and the dwelling's absolute location (XCOORD) and (YCOORD). To investigate the effect of tower construction on the price of homes the dummy variable (AFTER_TWR) was also included. Residential sales prices prior to tower construction, BEFORE (=0), were compared to sales prices after tower construction, AFTER (=1). With the addition of the absolute location Model 1 was used to provide a sound model specification, to maximize the explanatory value of the study and minimize the potential for misspecification in the estimated models.

Model 2 integrated the base-model with distance intervals akin to discrete locations. Residential properties within the discrete intervals were then coded according to the interval in which each property was located. The distance intervals, adopted are: 500MTRS (500 to 451 meters), 450MTRS (450 to 401 meters), 400MTRS (400 to 351 meters), 350MTRS (350 to 301 meters), 300MTRS (300 to 251 meters), 250MTRS (250 to 201 meters), 150MTRS (150 to 101 meters), 100MTRS (100 to 51 meters), 50 MTRS (50 meters, or less, to the tower). These distance rings are

within the range of distances used in other similar proximity studies of detrimental features on property values (see for example: Des Rosiers 2002; Reichert 1997; Colwell 1990, and Bond and Hopkins 2000).

Model 3 includes distance-based measures indicating the property's explicit location, with respect to the closest tower. Model 3 integrated the base-model (Model 1) with the distance from the tower to the property. Model 3 introduces the independent variable DISTANCE and interacts this variable with the variables from Model 1. The final model, Model 3, is used to assess the variation in sale price due to proximity to a tower.

3.4 Empirical Results

Tables 2, 3 and 5 are shown in Appendices II and III. The Tables show the progressive development of a spatial and fully interactive model specification to estimate the effects of the proximity to towers on the price of residential property, according to the base-model, Model 1.

In the semi-logarithmic equation the interpretation of the dummy variable coefficients involves the use of the formula: $100(e^{bn} - 1)$, where bn is the dummy variable coefficient (Halvorsen & Palmquist).¹⁸ This formula derives the percentage effect on price of the presence of the factor represented by the dummy variable.

Results in Table 2 (Appendix II) suggest that the price of residential properties sold after the construction of a tower increases by 1.47% (i.e. AFTER_TWR = 1.46E-02). Interactions with AFTER_TWR and other variables also suggest an increase in the price for single, family residential properties sold after tower construction. This may reflect residents' preference to live near a tower to obtain better cell phone coverage.

Among the control variables SQFT increases price by 0.039% with each additional square foot of space (i.e. SQFT = 3.88E). AGE reduces price by 0.25% for each additional year of age. The t-statistics for the explanatory variables SQFT, AGE, XCOORD and YCOORD suggest significant explanatory power within the specification (i.e. SQFT = 47, AGE2 = 7, XCOORD = -7.105 and YCOORD = 6.799). Model 1 accounts for 82% of the variation in the SALE_PRICE (i.e. Adj. R-Square = .08219987).

The results of Model 2 (in Table 3, Appendix II) indicate the estimated effect that proximity to a tower has on residential property prices. Although the SALE_PRICE of single-family, residential properties may appear to increase after the construction of towers as indicated by Model 1, the discrete intervals created in Model 2 suggest that the value of residential properties also increases as the distance from towers increases. That is, if the distance from the residential property to the tower decreases, then the price of the residential property likewise decreases.

Model 2 indicates that the influence of the proximity of towers on the price of residential properties increases inversely with the distance. Under 200MTRS from the towers, the negative signs of the estimate coefficients suggest a decrease in the value of residential properties with an increased proximity or decreased distance to towers. The price of a property located between 101 and 150 meters of a tower decreases by 1.57% ($1 - e^{-0.0156}$) relative to properties that sold prior to the tower being built when holding other explanatory variables constant. The price of properties

¹⁸ Halvorsen, R. and Palmquist, R. "The Interpretation of Dummy Variables in Semilogarithmic Equations," *American Economic Review*, (70:3, 1980): 474-475.

that are located between 151 and 200 meters from a tower is reduced by 2.71% ($1 - e^{-0.0275}$). Thus, a tower has a statistically significant, albeit minimal, effect on prices of property located within 200 meters of a tower.

From 300MTRS to 400MTRS, the price of residential property increases with the distance from the tower. Between 400MTRS and 500MTRS, the price continues to increase with the distance from the tower. These price increases vary from between 1.045% at 350 meters to 2.32% at 500 meters. Additionally, the t-statistics increase with the distance, further suggesting the impact indicated by the increase in estimate coefficients. Although the general trend in the data suggests a positive relationship between the price of residential properties and distance, anomalies exist within the distance intervals.

Having provided a preliminary assessment of the impact of the proximity of towers on residential property prices, Model 3 introduces the independent variable DISTANCE to better assess the variation in sale price due to the external effect of a tower.

Table 4 provides a summary of the distance-based results from Models 2 and 3. While the results of Model 2 present minor anomalies within the data intervals, the results of Model 3 suggest a greater consistency in the results. The results from Model 3 are presented in Table 5 (see Appendix III).

Table 4: A Comparison of Distance-Based Location Coefficients (% impact on price)	
DISCRETE LOCATION	ADJ. R² = 0.826257
500-450MTRS	2.30E-02 (2.33%)
450-400MTRS	1.91E-02 (1.93%)
400-350MTRS	2.17E-02 (2.19%)
350-300MTRS	1.04E-02 (1.045%)
200-150MTRS	-2.75E-02 (-2.71%)
150-100MTRS	-1.56E-02 (-1.57%)
EXPLICIT LOCATION	ADJ. R² = 0.8282641
DISTANCE	5.69E-05 (5.69-03%)
DISTANCE2	-1.49E-08

The results of Model 3 clearly show that the price of residential property increases with the distance from a tower. The independent variable, DISTANCE, estimates a coefficient with a positive sign, that increases with increasing distance from the tower (i.e. Distance = 5.69E-05). Moreover, the t-statistic associated with the estimated coefficient indicates the significance of the explanatory power of the variable (i.e. *t*-Stat = 10.751).

DISTANCE presents significant interactions with the other independent variables. The t-statistics associated with these interactions provide strong evidence that the price of residential property, while highly associated with site and structural characteristics, may be significantly impacted by proximity to towers (i.e. AFTER_TWR*DISTANCE = 3.519; DISTANCE2 = -12.258; DISTANCE*AGE = 4.829).

Further, although the estimated effect of the explanatory variable AFTER_TWR continues to suggest that the value of residential property increases with the distance from towers, the interactive nature of AFTER_TWR with DISTANCE2 suggests that the effect of AFTER_TWR

may vary due to varying distances from the tower. Indeed, the estimated coefficient for AFTER_TWR from Model 1 is diminished in Model 2 and Model 3 as discrete and explicit, distance-based locational attributes are included in the model specification (i.e. Model 1, AFTER_TWR = 1.46E-02 (**1.47%**), Model 2, AFTER_TWR = 1.1495-02 (**1.156%**) and Model 3, AFTER_TWR = .012722 (**1.28%**)).

3.5 Limitations and Comparison with the NZ Study

This study analyzed residential property sales drawn from a number of different, but neighbouring, suburbs in Orange County, Florida as an entire dataset (the suburbs were grouped together and analyzed as a whole). While the Location Value Signature was included in the model to take into account composite externalities as well as to allow these and other independent variables in the model to vary spatially, and therefore preclude the need to analyse neighbourhoods separately, it is possible that not all neighbourhood differences were accounted for when these results are compared to those from the NZ study.

The NZ study (2004) included an analysis of the whole dataset but also of the separate suburbs. The analysis of the whole dataset indicates that CPBSs have a significant, but minimal, effect on the prices of proximate properties. The same general result was obtained for the current US study. However, what the NZ study showed by analyzing the suburbs separately was that substantive differences exist in the effect that CPBSs have on property prices between suburbs, since the distribution of the property sales prices is quite different in each.

The analysis showed that the most significant variables and their effect on price were similar between the four suburbs: St. Albans, Beckenham, Papanui, and Bishopdale. This indicates the relative stability of the coefficients between each model. The overall results indicate that the presence of a CPBS has a significant and negative effect on property prices. This effect is not very strong when the variable *TOWER* is included in the model fitted to the **entire dataset**. However, the effect in each suburb is quite pronounced. It is possible that if the current study had analyzed suburbs separately that similar differences would have been found. Table 6, below, summarizes the results.

Table 6: Coefficients of TOWER, inv.dist and DIST

Model & Date Tower Built		TOWER	Inv.dist	DIST1	DIST 2	DIST 3
All Suburbs	Coefficients	-2.29e-02	-3.68e-01	-2.78e-02	-2.91e-02	-3.98e-03
	Value Effects	-2.3%	50m @ -5.07% 100m@ -3.61%	-2.7%	-2.87%	Insignif.
St Albans 1994	Coefficients	1.48e-01	8.99e-01	1.45e-01	1.53e-01	1.44e-01
	Value Effects	+16% (+12%)	50m@ +13.6% 100m@ +9.4%	+15.6%	+16.5%	+15.5%
Beckenham 2000	Coefficients	-1.81e-01	-2.85e+00	-1.74e-01	-1.74e-01	-2.03e-01
	Value Effects	-16.56%	97m @ -25.13%	-15.9%	-15.9%	-18.37%
Bishopdale 1994	Coefficients	-9.86e-02	1.62e+00	-1.34e-01	-9.18e-02	
	Value Effects	-9.39%	50m @ -20.4% 100m@ -15%	-12.54%	-8.96%	

Papanui 2000	Coefficients	-8.17e-02	-2.24e+00	-7.02e-03	-1.55e-01	-6.70e-02
	Value Effects	-7.85%	177m @-15.5%	Insignif.	-14.36%	-6.48%

Other factors that could affect the results are the style and appearance of the CPBSs and how visible they are to residents.

4. Summary and Conclusions

This paper presents the results of a study carried out in Florida in 2004. The study involved the analysis of market transaction data of single-family homes that sold in Orange County between 1990 and 2000 to investigate the affect on the price of property in close proximity to a tower. The results showed that while a tower has a statistically significant effect on prices of property located near a tower, this effect is minimal. The price of properties within 200 meters (656 feet) decreased, on average, by just over 2%.

Each geographical location is unique as evidenced by the difference in results from the NZ and US studies. These observed differences are partly due to the manifold factors that influence the degree of negative reaction to towers. Residents’ perceptions and assessments of risk vary according to a wide range of processes including psychological, social, institutional, and **cultural**. In addition to the potential health, aesthetic and property value impacts from towers, other factors that may impact on the degree of negative reaction from residents living near these structures and that may be reflected in price are listed below:

- The kinds of health and other risks residents associate with towers, and the level of risk perceived;
- The height, style, and appearance of the towers, how visible these are to residents and how they perceive such views;
- The marketability of homes near towers;
- The extent and frequency of negative media attention to towers;
- The socio-economic make-up of the resident population (prior research indicates that social class is an important variable influencing people’s response to environmental detriments, Thayer *et al.* 1992, and Dale *et al.* 1999);
- The distance from the towers residents feel they have to be to be free of concerns.

As the results reported here are from a case study conducted in 2004 in a specific geographic area (Orange County, Florida) the results should not be generally applied. Wolverton and Bottemiller¹⁹ explain that:

“...limits on generalizations are a universal problem for real property sale data because analysis is constrained to properties that sell and sold properties are never a randomly drawn representative sample. Hence, generalizations must rely on the weight of evidence from numerous studies, samples, and locations,” p. 250.

Thus, to determine if the results are consistent across time and space many similar studies in different geographic locations would need to be conducted over time. Further, to allow valid comparison between them, such studies would need to be of similar design. As suggested by Bond

¹⁹ Wolverton, M.L. & Bottemiller, S.C., (2003), “Further analysis of transmission line impact on residential property values”, *The Appraisal Journal*, Vol.71, No.3, pp. 244.

and Wang (2005), the sharing of results from similar studies would aid in the development of a global database to assist appraisers in determining the perceived level of risk associated with towers and other similar structures from geographically and socio-economically diverse areas.

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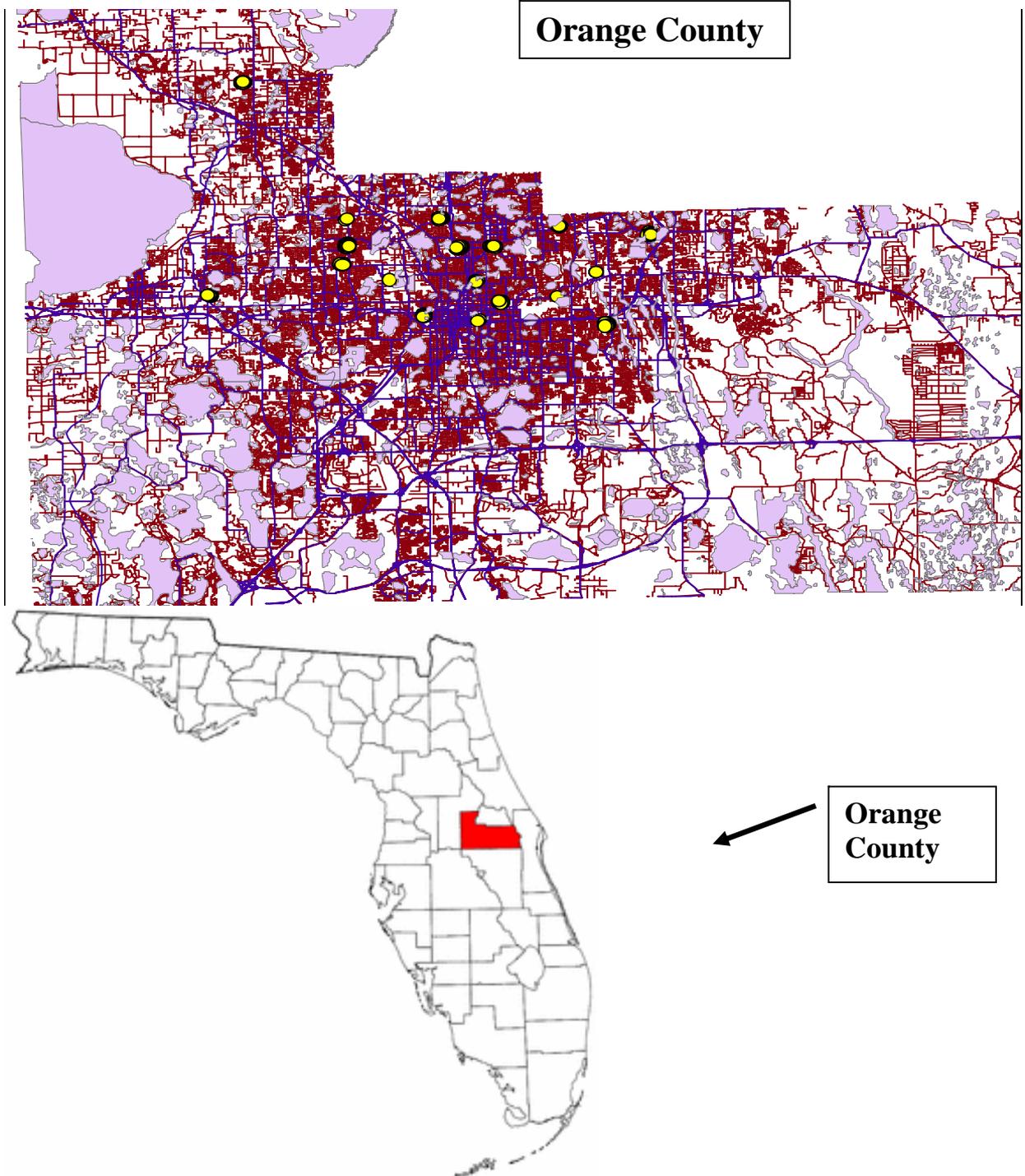
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Appendix I - Location Map



Appendix II – Model 1 & 2 Results

Table 2: Model 1 (n = 5783); Adjusted R-Square = .8219987					
Variables	Est. Coefficient	Std. Error	Std. Coefficient	t-Stat	Significance
Constant	3.689244	0.257416		14.332	0.0000
AFTER_TWR	1.46E-02	5.08E-03	0.0353	2.867	0.0042
AFTER_TWR*AGE	5.99E-04	2.62E-04	0.0395	2.29	0.0221
AFTER_TWR*LOT	8.79E-07	2.91E-07	0.0272	3.018	0.0026
SQFT	3.88E-04	8.20E-06	1.2072	47.368	0.0000
SQFT2	-3.02E-08	1.90E-09	-0.3779	-15.912	0.0000
SQFT*AGE	3.52E-07	1.78E-07	0.0429	1.982	0.0475
AGE	-2.81E-03	5.17E-04	-0.1739	-5.429	0.0000
AGE2	7.12E-05	9.94E-06	0.1527	7.165	0.0000
XCOORD	-1.14E-06	1.61E-07	-0.0432	-7.105	0.0000
YCOORD	3.05E-06	4.48E-07	0.0456	6.799	0.0000

Table 3: Model 2 (n = 5783); Adjusted R-Square = .826257					
Variables	Est. Coefficient	Std. Error	Std. Coefficient	t-Stat	Significance
Constant	3.9082	0.2556		15.291	0.0000
AFTER_TWR	0.011495	5.05E-03	0.0279	2.275	0.0230
AFTER_TWR*AGE	5.57E-04	2.59E-04	0.0367	2.151	0.0315
AFTER_TWR*LOT	1.25E-06	2.91E-07	0.0387	4.301	0.0000
SQFT	3.98E-04	7.78E-06	1.2385	51.236	0.0000
SQFT2	-3.21E-08	1.89E-09	-0.4011	-16.994	0.0000
SQFT*AGE	-----				
AGE	-2.29E-03	4.36E-04	-0.1418	-5.247	0.0000
AGE2	7.11E-05	9.81E-06	0.1524	7.245	0.0000
XCOORD	-1.67E-06	1.65E-07	-0.0633	-10.134	0.0000
YCOORD	3.26E-06	4.45E-07	0.0487	7.324	0.0000
500MTRS	2.30E-02	2.94E-03	0.0699	7.835	0.0000
450MTRS	1.91E-02	3.97E-03	0.0344	4.813	0.0000
400MTRS	2.17E-02	4.04E-03	0.0376	5.364	0.0000
350MTRS	1.04E-02	4.30E-03	0.0162	2.415	0.0158
200MTRS	-2.75E-02	6.12E-03	-0.0271	-4.489	0.0000
150MTRS	-1.56E-02	7.16E-03	-0.0128	-2.177	0.0295

Appendix III – Model 3 Results

Table 5: Model 3 (<i>n</i> = 5783); Adjusted R-Square = .8282641					
Variables	Est. Coefficient	Std. Error	Std. Coefficient	<i>t</i> -Stat	Significance
Constant	3.097387	0.268028		11.556	0.0000
AFTER_TWR	0.012722	4.42E-03	0.0309	2.877	0.0040
AFTER_TWR*AGE			--		
AFTER_TWR*LOT	1.26E-06	2.86E-07	0.0389	4.4	0.0000
AFTER_TWR*DISTANCE2	2.72E-09	7.73E-10	0.055	3.519	0.0004
SQFT	4.01E-04	8.45E-06	1.2464	47.46	0.0000
SQFT2	-3.04E-08	1.93E-09	-0.3797	-15.726	0.0000
SQFT*AGE			---		
AGE	-2.80E-03	3.95E-04	-0.1731	-7.077	0.0000
AGE2	6.72E-05	9.70E-06	0.1442	6.931	0.0000
XCOORD	-1.61E-06	1.63E-07	-0.061	-9.911	0.0000
YCOORD	4.70E-06	4.80E-07	0.0702	9.798	0.0000
DISTANCE	5.69E-05	5.29E-06	0.2548	10.751	0.0000
DISTANCE2	-1.49E-08	1.22E-09	-0.2927	-12.258	0.0000
DISTANCE*AGE	6.20E-07	1.28E-07	0.0909	4.829	0.0000
DISTANCE*SQFT	-5.43E-09	2.71E-09	-0.0568	-2.002	0.0453

Attachment 3

Report

Tom Keith and Associates

Impact of Cell Tower on Surrounding Properties
By Tom J. Keith & Associates, Inc.
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The following pages illustrate how to quantify the impact of a cell tower on surrounding properties. Property values surrounding several towers are studied in order to quantify the impact.

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Tower #306527



Address:	5409 Spence Farm Rd.
City:	Holly Springs
State:	North Carolina
Zip Code:	27540
Latitude:	35 - 36 - 22.6 N 35.60627
Longitude:	78 - 49 - 33.2 W -78.8259

SITE SPECS

MTA:	Charlotte-Raleigh
BTA:	Raleigh-Durham, NC
MSA/RSA:	Raleigh, NC
Ground Elevation AMSL:	0.0 ft.
Datum:	NAD83
County:	WAKE
Region:	USA
Comments:	
Driving Instructions:	Take US1 South to exit 95. Make left @ stop light. Go 9 miles make right on to Old Powell Road for 1 mile. Turn left onto Spencer Farm Road, @ intersection of Spencer Farm Road and Commission make left (infront of brick house) site is behind hous .3m

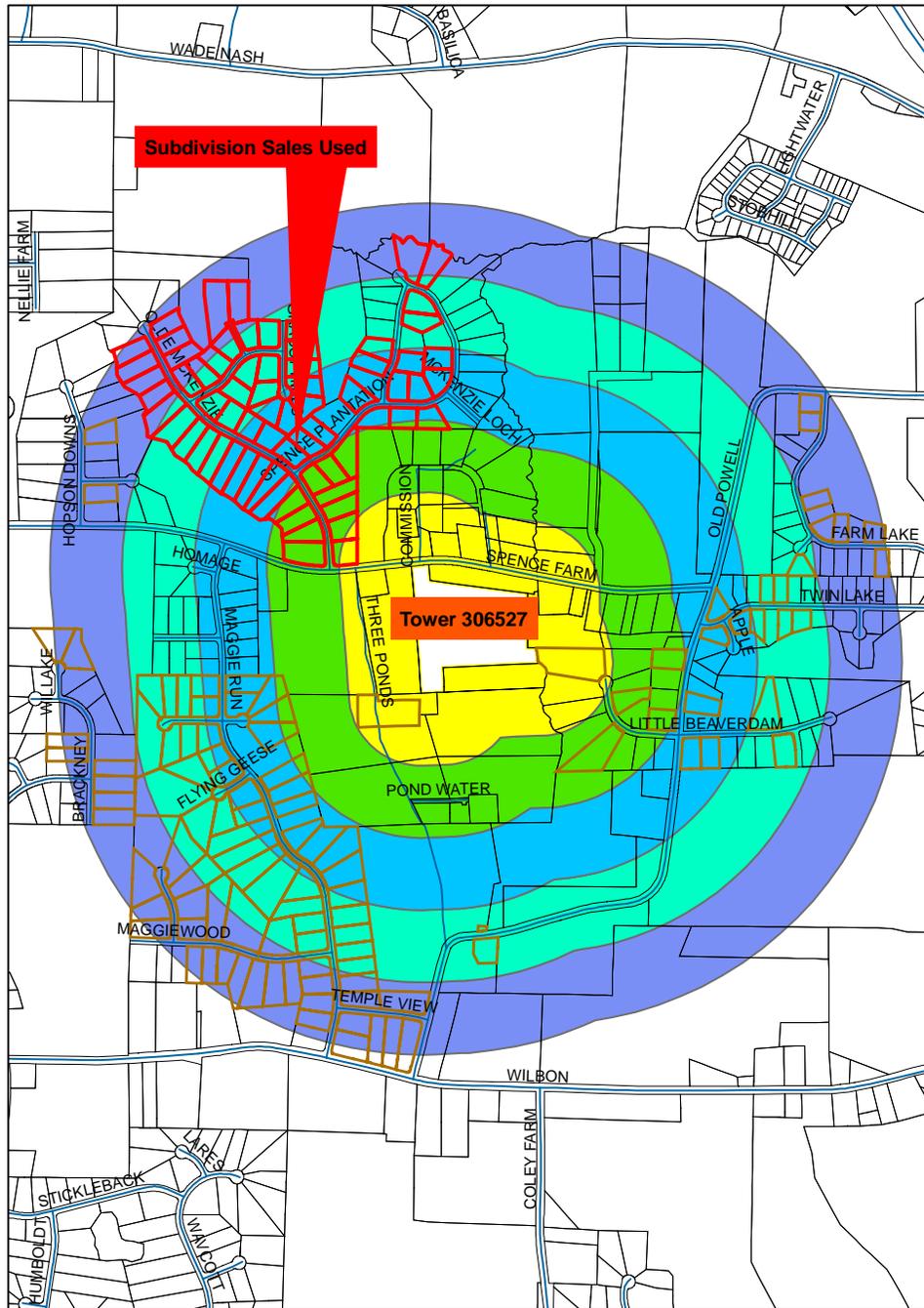
UTILITY INFORMATION

Telco Provider:	
Power Provider:	--No Business Entered--

TOWER DATA

Tower Number:	306527
Structure Height (AGL):	285 ft.
Structure Height (AMSL):	285 ft.
Clearance:	10 ft.
Total Height (AMSL):	295 ft.
Type:	Self Support
FAA #:	2003-ASO-5007-OE
FCC #:	1046859
Tower Status:	Active

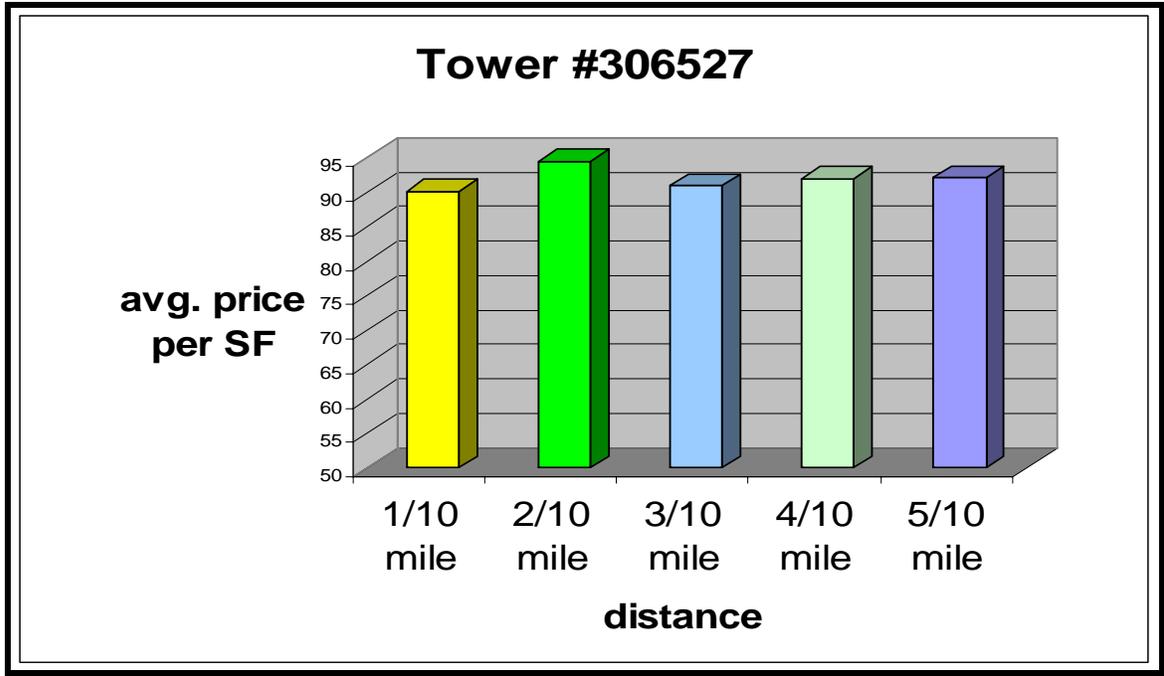
Tower #306527



Location of Sales within Buffer Rings of Tower Site

**WAKE COUNTY TOWER #306527
AVERAGE SALES PRICE PER SF**

Buffer Ring 1 1/10 Mile from Tower Site	Buffer Ring 2 2/10 Mile from Tower Site	Buffer Ring 3 3/10 Mile from Tower Site		Buffer Ring 4 4/10 Mile from Tower Site		Buffer Ring 5 5/10 Mile from Tower Site
\$ 95.96	\$ 89.42	\$ 79.29	\$ 92.24	\$ 85.76	\$ 104.17	\$ 81.56
\$ 84.51	\$ 89.63	\$ 85.82	\$ 92.45	\$ 94.14	\$ 101.85	\$ 85.54
	\$ 92.82	\$ 97.39	\$ 86.46	\$ 93.01	\$ 89.81	\$ 111.33
	\$ 79.99	\$ 85.05	\$ 85.99	\$ 113.36	\$ 86.08	\$ 90.76
	\$ 87.83	\$ 86.18	\$ 84.85	\$ 93.49	\$ 85.96	\$ 96.15
	\$ 126.17	\$ 96.57	\$ 85.36	\$ 97.50	\$ 87.83	\$ 109.97
	\$ 81.71	\$ 97.47	\$ 85.47	\$ 91.99	\$ 80.65	\$ 87.75
	\$ 107.91	\$ 94.80	\$ 101.63	\$ 88.48	\$ 87.80	\$ 89.59
	\$ 95.98	\$ 114.09	\$ 87.61	\$ 81.27	\$ 96.72	\$ 90.49
		\$ 94.30	\$ 89.51	\$ 108.16	\$ 82.49	\$ 86.24
		\$ 87.27	\$ 87.08	\$ 85.55	\$ 89.82	\$ 87.53
		\$ 91.58	\$ 94.59			\$ 88.64
\$90.24	\$94.61	\$90.96		\$92.09		\$92.13



As you will note we have averaged the price per square foot for dwellings located within each of the buffer rings.

Buffer Ring 1=	\$ 90.24
Buffer Ring 2=	\$ 94.61
Buffer Ring 3=	\$ 90.96
Buffer Ring 4=	\$ 92.09
Buffer Ring 5=	\$ 92.13

As you can observe from the charts and data above for tower #306527, there does not appear to be any significant or consistent change in value from the properties located in each buffer ring. Buffer ring one had a value of 90.24, which rises in buffer ring two to \$94.61. This rise could be of consideration until the fall in value of buffer ring three with \$90.96. Buffer ring four has a slight increase in value to \$92.09. The values rise and fall as you move out from ring one to ring five, concluding that the tower does not affect the value of the properties as distance increases from tower.

Attachment 4

Report

Valbridge Property Advisors

How Does the Proximity to a Cell Tower Impact Home Values?

September 14, 2018



Valbridge Property Advisors conducts market studies to determine the impact of wireless communication towers on property values in four metropolitan U.S. cities

Valbridge Property Advisors recently completed market studies in Boston, Dallas, Phoenix, and Raleigh, to determine the impact of the presence of wireless communications towers on residential property values.

THE PROCESS

The studies were conducted in multiple sub-areas of each city, which were then compiled to produce measurable results. Home sale values demonstrated no measurable difference for those homes within a 0.25-mile radius sphere of influence of the cell tower and those homes in a 0.50-1.0 mile radius outside of the cell tower sphere of influence. In many of the sub-areas, home prices increased nominally. No measurable difference is defined as a less than 1% difference; nominal difference is defined as 1-3%.

To prepare the sub-area studies, the center points of each sub-area's primarily single-family residential areas or specific subdivisions were identified by latitude and longitude. Single-family residential sales with both a qualified buyer and a qualified seller from the first quarter 2015 through first quarter 2018 were located and verified to assess the transactions.

THE RESULTS ARE IN

BOSTON

The Boston study revealed 10 of 22 pairings of home sales with higher sale prices within the 0.25- mile sphere of influence, 11 of 22 pairings with lower home prices, and one pairing indicating no difference. The data indicates cell towers do not have a negative impact on property values within a .25-mile radius of cell towers. Overall, the measurable difference is less than 1% in both the increasing and decreasing home price indications.

DALLAS

In Dallas, for homes in the .25 to 1.00-mile radius, there was no measurable difference. Out of 33 paired sales in five sub-areas, 20 pairings indicated higher values for those sales within the 0.25- mile sphere of influence, while 12 pairings indicated lower values and one indicated no difference. Overall, Dallas shows no measurable difference. The data indicates cell towers do not have a negative impact on property values within a .25-mile radius of cell towers.

PHOENIX

There were 37 paired sales in the Phoenix market, and 20 of the pairings indicated increased home prices within the 0.25% sphere of influence while seventeen of the 37 pairings indicated decreased home prices. Four of the five sub-areas studied had no measurable difference and one sub-area had a nominal difference.

RALEIGH

In Raleigh, fourteen of 22 pairings indicated higher home prices within the 0.25-mile sphere of influence while eight of 22 indicated slightly decreased home prices. Overall, the average and median prices increased in four of the five sub-area and one sub-area indicated no measurable difference. The data indicates cell towers do not have a negative impact on property values within a .25-mile radius of cell towers. Overall, the measurable difference is less than 1% in both the increasing and decreasing home price indications.

Attachment 5

Humboldt Bay Fire Response



Humboldt Bay Fire

Serving the City of Eureka and Greater Eureka Area since 2011

Humboldt Bay Fire Position on Proposed Addition of Cell Phone Antennas on City of Eureka Water Tower located at 1020 Wood St.

Issue:

In a partnership with Verizon/Epic Wireless Group, the City of Eureka is exploring installation of four cellular service antennas of the city-owned water tower located at 1020 Wood St. The Fire Chief has received e-mails from concerned citizens that live in the vicinity due to potential health concerns not only for residents in the vicinity but also Humboldt Bay Fire personnel who utilize the fire classroom on a regular basis. In response, the Fire Chief tasked our department's Community Risk Reduction (CRR) Staff to gather information and form a position for Humboldt Bay Fire on the matter.

Process:

CRR staff, consisting of the Deputy Fire Chief/Fire Marshal and Community Risk Reduction Specialist divided the task into two legs consisting of "pros" and "cons" of the project. "Pros" would be defined as information and evidence that definitively point to there being no health concerns for citizens and/or fire personnel in the vicinity of such towers. "Cons" would be information and evidence that show health and safety issues directly caused by such equipment.

Findings:

In research of this issue, there is a lot of information available both on and offline regarding the topic.

Two of the best resources we have available regarding the lack of hazard posed by cell phone towers/antennas come from the following:

1. Radio Frequency Electromagnetic Fields Exposure Report provided to Humboldt Bay Fire by Darang Tech (Electrical Engineer) via Verizon/Epic Wireless dated 12/21/2019. The report is written specific to the project and details the equipment proposed to be used, the Federal Communications Commission (FCC) safety guidelines on RF waves, and computer simulations of the electromagnetic fields generated by the project. The report details that the antennas, mounted 90 feet above the ground on the water tower, meet and exceed the minimum clearances required from the emissions for maximum permissible exposure (MPE). In fact, the only area(s) that could potentially be hazardous would be the catwalk area on the tower itself for personnel working on/maintaining the equipment. Personnel performing said maintenance would require special training and personal protective measures to ensure their safety. This however would not affect the surrounding area including HBF's classroom due to the distance and elevation.
2. The American Cancer Society's official website position on the issue is that there is currently "very little evidence to support this idea" that cell phone towers indeed cause cancer. They cite low energy levels, long wavelengths, and distance from the wave emitters as evidence that the risk posed is low. They do however state that there are few studies on human

exposure to emissions from cell phone towers, but in the studies that have been conducted do not show conclusive proof that exposure leads to cancer.

In regard to the “cons” or negative information found the following information was provided:

1. The International Association of Firefighters (IAFF) in a study from 2004 opposed the placement of cell phone towers on fire stations occupied by firefighters. They cite dated safety standards used by the U.S. Government circa 1985 as not being adequate or up to date with current technology. The study specifically opposes the use of Fire Stations as cell phone base location if mounted on the fire station with firefighters who live and work in the station 24/7 having increased exposure. They also cite the lack of specific studies on human beings and will remain opposed to such placements until definitive results are produced.
2. The Physicians for Safe Technology provided a report 3/14/2019 regarding exposure to cell towers. They cite studies from India, Brazil, and other countries that they claim shows some evidence of significant effects caused by cell phone tower emissions.

Conclusion:

Given the information that can be found online and in the Electrical Engineer’s report, and the distance and elevation from the unstaffed HBF Classroom at 3030 L St. from the proposed cellular antenna equipment, there is virtually no hazard posed to Humboldt Bay Fire personnel. If the distances were MUCH shorter placing personnel in a staffed 24/7 fire station in closer proximity to the emitters on a constant basis there would be cause for concern. However, the 90 feet of elevation of the equipment plus the distance from the equipment emitted fields, and the lack of constant staffing at the location all point to little to no hazard.

Resources:

Radio Frequency Electromagnetic Fields Exposure Report provided to Humboldt Bay Fire by Darang Tech (Electrical Engineer) via Verizon/Epic Wireless dated 12/21/2019 – REPORT ATTACHED

American Cancer Society Official Position from their official website:

<https://www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phone-towers.html>

International Association of Firefighters Position:

<http://www.iaff.org/hs/resi/celltowerfinal.htm>

Physicians for Safe Technology Position:

<https://mfsafetech.org/cell-tower-health-effects/>

Attachment 6

Updated RF Report

RADIO FREQUENCY ELECTROMAGNETIC FIELDS EXPOSURE REPORT

Prepared for Verizon

c/o Epic Wireless Group LLC

Site Name: West Buhne
Site Type: Water Tower

Located at:

**1020 Wood Street
Eureka, CA 95501
Latitude: 40.78088 / Longitude: -124.1575**

Report Date: 12/21/2018
Report By: Jamie Santos

**Based on FCC Rules and Regulations, Verizon will be compliant
provided recommendation(s) are implemented.**

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1.0 EXECUTIVE SUMMARY

Dtech Communications, LLC (“Dtech”) has been retained by Epic Wireless Group LLC., contractors to Verizon, to determine whether its wireless communications facility complies with the Federal Communications Commission (“FCC”) Radio Frequency (“RF”) Safety Guidelines. This report contains a computer-simulated with an on-site visit analysis of the Electromagnetic Fields (“EMF”) exposure resulting from the facility. The analysis also includes assessment of existing wireless carriers on site, where information is provided. The table below summarizes the results at a glance:

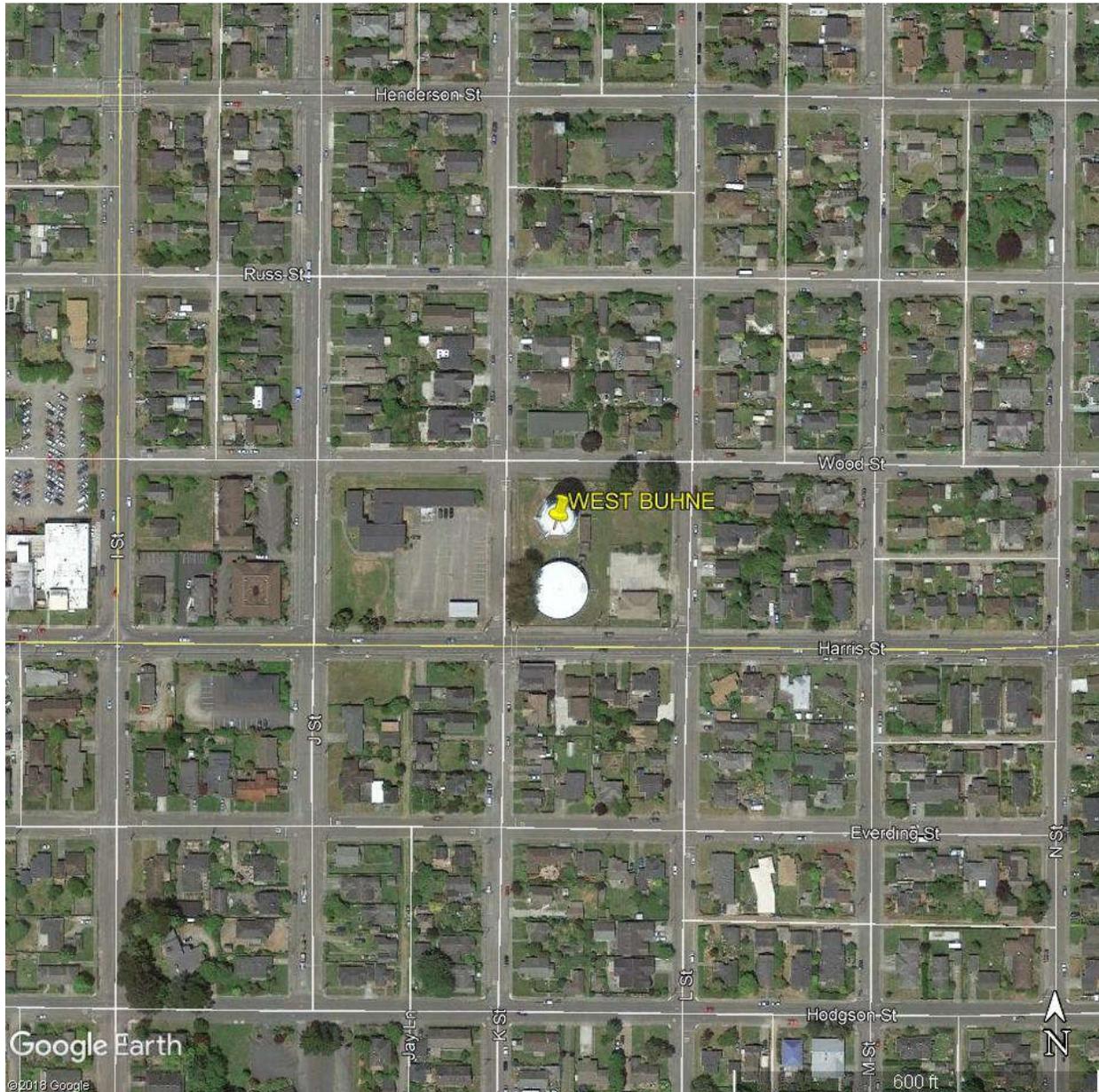
Table 1: EMF Summary

Verizon	Summary
Access Type	Ladder
Access to antennas locked	Recommended
RF Sign(s) @ access point(s)	NOC, Guidelines & Warning (Recommended)
RF Sign(s) @ antennas	None
Barrier(s) @ sectors	NA
Max EMF level for Verizon on Ground	0.5% General Population
Max cumulative EMF level for facility on Ground	0.5% General Population
Max EMF level for Verizon on Catwalk	14.5% General Population (2.9% Occupational)
Max cumulative EMF level for facility on Catwalk	14.5% General Population (2.9% Occupational)
Min Clearance Distance from Face of Verizon’s Antennas	65 Feet

2.0 SITE DESCRIPTION

The wireless telecommunication facility is located on the ground. The facility consists of 2 wireless carrier(s) or operator(s): Verizon & Other(s). The antennas are typically grouped into sectors pointing in different direction to achieve the desired areas of coverage. Verizon's antennas will be facade-mounted on the legs of the water tower and connected to the equipment via cables.

2.1 Site Map



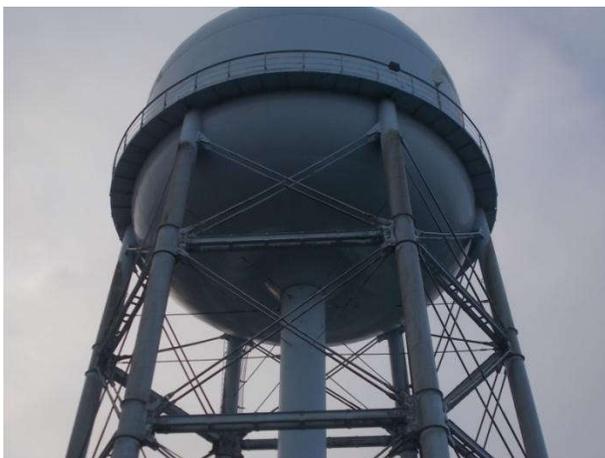
2.2 Site Photographs



General site view



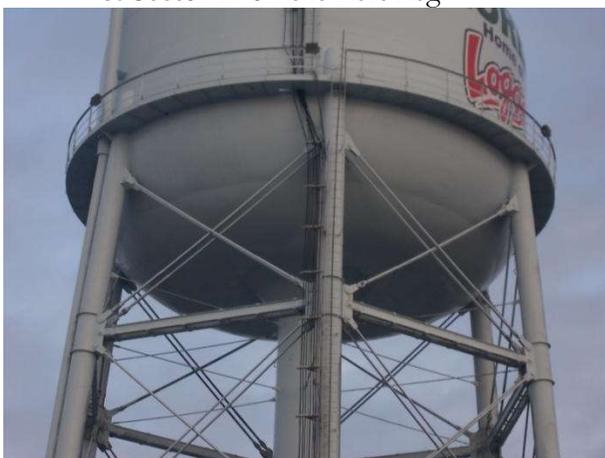
Access Ladder Access Ladder on the Leg of Tower



Verizon Proposed Location of Sector A on Right Leg & Sector D on the Left Leg



Verizon Proposed Location of Sector B on Center Leg



Verizon Proposed Locations of Sector C on Center Leg



Verizon Proposed Location of Equipment Shelter



Other Omni and Dish Antennas



Other Dish Antenna on Catwalk

2.3 Antenna Inventory

Technical specifications in the table below are provided by our clients and/or gathered from physical field surveys where applicable and/or possible. Conservative estimates are used where information is not provided or available.

Table 2: Site Technical Specifications

Antenna ID	Operator	Antenna Mfg	Antenna Model	Type	Frequency (MHz)	Orientation (°T)	Horizontal BWidth (°)	Antenna Aperture (ft)	Antenna Gain (dBd)	Total Input Power (Watts)	Total ERP (Watts)	Bottom Tip Height Above Ground (Z) (ft)	Bottom Tip Height Above Catwalk (Z) (ft)	Bottom Tip Height Above Ant. Level (Z) (ft)
A1	Verizon	Commscope	NHH-45B-R2B	Panel	746	20	48	6.0	14.0	283	7080	87.0	-15.0	0.0
A1	Verizon	Commscope	NHH-45B-R2B	Panel	2120	20	41	6.0	17.9	283	17425	87.0	-15.0	0.0
A2	Verizon	Commscope	NHH-45B-R2B	Panel	880	20	43	6.0	15.1	283	9142	87.0	-15.0	0.0
B1	Verizon	Commscope	NHH-45B-R2B	Panel	746	90	48	6.0	14.0	283	7080	87.0	-15.0	0.0
B1	Verizon	Commscope	NHH-45B-R2B	Panel	2120	90	41	6.0	17.9	283	17425	87.0	-15.0	0.0
B2	Verizon	Commscope	NHH-45B-R2B	Panel	880	90	43	6.0	15.1	283	9142	87.0	-15.0	0.0
C1	Verizon	Commscope	NHH-45B-R2B	Panel	746	180	65	6.0	12.3	283	4798	87.0	-15.0	0.0
C1	Verizon	Commscope	NHH-45B-R2B	Panel	2120	180	64	6.0	16.4	283	12251	87.0	-15.0	0.0
C2	Verizon	Commscope	NHH-45B-R2B	Panel	880	180	60	6.0	12.6	283	5201	87.0	-15.0	0.0
D1	Verizon	JMA	X7CQAP-FRO-633-VR	Panel	746	300	34	6.0	16.8	283	13399	87.0	-15.0	0.0
D1	Verizon	JMA	X7CQAP-FRO-633-VR	Panel	2120	300	35	6.0	16.7	283	13097	87.0	-15.0	0.0
D2	Verizon	JMA	X7CQAP-FRO-633-VR	Panel	880	300	30	6.0	17.4	283	15384	87.0	-15.0	0.0
1	Others 1	Unknown	Unknown	Omni	850	0	360	12.0	9.0	-	315	138.7	36.7	N/A
2	Others 1	Unknown	Unknown	Omni	1900	0	360	6.0	10.0	-	125	138.5	36.5	N/A
3	Others 1	Unknown	Unknown	Omni	850	0	360	12.0	9.0	-	315	138.7	36.7	N/A
4	Others 1	Unknown	Unknown	Omni	1900	0	360	6.0	10.0	-	125	138.5	36.5	N/A
5	Others 1	Unknown	Unknown	Omni	1900	0	360	6.0	10.0	-	125	138.5	36.5	N/A
6	Others 1	Unknown	Unknown	Omni	1900	0	360	6.0	10.0	-	125	138.5	36.5	N/A
1	Others 2	Unknown	Unknown	Dish	10000	0	2	2.0	38.0	-	65	134.0	32.0	N/A
2	Others 2	Unknown	Unknown	Dish	10000	90	2	2.0	38.0	-	65	134.0	32.0	N/A
3	Others 2	Unknown	Unknown	Dish	10000	0	2	2.0	38.0	-	65	107.0	5.0	N/A

3.0 ANALYSIS

3.1 Site Diagram

Figure 1: Site Diagram - Plan (bird's eye view)



3.2 Emission Predictions

Figure 2: Plan (bird's eye) view map of results compared to FCC's General Population MPE (Maximum Permissible Exposure) Limits. Gray represents areas where exposure levels are calculated to be at or below 5%; Green- between 5% & 100% (below MPE limits); blue, yellow & red – greater than 100% (exceeds MPE limits). Individuals can safely occupy areas in gray and green for indefinite amount of time; whereas areas in blue, yellow & red must be restricted to RF trained personnel who has been made fully aware of potential for exposure, has control and knows how to reduce their exposure with the use of personal protection equipment or has the ability to power down the transmitters.

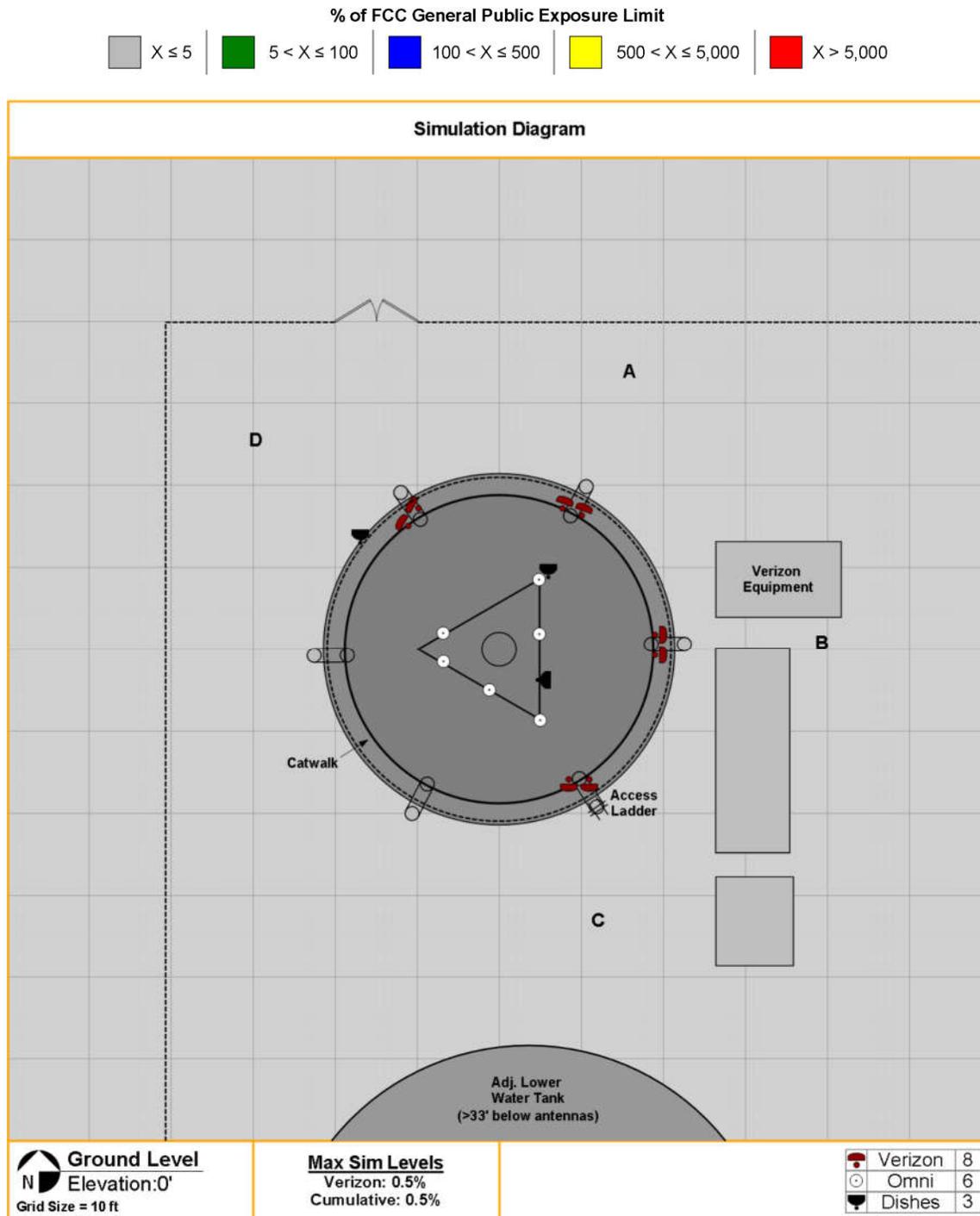


Figure 3: Plan (bird's eye) view map of results compared to FCC's General Population MPE (Maximum Permissible Exposure) Limits. Gray represents areas where exposure levels are calculated to be at or below 5%; Green- between 5% & 100% (below MPE limits); blue, yellow & red – greater than 100% (exceeds MPE limits). Individuals can safely occupy areas in gray and green for indefinite amount of time; whereas areas in blue, yellow & red must be restricted to RF trained personnel who has been made fully aware of potential for exposure, has control and knows how to reduce their exposure with the use of personal protection equipment or has the ability to power down the transmitters.

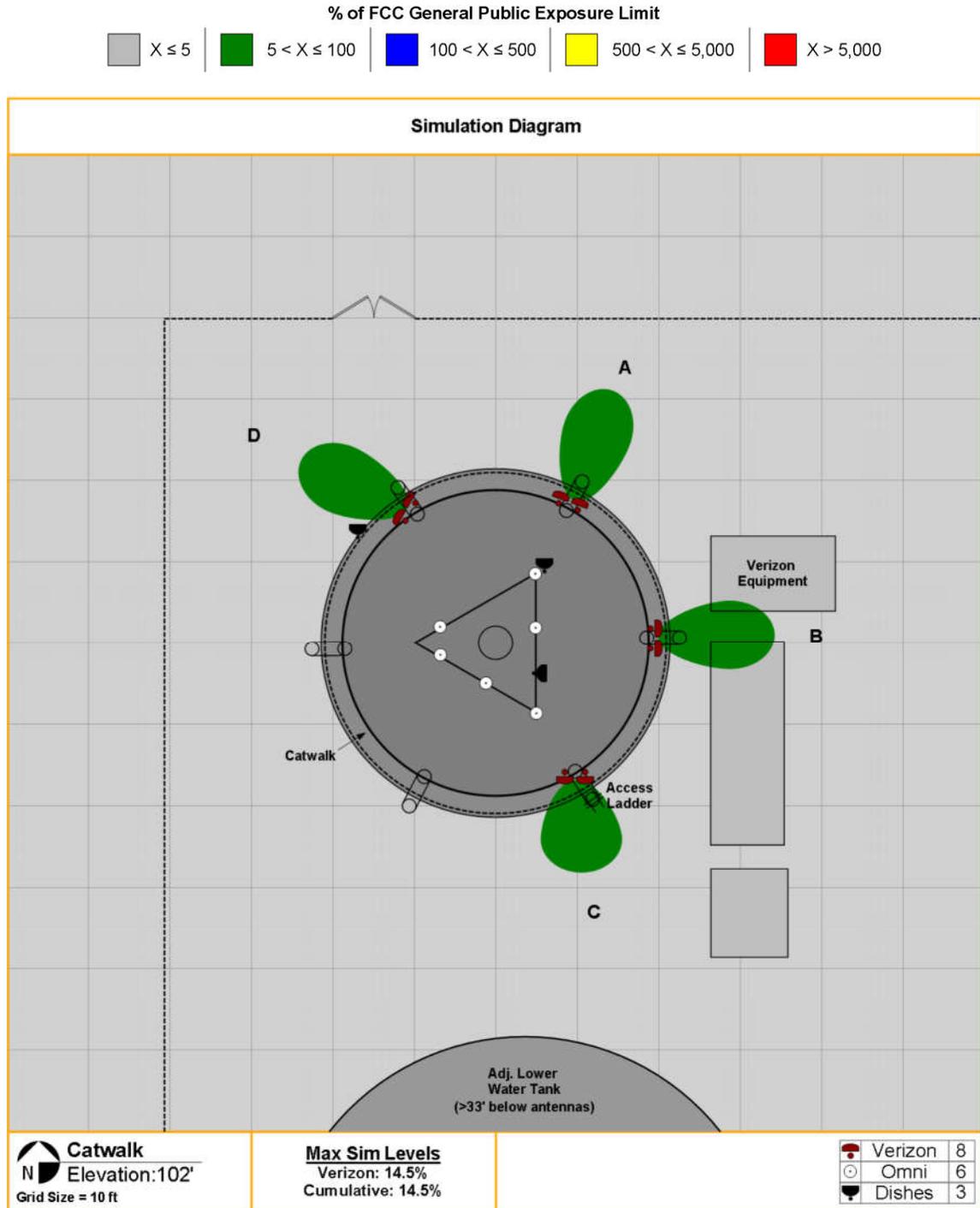
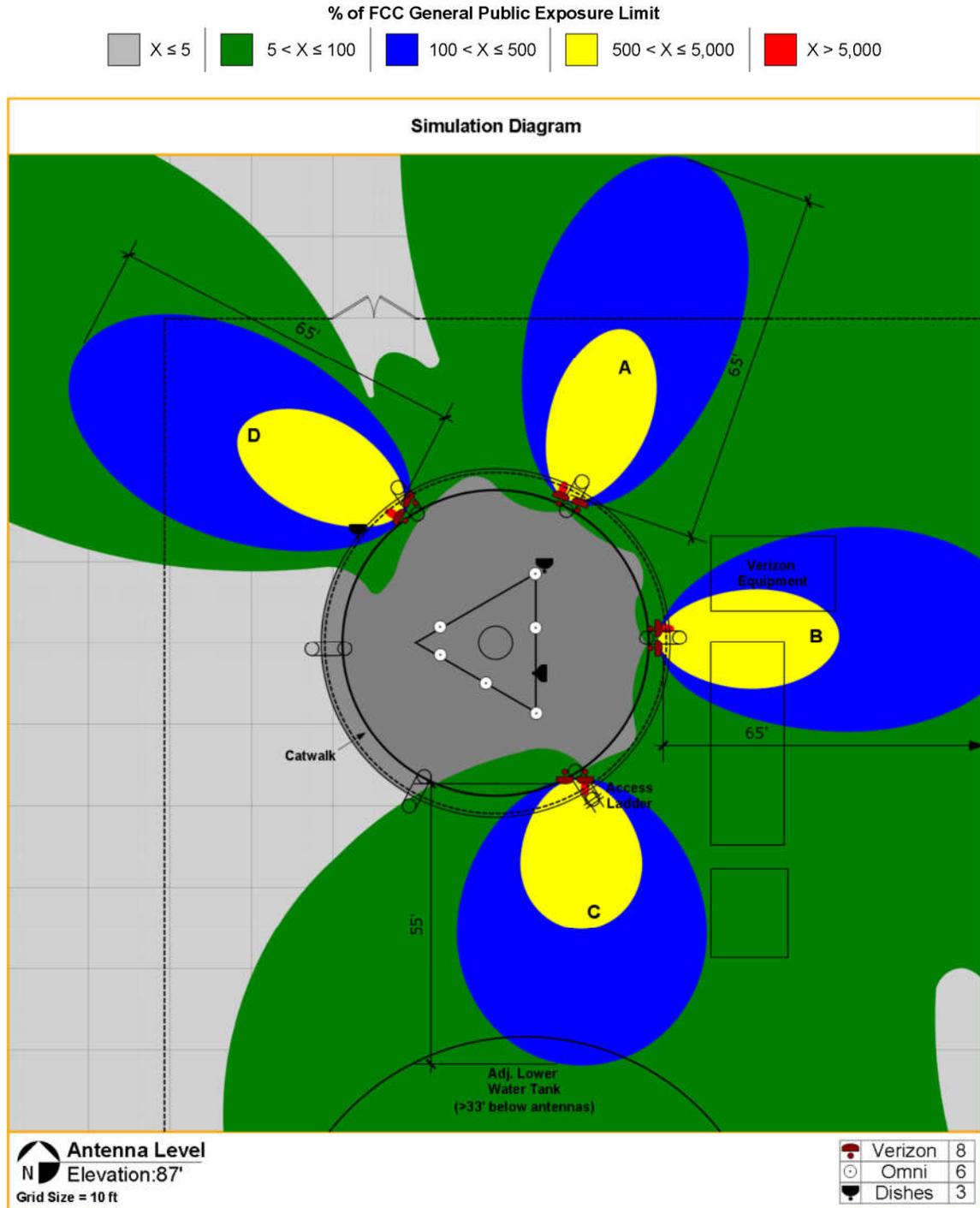


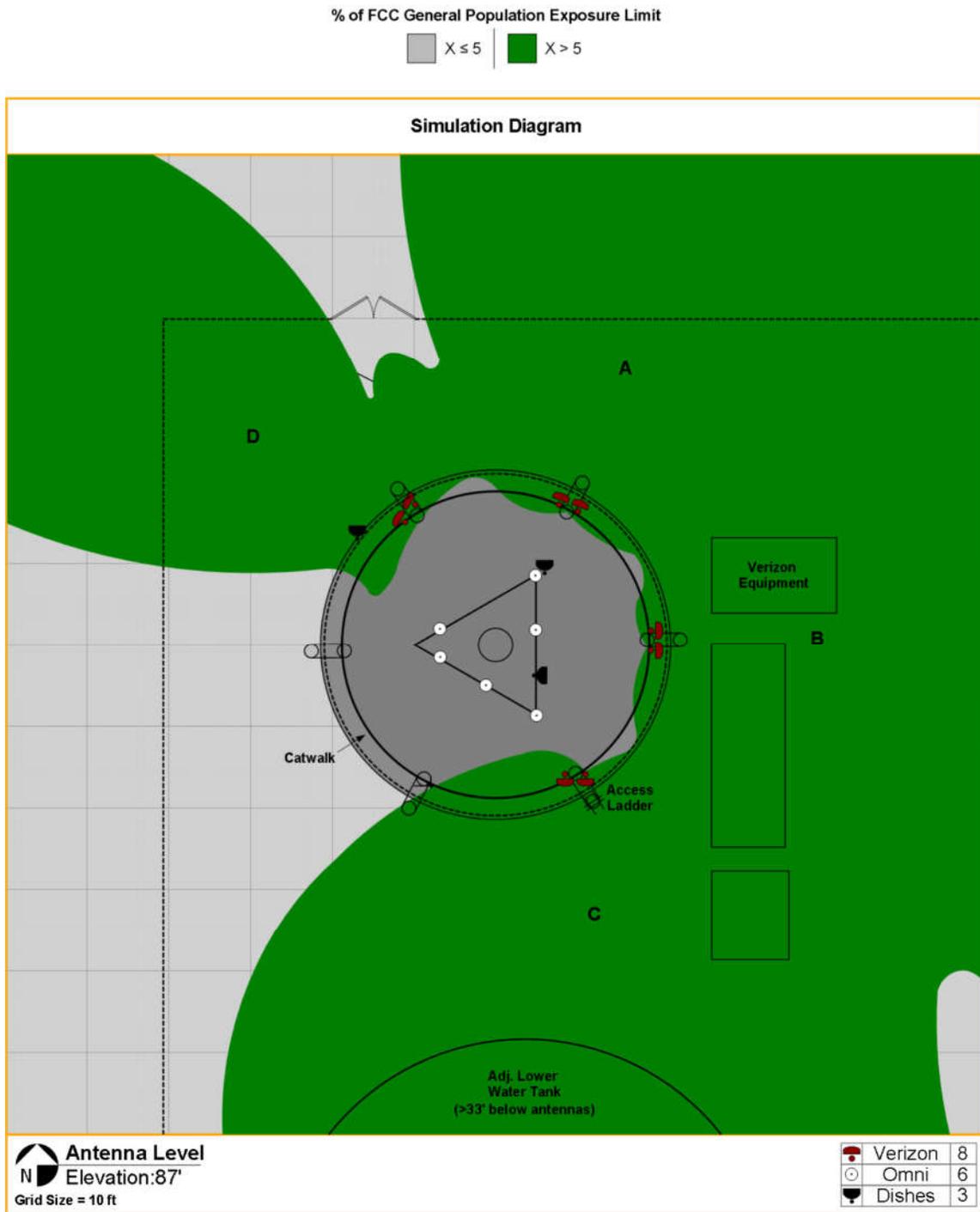
Figure 4: Plan (bird's eye) view map of results compared to FCC's General Population MPE (Maximum Permissible Exposure) Limits. Gray represents areas where exposure levels are calculated to be at or below 5%; Green- between 5% & 100% (below MPE limits); blue, yellow & red – greater than 100% (exceeds MPE limits). Individuals can safely occupy areas in gray and green for indefinite amount of time; whereas areas in blue, yellow & red must be restricted to RF trained personnel who has been made fully aware of potential for exposure, has control and knows how to reduce their exposure with the use of personal protection equipment or has the ability to power down the transmitters.



3.3 Five Percent Contributions

Mitigation measures are a shared responsibility for carriers whose RF emission levels exceed five percent of the FCC's exposure limits in areas of non-compliance.

Figure 5: Plan (bird's eye) view map of results compared to FCC's General Population MPE (Maximum Permissible Exposure) Limits. Gray represents areas where exposure levels are calculated to be at or below 5%; Green – greater than 5%.



4.0 CONCLUSION

4.1 Results

For a person standing in accessible areas on the ground and catwalk, calculations for Verizon's site including contributions from existing carriers resulted in exposure levels below the FCC's most stringent General Population MPE Limits (see figure 2 - 3).

At antenna elevation, the highest calculated exposure level is above the FCC's General Population MPE Limits near the Verizon antenna(s) (see figure 4). The overexposed (yellow, blue and red) areas extend 65-feet from the front face of the Verizon antenna(s). From the provided drawings, there are no other buildings or surrounding structures at antenna elevation within 65-feet of the Verizon antenna(s). Beyond 65-feet, exposure levels are predicted to be below the FCC's most stringent General Population MPE Limits.

The antennas are mounted on a tall tower and therefore not accessible by the general public. It is presumed that Verizon employees and facility owners are aware of the transmitting antennas and will take appropriate precautions when working near them. However, there may be situations where workers i.e. water tower personnel, painters, etc. may find themselves directly in front of the antennas where exposure levels may exceed the FCC's MPE Limits. Individuals entering the site or working near/in front of antennas must receive appropriate RF safety training¹ and be made aware of the HotZones (areas where RF exposure may potentially exceed FCC safety limits). In addition, contact information should be made available in the event work is required within the HotZones.

This study already took into account contributions from existing carriers at this facility. There may be other wireless facilities within 2000 feet; however, their contributions would be negligible and would not impact the results of this study.

4.2 Recommendation(s)

The following compliance action(s) would be sufficient to meet the FCC's and Verizon's RF Safety Guidelines² (see figure 6):

- 1) Access to the facility must be kept locked to restrict routine access by the general public.
- 2) Install WARNING Sign(s), NOC INFORMATION Sign(s) and GUIDELINES Sign(s) at antenna access points, gate entrances or climbing access points.

Compliance actions, if necessary, for the other carrier(s) at this site have not been determined as part of this study since estimates were used for their site specifications.

¹ See Appendix for Dtech's RF Safety training program - AntennaView®

² Verizon Radio Frequency Compliance (RFC) Signage & Demarcation Policy – June 2014

Figure 6: Recommendation(s)



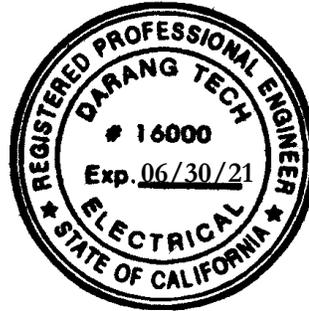
4.3 Statement of Compliance

Based on the above results, analysis and recommendation(s), it is the undersigned's professional opinion that Verizon's site including contributions from existing carriers will be compliant with the FCC's RF Safety Guidelines provided recommendation(s) are implemented.

4.4 Engineer Certification

This report has been prepared by or under the direction of the following Registered Professional Engineer: Darang Tech, holding California registration number 16000. I have reviewed this report and believe it to be both true and accurate to the best of my knowledge.


Darang Tech, P.E.



Appendix A: Background

Dtech uses the FCC’s guidelines described in detail in Office of Engineering & Technology, Bulletin No. 65 (“OET-65”) “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”. The table below summarizes the current Maximum Permissible Exposure (“MPE”) safety limits classified into two groups: General population and Occupational.

Table 3: FCC MPE Limits (from OET-65)

Frequency (Mhz)	General Population/ Uncontrolled MPE (mW/cm ²)	Averaging Time (minutes)	Occupational/ Controlled MPE (mW/cm ²)	Averaging Time (minutes)
30 - 300	0.2	30	1.0	6
300 - 1500	Frequency (Mhz)/1500 (0.2 – 1.0)	30	Frequency (Mhz)/300 (1.0 – 5.0)	6
1500 - 100,000	1.0	30	5.0	6

General population/uncontrolled limits apply in situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment, and may not be fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public always fall under this category when exposure is not employment-related.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment, and those persons have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits, as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

It is important to understand that the FCC guidelines specify *exposure* limits not *emission* limits. For a transmitting facility to be out of compliance with the FCC's RF safety guidelines an area or areas where levels exceed the MPE limits must, first of all, be in some way *accessible* to the public or to workers. When accessibility to an area where excessive levels is appropriately restricted, the facility or operation can certify that it complies with the FCC requirements.

Appendix B: Measurement and/or Computer Simulation Methods

Spatial averaging measurement technique is used. An area between 2 and 6 feet, approximately the size of an average human, is scanned in single passes from top to bottom in multiple planes. When possible, measurements were made at very close proximity to the antennas and inside the main beam where most of the energy is emitted. The spatial averaged values were recorded.

Dtech uses an industry standard power density prediction computer Model³ to assess the worse-case, cumulative EMF impact of the surrounding areas of the subject site. The Model does not take into account losses due to buildings. Its methodologies are conservative enough to account for typical down-tilts deployed in wireless communications. In addition, the analysis is performed at 100% duty cycle-all transmitters are active at all times and transmitting at maximum power. For purposes of a cumulative study, nearby transmitters are included where possible. The result is a surrounding area map color-coded to percentages of the applicable FCC's MPE Limits. A result higher than 100% exceeds the Limits.

Appendix C: Limitations

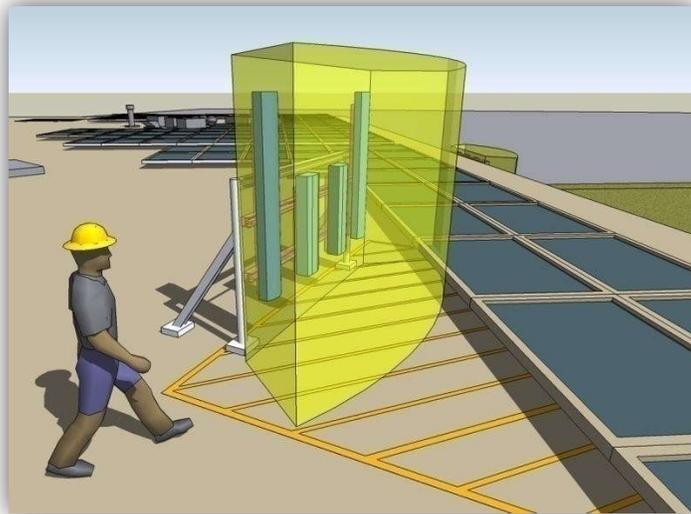
The conclusions in this document rendered by Dtech are based solely upon the information collected during the site survey and/or furnished by our Client which Dtech believes is accurate and correct. Dtech, however, has no responsibility should such Client provided information prove to be inaccurate or incorrect. Third party specification estimates used for cumulative computer simulation purposes, where applicable, are based on common industry practices and our best interpretation of available information. Data, results and conclusions in this document are valid as of its date. However, as mobile technologies continuously change, these data, results and conclusions may also be at variance with such future changes. Dtech has no responsibility to update its survey or report to account for such future technology changes. This document was prepared for the use of our Client only and cannot be utilized by any third party for any purpose without Dtech's written consent. Dtech shall have no liability for any unauthorized use of this document and any such unauthorized user shall defend, indemnify and hold Dtech and its owners, directors, officers and employees harmless from and against any liability, claim, demand, loss or expense (including reasonable attorney's fees) arising from such unauthorized use.

³ Dtech uses Roofmaster(tm) 2015 Version 15.7.2.18 per Verizon's direction.

Appendix D: AntennaView®

Dtech Communications offers a unique, online tool (AntennaView®) to train, identify and inform individuals of site-specific HotZones – areas that may potentially exceed the FCC’s Safety Limits. AntennaView® is an online, interactive training tool that will educate nontechnical people in about ten minutes. It is a site-specific, RF safety training program that requires the end user to sign an online agreement thereby limiting the liability to the landlord and carriers. Some of the advantages include:

- Virtual walk-through in 3-D with corresponding photographs
- Site-specific, interactive, simple to understand
- Delivers pertinent information i.e. HotZones (areas that may potentially exceed FCC safety limits), site owners and contact numbers.
- User online agreement = accountability



We invite you to take a quick tour at www.AntennaView.com and see how easy to understand and informative AntennaView® is.

Under Article 47 CFR § 1.1307(b), the FCC & OSHA mandates wireless operators/facility owners to have an RF survey completed including a safety plan and training to ensure that their tenants, employees and contractors who work in or around RF sites are aware of the potential risks posed by RF radiation. Most cell sites are located on building rooftops where HVAC contractors, window washers, painters, etc. routinely work and generally do not know what antennas even look like. Dtech Communications can help with ongoing FCC/OSHA compliance and provide practical training that is easy to understand by anyone regardless of their technical background.

Appendix E: Verizon's RF Advisory Signs



GUIDELINES Sign



NOC INFORMATION Sign



NOTICE Sign



CAUTION Sign



WARNING Sign