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brownrudnick

Michael R. Dolan, Esq.
direct dial: 401-276-2610
mdolan@brownrudnick.com

March 24, 2020

Board of Selectmen
Town of Bourne
c/o Town Clerk
24 Perry Avenue
Buzzards Bay, MA 02532

RE: Application of New Cingular Wireless PCS, LLC (d/b/a AT&T) for a Grant of Location for a Wireless Small Cell Facility, Including Telecommunication Wires and Wireless Attachments and Appurtenances on a Replacement Utility Pole in the Public Right of Way at the Following Location:

Pole #2/15-S – 5 Old Bridge Road, Bourne, MA 02532

Dear Honorable Members of the Board of Selectmen:

We represent New Cingular Wireless PCS, LLC (d/b/a "AT&T") with respect to its deployment of small cell facilities in the Town of Bourne and the Commonwealth of Massachusetts. AT&T is licensed by the Federal Communications Commission (the "FCC") to provide wireless communications services in the Town of Bourne and throughout the Commonwealth of Massachusetts.

On behalf of AT&T and while reserving all rights, please accept this submission as an application for approval (the "Application") for one (1) small cell facility on a replacement utility pole located in the public right of way near the above referenced address (the "Site"). The Application is filed pursuant to the federal Telecommunications Act of 1996 (the "Act"), the Declaratory Ruling and Third Report and Order 18-133 (the "Order") issued by the FCC in September 2018 https://docs.fcc.gov/public/attachments/FCC-18-133A1_Rcd.pdf and Massachusetts General Laws Chapter 166, Sections 21, 22 and 25A for telecommunication wires and wireless attachments and appurtenances attached to utility poles.

AT&T has entered into a Pole Attachment Agreement with Eversource and we have included a license from Eversource to AT&T to submit the Application. The replacement pole complies with, and to the extent possible, are in accordance with the Act, the Order and state law. The replacement pole will be taller to make room in the communication space on the pole for the antenna.

We have also provided a detailed set of drawings (the "Plans") and map for this small cell facility. Additionally, we have provided photographs of a similar small cell installation installed by AT&T and located at 8 General Street, Lawrence, Massachusetts for use as an example of a typical installation with respect to the equipment shroud. Lastly, please find a generic small cell facility report demonstrating compliance with applicable emissions standards established by the FCC.

AT&T proposes this small cell facility in the Town of Bourne to deal with the rapidly increasing demands on AT&T's wireless network. This small cell facility will work in conjunction with the existing macro sites installed on rooftops, towers and other structures in and around the Town of Bourne. AT&T's radio frequency engineers targeted the proposed location due to the high traffic and data demands on AT&T's network in these areas. AT&T's existing macro cell sites are not providing adequate data capacity near the Site due to population, vehicular and foot traffic, multiple wireless devices in use and other contributing factors. This small cell facility will work to offload the demands on the macro sites and allow for increased data capacity and speed within the immediate vicinity of the Sites and near the existing macro sites.

This small cell facility will be installed using standard commercially accepted methods in accordance with all applicable federal, state and local laws, regulations and orders. As depicted on the Plans, this small cell installation on the replacement utility pole will include: fiber optic cable(s); remote radios in a small equipment cabinet 39" in height by 23" wide by 15" deep (7.8 cubic feet in volume) mounted to the pole at 11' 6" above ground level; an unobtrusive side mounted antenna measuring 25" long and 10" in diameter (1.22 cubic feet in volume) with a mounting bracket which extends 36" from the side of the pole; conduits and cable protectors; and, an electrical meter 8' above ground level with shutoff switch and grounding rod. The Plans also provide the proposed location, pole height, mounting height and equipment specifications.

The Telecommunications Act of 1996

Without the installation, AT&T would be unable to provide specifically established coverage and capacity objectives. The replacement utility pole is located within the limited geographic area whereby AT&T's radio frequency engineers determined that a wireless facility is required. The Act imposes substantial restrictions affecting the standard for granting the requested relief. The Act provides that: no laws or actions by any local government or planning or zoning board may prohibit, or have the effect of prohibiting, the placement, construction, or modification of communications towers, antennas, or other wireless facilities in any particular geographic area, see 47 U.S.C. §332(c)(7)(B)(i); local government or planning or zoning boards may not unreasonably discriminate among providers of functionally equivalent services, see 47 U.S.C. §332(c)(7)(B)(i); health concerns may not be considered so long as the emissions comply with the applicable standards of the FCC, see 47 U.S.C. §332(c)(7)(B)(iv); and, decisions must be rendered within a reasonable period of time, see 47 U.S.C. §332(c)(7)(B)(ii) and the Order commonly referenced as the applicable "shot clocks". The FCC shot clock in this instance is ninety (90) days from the submission of the Application.

We respectfully assert that AT&T's proposed small cell facility is reasonable and reasonably complies with the requirements of the Town of Bourne in light of the Act, the Order and state law. AT&T is willing to work cooperatively with the Town of Bourne with respect to

Board of Selectmen
Town of Bourne
March 24, 2020
Page 3

the deployment of its small cell facility and we look forward to your feedback. For the convenience of the Select Board, AT&T has provided a proposed Form of Order for your consideration.

If you have any questions, please don't hesitate to contact me. We look forward to presenting the Application at an upcoming meeting.

Sincerely,

BROWN RUDNICK LLP



Michael R. Dolan, Esq.

Enclosures: Plans
Structural Report
Photograph of Existing Small Cell Facility
Emissions Report

cc: Admin. Asst. to Selectmen

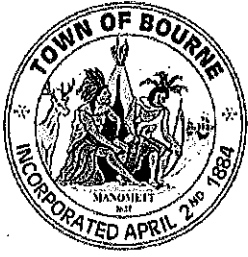
Extract: 1 Abuters List
 Database: LIVE
 Filter: Key IN 4208,4192,4193
 Sort:

Report #24: Owner Listing Report
 Fiscal Year: 2021

Bourne MA

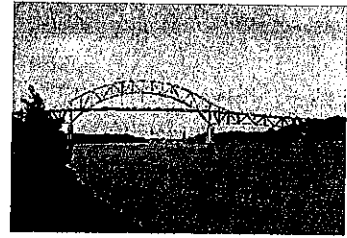
Key	Parcel ID	Owner	Location	LC/CI	Bk-Pr/Cert)/Dt	Mailing Street	Mailing City	ST	Zip Cd/Country
4192	20.3-118-0	BOURNE GARY J & IRENE E TRS OF BOURNE SUNDCCO	282 MAIN ST N 0310	11819/82	11/5/1998	414 WEST GROVE ST	MIDDLEBORO	MA	02346
4193	20.3-119-0	DEKKERS ROELA	7 OLD BRIDGE RD N 1010	26885/78	9/16/2011	7 OLD BRIDGE RD	BUZZARDS BAY	MA	02632
4208	20.3-132-0	CHU BENNY P TR OF CHINA BAY TRUST	304 MAIN ST N 0310	15718/312	10/9/202	300 MAIN STREET	BUZZARDS BAY	MA	02632-3327

Total Records 3



TOWN OF BOURNE

Town Administrator
24 Perry Avenue – Room 101
Buzzards Bay, MA 02532
www.townofbourne.com
508.759.0600, Ext. 1308



Anthony E. Schiavi, Town Administrator
Email: aschiavi@townofbourne.com

NOTICE

To: Benny P Chu
Trust of China Bay Trust
300 Main Street
Buzzards Bay, MA 02532

Map 20.3 – 132-0

You are hereby notified that a public hearing will be held at 7:20 P.M. on Tuesday, May 5, 2020 upon the petition dated March 24, 2020 from Brown Rudnick LLP for application of New Cingular Wireless PCS, LLC d/b/a AT&T] for a Grant of Location for a Wireless Small Cell Facility, Including Telecommunications of Wires and Wireless Attachments and Appurtenances on a Replacement Utility Pole in the Public Right of Way at the following location: Pole #2/15-S – 5 Old Bridge Road, Bourne, MA 02532.

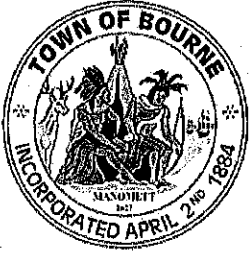
The meeting will be Zoom Remote with access for the phone number for calling in on the posted agenda on May 1, 2020.

You are being notified by which designated route of line you are an owner of real estate, as determined by the preceding assessment for taxation.

Please contact David Ford, AT&T Contractor at 508-821-6509 if you have any questions.

Anthony E. Schiavi
Town Administrator

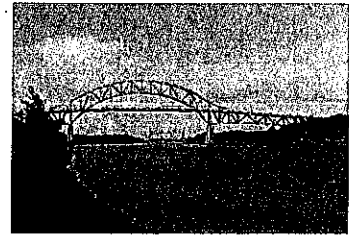
Dated: April 23, 2020



TOWN OF BOURNE

Town Administrator

24 Perry Avenue – Room 101
Buzzards Bay, MA 02532
www.townofbourne.com
508.759.0600, Ext. 1308



Anthony E. Schiavi, Town Administrator
Email: aschiavi@townofbourne.com

NOTICE

To: Gary J Bourne
Irene E Bourne
Trust of Bourne Sunoco
414 West Grove Street
Middleboro, MA 02346

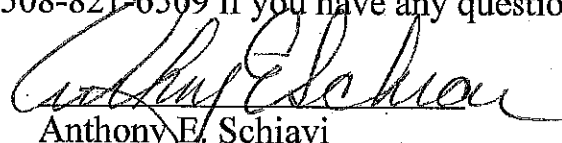
Map 20.3 – 118-0

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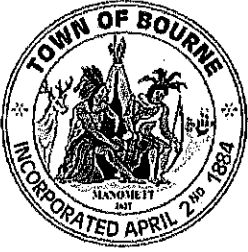
You are being notified by which designated route of line you are an owner of real estate, as determined by the preceding assessment for taxation.

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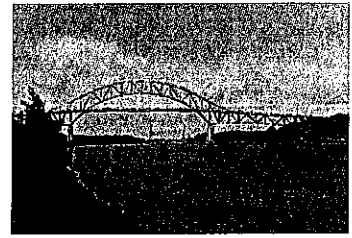

Anthony E. Schiavi
Town Administrator

Dated: April 23, 2020



TOWN OF BOURNE

Town Administrator
24 Perry Avenue – Room 101
Buzzards Bay, MA 02532
www.townofbourne.com
508.759.0600, Ext. 1308



Anthony E. Schiavi, Town Administrator
Email: aschiavi@townofbourne.com

NOTICE

To: Roel A Dekkers
7 Old Bridge Road
Buzzards Bay, MA 02532

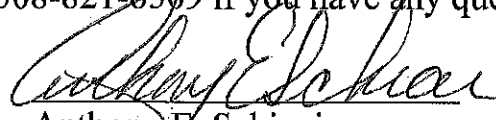
Map 20.3 – 119-0

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Please contact David Ford, AT&T Contractor at 508-821-6509 if you have any questions.


Anthony E. Schiavi
Town Administrator

Dated: April 23, 2020

M036_Parcels_Level3_update_2019

MAP_PAR_ID	SITE_ADDR
20.3_132.00	304 MAIN ST
20.3_118.00	282 MAIN ST
20.3_119.00	7 OLD BRIDGE RD

4206
4192
4193

Sundman, Nancy

From: Moore, Coreen
Sent: Tuesday, April 14, 2020 2:54 PM
To: Schiavi, Anthony; Cannon, Glenn
Cc: Sundman, Nancy; Murphy, Ken; Copeland, Jennifer; Steven P. Strojny PB
Subject: AT&T Telecommunication Utility Pole
Attachments: AT&T_ (Generic MA)_v1.pdf; CRAN_RCTB_UCAP_007 Structural Analysis 03092020.pdf; CRAN_RCTB_UCAP_007_CD_Rev1_03.24.20.pdf; Planning Memo_4.14.20.pdf

Attached please find my memo in reference to the request for a new telecommunication pole on Old Bridge Road
Coreen



COREEN V. MOORE
TOWN PLANNER

TOWN OF BOURNE
Office of the Town Planner

TOWN HALL 24 PERRY AVE.
BUZZARDS BAY, MA 02532
PHONE: 508-759-0600 ext #1346 • FAX: 508-759-0611
Email: cmoore@townofbourne.com



MEMORANDUM

To: Office of the Town Administrator
Cc: Kenneth Murphy, Building Inspector
Steven Strojny, Planning Board Chairman
From: Coreen V. Moore, Town Planner
Date: April 13, 2020
Re: AT&T Personal Wireless Services (PWS) Omni-directional panel antenna installation on a utility pole @ 5 Old Bridge Rd for Cran_RCTB_UCAP_007

The proposed AT&T personal wireless antenna is regulated under Section 2500 footnotes m and n of the Bourne Zoning Bylaw as an antenna / tower. An antenna or tower cannot exceed the height of 40 feet without a special permit from the Planning Board. According to the plan submitted Plan A-1 dated 3/12/20 named "Key Plan & Elevation" the proposed height does not exceed 40 feet, therefore a special permit from the planning board is not required. (see below)

Bourne Zoning Bylaw Section 2500 - Footnotes

- m. No antenna or tower, other than those exclusively used by amateur radio operators, shall exceed a height of 40 feet above ground level at the base of the antenna or tower or the average finished grade on the street side of the building to which it is attached.
- n. No antenna or tower, other than those exclusively used by amateur radio operators, shall exceed a height of 40 feet above ground level at the base of the antenna or tower or the average finished grade on the street side of the building to which it is attached, unless authorized by special permit granted by the Planning Board, upon the Board's determination that the antenna or tower is of the minimum height necessary for its purpose; is set back at least the height of the tower or antenna from any property line or is otherwise determined by the Planning Board to pose no hazard on abutting premises in the event of structural failure; and has been located, landscaped, and fenced or otherwise secured so as to minimize hazard and visual intrusion. Such permit shall require removal within one year of disuse.

Also upon my research I have found that local agencies may regulate "the placement, construction, and modification of the personal wireless service facilities however shall not unreasonably discriminate among providers of functionally equivalent services; and shall not prohibit or have the effect of prohibiting the provision of personal wireless services." (see below)

Title 47 Telecommunications Section 332 (c)(7)(A&B)

(7) Preservation of local zoning authority

(A) General authority

Except as provided in this paragraph, nothing in this chapter shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities.

(B) Limitations

(i) The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof—

(I) shall not unreasonably discriminate among providers of functionally equivalent services; and

(II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services.

It is the opinion of the Office of the Town Planner that the application is properly before the Board of Selectmen for permission to continue the use and placement within a town right of way, and to modify the of the small cell facility on a replacement utility pole. The new pole will require a building permit at which time the building inspector will review the structural drawings for compliance with all building codes.

It is also the Planning Department's opinion that review by the Planning Board is not required as long as the height of the pole is less than 40 feet.

Board of Selectmen
Town of Bourne
March 24, 2020
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ORDER FOR LOCATION FOR TELECOMMUNICATIONS WIRES AND WIRELESS ATTACHMENTS AND APPURTENANCES

By the Select Board

Of the Town of Bourne, Massachusetts, _____, 2020

ORDERED:

That pursuant to the federal Telecommunication Act of 1996 and Massachusetts General Laws, Chapter 166, NEW CINGULAR WIRELESS PCS, LLC ("AT&T") is hereby granted a location for and permission to construct and maintain telecommunications wires and wireless attachments and appurtenances, including fiber optic cable(s), remote nodes and pole top antennas, to be attached to an Eversource utility pole, located upon, along and under the public ways within the Town of Bourne, as substantially shown on the plans filed with said petition.

The forgoing permission is subject to the following condition: the telecommunications wires and wireless attachments and appurtenances shall be installed and operated in compliance with all applicable federal and state laws and regulations.

I hereby certify that the foregoing was adopted at a meeting of the Select Board of the Town of Bourne, Massachusetts, held on the _____ day of _____, 2020.

Town Clerk

STRUCTURAL ANALYSIS REPORT

For

CRAN_RCTB_UCAP_007

5 Old Bridge Road
Bourne, MA 02532

Equipment Mounted on Utility Pole



Prepared for:



Dated: March 9, 2020

Prepared by:



45 Beechwood Drive
North Andover, MA 01845
Phone: (978) 557-5553

www.hudsondesigngroupllc.com



SCOPE OF WORK:

Hudson Design Group LLC (HDG) has been authorized by AT&T to conduct a structural evaluation of the proposed wood pole supporting the proposed AT&T equipment.

This report represents this office's findings, conclusions and recommendations pertaining to the support of the proposed AT&T equipment listed below.

This office conducted an on-site visual survey of the above areas on November 15, 2019. Attendees included Sergio Anastacio (HDG – Assistant Project Manager).

CONCLUSION SUMMARY:

Based on our evaluation, we have determined that the proposed pole is in conformance with the National Electric Safety Code 2017 (NESC). The wood pole structure is rated at 7.7%.

APPURTENANCES CONFIGURATION:

Appurtenances	Elev.	Mount
(1) GQ2410-06621 Antenna	36'-0"	Top of Wood Pole
(1) Demarc Box	15'-6"	Side of Wood Pole
(1) RRH Shroud	13'-2"	Side of Wood Pole
(1) Disconnect Switch	10'-3"	Side of Wood Pole
(1) Electric Meter	8'-9"	Side of Wood Pole

ANALYSIS RESULTS SUMMARY:

Component	Max. Stress Ratio	Elev. of Component (ft.)	Pass/Fail
SYP 1 (Proposed)	7.7%	0 – 34.0	PASS



HUDSON
Design Group LLC

DESIGN CRITERIA:

National Electric Safety Code 2017 (NESC) and the Massachusetts State Building Code 9th Edition.		
Wind		
City/Town:	Bourne	
County:	Barnstable	
NESC Rule	Rule 250B	NESC Section 25
Construction Grade	C	NESC Section 25
Wind Load:	39.53 mph	NESC Table 230-2
Ice		
Loading District	Heavy	NESC Figure 250-1
Radial Ice Thickness:	0.50 in	NESC Table 230-1

1. Approximate height above grade to center of the proposed antenna: 36'-0" +/-

***Calculations and referenced documents are attached.**



HUDSON
Design Group LLC

PROPOSED STRUCTURE:

The proposed 34'-0" +/- wood pole is assumed to be Southern Yellow Pine Class 1 (fb=8000 psi) with a 13.05" diameter base. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.

ANTENNA SUPPORT RECOMMENDATIONS:

The new antenna is proposed to be installed on a mounting bracket secured to the wood pole using thru bolts.

EQUIPMENT SUPPORT RECOMMENDATIONS:

The new equipment is proposed to be installed on the wood pole using the approved manufacturer's mounts.

Limitations and assumptions:

1. Reference the latest HDG construction drawings for all the equipment locations details.
2. Mount all equipment per manufacturer's specifications.
3. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities. Contractor to perform pre-inspection prior to construction.
4. All antennas and waveguide cables are assumed to be properly installed and supported as per the manufacturer requirements.
5. HDG is not responsible for any modifications completed prior to and hereafter which HDG was not directly involved.
6. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.
7. HDG did not perform any geotechnical analysis / or / investigation. Soil information is unknown.



HUDSON
Design Group LLC

FIELD PHOTOS:



Photo 1: Sample photo illustrating the existing wood pole (to be removed and replaced).

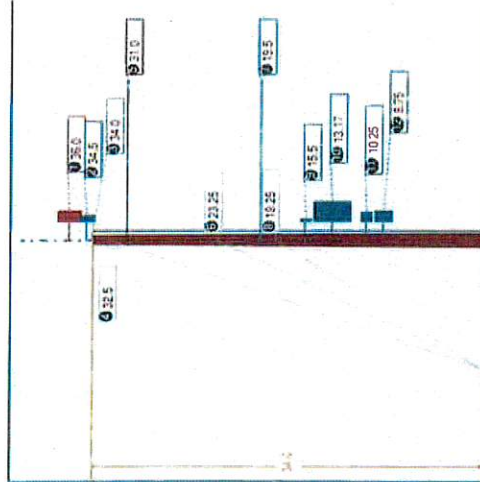
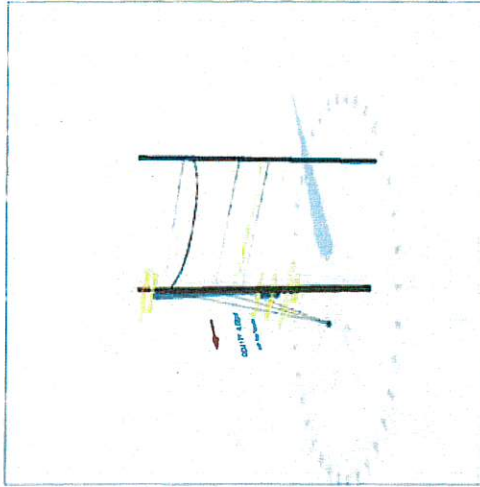


HUDSON
Design Group LLC

Calculations

O-Calc® Pro Analysis Report

Pole Num:	Unset	Pole Length / Class:	40 / 1	Code:	40 / 1	NESC Structure Type:	Deadend
Pole Number:	Unset	Species:	SOUTHERN PINE	NESC Rule:	6.0	Rule 250B Status	C Pole Strength Factor: 0.85
Site Name:	CRAN_RCTB_UCAP_007	Setting Depth (ft):	41.00	Construction Grade:	8,000	Heavy Transverse Wind LF:	1.75
Address:	5 Old Bridge Road	G/L Circumference (in):	8,000	Ice Thickness (in):	6,800	Wire Tension LF:	1.30
Town, State:	Bourne, MA	G/L Fiber Stress (psi):	02532	Wind Speed (mph):	No	Vertical LF:	1.90
Zip Code:	02532	Allowable Stress (psi):	LBW	Fiber Stress (psi):	41.750758° N	Wind Pressure (psf):	4.00
Designed By:	LBW	Fiber Stress Ht. Reduc:	41.750758° N	Longitude:	70.597997° W	Elevation:	0'
Latitude:							



Pole Capacity Utilization (%)	Height (ft)	Wind Angle (deg)
Maximum	7.7	171.2
Groundline	7.7	171.2
Vertical	18.83	281.2

Pole Moments (ft-lb)	Load Angle (deg)	Wind Angle (deg)
Max Cap Util	8,944	171.2
Groundline	8,944	171.2
GL Allowable	123,660	

O-Calc® Pro Analysis Report

Guy System Component Summary						
Description	Lead Length (ft)	Lead Angle (deg)	Height (ft)	Load From Worst Wind Angle on Pole		Individual Maximum Load With Overload Applied
				Nominal Capacity (%)	Wind Angle (deg)	
Single Helix Anchor	9.3	266.0		3.6	171.2	5.6 90.0
EHS 1/4 (Down)			32.5	3.5	171.2	5.6 90.0
EHS 1/4 (Down)			23.3	4.1	171.2	6.4 90.0
EHS 1/4 (Down)			18.3	4.4	171.2	6.8 90.0
Anchor	100.0	101.3		0.0	171.2	0.0 0.0
Anchor	30.3	86.0		0.0	171.2	0.0 0.0
EHS 1/4 (Span/Head)			32.5	0.0	171.2	0.0 0.0
EHS 1/4 (Span/Head)			23.3	0.0	171.2	0.0 0.0
EHS 1/4 (Span/Head)			18.3	0.0	171.2	0.0 0.0
System Capacity Summary:				Adequate		

Groundline Load Summary - Reporting Angle Mode: Load - Reporting Angle: 166.8°										
	Shear Load* (lbs)	Applied Load (%)	Bending Moment (ft-lb)	Applied Moment (%)	Pole Capacity (%)	Bending Stress (+/- psi)	Vertical Load (lbs)	Vertical Stress (psi)	Total Stress (psi)	Pole Capacity (%)
Powers	33	7.3	994	11.1	0.8	56	34	0	56	0.8
Comms	51	11.0	957	10.7	0.8	54	17	0	54	0.8
GuyBraces	26	5.7	732	8.2	0.6	41	1,059	8	49	0.7
GenericEquipments	101	22.0	1,854	20.7	1.5	104	310	2	106	1.6
Pole	214	46.6	3,648	40.8	3.0	205	2,511	19	223	3.3
Risers	34	7.4	759	8.5	0.6	43	65	0	43	0.6
Insulators	0	0.0	0	0.0	0.0	0	19	0	0	0.0
Pole Load	459	100.0	8,944	100.0	7.2	502	4,014	30	532	7.8
Pole Reserve Capacity			114,716		92.8	6,298			6,268	92.2

O-Calc® Pro Analysis Report

Load Summary by Owner - Reporting Angle Mode: Load - Reporting Angle: 166.8°										
Shear Load* (lbs)	Applied Load (%)	Bending Moment (ft-lb)	Applied Moment (%)	Pole Capacity (%)	Bending Stress (+/- psi)	Vertical Load (lbs)	Vertical Stress (psi)	Total Stress (psi)	Pole Capacity (%)	
168	36.7	3,608	40.3	2.9	202	417	3	205	3.0	
<Undefined>	51	957	10.7	0.8	54	26	0	54	0.8	
Existing	26	732	8.2	0.6	41	1,059	8	49	0.7	
Pole	214	3,648	40.8	3.0	205	2,511	19	223	3.3	
Totals:	459	100.0	100.0	7.2	502	4,014	30	532	7.8	

Detailed Load Components:

Power	Owner	Height (ft)	Horiz. Offset (in)	Cable Diameter (in)	Sag at Max Temp (ft)	Cable Weight (lbs/ft)	Lead/Span Length (ft)	Span Angle (deg)	Wire Length (ft)	Tension (lbs)	Tension Moment* (ft-lb)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Secondary	DUPLEX 1/0	Proposed	31.00	6.99	0.95-40	2.05	30.3	86.2	30.8	77	506	-19	526	1,014
										Totals:	506	-19	526	1,014

Comm	Owner	Height (ft)	Horiz. Offset (in)	Cable Diameter (in)	Sag at Max Temp (ft)	Cable Weight (lbs/ft)	Lead/Span Length (ft)	Span Angle (deg)	Wire Length (ft)	Tension (lbs)	Tension Moment* (ft-lb)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Overlashed Bundle	6M	Proposed	19.50	7.75	0.2420	0.63	30.3	86.2	30.3	186	771	-11	215	976
										Totals:	771	-11	215	976

Generic Equipment	Owner	Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Diameter (in)	Unit Depth (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Box	Proposed	34.50	0.26	176.0	0.0	20.00	18.00	2.00	2.00	6.00	1	286	287
Cylinder	Proposed	36.00	0.26	176.0	0.0	18.00	24.90	10.00	10.00	10.00	1	416	417
Box	Proposed	8.75	8.45	176.0	0.0	15.00	19.00	5.00	5.00	10.00	20	128	148
Box	Proposed	10.25	7.95	176.0	0.0	17.00	12.60	4.20	4.20	8.80	21	88	109
Box	Proposed	13.17	11.63	176.0	0.0	90.00	39.56	11.94	11.94	17.89	164	720	883
Box	Proposed	15.50	7.21	176.0	0.0	3.00	12.30	3.40	3.40	3.00	3	44	48
										Totals:	210	1,682	1,892

Riser	Owner	Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Height (in)	Unit Diameter (in)	Unit Depth (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
2" U-Guard H:34.0	Proposed	34.00	6.66	230.0	230.0	34.00	408.00	2.00	2.00	408.00	8	766	775
										Totals:	8	766	775

O-Calc® Pro Analysis Report

Insulator	Owner	Height (ft)	Horiz. Offset (in)	Offset Angle (deg)	Rotate Angle (deg)	Unit Weight (lbs)	Unit Diameter (in)	Unit Length (in)	Offset Moment* (ft-lb)	Wind Moment* (ft-lb)	Moment at GL* (ft-lb)
Bolt	Proposed	31.00	0.00	0.0	0.0	5.00	3.00	0.00	0	0	0
Bolt	Proposed	19.50	0.00	0.0	0.0	5.00	3.00	0.00	0	0	0
Totals:											0

Guy Wire and Brace	Owner	Attach Height (ft)	End Height (ft)	Lead/Span Length (ft)	Wire Diameter (in)	Percent Solid (%)	Lead Angle (deg)	Incline Angle (deg)	Wire Weight (lbs/ft)	Rest Length (ft)	Stretch Length (in)
EHS 1/4	Existing	32.50	0.00	9.33	0.25	75.00	266.0	73.7	0.121	38.03	0.11
EHS 1/4	Existing	23.25	0.00	9.33	0.25	75.00	266.0	67.9	0.121	29.08	0.10
EHS 1/4	Existing	18.25	0.00	9.33	0.25	75.00	266.0	62.7	0.121	24.33	0.09
EHS 1/4	Existing	32.50	32.50	30.33	0.25	75.00	86.0	0.0	0.121	29.06	0.00
EHS 1/4	Existing	23.25	23.25	30.33	0.25	75.00	86.0	0.0	0.121	29.01	0.00
EHS 1/4	Existing	18.25	18.25	30.33	0.25	75.00	86.0	0.0	0.121	28.98	0.00

Guy Wire and Brace (Loads and Reactions)	Elastic Modulus (psi)	Rated Tensile Strength (lbs)	Guy Strength Factor	Allowable Tension (lbs)	Initial Tension (lbs)	Loaded Tension ^{2c} (lbs)	Maximum Tension ² (lbs)	Applied Tension ³ (lbs)	Vertical Load (lbs)	Shear Load In Guy Dir (lbs)	Shear Load At Report Angle (lbs)	Moment at GL* (ft-lb)		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	333	302	207	199	58	-9	168		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	384	349	245	227	92	-15	-76		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	405	368	261	232	120	-19	-168		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	0	0	0	0	0	0	362		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	0	0	0	0	0	0	258		
EHS 1/4	2.30e+7	6,650	0.90	5,985	700	0	0	0	0	0	0	203		
Totals:											657	270	-43	746

Anchor/Rod Load Summary	Owner	Rod Length AGL (in)	Lead Length (ft)	Lead Angle (deg)	Strength of Assembly (lbs)	Anchor/Rod Strength Factor	Allowable Load (lbs)	Max Load ¹ (lbs)	Load at Pole MCLP (lbs)	Max Required Capacity ² (%)
Single Helix Anchor	Existing	18.00	9.33	266.0	20,000	1.00	20,000	1,118	711	5.6
Anchor	Existing	30.00	100.00	101.3	20,000	1.00	20,000	0	0	0.0
Anchor	Existing	18.00	30.33	86.0	20,000	1.00	20,000	0	0	0.0

Pole Buckling	Buckling Constant	Buckling Column Height (ft)	Buckling Section Height (% Buckling Col. Hgt.)	Buckling Section Diameter (in)	Minimum Buckling Diameter at GL (in)	Diameter at Tip (in)	Diameter at GL (in)	Modulus of Elasticity (psi)	Pole Density (pcf)	Ice Density (pcf)	Pole Tip Height (ft)	Buckling Load Capacity at Height (lbs)	Buckling Load Applied at Height (lbs)	Buckling Load Factor of Safety
0.71	18.76	32.83	12.24	3.76	8.60	13.06	1.60e+6	60.00	57.00	34.00	584,485	5733.63	142.86	

User:ccalc HDG OCP:6.00

* Includes Load Factor(s)

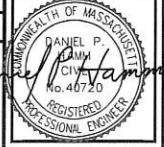
Page 4 of 5

² Worst Wind Per Guy Wire

³ Wind At 171.2'



AT&T SITE ID: CRAN_RCTB_UCAP_007
 5 OLD BRIDGE ROAD
 BOURNE, MA 02532



CHECKED BY: AT
 APPROVED BY: DPH

REV	DATE	DESCRIPTION	BY
T	02/12/18	ISSUED FOR CONSTRUCTION	DPH
A	02/27/18	ISSUED FOR REVIEW	DPH

CLUSTER AND NODE NUMBER:
 CRAN_RCTB_UCAP_007
 SITE ID:
 CRAN_RCTB_UCAP_007
 SITE ADDRESS:
 5 OLD BRIDGE ROAD
 BOURNE, MA 02532
 BARNSTABLE COUNTY

SHEET TITLE
 TITLE SHEET

SHEET NUMBER
 T-1

SHEET INDEX

SHEET NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	1
GN-1	GENERAL NOTES	1
A-1	KEY PLAN AND ELEVATION	1
A-2	EQUIPMENT DETAILS	1
E-1	ELECTRICAL & GROUNDING DETAILS	1

VICINITY MAP (NOT TO SCALE)



GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF AT&T. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE AT&T MOBILITY REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.
4. CONSTRUCTION DRAWINGS ARE VALID FOR SIX MONTHS AFTER ENGINEER OF RECORD'S STAMPED AND SIGNED SUBMITTAL DATE LISTED HEREIN.

PROJECT DESCRIPTION

1. INSTALLATION OF ANTENNA AND ASSOCIATED EQUIPMENT ON PROPOSED CLASS 1 UTILITY POLE.
2. THIS IS AN UNMANNED AND RESTRICTED ACCESS EQUIPMENT SITE AND WILL BE USED FOR THE TRANSMISSION OF RADIO SIGNALS FOR THE PURPOSE OF IMPROVING CELLULAR AND WIRELESS INTERNET SERVICE.
3. AT&T MAINTENANCE CREW (TYPICALLY ONE PERSON) WILL MAKE AN AVERAGE OF ONE TRIP PER MONTH AT ONE HOUR PER VISIT.

DO NOT SCALE DRAWINGS

CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE PROJECT OWNER'S REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

PROJECT SUMMARY

SITE ADDRESS: 5 OLD BRIDGE ROAD
 BOURNE, MA 02532
 COUNTY: BARNSTABLE
 LATITUDE: 41.750756° N
 LONGITUDE: 70.587897° W
 POLE OWNER: EVERSOURCE
 STRUCTURE TYPE: UTILITY POLE
 POLE NUMBER: #2-155
 ARCHITECT/ENGINEER: HUDSON DESIGN GROUP LLC
 45 BEECHWOOD DRIVE
 NORTH ANDOVER, MA 01845

DRIVING DIRECTIONS

FROM FRAMINGHAM, MA:
 HEAD NORTHWEST TOWARD LEGGATT McCALL CONN. TURN LEFT ONTO LEGGATT CONN. CONTINUE ONTO BURR ST. TURN LEFT ONTO COCHRAN RD. TAKE THE RAMP TO I-90 E/MASSPIKE W/SPRINGFIELD/BOSTON. KEEP RIGHT AT THE FORK SIGNS FOR I-90 E/INTERSTATE 95/MASSPIKE/BOSTON AND MERGE ONTO I-90 E/MASSPIKE. MERGE ONTO I-90 E/MASSPIKE (SIGNS FOR 90 E/I-95/BOSTON) TAKE EXIT 14 TOWARD NH-MAINE/I-95/MA128/ S SHORE. KEEP LEFT TO CONTINUE TOWARD I-95 S/MA-128 S. KEEP RIGHT AT THE FORK. FOLLOW SIGNS FOR I-95 S/STATE ROUTE 128 S/CAPE COD/S SHORE AND MERGE ONTO I-95 S/MA-128 S. CONTINUE ONTO US-1 N. CONTINUE ONTO I-93 N/US-1 N. TAKE EXIT 4 FOR STATE RTE 24 S. CONTINUE ONTO MA-24 S/STATE RTE S. TAKE EXIT 14A TO MERGE ONTO I-405 TOWARD CAPE COD. KEEP LEFT COT CONTINUE ON MA-25 E. TAKE 3 FOR US-8 TOWARD BOURNE/HYANNIS. AT THE TRAFFIC CIRCLE, TAKE EXIT 4TH ONTO MAIN ST. CONTINUE STRAIGHT ONTO OLD BRIDGE RD.

CALL 811



WWW.DIGSAFE.COM
 72 HOURS PRIOR
 UNDERGROUND SERVICE ALERT

APPROXIMATE COORDINATES: LAT. 41.750758° N LONG. 70.597687° W



CENTERLINE
750 WEST CENTER STREET, SUITE 301 WEST BRIDGEWATER, MA 02379

H2G HUDSON Design Group LLC
400 COMMERCIAL DRIVE, SUITE 100, BRIDGEWATER, MA 02325



CHECKED BY: AT
APPROVED BY: DPH

SUBMITTALS			
REV	DATE	DESCRIPTION	BY
1	05/12/20	ISSUED FOR CONSTRUCTION	DPH
2	05/20/20	FIELD FOR REVIEW	DPH

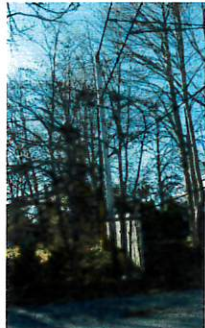
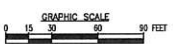
CLUSTER AND NODE NUMBER:
CRAN_RCTB_UCAP_007
SITE ID:
CRAN_RCTB_UCAP_007
SITE ADDRESS:
5 OLD BRIDGE ROAD
BOULINE, MA 02532
BARNSTABLE COUNTY

SHEET TITLE
KEY PLAN AND ELEVATION

SHEET NUMBER
A-1



KEY PLAN
22x34 SCALE: 1"=30'
11x17 SCALE: 1"=60'



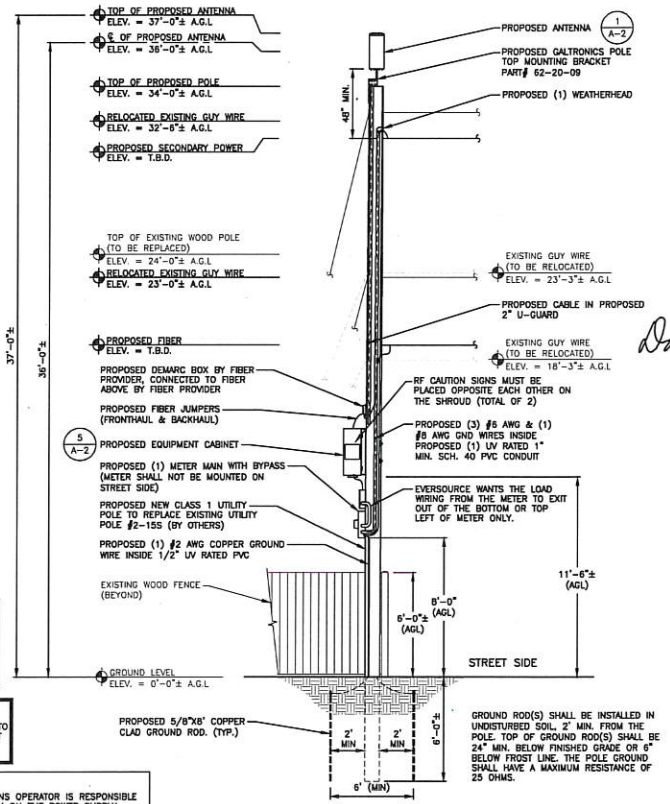
EXISTING GUY WIRE
EXISTING UTILITY POLE #2-155 TO BE REPLACED WITH NEW CLASS 1 POLE (BY OTHERS)
EXISTING FENCE
TREE TRIM REQUIRED

NOTE:
REFER TO STRUCTURAL ANALYSIS BY HUDSON DESIGN GROUP, LLC, DATED: MARCH 09, 2020, FOR THE CAPACITY OF THE STRUCTURE TO SUPPORT THE PROPOSED EQUIPMENT.

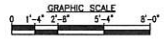
NOTE:
ALL EXISTING UTILITY POLE ATTACHMENTS AND FIXTURES ARE TO BE TRANSFERRED TO NEW POLE AT THE SAME HEIGHTS UNLESS OTHERWISE NOTED.

NOTE:
1. THE WIRELESS COMMUNICATIONS OPERATOR IS RESPONSIBLE FOR PLACING A WARNING SIGN ON THE POWER SUPPLY COMMUNICATING THE RF EMISSIONS IN COMPLIANCE WITH THE CURRENT EDITION OF IEEE STANDARD C95.2. THIS SIGN MUST ALSO HAVE A 24-HOUR CONTACT PHONE NUMBER IN CASE OF EMERGENCY. THIS NUMBER MUST BE VISIBLE FROM THE GROUND.

EXISTING CONDITIONS PHOTO DETAIL
SCALE: N.T.S.



ELEVATION
22x34 SCALE: 3/8"=1'-0"
11x17 SCALE: 3/16"=1'-0"



SUBMITTALS

REV.	DATE	DESCRIPTION	BY
1	03/12/20	ISSUED FOR CONSTRUCTION	DPH
2	03/27/20	ISSUED FOR REVISION	DPH

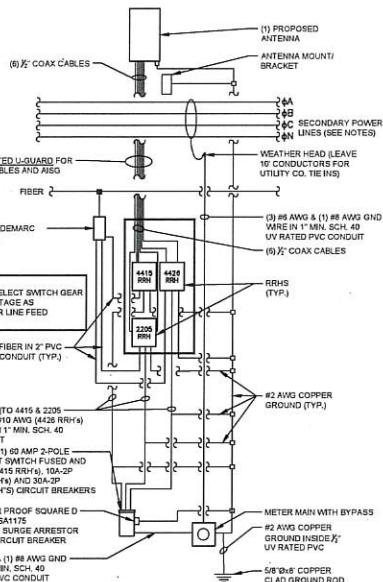
CLUSTER AND MODEL NUMBER:
CRAN_RCTB_UCAP_007

SITE ID:
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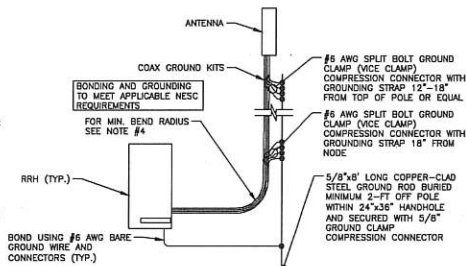
SITE ADDRESS:
3 OLD BRIDGE ROAD
BOURNE, MA 02532
BARNSTABLE COUNTY

SHEET TITLE
ELECTRICAL &
GROUNDING DETAILS

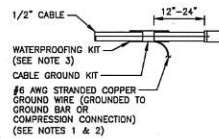
SHEET NUMBER
E-1



GENERAL WIRING DIAGRAM
SCALE: N.T.S. (1) E-1

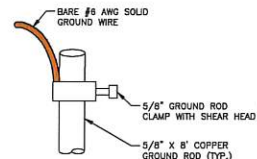


GROUNDING ONE LINE DIAGRAM
SCALE: N.T.S. (2) E-1



- NOTES:
- DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR, OR COMPRESSION CONNECTION.
 - GROUNDING KIT SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
 - WEATHERPROOFING SHALL BE TWO-PART TAPE KIT, COLD SHRINK SHALL NOT BE USED.
 - MINIMUM BEND RADIUS OF A CONDUCTOR SHALL NOT BE BENT TO LESS THAN 12 TIMES OVERALL CONDUCTOR DIAMETER.

ANTENNA CABLE GROUND KIT
SCALE: N.T.S. (4) E-1



CONNECTION TO GROUND ROD
SCALE: N.T.S. (3) E-1



METER MAIN WITH BYPASS DETAIL
SCALE: N.T.S. (5) E-1

USE MILBANK MODEL NO.: U2272-RL-S19-BL OR APPROVED EQUAL

DONALD L. HAES, JR., CHP, CLSO

Radiation Safety Specialist

PO Box 198, Hampstead, NH 03841

617-680-6262

Email: donald_haes_chp@comcast.net

November 19, 2019

I have reviewed the information pertinent to the hypothetical installation of an AT&T Personal Wireless Services (PWS) omni-directional panel antenna installation on a utility pole. I have analyzed the scenario where there would be one antenna mounted with a centerline height of 30' above ground level (AGL). This analysis considers the contributions of the AT&T PWS transmitters operating at each of the following supplied parameters:

**Table 1: Transmitter / Antenna Data and Supporting Parameters for
"Typical" AT&T "Small Cell" Site**

Remote Radio Unit (RRU) / PWS Service	Frequency (MHz) †	Transmit # and Output Power (Watts) ‡ (Appendix A)	Antenna Manufacturer - Model Number	Antenna Gain (dBd) (Appendix B)
RRUS-4415 / B25 PCS	1930-1950	4 X 40	Galtronics / GQ2410-06621 (See Appendix A)	7.03
RRUS-4426 / B66 AWS	2100-2180	4 X 60		7.53
RRUS-2205 / UNii	5155-5250	2 X 0.316		1.57

Table Notes

† Transmitter (Tx) Frequency: Central transmit frequency used to account for multiple channels

‡ Maximum rated output power (per channel). Effective Radiated Power is the directional (RF) power (in watts) that would have to be radiated by a half-wave dipole antenna to give the same radiation intensity as the actual source at a distant receiver located in the direction of the antenna's strongest beam (main lobe). ERP It is equal to the input power to the antenna multiplied by the gain of the antenna. (Source Wiki).

Personal Wireless Services (PWS) Technologies

AWS: Advanced Wireless Services

PCS: Personal Communication System

UNii: Unlicensed band-ii

Note: The analyses, conclusions and professional opinions are based upon the precise parameters and conditions of this typical AT&T "small cell" installation on a utility pole with a mounting centerline height of 30' AGL. Utilization of these analyses, conclusions and professional opinions for any personal wireless services installation, existing or proposed, other than the aforementioned has not been sanctioned by the author, and therefore should not be accepted as evidence of regulatory compliance.

THEORETICAL RF FIELD CALCULATIONS - GROUND LEVELS

METHODOLOGY

These calculations are based on what are called "worst-case" estimates. That is, the estimates assume 100% use of all transmitters simultaneously, and assume the surrounding area is a flat plane.

The calculations are based on the following information:

1. Effective Radiated Power (ERP) (See Table 1 and Appendix A data).
2. Antenna height (centerline, above ground level (AGL)).
Trigonometry was used to determine the resultant "RANGE", and the antenna depression angle.
3. Antenna vertical energy patterns; the source of the negative gain (G) values. See Appendix B.
Most antennas, even so-called "omni-directional" antennas, are designed to focus the RF signal, resulting in "patterns" of signal loss and gain. Antenna vertical energy patterns display the loss of signal strength relative to the direction of propagation due to elevation angle changes.

The magnitude of the RF field (the power density (S)) from an isotropic RF source is calculated making use of the power density formula as outlined in FCC's OET Bulletin 65, Edition 97-01:¹

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot R^2}$$

Where:

- P → Power to antenna (watts)
- G → Gain of antenna
- R → Distance (range) from antenna source to point of intersection with the ground (feet)
- $R^2 = (\text{Height})^2 + (\text{Horizontal distance})^2$

Since: $P \cdot G = \text{EIRP}$ (Effective Isotropic Radiated Power), and for the situation of off-axis power density calculations, apply the negative elevation gain (G^E) value from the vertical energy patterns with the following formula:

$$S = \frac{\text{EIRP} \cdot G^E}{4 \cdot \pi \cdot R^2}$$

Ground reflections may add in-phase with the direct wave, and essentially double the electric field intensity. Because power density is proportional to the *square* of the electric field, the power density may quadruple, that is, increase by a factor of four (4).

Since ERP is routinely used, convert ERP into EIRP by multiplying by the factor of 1.64 (the gain of a 1/2-wave dipole relative to an isotropic radiator).

$$S = \frac{4 \cdot (\text{ERP} \cdot 1.64) \cdot G^E}{4 \cdot \pi \cdot R^2} = \frac{\text{ERP} \cdot 1.64 \cdot G^E}{\pi \cdot R^2} = \frac{0.522 \cdot \text{ERP} \cdot G^E}{R^2}$$

To calculate the % MPE, use the formula:

$$\% \text{ MPE} = \frac{S}{\text{MPE}} \cdot 100$$

Note that any loss along the horizontal direction was neglected which means the results would be the maximum values in any direction. The resultant values are thus conservative in that they over predict actual resultant power densities. The data used to prepare the theoretical RF field calculations are outlined in Table 1.

RESULTS

The results of the %MPE calculations for the summation of the proposed AT&T Mobility RF emissions are depicted in Figure 1 as plotted against linear distance from the base of the proposed utility pole in Barnstable, MA. The values have been calculated for a height of six feet above ground level in accordance with regulatory rationale. Values for 16' AGL have also been calculated for informational purposes only as it represents the height above ground of a typical two-story structure. A logarithmic scale was used to plot the calculated values in order to compare with the MPE of 100%, which is so much larger that it would be off the page in a linear plot.

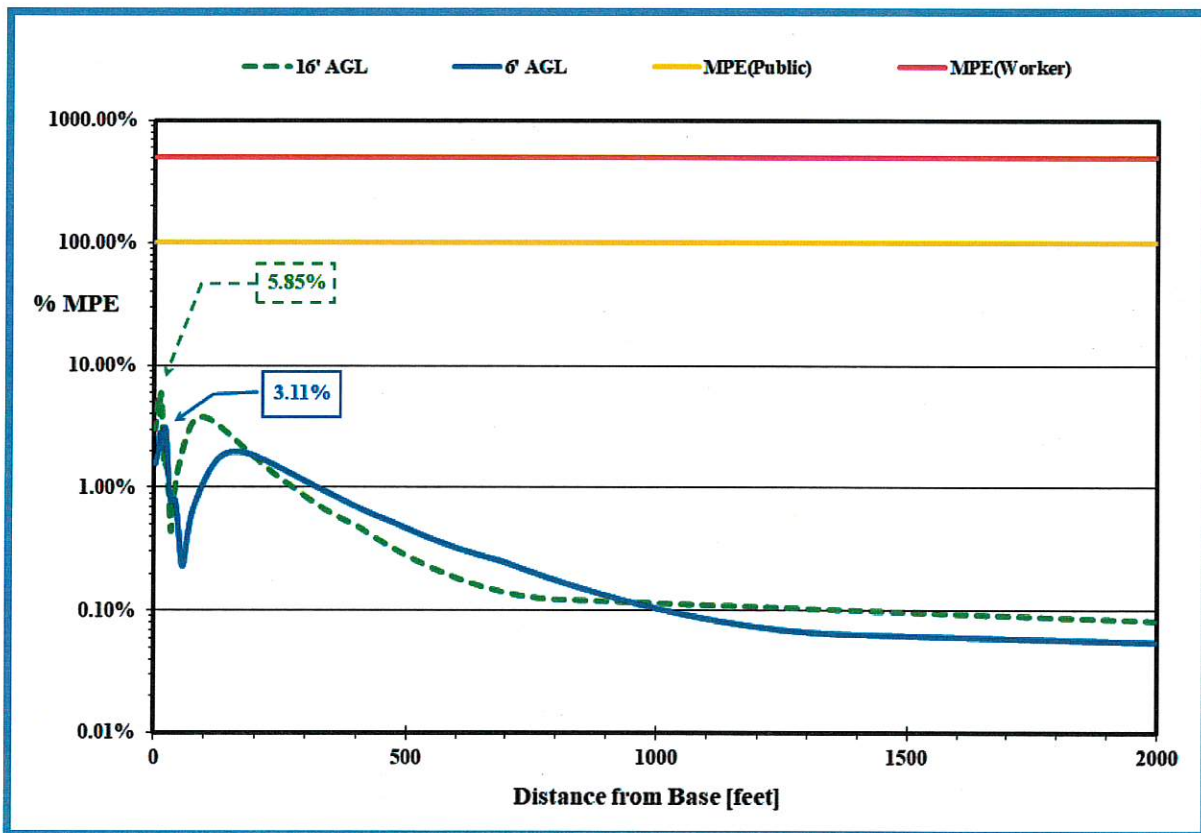


Figure 1: Theoretical Cumulative Maximum Percent MPE - vs. - Distance
PWS RF Emissions in any Direction
“Typical” AT&T Mobility SC Site Mounted 30’ AGL Centerline
(See Table 1 parameters)

CONCLUSION

Theoretical RF field calculations data indicate the summation of the AT&T RF contributions on a typical utility pole would be well within the established RF exposure guidelines; see Figure 1. Although the calculations assume a typically low mounting height of 30' AGL, some applications may require the antenna to be mounted higher. In these circumstances, the increased separation between the ground and antenna would result in an even lower general public RF exposure levels. These results indicate there could be more similar installations at these locations, and still be within Federal and State guidelines for RF exposure. This report provides written proof that the proposed facilities would comply with the FCC RF exposure guidelines. These small cell antenna installations proposed by AT&T would not produce significant changes to the ambient RF environment.

STATEMENT OF CERTIFICATION

1. I certify to the best of my knowledge and belief, the statements of fact contained in this report are true and correct.
2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are personal, unbiased professional analyses, opinions and conclusions.
3. I have no present or prospective interest in the property that is the subject of this report and I have no personal interest or bias with respect to the parties involved.
4. My compensation is not contingent upon the reporting of a predetermined energy level or direction in energy level that favors the cause of the client, the amount of energy level estimate, the attainment of a stipulated result, or the occurrence of a subsequent event.
5. This assignment was not based on a requested minimum environmental energy level or specific power density.
6. My compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in, or the use of, this report.
7. The consultant has accepted this assessment assignment having the knowledge and experience necessary to complete the assignment competently.
8. My analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the *American Board of Health Physics* (ABHP) statements of standards of professional responsibility for Certified Health Physicists.



Donald L. Haes, Jr.

Certified Health Physicist

Note: The analyses, conclusions and professional opinions are based upon the precise parameters and conditions of this typical AT&T "small cell" installation on a utility pole with a mounting centerline height of 30' AGL. Utilization of these analyses, conclusions and professional opinions for any personal wireless services installation, existing or proposed, other than the aforementioned has not been sanctioned by the author, and therefore should not be accepted as evidence of regulatory compliance.

DONALD L. HAES, JR., CHP, CLSO

Radiation Safety Specialist

PO Box 198, Hampstead, NH 03841

617-680-6262

Email: donald_haes_chp@comcast.net

SUMMARY OF QUALIFICATIONS

- **Academic Training -**

- Graduated from Chelmsford High School, Chelmsford, MA; June 1973.
- Completed Naval Nuclear Power School, 6-12/1976.
- Completed Naval Nuclear Reactor Plant Mechanical Operator and Engineering Laboratory Technician (ELT) schools and qualifications, Prototype Training Unit, Knolls Atomic Power Laboratory, Windsor, Connecticut, 1-9/1977.
- Graduated Magna Cum Laude from University of Lowell with a Bachelor of Science Degree in *Radiological Health Physics*; 5/1987.
- Graduated from University of Lowell with a Master of Science Degree in *Radiological Sciences and Protection*; 5/1988.

- **Certification -**

- Board Certified by the American Board of Health Physics 1994; renewed 1998, 2002, 2006, 2010, 2014, and 2018. Expiration 12/31/2022.
- Board Certified by the Board of Laser Safety 2008; renewed 2011, 2014, 2017. Expiration 12/31/2020.

- **Employment History -**

- Consulting Health Physicist; Ionizing/Nonionizing Radiation, 1988 - present.
- Radiation, RF and Laser Safety Officer; BAE Systems, 2005–2018 (retired).
- Assistant Radiation Safety Officer; MIT, 1988 – 2005 (retired).
- Radiopharmaceutical Production Supervisor - DuPont/NEN, 1981 – 1988 (retired).
- United States Navy; Nuclear Power Qualifications, 1975 – 1981 (Honorably Discharged).

- **Professional Societies -**

- Health Physics Society [HPS].
- American Academy of Health Physics [AAHP]
- Institute of Electrical and Electronics Engineers [IEEE];
- International Committee on Electromagnetic Safety [ICES] (ANSI C95 series).
- Laser Institute of America [LIA].
- Board of Laser Safety [BLS].
- American National Standards Institute Accredited Standards Committee [ASC Z136].
- Committee on Man and Radiation [COMAR].

APPENDIX A

SPECIFIC REMOTE RADIO HEAD UNITS RRU RRUS-4415



RISE Research Institutes of Sweden AB

REPORT

Doc No: 2017-10-23
Release: 7P06127-1.0

Rev: 1 (27)

Description of the test object

Equipment:	Radio equipment Radio 4415 B2 B25 Product number KRC 161 616/1 FCC ID: TABAKRC161636 IC: 287AB-AS161636
HWIN:	AS161636
Hardware revision state:	R1B
Tested configuration:	Multi RRU LTE+GSM
Frequency range:	TX: 1930 - 1990 MHz RX: 1850 - 1910 MHz
BRW:	40 MHz
Output power:	Max 40 W/ antenna port
Antenna ports:	1 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	LTE: 1-5 carriers/ port GSM: 1-4 carriers/ port (max 10 carriers/ unit) Max 6 carriers/ port LTE: TX Diversity, 2x2 MIMO, 4x4 MIMO, and NB IoT in-band operation. Carrier Aggregation (CA) inter-band ¹ and Intra-band. GSM: Single antenna, dual TX Contiguous Spectrum (CS), Non-Contiguous Spectrum (NCS)
Channel bandwidths:	LTE: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz GSM: 200 kHz
Modulations:	LTE: QPSK, 16QAM, 64QAM and 256QAM GSM: GMSK, AQPSK and 8PSK
RF power Tolerance:	+0.6/-2.5 dB
CPRI Speed	Up to 10.1 Gbit/s
Nominal supply voltage:	-48VDC

¹Carrier Aggregation (CA) inter-band requires an additional unit operating on the other band.

RRU RRUS-4426

No.118Z61058-WMD02 Page60f233 Equipment Under Test (EUT)

Product Name	Radio 4426 866
Product Number	KRC 161 472/3
FCC ID	TA8AKRC161472-3
HVIN	AS1614723
Antenna	N/A
Output power	Maximum 47.78dBm (60W) per port
Power source	-48V DC
Serial Number	D827666422
Hardware Version	R2A
Software Version	R71 JX06
Frequency range	Rx: 1710-1780 MHz, rx: 2110-2200 MHz (WCDMA: Rx: 1710-1755 MHz, rx: 2110 -2155 MHz NB-IoT: Rx: 1710-1780 MHz, Tx: 2110-2180 MHz)
Supported TX/RX configuration	4 TX/ 4 RX
Maximum RF bandwidth (IBW)	WCDMA SR: 45MHz LTE SR: 90MHz valid for LTE BW->5 MHz NB-IoT Standalone: 20MHz LTE+WCDMA Mix Mode: 90MHz valid for LTE BW->5 MHz NB+WCDMA: 70MHz NB+LTE: 90MHz valid for LTE BVV->5 MHz NB+WCDMA+LTE: 90MHz valid for LTE BW->5 MHz
Total number of supported carriers per port	Maximum 6 carriers for all except NB-IoT per port. NB-IoT: Maximum 1 carrier
Supported channel bandwidth configuration	WCDMA: 3.8MHz to 5MHz LTE: 5MHz, 10MHz, 15MHz and 20MHz NB-IoT Standalone: 250kHz NB-IoT In-Band: 5MHz, 10MHz, 15MHz and 20MHz NB-IoT GuardBand: 10MHz, 15MHz and 20MHz
Supported modulations	WCDMA: QPSK, 16QAM, 64QAM LTE: QPSK, 16QAM, 64QAM, 256QAM NB-IoT: QPSK
Date of receipt	2018-07-03

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RRU 2205 (UNii-5G)

¹ This page contains a summary of the test results. The full report provides a complete description of all test details and results.



3 (7)

GFTE-17:000484 Uen, Rev C, 2017-07-06

2 General information

The test results reported in this document have been obtained by calculations according to plane-wave equivalent conditions [3]. The purpose of the tests was to verify that the EUT is in compliance with the appropriate RF exposure standards, recommendations and limits [1] - [4].

3 Equipment under test

Table 1 summarizes the technical data for the EUT. Photographs of the EUT are presented in Appendix A.

Table 1 Technical data for the EUT.

Product name	Radio 2205		
Product tested	KRC 161 609/1		
Dimensions, Width x Height x Depth (mm)	200 x 200 x 100 (including mounting bracket and front cover)		
Configurations(s) covered by this report	LTE 5000 (B46)		
Antenna(s)		Product number	Maximum gain (dBi)
	External omni-directional antenna	Galtronics P64801	6.0
	Internal sector coverage antenna	KRE 105 259/1	10.5
Transmitter frequency range (MHz)	LTE 5000 (B46): 5155.8 -- 5250, 5725 -- 5850		

In Table 2 nominal output power levels are given.

Table 2 Nominal output power levels.

Band / Mode	Nominal output power ² (dBm)	Tolerance, upper limit (dB)	Transmission loss (dB)	Maximum output power ² (dBm)
LTE LAA B46 (5000), 2x310mW, External omni-directional antenna	25	1	0.5	28.5
LTE LAA B46 (5000), 2x112mW, Internal sector coverage antenna	20.5	1	0.5	24.0

4 EMF exposure assessments

FCC procedures [3] specify exposure assessment methods to verify compliance with EMF exposure limits [1] of mobile devices. A minimum test separation distance of at least 20 cm is required between the device and nearby persons to apply mobile device exposure limits. The test separation distance for which the equipment is shown to comply with the exposure limits must be clearly provided in the operating and installation instructions.

APPENDIX B

ANTENNA SPECIFICATIONS & ENERGY PATTERNS

GALTRONICS / GQ2410-06621

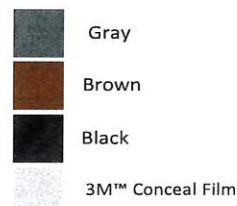
2' Pseudo Omni 10-Port Canister Antenna [1695-2360, 3550-3700 and 5150-5925 MHz]

GQ2410-06621

Description:

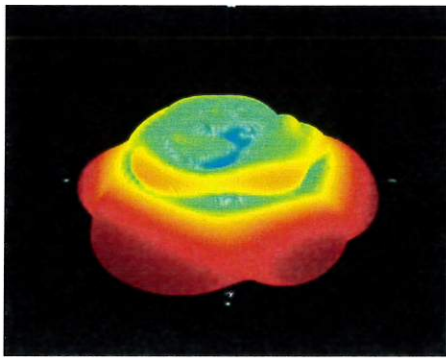
- Pseudo Omni Canister Antenna for Outdoor DAS and Small Cells.
- 4x ports for AWS/PCS/WCS Band 1695-2360 MHz
- 4x ports for CBRS Band 3550-3700 MHz
- 2x ports for U-NII Band 5150-5925 MHz*

1695-2360, 3550-3700 and 5150-5925 MHz
Pseudo Omni Canister Antenna

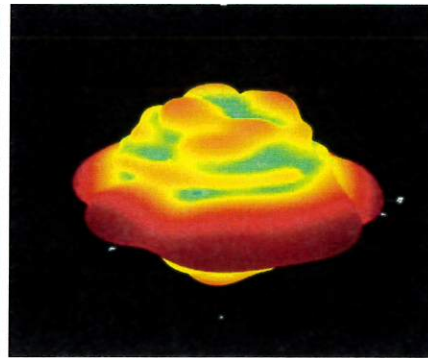


Electrical Specification	IS			
Frequency Band [MHz]	1695-2180	2305-2360	3550-3700	5150-5925
Input Connector Type	4x 4.3-10 (F)		4x 4.3-10 (F)	2x 4.3-10 (F)
Isolation (Typ.)	20 dB			
VSWR/Return Loss (Typ.)	1.5:1 / 14.0 dB			
Impedance	50 Ω			
Polarization	Dual slant 45° (±45°)			
Horizontal Beamwidth	Omni (360°)			
Vertical Beamwidth	19°	15.4°	18.7°	23.0°
Max. Gain	8.9 dBi	8.3 dBi	8.0 dBi	5.5 dBi
Avg. Gain	7.7 dBi	7.9 dBi	7.6 dBi	4.7 dBi
Downtilt	0° Fixed			
Max Power / Port	100 Watts		50 Watts	1 Watt
PIM @ 2x43 dBm	<-153 dBc		N/A	N/A

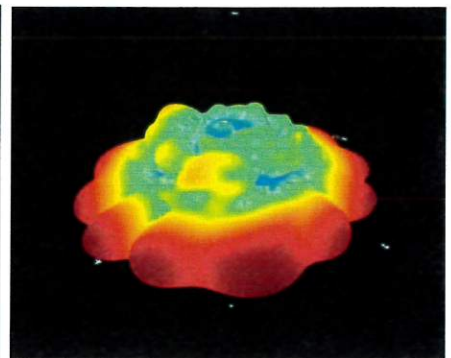
3D Antenna Patterns



1950 MHz

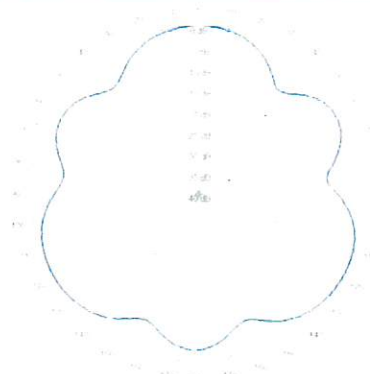


2315 MHz

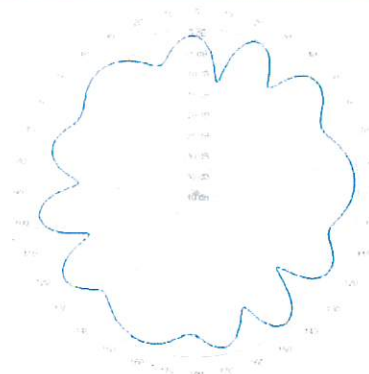


3650 MHz

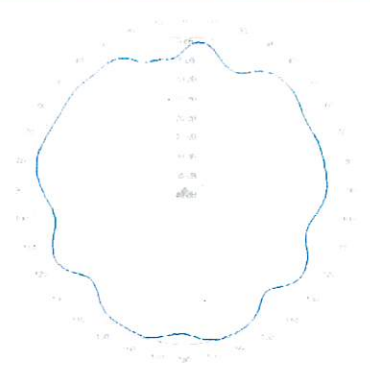
2D Antenna Patterns



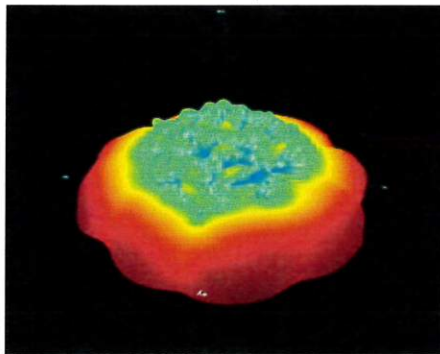
1930 MHz



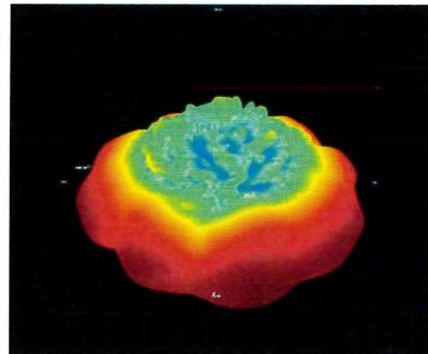
3650 MHz



5825 MHz



5250 MHz



5825 MHz

Additional Technical Information

ENDNOTES

¹. OET Bulletin 65: Federal Communications Commission Office of Engineering and Technology, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*; Edition 97-01, August 1999.

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