

**JULIE D. KOHLER**

PLEASE REPLY TO: Bridgeport  
WRITER'S DIRECT DIAL: (203) 337-4157  
E-Mail Address: jkohler@cohenandwolf.com

July 25, 2013

Attorney Melanie Bachman  
Acting Executive Director  
Connecticut Siting Council  
Ten Franklin Square  
New Britain, CT 06051

**Re: Notice of Exempt Modification  
AT&T/T-Mobile co-location  
Site ID CT11403A  
Andrews Road, Wolcott**

Dear Attorney Bachman:

This office represents T-Mobile Northeast LLC ("T-Mobile") and has been retained to file exempt modification filings with the Connecticut Siting Council on its behalf.

In this case, Southern New England Telephone Company ("AT&T") owns the existing lattice telecommunications tower and related facility at Andrews Road, Wolcott Connecticut (latitude 41.6177 / longitude -73.0045). T-Mobile intends to replace six antennas and related equipment at this existing telecommunications facility in Wolcott ("Wolcott Facility"). Please accept this letter as notification, pursuant to R.C.S.A. § 16-50j-73, of construction which constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to the Mayor, Thomas G. Dunn. AT&T is also the property owner.

The existing Wolcott Facility consists of an 80 foot tall lattice structure. T-Mobile plans to replace six antennas at a centerline of 77 feet. (See the plans revised to April 19, 2013 attached hereto as Exhibit A). T-Mobile will also install hybrid cable and reuse existing coax cables. The existing Facility is structurally capable of supporting T-Mobile's proposed modifications, as indicated in the structural analysis dated July 3, 2013 and attached hereto as Exhibit B.

The planned modifications to the Wolcott Facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modification will not increase the height of the tower. T-Mobile's

July 24, 2013  
Site ID CT11403A  
Page 2

replacement antennas will be installed at the 77 foot level. The enclosed tower drawing confirms that the proposed modification will not increase the height of the tower.

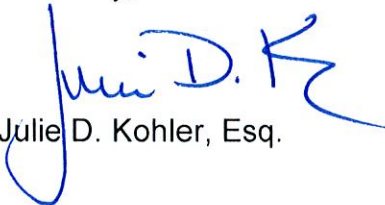
2 . The installation of the T-Mobile replacement equipment in the existing compound, as reflected on the attached site plan, will not require an extension of the site boundaries. T-Mobile's proposed equipment will be located entirely within the existing compound area.

3 . The proposed modification to the Facility will not increase the noise levels at the existing facility by six decibels or more.

4 . The operation of the replacement antennas will not increase the total radio frequency (RF) power density, measured at the base of the tower, to a level at or above the applicable standard. According to a Radio Frequency Emissions Analysis Report prepared by EBI dated July 16, 2013 T-Mobile's operations would add 2.068% of the FCC Standard. Therefore, the calculated "worst case" power density for the planned combined operation at the site including all of the proposed antennas would be 31.178% of the FCC Standard as calculated for a mixed frequency site as evidenced by the engineering exhibit attached hereto as Exhibit C.

For the foregoing reasons, T-Mobile respectfully submits that the proposed replacement antennas and equipment at the Wolcott Facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,



Julie D. Kohler, Esq.

cc: Town of Wolcott, Mayor Thomas G. Dunn  
AT&T  
Scott Chase, Northeast Site Solutions



T-MOBILE USA, INC.  
 12920 SE 38TH STREET  
 BELLEVUE, WA 98006  
 (425) 378-4000

2637296  
 7/19/2013  
 2000011160

Invoice Number	Inv. Date	Description	Deductions	Voucher	Amount Paid
CKKMB00335	7/18/2013	AD CT11403A SITING COUNCIL	0.00	1101316020	625.00

DO NOT ACCEPT THIS CHECK UNLESS THE FACE FADES FROM BLACK TO RED WITH LOGO IN BACKGROUND. THE BACK OF THIS DOCUMENT HAS HEAT-SENSITIVE INK THAT CHANGES FROM ORANGE TO YELLOW.



T-MOBILE USA, INC.  
 12920 SE 38th Street  
 Bellevue, WA 98006  
 (425) 378-4000

The Bank of New York Mellon  
 Pittsburgh, PA  
 60-160/433

2637296  
 7/19/2013  
 VID 2000011160

PAY **\$625.00**  
SIX TWO FIVE CTS CTS

**\*\$625.00**

\*\*\*Six Hundred Twenty Five Dollars Only\*\*\*\*\*

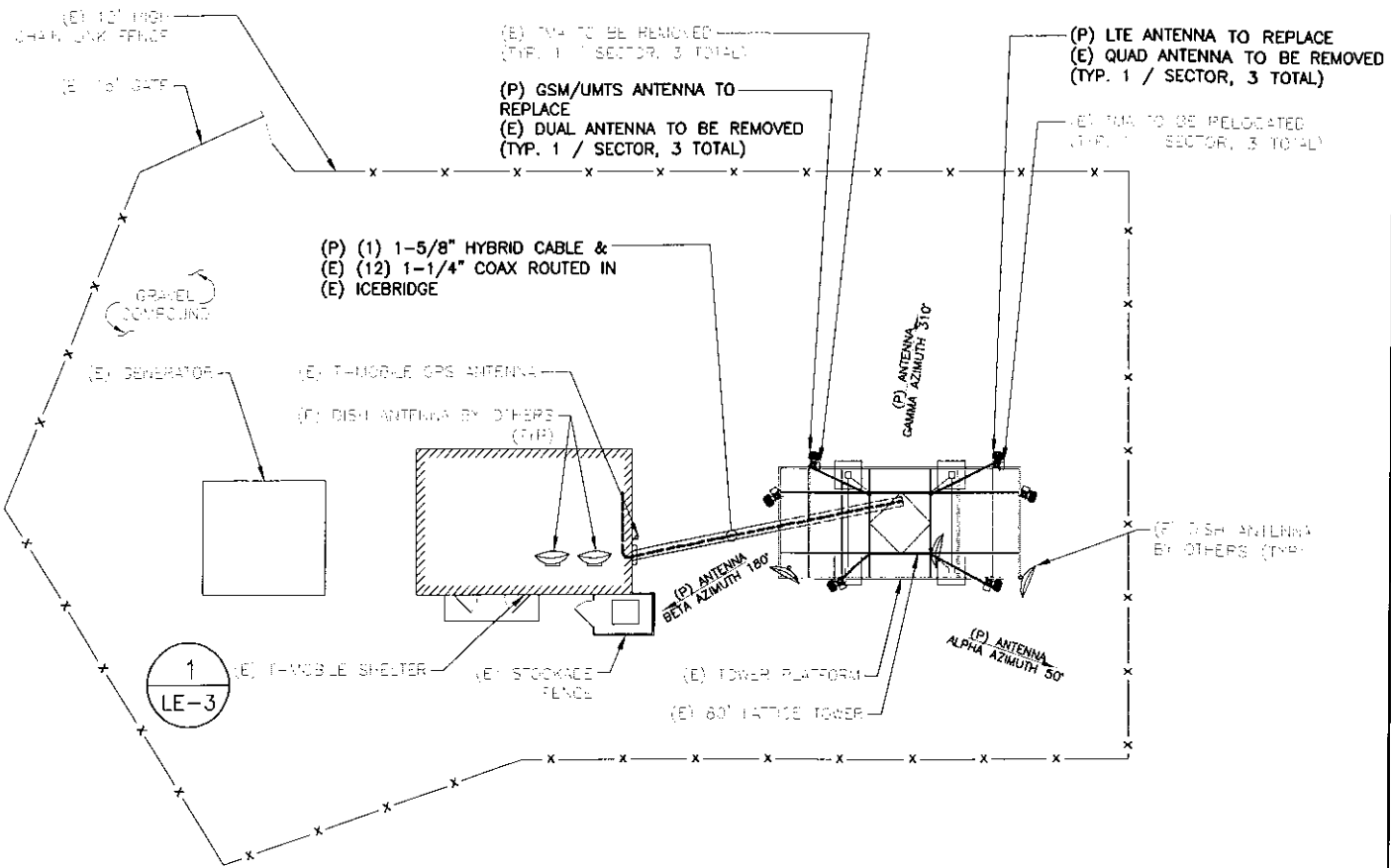
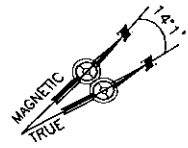
To The Order Of **CONNECTICUT SITING COUNCIL**  
 10 FRANKLIN SQ  
 NEW BRITAIN, CT 06051

VOID AFTER 180 DAYS  
 THIS CHECK CLEARS THROUGH POSITIVE PAY

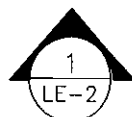
*David [Signature]*

⑈000 26 37 296⑈ ⑆04 330 160 1⑆ 0 13 84 30⑈

# **EXHIBIT A**



**SITE PLAN** 1  
N.T.S. LE-1



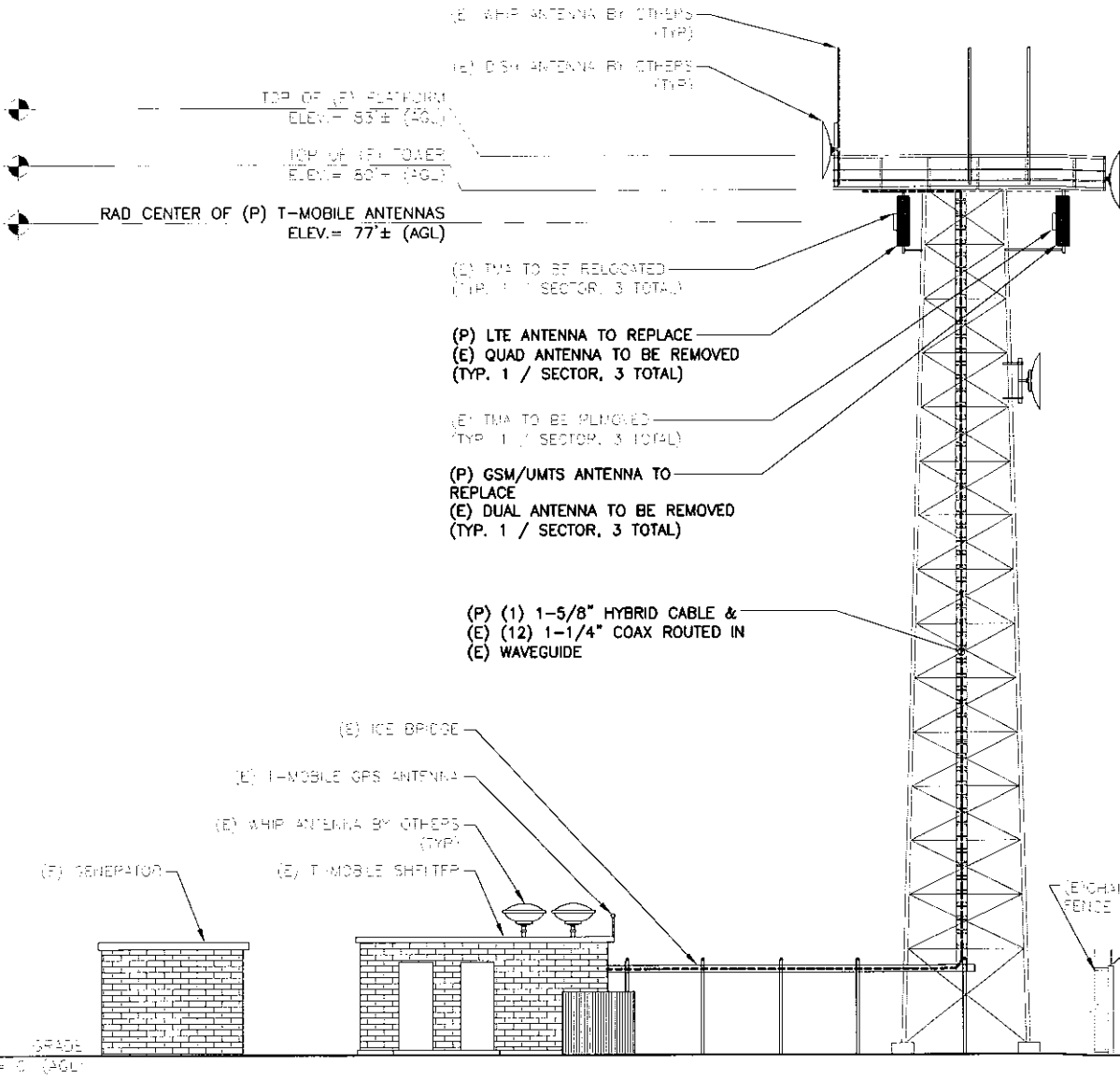
**Configuration**  
**2C**

SUBMITTALS	
LE REV A	04.18.13
LE REV 0	04.19.13

**ATLANTIS GROUP**  
1340 Centre Street  
Suite 203  
Newton, MA 02459  
Office: 617-965-0789  
Fax: 617-213-5056

**LEASE EXHIBIT**  
SITE NUMBER:  
CT11403A  
SITE NAME:  
WOLCOTT/ANDREWS RD.\_1  
SITE ADDRESS:  
ANDREWS ROAD  
WOLCOTT, CT 06716

**NORTHEAST TOWERS**  
199 BRICKYARD ROAD  
FARMINGTON, CT 06032  
OFFICE: (860) 677-1999  
FOR  
**T-MOBILE NORTHEAST, LLC**  
35 GRIFFIN ROAD SOUTH  
BLOOMFIELD, CT 06002  
OFFICE: (860) 692-7100  
FAX: (860) 692-7159



**SOUTHWESTER ELEVATION** 1  
 N.T.S. LE-2

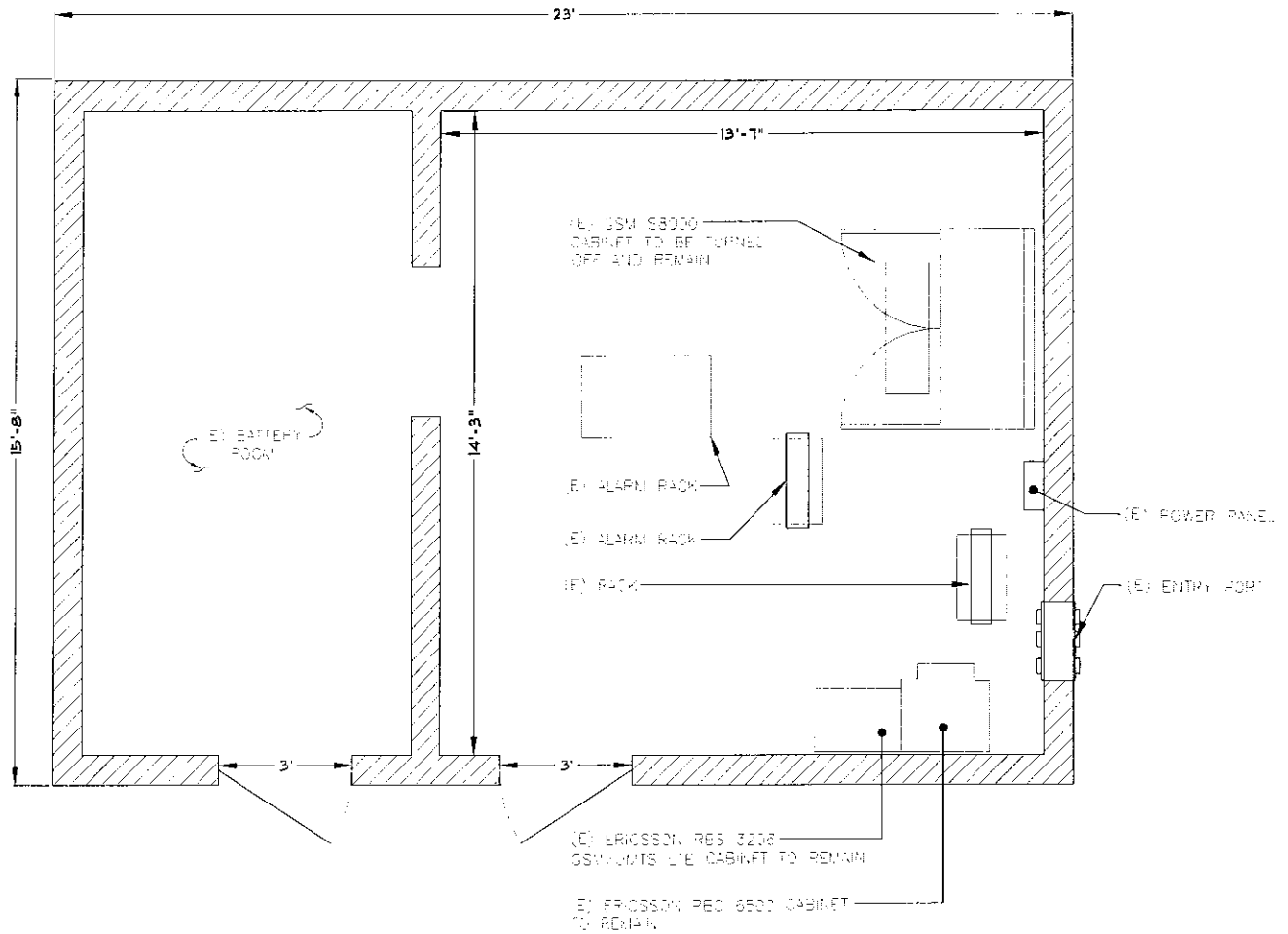
**Configuration**  
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**SHELTER PLAN**  
N.T.S.

1  
LE-3

Configuration  
**2C**

SUBMITTALS	
LE REV A	04.18.13
LE REV 0	04.19.13

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Suite 203  
Newton, MA 02459  
Office: 617-965-0789  
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**LEASE EXHIBIT**  
SITE NUMBER:  
CT11403A  
SITE NAME:  
WOLCOTT/ANDREWS RD.\_1  
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ANDREWS ROAD  
WOLCOTT, CT 06716

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199 BRICKYARD ROAD  
FARMINGTON, CT 06032  
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FOR  
**T-MOBILE NORTHEAST, LLC**  
35 GRIFFIN ROAD SOUTH  
BLOOMFIELD, CT 06002  
OFFICE: (860) 692-7100  
FAX: (860) 692-7159

# **EXHIBIT B**





FDH Engineering, Inc., 6521 Meridien Drive Raleigh, NC 27616, Ph. 919.755.1012

## Structural Analysis for T-Mobile Towers

### 80' Self-Support Tower

T-Mobile Towers Site Name: Wolcott

T-Mobile Towers Site ID: SNET037-A

FDH Project Number 1337661400 (R1)

#### Analysis Results

Tower Components	65.8%	Sufficient
Foundation	20.3%	Sufficient

Prepared By:

Ross Alexander, EI  
Project Engineer

Reviewed By:

Christopher M Murphy, PE  
President  
CT PE License No. 25842

**FDH Engineering, Inc.**  
6521 Meridien Drive  
Raleigh, NC 27616  
(919) 755-1012  
info@fdh-inc.com



July 3, 2013

Prepared pursuant to TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT State Building Code

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## EXECUTIVE SUMMARY

At the request of T-Mobile, FDH Engineering, Inc. performed a structural analysis of the existing self-supported tower located in Wolcott, CT to determine whether the tower is structurally adequate to support both the existing and proposed loads pursuant to the *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, TIA/EIA-222-F* and *2005 CT State Building Code*. Information pertaining to the existing/proposed antenna loading, current tower geometry, the member sizes, geotechnical data, and foundation dimensions was obtained from:

- FDH Engineering, Inc. (Project No. 1308551500) Dispersive Wave Propagation Testing of an Existing Tower Foundation dated June 25, 2013
- FDH Engineering, Inc. (Project No. 1304701600) Geotechnical Evaluation of Subsurface Conditions dated June 26, 2013
- FDH Engineering, Inc. (Project No. 1308541500) Self-Support Tower Mapping Report dated July 1, 2013
- T-Mobile Towers

The *basic design wind speed* per the *TIA/EIA-222-F* standards is 85 mph without ice and 38 mph with 3/4" radial ice. Ice is considered to increase in thickness with height.

## Conclusions

With the existing and proposed antennas from T-Mobile in place at 77 ft, the tower meets the requirements of the *TIA/EIA-222-F* standard and *2005 CT State Building Code* provided the **Recommendation** listed below is satisfied. Furthermore, given the existing foundation dimensions listed (see FDH Project No. 1308551500) and given the existing soil parameters (see FDH Project No. 1304701600), the foundation should have the necessary capacity to support both the proposed and existing loading. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

Our structural analysis has been performed assuming all information provided to FDH Engineering, Inc. is accurate (i.e., the steel data, tower layout, existing antenna loading, and proposed antenna loading) and that the tower has been properly erected and maintained per the original design drawings.

## Recommendation

To ensure the requirements of the *TIA/EIA-222-F* standard and *2005 CT State Building Code* are met with the existing and proposed loading in place, we have the following recommendation:

1. Coax lines must be installed as shown in **Figure 1**.

## APPURTENANCE LISTING

The proposed and existing antennas with their corresponding cables/coax lines are shown in **Table 1**. *If the actual layout determined in the field deviates from the layout, FDH Engineering, Inc. should be contacted to perform a revised analysis.*

**Table 1 - Appurtenance Loading**

### Existing Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
88.8	(1) 2.4'Ø x 21.5' Omni	(4) 1/2"	AT&T	80	Platform
85.5	(2) 2'Ø x 20' (4 element) Dipole				
84	(1) 6.6' Yagi (2) 4' Grid Dish				
76	(3) EMS RR90-17-02DP w/Mount Pipe (3) RFS APX16DWV-16DWVS-C w/ Mount Pipe (6) Andrew One Base Twin Dual Duplex TMA	(12) 1-1/4"	T-Mobile		
63	(1) 4' Dish	(1) 1/2"	AT&T	63	Pipe Mount

### Final Loading:

Antenna Elevation (ft)	Description	Coax and Lines	Carrier	Mount Elevation (ft)	Mount Type
88.8	(1) 2.4'Ø x 21.5' Omni	(4) 1/2"	AT&T	80	Platform
85.5	(2) 2'Ø x 20' (4 element) Dipole				
84	(1) 6.6' Yagi (2) 4' Grid Dish				
77	(6) Ericsson AIR21 w/ Mount Pipe (3) Andrew One Base Twin Dual Duplex TMA	(12) 1-5/8" (1) 1-5/8" Hybrid	T-Mobile		
63	(1) 4' Dish	(1) 1/2"	AT&T	63	Pipe Mount

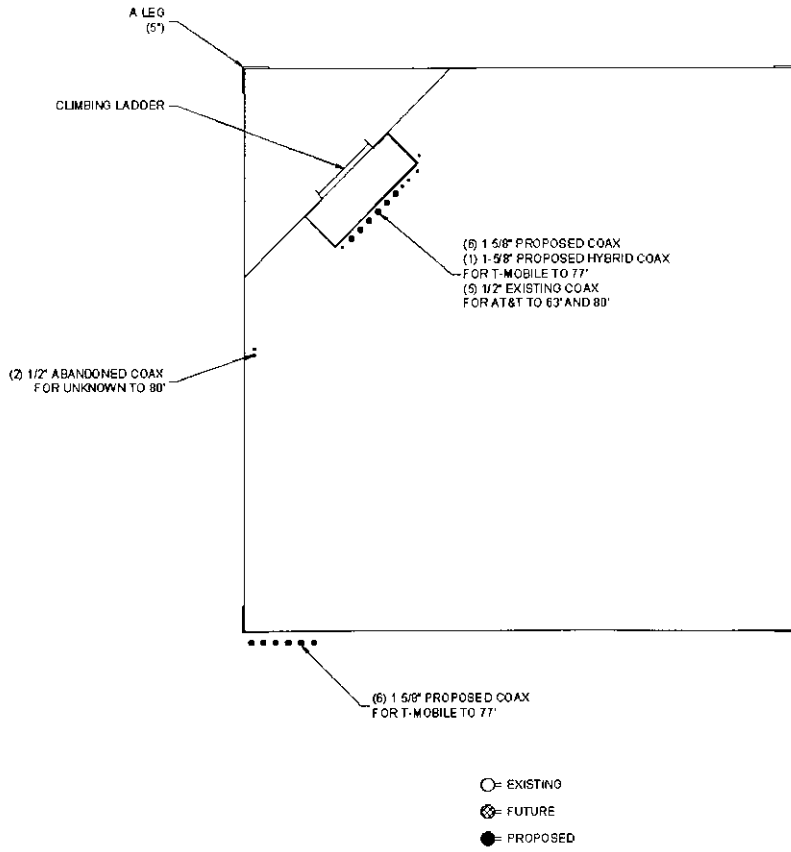


Figure 1 – Coax Layout

## RESULTS

The following yield strength of steel for individual members was used for analysis:

**Table 2 - Material Strength**

Member Type	Yield Strength
Legs	36 ksi (assumed)
Bracing	36 ksi (assumed)

**Table 3** displays the summary of the ratio (as a percentage) of force in the member to their capacities. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. *Note: Capacities up to 105% are considered acceptable.* **Table 4** displays the maximum foundation reactions.

If the assumptions outlined in this report differ from actual field conditions, FDH Engineering, Inc. should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the existing or proposed appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information

**Table 3 - Summary of Working Percentage of Structural Components**

Section No.	Elevation ft	Component Type	Size	% Capacity	Pass Fail
T1	80 - 60	Leg	L4x4x3/8	21.4 26.0 (b)	Pass
		Diagonal	L2 1/2x2 1/2x1/4	10.7 11.0 (b)	Pass
		Top Girt	L3x3x1/4	0.5	Pass
T2	60 - 40	Leg	L5x5x1/2	26.2 38.7 (b)	Pass
		Diagonal	L2 1/2x2 1/2x1/4	11.8	Pass
		Top Girt	C7x12.25	0.2 0.3 (b)	Pass
T3	40 - 20	Leg	L6x6x1/2	28.5 39.9 (b)	Pass
		Diagonal	L3x3x5/16	27.8	Pass
		Secondary Horizontal	L2 1/2x2 1/2x1/4	3.1	Pass
		Top Girt	L2 1/2x2 1/2x1/4	18.9	Pass
		Mid Girt	L2 1/2x2 1/2x1/4	43.9	Pass
T4	20 - 0	Leg	L6x6x5/8	32.4 44.9 (b)	Pass
		Diagonal	L3x3x5/16	37.0	Pass
		Secondary Horizontal	L2 1/2x2 1/2x1/4	5.6	Pass
		Top Girt	L2 1/2x2 1/2x1/4	47.5	Pass
		Mid Girt	L2 1/2x2 1/2x1/4	65.8	Pass

**Table 4 - Maximum Base Reactions**

Load Type	Direction	Current Analysis* (TIA/EIA-222-F)
Individual Foundation	Horizontal	9 k
	Uplift	53 k
	Compression	63 k
Overturing Moment	---	885 k-ft

\*Foundation determined to be adequate per independent analysis.

## GENERAL COMMENTS

This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of T-Mobile Towers to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading information) modeled. If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, FDH Engineering, Inc. should be notified immediately to perform a revised analysis.

## LIMITATIONS

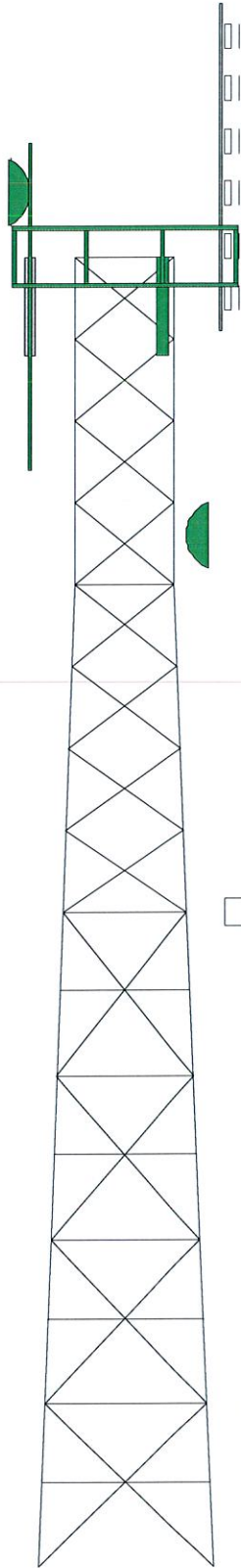
All opinions and conclusions are considered accurate to a reasonable degree of engineering certainty based upon the evidence available at the time of this report. All opinions and conclusions are subject to revision based upon receipt of new or additional/updated information. All services are provided exercising a level of care and diligence equivalent to the standard and care of our profession. No other warranty or guarantee, expressed or implied, is offered. Our services are confidential in nature and we will not release this report to any other party without the client's consent. The use of this engineering work is limited to the express purpose for which it was commissioned and it may not be reused, copied, or distributed for any other purpose without the written consent of FDH Engineering, Inc.

## **APPENDIX**



Section	T1	T2	T3	T4	
Legs	L4x4x3/8	L5x5x1/2	L6x6x1/2	L6x6x5/8	
Diagonals		L2 1/2x2 1/2x1/4	L3x3x5/16		
Diagonal Grade			A36		
Top Girts	L3x3x1/4	C7x12.25		L2 1/2x2 1/2x1/4	
Mid Girts		N.A.		L2 1/2x2 1/2x1/4	
Sec. Horizontals		N.A.		L2 1/2x2 1/2x1/4	
Face Width (ft)	6.17		7.70333	9.23667	
# Panels @ (ft)		8 @ 5	4 @ 10		
Weight (K)	1.9	2.7	3.4	3.9	12.0

80.0 ft  
60.0 ft  
40.0 ft  
20.0 ft  
0.0 ft



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2.4" x 21.5' Omni	80	AIR 21 w/Mount Pipe	80
7'8"x5'5" Yagi	80	OneBase Dual Band TMA	80
2"x20' (4 element) Dipole	80	(2) OneBase Dual Band TMA	80
2"x20' (4 element) Dipole	80	4' Dish	80
Platform	80	4' Dish	80
AIR 21 w/Mount Pipe	80	Pipe Mount	63
(2) AIR 21 w/Mount Pipe	80	4' Dish	63
(2) AIR 21 w/Mount Pipe	80		

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi			

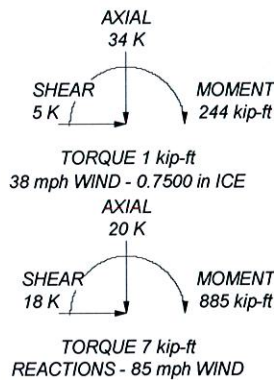
### TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 65.8%

#### MAX. CORNER REACTIONS AT BASE:

DOWN: 63 K  
SHEAR: 9 K

UPLIFT: -53 K  
SHEAR: 8 K



<p><b>FDH Engineering, Inc</b> 6521 Meridien Drive Raleigh, NC 27616 Phone: 919-755-1012 FAX: 919-755-1031</p>	Job: <b>SNET037-A - Wolcott</b>
	Project: <b>1337661400 (R1)</b>
	Client: T-Mobile Towers
	Code: TIA/EIA-222-F
	Path:
Drawn by: Ross Alexander	App'd:
Date: 07/03/13	Scale: NTS
	Dwg No. E-1

<b>tnxTower</b>  <b>FDH Engineering, Inc</b> 6521 Meridien Drive Raleigh, NC 27616 Phone: 919-755-1012 FAX: 919-755-1031	<b>Job</b> SNET037-A - Wolcott	<b>Page</b> 1 of 18
	<b>Project</b> 1337661400 (R1)	<b>Date</b> 14:49:17 07/03/13
	<b>Client</b> T-Mobile Towers	<b>Designed by</b> Ross Alexander

## Tower Input Data

The main tower is a 4x free standing tower with an overall height of 80.00 ft above the ground line.  
 The base of the tower is set at an elevation of 0.00 ft above the ground line.  
 The face width of the tower is 6.17 ft at the top and 10.77 ft at the base.  
 This tower is designed using the TIA/EIA-222-F standard.

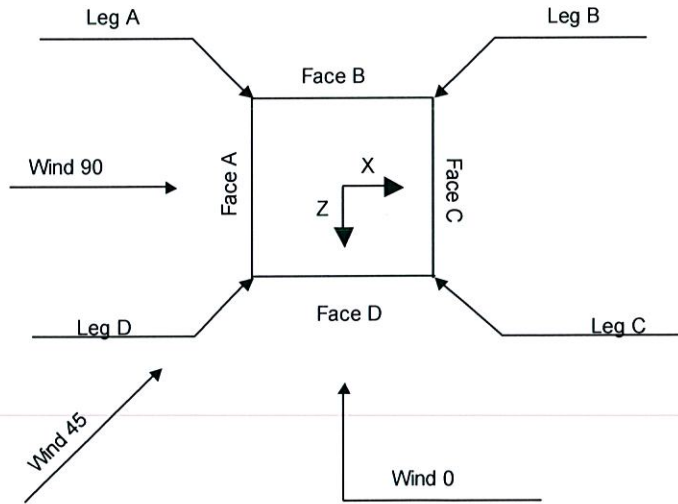
The following design criteria apply:

- Tower is located in New Haven County, Connecticut.
- Basic wind speed of 85 mph.
- Nominal ice thickness of 0.7500 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 38 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

## Options

- |  |  |  |
|--|--|--|
| <ul style="list-style-type: none"> <li>Consider Moments - Legs</li> <li>Consider Moments - Horizontals</li> <li>Consider Moments - Diagonals</li> <li>Use Moment Magnification</li> <li>√ Use Code Stress Ratios</li> <li>√ Use Code Safety Factors - Guys</li> <li>√ Escalate Ice</li> <li>Always Use Max Kz</li> <li>Use Special Wind Profile</li> <li>√ Include Bolts In Member Capacity</li> <li>Leg Bolts Are At Top Of Section</li> <li>√ Secondary Horizontal Braces Leg</li> <li>Use Diamond Inner Bracing (4 Sided)</li> <li>Add IBC .6D+W Combination</li> </ul> | <ul style="list-style-type: none"> <li>Distribute Leg Loads As Uniform</li> <li>Assume Legs Pinned</li> <li>√ Assume Rigid Index Plate</li> <li>√ Use Clear Spans For Wind Area</li> <li>Use Clear Spans For KL/r</li> <li>Retension Guys To Initial Tension</li> <li>√ Bypass Mast Stability Checks</li> <li>√ Use Azimuth Dish Coefficients</li> <li>√ Project Wind Area of Appurt.</li> <li>Autocalc Torque Arm Areas</li> <li>SR Members Have Cut Ends</li> <li>Sort Capacity Reports By Component</li> <li>Triangulate Diamond Inner Bracing</li> </ul> | <ul style="list-style-type: none"> <li>Treat Feedline Bundles As Cylinder</li> <li>Use ASCE 10 X-Brace Ly Rules</li> <li>√ Calculate Redundant Bracing Forces</li> <li>Ignore Redundant Members in FEA</li> <li>SR Leg Bolts Resist Compression</li> <li>√ All Leg Panels Have Same Allowable</li> <li>Offset Girt At Foundation</li> <li>√ Consider Feedline Torque</li> <li>√ Include Angle Block Shear Check</li> </ul> |
| <b>Poles</b>   |  |  |
| <ul style="list-style-type: none"> <li>Include Shear-Torsion Interaction</li> <li>Always Use Sub-Critical Flow</li> <li>Use Top Mounted Sockets</li> </ul>   |  |  |

<b>tnxTower</b>  <b>FDH Engineering, Inc</b> 6521 Meridien Drive Raleigh, NC 27616 Phone: 919-755-1012 FAX: 919-755-1031	<b>Job</b> SNET037-A - Wolcott	<b>Page</b> 2 of 18
	<b>Project</b> 1337661400 (R1)	<b>Date</b> 14:49:17 07/03/13
	<b>Client</b> T-Mobile Towers	<b>Designed by</b> Ross Alexander



**Square Tower**

**Tower Section Geometry**

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	80.00-60.00			6.17	1	20.00
T2	60.00-40.00			6.17	1	20.00
T3	40.00-20.00			7.70	1	20.00
T4	20.00-0.00			9.24	1	20.00

**Tower Section Geometry (cont'd)**

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T1	80.00-60.00	5.00	X Brace	No	No	0.0000	0.0000
T2	60.00-40.00	5.00	X Brace	No	No	0.0000	0.0000
T3	40.00-20.00	10.00	X Brace	No	Yes	0.0000	0.0000
T4	20.00-0.00	10.00	X Brace	No	Yes	0.0000	0.0000

**Tower Section Geometry (cont'd)**

Tower Elevation	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
<i>ft</i>						
T1 80.00-60.00	Equal Angle	L4x4x3/8	A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)

<b>tnxTower</b>  <b>FDH Engineering, Inc</b> 6521 Meridien Drive Raleigh, NC 27616 Phone: 919-755-1012 FAX: 919-755-1031	<b>Job</b> SNET037-A - Wolcott	<b>Page</b> 3 of 18
	<b>Project</b> 1337661400 (R1)	<b>Date</b> 14:49:17 07/03/13
	<b>Client</b> T-Mobile Towers	<b>Designed by</b> Ross Alexander

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T2 60.00-40.00	Equal Angle	L5x5x1/2	A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T3 40.00-20.00	Equal Angle	L6x6x1/2	A36 (36 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T4 20.00-0.00	Equal Angle	L6x6x5/8	A36 (36 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)

### Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T2 60.00-40.00	Channel	C7x12.25	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 40.00-20.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T4 20.00-0.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

### Tower Section Geometry (cont'd)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T3 40.00-20.00	1	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T4 20.00-0.00	1	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

### Tower Section Geometry (cont'd)

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T3 40.00-20.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T4 20.00-0.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

### Tower Section Geometry (cont'd)

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Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor $A_f$	Adjust. Factor $A_r$	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft <sup>2</sup>	in					in	in
T1 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

### Tower Section Geometry (cont'd)

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	K Factors <sup>1</sup>							
			Legs	X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
T1 80.00-60.00	Yes	No	1	1	1	1	1	1	1	1
T2 60.00-40.00	Yes	No	1	1	1	1	1	1	1	1
T3 40.00-20.00	No	No	1	1	1	1	1	1	0.5	1
T4 20.00-0.00	No	No	1	1	1	1	1	1	0.5	1

<sup>1</sup>Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

### Tower Section Geometry (cont'd)

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U	Net Width	U
	Deduct		Deduct		Deduct		Deduct		Deduct		Deduct		Deduct	
	in		in		in		in		in		in		in	
T1 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

### Tower Section Geometry (cont'd)

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Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
				Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 80.00-60.00	Sleeve DS	0.7500	4	0.7500	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T2 60.00-40.00	Sleeve DS	0.7500	6	0.7500	2	0.7500	2	0.6250	0	0.0000	0	0.6250	0	0.6250	0
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T3 40.00-20.00	Sleeve DS	0.7500	8	0.7500	2	0.7500	2	0.6250	0	0.7500	2	0.6250	0	0.7500	2
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	
T4 20.00-0.00	Sleeve DS	0.7500	10	0.7500	2	0.7500	2	0.6250	0	0.7500	2	0.6250	0	0.7500	2
		A325N		A325N		A325N		A325N		A325N		A325N		A325N	

**Feed Line/Linear Appurtenances - Entered As Round Or Flat**

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
*** Climbing Ladder ***	A	No	Af (Leg)	80.00 - 0.00	0.0000	0.2	1	1	2.5000	2.5000	10.0000	7.90
*** Feedline Ladder (Af) ***	A	No	Af (Leg)	80.00 - 8.00	0.0000	0.25	1	1	3.0000	3.0000	12.0000	8.40
LDF7-50A(1-5/8")	A	No	Ar (Leg)	80.00 - 8.00	0.0000	0.25	7	1	1.0000	1.9800		0.82
LDF4-50A(1/2")	A	No	Ar (Leg)	63.00 - 8.00	0.0000	0.25	5	1	0.6300	0.6300		0.15
LDF4-50A(1/2")	A	No	Ar (Leg)	80.00 - 63.00	0.0000	0.25	4	1	0.6300	0.6300		0.15
*** Feedline Ladder (Af) ***	D	Yes	Af (CfAe)	80.00 - 5.30	0.0000	0.45	1	1	3.0000	3.0000	12.0000	8.40
LDF7-50A(1-5/8")	D	Yes	Ar (CfAe)	80.00 - 5.30	0.0000	0.45	6	6	1.0000 1.9800	1.9800		0.82
LDF4-50A(1/2")	A	Yes	Ar (CfAe)	80.00 - 8.00	0.0000	0	2	2	0.6300	0.6300		0.15

**Feed Line/Linear Appurtenances Section Areas**

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>1</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>1</sub> Out Face ft <sup>2</sup>	Weight K
T1	80.00-60.00	A	6.450	9.167	0.000	0.000	0.46
		B	4.350	9.167	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
		D	19.800	5.000	0.000	0.000	0.27
T2	60.00-40.00	A	6.450	9.167	0.000	0.000	0.46
		B	4.350	9.167	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
		D	19.800	5.000	0.000	0.000	0.27
T3	40.00-20.00	A	6.450	9.167	0.000	0.000	0.46
		B	4.350	9.167	0.000	0.000	0.00

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Tower Section	Tower Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{A,A}$ In Face ft <sup>2</sup>	$C_{A,A}$ Out Face ft <sup>2</sup>	Weight K
T4	20.00-0.00	C	0.000	0.000	0.000	0.000	0.00
		D	19.800	5.000	0.000	0.000	0.27
		A	3.870	7.167	0.000	0.000	0.34
		B	2.610	7.167	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
		D	14.553	3.675	0.000	0.000	0.20

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{A,A}$ In Face ft <sup>2</sup>	$C_{A,A}$ Out Face ft <sup>2</sup>	Weight K
T1	80.00-60.00	A	0.821	13.608	14.915	0.000	0.000	1.20
		B		9.822	12.815	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
		D		6.036	31.657	0.000	0.000	0.72
T2	60.00-40.00	A	0.788	13.283	14.770	0.000	0.000	1.19
		B		9.606	12.670	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
		D		5.928	31.585	0.000	0.000	0.70
T3	40.00-20.00	A	0.750	12.900	14.600	0.000	0.000	1.14
		B		9.350	12.500	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
		D		5.800	31.500	0.000	0.000	0.69
T4	20.00-0.00	A	0.750	7.740	11.093	0.000	0.000	0.78
		B		5.610	9.833	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
		D		4.263	23.153	0.000	0.000	0.50

### Feed Line Shielding

Section	Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_R$ Ice ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$A_F$ Ice ft <sup>2</sup>
T1	80.00-60.00	A	0.000	0.455	0.251	0.705
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
		D	0.000	2.983	2.970	4.623
T2	60.00-40.00	A	0.000	0.413	0.277	0.763
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
		D	0.000	2.743	3.275	5.070
T3	40.00-20.00	A	0.000	0.360	0.250	0.673
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
		D	0.000	2.430	2.954	4.541
T4	20.00-0.00	A	0.000	0.205	0.142	0.381
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
		D	0.000	1.692	2.049	3.150

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### Feed Line Center of Pressure

Section	Elevation	CP <sub>X</sub>	CP <sub>Z</sub>	CP <sub>X</sub> Ice	CP <sub>Z</sub> Ice
	<i>ft</i>	<i>in</i>	<i>in</i>	<i>in</i>	<i>in</i>
T1	80.00-60.00	-7.0686	3.1108	-5.6360	1.4534
T2	60.00-40.00	-6.8231	2.9461	-5.7062	1.4721
T3	40.00-20.00	-7.5269	3.2722	-6.5017	1.8153
T4	20.00-0.00	-6.5026	2.8682	-5.6538	1.6891

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert <i>ft</i> <i>ft</i> <i>ft</i>	Azimuth Adjustment  °	Placement  <i>ft</i>	C <sub>A</sub> A <sub>A</sub> Front  <i>ft</i> <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side  <i>ft</i> <sup>2</sup>	Weight  K
***								
2.4" x 21.5' Omni	A	From Face	4.00 0.00 8.75	0.0000	80.00	No Ice 6.35 1/2" Ice 8.83 1" Ice 11.34 2" Ice 16.43 4" Ice 26.97	6.35 8.83 11.34 16.43 26.97	0.03 0.08 0.15 0.33 0.91
7'8"x5'5" Yagi	A	From Face	4.00 0.00 4.00	0.0000	80.00	No Ice 4.90 1/2" Ice 5.88 1" Ice 6.86 2" Ice 8.82 4" Ice 12.74	4.90 5.88 6.86 8.82 12.74	0.03 0.04 0.04 0.05 0.08
*								
2"x20' (4 element) Dipole	B	From Leg	4.00 0.00 5.50	0.0000	80.00	No Ice 4.00 1/2" Ice 6.03 1" Ice 8.07 2" Ice 12.20 4" Ice 20.59	4.00 6.03 8.07 12.20 20.59	0.02 0.05 0.09 0.22 0.63
*								
2"x20' (4 element) Dipole	C	From Face	4.00 0.00 5.50	0.0000	80.00	No Ice 4.00 1/2" Ice 6.03 1" Ice 8.07 2" Ice 12.20 4" Ice 20.59	4.00 6.03 8.07 12.20 20.59	0.02 0.05 0.09 0.22 0.63
*								
***								
Platform	C	None		0.0000	80.00	No Ice 77.10 1/2" Ice 93.30 1" Ice 109.50 2" Ice 141.90 4" Ice 206.70	77.10 93.30 109.50 141.90 206.70	4.05 5.27 6.48 8.91 13.77
***								
Pipe Mount	C	From Leg	0.50 0.00 0.00	0.0000	63.00	No Ice 3.00 1/2" Ice 3.74 1" Ice 4.48 2" Ice 5.96 4" Ice 8.92	0.90 1.12 1.34 1.78 2.66	0.07 0.08 0.09 0.12 0.18
***								
AIR 21 w/Mount Pipe	A	From Leg	4.00 0.00	0.0000	80.00	No Ice 6.85 1/2" Ice 7.41	5.78 6.70	0.10 0.16



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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>1</sub> Front	C <sub>A</sub> A <sub>1</sub> Side	Weight
			Horz	Lateral					
(2) AIR 21 w/Mount Pipe	B	From Leg	4.00	0.0000	80.00	1" Ice	7.94	7.50	0.23
			0.00			2" Ice	9.05	9.14	0.38
			-3.00			4" Ice	11.38	12.65	0.81
						No Ice	6.85	5.78	0.10
						1/2" Ice	7.41	6.70	0.16
						1" Ice	7.94	7.50	0.23
						2" Ice	9.05	9.14	0.38
						4" Ice	11.38	12.65	0.81
(2) AIR 21 w/Mount Pipe	C	From Leg	4.00	0.0000	80.00	No Ice	6.85	5.78	0.10
			0.00			1/2" Ice	7.41	6.70	0.16
			-3.00			1" Ice	7.94	7.50	0.23
						2" Ice	9.05	9.14	0.38
						4" Ice	11.38	12.65	0.81
AIR 21 w/Mount Pipe	D	From Leg	4.00	0.0000	80.00	No Ice	6.85	5.78	0.10
			0.00			1/2" Ice	7.41	6.70	0.16
			-3.00			1" Ice	7.94	7.50	0.23
						2" Ice	9.05	9.14	0.38
						4" Ice	11.38	12.65	0.81
OneBase Dual Band TMA	B	From Leg	4.00	0.0000	80.00	No Ice	0.32	0.67	0.01
			0.00			1/2" Ice	0.41	0.78	0.02
			-3.00			1" Ice	0.50	0.90	0.03
						2" Ice	0.72	1.17	0.04
						4" Ice	1.27	1.81	0.11
(2) OneBase Dual Band TMA	C	From Leg	4.00	0.0000	80.00	No Ice	0.32	0.67	0.01
			0.00			1/2" Ice	0.41	0.78	0.02
			-3.00			1" Ice	0.50	0.90	0.03
						2" Ice	0.72	1.17	0.04
						4" Ice	1.27	1.81	0.11

### Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				Horz	Lateral						
***											
4' Dish	D	Grid	From Leg	4.00	0.0000	80.00	4.00	No Ice	12.57	0.00	
				0.00				1/2" Ice	13.10	0.00	
				4.00				1" Ice	13.62	0.00	
								2" Ice	14.68	0.00	
								4" Ice	16.80	0.00	
*											
4' Dish	A	Grid	From Leg	4.00	0.0000	80.00	4.00	No Ice	12.57	0.00	
				0.00				1/2" Ice	13.10	0.00	
				4.00				1" Ice	13.62	0.00	
								2" Ice	14.68	0.00	
								4" Ice	16.80	0.00	
***											
4' Dish	C	Grid	From Leg	1.00	0.0000	63.00	4.00	No Ice	12.57	0.00	
				0.00				1/2" Ice	13.10	0.00	

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Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K
				0.00				1" Ice	13.62	0.00
								2" Ice	14.68	0.00
								4" Ice	16.80	0.00

### Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 45 deg - No Ice
4	Dead+Wind 90 deg - No Ice
5	Dead+Wind 135 deg - No Ice
6	Dead+Wind 180 deg - No Ice
7	Dead+Wind 225 deg - No Ice
8	Dead+Wind 270 deg - No Ice
9	Dead+Wind 315 deg - No Ice
10	Dead+Ice+Temp
11	Dead+Wind 0 deg+Ice+Temp
12	Dead+Wind 45 deg+Ice+Temp
13	Dead+Wind 90 deg+Ice+Temp
14	Dead+Wind 135 deg+Ice+Temp
15	Dead+Wind 180 deg+Ice+Temp
16	Dead+Wind 225 deg+Ice+Temp
17	Dead+Wind 270 deg+Ice+Temp
18	Dead+Wind 315 deg+Ice+Temp
19	Dead+Wind 0 deg - Service
20	Dead+Wind 45 deg - Service
21	Dead+Wind 90 deg - Service
22	Dead+Wind 135 deg - Service
23	Dead+Wind 180 deg - Service
24	Dead+Wind 225 deg - Service
25	Dead+Wind 270 deg - Service
26	Dead+Wind 315 deg - Service

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	80 - 60	Leg	Max Tension	9	9.35	0.04	0.02
			Max. Compression	7	-12.87	-0.07	-0.07
			Max. Mx	9	-1.69	0.14	-0.12
			Max. My	5	-1.77	-0.12	0.14
			Max. Vy	4	1.07	0.00	0.00
			Max. Vx	4	-1.07	0.00	0.00
		Diagonal	Max Tension	6	2.20	0.00	0.00
			Max. Compression	2	-2.25	0.00	0.00
			Max. Mx	7	1.43	0.03	0.00
			Max. My	6	-2.08	0.00	-0.00
			Max. Vy	18	-0.02	0.02	-0.00
			Max. Vx	6	0.00	0.02	-0.00
		Top Girt	Max Tension	8	0.07	0.00	0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T2	60 - 40	Leg	Max. Compression	8	-0.09	0.00	0.00
			Max. Mx	10	-0.03	-0.05	0.00
			Max. Vy	10	-0.03	0.00	0.00
			Max Tension	9	23.38	0.04	0.03
			Max. Compression	9	-28.70	-0.02	-0.06
			Max. Mx	9	-2.89	0.21	-0.21
		Diagonal	Max. My	5	-2.89	-0.21	0.21
			Max. Vy	9	-0.07	0.19	-0.17
			Max. Vx	5	-0.07	-0.17	0.19
			Max Tension	6	2.18	0.00	0.00
			Max. Compression	2	-2.18	0.00	0.00
			Max. Mx	9	1.53	0.02	0.00
		Top Girt	Max. My	6	-1.92	0.00	-0.00
			Max. Vy	18	-0.02	0.02	-0.00
			Max. Vx	6	0.00	0.00	0.00
			Max Tension	8	0.02	0.00	0.00
			Max. Compression	8	-0.07	0.00	0.00
			Max. Mx	10	-0.04	0.10	0.00
T3	40 - 20	Leg	Max. My	10	-0.04	0.00	-0.00
			Max. Vy	10	-0.06	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
			Max Tension	9	33.29	0.01	-0.05
			Max. Compression	9	-39.48	0.12	0.08
			Max. Mx	9	-3.19	0.50	-0.46
		Diagonal	Max. My	5	-2.89	-0.46	0.50
			Max. Vy	9	0.17	0.50	-0.46
			Max. Vx	5	0.17	-0.46	0.50
			Max Tension	9	4.23	0.00	0.00
			Max. Compression	9	-4.88	0.00	0.00
			Max. Mx	9	0.20	0.05	0.01
		Secondary Horizontal	Max. My	11	-1.39	0.03	0.01
			Max. Vy	18	0.03	0.05	-0.01
			Max. Vx	11	-0.00	0.00	0.00
			Max Tension	9	0.59	0.00	0.00
			Max. Compression	9	-0.59	0.00	0.00
			Max. Mx	10	0.10	-0.08	0.00
T4	20 - 0	Top Girt	Max. My	10	0.10	0.00	0.00
			Max. Vy	10	0.03	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
			Max Tension	8	1.64	0.00	0.00
			Max. Compression	8	-1.26	0.00	0.00
			Max. Mx	10	0.35	-0.06	0.00
		Mid Girt	Max. My	10	0.35	0.00	0.00
			Max. Vy	10	-0.03	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
			Max Tension	8	3.16	0.00	0.00
			Max. Compression	8	-2.42	0.00	0.00
			Max. Mx	10	0.61	-0.07	0.00
Leg	Max. My	10	0.61	0.00	0.00		
	Max. Vy	10	0.03	0.00	0.00		
	Max. Vx	10	-0.00	0.00	0.00		
	Max Tension	9	47.19	-0.01	-0.07		
	Max. Compression	9	-55.51	-0.00	0.00		
	Max. Mx	9	-4.22	0.69	-0.64		
Diagonal	Max. My	5	-4.32	-0.63	0.68		
	Max. Vy	9	0.21	0.69	-0.64		
	Max. Vx	5	0.21	-0.63	0.68		
	Max Tension	9	4.90	0.00	0.00		
	Max. Compression	9	-5.65	0.00	0.00		
	Max. Mx	9	0.06	0.06	0.01		

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Secondary Horizontal	Max. My	11	3.30	0.02	0.01
			Max. Vy	18	0.03	0.06	-0.01
			Max. Vx	11	-0.00	0.00	0.00
			Max Tension	9	0.83	0.00	0.00
		Top Girt	Max. Compression	9	-0.83	0.00	0.00
			Max. Mx	10	0.19	-0.11	0.00
			Max. My	10	0.19	0.00	0.00
			Max. Vy	10	0.04	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
			Max Tension	8	2.86	0.00	0.00
			Max. Compression	8	-2.21	0.00	0.00
			Max. Mx	10	0.90	-0.08	0.00
			Max. My	10	0.90	0.00	0.00
			Max. Vy	10	0.04	0.00	0.00
		Mid Girt	Max. Vx	10	-0.00	0.00	0.00
			Max Tension	8	3.37	0.00	0.00
			Max. Compression	8	-2.61	0.00	0.00
			Max. Mx	10	-1.29	-0.10	0.00
			Max. My	10	-1.29	0.00	0.00
			Max. Vy	10	-0.04	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg D	Max. Vert	7	62.36	6.11	-6.27
	Max. H <sub>x</sub>	7	62.36	6.11	-6.27
	Max. H <sub>y</sub>	3	-51.90	-5.21	5.30
	Min. Vert	3	-51.90	-5.21	5.30
	Min. H <sub>x</sub>	3	-51.90	-5.21	5.30
	Min. H <sub>y</sub>	7	62.36	6.11	-6.27
Leg C	Max. Vert	5	62.29	-6.40	-6.02
	Max. H <sub>x</sub>	9	-53.20	5.50	5.18
	Max. H <sub>y</sub>	9	-53.20	5.50	5.18
	Min. Vert	9	-53.20	5.50	5.18
	Min. H <sub>x</sub>	5	62.29	-6.40	-6.02
	Min. H <sub>y</sub>	5	62.29	-6.40	-6.02
Leg B	Max. Vert	3	61.66	-6.23	6.08
	Max. H <sub>x</sub>	7	-52.60	5.34	-5.24
	Max. H <sub>y</sub>	3	61.66	-6.23	6.08
	Min. Vert	7	-52.60	5.34	-5.24
	Min. H <sub>x</sub>	3	61.66	-6.23	6.08
	Min. H <sub>y</sub>	7	-52.60	5.34	-5.24
Leg A	Max. Vert	9	62.96	6.05	6.43
	Max. H <sub>x</sub>	9	62.96	6.05	6.43
	Max. H <sub>y</sub>	9	62.96	6.05	6.43
	Min. Vert	5	-52.53	-5.15	-5.47
	Min. H <sub>x</sub>	5	-52.53	-5.15	-5.47
	Min. H <sub>y</sub>	5	-52.53	-5.15	-5.47

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### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>y</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>y</sub> kip-ft	Torque kip-ft
Dead Only	19.52	-0.00	0.00	-0.31	6.54	0.00
Dead+Wind 0 deg - No Ice	19.52	-0.05	-15.75	-790.06	9.81	-6.27
Dead+Wind 45 deg - No Ice	19.52	12.64	-12.64	-615.32	-607.80	-2.74
Dead+Wind 90 deg - No Ice	19.52	15.75	0.05	2.86	-783.36	2.91
Dead+Wind 135 deg - No Ice	19.52	12.74	12.76	622.52	-614.14	7.45
Dead+Wind 180 deg - No Ice	19.52	0.05	15.75	789.08	3.70	6.31
Dead+Wind 225 deg - No Ice	19.52	-12.65	12.65	615.27	622.78	2.74
Dead+Wind 270 deg - No Ice	19.52	-15.75	-0.05	-3.26	795.78	-2.95
Dead+Wind 315 deg - No Ice	19.52	-12.77	-12.74	-621.38	629.76	-7.45
Dead+Ice+Temp	34.47	-0.00	0.00	-0.20	17.21	0.00
Dead+Wind 0 deg+Ice+Temp	34.47	-0.00	-4.06	-210.74	15.71	-1.29
Dead+Wind 45 deg+Ice+Temp	34.47	3.23	-3.23	-162.12	-144.67	-0.78
Dead+Wind 90 deg+Ice+Temp	34.47	4.07	0.01	0.39	-194.29	0.39
Dead+Wind 135 deg+Ice+Temp	34.47	3.27	3.27	164.48	-147.37	1.31
Dead+Wind 180 deg+Ice+Temp	34.47	0.09	4.03	208.19	9.87	1.09
Dead+Wind 225 deg+Ice+Temp	34.47	-3.20	3.20	159.47	176.92	0.78
Dead+Wind 270 deg+Ice+Temp	34.47	-4.03	-0.08	-5.45	224.64	-0.18
Dead+Wind 315 deg+Ice+Temp	34.47	-3.27	-3.27	-164.10	181.22	-1.31
Dead+Wind 0 deg - Service	19.52	-0.02	-5.45	-273.58	7.67	-2.17
Dead+Wind 45 deg - Service	19.52	4.37	-4.37	-213.12	-206.04	-0.95
Dead+Wind 90 deg - Service	19.52	5.45	0.02	0.78	-266.78	1.01
Dead+Wind 135 deg - Service	19.52	4.41	4.42	215.20	-208.23	2.58
Dead+Wind 180 deg - Service	19.52	0.02	5.45	272.83	5.55	2.18
Dead+Wind 225 deg - Service	19.52	-4.38	4.38	212.69	219.77	0.95
Dead+Wind 270 deg - Service	19.52	-5.45	-0.02	-1.33	279.63	-1.02
Dead+Wind 315 deg - Service	19.52	-4.42	-4.41	-215.22	222.18	-2.58

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-19.52	0.00	0.00	19.52	0.00	0.000%
2	-0.05	-19.52	-15.75	0.05	19.52	15.75	0.000%
3	12.64	-19.52	-12.64	-12.64	19.52	12.64	0.000%
4	15.75	-19.52	0.05	-15.75	19.52	-0.05	0.000%
5	12.74	-19.52	12.76	-12.74	19.52	-12.76	0.000%
6	0.05	-19.52	15.75	-0.05	19.52	-15.75	0.000%
7	-12.65	-19.52	12.65	12.65	19.52	-12.65	0.000%
8	-15.75	-19.52	-0.05	15.75	19.52	0.05	0.000%
9	-12.77	-19.52	-12.74	12.77	19.52	12.74	0.000%
10	0.00	-34.47	0.00	0.00	34.47	0.00	0.000%
11	-0.00	-34.47	-4.06	0.00	34.47	4.06	0.000%
12	3.23	-34.47	-3.23	-3.23	34.47	3.23	0.000%
13	4.07	-34.47	0.01	-4.07	34.47	-0.01	0.000%
14	3.27	-34.47	3.27	-3.27	34.47	-3.27	0.000%
15	0.09	-34.47	4.03	-0.09	34.47	-4.03	0.000%
16	-3.20	-34.47	3.20	3.20	34.47	-3.20	0.000%
17	-4.03	-34.47	-0.08	4.03	34.47	0.08	0.000%
18	-3.27	-34.47	-3.27	3.27	34.47	3.27	0.000%
19	-0.02	-19.52	-5.45	0.02	19.52	5.45	0.000%
20	4.37	-19.52	-4.37	-4.37	19.52	4.37	0.000%
21	5.45	-19.52	0.02	-5.45	19.52	-0.02	0.000%
22	4.41	-19.52	4.42	-4.41	19.52	-4.42	0.000%
23	0.02	-19.52	5.45	-0.02	19.52	-5.45	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
24	-4.38	-19.52	4.38	4.38	19.52	-4.38	0.000%
25	-5.45	-19.52	-0.02	5.45	19.52	0.02	0.000%
26	-4.42	-19.52	-4.41	4.42	19.52	4.41	0.000%

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	80 - 60	0.455	26	0.0434	0.0022
T2	60 - 40	0.273	26	0.0369	0.0021
T3	40 - 20	0.130	26	0.0253	0.0014
T4	20 - 0	0.039	26	0.0127	0.0007

### Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
84.00	4' Dish	26	0.455	0.0434	0.0022	415882
80.00	2.4" x 21.5' Omni	26	0.455	0.0434	0.0022	415882
63.00	4' Dish	26	0.299	0.0381	0.0022	122681

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	80 - 60	1.304	9	0.1246	0.0065
T2	60 - 40	0.783	9	0.1054	0.0061
T3	40 - 20	0.373	9	0.0723	0.0041
T4	20 - 0	0.112	9	0.0363	0.0020

### Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
84.00	4' Dish	9	1.304	0.1246	0.0065	144006
80.00	2.4" x 21.5' Omni	9	1.304	0.1246	0.0065	144006
63.00	4' Dish	9	0.856	0.1091	0.0062	42482

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### Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	80	Leg	A325N	0.7500	4	6.44	18.56	0.347 ✓	1.333	Bolt DS
		Diagonal	A325N	0.7500	2	1.10	7.52	0.146 ✓	1.333	Member Block Shear
T2	60	Leg	A325N	0.7500	6	9.57	18.56	0.516 ✓	1.333	Bolt DS
		Diagonal	A325N	0.7500	2	1.09	7.52	0.145 ✓	1.333	Member Block Shear
T3	40	Top Girt	A325N	0.7500	2	0.04	9.28	0.004 ✓	1.333	Bolt Shear
		Leg	A325N	0.7500	8	9.87	18.56	0.532 ✓	1.333	Bolt DS
		Diagonal	A325N	0.7500	2	2.44	9.28	0.263 ✓	1.333	Bolt Shear
T4	20	Secondary Horizontal	A325N	0.7500	2	0.30	7.52	0.039 ✓	1.333	Member Block Shear
		Top Girt	A325N	0.7500	2	0.82	7.52	0.109 ✓	1.333	Member Block Shear
		Mid Girt	A325N	0.7500	2	1.58	7.52	0.210 ✓	1.333	Member Block Shear
		Leg	A325N	0.7500	10	11.10	18.56	0.598 ✓	1.333	Bolt DS
T4	20	Diagonal	A325N	0.7500	2	2.82	9.28	0.304 ✓	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.7500	2	0.42	7.52	0.055 ✓	1.333	Member Block Shear
		Top Girt	A325N	0.7500	2	1.43	7.52	0.190 ✓	1.333	Member Block Shear
		Mid Girt	A325N	0.7500	2	1.68	7.52	0.224 ✓	1.333	Member Block Shear

### Compression Checks

### Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P / P <sub>a</sub>
T1	80 - 60	L4x4x3/8	20.00	5.00	76.1 K=1.00	15.779	2.8600	-12.87	45.13	0.285 ✓
T2	60 - 40	L5x5x1/2	20.03	5.01	61.1 K=1.00	17.321	4.7500	-28.70	82.27	0.349 ✓
T3	40 - 20	L6x6x1/2	20.03	5.24	53.3 K=1.00	18.052	5.7500	-39.48	103.80	0.380 ✓
T4	20 - 0	L6x6x5/8	20.03	5.21	53.0 K=1.00	18.087	7.1100	-55.51	128.60	0.432 ✓

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**Diagonal Design Data (Compression)**

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KL/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
T1	80 - 60	L2 1/2x2 1/2x1/4	7.94	3.72	98.2 K=1.08	13.204	1.1900	-2.25	15.71	0.143 ✓
T2	60 - 40	L2 1/2x2 1/2x1/4	9.03	4.38	110.2 K=1.03	11.639	1.1900	-2.18	13.85	0.157 ✓
T3	40 - 20	L3x3x5/16	13.36	6.97	142.0 K=1.00	7.406	1.7800	-4.88	13.18	0.370 ✓
T4	20 - 0	L3x3x5/16	14.42	7.48	152.3 K=1.00	6.434	1.7800	-5.65	11.45	0.493 ✓

**Secondary Horizontal Design Data (Compression)**

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KL/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
T3	40 - 20	L2 1/2x2 1/2x1/4	8.84	8.84	108.0 K=0.50	11.942	1.1900	-0.59	14.21	0.042 ✓
T4	20 - 0	L2 1/2x2 1/2x1/4	10.37	10.37	126.8 K=0.50	9.295	1.1900	-0.83	11.06	0.075 ✓

**Top Girt Design Data (Compression)**

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KL/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
T1	80 - 60	L3x3x1/4	6.17	6.17	123.1 K=0.98	9.831	1.4400	-0.09	14.16	0.007 ✓
T2	60 - 40	C7x12.25	6.17	6.17	129.7 K=1.00	8.882	3.6000	-0.07	31.97	0.002 ✓
T3	40 - 20	L2 1/2x2 1/2x1/4	7.70	7.70	188.3 K=1.00	4.213	1.1900	-1.26	5.01	0.251 ✓
T4	20 - 0	L2 1/2x2 1/2x1/4	9.24	9.24	225.7 K=1.00	2.930	1.1900	-2.21	3.49	0.633 ✓

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**Mid Girt Design Data (Compression)**

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KL/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
T3	40 - 20	L2 1/2x2 1/2x1/4	8.47	8.47	207.0 K=1.00	3.485	1.1900	-2.42	4.15	0.585 ✓

KL/R > 200 (C) - 90



<b>tnxTower</b>  <b>FDH Engineering, Inc</b> 6521 Meridien Drive Raleigh, NC 27616 Phone: 919-755-1012 FAX: 919-755-1031	<b>Job</b>	SNET037-A - Wolcott	<b>Page</b>	16 of 18
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	<b>Client</b>	T-Mobile Towers	<b>Designed by</b>	Ross Alexander

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L <sub>u</sub> <i>ft</i>	Kl/r	F <sub>a</sub> <i>ksi</i>	A <i>in<sup>2</sup></i>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
T4	20 - 0	L2 1/2x2 1/2x1/4	10.00	10.00	244.5 K=1.00	2.498	1.1900	-2.61	2.97	0.877 ✓
KL/R > 200 (C) - 126										

### Tension Checks

### Leg Design Data (Tension)

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L <sub>u</sub> <i>ft</i>	Kl/r	F <sub>a</sub> <i>ksi</i>	A <i>in<sup>2</sup></i>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
T1	80 - 60	L4x4x3/8	20.00	5.00	48.8	21.600	2.8600	9.35	61.78	0.151 ✓
T2	60 - 40	L5x5x1/2	20.03	5.01	39.0	21.600	4.7500	23.38	102.60	0.228 ✓
T3	40 - 20	L6x6x1/2	20.03	5.24	33.8	21.600	5.7500	33.29	124.20	0.268 ✓
T4	20 - 0	L6x6x5/8	20.03	5.21	34.0	21.600	7.1100	47.19	153.58	0.307 ✓

### Diagonal Design Data (Tension)

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L <sub>u</sub> <i>ft</i>	Kl/r	F <sub>a</sub> <i>ksi</i>	A <i>in<sup>2</sup></i>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
T1	80 - 60	L2 1/2x2 1/2x1/4	7.94	3.72	62.0	29.000	0.7284	2.20	21.12	0.104 ✓
T2	60 - 40	L2 1/2x2 1/2x1/4	9.03	4.38	72.2	29.000	0.7284	2.18	21.12	0.103 ✓
T3	40 - 20	L3x3x5/16	13.36	6.97	90.7	29.000	1.1299	4.23	32.77	0.129 ✓
T4	20 - 0	L3x3x5/16	14.42	7.48	97.3	29.000	1.1299	4.90	32.77	0.150 ✓

### Secondary Horizontal Design Data (Tension)

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L <sub>u</sub> <i>ft</i>	Kl/r	F <sub>a</sub> <i>ksi</i>	A <i>in<sup>2</sup></i>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
T3	40 - 20	L2 1/2x2 1/2x1/4	8.84	8.84	137.9	29.000	0.7284	0.59	21.12	0.028 ✓
T4	20 - 0	L2 1/2x2 1/2x1/4	10.37	10.37	161.9	29.000	0.7284	0.83	21.12	0.039 ✓

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	<b>Client</b> T-Mobile Towers	<b>Designed by</b> Ross Alexander

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
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### Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
T1	80 - 60	L3x3x1/4	6.17	6.17	79.6	21.600	1.4400	0.07	31.10	0.002
T2	60 - 40	C7x12.25	6.17	6.17	129.7	21.600	3.6000	0.02	77.76	0.000
T3	40 - 20	L2 1/2x2 1/2x1/4	7.70	7.70	120.2	29.000	0.7284	1.64	21.12	0.077
T4	20 - 0	L2 1/2x2 1/2x1/4	9.24	9.24	144.1	29.000	0.7284	2.86	21.12	0.135

### Mid Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
T3	40 - 20	L2 1/2x2 1/2x1/4	8.47	8.47	132.2	29.000	0.7284	3.16	21.12	0.149
T4	20 - 0	L2 1/2x2 1/2x1/4	10.00	10.00	156.1	29.000	0.7284	3.37	21.12	0.159

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
T1	80 - 60	Leg	L4x4x3/8	1	-12.87	60.16	21.4	Pass
		Diagonal	L2 1/2x2 1/2x1/4	15	-2.25	20.95	26.0 (b) 10.7 11.0 (b)	Pass
T2	60 - 40	Top Girt	L3x3x1/4	8	-0.09	18.87	0.5	Pass
		Leg	L5x5x1/2	44	-28.70	109.67	26.2	Pass
		Diagonal	L2 1/2x2 1/2x1/4	55	-2.18	18.46	11.8	Pass
T3	40 - 20	Top Girt	C7x12.25	46	-0.07	42.62	0.2	Pass
		Leg	L6x6x1/2	84	-39.48	138.37	38.7 (b) 28.5	Pass
		Diagonal	L3x3x5/16	99	-4.88	17.57	27.8	Pass
		Secondary Horizontal	L2 1/2x2 1/2x1/4	103	-0.59	18.94	3.1	Pass
		Top Girt	L2 1/2x2 1/2x1/4	86	-1.26	6.68	18.9	Pass
T4	20 - 0	Mid Girt	L2 1/2x2 1/2x1/4	90	-2.42	5.53	43.9	Pass
		Leg	L6x6x5/8	120	-55.51	171.42	32.4	Pass

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
							44.9 (b)	
		Diagonal	L3x3x5/16	135	-5.65	15.27	37.0	Pass
		Secondary Horizontal	L2 1/2x2 1/2x1/4	140	-0.83	14.74	5.7	Pass
		Top Girt	L2 1/2x2 1/2x1/4	122	-2.21	4.65	47.5	Pass
		Mid Girt	L2 1/2x2 1/2x1/4	126	-2.61	3.96	65.8	Pass
							Summary	
							Leg (T4)	44.9 Pass
							Diagonal (T4)	37.0 Pass
							Secondary Horizontal (T4)	5.7 Pass
							Top Girt (T4)	47.5 Pass
							Mid Girt (T4)	65.8 Pass
							Bolt Checks	44.9 Pass
							<b>RATING = 65.8</b>	<b>Pass</b>

**(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)**

**Site Data**

Site ID: *SNET037-A*  
 Site Name: *Wolcott*

**Enter Load Factors Below:**

For P (DL)	1.2	<---- Enter Factor
For P,V, and M (WL)	1.35	<---- Enter Factor

**Pad & Pier Data**

Base PL Dist. Above Pier:	3	in
Pier Dist. Above Grade:	0.4	in
Pad Bearing Depth, D:	4.3	ft
Pad Thickness, T:	2.2	ft
Pad Width=Length, L:	23.3	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	6	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	36.00	ft^2
Pier Height:	2.13	ft
Soil (above pad) Height:	2.10	ft

**Soil Parameters**

Unit Weight, $\gamma$ :	165.0	pcf
Ultimate Bearing Capacity, $q_n$ :	30.00	ksf
Strength Reduct. factor, $\phi$ :	0.75	
Angle of Friction, $\Phi$ :	0.0	degrees
Undrained Shear Strength, $C_u$ :	10.00	ksf
Allowable Bearing: $\phi * q_n$ :	22.50	ksf
Passive Pres. Coeff., $K_p$ :	1.00	

**Forces/Moments due to Wind and Lateral Soil**

Minimum of ( $\phi * \text{Ultimate Pad Passive Force, } V_u$ ):	24.3	kips
Pad Force Location Above D:	1.10	ft
$\phi$ (Passive Pressure Moment):	26.65	ft-kips
Factored O.T. M(WL), "1.6W":	1306.1	ft-kips
Factored OT (MW-Msoil), M1	1279.47	ft-kips

**Resistance due to Foundation Gravity**

Soil Wedge Projection grade, a:	0.00	ft
Sum of Soil Wedges Wt:	0.00	kips
Soil Wedges ecc, K1:	0.00	ft
Ftg+Soil above Pad wt:	366.3	kips
Unfactored (Total ftg-soil Wt):	366.31	kips
1.2D. <b>No Soil Wedges.</b>	463.57	kips
0.9D. <b>With Soil Wedges</b>	347.68	kips

**Resistance due to Cohesion (Vertical)**

$\phi * (1/2 * C_u)$ (Total Vert. Planes)	183.49	kips
Cohesion Force Eccentricity, K2	11.65	ft

**Monopole Base Reaction Forces**

TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	20	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	18	kips
Unfactored WL Moment, M:	885	ft-kips

**Load Factor Shaft Factored Loads**

1.20	1.2D+1.6W, Pu:	24	kips
0.90	0.9D+1.6W, Pu:	18	kips
1.35	Vu:	24.3	kips
	Mu:	1194.75	ft-kips

**1.2D+1.6W Load Combination, Bearing Results:**

<b>(No Soil Wedges)</b> [Reaction+Conc+Soil]	463.57	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	1279.47	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 = 2.76 ft  
 Orthogonal qu= 1.26 ksf  
 qu/ $\phi * q_n$  Ratio= **5.59%** **Pass**

Diagonal Direction:

ecc2 = (0.707M1)/P1 = 1.95 ft  
 Diagonal qu= 1.23 ksf  
 qu/ $\phi * q_n$  Ratio= **5.48%** **Pass**

**Run**

<-- Press Upon Completing All Input

**Overturning Stability Check**

**0.9D+1.6W Load Combination, Bearing Results:**

<b>(w/ Soil Wedges)</b> [Reaction+Conc+Soil]	347.68	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	0.00	ft-kips

Orthogonal ecc3 = M2/P2 = 0.00 ft  
 Ortho Non Bearing Length, NBL= **0.00** ft  
 Orthogonal qu= 0.64 ksf  
 Diagonal qu= 0.64 ksf

**Max Reaction Moment (ft-kips) so that qu= $\phi * q_n$  = 100% Capacity Rating**

Actual M:	885.00		
M Orthogonal:	4356.09	<b>20.32%</b>	<b>Pass</b>
M Diagonal:	4356.09	<b>20.32%</b>	<b>Pass</b>

# EXHIBIT C

**RADIO FREQUENCY EMISSIONS ANALYSIS REPORT  
EVALUATION OF HUMAN EXPOSURE POTENTIAL  
TO NON-IONIZING EMISSIONS**

**T-Mobile Existing Facility**

**Site ID: CT11403A**

**Wolcott / Andrews Road  
Andrews Road  
Wolcott, CT 06716**

**July 16, 2013**

**EBI Project Number: 62138422**

July 16, 2013

T-Mobile USA  
Attn: Jason Overbey, RF Manager  
35 Griffin Road South  
Bloomfield, CT 06002

Re: Emissions Values for Site: **CT11403A - Wolcott / Andrews Road**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at Andrews Road, Wolcott, CT, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The number of  $\mu\text{W}/\text{cm}^2$  calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The general population exposure limit for the cellular band is  $567 \mu\text{W}/\text{cm}^2$ , and the general population exposure limit for the PCS band is  $1000 \mu\text{W}/\text{cm}^2$ . Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure 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 (see below), 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.

Additional details can be found in FCC OET 65.

## **CALCULATIONS**

Calculations were done for the proposed T-Mobile Wireless antenna facility located at Andrews Road, Wolcott, CT, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, the actual antenna pattern gain value in the direction of the sample area was used. For this report the sample point is a 6 foot person standing at the base of the tower

For all calculations, all equipment was calculated using the following assumptions:

- 1) 2 GSM channels (1935.000 MHz—to 1945.000 MHz / 1980.000 MHz—to 1985.000 MHz) were considered for each sector of the proposed installation.
- 2) 2 UMTS channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
- 3) 2 LTE channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
- 4) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
- 5) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
- 6) The antenna used in this modeling is the Ericsson AIR21 for LTE, UMTS and GSM. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.6 dBd gain value at its main lobe. Actual antenna gain values were used for all calculations as per the manufacturers specifications



- 7) The antenna mounting height centerline of the proposed antennas is **77 feet** above ground level (AGL)
- 8) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculation were done with respect to uncontrolled / general public threshold limits

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Site ID	CT11403A - Wolcott / Andrews Road
Site Address	Andrews Road, Wolcott, CT 06716
Site Type	Self Support Tower

Sector 1																	
Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	77	71	None	0	0	48.326044	3.446438	0.34464%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-	-	-	0	-3.95	77	71	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
2B	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
Sector total Power Density Value:																0.689%	
Sector 2																	
Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	77	71	None	0	0	48.326044	3.446438	0.34464%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-	-	-	0	-3.95	77	71	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
2B	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
Sector total Power Density Value:																0.689%	
Sector 3																	
Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	77	71	None	0	0	48.326044	3.446438	0.34464%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-	-	-	0	-3.95	77	71	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
2B	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	77	71	1-5/8"	0	0	24.163022	1.723219	0.17232%
Sector total Power Density Value:																0.689%	

Site Composite MPE %	
Carrier	MPE %
T-Mobile	2.068%
Personal Vision	0.000%
SNET TMRS	29.110%
<b>Total Site MPE %</b>	<b>31.178%</b>

## Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public exposure to RF Emissions.

The anticipated Maximum Composite contributions from the T-Mobile facility are **2.068 % (0.689% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **31.178%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were within the allowable 100% threshold standard per the federal government.



**Scott Heffernan**  
RF Engineering Director

**EBI Consulting**  
21 B Street  
Burlington, MA 01803