



**Crown Castle**  
3 Corporate Park Drive, Suite 101  
Clifton Park, NY 12065

April 13, 2017

Melanie A. Bachman  
Acting Executive Director  
Connecticut Siting Council  
10 Franklin Square  
New Britain, CT 06051

**RE: Notice of Exempt Modification for AT&T/ LTE 3C Crown Site BU: 842871**  
**AT&T Site ID: CT5101**  
**26 South Orange Center, Orange, CT 06477**  
**Latitude: 41° 15' 19.98" / Longitude: -73° 0' 39.2"**

Dear Ms. Bachman:

AT&T currently maintains nine (9) antennas at the 177-foot level of the existing 180-foot monopole tower at 26 South Orange Center in Orange, CT. The tower is owned by Crown Castle. The property is owned by the Town of Orange. AT&T intends to install six (6) triplexers.

The Town of Orange has not responded to a request for original zoning documents, at this time.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.S.C.A. § 16-50j-73, a copy of this letter is being sent to Mr. James Zeoli, First-Selectman, Town of Orange, as well as the property owner, and Crown Castle is the tower owner.

1. The proposed modifications will not result in an increase in the height of the existing tower.
2. The proposed modifications will not require the extension of the site boundary.
3. The proposed modification will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communication Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

Melanie A. Bachman

April 13, 2017

Page 2

For the foregoing reasons, AT&T respectfully submits that the proposed modifications to the above-reference telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2). Please send approval/rejection letter to Attn: Jeffrey Barbadora.

Sincerely,

Jeffrey Barbadora  
Real Estate Specialist  
12 Gill Street, Suite 5800, Woburn, MA 01801  
781-729-0053  
[Jeff.Barbadora@crowncastle.com](mailto:Jeff.Barbadora@crowncastle.com)

Attachments:

Tab 1: Exhibit-1: Compound plan and elevation depicting the planned changes

Tab 2: Exhibit-2: Structural Modification Report

Tab 3: Exhibit-3: General Power Density Table Report (RF Emissions Analysis Report)

cc: Mr. James Zeoli, First-Selectman  
Town of Orange  
617 Orange Center Road  
Orange, CT 06477

Plan & Zoning  
Town of Orange  
617 Orange Center Rd  
Orange, CT 06477

## BOSTON POST RD

<b>Location</b>	BOSTON POST RD	<b>Assessment</b>	\$150,300
<b>Mblu</b>	13/ 7/ 2A/ /	<b>Appraisal</b>	\$214,700
<b>Acct#</b>	34600	<b>PID</b>	596
<b>Owner</b>	ORANGE TOWN OF	<b>Building Count</b>	1

### Current Value

Appraisal			
Valuation Year	Improvements	Land	Total
2014	\$0	\$214,700	\$214,700

Assessment			
Valuation Year	Improvements	Land	Total
2014	\$0	\$150,300	\$150,300

### Owner of Record

<b>Owner</b>	ORANGE TOWN OF	<b>Sale Price</b>	\$0
<b>Co-Owner</b>		<b>Certificate</b>	
<b>Address</b>	617 ORANGE CENTER RD ORANGE, CT 06477	<b>Book &amp; Page</b>	270/ 121
		<b>Sale Date</b>	12/28/1978
		<b>Instrument</b>	00

### Ownership History

Ownership History					
Owner	Sale Price	Certificate	Book & Page	Instrument	Sale Date
ORANGE TOWN OF	\$0		270/ 121	00	12/28/1978

### Building Information

#### Building 1 : Section 1

**Year Built:**  
**Living Area:** 0  
**Replacement Cost**  
**Less Depreciation:** \$0

#### Building Photo

Building Attributes	
Field	Description
Style	Vacant Land
Model	
Stories	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure	

Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Floor 1	
Interior Floor 2	
Heat Fuel	
Heat Type	
AC Type	
Bedrooms	
Full Baths	
Half Baths	
Extra Fixtures	
Total Rooms	
Stacks	
Fireplace(s)	
Gas Fireplace(s)	
Attic	
Frame	
Traffic	
Bsmt Gar(s)	
SF FBM	
Basement	
Bsmt Floor	



(<http://images.vgsi.com/photos/OrangeCTPhotos//default.jpg>)

**Building Layout**

Building Layout

Building Sub-Areas	<u>Legend</u>
No Data for Building Sub-Areas	

**Extra Features**

Extra Features	<u>Legend</u>
No Data for Extra Features	

**Land**

**Land Use**

**Use Code** 520E  
**Description** Exempt Comm Vac  
**Zone** C-2  
**Neighborhood** C40  
**Alt Land Appr Category** No

**Land Line Valuation**

**Size (Acres)** 1.06  
**Frontage**  
**Depth**  
**Assessed Value** \$150,300  
**Appraised Value** \$214,700

**Outbuildings**

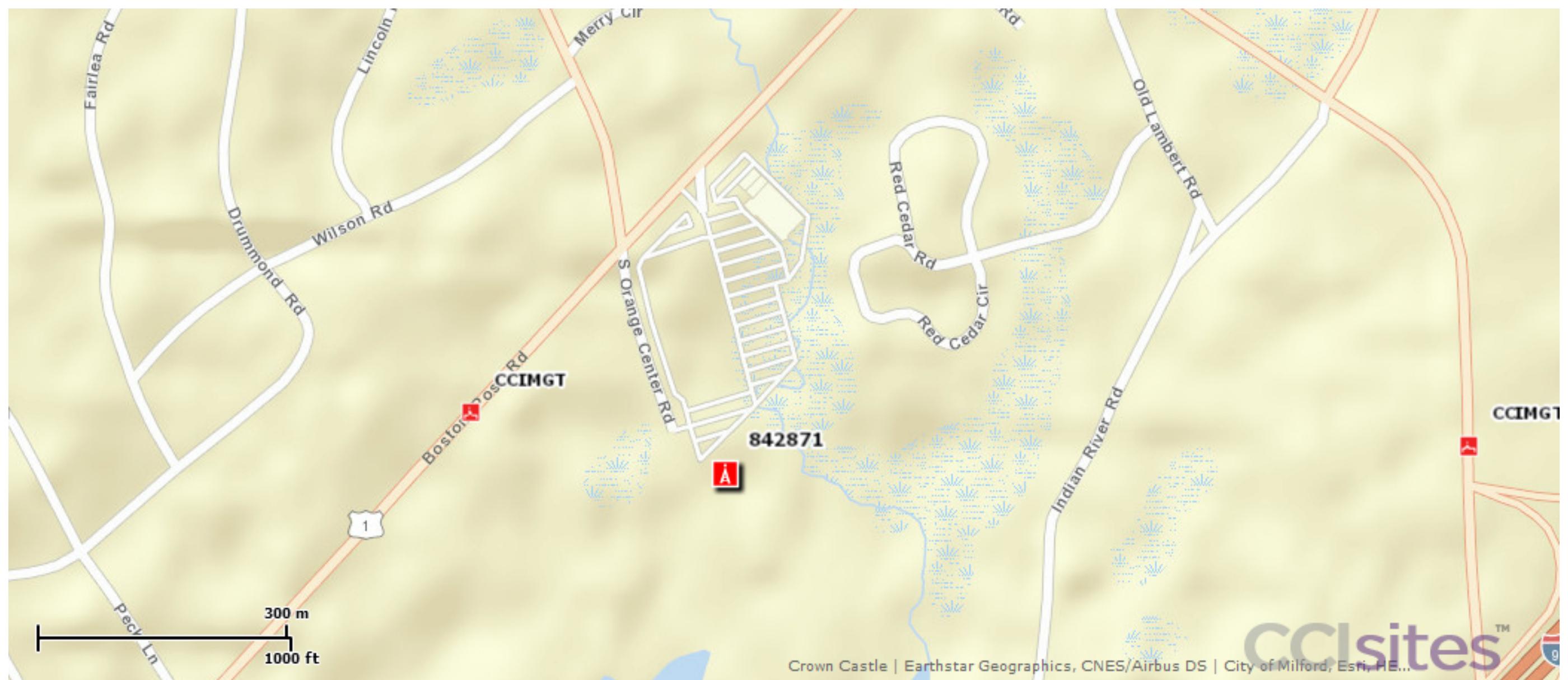
Outbuildings	<u>Legend</u>
No Data for Outbuildings	

**Valuation History**

<b>Appraisal</b>			
<b>Valuation Year</b>	<b>Improvements</b>	<b>Land</b>	<b>Total</b>
2013	\$0	\$214,700	\$214,700
2012	\$0	\$214,700	\$214,700
2011	\$0	\$254,400	\$254,400

<b>Assessment</b>			
<b>Valuation Year</b>	<b>Improvements</b>	<b>Land</b>	<b>Total</b>
2013	\$0	\$150,300	\$150,300
2012	\$0	\$150,300	\$150,300
2011	\$0	\$178,100	\$178,100

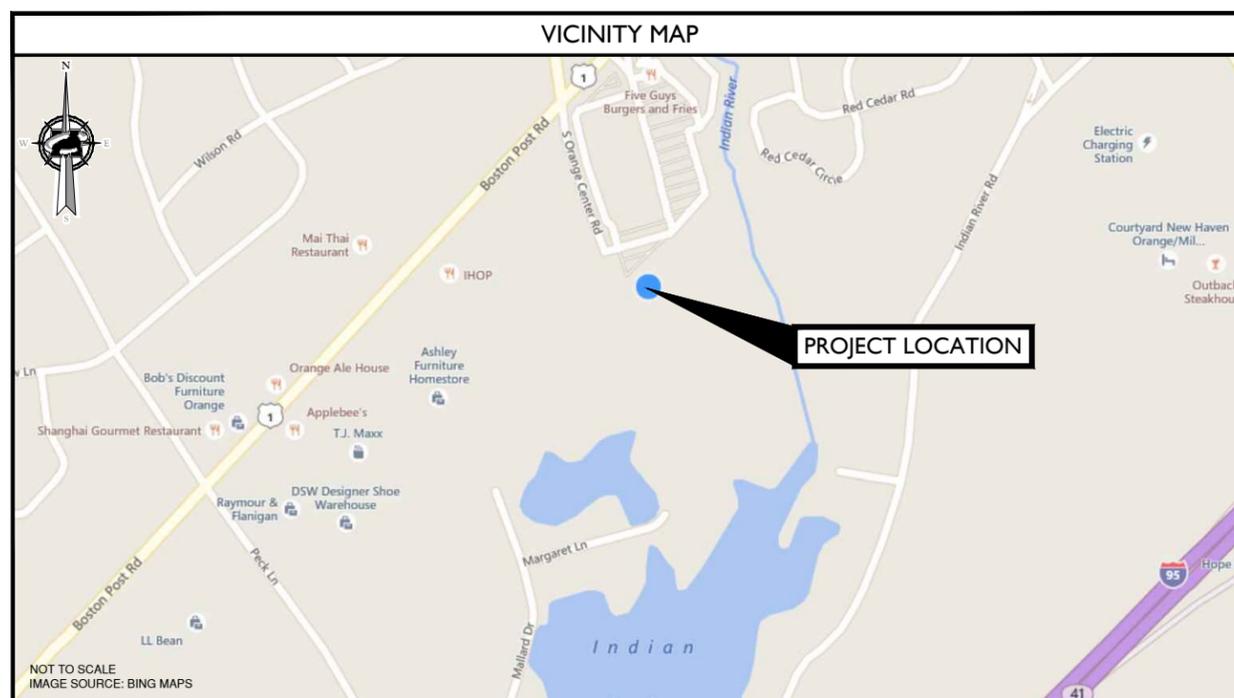
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**SITE NAME: ORANGE TRANSFER STATION**  
**FA NUMBER: 10071197**  
**SITE NUMBER: CTL05101**  
**4C - MRCTB019918**  
**5C - MRCTB019868**  
**CROWN BU #: 842871**  
**26 SOUTH ORANGE CENTER ROAD**  
**ORANGE, CT 06477**  
**NEW HAVEN COUNTY**

**CROWN CASTLE SITE NAME: ORANGE TRANSFER STATION**  
**CROWN CASTLE SITE #: 842871**



PROJECT TEAM	
<b>CLIENT REPRESENTATIVE</b>	
COMPANY:	SMARTLINK, LLC
ADDRESS:	85 RANGWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	TODD OLIVER
PHONE:	(774) 369-3618
E-MAIL:	TODD.OLIVER@SMARTLINKLLC.COM
<b>SITE ACQUISITION</b>	
COMPANY:	SMARTLINK, LLC
ADDRESS:	85 RANGWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	TODD OLIVER
PHONE:	(774) 369-3618
E-MAIL:	TODD.OLIVER@SMARTLINKLLC.COM
<b>ENGINEER</b>	
COMPANY:	MASER CONSULTING CONNECTICUT
ADDRESS:	331 NEWMAN SPRINGS ROAD
CITY, STATE, ZIP:	RED BANK, NJ 07701-5699
CONTACT:	FRANK PAZDEN
PHONE:	(732) 383-1950
E-MAIL:	FPAZDEN@MASERCONSULTING.COM
<b>RF ENGINEER</b>	
COMPANY:	NEW CINGULAR WIRELESS PCS, LLC
ADDRESS:	550 COCHITUATE ROAD
CITY, STATE, ZIP:	FRAMINGHAM, MA 01701
CONTACT:	OMAIR MOHAMMED
E-MAIL:	OM636A@ATT.COM
<b>CONSTRUCTION MANAGER</b>	
COMPANY:	SMARTLINK, LLC
ADDRESS:	85 RANGWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	MARK DONNELLY
PHONE:	(617) 515-2080
E-MAIL:	MARK.DONNELLY@SMARTLINKLLC.COM

SITE INFORMATION	
<b>APPLICANT/LESSEE</b>	
NEW CINGULAR WIRELESS PCS, LLC 550 COCHITUATE ROAD FRAMINGHAM, MA 01701	
<b>PROPERTY/TOWER OWNER:</b>	
NAME:	CROWN CASTLE
ADDRESS:	2000 CORPORATE DRIVE
CITY, STATE, ZIP:	CANONSBURG, PA 15317
CROWN SITE #:	842871
LATITUDE:	41.255550° N
LONGITUDE:	73.010889° W
LAT./LONG. TYPE:	NAD 83
AREA OF CONSTRUCTION:	EXISTING EQUIPMENT PLATFORM AND MONOPOLE
ZONING/JURISDICTION:	CITY OF ORANGE
CURRENT USE/PROPOSED USE:	UNMANNED TELECOMMUNICATIONS FACILITY
HANDICAP REQUIREMENTS:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. HANDICAPPED ACCESS NOT REQUIRED.
CONSTRUCTION TYPE:	IIB
USE GROUP:	U

CODE COMPLIANCE	
ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE LATEST EDITIONS OF THE FOLLOWING CODES.	
1. 2016 CONNECTICUT STATE BUILDING CODE INCORPORATING THE 2012 IBC	7. EIA/TIA-222 REVISION G
2. NATIONAL FIRE PROTECTION ASSOCIATION 70 - 2015	8. TIA 607 FOR GROUNDING
3. NATIONAL FIRE PROTECTION ASSOCIATION 70 - 2015	9. INSTITUTE FOR ELECTRICAL AND ELECTRONICS ENGINEERS 81
4. LIGHTNING PROTECTION CODE 201	10. IEEE C2 LATEST EDITION
5. AMERICAN CONCRETE INSTITUTE 318	11. TELCORDIA GR-1275 12, ANSI T1.311
6. AMERICAN INSTITUTE OF STEEL CONSTRUCTION 360-10.	

GENERAL CONTRACTOR NOTES	
<b>DO NOT SCALE DRAWINGS</b>	
CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.	

GENERAL NOTES	
THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. A TECHNICIAN WILL VISIT THE SITE AS REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE; NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.	

SHEET	DESCRIPTION
T-1	TITLE SHEET
GN-1	GENERAL NOTES
A-1	COMPOUND PLAN AND EQUIPMENT PLAN
A-2	ELEVATION VIEW AND ANTENNA SCHEDULE
A-3	ANTENNA LAYOUTS
A-4	DETAILS
A-5	RF PLUMBING DIAGRAMS
G-1	GROUNDING DETAILS

PROJECT DESCRIPTION/SCOPE OF WORK	
THIS PROJECT WILL BE COMPRISED OF:	
<ul style="list-style-type: none"> <li>• DECOMMISSION GSM 850</li> <li>• ADD (3) RRUS-11 AT GRADE</li> <li>• ADD (3) RRUS-E2 AT GRADE</li> <li>• ADD (12) TRIPLEXERS, (4) PER SECTOR</li> <li>• ADD 2ND XMU</li> </ul>	
PROPOSED PROJECT SCOPE BASED ON RFDS ID # 1405342, VERSION 2.00, LAST UPDATED 01/18/17	

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85 RANGWAY ROAD  
 BUILDING 3, SUITE 102  
 NORTH BILLERICA, CT 01862-2105  
 TEL: (774) 369-3613

NEW CINGULAR WIRELESS PCS, LLC  
 550 COCHITUATE ROAD  
 FRAMINGHAM, MA 01701

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 Know what's below. Call before you dig.  
 FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM

SCALE:	JOB NUMBER:
AS SHOWN	16946019A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
1	03/22/17	FOR CONSTRUCTION	RA	FEP
0	01/16/17	ISSUED FOR REVIEW	AJC	FEP

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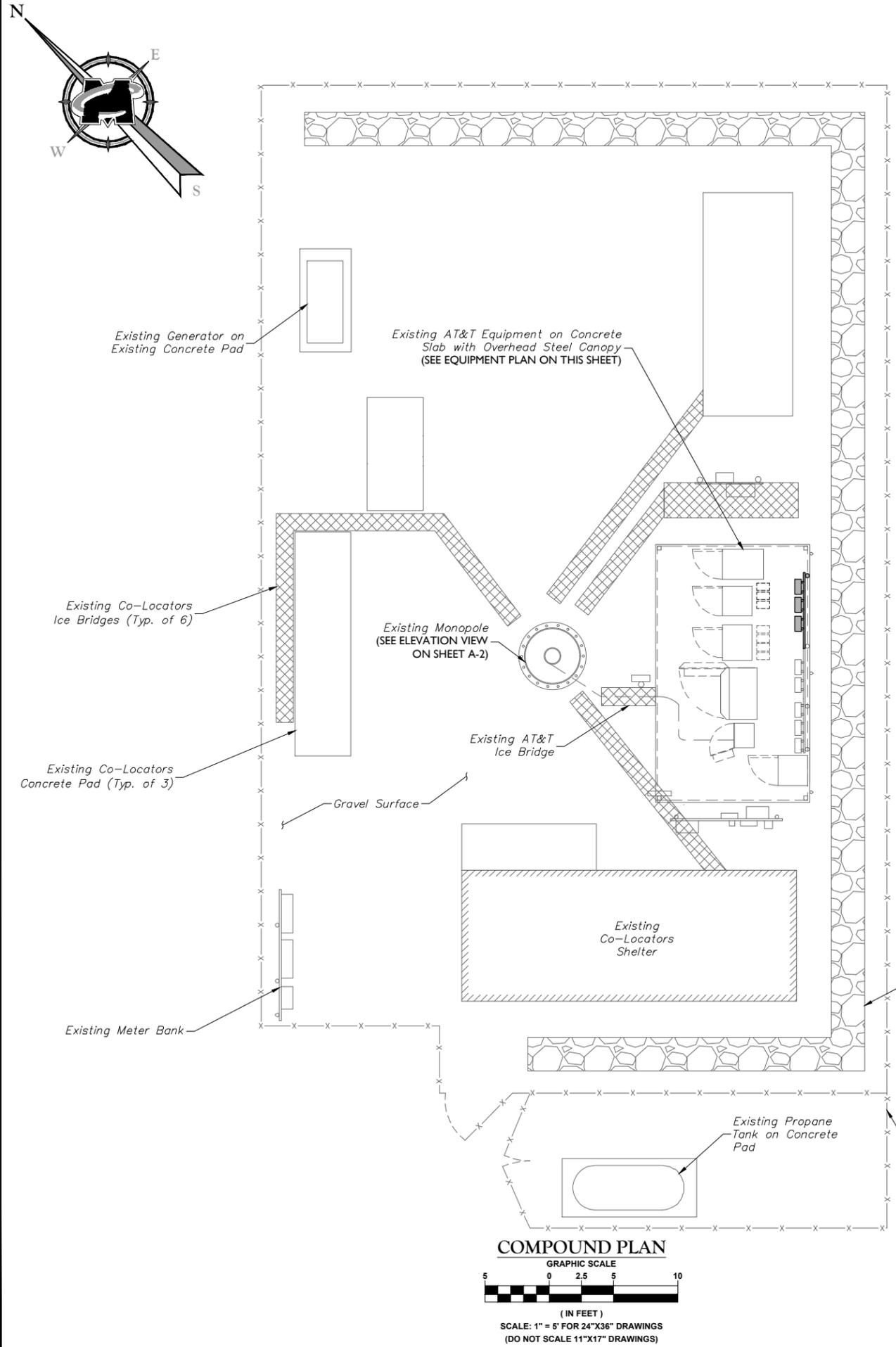
**SITE NAME:**  
**ORANGE TRANSFER STATION**  
**FA# 10071197**  
**SITE # CTL05101**  
**26 SOUTH ORANGE CENTER RD**  
**ORANGE, CT 06477**  
**NEW HAVEN COUNTY**

331 Newman Springs Road  
 Suite 203  
 Red Bank, NJ 07701  
 Phone: 732.383.1950  
 Fax: 732.383.1964  
 email: solutions@maserconsulting.com

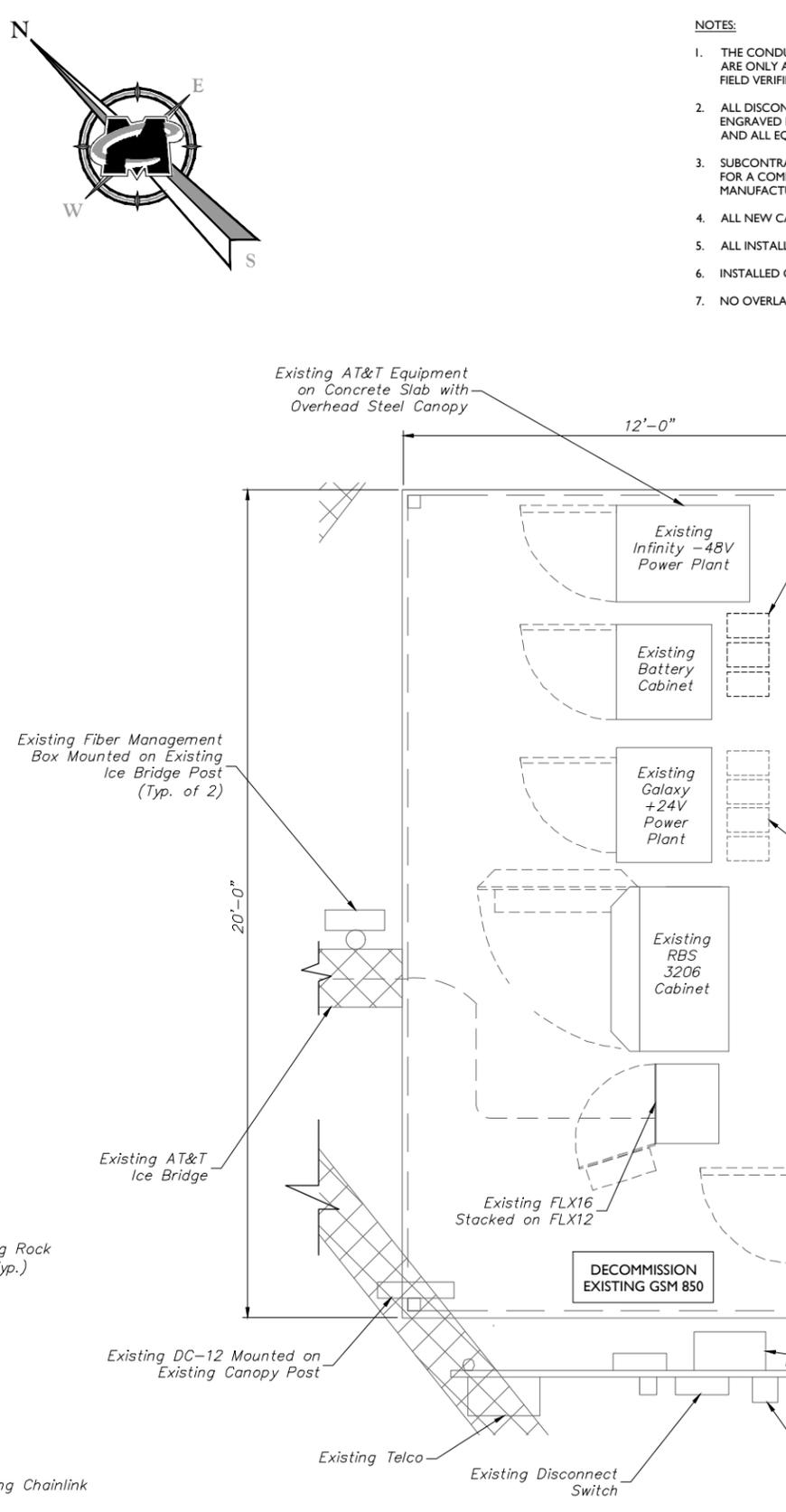
SHEET TITLE:
TITLE SHEET

SHEET NUMBER:
T-1





**COMPOUND PLAN**  
 GRAPHIC SCALE  
 (IN FEET)  
 SCALE: 1" = 5' FOR 24"X36" DRAWINGS  
 (DO NOT SCALE 11"X17" DRAWINGS)



**EQUIPMENT PLAN**  
 GRAPHIC SCALE  
 (IN FEET)  
 SCALE: 1" = 2' FOR 24"X36" DRAWINGS  
 (DO NOT SCALE 11"X17" DRAWINGS)

**NOTE:**  
 THESE PLANS WERE DESIGNED WITH THE ASSUMPTION THAT THE PREVIOUS PLANS PREPARED BY MASER CONSULTING CONNECTICUT DATED 01/13/17 WILL BE COMPLETED PRIOR TO THE CURRENT SCOPE OF WORK BEING INSTALLED. ANY CHANGES IN PREVIOUS DESIGN SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.

- NOTES:**
1. THE CONDUIT ROUTING IS DIAGRAMMATICALLY SHOWN ON THE PLANS AND ARE ONLY APPROXIMATIONS. THE EXACT LOCATION AND ROUTING SHALL BE FIELD VERIFIED.
  2. ALL DISCONNECTS AND CONTROLLING DEVICES SHALL BE PROVIDED WITH ENGRAVED LAMICOID NAMEPLATES, INDICATING THE CIRCUITS ORIGIN AND ALL EQUIPMENT TERMINATIONS.
  3. SUBCONTRACTOR SHALL PROVIDE ALL CONDUITS AND CIRCUITS AS REQUIRED FOR A COMPLETED SYSTEM AND SHALL BE IN COMPLIANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
  4. ALL NEW CABLING TO BE ROUTED ON EXISTING CABLE RACKS.
  5. ALL INSTALLED GROUND LUGS MUST BE INSPECTION HOLE LUGS.
  6. INSTALLED GROUND LEADS MUST TERMINATE AT MGB, NOT HALO.
  7. NO OVERLAPPING GROUND HARDWARE.

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 TEL: (774) 369-3613

**at&t**  
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0	01/16/17	ISSUED FOR REVIEW	AJC	FEP
REV	DATE	DRAWN BY	CHECKED BY	

STATE OF CONNECTICUT  
 FRANK SPAZDEN  
 REGISTERED PROFESSIONAL ENGINEER  
 LICENSE NUMBER: PEN000128

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 NEW HAVEN COUNTY

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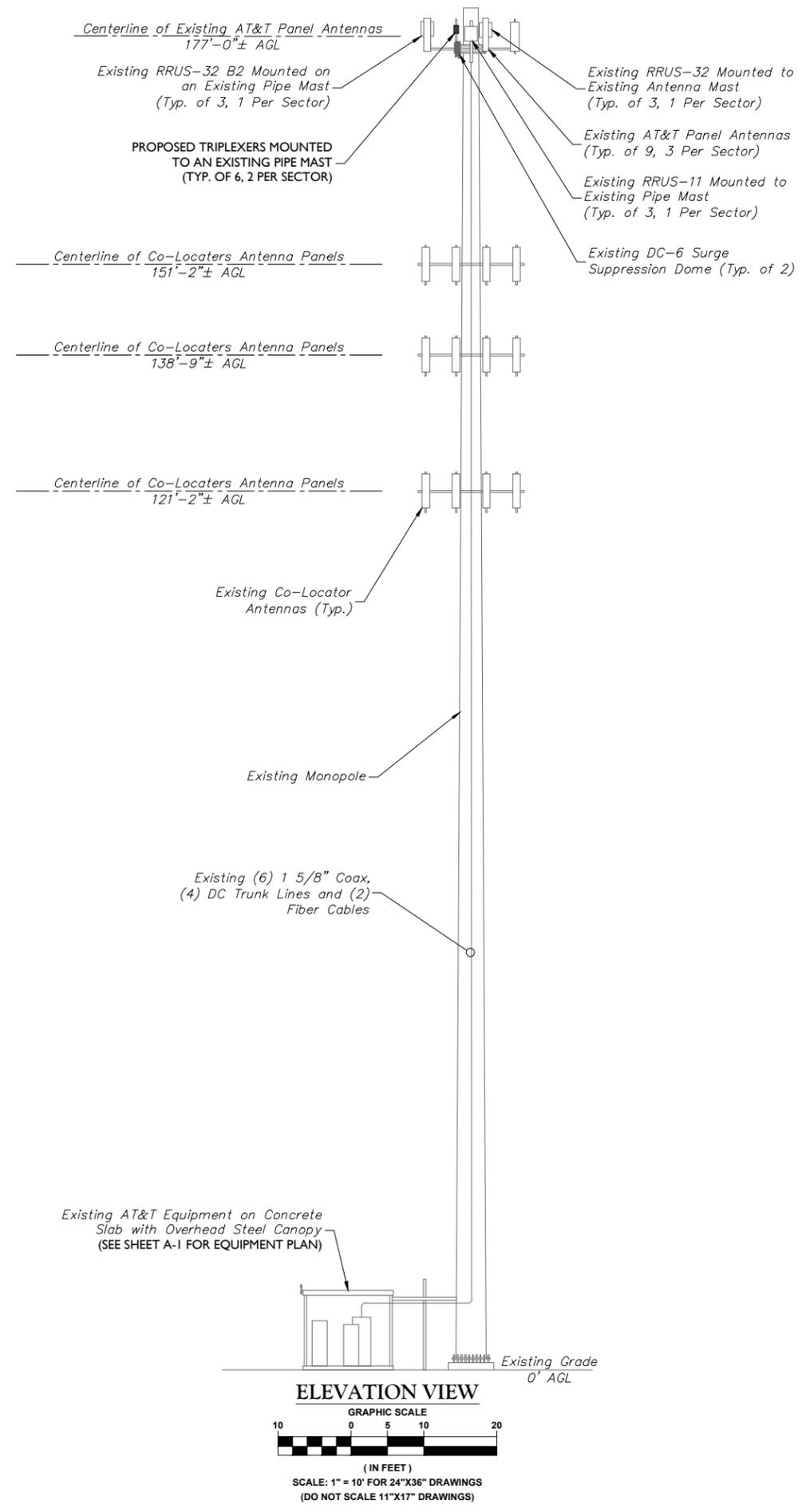
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 Fax: 732.383.1904  
 email: solutions@maserconsulting.com

SHEET TITLE:  
**ELEVATION VIEW AND ANTENNA SCHEDULE**

SHEET NUMBER:  
**A-2**



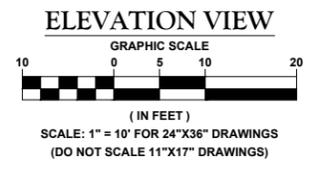
PROPOSED ANTENNA AND RRUS CONFIGURATION													
SECTOR	EXISTING ANTENNA CONFIGURATION	PROPOSED ANTENNA CONFIGURATION	TECHNOLOGY	ANTENNA STATUS	HEIGHT (in)	WIDTH (in)	DEPTH (in)	WEIGHT (lbs)	ANTENNA AZIMUTH	ANT. CL. ELEV. (ft.)	RRUS CONFIGURATION	STATUS	
ALPHA	A1	Povonlave 7770.00.850.00	Povonlave 7770.00.850.00	UMTS/GSM	REMAIN	55.00	11.00	5.00	35.00	20°	177'	-	-
	A2	CCI OPA-65R-LCUU-H4K	CCI OPA-65R-LCUU-H4K	WCS LTE	REMAIN	48.00	14.40	7.30	57.00	20°	177'	(1) RRUS-32 (1) RRUS-E2 (GROUND) (1) RRUS-11 (GROUND)	REMAIN NEW NEW
	A3	VACANT MAST	VACANT MAST	-	-	-	-	-	-	-	-	-	-
	A4	Andrew SBNHH-1D65A	Andrew SBNHH-1D65A	LTE 1900	REMAIN	55.00	11.90	7.10	33.50	20°	177'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN
BETA	B1	Povonlave 7770.00.850.00	Povonlave 7770.00.850.00	UMTS/GSM	REMAIN	55.00	11.00	5.00	35.00	120°	177'	-	-
	B2	CCI OPA-65R-LCUU-H4K	CCI OPA-65R-LCUU-H4K	WCS LTE	REMAIN	48.00	14.40	7.30	57.00	120°	177'	(1) RRUS-32 (1) RRUS-E2 (GROUND) (1) RRUS-11 (GROUND)	REMAIN NEW NEW
	B3	VACANT MAST	VACANT MAST	-	-	-	-	-	-	-	-	-	-
	B4	Andrew SBNHH-1D65A	Andrew SBNHH-1D65A	LTE 1900	REMAIN	55.00	11.90	7.10	33.50	120°	177'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN
GAMMA	C1	Povonlave 7770.00.850.00	Povonlave 7770.00.850.00	UMTS/GSM	REMAIN	55.00	11.00	5.00	35.00	230°	177'	-	-
	C2	CCI OPA-65R-LCUU-H4K	CCI OPA-65R-LCUU-H4K	WCS LTE	REMAIN	48.00	14.40	7.30	57.00	230°	177'	(1) RRUS-32 (1) WCS FILTER (1) RRUS-E2 (GROUND) (1) RRUS-11 (GROUND)	REMAIN REMAIN NEW NEW
	C3	VACANT MAST	VACANT MAST	-	-	-	-	-	-	-	-	-	-
	C4	Andrew SBNHH-1D65A	Andrew SBNHH-1D65A	LTE 1900	REMAIN	55.00	11.90	7.10	33.50	230°	177'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN

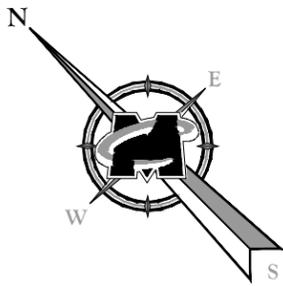
**ANTENNA SCHEDULE**

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**STRUCTURAL NOTES:**

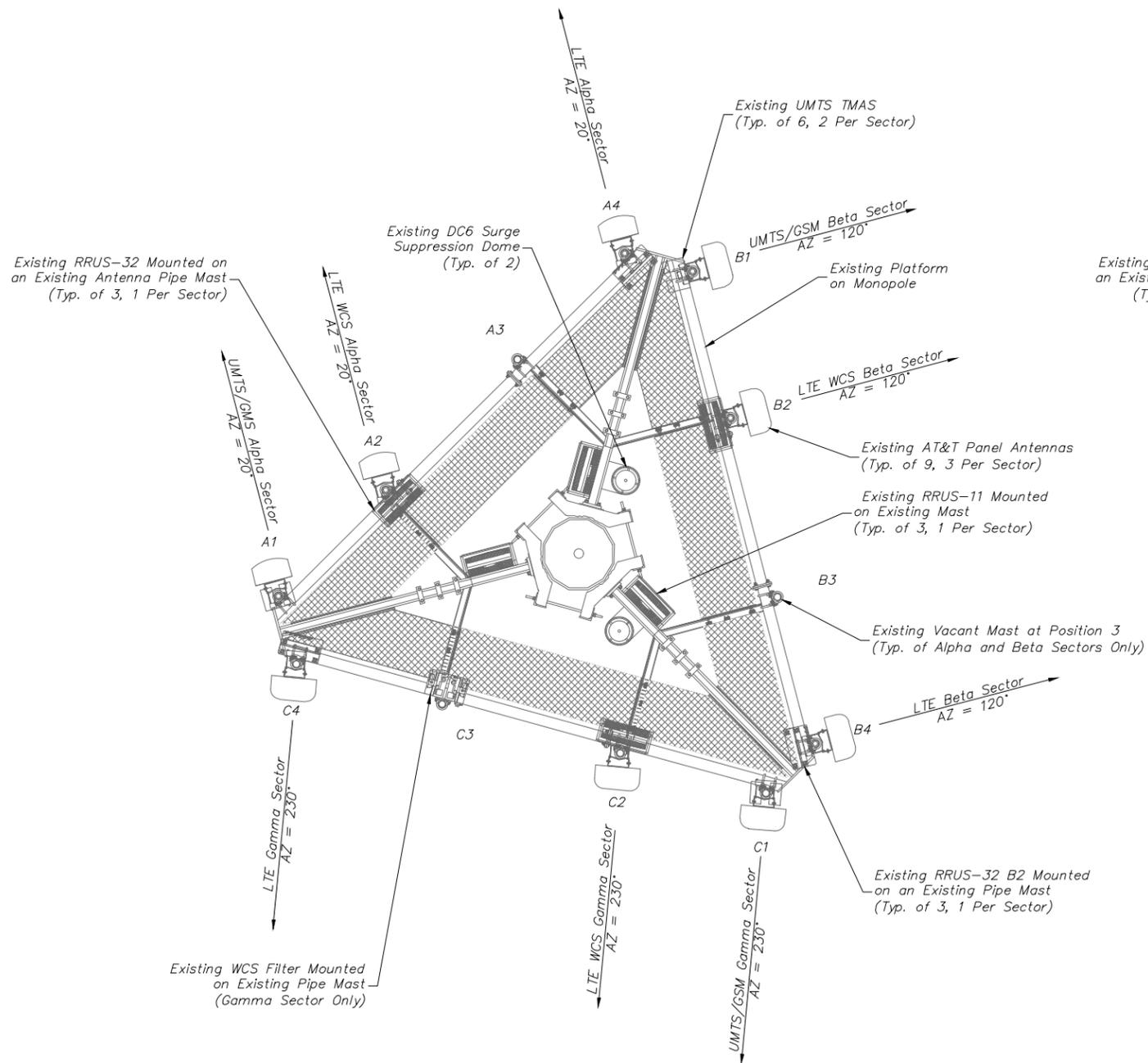
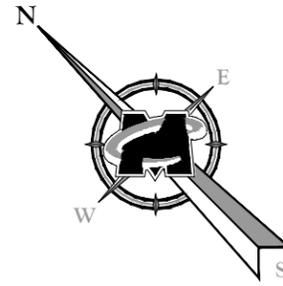
- NO CONSTRUCTION OF THE PROPOSED LOADING SHOWN SHALL PROCEED UNTIL ADEQUACY OF THE EXISTING STRUCTURE AND FOUNDATION, INCLUDING THE PROPOSED AT&T ANTENNA MOUNTING CONFIGURATION SHOWN HEREIN, HAS BEEN COMPLETED.
- THE STRUCTURE ELEVATION IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND MAY NOT REFLECT AS-BUILT FIELD CONDITIONS FOR ALL EXISTING INVENTORY LOADING/ANTENNAS/APURTANENCES ON STRUCTURE. REFER TO THE LATEST STRUCTURAL ANALYSIS FOR EXISTING STRUCTURE LOADING AND THE PROPOSED METHOD OF ATTACHMENT OF THE PROPOSED ANTENNAS/CABLES.
- THE CONTRACTOR IS RESPONSIBLE TO CONFIRM THAT ANY IMPROVEMENTS AND REINFORCEMENTS REQUIRED BY THE STRUCTURAL ANALYSIS CERTIFICATION ARE PROPERLY INSTALLED PRIOR TO THE ADDITION OF ANTENNAS, CABLES, SUPPORTS AND APPURTANENCES PROPOSED ON THESE DRAWINGS OR OTHERWISE NOTED IN THE STRUCTURAL ANALYSIS.



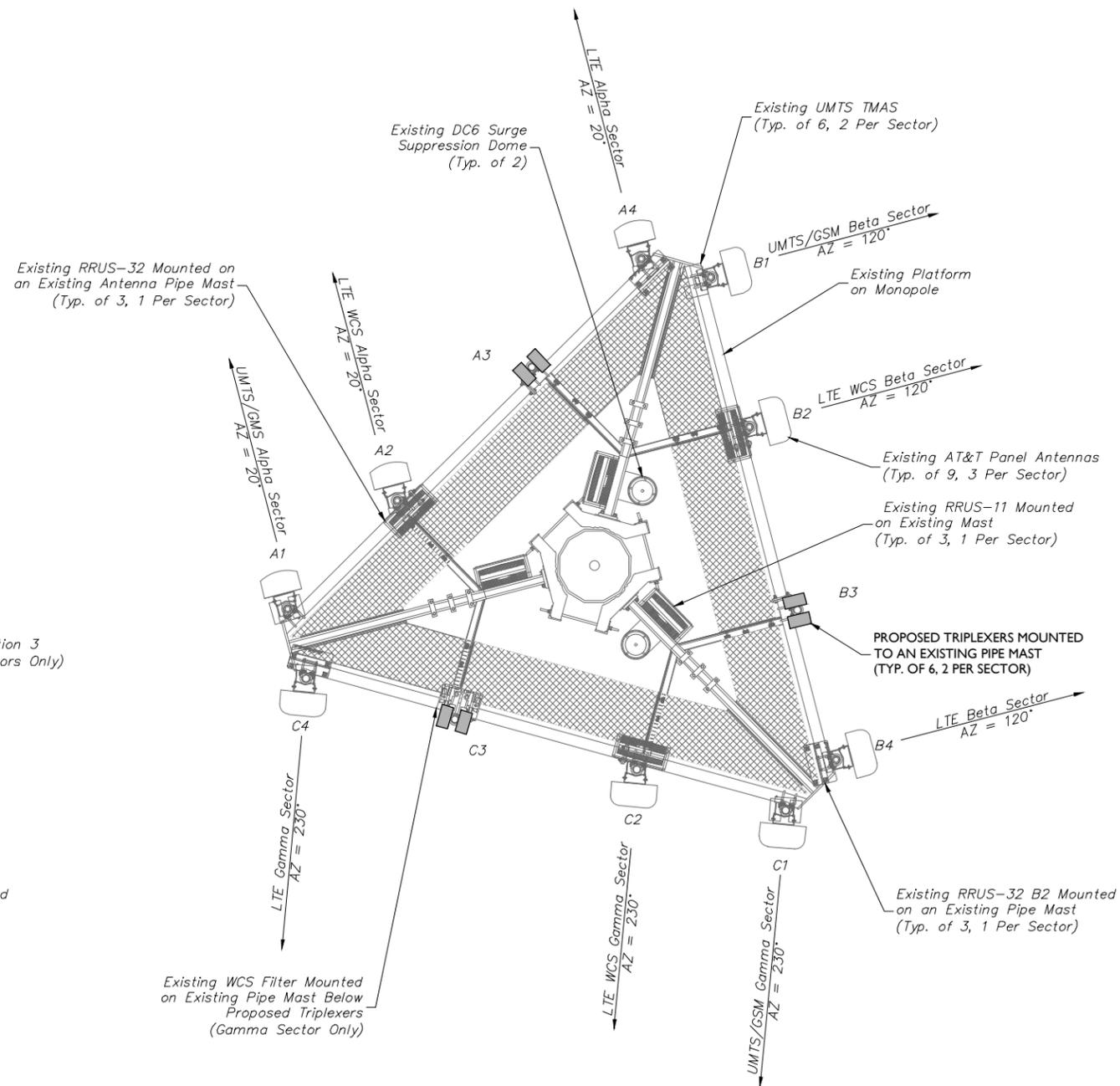


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**EXISTING - ANTENNA LAYOUT**  
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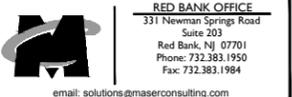
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0	01/16/17	ISSUED FOR REVIEW	AJC	FEP



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STATION  
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SITE # CTL05101  
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NEW HAVEN COUNTY

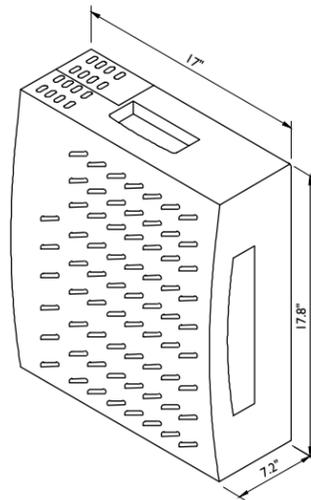


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ANTENNA LAYOUTS

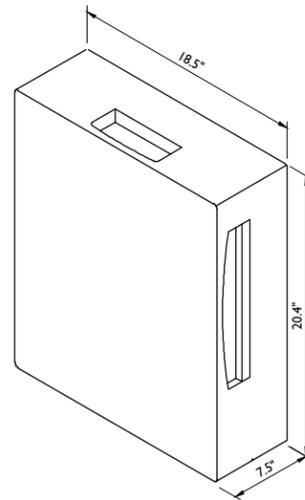
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A-3



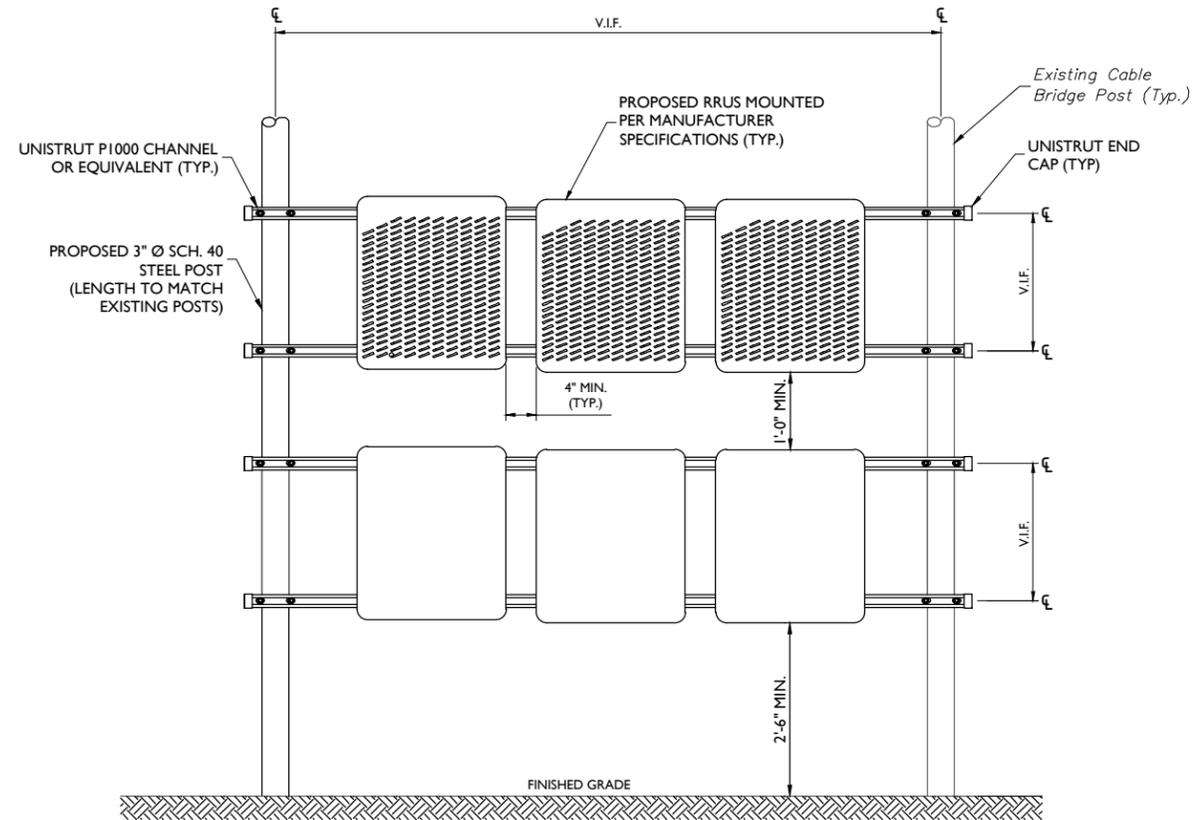
RRUS-11 DIMENSIONS (H X W X D): 17.8" X 17" X 7.2" (INCLUDES SUNSHIELD)  
WEIGHT: 55 LBS

**RRUS-11 DETAIL**  
NOT TO SCALE



RRUS-E2 DIMENSIONS (H X W X D): 20.4" X 18.5" X 7.5" (INCLUDES SUNSHIELD)  
WEIGHT: 58 LBS

**RRUS-E2 DETAIL**  
NOT TO SCALE



**NOTES:**

1. ALCATEL-LUCENT (ALU) VIA AT&T SUPPLIES THE RRUS. SUBCONTRACTOR SHALL SUPPLY ALL OTHER MATERIALS AND INSTALL ALL MOUNTING HARDWARE. ALU INSTALLS RRUS AND MAKES CABLE TERMINATIONS.
2. INSTALL VERTICAL UNISTRUT CHANNELS AS REQUIRED TO ALIGN FRAME WITH EQUIPMENT MOUNTING HOLES. FASTEN UNISTRUT CHANNELS TOGETHER WITH 3/8" UNISTRUT BOLTING HARDWARE AND SPRING NUTS.
3. MOUNT RRUS TO UNISTRUT PER MANUFACTURER'S SPECIFICATIONS.
4. MOUNT FRAME AS CLOSE TO PLATFORM AS POSSIBLE.
5. NO PAINTING OF THE RRUS IS ALLOWED.

**RRUS DETAIL TO UNISTRUT FRAME DETAIL**  
NOT TO SCALE

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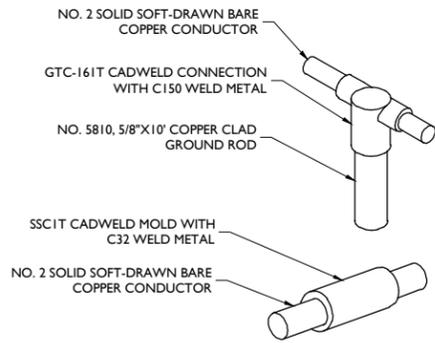
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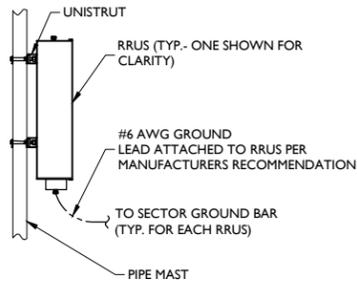
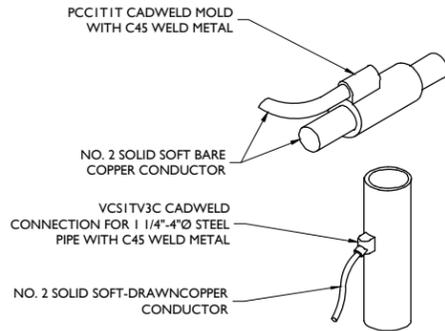
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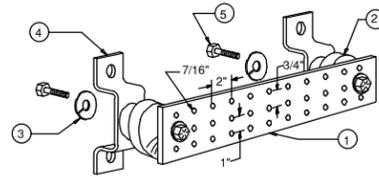




**CADWELD DETAILS**  
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**RRH GROUNDING**  
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- LEGEND**
- 1- TINNED COPPER GROUND BAR, 1/4"x4"x20", NEWTON INSTRUMENT CO. CAT. NO. B-6142 OR EQUAL. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
  - 2- INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4
  - 3- 5/8" LOCKWASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8
  - 4- WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT. NO. A-5056
  - 5- 5/8-11 X 1" HHCS BOLTS, NEWTON INSTRUMENT CO. CAT. NO. 3012-1
  - 6- EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION.

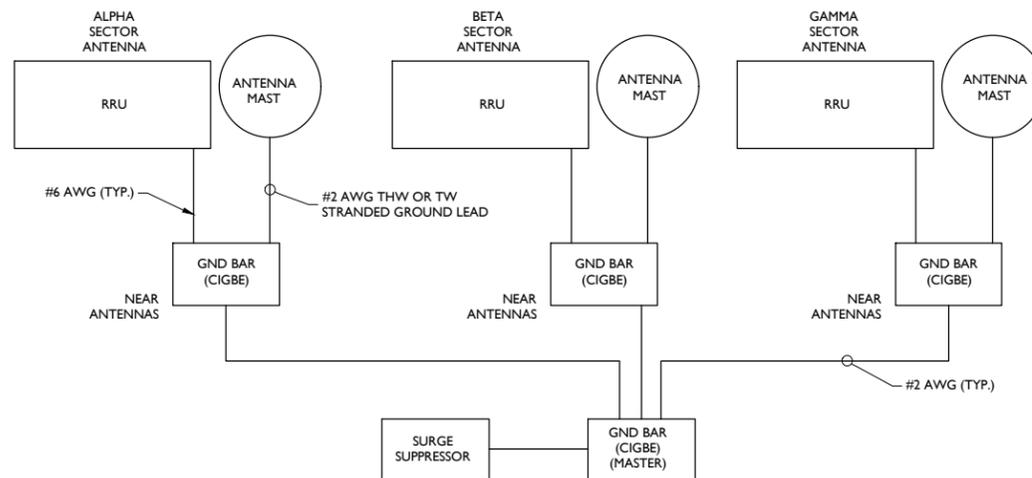
**SECTION "P" - SURGE PRODUCERS**

- CABLE ENTRY PORTS (HATCH PLATES) (#2)
- GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
- TELCO GROUND BAR
- COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
- +24V POWER SUPPLY RETURN BAR (#2)
- 48V POWER SUPPLY RETURN BAR (#2)
- RECTIFIER FRAMES.

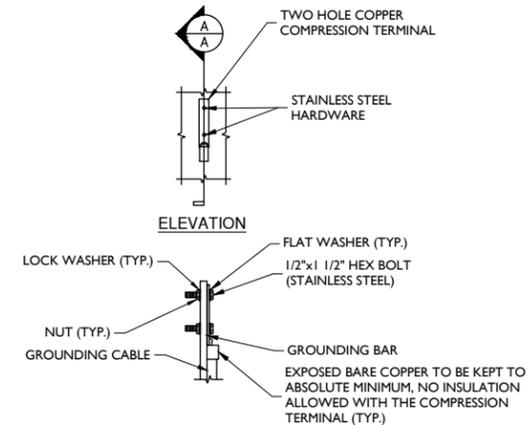
**SECTION "A" - SURGE ABSORBERS**

- INTERIOR GROUND RING (#2)
- EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
- METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
- BUILDING STEEL (IF AVAILABLE) (#2)

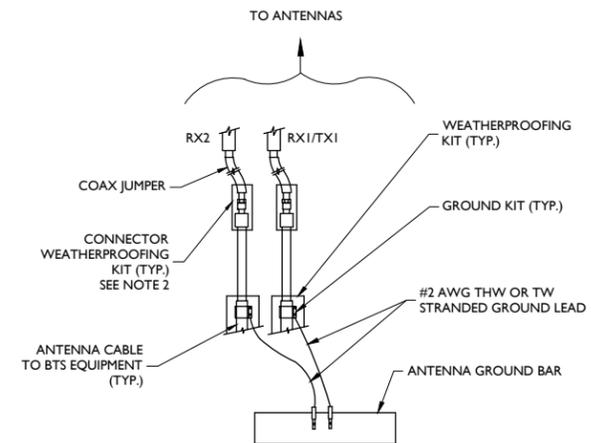
**MASTER GROUND BAR**  
NOT TO SCALE



**SCHEMATIC DIAGRAM GROUNDING SYSTEM**  
NOT TO SCALE



**TYPICAL GROUND BAR CONNECTION DETAIL**  
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- NOTES:**
1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO ANTENNA GROUND BAR.
  2. WEATHER PROOFING SHALL BE TWO-PART TAPE KIT, COLD SHRINK SHALL NOT BE USED.

**TYPICAL GROUND WIRE TO GROUNDING BAR**  
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SITE # CTL05101  
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NEW HAVEN COUNTY



Date: **February 28, 2017**

Charles McGuirt  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277



**Subject: Structural Analysis Report**

**Carrier Designation:** **AT&T Mobility Co-Locate**  
**Carrier Site Number:** CTL05101  
**Carrier Site Name:** Orange Transfer Station

**Crown Castle Designation:** **Crown Castle BU Number:** 842871  
**Crown Castle Site Name:** Orange Transfer Station  
**Crown Castle JDE Job Number:** 426374  
**Crown Castle Work Order Number:** 1367124  
**Crown Castle Application Number:** 379717 Rev. 0

**Engineering Firm Designation:** **Black & Veatch Corp. Project Number:** 194393

**Site Data:** **26 South Orange Center Road, Orange, New Haven County, CT**  
**Latitude 41° 15' 19.98", Longitude -73° 0' 39.2"**  
**180 Foot - Monopole Tower**

Dear Charles McGuirt,

*Black & Veatch Corp.* is pleased to submit this "**Structural Analysis Report**" to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 1005644, in accordance with application 379717, revision 0.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC5: Existing + Proposed Equipment

**Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing loading, respectively.

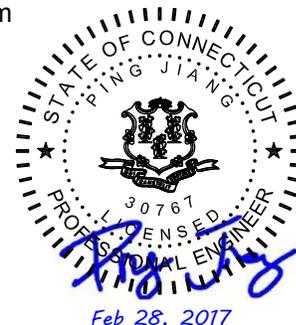
This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 125 mph converted to a nominal 3-second gust wind speed of 97 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C with a maximum topographic factor,  $K_{zt}$ , of 1 and Risk Category II were used in this analysis. Seismic forces have been evaluated based on Site Class D with spectral response factors  $S_s$  of 0.191g and  $S_1$  of 0.063g.

We at *Black & Veatch Corp.* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Suttinee Somchana / Teddy Haile-Mariam

Respectfully submitted by:

Ping Jiang, P.E.  
Professional Engineer



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tnxTower Output

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### 7) APPENDIX C

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## 1) INTRODUCTION

This tower is a 180 ft Monopole tower designed by Paul J. Ford and Company in August of 2001. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

## 2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standard for Antenna Supporting Structures and Antennas using a 3-second gust wind speed of 97 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category C with topographic category 1 and crest height of 0 feet. Seismic forces have been evaluated based on Site Class D with spectral response factors  $S_s$  of 0.191g and  $S_1$  of 0.063g.

**Table 1 - Proposed Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
177.0	177.0	3	andrew	SBNHH-1D65A w/ Mount Pipe	1 2	3/8 3/4	1
		3	cci antennas	OPA-65R-LCUU-H4 w/ Mount Pipe			
		6	cci antennas	TPX-070821			
		1	commscope	WCS-IMFT-AMT			
		3	ericsson	RRUS 11			
		3	ericsson	RRUS 32 B2			
		3	ericsson	RRUS 32 B30			
		1	raycap	DC6-48-60-18-8F			

Notes:

- 1) See Appendix B for proposed coax configuration

**Table 2 - Existing Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note	
177.0	179.0	3	kmw communications	AM-X-CW-14-65-00T-RET w/ Mount Pipe	-	-	3	
		3	ericsson	RRUS-11				
		1	raycap	DC6-48-60-18-8F			2	
	177.0	177.0	1	cci tower mounts	Platform Mount [LP 303-1]			
			6	powerwave technologies	7020.00	1 12	1/4 1-5/8	
			3	powerwave technologies	7770.00 w/ Mount Pipe	2 1	3/4 3/8	1
			6	powerwave technologies	LGP21401			
			3	powerwave technologies	7770.00 w/ Mount Pipe			
			6	powerwave technologies	LGP21401	-	-	3

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
148.0	148.0	1	cci tower mounts	Platform Mount [LP 303-1]	1 12	1-1/4 1-5/8	1
		3	ericsson	AIR 21 B2A/B4P w/ Mount Pipe			
		3	ericsson	AIR 21 B4A/B2P w/ Mount Pipe			
		3	ericsson	KRY 112 144/1			
	146.0	3	andrew	LNX-6515DS-A1M w/ Mount Pipe			
		3	ericsson	RRUS 11 B12			
134.0	134.0	1	cci tower mounts	Pipe Mount [PM 601-3]	-	-	1
		1	cci tower mounts	Side Arm Mount [SO 102-3]			
	132.0	3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
	127.0	3	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
	131.0	131.0	1	cci tower mounts			
1			cci tower mounts	Platform Mount [LP 714-1]			
130.0		3	alcatel lucent	TD-RRH8x20-25			
		9	rfs celwave	ACU-A20-N			
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
		3	rfs celwave	APXVTM14-C-120 w/ Mount Pipe			
115.0	117.0	3	alcatel lucent	RRH2X40-AWS	1 18	1-1/4 1-5/8	1
		6	antel	BXA-171063-12BF w/ Mount Pipe			
		3	antel	BXA-70063/4CF w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
		3	swedcom	SLCP 2x6015 w/ Mount Pipe			
	115.0	1	cci tower mounts	Platform Mount [LP 1201-1]			
44.0	45.0	1	pctel	GPS-TMG-HR-26NCM	1	1/2	1
	44.0	1	cci tower mounts	Side Arm Mount [SO 701-1]			

Notes:

- 1) Existing Equipment
- 2) Existing Equipment To Be Relocated to 177' CL
- 3) Existing Equipment To Be Removed; Not Considered in This Analysis

**Table 3 - Design Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
180.0	180.0	4	celwave	PD220	-	-
		12	swedcom	ALP-9212-N		
168.0	168.0	12	swedcom	ALP-9212-N	-	-
158.0	158.0	12	swedcom	ALP-9212-N	-	-
148.0	148.0	12	swedcom	ALP-9212-N	-	-
138.0	138.0	12	swedcom	ALP-9212-N	-	-
128.0	128.0	12	swedcom	ALP-9212-N	-	-

**3) ANALYSIS PROCEDURE**

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	WEI Geotechnical Engineer	4529423	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	WEI Geotechnical Engineer (Mapped)	4529422	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Paul J. Ford and Company	4705360	CCISITES
4-TOWER STRUCTURAL ANALYSIS REPORTS	B+T Group.	6701098	CCISITES

**3.1) Analysis Method**

tnxTower (version 7.0.5.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

**3.2) Assumptions**

- 1) Tower and structures were built in accordance with the manufacturer’s specifications.
- 2) The tower and structures have been maintained in accordance with the manufacturer’s specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 4) This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appurtenance loading, tower/foundation details, and geotechnical data. The existing/proposed loading on the structure is based on CAD level drawings and carrier applications provided by the owner. If any of this information is not current and correct, this report should be considered obsolete and further analysis will be required.

This analysis may be affected if any assumptions are not valid or have been made in error. Black & Veatch Corp. should be notified to determine the effect on the structural integrity of the tower.

#### 4) ANALYSIS RESULTS

##### 4.1) Wind Results

**Table 5 - Section Capacity (Summary)**

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	180 - 170.58	Pole	TP26.25x24x0.1875	1	-3.04	1019.44	3.4	Pass
L2	170.58 - 126	Pole	TP36.525x25.0581x0.25	2	-14.22	1861.24	31.2	Pass
L3	126 - 82.75	Pole	TP46.357x34.8903x0.3125	3	-26.69	2935.51	56.3	Pass
L4	82.75 - 40.75	Pole	TP55.765x44.2987x0.375	4	-40.05	4233.02	61.1	Pass
L5	40.75 - 0	Pole	TP64.75x53.2831x0.4375	5	-60.94	5854.04	60.6	Pass
							Summary	
						Pole (L4)	61.1	Pass
						RATING =	61.1	Pass

**Table 6 - Tower Component Stresses vs. Capacity – LC5**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	61.8	Pass
1	Base Plate	0	35.0	Pass
1	Base Foundation	0	68.8	Pass
1	Base Foundation Soil Interaction	0	15.9	Pass

##### 4.2) Seismic Results

Tower and foundation have been analyzed based on the seismic criteria outlined in section 2 of this report. Based on the analysis, seismic loading is not governing the tower and foundation stress. Wind loading is governing the tower and foundation stress.

<b>Structure Rating (max from all components) =</b>	<b>68.8%</b>
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Notes:

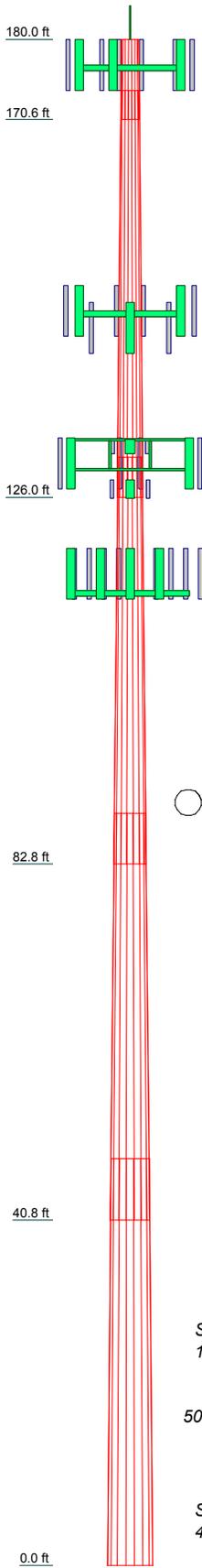
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

##### 4.3) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

**APPENDIX A**  
**TNXTOWER OUTPUT**

Section	1	2	3	4	5
Length (ft)	9.42	48.00	48.00	48.00	48.00
Number of Sides	18	18	18	18	18
Thickness (in)	0.1875	0.2500	0.3125	0.3750	0.4375
Socket Length (ft)	3.42	4.75	6.00	7.25	8.50
Top Dia (in)	24.0000	25.0681	34.8903	44.2987	53.2831
Bot Dia (in)	26.2500	36.5250	46.3570	55.7650	64.7500
Grade			A572-65		
Weight (K)	0.5	4.0	6.5	9.7	13.3



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8"x4'	182	KRY 112 144/1	148
Platform Mount [LP 303-1]	177	Side Arm Mount [SO 102-3]	134
6' x 2" Mount Pipe	177	Pipe Mount [PM 601-3]	134
6' x 2" Mount Pipe	177	800MHZ RRH	134
6' x 2" Mount Pipe	177	800MHZ RRH	134
OPA-65R-LCUU-H4 w/ Mount Pipe	177	800MHZ RRH	134
OPA-65R-LCUU-H4 w/ Mount Pipe	177	PCS 1900MHz 4x45W-65MHz	134
OPA-65R-LCUU-H4 w/ Mount Pipe	177	PCS 1900MHz 4x45W-65MHz	134
SBNHH-1D65A w/ Mount Pipe	177	PCS 1900MHz 4x45W-65MHz	134
SBNHH-1D65A w/ Mount Pipe	177	800 EXTERNAL NOTCH FILTER	134
SBNHH-1D65A w/ Mount Pipe	177	800 EXTERNAL NOTCH FILTER	134
7770.00 w/ Mount Pipe	177	800 EXTERNAL NOTCH FILTER	134
7770.00 w/ Mount Pipe	177	Platform Mount [LP 714-1]	131
7770.00 w/ Mount Pipe	177	Miscellaneous [NA 510-1]	131
RRUS 32 B2	177	(2) 8' x 3.5" Mount Pipe	131
RRUS 32 B2	177	8' x 3.5" Mount Pipe	131
RRUS 32 B2	177	APXVSP18-C-A20 w/ Mount Pipe	131
(2) TPX-070821	177	APXVSP18-C-A20 w/ Mount Pipe	131
(2) TPX-070821	177	APXVSP18-C-A20 w/ Mount Pipe	131
(2) TPX-070821	177	APXVTM14-C-120 w/ Mount Pipe	131
RRUS 32 B30	177	APXVTM14-C-120 w/ Mount Pipe	131
RRUS 32 B30	177	APXVTM14-C-120 w/ Mount Pipe	131
RRUS 32 B30	177	(3) ACU-A20-N	131
RRUS 11	177	(3) ACU-A20-N	131
RRUS 11	177	(3) ACU-A20-N	131
RRUS 11	177	TD-RRH8x20-25	131
WCS-IMFT-AMT	177	TD-RRH8x20-25	131
DC6-48-60-18-8F	177	TD-RRH8x20-25	131
DC6-48-60-18-8F	177	Platform Mount [LP 1201-1]	115
(2) 7020.00	177	6' x 2" Mount Pipe	115
(2) 7020.00	177	6' x 2" Mount Pipe	115
(2) 7020.00	177	6' x 2" Mount Pipe	115
(2) 7020.00	177	6' x 2" Mount Pipe	115
(2) LGP21401	177	SLCP 2x6015 w/ Mount Pipe	115
(2) LGP21401	177	SLCP 2x6015 w/ Mount Pipe	115
(2) LGP21401	177	SLCP 2x6015 w/ Mount Pipe	115
(2) LGP21401	177	SLCP 2x6015 w/ Mount Pipe	115
Platform Mount [LP 303-1]	148	BXA-70063/4CF w/ Mount Pipe	115
AIR 21 B2A/B4P w/ Mount Pipe	148	BXA-70063/4CF w/ Mount Pipe	115
AIR 21 B2A/B4P w/ Mount Pipe	148	BXA-70063/4CF w/ Mount Pipe	115
AIR 21 B2A/B4P w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
LNX-6515DS-A1M w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
LNX-6515DS-A1M w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
LNX-6515DS-A1M w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
LNX-6515DS-A1M w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
AIR 21 B4A/B2P w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
AIR 21 B4A/B2P w/ Mount Pipe	148	BXA-171063-12BF w/ Mount Pipe	115
AIR 21 B4A/B2P w/ Mount Pipe	148	RRH2X40-AWS	115
RRUS 11 B12	148	(2) RRH2X40-AWS	115
RRUS 11 B12	148	DB-T1-6Z-8AB-0Z	115
RRUS 11 B12	148	Side Arm Mount [SO 701-1]	44
KRY 112 144/1	148	3' x 2" Pipe Mount	44
KRY 112 144/1	148	GPS-TMG-HR-26NCM	44

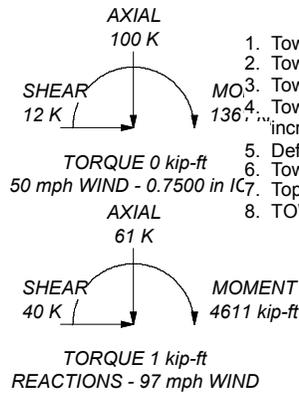
### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

### TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 61.1%

ALL REACTIONS ARE FACTORED





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Phone: (913) 458-2000  
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**Job: ORANGE TRANSFER STATION (BU#842871)**  
Project: 194393 (842871.1367124)  
Client: Crown Castle | Drawn by: Teddy Haile-Mariam, E.I.T. | App'd:  
Code: TIA-222-G | Date: 02/28/17 | Scale: NTS  
Path: | Dwg No. E-1

## Tower Input Data

There is a pole section.  
 This tower is designed using the TIA-222-G standard.  
 The following design criteria apply:

- 1) Tower is located in New London County, Connecticut.
- 2) Basic wind speed of 97 mph.
- 3) Structure Class II.
- 4) Exposure Category C.
- 5) Topographic Category 1.
- 6) Crest Height 0.00 ft.
- 7) Nominal ice thickness of 0.7500 in.
- 8) Ice thickness is considered to increase with height.
- 9) Ice density of 56 pcf.
- 10) A wind speed of 50 mph is used in combination with ice.
- 11) Temperature drop of 50 °F.
- 12) Deflections calculated using a wind speed of 60 mph.
- 13) A non-linear (P-delta) analysis was used.
- 14) Pressures are calculated at each section.
- 15) Stress ratio used in pole design is 1.
- 16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile  Include Bolts In Member Capacity  Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt.  Autocalc Torque Arm Areas  Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder	Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption  <div style="text-align: center; background-color: #e0e0e0; padding: 2px;"><b>Poles</b></div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	180.00-170.58	9.42	3.42	18	24.0000	26.2500	0.1875	0.7500	A572-65 (65 ksi)
L2	170.58-126.00	48.00	4.75	18	25.0581	36.5250	0.2500	1.0000	A572-65 (65 ksi)
L3	126.00-82.75	48.00	6.00	18	34.8903	46.3570	0.3125	1.2500	A572-65 (65 ksi)
L4	82.75-40.75	48.00	7.25	18	44.2987	55.7650	0.3750	1.5000	A572-65 (65 ksi)
L5	40.75-0.00	48.00		18	53.2831	64.7500	0.4375	1.7500	A572-65 (65 ksi)

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
L1	24.3702	14.1714	1015.2211	8.4534	12.1920	83.2694	2031.7780	7.0871	3.8940	20.768
	26.6549	15.5104	1331.0484	9.2522	13.3350	99.8162	2663.8483	7.7567	4.2900	22.88
L2	26.2743	19.6852	1530.6151	8.8069	12.7295	120.2413	3063.2442	9.8445	3.9702	15.881
	37.0885	28.7842	4785.2722	12.8776	18.5547	257.9008	9576.8409	14.3948	5.9884	23.954
L3	36.5807	34.2968	5180.6571	12.2751	17.7243	292.2920	10368.131	17.1517	5.5907	17.89
	47.0721	45.6704	12232.8508	16.3458	23.5494	519.4559	24481.7979	22.8395	7.6088	24.348
L4	46.4374	52.2801	12742.9833	15.5929	22.5037	566.2612	25502.7342	26.1450	7.1366	19.031
	56.6253	65.9279	25554.6382	19.6635	28.3286	902.0785	51142.9018	32.9702	9.1546	24.412
L5	55.8638	73.3827	25891.0121	18.7602	27.0678	956.5238	51816.0923	36.6983	8.6078	19.675
	65.7489	89.3059	46666.8628	22.8309	32.8930	1418.7475	93395.1311	44.6615	10.6260	24.288

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
ft	ft <sup>2</sup>	in							
L1 180.00-170.58				1	1	1			
L2 170.58-126.00				1	1	1			
L3 126.00-82.75				1	1	1			
L4 82.75-40.75				1	1	1			
L5 40.75-0.00				1	1	1			

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

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
Safety Line 3/8	C	Surface Ar (CaAa)	180.00 - 3.00	1	1	0.320 0.330	0.3750		0.22
LDF7-50A(1-5/8)	C	Surface Ar (CaAa)	115.00 - 5.00	6	6	-0.500 -0.280	1.9800		0.82

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
*** FB-L98B-034-XXXXXX(3/8)	B	No	Inside Pole	177.00 - 7.00	1	No Ice 1/2" Ice 1" Ice	0.05 0.05 0.05
WR-VG86ST-BRD(3/4)	B	No	Inside Pole	177.00 - 7.00	2	No Ice 1/2" Ice 1" Ice	0.58 0.58 0.58
LDF1-50A(1/4)	B	No	Inside Pole	177.00 - 7.00	1	No Ice	0.06

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
LDF7-50A(1-5/8)	B	No	Inside Pole	177.00 - 7.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
2" innerduct conduit	B	No	Inside Pole	177.00 - 7.00	2	No Ice	0.00	0.20
						1/2" Ice	0.00	0.20
						1" Ice	0.00	0.20
FB-L98B-002-XXX(3/8)	B	No	Inside Pole	177.00 - 7.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
WR-VG86ST-BRD(3/4)	B	No	Inside Pole	177.00 - 7.00	2	No Ice	0.00	0.58
						1/2" Ice	0.00	0.58
						1" Ice	0.00	0.58
***								
LDF6-50A(1-1/4)	A	No	Inside Pole	148.00 - 7.00	1	No Ice	0.00	0.60
						1/2" Ice	0.00	0.60
						1" Ice	0.00	0.60
LDF7-50A(1-5/8)	A	No	Inside Pole	148.00 - 7.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
***								
LDF4.5-50(5/8)	A	No	Inside Pole	131.00 - 7.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
HB114-1-05U3-S3J(1-1/4)	A	No	Inside Pole	131.00 - 7.00	3	No Ice	0.00	0.90
						1/2" Ice	0.00	0.90
						1" Ice	0.00	0.90
***								
HB114-1-05U5-S6J(1-1/4)	C	No	Inside Pole	115.00 - 4.00	1	No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30
LDF7-50A(1-5/8)	C	No	Inside Pole	115.00 - 4.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
***								
LDF4-50A(1/2)	A	No	Inside Pole	44.00 - 7.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	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>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	180.00-170.58	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.08
		C	0.000	0.000	0.353	0.000	0.00
L2	170.58-126.00	A	0.000	0.000	0.000	0.000	0.24
		B	0.000	0.000	0.000	0.000	0.57
		C	0.000	0.000	1.672	0.000	0.01
L3	126.00-82.75	A	0.000	0.000	0.000	0.000	0.57
		B	0.000	0.000	0.000	0.000	0.55
		C	0.000	0.000	39.935	0.000	0.53
L4	82.75-40.75	A	0.000	0.000	0.000	0.000	0.56
		B	0.000	0.000	0.000	0.000	0.54
		C	0.000	0.000	51.471	0.000	0.68
L5	40.75-0.00	A	0.000	0.000	0.000	0.000	0.45
		B	0.000	0.000	0.000	0.000	0.43
		C	0.000	0.000	43.887	0.000	0.59

### 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>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L1	180.00-170.58	A	1.773	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.08
		C		0.000	0.000	3.693	0.000	0.05
L2	170.58-126.00	A	1.742	0.000	0.000	0.000	0.000	0.24
		B		0.000	0.000	0.000	0.000	0.57
		C		0.000	0.000	17.476	0.000	0.22
L3	126.00-82.75	A	1.682	0.000	0.000	0.000	0.000	0.57
		B		0.000	0.000	0.000	0.000	0.55
		C		0.000	0.000	78.625	0.000	1.46
L4	82.75-40.75	A	1.596	0.000	0.000	0.000	0.000	0.56
		B		0.000	0.000	0.000	0.000	0.54
		C		0.000	0.000	95.734	0.000	1.79
L5	40.75-0.00	A	1.431	0.000	0.000	0.000	0.000	0.45
		B		0.000	0.000	0.000	0.000	0.43
		C		0.000	0.000	80.821	0.000	1.49

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	180.00-170.58	-0.0348	0.0429	-0.2795	0.3451
L2	170.58-126.00	-0.0348	0.0430	-0.2926	0.3614
L3	126.00-82.75	0.7866	0.7992	0.7444	1.1485
L4	82.75-40.75	1.0068	1.0048	1.0172	1.3898
L5	40.75-0.00	0.9203	0.9222	0.9729	1.3430

### Shielding Factor $K_a$

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	$K_a$ No Ice	$K_a$ Ice
L1	1	Safety Line 3/8	170.58 - 180.00	1.0000	1.0000
L2	1	Safety Line 3/8	126.00 - 170.58	1.0000	1.0000
L2	19	LDF7-50A(1-5/8)	126.00 - 115.00	1.0000	1.0000
L3	1	Safety Line 3/8	82.75 - 126.00	1.0000	1.0000
L3	19	LDF7-50A(1-5/8)	82.75 - 115.00	1.0000	1.0000
L4	1	Safety Line 3/8	40.75 - 82.75	1.0000	1.0000
L4	19	LDF7-50A(1-5/8)	40.75 - 82.75	1.0000	1.0000

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
Lightning Rod 5/8"x4'	C	From Face	4.00	0.0000	182.00	No Ice	0.25	0.25	0.00
			0.00			1/2"	0.66	0.66	0.01
			0.00			Ice	0.97	0.97	0.01
						1" Ice			
***									
Platform Mount [LP 303-1]	C	None		0.0000	177.00	No Ice	14.66	14.66	1.25
						1/2"	18.87	18.87	1.48
						Ice	23.08	23.08	1.71
						1" Ice			
6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	177.00	No Ice	1.43	1.43	0.02
			-2.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice			
6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	177.00	No Ice	1.43	1.43	0.02
			-2.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice			
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	177.00	No Ice	1.43	1.43	0.02
			-2.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice			
OPA-65R-LCUU-H4 w/ Mount Pipe	A	From Face	4.00	20.0000	177.00	No Ice	6.18	4.55	0.08
			2.00			1/2"	6.57	5.16	0.13
			0.00			Ice	6.98	5.78	0.19
						1" Ice			
OPA-65R-LCUU-H4 w/ Mount Pipe	B	From Face	4.00	0.0000	177.00	No Ice	6.18	4.55	0.08
			2.00			1/2"	6.57	5.16	0.13
			0.00			Ice	6.98	5.78	0.19
						1" Ice			
OPA-65R-LCUU-H4 w/ Mount Pipe	C	From Face	4.00	-10.0000	177.00	No Ice	6.18	4.55	0.08
			2.00			1/2"	6.57	5.16	0.13
			0.00			Ice	6.98	5.78	0.19
						1" Ice			
SBNHH-1D65A w/ Mount Pipe	A	From Face	4.00	20.0000	177.00	No Ice	6.19	5.25	0.05
			6.00			1/2"	6.64	6.04	0.11
			0.00			Ice	7.07	6.74	0.17
						1" Ice			
SBNHH-1D65A w/ Mount Pipe	B	From Face	4.00	0.0000	177.00	No Ice	6.19	5.25	0.05
			6.00			1/2"	6.64	6.04	0.11
			0.00			Ice	7.07	6.74	0.17
						1" Ice			
SBNHH-1D65A w/ Mount Pipe	C	From Face	4.00	-10.0000	177.00	No Ice	6.19	5.25	0.05
			6.00			1/2"	6.64	6.04	0.11
			0.00			Ice	7.07	6.74	0.17
						1" Ice			
7770.00 w/ Mount Pipe	A	From Face	4.00	20.0000	177.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.10
			0.00			Ice	6.61	5.71	0.16
						1" Ice			
7770.00 w/ Mount Pipe	B	From Face	4.00	0.0000	177.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.10
			0.00			Ice	6.61	5.71	0.16
						1" Ice			
7770.00 w/ Mount Pipe	C	From Face	4.00	-10.0000	177.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.10
			0.00			Ice	6.61	5.71	0.16
						1" Ice			
RRUS 32 B2	A	From Face	4.00	0.0000	177.00	No Ice	2.73	1.67	0.05
			0.00			1/2"	2.95	1.86	0.07
			0.00			Ice	3.18	2.05	0.10
						1" Ice			
RRUS 32 B2	B	From Face	4.00	0.0000	177.00	No Ice	2.73	1.67	0.05
			0.00			1/2"	2.95	1.86	0.07
			0.00			Ice	3.18	2.05	0.10
						1" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K
RRUS 32 B2	C	From Face	4.00	0.0000	177.00	No Ice	2.73	1.67	0.05
			0.00			1/2"	2.95	1.86	0.07
			0.00			Ice	3.18	2.05	0.10
(2) TPX-070821	A	From Face	4.00	0.0000	177.00	No Ice	0.47	0.10	0.01
			0.00			1/2"	0.56	0.15	0.01
			0.00			Ice	0.66	0.20	0.02
(2) TPX-070821	B	From Face	4.00	0.0000	177.00	No Ice	0.47	0.10	0.01
			0.00			1/2"	0.56	0.15	0.01
			0.00			Ice	0.66	0.20	0.02
(2) TPX-070821	C	From Face	4.00	0.0000	177.00	No Ice	0.47	0.10	0.01
			0.00			1/2"	0.56	0.15	0.01
			0.00			Ice	0.66	0.20	0.02
RRUS 32 B30	A	From Face	4.00	0.0000	177.00	No Ice	2.69	1.57	0.06
			0.00			1/2"	2.91	1.76	0.08
			0.00			Ice	3.14	1.95	0.10
RRUS 32 B30	B	From Face	4.00	0.0000	177.00	No Ice	2.69	1.57	0.06
			0.00			1/2"	2.91	1.76	0.08
			0.00			Ice	3.14	1.95	0.10
RRUS 32 B30	C	From Face	4.00	0.0000	177.00	No Ice	2.69	1.57	0.06
			0.00			1/2"	2.91	1.76	0.08
			0.00			Ice	3.14	1.95	0.10
RRUS 11	A	From Face	4.00	0.0000	177.00	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
RRUS 11	B	From Face	4.00	0.0000	177.00	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
RRUS 11	C	From Face	4.00	0.0000	177.00	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
WCS-IMFT-AMT	C	From Face	4.00	0.0000	177.00	No Ice	0.64	0.46	0.01
			0.00			1/2"	0.75	0.55	0.02
			0.00			Ice	0.86	0.65	0.03
DC6-48-60-18-8F	A	From Face	1.00	0.0000	177.00	No Ice	0.92	0.92	0.02
			0.00			1/2"	1.46	1.46	0.04
			0.00			Ice	1.64	1.64	0.06
DC6-48-60-18-8F	A	From Face	1.00	0.0000	177.00	No Ice	0.92	0.92	0.02
			0.00			1/2"	1.46	1.46	0.04
			0.00			Ice	1.64	1.64	0.06
(2) 7020.00	A	From Face	4.00	0.0000	177.00	No Ice	0.10	0.17	0.00
			0.00			1/2"	0.15	0.24	0.01
			0.00			Ice	0.20	0.31	0.01
(2) 7020.00	B	From Face	4.00	0.0000	177.00	No Ice	0.10	0.17	0.00
			0.00			1/2"	0.15	0.24	0.01
			0.00			Ice	0.20	0.31	0.01
(2) 7020.00	C	From Face	4.00	0.0000	177.00	No Ice	0.10	0.17	0.00
			0.00			1/2"	0.15	0.24	0.01
			0.00			Ice	0.20	0.31	0.01
(2) LGP21401	A	From Face	4.00	0.0000	177.00	No Ice	1.10	0.35	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	Ice 1/2" Ice 1"	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
			0.00			1/2"	1.24	0.44	0.02
			0.00			Ice	1.38	0.54	0.03
(2) LGP21401	B	From Face	4.00	0.0000	177.00	1" Ice	1.10	0.35	0.01
			0.00			No Ice	1.24	0.44	0.02
			0.00			1/2"	1.24	0.44	0.02
			0.00			Ice	1.38	0.54	0.03
			0.00			1" Ice	1.10	0.35	0.01
(2) LGP21401	C	From Face	4.00	0.0000	177.00	No Ice	1.10	0.35	0.01
			0.00			1/2"	1.24	0.44	0.02
			0.00			Ice	1.38	0.54	0.03
			0.00			1" Ice	1.10	0.35	0.01
***									
Platform Mount [LP 303-1]	C	None		0.0000	148.00	No Ice	14.66	14.66	1.25
						1/2"	18.87	18.87	1.48
						Ice	23.08	23.08	1.71
						1" Ice			
AIR 21 B2A/B4P w/ Mount Pipe	A	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			-6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
AIR 21 B2A/B4P w/ Mount Pipe	B	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			-6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
AIR 21 B2A/B4P w/ Mount Pipe	C	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			-6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
LNX-6515DS-A1M w/ Mount Pipe	A	From Face	4.00	0.0000	148.00	No Ice	11.68	9.84	0.08
			0.00			1/2"	12.40	11.37	0.17
			-2.00			Ice	13.14	12.91	0.27
			0.00			1" Ice			
LNX-6515DS-A1M w/ Mount Pipe	B	From Face	4.00	0.0000	148.00	No Ice	11.68	9.84	0.08
			0.00			1/2"	12.40	11.37	0.17
			-2.00			Ice	13.14	12.91	0.27
			0.00			1" Ice			
LNX-6515DS-A1M w/ Mount Pipe	C	From Face	4.00	0.0000	148.00	No Ice	11.68	9.84	0.08
			0.00			1/2"	12.40	11.37	0.17
			-2.00			Ice	13.14	12.91	0.27
			0.00			1" Ice			
AIR 21 B4A/B2P w/ Mount Pipe	A	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
AIR 21 B4A/B2P w/ Mount Pipe	B	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
AIR 21 B4A/B2P w/ Mount Pipe	C	From Face	4.00	0.0000	148.00	No Ice	6.16	5.55	0.10
			6.00			1/2"	6.60	6.30	0.16
			0.00			Ice	7.03	7.00	0.22
			0.00			1" Ice			
RRUS 11 B12	A	From Face	4.00	0.0000	148.00	No Ice	2.83	1.18	0.05
			0.00			1/2"	3.04	1.33	0.07
			-2.00			Ice	3.26	1.48	0.10
			0.00			1" Ice			
RRUS 11 B12	B	From Face	4.00	0.0000	148.00	No Ice	2.83	1.18	0.05
			0.00			1/2"	3.04	1.33	0.07
			-2.00			Ice	3.26	1.48	0.10
			0.00			1" Ice			
RRUS 11 B12	C	From Face	4.00	0.0000	148.00	No Ice	2.83	1.18	0.05
			0.00			1/2"	3.04	1.33	0.07
			-2.00			Ice	3.26	1.48	0.10
			0.00			1" Ice			
KRY 112 144/1	A	From Face	4.00	0.0000	148.00	No Ice	0.35	0.17	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
			0.00			1/2"	0.43	0.23	0.01
			0.00			Ice	0.51	0.30	0.02
KRY 112 144/1	B	From Face	4.00	0.0000	148.00	1" Ice	0.35	0.17	0.01
			0.00			No Ice	0.43	0.23	0.01
			0.00			1/2"	0.43	0.23	0.01
			0.00			Ice	0.51	0.30	0.02
KRY 112 144/1	C	From Face	4.00	0.0000	148.00	1" Ice	0.35	0.17	0.01
			0.00			No Ice	0.43	0.23	0.01
			0.00			1/2"	0.43	0.23	0.01
			0.00			Ice	0.51	0.30	0.02
			0.00			1" Ice			
***									
Side Arm Mount [SO 102-3]	C	None		0.0000	134.00	No Ice	3.00	3.00	0.08
						1/2"	3.48	3.48	0.11
						Ice	3.96	3.96	0.14
						1" Ice			
Pipe Mount [PM 601-3]	C	None		0.0000	134.00	No Ice	4.39	4.39	0.20
						1/2"	5.48	5.48	0.24
						Ice	6.57	6.57	0.28
						1" Ice			
800MHZ RRH	A	From Face	1.00	0.0000	134.00	No Ice	2.13	1.77	0.05
			0.00			1/2"	2.32	1.95	0.07
			-2.00			Ice	2.51	2.13	0.10
						1" Ice			
800MHZ RRH	B	From Face	1.00	0.0000	134.00	No Ice	2.13	1.77	0.05
			0.00			1/2"	2.32	1.95	0.07
			-2.00			Ice	2.51	2.13	0.10
						1" Ice			
800MHZ RRH	C	From Face	1.00	0.0000	134.00	No Ice	2.13	1.77	0.05
			0.00			1/2"	2.32	1.95	0.07
			-2.00			Ice	2.51	2.13	0.10
						1" Ice			
PCS 1900MHz 4x45W-65MHz	A	From Face	1.00	0.0000	134.00	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			-7.00			Ice	2.74	2.65	0.11
						1" Ice			
PCS 1900MHz 4x45W-65MHz	B	From Face	1.00	0.0000	134.00	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			-7.00			Ice	2.74	2.65	0.11
						1" Ice			
PCS 1900MHz 4x45W-65MHz	C	From Face	1.00	0.0000	134.00	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			-7.00			Ice	2.74	2.65	0.11
						1" Ice			
800 EXTERNAL NOTCH FILTER	A	From Face	1.00	0.0000	134.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			-2.00			Ice	0.87	0.48	0.02
						1" Ice			
800 EXTERNAL NOTCH FILTER	B	From Face	1.00	0.0000	134.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			-2.00			Ice	0.87	0.48	0.02
						1" Ice			
800 EXTERNAL NOTCH FILTER	C	From Face	1.00	0.0000	134.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			-2.00			Ice	0.87	0.48	0.02
						1" Ice			
***									
Platform Mount [LP 714-1]	C	None		0.0000	131.00	No Ice	37.47	37.47	1.60
						1/2"	44.23	44.23	2.04
						Ice	50.99	50.99	2.48
						1" Ice			
Miscellaneous [NA 510-1]	C	None		0.0000	131.00	No Ice	6.00	6.00	0.26
						1/2"	8.50	8.50	0.34
						Ice	11.00	11.00	0.42
						1" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft		C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
(2) 8' x 3.5" Mount Pipe	A	From Face	4.00	0.0000	131.00	No Ice	2.74	2.74	0.06
			0.00			1/2"	3.41	3.41	0.08
			0.00			Ice	3.89	3.89	0.11
8' x 3.5" Mount Pipe	B	From Face	4.00	0.0000	131.00	No Ice	2.74	2.74	0.06
			0.00			1/2"	3.41	3.41	0.08
			0.00			Ice	3.89	3.89	0.11
APXVSP18-C-A20 w/ Mount Pipe	A	From Face	4.00	10.0000	131.00	No Ice	8.26	6.95	0.08
			-7.00			1/2"	8.82	8.13	0.15
			-1.00			Ice	9.35	9.02	0.23
APXVSP18-C-A20 w/ Mount Pipe	B	From Face	4.00	0.0000	131.00	No Ice	8.26	6.95	0.08
			-7.00			1/2"	8.82	8.13	0.15
			-1.00			Ice	9.35	9.02	0.23
APXVSP18-C-A20 w/ Mount Pipe	C	From Face	4.00	15.0000	131.00	No Ice	8.26	6.95	0.08
			-7.00			1/2"	8.82	8.13	0.15
			-1.00			Ice	9.35	9.02	0.23
APXVTM14-C-120 w/ Mount Pipe	A	From Face	4.00	10.0000	131.00	No Ice	6.58	4.96	0.08
			7.00			1/2"	7.03	5.75	0.13
			-1.00			Ice	7.47	6.47	0.19
APXVTM14-C-120 w/ Mount Pipe	B	From Face	4.00	0.0000	131.00	No Ice	6.58	4.96	0.08
			7.00			1/2"	7.03	5.75	0.13
			-1.00			Ice	7.47	6.47	0.19
APXVTM14-C-120 w/ Mount Pipe	C	From Face	4.00	15.0000	131.00	No Ice	6.58	4.96	0.08
			7.00			1/2"	7.03	5.75	0.13
			-1.00			Ice	7.47	6.47	0.19
(3) ACU-A20-N	A	From Face	4.00	0.0000	131.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			-1.00			Ice	0.15	0.21	0.00
(3) ACU-A20-N	B	From Face	4.00	0.0000	131.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			-1.00			Ice	0.15	0.21	0.00
(3) ACU-A20-N	C	From Face	4.00	0.0000	131.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			-1.00			Ice	0.15	0.21	0.00
TD-RRH8x20-25	A	From Face	4.00	0.0000	131.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			-1.00			Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	4.00	0.0000	131.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			-1.00			Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	4.00	0.0000	131.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			-1.00			Ice	4.56	1.90	0.13
***									
Platform Mount [LP 1201- 1]	C	None		0.0000	115.00	No Ice	23.10	23.10	2.10
						1/2"	26.80	26.80	2.50
						Ice	30.50	30.50	2.90
6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	115.00	No Ice	1.43	1.43	0.02
			7.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight	
			Horz	Lateral						ft
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	115.00	No Ice	1.43	1.43	0.02	
			7.00			1/2"	1.92	1.92	0.03	
			0.00			Ice	2.29	2.29	0.05	
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	115.00	No Ice	1.43	1.43	0.02	
			7.00			1/2"	1.92	1.92	0.03	
			0.00			Ice	2.29	2.29	0.05	
SLCP 2x6015 w/ Mount Pipe	A	From Face	4.00	40.0000	115.00	No Ice	10.22	10.00	0.06	
			3.50			1/2"	10.82	11.24	0.15	
			2.00			Ice	11.39	12.26	0.25	
SLCP 2x6015 w/ Mount Pipe	B	From Face	4.00	0.0000	115.00	No Ice	10.22	10.00	0.06	
			3.50			1/2"	10.82	11.24	0.15	
			2.00			Ice	11.39	12.26	0.25	
SLCP 2x6015 w/ Mount Pipe	C	From Face	4.00	40.0000	115.00	No Ice	10.22	10.00	0.06	
			3.50			1/2"	10.82	11.24	0.15	
			2.00			Ice	11.39	12.26	0.25	
BXA-70063/4CF w/ Mount Pipe	A	From Face	4.00	40.0000	115.00	No Ice	4.95	3.62	0.03	
			0.00			1/2"	5.32	4.22	0.07	
			2.00			Ice	5.71	4.83	0.12	
BXA-70063/4CF w/ Mount Pipe	B	From Face	4.00	0.0000	115.00	No Ice	4.95	3.62	0.03	
			0.00			1/2"	5.32	4.22	0.07	
			2.00			Ice	5.71	4.83	0.12	
BXA-70063/4CF w/ Mount Pipe	C	From Face	4.00	40.0000	115.00	No Ice	4.95	3.62	0.03	
			0.00			1/2"	5.32	4.22	0.07	
			2.00			Ice	5.71	4.83	0.12	
BXA-171063-12BF w/ Mount Pipe	A	From Face	4.00	40.0000	115.00	No Ice	4.97	5.23	0.04	
			-3.50			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
BXA-171063-12BF w/ Mount Pipe	B	From Face	4.00	0.0000	115.00	No Ice	4.97	5.23	0.04	
			-3.50			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
BXA-171063-12BF w/ Mount Pipe	C	From Face	4.00	40.0000	115.00	No Ice	4.97	5.23	0.04	
			-3.50			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
BXA-171063-12BF w/ Mount Pipe	A	From Face	4.00	40.0000	115.00	No Ice	4.97	5.23	0.04	
			7.00			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
BXA-171063-12BF w/ Mount Pipe	B	From Face	4.00	0.0000	115.00	No Ice	4.97	5.23	0.04	
			7.00			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
BXA-171063-12BF w/ Mount Pipe	C	From Face	4.00	40.0000	115.00	No Ice	4.97	5.23	0.04	
			7.00			1/2"	5.52	6.39	0.09	
			2.00			Ice	6.04	7.26	0.14	
RRH2X40-AWS	A	From Face	4.00	0.0000	115.00	No Ice	2.16	1.42	0.04	
			0.00			1/2"	2.36	1.59	0.06	
			2.00			Ice	2.57	1.77	0.08	
(2) RRH2X40-AWS	B	From Face	4.00	0.0000	115.00	No Ice	2.16	1.42	0.04	
			0.00			1/2"	2.36	1.59	0.06	
			2.00			Ice	2.57	1.77	0.08	
DB-T1-6Z-8AB-OZ	A	From Face	4.00	0.0000	115.00	No Ice	4.80	2.00	0.04	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
			0.00		1/2"	5.07	2.19	0.08	
			2.00		Ice	5.35	2.39	0.12	
					1" Ice				
*** Side Arm Mount [SO 701-1]	B	From Leg	1.50	0.0000	44.00	No Ice	0.85	1.67	0.07
			0.00			1/2"	1.14	2.34	0.08
			0.00			Ice	1.43	3.01	0.09
						1" Ice			
3' x 2" Pipe Mount	B	From Face	3.00	0.0000	44.00	No Ice	0.58	0.58	0.01
			0.00			1/2"	0.77	0.77	0.02
			0.00			Ice	0.97	0.97	0.02
						1" Ice			
GPS-TMG-HR-26NCM	B	From Leg	3.00	0.0000	44.00	No Ice	0.13	0.13	0.00
			0.00			1/2"	0.18	0.18	0.00
			1.00			Ice	0.24	0.24	0.01
						1" Ice			

## Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp

Comb. No.	Description
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	180 - 170.58	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-8.27	0.37	-0.21
			Max. Mx	20	-3.05	15.85	0.12
			Max. My	14	-3.04	-0.09	-16.18
			Max. Vy	20	-5.24	15.85	0.12
			Max. Vx	2	-5.36	0.18	16.10
L2	170.58 - 126	Pole	Max. Torque	24			0.65
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-32.33	1.33	0.95
			Max. Mx	20	-14.24	402.80	2.60
			Max. My	2	-14.22	2.45	408.73
			Max. Vy	20	-19.91	402.80	2.60
L3	126 - 82.75	Pole	Max. Vx	2	-20.06	2.45	408.73
			Max. Torque	4			1.14
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-54.32	0.79	1.26
			Max. Mx	20	-26.70	1481.15	4.13
			Max. My	2	-26.70	3.47	1491.62
L4	82.75 - 40.75	Pole	Max. Vy	8	29.85	-1480.69	-2.40
			Max. Vx	2	-29.92	3.47	1491.62
			Max. Torque	4			1.56
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-72.91	-0.70	-0.66
			Max. Mx	8	-40.06	-2797.86	-4.04
L5	40.75 - 0	Pole	Max. My	2	-40.05	4.42	2810.76
			Max. Vy	8	34.70	-2797.86	-4.04
			Max. Vx	2	-34.77	4.42	2810.76
			Max. Torque	4			1.56
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-100.11	-3.14	-3.15
			Max. Mx	8	-60.94	-4594.22	-5.42
			Max. My	14	-60.94	-6.27	-4609.67
			Max. Vy	8	39.77	-4594.22	-5.42
			Max. Vx	14	39.84	-6.27	-4609.67
			Max. Torque	6			1.28

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	100.11	-10.09	-5.83
	Max. H <sub>x</sub>	20	60.96	39.73	0.01
	Max. H <sub>z</sub>	2	60.96	0.01	39.81

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. M <sub>x</sub>	2	4609.58	0.01	39.81
	Max. M <sub>z</sub>	8	4594.22	-39.73	-0.01
	Max. Torsion	6	1.28	-34.40	19.89
	Min. Vert	19	45.72	34.40	-19.89
	Min. H <sub>x</sub>	8	60.96	-39.73	-0.01
	Min. H <sub>z</sub>	14	60.96	-0.01	-39.81
	Min. M <sub>x</sub>	14	-4609.67	-0.01	-39.81
	Min. M <sub>z</sub>	20	-4592.44	39.73	0.01
	Min. Torsion	18	-1.27	34.40	-19.89

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	50.80	0.00	0.00	0.06	-0.73	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	60.96	-0.01	-39.81	-4609.58	4.47	-0.79
0.9 Dead+1.6 Wind 0 deg - No Ice	45.72	-0.01	-39.81	-4569.78	4.63	-0.78
1.2 Dead+1.6 Wind 30 deg - No Ice	60.96	19.85	-34.47	-3989.35	-2292.91	-1.19
0.9 Dead+1.6 Wind 30 deg - No Ice	45.72	19.85	-34.47	-3954.91	-2272.93	-1.19
1.2 Dead+1.6 Wind 60 deg - No Ice	60.96	34.40	-19.89	-2300.14	-3976.16	-1.28
0.9 Dead+1.6 Wind 60 deg - No Ice	45.72	34.40	-19.89	-2280.30	-3941.66	-1.27
1.2 Dead+1.6 Wind 90 deg - No Ice	60.96	39.73	0.01	5.42	-4594.22	-1.02
0.9 Dead+1.6 Wind 90 deg - No Ice	45.72	39.73	0.01	5.35	-4554.38	-1.01
1.2 Dead+1.6 Wind 120 deg - No Ice	60.96	34.42	19.92	2309.52	-3981.50	-0.48
0.9 Dead+1.6 Wind 120 deg - No Ice	45.72	34.42	19.92	2289.55	-3946.93	-0.49
1.2 Dead+1.6 Wind 150 deg - No Ice	60.96	19.88	34.49	3994.79	-2302.19	0.17
0.9 Dead+1.6 Wind 150 deg - No Ice	45.72	19.88	34.49	3960.27	-2282.10	0.17
1.2 Dead+1.6 Wind 180 deg - No Ice	60.96	0.01	39.81	4609.67	-6.27	0.79
0.9 Dead+1.6 Wind 180 deg - No Ice	45.72	0.01	39.81	4569.86	-5.97	0.78
1.2 Dead+1.6 Wind 210 deg - No Ice	60.96	-19.85	34.47	3989.45	2291.11	1.19
0.9 Dead+1.6 Wind 210 deg - No Ice	45.72	-19.85	34.47	3954.99	2271.59	1.18
1.2 Dead+1.6 Wind 240 deg - No Ice	60.96	-34.40	19.89	2300.24	3974.37	1.27
0.9 Dead+1.6 Wind 240 deg - No Ice	45.72	-34.40	19.89	2280.39	3940.32	1.27
1.2 Dead+1.6 Wind 270 deg - No Ice	60.96	-39.73	-0.01	-5.32	4592.44	1.02
0.9 Dead+1.6 Wind 270 deg - No Ice	45.72	-39.73	-0.01	-5.26	4553.05	1.02
1.2 Dead+1.6 Wind 300 deg - No Ice	60.96	-34.42	-19.92	-2309.43	3979.72	0.49
0.9 Dead+1.6 Wind 300 deg - No Ice	45.72	-34.42	-19.92	-2289.47	3945.60	0.49
1.2 Dead+1.6 Wind 330 deg - No Ice	60.96	-19.88	-34.49	-3994.70	2300.40	-0.17
0.9 Dead+1.6 Wind 330 deg - No Ice	45.72	-19.88	-34.49	-3960.19	2280.76	-0.17
1.2 Dead+1.0 Ice+1.0 Temp	100.11	0.00	0.00	3.15	-3.14	0.00

Load Combination	Vertical	Shear <sub>x</sub>	Shear <sub>z</sub>	Overturning Moment, M <sub>x</sub>	Overturning Moment, M <sub>z</sub>	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	100.11	-0.02	-11.62	-1349.10	-0.01	-0.15
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	100.11	5.80	-10.05	-1166.33	-677.71	-0.36
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	100.11	10.07	-5.79	-670.20	-1174.66	-0.47
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	100.11	11.64	0.02	6.37	-1357.72	-0.45
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	100.11	10.09	5.83	682.08	-1177.84	-0.32
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	100.11	5.84	10.08	1175.88	-683.21	-0.09
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	100.11	0.02	11.62	1355.46	-6.37	0.15
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	100.11	-5.80	10.05	1172.70	671.32	0.36
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	100.11	-10.07	5.79	676.57	1168.28	0.47
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	100.11	-11.64	-0.02	0.01	1351.34	0.45
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	100.11	-10.09	-5.83	-675.71	1171.46	0.32
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	100.11	-5.84	-10.08	-1169.51	676.83	0.10
Dead+Wind 0 deg - Service	50.80	-0.00	-8.52	-981.34	0.40	-0.17
Dead+Wind 30 deg - Service	50.80	4.25	-7.38	-849.29	-488.71	-0.26
Dead+Wind 60 deg - Service	50.80	7.36	-4.26	-489.66	-847.07	-0.27
Dead+Wind 90 deg - Service	50.80	8.50	0.00	1.18	-978.65	-0.22
Dead+Wind 120 deg - Service	50.80	7.36	4.26	491.72	-848.21	-0.10
Dead+Wind 150 deg - Service	50.80	4.25	7.38	850.51	-490.68	0.04
Dead+Wind 180 deg - Service	50.80	0.00	8.52	981.42	-1.88	0.17
Dead+Wind 210 deg - Service	50.80	-4.25	7.38	849.37	487.23	0.26
Dead+Wind 240 deg - Service	50.80	-7.36	4.26	489.74	845.58	0.27
Dead+Wind 270 deg - Service	50.80	-8.50	-0.00	-1.10	977.17	0.22
Dead+Wind 300 deg - Service	50.80	-7.36	-4.26	-491.64	846.73	0.10
Dead+Wind 330 deg - Service	50.80	-4.25	-7.38	-850.43	489.20	-0.04

## 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	-50.80	0.00	0.00	50.80	0.00	0.000%
2	-0.01	-60.96	-39.81	0.01	60.96	39.81	0.000%
3	-0.01	-45.72	-39.81	0.01	45.72	39.81	0.000%
4	19.85	-60.96	-34.47	-19.85	60.96	34.47	0.000%
5	19.85	-45.72	-34.47	-19.85	45.72	34.47	0.000%
6	34.40	-60.96	-19.89	-34.40	60.96	19.89	0.000%
7	34.40	-45.72	-19.89	-34.40	45.72	19.89	0.000%
8	39.73	-60.96	0.01	-39.73	60.96	-0.01	0.000%
9	39.73	-45.72	0.01	-39.73	45.72	-0.01	0.000%
10	34.42	-60.96	19.92	-34.42	60.96	-19.92	0.000%
11	34.42	-45.72	19.92	-34.42	45.72	-19.92	0.000%
12	19.88	-60.96	34.49	-19.88	60.96	-34.49	0.000%
13	19.88	-45.72	34.49	-19.88	45.72	-34.49	0.000%
14	0.01	-60.96	39.81	-0.01	60.96	-39.81	0.000%
15	0.01	-45.72	39.81	-0.01	45.72	-39.81	0.000%
16	-19.85	-60.96	34.47	19.85	60.96	-34.47	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
17	-19.85	-45.72	34.47	19.85	45.72	-34.47	0.000%
18	-34.40	-60.96	19.89	34.40	60.96	-19.89	0.000%
19	-34.40	-45.72	19.89	34.40	45.72	-19.89	0.000%
20	-39.73	-60.96	-0.01	39.73	60.96	0.01	0.000%
21	-39.73	-45.72	-0.01	39.73	45.72	0.01	0.000%
22	-34.42	-60.96	-19.92	34.42	60.96	19.92	0.000%
23	-34.42	-45.72	-19.92	34.42	45.72	19.92	0.000%
24	-19.88	-60.96	-34.49	19.88	60.96	34.49	0.000%
25	-19.88	-45.72	-34.49	19.88	45.72	34.49	0.000%
26	0.00	-100.11	0.00	0.00	100.11	0.00	0.000%
27	-0.02	-100.11	-11.62	0.02	100.11	11.62	0.001%
28	5.80	-100.11	-10.05	-5.80	100.11	10.05	0.000%
29	10.07	-100.11	-5.79	-10.07	100.11	5.79	0.000%
30	11.64	-100.11	0.02	-11.64	100.11	-0.02	0.000%
31	10.09	-100.11	5.83	-10.09	100.11	-5.83	0.000%
32	5.84	-100.11	10.08	-5.84	100.11	-10.08	0.000%
33	0.02	-100.11	11.62	-0.02	100.11	-11.62	0.000%
34	-5.80	-100.11	10.05	5.80	100.11	-10.05	0.000%
35	-10.07	-100.11	5.79	10.07	100.11	-5.79	0.000%
36	-11.64	-100.11	-0.02	11.64	100.11	0.02	0.000%
37	-10.09	-100.11	-5.83	10.09	100.11	5.83	0.000%
38	-5.84	-100.11	-10.08	5.84	100.11	10.08	0.000%
39	-0.00	-50.80	-8.52	0.00	50.80	8.52	0.000%
40	4.25	-50.80	-7.38	-4.25	50.80	7.38	0.000%
41	7.36	-50.80	-4.26	-7.36	50.80	4.26	0.000%
42	8.50	-50.80	0.00	-8.50	50.80	-0.00	0.000%
43	7.36	-50.80	4.26	-7.36	50.80	-4.26	0.000%
44	4.25	-50.80	7.38	-4.25	50.80	-7.38	0.000%
45	0.00	-50.80	8.52	-0.00	50.80	-8.52	0.000%
46	-4.25	-50.80	7.38	4.25	50.80	-7.38	0.000%
47	-7.36	-50.80	4.26	7.36	50.80	-4.26	0.000%
48	-8.50	-50.80	-0.00	8.50	50.80	0.00	0.000%
49	-7.36	-50.80	-4.26	7.36	50.80	4.26	0.000%
50	-4.25	-50.80	-7.38	4.25	50.80	7.38	0.000%

## Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00050841
3	Yes	4	0.00000001	0.00031568
4	Yes	5	0.00000001	0.00047062
5	Yes	5	0.00000001	0.00021158
6	Yes	5	0.00000001	0.00048851
7	Yes	5	0.00000001	0.00022045
8	Yes	4	0.00000001	0.00027403
9	Yes	4	0.00000001	0.00015537
10	Yes	5	0.00000001	0.00048423
11	Yes	5	0.00000001	0.00021800
12	Yes	5	0.00000001	0.00047947
13	Yes	5	0.00000001	0.00021559
14	Yes	4	0.00000001	0.00042187
15	Yes	4	0.00000001	0.00025882
16	Yes	5	0.00000001	0.00049175
17	Yes	5	0.00000001	0.00022198
18	Yes	5	0.00000001	0.00047042
19	Yes	5	0.00000001	0.00021167
20	Yes	4	0.00000001	0.00033647
21	Yes	4	0.00000001	0.00019896
22	Yes	5	0.00000001	0.00048364
23	Yes	5	0.00000001	0.00021763
24	Yes	5	0.00000001	0.00049187
25	Yes	5	0.00000001	0.00022151
26	Yes	4	0.00000001	0.00000001

27	Yes	5	0.00000001	0.00025223
28	Yes	5	0.00000001	0.00030953
29	Yes	5	0.00000001	0.00031216
30	Yes	5	0.00000001	0.00025243
31	Yes	5	0.00000001	0.00031220
32	Yes	5	0.00000001	0.00031228
33	Yes	5	0.00000001	0.00025213
34	Yes	5	0.00000001	0.00031205
35	Yes	5	0.00000001	0.00030965
36	Yes	5	0.00000001	0.00025251
37	Yes	5	0.00000001	0.00031332
38	Yes	5	0.00000001	0.00031301
39	Yes	4	0.00000001	0.00003895
40	Yes	4	0.00000001	0.00014146
41	Yes	4	0.00000001	0.00016005
42	Yes	4	0.00000001	0.00003358
43	Yes	4	0.00000001	0.00015199
44	Yes	4	0.00000001	0.00014647
45	Yes	4	0.00000001	0.00003827
46	Yes	4	0.00000001	0.00016235
47	Yes	4	0.00000001	0.00014183
48	Yes	4	0.00000001	0.00003391
49	Yes	4	0.00000001	0.00015161
50	Yes	4	0.00000001	0.00015913

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio $\frac{P_u}{\phi P_n}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	9.42	0.00	0.0	15.024 3	-3.04	1019.44	0.003
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	48.00	0.00	0.0	27.883 8	-14.22	1861.24	0.008
L3	126 - 82.75 (3)	TP46.357x34.8903x0.312 5	48.00	0.00	0.0	44.248 7	-26.69	2935.51	0.009
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	48.00	0.00	0.0	63.866 6	-40.05	4233.02	0.009
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	48.00	0.00	0.0	89.305 9	-60.94	5854.04	0.010

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> kip-ft	φM <sub>nx</sub> kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M <sub>uy</sub> kip-ft	φM <sub>ny</sub> kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	16.18	529.45	0.031	0.00	529.45	0.000
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	409.20	1345.93	0.304	0.00	1345.93	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.312 5	1491.98	2695.18	0.554	0.00	2695.18	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	2811.44	4674.70	0.601	0.00	4674.70	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	4610.68	7749.95	0.595	0.00	7749.95	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V_u$ K	$\phi V_n$ K	Ratio $\frac{V_u}{\phi V_n}$	Actual $T_u$ kip-ft	$\phi T_n$ kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	180 - 170.58 (1)	TP26.25x24x0.1875	5.36	509.72	0.011	0.56	1060.19	0.001
L2	170.58 - 126 (2)	TP36.525x25.0581x0.25	20.04	930.62	0.022	0.65	2695.15	0.000
L3	126 - 82.75 (3)	TP46.357x34.8903x0.312 5	29.93	1467.75	0.020	0.45	5396.95	0.000
L4	82.75 - 40.75 (4)	TP55.765x44.2987x0.375	34.78	2116.51	0.016	0.45	9360.83	0.000
L5	40.75 - 0 (5)	TP64.75x53.2831x0.4375	39.84	2927.02	0.014	0.17	15518.83	0.000

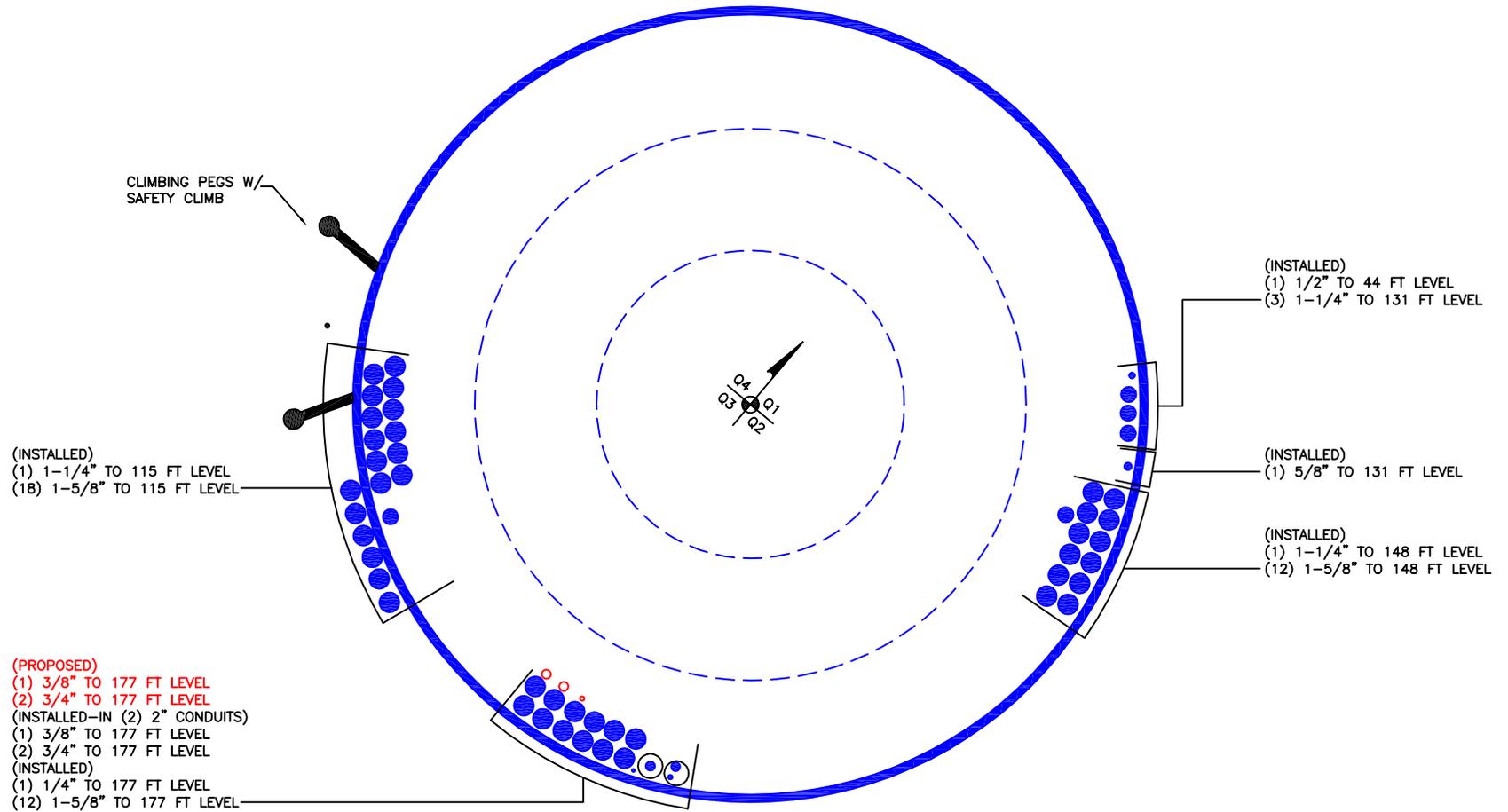
### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $P_u$	Ratio $M_{ux}$	Ratio $M_{uy}$	Ratio $V_u$	Ratio $T_u$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\phi P_n$	$\phi M_{nx}$	$\phi M_{ny}$	$\phi V_n$	$\phi T_n$			
L1	180 - 170.58 (1)	0.003	0.031	0.000	0.011	0.001	0.034	1.000	4.8.2 ✓
L2	170.58 - 126 (2)	0.008	0.304	0.000	0.022	0.000	0.312	1.000	4.8.2 ✓
L3	126 - 82.75 (3)	0.009	0.554	0.000	0.020	0.000	0.563	1.000	4.8.2 ✓
L4	82.75 - 40.75 (4)	0.009	0.601	0.000	0.016	0.000	0.611	1.000	4.8.2 ✓
L5	40.75 - 0 (5)	0.010	0.595	0.000	0.014	0.000	0.606	1.000	4.8.2 ✓

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ K	% Capacity	Pass Fail
L1	180 - 170.58	Pole	TP26.25x24x0.1875	1	-3.04	1019.44	3.4	Pass
L2	170.58 - 126	Pole	TP36.525x25.0581x0.25	2	-14.22	1861.24	31.2	Pass
L3	126 - 82.75	Pole	TP46.357x34.8903x0.3125	3	-26.69	2935.51	56.3	Pass
L4	82.75 - 40.75	Pole	TP55.765x44.2987x0.375	4	-40.05	4233.02	61.1	Pass
L5	40.75 - 0	Pole	TP64.75x53.2831x0.4375	5	-60.94	5854.04	60.6	Pass
Summary								
Pole (L4)							61.1	Pass
<b>RATING =</b>							<b>61.1</b>	<b>Pass</b>

**APPENDIX B**  
**BASE LEVEL DRAWING**



**APPENDIX C**  
**ADDITIONAL CALCULATIONS**

## Stiffened or Unstiffened, UngROUTED, Circular Base Plate - Any Rod Material

**TIA Rev G**

Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)\*(Rod Diameter)

### Site Data

BU#: 842871
Site Name: ORANGE TRANSFER STATION
App #: 379717 Rev.0
Pole Manufacturer: <b>Other</b>

### Anchor Rod Data

Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	72	in

### Plate Data

Diam:	77.25	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	10.28	in

### Stiffener Data (Welding at both sides)

Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

### Pole Data

Diam:	64.75	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

### Reactions

Mu:	4611	ft-kips
Axial, Pu:	61	kips
Shear, Vu:	40	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

If No stiffeners, Criteria: **AISC LRFD** <-Only Applicable to Unstiffened Cases

### Anchor Rod Results

Max Rod (Cu+ Vu/η): 160.7 Kips  
 Allowable Axial, Φ\*Fu\*Anet: 260.0 Kips  
 Anchor Rod Stress Ratio: 61.8% **Pass**

Rigid
AISC LRFD
φ*Tn

### Base Plate Results

Base Plate Stress: 18.9 ksi  
 Allowable Plate Stress: 54.0 ksi  
 Base Plate Stress Ratio: 35.0% **Pass**

### Flexural Check

Rigid
AISC LRFD
φ*Fy
Y.L. Length:
31.49

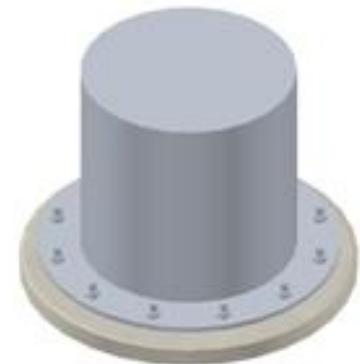
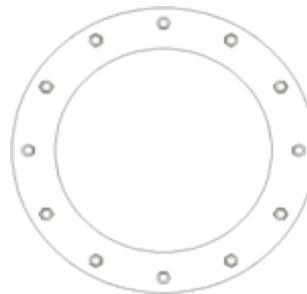
**n/a**

### Stiffener Results

Horizontal Weld : n/a  
 Vertical Weld: n/a  
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: n/a  
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: n/a  
 Plate Comp. (AISC Bracket): n/a

### Pole Results

Pole Punching Shear Check: n/a



\* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

\*\* Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

# Monopole Pier and Pad Foundation

BU #: 842871

Site Name: ORANGE TRANSFER STAT

App. Number: 379717

TIA-222 Revision: G



Design Reactions		
Shear, <b>S</b> :	40	kips
Moment, <b>M</b> :	4611	ft-kips
Tower Height, <b>H</b> :	180	ft
Tower Weight, <b>Wt</b> :	61	kips
Base Diameter, <b>BD</b> :	5.40	ft

Foundation Dimensions		
Pad Bearing Depth, <b>D</b> :	7	ft
Pad Width, <b>W</b> :	48	ft
Neglected Depth, <b>N</b> :	3	ft
Thickness, <b>T</b> :	6.00	ft
Pier Diameter, <b>Pd</b> :	8.00	ft
Ext. Above Grade, <b>E</b> :	1.00	ft
BP Dist. Above Pier:	3.25	in.
Clear Cover, <b>Cc</b> :	6.0	in

Soil Properties		
Soil Unit Weight, <b>γ</b> :	0.120	kcf
Ult. Bearing Capacity, <b>Bc</b> :	12.0	ksf
Angle of Friction, <b>Φ</b> :	32	deg
Cohesion, <b>Co</b> :	0.000	ksf
Passive Pressure, <b>Pp</b> :	1.800	ksf
Base Friction, <b>μ</b> :	0.35	

Material Properties		
Rebar Yield Strength, <b>Fy</b> :	60000	psi
Concrete Strength, <b>F'c</b> :	3000	psi
Concrete Unit Weight, <b>δc</b> :	0.150	kcf
Seismic Zone, <b>z</b> :	1	

Rebar Properties		
Pier Rebar Size, <b>Sp</b> :	11	
Pier Rebar Quantity, <b>mp</b> :	24	24
Pad Rebar Size, <b>Spad</b> :	11	
Pad Rebar Quantity, <b>mpad</b> :	24	24
Pier Tie Size, <b>St</b> :	4	4
Tie Quantity, <b>mt</b> :	4	4

Design Checks			
	Capacity/ Availability	Demand/ Limits	Check
<i>Req'd Pier Diam. (ft)</i>	8	7.395833333	<b>OK</b>
<i>Overtuning (ft-kips)</i>	46502.88	4611.00	<b>9.9%</b>
<i>Shear Capacity (kips)</i>	896.39	40.00	<b>4.5%</b>
<i>Bearing (ksf)</i>	9.00	1.43	<b>15.9%</b>
<i>Pad Shear - 1-way (kips)</i>	3023.24	873.02	<b>28.9%</b>
<i>Pad Shear - 2-way (kips)</i>	5272.76	121.32	<b>2.3%</b>
<i>Pad Moment Capacity (k-ft)</i>	10634.51	2109.00	<b>19.8%</b>
<i>Pier Moment Capacity (k-ft)</i>	6815.60	4691.00	<b>68.8%</b>

# Maximum Allowable Moment of a Circular Pier

## Rev.G

Axial Load (Negative for Compression) =  kips

<u>Pier Properties</u>		<u>Material Properties</u>	
<b>Concrete:</b>		Concrete compressive strength =	<input type="text" value="3000"/> psi
Pier Diameter =	<input type="text" value="8.0"/> ft	Reinforcement yield strength =	<input type="text" value="60000"/> psi
Concrete Area =	7238.2 in <sup>2</sup>	Modulus of elasticity =	<input type="text" value="29000"/> ksi
<b>Reinforcement:</b>		Reinforcement yield strain =	<input type="text" value="0.00207"/>
Clear Cover =	<input type="text" value="6.00"/> in	Limiting compressive strain =	<input type="text" value="0.003"/>
Cage Diameter =	6.88 ft		
Bar Size =	<input type="text" value="11"/>		
Bar Diameter =	1.41 in		
Bar Area =	1.56 in <sup>2</sup>		
Number of Bars =	<input type="text" value="24"/>		

### Axial Loading

Load factor =   
Reduction factor = 0.9  
Factored axial load = -67.7778 kips

### Neutral Axis

Distance from extreme edge to neutral axis = 15.23 in  
Equivalent compression zone factor = 0.85  
Distance from extreme edge to  
equivalent compression zone factor = 12.94 in  
Distance from centroid to neutral axis = 32.77 in

### Compression Zone

Area of steel in compression zone = 7.80 in<sup>2</sup>  
Angle from centroid of pier to intersection of  
equivalent compression zone and edge of pier = 43.08 deg  
Area of concrete in compression = 582.97 in<sup>2</sup>  
Force in concrete = 0.85 \* f<sub>c</sub> \* Acc = 1486.58 kips  
Total reinforcement forces = -1418.80 kips  
Factored axial load = -67.78 kips  
Force in concrete = -1486.58 kips  
  
Sum of the forces in concrete = 0.00 kips **OK**

### Maximum Moment

First moment of the concrete  
area in compression about the centroid = 23493.81 in<sup>3</sup>  
Distance between centroid of concrete  
in compression and centroid of pier = 40.30 in  
Moment of concrete in compression = 59909.21 in-kips  
Total reinforcement moment = 30965.50 in-kips  
Nominal moment strength of column = 90874.71 in-kips  
Factored moment strength of column = 81787.24 in-kips

**Maximum Allowable Moment =  ft-kips**

### Individual Bars

Bar #	Angle from first bar (deg)	Distance to centroid (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in <sup>2</sup> )	Stress (ksi)	Axial force (kips)
1	0.00	0.00	-32.77	-35.06	-0.0064581	0.00	-60.00	-93.60
2	15.00	10.69	-22.09	-24.37	-0.0043521	0.00	-60.00	-93.60
3	30.00	20.65	-12.13	-14.41	-0.0023896	0.00	-60.00	-93.60
4	45.00	29.20	-3.57	-5.86	-0.0007044	0.00	-20.43	-31.87
5	60.00	35.76	2.99	0.70	0.0005887	1.56	17.07	22.65
6	75.00	39.89	7.11	4.83	0.0014016	1.56	40.65	59.43
7	90.00	41.30	8.52	6.24	0.0016788	1.56	48.69	71.97
8	105.00	39.89	7.11	4.83	0.0014016	1.56	40.65	59.43
9	120.00	35.76	2.99	0.70	0.0005887	1.56	17.07	22.65
10	135.00	29.20	-3.57	-5.86	-0.0007044	0.00	-20.43	-31.87
11	150.00	20.65	-12.13	-14.41	-0.0023896	0.00	-60.00	-93.60
12	165.00	10.69	-22.09	-24.37	-0.0043521	0.00	-60.00	-93.60
13	180.00	0.00	-32.77	-35.06	-0.0064581	0.00	-60.00	-93.60
14	195.00	-10.69	-43.46	-45.75	-0.0085641	0.00	-60.00	-93.60
15	210.00	-20.65	-53.42	-55.71	-0.0105265	0.00	-60.00	-93.60
16	225.00	-29.20	-61.97	-64.26	-0.0122118	0.00	-60.00	-93.60
17	240.00	-35.76	-68.54	-70.82	-0.0135049	0.00	-60.00	-93.60
18	255.00	-39.89	-72.66	-74.95	-0.0143177	0.00	-60.00	-93.60
19	270.00	-41.30	-74.07	-76.35	-0.014595	0.00	-60.00	-93.60
20	285.00	-39.89	-72.66	-74.95	-0.0143177	0.00	-60.00	-93.60
21	300.00	-35.76	-68.54	-70.82	-0.0135049	0.00	-60.00	-93.60
22	315.00	-29.20	-61.97	-64.26	-0.0122118	0.00	-60.00	-93.60
23	330.00	-20.65	-53.42	-55.71	-0.0105265	0.00	-60.00	-93.60
24	345.00	-10.69	-43.46	-45.75	-0.0085641	0.00	-60.00	-93.60

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

**Site Data**

BU#: 842871
Site Name: ORANGE TRANSFER STATION
App #: 379717

Monopole Base Reaction Forces		
TIA Revision:	G	<--Pull Down
Factored DL Axial, PDU:	61	kips
Factored WL Axial, PWu:	0	kips
Factored WL Shear, Vu:	40	kips
Factored WL Moment, Mu:	4611	ft-kips

Loads Already Factored		
For P (DL)	1.2	<----Disregard
For P,V, and M (WL)	1.35	<----Disregard

Load Factor	Shaft Factored Loads		
1.00	1.2D+1.6W, Pu:	61	kips
0.90	0.9D+1.6W, Pu:	45.75	kips
1.00	Vu:	40	kips
	Mu:	4611	ft-kips

Pad & Pier Data		
Base PL Dist. Above Pier:	3.25	in
Pier Dist. Above Grade:	12	in
Pad Bearing Depth, D:	7	ft
Pad Thickness, T:	6.00	ft
Pad Width=Length, L:	48	ft
Pier Cross Section Shape:	Round	<--Pull Down
Enter Pier Diameter:	8.00	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	50.27	ft^2
Pier Height:	2.00	ft
Soil (above pad) Height:	1.00	ft

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

<b>(No Soil Wedges)</b> [Reaction+Conc+Soil]	2891.95	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	4851.83	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 = 1.68 ft  
 Orthogonal qu= 1.43 ksf  
 qu/φ\*qn Ratio= **15.90% Pass**

Diagonal Direction:

ecc2 = (0.707M1)/P1 = 1.19 ft  
 Diagonal qu= 1.39 ksf  
 qu/φ\*qn Ratio= **15.43% Pass**

<-- Press Upon Completing All Input

Soil Parameters		
Unit Weight, γ:	120.0	pcf
Ultimate Bearing Capacity, qn:	12.00	ksf
Strength Reduct. factor, φ:	0.75	
Angle of Friction, Φ:	32.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: φ*qn:	9.00	ksf
Passive Pres. Coeff., Kp	3.25	

**Overturning Stability Check**

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

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	40.0	kips
Pad Force Location Above D:	2.25	ft
φ(Passive Pressure Moment):	90.00	ft-kips
Factored O.T. M(WL), "1.6W":	4941.8	ft-kips
Factored OT (MW-Msoil), M1	4851.83	ft-kips

<b>(w/ Soil Wedges)</b> [Reaction+Conc+Soil]	2170.91	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	4805.43	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	0.62	ft
Sum of Soil Wedges Wt:	2.16	kips
Soil Wedges ecc, K1:	23.84	ft
Ftg+Soil above Pad wt:	2359.1	kips
Unfactored (Total ftg-soil Wt):	2361.29	kips
1.2D. <b>No Soil Wedges.</b>	2891.95	kips
0.9D. <b>With Soil Wedges</b>	2170.91	kips

Orthogonal ecc3 = M2/P2 = 2.21 ft  
 Ortho Non Bearing Length,NBL= **4.43 ft**  
 Orthogonal qu= 1.12 ksf  
 Diagonal qu= 1.08 ksf

Resistance due to Cohesion (Vertical)		
φ*(1/2*Cu)(Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	4611.00		
M Orthogonal:	46502.88	<b>9.92%</b>	<b>Pass</b>
M Diagonal:	46502.88	<b>9.92%</b>	<b>Pass</b>



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200 North Glebe Road, Suite 1000, Arlington, VA 22203-3728  
703.276.1100 • 703.276.1169 fax  
info@sitesafe.com • www.sitesafe.com



**SmartLink, LLC on behalf of  
AT&T Mobility, LLC  
Site FA – 10071197  
Site ID – CT5101 (4C-5C)  
Site Name – Orange Transfer  
Station  
Site Compliance Report**

**617 South Orange Center Road  
Orange, CT 06477**

Latitude: N41-15-19.98  
Longitude: W73-0-39.17  
Structure Type: Monopole

Report generated date: April 7, 2017  
Report by: Michelle Stone  
Customer Contact: Kristen Smith

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**AT&T Mobility, LLC will be compliant when the  
remediation recommended in Section 5.2 or  
other appropriate remediation is implemented.**

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# 1 General Site Summary

## 1.1 Report Summary

AT&T Mobility, LLC	Summary
<b>Access to Antennas Locked?</b>	Unknown
<b>RF Sign(s) @ access point(s)</b>	Unknown
<b>RF Sign(s) @ antennas</b>	None
<b>Barrier(s) @ sectors</b>	None
<b>Max cumulative simulated RFE level on the Ground</b>	<1% General Public Limit at Ground Level
<b>FCC &amp; AT&amp;T Compliant?</b>	Will be compliant

The following documents were provided by the client and were utilized to create this report:

**RFDS: NEW-ENGLAND\_CONNECTICUT\_CTU5101\_2017-LTE-Next-Carrier\_LTE\_mm093q\_PTN\_10071197\_16326\_09-22-2016\_Preliminary-Approved\_v1.00**

**CD's: 10071197\_AE201\_170322\_CTL05101\_Rev2\_4C-5C CD**

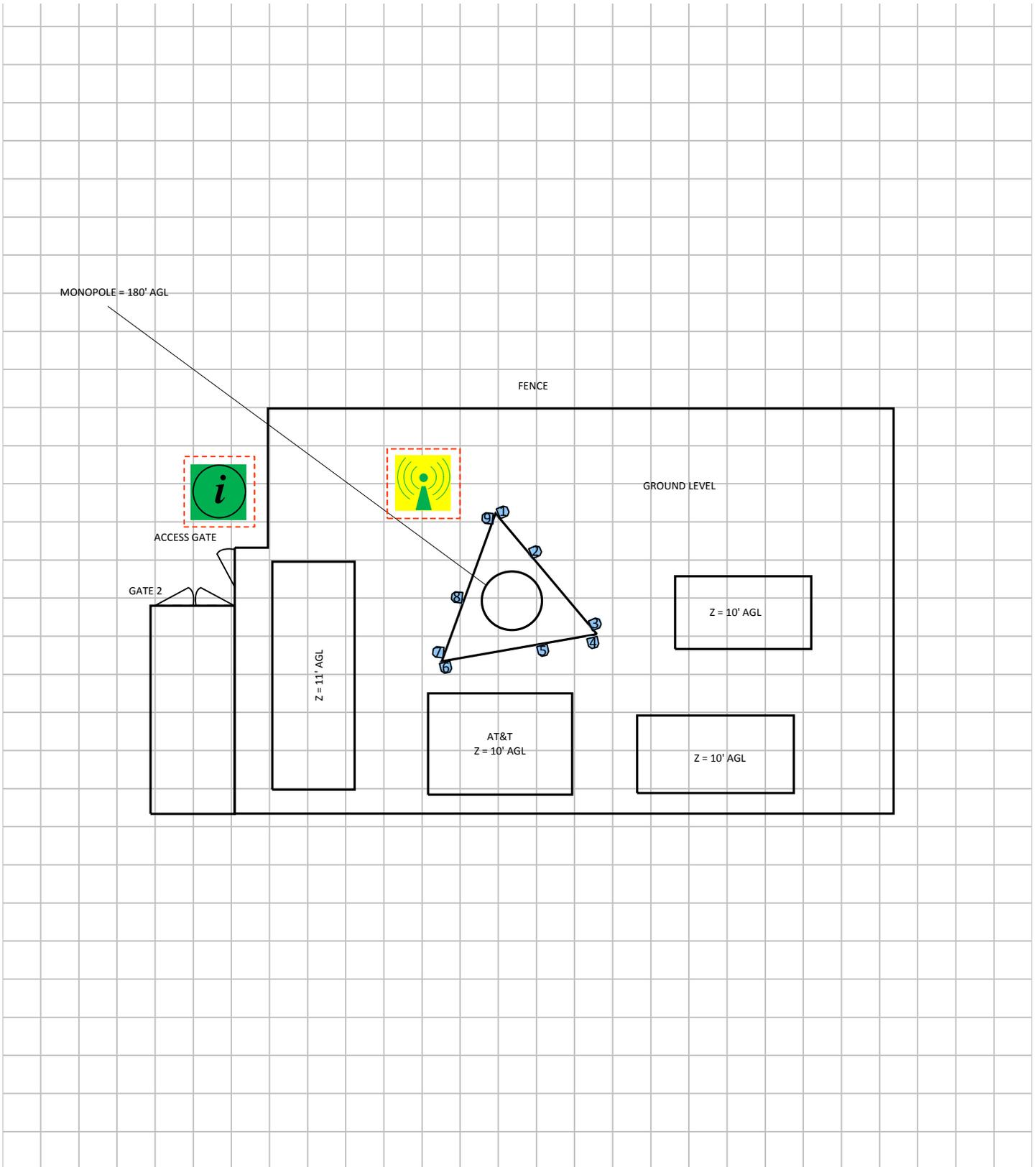
**RF Powers Used: AT&T Engineering Defaults**

## 2 Scale Maps of Site

The following diagrams are included:

- ) Site Scale Map
- ) RF Exposure Diagram
- ) Elevation View

# Site Scale Map For: Orange Transfer Station



(Feet)

0 9 18

www.sitesafe.com  
Site Name: Orange Transfer Station  
4/7/2017 10:21:24 AM

Carrier Identification													
	AT&T MOBILITY LLC		VERIZON WIRELESS		T-MOBILE		SPRINT		UNKNOWN CARRIER				
Sign Legend													
	Caution 1		Caution 2		Notice 2		Notice 1		Warning		Info 1		Info 2
Barrier				Proposed Barriers/ Signs									

### 3 Antenna Inventory

The following antenna inventory on this and the following page, were obtained by the customer and were utilized to create the site model diagrams:

Ant ID	Operator	Antenna Make & Model	Type	TX Freq (MHz)	Az (Deg)	Hor BW (Deg)	Ant Len (ft)	Ant Gain (dBd)	2G GSM Radio(s)	3G UMTS Radio(s)	4G Radio(s)	Total ERP (Watts)	X	Y	Z AGL
1	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	20	82	4.6	11.51	0	1	0	1132.6	95.8'	172.5'	174.7'
1	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	20	86	4.6	13.41	0	1	0	1754.2	95.8'	172.5'	174.7'
2	AT&T MOBILITY LLC	CCI Antennas OPA-65R-LCUU-H4	Panel	2300	20	61.1	4	14.26	0	0	1	1600.1	100.1'	167.3'	175'
2	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	850	20	60	4	11.36	0	0	1	820.6	100.1'	167.3'	175'
2	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	737	20	65.8	4	10.76	0	0	1	714.7	100.1'	167.3'	175'
3	AT&T MOBILITY LLC	Andrew SBNHH-1D65A	Panel	737	20	66	4.6	11.29	0	0	1	807.5	107.9'	157.8'	174.7'
3	AT&T MOBILITY LLC	Andrew SBNHH-1D65A	Panel	1900	20	65	4.6	14.65	0	0	1	1750.5	107.9'	157.8'	174.7'
4	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	120	82	4.6	11.51	0	1	0	1132.6	107.7'	155.4'	174.7'
4	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	120	86	4.6	13.41	0	1	0	1754.2	107.7'	155.4'	174.7'
5	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	850	120	60	4	11.36	0	0	1	820.6	101.1'	154.3'	175'
5	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	737	120	65.8	4	10.76	0	0	1	714.7	101.1'	154.3'	175'
5	AT&T MOBILITY LLC	CCI Antennas OPA-65R-LCUU-H4	Panel	2300	120	61.1	4	14.26	0	0	1	1600.1	101.1'	154.3'	175'
6	AT&T MOBILITY LLC	Kmw AM-X-CD-14-65-00T	Panel	737	120	67	4	11.66	0	0	1	879.3	88.3'	152.1'	175'
6	AT&T MOBILITY LLC	Kmw AM-X-CD-14-65-00T	Panel	1900	120	65	4	13.86	0	0	1	1459.3	88.3'	152.1'	175'
7	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	230	82	4.6	11.51	0	1	0	1132.6	87.3'	154.1'	174.7'
7	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	230	86	4.6	13.41	0	1	0	1754.2	87.3'	154.1'	174.7'
8	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	850	230	60	4	11.36	0	0	1	820.6	89.8'	161.3'	175'
8	AT&T MOBILITY LLC (Proposed)	CCI Antennas OPA-65R-LCUU-H4	Panel	737	230	65.8	4	10.76	0	0	1	714.7	89.8'	161.3'	175'
8	AT&T MOBILITY LLC	CCI Antennas OPA-65R-LCUU-H4	Panel	2300	230	61.1	4	14.26	0	0	1	1600.1	89.8'	161.3'	175'
9	AT&T MOBILITY LLC	Kmw AM-X-CD-14-65-00T	Panel	737	230	67	4	11.66	0	0	1	879.3	93.8'	171.7'	175'
9	AT&T MOBILITY LLC	Kmw AM-X-CD-14-65-00T	Panel	1900	230	65	4	13.86	0	0	1	1459.3	93.8'	171.7'	175'

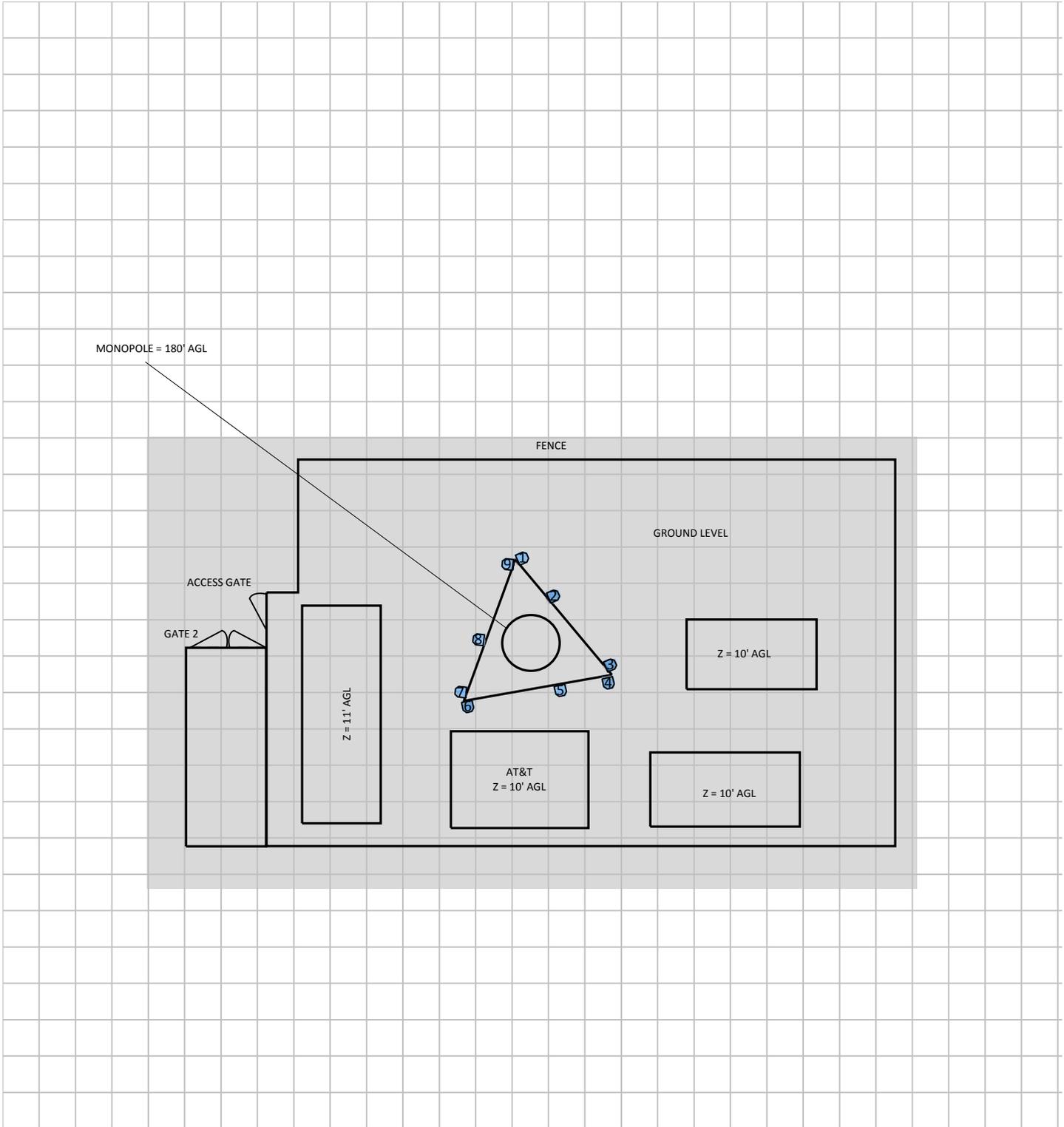
NOTE: X, Y and Z indicate relative position of the bottom of the antenna to the origin location on the site, displayed in the model results diagram. Specifically, the Z reference indicates the bottom of the antenna height above the main site level unless otherwise indicated. The distance to the bottom of the antenna is calculated by subtracting half of the length of the antenna from the antenna centerline. Effective Radiated Power (ERP) is provided by the operator or based on Sitesafe experience. The values used in the modeling may be greater than are currently deployed. For other operators at this site the use of "Generic" as an antenna model or "Unknown" for a wireless operator means the information with regard to operator, their FCC license and/or antenna information was not available nor could it be secured while on site. Other operator's equipment, antenna models and powers used for modeling are based on obtained information or Sitesafe experience.

## 4 Emission Predictions

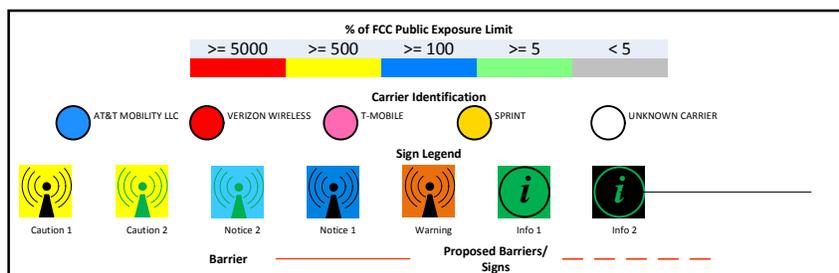
In the RF Exposure Simulations below all heights are reflected with respect to main site level. In most rooftop cases this is the height of the main rooftop and in other cases this can be ground level. Each different height area, rooftop, or platform level is labeled with its height relative to the main site level. Emissions are calculated appropriately based on the relative height and location of that area to all antennas.

The Antenna Inventory heights are referenced to the same level.

# RF Exposure Simulation For: Orange Transfer Station



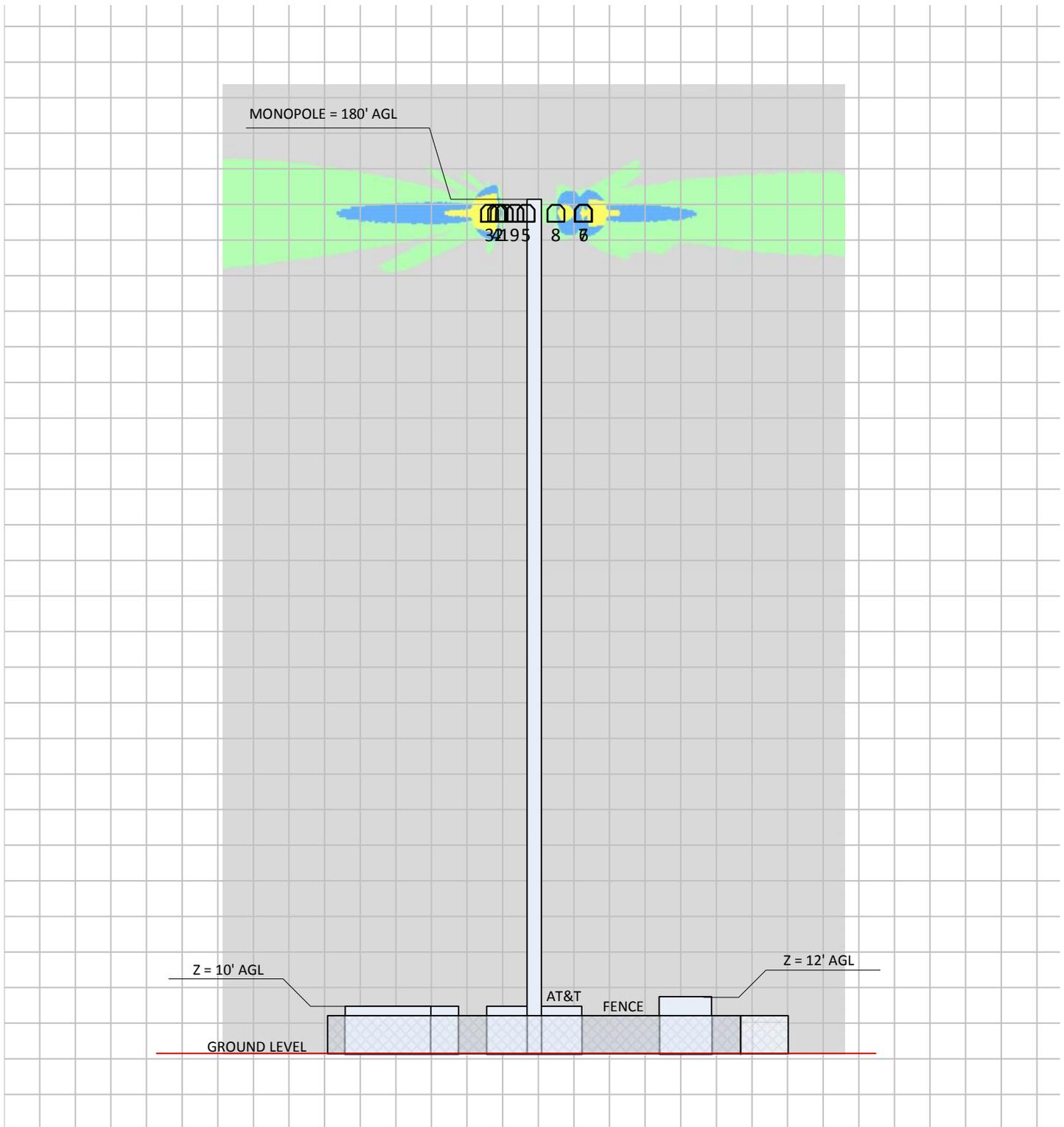
% of FCC Public Exposure Limit  
Spatial average 0' - 6'



(Feet)  
0 9.7 19.4  
www.sitesafe.com  
Site Name: Orange Transfer Station  
4/7/2017 10:22:44 AM

SitesafeTC Version: 1.0.0.0 - 0.0.0.259  
Sitesafe OET-65 Model  
Near Field Boundary: 1.5 \* Aperture  
Reflection Factor: 1  
Spatially Averaged

# RF Exposure Simulation For: Orange Transfer Station Elevation View



% of FCC Public Exposure Limit  
Spatial average 0' - 6'

% of FCC Public Exposure Limit				
>= 5000	>= 500	>= 100	>= 5	< 5
Carrier Identification				
AT&T MOBILITY LLC	VERIZON WIRELESS	T-MOBILE	SPRINT	UNKNOWN CARRIER
Sign Legend				
Caution 1	Caution 2	Notice 2	Notice 1	Warning
			Info 1	Info 2
Barrier		Proposed Barriers/ Signs		

(Feet)

0      15.8      31.5

www.sitesafe.com  
Site Name: Orange Transfer Station  
4/11/2017 11:02:06 AM

SitesafeTC Version: 1.0.0.0 - 0.0.0.259  
Sitesafe OET-65 Model  
Near Field Boundary: 1.5 \* Aperture  
Reflection Factor: 1  
Single Level (0)

## 5 Site Compliance

### 5.1 Site Compliance Statement

Upon evaluation of the cumulative RF emission levels from all operators at this site, RF hazard signage and antenna locations, Sitesafe has determined that:

AT&T Mobility, LLC will be compliant when the remediation recommended in Section 5.2 or other appropriate remediation is implemented.

The compliance determination is based on General Public RFE levels derived from theoretical modeling, RF signage placement, proposed antenna inventory and the level of restricted access to the antennas at the site. Any deviation from the SmartLink, LLC's proposed deployment plan could result in the site being rendered non-compliant.

Modeling is used for determining compliance and the percentage of MPE contribution.

### 5.2 Actions for Site Compliance

Based on FCC regulations, common industry practice, and our understanding of AT&T Mobility, LLC RF Safety Policy requirements, this section provides a statement of recommendations for site compliance. Recommendations have been proposed based on our understanding of existing access restrictions, signage, and an analysis of predicted RFE levels.

AT&T Mobility, LLC will be made compliant if the following changes are implemented:

#### **Site Access Gate**

Information 1 sign required.

#### **Monopole Base**

Yellow Caution 2 sign required.

## 6 Reviewer Certification

The reviewer whose signature appears below hereby certifies and affirms:

That I am an employee of Sitesafe, Inc., in Arlington, Virginia, at which place the staff and I provide RF compliance services to clients in the wireless communications industry; and

That I am thoroughly familiar with the Rules and Regulations of the Federal Communications Commission (FCC) as well as the regulations of the Occupational Safety and Health Administration (OSHA), both in general and specifically as they apply to the FCC Guidelines for Human Exposure to Radio-frequency Radiation; and

That I have thoroughly reviewed this Site Compliance Report and believe it to be true and accurate to the best of my knowledge as assembled by and attested to by Michelle Stone.

April 7, 2017

*Samuel Cosgrove*

## Appendix A – Statement of Limiting Conditions

Sitesafe has provided computer generated model(s) in this Site Compliance Report to show approximate dimensions of the site, and the model is included to assist the reader of the compliance report to visualize the site area, and to provide supporting documentation for Sitesafe's recommendations.

Sitesafe may note in the Site Compliance Report any adverse physical conditions, such as needed repairs, that Sitesafe became aware of during the normal research involved in creating this report. Sitesafe will not be responsible for any such conditions that do exist or for any engineering or testing that might be required to discover whether such conditions exist. Because Sitesafe is not an expert in the field of mechanical engineering or building maintenance, the Site Compliance Report must not be considered a structural or physical engineering report.

Sitesafe obtained information used in this Site Compliance Report from sources that Sitesafe considers reliable and believes them to be true and correct. Sitesafe does not assume any responsibility for the accuracy of such items that were furnished by other parties. When conflicts in information occur between data collected by Sitesafe provided by a second party and data collected by Sitesafe, the data will be used.

## Appendix B – Regulatory Background Information

### FCC Rules and Regulations

In 1996, the Federal Communication Commission (FCC) adopted regulations for the evaluating of the effects of RF emissions in 47 CFR § 1.1307 and 1.1310. The guideline from the FCC Office of Engineering and Technology is Bulletin 65 (“OET Bulletin 65”), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*, Edition 97-01, published August 1997. Since 1996 the FCC periodically reviews these rules and regulations as per their congressional mandate.

FCC regulations define two separate tiers of exposure limits: Occupational or “Controlled environment” and General Public or “Uncontrolled environment”. The General Public limits are generally five times more conservative or restrictive than the Occupational limit. These limits apply to *accessible* areas where workers or the general public may be exposed to Radio Frequency (RF) electromagnetic fields.

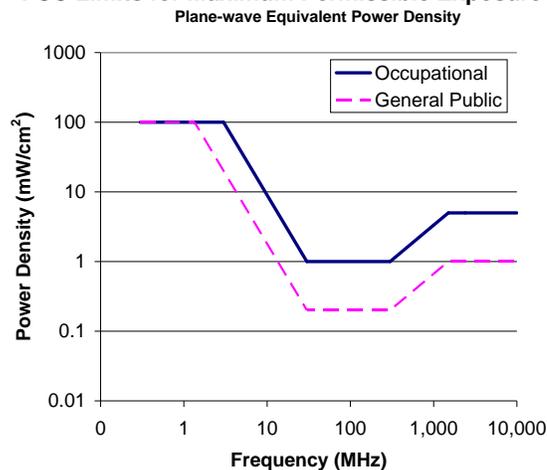
Occupational or Controlled limits apply in situations in which persons are exposed as a consequence of their employment and where those persons exposed have been made fully aware of the potential for exposure and can exercise control over their exposure.

An area is considered a Controlled environment when access is limited to these aware personnel. Typical criteria are restricted access (i.e. locked or alarmed doors, barriers, etc.) to the areas where antennas are located coupled with proper RF warning signage. A site with Controlled environments is evaluated with Occupational limits.

All other areas are considered Uncontrolled environments. If a site has no access controls or no RF warning signage it is evaluated with General Public limits.

The theoretical modeling of the RF electromagnetic fields has been performed in accordance with OET Bulletin 65. The Maximum Permissible Exposure (MPE) limits utilized in this analysis are outlined in the following diagram:

**FCC Limits for Maximum Permissible Exposure (MPE)**



### Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

### Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz

\*Plane-wave equivalent power density

## OSHA Statement

The General Duty clause of the OSHA Act (Section 5) outlines the occupational safety and health responsibilities of the employer and employee. The General Duty clause in Section 5 states:

(a) Each employer –

- (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- (2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

OSHA has defined Radiofrequency and Microwave Radiation safety standards for workers who may enter hazardous RF areas. Regulation Standards 29 CFR § 1910.147 identify a generic Lock Out Tag Out procedure aimed to control the unexpected energization or start up of machines when maintenance or service is being performed.

## Appendix C – Safety Plan and Procedures

The following items are general safety recommendations that should be administered on a site by site basis as needed by the carrier.

**General Maintenance Work:** Any maintenance personnel required to work immediately in front of antennas and / or in areas indicated as above 100% of the Occupational MPE limits should coordinate with the wireless operators to disable transmitters during their work activities.

**Training and Qualification Verification:** All personnel accessing areas indicated as exceeding the General Population MPE limits should have a basic understanding of EME awareness and RF Safety procedures when working around transmitting antennas. Awareness training increases a workers understanding to potential RF exposure scenarios. Awareness can be achieved in a number of ways (e.g. videos, formal classroom lecture or internet based courses).

**Physical Access Control:** Access restrictions to transmitting antennas locations is the primary element in a site safety plan. Examples of access restrictions are as follows:

- ) Locked door or gate
- ) Alarmed door
- ) Locked ladder access
- ) Restrictive Barrier at antenna (e.g. Chain link with posted RF Sign)

**RF Signage:** Everyone should obey all posted signs at all times. RF signs play an important role in properly warning a worker prior to entering into a potential RF Exposure area.

**Assume all antennas are active:** Due to the nature of telecommunications transmissions, an antenna transmits intermittently. Always assume an antenna is transmitting. Never stop in front of an antenna. If you have to pass by an antenna, move through as quickly and safely as possible thereby reducing any exposure to a minimum.

**Maintain a 3 foot clearance from all antennas:** There is a direct correlation between the strength of an EME field and the distance from the transmitting antenna. The further away from an antenna, the lower the corresponding EME field is.

**Site RF Emissions Diagram:** Section 4 of this report contains an RF Diagram that outlines various theoretical Maximum Permissible Exposure (MPE) areas at the site. The modeling is a worst case scenario assuming a duty cycle of 100% for each transmitting antenna at full power. This analysis is based on one of two access control criteria: General Public criteria means the access to the site is uncontrolled and anyone can gain access. Occupational criteria means the access is restricted and only properly trained individuals can gain access to the antenna locations.

## Appendix D – RF Emissions

The RF Emissions Simulation(s) in this report display theoretical spatially averaged percentage of the Maximum Permissible Exposure for all systems at the site unless otherwise noted. These diagrams use modeling as prescribed in OET Bulletin 65 and assumptions detailed in Appendix E.

The key at the bottom of each RF Emissions Simulation indicates percentages displayed referenced to FCC General Public Maximum Permissible Exposure (MPE) limits. Color coding on the diagram is as follows:

- J Areas indicated as Gray are predicted to be below 5% of the MPE limits. **Gray represents areas more than 20 times below the most conservative exposure limit.**
- J Green represents areas are predicted to be between 5% and 100% of the MPE limits. **Green areas are accessible to anyone.**
- J Blue represents areas predicted to exceed the General Public MPE limits but are less than Occupational limits. **Blue areas should be accessible only to RF trained workers.**
- J Yellow represents areas predicted to exceed Occupational MPE limits. **Yellow areas should be accessible only to RF trained workers able to assess current exposure levels.**
- J Red represents areas predicted to have exposure more than 10 times the Occupational MPE limits. **Red indicates that the RF levels must be reduced prior to access.** An RF Safety Plan is required which outlines how to reduce the RF energy in these areas prior to access.

## Appendix E – Assumptions and Definitions

### General Model Assumptions

In this site compliance report, it is assumed that all antennas are operating at **full power at all times**. Software modeling was performed for all transmitting antennas located on the site. Sitesafe has further assumed a 100% duty cycle and maximum radiated power.

The modeling is based on recommendations from the FCC's OET-65 bulletin with the following variances per AT&T guidance. Reflection has not been considered in the modeling, i.e. the reflection factor is 1.0. The near / far field boundary has been set to 1.5 times the aperture height of the antenna and modeling beyond that point is the lesser of the near field cylindrical model and the far field model taking into account the gain of the antenna.

The site has been modeled with these assumptions to show the maximum RF energy density. Areas modeled with exposure greater than 100% of the General Public MPE level may not actually occur, but are shown as a prediction that could be realized. Sitesafe believes these areas to be safe for entry by occupationally trained personnel utilizing appropriate personal protective equipment (in most cases, a personal monitor).

### Use of Generic Antennas

For the purposes of this report, the use of "Generic" as an antenna model, or "Unknown" for an operator means the information about a carrier, their FCC license and/or antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use our industry specific knowledge of equipment, antenna models, and transmit power to model the site. If more specific information can be obtained for the unknown measurement criteria, Sitesafe recommends remodeling of the site utilizing the more complete and accurate data. Information about similar facilities is used when the service is identified and associated with a particular antenna. If no information is available regarding the transmitting service associated with an unidentified antenna, using the antenna manufacturer's published data regarding the antenna's physical characteristics makes more conservative assumptions.

Where the frequency is unknown, Sitesafe uses the closest frequency in the antenna's range that corresponds to the highest Maximum Permissible Exposure (MPE), resulting in a conservative analysis.

## Definitions

**5% Rule** – The rules adopted by the FCC specify that, in general, at multiple transmitter sites actions necessary to bring the area into compliance with the guidelines are the shared responsibility of all licensees whose transmitters produce field strengths or power density levels at the area in question in excess of 5% of the exposure limits. In other words, any wireless operator that contributes 5% or greater of the MPE limit in an area that is identified to be greater than 100% of the MPE limit is responsible taking corrective actions to bring the site into compliance.

**Compliance** – The determination of whether a site is safe or not with regards to Human Exposure to Radio Frequency Radiation from transmitting antennas.

**Decibel (dB)** – A unit for measuring power or strength of a signal.

**Duty Cycle** – The percent of pulse duration to the pulse period of a periodic pulse train. Also, may be a measure of the temporal transmission characteristic of an intermittently transmitting RF source such as a paging antenna by dividing average transmission duration by the average period for transmission. A duty cycle of 100% corresponds to continuous operation.

**Effective (or Equivalent) Isotropic Radiated Power (EIRP)** – The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

**Effective Radiated Power (ERP)** – In a given direction, the relative gain of a transmitting antenna with respect to the maximum directivity of a half wave dipole multiplied by the net power accepted by the antenna from the connecting transmitter.

**Gain (of an antenna)** – The ratio of the maximum intensity in a given direction to the maximum radiation in the same direction from an isotropic radiator. Gain is a measure of the relative efficiency of a directional antennas as compared to an omni directional antenna.

**General Population/Uncontrolled Environment** – Defined by the FCC, as an area where exposure to RF energy may occur to persons who are **unaware** of the potential for exposure and who have no control of their exposure. General Population is also referenced as General Public.

**Generic Antenna** – For the purposes of this report, the use of "Generic" as an antenna model means the antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use our industry specific knowledge of antenna models to select a worst case scenario antenna to model the site.

**Isotropic Antenna** – An antenna that is completely non-directional. In other words, an antenna that radiates energy equally in all directions.

**Maximum Measurement** – This measurement represents the single largest measurement recorded when performing a spatial average measurement.

**Maximum Permissible Exposure (MPE)** – The maximum levels of RF exposure a person may be exposed to without harmful effect and with acceptable safety factor.

**Occupational/Controlled Environment** – Defined by the FCC, as an area where Radio Frequency Radiation (RFR) exposure may occur to persons who are **aware** of the

potential for exposure as a condition of employment or specific activity and can exercise control over their exposure.

**OET Bulletin 65** – Technical guideline developed by the FCC’s Office of Engineering and Technology to determine the impact of Radio Frequency radiation on Humans. The guideline was published in August 1997.

**OSHA (Occupational Safety and Health Administration)** – Under the Occupational Safety and Health Act of 1970, employers are responsible for providing a safe and healthy workplace for their employees. OSHA’s role is to promote the safety and health of America’s working men and women by setting and enforcing standards; providing training, outreach and education; establishing partnerships; and encouraging continual process improvement in workplace safety and health. For more information, visit [www.osha.gov](http://www.osha.gov).

**Radio Frequency (RF)** – The frequencies of electromagnetic waves which are used for radio communications. Approximately 3 kHz to 300 GHz.

**Radio Frequency Exposure (RFE)** – The amount of RF power density that a person is or might be exposed to.

**Spatial Average Measurement** – A technique used to average a minimum of ten (10) measurements taken in a ten (10) second interval from zero (0) to six (6) feet. This measurement is intended to model the average power density an average sized human will be exposed to at a location.

**Transmitter Power Output (TPO)** – The radio frequency output power of a transmitter’s final radio frequency stage as measured at the output terminal while connected to a load.

## Appendix F – References

The following references can be followed for further information about RF Health and Safety.

Sitesafe, Inc.

<http://www.sitesafe.com>

FCC Radio Frequency Safety

<http://www.fcc.gov/encyclopedia/radio-frequency-safety>

National Council on Radiation Protection and Measurements (NCRP)

<http://www.ncrponline.org>

Institute of Electrical and Electronics Engineers, Inc., (IEEE)

<http://www.ieee.org>

American National Standards Institute (ANSI)

<http://www.ansi.org>

Environmental Protection Agency (EPA)

<http://www.epa.gov/radtown/wireless-tech.html>

National Institutes of Health (NIH)

<http://www.niehs.nih.gov/health/topics/agents/emf/>

Occupational Safety and Health Agency (OSHA)

<http://www.osha.gov/SLTC/radiofrequencyradiation/>

International Commission on Non-Ionizing Radiation Protection (ICNIRP)

<http://www.icnirp.org>

World Health Organization (WHO)

<http://www.who.int/peh-emf/en/>

National Cancer Institute

<http://www.cancer.gov/cancertopics/factsheet/Risk/cellphones>

American Cancer Society (ACS)

[http://www.cancer.org/docroot/PED/content/PED\\_1\\_3X\\_Cellular\\_Phone\\_Towers.asp?sitearea=PED](http://www.cancer.org/docroot/PED/content/PED_1_3X_Cellular_Phone_Towers.asp?sitearea=PED)

European Commission Scientific Committee on Emerging and Newly Identified Health Risks

[http://ec.europa.eu/health/ph\\_risk/committees/04\\_scenihp/docs/scenihp\\_o\\_022.pdf](http://ec.europa.eu/health/ph_risk/committees/04_scenihp/docs/scenihp_o_022.pdf)

Fairfax County, Virginia Public School Survey

<http://www.fcps.edu/fts/safety-security/RFEESurvey/>

UK Health Protection Agency Advisory Group on Non-ionising Radiation

[http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb\\_C/1317133826368](http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1317133826368)

Norwegian Institute of Public Health

<http://www.fhi.no/dokumenter/545eea7147.pdf>