

**WATER WORKS DISTRICT OF HIGHLAND
Board of Water Works Directors
Resolution No. 2025-07**

**A RESOLUTION AUTHORIZING AND APPROVING A LICENSE AGREEMENT
BETWEEN THE TOWN OF MUNSTER AND THE WATER WORKS DISTRICT OF
HIGHLAND TO INSTALL ADVANCED METERING INFRASTRUCTURE
EQUIPMENT ON THE INDIANAPOLIS BOULEVARD ELEVATED WATER TANK**

Whereas, the Water Works District of Highland (District) is governed by its Board of Water Works Directors, pursuant to the provisions of IC 8-1.5-4 et seq.; and

Whereas, IC 8-1.5-4-4 specifically provides that the Board of Directors shall manage and control all works of the water works and may purchase, acquire, construct, reconstruct, operate, repair and maintain all water works; and

Whereas, the District owns and operates an elevated water storage tank located at 10000 Indianapolis Boulevard; and

Whereas, the Town of Munster desires to install, maintain, and operate advanced metering infrastructure equipment, antennas, and appurtenances on the Indianapolis Boulevard Elevated Water Tank; and

Whereas, the Town of Munster and the Board of Directors have negotiated and prepared a license agreement (License Agreement) between the District and the Town of Munster, attached hereto and made part of this Resolution, that details the terms and conditions for the installation and operation of the advanced metering infrastructure equipment; and

Whereas, the Water Works Board of Directors of Highland believes that the License Agreement is fair and just.

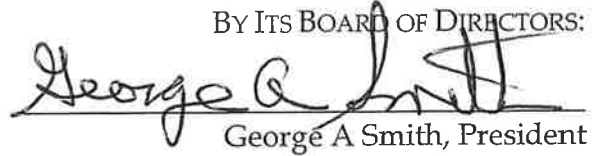
Now, Therefore Be it Resolved by the Board of Directors of the Highland Water Works, Lake County, Indiana, as follows:

1. That the License Agreement between the Water Works District and the Town of Munster for advanced metering infrastructure equipment, antennas, and appurtenances at the Indianapolis Boulevard Elevated Water Tank is hereby authorized and approved in each and every respect, subject to attorney approval of a final draft;
2. That the proper officials, agents and employees of the Town of Highland and the District are hereby authorized and directed to take such further action as they

may deem necessary or appropriate to perform all obligations and commitments of the Town in accordance with the provisions of the License Agreement.

Duly Adopted, Resolved and Ordered by the Water Works Board of Directors of Highland, Lake County, Indiana, 27th day of March, 2025. Having been passed by a vote of 3 in favor and 0 opposed.

HIGHLAND WATER WORKS
BY ITS BOARD OF DIRECTORS:


George A Smith, President

Attest:


Richard Volbrecht, Secretary
E,

EXHIBIT

LICENSE AGREEMENT WITH THE TOWN OF MUNSTER.

LICENSE AGREEMENT

This License Agreement (the "License") is made and entered into this _____ day of _____, 2025 by and between the TOWN OF HIGHLAND WATER WORKS BOARD OF DIRECTORS, whose mailing address is 3333 Ridge Road Highland, IN 46322 hereinafter referred to as "Licensor", and the TOWN OF MUNSTER, IN whose mailing address is 1005 Ridge Road, Munster, Indiana 46321, hereinafter referred to as "Licensee".

BACKGROUND

1. Licensor owns that certain parcel of real property, which includes an elevated steel water tower along with other improvements located at 10000 Indianapolis Blvd. Highland, IN 46322 hereinafter referred to as "Site."
2. Licensor has entered into a water tower maintenance agreement, hereinafter referred to as "Maintenance Agreement" with Utility Service Co., Inc aka USG Water, LLC, its successors and/or assigns hereinafter referred to as "Maintenance Contractor".
3. Licensee desires to install, operate and maintain AMI (Advanced Metering Infrastructure) devices at the Site.

IT IS HEREBY AGREED as follows:

1. **Licensed Premises.** Licensor hereby licenses to Licensee a portion of the Site to install, operate and maintain the AMI Equipment as defined herein, which will be referred to herein as the "Licensed Premises" which is indicated and depicted on Exhibit A attached hereto and further described as follows:
 - A. Exterior top or sides of the water tower for the installation and maintenance of Licensee's AMI Equipment.
 - B. Sufficient square feet of exterior space for housing Licensee's transmitter/receiver base station.
 - C. The space to run electrical cable from the main electrical feed point of the utility provider to Licensee's transmitter/receiver base station.
 - D. The space to run cable, including but not limited to phone lines, electrical cable, and coaxial cable, from the equipment located on the water tower to Licensee's transmitter / receiver base station. Licensor agrees to grant to Licensee or to the utility provider as Licensee may designate, a utilities path necessary to serve the AMI Equipment.
 - E. Licensee agrees to be responsible for all cost associated with routing power to Licensee's transmitter/receiver base station and all costs associated with routing its own cable from its power source or data source located inside of

Licensee's transmitter/receiver base station to the equipment located on the water tower, including any necessary installation and maintenance of cable innerduct/conduit.

- F. Notwithstanding anything provided in this License and Exhibit A, the exact final location or relocation of the AMI Equipment and all appurtenances thereto, as well as any installation/mounting system is subject to final approval of Licensor and Maintenance Contractor. Licensee shall pay any fees charged by Maintenance Contractor and by Licensor's engineering consultant to review and approve Licensee's plans and drawings prior to installation of any AMI Equipment. Any additional equipment to be subsequently installed shall also require prior review and approval by Licensor and Maintenance Contractor.

2. **AMI Equipment.** Licensee will use the Licensed Premises to install, construct, house, operate, maintain, and repair Licensee's equipment. Licensee's equipment is described in Exhibit A and which will hereinafter be referred to as the "AMI Equipment". Licensee will have the right to add, remove or substitute equipment should the need arise which shall be consistent with and not materially alter Licensee's current use of the Licensed Premises. Licensee will retain title to all its AMI Equipment.

3. **Term.** This License will continue for an original term of Twenty-Five (25) Years commencing on April 1st, 2025, hereinafter referred to as the "Commencement Date".

4. **License Fee.** Commencing on the Commencement Date, Licensee will pay a license fee to Licensor in the annual amount of One Hundred and 00/100 Dollars (\$100.00). In addition to the foregoing, Licensee shall reimburse Licensor for all reasonable attorney fees and consultant fees incurred in drafting this License.

5. **Access to the Licensed Premises.** Beginning on the date that all parties hereto have executed this License and contingent upon Licensee providing Licensor with proof of insurance in accordance with the provisions of Section 12, Licensee will have the right of access to the Site and Licensed Premises, twenty-four (24) hours a day, seven (7) days a week as may be required on an emergency basis to conduct after hours maintenance, repair, replacement, protection, network upgrades or secure the AMI Equipment and otherwise exercise the rights granted herein via special access keys or entry codes supplied by Licensor. Licensee agrees to return such special access codes and keys to the possession of the Licensor in the event that this License is terminated or is not renewed under the terms and conditions of this License. Licensee will notify Licensor whenever possible that it will be entering the facility to conduct after hours maintenance, repair, replacement, protection, network upgrades or secure the AMI Equipment and otherwise exercise the rights granted herein. Licensor will at all times during the term of this License provide Licensee with the proper name, telephone number and e-mail address of the person responsible for being notified when Licensee is entering the facility after hours. Licensor will at all times during the term of this License provide Licensee with the proper name, telephone number and e-mail address of the person responsible for giving

Licensee access to the Site after hours or supplying any keys, pass codes or key cards necessary to access the Licensed Premises as needed on Licensee's own schedule. Licensee will also be granted normal access during the operational hours of 7:00 AM to 5:00 PM Monday through Saturday for the purpose to access, install construct, house, operate, maintain, repair, replace, upgrade, protect or secure the AMI Equipment and otherwise exercise the rights granted herein. Licensor will at all times during the term of this License provide Licensee with the proper name, telephone number and e-mail address of the person responsible for giving Licensee access to the Site during normal operational hours.

6. **Utilities.** Licensee will be solely responsible for and will promptly pay all charges associated with installing, powering and operating the AMI Equipment at the Licensed Premises.

7. **RF Compliance.** Licensee will maintain its equipment in compliance with the FCC guidelines.

8. **Radio Frequency and/or Electrical Interference.** (a) Licensee will not cause radio frequency and/or electrical interference to the existing equipment of Licensor or to any other tenant/licensee who is using the Site upon the earlier of the Commencement Date or at the time Licensee installs its AMI Equipment. Upon written notice from Licensor to Licensee of such interference, Licensee will take all reasonable steps to correct such interference in a timely manner. If such interference cannot be reasonably corrected within five (5) business days from receipt of Licensor's notice, Licensee will cease using its AMI Equipment, except for testing, until such time as Licensee corrects the interference. In the event Licensee cannot correct the interference, Licensee will have the option to terminate this License without further liability hereunder, upon thirty (30) days written notice to Licensor.

(b) If Licensor or its agents, employees or other licensees of Licensor's Site causes uncorrected radio frequency and/or electrical interference with Licensee's AMI Equipment, Licensor will use its best efforts to correct the interference or require its licensee to do so. If Licensor is unable to correct the interference or cause the interference to be corrected, Licensee will have the option to terminate this License without further liability hereunder, upon thirty (30) days written notice to Licensor

9. **Notice.** Any notice or demand required or permitted to be given hereunder will be sufficiently given if made by regular, registered, certified mail, postage prepaid, or return receipt requested, overnight courier, or hand delivery addressed to the other party at the address set forth herein. Any such notice or demand will be deemed to have been made three (3) business days after it is postmarked in the United States Postal Service, if by mail, the next business day if by overnight courier, and upon receipt if by hand delivery. Either party may from time to time designate any other address for this purpose by giving written notice thereof to the other party.

If to Licensor:
Town of Highland
Water Works Board of Directors
3333 Ridge Rd.
Highland, IN 46322

Attn: Mark Knesek
Public Works Director

Phone: 219-972-5069
Fax: 219-972-5085

If to Licensee:
Town of Munster
Town Manager's Office
1005 Ridge Road
Munster, IN 46321

Attn: Patricia Abbott
Controller/Interim Town Manager

Phone: 219-836-6946
Fax: 219-836-8350

E-mail Address: mknesek@highland.in.gov E-mail Address: pabbot@munster.in.gov

10. **Liability and Indemnity.** (a) Unless otherwise set forth herein, Licensor shall not, at any time, be liable for injury or damage occurring to any person or property caused by Licensee's construction, installation, maintenance, repair, use, operation, condition or dismantling of the AMI Equipment or any appurtenance thereto and Licensee expressly assumes all such risk.

(b) Licensee agrees to indemnify and hold Licensor and Licensor's officers, employees, agents, members, contractors and invitees harmless from any and all liability, damages or claims, (including without limitation, reasonable fees and expenses of attorneys, expert witness and consultants for physical injury, loss, damage or liability, costs or expenses) to the extent caused by the construction, installation, maintenance, repair, use, operation, condition or dismantling of the AMI Equipment or any appurtenance thereto by Licensee or its employees, contractors or agents on the Site and Leased Premises and from Licensee's breach of any representation or warranty as set forth herein.

11. **Defaults and Remedies.** Failure by either party to perform any obligation under this License will not constitute default unless the non-defaulting party gives the defaulting party prior written notice of such failure, and the defaulting party fails to correct such failure within thirty (30) days of that notice; provided, however, that if any such default cannot reasonably be cured within thirty (30) days, there will be no default if the defaulting party commences to cure such default within the thirty (30) day period and thereafter diligently pursues such cure to completion within sixty (60) days after such notice.

In the event of a default as provided above, the non-defaulting party, in addition to any other rights it may have at law or in equity, will have the right to terminate this License upon ten (10) days prior written notice.

12. **Insurance.** Licensee will carry, during the term of this License and at its own expense, the following insurance: (a) comprehensive general liability insurance with a "broad form" comprehensive general liability endorsement having a minimum limit of liability of one million dollars (\$1,000,000) for injury or death arising out of one

occurrence and one million dollars (\$1,000,000) for damage to property from any one occurrence. The policy must be endorsed to include the Town of Highland as an additional insured including products and completed operations on a primary and non-contributory basis; (b) Following form excess/umbrella coverage of two million dollars (\$2,000,000). Licensors will be named as an additional insured including products and completed operations on Licensee's policy and be issued an insurance certificate within 30 days; and (c) Statutory Workers Compensation coverage with employers liability coverage with a limit of five hundred thousand dollars (\$500,000) shall be included. The certificate shall contain standard language providing for 30 days' written notice to Licensors from the insurer of termination or cancellation of the policy. Each party shall be solely responsible for maintaining all risk casualty insurance coverage for its own improvements and personal property located on or near the Site and Licensed Premises. Each party hereby waives its right of recovery against the other for any loss or damage covered by any insurance policy required to be maintained by such party pursuant to this provision. Each party shall cause each insurance policy maintained by it to provide that the insurance company waives all rights of recovery against the other party in connection with any damage covered by such policy.

13. **Environmental Indemnification.** Licensee will defend, indemnify and hold harmless Licensors from and against any and all losses, claims, liabilities, damages, demands, fines, costs and expenses (including reasonable legal expense) of whatever kind and nature that Licensors may incur as a result of the release by Licensee on, in, or under the Site of any hazardous materials, hazardous substances, hazardous wastes, pollutants, asbestos, PCBs, petroleum or other fuels (including crude oil or any extraction or derivative thereof) or USTs.

14. **Condition of Licensed Premises.** Licensors will furnish the Site, including the Licensed Premises, to Licensee in good condition and repair and will maintain the Site in good condition and repair during the term of this License in accordance with the Maintenance Agreement. During the term of the License, Licensee shall observe all reasonable precautions to protect the water tower, including the paint system. These precautions include, but are not limited to the following:

- (a) All attachments to the water tower required to support the AMI Equipment shall be made in a manner which protects the integrity of the water tower and the water tower's paint. Metal bands or clamps will be electrically insulated from the water tower steel to prevent galvanic corrosion, particularly when metal clamps or brackets other than steel are used. All components will be independently grounded and no electric component will be in direct contact with the water tower.
- (b) No drilling or tapping of steel water tower components will be allowed. Drilling or tapping on the legs of the water tower will be allowed only if such action does not compromise the integrity of the water tower.

- (c) All nicks, scrapes, or scratches in the water tower painting system resulting from installation, removal or reinstallation of the AMI Equipment will be repaired by Licensor or Maintenance Contractor at Licensee's expense.

Upon expiration, cancellation, or termination of this License, Licensee will remove its AMI Equipment from the Licensed Premises at no cost to Licensor and will surrender the Licensed Premises in substantially the same condition as received, ordinary wear and tear excepted.

15. **Assignment.** Licensee may not assign this License without Licensor's written consent.

16. **Governmental Approvals.** Licensee will at all times comply with all laws, ordinances, rules and regulations of municipal, state, and federal governmental authorities relating to the installation, maintenance, height, location, use, operation, and removal of its AMI Equipment, and other alterations or improvements authorized herein. Licensee, at its expense, will be responsible for obtaining and maintaining all permits or approvals required by governmental or regulatory agencies arising out of Licensee's intended use of the Site. Licensor agrees, at no cost or expense to Licensor, to fully cooperate with Licensee in obtaining such permits and approvals and, without limiting the generality of the foregoing, to execute any applications, maps, certificates or other documents that may be required in connection with the permits and approvals, with all expenses to be paid by Licensee.

17. **Relocation of AMI Equipment.** The water tower requires painting and maintenance in accordance with the Maintenance Agreement. Licensee, at Licensee's expense, shall remove or relocate and/or protect its AMI Equipment as necessary to allow Licensor or Maintenance Contractor to perform painting and/or maintenance. Licensor shall give Licensee reasonable notice of the timing and duration of the required painting and/or maintenance to allow Licensee remove or relocate and/or protect the AMI Equipment. In the event that Licensee must remove the AMI Equipment from the water tower to accommodate any required painting and/or maintenance, Licensee shall be entitled to install temporary facilities on or near the Site or the Licensed Premises and Licensee shall be entitled to conduct its operations without interruption during such painting and/or maintenance.

18. **Representations and Warranties.** Licensor represents and warrants (a) that it is the owner of the Site in fee simple, unencumbered by any lien, agreement, mortgage, condition or covenant, other than existing license agreements and the Maintenance Agreement, that would adversely affect Licensee's use of the Licensed Premises pursuant to this License; and (b) that it is duly organized, validly existing and in good standing and has all the rights, powers and authority to make this License and bind itself through the party set forth below as signatory of Licensor.

Licensee represents and warrants that it is duly organized, validly existing and in good standing and has all the rights, powers and authority to make this License and bind itself through the party set forth below as signatory of Licensee.

19. **Destruction of Site.** If the Site, in whole or in part, is damaged by fire or other casualty so as to prevent Licensee's use of the Licensed Premises and Licensors cannot repair the Site within thirty (30) days after the date of damage Licensee will have the option to terminate this License, without any further liability hereunder, upon written notice to Licensors.

20. **Consent.** Whenever under the License, the consent or approval of either party is required or a determination must be made by either party, no such consent or approval will be unreasonably withheld or delayed, and all such determinations will be made on a reasonable basis and in a reasonable manner.

21. **Entire Agreement and Binding Effect.** This License and Exhibit A constitute the entire agreement between Licensors and Licensee and shall supersede all prior offers, negotiations and agreements; no prior written or contemporaneous oral promises or representations will be binding. The undersigned have full power and authority to bind their principals to this License. This License will not be amended, or changed except by written instrument signed by both parties hereto. If any clause or provision of this License is found to be invalid and unenforceable with respect to any party, the remainder of this License will not be affected and will remain valid and enforceable. Paragraph captions herein are for convenience only, and neither limits nor amplify the provisions of this License.

The provisions of this License will be binding upon and inure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors, transferees, and permitted assignees.

22. **Choice of Law.** The License will be governed and construed by the laws of the State of Indiana.

23. **Existing Water Tower Maintenance Agreement.** Licensee acknowledges that the Site and the water tower are subject to the existing water tower Maintenance Agreement with Maintenance Contractor. Licensee agrees to abide by all terms, conditions and requirements of the Maintenance Agreement. If Licensee violates the provisions of the Maintenance Agreement or causes Licensors to be in violation of the Maintenance Agreement, Licensors shall have the option to terminate the License without further liability hereunder, upon thirty (30) days written notice to Licensee.

LICENSOR: Town of Highland

BY: George B. Inell

NAME: George A. Smith

TITLE: President, Water Works Board of Directors

DATE: Apr 2, 2025

W

LICENSEE: Town of Munster

BY: _____

NAME:

TITLE:

DATE: _____

EXHIBIT A
LICENSED PREMISES AND AMI EQUIPMENT

Highland Water Tower

Highland, IN GPS Coordinates: 41.531163, -87.472098

Scope of Work:

- THE INSTALLATION OF (1) PCTEL MFB9155NF ANTENNA ON EXISTING HANDRAIL, OR BY USE OF MAGMOUNT, AT TOP OF EXISTING WATER TANK.
- THE INSTALLATION OF (1) NEPTUNE R900 GATEWAY AND (1) TSI POWER OUTDOOR UPS MOUNTED TO (1) H-FRAME RACK TO BE LOCATED OUTSIDE OF EXISTING WATER TANK.
- ROUTE (1) 7/8" COAX FROM GATEWAY TO ANTENNA
- ROUTE NEW ELECTRIC FROM EXISTING BREAKER PANEL (110V CIRCUIT) TO THE UPS (NOT TO EXCEED 20FT)



Antenna will be attached to handrail. 10ft of minimum separation from other antennas is required. If additional separation is needed, an extension mast will be installed.

Coax will be routed along this tank leg. Routing will avoid any disruption to the ladder.

A H-Frame will be constructed in the sod to mount the Gateway and UPS (see image below)

Images of Each Component:



Figure 84 – RF Antenna to Mast

5. Mount the RF antenna to the antenna mast using antenna mounting brackets. See Figure 84.



Figure 78 – Wall Installation

6. Illustrates the completed Gateway and UPS wall installation.



H-Frame Mount

Coax Cable Run Example



RF Antenna Specifications

Manufacturer	PCTEL
Part No.	MFB9155NF
Center Frequency (factory tuned)	916 MHz
Frequency Range	902-928 MHz
Gain	5 dB
Normal Impedance	50 ohms
Bandwidth @ 1.51 Voltage Standing Wave Ratio (VSWR)	20 MHz
Vertical Beam Width @ 1/2 Power	22°
Maximum Power	150 watts
Height	48.0 in.
Weight	1.75 lbs.
Radome Material	1.0 in. Outer Diameter (OD pultruded white fiberglass
Radiator Material	Coated steel wire
ESD Protection	DC grounded
Wind Survival	100 mph
Bending Moment at Rated Wind	14.2 ft.-lbs.
Lateral Thrust at Rated Wind	8.0 lbs.
Equivalent Flat Plate Area	.22 sq ft.
Termination	N Female
Mounting Base Diameter	1.3125 (5/16) in.
Mounting Method	Mast or wall mounted
Mounting Hardware	MMK4 heavy duty mast mount (sold separately). Optional wall mounting kit (Neptune Part No. 13145-000)

UPS Specifications

Manufacturer	TSI Power
Part No.	OUTDOOR-DC-UPS-8009 w/option BH-5
AC Input	120V 60Hz (100 - 140 VAC range)
Output	12 VDC
Dimensions	10.0 W x 12.0 H x 6.0 in. D (25.4 x 30.5 x 15.2 cm)
Weight	30 lbs. (14kg)
Mounting	Pole or wall mountable
Safety	ELT listed (US & Canada)

Appendix C RF Antenna and Coax Installation

This appendix provides information about how to install the RF antenna and coax cable.



Neptune recommends that you consult with a qualified installer on the design and installation of the antenna system. If the installer is already familiar with the site and the existing equipment, this can make the installation go more smoothly.

RF Antenna Overview

There are a number of critical items you must consider when placing and installing antennas. The following table contains actions that can influence the antenna placement and installation.

Mounting the Antennas

Consider the following when mounting the antennas.

Table 30 – Mounting Antenna Considerations

Action	Consider...
Mount antennas as high as possible with an unobstructed view of the coverage area.	<ul style="list-style-type: none">• The supporting structure, if the antenna is not mounted above it, can cause specific areas of limited coverage.• Water towers can severely limit coverage where the signal must pass directly through the tank. When mounting antennas on a water tower, it is recommended that they be mounted on top as close to the center as possible.• When mounting the antenna on a traditional three-leg or four-leg tower, the standoff mount for the antenna must position the antenna at least 5 feet away from the tower to minimize coverage area problems.
Avoid making the antenna the tallest point in the surrounding area.	This may be unavoidable, but it increases the risk of the antenna being damaged by lightning.

Site Recommendations

These sites require extra care when determining a location to install the antenna.

The following are recommendations for sites with multiple transmitters, receivers, and antennas.

- Avoid mounting the antenna so that it is at the same height as another on the site, regardless of the frequencies.
- Mount the antennas one above the other (if possible) for sites that have multiple antennas. Separate each antenna by at least 10 feet. This minimizes the interference between the systems.
- Exception to the previous rule is for cellular antennas. As long as the antenna is either above, below, or in the middle of the ring of cell antennas, the two systems can coexist without inference.
- Antenna sites that must share space with multiple transmitting systems could require additional equipment to protect the systems from interfering with each other. These sites could also require additional engineering to make them perform well.
- If there are radio systems at the site that are already operating on the frequency band, it can be advantageous to combine the signals into one antenna system using the appropriate equipment. This often works better than attempting to protect the individual systems from interfering with each other.
- Managed antenna sites can require additional equipment, and might dictate how an installation is to be performed. Follow the site's requirements as long as the installation meets Neptune's minimum requirements.

Antenna Requirements

Consider the following.

- The antenna, if mounted on the side of a tower or other supporting structure, must be mounted so that it is at least 5 feet away from the structure. The components to offset the antenna are specific to the installation and are not provided by Neptune.
- The antenna must be carefully hoisted up a tower so that it is not damaged.

- The feed line should not be attached to the antenna while it is being hoisted up the tower or other supporting structure. The feed line should be attached after the antenna is in place.
- The antenna connector must not be damaged during installation. There have been reports of damage to the antenna's N connector where the center pin has become bent and shorts out the antenna system.

Feed Line Overview

The feed line is a significant contributor to both good and poor system performance. A properly installed feed line is critical to optimal system performance. Testing the antenna while it is on the ground can ensure the system works properly. It is best to install the connectors with the proper tools and a trained installer. With the proper tools and jigs, installing coaxial (coax) connectors takes only a few minutes each. Not using the proper tools as recommended by the manufacturer could potentially cause problems, either immediately or after several years of seemingly proper operation.

Coaxial Cable Lengths for the Gateway

Table 31 provides part numbers of acceptable coax cables.

Table 31 – Acceptable Coax Cables

Length	Part Number
40 ft. or <	Times Microwave Part Number: LMR-400-UF or LMR-400
100 ft. or <	Andrew Part Number: LD54-50A
> 100 ft.	Andrew Part Number: AVA5-50 or AVA5-50FX

You can order coax cable assemblies already terminated as accessories from Neptune or purchased from companies such as Tessco Technologies, Talley Communications, and Hutton Communications. Each end must be terminated with an N-male type connector. However, the larger 7/8-inch diameter coaxial cable, such as Andrew AVA5-50, uses a 7-16 DIN female connector on each end. Jumpers provide downsizing for the last 6 feet of the installation, allowing a more flexible and manageable connection. The jumpers are preassembled with the appropriate connectors at each end: a 7-16 DIN male on one end and an N-male on the other. See Table 32 on the next page.

Table 32 – Coaxial Order Matrix

Coax Lengths	Description	Loss/100 ft. @ 900 MHz	Max Length	Min Bend Radius	Neptune Part No.	Manufacturer Part No.
≤ 60 ft. - Pre-terminated Coax Cable Assemblies	LMR-400-UF 10 ft. assembly	4.7 dB	40 ft.	1 in.	13090-001	Tessco LMR400UFNMNM-10
	LMR-400-UF 20 ft. assembly	4.7 dB	40 ft.	1 in.	13090-002	Tessco LMR400UFNMNM-20
	LMR-400-UF 30 ft. assembly	4.7 dB	40 ft.	1 in.	13090-003	Tessco LMR400UFNMNM-30
	LMR-400-UF 40 ft. assembly	4.7 dB	40 ft.	1 in.	13090-004	Tessco LMR400UFNMNM-40
	LDF4-50A 50 ft. assembly	2.09 dB	100 ft.	5 in.	13090-006	Tessco 377096 or Hutton HSF-L4A-PNMNM-50
≤ 100 ft.	Cable, Coax, Helix 1/2-in. Diameter ¹	2.09 dB	100 ft.	5 in.	10046-119	Andrew LDF4-50A
≤ 100 ft.	Connector, Coax N-male (two connectors required per installation)				8138-200	Andrew L4TNM-PS
≤ 200 ft.	Cable, Coax, Helix 7/8-in. Diameter ¹	1.08 dB	200 ft.	10 in.	10046-118	Andrew AVA5-50 or AVA5-50FX
	Connector Coax, 7-16 DIN Female (two connectors required per installation)				8138-190	Andrew AL5DF-PS or Andrew 78EZDF
	Cable, Coax 6 ft. Jumper N-Male to 7-16 DIN male (two jumpers required per installation)				10046-117	Andrew F4A-PNMDM-6-USA

Feed Line Requirements

Consider the following.

- The antenna and feed line system installation must be certified by the installer after it is completed. The installer confirms that the installation is performing according to specifications.
- The cable must be secured at intervals per manufacturer specifications on vertical and horizontal runs. Horizontal runs may require a bridge to prevent damage.
- The feed line and connectors maximum loss must be less than 3dB.
- The feed line must be bonded at the top of the tower and at the base of the tower. Use Andrew bonding kits and procedures for all bonds.
- The feed line should be bonded at regular intervals down the tower for towers over 150 feet tall. The general recommendation is that the feed line should be bonded by a minimum of 200 feet. Site requirements and standard practices should dictate the configuration.
- A surge protector can be installed on the tower near the antenna to help protect the feed line, but it is optional.
- The cable should not exceed the bend radius. This helps prevent damage, which is not always visible on the exterior of the cable.
- The AVA5-cable (or larger) needs jumpers between the larger cable and the collector and antenna connectors.
- The installation could use more than one type of coax cable. The 1/2-inch cable is flexible and may be used for the last section of a coax run to the collector, if the additional flexibility is required. See "Coaxial Cable Lengths for the Gateway" on page 103.
- The installation instructions for the Heliac Coaxial Cable are provided by Andrew. See Bulletin 17800B Revision C. Neptune can supply a PDF copy by request through Customer Support.

Table 33 – Installation Materials Needed

Items	Description/Recommendation
Securing Coax Cable	<ul style="list-style-type: none"> • Cable clips/coax hangers - for 1/2 inch or 7/8 inch • UV-Stable cable ties 8 inch - 12 inch (20.32 cm - 30.48 cm)
Weatherizing Kit	Pick one of the following: <ul style="list-style-type: none"> • PolyPhasor P/N: WK-1 • Times Microwave P/N: WK-S-2 • Andrews P/N: 245171 • Scotch P/N: WK-101
Additional Weatherizing Materials	<ul style="list-style-type: none"> • Scotch® Heavy Duty Vinyl 22 • Scotch® Super 88 Electrical Tape • Scotch® Super 33+ Electrical Tape
Coax Ground Kits	Manufacturer specified for specific cable
Coax Hoisting Grips	Manufacturer specified for specific cable

System Certification

The antenna supplied is specified as having a VSWR of 1.5:1 for operating frequency. When measuring VSWR, you need to take into account losses in the feed line. The 1.5:1 VSWR translates into a Return Loss of 14.0dB. It is recommended that the feed line be certified as a separate step. This is best performed by completing the following steps.

1. Put a known amount of power into one end of the cable.
2. Correct the cable losses.
3. Verify the correct amount of power is coming out the other end with the proper test equipment, such as Frequency Domain Reflectometry (FDR) or Time Domain Reflectometry (TDR) cable and antenna testers.