BLACK MOUNTAIN CONSULTING LLC
22566 SW Washington St., Ste. 206 Sherwood, OR 97140
503.625.2517
www.blkmountain.com

April 18, 2021

Black Mountain Project No. 210035-SRT

J5 Infrastructure Partners
767 North Star Road
Star, Idaho 83669

Attention: Ms. Sara Mitchell

Subject: **Soil Resistivity Survey**
WL4557 Walla Walla Mill Creek
1010 Sturm Avenue
Walla Walla, Washington 99362

Dear Ms. Mitchell,

At your request, a representative of Black Mountain Consulting LLC (Black Mountain) visited the above referenced site on April 7, 2021 to perform soil resistivity testing. Two surveys were completed, at the approximate locations and orientations described in this report. We understand others will use these test results in their design of the antenna grounding system.

We appreciate this opportunity to be of service.
Sincerely,

Black Mountain Consulting LLC

Robert Nystrom, L.G.
Staff Geologist

Methods:

The resistivity survey was completed using the Wenner Four-Electrode Method and the Miller Model 400A Soil Resistance Meter. The Wenner Four-Electrode Method requires that four metal electrodes be placed in a straight line, equal distance from one another. Each electrode is driven approximately 6 -12 inches below ground surface at 5, 10, 20, 30 and 40-foot spacing intervals. A current of known amperage is subsequently circulated into the soil through the end electrodes and the resulting voltage drop between the inner electrodes is measured, yielding the resistance (in ohms) of the soil. The correct unit for resistivity is the ohm-centimeter (Ω-cm). The following equation is used to calculate the resistivity (Ω-cm).

$$\rho = 191.5\, aR$$

Where:

ρ = soil resistance in ohm-cm (Ω-cm)

a = electrode separation (in feet)

R = resistance measured in ohms (Ω)

This method is in general accordance with ASTM method G57-06 (IEEE Standard 81).

Site Conditions:

The site is located in a vacant field and is approximately level. There were no structures or underground utilities in the area. Array 1 was configured along an N-S axis that extended through the lease area. Array 2 was configured along an E-W axis that extended along the southern edge of the lease area.

Surficial soils consist of moist fine sand with some silt. Our geotechnical exploration conducted in the lease area encountered about five feet of fine sand fine sand mantling about a 2-foot strata of silt. Below about 7 feet we encountered very dense sandy gravel. We terminated our exploration, due to auger refusal, in the very dense sandy gravel at about 17 feet bgs below ground surface (bgs). We encountered groundwater at about 12 feet bgs the time of our exploration. There was sufficient room to perform 40-foot spacing on both arrays and the arrays were oriented approximately 90° to one another.

Soil Resistivity Survey Results

Table 1: Soil Resistivity Data						
Site Name & Address:		**WL4557 Walla Walla Mill Creek, 1010 Sturm Ave., Walla Walla, Washington 99362**				
Company Performing Test (Include Name of Person & Date):		**Black Mountain Consulting LLC, Robert Nystrom, 4-7-2021**				
Test Instrument (Model #, Serial #, Date of Last Calibration):		**Miller Model 400A Soil Resistance Meter, #44500, Calibrated April 2021**				
Areas to be Measured	**Data Recordings**	**Distance Between Test Rods in Feet**				
		5	**10**	**20**	**30**	**40**
Array 1	Measured Resistance (Ω):	3.5	2.2	1.7	1.3	1.1
	Calculated Resistivity (Ω-cm):	3,351	4,213	6,511	7,469	8,426
Array 2	Measured Resistance (Ω):	3.2	1.7	1.5	1.3	1.0
	Calculated Resistivity (Ω-cm):	3,064	3,256	5,745	7,469	7,660
Array 3	Measured Resistance (Ω):					
	Calculated Resistivity (Ω-cm):					
Additional Site Information						
Description of Soil as Seen as Site:		Fine sand and silt mantling sandy gravel and cobbles at 7'.				
Soil Condition (Wet, Damp, or Dry):		Damp				
Weather:		Clear at time of survey: clear last 24 hours, 60° F				