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April 20, 2021 - *revised August 1, 2023*

Black Mountain Project No. 210035-GEO

J5 Infrastructure Partners
2030 Main Street, Suite 200
Irving, CA 92614

Attn: Ms. Sara Mitchell

Subject: **Geotechnical Engineering Evaluation**
WL4557 Walla Walla Mill Creek
1010 Sturm Avenue
Walla Walla, Washington 99362

Black Mountain Consulting LLC (Black Mountain) is pleased to submit this report describing our recent geotechnical engineering evaluation for the WL4557 Walla Walla Mill Creek tower site. The purpose of our work was to interpret general surface and subsurface site conditions in order to provide recommendations for design and construction. Our scope of services was authorized by J5 Infrastructure Partners (J5) on behalf of AT&T Mobility (AT&T) and consisted of a surface reconnaissance, subsurface exploration, geotechnical analyses, and report preparation.

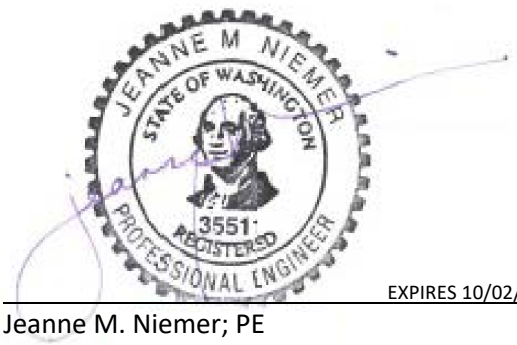
We prepared this report in accordance with generally accepted geotechnical engineering practices at the time we prepared it, for the exclusive use of J5, AT&T and their agents, for specific application to this project. Use or reliance upon this report by a third party is at their own risk. Black Mountain does not make any representation or warranty, express or implied, to such other parties as to the accuracy or completeness of this report or the suitability of its use by such other parties for any purpose whatever, known or unknown, to Black Mountain.

We appreciate the opportunity to be of service to you. If you have any questions, or if we can be of further assistance to you, please contact us at (503) 625.2517.

Respectfully Submitted,

Black Mountain Consulting LLC

Robert Nystrom, L.G.
Staff Geologist



EXPIRES 10/02/2023

Jeanne M. Niemer; PE
Principal Engineer

Attachment A Figures
Figure 1 - Site Location Map
Figure 2 - Site & Exploration Plan

Attachment B Subsurface Exploration Logs

J5 Infrastructure Partners
Geotechnical Engineering Evaluation

WL4557 Walla Walla Mill Creek
Walla Walla, Washington

210035-GEO
April 2021
revised 8/1/23

PROJECT DESCRIPTION

The property is located at 1010 Sturm Avenue, in Walla Walla, Washington, as shown on the attached *Site Location Map,* Figure 1. The proposed project will consist of constructing a new ***65***-foot-tall telecommunications tower and installing ground equipment within a new fenced compound. A new gravel access road will be constructed from Sturm Avenue to the planned compound.

SITE CONDITIONS

Surface Conditions
The site is located in a vacant field and that is approximately level. The site is partially covered with grasses and there was no standing water present at the time of our site visit.

Subsurface Conditions
We explored the subsurface conditions at the project site on April 14, 2021. We drilled two borings, using hollow-stem drilling methods, to approximately 14 feet and 17 feet below ground surface (bgs) near the proposed tower location as shown on the attached *Site & Exploration Plan*, Figure 2. We performed Standard Penetration Tests (ASTM D 1586) at regular five-foot intervals. We logged and classified the subsurface materials in general accordance with the Manual Visual Classification Method (ASTM D 2488).

In boring B-1 we encountered about five feet of loose to very loose fine sand mantling about a two foot strata of medium stiff silt. Below about seven feet we encountered dense to very dense sandy gravel. We terminated our exploration, due to auger refusal, in the very dense sandy gravel at about 17 feet bgs. We drilled boring B-2 to confirm the materials encountered in boring B-1.

We encountered groundwater at about 12 feet bgs in the borings at the time of our exploration. Groundwater levels may fluctuate in response to changing precipitation patterns, off-site construction activities, and changes in site utilization.

CONCLUSIONS

Based on the results of our explorations and analyses, the tower can be supported on a mat foundation. The equipment shelter can be constructed on the upper sand that is compacted to a medium dense state or better, or on imported structural fill.

Seismic Conditions
Based on our analysis of subsurface exploration logs and a review of published geologic maps, we interpret the on-site soil conditions to correspond to Soil Class C, as defined by Table 1613.5.2 of the 20***21*** *International Building Code*.

Based on the consistency of the site soils below the water table, we conclude that the potential for liquefaction settlement at the site during a design level earthquake is negligible. Our specific recommendations are presented in the following sections.

GEOTECHNICAL DESIGN RECOMMENDATIONS

Seismic Design Parameters
Our recommended seismic design parameters are summarized in the table below.

Seismic Design Parameters		
	Short Period	**1 Second**
Mapped Spectral Acceleration Values	S_S=0.37	S_1=0.11
Site Soil Class	*C*	
Seismic Design Category	*B*	
Design Spectral Response Acceleration Parameters	S_{DS}=0.28	S_{D1}=0.1

Mat Foundation

A mat foundation may be used to support the tower at this site. The base of the mat foundation should be located at a minimum depth of seven feet bgs, on the dense sandy gravel. After excavation to design grade, the subgrade should be cleaned of material loosened by excavation. Irregularities resulting from the excavation should be filled with sand, lean concrete, or other suitable material to produce a level bearing surface for the foundation.

We recommend using an ultimate static bearing capacity of 9,000 pounds per square foot (psf). In accordance with the provisions of the EIA/TIA 222-G code, this static bearing pressure does not incorporate a factor of safety. We estimate post construction settlements will be less than one inch. We estimate that the differential settlement will be approximately half of the total settlement.

Lateral loads acting on the foundations can be resisted by passive earth pressure on one side of the foundation and by friction along the soil-concrete interface at the base of the foundation. We recommend using an ultimate foundation base friction coefficient of 0.72 for the sandy gravel. A passive earth pressure of 700 pounds per-cubic-foot (pcf), expressed as an equivalent fluid unit weight, may be used for that portion of the foundation embedded more than one foot below finished exterior subgrade elevation. These lateral resistance values do not incorporate a safety factor, in accordance with the provisions of the EIA/TIA 222-G code. In order to develop these capacities, concrete must be poured neat in excavations, the adjacent grade must be level, and the static ground water level must remain below the base of the footing throughout the year. The passive pressure within the upper foot of embedment should be neglected.

Eccentric loads and moments acting on the foundation produce a skewed bearing pressure distribution to the ground. The mat foundation should be sized so that the resultant load acts within the middle third of the foundation for one-way and two-way eccentric loading to maintain a compressive contact pressure along the base of the foundation. The maximum bearing pressure from the eccentric loading must be less than the allowable bearing pressure.

Uplift loads can be resisted by the self-weight of the mat and the backfill directly overlying the embedded mat foundation. The overlying material can be re-used as backfill over the mat provided it is prepared and placed in accordance with recommendations contained in the Structural Fill section of this report.
For preliminary design purposes, the total unit weight of the overlying soils can be assumed to be 100 pounds pcf.

Excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. It is the contractor's responsibility to select the excavation and dewatering methods, to monitor the excavations for safety and to provide any shoring required to protect personnel and adjacent improvements.

Spread Footings

Lightly loaded structures such as the equipment shelter can be supported on spread footings. Continuous-wall and isolated-spread footings should be at least 18 and 24 inches wide, respectively. For frost protection, the footings should be located at least 24 inches below the lowest adjacent grades or deeper if required by local building code.

Footings should bear directly on the native sand that is compacted to a medium dense state or better, or on a minimum two-foot thickness of structural fill placed over the native soils in accordance with our recommendations. Footings should be sized for an allowable bearing capacity of 2,500 psf. We estimate post construction settlements will be less than one inch for the above recommended bearing capacity. We estimate that the differential settlement will be approximately half of the total settlement. Our recommended bearing capacity is based on limiting settlements and includes a factor of safety of 3 against bearing capacity failure.

Lateral loads acting on the foundations can be resisted by passive earth pressures on the sides of the foundation and by friction along the soil-concrete interface at the base of the foundation. We recommend using an allowable passive earth pressure of 300 pounds per cubic foot (pcf) for foundations confined by the sandy gravel or structural fill placed in accordance with our recommendations. The passive pressure within the upper two feet of embedment should be neglected. We recommend an allowable coefficient of friction of 0.34. In order to develop these capacities, concrete must be poured neat in excavations, the adjacent grade must be level, and the static ground water level must remain below the base of the footing throughout the year. These allowable lateral resistance values include a minimal factor of safety of 1.5.

Floor Slabs

We recommend a 6-inch-thick layer of imported granular structural fill be placed and compacted over the prepared subgrade. The granular fill should be placed in 6-inch-thick lifts and compacted to at least 95 percent of the maximum dry density, as determined by the American Society for Testing and Materials (ASTM) D 1557. A modulus of subgrade reaction value of 100 pounds per cubic inch (pci) may be used to design the floor slab.

Foundation Construction Considerations

A geotechnical engineer from Black Mountain (or their representative) should confirm suitable bearing conditions and evaluate the foundation subgrades. Observations should also confirm that loose or soft material, organics, unsuitable fill, or old topsoil zones were removed. Localized deepening of footing excavations may be required to penetrate any deleterious materials.

Because foundation stresses are transferred outward as well as downward into the bearing soils, all footing over-excavations should extend horizontally outward from the footing edge a distance equal to one half the over-excavation depth for the structural backfill.

Access Driveway

We recommend that the subgrade for any access roadway be prepared in accordance with the Site Preparation section of this report. For planning purposes, we anticipate that 6 to 12-inches of clean sand and gravel subbase material and a minimum 3-inches of crushed rock surfacing will be required to create a stable gravel roadway surface at this site. Black Mountain can provide additional subgrade stabilization or gravel road section recommendations based on observed field conditions at the time of construction.

CONSTRUCTION RECOMMENDATIONS

Site Preparation

Clearing and Stripping: After surface and near-surface water sources have been controlled, the construction areas should be cleared and stripped of organic matter and other deleterious materials. Silt fences, hay bales, buffer zones of natural growth, sedimentation ponds, and granular haul roads should be used as required to reduce sediment transport during construction to acceptable levels.

Where present, fill and existing topsoil should be stripped and removed from proposed development locations and for a five-foot-margin around such areas. Based on our explorations, we anticipate the depth of stripping will be minimal, although greater stripping depths may be required if deleterious materials are encountered. Deleterious materials encountered during site preparation should be removed from the subgrade soils and hauled off site for disposal. Stripped material should be transported off site for disposal or stockpiled for use in landscaped areas. If stripping operations occur during wet weather, a generally greater stripping depth might be required in order to remove disturbed moisture-sensitive soils; therefore, stripping is best performed during a period of dry weather.

Excavations: We anticipate that site grading will be minimal. Where required, temporary soil cuts associated with site excavations or regrading activities should be adequately sloped back to prevent sloughing and collapse, unless a shoring box or other suitable excavation side wall bracing is provided. It is the responsibility of the contractor to ensure that excavations are properly sloped or braced for worker safety protection, in accordance with OSHA safety guidelines.

Final Grades: Final site grades should slope downward away from the structure at a minimum of two percent and runoff should be conveyed to a suitable drainage outlet. Additionally, the area surrounding the structure could be capped with concrete, asphalt or compacted, low-permeability soils to reduce surface water infiltration into the subsurface soils near the foundation.

Structural Fill

The following recommendations for structural fill are provided for design and construction purposes, if required.

Materials: Structural fill includes any fill materials placed under footings, pavements, or driveways and backfill over the embedded mat foundation. Typical materials used for structural fill include: clean, well-graded sand and gravel; clean sand; crushed rock; controlled-density fill (CDF); lean-mix concrete; and various soil mixtures of silt, sand, and gravel. Recycled concrete, asphalt, and glass derived from pulverized parent materials may also be used as structural fill when mixed at a ratio of 1:1 with clean gravel. Use of the on-site soils as structural fill is also feasible.

Placement and Compaction: When used as structural fill, the on-site soils should be placed in lifts with a maximum thickness of 8 inches and compacted to not less than 92 percent of the material's maximum dry density, as determined by ASTM D-1557. The on-site soils should be moisture-conditioned to within 3 percent of the optimum moisture content (ASTM D-1557). If the on-site soils cannot be properly moisture-conditioned, we recommend using imported granular material for structural fill.

Imported granular structural fill should consist of angular pit or quarry run rock, crushed rock, or crushed gravel and sand that is fairly well graded between coarse and fine particle sizes. The fill should contain no organic matter or other deleterious materials, have a maximum particle size of one inch, and have less than

5 percent passing the U.S. No. 200 Sieve. In deep excavations, or where subgrade soils require stabilization, the particle size may be increased to four inches. The percentage of fines can be increased to 12 percent of the material passing the U.S. No. 200 Sieve if placed during dry weather and provided the fill material is moisture-conditioned, as necessary, for proper compaction. The material should be placed in lifts with a maximum uncompacted thickness of 12 inches and be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D-1557. During the wet season or when wet subgrade conditions exist, the initial lift thickness should be increased to 24 inches and should be compacted by rolling with a smooth-drum, nonvibratory roller.

CDF and lean-mix concrete do not require special placement or compaction procedures. Regardless of location or material, all structural fill should be placed over firm, unyielding subgrade soils. If earthwork takes place during freezing conditions, we recommend that all exposed subgrades be allowed to thaw and be recompacted prior to placing subsequent lifts of structural fill.

CONSTRUCTION OBSERVATIONS

Satisfactory earthwork performance depends on the quality of construction. Sufficient monitoring of the contractor's activities is a key part of ensuring that work is completed in accordance with the construction drawings and specifications. We recommend that a representative from Black Mountain confirm that the subsurface conditions observed during our site investigation are consistent with those encountered during construction, and that foundation subgrades are suitable for placement of structural fill, rebar, or concrete for the new structures.

Some jurisdictions require a final letter of geotechnical compliance before they will provide a final permit. It is incumbent on the client to determine if a final letter of geotechnical compliance is required by the jurisdiction. If such a letter is required, a representative from Black Mountain MUST observe pier installation and/or foundation subgrades PRIOR to concrete being poured for the foundation. If Black Mountain does not perform this observation, we cannot provide a final letter of geotechnical compliance, and a permit will not be eligible for final sign-off. ***It is the owner's responsibility to ensure that Black Mountain is notified in a timely manner (i.e., at least 48 hours prior to the required site observation) of the need for our services on site during construction.***

CLOSURE

We have prepared this report for use by the owner/developer and other members of the design and construction team for the proposed tower site. The opinions and recommendations contained within this report are not intended to be, nor should they be construed as a warranty of subsurface conditions, but are forwarded to assist in the planning and design process.

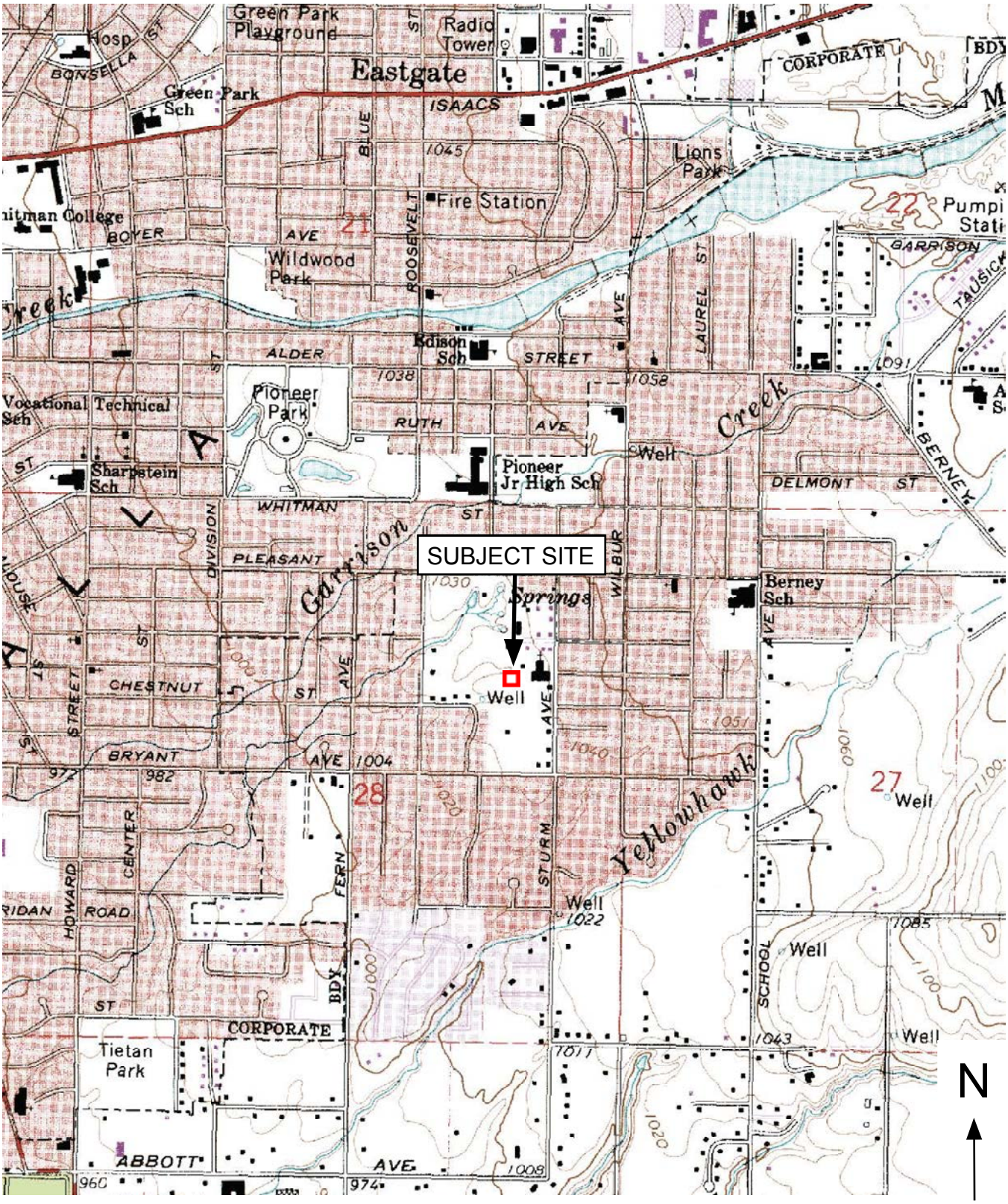
We have made observations based on our explorations that indicate the soil conditions at only those specific locations and only to the depths penetrated. These observations do not necessarily reflect soil types, strata thickness, or water level variations that may exist in other locations. If subsurface conditions vary from those encountered in our site exploration, Black Mountain should be alerted to the change in conditions so that we may provide additional geotechnical recommendations, if necessary. The future performance and integrity of the improvements will depend largely on proper initial site preparation, drainage, and construction procedures. Observation by experienced geotechnical personnel should be considered an integral part of the construction process.

The conclusions and recommendations contained in this report are based on our understanding of the currently proposed project, as derived from written and verbal information supplied to us by the client. When the design has been finalized, we recommend we review the design and specifications to see that our recommendations have been interpreted and implemented as intended. If design changes are made, we request that we be retained to review our conclusions and recommendations and to provide a written modification or verification.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

ATTACHMENT A

FIGURES



Base Map Courtesy of U.S.G.S. Topographic Map "Walla Walla, Wash.-Oreg." (1966, photorevised 1978) Not to Scale

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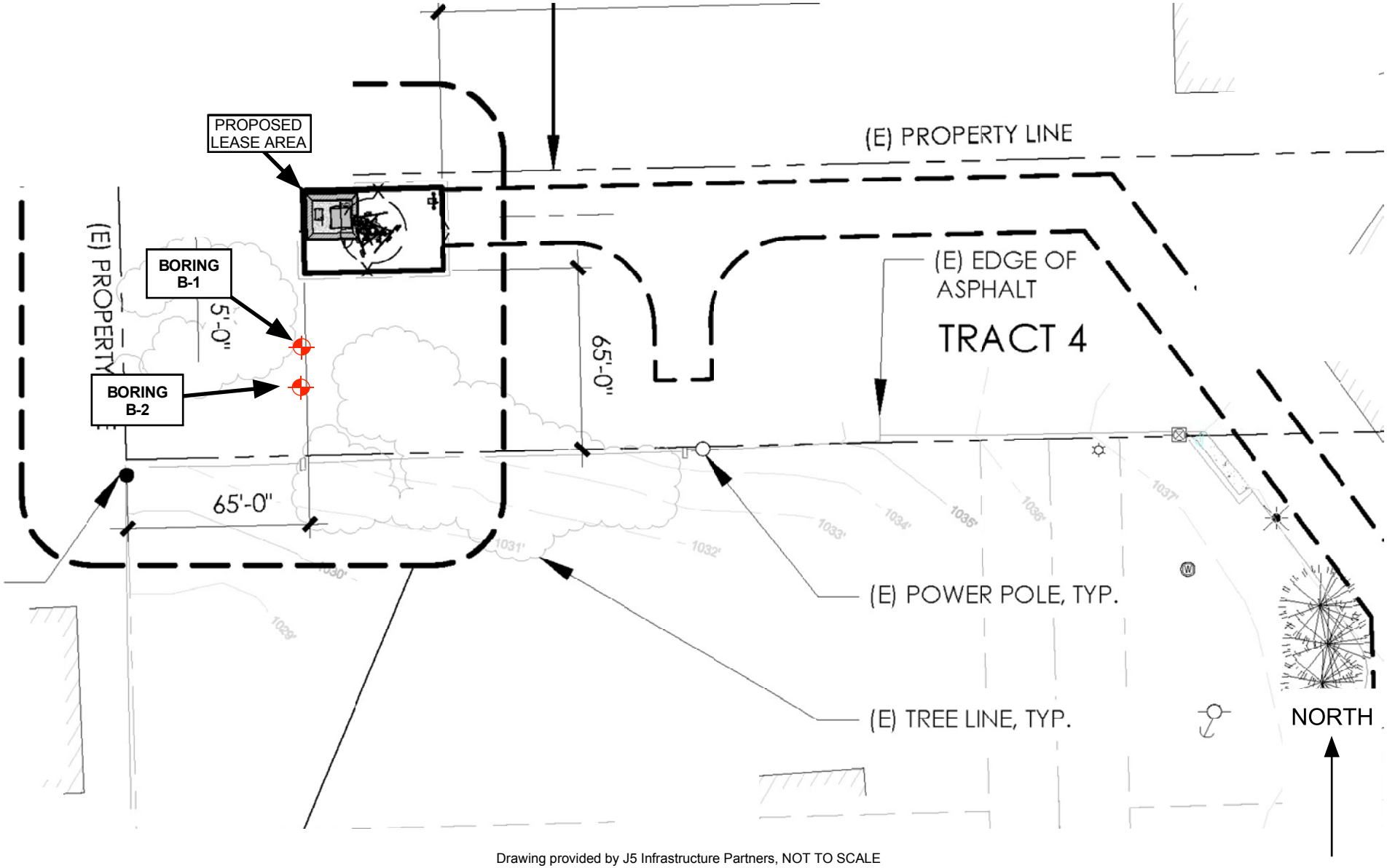
FIGURE 1 - Location Map

Project : 210035-GEO

Client : J5 Infrastructure Partners

Location
WL4557 Walla Walla Mill Creek
1010 Sturm Avenue
Walla Walla, Washington 99362

Date : April 2021



Drawing provided by J5 Infrastructure Partners, NOT TO SCALE

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FIGURE 2 - Site & Exploration Plan

Project : 210035-GEO

Client : J5 Infrastructure Partners

Location
WL4557 Walla Walla Mill Creek
1010 Sturm Avenue
Walla Walla, Washington 99362

Date : April 2021
revised August 2023

ATTACHMENT B

SUBSURFACE EXPLORATION LOGS

BORING LOG

Black Mountain Consulting LLC
22566 SW Washington St., Suite 206
Sherwood, Oregon 97140
TEL:503.625.2517

PROJECT : WL4557 Walla Walla Mill Creek
Walla Walla, Washington 99362
J5 Infrastructure Partners

Job Number: 210035-GEO

Boring No.: **B-1**

Elevation Reference :
Ground Surface Elevation :

Well Completed : N.A.
Casing Elevation : N.A.

DEPTH (feet)		SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	POCKET PEN	TORVANE	GROUND WATER	OBSERVATIONS	TESTING
0	Very loose, dark brown, moist, fine SAND (SP), fine roots		1	2 2 2					
	becomes loose, below 2.5'		2	4 4 3					
5	Medium stiff, dark brown, moist, SILT (ML) below 5', some fine sand		3	2 2 3	1.0			Slightly plastic	
	Dense, dark brown, moist, sandy GRAVEL (GW) below 7.5'		4	10 19 18				Decrease in drilling speed below 7', very gravelly, cobbles in cuttings	
10	becomes very dense, wet-saturated below 10'		5	35 50/3			▼ 4-14	Groundwater approximately 12'	
15			6	14 30 50/2					
			7	50/2				Hammer bouncing	
	Boring terminated, due to refusal, at approximately 17 feet bgs. Groundwater encountered at about 12 feet bgs at time of exploration.								
20									
25									

LEGEND

- 2-inch O.D. Split-Spoon Sample
- 1" Geoprobe
- Sample not Recovered
- DATE ▼ Static Water Level at Drilling
- DATE ▽ Static Water Level
- Perched Groundwater
- Grab Sample
- WTPH-D Ext. 8010 — Type of Analytical Testing Used
- NR — No Recovery
- ATD — At Time of Drilling

Drilling Start Date: 4-14-21

Drilling Completion Date: 4-14-21

Logged By: RN

BORING LOG

Black Mountain Consulting LLC
22566 SW Washington St., Suite 206
Sherwood, Oregon 97140
TEL:503.625.2517

PROJECT : WL4557 Walla Walla Mill Creek
Walla Walla, Washington 99362
J5 Infrastructure Partners

Job Number: 210035-GEO

Boring No.: **B-2**

Elevation Reference :
Ground Surface Elevation :

Well Completed : N.A.
Casing Elevation : N.A.

DEPTH (feet)		SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	POCKET PEN	TORVANE	GROUND WATER	OBSERVATIONS	TESTING
0	Confirmation sample, drilled straight to about 12.5' (auger refusal on cobbles, likely)								
5								Decrease in drilling speed below 7', very gravelly, cobbles in cuttings	
10							▼ 4-14	Groundwater approximately 12'	
	Dense, dark brown, saturated, sandy GRAVEL (GW)	I	1	42 25 18					
15	Boring terminated, due to refusal, at approximately 14 feet bgs. Groundwater encountered at about 12 feet bgs at time of exploration.								
20									
25									

LEGEND

I	2-inch O.D. Split-Spoon Sample	▼ DATE	Static Water Level at Drilling	▨	Grab Sample
II	1" Geoprobe	▽ DATE	Static Water Level	WTPH-D Ext. 8010	Type of Analytical Testing Used
X	Sample not Recovered	▼	Perched Groundwater	NR	No Recovery
				ATD	At Time of Drilling

Page:

Drilling Start Date: 4-14-21

Drilling Completion Date: 4-14-21

Logged By: RN