Geotechnical Conditions Report
Ash Place Townhomes
Spokane, WA

Prepared for:

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9/6/2024

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BAI Project Number: S24141

September 6, 2024
Revised June 5, 2024

EMBEDDED TABLES

ATTACHED FIGURES

CONTEXT

This conceptual phase geotechnical conditions report (GCR) presents the results of geotechnical exploration and analysis for the proposed residential development in Spokane, Washington. These services were contracted with Whipple Consulting Engineers, represented by Austin Fuller, Assistant Planner.

Project Considerations

We understand 20 lots for attached units and several tracts are planned for a 1.32-acre site. The lots vary in size from 1,280 to 4,334 square feet. Approximately 6,370 square-feet of asphalt paved surfaces are also planned for the site.

The plans are preliminary and may not reflect final layout of the development. Locations of retaining walls (if needed) and stormwater and drainage facilities were not shown in the drawings. Estimated daily traffic volumes were not provided at the time this report was prepared.

This report addresses general geotechnical information needed to complete planning, layout, and conceptual design. Additional geotechnical services will be needed to complete a geotechnical engineering report (GER) appropriate for civil design, structural design, and construction.

Location

The site is in the SE ¼ of the SE ¼ of Section 1, Township 25 North, Range 42 East, Willamette Meridian. Spokane County lists the tax parcels as 25014.4207, .4701, and .4702. It is east of Ash Place approximately 260 feet south of Liberty Avenue as shown in the *Vicinity Map* and *Site Plan*.

Scope

This geotechnical study involved limited interpretation of subsurface soil, rock, and groundwater conditions to assess the suitability of the site for the overall conceptual design phase. We endeavored to conduct these services in accordance with generally accepted geotechnical engineering practices as outlined in proposal S24141, dated April 2, 2024.

Design Phase Evaluation

Information needed to complete design-level geotechnical services include anticipated building foundation loads, traffic loads, finish floor elevations, stormwater infiltration requirements, grading plans, and locations and heights of retaining walls, if required.

ENCOUNTERED CONDITIONS

Physical Setting and USDA Soil Mapping

The site is on a basalt outcrop overlooking the center of the broad Spokane Valley. The Spokane Valley - Rathdrum Prairie (SVRP) aquifer is bound by crystalline rock to the north and south which was eroded by tectonics and pre-Tertiary river systems to form a deep channel. These channels were infilled by Pleistocene glacial-flood deposits, generated and deposited during the catastrophic Glacial Lake Missoula Outburst Floods. These flood deposits consist of boulders, cobbles, gravels, and sands with lenses of sand and silt. The project area is located on an outcropping basalt (*M̶gr*) feature that separates the Trinity Trough from the Hillyard Trough.

The *Mgr* unit is described as "*Dark gray to dark greenish gray, fine-grained basalt…locally vesicular…thickness is quite variable due to irregular underlying topography, variable thickness of water-saturated Latah Formation (unit Ml) interbeds"* (WSDNR, 2024).

The depth to the Latah interbeds is not known. It could be an important subsurface feature controlling stability of the slope down to Ash but requires drilled borings to determine the depth to Latah interbeds.

The Natural Resource Conservation Service (NRCS) list the site soils as:

Table 1. NRCS Soil Type

Soil Unit	Soil Name	Slopes	K Factor, Whole Soil
2053	Speigle-Rock outcrop complex	15 to 30 percent	0.15
3117	Northstar-Rock outcrop-Rockly complex	0 to 15 percent	-

Surface Conditions

The site generally slopes down toward the east loosing approximately 5 feet to the edge of a rimrock feature. Slopes down from the edge of the rimrock range from nearly vertical near the southern boundary to 27 degrees near the northern boundary. Outcropping basalt was observed at the majority of the site surface. Stockpiles of existing fill were observed near the middle of the site. Stockpiles were up to 8 feet tall. Tall grass and weeds covered the ground surface. The slopes were moderately populated with conifers, shrubs, and grasses.

Markings for utilities were observed in Ash Place as water and sanitary.

Subsurface Conditions

Conditions encountered in the explorations are described in the *Logs* in accordance with methods described in *Field Exploration*. The subsurface materials were differentiated based on characteristics relevant to this project.

Existing fill was encountered in test pit 1 (TP-1), TP-2, and TP-3 beginning at the ground surface and extending to depths ranging from 0.6 to 6 feet. *Existing fill* consisted of silty clayey sand and silty sand with gravel, and cobbles. Anthropogenic debris as bricks and concrete was encountered in TP-3.

Loose soil was encountered in the explorations beginning at the ground surface in TP-4 or beneath *existing fill* and extended to depths ranging from 1.2 to 5 feet. *Loose soil* was composed of silty sand with varying amounts of gravel and cobbles.

Basalt was encountered in the explorations beginning at depths ranging from 0.6 to 6 feet. *Basalt* was fine-grained, moderately weathered, and strong to very strong (R4 to R5).

Silt-clay interbeds. The depth to the Latah Formation interbeds is not known. It could be an important subsurface feature controlling stability of the slope down to Ash, but requires drilled borings to determine the depth to *silt-clay interbeds*.

Surface and Groundwater Hydrology

Surface water was not observed on the site at the time of our explorations. The nearest surface water was observed in a topographic depression approximately 550 feet west of the site.

Groundwater was not encountered in the explorations. Seasonal groundwater should be expected to perch above bedrock, where present.

Geologically Hazardous Areas

The City of Spokane Municipal Code Chapter 17E.040, *Geologically Hazardous Areas* requires evaluation of, principally erosion, landslide, and seismic hazards (Section 17E.040.030). The purpose of the code is to discourage development in geologically hazardous areas unless proponents demonstrate that such areas can be developed consistent to acceptable standards for public health and safety.

Geologically hazardous areas shall include both erosion and landslide hazard areas and be determined by the following characteristics:

A. *Erosion hazard areas are susceptible to severe erosion and may require mitigation measures, engineering solutions or restrictions to development to protect public safety. Erosion hazard areas are defined as "at least those identified by the U.S. department of agriculture natural resource conservation service (NRCS) as having a severe rill and interrill erosion hazard." The NRCS has compiled a table that identifies all soils in the City of Spokane having a severe rill or interrill erosion hazard. This Building Site Development Water Erosion Hazard Table and associated map will be used to classify erosion hazard areas. Erosion hazard areas are also defined as those cutbank areas within a river or stream meander that area highly susceptible to bank carving. A variety of techniques may be used to identify cutbanks along the outside banks or river and stream meanders. Erosion also occurs through the slow process of channel migration. The channel migration zone (CMZ) is the area where the active channel of a stream is prone to movement over time. Channel migration is usually found along a small percentage of the entire stream network length; however effective management of ecological functions in the CMZ is critical to reduce flood hazards, erosion and habitat loss, and to avoid the need for future shoreline stabilization.*

B. *Landslide hazard areas are potentially subject to landslides based on a combination of geologic, topographic and hydrologic factors. These include areas susceptible to landslides because of any combination of bedrock, soil, slope, structure, hydrology or other factors. Classifications of landslide hazard areas include:*

    1. *slopes greater than eighty percent subject to rockfall during seismic shaking;*
    2. *any area with a slope of thirty percent or greater;*
    3. *areas with all three of the following characteristics:*
        a. *Slopes greater than fifteen percent.*
        b. *Steep hillsides intersecting permeable sediment overlying an impermeable sediment or bedrock; and*

   c. *Evidence of perennial or intermittent springs or ground water seepage.*

4. *slopes that are parallel or sub-parallel to planes of weakness (such as bedding-planes, joint systems and fault planes) in subsurface materials;*
5. *areas of previous failures identified by the NRCS as having a severe limitation for building site development;*
6. *areas of previous failures designated on department of natural resources (DNR) maps as landslides;*
7. *areas potentially unstable as a result of bank carving and erosion or areas located in a canyon or on an active alluvial fan subject to inundation by debris flows or catastrophic flooding;*
8. *areas of the Latah formation (sedimentary layers of clay interlain between basalt flows) that are subject to landslides;*
9. *areas of uncompacted fill;*
10. *sloped areas exhibiting recent erosion or mass-wasting landslide activity such as gullies, piping and surfaces devoid of all vegetation;*
11. *sloped areas greater than fifteen percent with previous levels of development that may have changed sloped stability. Slope characteristics may have changed due to removal of vegetation, the removal and disturbance of soil or a change in surface geology, and modification to underlying geology. Slopes may also experience increased water content and corresponding increase in weight and change in soil friction characteristics due to increased irrigation.*
12. *sloped areas exhibiting high rates of creep as evidenced by trees with curved trunks, fence posts angled downslope or retaining walls that are angled downslope or broken.*

C. *The City of Spokane is not in an area of severe risk for seismic hazards; therefore, no designation of these areas is warranted at this time. All building activity is subject to the provisions of the International Building Code which provides structural safeguards to reduce the risks from seismic activity.*

D. *Other geological hazard areas include volcanic and mine hazards. Initial research and investigation has determined that no mine hazards exist in the City of Spokane. In the past, the City has been impacted by volcanic ash, but this is not considered a geological hazard and does not warrant classification or designation for the purpose of this chapter.*

A review of readily available information and site observations indicate slopes greater than 30 percent, soils posing a sever potential for erosion, landslide deposits, and uncompacted fill were present – see characteristics "A", "B-1", "B-2", "B-8", and "B-9", in the *Geologically Hazardous Area*, as described above. Other components of the municipal code were not observed. Slopes greater than 30 percent were isolated to the eastern slope of the site.

CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

This GCR is suitable for conceptual and preliminary design. Additional geotechnical services will be needed to complete a geotechnical engineering report once design-level information is available, as described in *Project Considerations*.

Silt-clay interbeds were not encountered in the test pits but are anticipated to be present near the level of Ash Street, which requires tests borings to determine. If present, the interbeds would tend to control slope stability potentially requiring mitigation to address the risk.

Geologic hazards were delineated in *Figures 2-2* to *2-3* utilizing GIS data obtained from the Washington State Department of Natural Resources and Spokane County. Geologic hazards as defined by the *Spokane Municipal Code 17E.040* are present as slopes greater than 30 percent, soils posing a sever potential for erosion, and uncompacted fill.

We used the modified version of Universal Soil Loss Equation (USLE) outlined in Section 11.20.090 L Appendix L in the Spokane County Critical Areas Ordinance (CAO) which *states "The index is a product of K times the average slope of the map unit (K*ave slope). Slight has an index of less than or equal to 3.0 (less than 5 tons/acre/yr.), moderate has an index of 3.0 to 4.0 (5 to 8 tons/acre/yr.), and severe has and index greater than 4.0 (greater than 8 tons/acre/yr.)."* to determine whether soils pose a severe potential for erosion. Based on a K Factor of 0.15 slopes greater than 27 percent pose severe potential for erosion.

While geologic hazard conditions are present within the proposed development, we conclude the project is feasible because these conditions can be managed through proper design, construction, and verification.

Typical construction Best Management Practices are anticipated to be adequate to address soil erosion issues. Dust abatement will likely be necessary during grading activities and dry periods.

Existing fill was encountered in TP-1 to TP-3 to depths ranging from 0.6 to 6 feet. *Existing fill* may pose a settlement hazard to structures.

Loose soil contained elevated fines percentages. The *loose soil* could pose a settlement risk for embankments and foundations. *Loose soil* was encountered to 5 feet BGS. Removal of the *loose soil* is recommended. Other methods such as deep dynamic compaction or rapid impact conditioning may be considered. These soils are moisture-sensitive due to high fines contents, which could make them difficult to work with in wet conditions. Stockpile the *loose soil* for reuse as non-structural fill and landscaping.

Basalt was observed at the ground surface and in the explorations beginning at depths ranging from 0.6 to 6 feet. Heavy ripping, chipping, and blasting may be needed to establish grades.

Geotechnical site characterization criteria for use of rapid infiltration structures, such as drywells, requires the presence of a suitable target soil with high permeability, wide horizontal extent, and suitable thickness above limiting layers such as fine-grained soils, rock, or groundwater. These conditions were not encountered in the explorations. *Basalt* is considered a limiting layer.

Seismic Considerations

The recommended seismic site class designation is Site Class B, "*rock*."

Earthwork

Due to the potential for *silt-clay interbeds* of the Latah Formation to control stability of the slope down to Ash Street, test borings to approximately 5 feet below the level of Ash are recommended as part of the geotechnical engineering evaluation.

Subgrade preparation must include stripping organic topsoil, *existing fill*, and benching per WSDOT specifications on slopes, along with scarifying, moisture-conditioning, and compacting.

In the design phase, embankments and other structures will need to be evaluated for settlement. For example, while it may be feasible to place roadway embankments over *loose soil,* it may not be acceptable under home sites. *Existing fill* and *loose soil* should be removed and replaced with compacted structural fill below roadways and home sites.

The overburden soils are granular in nature, consistent with Type C materials per WISHA excavation criteria. WISHA specifies a maximum inclination of 1½ horizontal to 1 vertical in the temporary condition for Type C soils. Temporary slopes are ultimately the responsibility of the contractor.

Stormwater Drainage

We recommend grading surfaces to allow positive drainage away from structures and pavements. Prevent water from accumulating near embankments, pavements, and other structures.

The use of rapid infiltration structures such as drywells and gravel galleries do not appear feasible due to the depth to *basalt*. Stormwater will require alternative methods for disposal such as retention or evaporation ponds.

Pavement subgrade

The subgrade strength will be dependent on final grades and material used to establish subgrade elevations. Typical CBR values of 7 to 10 should be expected corresponding to resilient modulus values of approximately 7400 to 9400 pounds per square inch assuming compacted embankments and structural fill will be place over new underground utilities and *basalt*.

Additional Services

Effective geotechnical services involve cooperation with the owner, designer, and constructor as follows:

1. Preliminary study to assist in planning and to economically adapt the project to its geologic environment;
2. Soil exploration and analysis to characterize subsurface conditions and recommend design criteria;
3. Consultation with the designer to adapt the specific design to the site in accordance with the recommendations;
4. Construction observation to verify the conditions encountered and to make recommendations for modifications, as necessary; and,

5. Construction material testing, quality control, and special inspection.

This report satisfies item 1 of the 5-phase endeavor, as well as a portion of item 2 for the items included in the scope of services, as proposed. We are eager to provide assistance with design and construction as appropriate to assist in completing a safe and economical project.

The scope of services does not include foundation design evaluation for homes or outbuildings.

FIELD EXPLORATION

The fieldwork was conducted by staff geologist Kaila Savage, and supervised by geotechnical engineer John Finnegan, PE, on April 26, 2024. The field activities generally consisted of the following:

- Reconnaissance of the site and surrounding area;
- Logging subsurface conditions in 4 test pits; and,
- Obtaining bulk samples of the encountered soils.

Results are presented in *Figures*.

Test Pits

Test pits were excavated utilizing a Volvo EC60E track-mounted excavator with a 22-inch-wide toothed bucket. The total depth to which test pits were excavated was controlled by refusal on *basalt*.

Soil Samples

Samples collected during test pit excavations were obtained by collecting representative materials from the bucket of the excavator or directly from within the excavation at 4 feet below grade or less.

Soil and Rock Classification

Field descriptions of soils and rock were completed in accordance with the current version of the Washington State Department of Transportation, *Geotechnical Design Manual* (GDM), M 46-03, except that fines (silt and clay) were described in accordance with ASTM D 2487. *Whereas, the GDM uses the terms 'silty' and 'clayey' to describe a very broad range of fines from 10 to 49 percent; ASTM D 2487 uses those terms for percentages greater than 12 and the term 'with' for fines ranging from 5 to 12 percent, which is typically necessary to describe variations relevant to soil permeability per the SRSM.* A key to the descriptions is provided in *Guide to Soil and Rock Descriptions.*

Location

Horizontal & vertical control. The *Site Plan* was reproduced from a preliminary plan provided by Whipple Consulting Engineers dated January 29,2024, and is based on measured offsets from existing site features.

Elevations presented in the *Logs* are based on elevations shown on the provided plans. Horizontal and vertical locations can be considered accurate to within 5-foot and 1-foot respectively, relative to the information provided.

LABORATORY ANALYSIS

Laboratory testing was performed on representative samples of the soils encountered to provide data used in our assessment of soil characteristics.

Tests were conducted, where practical, in accordance with nationally recognized standards (ASTM, AASHTO, etc.), which are intended to model in-situ soil conditions and behavior. The results are presented in *Figures*.

Index Parameters

Moisture content – ASTM D2216. Moisture contents were determined by direct weight proportion (weight of water/weight of dry soil) determined by drying soil samples in an oven until reaching constant weight.

Gradation – ASTM D6913. Gradation analysis was performed by the mechanical sieve method. The mechanical sieve method is utilized to determine particle size distribution based upon the dry weight of sample passing through sieves of varying mesh sizes. The results of gradation are provided in *Grain Size Distribution Results*.

Atterberg Limits – ASTM D4318. Atterberg Limits describe the properties of the fine-grained constituents of soils by relating the water content to the plastic and liquid limits of engineering behavior. As the water content increases, the state of the soil changes from a brittle solid, to a plastic solid, and then to a viscous liquid.

The liquid limit (LL) is the water content above which the soil tends to behave as a viscous liquid. Similarly, the plastic limit (PL) is defined as the water content below which the soil tends to behave as a brittle solid. The plasticity index describes the range of water content over which a soil is plastic and is derived by subtracting the PL from the LL. The soil is classified as “non-plastic” if rolling a 1/8-inch bead is not possible at any water content.

Chemical Parameters

pH – AASHTO T289. The quantified measurement of soil pH (acidity = pH <7) and minimum resistivity, are useful variables in determining the potential corrosivity of the soil. Certain clayey soils contain excess acidity that attacks concrete, iron, and buried utilities.

LIMITATIONS

The conclusions and recommendations presented herein are based upon the results of field explorations and laboratory testing results. They are predicated upon our understanding of the project, its design, and its location as defined in by the client. We endeavored to conduct this study in accordance with generally accepted geotechnical engineering practices in this area.

This GCR presents our professional interpretation of exploration data developed, which we believe meets the standards of the geotechnical profession in this area; we make no other warranties, express or implied. Attached is a document titled “*Important Information About Your Geotechnical-Engineering Report,*” which we recommend you review carefully to better understand the context within which these services were completed.

Unless test locations are specified by others or limited by accessibility, the scope of analysis is intended to develop data from a representative portion of the site. However, the areas tested are discreet. Interpolation between these discreet locations is made for illustrative purposes only but should be expected to vary. If a greater level of detail is desired, the client should request an increased scope of exploration.

REFERENCES

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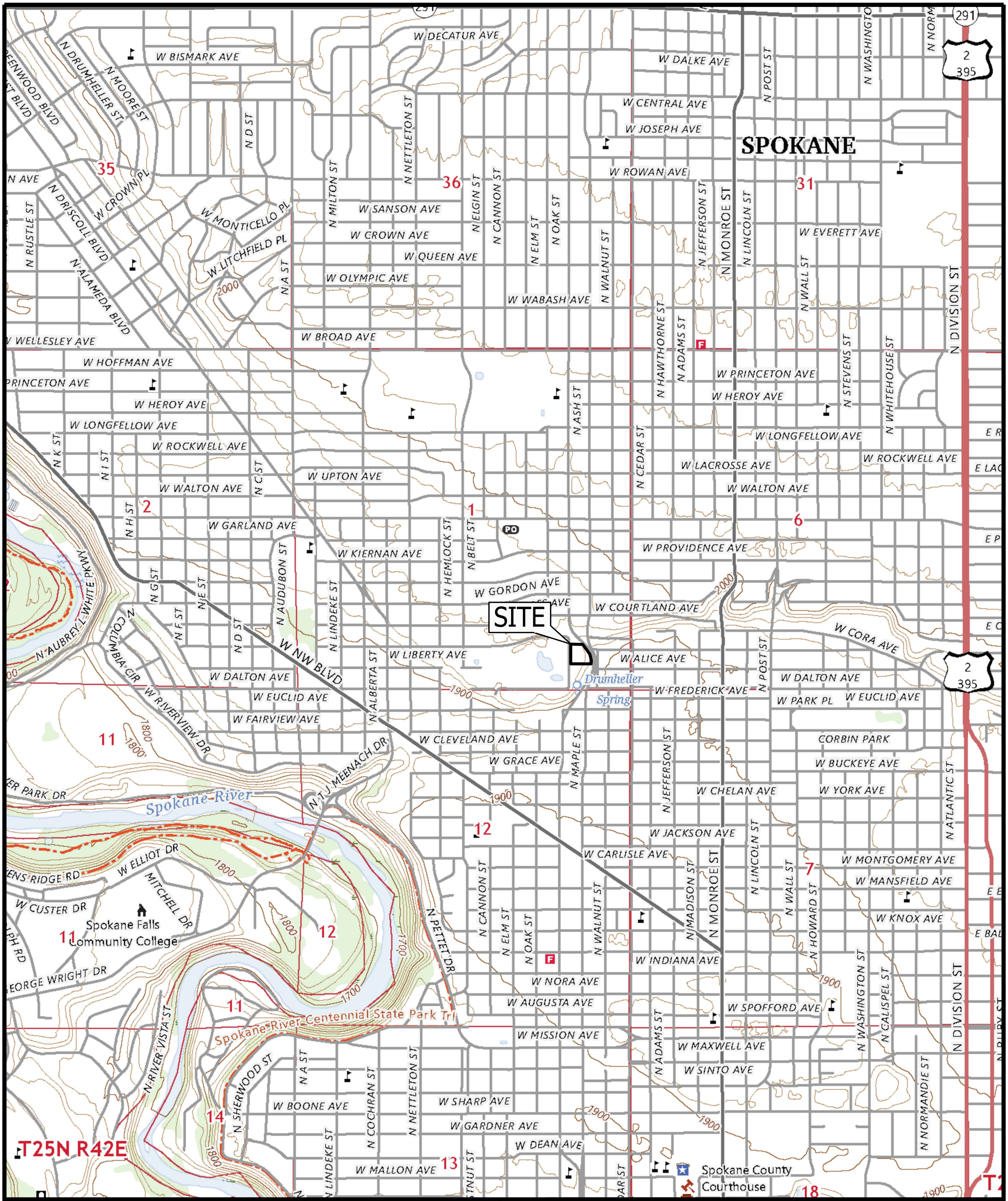

N

SCALE: 1"=2000'

0 1000 2000

SECTION 1
T 25 N R 42 E
USGS 2023

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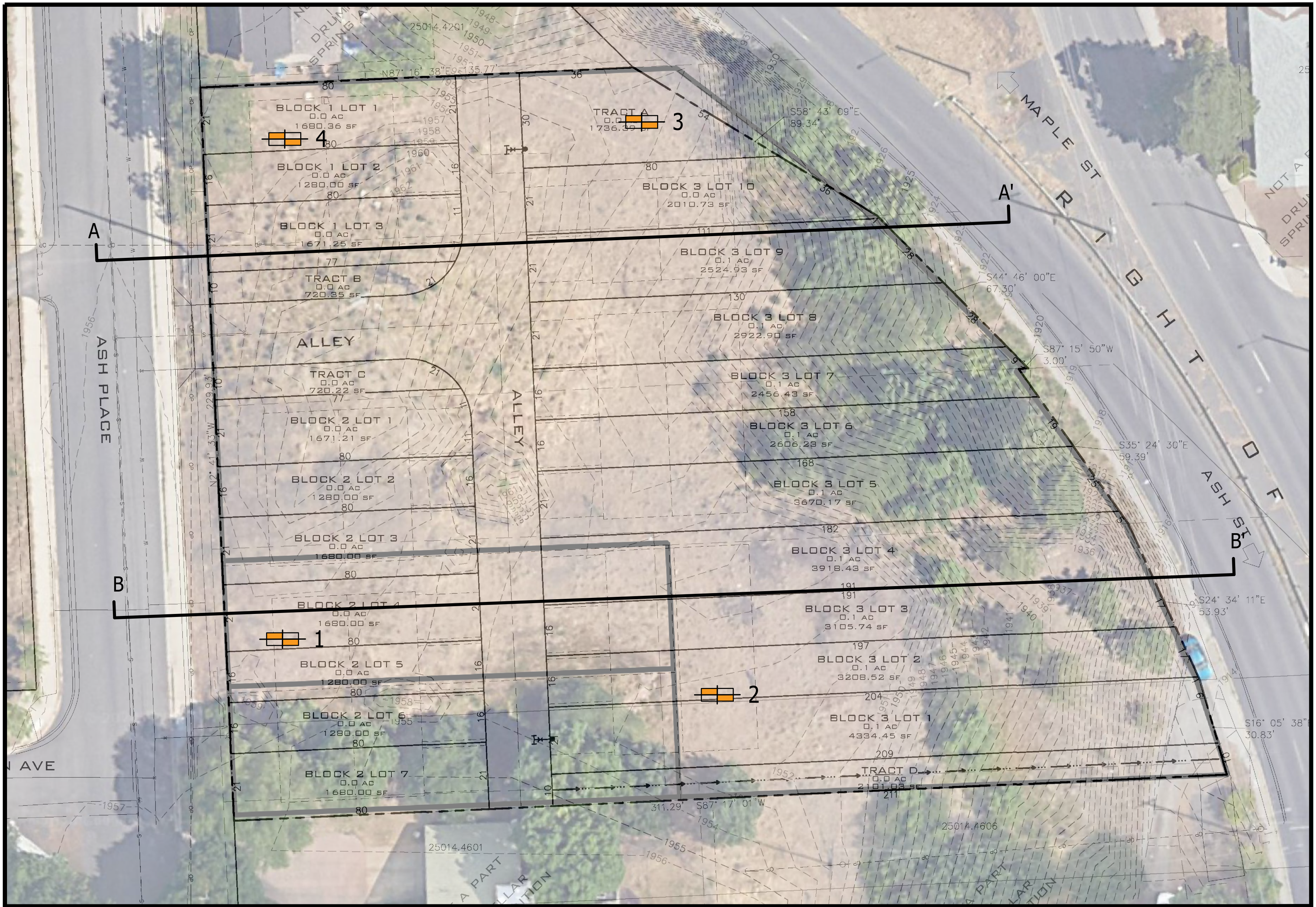
VICINITY MAP

ASH PLACE TOWNHOMES
SPOKANE, WASHINGTON

FIGURE 1

PROJECT NUMBER S24141

DATE: 5/2024



TEST PIT LOCATION (1)

N

SCALE: 1"=40'

0 20 40

BASE PLAN PROVIDED BY
WCE DATED: 1/29/2024
AERIAL IMAGERY
PROVIDED BY GOOGLE

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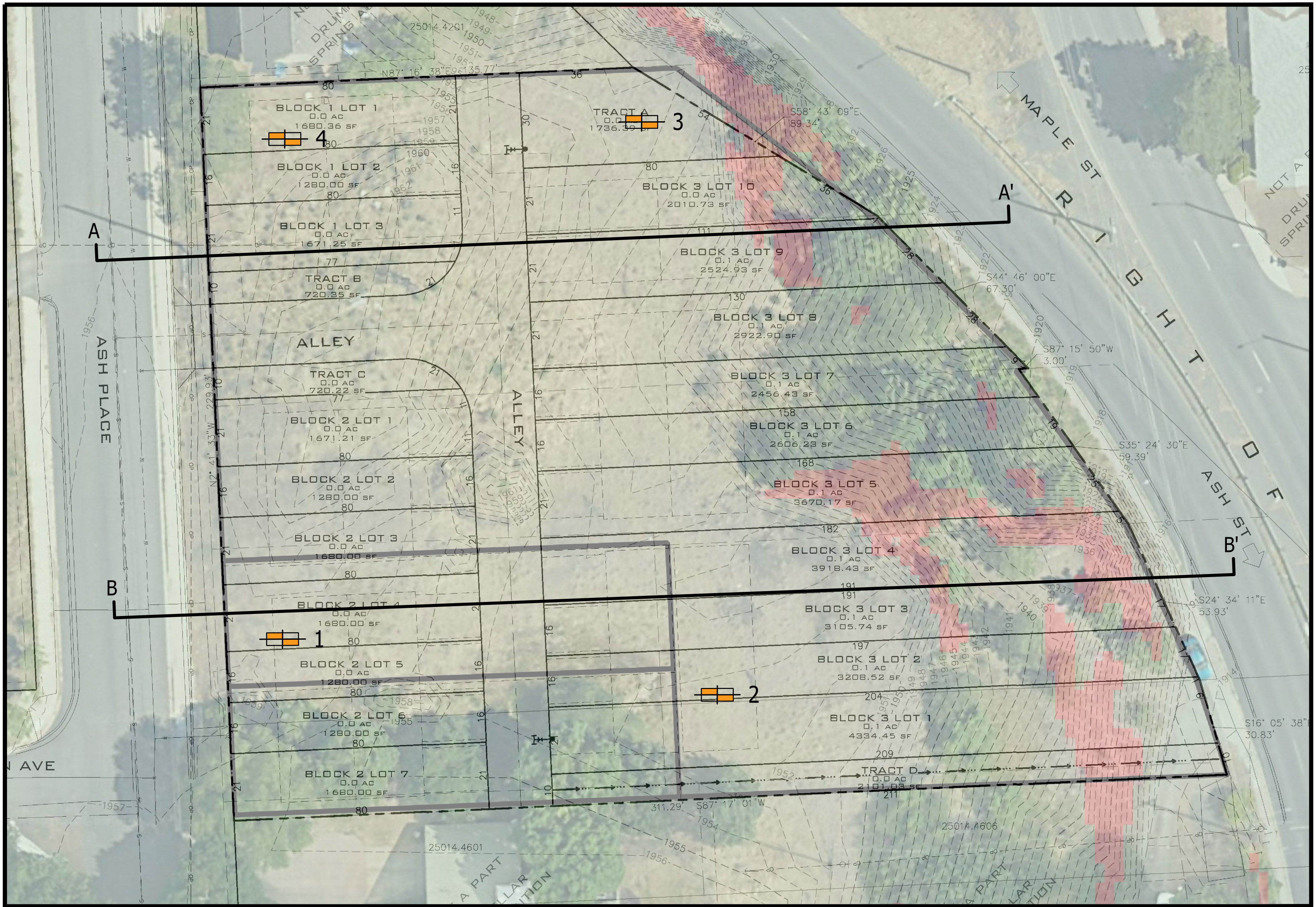
SITE PLAN

ASH PLACE TOWNHOMES
SPOKANE WASHINGTON

FIGURE 2-1

PROJECT NUMBER S24141

DATE: 5/2024



🟧 TEST PIT LOCATION (1)

SLOPES GREATER THAN 30
PERCENT SHOWN IN RED

N
SCALE: 1"=40'
0 20 40

BASE PLAN PROVIDED BY
WCE DATED: 1/29/2024
AERIAL IMAGERY
PROVIDED BY GOOGLE

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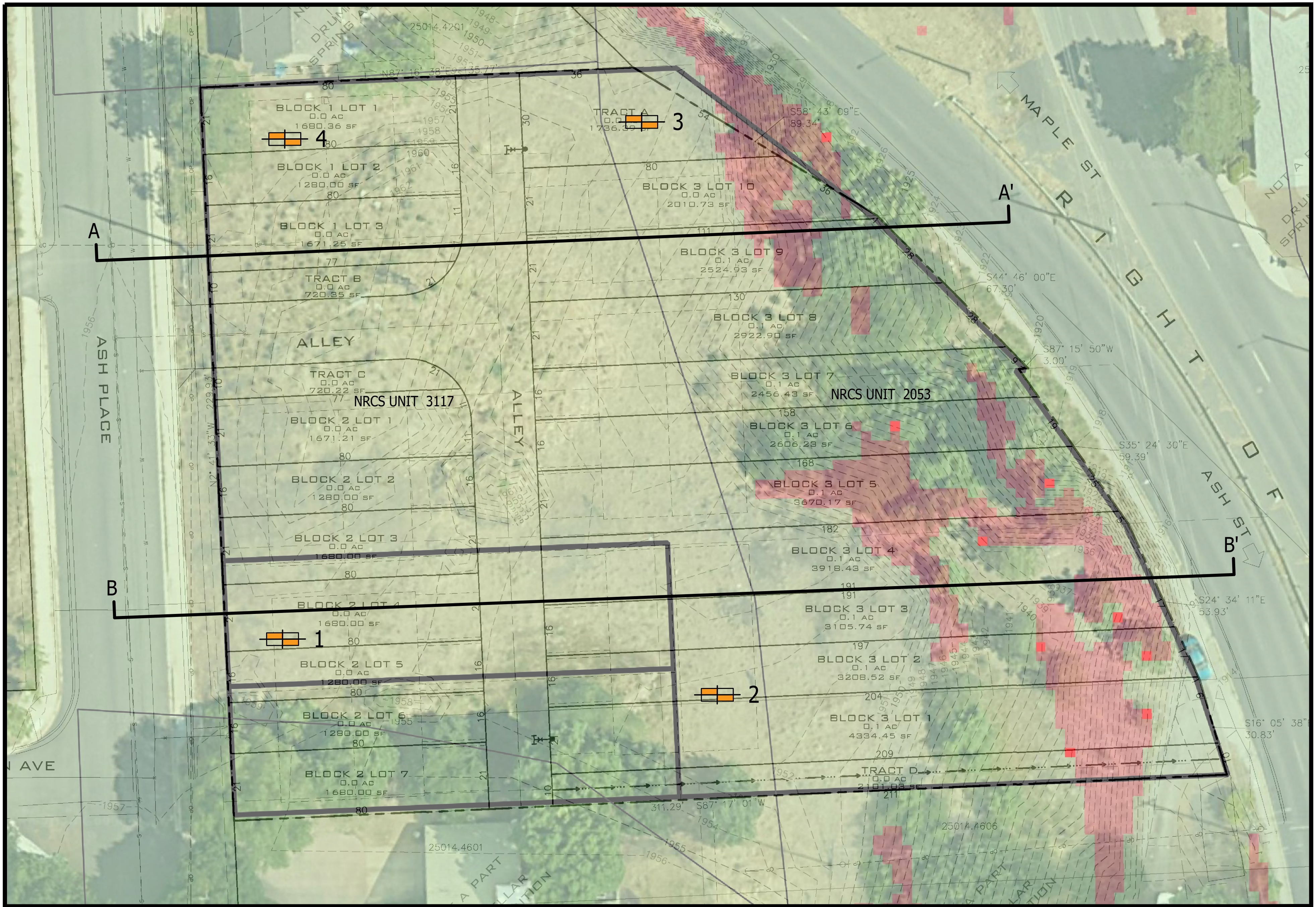
SLOPES

ASH PLACE TOWNHOMES
SPOKANE WASHINGTON

FIGURE 2-2

PROJECT NUMBER S24141

DATE: 5/2024



🟧 TEST PIT LOCATION (1)

POTENTIAL FOR SEVERE EROSION SHOWN IN RED

N

SCALE: 1"=40'

0 20 40

BASE PLAN PROVIDED BY WCE DATED: 1/29/2024
AERIAL IMAGERY PROVIDED BY GOOGLE

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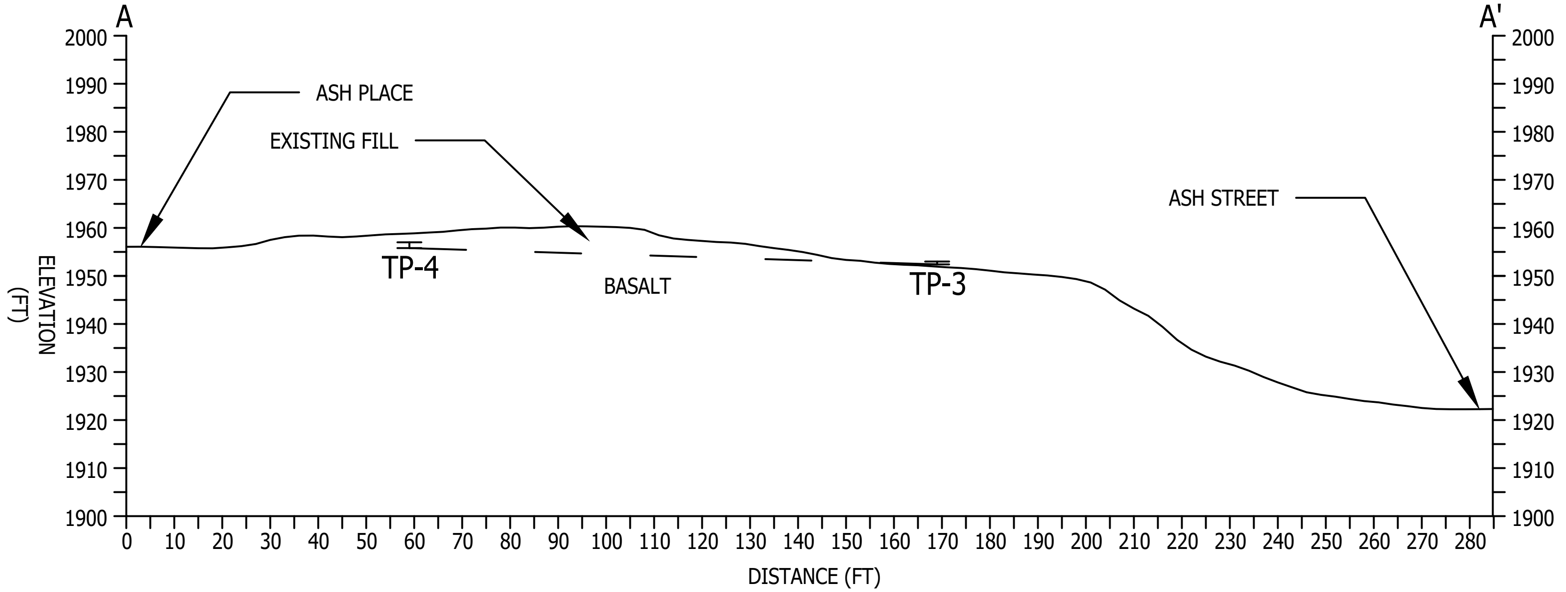
EROSION POTENTIAL

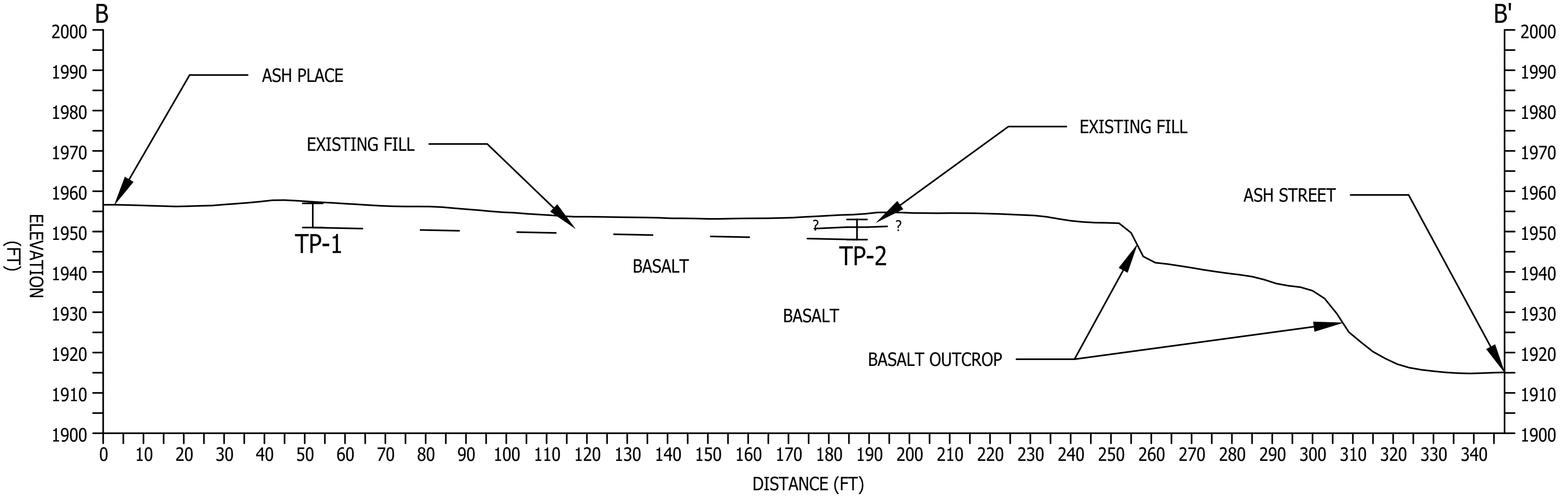
ASH PLACE TOWNHOMES
SPOKANE WASHINGTON

FIGURE 2-3

PROJECT NUMBER S24141

DATE: 5/2024





N

SCALE: 1"=40'

0 20 40

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PROFILES

ASH PLACE TOWNHOMES
SPOKANE WASHINGTON

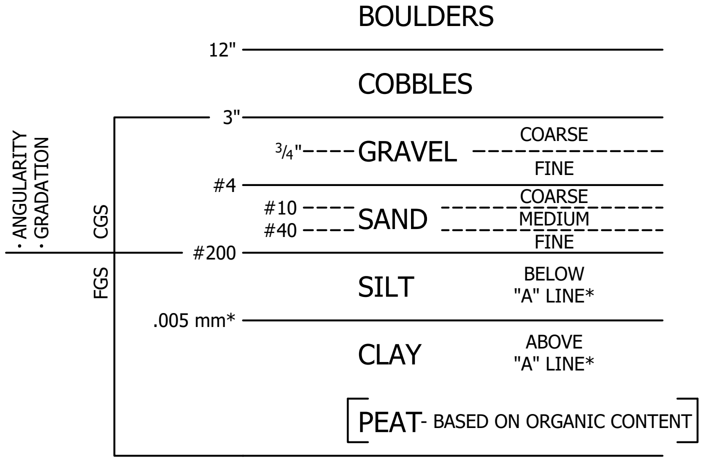
FIGURE 2-4

PROJECT NUMBER S24141

DATE: 5/2024

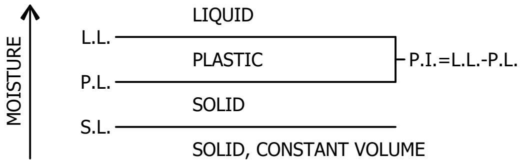
GUIDE TO SOIL & ROCK DESCRIPTIONS

SOIL CLASSIFICATION

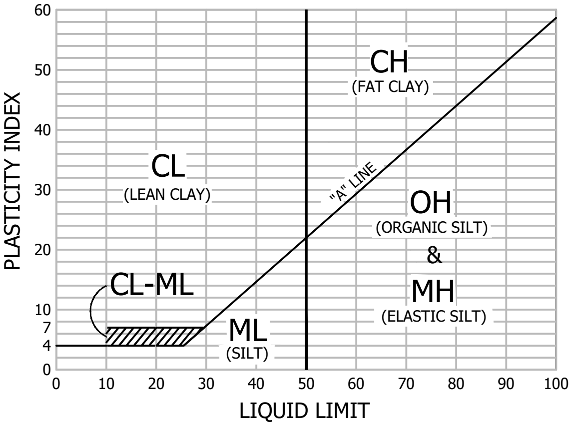


** SEE PLASTICITY CHART*
CGS - COARSE GRAINED SOIL - MORE THAN 50% RETAINED ON A #200 SIEVE
FGS - FINE GRAINED SOIL - 50% MORE PASSES, #200 SIEVE
FINES - PORTION FINER THAN #200 SIEVE

ATTERBERG LIMITS



PLASTICITY CHART



NOTE - CHART APPLIES TO FGS AND MINUS #40 SIEVE FRACTION OF CGS

GUIDE TO SOIL DESCRIPTION MODIFIERS, MOISTURE, AND CONDITION PRESENTED ON LOGS

MODIFIER	ESTIMATED PERCENTAGE OF MATERIAL
SUFFIX "LY" OR "Y".....................	30% OR MORE FOR COARSE PARTS IN FGS GREATER THAN 12% FOR FINES IN CGS
WITH	15% - 29% FOR COARSE PARTS IN FGS 5% - 12% FOR FINES IN CGS

MOISTURE

- DRY
- MOIST
- SATURATED OR WET

SOIL CONDITION

- CGS:
  - VERY LOOSE
  - LOOSE
  - MEDIUM DENSE
  - DENSE
  - VERY DENSE
- FGS:
  - VERY SOFT
  - SOFT
  - MEDIUM STIFF
  - STIFF
  - VERY STIFF
  - HARD

NOTE - VISUAL ESTIMATES OF MATERIAL PERCENTAGES TYPICALLY VARY 0 TO 10% FROM THOSE DETERMINED BY LABORATORY TESTING.

SAMPLES

◩	STANDARD 2" PENETRATION TEST SAMPLER WITH BLOWS PER FOOT
■	3" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
□	DRILL CUTTING SAMPLE
▨	BULK SAMPLE
⧖	THIN-WALLED TUBE SAMPLE
▯	DIAMOND CORE RUN WITH % RECOVERY & ROCK QUALITY DESIGNATION
⊠	2.5" SPLIT SPOON SAMPLER WITH BLOWS PER FOOT
▨	CONTINUOUS SOIL SAMPLE
R	REFUSAL OF SAMPLE (50+ BLOWS PER 6")

ROCK WEATHERING

- FRESH
- SLIGHTLY WEATHERED
- MODERATELY WEATHERED
- HIGHLY WEATHERED
- COMPLETELY WEATHERED
- RESIDUAL SOIL

ROCK CONDITION

- EXTREMELY WEAK
- VERY WEAK
- MODERATELY WEAK
- MODERATELY STRONG
- STRONG
- VERY STRONG

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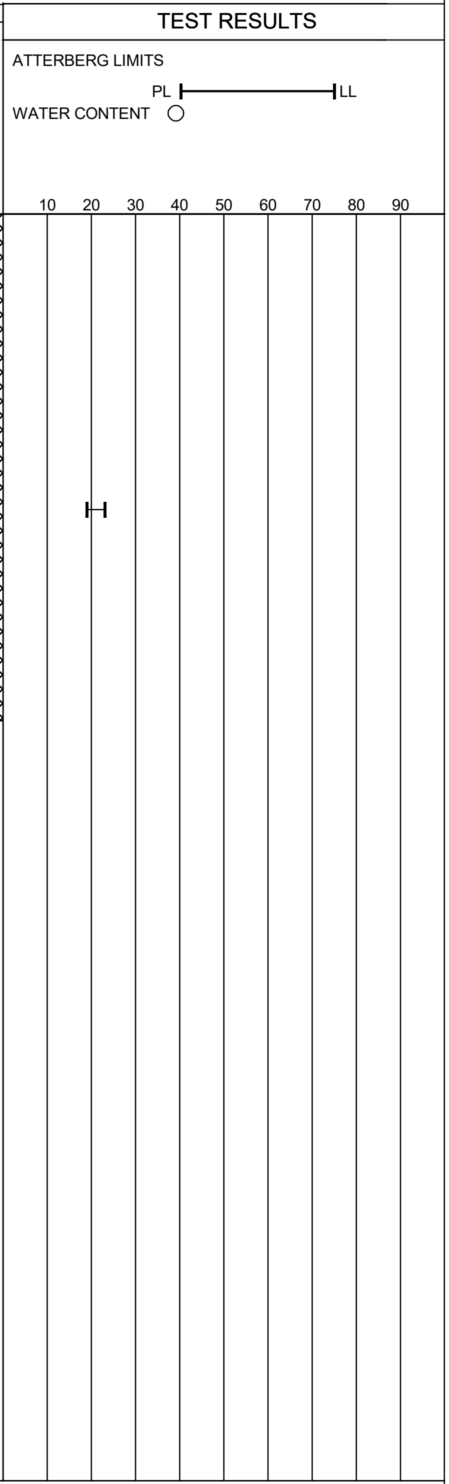
FIGURE 3

TEST PIT 1

Date: 4-26-24
Excavator: Budinger & Assoc., Inc.
Equipment: Volvo EC60E with 22-inch bucket
Location: southwest
Surface: grass and weeds

Elevation: 1957 ft
Logged by: K. Savage
Size of hole: 3 x 7 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0		dry, dark brown	SILTY CLAYEY SAND with Gravel and Cobbles, coarse to fine, angular to subangular (existing fill) organics as fine roots to 1.1 feet	▩
	▨		cobbles decrease	▩
5				▩
		no free groundwater observed	refusal on basalt End of Excavation @ 6 ft	
10				
15				



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TEST PIT LOGS

FIGURE 4-1

Project: Ash Place Townhomes

Location: Spokane, WA

Number: S24141

TEST PIT 2

Date: 4-26-24
Excavator: Budinger & Assoc., Inc.
Equipment: Volvo EC60E with 22-inch bucket
Location: southeast
Surface: grass and weeds

Elevation: 1953 ft
Logged by: K. Savage
Size of hole: 2 x 7 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG
0	▨	dry, brown	SILTY SAND with Gravel, coarse to fine, subangular to subrounded (existing fill) 1-foot: weed barrier encountered organics as fine roots to 1.9-feet	▩
	▨	dry, brownish yellow	SILTY SAND, fine, subangular to subrounded	░
5		no free groundwater observed	refusal on basalt End of Excavation @ 5 ft	
10				
15				

TEST RESULTS

ATTERBERG LIMITS
PL ├──┤ LL
WATER CONTENT ○

10 20 30 40 50 60 70 80 90

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TEST PIT LOGS

FIGURE 4-2

Project: Ash Place Townhomes
Location: Spokane, WA
Number: S24141

TEST PIT 3

Date: 4-26-24
Excavator: Budinger & Assoc., Inc.
Equipment: Volvo EC60E with 22-inch bucket
Location: northeast
Surface: grass and weeds

Elevation: 1953 ft
Logged by: K. Savage
Size of hole: 2 x 3 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ├──┤ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0		dry, yellowish brown	SILTY SAND with Gravel, coarse to fine, subangular to subrounded, brick and concrete debris, organics as roots (existing fill)	▨	
		no free groundwater observed	refusal on basalt End of Excavation @ 0.6 ft		
5					
10					
15					

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TEST PIT LOGS

FIGURE 4-3

Project: Ash Place Townhomes

Location: Spokane, WA

Number: S24141

TEST PIT 4

Date: 4-26-24
Excavator: Budinger & Assoc., Inc.
Equipment: Volvo EC60E with 22-inch bucket
Location: northwest
Surface: grass and weeds

Elevation: 1957 ft
Logged by: K. Savage
Size of hole: 2 x 3 feet

DEPTH	SAMPLES	MOISTURE, COLOR, CONDITION	DESCRIPTION	SOIL LOG	TEST RESULTS ATTERBERG LIMITS PL ├──┤ LL WATER CONTENT ○ 10 20 30 40 50 60 70 80 90
0	▨	dry, brown	SILTY SAND with Cobbles, and Gravel, coarse to fine, subangular to subrounded, organics as roots	░	
		no free groundwater observed	refusal on basalt End of Excavation @ 1.2 ft		
5					
10					
15					

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TEST PIT LOGS

FIGURE 4-4

Project: Ash Place Townhomes

Location: Spokane, WA

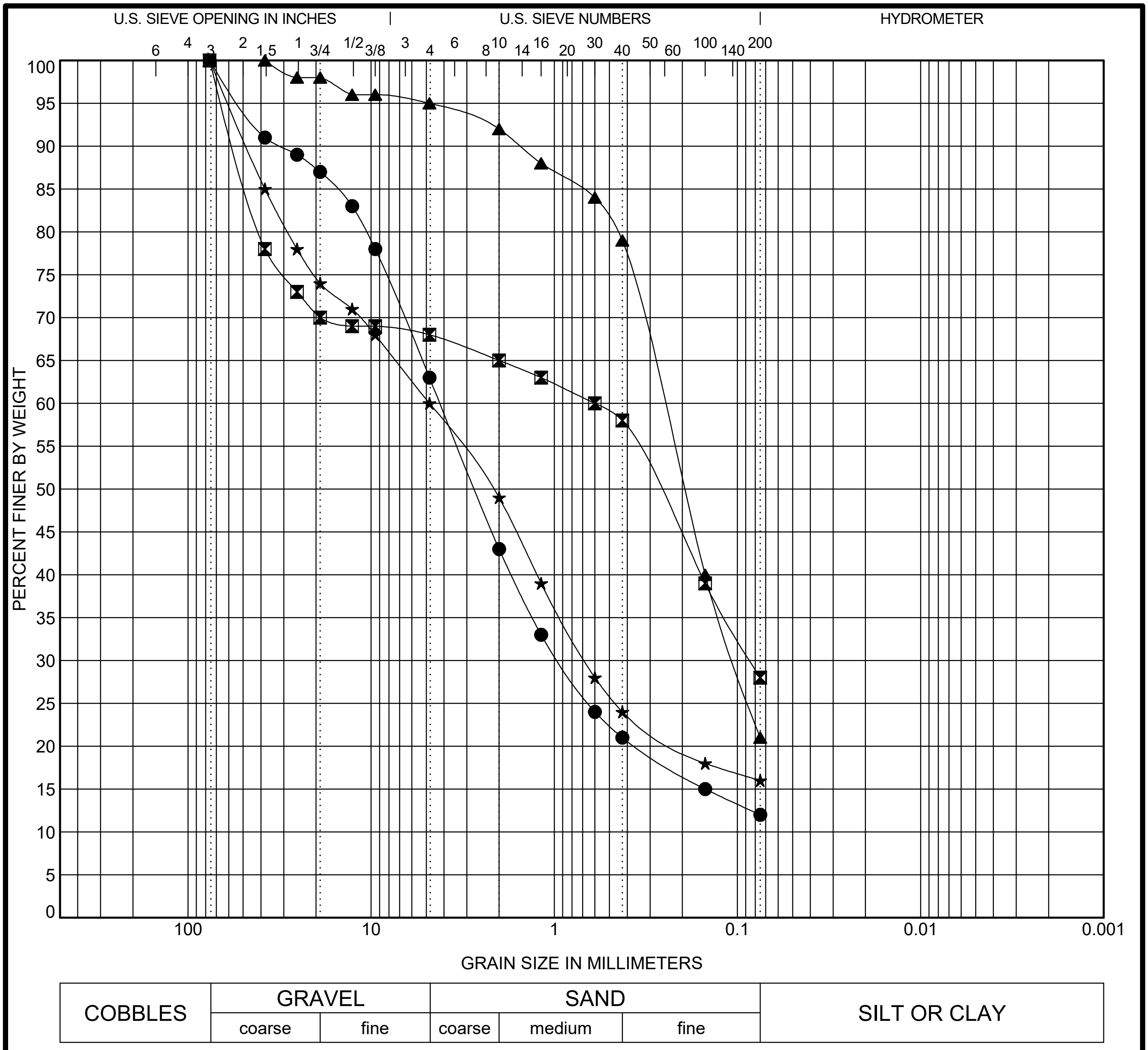
Number: S24141

SOIL MECHANICS
LABORATORY SUMMARY

		Units	Test Methods				
LABORATORY NUMBER				24-5170	24-5171	24-5172	24-5173
TEST PIT NUMBER				TP-1	TP-2	TP-2	TP-4
DEPTH	TOP	feet		3 1/2	1/2	3	0
	BOTTOM	feet		4 1/2	2	4	1
STRATUM				*existing fill*		*loose soil*	
SAMPLE TYPE				Bulk			
MOISTURE CONTENT		%	ASTM D2216	6.5	14.1	10.6	4.7
pH			AASHTO T289	7.9	6.0	6.2	7.0
LIQUID LIMIT		%	ASTM D4318	23			
PLASTIC LIMIT		%		19			
PLASTICITY INDEX		%		4	NP	NP	NP
UNIFIED CLASSIFICATION			ASTM D2487	SC-SM	SM	SM	SM[1]
SIEVE ANALYSIS			ASTM D6913				
	3"			100	100		100
S	1 1/2"			91	78	100	85
I	1"	%		89	73	98	78
E	3/4"			87	70	98	74
V	1/2"	P		83	69	96	71
E	3/8"	A		78	69	96	68
	#4	S		63	68	95	60
S	#10	S		43	65	92	49
I	#16	I		33	63	88	39
Z	#30	N		24	60	84	28
E	#40	G		21	58	79	24
	#100			15	39	40	18
	#200			12	28	21	16

NP = Non Plastic

[1] = plus 18 percent cobbles



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	1	3.5	**SILTY, CLAYEY SAND with GRAVEL(SC-SM)**	23	19	4	4.46	89.09
☒	2	0.5	**SILTY SAND with GRAVEL(SM)**	NP	NP	NP		
▲	2	3.0	**SILTY SAND(SM)**	NP	NP	NP		
★	4	0.0	**SILTY SAND with GRAVEL(SM)**	NP	NP	NP		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	3.5	76.2	4.209	0.942		37.0	50.8	12.0	
☒	2	0.5	76.2	0.6	0.085		31.5	40.0	28.0	
▲	2	3.0	38	0.256	0.104		5.0	74.0	21.0	
★	4	0.0	76.2	4.8	0.679		39.8	43.9	16.0	

GRAINSIZE WO FIGURE # ASH PLACE TOWNHOMES.GPJ GINT STD US.GDT 5/13/24

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GRAIN SIZE DISTRIBUTION

Project: Ash Place Townhomes

Location: Spokane, WA

Number: S24141

Figure 6

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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