



Geotechnical Engineering Report:

City of Newberg – River Street Improvements
South River Street
Newberg, Oregon

Central Project: Keller-23-01



Prepared For:

City of Newberg
c/o Keller Associates
245 Commercial Street SE, Suite 210
Salem, Oregon



Date: September 22, 2026

September 22, 2025

City of Newberg
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Attention: TJ (tjcentanni@kellerassociates.com)

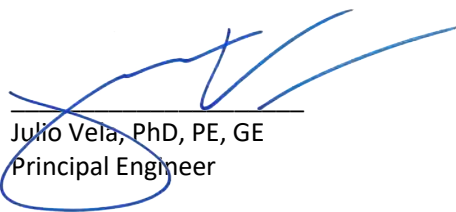
Subject: Geotechnical Engineering Report
City of Newberg – River Street Improvements
South River Street
Newberg, Oregon
Central Project No. Keller-23-01

Central Engineering Services (Central) is pleased to submit this report of geotechnical engineering design services for the proposed South River Street Improvements project located in Newberg, Oregon. This report was prepared in accordance with our Geotechnical Scope of Work and Budget dated June 23, 2025 and Agreement for Professional Services with Keller Associates executed on August 9, 2025.

Thank you for the opportunity to work with you on this project. Please feel free to call our office with questions about this report.

Respectfully,

Central Engineering Services



Julio Vela, PhD, PE, GE
Principal Engineer

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1.0 PROJECT DESCRIPTION

Central Engineering Services (Central) is pleased to submit this report of geotechnical engineering services for the proposed South River Street Improvements project in Newberg, Oregon. We understand that construction will consist of pavement improvements to South River Street between E 3rd Street and E 11th Street. The intent of this report is to provide a general geotechnical characterization of the project corridor, including general soil data, subsurface observations from boring and ground-penetrating radar (GPR) data, and pavement improvement recommendations.

Figure 1 shows the site vicinity relative to surrounding features. Figure 2 shows our approximate exploration locations completed as discussed below.

2.0 PURPOSE AND SCOPE OF WORK

Our scope of services was written based on information provided to us by Keller Associates (Keller), our experience in the area, specific services requested based on discussions with Keller, and our understanding of the project. Our scope of services included the following:

1. Coordinated and managed field investigation, including public and private utility notification, and scheduling of subcontractors and field staff.
2. Provided traffic control and traffic control plans where required for up to five exploration locations within the existing roadway.
3. Explored subsurface conditions in the proposed by completing the following explorations:
 - Four borings (C-1 through C-4) to a depth of 6.5 feet below ground surface (bgs) in S River Street between E 3rd Street and E 11th Street.
 - One boring (C-5) to a depth of 31.5 feet bgs in S River Street south of E 11th Street.
4. Performed one infiltration test south of E 11th Street at a depth of 5 feet bgs.
5. Performed dynamic cone penetrometer (DCP) tests in the vicinity of each exploration location.
6. Maintained a detailed log of the explorations. Obtained samples of the pavement, base, and subgrade materials encountered, and performed laboratory testing, including moisture content and material passing a U.S. Standard No. 200 sieve.
7. Patched pavement borings with polymer-modified asphalt patch.
8. Collected and analyzed GPR test results and provided a plot of estimated surface layer thickness by pavement station.
9. Provided general recommendations for paving options (asphalt concrete [AC]), including general subgrade, drainage, and base rock preparation for anticipated pavement sections.
10. Provided a geotechnical report summarizing our pre-design findings.
11. Estimated pavement thickness from a review of subsurface explorations and GPR results.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The scope of work described in this report was provided for the City of Newberg, Oregon. We understand construction will consist of pavement improvements to South River Street between E 3rd Street and E 11th Street. We have divided the project area into two subareas: E 3rd Street to E 11th Street, and south of E 11th Street.

Surface conditions between E 3rd Street and E 11th Street consists of AC pavement. Based on site reconnaissance, S River Street appears to have received several utility improvements as evidenced by repaving of trenches and utility crossings visible at the site surface. Surface conditions at our boring location south of E 11th Street consists of low-lying, periodically maintained grass.

The project area is generally flat, with surface elevations ranging from approximately 169 to 174 feet above mean sea level (msl) based on topography from publicly available aerial imaging.

3.2 SUBSURFACE CONDITIONS

3.2.1 General

We explored subsurface conditions at the site by drilling four pavement borings (C-1 through C-4) between E 3rd Street and E 11th Street to a depth of 6.5 feet bgs, and one boring (C-5) south of E 11th Street to a depth of 31.5 feet bgs. Approximate exploration locations are shown in Figure 2. A description of explorations, exploration logs, and laboratory testing results are presented in Appendix A. Photographs of core locations and cores are presented in Appendix B, Figures B-1 through B-4.

Subsurface conditions in the improvement area generally consist of composite pavement overlying undocumented fill and/or silt soil. Composite pavement is defined as AC pavement overlying portland cement concrete (PCC).

3.2.2 E 3rd Street to E 11th Street

3.2.2.1 General

We explored subsurface conditions in the S River Street right-of-way (ROW) between E 3rd Street and E 11th Street by drilling four borings (C-1 through C-4) to a depth of 6.5 feet bgs.

3.2.2.2 Existing Pavement

We encountered a composite pavement section (AC over PCC) at borings C-1 through C-4. We encountered 1 to 3 inches of AC overlying 5.5 to 6.5 inches of PCC in the S River Street ROW between E 3rd Street and E 11th Street. Aggregate base was not encountered beneath the composite pavement section in our explorations. A summary of observed pavement thicknesses is presented in Table 1.

Table 1. Observed Pavement Thicknesses

Location	Lane	Wheel Track ^{1,2,3}	AC Thickness (inches)	PCC Thickness (inches)	Aggregate Base Thickness (inches)
C-1	Southbound	BWT	1.0	6.5	0.0
C-2	Northbound	BWT	2.5	5.5	0.0
C-3	Southbound	IWT	2.5	6.0	0.0
C-4	Northbound	IWT	3.0	6.5	0.0

Notes:

1. BWT = Between Wheel Track
2. IWT = Inside Wheel Track
3. OWT = Outside Wheel Track

Although we did not specifically explore the trench patch areas and AC thickness in S River Street ROW, we anticipate that PCC is not present in trench patch areas in S River Street ROW between E 3rd Street and E 11th Street. In addition, based on correspondence with the design team, we understand AC used to patch trenches on the northbound and southbound sides of S River Street is on the order of 3 inches thick and underlain by compacted crushed rock used for trench backfill.

3.2.2.3 Undocumented Fill

We encountered undocumented fill beneath the composite pavement section in one boring (C-2) to a depth of 2.5 feet bgs. Undocumented fill we observed generally consists of silt with sand. Standard Penetration Test (SPT) blow counts indicate the undocumented silt fill is soft, and sand fill is loose to dense. Laboratory testing of one sample of the undocumented fill indicates a moisture content of 20 percent at the time of our explorations.

3.2.2.4 Silt

Silt soil was encountered beneath the composite pavement section and undocumented fill in borings C-1 through C-4 in the S River Street ROW between E 3rd Street and E 11th Street. The silt soil has trace to minor amounts of sand. The silt soil was encountered to the maximum depth explored of 6.5 feet bgs.

SPT blow counts indicate the silt soil is generally medium-stiff to stiff. Laboratory testing of selected samples of the silt and sand soil indicates moisture contents between 41 and 42 percent at the time of our explorations.

3.2.2.5 Groundwater

Groundwater was not encountered in borings C-1 through C-4 in the S River Street ROW between E 3rd Street and E 11th Street.

3.2.3 South of E 11th Street

3.2.3.1 General

We explored subsurface conditions in the area south of E 11th Street by drilling one boring (C-5) to a depth of 31.5 feet bgs. In addition, we conducted infiltration testing in boring C-5 at a depth of 5 feet bgs. Boring C-5 was conducted in the lawn area directly west of S River Street and south of E 11th Street.

3.2.3.2 Root Zone

We encountered a 3-inch-thick root zone at the surface of boring C-5.

3.2.3.3 Undocumented Fill

Beneath the root zone, we encountered undocumented fill in boring C-5 to a depth of 0.8 feet. The undocumented fill generally consists of silt underlain by gravel with silt and sand.

3.2.3.4 Silt

Silt soil was encountered beneath the undocumented fill in boring C-5 in the lawn area directly west of S River Street and south of E 11th Street. The silt soil has varying amounts of sand and was encountered to the maximum depth explored of 31.5 feet bgs.

SPT blow counts indicate the silt soil is generally soft to stiff. Laboratory testing of selected samples of the silt and sand soil indicates moisture contents between 25 and 39 percent at the time of our explorations.

3.2.3.5 Groundwater

Groundwater was encountered in boring C-5 at a depth of 17 feet bgs in the lawn area directly west of S River Street and south of E 11th Street. Based on our experience in the area and our review of well logs in the area, groundwater appears to be present at depths greater than 10 feet bgs in the general site vicinity. The depth to groundwater will fluctuate in response to seasonal changes, prolonged rainfall, changes in surface topography, and other factors not observed in this study.

3.3 DCP TESTING

We conducted DCP testing in general accordance with ASTM D6951 to estimate the resilient modulus of the subgrade at the locations for proposed parking lots. We used the least-squares regression to determine the slopes of the DCP curves and the equation from the Oregon Department of Transportation (ODOT) Pavement Design Guide to estimate the moduli using a correction factor of 0.35 for estimating the subgrade resilient moduli. Our estimates of subgrade resilient modulus at each test location are presented in Table 2.

Table 2. DCP Test Results

Location	Estimated Subgrade Resilient Modulus (psi) ¹
C-1	5,700
C-2	3,270
C-3	4,370
C-4	4,420

Note:

¹ psi = pounds per square inch

3.4 GPR TESTING

Central performed van-mounted GPR testing on August 22, 2025. The purpose of the GPR testing was to estimate AC pavement thickness variations. GPR test data lines are collected directly under the GPR antenna and do not include pavement information outside of the GPR travel path. Accordingly, the test data does not represent transverse profile pavement sections. Additional GPR testing with more longitudinal testing lines would be required to provide pavement profile variations and, as such, the pavement thickness data should be used for information purposes only.

Testing was completed in the OWT in the northbound and southbound lanes. Details of our test program and figures showing GPR-estimated AC surface thickness are presented in Appendix C, Figure C-1.

GPR results show varying composite pavement thicknesses, generally ranging between 4 and 8 inches. Thicknesses observed in the GPR data generally agrees with section thicknesses observed in our pavement core measurements and our assumptions regarding thickness of AC in trench patch areas. As anticipated, AC on the order of 2- to 4-inches-thick is present in the larger existing trench patch repair areas.

3.5 INFILTRATION TESTING

Infiltration testing was conducted to evaluate feasibility of on-site stormwater disposal. Infiltration testing was conducted in boring C-5 at a depth of 5 feet bgs. Our general procedure included embedding a 4-inch-diameter PVC pipe to the infiltration depth and performing infiltration testing using the encased falling head method. After testing, a representative soil sample was collected below the infiltration test depths for particle-size analysis.

Table 3 summarizes the infiltration test results and fines content determination. Exploration logs and results of fines content analysis are presented in Appendix A.

Table 3. Infiltration Testing Results

Exploration	Depth (feet bgs)	Soil Description	Fines Content ¹ (percent)	Observed Infiltration Rate ² (inches per hour)
C-5	5	SILT (ML) minor sand	88	0.3

Notes:

¹ Fines content – material passing the U.S. Standard No. 200 sieve.

² In-situ infiltration rate observed in the field; not to be used for design without consideration of the discussion below.

Infiltration rates shown in Table 3 represent a field-measured infiltration rate. The rate summarized for boring C-5 indicates low infiltration (drop in water levels) during the testing period. Field measurements are limited to the accuracy of equipment employed to conduct the test and represent relatively short-term infiltration rates. Factors of safety (correction factors) have not been applied for the type of infiltration system being considered, or for variability that may be present across large areas in the on-site soil. From a geotechnical perspective, we recommend a correction factor of at least 2 be applied to the field infiltration values to account for potential soil variability with depth and location within the area tested.

In addition, as part of stormwater management design, the design engineer should determine and apply appropriate remaining correction factor values to account for repeated wetting and drying that occurs in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, the potential for siltation and biofouling, etc., as well as system design correction factors for overflow or redundancy and base and facility size.

Actual depths, lateral extent, and estimated infiltration rates can vary from the values presented above. Field testing/confirmation during construction is often required in large or long systems or other situations where soil conditions may vary within the area where the system is constructed. Results of this field testing might necessitate that infiltration locations be modified to achieve the design infiltration rate.

Successful design and implementation of stormwater infiltration systems and whether a system is suitable for development depends on several site-specific factors. Stormwater infiltration systems are generally best suited for sites having sandy or gravelly soil with saturated hydraulic conductivities greater than 2 inches per hour. Sites with silty or clayey soil, such as the project site, are generally not well-suited for long-term stormwater infiltration or as a sole method of stormwater infiltration. Soils that have fine-grained matrices such as those on this site are susceptible to volumetric change and softening during wetting and drying cycles. Fine-grained soils also have large variations in the magnitude of infiltration rates because of bedding and stratification that occurs during alluvial deposition and often have thin layers of less permeable or impermeable soil within a larger layer.

Groundwater was observed at a depth of 17 feet bgs in boring C-5 at the time of exploration. Stormwater infiltration facilities without adequate separation to groundwater can result in groundwater mounding. A hydraulic gradient that reaches the level of water in the soil immediately drops to zero and local groundwater will rise and mound, which slows the infiltration rate dramatically, resulting in overflows or system flooding (failure). Groundwater mounding can also negatively impact structures, slopes, or other areas adjacent to the stormwater infiltration facility.

We recommend that infiltration systems include an overflow that is connected to a suitable discharge point such that the infiltration system is not the sole source or stormwater management for the site. Also, infiltration systems can cause localized high groundwater levels and should not be located near retaining walls or other embedded structures such as basements unless these are specifically designed to account for the resulting hydrostatic pressure. Infiltration systems should not be located on sloping ground unless approved by a geotechnical engineer, and stormwater should not be infiltrated at a location that allows for lateral flow toward a slope face, such as a mounded water condition, or too close to a slope face that could cause instability of the slope.

Considering the fine-grained soil conditions at the site, on-site infiltration will likely be minimal during wet times of the year. Consequently, we do not recommend stormwater infiltration be used as the exclusive method of stormwater management and, at a minimum, recommend an overflow be a part of stormwater system design if infiltration facilities are implemented.

4.0 CONSTRUCTION RECOMMENDATIONS

4.1 SITE PREPARATION

Site preparation along the proposed alignment may require demolition of structural elements beyond the paved surface. If required, demolition should include complete removal of existing structures and buried foundations, vaults, or blocks (if present) within the alignment and within 5 feet of areas to receive new pavement and utilities. Underground vaults, tanks, wells, and other subsurface structures should be removed in areas of new improvements. Abandoned utility lines should be completely removed or grouted full if left in place. Voids resulting from removal of existing structures should be backfilled with compacted structural fill, as discussed in the "Structural Fill" section. The bottoms of such excavations should be excavated to expose a firm subgrade before filling and their sides sloped at a minimum of 1.5 horizontal to 1 vertical (1.5H:1V) to allow for more uniform compaction at the edges of the excavations. Material generated during demolition should be transported off site for disposal or stockpiled in areas designated by the owner.

4.2 SUBGRADE PREPARATION AND EVALUATION

Upon completion of site preparation activities, exposed subgrades should be proof-rolled with a fully loaded dump truck or similar heavy rubber-tired construction equipment where space allows, to identify soft, loose, or unsuitable areas. Probing may be used for evaluating smaller areas or where proof-rolling is not practical. Proof-rolling and probing should be conducted prior to placing structural fill and should be performed by a representative of Central who will evaluate the suitability of the subgrade and identify areas of yielding that are indicative of soft or loose soil. We anticipate that there will be areas where soft or otherwise unsuitable soil is identified during subgrade evaluation. Unsuitable soil should be replaced by imported granular material or should be improved by scarifying and compacting the material in accordance with the “Structural Fill and Backfill” and “Fill Placement and Compaction” sections of this report.

As discussed in the “Subgrade Protection and Wet-Weather Considerations” section of this report, the fine-grained soil at the surface can be sensitive to small changes in moisture content and will be difficult, or not possible, to compact adequately during wet weather. While tilling and compacting the subgrade is the economical method for subgrade improvement, it will likely only be possible during extended dry periods and following moisture-conditioning of the soil.

During wet weather, or when the exposed subgrade is wet or unsuitable for proof-rolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations, probing and compaction testing should be performed by a member of Central staff. Wet soil that has been disturbed due to site preparation activities or soft or loose zones identified during probing should be removed and replaced with compacted structural fill.

4.3 SUBGRADE PROTECTION AND WET-WEATHER CONSIDERATIONS

Upper site soils along each road section are considered to be highly susceptible to moisture. We have provided the following recommendations if wet-weather construction practices are necessary based on conditions observed at the time of construction. The contractor should be responsible for protecting the subgrade during construction. Accordingly, earthwork planning should include considerations for minimizing subgrade disturbance. We have provided the following recommendations if wet-weather construction is considered:

- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work areas.
- Earthwork activities should not take place during periods of heavy precipitation.
- The site soils should not be left in a disturbed or uncompacted state and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation may reduce the extent to which these soils become wet or unstable.
- Construction activities should be scheduled so that the length of time that soil is left exposed to moisture is reduced to the extent practicable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are not susceptible to wet-weather disturbance, such as areas that are adequately surfaced with working pad materials or asphalt.
- When on-site, moisture sensitive soils are wet of optimum, they are easily disturbed and will not provide adequate support for construction traffic nor for the proposed development.

- The aggregate base thicknesses described in the “Pavement Design” sections of this report are intended to support post-construction design traffic loads. The design aggregate base thicknesses will likely not support repeated heavy construction traffic during site construction or during pavement construction if present. A thicker aggregate base section may be required to support construction traffic if necessary.
- Additional considerations for subgrade preparation and evaluation should be considered as discussed in the “Subgrade Preparation and Evaluation” section.
- In the event of wet-weather construction, we recommend that the aggregate base thickness be increased by a minimum of 6 inches.

4.4 EXCAVATION

4.4.1 General

Excavations should be possible with conventional earthmoving equipment. Groundwater was encountered in one exploration at the site, boring C-5 at a depth of 17 feet bgs. It is possible that perched groundwater will be present at shallower depths, especially during periods of persistent wet weather. If groundwater is encountered in excavations, sloughing and caving may occur. Accordingly, the contractor should expect to flatten excavations or shore excavations as described below where water is encountered. In addition to safety considerations, caving and loss of ground will increase backfill volumes and can result in damage to adjacent structures or utilities.

4.4.2 Excavation and Shoring

Temporary excavation sidewalls should stand vertically to a depth of approximately 4 feet, provided groundwater seepage is not observed in the sidewalls. Open excavation techniques may be used to excavate trenches with depths between 4 and 8 feet, provided the walls of the excavation are cut at a slope of 1.5H:1V and groundwater seepage is not present. At this inclination, the slopes may ravel and require some ongoing repair. Excavations should be flattened if excessive sloughing or raveling occurs. In lieu of large and open cuts, approved temporary shoring may be used for excavation support. A wide variety of shoring and dewatering systems are available. We recommend the contractor be responsible for selecting the appropriate shoring and dewatering systems.

If box shoring is used, it should be understood that box shoring is a safety feature used to protect workers and does not prevent caving. If the excavations are left open for extended periods of time, caving of the sidewalls will likely occur. The presence of caved material will limit the ability to properly backfill and compact the trenches. The contractor should be prepared to fill voids between the box shoring and the sidewalls of the trenches with sand or gravel before caving occurs.

If shoring is used, we recommend that the type and design of the shoring system be the responsibility of the contractor, who is in the best position to choose a system that fits the overall plan of operation.

4.4.3 Temporary Dewatering

Groundwater was encountered in one exploration at the site, boring C-5 at a depth of 17 feet bgs, and may be encountered at shallower depths during the wet winter months or after periods of extended rainfall. Perched water may be encountered during periods of persistent wet weather and in deeper utility excavations. The contractor should be made responsible for temporary drainage of surface water and perched water as necessary to prevent standing water and/or erosion at the working surface.

If perched groundwater is present, dewatering may be required to maintain dry working conditions. Pumping from sumps will likely be effective in removing water resulting from seepage. These recommendations are for

guidance only. Dewatering of excavations is the sole responsibility of the contractor, as the contractor is in the best position to select these systems based on their means and methods.

4.4.4 Safety

All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) requirements and regulations of the state, county, and local jurisdiction. While this report describes certain approaches to excavation and dewatering, the contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety, and providing shoring (as required) to protect personnel and adjacent structural elements.

4.5 STRUCTURAL FILL

4.5.1 General

All structural fill should have a maximum particle size of 4 inches and should be free of organic or unsuitable material, and should be readily compactible to densities recommended for structural fill as described below. If larger-than-standard equipment is used for compaction, maximum particle size may be increased to 6 inches if approved by the geotechnical engineer of record (GER) and provided adequate compaction can be applied where fill is proposed for use. Structural fill should only be placed over subgrade that has been prepared in conformance with the "Site Preparation" section. A brief characterization of the acceptable materials and recommendations for their use as structural fill are provided below.

4.5.2 On-Site Soil

Use of on-site soil as structural fill is subject to approval by local City or County jurisdictions and the GER to be in conformance with recommendations provided in this report. Upper on-site fine-grained (silt) soil will be sensitive to small changes in moisture content and will be difficult, if not impossible, to compact adequately during periods of wet weather. Laboratory testing indicates that the moisture content of the on-site fine-grained soil is generally greater than the anticipated optimum moisture content required for satisfactory compaction and that the fine-grained soil will require drying in order to be used as structural fill. In general, we do not recommend that the on-site soil be used as structural fill in the area of new utilities.

4.5.3 Imported Granular Material

Imported granular material used as structural fill should be pit- or quarry-run rock, crushed rock, or crushed gravel and sand and should meet the specifications provided in 2024 Oregon Standard Specifications for Construction (OSSC) 00330.14 (Selected Granular Backfill) or OSSC 00330.15 (Selected Stone Backfill). Imported granular material should also be angular, should be fairly well graded between coarse and fine material, should have less than 6 percent by dry weight passing the U.S. Standard No. 200 sieve, and should have at least two mechanically fractured faces.

4.5.4 Trench Backfill

Trench backfill placed beneath, adjacent to, and for at least 12 inches above utility lines (i.e., the pipe zone) should consist of well-graded granular material with a maximum particle size of 1½ inches and less than 10 percent by dry weight passing the U.S. Standard No. 200 sieve and should meet the specifications provided in OSSC 00405.13 (Pipe Zone Material). Within roadway alignments, the remainder of the trench backfill up to the subgrade elevation should consist of well-graded granular material with a maximum particle size of 2½ inches and less than 10 percent by dry weight passing the U.S. Standard No. 200 sieve and should meet the specifications provided in OSSC 00405.14 (Trench Backfill; Class B, C, or D).

Outside of structural improvement areas (e.g., roadway alignments or building pads), trench backfill placed above the pipe zone may consist of general fill material that is free of organic material and material over 6 inches in diameter and meets the specifications provided in OSSC 00405.14 (Trench Backfill; Class A, B, C, or D).

4.6 PAVEMENT MATERIALS

The contractor should provide a submittal for each geotechnical construction material prior to the start of construction of pavement sections. Each submittal should include test information necessary to evaluate how the material's properties comply with the properties that were recommended or specified for the project. The geotechnical engineer and other appropriate members of the design team should review each submittal.

4.6.1 Asphalt Concrete Pavement

The AC should be Level 3, ½ inch, dense asphalt-concrete pavement (ACP) according to OSSC 00744 (Asphalt Concrete Pavement) and compacted to 92 percent of the theoretical maximum density of the mix, as determined by AASHTO T209. The minimum and maximum lift thicknesses are 2 and 3.5 inches, respectively, for ½-inch ACP. Asphalt binder should be performance graded and conform to PG 64-22 or better. The binder grade should be adjusted depending on the aggregate gradation and amount of recycled asphalt pavement and/or recycled asphalt shingles in the contractor's mix design controls.

4.6.2 Aggregate Base

Imported granular material used as aggregate base should be clean, crushed rock or crushed gravel and sand that are well graded. The aggregate base should meet the gradation defined in OSSC section 00640 (Aggregate Base and Shoulders), with the exception that the aggregate should have less than 6 percent by dry weight passing the U.S. Standard No. 200 sieve, a maximum particle size of 1½ inches and have a minimum of 75 percent fractured particles according to AASHTO TP-61. The base aggregate should be compacted based on the ODOT specification.

4.6.3 Stabilization Aggregate

Stabilization aggregate should consist of quarry-run rock, crushed rock, or crushed gravel and sand, and should meet the requirements as described in OSSC Section 00330.14 (Selected Granular Backfill) and OSSC 00330.15 (Selected Stone Backfill) with a maximum particle size of 6 inches, less than 5 percent by dry weight passing the U.S. Standard No. 4 sieve and have a minimum of 75 percent fractured particles according to AASHTO TP-61. The material should be free of organic matter and other deleterious material. Stabilization aggregate should be placed over a geotextile fabric in one lift and compacted to a firm condition.

4.6.4 Subgrade Geotextile

The subgrade geotextile should conform to OSSC section 00350 (Geosynthetic Installation). A minimum initial aggregate base lift of 6-inches is required over geotextiles.

4.7 FILL PLACEMENT AND COMPACTION

Structural fill should be compacted at moisture contents that are within 3 percent of the optimum moisture content as determined by ASTM International Test Method D1557 (Modified Proctor). The optimum moisture content varies with gradation and should be evaluated during construction. Fill material that is not near the optimum moisture content should be moisture-conditioned prior to compaction.

Fill and backfill material should be placed in uniform, horizontal lifts and compacted with appropriate equipment. The appropriate lift thickness will vary depending on the material and compaction equipment used. Fill material should be compacted in accordance with Table 4. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet these criteria. However, in no case should the loose lift thickness exceed 18 inches. Initial lift thickness over pipe may need to be thicker than 18 inches to prevent damage to the pipe during the application of compactive effort.

A representative from Central should evaluate the compaction of every 2 vertical feet (or less) and 500 cubic yards of fill material placed. Compaction should be evaluated by compaction testing unless other methods are

proposed for oversized materials and are approved by Central during construction. These other methods typically involve procedural placement and compaction specifications together with verification requirements such as proof-rolling.

Table 4. Compaction Criteria

Fill Type	Compaction Requirements		
	Percent Maximum Dry Density Determined by ASTM Test Method D 1557 at $\pm 3\%$ of Optimum Moisture		
	0 to 2 Feet Below Subgrade	> 2 Feet Below Subgrade	Pipe Zone
Fine-grained soil (non-expansive)	92	92	-----
Imported Granular, maximum particle size < 1½ inch	95	95	-----
Imported Granular, maximum particle size 1½ inch to 6 inches (3-inch-maximum under-building footprints)	n/a (proof-roll)	n/a (proof-roll)	-----
Retaining Wall Backfill*	95	95	-----
Nonstructural Zones	90	90	90
Trench Backfill**	95	92	90

Note:

* For general fill walls. Walls with reinforcement inclusions may have different requirements to be determined by the wall designer depending on the wall type selected. Measures should be taken to prevent over-compaction of the backfill immediately behind retaining walls. We recommend placing the zone of backfill located within 2 feet of the wall in lifts not exceeding about 6 inches in loose thickness and compacting this zone with hand-operated equipment such as a vibrating plate compactor or a jumping jack. Backfill behind walls should not be completed until concrete strength is sufficiently developed as directed by the wall designer.

** Trench backfill placed in nonstructural zones may utilize a reduced compaction requirement of 90 percent.

5.0 PAVEMENT DESIGN

5.1 GENERAL

It is our opinion that the site is generally suitable for proposed road improvements, and project construction is feasible from a geotechnical engineering standpoint, provided the recommendations in this report are included in design and construction. Our recommendations are based on subsurface explorations, DCP testing, and GPR testing and analyses. Our specific recommendations should be incorporated into design and implemented during construction of the proposed project.

Standards used for pavement design are listed below:

- ODOT Pavement Design Guide (2019) – (ODOT Guide)
- Guide for Design of Pavement Structures, American Association of State Highway and Transportation Officials (AASHTO 1993) – (AASHTO Guide)
- City of Newberg Public Works Design and Construction Standards, Section 5, Streets (2015) – (Newberg PWDS)
- City of Newberg Transportation System Plan (2016) – (Newberg TSP)

We recommend that the contractor provide pavement construction material submittals at least 1 week prior to construction. Submittals should include pertinent test information required to evaluate general compliance with the project plans and specifications. Central should be involved in the submittal review process for materials used in pavement construction and/or rehabilitation. Pavement materials should follow the recommendations in the “Pavement Materials” portion of this report. In addition, our pavement recommendations assume that construction will include thorough and adequate substrate preparation prior to construction and between paving lifts including cleaning, preparing, and tack coat application.

Based on conversation with the design team, we understand that construction at the former mill site area may take place in the future. However, we understand that the City has preliminarily designated construction routes on other streets and S River Street has not been designated as a construction route. Accordingly, we have not included construction traffic loading in our analysis and pavement design.

5.2 REHABILITATION

Based on our explorations and understanding of the existing conditions in the S River Street ROW between E 3rd Street and E 11th Street, 1 to 3 inches of AC overlying 5.5 to 6.5 inches of PCC is present in the S River Street ROW between E 3rd Street and E 11th Street. Due to the presence of PCC in the existing pavement section, it is our opinion that pavement rehabilitation options such as grind and inlay is likely not a feasible method of roadway improvement due to challenges anticipated during grinding. As such, we understand that pavement rehabilitation is not considered as a design alternative by City of Newberg and the design team.

5.3 NEW PAVEMENT

In our opinion, due to the presence of PCC in the existing pavement section, we recommend the existing pavement be removed from the improvement area to its full depth (AC and PCC), and new pavement be constructed in S River Street ROW between E 3rd Street and E 11th Street. New pavement should be constructed on subgrade or structural fill that was prepared in accordance with the “Site Preparation” and “Structural Fill and Backfill” sections.

Our pavement recommendations were evaluated using the AASHTO 1993 pavement design method in accordance with Newberg PWDS guidance. We understand City of Newberg classifies S River Street as a Major Collector per the Newberg TSP; however, we do not have specific information on the frequency and type of vehicles expected at the site. Based on our experience, we evaluated several speculative traffic scenarios for our pavement analysis. The results are summarized in Table 5. The design team can select the appropriate pavement section based on the final design traffic loading and jurisdictional requirements. If these traffic scenarios and the following design input values are incorrect, please contact Central for revised pavement recommendations.

Our pavement recommendations are based on the following assumptions:

- Design value of 300,000 equivalent single-axle loads (ESALs).
- Resilient moduli of 20,000 psi and 4,400 psi were assumed for the aggregate base and native subgrade, respectively.
- Initial and terminal serviceability indices are 4.2 and 2.5, respectively.
- Reliability of 85 percent and standard deviation of 0.45.
- Structural coefficients of 0.40 and 0.10 for the asphalt and aggregate, respectively.
- Drainage coefficients of 1.0 and 0.8 for the asphalt and aggregate, respectively.
- A 20 year design life with no growth.
- Subgrade geotextile is placed between subgrade and aggregate base layer.

Our pavement design recommendations are summarized in Table 5. All recommended sections are suitable to support emergency vehicles on an intermittent basis such as an 80,000-pound fire truck and assumed design loads for Major Collector roadway traffic loading as noted in Table 5. As discussed in previous sections of this report, recommended sections are not intended to support regular, repeated heavy construction traffic. Construction traffic should not be allowed on newly installed AC or prepared subgrade without use of haul roads as recommended. Central can be contacted to provide alternate pavement sections to account for anticipated construction traffic.

Table 5. Recommended AC Pavement Sections

Street Classification	Assumed Traffic Loading (Design Life ESALs) ¹	Minimum Asphalt Thickness (inches)	Minimum Aggregate Base Thickness (inches) ²
Major Collector ²	300,000	4.5	15.0
	500,000	5.0	16.0
	700,000	6.0	16.0

Notes:

1. ESAL = equivalent single-axle load
2. City of Newberg Standard Drawing 527 specifies a minimum AC and aggregate base thickness of 4 and 12 inches, respectively, for Collector streets. Thicknesses presented in table exceed those calculated based on design traffic load and design parameters noted above using the AASHTO design methodology.

All recommended thicknesses are intended to be the minimum acceptable. Our design is based on the assumption that construction will be completed during an extended period of dry weather. If construction is considered during extended periods of wet weather in the region, we recommend that the aggregate base thickness be increased by 6 inches and wet weather recommendations provided in this report be implemented.

6.0 OBSERVATION OF CONSTRUCTION

Satisfactory earthwork and pavement performance depend to a large degree on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to determine whether subsurface conditions change significantly from those anticipated.

7.0 LIMITATIONS OF REPORT

We have prepared this report for the exclusive use of City of Newberg, Keller, and their authorized parties for the project specifically identified in this report only. The report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, Central should be notified for review of the recommendations of this report, and revision of such if necessary.

This report is not intended for use by others, and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

We recommend that Central be retained to review the plans and specifications and verify that our recommendations have been interpreted and implemented as intended. Sufficient geotechnical monitoring, testing, and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated.

Within the limitations of scope, schedule, and budget, the analysis, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology in this area at the time the report was prepared.

8.0 SIGNATURES

Thank you for the opportunity to work with you on this project. Please call if we can provide further discussion or explanation of the information presented in this report.

Central Engineering Services



Expires: 12/31/2026

Zane M. Rogers, PE
Project Engineer

A handwritten signature in blue ink, appearing to read "Julio C. Vela", written over a horizontal line.

Julio C. Vela, PhD, PE, GE
Principal Engineer

9.0 REFERENCES

City of Newberg. 2007. Engineering Department Standard Drawing 527.

City of Newberg. 2015. Public Works Design and Construction Standards. August 2015.

City of Newberg. 2016. City of Newberg Transportation System Plan. Adopted December 19, 2016.

International Code Council. 2024. 2024 International Building Code.

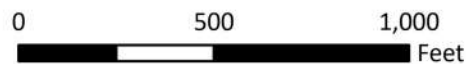
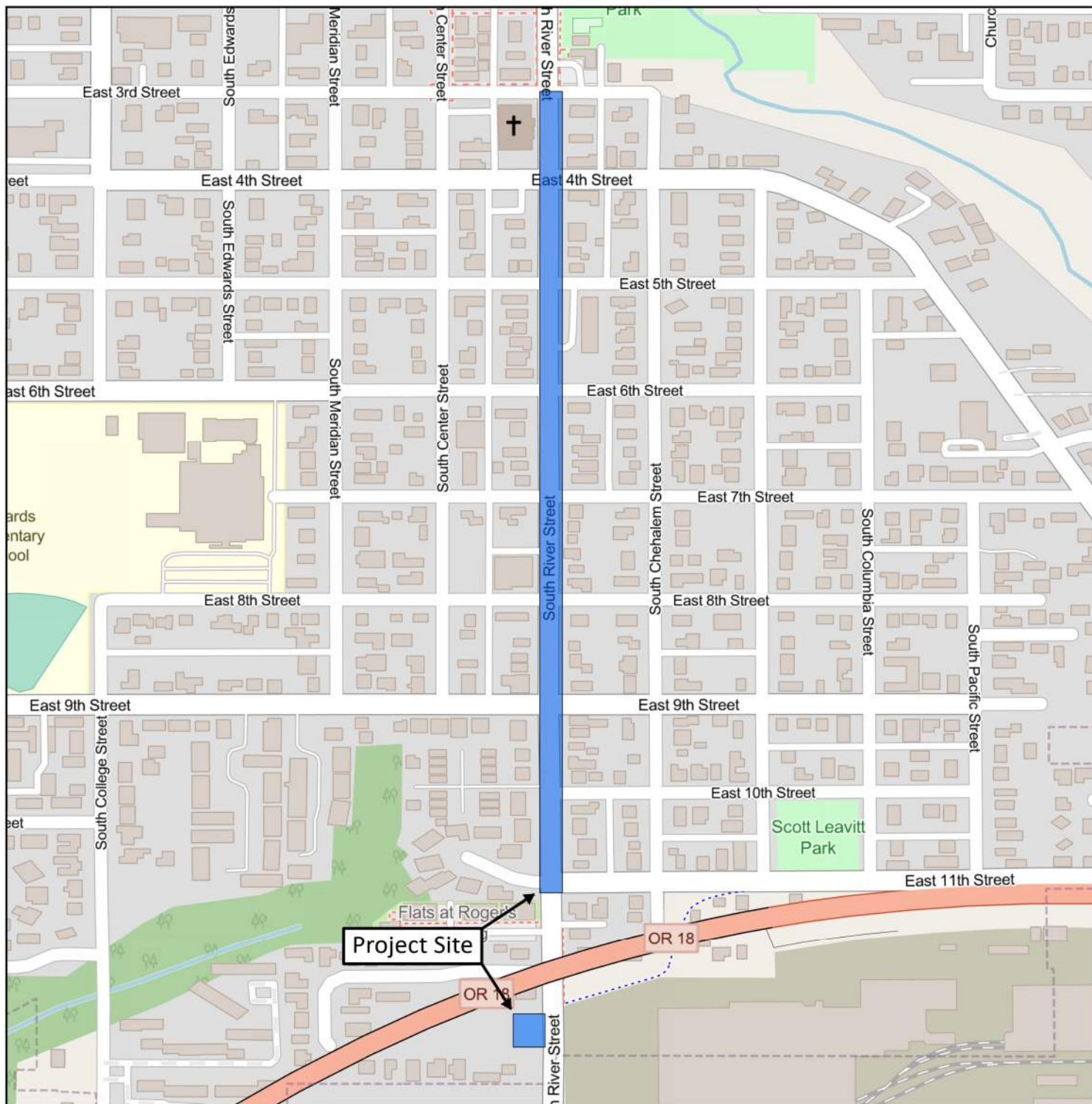
International Code Council. 2025. 2025 Oregon Structural Specialty Code.

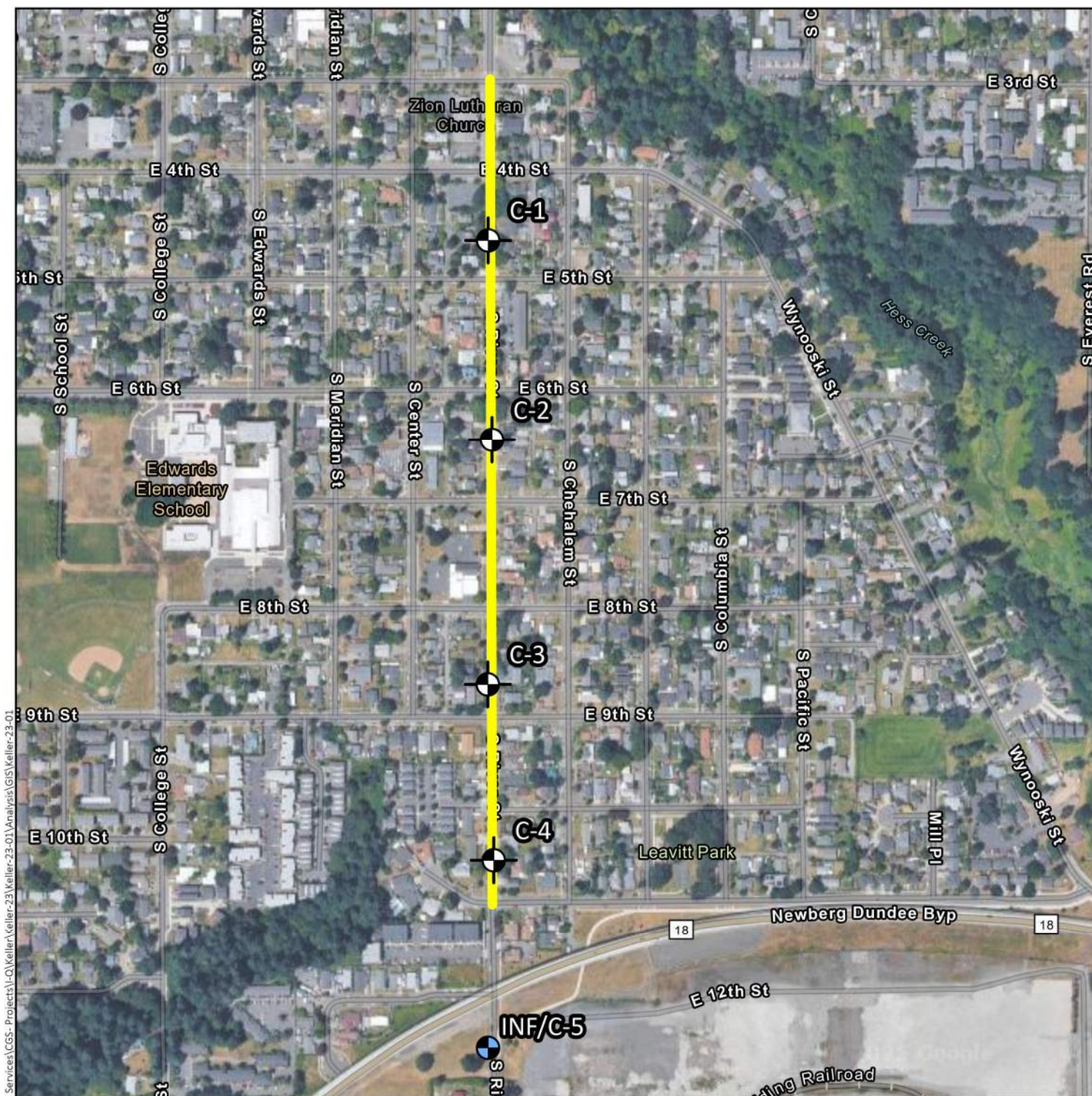
Occupational Safety and Health Administration (OSHA). Technical Manual Section V: Chapter 2, Excavations: Hazard Recognition in Trenching and Shoring: http://www.osha.gov/dts/osta/otm/otm_v/otm_v_2.html.

Oregon Department of Transportation. 2024. 2024 Oregon Standard Specifications for Construction.



Figures





Legend

Approximate Location and Exploration Designation

-  Pavement Boring
-  Boring and Infiltration Test
-  Improvement Area

0 500 1,000 1,500
Feet



Keller-23-01

Site Plan



Figure 2



APPENDIX A: Field Explorations and Laboratory Testing

APPENDIX A: Field Explorations and Laboratory Testing

FIELD EXPLORATIONS

Subsurface soil and groundwater conditions at the proposed project were explored on August 22, 2025 by completing 5 borings (C-1 through C-5) at the approximate locations shown on Figure 2. Borings C-1 through C-5 explorations were completed to depths between 6.5 and 31.5 feet bgs. The explorations were drilled using a trailer mounted drill rig and 4-inch diameter solid stem auger. The explorations were completed by Dan J. Fischer Excavating, Inc. of Forest Grove, Oregon

The explorations were continuously monitored by qualified staff from our office who maintained detailed logs of subsurface explorations, visually classified the soil encountered, and obtained representative soil samples from the borings. Representative soil samples were obtained from each exploration at the depths indicated on the exploration logs.

Recovered soil samples from the explorations were visually classified in the field in general accordance with ASTM D2488 and the classification chart listed in Key to Exploration Logs. Logs of the explorations are presented in this Appendix. The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials, or their characteristics change, although these changes may actually be gradual.

LABORATORY TESTING

Soil samples obtained from the explorations were visually classified in the field and in our laboratory using the USCS and ASTM classification methods. ASTM Test Method D2488 was used to visually classify the soil samples, while ASTM D2487 was used to classify the soils based on laboratory test results.

MOISTURE CONTENT

The natural moisture content of select soil samples was determined in general accordance with ASTM D2216. The natural moisture content is a ratio of the weight of the water to dry soil in a test sample and is expressed as a percentage. The test results are presented in the respective boring logs in this Appendix.

PARTICLE-SIZE ANALYSIS

Selected samples were “washed” through the U.S. No. 200 mesh sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to estimate the fines content for analysis purposes. The tests were conducted in accordance with ASTM D1140 and/or C117, and the results are shown on the exploration logs in this Appendix at the respective sample depths.



Relative Density - Coarse-Grained Soil						GEOTECHNICAL TESTING EXPLANATIONS	
Term	SPT (140-lb Hammer)*		D&M Sampler (140-lb Hammer)*		D&M Sampler (300-lb Hammer)*	ATT	Atterberg Limits
Very-loose	0-4		0-11		0-4	CBR	California Bearing Ratio
Loose	4-10		11-26		4-10	CON	Consolidation
Medium-dense	10-30		26-74		10-30	DD	Dry Density
Dense	30-50		74-120		30-47	DS	Direct Shear
Very-dense	>50		>120		>47	HYD	Hydrometer Gradation
Consistency - Fine-Grained Soil						LL	Liquid Limit
Term	SPT (140-lb Hammer)*	Sampler (140-lb Hammer)*	Sampler (300-lb Hammer)*	Pocket Pen (tsf)	Torvane (tsf)	PL	Plastic Limit
						PI	Plasticity Index
						MC	Moisture Content
						MD	Moisture-Density
Very-soft	0-2	0-3	0-2	<0.25	<0.13	NP	Non-Plastic
Soft	2-4	3-6	2-5	0.25-0.5	0.13-0.25	OC	Organic Content
Medium-stiff	4-8	6-12	5-9	0.5-1	0.25-0.5	P	Pushed Sample
Stiff	8-15	12-25	9-19	1.0-2.0	0.5-1.0	PP	Pocket Penetrometer
Very-stiff	15-30	25-65	19-31	2.0-4.0	1.0-2.0	Passing No.200	Percent Passing U.S. Std. No.200 Sieve
Hard	>30	>65	>31	>4.0	>2.0	RES	Resilient Modulus
SPT N-value correlation based off ASTM D1586						SIEV	Sieve Gradation
Unified Soil Classification System (USCS)						TOR	Torvane
USCS Symbols		Graph		Typical Descriptions		UC	Unconfined Compressive Strength
GP				Poorly graded GRAVEL, <5% fines		VS	Vane Shear
GP-GM/GP-GC				Poorly graded GRAVEL w/ silt/clay, 5 to 12% fines			
GM				silty GRAVEL, over 12% fines			
GC				clayey GRAVEL, over 12% fines			
GW				well graded GRAVEL, <5% fines			
SP				poorly graded SAND, <5% fines			
SP-SM/SP-SC				poorly graded SAND w/ silt/clay, 5 to 12% fines			
SM				silty SAND, over 12% fines			
SC				clayey SAND, over 12% fines			
SW				well graded SAND, <5% fines			
ML				SILT, low plasticity			
MH				SILT, high plasticity			
CL				CLAY, low plasticity			
CH				CLAY, high plasticity			
OL				ORGANIC SILT, low plasticity			
OH				ORGANIC CLAY, medium to high plasticity			
PT				PEAT			
ADDITIONAL CONSTITUENTS							
Silt/Clay in:				Sand/Gravel in:			
Percent*	Fine-Grained	Coarse-Grained	Percent*	Fine-Grained	Coarse-Grained	AC	 ASPHALT CONCRETE CEMENT CONCRETE CRUSHED ROCK SOD/FOREST DUFF FILL
<5	trace	trace	<5	trace	trace	CC	
5-12	minor	with	5-15	minor	minor	CR	
>12	some	silty/clayey	15-30	with	with	SOD	
			>30	sandy/gravelly	with	FILL	
SYMBOL	SAMPLER DESCRIPTIONS				SYMBOL	SAMPLER DESCRIPTIONS	
	Location of grab sample (GS)					Location of sample collected using Standard Penetration Test with recovery (SS)	
	No Recovery					Location of sample collected using Shelby tube/Geoprobe sample with recovery (ST)	
	Location of rock coring interval (RC)					Location of sample collected using Dames & Moore sampler or pushed with recovery (D&M)	

CGS BORING TEMPLATE 021125 - CGS BORING LOG.GDT - 9/19/25 10:46 - C:\USERS\CGSUSER\CENTRAL GEOTECHNICAL SERVICES\CGS - PROJECTS\I-Q\KELLER\KELLER-23\KELLER-23-01\FIELD LAB\FIELD EXPLORATION\FIELD FORMS AND LOGS\KELLER-23-01.GINT.GI



Central Engineering Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-23-01

BORING LOG C-1
PAGE 1 OF 1

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling:---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/REMARKS
0							
		0.1 ASPHALT CONCRETE (1.0 inches) 0.6 PORTLAND CEMENT CONCRETE (6.5 inches) Medium-stiff to stiff, brown with black mottles, SILT (ML), minor sand, moist, sand is fine					
1							
2							
3			SPT S-1	12	32	8	
4							
5							
6		Grades to stiff, sandy at 5 feet bgs.	SPT S-2	18		9	
6.5							

Completed at 6.5 feet bgs.
No groundwater observed.
SPTs completed with two wraps around a cathead.

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: SB, BWT
Equipment: Trailer Mounted Drill	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates:	
	Lat: Long:	

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Project No:
Keller-23-01

BORING LOG C-2
PAGE 1 OF 1

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling:---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/REMARKS
0							
		0.1 ASPHALT CONCRETE (2.5 inches)					
		0.7 PORTLAND CEMENT CONCRETE (5.5 inches)					
1		Soft, brown with orange mottles, SILT with sand (ML), trace gravel, moist, sand is fine (FILL)					
2			SPT S-1	18	20	3	
		2.5					
3		Medium-stiff to stiff, light brown to brown, SILT (ML), minor sand, moist, sand is fine	SPT S-2	18	42	8	
4							
5							
6		Grades to stiff at 5 feet bgs.	SPT S-3	18		10	
		6.5					

Completed at 6.5 feet bgs.
No groundwater observed.
SPTs completed with two wraps around a cathead.

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: NB, BWT
Equipment: Trailer Mounted Drill	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates:	
	Lat: Long:	

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Project No:
Keller-23-01

BORING LOG C-3
PAGE 1 OF 1

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling:---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/REMARKS
0							
		0.2 ASPHALT CONCRETE (2.5 inches) 0.7 PORTLAND CEMENT CONCRETE (6.0 inches)					
1		Medium-stiff, brown to gray with orange mottles, SILT (ML), trace sand, moist					
2			SPT S-1	12	31	7	
3		Grades to stiff, sandy at 2.5 feet bgs.	SPT S-2	18		12	
4							
5		Grades to medium-stiff at 5 feet bgs.	SPT S-3	18	34	7	
6							
6.5							

Completed at 6.5 feet bgs.
No groundwater observed.
SPTs completed with two wraps around a cathead.

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: SB, IWT
Equipment: Trailer Mounted Drill	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates:	
	Lat: Long:	

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Project No:
Keller-23-01

BORING LOG C-4
PAGE 1 OF 1

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling:---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/REMARKS
0							
		0.3 ASPHALT CONCRETE (3.0 inches)					
		PORTLAND CEMENT CONCRETE (6.5 inches)					
0.8							
1		Medium-stiff, gray to brown, SILT (ML), minor sand, trace gravel, moist, sand is fine					
			SPT S-1	18	31	6	
2							
		Grades to stiff, no gravel at 2.5 feet bgs.					
3			SPT S-2	18	36	11	
4							
5							
		Grades to medium-stiff at 5 feet bgs.					
6			SPT S-3	18		6	
6.5							

Completed at 6.5 feet bgs.
No groundwater observed.
SPTs completed with two wraps around a cathead.

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: NB, IWT
Equipment: Trailer Mounted Drill Rig Number: NA	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates: Lat: Long:	

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Project No:
Keller-23-01

INFILTRATION LOG INF/C-5

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling:---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: 17.00 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/REMARKS
0							
0.3		Medium-stiff, gray to dark brown, SILT (ML), trace sand, moist					
0.8		(3-inch thick root zone) (FILL)					
1		Medium-dense, gray, GRAVEL with silt and sand (GP-GM), moist, gravel is subangular, sand is fine to coarse (FILL)					
2		Stiff, brown with black mottles, SILT (ML), trace sand, moist					
3			SPT S-1	18	25	9	
4							
5		Grades to medium-stiff, minor fine sand at 5 feet bgs.	SPT S-2	18	36	7	Passing No. 200 = 88%
6							
7							
8		Grades to brown to light-gray, sandy at 7.5 feet bgs.	SPT S-3	18		7	
9							
10							
11		Grades to lens of sand at 10 feet bgs.	SPT S-4	18	39	5	
12							
13							
14							
15							

(Continued Next Page)

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: Grass lot
Equipment: Trailer Mounted Drill Rig Number: NA	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates: Lat: Long:	

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Central Engineering Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-23-01

INFILTRATION LOG INF/C-5

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation:
Project: River Street Improvements	Date Completed: 8/25/25	▽ Groundwater at time of drilling: ---
Location: S River St, Newberg, OR		▼ Groundwater at end of drilling: 17.00 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
15							
16		Grades to soft at 15 feet bgs	SPT S-5	18		3	
17							
18							
19							
20		Grades to gray at 20 feet bgs.	SPT S-6	18	39	3	
21							
22							
23							
24							
25		Grades to soft to medium-stiff at 25 feet bgs.	SPT S-7	18		4	
26							
27							
28							
29							
30		(Continued Next Page)					

Operator: Dan J. Fischer Excavating	Logged By: Nabin B.	Remarks: Grass lot
Equipment: Trailer Mounted Drill Rig Number: NA	Checked By: Ruslan P.	
Drilling Method: 4.5" Core / 4 3/8" Auger	Approximate Location Coordinates:	
	Lat: Long:	

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Project No:
Keller-23-01

INFILTRATION LOG INF/C-5
PAGE 3 OF 3

Client: Keller Associates, Inc	Date Started: 8/25/25	Approximate Ground Elevation: ▽ Groundwater at time of drilling:--- ▼ Groundwater at end of drilling: 17.00 ft
Project: River Street Improvements	Date Completed: 8/25/25	
Location: S River St, Newberg, OR		

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30							
31		Grades to soft at 15 feet bgs	SPT S-8	18	33	7	

Completed at 31.5 feet bgs.
Groundwater encountered at 17 feet bgs.
SPTs completed with two wraps around a cathead.

Operator: Dan J. Fischer Excavating Equipment: Trailer Mounted Drill Rig Number: NA Drilling Method: 4.5" Core / 4 3/8" Auger	Logged By: Nabin B. Checked By: Ruslan P.	Remarks: Grass lot
	Approximate Location Coordinates: Lat: Long:	



APPENDIX B: Pavement Core Photographs



Boring C-1 Core Location



Boring C-1 Pavement Core



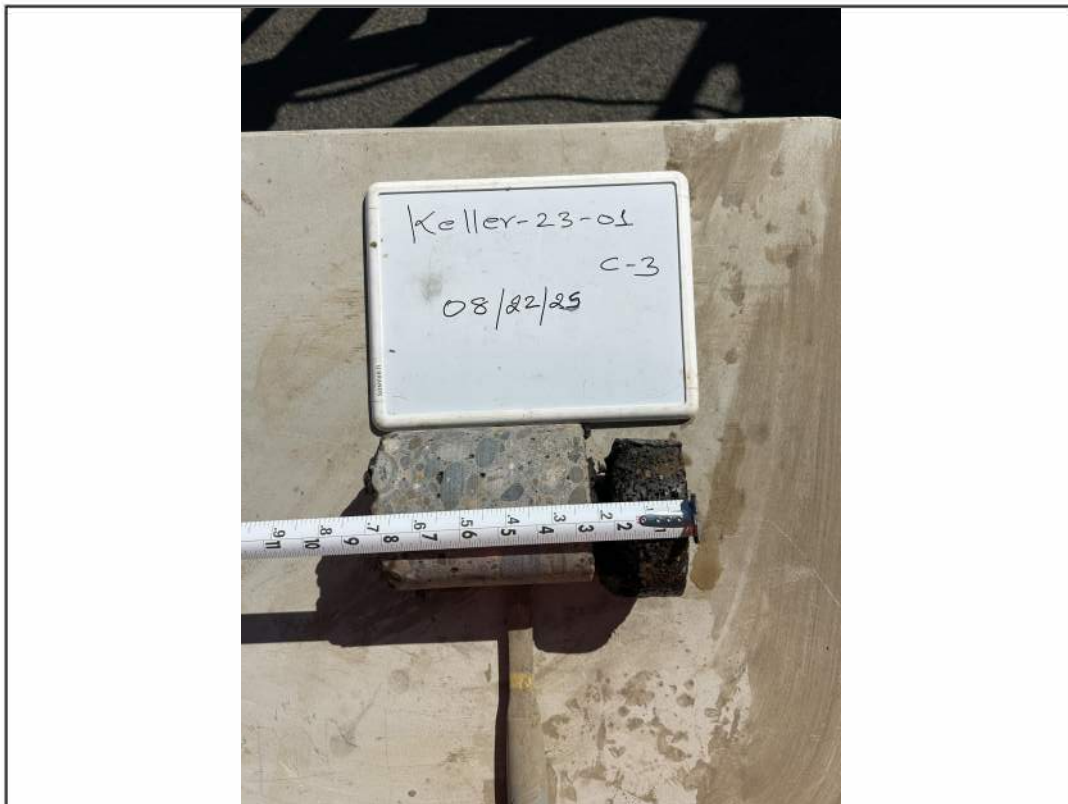
Boring C-2 Core Location



Boring C-2 Pavement Core



Boring C-3 Core Location



Boring C-3 Pavement Core



Boring C-4 Core Location



Boring C-4 Pavement Core



APPENDIX C: Ground-Penetrating Radar Testing

APPENDIX C: Ground-Penetrating Radar Testing

GPR TESTING

We completed GPR testing with van-mounted testing equipment for the purposes of determining the variability of the pavement surfacing thickness on August 22, 2025. We completed GPR testing in both directions with the antenna centered over the OWT of the inside and outside travel lanes, as applicable.

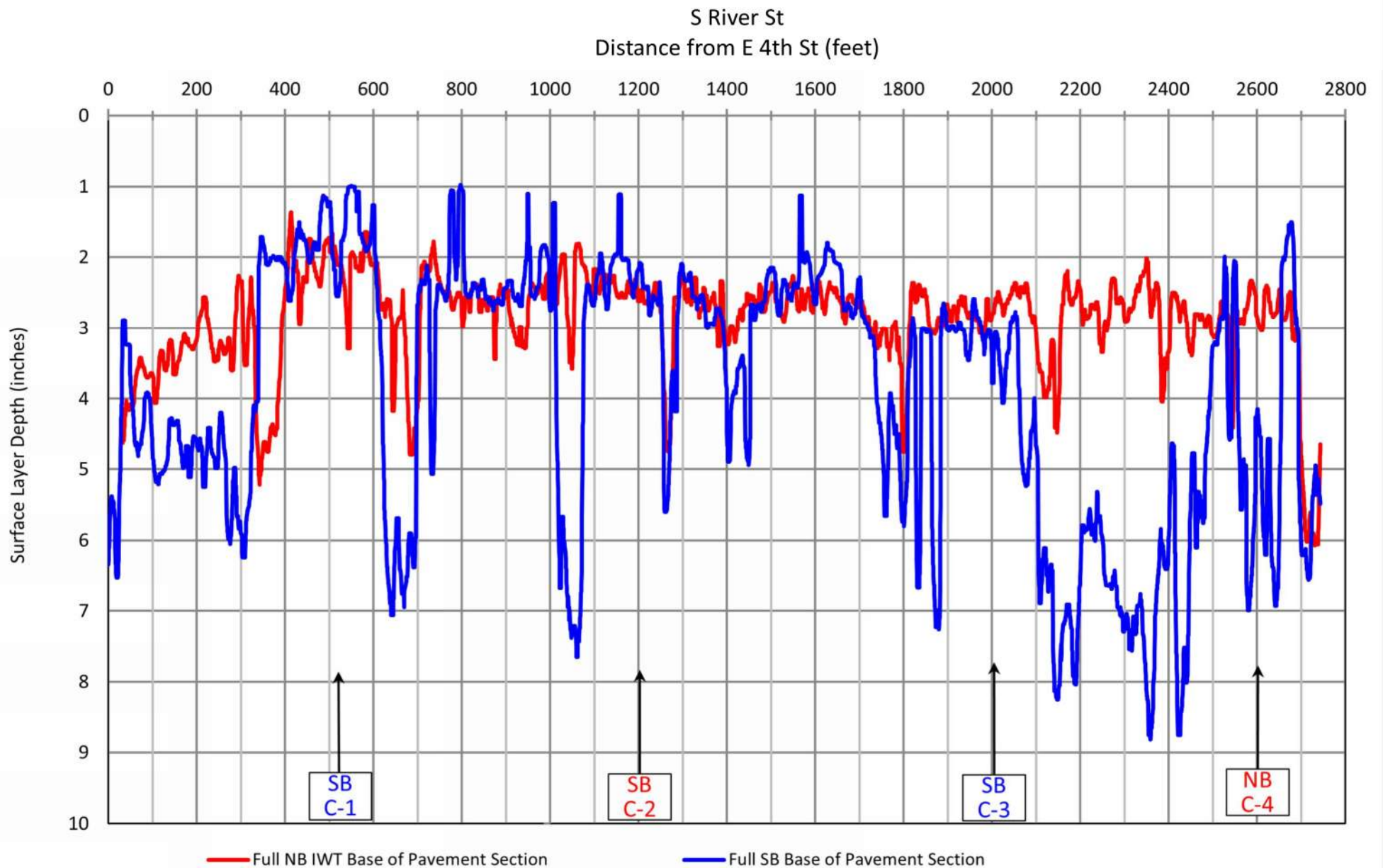
EQUIPMENT

We completed van-mounted GPR testing using our 2-GHz GPR horn antenna mounted on the front of the van. The road survey equipment included a Model 42000S (2-GHz) horn antenna and a SIR-30 control unit manufactured by GSSI from Nashua, New Hampshire. Real-time data location was collected using a Geode GNS3S GPS unit and a wheel mounted Distance Measuring Instrument (DMI) from GSSI. Data acquisition was collected using a GSSI SIR-30 computer software program running on a laptop computer. Prior to data acquisition, a horn calibration test was performed on the 2-GHz antenna to check for proper function and to account for local atmospheric and environmental conditions. Van-mounted GPR testing was completed at a rate of two scans per foot while travelling at approximately posted road speeds.

GPR DATA INTERPRETATION

Post-processing of the GPR data was completed using the RADAN (Version 7) computer software program produced by GSSI. The GPR uses a high-frequency electromagnetic pulse to reflect signals back from subsurface materials of varying electrical properties. The signal return time is dependent on the conductivity and dielectric properties of the subsurface material. Changes in subsurface material properties or pavement layer contacts can result in reflections in the subsurface. The returned signals of the survey section are recorded in units of depth (feet) and time (nanoseconds) and compiled into a depth profile using the RADAN software. The vertical distances were translated to inches for the interpretation profiles. The horizontal distances of the profiles were recorded in feet.

Interpretation of the GPR profile data was completed by identifying continuous, uniform sets of strong reflections observed in the profile. In general, we compared the GPR reflection profiles to nearby core data and identified areas of distress. A summary of our GPR interpretation is presented in graphical format in this appendix with results listed by direction (Figure C-1). GPR interpretation includes AC layer depth from the top of the pavement surface. Distances are identified as feet from the intersection or centerline of the intersecting road as identified on the graphs.



CENTRAL
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GPR Results - S River Street

Keller-23-01

September, 2025

S River Street Improvements

Figure C-1