Prepared for:

City of Nampa

Nampa, Idaho

Roadway Materials Report
Revision No. 1
Northside Boulevard and Karcher Road Intersection Improvements

Project No. A023(731);
Key No. KN23731

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GeoEngineers File No. 9468-021-00
September 18, 2025

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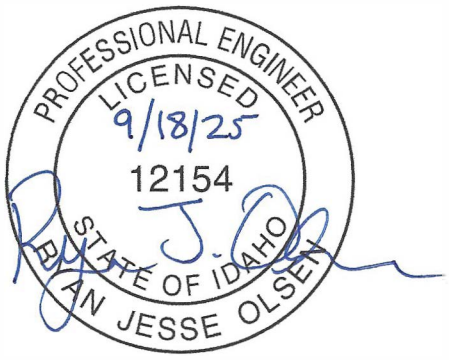

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240.01 Introduction

This roadway materials report presents the results of our geotechnical engineering services in support of the City of Nampa Northside and Karcher Roundabout Intersection Improvements project in Nampa, Idaho. The project includes:

- Reconfiguration of the Northside and Karcher intersection from a signalized intersection to a multi-lane roundabout,
- Containment wall for the Amalgamated Sugar tanks near the intersection,
- Roadway improvements to portions of Northside Boulevard and Karcher Road in all travel directions,
- Storm drainage features consisting of infiltration facilities.

The containment wall geotechnical design recommendations have been provided in a separate geotechnical engineering report, which was submitted draft to the client on April 18, 2025.

240.01.01 EXISTING INTERSECTION CONDITIONS

Northside Boulevard and Karcher Road have a north-south and east-west alignment, respectively, near the intersection. The project roadway alignments are relatively flat. At the project vicinity, the north approach of Northside Boulevard and the east approach of Karcher Road consist of two-lane, hot-mix asphalt (HMA) paved roads with gravel shoulders and an additional turning lane near the intersection. The south approach of Northside Boulevard and the west approach of Karcher Road consist of four- to five-lane, HMA paved roads with dedicated left and right turning lanes near the intersection.

The intersection is signalized and consists of HMA paved road and concrete islands to separate the right turning lanes of the south, west and north approaches. Curb and gutter are located on the north and south sides of Karcher Road on the west approach. There are underground utilities buried in the shoulders and the roadway, and overhead power lines are adjacent both roadways.

Abutting the roadways are agricultural fields and an employee parking lot for Amalgamated Sugar to the south of Karcher Road. The Amalgamated Sugar plant and storage tanks are north of Karcher Road. The storage tanks are encircled with a containment berm that varies in height and width. A segment of the containment berm alignment runs parallel to Northside Boulevard for about 550 feet north of the intersection and Karcher Road for about 650 feet east from the intersection. The containment berm is separated from the roadway shoulder by a fence. Vegetation along the project alignment includes agricultural fields, landscaped grass and occasional trees.

240.01.02 PROPOSED INTERSECTION IMPROVEMENTS

Based on our conversations with Parametrix, we understand that the proposed grades for Northside Boulevard, Karcher Road and the roundabout intersection will generally match the approximate existing project grades. Therefore, we understand new embankments will be relatively minor, and we assume maximum embankment and cut heights (if any) will be about 5 feet or less.

The approaches of Northside Boulevard that are north and south of the intersection will have two travel lanes in each direction and a concrete island will be added to separate the travel lanes in each direction near the roundabout. The project limits on the northern leg of Northside Boulevard abuts a future Economic Development Administration (EDA) project which is currently envisioned to have two travel lanes in each direction.

The approaches of Karcher Road will have two travel lanes in each direction and a concrete island will be added to separate the travel lanes in each direction near the roundabout. On the east, the two travel lanes in each direction will merge back to one travel lane in each direction approximately 400 feet east of the roundabout.

In general, Karcher Road and Northside Boulevard will be widened to accommodate vehicular traffic entering the roundabout, will be paved with HMA and will have concrete curb and gutter shoulders with 8- to 10-foot-wide concrete pathways near the roundabout to accommodate pedestrian and bicycle traffic.

The Northside and Karcher roundabout will have two travel lanes. The roundabout travel lanes will have an out-to-out diameter of approximately 180 feet. The center of the roundabout will consist of a circular island with a gore area and mountable truck apron for off-tracking of large tractor trailer vehicles. The Northside and Karcher roundabout will be paved with HMA.

Based on our understanding of proposed improvements, our conversations with Parametrix and the results of the exploration program, full-depth reconstruction of Northside Boulevard, Karcher Road and the roundabout intersection will occur. Rehabilitation of existing pavements is not anticipated.

240.02 Vicinity Sketch

The approximate project limits are presented in Figure 1, Vicinity and Geology Map. The project site, relative to surrounding physical features, is shown in Figure 2, Site Plan.

240.03 Soils Profile/Pavement Condition Survey

As the project includes reconstruction of the pavement on approximately the existing alignment, a soils profile of the project alignment and a pavement condition survey using the LTPP Distress Identification Manual were not included in our scope of services for this project.

240.04 Soil Report Summary

A Soil Report Summary was not prepared for this project. It is our understanding that the proposed roadway profile will be approximately at the same elevation as the existing roadway profile. Fill materials will come from approved Contractor-furnished sources.

240.04.01 REGIONAL GEOLOGY

The site is in the central portion of the Western Snake River Plain. The Western Snake River Plain is a northwest-trending structural basin bounded by high angle faults of Miocene and younger age. The basin separates the mountains of the Idaho Batholith on the northeast and the Owyhee Range on the southwest. Sedimentary deposits shed from adjacent uplands, as well as basaltic and andesitic flows and ash deposits associated with regional volcanic activity, fill the basin to depths exceeding 4,000 feet (Othberg 1994). Subsequent episodic erosion and deposition formed the Boise River Terraces by rapid fluvial downcutting followed by coarse gravel deposition, which may correlate to repeated periods of glacial climates. Fine-grained sediments deposited by the Bonneville Flood, known as slack-water deposits and wind-blown deposits, loess, mantle the terrace surfaces.

The majority of the project site is mapped as Gravel of Sunrise Terrace, which is part of a sequence of terraces of the ancestral Boise River, and portions of the site are mapped as Basalt Flows of Indian Creek. The Sunrise Terrace gravel deposits consist of sandy pebble and cobble gravel and is considered the third terrace above the existing floodplain. The Sunrise Terrace deposit thickness is about 44 feet and is often overlain with three to six feet of loess deposits consisting of silty fine sand, silt and clay. The Basalt Flows of Indian Creek deposits consist of a tan massive silt, light brown stratified clay, silt and sand and basalt that is 20 to 50 feet deep.

A geologic map of the area is presented in Figure 1.

240.04.02 SUBSURFACE EXPLORATIONS

Seven borings (GEI-B1-24 through GEI-B6-24 and GEI-P1-24) were completed to depths ranging from about 11½ to 21½ feet as part of our subsurface exploration program. Four boreholes (GEI-B1-24 through GEI-B4-24) were advanced through the pavement and base course to perform DCP testing and to measure the asphalt, base course and subbase thicknesses. We installed a piezometer in the completed borehole of GEI-P1-24 to measure the static groundwater levels. We installed two transducers, one in GEI-P1-24 and another in an existing monitoring well labeled “A-R” which is owned and operated by Amalgamated Sugar, to record the groundwater levels over time.

Three test pits (GEI-TP1-24 through GEI-TP3-24) were completed as part of our subsurface exploration program and were advanced to the assumed depth of the bottom of the proposed stormwater chamber receiving layer. After excavating to a depth ranging from about 7½ to 8 feet below the ground surface (bgs), we performed test pit infiltration testing at the bottom of the test pits.

The exploration coordinates and elevations were determined from survey data provided by Ardurra. The coordinates are based on the project coordinate system using combined scale factor (CSF) = 1.00014955836 and the vertical datum is North American Vertical Datum of 1988 (NAVD88). Exploration locations are shown in Figure 2. Logs of borings and logs of test pits are presented in Figures A-1 through A-11 in Appendix A.

240.04.03 LABORATORY TESTING

Soil samples collected from the explorations were transported to GeoEngineers’ office for further examination and laboratory testing to verify field classifications and to evaluate engineering properties of the soil. Selected samples were tested to determine moisture content, grain-size distribution, fines content, Idaho R-value (Idaho T-8), Atterberg limits, soil compaction, soil resistivity, soil pH, soluble chlorides and soluble sulfates.

A summary of laboratory test results can be found on Table B-1 in Appendix B. Sieve analyses results are presented in Figures B-1 and B-2; a plasticity chart is presented in Figure B-3; Idaho R-value results are presented in Figures B-4 and B-5; and Modified Proctor soil compaction results are presented in Figures B-6 and B-7. The laboratory test results are also summarized on the exploration logs in Appendix A.

240.04.04 EXISTING PAVEMENT SECTION

We measured the pavement section thicknesses in explorations GEI-B1-24 through GEI-B4-24. A summary of the approximate pavement section thicknesses measured in each exploration along Northside Boulevard and Karcher Road are summarized in Table 1.

TABLE 1. SUMMARY OF PAVEMENT SECTION OBSERVED IN BORINGS

BORING ID	HMA THICKNESS (IN.)	BASE COURSE THICKNESS (IN.)	SUBBASE THICKNESS (IN.)	TOTAL THICKNESS (IN.)
GEI-B1-24	8	6	5	19
GEI-B2-24	7	12	8	27
GEI-B3-24	7	23	Not Observed	30
GEI-B4-24	7	4	Not Observed	11

Note: in. = inches

The encountered base generally consisted of sand with silt and gravel (Unified Soil Classification System [USCS]: SW-SM), and the encountered subbase generally consisted of a sand with gravel and variable amounts of silt (USCS: SP-SM, SM).

240.04.05 SUBSURFACE CONDITIONS

Based on our explorations, the subsurface conditions underlying the pavement section generally consist of embankment fill and native soil deposits. We also observed basalt rock in GEI-P1-24. Descriptions of these deposits are provided below.

240.04.05.01 Fill

Fill material was encountered below the pavement section aggregates boring GEI-B1-24 and within borings GEI-B5-24 and GEI-B6-24. The fill thickness was observed to be between about ½ and 2 feet and generally consisted of a loose to medium dense silty sand with variable amounts of gravel (SM). Laboratory testing of a sample from the fill from boring GEI-B1-24 indicated a moisture content of 11 percent and a fines content (material passing the No. 200 sieve) of 41 percent.

240.04.05.02 Native Soil Deposits

Native soil deposits observed in the borings were similar with the mapped surficial geology. For our purposes, we describe the native soil deposits as upper clay and silt deposit, and interbedded sand and silt deposit. Transitions between the two native soil deposits are gradual; thicknesses and depths should be considered approximate.

UPPER CLAY AND SILT

The near surface native soils in explorations GEI-B2-24 through GEI-B6-24, GEI-P1-24 and GEI-TP1-24 through GEI-TP3-24 generally consisted of clay and silt with observed thicknesses of between about 2 to 7 feet. These were generally classified as medium stiff to hard lean to fat clay or silt with variable amounts of sand (CL, CH, ML). Laboratory testing of samples from the upper clay and silt indicate the following: moisture contents ranging from 13 to 31 percent, fines content ranging from 54 to 84 percent, Atterberg Limits ranging from a liquid limit of 39 to 52 and a plasticity index of 17 to 29 and Idaho R-value ranging from 19 to 20. We performed two modified proctor compaction tests that indicate a maximum dry density ranging from 108 to 112 pounds per cubic foot (pcf) and an optimum moisture content ranging from 16 to 18 percent. We observed pocket penetrometer readings from the sidewalls of the test pits with the average of our readings ranging from about 0.88 to greater than 4.5 tons per square foot (tsf).

INTERBEDDED SAND AND SILT

We encountered native soils that were interbedded and had variable fines contents underlying the upper clay and silt in all explorations. The interbedded sand and silt thickness extended to the bottom of each exploration, except boring GEI-P1-24. The interbedded sand and silt deposit consisted of loose to very dense sand with variable amounts of silt and gravel (SP, SP-SM, SM) and medium stiff to very stiff silt with variable amounts of sand (ML). Laboratory testing of samples from the interbedded sand and silt indicate moisture contents ranging from 15 to 39 percent, fines content ranging from 33 to 99 percent and an Atterberg Limit test result of non-plastic. We occasionally observed layers of weak to moderate cementation in some of the explorations within the interbedded sand and silt deposit.

240.04.05.03 Basalt Rock

We encountered basalt rock in the exploration GEI-P1-24 at a depth of about 16¾ feet bgs. We advanced to auger refusal at about 18 ft bgs and did not collect rock core.

240.05 Total Design Pavement Thickness

Pavement alternatives were discussed with the City of Nampa and the project team. A concrete pavement section was considered due to concerns about rutting and shoving under the high volume of commercial traffic at the intersection. We understand that a flexible pavement section is the City's preferred pavement type due to construction costs and to match the existing pavement type. As a result, information regarding a flexible pavement section is provided below.

240.05.01 SUBGRADE SOIL

Near surface native soils encountered in the explorations typically consist of silt, lean clay and fat clay. Two laboratory R-value tests were conducted on bulk samples obtained from boring GEI-B4-24 and GEI-TP2-24, which indicated R-values of 19 and 20, respectively. The results of the Idaho R-Value tests indicate moisture-sensitive behavior of the subgrade soils with significant reductions in R-value with changes in moisture of less than 1 percent.

Four DCP tests were conducted in borings GEI-B1-24 through GEI-B4-24 in the base, subbase and subgrade soils. An average resilient modulus was calculated from the DCP test results. The estimated average resilient modulus values for the subgrade soils in each boring ranged from about 6,200 to 14,200 pounds per square inch (psi). Results of the DCP tests are shown graphically in Figures C-1 through C-4 in Appendix C.

Based on the moisture-sensitive behavior indicated in the laboratory test results and our experience, we used a design value of 10 for the R-value to approximate the native subgrade soils for the project.

240.05.02 TRAFFIC

A Technical Memorandum summarizing traffic counts, growth rates and traffic forecasts for Northside Boulevard and Karcher Road dated December 20, 2024 and revised on January 13, 2025 was prepared by Parametrix. We developed a Traffic Index (TI) for the project using Section 510 of the ITD Materials Manual using the "Off-System Routes" method and the provided traffic data. We used the 2024 traffic count data and turning directions at the existing intersection to estimate the design lane traffic for the proposed roundabout configuration. We calculated a growth rate of two percent from the COMPASS model forecasts from 2022 to 2040. We applied the growth rate and approximated the traffic demand for the 2026 build year and the projected 2046 design year. Based on the traffic count by types of vehicles the commercial vehicles are classified as "Heavy." Using these parameters, we followed the procedures described in Section 510.02.05 of the ITD Materials Manual to estimate a traffic index of 12.5 for the project. Calculations for the TI are presented in Figure D-3 in Appendix D. Using the same procedure, we estimated the TI of 12.0 for the controlling approach to the intersection, which is the south leg.

240.05.03 FLEXIBLE PAVEMENT DESIGN PARAMETER SUMMARY

A summary of the design input parameters for flexible pavement evaluation using the Gravel Equivalency method is provided in Table 2 below. The Gravel Equivalency calculations are presented in Figure D-2 in Appendix D.

TABLE 2. FLEXIBLE PAVEMENT THICKNESS DESIGN INPUT PARAMETERS

DESIGN PARAMETER		DESIGN VALUE	NOTES
TI		12.5	ITD Figure 510.02.05.1
Climate Factor		1.0	ITD Figure 510.04.01.1
Aggregate Base R-value		80	Standard input parameter
Subbase R-value		60	Standard input parameter
Subgrade R-value		10	Idaho R-value
Substitution Ratios	New HMA Base Subbase	1.6 1.0 0.85	HMA Substitution ratio of 1.6 applicable to TI in range of 10 to 12.6. Used standard base and subbase substitution ratios.

240.05.04 FLEXIBLE PAVEMENT DESIGN THICKNESSES

As the TI estimated for the approaches was only slightly less than the estimated TI for the roundabout, to simplify the project bidding and construction, the recommended flexible pavement section should be used throughout the project, including the roundabout and roadway approaches to the roundabout. We used the FHWA online computer program LTPPBind to evaluate the binder grade of the asphalt and calculations are presented in Figure D-4. We determined the class of HMA using Table 240.25.03.1 in the ITD Materials Manual. We recommend a Type III (non-woven) subgrade separation geotextile per ITD Standard Specifications Section 718.07 be placed on top of the prepared subgrade.

Our flexible pavement section for full reconstruction of Northside Boulevard and Karcher Road project is presented in Table 3 below.

TABLE 3. NORTHSIDE BOULEVARD AND KARCHER ROAD FLEXIBLE PAVEMENT SECTION THICKNESS

ROADWAY	MINIMUM THICKNESS AND TYPE OF PAVEMENT[1]	MINIMUM THICKNESS AND TYPE OF BASE COURSE	MINIMUM THICKNESS AND TYPE OF SUBBASE[2]
Northside Boulevard and Karcher Road intersection approaches and roundabout	0.5 feet of SP-5, ½-inch mix, PG 76-28	1.0 foot of ¾-inch Type B Aggregate for Untreated Base	2.15 feet of 4-inch Aggregate for Granular Subbase

Notes:

[1] The HMA surfacing should be placed in two equal lifts.

[2] For construction, place a subgrade separation fabric Type III (non-woven) per ITD Section 718.07 on top of prepared subgrade prior to placement of pavement section materials.

240.06 Sub-Subgrading

No specific areas requiring sub-subgrading were identified for this project. However, depending on the moisture content of subgrade soil at the time of earthwork, sub-subgrading might be necessary to remove soil that is wet-of-optimum, and consequently soft or unstable. Soft or unsuitable soils encountered during construction should be repaired in accordance with Soft Spot Repair per Section 205 of the ITD Standard Specifications.

240.07 Grade Pointing

We anticipate grade pointing will not be necessary on this project.

240.08 Special Placement

No special placement is anticipated for this project.

240.09 Compaction

Class A compaction is required for this project.

240.10 Slope Design Summary

We recommend all permanent cut and fill slopes be designed with a maximum slope inclination of 3 feet horizontal to 1 foot vertical (3H:1V). We understand that the project will not include large permanent cuts or fills, which are assumed to be less than 5 feet in height.

240.11 Slope Design

As proposed cut and fill slopes will be relatively minor, special slope design measures are not anticipated for this project.

240.12 Embankment Foundation

New embankments to accommodate roadway widening are anticipated to be about 5 feet or less. Settlement under new embankment loads is expected to be about 1 inch or less.

240.13 Surface and Subsurface Water

240.13.01 SURFACE WATER

Surface water in the project limits generally consist of occasional flows generated by stormwater events. No streams or irrigation canals are located within the project limits.

240.13.02 SUBSURFACE WATER

Groundwater depths were recorded in the borings at the time of drilling and were also measured within the existing piezometer 'A-R' and measured within our piezometer GEI-P1-24. We observed groundwater in the borings at depths ranging from approximately 12 to 13½ feet bgs during drilling on November 14 and November 15, 2024.

Groundwater levels are currently being monitored using pressure transducers with data loggers installed within the existing piezometer 'A-R' and our piezometer GEI-P1-24 on November 14, 2024. Our field representative measured static ground water levels within the piezometers and downloaded the pressure transducer on January 17, 2025 and June 17, 2025. We observed and measured groundwater levels within the two piezometers that ranged from approximately 12 to 18 feet bgs during this time period. The groundwater plots are presented in Figures E-1 and E-2 in Appendix E. Additional groundwater measurements from the piezometers will be provided to the design team as the design progresses.

Depth to groundwater will vary depending on variables such as seasonal precipitation, land use and local irrigation practices. Groundwater levels should be expected to fluctuate.

If excavations extend below groundwater, temporary dewatering should be anticipated.

240.14 Drainage

Site grading should be designed so that precipitation and runoff will drain away from the pavement sections, embankments and structures. Precipitation runoff from the pavement surface should not be allowed to flow directly from the roadway to the cut or fill surfaces. All disturbed areas should be revegetated to reduce erosion from runoff. Drainage ditches and pipes should be designed to collect surface runoff and convey it away from cut or fill slopes so that the slope materials do not become saturated. We recommend drainage channels that transport water off fill slopes be concrete-lined or include geotextile and riprap protection and that runoff be discharged to prevent erosion at the toe of embankments. Riprap should be placed around drainage pipe outlets to reduce the potential for erosion. Riprap should be underlain by a Riprap/Erosion Control Geotextile per ITD Standard Specifications Section 718.06.

Where pipes do not daylight, pipe clean-outs should be installed to provide proper maintenance of the drainage pipes. Clean out should be spaced per ITD design guidance. Over time, drainage culverts and pipes can become obstructed with debris or soil. It is important that drainage pipes in cuts along the project alignment continue to function adequately over the design life of the roadway.

240.14.01 INFILTRATION TESTING

Groundwater levels should be considered when designing infiltration facilities such as seepage beds or stormwater ponds to limit the potential of groundwater mounding effects.

240.14.01.01 Overview

We completed infiltration testing within test pits GEI-TP1-24 through GEI-TP3-24. The testing was completed in general accordance with in-situ small-scale Pilot Infiltration Test (PIT) methods.

Photograph 1. GEI-TP1-24 infiltration set up.

The test pits were excavated to depths ranging from about 7½ to 8 feet bgs which is the approximate bottom of the infiltration stormwater chamber receiving layer. While excavating the test pits we observed approximately 2½ to 7 feet of native silt (ML) and clay (CL) overlying silty sand (SM).

The infiltration test pit dimensions provided an infiltration surface area at the bottom of the test pit of approximately 12 square feet.

A vertical measuring rod was placed on the floor of each test pit as a visual reference for monitoring water levels during testing. A piezoelectric pressure transducer was secured on the side of the measuring rod at the bottom of each test pit to provide water level records in 30-second to 1-minute intervals throughout the duration of the test. Water was introduced into the test pit using a hose and perforated bucket diffuser to reduce disturbance to the test pit bottom. Photograph 1 above shows our typical test setup.

After the test set up was complete, we presoaked the test pits by filling them with water for several hours. After presoaking the test pits, we completed a series of falling head infiltration tests. The test pits were filled to a head of water of about 14 inches and the water level was allowed to drop approximately 2 inches before the pit was refilled to the initial level again. At the conclusion of the falling head test series, we completed constant head infiltration tests by adding water to the test pit at a rate that maintained approximately 12 inches of water in the pit. The flow rate, recorded in gallons per minute, was calculated by recording the time to fill a 5-gallon bucket. The water was then shut off and the pit was allowed to drain for 1 hour and the water level was recorded. At the conclusion of the infiltration tests, the test pits were backfilled with the excavated soils and compacted by tamping with the excavator bucket.

240.14.01.02 Test Results

Infiltration rates were calculated based on the falling-head method trendlines and the flow rate required to maintain 12 inches of water in the test pit for 1 hour during the constant-head method. The results of the two infiltration test methods were compared. Our measured and recommended design infiltration rates for the tests are presented in Table 4.

TABLE 4. MEASURED AND CALCULATED INFILTRATION RATES

TEST PIT ID	TEST DEPTH (FT)	SOIL MATERIAL AT TEST DEPTH	MEASURED INFILTRATION RATE (INCHES/HOUR)	MAXIMUM DESIGN INFILTRATION RATE (INCHES/HOUR)
GEI-TP1-24	7.5	Silty sand (SM)	3.8	1.9
GEI-TP2-24	8	Silty sand (SM)	8.0	4.0
GEI-TP3-24	8	Silty sand (SM)	3.2	1.6

Note:

[1] The rates presented in this table are reflective of the test locations and depths only and assume a minimum of 3 feet of separation from the seasonal high groundwater elevation.

The field test results presented above represents the test at the specific depth and location indicated. We anticipate that infiltration rates could vary over short distances due to variations in fines content and soil type. The actual infiltration rates used in design should be determined by the designer by applying an appropriate factor of safety. A minimum factor of safety of two should be used, as indicated in the table above. A greater factor of safety may be warranted. The designer should select the design factor of safety that considers the severity of the impacts to the public if the system were to fail, the facility geometry, if the facility includes outlet structures, the degree of influent control to reduce siltation and bio-buildup, the quality and frequency of long-term maintenance, etc.

240.15 Geosynthetics

Based on the subsurface explorations and the preliminary roadway profile, we recommend a subgrade separation geotextile be placed below the pavement section. The subgrade separation geotextile should be placed directly on the prepared subgrade, prior to placement of the subbase layer. We recommend a nonwoven Type III subgrade separation geotextile per ITD Standard Specifications Section 718.07. Riprap, if any, should be underlain by a Riprap/Erosion Control Geotextile per ITD Standard Specifications Section 718.06.

240.16 Existing Roadway Materials

Existing HMA and underlying base/subbase materials may be reutilized as Granular Borrow, provided the project specification for use at the intended locations are met. The existing HMA pavement should not be recycled for use as Aggregate Base. If used in the subbase, the existing HMA should be ground to a maximum particle size of 3 inches, thoroughly mixed and evenly dispersed with imported Granular Subbase as required in Section 301 of the ITD Standard Specifications. We recommend that subbase contain no more than 50 percent (by weight) recycled asphalt. In addition, the use of recycled asphalt pavement for subbase should follow the governing environmental policy.

If intended for reuse, materials should be carefully excavated and stockpiled so that they are not contaminated with unsuitable materials.

240.17 Rock Subgrade

Basalt rock was encountered during drilling of GEI-P1-24 at a depth of approximately 16¾ feet below ground surface. Rock is not anticipated to be encountered at the pavement subgrade.

240.18 Topsoil

Topsoil was not encountered in our explorations performed within Northside Boulevard or Karcher Road. Topsoil was encountered in the test pits that were excavated for infiltration testing. Topsoil should be anticipated where widening extends over unimproved areas. Where encountered, the subgrade should be cleared of topsoil. Topsoil can be used on the cut slopes to reduce erosion and help establish vegetation. The requirements for topsoil are included in Section 213 of ITD Standard Specifications.

240.19 Pipe

Pipe culverts were not observed within the project boundaries, although some may exist that were not visible to us. Representative soil samples were collected near the proposed containment wall and the proposed stormwater pond for resistivity and pH testing. The chemical testing results can be used to select appropriate pipe materials. The laboratory results for pH and resistivity testing are presented in Table 5. Section 670 of the ITD Roadway Design Manual provides guidance for selecting the pipe materials based on pH, resistivity and bed load. We recommend that the drainage engineer evaluate and select appropriate pipe materials for corrosion protection. In addition to the materials described in the table below, silty sand was encountered in each exploration and an abrasive bed load is appropriate for these soils.

TABLE 5. PIPE CORROSION TESTING AND BED LOAD DATA

EXPLORATION	SAMPLE DEPTH (FEET)	SOIL CLASSIFICATION	PH	RESISTIVITY (OHM-CM)	BED LOAD
GEI-B6-24	0 – 1.5	Sandy silt (ML)	8.2	3,120	Non-abrasive
GEI-TP1-24	2.5 - 3.5	Lean clay with sand (CL)	7.9	769	Non-abrasive

240.20 Riprap

We anticipate that riprap may be required at drainage pipe outfalls, drainage facilities and other locations throughout the project. Riprap sizing will be recommended by others for this project. Approved Contractor-furnished sources will be used for all riprap on this project.

240.21 Staged Construction

Staged construction is not required for geotechnical purposes for roadway construction.

240.22 Pavement Data

240.22.01 PAVEMENT TYPE AND SURFACE SMOOTHNESS

A flexible pavement section is recommended for this project. Surface smoothness should be in accordance with Smoothness Schedule 1 for new construction.

240.22.02 TYPICAL SECTION

Figure D-1 in Appendix D presents the typical flexible pavement section for the project.

240.23 Base

Three-quarters inch (¾-inch) "Type B" aggregate for untreated base per ITD Standard Specifications Section703.04 is recommended for this project.

Aggregate for Granular Subbase per ITD Standard Specifications Section 703.11 is recommended for this project.

240.23.01 TACK FOR FLEXIBLE PAVEMENT

CSS-1H diluted emulsified asphalt for tack at 0.12 gallons per square yard (gal/SY) for new construction (diluted as specified in Section 401 of the ITD Standard Specifications), for estimating purposes only. CSS-1H diluted emulsified asphalt for tack at 0.18 gallons per square yard (gal/SY) on existing surfaces, for estimating purposes only.

240.24 Surface Treatment

Surface treatment of new paved sections is not recommended for this project.

240.25 Paving

240.25.01 CLASS OF HMA RECOMMENDATIONS

For estimating purposes only, use the following material properties:

Performance Graded (PG) 76-28, Class SP-5, Superpave HMA at 5.5 percent by weight of mix. Add anti-stripping additive to the asphalt cement at a rate of 0.5 percent by weight of the asphalt cement.

240.25.02 PERFORMANCE GRADE BINDER SELECTION

For performance grade binder, we recommend Performance Graded (PG) 76-28 asphalt binder. This asphalt binder for this project was evaluated considering the weather and traffic conditions at the project site using the LTPPBind software developed by the Federal Highway Administration (FHWA). We compared the software output to the binders that ITD has identified as locally available.

240.25.03 LIFT THICKNESS AND NOMINAL MAXIMUM AGGREGATE SIZE

We recommend HMA with a nominal maximum aggregate size of 0.5-inch be used on this project. The HMA should be placed in two approximately equal lifts.

240.25.04 PORTLAND CEMENT CONCRETE PAVEMENT

Portland cement concrete is not anticipated for this project.

240.25.05 REDUCED SHOULDER PAVEMENT THICKNESS

Reduced pavement thickness on shoulders is not anticipated for this project.

240.26 Seal

Seal coating is not anticipated for this project.

240.27 Dust Abatement

Dust abatement water quantities may be estimated at 400 MG (1 MG = 1,000 gallons), based on an assumed cumulative application of 4 inches of water over the roadway subgrade for the duration of the subgrade exposure, as shown in the formula below. We used a conceptual design figure to estimate a subgrade surface area for the intersection improvements of approximately 160,000 square feet. The dust abatement estimate should be updated once the subgrade areas and construction schedule have been better estimated during design.

Water Volume Estimation for Dust Abatement

$$Volume\ of\ Water = \left[160{,}000\ SF\ X\ \left(4\ in. X\ \frac{1\ ft.}{12\ in.}\right)\right] \times \left(7.48\ \frac{gal}{CF}\right) x \left(\frac{MG}{1{,}000 gal}\right) = 400\ MG$$

240.28 Aggregate Estimating Data

The unit weights in this estimating basis are based on area history and past project experience. This information is provided for use by the designer in developing reasonable project quantities. The actual quantities will vary dependent on the contractor-provided source, crushing operation and mix designs. The Contractor is responsible for determining actual unit weights based on the material produced and providing adequate materials for the project plus any losses due to stockpile operation, out of specification (rejected) materials or other wastes.

Half inch (½-inch) aggregate for Superpave HMA Pavement at 148 pcf, including 5.5 percent asphalt by weight of mix, with 0.5 percent anti-strip additive by weight of asphalt cement, estimated.

Three-quarters inch (¾-inch) “Type B” Crushed Aggregate for Untreated Base is estimated at 140 pcf, including 7 percent moisture content.

Subbase is estimated at 135 pcf, including 6 percent moisture content.

240.29 Aggregate Sources

Approved Contractor-furnished sources shall be used for all aggregates.

240.30 Special Provision Items

240.30.01 SPECIAL PROVISIONS

The following modifications of the Special Provision for 405 Superpave Hot Mix Asphalt 9/3/2025 should be made:

SUBSECTION 405.03.I – TABLE 405.03-4

Replace Table 405.03-4 with the following:

Table 405.03-4 – Acceptance Test Strip Tolerance

Quality Characteristic	Test Strip Mix Tolerance
VMA, %	703.05 minimum value-0.20
Laboratory Air Voids, %	4.0 ± 1.5
Asphalt Binder Content, %	JMF ± 0.40
Dust Proportion (DP)	Table 405.02-1 range ± 0.10
VFA, %	Table 405.02-1 range ± 5
No. 4 and larger sieves, %	JMF value ± 6.0 (a)
No. 8 to No. 30 sieves, %	JMF value ± 5.0 (a)
No. 50 to No. 100 sieves, %	JMF value ± 4.0 (a)
No. 200 and smaller sieves, %	JMF value ± 2.0 (a)
G_{mm}	JMF value at P_b ± 0.012 (d)
G_{se}	JMF value ± 0.012 (d)
Mainline Density, % Compaction	92.0 – 100.0
Rut Depth, mm (b)	10.0 mm maximum (e)
Stripping, passes (c)	12,500/15,000 (e)
Cracking Test, IDEAL-CT_{Index}	80 (index value) (d)

(a) The upper and lower specification limits are never allowed to be outside the control points specified in 703.05.
(b) Maximum depth after 12,500/15,000 passes.
(c) Minimum number of passes with no stripping inflection point.
(d) For information only.
(e) The Hamburg must have passing test results.

SUBSECTION 405.03.P

Insert the following after the 5th paragraph:

Before placing mixture against exposed longitudinal joints created by previous passes of the paver, cut back the exposed longitudinal joints on the recently laid asphalt 8 inches with a cutting wheel or pavement saw to expose a clean, sound, uniform vertical surface for the full depth of the course. Remove all cutback material and any laitance produced from cutting joints from the project. The cost of this work is incidental to the unit price for Superpave HMA. Staggering the longitudinal joints between courses, as described in the previous paragraph, should account for the final location of the joint after cut back occurs.

240.30.02 NOTES TO CONTRACTOR

The following note to contractor should be included in the specifications:

ASPHALT ADDITIVES: Warm mix additives used to assist in workability of the asphalt mix should be from the ITD Qualified Products List (QPL).

240.31 References

240.31.01 CURRENT SPECIFICATION AND MINIMUM TESTING REQUIREMENTS

Our geotechnical exploration program, analysis and recommendations are based on the following design standards:

- Idaho Transportation Department (ITD) Materials Manual, October 2020.
- ITD Standard Specifications for Highway Construction, March 2023.
- ITD Quality Assurance Manual, November 2019.

Should these change before the project is advertised, a review is required to ensure necessary changes to the report are made.

240.31.02 REFERENCE DOCUMENTS

Federal Highway Administration (FHWA), U.S. Department of Transportation, 1995. Comprehensive Truck Size and Weight Study, Phase 1-Synethesis, Pavements and Truck Size and Weight Regulations. February 1995.

FHWA, *LTPPBind Version 3.1*. 2005

Idaho Transportation Department, 2013. Roadway Design Manual, August 2013.

Idaho Transportation Department, 2020. Materials Manual, October 2020.

Idaho Transportation Department, 2025. Special Provision for 405 Superpave Hot Mix Asphalt, September 2025.

Idaho Transportation Department, 2025. Standard Specifications for Highway Construction, March 2023, with the 2025 supplemental specifications.

Othberg, K.L. and Stanford, L.R. 1992 Geologic Map of the Boise Valley and Adjoining Area, Western Snake River Plain, Idaho. Idaho Geological Survey Geologic Map Series. Scale 1:100,000.

Parametrix, 2024, Revised 2025. Technical Memorandum, Northside Boulevard/Karcher Road Intersection Analysis. December, 2024. Revised January, 2025.

Report Considerations

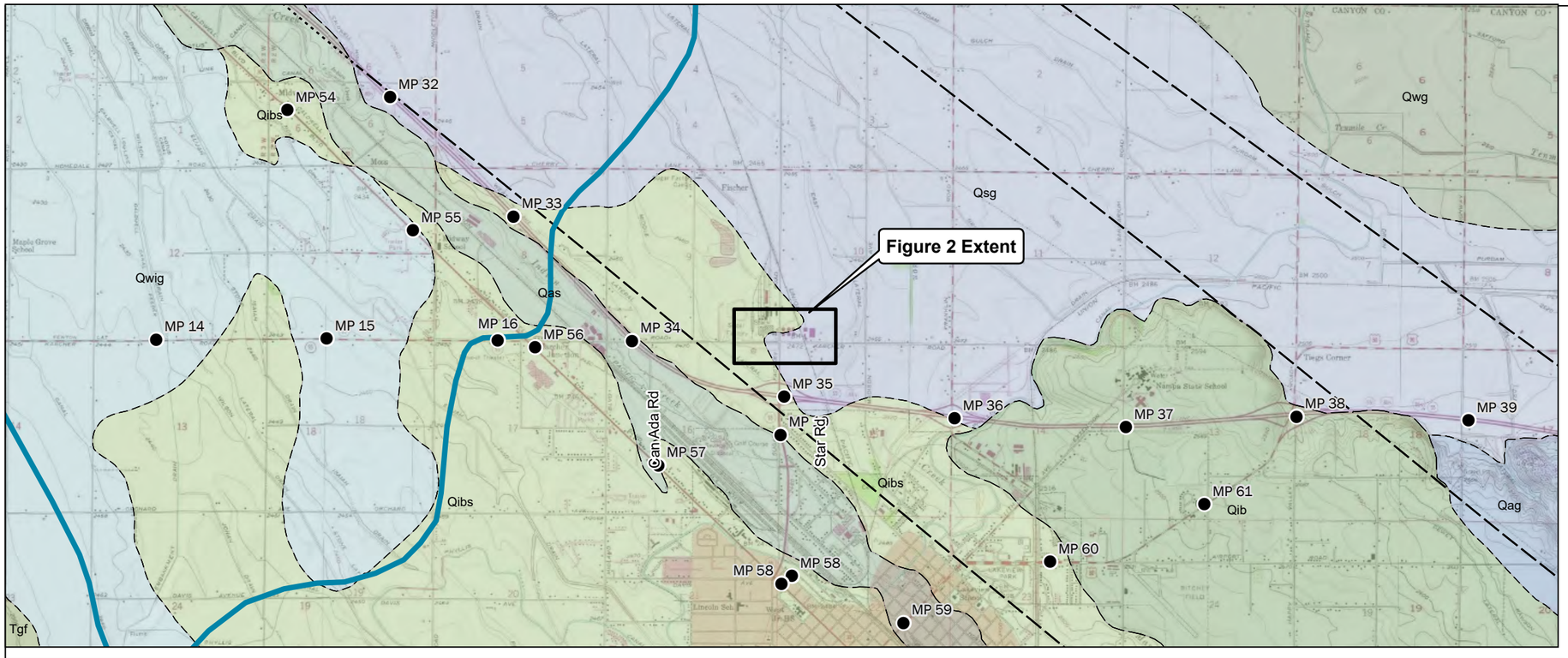
We have prepared this report for Parametrix, Inc., the City of Nampa and other members of the design team for the Northside Boulevard and Karcher Road Intersection Improvements Project No. A023(731); KN23731 in Nampa, Idaho. This report is not intended for use by others and the information contained herein is not applicable to other sites. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

If project conditions change from those assumed in this report, we recommend that we be retained to review our design, conclusions and recommendations and to determine whether they are still appropriate, or to provide supplemental information, as appropriate. When the design has been finalized, we recommend that the project design and specifications be reviewed by our firm to verify that our recommendations have been interpreted and implemented as intended.

The scope of our services does not include services related to construction safety precautions and our recommendations are not intended to direct the Contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Figures



Legend

- Figure Extent
- Approximate upper limit of Bonneville Flood slack water

Geologic Map Units

- Qag: GRAVEL OF AMITY TERRACE
- Qas: SANDY ALLUVIUM OF SIDESTREAM VALLEYS AND GULCHES
- Qib: BASALT FIOWS OF INDIAN CREEK, UNDIVIDED
- Qibs: BASALT FLOWS OF INDIAN C REEK BURIED BY LOESS AND STREAM SEDIMENTS
- Qsg: GRAVEL Of SUNRISE TERRACE
- Qwg: GRAVEL OF WHITNEY TERRACE
- Qwig: SANDY SILT OF BONNEVILIE FLOOD SLACK WATER
- Tgf: GLENNS FERRY FORN\ATION

Data Source: Surficial Geologic Map of the Boise Valley and Adjoining Area, Western Snake River Plain, Idaho 1992, http://www.idahogeology.org.

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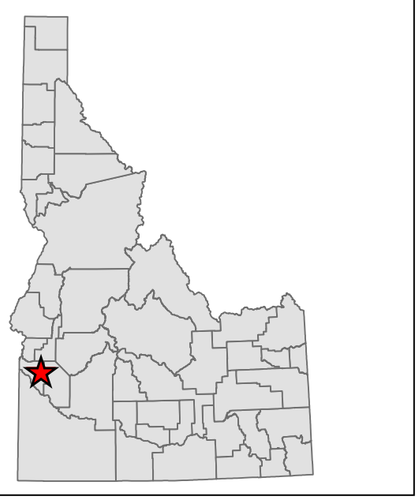

Data Source: ESRI Data Online.

Vicinity and Geology Map

Northside Boulevard and Karcher Road Intersection Improvements - Project No. A023(731); KN23731
Nampa, Idaho

GeoEngineers

Figure 1

P:\9\9468021\GIS\9468021_Project\9468021_Project.aprx\9468021100_F01_VMGeology Date Exported: 12/17/24 by maugust

Source(s):
- ESRI Street Map Premium
- ESRI Clarity

Coordinate System: NAD 1983 StatePlane Idaho West FIPS 1103 Feet

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

Legend

- Existing Piezometer
- Boring by GeoEngineers, 2024
- Piezometer by GeoEngineers, 2024
- Test Pit by GeoEngineers, 2024
- Containment Wall

N

0 200

Feet

Site Plan

Northside Boulevard and Karcher Road Intersection Improvements - Project No. A023(731); KN23731
Nampa, Idaho

GeoEngineers

Figure 2

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Appendices

Appendix A
Field Explorations

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- Modified California Sampler (6-inch sleeve) or Dames & Moore
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

- Measured groundwater level in exploration, well, or piezometer
- Measured free product in well or piezometer

Graphic Log Contact

- Distinct contact between soil strata
- Approximate contact between soil strata

Material Description Contact

- Contact between geologic units
- Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
UU	Unconsolidated undrained triaxial compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Drilled	Start 11/14/2024	End 11/14/2024	Total Depth (ft)	11.5	Logged By / Checked By	DSD / KAR	Driller	HazTech Drilling, Inc.	Drilling Method	Hollow-stem Auger
Surface Elevation (ft) / Vertical Datum	2474.3 / NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75				
Easting (X) / Northing (Y)	2407042 / 707229		System Datum	CF = 1.00014955836 Project Coordinate System (feet)	Groundwater not observed at time of exploration					

Notes: Hammer efficiency 85.4%; Preformed DCP testing from 9.9 to 45 inches below ground surface

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	12	12		1		AC	Approximately 8 inches of asphalt concrete			
							SW-SM	Approximately 6 inches of brown fine to coarse sand with silt and gravel (medium dense, moist) (base course)			
							SM				
		14	9		2 %F		SM	Approximately 5 inches of brown silty fine to coarse sand with gravel (medium dense, moist) (subbase)	11	41	
2470								Brown silty fine to coarse sand with gravel (medium dense to loose, moist) (fill)			
							SM	Brown silty fine to coarse sand with occasional gravel (loose, moist) (native)			
	5	17	40		3			Becomes light brown with medium sand and dense			Weak cementation
		17	18		4			Becomes medium dense			
2465											
	10	17	13		5						

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Boring GEI-B1-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-2
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary\Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled Start 11/14/2024 End 11/14/2024	Total Depth (ft) 11.5	Logged By DSD Checked By KAR	Driller HazTech Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2477 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75	
Easting (X) 2407491 Northing (Y) 707582		System Datum CF = 1.00014955836 Project Coordinate System (feet)		Groundwater not observed at time of exploration	

Notes: Hammer efficiency 85.4%; Preformed DCP testing from 9.5 to 52.8 inches below ground surface

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 7 inches of asphalt concrete			
2475		15	28		1		SW-SM	Approximately 12 inches of brown fine to coarse sand with silt and gravel (medium dense, moist) (base course)			Bulk sample from 1 to 3 feet
		17	17		2 %F		SP-SM ML	Approximately 8 inches of brown fine to coarse sand with silt and gravel (medium dense, moist) (subbase)	22	64	
								Brown sandy silt (very stiff, moist) (native)			
	5	18	42		3		SM	Brown silty fine to coarse sand with occasional gravel (dense, dry to moist)			Weak cementation
2470		17	33		4		SP-SM	Brown fine sand with silt (dense, moist)			
	10	17	21		5			Becomes medium dense			Weak cementation

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Boring GEI-B2-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-3
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary\Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled Start 11/14/2024 End 11/14/2024	Total Depth (ft) 11.5	Logged By DSD Checked By KAR	Driller HazTech Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2474.2 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75	
Easting (X) 2406868 Northing (Y) 707597		System Datum CF = 1.00014955836 Project Coordinate System (feet)		Groundwater not observed at time of exploration	

Notes: Hammer efficiency 85.4%; Preformed DCP testing from 8.5 to 44.4 inches below ground surface

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 7 inches of asphalt concrete			
		17	37		1 SA		SW-SM	Approximately 23 inches of brown fine to coarse sand with silt and gravel (dense, moist) (base course)	5	11	
		14	17		2 %F		CL	Dark brown clay with sand (very stiff, moist) (native)	22	84	
2470											
	5	18	53		3		SM	Brown silty fine to medium sand (very dense, moist)			Moderate cementation
							SP-SM	Brown fine sand with silt (medium dense, moist)			
		16	21		4						Weak cementation
2465											
	10	16	21		5		SM	Brown silty fine to medium sand (medium dense, moist)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Boring GEI-B3-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-4
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary\Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled Start 11/14/2024 End 11/14/2024	Total Depth (ft) 11.5	Logged By DSD Checked By KAR	Driller HazTech Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2473.3 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75	
Easting (X) 2407018 Northing (Y) 707991		System Datum CF = 1.00014955836 Project Coordinate System (feet)		Groundwater not observed at time of exploration	

Notes: Hammer efficiency 85.4%; Preformed DCP testing from 9.5 to 44.4 inches below ground surface

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						AC	Approximately 7 inches of asphalt concrete			
		16	18		1 Bulk R-Value; AL; SA		SW-SM CH	Approximately 4 inches of brown fine to coarse sand with silt and gravel (medium dense, moist) (base course) Dark brown sandy fat clay (very stiff, moist) (native)	18	70	Collected bulk sample from 1 to 3 feet Idaho R-value = 19; AL (LL = 52; PI = 29) Pocket penetrometer = 3.5 tsf
2470		13	21		2 %F		ML	Dark brown silt with sand (very stiff, moist)	22	82	Pocket penetrometer = 1.5 tsf
							SM	Brown silty fine sand (medium dense, moist)			
	5	17	29		3						
2465		16	55		4						Weak cementation
	10	17	8		5		SP-SM	Light brown fine to coarse sand with silt (loose, moist)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Log of Boring GEI-B4-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-5
Sheet 1 of 1

Drilled	Start 11/14/2024	End 11/14/2024	Total Depth (ft)	21	Logged By	DSD	Driller	HazTech Drilling, Inc.	Drilling Method	Hollow-stem Auger
					Checked By	KAR				

Surface Elevation (ft) / Vertical Datum	2473.5 NAVD88	Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Easting (X) / Northing (Y)	2407404 707652	System Datum	CF = 1.00014955836 Project Coordinate System (feet)	See "Remarks" section for groundwater observed	

Notes: Hammer efficiency 85.4%

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0											
			13	13		1		SM	Brown silty fine sand (medium dense, moist) (fill)			
								CL	Dark brown sandy clay (stiff, moist) (native)			
								ML	Brown sandy silt (hard, moist)			
2470			18	37		2 SA				28	54	
	5											
			14	26		3 %F		SM	Brown silty fine to medium sand (medium dense, moist)	21	33	
2465			14	17		4						
	10											
			16	16		5						Weak cementation
								ML	Brown silt with sand (medium stiff, wet)			
2460			18	7		6						Groundwater observed at approximately 13¼ feet
	15											
			18	5		7 AL		ML	Brown silt (medium stiff, wet)	39	99	AL (Non-plastic)
2455			24			8						600 to >4,000 psi pressure to push shelby tube
			18	10		9		SW	Brown fine to coarse sand (loose, wet)			
	20							ML	Brown silt with occasional sand (stiff, wet)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Boring GEI-B5-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-6
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_GEOTECH_STANDARD_%F_NO_GW

Drilled Start 11/15/2024 End 11/15/2024	Total Depth (ft) 21.5	Logged By DSD Checked By KAR	Driller HazTech Drilling, Inc.	Drilling Method Hollow-stem Auger	
Surface Elevation (ft) 2472.5 Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment CME 75	
Easting (X) 2407067 Northing (Y) 707766		System Datum CF = 1.00014955836 Project Coordinate System (feet)		See "Remarks" section for groundwater observed	

Notes: Hammer efficiency 85.4%

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0		14	8		1 pH; Resist; CA		SM	Brown silty fine to coarse sand with gravel (loose, moist) (fill)			pH = 8.2; Resistivity = 3,120 ohms-cm; soluable sulfate = 27 ppm; soluable chloride = 5 ppm
								CL	Dark brown sandy clay (stiff, moist) (native)			
2470			17	17		2 %F		ML	Brown sandy silt (very stiff, moist)	31	58	
								SM	Brown silty fine to medium sand (dense, moist)			
	5		16	32		3 SA				25	36	
2465			18	29		4			Becomes medium dense			
								SP	Light brown fine to coarse sand (medium dense, moist)			
	10		16	28		5		SM	Brown silty fine sand (medium dense, moist)			
2460			18	13		6		ML	Brown silt with occasional sand (stiff, wet)			Groundwater observed at approximately 12 feet
	15		18	17		7			Becomes very stiff			
2455			17	18		8		SM	Brown silty fine to medium sand (medium dense, wet)			
								ML	Brown silt with sand (very stiff, wet)			
	20		18	37		9		SP-SM	Brown fine to coarse sand with silt and occasional gravel (dense, wet)			
								SM	Brown silty fine sand (dense, wet)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Boring GEI-B6-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-7
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary\Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_GEOTECH_STANDARD_%F_NO_GW

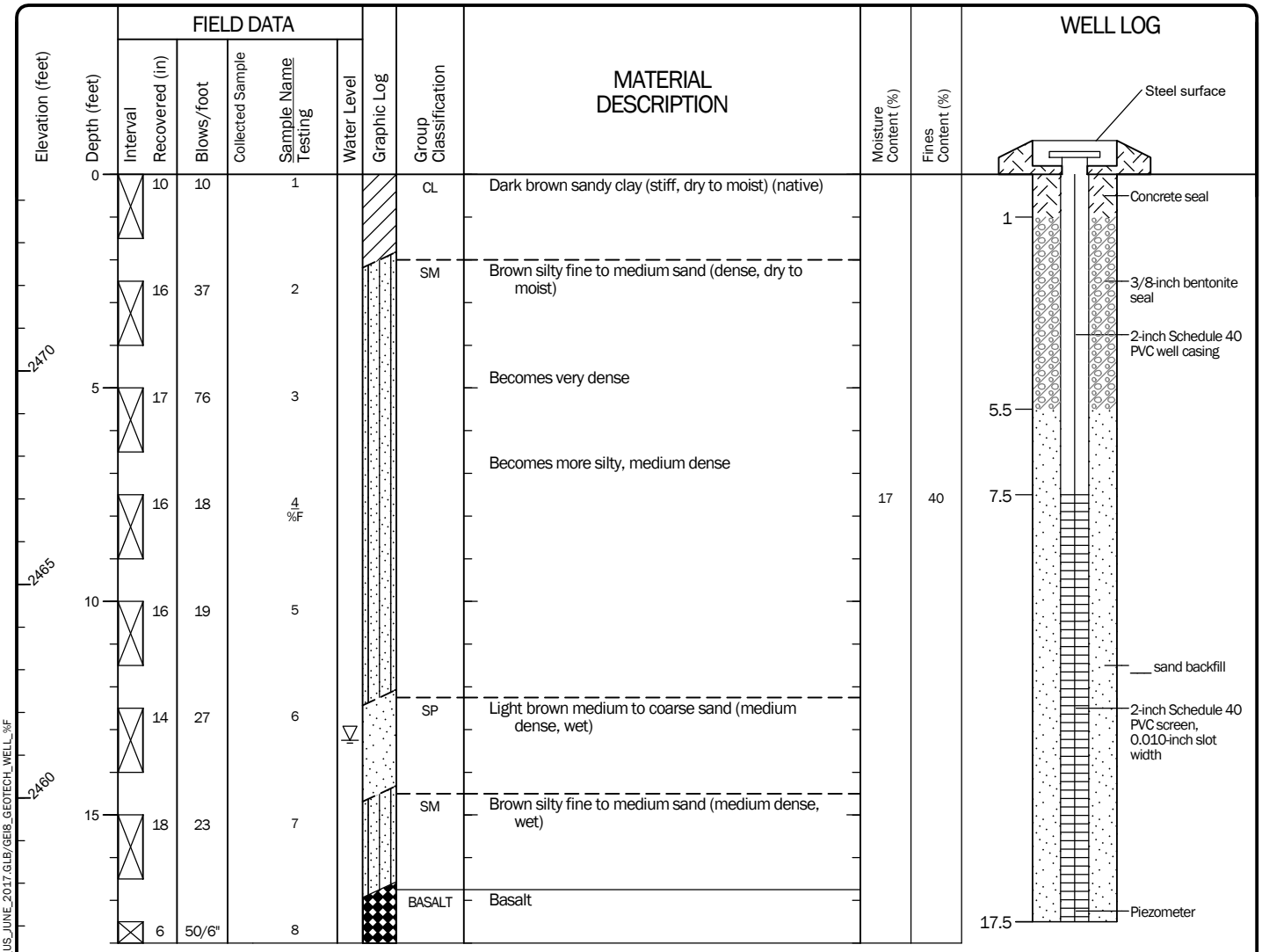
Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	11/14/2024	11/14/2024	18	DSD	KAR	HazTech Drilling, Inc.	Hollow-stem Auger

Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	2474.6 NAVD88	Top of Casing Elevation (ft)	
Easting (X) Northing (Y)	2406927 707173	Horizontal Datum	CF = 1.00014955836 Project Coordinate System (feet)

A 2-in well was installed on 11/14/2024 to a depth of 17.5 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
11/14/2024	13.25	2461.35

Notes: Hammer efficiency 85.4%



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Piezometer GEI-P1-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-8
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary\Library\GEOENGINEERS_DF_STD_US_JUNE_2017.GLB\GEI8_GEOTECH_WELL_%F

Date Excavated	11/14/2024	Total Depth (ft)	7.5	Logged By HG Checked By KAR	Excavator Precision Underground, LLC Equipment Cat 420F Backhoe	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	2474.7 NAVD88	Easting (X) Northing (Y)	2406929 707234	Coordinate System Horizontal Datum	CF = 1.00014955836 Project Coordinate System (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
2474	0		1 AL		CL	Dark brown lean clay (very stiff, moist) (native)	18		AL (LL = 39; PI = 17)
	1								Pocket penetrometer = 3.5 tsf
2473	2								
2472	3		2 pH; Resist; CA			Becomes with sand			pH = 7.9; Resistivity = 769 ohms-cm; soluable sulfate = 30 ppm; soluable chloride = 522 ppm
2471	4				ML	Brown silt (moist)			
2470	5		3						Weakly cemented lens
2469	6								
2468	7		4 SA		SM	Light brown silty fine to coarse sand with gravel (moist)	18	28	

Preformed infiltration testing at 7½ feet below ground surface

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Test Pit GEI-TP1-24

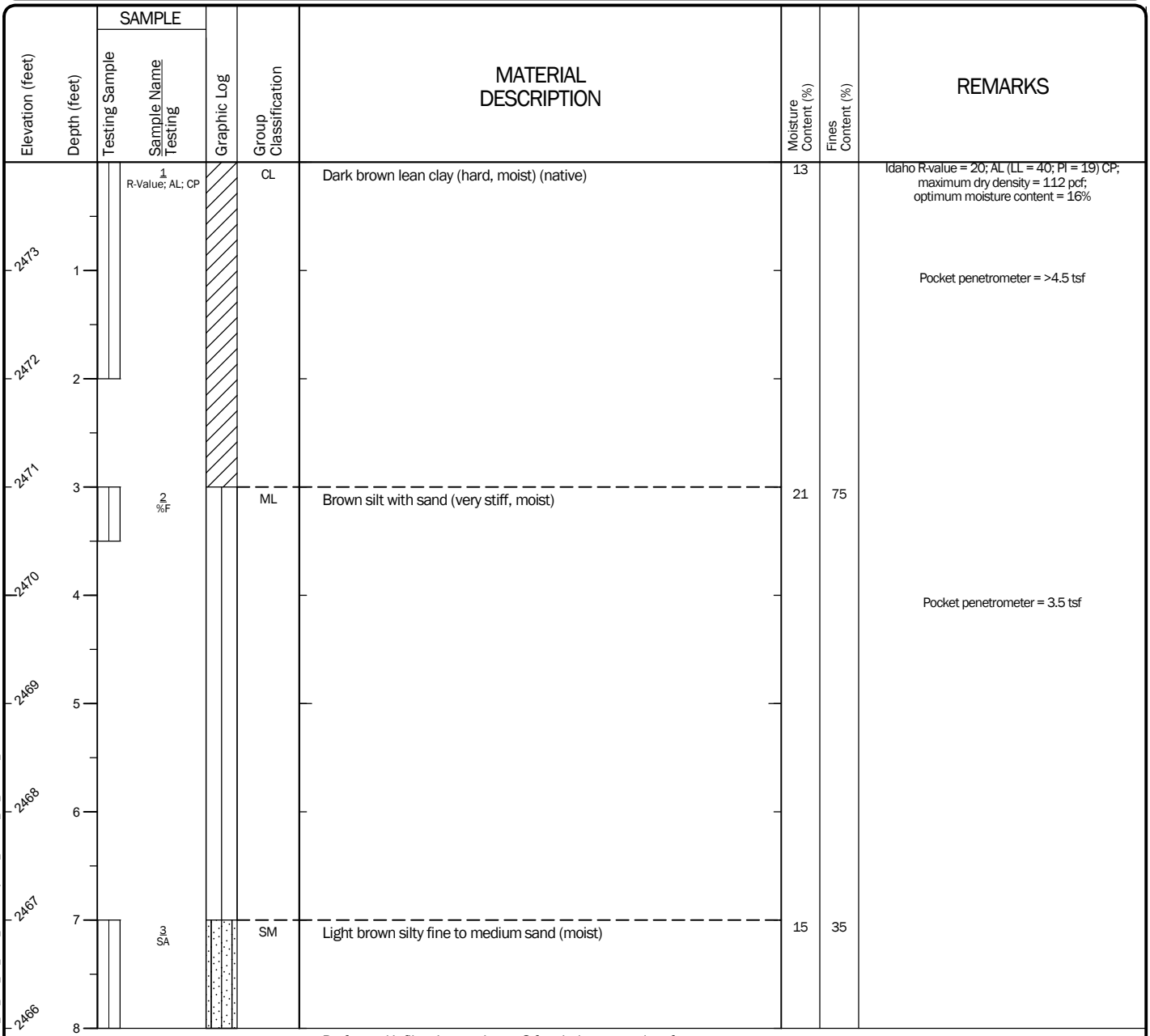
GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-9
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

Date Excavated	11/14/2024	Total Depth (ft)	8	Logged By HG Checked By KAR	Excavator Precision Underground, LLC Equipment Cat 420F Backhoe	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	2474 NAVD88	Easting (X) Northing (Y)	2407050 707270	Coordinate System Horizontal Datum	CF = 1.00014955836 Project Coordinate System (feet)	



Preformed infiltration testing at 8 feet below ground surface

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Test Pit GEI-TP2-24

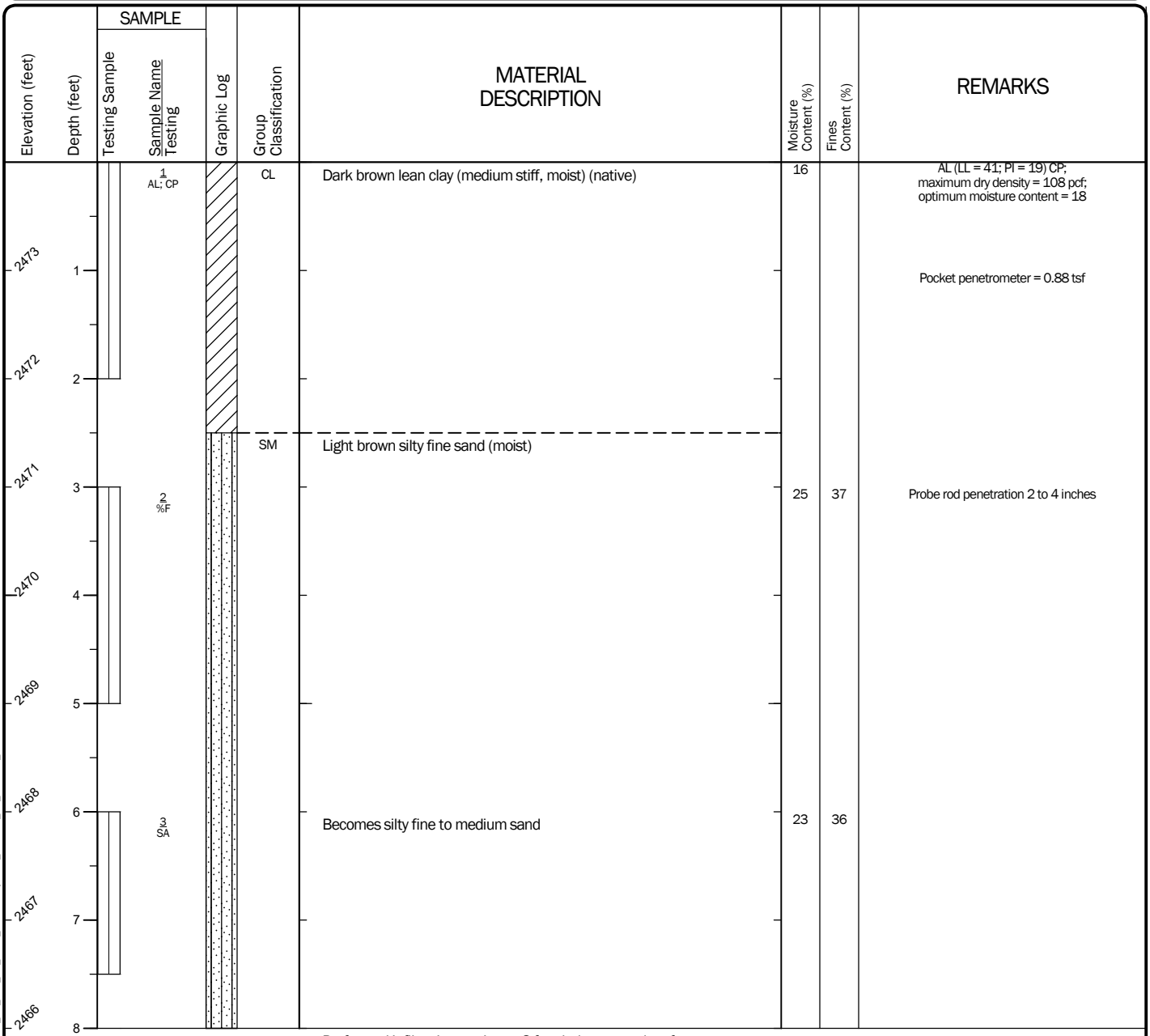
GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-10
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

Date Excavated 11/14/2024	Total Depth (ft) 8	Logged By HG Checked By KAR	Excavator Precision Underground, LLC Equipment Cat 420F Backhoe	Groundwater not observed Caving not observed
Surface Elevation (ft) 2474 Vertical Datum NAVD88		Easting (X) 2407085 Northing (Y) 707534	Coordinate System CF = 1.00014955836 Horizontal Datum Project Coordinate System (feet)	



Preformed infiltration testing at 8 feet below ground surface

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Survey by Ardurra. Vertical approximated based on Survey by Ardurra.

Log of Test Pit GEI-TP3-24

GeoEngineers

Project: KN23731 Northside and Karcher Roundabout
Project Location: Nampa, Idaho
Project Number: 9468-021-00

Figure A-11
Sheet 1 of 1

Date:1/24/25 Path:P:\9\9468021\GINT\9468021 00.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

Appendix B
Laboratory Testing

Table B-1

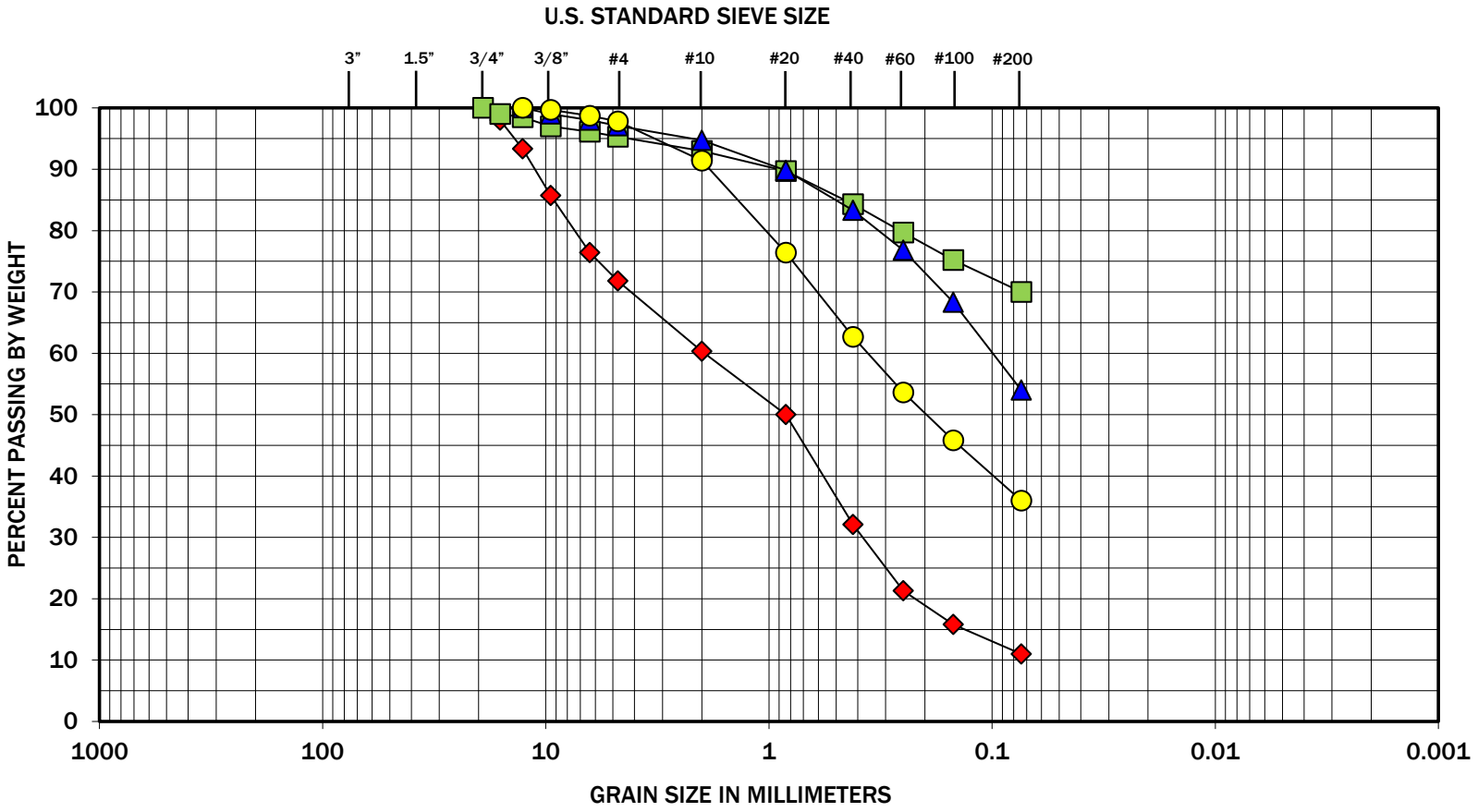
Laboratory Test Summary

Northside and Karcher Road Intersection Improvements
Project No. A023(731); KN23731
Nampa, Idaho

Sample Information				Water Content (%)	Soil Index Testing									Soil Corrosivity				Soil Description (USCS)
					Atterberg Limits (%)					Sieve Analysis								
Boring Designation	Sample Number	Sample Depth (feet)	Sample Type		Liquid Limit	Plastic Limit	Plastic Index	Optimum Moisture Content (%)	Maximum Dry Unit Weight (pcf)	Percent Gravel	Percent Sand	Percent Fines	Idaho R-Value	Resistivity (ohms-cm)	Soil pH	Soluble Choloride (mg/kg)	Soluble Sulfate (mg/kg)	
GEI-B1-24	2	2.5 - 4	SPT	11								41						Silty fine to coarse sand with occasional gravel (SM)
GEI-B2-24	2	2.5 - 4	SPT	22								64						Sandy silt (ML)
GEI-B3-24	1	0.5 - 2	SPT	5						28	61	11						Fine to coarse sand with silt and gravel (SW-SM)
GEI-B3-24	2	2.5 - 4	SPT	22								84						Lean clay with sand (CL)
GEI-B4-24	BULK	1 - 3	BULK	18	52	23	29			5	25	70	19					Sandy fat clay (CH)
GEI-B4-24	2	2.5 - 4	SPT	22								82						Silt with sand (ML)
GEI-B5-24	2	2.5 - 4	SPT	28						3	43	54						Sandy silt (ML)
GEI-B5-24	3	5 - 6.5	SPT	21								33						Silty fine to medium sand (SM)
GEI-B5-24	7	15 - 16.5	SPT	39	NP	NP	NP					99						Silt (ML)
GEI-B6-24	1	0 - 1.5	SPT											3,120	8.2	5	27	Silty sand (SM) and sandy lean clay (CL)
GEI-B6-24	2	2.5 - 4	SPT	31								58						Sandy silt (ML)
GEI-B6-24	3	5 - 6.5	SPT	25						2	62	36						Silty fine to medium sand (SM)
GEI-P1-24	4	7.5 - 9	SPT	17								40						Silty fine to medium sand (SM)
GEI-TP1-24	1	0 - 2	BULK	18	39	21	17											Lean clay (CL)
GEI-TP1-24	2	2.5 - 3.5	BULK											769	7.9	522	30	Lean clay (CL)
GEI-TP1-24	4	7 - 7.5	BULK	18						15	57	28						Silty fine to coarse sand with gravel (SM)
GEI-TP2-24	1	0 - 2	BULK	13	40	21	19	16	112				20					Lean clay (CL)
GEI-TP2-24	2	3 - 3.5	BULK	21								75						Silt with sand (ML)
GEI-TP2-24	3	7 - 8	BULK	15						6	59	35						Silty fine to medium sand (SM)
GEI-TP3-24	1	0 - 2	BULK	16	41	22	19	18	108									Lean clay (CL)
GEI-TP3-24	2	3 - 5	BULK	25								37						Silty fine sand (SM)
GEI-TP3-24	3	6 - 7.5	BULK	23						4	60	36						Silty fine to medium sand (SM)

Notes:

SPT = standard penetration test sample
NP = non-plastic
mg/kg = milligrams per kilogram; pcf = pounds per cubic foot



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	GEI-B3-24	0.5 – 2	5	Fine to coarse sand with silt and gravel (SW-SM)
■	GEI-B4-24	Bulk, 1 – 3	18	Sandy fat clay (CH)
▲	GEI-B5-24	2.5 – 4	28	Sandy silt (ML)
●	GEI-B6-24	5 – 6.5	25	Silty fine to medium sand (SM)

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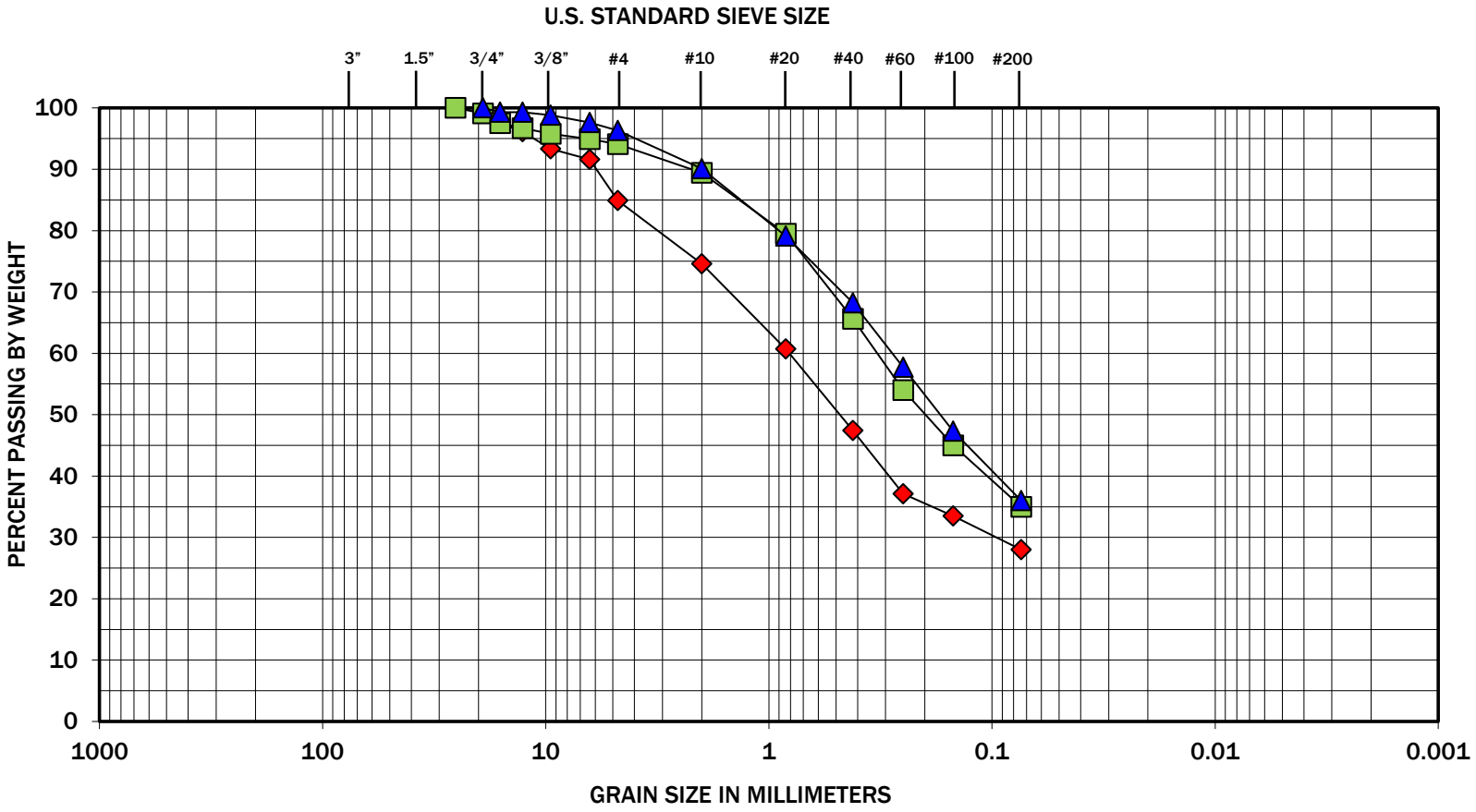
The grain size analysis results were obtained in general accordance with ASTM D 6913.

GEOENGINEERS

Figure B-1

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

Sieve Analysis Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Symbol	Boring Number	Depth (feet)	Moisture (%)	Soil Description
◆	GEI-TP1-24	7 – 7.5	18	Silty fine to coarse sand with gravel (SM)
■	GEI-TP2-24	7 – 8	15	Silty fine to medium sand (SM)
▲	GEI-TP3-24	6 – 7.5	23	Silty fine to medium sand (SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913.

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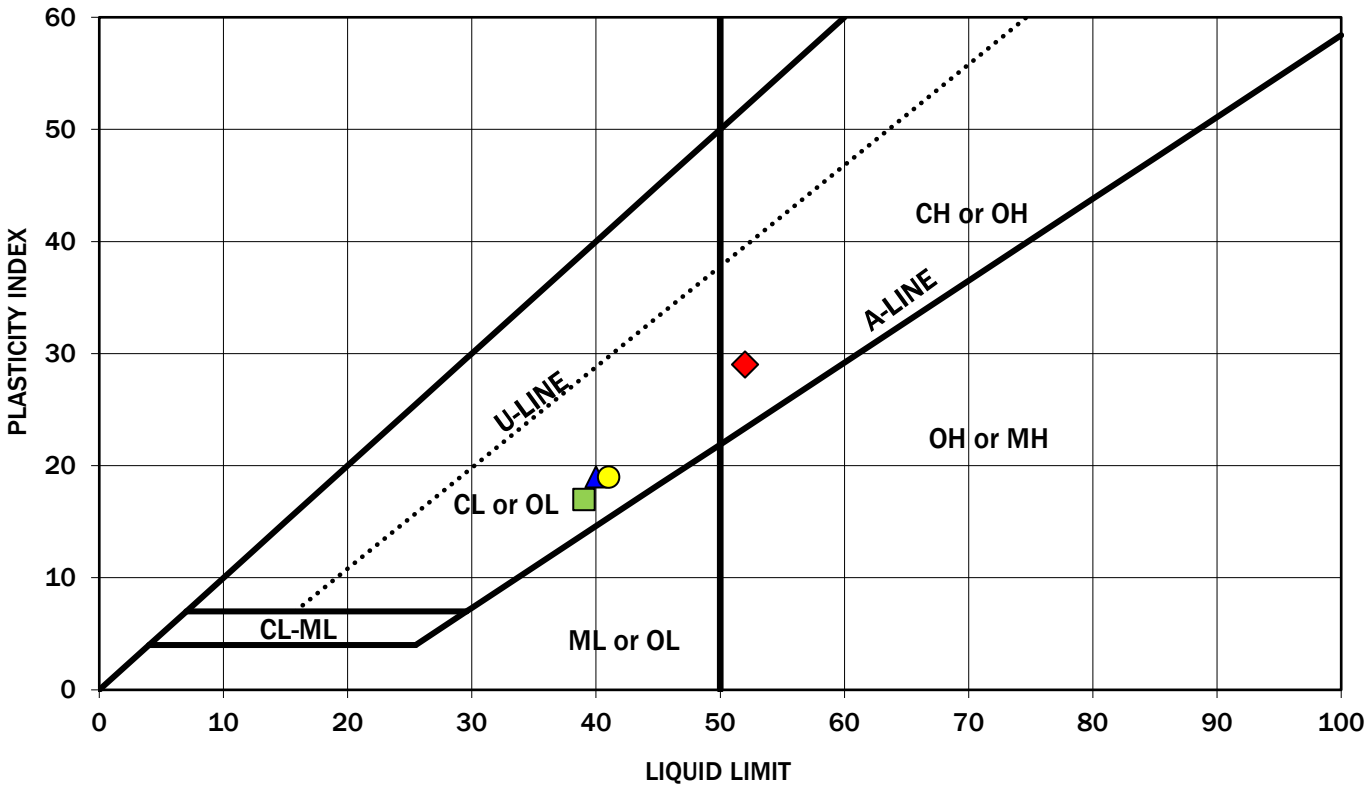
Figure B-2

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

Sieve Analysis Results

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	GEI-B4-24	Bulk; 1–3	18	52	29	Sandy fat clay (CH)
■	GEI-TP1-24	Bulk; 0–2	18	39	17	Lean clay (CL)
▲	GEI-TP2-24	Bulk; 0–2	13	40	19	Lean clay (CL)
●	GEI-TP3-24	Bulk; 0–2	16	41	19	Lean clay (CL)

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The liquid limit and plasticity index were obtained in general accordance with ASTM D 4318.

Atterberg Limits Test Results

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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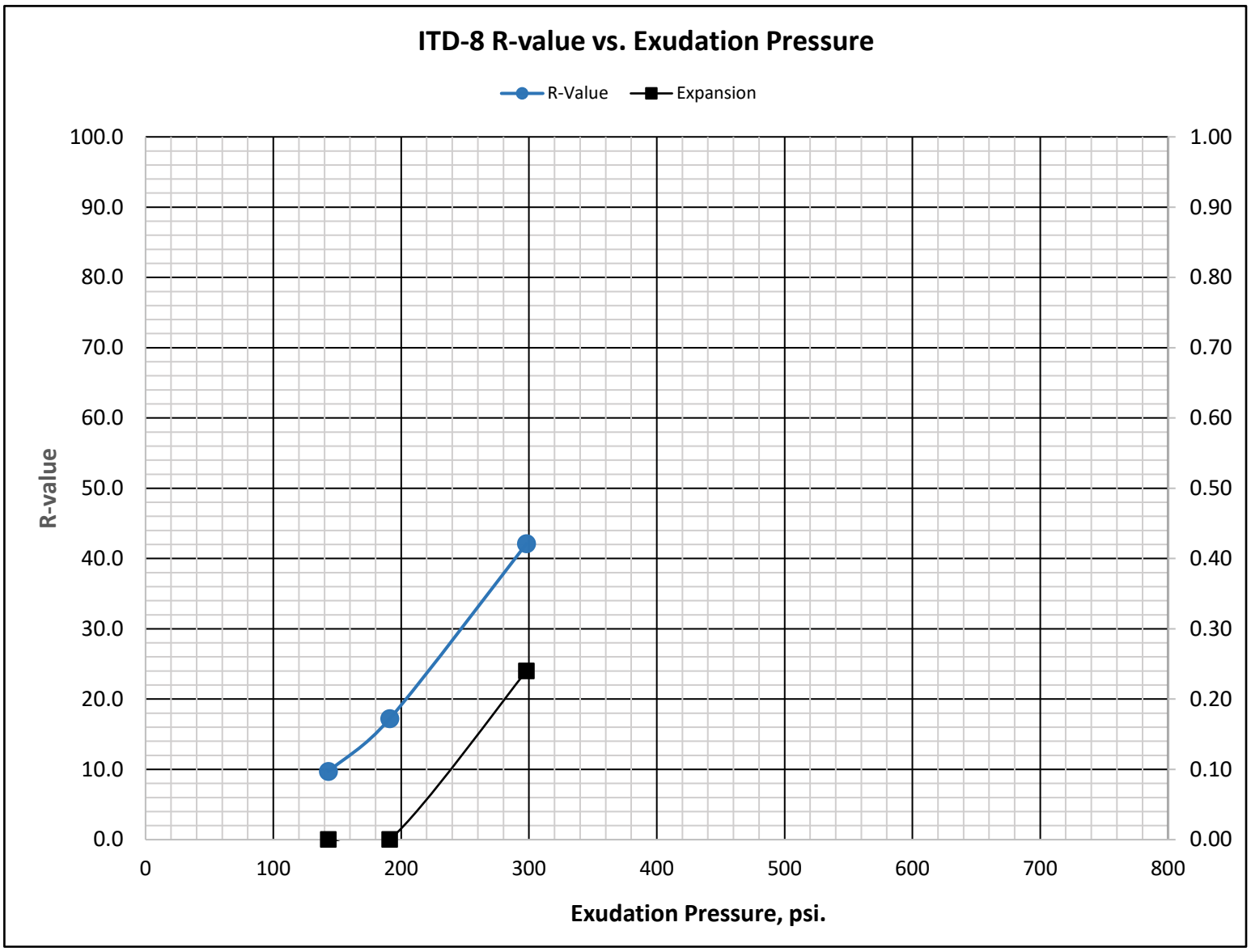
Figure B-3



SAMPLE ID	Depth (feet)	Soil Description	R-Value @ 200 psi exudation pressure	Expansion pressure @ 200 psi exudation
GEI-B4-24	0-2	Sandy fat clay, CH	19.0	0.01

Dry Density, pcf	Moisture content, %	Exudation Pressure, psi	Expansion Pressure, psi
104.3	19.4	191	0.00
105.9	19.8	143	0.00
104.0	18.1	298	0.24

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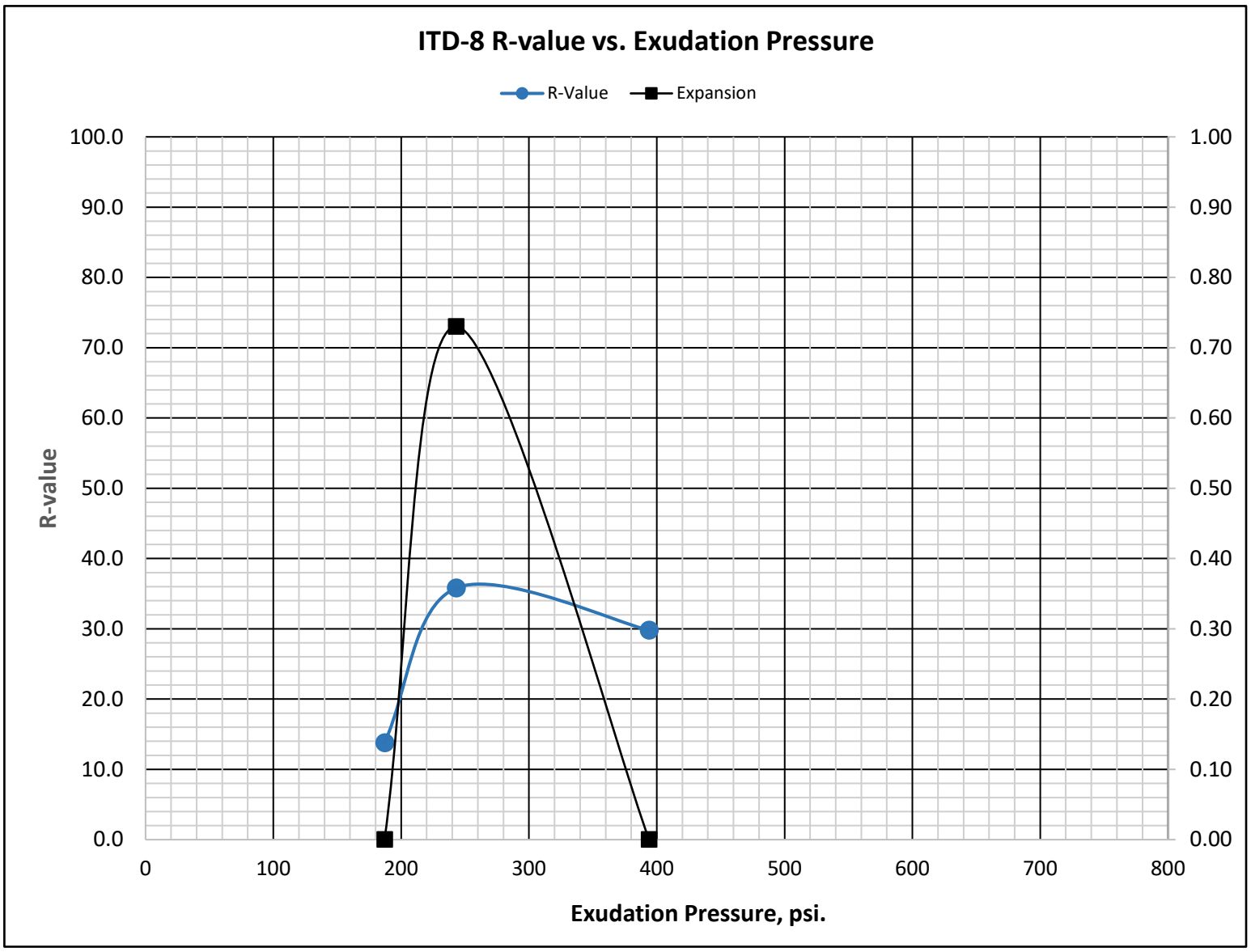
Test results were obtained in general accordance with –Idaho T-8

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS AND AGGREGATES

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

GeoEngineers

Figure B-4



SAMPLE ID	Depth (feet)	Soil Description	R-Value @ 200 psi exudation pressure	Expansion pressure @ 200 psi exudation
GEI-TP2-24	0-2	Lean clay w/ tr sand, CL	19.5	0.20

Dry Density, pcf	Moisture content, %	Exudation Pressure, psi	Expansion Pressure, psi
99.6	20.5	243	0.73
101.8	20.7	394	0.00
100.6	23.1	187	0.00

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Test results were obtained in general accordance with –Idaho T-8

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS AND AGGREGATES

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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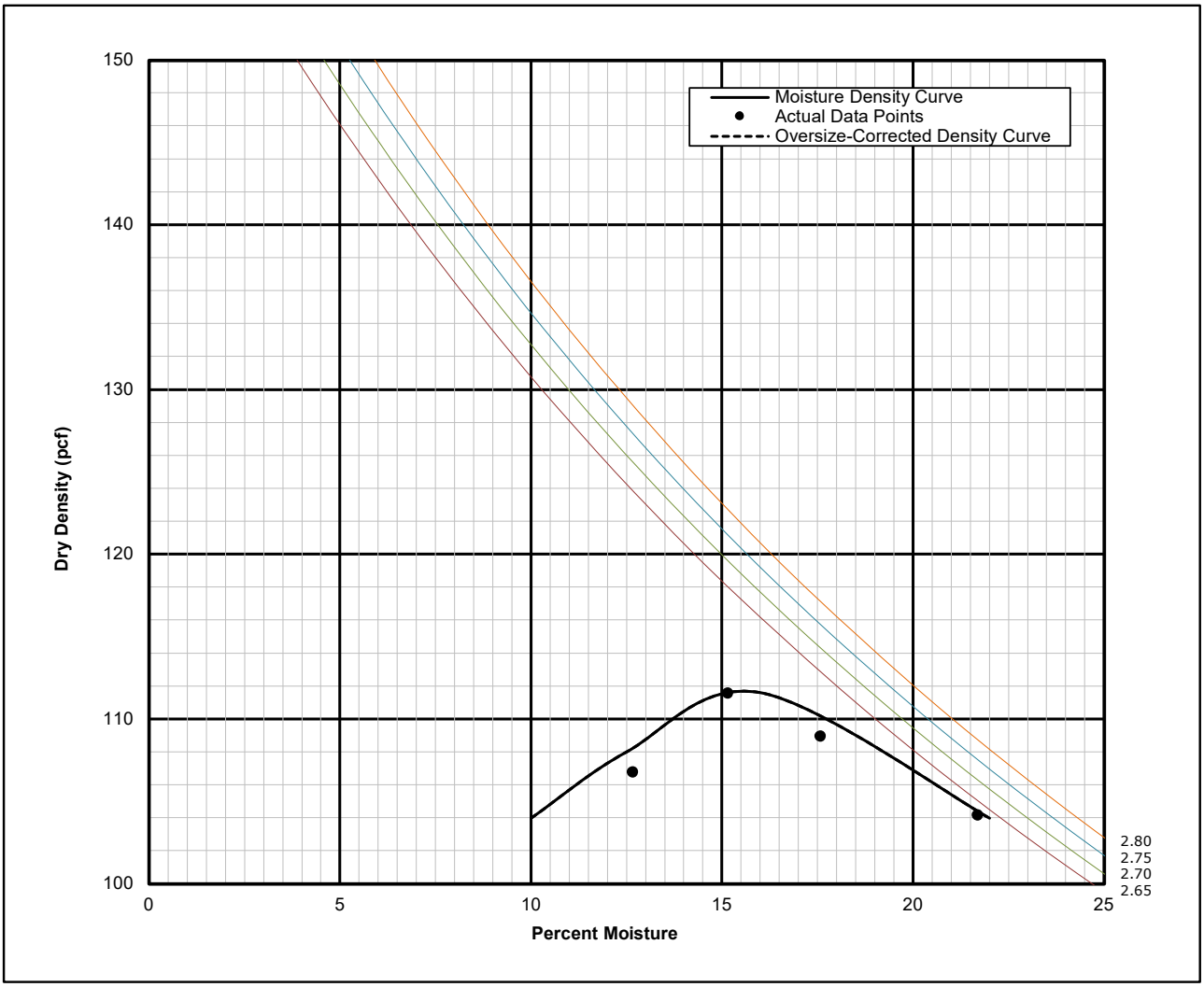
Figure B-5



Test Standard:	T180	**Maximum Dry Unit Weight, pcf**	111.6
Method:	A	**Optimum Water Content, %**	16.0
D 4718 Oversize Correction?	no	**Oversize Corrected Max., pcf:**	n/a
Percent Retained on No. 4	0.0	**Oversize Corrected Opt. WC, %:**	n/a

Rammer ID No.:	1639	☐ Manual ☑ Mechanical	**Specific Gravity:**	2.71	
Mold No.	1702	☑ Moist Preparation ☐ Dry Preparation	☑ Assumed	☐ By Test	
Mold Dia.	4 in.		**As-received MC, %:**	12.7	

Sample I.D.	GEI-TP2-24	**GEI Sample No.**	1
Sample Description:	**Lean clay, CL**	**Date Requested:**	11/19/24
Sample Source:	GEI-TP2-24 Bulk at 0-2 ft.	**Proposed use:**	R_value

Project:	Northside & Karcher Roundabout	**Date Tested:**	11/27/24
File No.:	09468-021-00	**Tested By:**	GT
Client:	City of Nampa	**Checked By:**	
Comments:			

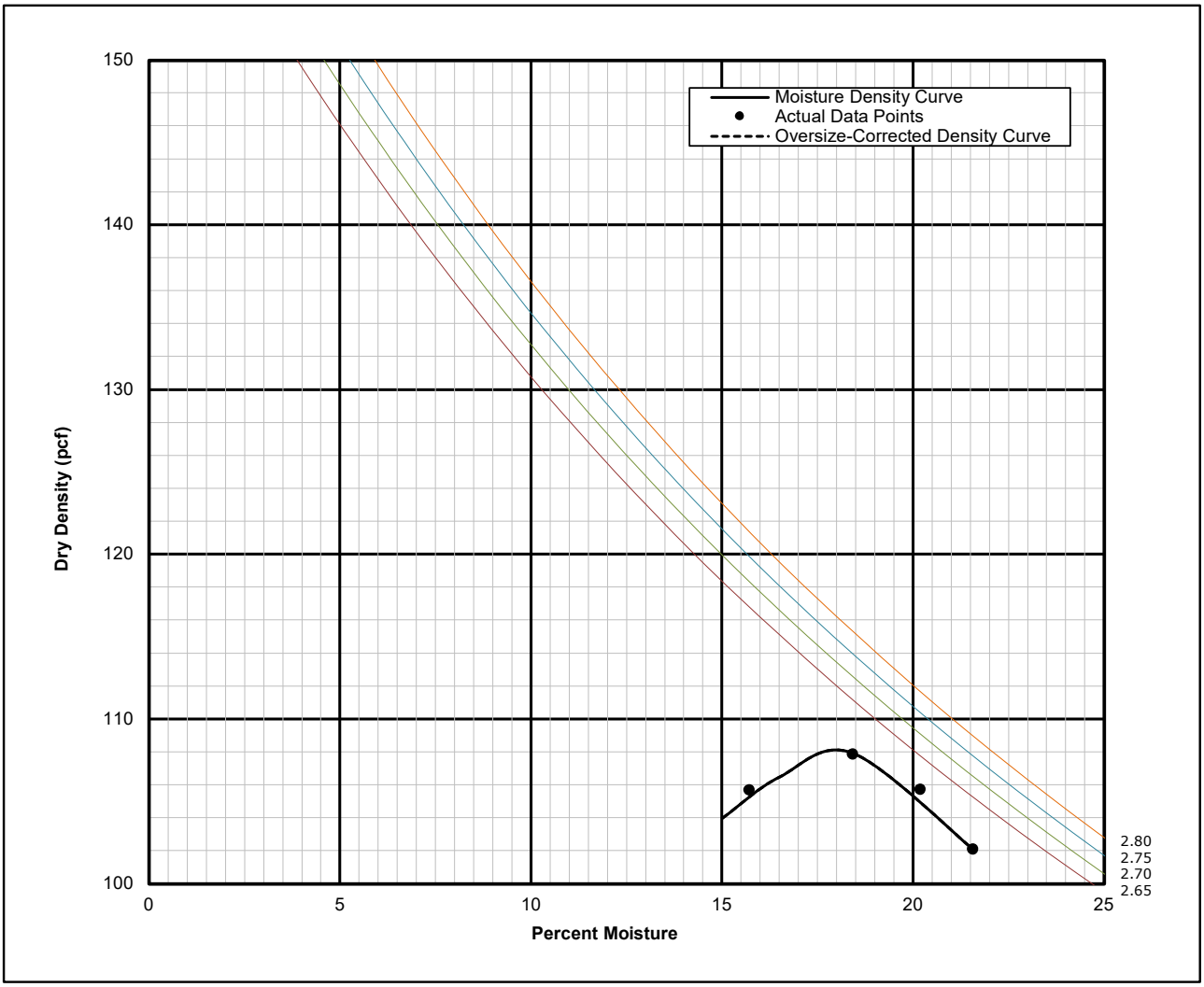
NOTE: Test was performed in general accordance with the referenced test method unless noted. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to to the specific sample on which they were performed, and should not be interpreted as representative of samples obtained at other times or locations, or generated by other operations or processes.

GeoEngineers
523 East Second Avenue, Spokane, WA 99202

LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT

Version Date 3/16/2016

FIGURE B-6



Test Standard:	T180	**Maximum Dry Unit Weight, pcf**	107.9
Method:	A	**Optimum Water Content, %**	18.4
D 4718 Oversize Correction?	no	**Oversize Corrected Max., pcf:**	n/a
Percent Retained on No. 4	0.0	**Oversize Corrected Opt. WC, %:**	n/a

Rammer ID No.:	1639	☐ Manual ☑ Mechanical	**Specific Gravity:**	2.71	
Mold No.	1702	☑ Moist Preparation	☑ Assumed	☐ By Test	
Mold Dia.	4 in.	☐ Dry Preparation	**As-received MC, %:**	15.7	

Sample I.D.	GEI-TP3-24	**GEI Sample No.**	n/a
Sample Description:	**Lean clay, CL**	**Date Requested:**	11/19/24
Sample Source:	GEI-TP3-24 Bulk at 0-2 ft.	**Proposed use:**	R_value

Project:	Northside & Karcher Roundabout	**Date Tested:**	11/19/24
File No.:	09468-021-00	**Tested By:**	GT
Client:	City of Nampa	**Checked By:**	
Comments:			

NOTE: Test was performed in general accordance with the referenced test method unless noted. This report may not be reproduced, except in full, without written approval of GeoEngineers, Inc. Test results are applicable only to to the specific sample on which they were performed, and should not be interpreted as representative of samples obtained at other times or locations, or generated by other operations or processes.

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523 East Second Avenue, Spokane, WA 99202

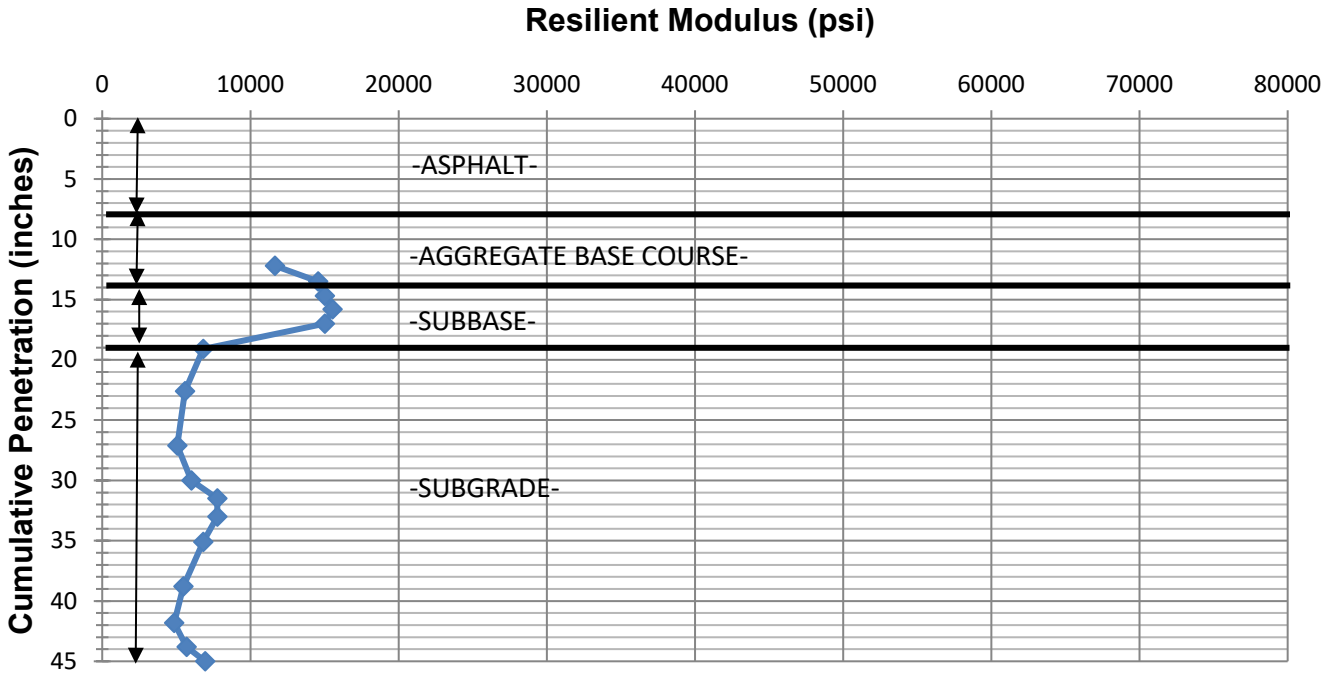
LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT

Version Date 3/16/2016

FIGURE B-7

Appendix C
Dynamic Cone Penetration (DCP) Test Results

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R	Soil Unit
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi	
1	0	0	9.9	-	203	9.9	-	-	1	-	-	-	-	
2	5	5	12.2	58.4	262	12.2	2.3	0.5	1	0.46	11.68	19	11653	Base
3	5	10	13.5	33.0	295	13.5	1.3	0.3	1	0.26	6.60	35	14557	
4	5	15	14.7	30.5	325	14.7	1.2	0.2	1	0.24	6.10	39	15018	
5	5	20	15.8	27.9	353	15.8	1.1	0.2	1	0.22	5.59	43	15537	Subbase
6	5	25	17.0	30.5	384	17.0	1.2	0.2	1	0.24	6.10	39	15018	
7	5	30	19.1	53.3	437	19.1	2.1	0.4	1	0.42	10.67	21	6816	
8	5	35	22.6	88.9	526	22.6	3.5	0.7	1	0.70	17.78	12	5585	
9	5	40	27.1	114.3	640	27.1	4.5	0.9	1	0.90	22.86	9	5063	
10	5	45	30.0	73.7	714	30.0	2.9	0.6	1	0.58	14.73	14	6010	
11	5	50	31.5	38.1	752	31.5	1.5	0.3	1	0.30	7.62	30	7772	
12	5	55	33.0	38.1	790	33.0	1.5	0.3	1	0.30	7.62	30	7772	Subgrade
13	5	60	35.1	53.3	843	35.1	2.1	0.4	1	0.42	10.67	21	6816	
14	5	65	38.8	94.0	937	38.8	3.7	0.7	1	0.74	18.80	11	5465	
15	3	68	41.8	76.2	1013	41.8	3.0	1.0	1	1.00	25.40	8	4859	
16	3	71	43.8	50.8	1064	43.8	2.0	0.7	1	0.67	16.93	12	5692	
17	3	74	45.0	30.5	1095	45.0	1.2	0.4	1	0.40	10.16	22	6947	



The approximate average Resilient Modulus of subgrade soils is 6,200 psi or 6.2 ksi

DCP Test at GEI-B1-24

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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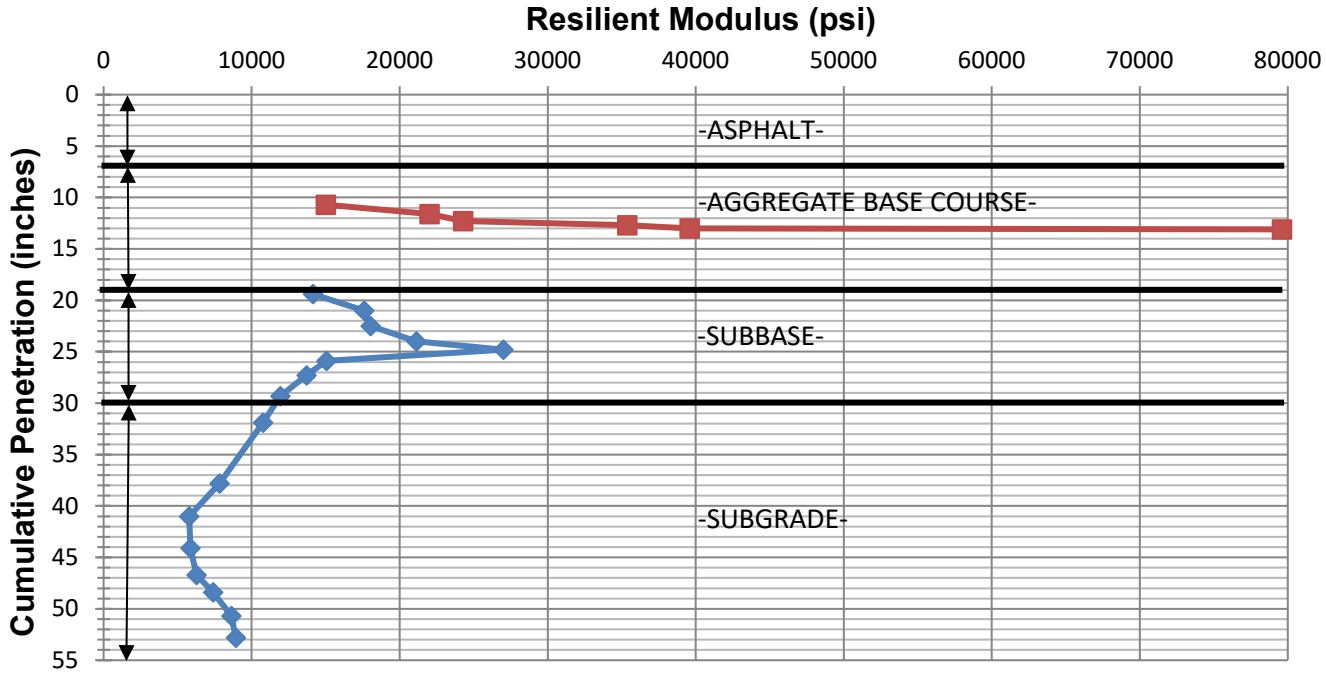
Figure C-1

09468-021-00 Date Exported: 11/21/2024

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R	Soil Unit
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi	
1	0	0	9.5	-	66	9.5	-	-	1	-	-	-	-	
2	5	5	10.7	15.24	81	10.7	1.2	0.2	1	0.24	6.10	39	15018	
3	10	15	11.6	2.54	84	11.6	0.9	0.1	1	0.09	2.29	116	22017	
4	10	25	12.3	7.62	91	12.3	0.7	0.1	1	0.07	1.78	153	24284	Base
5	15	40	12.7	2.54	94	12.7	0.4	0.0	1	0.03	0.68	452	35382	
6	15	55	13	7.62	102	13.0	0.3	0.0	1	0.02	0.51	623	39583	
7	30	85	13.1	2.54	104	13.1	0.1	0.0	1	0.00	0.08	4638	79613	
Refusal														
Restart														
1	0	0	18.0	-	457	18.0	-	-	1	-	-	-	-	
2	5	5	19.4	35.6	493	19.4	1.4	0.3	1	0.28	7.11	32	14142	
3	10	15	21.0	40.6	533	21.0	1.6	0.2	1	0.16	4.06	61	17591	
4	10	25	22.5	38.1	572	22.5	1.5	0.2	1	0.15	3.81	65	18040	
5	15	40	24.0	38.1	610	24.0	1.5	0.1	1	0.10	2.54	103	21130	Subbase
6	15	55	24.8	20.3	630	24.8	0.8	0.1	1	0.05	1.35	208	27001	
7	20	75	25.9	27.9	658	25.9	1.1	0.1	1	0.05	1.40	201	15061	
8	20	95	27.3	35.6	693	27.3	1.4	0.1	1	0.07	1.78	153	13709	
9	20	115	29.3	50.8	744	29.3	2.0	0.1	1	0.10	2.54	103	11928	
10	20	135	31.9	66.0	810	31.9	2.6	0.1	1	0.13	3.30	77	10768	
11	20	155	37.8	149.9	960	37.8	5.9	0.3	1	0.30	7.49	31	7823	
12	5	160	41.0	81.3	1041	41.0	3.2	0.6	1	0.64	16.26	13	5783	
13	5	165	44.1	78.7	1120	44.1	3.1	0.6	1	0.62	15.75	13	5855	Subgrade
14	5	170	46.7	66.0	1186	46.7	2.6	0.5	1	0.52	13.21	16	6271	
15	5	175	48.4	43.2	1229	48.4	1.7	0.3	1	0.34	8.64	26	7401	
16	10	185	50.7	58.4	1288	50.7	2.3	0.2	1	0.23	5.84	40	8620	
17	10	195	52.8	53.3	1341	52.8	2.1	0.2	1	0.21	5.33	45	8931	



The approximate average Resilient Modulus of subgrade soils is 7,200 psi or 7.2 ksi

DCP Test at GEI-B2-24

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
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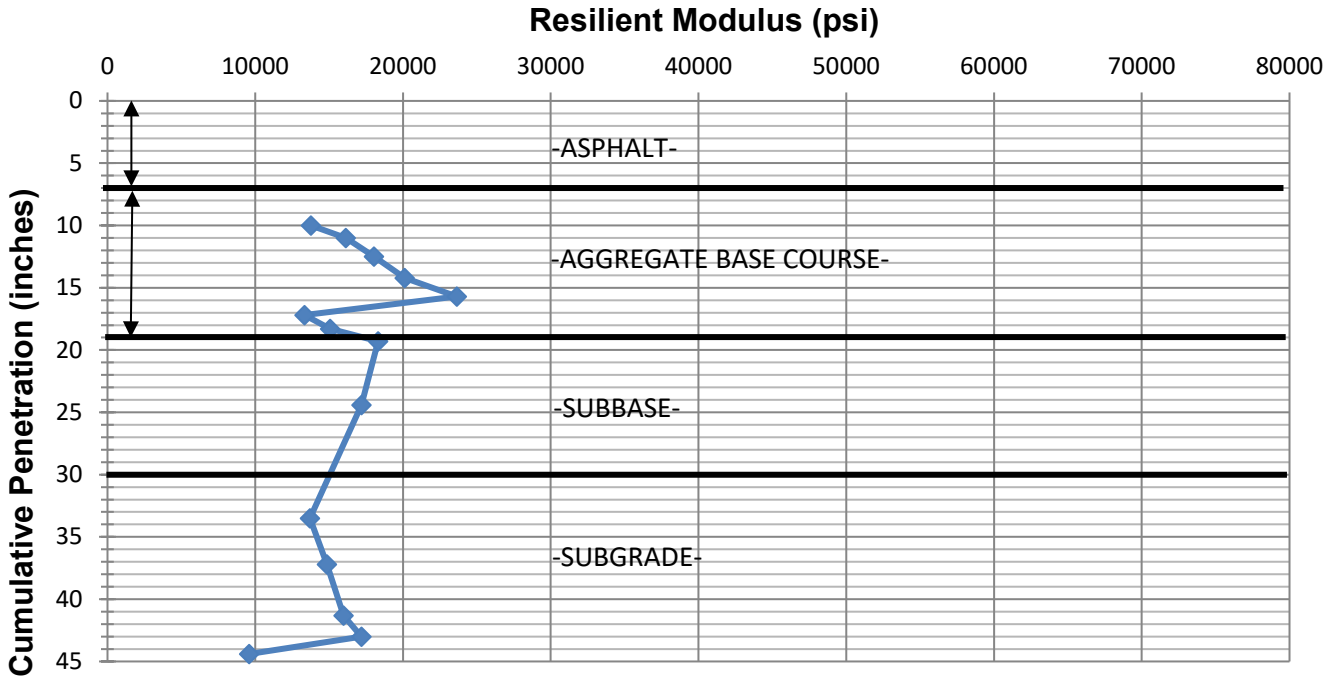
Figure C-2

09468-021-00 Date Exported: 11/21/2024

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R	Soil Unit
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi	
1	0	0	8.5		216	8.5	-	-	1	-	-	-	-	Base
2	5	5	10.0	38.1	254	10.0	1.5	0.3	1	0.30	7.62	30	13767	
3	5	10	11.0	25.4	279	11.0	1.0	0.2	1	0.20	5.08	47	16125	
4	10	20	12.5	38.1	318	12.5	1.5	0.2	1	0.15	3.81	65	18040	
5	15	35	14.2	43.2	361	14.2	1.7	0.1	1	0.11	2.88	89	20124	
6	20	55	15.7	38.1	399	15.7	1.5	0.1	1	0.08	1.91	142	23639	
7	20	75	17.2	38.1	437	17.2	1.5	0.1	1	0.08	1.91	142	13345	
8	20	95	18.3	27.9	465	18.3	1.1	0.1	1	0.06	1.40	201	15061	
9	30	125	19.3	25.4	490	19.3	1.0	0.0	1	0.03	0.85	352	18309	Subbase
10	30	155	24.4	129.5	620	24.4	5.1	0.2	1	0.17	4.32	57	17180	
11	30	185	33.5	231.1	851	33.5	9.1	0.3	1	0.30	7.70	30	13707	Subgrade
12	15	200	37.2	94.0	945	37.2	3.7	0.2	1	0.25	6.27	37	14859	
13	20	220	41.3	104.1	1049	41.3	4.1	0.2	1	0.21	5.21	46	15971	
14	10	230	43.0	43.2	1092	43.0	1.7	0.2	1	0.17	4.32	57	17180	
15	8	238	44.4	35.6	1128	44.4	1.4	0.2	1	0.18	4.44	55	9590	



The approximate average Resilient Modulus of subgrade soils is 14,300 psi or 14.3 ksi

DCP Test at GEI-B3-24

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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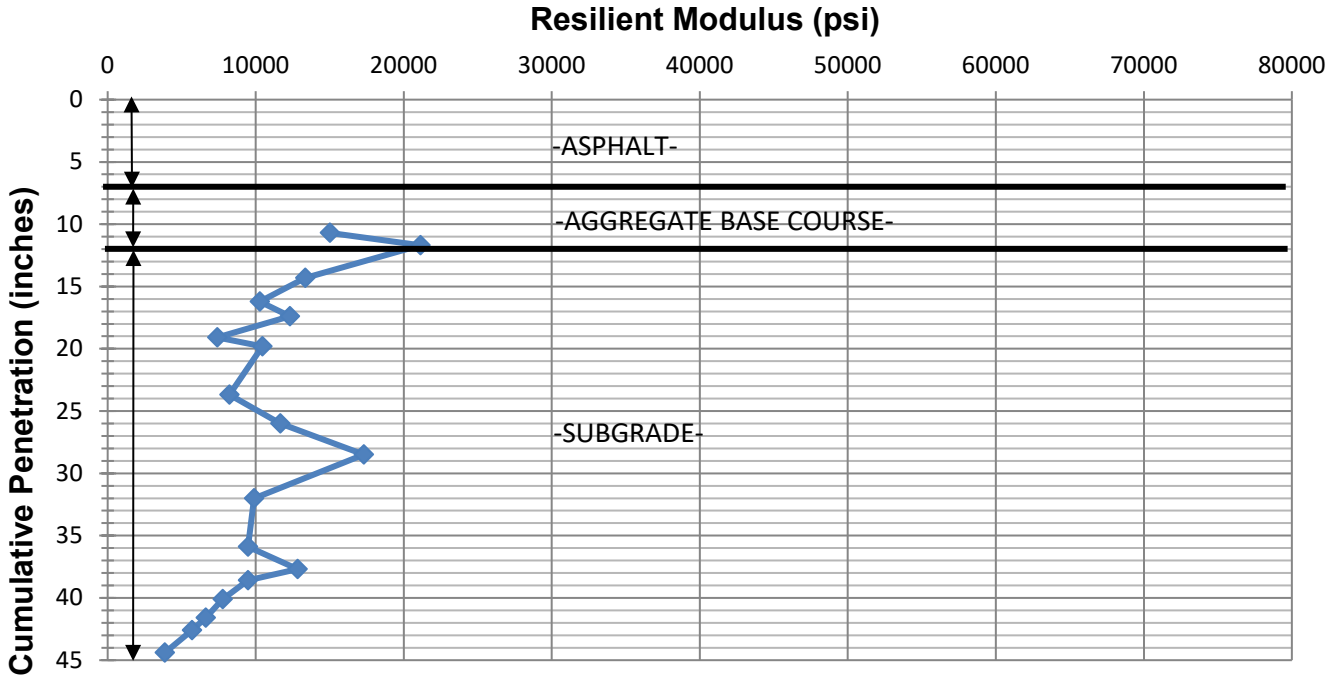
Figure C-3

09468-021-00 Date Exported: 11/21/2024

Test increment	Number of blows	Cumulative blows	Depth below ground surface	Penetration per increment	Cumulative penetration	Cummulative Penetration	Penetration per blow set	Penetration per blow	Hammer blow factor	DCP Index	DCP Index	CBR	M_R	Soil Unit
#	#	#	(in)	(mm)	(mm)	(in)	(in)	(in)	1 for 8-kg 2 for 4.6-kg hammer	in/blow	mm/blow	%	psi	
1	0	0	9.5		241	9.5	-	-	1	-	-	-	-	
2	5	5	10.7	30.5	272	10.7	1.2	0.2	1	0.24	6.10	39	15018	Base
3	10	15	11.7	25.4	297	11.7	1.0	0.1	1	0.10	2.54	103	21130	
4	8	23	14.3	66.0	363	14.3	2.6	0.3	1	0.33	8.26	27	13344	
5	3	26	16.2	48.3	411	16.2	1.9	0.6	1	0.63	16.09	13	10287	
6	3	29	17.4	30.5	442	17.4	1.2	0.4	1	0.40	10.16	22	12306	
7	5	34	19.1	43.2	485	19.1	1.7	0.3	1	0.34	8.64	26	7401	
8	5	39	19.8	17.8	503	19.8	0.7	0.1	1	0.14	3.56	71	10461	
9	15	54	23.7	99.1	602	23.7	3.9	0.3	1	0.26	6.60	35	8218	
10	5	59	26.0	58.4	660	26.0	2.3	0.5	1	0.46	11.68	19	11653	
11	15	74	28.5	63.5	724	28.5	2.5	0.2	1	0.17	4.23	58	17314	
12	5	79	32.0	88.9	813	32.0	3.5	0.7	1	0.70	17.78	12	9893	Subgrade
13	5	84	35.9	99.1	912	35.9	3.9	0.8	1	0.78	19.81	10	9484	
14	5	89	37.7	45.7	958	37.7	1.8	0.4	1	0.36	9.14	24	12822	
15	5	94	38.6	22.9	980	38.6	0.9	0.2	1	0.18	4.57	53	9485	
15	10	104	40.1	38.1	1019	40.1	1.5	0.2	2	0.30	7.62	30	7772	
15	10	114	41.6	38.1	1057	41.6	1.5	0.2	3	0.45	11.43	19	6635	
15	6	120	42.6	25.4	1082	42.6	1.0	0.2	4	0.67	16.93	12	5692	
15	5	125	44.4	45.7	1128	44.4	1.8	0.4	5	1.80	45.72	4	3864	



The approximate average Resilient Modulus of subgrade soils is 9,800 psi or 9.8 ksi

DCP Test at GEI-B4-24

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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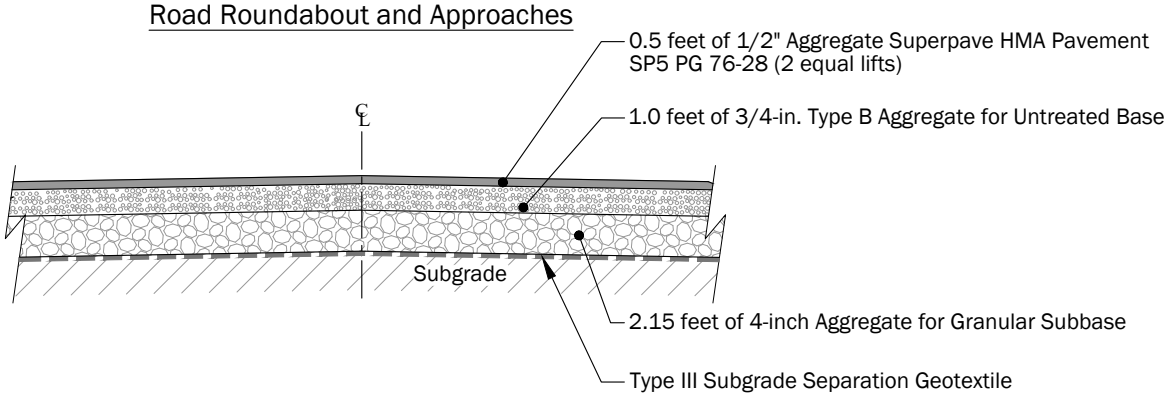
Figure C-4

09468-021-00 Date Exported: 11/21/2024

Appendix D
Flexible Pavement Design

Northside Boulevard and Karcher Road Roundabout and Approaches



Notes:

1. The dimensions of all features shown are approximate.

Disclaimer: This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

Typical Pavement Section

Northside and Karcher Roundabout Intersection Improvements; Project No. A023(731); KN23731
Nampa, Idaho

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Figure D-1

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FLEXIBLE ASPHALT PAVEMENT DESIGN - GRAVEL EQUIVALENCY (GE) METHOD

FIGURE D-2

Project: Northside and Karcher Roundabout
File: 9468-021-00
Date: 3-Mar-25
Section: HMA Base and Subbase

Design Subgrade Support R-value:	10	(Lab and DCP correlations)
Estimated Traffic Index (T.I.):	12.5	
Regional Climate Factor, F:	1.00	(see figure 510.04.01.1 ITD Materials Manual)
Material Substitution Ratios		
Asphalt:	1.60	
Base:	1.00	
Subbase:	0.85	
Aggregate Base Course Minimum Support R-value:	80	
Subbase Course Mininum Support R-value:	60	

Minimum Design Gravel Equivalence (GE)= 3.600 feet

Recommended Asphalt Concrete Thickness:	0.500	feet	
Design Asphalt Thickness:	0.50	feet	(0.15 feet min.) (0.25 feet min. on ATPB)
Recommended Aggregate Base Course Thickness:	0.800	feet	
Design Base Thickness: (round to next 0.05 feet)	1.00	feet	(0.35 feet min.) (ATB, ATPB, UTB)
Recommended Subbase Course Thickness:	2.118	feet	
Design Subbase Thickness: (round to next 0.05 feet)	2.15	feet	(0.35 feet min., if used or 2 x max particle size)

DESIGN PAVEMENT SECTION:

Asphalt concrete:	**0.50**	**feet**	**6.00 inches**
Base course:	**1.00**	**feet**	**12.00 inches**
Subbase course:	**2.15**	**feet**	**25.80 inches**
GE Provided :	**3.63**	**feet**	
Mininum GE Required:	**3.60**	**feet**	

Northside Boulevard and Karcher Road Intersection Improvements
Project No. A023(731); KN23731
Nampa, Idaho
FIGURE D-3

FLEXIBLE PAVEMENT DESIGN TRAFFIC INDEX

Develop Traffic Index for flexible pavement design using the ITD Off-System Method, COMPASS Model forecast growth rate, and the 2024 daily traffic count for the design lane of the proposed roundabout.

24-HOUR TRAFFIC COUNT AND TURNING DIRECTIONS

Vehicle Type	Northside (southbound)				Karcher (westbound)				Northside (northbound)				Karcher (eastbound)			
	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn
Lights	1693	3529	195		199	1949	1476		1745	3797	5022	2	4491	1655	1287	
Single-Unit Trucks	16	97	22		18	42	72		73	140	64		68	37	15	
Articulated Trucks	28	201	14		6	24	101		113	178	336		266	19	14	
Buses	1	5				15			3	7	5		4	17	3	

Notes: Highlighted cells are the traffic volume within the design traffic lane evaluated for the proposed roundabout.

TOTAL TRAFFIC IN DESIGN LANE FOR ROUNDABOUT

Vehicle Type	Traffic Count
Lights	13531
Single-Unit Trucks	333
Articulated Trucks	653
Buses	30
TOTAL	14547
Percent Trucks	7.0%
TOTAL TRUCKS	1016

Note: Using Table 510.02.01.1, route is designated as "Heavy" classification

PROJECTED DAILY TRAFFIC AND DAILY TRUCKS BY EACH DESIGN YEAR

The calculated COMPASS Model Forecast growth rate is approximately 2 percent

2024 (Traffic Count)		2026 (Build Year)		2046 (Design Year)	
ADT	CADT	ADT	CADT	ADT	CADT
14547	1016	15135	1057	22489	1571

CALCULATED TRAFFIC INDEX

2026 CADT =	1057	
2046 CADT=	1571	
Average=	1314	
% CADT in Design Lane	1.00	ITD Materials Manual Table 510.02.02.1
Design CADT	1314	
TI (Heavy) =	**12.5**	ITD Materials Manual Figure 510.02.05.1

Figure D-4
LTPPBind Results

PG Binder Selection

Parameter	A=1 km	B=11 km	C=14 km	D=20 km	E=27 km
Station ID	ID6305	ID1380	ID2444	ID5038	ID1022
Elevation, m	2294	2201	2331	2499	2636
Degree-Days >10 C	3069	3311	2974	2946	2945
Low Air Temperature, C	-20.5	-19.1	-19.1	-20.2	-19.6
Low Air Temp. Std Dev	5.8	5	5.3	4.5	5.3

Input Data

Latitude, Degree: 43.61
Lowest Yearly Air Temperature, C: -19.7
Yearly Degree-Days>10 Deg.C: 3049
Low Air Temp. Standard Dev., Deg C: 5.2

Temperature Adjustments

Base HT PG: 58
Desired Reliability, %: 98
Depth of Layer, mm: 0

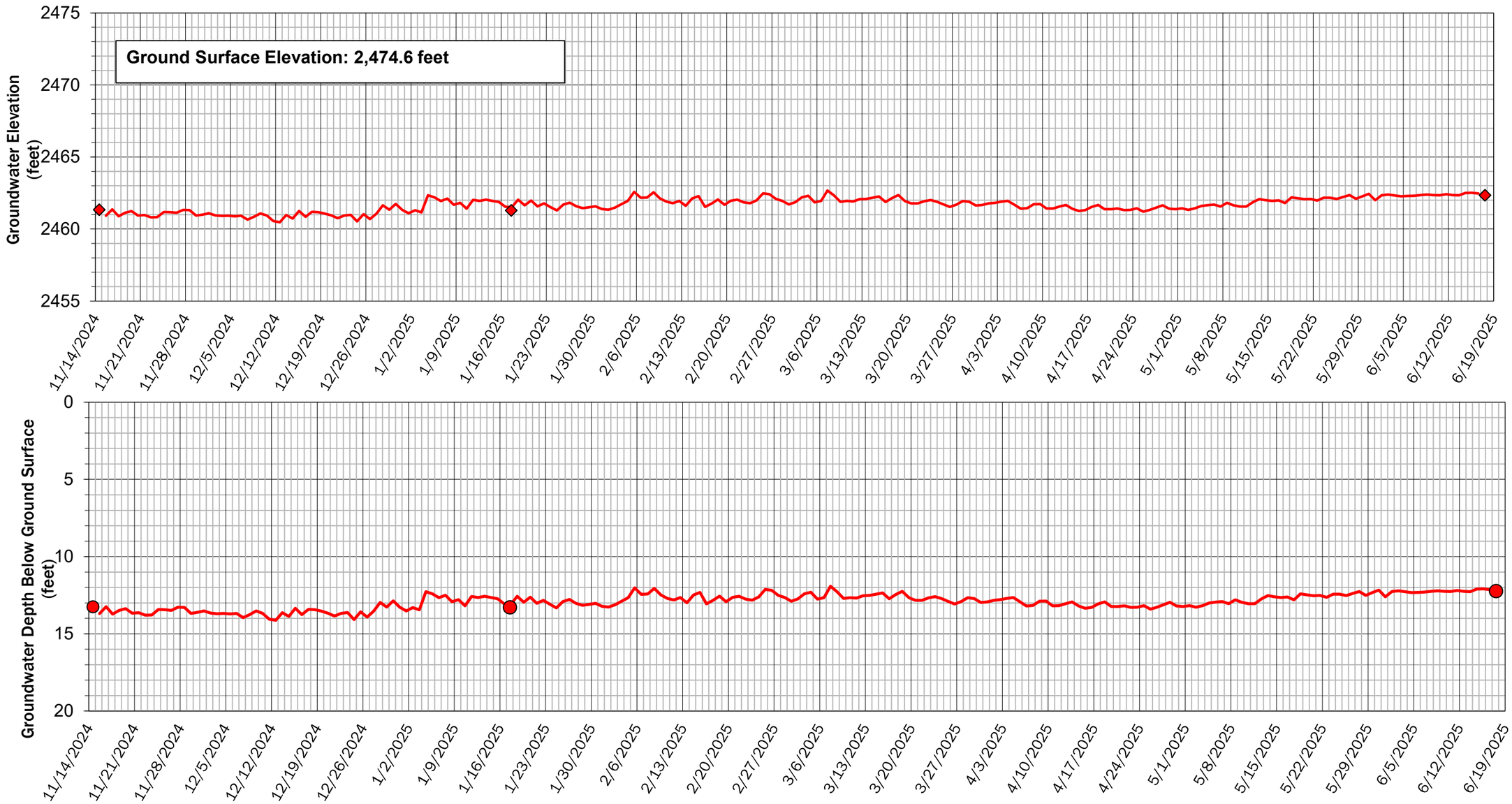
Traffic Adjustments for HT

Traffic Loading	Traffic Speed: Fast	Slow
Up to 3 M. ESAL	0.0	2.7
3 to 10 M. ESAL	7.1	9.5
10 to 30 M. ESAL	12.3	14.5
Above 30 M. ESAL	14.5	16.6

PG Temperature	HIGH	LOW
PG Temp. at 50% Reliability	57.0	-14.6
PG Temp. at Desired Reliability	60.4	-23.4
Adjustments for Traffic	14.5	
Adjustments for Depth	0.0	0.0
Adjusted PG Temperature	74.9	-23.4
Selected PG Binder Grade	76	-28

? Recalculate PG Save Cancel

Appendix E
Groundwater Plots



Notes:
1. Coordinates and Elevations from Ardurra.

Pressure Transducer
Manual Reading

GEI-P1-24 Groundwater Levels

Northside and Karcher Roundabout Intersection Improvements;Project No. A023(731); KN23731
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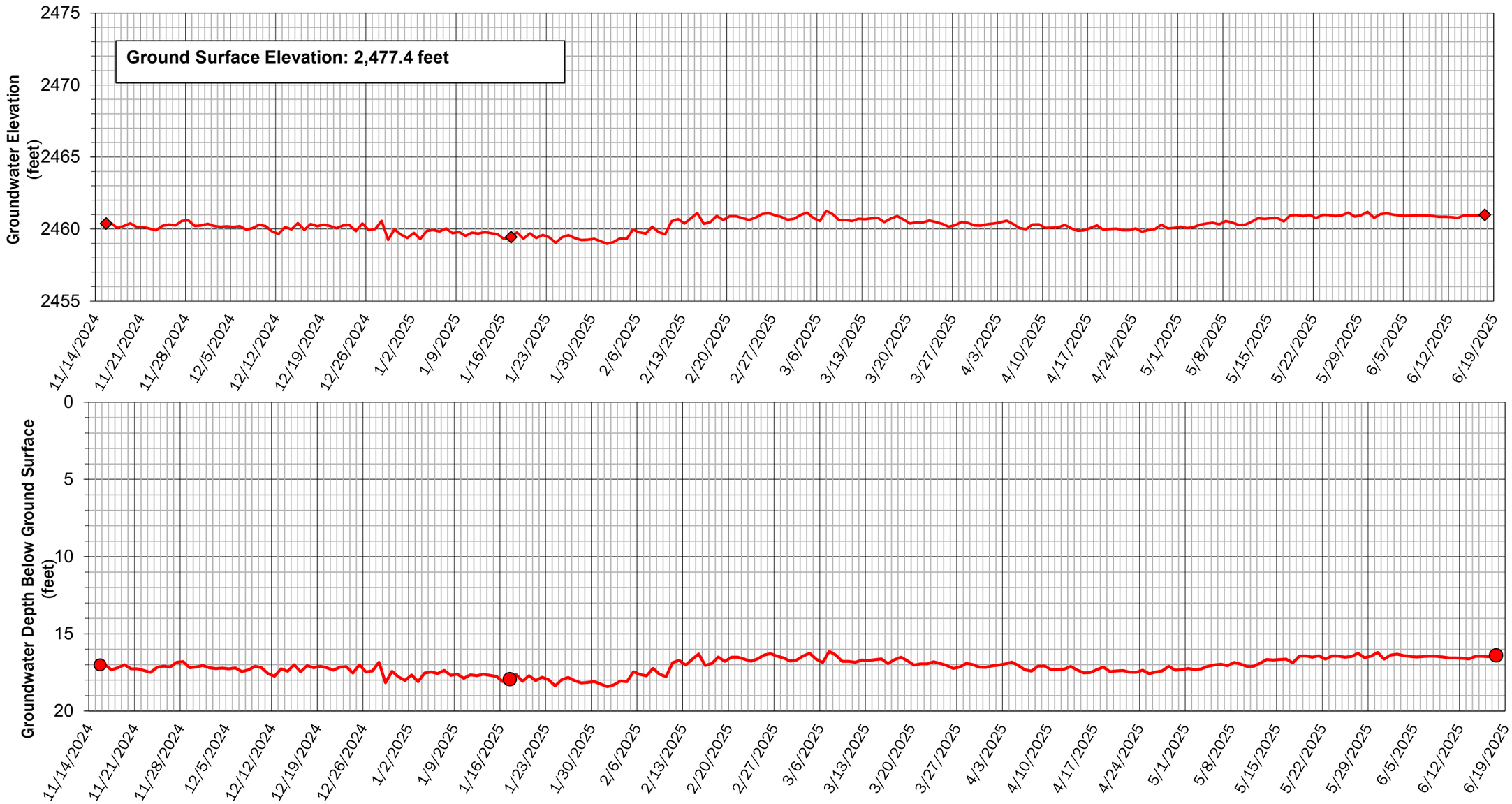
Figure E-1



Notes:
1. Coordinates and Elevations from Ardurra.

Pressure Transducer
Manual Reading

A-R Groundwater Levels

Northside and Karcher Roundabout Intersection Improvements;Project No. A023(731); KN23731
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Figure E-2