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Department Memorandum

Idaho Transportation Department

ITD 0500 (Rev. 07-17)
itd.idaho.gov

DATE: January 29, 2021

Program Number(s) A022(215)

TO: JESSE BARRUS, P.E
DE 4

Key Number(s) 22215

FROM: LYNN WHITE, P.E.
MTLS E4

Program ID, County, Etc.SH-27, BURLEY CL
US-30, BLUE LAKES TO EASTLAND DR, TWIN FALLS CO
WA# P204380

RE: ROADWAY MATERIALS REPORT APPROVAL

Your approval of the Roadway Materials Report is requested.

The scope of this project is the rehabilitation of US-30 from MP 218.638 to MP 219.579 in the city of Twin Falls. This report presents the recommendations for the pavement rehabilitation treatments for this section. The report was prepared by American Geotechnics and is dated January 22, 2021.

Approval Recommended by

Lynn White

District Materials Engineer

1-22-2021

Date

Report Approved by:

Jesse Barrus

District Engineer

1-01-21

Date

AMERICAN GEO TECHNICS

Roadway Materials Report

US-30, Blue Lakes Blvd to Eastland Dr

Twin Falls, Idaho

Key No 22215

Prepared for:

Idaho Transportation Department

January 22, 2021

03393

File No 03393

January 22, 2021

Idaho Transportation Department
216 South Date St.
Shoshone, Idaho 83352

Attention: Lynn White, PE

Roadway Materials Report

US-30, Blue Lakes Blvd to Eastland Dr

Twin Falls, Idaho

Key No 22215

Prepared by:

American Geotechnics

PROFESSIONAL ENGINEER LICENSED 1-22-21 6801 STATE OF IDAHO STANLEY G. CRAWFORTH

Travis H. Thomsen, WAQTC
Sr. Geotechnical Technician

Stanley G. Crawforth, PE
Geotechnical Engineer

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Appendices

240.00 ROADWAY MATERIALS REPORT

240.01 Introduction

This roadway project is located in Twin Falls County near Twin Falls, Idaho, on US-30, beginning at Blue Lakes Blvd and ending at Eastland Dr (MP 218.638 to 219.579).

The existing roadway is classified as a minor arterial with four 12-foot lanes, a center turn lane, intermittent curb, gutter, parking, sidewalks, business approaches, and paved shoulders of various widths. The posted speed limit is 35 mph.

This is a roadway rehabilitation project. As such, the Roadway Materials Report will not require geological reconnaissance and mapping, soil profile drawings, or slope investigations. Roadside embankments and/or retaining walls are not anticipated.

The proposed construction year is 2026.

240.02 Vicinity Map

A Vicinity Map is in Appendix A.

240.03 Pavement Condition Survey

The condition of the existing pavement is detailed in Section 540.03 Existing Pavement Conditions.

240.04 Soil Report Summary

This project involves pavement rehabilitation along the existing alignment; therefore, a Soil Report Summary was not prepared.

240.05 Total Design Pavement Thickness

The following summarizes the design recommendations for US-30, Blue Lakes Blvd to Eastland Dr, based on a combination of feasibility, constructability, and assumed cost benefits:

- Remove all existing asphalt concrete (AC).
- Recondition existing base (304).

- Add 0.18 feet of ¾" Untreated Aggregate Base.
- Tight grade and compact to design roadway crown and cross-slopes, as required, to the required final base layer lines and grades.
- If traffic is planned to operate on the base prior to paving, place a Prime Coat (402) CSS-1 diluted emulsified asphalt at 0.18 gal/sy (estimated).
- Place 0.40 feet of new Hot Mix Asphalt (HMA).

240.06 Sub-subgrading

Sub-subgrading is not required.

240.07 Grade Pointing

Grade pointing is not anticipated.

240.08 Special Placement

Special placement of materials is not specified.

240.09 Compaction

Class A compaction requirements should be specified.

240.10 Slope Design Summary

This project involves pavement rehabilitation along the existing alignment; therefore; a slope design summary is not needed.

240.11 Slope Design

Slope work is not anticipated.

240.12 Embankment Foundation

Embankment foundations are not planned.

240.13 Surface and Subsurface Water

No groundwater was encountered in the borings.

240.14 Drainage

Existing curb, gutter, and drop inlets are expected to remain adequate.

240.15 Geosynthetics

For Excavation and Repair of Soft Spot, specify Subgrade Separation Geotextile - Type III (718.07) as a filter between the pavement structure and the subgrade soils.

240.16 Existing Roadway Material

Asphalt and existing base materials from required project excavations are not planned for reuse on this project.

240.17 Rock Subgrade

Rock was not observed during the field investigations. Rock subgrade and/or rock cuts are not anticipated.

240.18 Topsoil

Topsoil is not generally present in the project development areas. Topsoil, if required, will have to be imported.

240.19 Pipe

Culvert pipe replacement is not within the scope or intent of this project.

Subsurface Utility Survey Using GPR

American Geotechnics performed a subsurface utility survey to identify the depths of known utilities within the US-30 roadway prism. This effort is intended to aid in the proposed roadway repair efforts along the corridor through the city of Twin Falls. The following table presents the utilities encountered, as well as the associated utility stakeholders.

Summary of Project Utilities	
Utility Type	**Stakeholder**
Water/Sewer/Storm Drain	City of Twin Falls
Gas	Intermountain Gas Co.
Communication/Fiber Optic	CenturyLink; Sparklight; Project Mutual
Electricity	Idaho Power

Methods

Prior to performing ground penetrating radar surveys, American Geotechnics contacted Idaho Digline to paint mark all utilities within the project limits.

On November 23, 2020, American Geotechnics used ground penetrating radar (GPR) to conduct the subsurface utility survey site evaluation in general accordance with the American Society of Civil Engineers (ASCE) *Standard Guide for the Collection and Depiction of Existing Subsurface Utility Data* (2002). The ASCE classifies GPR as a high level "Quality Level B" utility locating method using geophysical means (2002). For comparison, "Quality Level A" involves direct measurement through physical excavation, "Quality Level C" generally includes painted utility markings, and "Quality Level D" includes historic construction or as-built reference drawings and records.

No utility access vaults or delineators were opened or disturbed for this investigation. Furthermore, no potholing or invasive testing was conducted to verify utility locations or depths.

The American Geotechnics GPR system includes a GSSI SIR-3000 controller and a 400 MHz, ground-coupled antenna for general buried utility locating. When a utility reflection is observed under the radar antenna, the measured depth below the existing ground surface and the anticipated direction of the utility are noted. A Topcon GPS survey instrument was used to collect a submeter accuracy location for each observed utility in this project, including several unknown utilities observed during the survey. The Subsurface Utility Maps in Appendix A summarize the GPR-measured utility depths, latitude/longitude locations, and the observed direction of the utilities.

Summary and Recommendations

Because shallow utilities often impact construction pavement rehabilitation activities, American Geotechnics recommends the Contractor develop a plan for collecting "Quality Level A" data (e.g., potholing or excavation) to verify the exact location and depth of any unknown utilities and sensitive utilities such as water lines or communication lines less than 2 feet deep. Additionally, the design engineer should consider and include specifications to mitigate equipment vibration and excavation impacts to retain and protect the existing utilities accordingly.

Several of the observed utilities were located at considerably shallow depths, within 2.0 feet below the existing surface. These shallow utilities should be

given close attention in the potholing plan. At this depth, the utilities would be of high concern for construction activities and should be carefully identified.

It is not reasonable to guarantee subsurface utility depths or conditions via GPR. Open excavations are a “Quality Level A” utility locating method and are more reliable than GPR for determining the type, size, and location of buried utilities. Please be advised that American Geotechnics will not guarantee any ground markings or subsurface information developed using GPR technology.

Limitations

Due to the inability of utility stakeholders to completely field mark all area utilities, not all utility types could be identified. Utility stakeholders generally provided maps for this reason; however, the relatively low level of accuracy of the maps falls under “Quality Level D” by the ASCE (2002). In some cases, utility paint markings were observed on the ground surface from recent locator markings or surface features; however, their depths could not be deduced from GPR scans.

The frequency of the antenna, soil type, and moisture content below the existing ground surface influence the depth of GPR imaging and accuracy of utility locating. In certain areas, GPR may not be viable at all due to the influence of moisture and/or interfering reflections from soil/rock mineralogy and/or radio frequencies from adjacent cell phone towers. When a utility is detected, it is possible to note the depth below the ground surface, often within about 0.5 foot and maybe less, but should be validated through open excavations.

240.20 Riprap

Riprap is not planned.

240.21 Staged Construction

Staged construction for time-rate consolidation of embankment foundation is not required.

240.22 Pavement Data

240.22.01 Pavement Type and Surface Smoothness

The recommended pavement type is Superpave Hot Mix Asphalt, Class SP-5 (405).

The project should be constructed to Schedule I Surface Smoothness (405.03.P).

240.22.02 Typical Section

The following table summarizes the typical section for the project.

US-30, Blue Lakes Blvd to Eastland Dr Traffic Loading – Flexible ESALs: 16,133,040			
	Thickness (feet)	Layer	Materials
	0.40	Superpave Hot Mix Asphalt, Class SP-5 (405); 2 equal lifts	Aggregate for Superpave HMA Pavement, ½-inch (703.05) Asphalt, PG 70-28 (702.01)
	0.18	Untreated Aggregate Base (303)	Aggregate for Untreated Base, ¾-inch Type B (703.04)
	1.05	Recondition Existing Base (304)	

The LTPPBind output is in Appendix C.

240.23 Earthwork and Soft Spot Repair

Aggregate Base (303)

Aggregate for Untreated Base, ¾-inch Type B (703.04)

Geotextile

Subgrade Separation Geotextile, Type III (718.07)

240.24 Base

Aggregate Base (303)

Aggregate for Untreated Base, ¾-inch Type B (703.04)

Prime Coat (402) for Aggregate Base

Emulsified Asphalt, CSS-1 (702.03) diluted (1:1 ratio) at 0.18 gal/sy (estimated residual rate of 0.06 gal/sy)

240.25 Surface Treatment

A surface treatment is not planned.

240.26 Paving

Superpave Hot Mix Asphalt, Class SP-5 (405)

Aggregate for Superpave HMA Pavement, ½-inch (703.05)

Asphalt, PG 70-28 (702.01) at 5.6% by weight of mix (estimated)

Anti-Stripping Additive (702.04) at 0.5% by weight of asphalt binder (estimated)

Tack Coat (401) on New HMA

Emulsified Asphalt, CSS-1 (702.03) diluted (1:1 ratio) asphalt applied at a rate of 0.08 gal/sy (residual rate of 0.03 gal/sy estimated).

Pavement Joint Adhesive (SP)

Apply pavement joint adhesive to gutter/pavement construction joints prior to paving.

240.27 Seal

A seal coat is not planned.

240.28 Dust Abatement

Dust Abatement (205.02.C)

Water for Dust Abatement is estimated at 4 inches of water applied to areas disturbed by required earthwork activities in units of MG (thousand gallons).

240.29 Ancillary Construction

No ancillary construction is planned

240.30 Aggregate Estimating Data

Superpave Hot Mix Asphalt (405)

Aggregate for Superpave HMA Pavement at 148 lb/cf, including asphalt (estimated)

Aggregate Base (303)

Aggregate for Untreated Base at 146 lb/cf, including 7% water (estimated)

Granular Subbase (301)

Aggregate for Granular Subbase at 138 lb/cf, including 7% water (estimated)

Soft Spot Repair

Combined areas of soft spot repair may total about 300 sy with 2 feet of sub-excavation (estimated).

Disclaimer

The unit weights in this estimating basis are provided to the designer for developing approximate project quantities. The actual quantities will vary dependent on the Contractor-provided sources, crushing operations, and mix designs. The Contractor is solely responsible for determining actual unit weights based on the methods of production and providing adequate materials for the project, plus any losses due to stockpile operations, out of specification (rejected) materials, or other wastes.

240.31 Aggregate Sources

240.31.01 Source Identification

Approved Contractor-furnished sources are specified for all aggregates.

240.31.02 Designated Sources

Designated sources are not identified for this project.

240.31.03 Contractor Provided Sources

The Contractor shall furnish approved sources(s) for all materials to be embanked or processed for placement. A list of State-owned or State-controlled sources is available at the ITD District office. Written approval of the Contractor's source operation plan will be required prior to accepting materials or using State-owned or State-controlled sources.

240.31.04 Cost

The Contractor shall be responsible for all costs incurred in obtaining approval for the use of source(s).

240.31.04.01 Materials Source Purchase Program

If the Contractor chooses to use ITD controlled sources, the source recovery fee is the applicable rate, as established in the *ITD Materials Manual* Section 300.02.05 Source Control, at the time of bidding.

240.32 Current Specifications and Minimum Testing Requirements

The following documents are applicable:

Idaho Transportation Department (ITD). 2020. *Materials Manual*.

Idaho Transportation Department (ITD). 2019. *Quality Assurance Manual.*

Idaho Transportation Department (ITD). 2018. *Standard Specifications for Highway Construction.*

Idaho Transportation Department (ITD). 2020. *Supplemental to 2018 Standard Specifications for Highway Construction.*

240.33 Modification of Standard Specifications

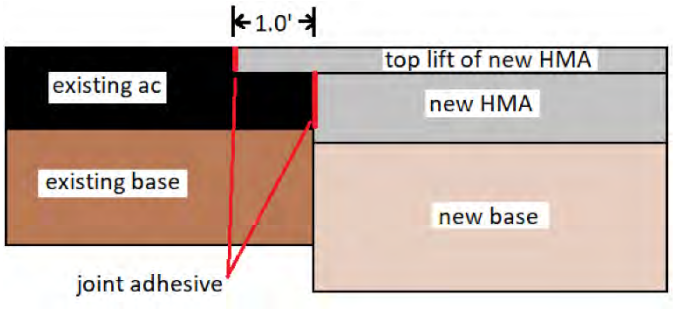
There are no materials-related modifications to the Standard Specifications.

240.34 Special Provisions

S911-05E – SP PAVEMENT JOINT ADHESIVE

Description:

Apply a hot-applied modified asphalt joint adhesive to the face of the longitudinal cold construction joints, including gutters.



Materials:

Provide joint adhesive meeting requirements as specified in Table 1.

Table 1 - Joint Adhesive Specifications				
Test				**Specification**
Brookfield Viscosity	400 °F	[204 °C]	ASTM D3236	4,000-10,000 cp
Cone Penetration	77 °F	[25 °C]	ASTM D5329	60-100 dmm
Flow	140°F	[60°C]	ASTM D5329	5 mm maximum
Resilience	77 °F	[25 °C]	ASTM D5329	30% minimum
Ductility	77 °F	[25 °C]	ASTM D113	30 cm minimum
Ductility	39.2 °F	[4 °C]	ASTM D113	30 cm minimum
Tensile Adhesion	77 °F	[25 °C]	ASTM D5329	500% minimum
Softening Point			ASTM D36	170 °F [77 °C] min.
Asphalt Compatibility			ASTM D5329	Pass

Construction Requirements:

Equipment Requirements:

Use a jacketed double boiler type melter with effective agitation that meets appendix X1.1 of ASTM D6690. Melter must be capable of safely heating adhesive to 400°F [204°C].

Material Handling:

Submit a copy of the manufacturer's recommendations for heating, re-heating, and applying the joint adhesive material.

Do not remove the joint adhesive from the package until immediately before it is placed in the melter. Joint adhesive boxes must be clearly marked with the name of the manufacturer, the trade name of the adhesive, the manufacturer's batch and lot number, the application/pour temperature, and the safe heating temperature. Feed additional material into the melter at a rate equal to the rate of material used.

Verify the pouring temperature of the joint adhesive at least once per hour at the point of discharge. Stop production if the adhesive falls below the recommended application/pour temperature. When the temperature of the adhesive exceeds the maximum safe heating temperature, stop production, empty the melter, and dispose of that adhesive in an environmentally safe method. No payment will be made for this material or its disposal.

Do not blend or mix different manufacturer brands or different types of adhesives.

Joint Adhesive Application:

Follow the manufacturer's installation instructions. The face of the longitudinal joint must be clean and dry before the joint adhesive is applied. Apply the joint adhesive material to the entire face of the final lift of HMA pavement where an adjacent HMA pavement will be constructed. The pavement surface shall be 40°F [4°C] and rising. The joint adhesive shall also be applied to the entire face of concrete pavement where an adjacent HMA shoulder pavement will be constructed. The recommended band thickness is approximately $^{1}/_{8}$″ [3 mm]. The use of an application shoe attached to the end of application wand is recommended. Do not overlap the joint by greater than ½″ [12.5 mm] at the top of the joint or 2″ [50 mm]

at the bottom of the joint. Apply the joint adhesive immediately in front of the paving operation. If the adhesive is tracked by construction vehicles, repair the damaged area and restrict traffic from driving on the adhesive. Compaction at the joint shall be as stated in the manufacturer's installation instruction.

Quality Control:

Acceptance of the joint adhesive material is based on the certification by the manufacturer that the sealant meets the requirements listed in Table 1. The Engineer may elect to sample and test the material to verify the certification(s). For the verification testing and sampling, the Contractor shall take a sample from the application wand during the first 20 minutes of placing sealant from each melter on the project in the presence of the Engineer.

Each sample shall consist of two (2) aluminum or steel sample containers with the capacity to hold five (5) pounds [2.3 kg] of sealant each. The two (2) sampling containers shall be labeled with the SP number, date, time, location, manufacturer, and lot number of the sealant. Each container shall be numbered one of two, or two of two.

The Contractor shall document the locations where the material from each lot number of sealant is placed.

Should sampling and testing indicate the material does not meet the specifications in Table 1, the material shall be subject to rejection. The Engineer may allow non-specification material to be left in place with a price adjustment if the finished product is found to be capable of performing its intended purpose. The price adjustment will be 75 percent of the contract unit bid price multiplied by the total quantity of material represented by the failing test results.

Independent assurance sampling and testing will not be required.

Method of Measurement.

Pavement Joint Adhesive will be measured by foot of longitudinal joint.

Basis of Payment:

Payment for accepted work will be made as follows.

Pay Item	Pay Unit
SP Pavement Joint Adhesive	FT

240.35 Notes to Contractor

Estimating Basis

The unit weights in the estimating basis were determined from area history and past project experience. This information is provided to assist the designer in developing reasonable project quantities. The actual quantities will vary dependent on Contractor-furnished sources, crushing operations, 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 operations or other wastes.

Soft Subgrade Soils

The Contractor should anticipate soft and moisture-sensitive subgrade soils, which could occur throughout this project. These soils will be prone to rutting or pumping under construction equipment, especially if they become wetter than optimum moisture content at the time of construction.

The Contractor is to protect these soils during construction activities, and the Contractor is to determine how best to achieve this requirement. No separate measurement of payment will be made for any excavation or replacement of excavated material below subgrade elevation made necessary from construction activities.

Excess Material Sites

Excess material sites will conform to the requirements of *ITD Standard Specifications* Subsection 205.03.A. General. All excess or unsuitable material removed from the project becomes the property of the Contractor.

240.36 Notes to Resident Engineer

There are no notes to the Resident Engineer.

240.37 Notes to Designer

Revision of This Roadway Materials Report

Delay of project advertisement or project changes that occur after the final design package is issued often necessitate revisions to the Roadway Materials Report. The Roadway Materials Report must be reviewed and revised as necessary when any of the following occur after the original Roadway Materials Report is issued and before project advertisement:

1. New standard specifications or supplemental specifications are released and are to be used on the project.
2. Revised Minimum Testing Requirements (MTRs) are released.
3. Additional bid items are added to the project, and design changes are made that have an impact on materials specification.

Geotechnical/Materials Review After Final Design

In the ITD "Consultant Agreement Specifications" document, the policy states that

> the Consultant must ensure that any Subconsultant performing geotechnical and materials work be involved in the final design review. This does not mean that the geotechnical materials consultant must attend the actual final design review meeting, but does mean that the Subconsultant, will at a minimum, participate in the final design plan and proposal review to assure that all geotechnical and materials recommendations/issues it raised concerning the project have been addressed, or notify the Consultant of any outstanding issues. (2019)

540.00 PAVEMENT STRUCTURE ANALYSIS

540.01 Introduction

See Section 240.01 Introduction.

540.02 Methodology

American Geotechnics used the AASHTOWare Pavement Mechanistic-Empirical (ME) v2.5.5 software for analyses and design.

540.03 Existing Pavement Conditions

History of Construction and Maintenance

According to ITD Transportation Asset Management Plan (TAMS) construction history, the roadway was initially constructed in 1960. A mill/inlay was performed in 2003, and a seal coat was done in 2006.

Visual Pavement Distress Survey

On September 24, 2020, American Geotechnics completed a pavement distress survey for the project in general accordance with FWHA's *Distress Identification Manual for Long-Term Pavement Performance Program* (FHWA 2003).

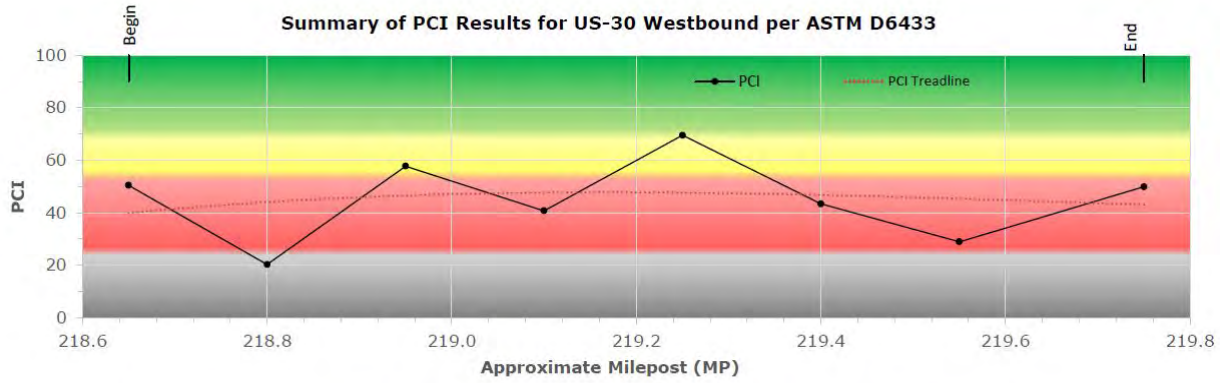
A Pavement Condition Index (PCI) is a numerical indicator that rates the surface condition of an existing pavement, based on visual observations. A PCI provides a quantifiable measure (from 0 to 100) of the present condition of the pavement based on the accumulation of various distresses observed on the pavement surface, which also indicates the structural integrity and surface operation condition (ASTM 2018). Generally, PCI ratings provide helpful guidance on the existing condition of the roadway using the scale and associated repair strategy in the following table.

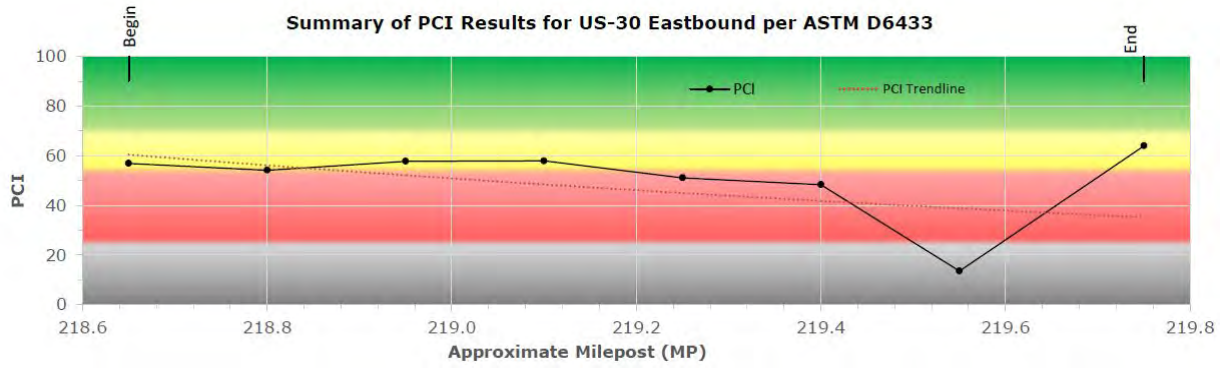
Summary of Generalized PCI Rating Scale		
PCI Rating	Condition Description	Suggested Repair Strategy
70-100	Good	Maintenance/Minor Rehabilitation
55-70	Fair	Functional Rehabilitation/Reclamation
25-55	Poor	Reclamation/Reconstruction

Summary of Generalized PCI Rating Scale		
PCI Rating	Condition Description	Suggested Repair Strategy
0-25	Failed	Reconstruction

Based on the PCI survey results, US-30 has an average PCI rating of 48, and reclamation/reconstruction is recommended. Appendix C includes pavement condition photographs and PCI survey results.

The following chart presents the PCI results from the survey.





Overall Condition Index

ITD uses a Transportation Asset Management Plan (TAMP) to address highway safety, congestion, and freight movement on its highway network.

ITD uses three measures to quantify performance: the international roughness index (IRI), Overall Condition Index (OCI), and rutting depth.

ITD Pavement Measures			
Measure Type	Condition		
	Good	Fair	Poor
IRI (In/Mile)	<95	96-170	>170
OCI (0-100 scale)	>=80	79-60	<59
Rutting Depth (inches)	<0.2	0.21-0.4	>0.4

The following tables summarizes the OCI and ITD pavement measurements for this segment of US-30.

US-30, Blue Lakes Blvd to Eastland Dr Overall Condition Index		
Index	Eastbound	Westbound
IRI	154	127
Rutting	0.09	0.09
Fatigue Cracking	99.89	99.70
Edge Cracking	97.25	99.12
Transverse Cracking	75.04	72.99
Block Cracking	96.94	99.55
Patch Deterioration	99.39	99.49
Raveling	99.96	99.97
OCI	74.57	72.84

ITD's 2020 Profiler Van data lists this segment of US-30 between Blue Lakes Blvd and Eastland Dr as being in fair condition.

540.04 Existing Pavement Structure – Materials and Thicknesses

The existing pavement structure layers were evaluated using data from a ground penetrating radar (GPR), falling weight deflectometer (FWD), and pavement borings, as described in the following sections.

GPR Pavement Structure Data

American Geotechnics collected GPR data on September 24, 2020, to supplement roadway borings.

A short-pulse GPR data collection system was used in general accordance with ASTM D4748 (2006). The American Geotechnics GPR system components include a GSSI SIR-30 controller and two antennas at frequencies of 2.0 GHz and 400 MHz. The 2.0 GHz antenna is especially suited for collecting detailed data in the upper 24 inches of the pavement structure. The 400 MHz antenna was set to collect data to 5 feet below the pavement surface for project-level pavement design.

The following table summarizes the GPR results in both the eastbound and westbound lanes.

GPR Existing Pavement Structure Layer Thicknesses				
Layer	Thickness Statistics (in.)			
	Minimum	Mean	Std. Dev.	Maximum
US-30, Blue Lakes Blvd to Eastland Dr (Eastbound)				
AC	1.3	7.7	1.3	11.8
Base	3.8	11.2	3.7	22.5
US-30, Blue Lakes Blvd to Eastland Dr (Westbound)				
AC	3.5	6.3	0.8	9.6
Base	4.4	14.0	5.4	25.4
Average Existing Pavement Layer Thickness				
AC	7.0			
Base	12.6			

See the GPR layers profile and statistics in Appendix C.

Borings

American Geotechnics advanced 2 borings to a depth of 6.0 feet in the eastbound travel lane (AG-01 & AG-02) and 2 borings in the westbound travel lane (AG-03 & AG-04), as shown on the Boring Location Map in Appendix A. Four-inch-diameter asphalt concrete (AC) cores were obtained at each boring, with an additional 4 cores obtained at cracks in search for both top-down and bottom-up types of cracking.

Groundwater or bedrock was not encountered at the time of drilling.

Appendix A includes the Exploration Location Map and boring logs.

Core and boring observations and measurements were useful in this investigation for the following reasons:

- Assessing stripping, delamination, fragmentation, and soft zones within the AC pavement course
- Assessing top-down or bottom-up cracking
- Providing ground truthing for the GPR layer (reflection) picking
- Providing an opportunity to examine the condition and quality of the buried materials and the nature of the native subgrade and to obtain samples for laboratory testing
- Identifying the near-surface bedrock or groundwater, if encountered

The boring logs were updated to include laboratory ASTM D2487 (USCS) soils classification information. Appendix B contains the laboratory test reports. Subgrade soils are classified as Silt (ML). The soils have F4 frost susceptibility characteristics, as classified by the US Army Corps of Engineers (USACE 2001).

540.05 Traffic Load

The ITD Roadway Data Section provided traffic data. The 20-year design traffic load for analysis and design is 16,133,040 ESALs (TI=12.5), assuming 90 percent of the truck traffic in the design (travel) lane for both directions. Traffic data, together with the traffic projection worksheet, are included in Appendix D.

The following table summarizes the traffic data and the traffic input parameters used for analysis in the AASHTOWare Pavement ME software for design.

Traffic Data	
Traffic Data Summary	**Value**
Average Daily Traffic (ADT)	18600
Average Annual Daily Truck Traffic (AADTT)	1330
Number of Lanes in Design Direction	2
Percent Trucks in the Design Lane	90%
Operational Speed	35 mph
Estimated Growth Rate	3.0% (Compound)
Calculated 20-Year Flexible ESALs	16,133,040
Traffic Index	12.5

The Idaho default traffic distribution was used in the AASHTOWare Pavement ME software for design.

540.06 Climate

For ME analyses, multiple local weather stations within the project climate zone provided detailed climate data to predict the temperature or moisture content of the various pavement structure layers.

The appendices contain the pavement structure design calculations that summarize climate input.

540.07 Deflections and E_{FWD} Layer Moduli

Deflections

A falling weight deflectometer (FWD) is a nondestructive and nonintrusive testing device widely used in pavement engineering.

FWD pavement deflection measurements were obtained every 200 feet in the wheel path of the eastbound and westbound travel lanes in September 2020. The testing was performed using a Dynatest 8002-158 FWD, in

accordance with ASTM D4694 (ASTM International 2015). The FWD had nine deflection sensors capable of 100-mil deflections located at -12" (LTE), 0" D(0)-Plate, 8", 12", 24", 30", 36", 48" D(48), and 60". The plate diameter was 5.91". Each test location included two targeted 9,000-lb load drops and two 12,000-lb drops. The measurements were located with a Trimble AG 332 GPS survey instrument for subsequent correlation with GPR layer thicknesses. At each test location, infrared pavement surface temperature and air temperature were measured.

FWD Deflection Data is in Appendix C.

Back-calculated Layer Moduli

The process of calculating the elastic moduli, E_{FWD}, of individual layers in a multilayer system (e.g., asphalt concrete on top of a base course on top of the subgrade) based on surface deflections is known as back-calculation.

The stiffness or elastic modulus of the AC surface course is sensitive to temperature. The elastic modulus back-calculation for the AC layer stiffness was adjusted to a reference temperature of 70° F using the BELLS method and the previous average daily temperature (PADT), in accordance with ASTM D7228 (2006). The PADT used for back-calculation was 67° F on September 24, 2020.

The deflection basin fit method was used to back-calculate layer elastic moduli (Dynatest International 2018). ELMOD6 software, developed by Dynatest, facilitated the back-calculation of elastic moduli of the layered pavement structure. The following table summarizes the back-calculated elastic moduli for each pavement structure layer.

Back-Calculated Layer Elastic Moduli (E_{FWD}) for Existing Layers		
Layer	Mean (ksi)	Std. Dev.
Eastbound		
AC[1]	477.3	179.5
Base	24.2	11.5
Subgrade	9.8	1.2
Westbound		

Back-Calculated Layer Elastic Moduli (E_{FWD}) for Existing Layers		
Layer	Mean (ksi)	Std. Dev.
AC[1]	619.9	248.5
Base	25.7	16.2
Subgrade	10.0	1.2
[1]Adjusted to Reference Condition (70˚F).		

The FWD data and back-calculation results are included in Appendix C.

540.08 C-Factor and Resilient Moduli

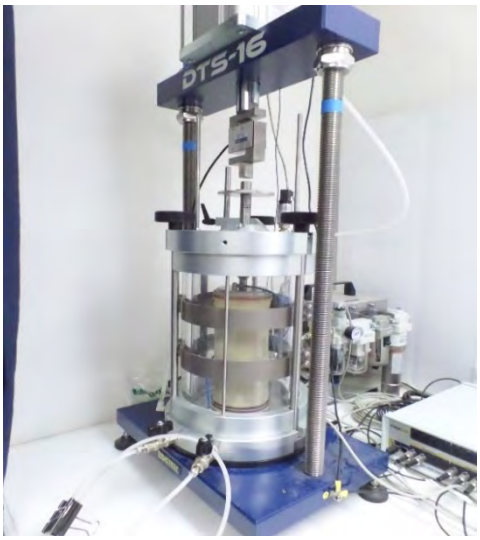
If the layer design resilient (or elastic) modulus values are determined by back-calculating elastic layer modulus values from FWD deflection basin tests, AASHTO guidelines require those values to be adjusted to laboratory conditions (2015). A ratio of the laboratory tested resilient modulus, M_r, to the back-calculated elastic modulus, E_{FWD}, or C-value (M_r/E_{FWD}), is used to adjust the back-calculated moduli obtained from FWD deflection data for base and subgrade materials.

To obtain a basic knowledge of the engineering properties of the materials and how they affect the design, American Geotechnics collected one bulk subgrade sample from AG-02 for M_r testing in general accordance with AASHTO T 307.

The testing included a series of 15 sequences of dynamic triaxial loading applications at various stress states. Linear regression analyses of the measured data determined the nonlinear elastic parameters (k1, k2, and k3) used for the generalized resilient modulus model. Test load sequence 6 (TRB 2003) was used to develop a design resilient modulus for subgrade soils.

The resilient modulus test report is in Appendix B.

The following table summarizes the results from this analysis.



Resilient Modulus Test Setup

Design C-Factors for Unbound Materials			
Location	M_r (psi)	E_{FWD} (psi)	C-Factor (M_r/E_{FWD})
AG-01	6200*	11100[1]	0.56
[1]Back-calculated Elastic Modulus, E_{FWD} is from the nearest FWD drop location.			

540.09 Analyses and Design

The ME approach for this project incorporated pavement deflection measurements from a falling weight deflectometer (FWD) and layer thicknesses from ground penetrating radar (GPR).

Pavement Design Layer Elastic Moduli

Based on the results of the preceding section in this report, American Geotechnics selected the design moduli summarized in the following table for use in the AASHTOWare Pavement ME design software.

Pavement Layer Design Moduli	
Layer	Elastic Moduli (ksi)
Average Existing AC	548.6
CRABS	90.0
Recondition Existing Base[1]	23.2
Average Existing Base[2]	15.5
Average Subgrade[3]	5.5
[1]Recondition existing base with added ¾" Untreated Aggregate base moduli was adjusted to 150% of the Average Existing Base Moduli.	
[2]Existing base moduli were adjusted using a C-value of 0.62 in the AASHTOWare Pavement ME analyses, per AASHTO guidelines (AASHTO 2015).	
[3]Back-calculated modulus values for existing subgrade soils were adjusted using the average site-calibrated C-value of 0.56 in the AASHTOWare Pavement ME analyses.	

Evaluation of Pavement Design Alternatives

For flexible pavement, 20 years of service is specified. The programmed construction year for the project is 2026.

The 20-year analysis strategies included the following:

- **Alternative 1** – Mill and Inlay Rehabilitation
- **Alternative 2** – Full Depth Removal (FDR) of AC and Hot Mix Asphalt (HMA) Replacement
- **Alternative 3** – Cement Recycled Asphalt Base Stabilization (CRABS) Rehabilitation with HMA Overlay
- **Alternative 4** – Flexible Reconstruction

AASHTOWare Pavement ME analysis results for the design alternatives are included in Appendix E.

Alternative 1 – Mill and Inlay

A 2.4-inch mill/inlay was analyzed using the AASHTO Pavement ME Method. This strategy was not deemed feasible as bottom-up cracking failure is predicted at year 2.

Alternative 2 – Full Depth Removal of AC and HMA Replacement

The existing pavement is 0.58 feet thick on average.

This strategy includes the following steps:

- Remove all existing AC.
- Recondition existing base (304).
- Add 0.18 feet of ¾" Untreated Aggregate Base.
- Tight grade and compact to design roadway crown and cross-slopes, as required, to the required final base layer lines and grades.
- If traffic is planned to operate on the base prior to paving, place a Prime Coat (402) CSS-1 diluted emulsified asphalt at 0.18 gal/sy (estimated).
- Place 0.40 feet of new HMA.

Based on the AASHTO Pavement ME Method, this strategy appears to meet all performance criteria for 20 years of service.

Alternative 3 – CRABS with HMA Overlay

This strategy includes the following steps:

- Mill 0.20 feet of the existing pavement.
- Pulverize the remaining existing AC and a portion of the existing base to a depth of 0.85 feet to create base material consisting of an approximate 50/50 mix of pulverized AC to base.
    - Note: The depth of pulverized material is expected to be about 1.00 foot due to swelling.
- Remove 0.35 feet of the pulverized and blended material.
- Tight grade and compact to design roadway crown and cross-slopes. Remove excess base or supplement with new base, as required, to the required final base layer lines and grades.
- Uniformly admix 2.0 percent cement (including water for hydration) to a depth of 0.67 feet, compact, and restore to final base layer lines and grades. This should create a CRABS layer having a stiffness (E) of at least 80,000 psi. Class II CRABS (308) by prescribed elevations is appropriate.
- Place a 0.40-foot HMA (405) overlay.
    - Note: This should maintain the roadway profile.

Alternative 4 – Flexible Reconstruction

This alternative includes removing the existing roadway and constructing a new flexible pavement section. The following table shows the proposed pavement layer structure. Appendix E contains the flexible design calculations and PavementME results.

Flexible Reconstruction (20-Year Analysis) Design Results	
Pavement Design Element	Thickness (Feet)
HMA	0.50

Untreated Base	0.80
Granular Subbase	1.45
Subgrade Separation Geotextile	Recommended
Total	2.75

540.10 Economic Comparison of Alternatives

A Life-Cycle Cost Analysis (LCCA) provides an economic comparison of related costs of the Full Depth Removal (FDR) and CRABS design alternatives. The following table summarizes the LCCA results. The LCCA output can be found in Appendix F.

Summary of Life-Cycle Cost Analysis[1., 2]				
Pavement Design Alternative	Initial Cost	Total 36-Year Life-Cycle Cost	EUAC	Total Net Present Worth at 4%
FDR	$972,500	$2,038,800	$79,300	$1,499,100
CRABS	$1,917,300	$2,158,233	$127,900	$2,417,800
[1]The LCCA uses unit costs provided by ITD. The LCCA costs are for comparison purposes only. [2]Does not include all costs that are common to each alternative.				

The LCCA results indicate the Full Depth Removal of AC and Replacement strategy has the most favorable Equivalent Uniform Annual Cost (EUAC).

540.11 Recommendations

Based on the EUAC of the LCCA, the Full Depth Removal design alternative, as detailed in Section 540.09, is the preferred strategy. This strategy will have a lower impact on traffic and the surrounding businesses.

540.12 References

American Association of State Highway and Transportation Officials (AASHTO). 1999. *Test for Determining the Resilient Modulus of Soils and Aggregate Materials.* Washington, DC: AASHTO.

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Appendix A

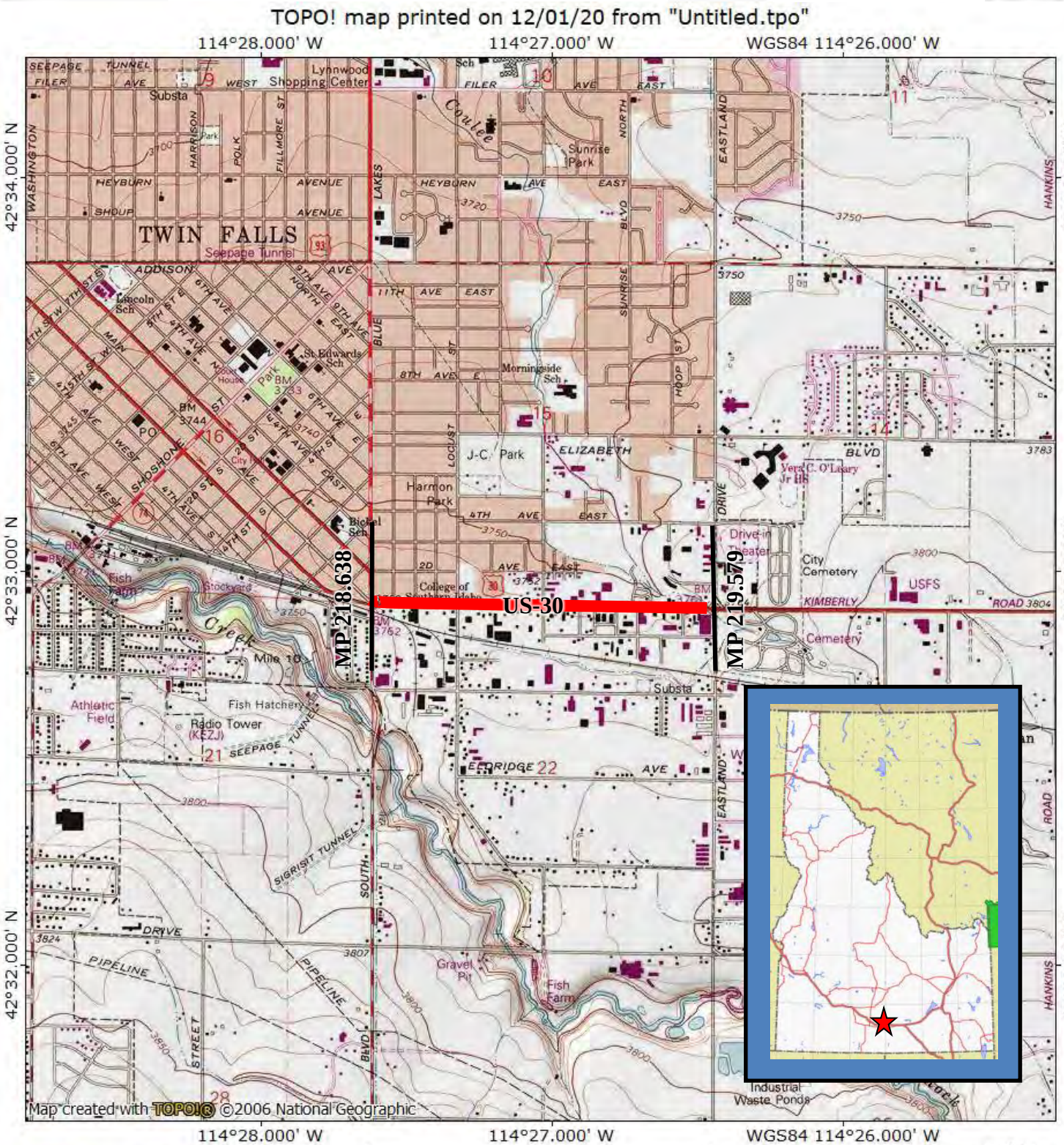
Vicinity Map

Exploration Location Map

Boring Logs

Core Photographs

Subsurface Utility Maps



Vicinity Map

US-30, Blue Lake Blvd to Eastland Dr
Twin Falls, Idaho

Figure 1

File No
03393

December 1, 2020

AMERICAN GEO TECHNICS

LEGEND

AG-01 — BORING LOCATION

C-01 — CORING LOCATION

N

0 50 100 200 300

SCALE IN FEET

Exploration Location Map

US-30, Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Figure 2

File No. 03393

September 18, 2020

AMERICAN GEOTECHNICS

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. AG-01

METHOD: Hollow-Stem Auger
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5485470091°
LONGITUDE: -114.4572024577°

DEPTH (ft)	TYPE - No.	TYPE - No.	RECOVERY %	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5		CR-01			Asphalt Concrete - Dense; chip seal; delamination at 0.46'. Core Recovery = 0.46'.	0.70	0.70	Located in the east bound travel lane with curb and gutter to the north and south.
1.0		GB-02			Poorly Graded Sand with Gravel (SP) - (Base) About 55% fine to coarse, subangular sand; about 40% medium hard, subangular gravel to 1/2"; about 5% non-plastic fines; moist; brown.	1.03	1.73	
2.0					Silt (ML) - (Native) 95% non-plastic fines; 5% medium to fine sand; moist; brown.			A-4 ω=18.9, LL=NV, PI=NP in-situ density=88.7pcf.
2.5								
3.0	BK-04	ST-03	100					
3.5								
4.0						4.27		Reaction to HCl. Easy driving, little to no hammer.
4.5								0.0-0.75 tsf
5.0		SS-05	100					
5.5								
6.0							6.00	

Bottom of Boring at 6.0 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. AG-02

METHOD: Hollow-Stem Auger
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5484827454°
LONGITUDE: -114.4477695767°

DEPTH (ft)	TYPE - No.	RECOVERY %	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5	CR-07			Asphalt Concrete - Dense; chip seal, delamination at 0.29'. Core recovery = 0.48'.	0.60	0.60	Located in the east bound travel lane with curb and gutter to the north and south. Possible CRABS.
1.0	GB-08			Well-Graded Sand with Silt and Gravel (SW-SM) - (Base) 54% coarse to fine, subangular sand; 38% medium hard, subangular gravel to 3/4"; 8% fines; moist; brown.	1.16	1.76	A-1-a Sight reaction to HCl, likely natural.
2.0				Silt (ML) - (Native) 91% non-plastic fines; 7% coarse to fine sand; 2% gravel to 3/8"; moist; brown.			A-4 ω=18.9, LL=NV, PI=NP
3.0	SS-09	100					
4.0					4.24		Easy pushing, no hammer.
4.5							0.75-1.0 tsf
5.0	SS-10	100					
6.0						6.00	

Bottom of Boring at 6.0 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. AG-03

METHOD: Hollow-Stem Auger
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5486046375°
LONGITUDE: -114.443548645°

DEPTH (ft)	TYPE - No.	TYPE - No.	RECOVERY %	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.0		CR-12			Asphalt Concrete - Dense; chip seal; stripped below 0.50'. Core recovery = 0.50'.	0.55	0.55	Located in te west bound travel lane with curb and gutter to the north and south.
0.5		GB-13			Poorly Graded Gravel with Sand (GP) - (BASE) About 55% medium to hard, subangular gravel to 1/2"; about 40% fine to coarse sub angular sand; about 5% non-plastic fines; moist; brown.	1.65	2.20	Possible crabs between 0.55' and 1.1'. Stong reaction to HCL.
2.0								
2.5		ST-15			Silt (ML) - (NATIVE) 95% non-plastic fines; 5% fine sand; moist; brown.			A-4 ω=22.9, LL=NV, PI=NP Easy driving, little to no hammer. Shelby tube crushed on bottom.
3.0	BK-14							
3.5								
4.0					As above except moist to wet.	3.60		0.0 tsf
4.5		SS-16	93					
5.0								
5.5							5.80	

Bottom of Boring at 5.8 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. AG-04

METHOD: Hollow-Stem Auger
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5486671294°
LONGITUDE: -114.4526589467°

DEPTH (ft)	TYPE - No.	RECOVERY %	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5	CR-18			Asphalt Concrete - Dense; chip seal; delamination at 0.26'; fragmented below 0.52'. Core recovery = 0.52'.	0.57	0.57	Located in the west bound travel lane with curb and gutter to the north and south.
1.0	GB-19			Silty Sand and Gravel (SM) - (Base) 49% coarse to fine, subangular sand; 38% medium to hard, subangular garvel to 3/4"; 13% non-plastic fines; moist; gray brown.	1.08	1.65	A-1-a
2.0				Silt (ML) - (Native) 96% non-plastic fines; 4% medium to fine sand; moist; brown.			A-4 ω=20.3, LL=NV, PI=NP 0.0-1.25 tsf
3.0	SS-20	100			4.35		
4.0							Very soft, little to no hammer.
4.5							0.0-0.75 tsf
5.0	SS-21	93					
5.5							
6.0						6.00	

Bottom of Boring at 6.0 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. C-05

METHOD: HQ Diamond Core
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5485197017°
LONGITUDE: -114.4531707974°

DEPTH (ft)	TYPE - No.	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5	CR-06		Asphalt Concrete - Dense; chip seal; stripped below 0.23'. Bottom up crack. Core recovery = 0.38'.	0.71	0.71	Located in the east bound travel lane with curb and gutter to the north and south.

Bottom of Boring at 0.7 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. C-06

METHOD: HQ Diamond Core
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5484582817°
LONGITUDE: -114.4434124204°

DEPTH (ft)	TYPE - No.	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5	CR-11		Asphalt Concrete - Dense; chip seal; delamination at 0.23'; stripped below 0.41'. Bottom up crack. Core recovery = 0.41'.	0.63	0.63	Located in the east bound travel lane with curb and gutter to the north and south.
			Bottom of Boring at 0.6 ft on 9/28/2020.			

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. C-07

METHOD: HQ Diamond Core
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.548629601°
LONGITUDE: -114.4473650645°

DEPTH (ft)	TYPE - No.	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
			Asphalt Concrete - Dense; chip seal; delamination at 0.10' and 0.25'; stripped below 0.38'. Bottom up crack. Core recovery = 0.38'.	0.49	0.49	Located in west bound travel lane with curb and gutter to the north and south.

Bottom of Boring at 0.5 ft on 9/28/2020.

PROJECT: US-30 Blue Lakes Blvd to Eastland Dr
LOCATION: Twin Falls County, Idaho

BORING NO. C-08

METHOD: HQ Diamond Core
DATE LOGGED: 9/28/2020
LOGGED BY: Kelli Browning

GROUNDWATER:

Groundwater not encountered on 9/28/2020

LATITUDE: 42.5486933304°
LONGITUDE: -114.457246058°

DEPTH (ft)	TYPE - No.	LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5			Asphalt Concrete - Dense; chip seal; delamination at 0.20', and 0.37'; one half of core is rubble below 0.20'. Bottom up crack. Core recovery = 0.53'.	0.63	0.63	Located in the west bound travel lane with curb and gutter to the north and south.
			Bottom of Boring at 0.6 ft on 9/28/2020.			

Photo 1: AG-01, CR-01; 0.0'-0.46'

Photo 2: AG-02, CR-07; 0.0'-0.48'

Scale in Feet

Scale in Inches

Photo 3: AG-03, CR-12; 0.0'-0.50'

Scale in Feet

Scale in Inches

Photo 4: AG-04, CR-18; 0.0'-0.52'

Scale in Feet

Scale in Inches

Photo 5: C-05, CR-06; 0.0'-0.38'

Scale in Feet

Scale in Inches

Photo 6: C-06, CR-11; 0.0'-0.41'

Scale in Feet

Scale in Inches

Photo 7: C-07, CR-17; 0.0'-0.38'

Scale in Feet

Scale in Inches

Photo 8: C-03, CR-22; 0.0'-0.53'

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-89	Sewer	2.5	42.548734	-114.458369
U-90	Storm Drain	3.0	42.548737	-114.458872
U-91	Electricity	2.0	42.548740	-114.459192
U-92	Electricity	1.5	42.548742	-114.459404
U-93	Gas	2.5	42.548715	-114.459561
U-94	Electricity	1.5	42.548747	-114.459672
U-95	Electricity	2.5	42.548758	-114.459929
U-96	Storm Drain	2.0	42.548778	-114.460003
U-97	Electricity	3.5	42.548625	-114.459985
U-98	Electricity	3.5	42.548653	-114.459979
U-99	Storm Drain	2.5	42.548526	-114.460052
U-100	Electricity	2.0	42.548528	-114.460061
U-101	Storm Drain	3.0	42.548543	-114.458883

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

N

10 0 20 40 60

APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 1 of 8

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AMERICAN GEO TECHNICS

SHEET 2 of 8

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-79	Sewer	2.5	42.548717	-114.455942
U-80	Storm Drain	3.0	42.548724	-114.456437
U-81	Water	2.0	42.548727	-114.456647
U-82	Unknown	2.5	42.548701	-114.456660
U-83	Water	2.5	42.548527	-114.456333
U-84	Sewer	2.5	42.548525	-114.455926
U-86	Storm Drain	3.0	42.548730	-114.457654
U-87	Water	2.0	42.548706	-114.457659
U-88	Water	2.0	42.548729	-114.457679
U-102	Unknown	2.5	42.548708	-114.457783
U-103	Storm Drain	3.0	42.548532	-114.457664

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

N

10 40
0 20 60
APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 2 of 8

File No. 03393

December 16, 2020

AMERICAN GEOTECHNICS

03393 Utility Map Drawing Prep 12-16-2020.dwg
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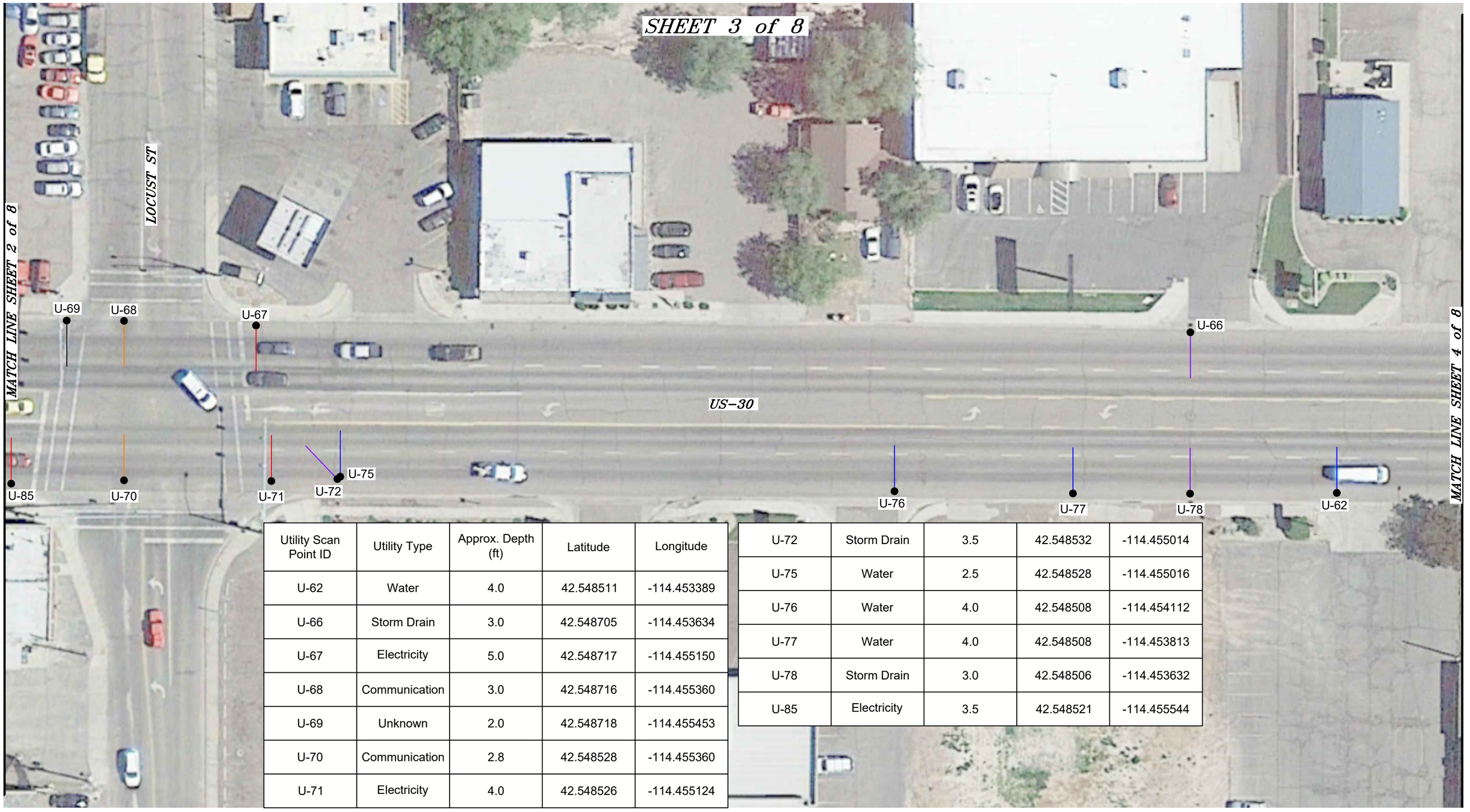
B. Alvarado

SHEET 3 of 8



Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-62	Water	4.0	42.548511	-114.453389
U-66	Storm Drain	3.0	42.548705	-114.453634
U-67	Electricity	5.0	42.548717	-114.455150
U-68	Communication	3.0	42.548716	-114.455360
U-69	Unknown	2.0	42.548718	-114.455453
U-70	Communication	2.8	42.548528	-114.455360
U-71	Electricity	4.0	42.548526	-114.455124
U-72	Storm Drain	3.5	42.548532	-114.455014
U-75	Water	2.5	42.548528	-114.455016
U-76	Water	4.0	42.548508	-114.454112
U-77	Water	4.0	42.548508	-114.453813
U-78	Storm Drain	3.0	42.548506	-114.453632
U-85	Electricity	3.5	42.548521	-114.455544

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

N

0 10 20 40 60

APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 3 of 8

File No. 03393

December 16, 2020

AMERICAN GEOTECHNICS

03393 Utility Map Drawing Prep 12-16-2020.dwg
12/16/2020 12:13 PM
B. Alvarado

SHEET 4 of 8

MATCH LINE SHEET 3 of 8

MATCH LINE SHEET 5 of 8

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-61	Storm Drain	3.0	42.548690	-114.452234
U-63	Water	2.0	42.548507	-114.452629
U-64	Water	4.0	42.548504	-114.452272
U-65	Storm Drain	3.0	42.548503	-114.452251

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

N

10 0 20 40 60

APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 4 of 8

File No. 03393

December 16, 2020

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SHEET 5 of 8

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-38	Communication Vault	2.5	42.548662	-114.448669
U-40	Communication	3.3	42.548473	-114.447614
U-41	Storm Drain	3.5	42.548658	-114.449178
U-42	Communication	3.0	42.548679	-114.449598
U-43	Storm Drain	3.0	42.548483	-114.449180
U-44	Communication	3.5	42.548683	-114.450292
U-45	Gas	3.0	42.548678	-114.450452
U-46	Storm Drain	3.0	42.548573	-114.450496
U-47	Storm Drain	3.5	42.548573	-114.450496
U-48	Unknown	3.0	42.548573	-114.450431
U-49	Storm Drain	4.5	42.548571	-114.450367
U-50	Water	3.0	42.548572	-114.450347
U-51	Gas	2.5	42.548490	-114.450346
U-52	Storm Drain	5.0	42.548490	-114.450369
U-53	Unknown	1.5	42.548491	-114.450402
U-54	Sewer	2.5	42.548493	-114.450419
U-55	Communication	2.5	42.548495	-114.450482
U-56	Storm Drain	3.0	42.548496	-114.450504
U-57	Water	3.0	42.548528	-114.450385
U-58	Water	3.0	42.548533	-114.450548
U-59	Water	2.5	42.548518	-114.450561
U-60	Unknown	3.5	42.548478	-114.450603

LEGEND

U-01 Utility Scan Point
Communication Vault
TEL Communication
UP Electricity
GAS Gas
SS Sewer
SD Storm Drain
W Water
??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

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10 40
0 20 60
APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 5 of 8

File No. 03393

December 16, 2020

AMERICAN GEOTECHNICS

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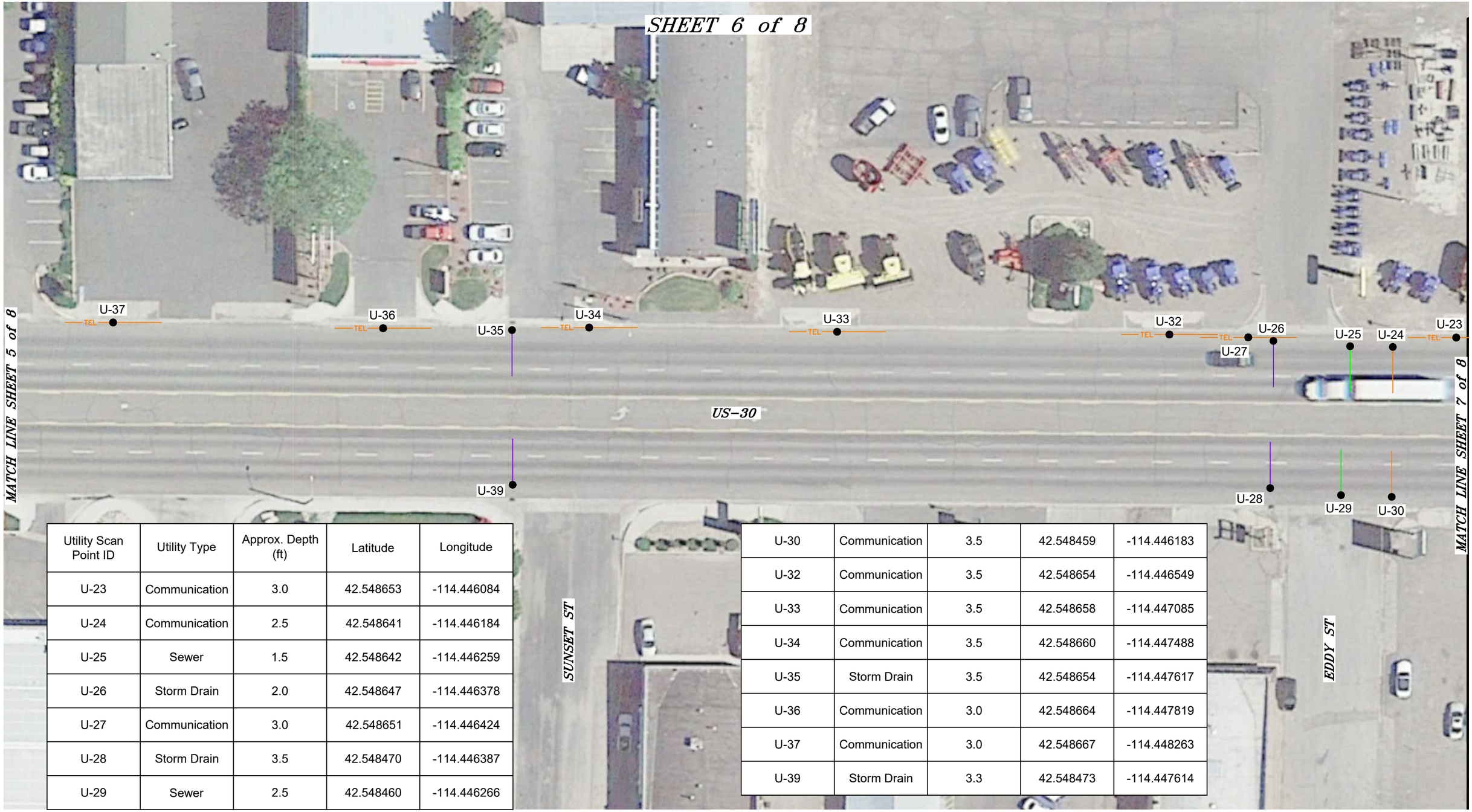
SHEET 6 of 8



Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-23	Communication	3.0	42.548653	-114.446084
U-24	Communication	2.5	42.548641	-114.446184
U-25	Sewer	1.5	42.548642	-114.446259
U-26	Storm Drain	2.0	42.548647	-114.446378
U-27	Communication	3.0	42.548651	-114.446424
U-28	Storm Drain	3.5	42.548470	-114.446387
U-29	Sewer	2.5	42.548460	-114.446266
U-30	Communication	3.5	42.548459	-114.446183
U-32	Communication	3.5	42.548654	-114.446549
U-33	Communication	3.5	42.548658	-114.447085
U-34	Communication	3.5	42.548660	-114.447488
U-35	Storm Drain	3.5	42.548654	-114.447617
U-36	Communication	3.0	42.548664	-114.447819
U-37	Communication	3.0	42.548667	-114.448263
U-39	Storm Drain	3.3	42.548473	-114.447614

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

N

10 40
0 20 60
APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 6 of 8

File No. 03393

December 16, 2020

AMERICAN GEOTECHNICS

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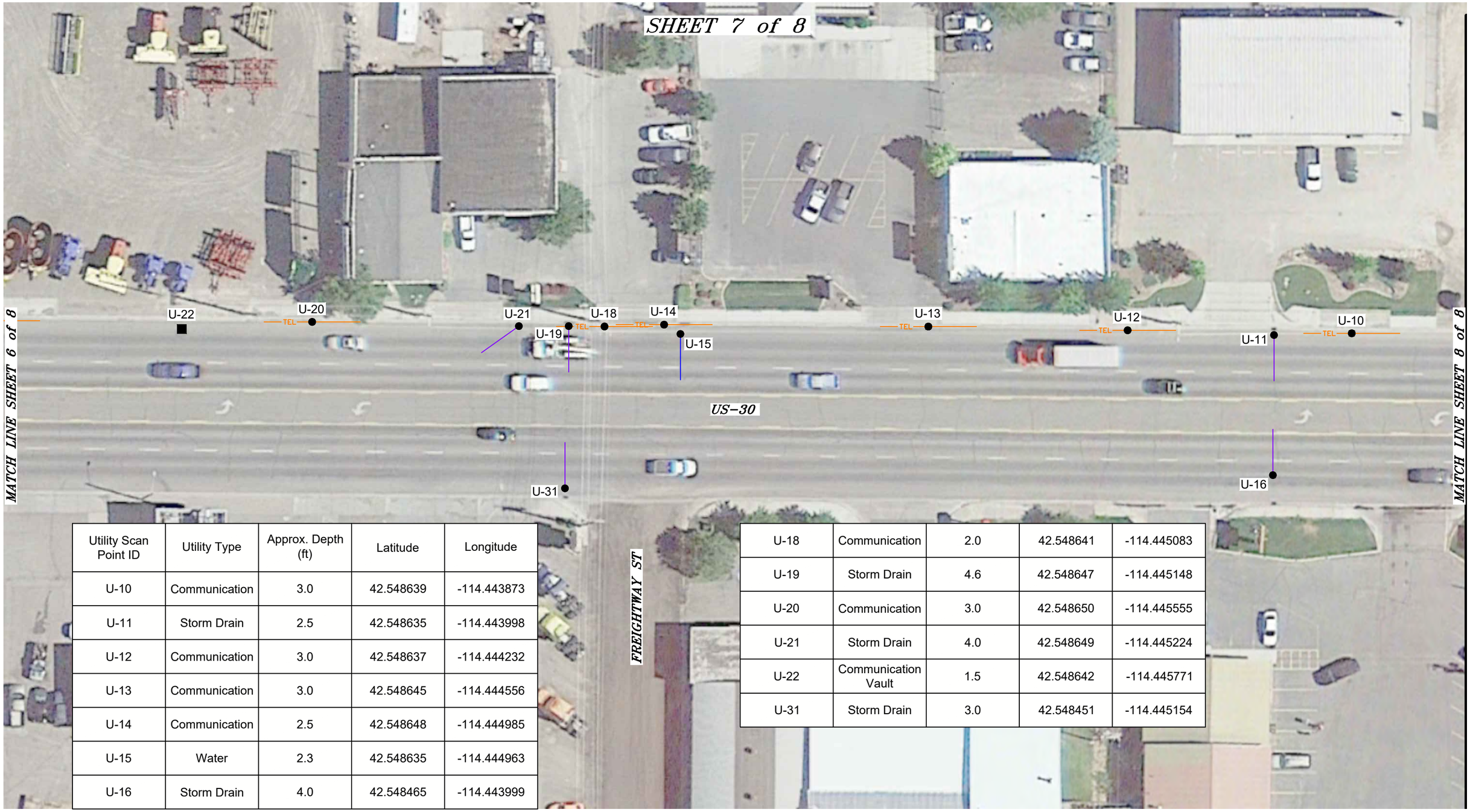

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-10	Communication	3.0	42.548639	-114.443873
U-11	Storm Drain	2.5	42.548635	-114.443998
U-12	Communication	3.0	42.548637	-114.444232
U-13	Communication	3.0	42.548645	-114.444556
U-14	Communication	2.5	42.548648	-114.444985
U-15	Water	2.3	42.548635	-114.444963
U-16	Storm Drain	4.0	42.548465	-114.443999
U-18	Communication	2.0	42.548641	-114.445083
U-19	Storm Drain	4.6	42.548647	-114.445148
U-20	Communication	3.0	42.548650	-114.445555
U-21	Storm Drain	4.0	42.548649	-114.445224
U-22	Communication Vault	1.5	42.548642	-114.445771
U-31	Storm Drain	3.0	42.548451	-114.445154

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

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10 0 20 40 60

APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 7 of 8

File No. 03393

December 16, 2020

AMERICAN GEOTECHNICS

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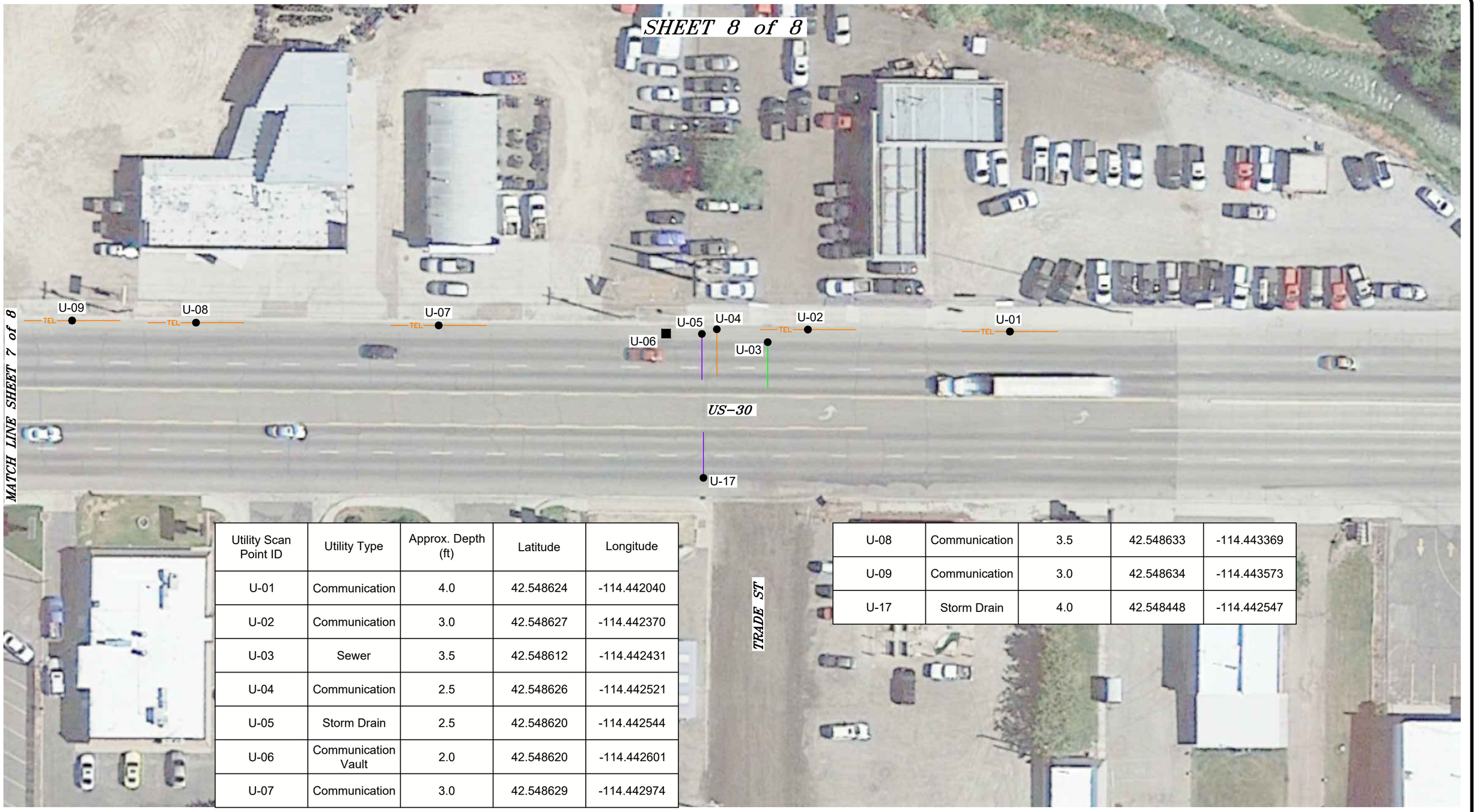
SHEET 8 of 8



MATCH LINE SHEET 7 of 8

Utility Scan Point ID	Utility Type	Approx. Depth (ft)	Latitude	Longitude
U-01	Communication	4.0	42.548624	-114.442040
U-02	Communication	3.0	42.548627	-114.442370
U-03	Sewer	3.5	42.548612	-114.442431
U-04	Communication	2.5	42.548626	-114.442521
U-05	Storm Drain	2.5	42.548620	-114.442544
U-06	Communication Vault	2.0	42.548620	-114.442601
U-07	Communication	3.0	42.548629	-114.442974
U-08	Communication	3.5	42.548633	-114.443369
U-09	Communication	3.0	42.548634	-114.443573
U-17	Storm Drain	4.0	42.548448	-114.442547

LEGEND

- U-01 ● Utility Scan Point
- ■ Communication Vault
- TEL Communication
- UP Electricity
- GAS Gas
- SS Sewer
- SD Storm Drain
- W Water
- ??? Unknown

Notes:
1. Utility lines indicate the observed direction of utility markings from the scan point.
2. Scan point locations and utility depths are approximate and may vary based on in-situ soil moisture. No warranty, expressed or otherwise, is implied.

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0 10 20 40 60

APPROXIMATE SCALE IN FEET

Subsurface Utility Survey Map

US-30; Blue Lakes Blvd to Eastland Dr
Twin Falls, Idaho

Sheet 8 of 8

File No. 03393

December 16, 2020

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Appendix B

Laboratory Test Reports

Resilient Modulus Test Report

Project Information

Report to: Idaho Transportation Department District 4
Project: US-30 Blue Lakes Blvd to Eastland Dr
Report Date: 10/28/2020
File No.: 03393

Material Information

Date Sampled: 9/28/2020
Sampled By: American Geotechnics
Date Received: 10/08/2020
Date Tested: 10/08 - 10/20/2020

SUMMARY OF LABORATORY RESULTS

Lab Number	Borehole	Sample Type	Depth (ft)	Water Content (%)	% Passing #200 Sieve	Liquid Limit (%)	Plasticity Index	Soil Type	Remarks
20-0752	AG-01	ST-03	2.1'-2.7'	18.9	95.4	NV	NP	ML	--
20-0753	AG-02	GB-08	0.6'-1.8'	--	8.3	--	--	SW-SM	--
20-0754	AG-02	SS-09	2.0'-4.0'	18.9	90.6	NV	NP	ML	--
20-0755	AG-03	ST-15	2.4'-3.8'	22.9	94.9	NV	NP	ML	--
20-0756	AG-04	GB-19	0.7'-2.0'	--	13.0	--	--	SM	--
20-0757	AG-04	SS-21	4.0'-6.0'	20.3	95.8	NV	NP	ML	--

Prepared By: Holly Lockett

American Geotechnics
5260 Chinden Blvd.
Boise, Idaho 83714
Phone:(208) 658-8700
Fax: (208) 658-8703

Report to: ITD D4
Report Date: 10/30/2020
Project No.: 03393
Project: US 30 Blue Lakes BLVD to Eastland DR

Material Information

Date Sampled: 9/28/2020
Sampled By: American Geotechnics
Date Received: 10/8/2020
Date Tested: 10/08 - 10/20/2020

AASHTO CLASSIFICATION

Lab Number	Boring/Pit	Sample ID	Depth	AASHTO Classification	
20-0752	AG-01	ST-03	2.1'-2.7'	A-4	Silty Soils
20-0753	AG-02	GB-08	0.6'-1.76'	A-1-a	Stone Fragments, Gravel and Sand
20-0754	AG-02	SS-09	2.0'-4.0'	A-4	Silty Soils
20-0755	AG-03	ST-15	2.4'-3.8'	A-4	Silty Soils
20-0756	AG-04	GB-19	0.7'-2.0'	A-1-a	Stone Fragments, Gravel and Sand
20-0757	AG-04	SS-21	4.0'-6.0'	A-4	Silty Soils

Reviewed By: *Travis Thomsen*

Project Information

Report to: Idaho Transportation Department District 4
Project: US-30 Blue Lakes Blvd to Eastland Dr
Report Date: 10/28/2020
File No.: 03393

Material Information

Date Sampled: 9/28/2020
Sampled By: American Geotechnics
Date Received: 10/08/2020
Date Tested: 10/08 -10/20/2020

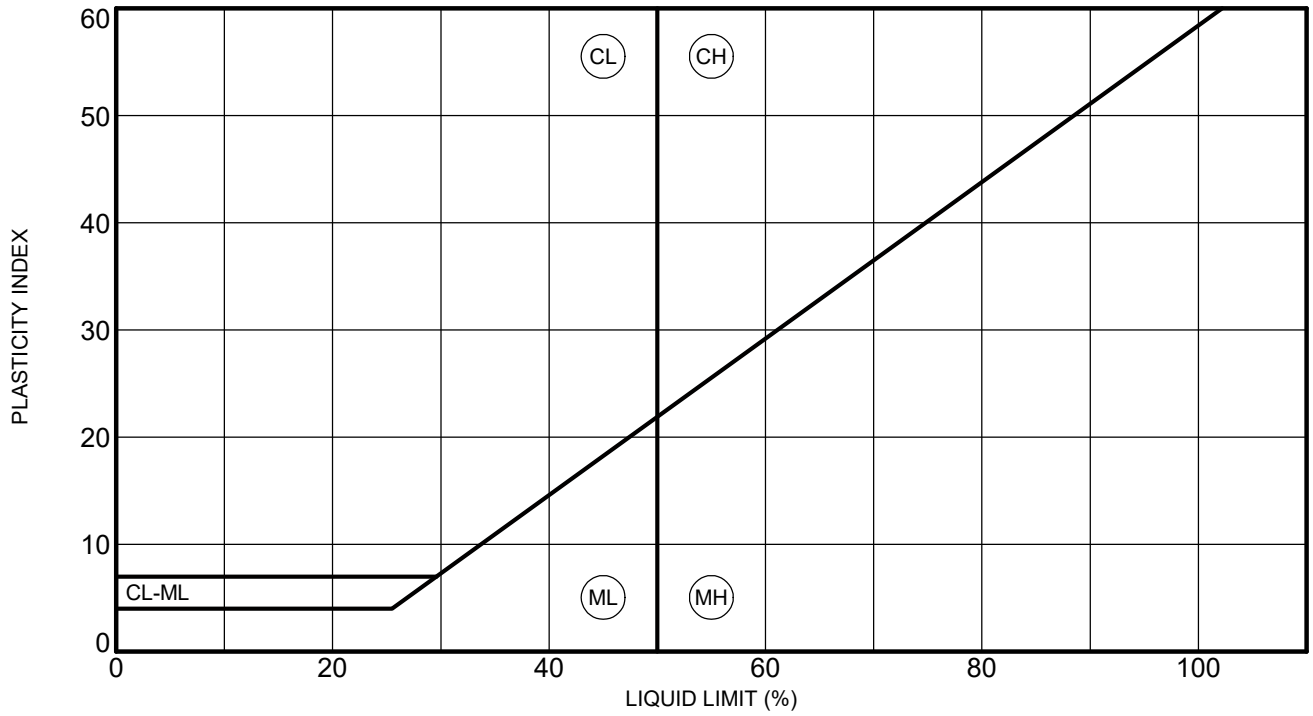
Sand Equivalent Test
AASHTO T-176

Lab Number	Location	Sample Type	Depth (ft)	Sand Equivalent	Remarks
20-0753	AG-02	GB-08	0.6'-1.8'	32	--
20-0756	AG-04	GB-19	0.7'-2.0'	32	--

Prepared By: Holly Lockett

ATTERBERG LIMITS REPORT

CLIENT: Idaho Transportation Department District 4 **PROJECT NAME:** US-30 Blue Lakes Blvd to Eastland Dr
FILE NUMBER: 03393 **PROJECT LOCATION:** Twin Falls County, Idaho



Specimen Identification			MC	LL	PL	PI	Fines	Classification
AG-01	ST-03	2.1	18.9	NV	NV	NP	95	SILT (ML)
AG-02	SS-09	2.0	18.9	NV	NV	NP	91	SILT (ML)
AG-03	ST-15	2.4	22.9	NV	NV	NP	95	SILT (ML)
AG-04	SS-21	4.0	20.3	NV	NV	NP	96	SILT (ML)
-			--				--	
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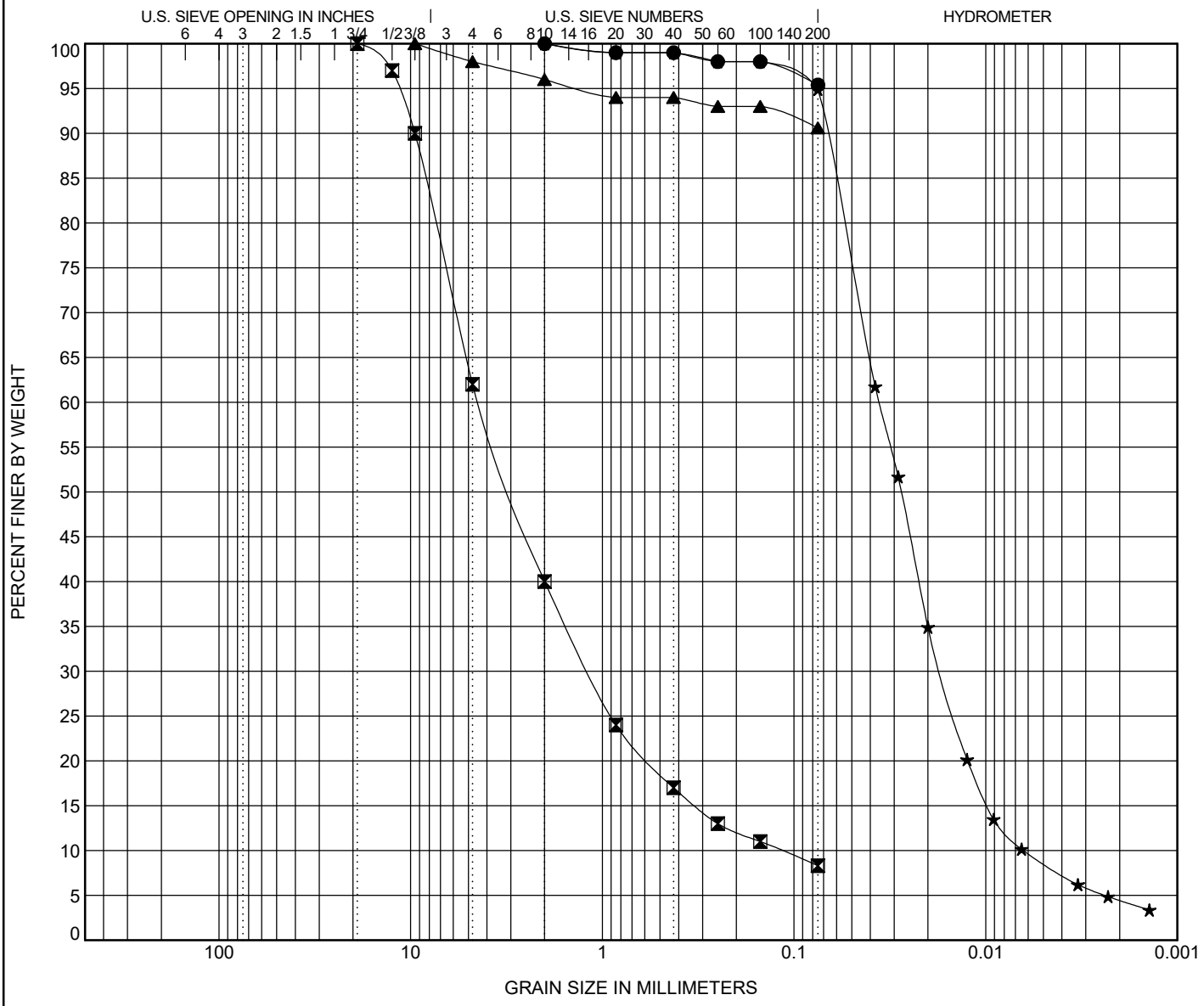
Prepared By: Holly Lockett

PARTICLE-SIZE DISTRIBUTION REPORT

CLIENT: Idaho Transportation Department District 4 **PROJECT NAME:** US-30 Blue Lakes Blvd to Eastland Dr

FILE NUMBER: 03393 **PROJECT LOCATION:** Twin Falls County, Idaho



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	D10	D30	D60
●	AG-01 ST-03	2.1	SILT (ML)	--	--	--
⊠	AG-02 GB-08	0.6	WELL-GRADED Sand with SILT and GRAVEL (SW-SM)	0.116	1.172	4.391
▲	AG-02 SS-09	2.0	SILT (ML)	--	--	--
★	AG-03 ST-15	2.4	SILT (ML)	0.006	0.017	0.036

Specimen Identification			%Gravel	%Sand	%Fines	D15	D50	D85	Cc	Cu	MC	LL	PI
●	AG-01 ST-03	2.1	0.0	4.6	95.4	--	--	--	--	--	18.9	NV	NP
⊠	AG-02 GB-08	0.6	38.0	53.7	8.3	0.326	2.963	8.394	2.69	37.84	--	--	--
▲	AG-02 SS-09	2.0	2.0	7.4	90.6	--	--	--	--	--	18.9	NV	NP
★	AG-03 ST-15	2.4	0.0	5.1	94.9	0.01	0.028	0.061	1.29	5.67	22.9	NV	NP

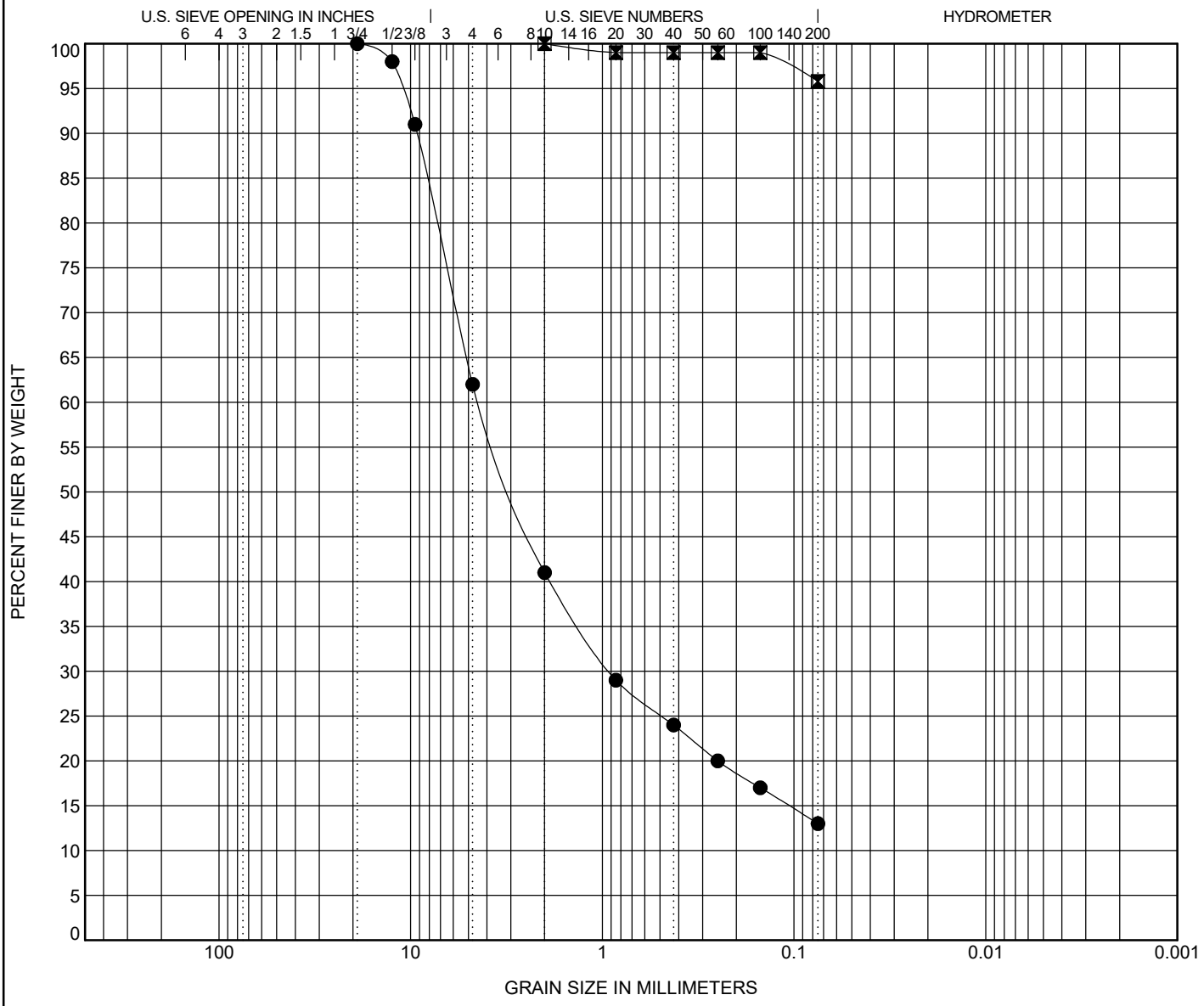
Prepared By: Holly Lockett

American Geotechnics

PARTICLE-SIZE DISTRIBUTION REPORT

CLIENT: Idaho Transportation Department District 4 **PROJECT NAME:** US-30 Blue Lakes Blvd to Eastland Dr

FILE NUMBER: 03393 **PROJECT LOCATION:** Twin Falls County, Idaho



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification			Classification	D10	D30	D60
●	AG-04	GB-19	0.7	SILTY SAND with GRAVEL (SM)	--	0.913	4.374
⊠	AG-04	SS-21	4.0	SILT (ML)	--	--	--

	Specimen Identification			%Gravel	%Sand	%Fines	D15	D50	D85	Cc	Cu	MC	LL	PI
●	AG-04	GB-19	0.7	38.0	49.0	13.0	0.106	2.898	8.231	--	--	--	--	--
⊠	AG-04	SS-21	4.0	0.0	4.2	95.8	--	--	--	--	--	20.3	NV	NP

Prepared By: Holly Lockett

American Geotechnics

American Geotechnics
5260 Chinden Blvd.
Boise, Idaho 83714
Phone:(208) 658-8700
Fax: (208) 658-8703

Report to: ITD D4
Project: US-30 Blue Lakes Blvd to Eastland Dr.
Report Date: 10/30/2020
File No.: 03393

Material Information

Date Sampled: 9/28/2020
Sampled By: American Geotechnics
Date Received: 10/8/2020
Date Tested: 10/13/2020

Test Results

In-situ Density and Moisture Content

Lab Number	Location	Depth (ft)	Dry Density (pcf)	Moisture (%)	Soil Type
20-0752	AG-01; ST-03	2.1'-2.7'	88.7	18.9	ML

Reviewed By: *Travis Thomsen*

Client Name: ITD D4
Project Name: US-30, Blue Lakes Blvd to Eastland Dr
Project No: 03393
Report Date: 10/15/2020

Material Information

Boring/Sample ID: AG-01 / ST-30
Material Type: Type-2 (Subgrade)
Type of Sample: 4" Dia Undisturbed
Dry Density (pcf): 88.7 In-situ
Specimen WC (%) 18.9 In-situ

Lab Number: 20-0752
AASHTO Clasification: A4
Depth of Specimen (ft.): 2.1-2.7
Date Sampled: 9/28/2020
Date Tested: 10/13/2020

Test Results

Resilient Modulus Test (AASHTO T-307)

Sequence No	Confining Stress	Total Axial Stress	Bulk Stress	Octahedral Shear Stress	Measured Resilient Modulus	Predicted Resilient Modulus
	σ_3	σ_d	θ	τ_{oct}	M_r	Pred. M_r
	psi	psi	psi	psi	psi	psi
1	6.00	2.05	20.07	0.97	12052	11758
2	6.00	4.12	22.14	1.94	11907	11774
3	6.01	6.17	24.19	2.91	11536	11762
4	6.01	8.17	26.19	3.85	11719	11728
5	6.01	10.18	28.20	4.80	12179	11682
6	4.00	2.05	14.06	0.97	9381	8987
7	4.01	4.10	16.12	1.93	8584	9271
8	4.00	6.10	18.11	2.88	8800	9472
9	4.01	8.12	20.14	3.83	9578	9632
10	4.00	10.10	22.11	4.76	10172	9743
11	2.00	2.04	8.04	0.96	6529	5895
12	2.00	4.09	10.10	1.93	6119	6513
13	2.00	6.07	12.08	2.86	6521	6981
14	2.00	8.10	14.10	3.82	7368	7364
15	2.00	10.09	16.09	4.75	7979	7665

Resilient Modulus Equation

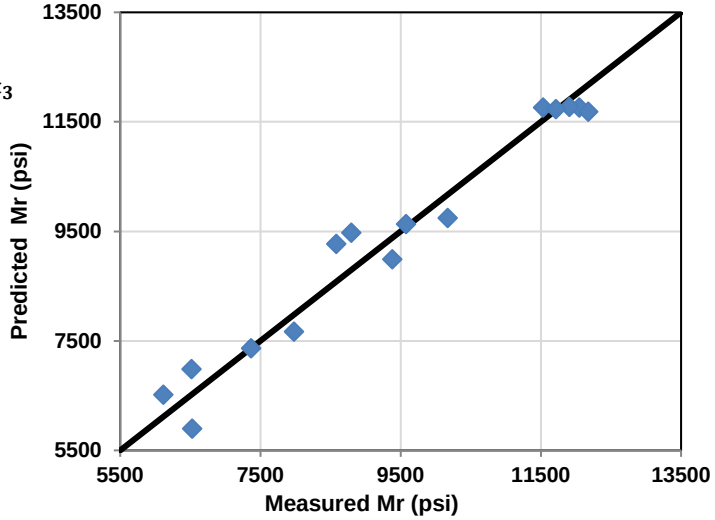
$$Mr = k_1 * Pa * \left(\frac{\theta}{Pa}\right)^{k_2} * \left(\frac{\zeta oct}{Pa} + 1\right)^{k_3}$$

Resilient Modulus Model Parameters

k_1 = **682.840**

k_2 = **0.756**

k_3 = **-1.204**



Tested By: Kelli Browning

Reviewed By: Mir Tamim

Client Name: ITD D4
Project Name: US-30, Blue Lakes Blvd to Eastland Dr
Project No: 03393
Report Date: 15/Oct/20
Boring/Sample ID: AG-01 / ST-30

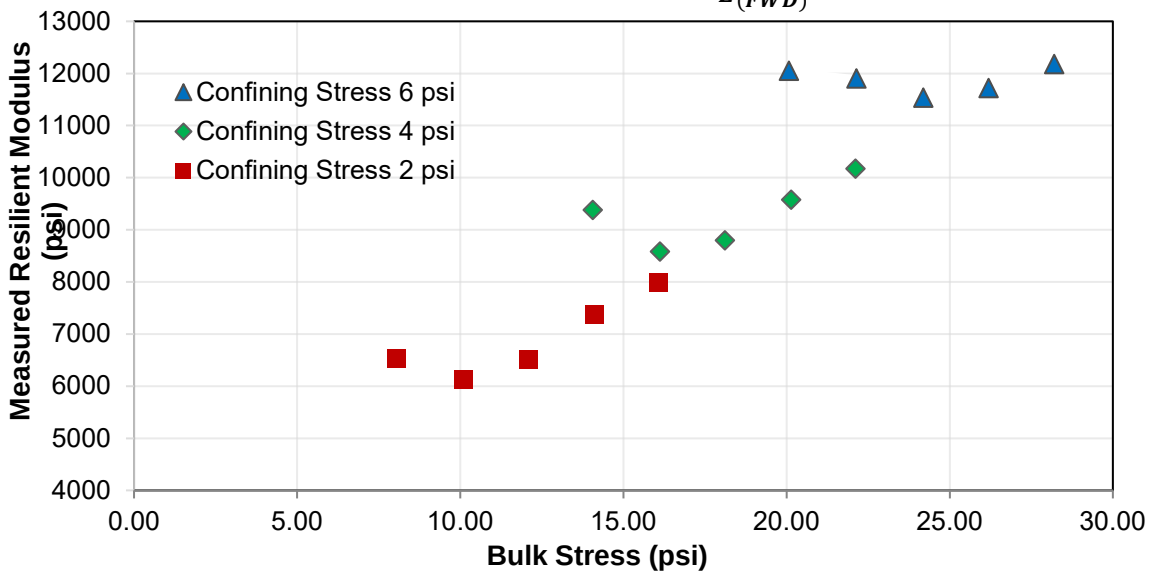
Design Resilient Modulus and C-Value for Subgrade Soil

Pavement Structure Details

Layer Number	Material Type	Layer Thickness (in)	Density (pcf)	Vertical Stress (psi)	Remarks
1	Asphalt Concrete	8.4	145	0.70	
2	Base	12.4	130	0.93	
3	Subgrade	18	88.7	0.92	

At-Rest Vertical Stress (psi)	2.56
At-Rest Earth Pressure Coefficient	0.85
At-Rest Lateral Stress (psi)	2.18
At-Rest Bulk Stress (psi)	6.92
Load-Related Bulk Stress (psi)	1.05
Total Bulk Stress (psi)	7.97
At-Rest Octahedral Shear Stress (psi)	0.18
Load-Related Octahedral Shear Stress (psi)	0.09
Total Octahedral Shear Stress (psi)	0.27
Atmospheric Pressure (psi)	14.70
Resilient Modulus from M_r Equation (psi)	6181
Design Subgrade Resilient Modulus, M_r (psi)	6,200
Elastic Modulus from FWD Back Calculation, $E_{(FWD)}$ (psi)	11,100

C-Value = $\frac{M_r}{E_{(FWD)}}$ **=** **0.56**



Reviewed By:

Appendix C

Pavement Condition Photographs

PCI Survey Sheets

GPR Layers Profile and Statistics

FWD Data and Back-calculation Results

LTTPBind Output

Photo 1: US-30, MP 218.65. Westbound Lane.

Photo 2: US-30, MP 218.80. Westbound Lane

Photo 3: US-30, MP 218.95. Westbound Lane.

Photo 4: US-30, MP 219.10. Westbound Lane

Photo 5: US-30, MP 219.25. Westbound Lane.

Photo 6: US-30, MP 219.40. Westbound Lane

Photo 7: US-30, MP 219.55. Westbound Lane.

Photo 8: US-30, MP 219.75. Westbound Lane

Photo 9: US-30, MP 219.75. Eastbound Lane.

Photo 10: US-30, MP 219.55. Eastbound Lane

Photo 11: US-30, MP 219.40. Eastbound Lane.

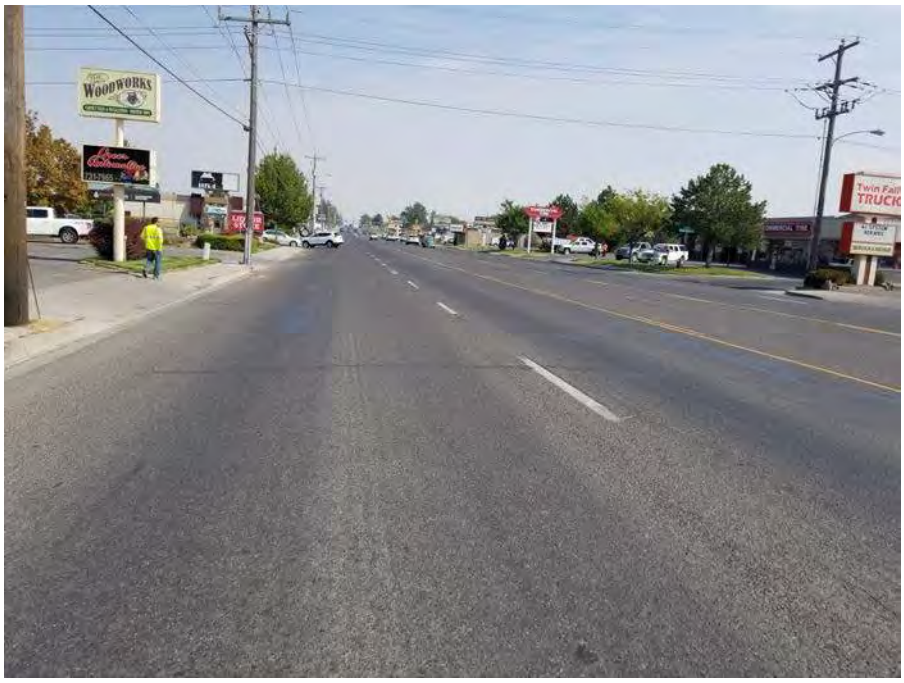


Photo 12: US-30, MP 219.25. Eastbound Lane

Photo 13: US-30, MP 219.10. Eastbound Lane.

Photo 14: US-30, MP 218.95. Eastbound Lane

Photo 15: US-30, MP 218.80. Eastbound Lane.

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

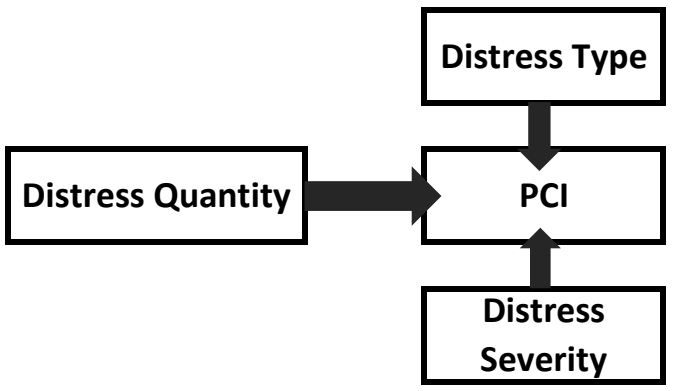
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	1WB	MP:	218.65
Sample Area:	2500 sf			Photo No.	PCI-1
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1H	21	50	2								73	2.92%	45.6
2L	168	168	168	168							672	26.88%	7.1
10M	90	10									100	4.00%	19.6
11L	4										4	0.16%	1.0

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	45.6	19.6	7.1								72.3	3	46.3
2	45.6	19.6	2.0								67.2	2	49.2
3	45.6	2.0	2.0								49.6	1	49.6
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 46				m= 6.0			MaxCDV= 50				PCI =	50



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	2WB	MP:	218.80
Sample Area:	2500 sf			Photo No.	PCI-2
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1H	120	12	30	4							166	6.64%	56.8
2L	136	136	136	136							544	21.76%	5.8
10M	51	15	37	30	3	20					156	6.24%	24.7
11H	168										168	6.72%	42.4
15L	136										136	5.44%	21.3

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	56.8	42.4	24.7	21.3	5.6						150.9	5	77.3
2	56.8	42.4	24.7	21.3	2.0						147.2	4	79.7
3	56.8	42.4	24.7	2.0	2.0						128.0	3	77.5
4	56.8	42.4	2.0	2.0	2.0						105.2	2	73.0
5	56.8	2.0	2.0	2.0	2.0						64.8	1	64.8
6													
7													
8													
9													
10													
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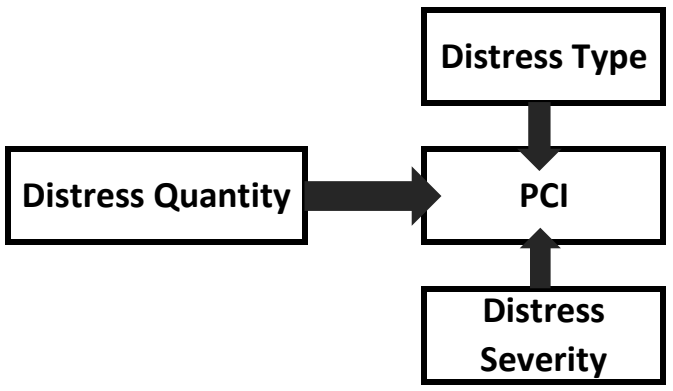


Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

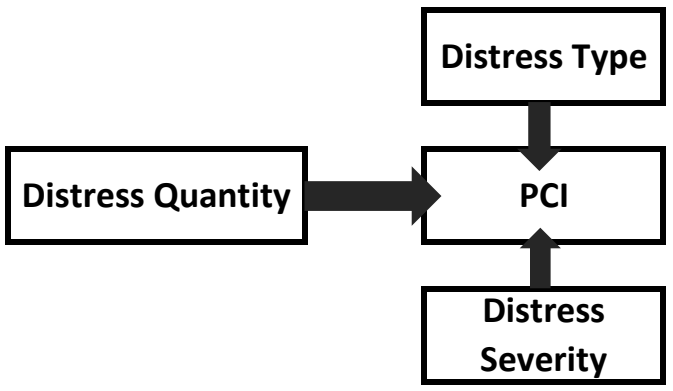
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	3WB	MP:	218.95
Sample Area:	2500 sf			Photo No.	PCI-3
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	9	6	30	16							61	2.44%	30.4
2L	136	136	136	136							544	21.76%	5.8
10M	37	8	40	20	8	45					158	6.32%	24.9

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	30.4	24.9	5.8								61.1	3	39.0
2	30.4	24.9	2.0								57.3	2	42.3
3	30.4	2.0	2.0								34.4	1	34.4
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 30				m= 7.4			MaxCDV= 42				PCI =	58



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

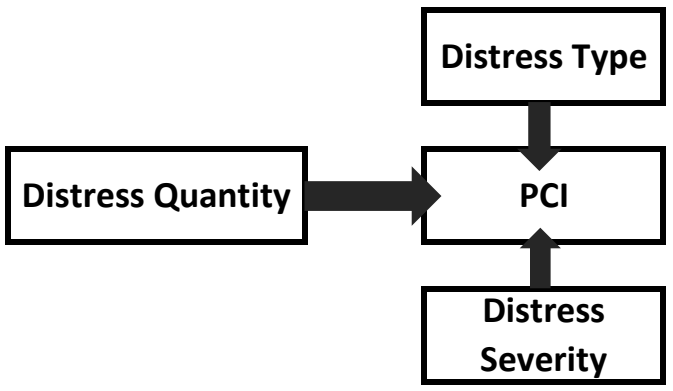
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	4WB	MP:	219.1
Sample Area:	2500 sf			Photo No.	PCI-4
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	108	60									168	6.72%	41.9
2L	136	136	136	136							544	21.76%	5.8
10M	10	15	68	16	11	9	10	9	21	37	206	8.24%	28.3
11L	6										6	0.24%	1.0
15L	136										136	5.44%	21.3

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	41.9	28.3	21.3	5.8							97.3	4	54.9
2	41.9	28.3	21.3	2.0							93.5	3	59.3
3	41.9	28.3	2.0	2.0							74.2	2	53.9
4	41.9	2.0	2.0	2.0							47.9	1	47.9
5													
6													
7													
8													
9													
10													
	MaxDV= 42				m= 6.3			MaxCDV= 59				PCI =	41



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

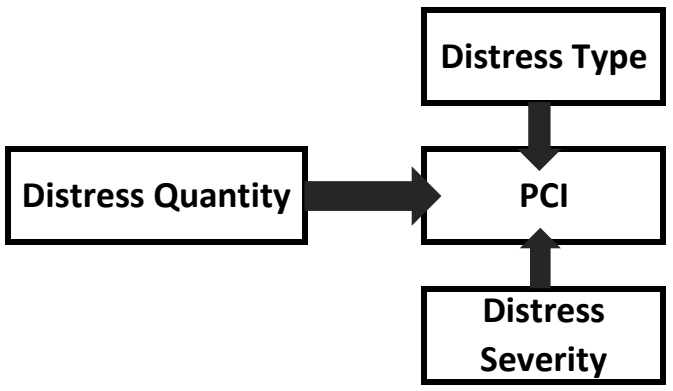
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	5WB	MP:	219.25
Sample Area:	2500 sf			Photo No.	PCI-5
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
2L	136	136	136	136							544	21.76%	5.8
1M	10										10	0.40%	13.8
10M	30	37	10	68	5	4	4	7			165	6.60%	25.4
11L	6										6	0.24%	1.0

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	25.4	13.8	5.8								45.0	3	27.9
2	25.4	13.8	2.0								41.2	2	30.5
3	25.4	2.0	2.0								29.4	1	29.4
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 25				m= 7.9			MaxCDV= 31				PCI =	69



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

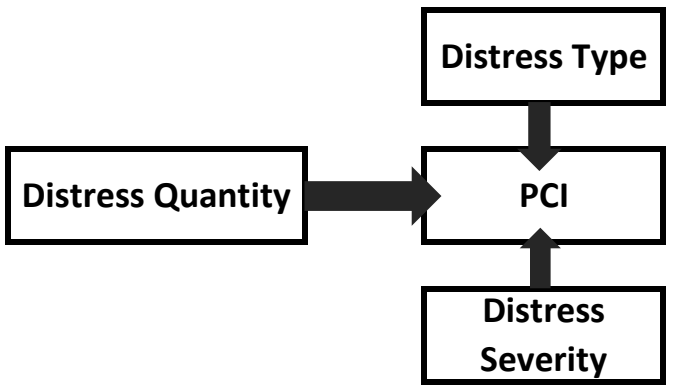
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	6WB	MP:	219.4
Sample Area:	2500 sf			Photo No.	PCI-6
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	210	12	24								246	9.84%	46.5
2L	136	136	136	136							544	21.76%	5.8
10M	68	8	14	22	6	8	10	20	24	19	199	7.96%	27.8
15L	40										40	1.60%	11.1

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	46.5	27.8	11.1	5.8							91.2	4	51.4
2	46.5	27.8	11.1	2.0							87.4	3	55.7
3	46.5	27.8	2.0	2.0							78.3	2	56.6
4	46.5	2.0	2.0	2.0							52.5	1	52.5
5													
6													
7													
8													
9													
10													
	MaxDV= 47				m= 5.9			MaxCDV= 57				PCI =	43



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	7WB	MP:	219.55
Sample Area:	2500	sf		Photo No.	PCI-7
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	15	60	84	9							168	6.72%	41.9
2L	136	136	136	136							544	21.76%	5.8
10M	4	33	6	5	22	12	25	68			175	7.00%	26.1
11M	160	60									220	8.80%	29.2
15L	136	136									272	10.88%	28.5

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	41.9	29.2	28.5	26.1	5.8						131.6	5	68.5
2	41.9	29.2	28.5	26.1	2.0						127.8	4	71.0
3	41.9	29.2	28.5	2.0	2.0						103.6	3	65.0
4	41.9	29.2	2.0	2.0	2.0						77.1	2	55.8
5	41.9	2.0	2.0	2.0	2.0						49.9	1	49.9
6													
7													
8													
9													
10													
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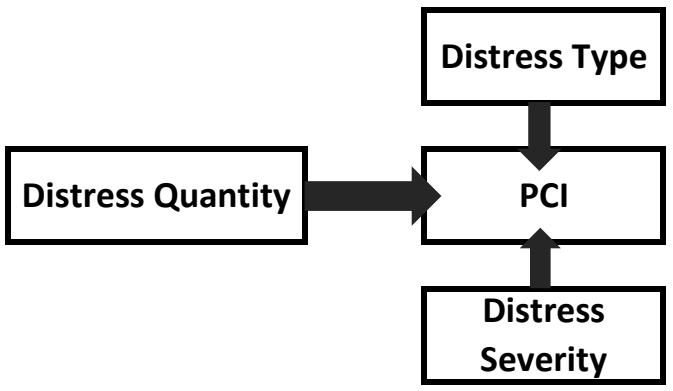


Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

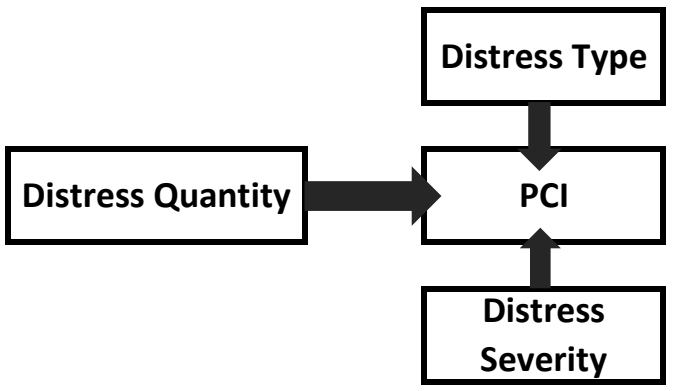
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 WB	Section:	8WB	MP:	219.75
Sample Area:	2500 sf			Photo No.	PCI-8
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
2L	186	186	186	186							744	29.76%	7.8
10M	93	40	20								153	6.12%	24.5
11M	4										4	0.16%	3.4
15L	186	186	186	186							744	29.76%	40.1

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	40.1	24.5	7.8	3.4							75.7	4	42.1
2	40.1	24.5	7.8	2.0							74.4	3	47.7
3	40.1	24.5	2.0	2.0							68.6	2	50.2
4	40.1	2.0	2.0	2.0							46.1	1	46.1
5													
6													
7													
8													
9													
10													
	MaxDV= 40				m= 6.5			MaxCDV= 50				PCI =	50



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

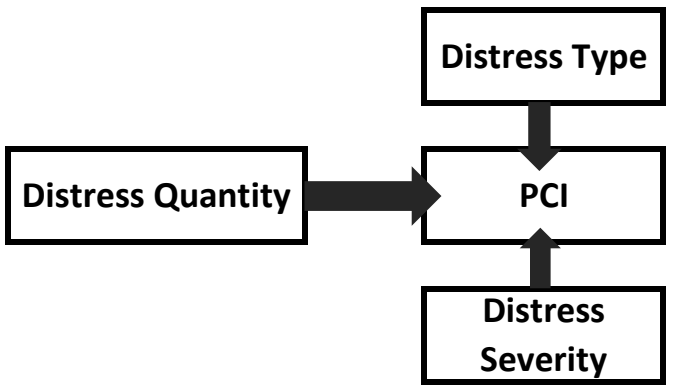
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	8EB	MP:	219.75
Sample Area:	2500 sf			Photo No.	PCI-9
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1L	10										10	0.40%	5.7
2M	279	279	279	279							1116	44.64%	26.8
10M	27	12	3	3	15	14	7	20	1		102	4.08%	19.8

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	26.8	19.8	5.7								52.4	3	33.1
2	26.8	19.8	2.0								48.7	2	36.1
3	26.8	2.0	2.0								30.8	1	30.8
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 27				m= 7.7			MaxCDV= 36				PCI =	64



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

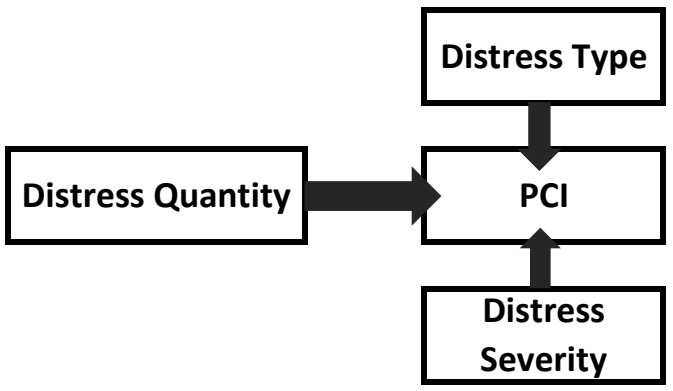
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	10EB	MP:	219.55
Sample Area:	2500 sf			Photo No.	PCI-10
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	36	40	12								88	3.52%	34.4
1H	80										80	3.20%	46.9
2M	136	136	136								408	16.32%	16.6
10M	37	12	68	6	7	8	10	60			208	8.32%	28.4
15M	136										136	5.44%	36.2
15L	136										136	5.44%	21.3

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	46.9	36.2	34.4	28.4	21.3	14.6					181.7	6	86.5
2	46.9	36.2	34.4	28.4	21.3	2.0					169.1	5	84.6
3	46.9	36.2	34.4	28.4	2.0	2.0					149.8	4	80.7
4	46.9	36.2	34.4	2.0	2.0	2.0					123.4	3	75.3
5	46.9	36.2	2.0	2.0	2.0	2.0					91.0	2	64.6
6	46.9	2.0	2.0	2.0	2.0	2.0					56.9	1	56.9
7													
8													
9													
10													
	MaxDV= 47			m= 5.9				MaxCDV= 86				PCI =	14



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

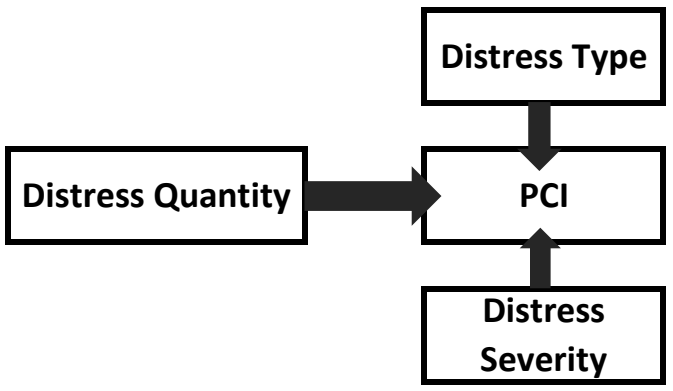
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	11EB	MP:	219.4
Sample Area:	2500 sf			Photo No.	PCI-11
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	60	6									66	2.64%	31.2
2L	136	136									272	10.88%	3.0
10M	8	5	37	20	9	15	25	8	24	16	167	6.68%	25.6
15M	40										40	1.60%	22.0

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	31.2	25.6	22.0	3.0							81.8	4	45.8
2	31.2	25.6	22.0	2.0							80.8	3	51.7
3	31.2	25.6	2.0	2.0							60.8	2	44.8
4	31.2	2.0	2.0	2.0							37.2	1	37.2
5													
6													
7													
8													
9													
10													
	MaxDV= 31				m= 7.3			MaxCDV= 52				PCI =	48



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

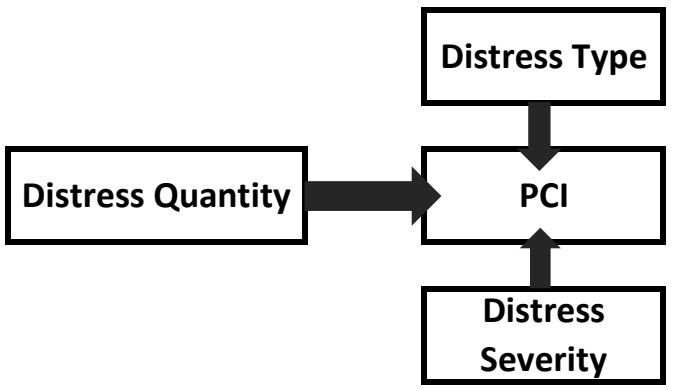
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	12EB	MP:	219.25
Sample Area:	2500 sf			Photo No.	PCI-12
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	4	24	90								118	4.72%	37.8
2L	136	136									272	10.88%	3.0
10M	5	50	14	15	20	16	7	25	8		160	6.40%	25.0
15M	10										10	0.40%	11.0

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	37.8	25.0	11.0	3.0							76.8	4	42.7
2	37.8	25.0	11.0	2.0							75.8	3	48.5
3	37.8	25.0	2.0	2.0							66.8	2	48.9
4	37.8	2.0	2.0	2.0							43.8	1	43.8
5													
6													
7													
8													
9													
10													
	MaxDV= 38				m= 6.7			MaxCDV= 49				PCI =	51



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

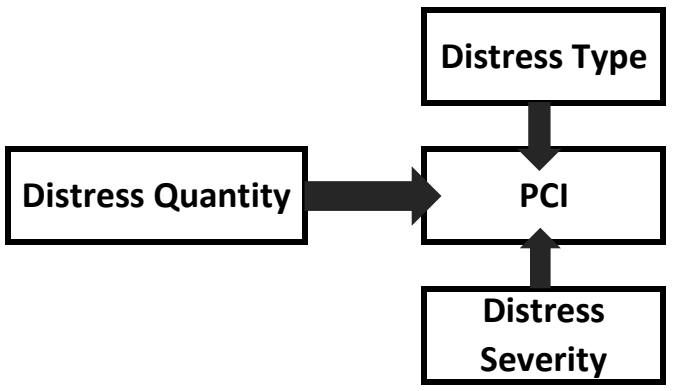
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	13EB	MP:	219.1
Sample Area:	2500 sf			Photo No.	PCI-13
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	68										68	2.72%	31.6
2L	136	136	136	136							544	21.76%	5.8
10M	30	6	30	8	7	8	25	25	2		141	5.64%	23.5

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	31.6	23.5	5.8								60.9	3	38.9
2	31.6	23.5	2.0								57.1	2	42.1
3	31.6	2.0	2.0								35.6	1	35.6
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 32				m= 7.3			MaxCDV= 42				PCI =	58



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

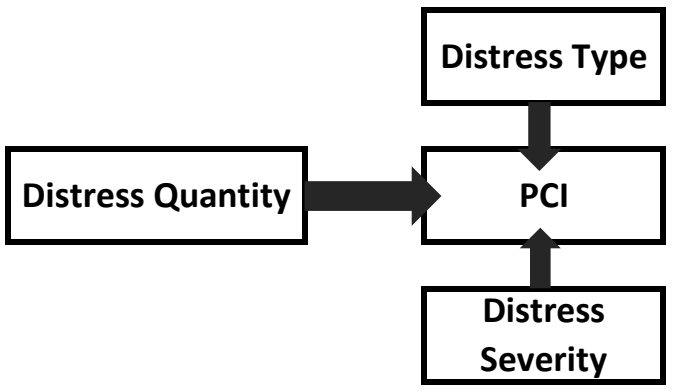
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	14EB	MP:	218.95
Sample Area:	2500 sf			Photo No.	PCI-14
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	5	40	6	8	18						77	3.08%	32.9
2L	136	136	136	136							544	21.76%	5.8
10M	8	14	29	7	20	7	15	7	21		128	5.12%	22.4

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	32.9	22.4	5.8								61.1	3	39.0
2	32.9	22.4	2.0								57.3	2	42.3
3	32.9	2.0	2.0								36.9	1	36.9
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 33				m= 7.2			MaxCDV= 42				PCI =	58



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

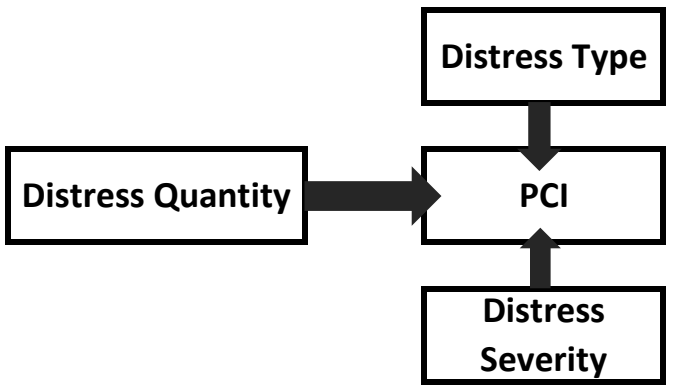
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	15EB	MP:	218.8
Sample Area:	2500 sf			Photo No.	PCI-15
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	8	8	18	12	24	45	16	4			135	5.40%	39.3
2L	136	136	136	136							544	21.76%	5.8
10M	15	4	4	20	3	3	37	8	20		114	4.56%	21.0

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	39.3	21.0	5.8								66.2	3	42.4
2	39.3	21.0	2.0								62.4	2	45.9
3	39.3	2.0	2.0								43.3	1	43.3
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 39				m= 6.6			MaxCDV= 46				PCI =	54



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

Asphalt Surfaced Roads and Parking Lots Condition Survey Data Sheet for Sample Unit (ASTM D6433)

AMERICAN GEO TECHNICS

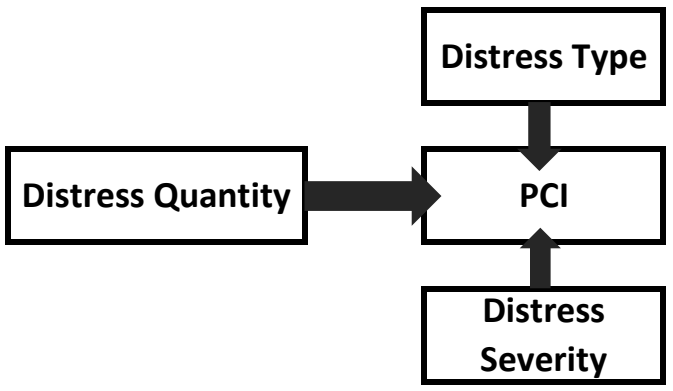
Sketch:

File No.	03393	Project:	US-30, Blue Lakes Blvd to Eastland Dr		
Branch:	US-30 EB	Section:	16EB	MP:	218.65
Sample Area:	2500 sf			Photo No.	PCI-16
Surveyed By:	M. Tamim/B. Alvarado			Date:	9/24/2020

1. Alligator Cracking	6. Depression	11. Patching & Util Cut Patching	16. Shoving
2. Bleeding	7. Edge Cracking	12. Polished Aggregate	17. Slippage Cracking
3. Block Cracking	8. Jt. Reflection Cracking	13. Potholes	18. Swell
4. Bumps and Sags	9. Lane/Shoulder Drop Off	14. Railroad Crossing	19. Weathering/Ravelling
5. Corrugation	10. Long. & Trans. Cracking	15. Rutting	

Distress Severity	Quantity										Total Distress Value	Density (%)	Deduct Value (DV)
1M	40	12	12	25	9						98	3.92%	35.6
2L	136	136	136	136							544	21.76%	5.8
10M	35	9	6	12	6	12	14	8	10		112	4.48%	20.8

Row #	Deduct Values										Total Deduct Value (TVD)	q	Corrected Deduct Value (CDV)
1	35.6	20.8	5.8								62.3	3	39.8
2	35.6	20.8	2.0								58.5	2	43.1
3	35.6	2.0	2.0								39.6	1	39.6
4													
5													
6													
7													
8													
9													
10													
	MaxDV= 36				m= 6.9			MaxCDV= 43				PCI =	57



Pavement Condition Index (PCI) Rating			
ASTM D 6433 PCI Scale		Simplified ASTM D 6433 PCI Scale	
86-100	Good	71-100	Good
71-85	Satisfactory	56-70	Fair
56-70	Fair	26-55	Poor
41-55	Poor	0-25	Failed
26-40	Very Poor		
11-25	Serious		
0-10	Failed		

File No: 03393

ITD Key No. 22215

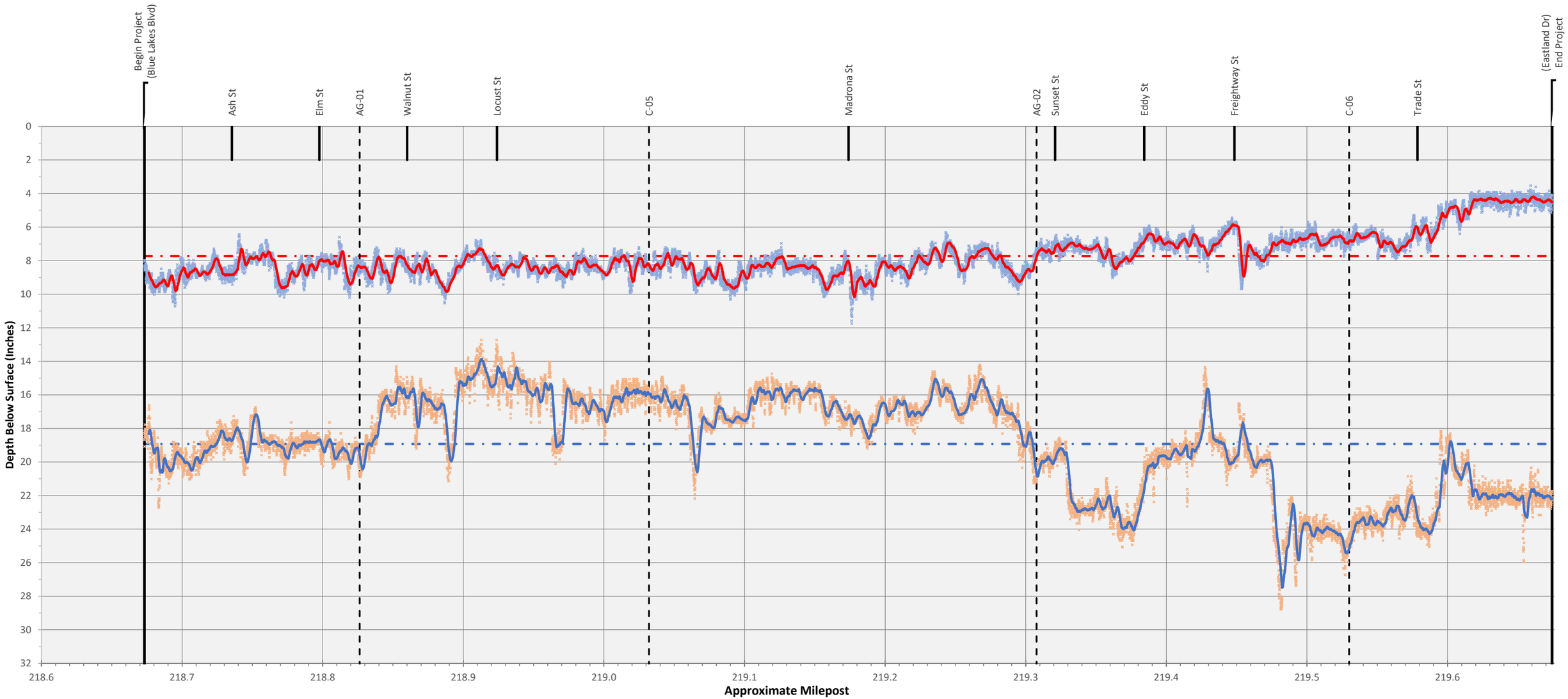
Scan Date: 9/24/2020

Existing Pavement Layer Depths

US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(East Bound, Lane 0, Right Wheel Path)



Note: GPR distance scale along the x-axis may not corespond exactly with project stationing.

Processed by KB
Checked by BA

American Geotechnics

File No: 03393

ITD Key No: 22215

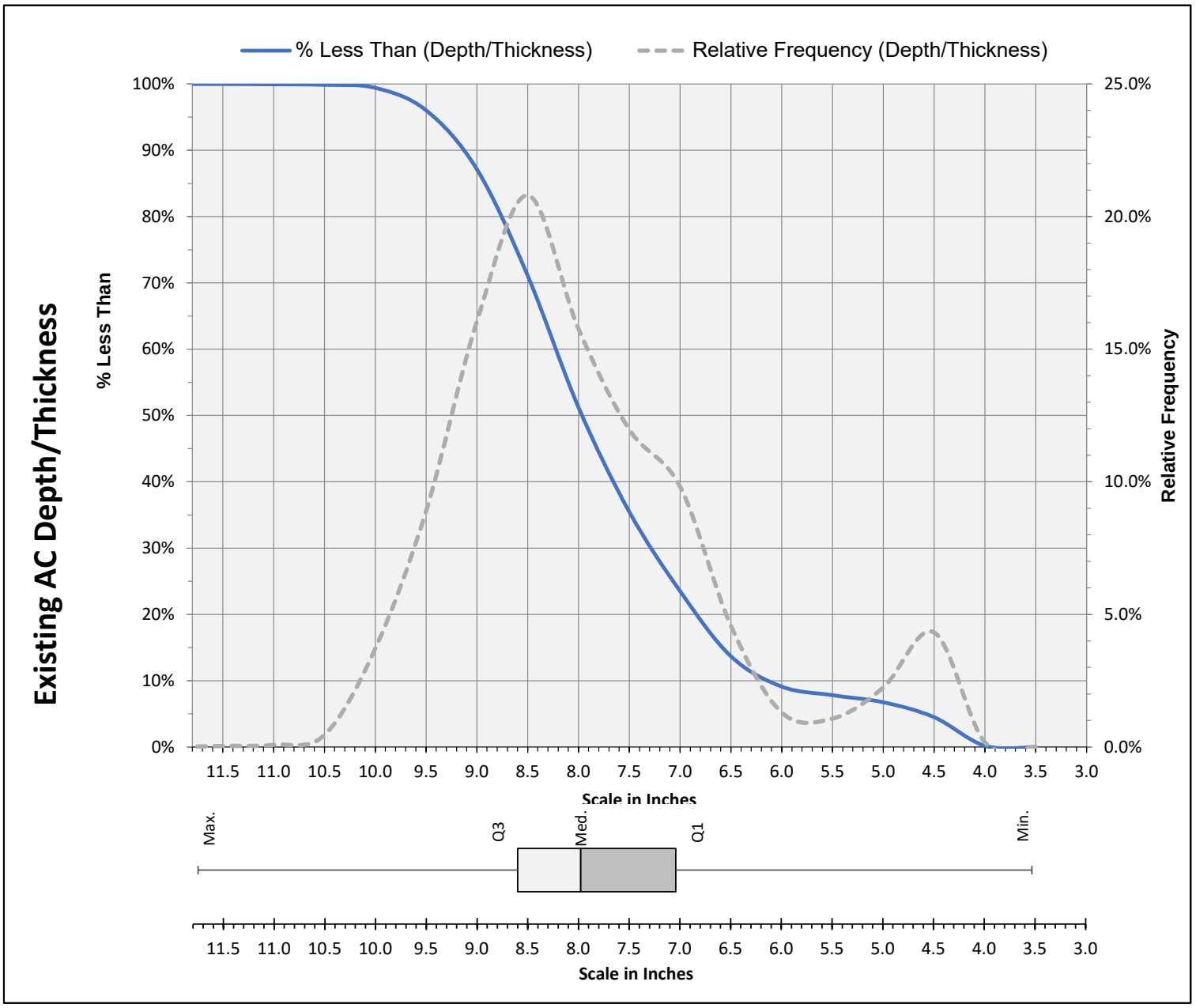
Scan Date: 9/24/2020

Existing AC Depth/Thickness Statistics

US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(East Bound, Lane 0, Right Wheel Path)



Existing AC Depth/Thickness Statistics

Average=	7.7 in.	(0.64 ft.)
Max=	11.8 in.	(0.98 ft.)
Min=	3.5 in.	(0.29 ft.)
SD=	1.3 in.	(0.11 ft.)
Median=	8 in.	(0.67 ft.)
Q1=	7 in.	(0.59 ft.)
Q3=	8.6 in.	(0.72 ft.)
Total Number of Scans=	15858	

File No: 03393

ITD Key No: 22215

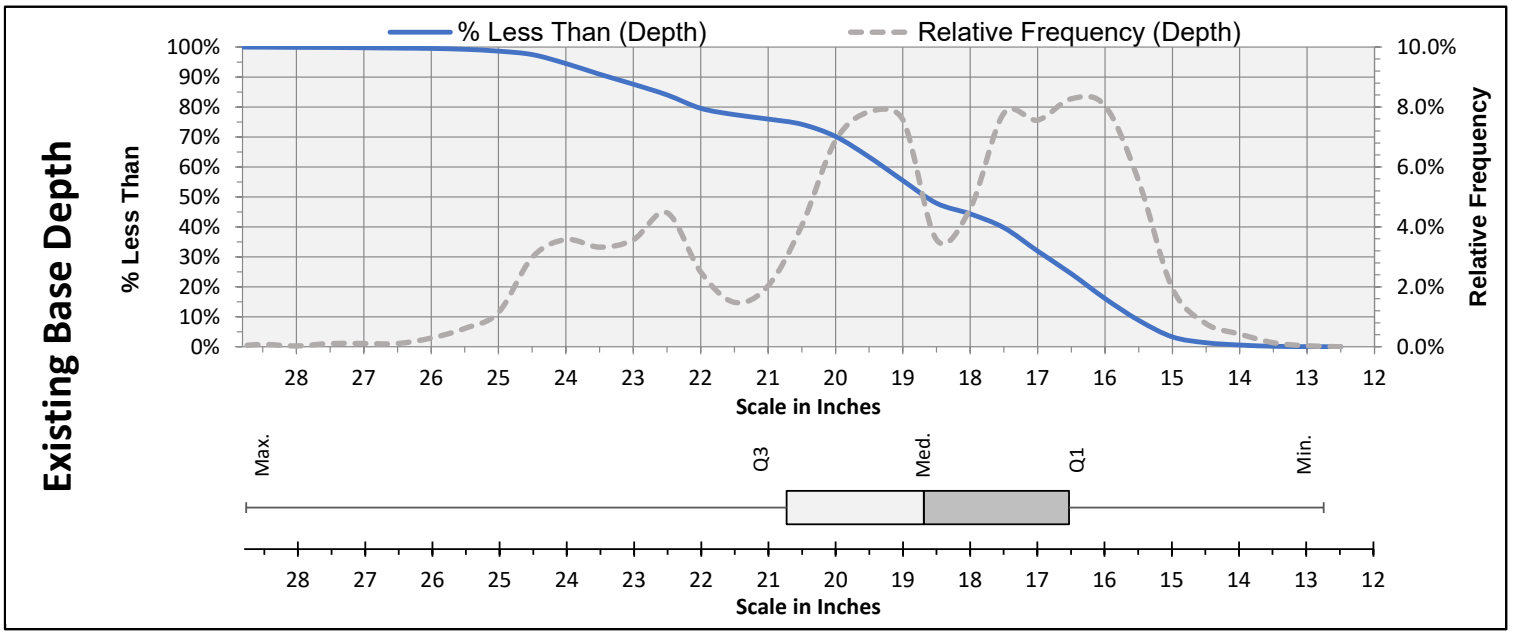
Scan Date: 9/24/2020

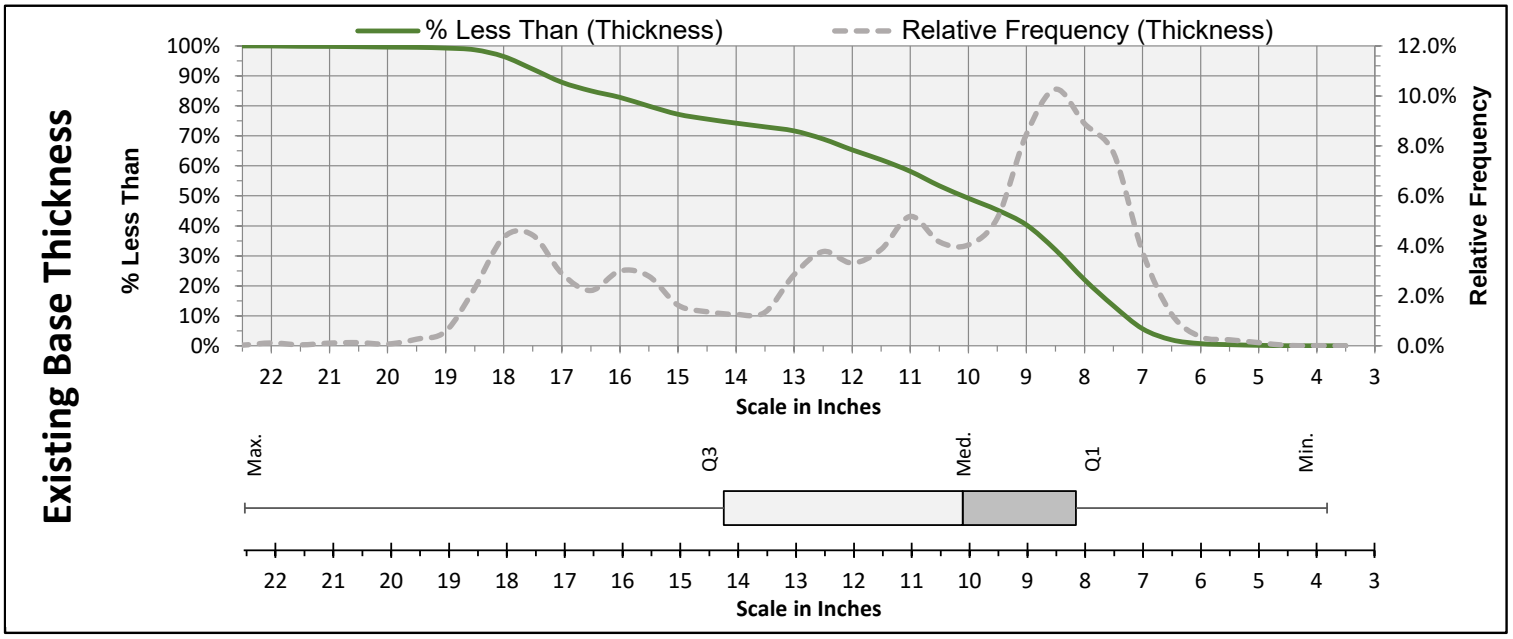
Existing BASE Depth And Thickness Statistics

US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(East Bound, Lane 0, Right Wheel Path)





Existing BASE Depth Statistics		Existing BASE Thickness Statistics	
Average=	18.9 in. (1.58 ft.)	Average=	11.2 in. (0.93 ft.)
Max=	28.8 in. (2.4 ft.)	Max=	22.5 in. (1.88 ft.)
Min=	12.7 in. (1.06 ft.)	Min=	3.8 in. (0.32 ft.)
SD=	2.9 in. (0.24 ft.)	SD=	3.7 in. (0.31 ft.)
Median=	18.7 in. (1.56 ft.)	Median=	10.1 in. (0.84 ft.)
Q1=	16.5 in. (1.38 ft.)	Q1=	8.2 in. (0.68 ft.)
Q3=	20.7 in. (1.73 ft.)	Q3=	14.3 in. (1.19 ft.)

Total Number of Scans= 15858

File No: 03393

ITD Key No. 22215

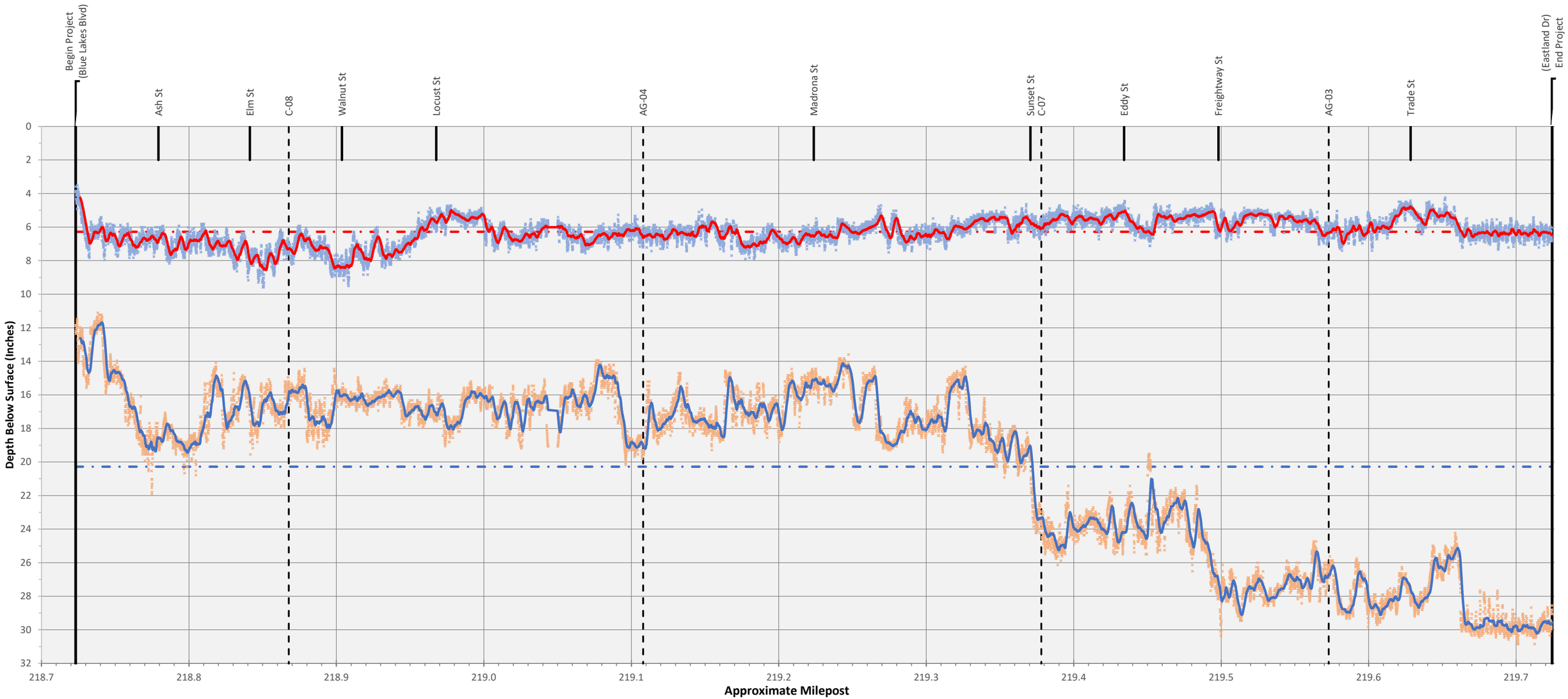
Scan Date: 9/24/2020

Existing Pavement Layer Depths

US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(West Bound, Lane 0, Right Wheel Path)



Note: GPR distance scale along the x-axis may not corespond exactly with project stationing.

Processed by KB
Checked by BA

File No: 03393

ITD Key No: 22215

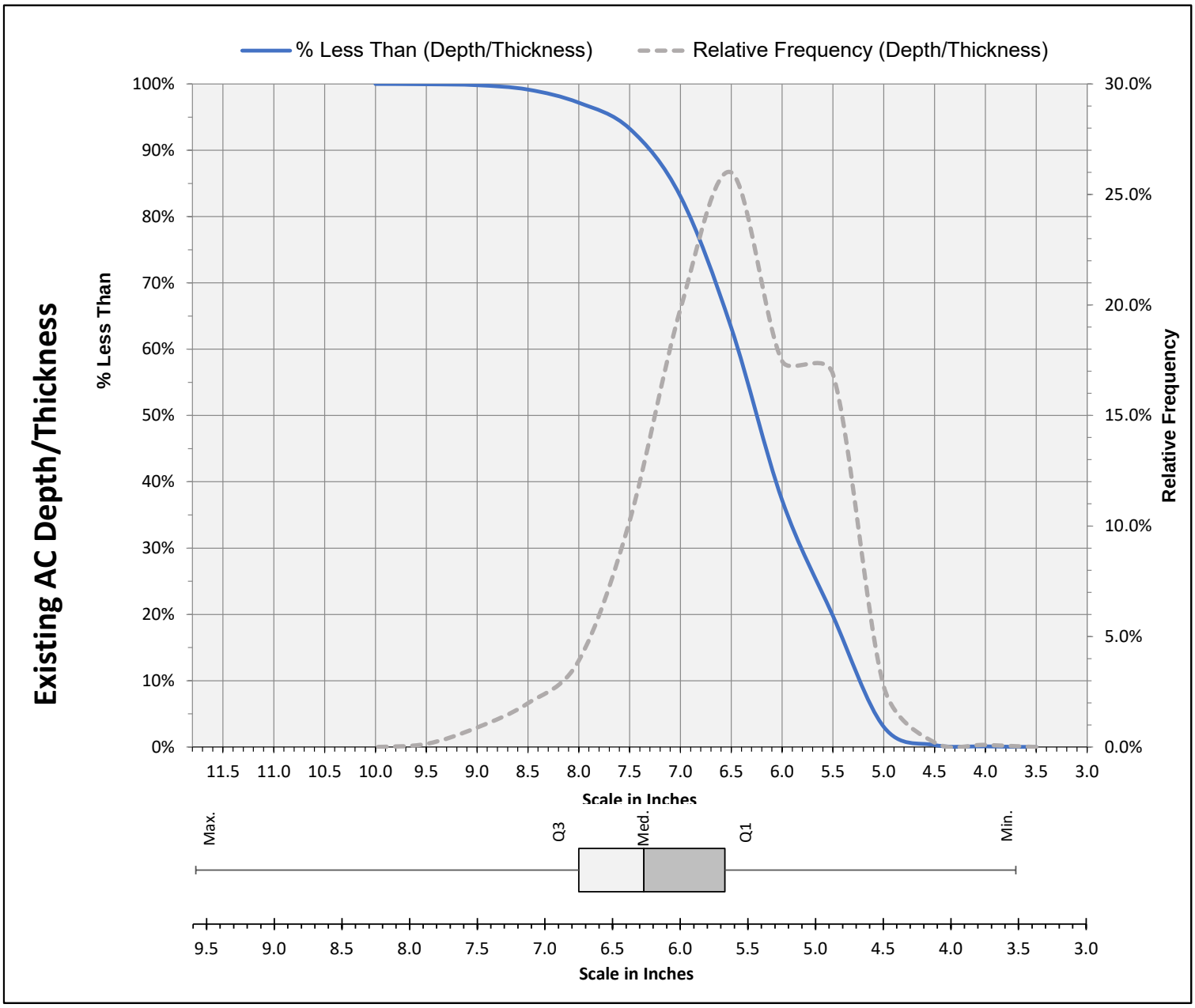
Scan Date: 9/24/2020

Existing AC Depth/Thickness Statistics

US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(West Bound, Lane 0, Right Wheel Path)



Existing AC Depth/Thickness Statistics

Average=	6.3 in.	(0.52 ft.)
Max=	9.6 in.	(0.8 ft.)
Min=	3.5 in.	(0.29 ft.)
SD=	0.8 in.	(0.07 ft.)
Median=	6.3 in.	(0.52 ft.)
Q1=	5.7 in.	(0.47 ft.)
Q3=	6.8 in.	(0.56 ft.)
Total Number of Scans=	15760	

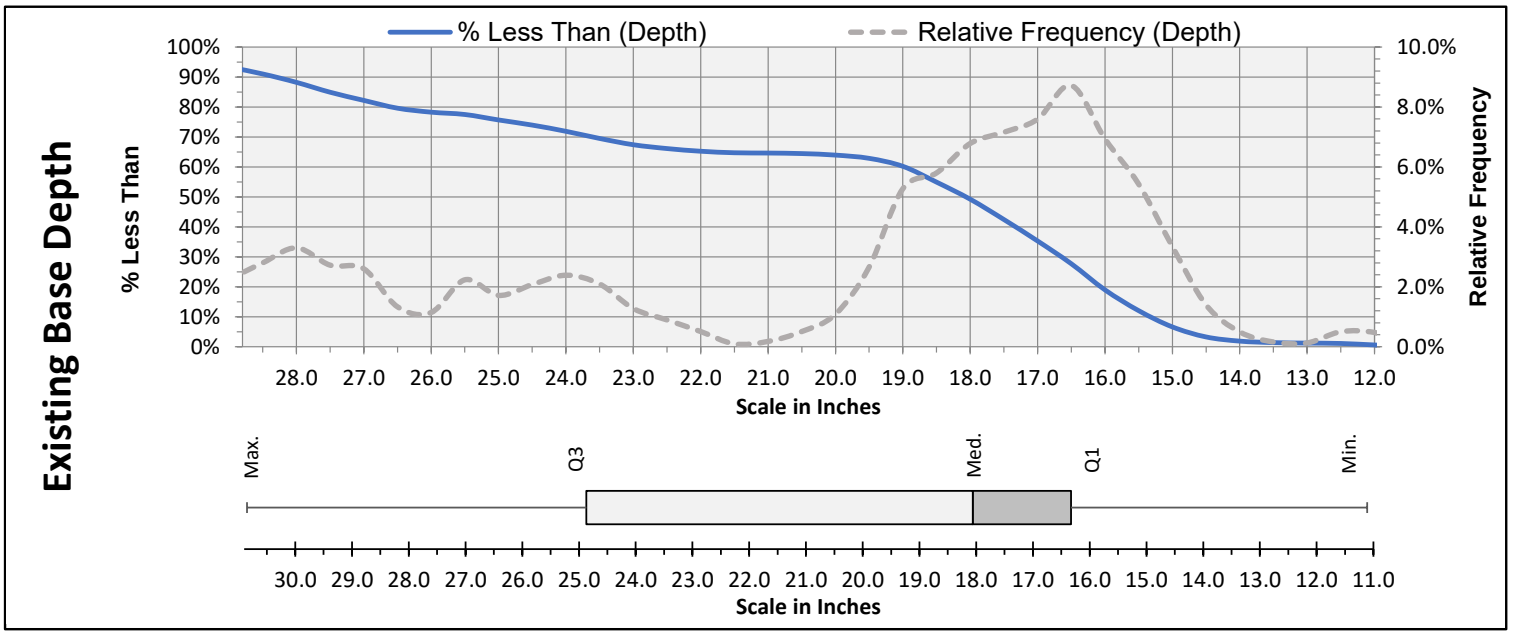
Existing BASE Depth And Thickness Statistics

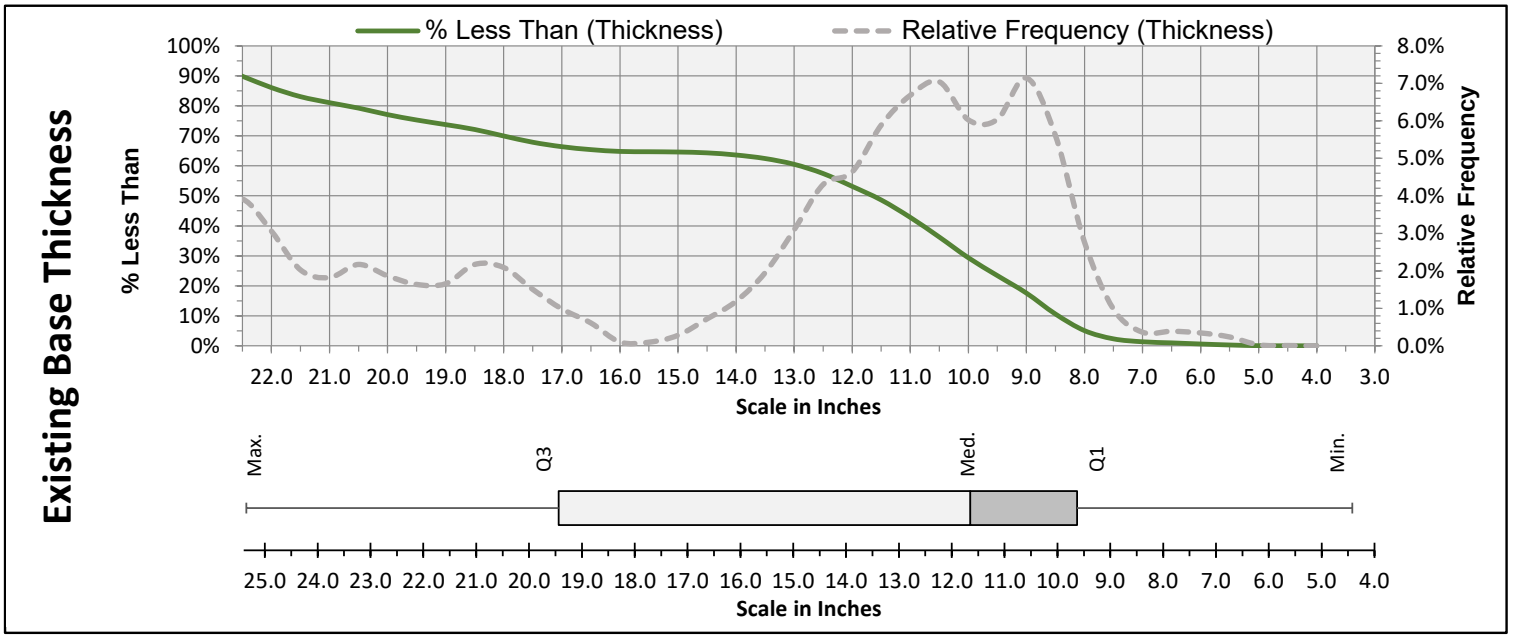
US-30, Blue Lakes Blvd to Eastland Dr

Blue Lakes Blvd to Eastland Dr

(West Bound, Lane 0, Right Wheel Path)

File No:	03393
ITD Key No:	22215
Scan Date:	9/24/2020





Existing BASE Depth Statistics			Existing BASE Thickness Statistics		
Average=	20.3 in.	(1.69 ft.)	Average=	14 in.	(1.17 ft.)
Max=	30.9 in.	(2.57 ft.)	Max=	25.4 in.	(2.11 ft.)
Min=	11.1 in.	(0.93 ft.)	Min=	4.4 in.	(0.37 ft.)
SD=	5 in.	(0.42 ft.)	SD=	5.4 in.	(0.45 ft.)
Median=	18.1 in.	(1.51 ft.)	Median=	11.7 in.	(0.97 ft.)
Q1=	16.3 in.	(1.36 ft.)	Q1=	9.6 in.	(0.8 ft.)
Q3=	24.9 in.	(2.07 ft.)	Q3=	19.4 in.	(1.62 ft.)

Total Number of Scans= 15760

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Project Name: **US-30, Blue Lakes to Eastland**
Segment: **Blue Lakes to Eastland**
Direction: **Eastbound**

Calc. Date: 12/1/2020
File No.: 03256

Summary of Input Data

Date of FWD Testing: **September 25, 2020**
PDAT used for Backcalculation (BELLS): **66°F**
FWD Plate Radius: **5.905"**

	Summary of Backcalculated Moduli			
	AC	Base	Subgrade	RMS (%)
Mean:	477.3	24.2	9.8	1.5
Standard Deviation:	179.5	11.5	1.2	1.1

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)				LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade	RMS (%)	
218.689	1	8676	79.2	10.15	15.56	13.47	10.64	7.12	4.78	3.05	2.06	1.52	79.3	77.1	66.7	9.5	11.0	205.4	18.3	8.7	6.8	
218.689	2	8687	79.3	10.16	15.65	13.46	10.63	7.12	4.78	3.05	2.06	1.50	79.3	77.1	66.7	9.5	11.0	209.9	18.8	8.9	7.1	
218.689	3	11579	105.7	13.72	20.89	17.76	14.31	9.97	6.84	4.43	3.05	2.23	79.3	77.1	66.7	9.5	11.0	219.1	19.8	7.8	5.7	
218.689	4	11579	105.7	13.67	20.31	17.76	14.31	9.97	6.85	4.43	3.05	2.24	79.3	77.1	66.7	9.5	11.0	216.9	21.8	7.9	6.1	
218.727	1	8731	79.7	7.47	11.58	9.62	7.72	5.54	4.09	2.22	1.54	1.13	79.3	77.4	66.7	8.7	9.5	385.4	14.5	8.9	2.0	
218.727	2	8764	80.0	7.76	11.53	9.59	7.79	5.59	4.12	2.30	1.54	1.19	79.3	77.4	66.7	8.7	9.5	391.5	33.6	8.6	2.0	
218.727	3	11875	108.4	10.48	15.80	12.54	10.31	7.57	5.71	3.32	2.27	1.69	79.3	77.4	66.7	8.7	9.5	367.8	47.2	9.5	1.1	
218.727	4	11951	109.1	10.48	16.07	12.59	10.36	7.61	5.73	3.34	2.26	1.70	79.3	77.4	66.7	8.7	9.5	355.8	34.1	13.8	1.0	
218.764	1	8972	81.9	6.31	8.74	7.12	6.17	4.88	3.94	2.54	1.84	1.34	78.4	76.2	66.1	7.9	10.9	667.9	13.1	12.1	1.2	
218.764	2	9059	82.7	6.25	8.83	7.17	6.19	4.94	3.96	2.57	1.81	1.33	78.4	76.2	66.1	7.9	10.9	649.7	14.5	11.1	0.9	
218.764	3	12050	110.0	8.20	11.33	9.30	8.11	6.54	5.30	3.57	2.50	1.89	78.4	76.2	66.1	7.9	10.9	693.1	14.5	10.0	0.7	
218.764	4	12061	110.1	8.22	11.40	9.25	8.08	6.48	5.30	3.49	2.46	1.88	78.4	76.2	66.1	7.9	10.9	689.3	26.9	8.9	1.1	
218.779	1	8862	80.9	7.11	11.04	8.83	7.22	5.33	4.10	2.58	1.71	1.40	78.7	76.3	66.1	8.9	10.1	339.5	34.5	9.0	1.6	
218.779	2	8851	80.8	7.25	11.07	8.83	7.18	5.34	4.02	2.54	1.77	1.46	78.7	76.3	66.1	8.9	10.1	328.5	48.7	10.4	1.6	
218.779	3	11853	108.2	9.48	14.70	11.82	9.75	7.36	5.77	3.75	2.70	2.12	78.7	76.3	66.1	8.9	10.1	344.9	61.6	9.8	1.7	
218.779	4	11907	108.7	9.42	14.76	11.80	9.76	7.39	5.78	3.78	2.69	2.11	78.7	76.3	66.1	8.9	10.1	345.8	61.3	10.1	1.6	94%
218.802	1	9026	82.4	8.91	14.20	12.06	10.30	6.89	4.99	2.95	1.90	1.42	78.4	76.3	66.3	7.9	10.8	374.0	21.5	9.5	3.3	
218.802	2	9092	83.0	8.96	14.18	12.05	10.25	6.83	5.00	2.95	1.87	1.41	78.4	76.3	66.3	7.9	10.8	359.1	21.0	10.1	3.3	
218.802	3	12105	110.5	11.47	18.47	15.20	13.04	9.14	6.81	4.11	2.59	1.99	78.4	76.3	66.3	7.9	10.8	377.8	21.9	13.3	1.7	
218.802	4	12050	110.0	11.41	18.08	15.13	13.00	9.12	6.78	4.03	2.61	2.05	78.4	76.3	66.3	7.9	10.8	402.0	26.8	8.4	2.0	
218.826	1	9048	82.6	6.91	10.82	8.32	6.79	4.92	3.67	2.19	1.46	1.08	79.1	77.1	66.0	8.4	11.5	360.5	57.8	10.7	0.7	
218.826	2	9059	82.7	6.89	10.69	8.24	6.76	4.96	3.69	2.19	1.46	1.08	79.1	77.1	66.0	8.4	11.5	384.2	49.8	11.8	0.6	
218.826	3	11929	108.9	8.89	13.48	10.34	8.55	6.39	4.84	3.05	2.03	1.55	79.1	77.1	66.0	8.4	11.5	382.7	73.7	10.9	0.6	
218.826	4	11995	109.5	8.82	13.35	10.39	8.61	6.41	4.88	3.07	2.06	1.55	79.1	77.1	66.0	8.4	11.5	404.1	70.3	11.0	0.7	
218.840	1	8983	82.0	12.86	21.33	16.62	13.41	9.71	6.78	4.15	2.84	2.07	78.9	77.0	66.3	8.1	8.9	188.5	20.0	8.8	2.1	
218.840	2	9005	82.2	12.62	21.30	16.54	13.35	9.67	6.73	4.05	2.81	2.00	78.9	77.0	66.3	8.1	8.9	192.1	16.8	9.8	1.7	
218.840	3	11929	108.9	16.37	26.56	21.04	17.22	12.74	9.10	5.63	3.88	2.89	78.9	77.0	66.3	8.1	8.9	223.8	21.2	8.7	1.5	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)				LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade	RMS (%)	
218.840	4	11951	109.1	16.56	26.84	21.15	17.29	12.81	9.14	5.68	3.90	2.94	78.9	77.0	66.3	8.1	8.9	219.3	22.0	8.9	1.5	
218.878	1	9081	82.9	6.44	8.89	7.80	6.93	5.78	4.65	3.19	2.28	1.68	78.8	76.7	65.9	8.5	8.4	956.3	14.6	9.9	1.2	
218.878	2	9026	82.4	6.41	8.82	7.74	6.87	5.64	4.65	3.12	2.23	1.64	78.8	76.7	65.9	8.5	8.4	943.5	16.4	11.8	1.2	
218.878	3	11951	109.1	8.56	11.71	10.19	9.13	7.60	6.31	4.32	3.10	2.33	78.8	76.7	65.9	8.5	8.4	910.0	14.6	9.7	0.9	
218.878	4	12028	109.8	8.63	11.63	10.25	9.19	7.68	6.35	4.41	3.12	2.36	78.8	76.7	65.9	8.5	8.4	948.0	15.0	10.0	0.8	
218.892	1	9092	83.0	8.87	17.11	11.59	9.13	6.38	4.61	2.64	1.76	1.45	78.4	75.6	66.5	9.0	10.4	155.4	37.1	10.6	0.7	
218.892	2	9048	82.6	8.81	16.95	11.48	9.10	6.37	4.58	2.70	1.78	1.44	78.4	75.6	66.5	9.0	10.4	154.9	39.5	10.2	0.9	
218.892	3	11831	108.0	11.00	21.38	14.34	11.41	8.09	5.97	3.54	2.43	2.03	78.4	75.6	66.5	9.0	10.4	159.6	39.6	12.3	0.4	
218.892	4	11842	108.1	11.14	21.53	14.34	11.43	8.12	5.98	3.54	2.49	2.05	78.4	75.6	66.5	9.0	10.4	158.9	40.7	11.9	0.0	97%
218.931	1	8829	80.6	7.24	10.35	8.61	7.51	6.00	4.84	3.30	2.37	1.64	77.8	75.0	66.2	8.2	7.6	537.3	63.2	9.8	0.6	
218.931	2	8983	82.0	7.42	10.46	8.80	7.70	6.15	4.96	3.39	2.42	1.76	77.8	75.0	66.2	8.2	7.6	572.7	38.4	10.9	0.6	
218.931	3	11645	106.3	9.87	13.82	11.50	10.05	8.17	6.69	4.62	3.35	2.50	77.8	75.0	66.2	8.2	7.6	530.8	24.7	8.6	0.6	
218.931	4	11645	106.3	9.81	13.74	11.49	10.06	8.18	6.69	4.64	3.33	2.62	77.8	75.0	66.2	8.2	7.6	533.7	58.7	9.0	0.4	
218.953	1	8873	81.0	5.72	8.20	6.77	5.99	4.92	4.09	2.78	2.06	1.58	78.1	75.3	66.3	8.9	7.6	637.2	15.1	11.2	0.7	
218.953	2	8950	81.7	5.83	8.05	6.78	6.03	4.91	4.08	2.79	2.03	1.64	78.1	75.3	66.3	8.9	7.6	768.5	13.8	11.9	1.2	
218.953	3	11732	107.1	8.03	10.75	8.92	7.92	6.57	5.52	3.86	2.88	2.21	78.1	75.3	66.3	8.9	7.6	642.9	15.3	9.3	0.6	
218.953	4	11699	106.8	7.95	10.72	8.91	7.91	6.59	5.53	3.91	2.86	2.18	78.1	75.3	66.3	8.9	7.6	624.0	17.7	9.0	0.6	
218.991	1	8906	81.3	7.27	11.70	8.97	7.22	5.41	4.17	2.70	1.88	1.41	77.0	74.8	65.9	8.2	7.9	291.9	102.1	10.0	1.2	
218.991	2	9037	82.5	7.38	11.84	9.08	7.32	5.49	4.24	2.75	1.92	1.43	77.0	74.8	65.9	8.2	7.9	290.4	78.4	11.9	1.2	
218.991	3	11710	106.9	9.44	14.89	11.44	9.33	7.14	5.61	3.72	2.61	1.99	77.0	74.8	65.9	8.2	7.9	292.0	18.3	8.9	1.4	
218.991	4	11688	106.7	9.46	14.87	11.48	9.37	7.18	5.64	3.75	2.62	1.99	77.0	74.8	65.9	8.2	7.9	296.8	35.2	8.5	1.4	
219.003	1	8939	81.6	6.59	10.15	7.89	6.61	5.10	4.03	2.61	1.89	1.46	77.1	74.7	66.3	8.5	8.2	376.6	16.3	11.6	0.8	
219.003	2	8961	81.8	6.58	10.13	7.89	6.62	5.11	4.04	2.64	1.89	1.47	77.1	74.7	66.3	8.5	8.2	378.0	17.7	9.6	0.8	
219.003	3	11688	106.7	8.63	13.06	10.05	8.50	6.64	5.31	3.53	2.59	2.03	77.1	74.7	66.3	8.5	8.2	363.1	13.2	10.0	0.6	
219.003	4	11732	107.1	8.61	12.98	10.09	8.55	6.68	5.35	3.56	2.60	2.06	77.1	74.7	66.3	8.5	8.2	382.5	14.8	10.1	0.6	99%
219.029	1	9048	82.6	5.94	7.66	6.28	5.52	4.48	3.66	2.50	1.91	1.52	76.8	74.4	65.8	8.3	7.6	652.9	14.3	9.7	0.0	
219.029	2	9026	82.4	5.85	7.64	6.24	5.52	4.45	3.65	2.54	1.85	1.50	76.8	74.4	65.8	8.3	7.6	639.5	10.7	11.4	0.8	
219.029	3	12028	109.8	7.69	10.19	8.21	7.31	5.96	4.92	3.44	2.61	2.10	76.8	74.4	65.8	8.3	7.6	650.2	11.2	9.7	0.7	
219.029	4	12017	109.7	7.63	10.15	8.18	7.24	5.94	4.90	3.41	2.59	2.09	76.8	74.4	65.8	8.3	7.6	645.1	10.7	8.6	0.8	
219.067	1	9026	82.4	6.24	10.85	7.93	6.37	4.71	3.73	2.52	1.86	1.44	77.2	74.5	66.2	9.3	10.0	243.1	88.2	12.1	2.0	
219.067	2	9015	82.3	6.21	10.72	7.88	6.35	4.70	3.71	2.51	1.84	1.43	77.2	74.5	66.2	9.3	10.0	251.0	87.1	11.4	1.9	
219.067	3	11918	108.8	8.04	13.37	10.04	8.22	6.23	5.01	3.46	2.56	2.00	77.2	74.5	66.2	9.3	10.0	278.8	16.2	9.3	2.0	
219.067	4	12028	109.8	8.09	13.44	10.13	8.30	6.30	5.06	3.50	2.59	2.02	77.2	74.5	66.2	9.3	10.0	283.0	104.5	11.5	2.0	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)				LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade	RMS (%)	
219.105	1	9070	82.8	6.40	9.78	7.65	6.26	4.51	3.31	2.04	1.49	1.19	76.8	74.4	66.1	8.2	7.9	403.0	13.7	9.3	1.4	
219.105	2	9005	82.2	6.33	9.77	7.58	6.21	4.48	3.28	2.04	1.49	1.20	76.8	74.4	66.1	8.2	7.9	386.0	13.7	9.9	1.4	
219.105	3	11907	108.7	8.22	12.26	9.68	8.01	5.92	4.42	2.78	2.05	1.63	76.8	74.4	66.1	8.2	7.9	444.8	57.5	10.2	0.6	
219.105	4	11984	109.4	8.23	12.32	9.73	8.05	5.96	4.45	2.80	2.06	1.65	76.8	74.4	66.1	8.2	7.9	445.0	35.0	10.5	0.6	
219.120	1	8851	80.8	6.41	10.48	7.87	6.58	4.92	3.73	2.22	1.52	1.16	76.8	74.4	66.1	8.1	7.5	374.0	14.6	9.3	0.8	
219.120	2	8950	81.7	6.44	10.52	7.93	6.63	4.96	3.77	2.24	1.55	1.17	76.8	74.4	66.1	8.1	7.5	381.1	14.6	9.3	0.7	
219.120	3	11732	107.1	8.37	13.22	10.09	8.54	6.52	5.05	3.08	2.15	1.64	76.8	74.4	66.1	8.1	7.5	424.1	14.5	9.0	1.6	
219.120	4	11666	106.5	8.28	13.14	10.02	8.49	6.49	5.02	3.06	2.13	1.62	76.8	74.4	66.1	8.1	7.5	433.2	14.5	9.0	1.4	96%
219.142	1	9015	82.3	5.28	7.39	6.07	5.31	4.27	3.48	2.35	1.72	1.31	76.8	74.3	66.1	8.3	7.7	708.4	10.5	10.6	0.4	
219.142	2	8961	81.8	5.25	7.34	6.02	5.26	4.23	3.46	2.31	1.69	1.30	76.8	74.3	66.1	8.3	7.7	695.9	10.5	10.6	0.4	
219.142	3	11929	108.9	6.96	9.56	7.93	6.96	5.65	4.65	3.17	2.37	1.79	76.8	74.3	66.1	8.3	7.7	736.5	9.1	9.4	0.6	
219.142	4	11962	109.2	6.98	9.52	7.96	6.99	5.66	4.67	3.20	2.36	1.79	76.8	74.3	66.1	8.3	7.7	760.0	12.0	9.3	0.6	
219.180	1	9158	83.6	5.82	8.19	6.92	6.06	4.89	4.02	2.73	1.93	1.50	77.2	74.6	65.9	9.2	8.1	681.1	19.5	9.8	1.3	
219.180	2	9037	82.5	5.76	8.11	6.81	5.99	4.83	3.94	2.69	1.87	1.41	77.2	74.6	65.9	9.2	8.1	650.7	19.5	9.9	1.0	
219.180	3	11918	108.8	7.61	10.86	9.01	7.92	6.47	5.35	3.70	2.65	2.03	77.2	74.6	65.9	9.2	8.1	600.2	14.5	8.6	0.8	
219.180	4	12006	109.6	7.70	11.02	9.08	8.16	6.54	5.42	3.75	2.66	2.03	77.2	74.6	65.9	9.2	8.1	611.8	16.3	8.6	1.0	
219.218	1	9059	82.7	5.46	7.77	6.65	5.89	4.87	4.01	2.35	1.72	1.31	76.0	72.8	65.4	8.4	8.5	952.9	8.2	10.6	2.2	
219.218	2	9092	83.0	5.45	7.78	6.64	5.88	4.88	4.00	2.37	1.72	1.31	76.0	72.8	65.4	8.4	8.5	953.3	9.1	10.3	2.1	
219.218	3	11853	108.2	7.08	9.87	8.55	7.61	6.39	5.29	3.20	2.35	1.81	76.0	72.8	65.4	8.4	8.5	1170.2	12.0	8.4	1.9	
219.218	4	11886	108.5	7.06	9.91	8.54	7.59	6.37	5.28	3.19	2.34	1.80	76.0	72.8	65.4	8.4	8.5	1173.0	9.1	8.9	2.0	
219.242	1	9037	82.5	6.91	11.30	8.56	7.26	5.59	4.39	2.85	2.00	1.57	76.7	74.7	65.8	7.2	8.2	359.6	13.5	11.2	0.7	
219.242	2	9059	82.7	6.90	11.23	8.55	7.19	5.59	4.40	2.83	1.99	1.55	76.7	74.7	65.8	7.2	8.2	372.3	13.2	11.0	0.7	
219.242	3	11853	108.2	9.05	14.16	10.87	9.19	7.25	5.78	3.81	2.72	2.11	76.7	74.7	65.8	7.2	8.2	369.5	14.6	9.1	0.4	
219.242	4	11886	108.5	9.03	14.13	10.87	9.15	7.28	5.80	3.84	2.72	2.12	76.7	74.7	65.8	7.2	8.2	372.8	14.6	9.1	0.6	98%
219.255	1	9015	82.3	6.43	10.31	8.03	6.72	5.42	4.26	2.44	1.32	1.22	76.8	74.2	65.6	8.5	8.5	451.0	16.3	10.3	2.3	
219.255	2	9037	82.5	6.41	10.31	8.00	6.77	5.33	4.27	2.45	1.45	1.21	76.8	74.2	65.6	8.5	8.5	446.6	19.3	9.8	2.4	
219.255	3	11831	108.0	8.24	13.21	10.19	8.69	6.97	5.65	3.32	2.14	1.69	76.8	74.2	65.6	8.5	8.5	467.9	13.2	8.8	2.9	
219.255	4	11842	108.1	8.24	13.11	10.22	8.69	6.99	5.67	3.31	2.12	1.70	76.8	74.2	65.6	8.5	8.5	488.5	13.8	8.7	3.1	
219.293	1	8873	81.0	6.65	9.50	7.66	6.66	5.28	4.25	2.80	1.97	1.49	76.8	73.8	65.5	9.2	8.4	455.1	14.6	9.3	0.7	
219.293	2	9081	82.9	6.76	9.57	7.80	6.77	5.38	4.34	2.85	2.02	1.52	76.8	73.8	65.5	9.2	8.4	480.5	13.9	9.5	0.8	
219.293	3	11677	106.6	8.64	12.08	9.87	8.64	6.95	5.66	3.80	2.72	2.06	76.8	73.8	65.5	9.2	8.4	490.2	14.6	9.1	0.6	
219.293	4	11721	107.0	8.69	12.20	9.91	8.69	6.99	5.70	3.83	2.73	2.07	76.8	73.8	65.5	9.2	8.4	477.3	16.9	9.1	0.6	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)				LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade	RMS (%)	
219.308	1	9037	82.5	6.51	8.41	7.01	6.13	4.95	3.93	2.61	1.87	1.46	76.2	73.8	65.5	7.4	13.4	777.0	15.0	11.8	0.8	
219.308	2	9015	82.3	6.48	8.46	6.97	6.09	4.93	3.92	2.60	1.86	1.44	76.2	73.8	65.5	7.4	13.4	756.1	16.7	10.4	0.9	
219.308	3	11831	108.0	8.42	10.80	9.01	7.93	6.48	5.20	3.51	2.54	2.00	76.2	73.8	65.5	7.4	13.4	826.6	13.8	8.8	0.9	
219.308	4	11787	107.6	8.41	10.75	9.01	7.93	6.48	5.20	3.51	2.54	1.98	76.2	73.8	65.5	7.4	13.4	830.4	24.5	9.1	0.9	
219.331	1	9015	82.3	6.07	8.92	7.61	6.24	4.81	3.72	2.35	1.67	1.33	75.9	73.6	65.5	7.0	15.4	708.6	11.8	10.7	1.2	
219.331	2	9048	82.6	6.08	8.90	7.62	6.24	4.83	3.73	2.37	1.69	1.37	75.9	73.6	65.5	7.0	15.4	698.1	13.0	11.9	1.4	
219.331	3	11973	109.3	7.92	11.85	9.77	8.06	6.32	4.95	3.22	2.32	1.86	75.9	73.6	65.5	7.0	15.4	609.4	65.5	12.4	0.7	
219.331	4	12006	109.6	7.91	11.73	9.75	8.03	6.33	4.94	3.20	2.32	1.87	75.9	73.6	65.5	7.0	15.4	634.9	59.1	13.7	1.1	
219.342	1	9037	82.5	6.84	11.14	8.87	7.60	5.98	4.60	2.74	1.92	1.47	76.1	73.7	65.6	7.2	15.6	534.8	45.9	9.0	1.6	
219.342	2	8994	82.1	6.79	11.14	8.82	7.55	5.96	4.59	2.69	1.89	1.47	76.1	73.7	65.6	7.2	15.6	540.2	48.3	8.4	2.1	
219.342	3	11831	108.0	8.94	13.96	11.17	9.81	7.83	6.13	3.75	2.66	2.04	76.1	73.7	65.6	7.2	15.6	671.6	45.9	9.6	2.2	
219.342	4	11853	108.2	8.89	13.98	11.21	9.74	7.81	6.17	3.72	2.70	2.05	76.1	73.7	65.6	7.2	15.6	612.3	49.9	8.8	2.5	83%
219.369	1	8994	82.1	7.15	12.07	8.89	6.91	4.97	3.89	2.43	1.62	1.24	76.4	73.9	65.7	7.9	16.0	247.8	46.8	13.4	1.6	
219.369	2	9070	82.8	7.19	12.13	8.91	6.93	4.99	3.87	2.40	1.65	1.22	76.4	73.9	65.7	7.9	16.0	246.9	44.8	14.8	1.5	
219.369	3	12072	110.2	9.18	14.86	11.24	8.90	6.54	5.18	3.30	2.29	1.76	76.4	73.9	65.7	7.9	16.0	289.5	56.8	12.0	1.5	
219.369	4	12028	109.8	9.07	14.81	11.21	8.88	6.53	5.15	3.35	2.28	1.73	76.4	73.9	65.7	7.9	16.0	278.7	57.6	12.2	1.5	
219.407	1	8994	82.1	6.00	8.57	6.96	5.97	4.68	3.72	2.44	1.76	1.32	75.8	73.9	65.7	7.2	12.2	643.1	13.0	10.7	0.6	
219.407	2	8994	82.1	5.96	8.59	6.93	5.96	4.67	3.71	2.44	1.76	1.33	75.8	73.9	65.7	7.2	12.2	645.5	11.8	11.1	0.7	
219.407	3	11765	107.4	7.71	11.09	8.87	7.66	6.06	4.90	3.29	2.39	1.82	75.8	73.9	65.7	7.2	12.2	603.5	13.2	9.2	0.6	
219.407	4	11732	107.1	7.70	11.15	8.87	7.65	6.06	4.90	3.28	2.38	1.83	75.8	73.9	65.7	7.2	12.2	577.9	16.1	10.0	0.6	
219.444	1	9026	82.4	5.75	9.59	7.10	5.67	4.10	3.02	1.64	0.96	0.65	74.9	73.9	65.7	6.0	13.9	518.8	11.7	11.0	1.8	
219.444	2	8994	82.1	5.69	9.54	7.06	5.63	4.06	2.98	1.62	0.95	0.64	74.9	73.9	65.7	6.0	13.9	511.2	11.7	11.1	1.6	
219.444	3	11842	108.1	7.35	11.69	8.94	7.25	5.29	3.92	2.17	1.27	0.84	74.9	73.9	65.7	6.0	13.9	656.7	11.1	8.8	1.7	
219.444	4	11853	108.2	7.35	11.70	8.95	7.26	5.31	3.94	2.18	1.28	0.85	74.9	73.9	65.7	6.0	13.9	656.3	9.0	11.0	1.7	
219.474	1	9048	82.6	5.91	12.41	8.38	6.70	4.70	3.55	1.76	1.02	0.82	75.6	73.9	65.7	6.7	13.7	268.6	70.6	9.2	3.2	
219.474	2	9037	82.5	5.90	12.49	8.36	6.67	4.67	3.55	1.79	1.03	0.86	75.6	73.9	65.7	6.7	13.7	254.0	83.8	7.8	3.0	
219.474	3	11896	108.6	7.79	15.29	10.57	8.62	6.19	4.75	2.48	1.42	1.25	75.6	73.9	65.7	6.7	13.7	301.9	65.7	11.4	2.7	
219.474	4	11995	109.5	7.85	15.46	10.61	8.66	6.24	4.75	2.49	1.41	1.24	75.6	73.9	65.7	6.7	13.7	283.5	67.0	11.2	2.3	89%
219.482	1	9015	82.3	8.19	11.78	9.48	8.13	6.29	4.88	2.90	1.71	1.04	75.5	73.9	65.7	6.7	21.2	571.1	32.0	9.8	1.5	
219.482	2	9026	82.4	8.16	11.76	9.44	8.09	6.26	4.86	2.89	1.70	1.01	75.5	73.9	65.7	6.7	21.2	576.3	31.3	9.9	1.5	
219.482	3	11886	108.5	10.71	15.17	12.28	10.60	8.31	6.55	4.02	2.41	1.44	75.5	73.9	65.7	6.7	21.2	604.4	32.4	10.3	2.3	
219.482	4	12006	109.6	10.82	15.28	12.40	10.63	8.41	6.63	4.05	2.41	1.44	75.5	73.9	65.7	6.7	21.2	630.1	34.1	9.5	2.1	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)				LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade	RMS (%)	
219.520	1	9081	82.9	8.44	12.31	9.84	8.47	6.67	5.33	3.39	2.38	1.75	76.9	73.9	65.7	6.6	17.7	595.9	40.7	9.8	1.8	
219.520	2	9005	82.2	8.32	12.18	9.78	8.38	6.65	5.27	3.29	2.36	1.75	76.9	73.9	65.7	6.6	17.7	594.4	37.5	10.0	2.0	
219.520	3	12116	110.6	10.65	15.46	12.48	10.84	8.72	7.06	4.65	3.33	2.44	76.9	73.9	65.7	6.6	17.7	649.9	44.7	10.6	1.6	
219.520	4	12116	110.6	10.78	15.57	12.40	10.93	8.71	7.12	4.70	3.31	2.42	76.9	73.9	65.7	6.6	17.7	566.4	47.7	10.4	1.8	
219.558	1	8983	82.0	7.10	9.99	8.48	7.42	5.95	4.85	3.15	2.05	1.47	73.3	73.9	65.7	6.9	15.9	750.0	53.9	8.9	1.2	
219.558	2	9037	82.5	7.22	9.89	8.47	7.42	5.98	4.89	3.15	2.06	1.46	73.3	73.9	65.7	6.9	15.9	845.8	52.0	8.9	1.4	
219.558	3	12203	111.4	9.47	13.21	11.11	9.78	7.98	6.52	4.33	2.92	2.01	73.3	73.9	65.7	6.9	15.9	789.2	68.9	8.1	1.4	
219.558	4	12116	110.6	9.33	13.13	11.01	9.69	7.91	6.46	4.34	2.88	2.00	73.3	73.9	65.7	6.9	15.9	730.7	60.7	9.5	0.9	
219.580	1	8983	82.0	10.60	16.22	11.76	9.17	6.18	4.19	1.88	0.93	0.62	72.9	73.9	65.7	6.5	17.5	258.1	22.4	10.2	2.4	
219.580	2	8972	81.9	10.55	16.02	11.69	9.12	6.17	4.18	1.86	0.94	0.61	72.9	73.9	65.7	6.5	17.5	275.7	21.6	10.4	2.2	
219.580	3	11962	109.2	13.60	20.80	14.87	11.70	8.02	5.56	2.60	1.35	0.90	72.9	73.9	65.7	6.5	17.5	263.8	29.5	8.4	2.4	
219.580	4	12094	110.4	13.66	20.93	14.99	11.80	8.10	5.61	2.63	1.36	0.91	72.9	73.9	65.7	6.5	17.5	266.6	28.9	8.5	2.5	80%
219.595	1	12000	109.5	9.54	16.10	11.86	9.22	6.63	5.19	3.24	2.16	1.65	72.2	73.9	65.7	5.1	13.9	619.7	6.2	5.9	0.7	
219.595	2	12000	109.5	9.51	16.05	11.79	9.17	6.60	5.12	3.18	2.18	1.61	72.2	73.9	65.7	5.1	13.9	574.6	12.9	9.5	0.4	
219.595	3	12000	109.5	9.13	14.77	11.17	8.85	6.50	5.15	3.28	2.28	1.75	72.2	73.9	65.7	5.1	13.9	664.6	5.8	5.1	1.2	
219.595	4	12000	109.5	9.05	14.78	11.18	8.86	6.51	5.14	3.34	2.27	1.73	72.2	73.9	65.7	5.1	13.9	654.6	5.8	4.8	0.9	
219.611	1	12000	109.5	9.54	16.10	11.86	9.22	6.63	5.19	3.24	2.16	1.65	71.2	73.9	65.7	4.7	15.4	625.8	50.8	8.1	2.7	
219.611	2	12000	109.5	9.51	16.05	11.79	9.17	6.60	5.12	3.18	2.18	1.61	71.2	73.9	65.7	4.7	15.4	606.7	46.0	10.0	1.8	
219.611	3	12000	109.5	9.13	14.77	11.17	8.85	6.50	5.15	3.28	2.28	1.75	71.2	73.9	65.7	4.7	15.4	725.5	38.4	12.3	2.2	
219.611	4	12000	109.5	9.05	14.78	11.18	8.86	6.51	5.14	3.34	2.27	1.73	71.2	73.9	65.7	4.7	15.4	754.0	44.6	10.8	1.8	
219.674	1	12000	109.5	9.54	16.10	11.86	9.22	6.63	5.19	3.24	2.16	1.65	71.1	73.9	65.7	4.6	17.6	1412.1	30.5	10.4	2.2	
219.674	2	12000	109.5	9.51	16.05	11.79	9.17	6.60	5.12	3.18	2.18	1.61	71.1	73.9	65.7	4.6	17.6	1427.3	32.5	10.3	2.6	
219.674	3	12000	109.5	9.13	14.77	11.17	8.85	6.50	5.15	3.28	2.28	1.75	71.1	73.9	65.7	4.6	17.6	1483.6	47.7	8.6	2.3	
219.674	4	12000	109.5	9.05	14.78	11.18	8.86	6.51	5.14	3.34	2.27	1.73	71.1	73.9	65.7	4.6	17.6	1377.3	45.8	8.6	2.5	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Project Name: **US-30, Blue Lakes to Eastland**
Segment: **Blue Lakes to Eastland**
Direction: **Westbound**

Calc. Date: 11/30/2020
File No.: 03256

Summary of Input Data

Date of FWD Testing: **September 24, 2020**
PDAT used for Backcalculation (BELLS): **67°F**
FWD Plate Radius: **5.905"**

	Summary of Backcalculated Moduli			
	AC	Base	Subgrade	RMS (%)
Mean:	619.9	25.7	10.0	1.4
Standard Deviation:	248.5	16.2	1.2	1.3

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)			RMS (%)	LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade		
218.710	1	8895	81.2	8.94	13.08	11.29	9.33	7.15	5.40	3.33	2.17	1.52	67.2	64.2	62.5	7.0	9.8	382.1	36.9	8.3	1.0	
218.710	2	8950	81.7	8.98	13.41	11.32	9.43	7.20	5.43	3.34	2.20	1.55	67.2	64.2	62.5	7.0	9.8	362.4	33.6	10.0	0.6	
218.710	3	11656	106.4	11.88	17.46	14.57	12.21	9.43	7.27	4.54	3.05	2.23	67.2	64.2	62.5	7.0	9.8	355.6	47.7	8.5	0.7	
218.710	4	11634	106.2	11.93	17.52	14.58	12.25	9.46	7.30	4.55	3.00	2.19	67.2	64.2	62.5	7.0	9.8	357.1	33.1	11.8	0.6	
218.721	1	9005	82.2	10.54	15.49	12.72	10.50	7.82	5.85	3.52	2.44	1.93	67.2	64.5	63.0	6.7	12.4	291.0	28.2	9.7	0.4	
218.721	2	9005	82.2	10.47	15.50	12.68	10.46	7.81	5.84	3.52	2.43	1.93	67.2	64.5	63.0	6.7	12.4	289.7	28.8	9.7	0.4	
218.721	3	11962	109.2	13.70	19.84	16.33	13.61	10.30	7.81	4.82	3.41	2.71	67.2	64.5	63.0	6.7	12.4	310.6	30.4	10.1	0.4	
218.721	4	11951	109.1	13.69	19.56	16.33	13.58	10.31	7.82	4.82	3.42	2.72	67.2	64.5	63.0	6.7	12.4	334.5	29.4	10.1	0.6	
218.759	1	9070	82.8	7.24	12.89	10.06	8.29	6.39	5.21	3.45	2.54	1.93	67.5	65.5	63.4	6.1	11.8	279.9	71.7	11.0	0.6	
218.759	2	9114	83.2	7.28	12.86	10.05	8.43	6.57	5.22	3.51	2.57	1.96	67.5	65.5	63.4	6.1	11.8	316.6	74.7	10.6	0.8	
218.759	3	11886	108.5	9.83	16.11	12.78	10.94	8.60	6.97	4.74	3.50	2.77	67.5	65.5	63.4	6.1	11.8	352.2	87.8	10.0	0.7	
218.759	4	11984	109.4	9.87	16.31	12.99	11.01	8.67	7.00	4.79	3.54	2.81	67.5	65.5	63.4	6.1	11.8	343.9	87.9	9.6	0.7	
218.779	1	9114	83.2	5.46	8.53	6.71	5.81	4.78	3.92	2.73	1.96	1.54	68.1	65.5	63.0	7.4	9.7	390.5	14.5	10.7	1.1	
218.779	2	9015	82.3	5.55	8.48	6.59	5.72	4.59	3.84	2.61	1.87	1.48	68.1	65.5	63.0	7.4	9.7	385.8	13.2	11.4	1.3	
218.779	3	12050	110.0	7.81	10.80	8.76	7.71	6.39	5.28	3.74	2.74	2.15	68.1	65.5	63.0	7.4	9.7	483.0	16.1	10.2	0.8	
218.779	4	12039	109.9	7.81	10.74	8.78	7.75	6.42	5.30	3.74	2.76	2.15	68.1	65.5	63.0	7.4	9.7	529.5	14.6	8.9	0.8	98%
218.797	1	9037	82.5	6.74	8.85	7.41	6.62	5.56	4.70	3.30	2.46	1.89	68.6	65.5	63.4	8.6	8.9	454.8	12.3	12.3	0.9	
218.797	2	9048	82.6	6.69	8.87	7.33	6.62	5.61	4.74	3.35	2.46	1.88	68.6	65.5	63.4	8.6	8.9	467.0	14.6	11.4	1.2	
218.797	3	12061	110.1	8.62	11.43	9.81	8.87	7.54	6.40	4.64	3.36	2.51	68.6	65.5	63.4	8.6	8.9	578.9	13.3	9.4	0.7	
218.797	4	12039	109.9	8.84	11.43	9.87	8.86	7.53	6.39	4.62	3.42	2.59	68.6	65.5	63.4	8.6	8.9	570.3	13.3	9.4	0.6	
218.835	1	8983	82.0	5.33	7.03	6.17	5.47	4.56	3.76	2.55	1.76	1.28	68.7	66.6	63.6	7.4	10.4	1099.2	9.2	10.7	1.4	
218.835	2	8906	81.3	5.29	7.02	6.10	5.42	4.49	3.70	2.51	1.73	1.26	68.7	66.6	63.6	7.4	10.4	951.7	10.8	12.0	0.7	
218.835	3	11973	109.3	7.20	9.75	8.31	7.40	6.20	5.17	3.57	2.51	1.85	68.7	66.6	63.6	7.4	10.4	772.0	14.5	9.3	0.9	
218.835	4	11995	109.5	7.20	9.71	8.31	7.43	6.21	5.17	3.59	2.52	1.86	68.7	66.6	63.6	7.4	10.4	807.3	15.2	9.3	0.8	
218.872	1	8840	80.7	5.57	8.80	6.69	5.69	4.52	3.61	2.47	1.68	1.40	68.8	66.5	63.5	7.9	8.5	300.5	14.5	11.0	0.4	
218.872	2	9081	82.9	5.64	8.89	6.77	5.82	4.59	3.73	2.47	1.74	1.37	68.8	66.5	63.5	7.9	8.5	320.3	19.3	10.9	0.9	
218.872	3	11820	107.9	7.55	11.21	8.80	7.62	6.01	4.97	3.39	2.41	1.91	68.8	66.5	63.5	7.9	8.5	368.2	11.8	9.7	0.7	
218.872	4	11798	107.7	7.50	11.19	8.76	7.62	6.04	4.98	3.38	2.40	1.89	68.8	66.5	63.5	7.9	8.5	375.1	14.5	9.4	0.8	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)			RMS (%)	LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade		
218.909	1	9081	82.9	5.60	7.27	6.26	5.47	4.43	3.61	2.46	1.78	1.41	68.1	66.5	62.8	6.2	11.3	946.3	10.7	11.3	0.4	
218.909	2	9081	82.9	5.58	7.26	6.24	5.44	4.41	3.60	2.45	1.78	1.40	68.1	66.5	62.8	6.2	11.3	951.2	10.9	11.7	0.4	
218.909	3	11995	109.5	7.41	9.25	8.25	7.24	5.91	4.85	3.37	2.48	1.96	68.1	66.5	62.8	6.2	11.3	1243.8	13.0	9.2	0.4	
218.909	4	12017	109.7	7.41	9.34	8.24	7.27	5.96	4.85	3.31	2.46	1.95	68.1	66.5	62.8	6.2	11.3	1316.4	10.7	9.6	0.6	
218.930	1	9081	82.9	5.83	11.24	8.26	6.51	4.67	3.57	2.42	1.82	1.42	67.4	66.2	62.9	5.2	12.4	305.1	29.8	11.1	1.2	
218.930	2	9015	82.3	5.52	11.01	8.19	6.47	4.70	3.53	2.44	1.76	1.44	67.4	66.2	62.9	5.2	12.4	326.4	91.6	12.1	1.6	
218.930	3	11962	109.2	7.67	13.67	10.48	8.42	6.15	4.81	3.26	2.47	1.99	67.4	66.2	62.9	5.2	12.4	401.8	104.3	9.5	0.8	
218.930	4	12006	109.6	7.71	13.62	10.46	8.41	6.19	4.85	3.33	2.47	1.97	67.4	66.2	62.9	5.2	12.4	388.2	47.5	12.1	1.2	88%
218.948	1	9081	82.9	6.72	9.77	7.95	6.59	4.98	3.85	2.61	1.76	1.41	67.7	66.6	63.2	5.2	11.1	615.4	131.2	7.9	0.7	
218.948	2	9015	82.3	6.60	9.54	7.89	6.50	4.90	3.83	2.52	1.79	1.43	67.7	66.6	63.2	5.2	11.1	685.8	111.1	8.6	0.4	
218.948	3	11853	108.2	8.44	12.28	10.02	8.41	6.43	5.11	3.44	2.50	1.93	67.7	66.6	63.2	5.2	11.1	652.1	16.1	9.3	0.4	
218.948	4	11853	108.2	8.46	12.29	10.02	8.43	6.47	5.11	3.46	2.48	1.95	67.7	66.6	63.2	5.2	11.1	640.3	13.2	9.8	0.6	
218.986	1	9026	82.4	5.93	8.26	7.11	6.24	5.04	4.06	2.68	1.85	1.55	68.3	66.7	63.5	6.4	10.0	958.3	15.2	10.5	0.8	
218.986	2	9005	82.2	5.92	8.26	7.03	6.18	4.98	4.06	2.57	1.91	1.50	68.3	66.7	63.5	6.4	10.0	989.9	11.2	11.1	1.6	
218.986	3	11907	108.7	7.83	10.43	9.19	8.19	6.68	5.45	3.68	2.65	2.11	68.3	66.7	63.5	6.4	10.0	1202.0	14.5	8.7	0.9	
218.986	4	11984	109.4	7.83	10.51	9.24	8.21	6.69	5.48	3.67	2.63	2.14	68.3	66.7	63.5	6.4	10.0	1151.8	16.7	8.7	0.7	
219.030	1	8884	81.1	6.21	9.71	7.98	6.42	4.67	3.45	2.11	1.47	1.12	68.3	66.7	63.7	6.3	8.7	483.7	17.5	8.6	0.7	
219.030	2	9059	82.7	6.46	9.72	8.11	6.55	4.72	3.55	2.24	1.48	1.11	68.3	66.7	63.7	6.3	8.7	506.8	9.6	9.6	1.0	
219.030	3	11787	107.6	8.08	12.26	10.30	8.41	6.27	4.72	3.09	2.08	1.56	68.3	66.7	63.7	6.3	8.7	547.9	10.9	8.9	1.1	
219.030	4	11765	107.4	8.00	12.16	10.26	8.37	6.22	4.72	3.01	2.07	1.57	68.3	66.7	63.7	6.3	8.7	580.0	11.2	9.5	0.8	
219.045	1	8862	80.9	6.66	12.14	9.04	7.57	5.84	4.58	2.89	1.91	1.39	68.4	66.9	63.7	6.3	12.2	285.8	80.7	10.7	1.5	
219.045	2	8950	81.7	6.68	12.14	9.11	7.60	5.86	4.65	2.99	1.98	1.38	68.4	66.9	63.7	6.3	12.2	288.1	85.0	10.5	1.2	
219.045	3	11820	107.9	9.01	15.34	11.80	10.05	7.96	6.32	4.15	2.77	1.98	68.4	66.9	63.7	6.3	12.2	340.1	97.7	9.5	1.5	
219.045	4	11798	107.7	9.09	15.23	11.81	10.06	7.96	6.30	4.13	2.78	1.98	68.4	66.9	63.7	6.3	12.2	359.2	92.1	9.7	1.2	84%
219.059	1	8873	81.0	6.54	9.18	7.49	6.20	4.68	3.76	2.55	2.00	1.57	68.4	66.7	64.2	6.5	12.8	460.0	14.5	10.2	0.8	
219.059	2	9081	82.9	6.65	9.30	7.60	6.28	4.79	3.81	2.56	2.05	1.62	68.4	66.7	64.2	6.5	12.8	440.7	14.5	11.9	0.8	
219.059	3	11896	108.6	8.60	11.61	9.84	8.25	6.39	5.21	3.61	2.77	2.16	68.4	66.7	64.2	6.5	12.8	557.2	16.0	10.0	1.0	
219.059	4	11973	109.3	8.63	11.74	9.83	8.22	6.41	5.15	3.56	2.80	2.17	68.4	66.7	64.2	6.5	12.8	528.0	19.5	9.9	0.7	
219.068	1	8818	80.5	5.73	7.87	6.70	5.87	4.63	3.55	1.75	1.07	0.90	68.5	66.8	64.1	6.6	11.6	1211.6	5.2	8.3	2.7	
219.068	2	9015	82.3	5.81	8.02	6.89	5.94	4.67	3.60	1.77	1.27	0.96	68.5	66.8	64.1	6.6	11.6	1139.7	8.5	8.7	3.0	
219.068	3	11842	108.1	7.59	10.74	8.94	7.83	6.34	4.92	2.66	1.81	1.35	68.5	66.8	64.1	6.6	11.6	1114.3	8.7	8.9	3.1	
219.068	4	11875	108.4	7.53	10.60	8.96	7.81	6.25	4.86	2.57	1.85	1.40	68.5	66.8	64.1	6.6	11.6	1211.2	3.8	8.9	2.5	
219.106	1	8774	80.1	5.51	7.69	6.33	5.43	4.18	3.15	1.83	1.18	0.98	68.2	66.9	63.5	5.8	12.2	1085.9	3.3	10.5	1.4	
219.106	2	9059	82.7	5.68	7.78	6.51	5.57	4.32	3.28	1.83	1.23	1.01	68.2	66.9	63.5	5.8	12.2	1221.3	3.5	11.5	2.1	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)			RMS (%)	LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade		
219.106	3	11864	108.3	7.40	9.88	8.44	7.28	5.61	4.39	2.65	1.83	1.44	68.2	66.9	63.5	5.8	12.2	1230.8	3.0	10.1	1.2	
219.106	4	11831	108.0	7.42	9.93	8.38	7.24	5.60	4.34	2.65	1.77	1.42	68.2	66.9	63.5	5.8	12.2	1180.4	2.9	8.6	1.4	
219.143	1	9059	82.7	5.23	7.41	6.25	5.40	4.24	3.25	2.02	1.36	0.99	68.4	67.0	63.1	6.2	11.0	1005.7	9.6	10.6	1.0	
219.143	2	9015	82.3	5.25	7.41	6.18	5.42	4.19	3.20	2.00	1.32	0.98	68.4	67.0	63.1	6.2	11.0	1019.1	2.8	13.2	1.4	
219.143	3	12028	109.8	6.97	9.63	8.15	7.18	5.63	4.34	2.74	1.85	1.39	68.4	67.0	63.1	6.2	11.0	1130.5	9.6	9.3	1.2	
219.143	4	12017	109.7	6.89	9.58	8.18	7.07	5.62	4.39	2.82	1.90	1.39	68.4	67.0	63.1	6.2	11.0	1037.7	2.4	9.9	0.9	
219.159	1	8731	79.7	5.67	9.70	7.33	5.96	4.41	3.27	2.06	1.32	1.02	68.7	67.2	63.2	6.6	8.6	339.4	18.4	10.1	0.7	
219.159	2	9103	83.1	5.94	9.87	7.57	6.23	4.61	3.35	2.16	1.33	1.10	68.7	67.2	63.2	6.6	8.6	336.4	16.6	11.0	1.8	
219.159	3	11864	108.3	7.85	12.22	9.66	7.95	5.99	4.49	2.89	1.92	1.49	68.7	67.2	63.2	6.6	8.6	446.8	15.9	9.0	0.6	
219.159	4	11886	108.5	7.77	12.24	9.65	7.93	5.96	4.49	2.87	1.92	1.46	68.7	67.2	63.2	6.6	8.6	450.1	15.9	8.9	0.7	96%
219.181	1	8961	81.8	4.54	6.47	5.19	4.53	3.65	2.96	2.16	1.61	1.18	68.7	67.2	63.8	6.7	9.0	603.8	12.2	12.5	0.9	
219.181	2	8994	82.1	4.54	6.45	5.21	4.56	3.69	3.02	2.12	1.63	1.24	68.7	67.2	63.8	6.7	9.0	660.8	8.6	13.5	0.8	
219.181	3	11973	109.3	5.99	8.34	6.95	6.12	5.00	4.16	3.01	2.19	1.75	68.7	67.2	63.8	6.7	9.0	766.8	9.6	9.5	0.0	
219.181	4	11995	109.5	6.00	8.41	6.96	6.14	5.07	4.13	3.04	2.25	1.80	68.7	67.2	63.8	6.7	9.0	745.4	9.6	10.6	0.8	
219.218	1	9070	82.8	5.87	8.12	7.08	6.19	5.04	4.06	2.67	1.66	1.30	67.9	67.0	64.0	5.2	12.9	1685.1	13.5	10.1	1.1	
219.218	2	9005	82.2	5.81	8.16	7.02	6.14	4.98	4.02	2.64	1.63	1.27	67.9	67.0	64.0	5.2	12.9	1667.3	16.7	10.9	1.5	
219.218	3	12006	109.6	7.75	10.55	9.28	8.17	6.72	5.48	3.68	2.31	1.80	67.9	67.0	64.0	5.2	12.9	1886.4	20.4	8.7	1.3	
219.218	4	11995	109.5	7.76	10.52	9.36	8.20	6.79	5.52	3.76	2.33	1.84	67.9	67.0	64.0	5.2	12.9	1660.8	16.7	9.0	0.7	
219.256	1	8818	80.5	7.35	11.68	11.02	6.54	4.68	3.73	2.36	1.66	1.34	68.7	67.5	63.8	6.2	11.2	221.4	48.0	10.4	9.2	
219.256	2	9005	82.2	7.47	11.76	11.19	6.76	4.91	3.88	2.57	1.71	1.41	68.7	67.5	63.8	6.2	11.2	234.1	48.9	11.6	8.8	
219.256	3	11787	107.6	9.56	14.85	14.02	9.02	6.65	5.31	3.44	2.50	2.05	68.7	67.5	63.8	6.2	11.2	286.1	66.4	9.7	7.5	
219.256	4	11776	107.5	9.62	15.04	14.07	9.00	6.62	5.25	3.43	2.50	2.00	68.7	67.5	63.8	6.2	11.2	269.1	42.7	16.8	7.5	
219.281	1	8983	82.0	6.24	9.01	7.54	6.39	5.21	4.28	2.98	2.27	1.78	68.5	67.5	63.9	5.7	12.8	692.7	20.7	11.0	1.1	
219.281	2	9005	82.2	6.28	9.06	7.59	6.30	5.13	4.26	3.07	2.28	1.73	68.5	67.5	63.9	5.7	12.8	584.6	111.8	11.2	0.8	
219.281	3	11973	109.3	8.64	12.04	10.03	8.74	7.13	5.90	4.31	3.20	2.49	68.5	67.5	63.9	5.7	12.8	670.2	103.0	12.4	0.6	
219.281	4	11962	109.2	8.66	11.97	10.04	8.45	7.14	5.90	4.24	3.17	2.51	68.5	67.5	63.9	5.7	12.8	676.5	146.8	9.1	1.3	94%
219.294	1	8862	80.9	7.41	9.30	7.56	6.53	5.16	4.23	2.77	1.92	1.50	68.2	67.3	63.6	5.4	13.3	749.6	113.8	9.7	1.5	
219.294	2	9103	83.1	7.70	9.66	7.74	6.74	5.40	4.44	2.88	1.94	1.60	68.2	67.3	63.6	5.4	13.3	716.6	18.1	11.7	2.3	
219.294	3	11798	107.7	9.98	12.23	10.12	8.83	7.16	5.93	3.98	2.79	2.15	68.2	67.3	63.6	5.4	13.3	752.7	126.4	8.2	1.5	
219.294	4	11820	107.9	9.97	12.13	10.16	8.88	7.20	5.94	4.06	2.80	2.17	68.2	67.3	63.6	5.4	13.3	863.8	105.2	10.0	1.1	
219.332	1	8654	79.0	5.43	8.49	6.48	5.35	4.07	3.20	2.05	1.54	1.28	68.7	67.8	63.7	5.9	18.4	473.5	75.1	12.9	1.3	
219.332	2	8774	80.1	5.49	8.48	6.51	5.39	4.12	3.21	2.12	1.51	1.22	68.7	67.8	63.7	5.9	18.4	478.4	17.7	11.6	1.1	
219.332	3	11820	107.9	7.11	11.09	8.82	7.46	5.76	4.64	3.15	2.37	1.91	68.7	67.8	63.7	5.9	18.4	569.1	95.7	8.8	0.6	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)			RMS (%)	LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade		
219.332	4	11896	108.6	7.23	11.03	8.84	7.46	5.80	4.66	3.14	2.32	1.92	68.7	67.8	63.7	5.9	18.4	604.8	13.2	10.2	0.6	
219.369	1	8796	80.3	5.82	7.93	6.35	5.32	4.03	3.10	1.90	1.30	0.99	68.6	67.9	63.2	5.4	18.6	889.4	10.1	11.4	1.6	
219.369	2	8774	80.1	5.84	7.95	6.34	5.32	4.05	3.13	1.93	1.30	1.04	68.6	67.9	63.2	5.4	18.6	910.4	11.8	11.6	2.1	
219.369	3	11798	107.7	7.91	10.63	8.65	7.33	5.67	4.40	2.79	1.93	1.42	68.6	67.9	63.2	5.4	18.6	945.6	88.3	8.4	1.7	
219.369	4	11831	108.0	7.94	10.50	8.67	7.35	5.70	4.43	2.81	1.96	1.38	68.6	67.9	63.2	5.4	18.6	1013.3	11.8	9.6	1.4	
219.407	1	8687	79.3	5.45	8.13	6.42	5.44	4.31	3.31	2.23	1.57	1.26	68.8	68.2	63.1	5.4	18.9	776.1	13.2	12.3	2.0	
219.407	2	8720	79.6	5.54	8.34	6.42	5.47	4.26	3.34	2.13	1.55	1.22	68.8	68.2	63.1	5.4	18.9	760.9	14.5	12.2	2.5	
219.407	3	11853	108.2	7.59	11.06	8.73	7.50	5.96	4.73	3.17	2.31	1.82	68.8	68.2	63.1	5.4	18.9	707.6	101.2	8.7	2.0	
219.407	4	11896	108.6	7.58	10.88	8.76	7.50	5.95	4.74	3.18	2.27	1.82	68.8	68.2	63.1	5.4	18.9	819.9	16.0	11.5	1.5	
219.427	1	8742	79.8	5.90	10.53	7.63	6.08	4.51	3.38	1.98	1.19	0.85	69.1	68.8	63.2	5.4	18.9	383.7	69.5	9.3	2.3	
219.427	2	8818	80.5	5.94	10.58	7.73	6.15	4.56	3.42	2.02	1.21	0.86	69.1	68.8	63.2	5.4	18.9	411.6	63.3	10.8	1.9	
219.427	3	11853	108.2	8.38	13.98	10.65	8.63	6.47	4.89	2.92	1.74	1.24	69.1	68.8	63.2	5.4	18.9	521.2	64.0	8.9	2.3	
219.427	4	11896	108.6	8.35	13.74	10.65	8.63	6.47	4.91	2.93	1.75	1.24	69.1	68.8	63.2	5.4	18.9	543.4	59.1	10.2	1.6	95%
219.445	1	8851	80.8	6.74	9.42	8.27	6.95	5.12	3.61	1.98	1.15	0.79	68.8	68.8	63.2	5.2	21.4	1208.3	36.1	7.9	0.8	
219.445	2	8796	80.3	6.85	9.35	8.23	6.87	5.09	3.60	1.98	1.17	0.78	68.8	68.8	63.2	5.2	21.4	1219.2	33.4	8.9	0.7	
219.445	3	11787	107.6	9.24	13.07	10.90	9.19	6.95	5.06	2.89	1.77	1.15	68.8	68.8	63.2	5.2	21.4	1013.2	41.2	8.1	1.4	
219.445	4	11754	107.3	9.23	12.99	10.87	9.19	6.93	5.06	2.91	1.76	1.17	68.8	68.8	63.2	5.2	21.4	1047.6	38.2	9.3	1.1	
219.483	1	8829	80.6	6.51	10.89	8.47	6.73	4.85	3.69	2.18	1.50	1.30	68.8	68.8	63.2	5.4	22.6	471.0	44.8	10.6	1.5	
219.483	2	8895	81.2	6.59	10.88	8.52	6.73	4.92	3.70	2.11	1.55	1.10	68.8	68.8	63.2	5.4	22.6	509.4	46.6	9.3	1.8	
219.483	3	12236	111.7	9.67	14.51	11.79	9.56	7.16	5.46	3.34	2.30	1.64	68.8	68.8	63.2	5.4	22.6	575.4	48.6	8.5	0.6	
219.483	4	12269	112.0	9.72	14.28	11.77	9.59	7.19	5.46	3.42	2.30	1.81	68.8	68.8	63.2	5.4	22.6	653.3	45.3	9.7	0.8	
219.520	1	8906	81.3	6.75	9.52	8.00	6.87	5.41	4.34	2.66	1.71	1.18	71.3	68.8	63.2	6.3	20.6	781.0	44.1	9.1	1.6	
219.520	2	9005	82.2	6.81	9.54	8.13	7.00	5.62	4.34	2.75	1.76	1.26	71.3	68.8	63.2	6.3	20.6	849.7	38.2	10.6	1.2	
219.520	3	11798	107.7	8.73	12.34	10.59	9.06	7.25	5.80	3.72	2.47	1.74	71.3	68.8	63.2	6.3	20.6	818.3	48.3	8.7	1.2	
219.520	4	11809	107.8	8.82	12.20	10.42	9.08	7.30	5.81	3.72	2.43	1.70	71.3	68.8	63.2	6.3	20.6	931.2	45.8	8.7	0.9	
219.527	1	8851	80.8	6.20	8.72	7.25	6.23	4.93	3.94	2.60	1.84	1.42	70.8	68.8	63.2	6.2	21.2	782.0	59.1	9.3	0.8	
219.527	2	9092	83.0	6.32	8.72	7.38	6.36	5.04	4.04	2.67	1.90	1.47	70.8	68.8	63.2	6.2	21.2	843.8	52.6	10.9	0.9	
219.527	3	11842	108.1	8.20	11.07	9.50	8.21	6.58	5.33	3.61	2.59	2.01	70.8	68.8	63.2	6.2	21.2	914.7	65.8	7.9	0.7	
219.527	4	11853	108.2	8.21	11.03	9.53	8.24	6.60	5.35	3.64	2.62	2.03	70.8	68.8	63.2	6.2	21.2	925.8	62.1	7.9	0.6	
219.558	1	9081	82.9	6.78	9.43	7.86	6.83	5.44	4.38	2.87	1.98	1.53	70.7	68.8	63.2	5.9	23.0	918.2	46.1	10.2	1.5	
219.558	2	9015	82.3	6.72	9.20	7.80	6.81	5.43	4.33	2.90	1.98	1.47	70.7	68.8	63.2	5.9	23.0	969.3	50.6	8.6	0.8	
219.558	3	11929	108.9	8.82	12.02	10.27	9.01	7.26	5.92	4.02	2.80	2.07	70.7	68.8	63.2	5.9	23.0	977.8	54.5	8.2	0.9	
219.558	4	11940	109.0	8.93	11.94	10.24	8.96	7.27	5.92	4.02	2.83	2.07	70.7	68.8	63.2	5.9	23.0	1038.9	52.0	8.3	0.8	

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Approx. Station	FWD Drop No.	FWD Plate Load (lbs)	Stress (psi)	Pavement Deflections in Mils (inches from load plate)									Temperatures (Deg. F)			Layer Thickness (inches)		Backcalculated Elastic Modulus, E_{FWD} (ksi)			RMS (%)	LTE
				D(-12)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(48)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	AC	Base	Subgrade		
219.580	1	9005	82.2	8.41	14.81	10.26	8.18	5.52	3.82	1.85	0.97	0.72	70.3	68.8	63.2	5.1	23.0	355.8	30.9	9.8	3.4	
219.580	2	9037	82.5	8.39	14.79	10.23	8.17	5.55	3.83	1.86	1.06	0.69	70.3	68.8	63.2	5.1	23.0	356.9	30.9	9.9	3.5	
219.580	3	11842	108.1	10.83	18.75	12.82	10.33	7.20	5.07	2.58	1.38	1.00	70.3	68.8	63.2	5.1	23.0	353.5	37.8	9.0	3.6	
219.580	4	11875	108.4	10.79	18.63	12.93	10.37	7.21	5.15	2.62	1.48	1.02	70.3	68.8	63.2	5.1	23.0	381.9	35.7	9.4	3.7	95%
219.595	1	9015	82.3	6.78	11.22	8.62	6.87	4.87	3.48	2.00	1.22	0.90	71.0	68.8	63.2	5.5	20.7	483.9	47.5	9.7	0.8	
219.595	2	8994	82.1	6.73	11.05	8.56	6.83	4.86	3.48	1.98	1.21	0.91	71.0	68.8	63.2	5.5	20.7	534.2	46.5	9.7	0.9	
219.595	3	11918	108.8	8.64	13.70	10.84	8.77	6.39	4.69	2.74	1.69	1.23	71.0	68.8	63.2	5.5	20.7	624.0	47.1	10.5	1.0	
219.595	4	11995	109.5	8.67	13.74	10.89	8.81	6.43	4.73	2.76	1.70	1.19	71.0	68.8	63.2	5.5	20.7	613.7	47.7	10.3	1.0	
219.611	1	9005	82.2	7.25	11.70	9.16	7.33	4.98	3.41	1.91	1.23	0.93	70.8	68.8	63.2	6.1	20.1	389.2	34.1	11.8	1.4	
219.611	2	8983	82.0	7.22	11.58	9.11	7.30	4.96	3.40	1.91	1.23	0.93	70.8	68.8	63.2	6.1	20.1	403.7	41.7	8.7	1.3	
219.611	3	12039	109.9	9.48	14.93	11.73	9.49	6.66	4.68	2.67	1.72	1.30	70.8	68.8	63.2	6.1	20.1	445.9	45.0	8.4	0.6	
219.611	4	12039	109.9	9.41	14.87	11.72	9.48	6.65	4.67	2.67	1.72	1.29	70.8	68.8	63.2	6.1	20.1	436.4	46.0	8.4	0.7	
219.674	1	9037	82.5	5.23	7.15	6.11	5.45	4.60	3.89	2.83	2.05	1.57	69.7	68.8	63.2	6.5	22.9	1082.1	14.5	13.3	1.4	
219.674	2	9015	82.3	5.20	7.17	6.08	5.43	4.55	3.87	2.80	2.01	1.56	69.7	68.8	63.2	6.5	22.9	1044.2	11.3	15.2	1.5	
219.674	3	12422	113.4	7.18	9.78	8.33	7.46	6.34	5.39	3.97	2.88	2.22	69.7	68.8	63.2	6.5	22.9	1120.5	87.4	9.1	1.4	
219.674	4	12357	112.8	7.13	9.72	8.27	7.40	6.29	5.36	3.93	2.86	2.19	69.7	68.8	63.2	6.5	22.9	1164.5	17.9	11.9	1.6	90%

US-30, Blue Lakes to Eastland

LTPPBind V3.1 PG Binder Selection Report (Date: 12/1/2020)

Parameter	A=1 km	B=10 km	C=17 km	D=25 km	E=31 km
Station ID	ID9303	ID9293	ID4140	ID4670	ID4295
Elevation, m	3678	3409	3771	3474	4203
Degree-Days >10 C	2530	2811	2845	3005	2597
Low Air Temperature, C	-20.8	-20.2	-22	-21.3	-21.6
Low Air Temp. Std Dev	4.2	4.6	4.5	4.2	4.8

Input Data

Latitude, Degree	42.56
Yearly Degree-Days>10C	2758
Lowest Yearly Air Temp., Deg. C	-21.2
Low Temp. Std. Dev., Deg. C	4.5
Base HT PG	58

Traffic Adjustments for HT

Desired Reliability, Percent	98
Traffic Loading, Million ESAL	10 to 30 M. ESAL
Traffic Speed	Slow
High Temp. Adjustment	14.5

PG Temperature	HIGH	LOW
PG Temp. at 50% Reliability	54.5	-15.3
PG Temp. at Desired Reliability	57.5	-23.3
Adjustments for Traffic	14.5	
Adjustments for Depth	0.0	0.0
Adjusted PG Temperature	72.0	-23.3
Selected PG Binder Grade	70	-28

Per section 240.25.04 of the Materials Manual, "it is acceptable to round down to the lower supplied binder grade if the adjusted PG temperature is not more than two degrees higher than the Adjusted PG temperature".

Appendix D

Traffic Data Summary

Traffic Projection Worksheet

Projected commercial and 18,000 Equivalent Single Axle Loadings (ESALS)

Project number: A022(215) Key number: 22215 Location: Kimberly Rd @ Blue Lakes to Eastland Dr
Route: US-30 RouteID:)2040AUS030 FromMeasure: 190.294 ToMeasure: 191.293
Truck Density = 3 Heavy Last year with data: 2019 Cumulating ESALs up to: 2066 Starting to Cumulate in: 2026

Year	ADTS			Rigid Pavement ESALs (In 1000s)				Flexible Pavement ESALs (In 1000s)			
				Both Directions		50% Dir of Travel		Both Directions		50% Dir of Travel	
	Total	Pass	Comm	Year Value	Cumulative	50% Year	50% Cum	Year Value	Cumulative	50% Year	50% Cum
2019	16250	15150	1100								
2026	18600	17270	1330	2051	2051	1026	1026	1055	1055	528	528
2027	18940	17570	1360	2122	4174	1061	2087	1097	2152	548	1076
2028	19270	17880	1400	2189	6362	1094	3181	1133	3285	567	1643
2029	19610	18180	1430	2261	8624	1131	4312	1176	4461	588	2231
2030	19940	18480	1460	2335	10959	1167	5479	1214	5675	607	2837
2031	20280	18780	1500	2409	13368	1205	6684	1252	6926	626	3463
2032	20620	19090	1530	2485	15853	1242	7926	1296	8223	648	4111
2033	20950	19390	1560	2561	18414	1281	9207	1336	9558	668	4779
2034	21290	19690	1600	2639	21053	1319	10526	1375	10933	688	5467
2035	21620	20000	1630	2717	23770	1359	11885	1422	12355	711	6178
2036	21960	20300	1660	2790	26560	1395	13280	1463	13818	731	6909
2037	22300	20600	1690	2870	29431	1435	14715	1510	15328	755	7664
2038	22630	20910	1730	2952	32382	1476	16191	1552	16880	776	8440
2039	22970	21210	1760	3034	35416	1517	17708	1595	18475	797	9237
2040	23300	21510	1790	3117	38533	1558	19266	1644	20119	822	10059
2041	23640	21810	1830	3201	41733	1600	20867	1688	21807	844	10903
2042	23980	22120	1860	3286	45019	1643	22510	1732	23539	866	11769
2043	24310	22420	1890	3365	48384	1682	24192	1776	25315	888	12658
2044	24650	22720	1930	3459	51843	1729	25921	1821	27137	911	13568
2045	24980	23030	1960	3546	55389	1773	27694	1874	29011	937	14505
2046	25320	23330	1990	3643	59032	1821	29516	1920	30931	960	15465
2047	25660	23630	2020	3725	62757	1863	31378	1967	32898	983	16449
2048	25990	23940	2060	3816	66572	1908	33286	2021	34919	1011	17460
2049	26330	24240	2090	3908	70480	1954	35240	2069	36988	1035	18494
2050	26660	24540	2120	3993	74472	1996	37236	2125	39113	1063	19557
2051	27000	24840	2160	4086	78559	2043	39279	2174	41287	1087	20643
2052	27340	25150	2190	4181	82739	2090	41370	2223	43510	1112	21755
2053	27670	25450	2220	4276	87015	2138	43508	2281	45791	1140	22895
2054	28010	25750	2260	4372	91387	2186	45694	2339	48130	1170	24065
2055	28340	26060	2290	4470	95857	2235	47929	2399	50529	1199	25264
2056	28680	26360	2320	4568	100425	2284	50213	2450	52979	1225	26490
2057	29020	26660	2350	4676	105101	2338	52551	2511	55490	1255	27745
2058	29350	26960	2390	4768	109869	2384	54935	2563	58053	1282	29027
2059	29690	27270	2420	4878	114747	2439	57373	2625	60679	1313	30339
2060	30020	27570	2450	4980	119727	2490	59864	2679	63358	1340	31679
2061	30360	27870	2490	5083	124811	2542	62405	2742	66100	1371	33050
2062	30700	28180	2520	5188	129998	2594	64999	2806	68907	1403	34453
2063	31030	28480	2550	5293	135291	2646	67646	2871	71778	1436	35889
2064	31370	28780	2590	5399	140690	2700	70345	2936	74714	1468	37357
2065	31700	29090	2620	5506	146196	2753	73098	2955	77669	1477	38834
2066	32040	29390	2650	5614	151811	2807	75905	3011	80680	1506	40340

Projected Traffic Volumes

Project No: A022(215) **Key No:** 22215
Route: US-30 **Location:** Kimberly Rd @ Blue Lakes to Eastland Dr
RouteID: 02040AUS030 **Measures:** 190.294 191.293 **County:** Twin Falls

From: / **To:**		Kimberly Rd @ Blue Lakes to Madrona St		Madrona St to Eastland Dr		Weighted Average	
RouteID:		02040AUS030		02040AUS030		02040AUS030	
FromMeasure:		190.294		190.793		190.294	
ToMeasure:		190.793		191.293		191.293	
AADT	2019	17,000		15,500		16,250	
AADT	2026	19,460		17,750		18,600	
AADT	2066	33,500		30,590		32,040	
DHV	2019	1,700	10.0%	1,550	10.0%	1,620	10.0%
DHV	2026	1,950	10.0%	1,770	10.0%	1,860	10.0%
DHV	2066	3,350	10.0%	3,060	10.0%	3,200	10.0%
Commercial:							
AADT	2019	1,100	6.5%	1,100	7.1%	1,100	6.8%
AADT	2026	1,330	6.8%	1,330	7.5%	1,330	7.2%
AADT	2066	2,650	7.9%	2,650	8.7%	2,650	8.3%
DHV	2019	80	4.5%	80	5.0%	80	4.7%
DHV	2026	90	4.8%	90	5.2%	90	5.0%
DHV	2066	190	5.5%	190	6.1%	190	5.8%
Direction:		60/40%		60/40%		60/40%	
Trk Density:		Heavy		Heavy		Heavy	

Remarks: Based on 2019 data

Requested by: Mart Earl **Prepared by:** Vicky Calderon
Phone number: MEarl@americangeo **District:** 4

Traffic Projection Worksheet

Project: **US-30, Blue Lakes Blvd to Eastland Dr** File No: 3393 Date: **November 23, 2020**

Flexible Pavement --> Beginning Year: **2026** Ending Year: **2046** **Analysis Period: 20**
Rigid Pavement --> Beginning Year: **2026** Ending Year: **2066** **(Years) 40**

AMERICAN GEO TECHNICS

		Roadway Segment						
		US-30						
	Lane Information							
	No. of Lanes in Design Direction	**2**						
	% Split of Trucks in Design Direction	**60%**						
	% of Trucks in Design Lane	**90%**						
From ITD's AADT Projection Report	Total Traffic - Both Directions							Flexible
	2026 AADT	**18,600**						
	2046 AADT	**25,320**						
	AADT for the Analysis Period	**21960**						
	Truck Traffic - Both Directions							
	% Truck Traffic	**7.6%**						
	AADTT	**1669**						
	Truck Density (H, M, L)	**H**						
	Design Lane							
	AADTT	**901**						
	Traffic Index, TI	**11.9**						
	Flexible Design ESALs	**10,340,481**						
	Compound Annual Growth Rate	**1.6%**						
From ITD's ESAL Projection Report	Flexible ESAL Projections - Both Directions							
	2026 Yearly and Cummulative ESALs	**1,055,000**						
	2046 Cummulative ESALs	**30,931,000**						
	Design Lane							
	Flexible Design ESALs	**16,133,040**						
	Traffic Index, TI	**12.5**						
	Rigid ESAL Projections - Both Directions							Rigid
	2026 Yearly and Cummulative ESALs	**2,051,000**						
	2066 Cummulative ESALs	**151,811,000**						
	Design Lane							
	Rigid Design ESALs	**80,870,400**						

Appendix E

Mill and Inlay

Full Depth AC Removal and Replacement

CRABS with HMA Overlay

US-30 Mill Inlay

Design Inputs

Design Life: 20 years
Design Type: ACC_ACC

Existing construction: September, 2002
Pavement construction: October, 2026
Traffic opening: November, 2026

Climate Data Sources (Lat/Lon): 42.5, -114.375; 43, -114.375; 43, -115

Design Structure

Layer type	Material Type	Thickness (in)
Flexible (OL)	New HMA (PG 70-28)	2.4
Flexible (existing)	Existing Basel	7.0
NonStabilized	Existing Untreated Aggregate Base	12.6
Subgrade	Subgrade	Semi-infinite

Volumetric at Construction:	
Effective binder content (%)	11.6
Air voids (%)	7.5

Traffic

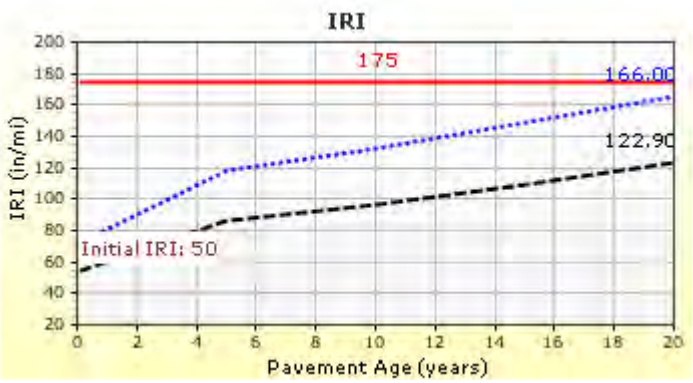
Age (year)	Heavy Trucks (cumulative)
2026 (initial)	1,330
2036 (10 years)	3,007,230
2046 (20 years)	7,048,710

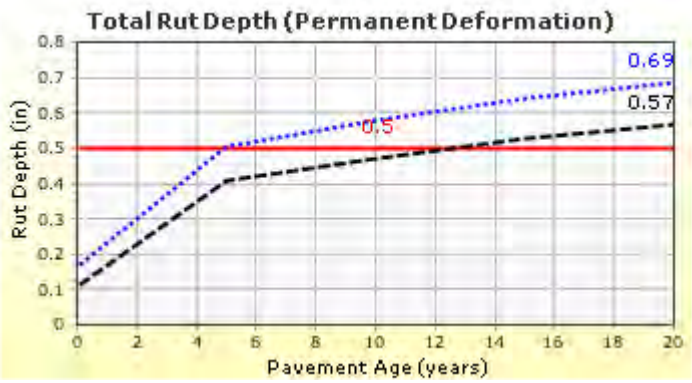
Design Outputs

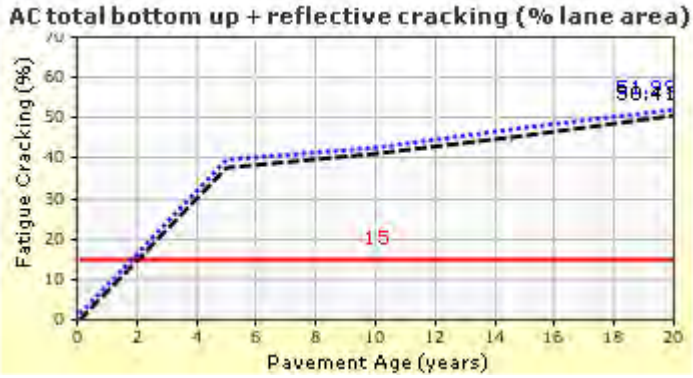
Distress Prediction Summary

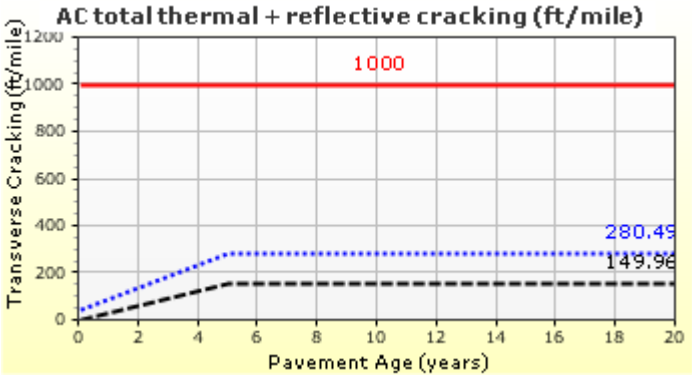
Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	175.00	166.05	90.00	93.91	Pass
Permanent deformation - total pavement (in)	0.50	0.69	90.00	21.81	Fail
AC total fatigue cracking: bottom up + reflective (% lane area)	15.00	51.99	90.00	0.00	Fail
AC total transverse cracking: thermal + reflective (ft/mile)	1000.00	280.49	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.17	90.00	98.12	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	0.00	50.00	100.00	Pass
AC thermal cracking (ft/mile)	1000.00	1.00	50.00	100.00	Pass

Distress Charts









US-30 AC Removal and Replacement

Design Inputs

Design Life: 20 years
Design Type: FLEXIBLE

Base construction: September, 2002
Pavement construction: October, 2026
Traffic opening: November, 2026

Climate Data Sources (Lat/Lon): 42.5, -114.375; 43, -114.375; 43, -115

Design Structure

Layer type	Material Type	Thickness (in)
Flexible	New HMA (PG 70-28)	4.8
NonStabilized	Untreated Aggregate Base	1.8
NonStabilized	Recompacted Aggregate Base	12.6
Subgrade	Subgrade	Semi-infinite

Volumetric at Construction:	
Effective binder content (%)	11.6
Air voids (%)	7.5

Traffic

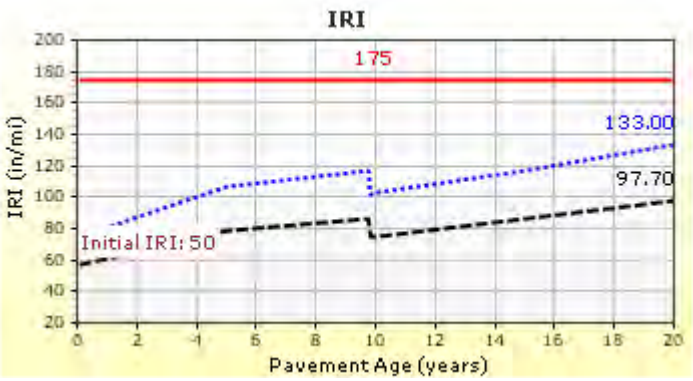
Age (year)	Heavy Trucks (cumulative)
2026 (initial)	1,330
2036 (10 years)	3,007,230
2046 (20 years)	7,048,710

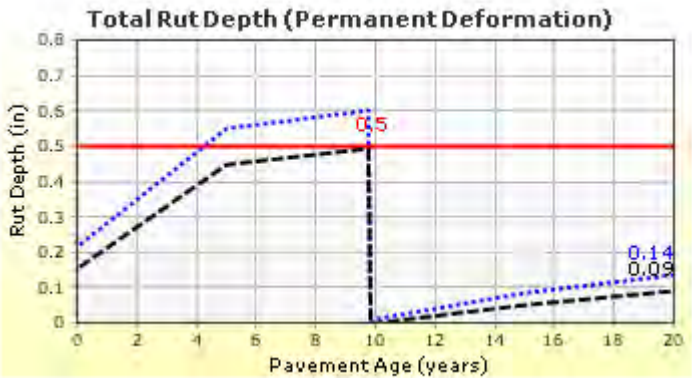
Design Outputs

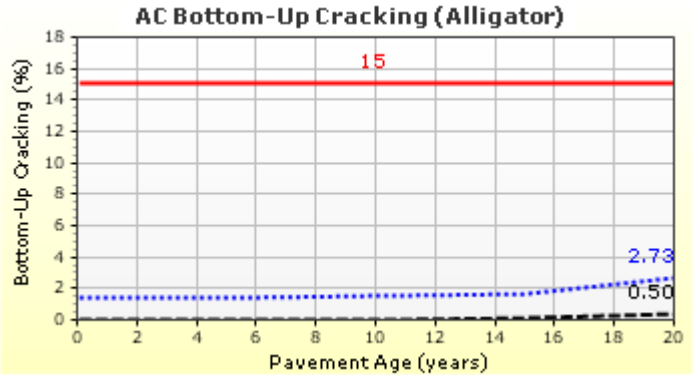
Distress Prediction Summary

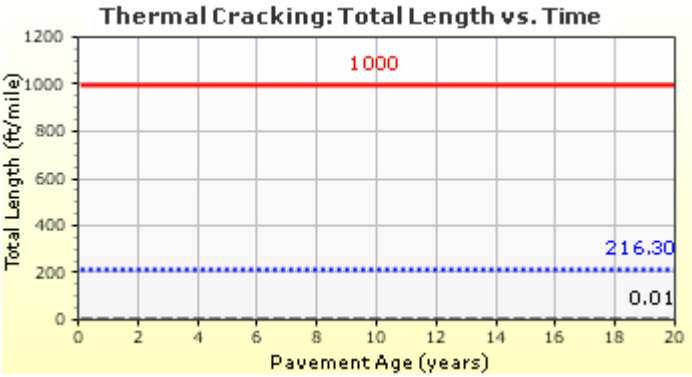
Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	175.00	133.01	90.00	99.75	Pass
Permanent deformation - total pavement (in)	0.50	0.14	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	2.73	90.00	100.00	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.04	90.00	100.00	Pass

Distress Charts





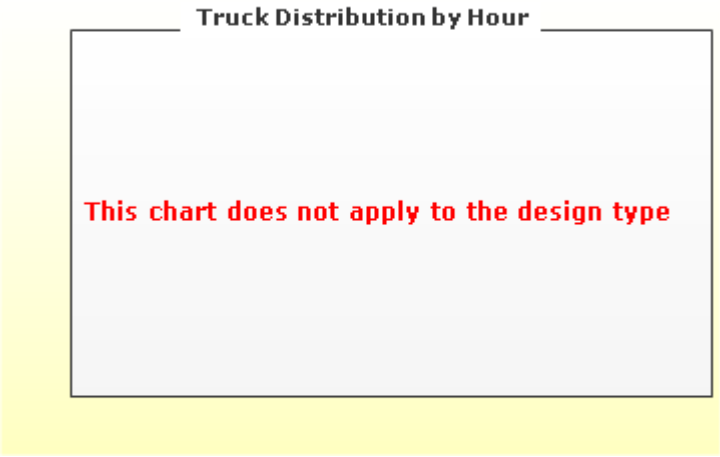


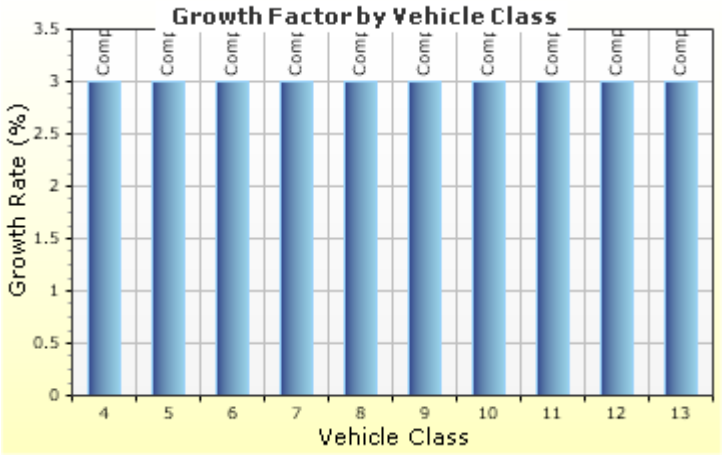


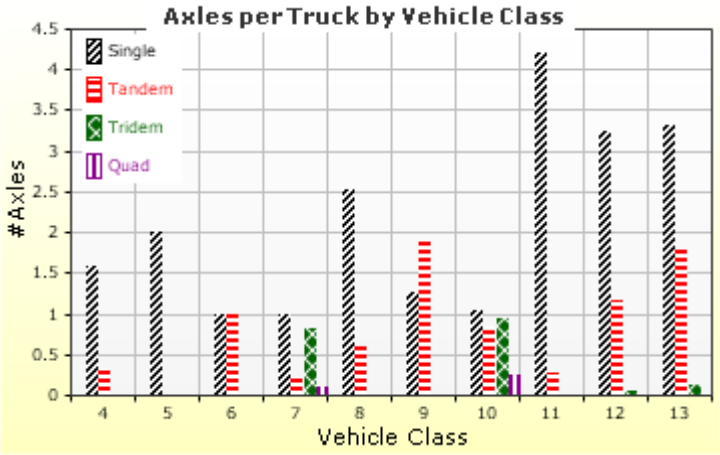
Traffic Inputs

Graphical Representation of Traffic Inputs

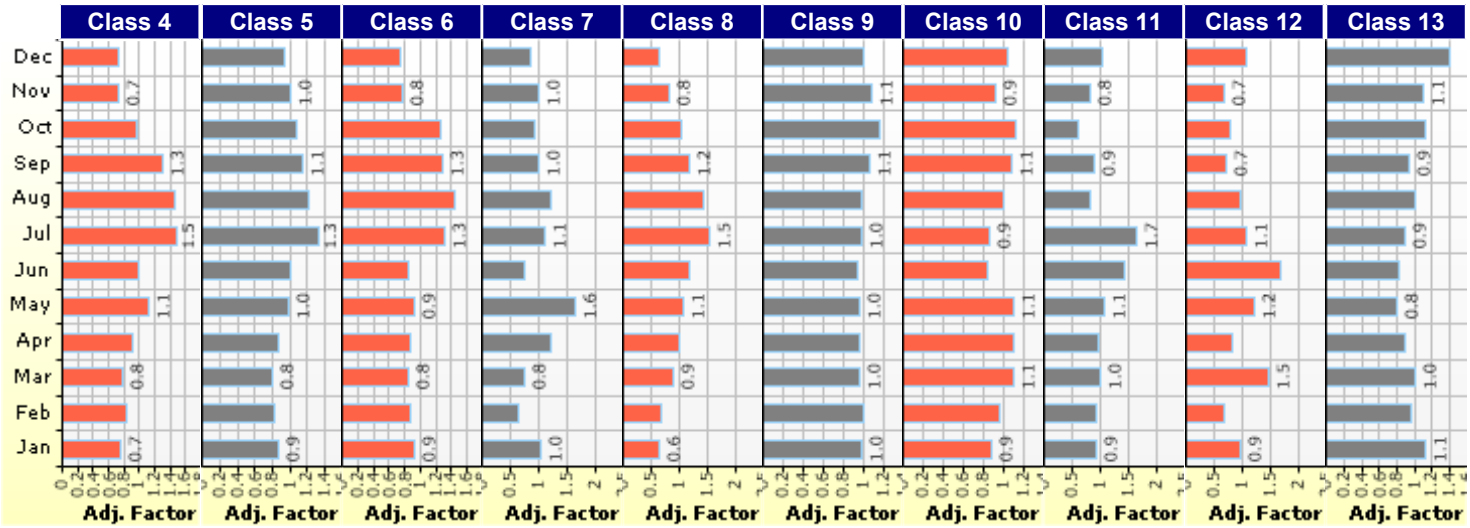
Initial two-way AADTT:	1,330	Percent of trucks in design direction (%):	60.0
Number of lanes in design direction:	2	Percent of trucks in design lane (%):	90.0
		Operational speed (mph)	35.0







Traffic Volume Monthly Adjustment Factors



Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
January	0.7	0.9	0.9	1.0	0.6	1.0	0.9	0.9	0.9	1.1
February	0.8	0.8	0.9	0.6	0.7	1.0	1.0	0.9	0.7	1.0
March	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.0	1.5	1.0
April	0.9	0.9	0.9	1.2	1.0	1.0	1.1	0.9	0.8	0.9
May	1.1	1.0	0.9	1.6	1.1	1.0	1.1	1.1	1.2	0.8
June	1.0	1.0	0.8	0.7	1.2	0.9	0.8	1.4	1.7	0.8
July	1.5	1.3	1.3	1.1	1.5	1.0	0.9	1.7	1.1	0.9
August	1.5	1.2	1.5	1.2	1.4	1.0	1.0	0.8	1.0	1.0
September	1.3	1.1	1.3	1.0	1.2	1.1	1.1	0.9	0.7	0.9
October	0.9	1.1	1.3	0.9	1.0	1.2	1.1	0.6	0.8	1.1
November	0.7	1.0	0.8	1.0	0.8	1.1	0.9	0.8	0.7	1.1
December	0.7	0.9	0.7	0.9	0.6	1.0	1.0	1.0	1.1	1.4

Distributions by Vehicle Class

Truck Distribution by Hour does not apply

Vehicle Class	AADTT Distribution (%) (Level 3)	Growth Factor	
		Rate (%)	Function
Class 4	0.35%	3%	Compound
Class 5	10.37%	3%	Compound
Class 6	9.84%	3%	Compound
Class 7	0.53%	3%	Compound
Class 8	2.64%	3%	Compound
Class 9	35.85%	3%	Compound
Class 10	13.36%	3%	Compound
Class 11	0%	3%	Compound
Class 12	0%	3%	Compound
Class 13	27.06%	3%	Compound

Axle Configuration

Traffic Wander	
Mean wheel location (in)	18.0
Traffic wander standard deviation (in)	10.0
Design lane width (ft)	12.0

Axle Configuration	
Average axle width (ft)	8.5
Dual tire spacing (in)	12.0
Tire pressure (psi)	120.0

Average Axle Spacing	
Tandem axle spacing (in)	51.6
Tridem axle spacing (in)	49.2
Quad axle spacing (in)	49.2

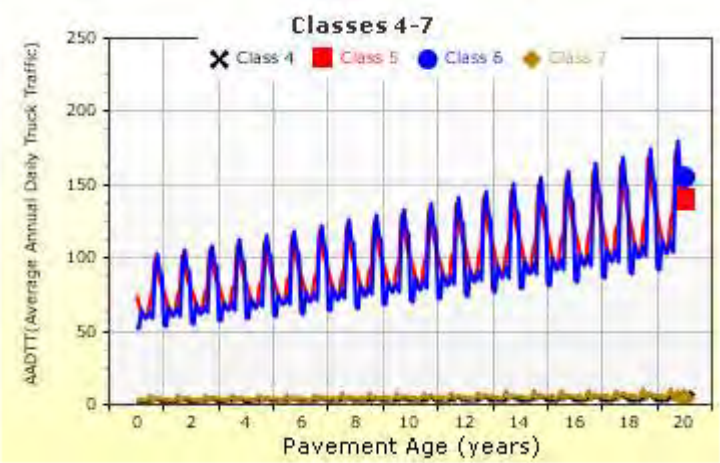
Wheelbase does not apply

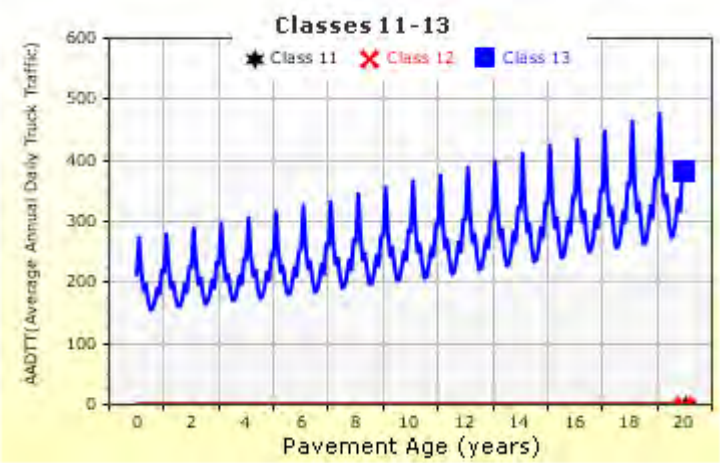
Number of Axles per Truck

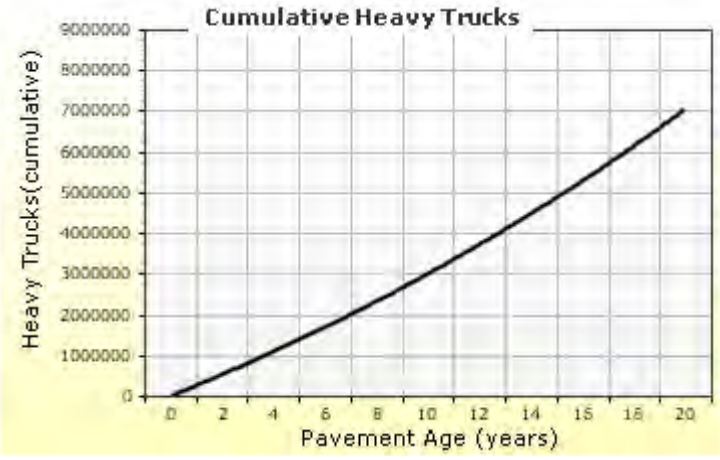
Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.59	0.34	0	0
Class 5	2	0	0	0
Class 6	1	1	0	0
Class 7	1	0.22	0.83	0.1
Class 8	2.52	0.6	0	0
Class 9	1.25	1.87	0	0
Class 10	1.03	0.85	0.95	0.26
Class 11	4.21	0.29	0.01	0
Class 12	3.24	1.16	0.07	0.01
Class 13	3.32	1.79	0.14	0.02

AADTT (Average Annual Daily Truck Traffic) Growth

*** Traffic cap is not enforced**







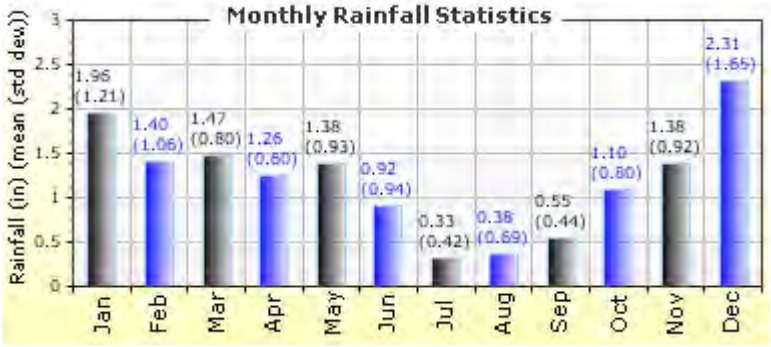
Climate Inputs

Climate Data Sources:

Climate Station Cities:	Location (lat lon elevation(ft))
US, ID	42.50000 -114.37500 3936
US, ID	43.00000 -114.37500 4064
US, ID	43.00000 -115.00000 3552

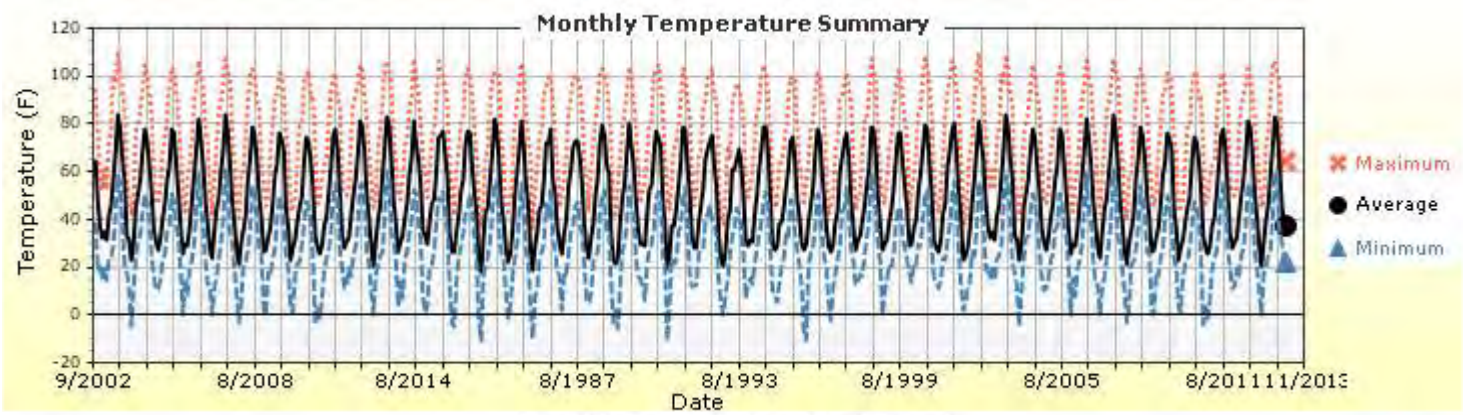
Annual Statistics:

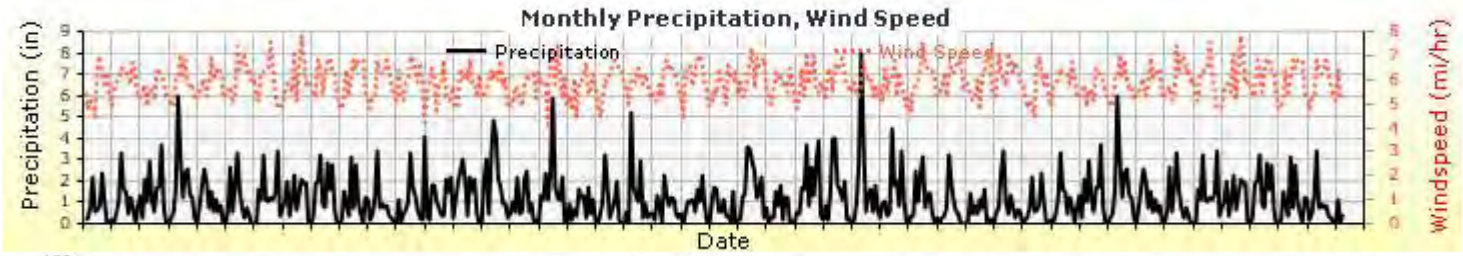
Mean annual air temperature (°F)	50.08
Mean annual precipitation (in)	14.41
Freezing index (°F - days)	440.07
Average annual number of freeze/thaw cycles:	114.69

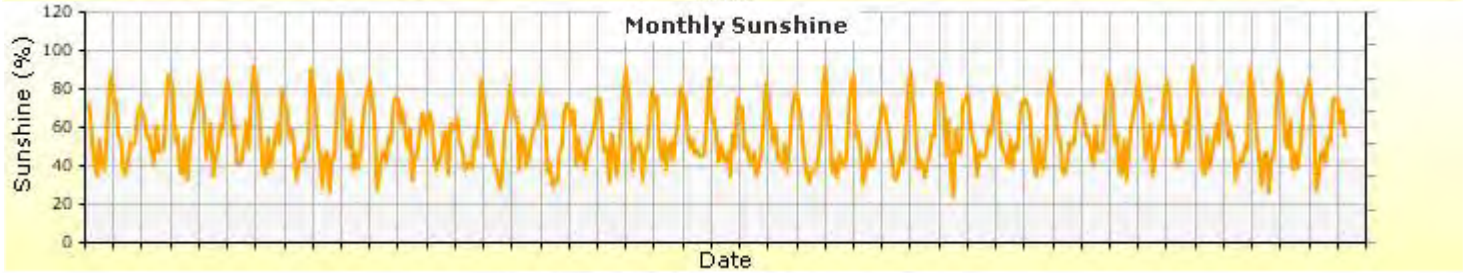


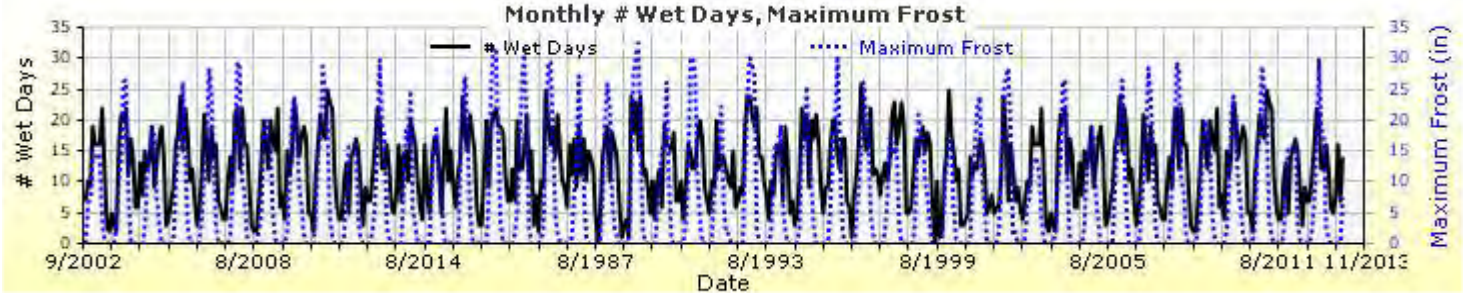
Water table depth (ft)	10.00

Monthly Climate Summary:

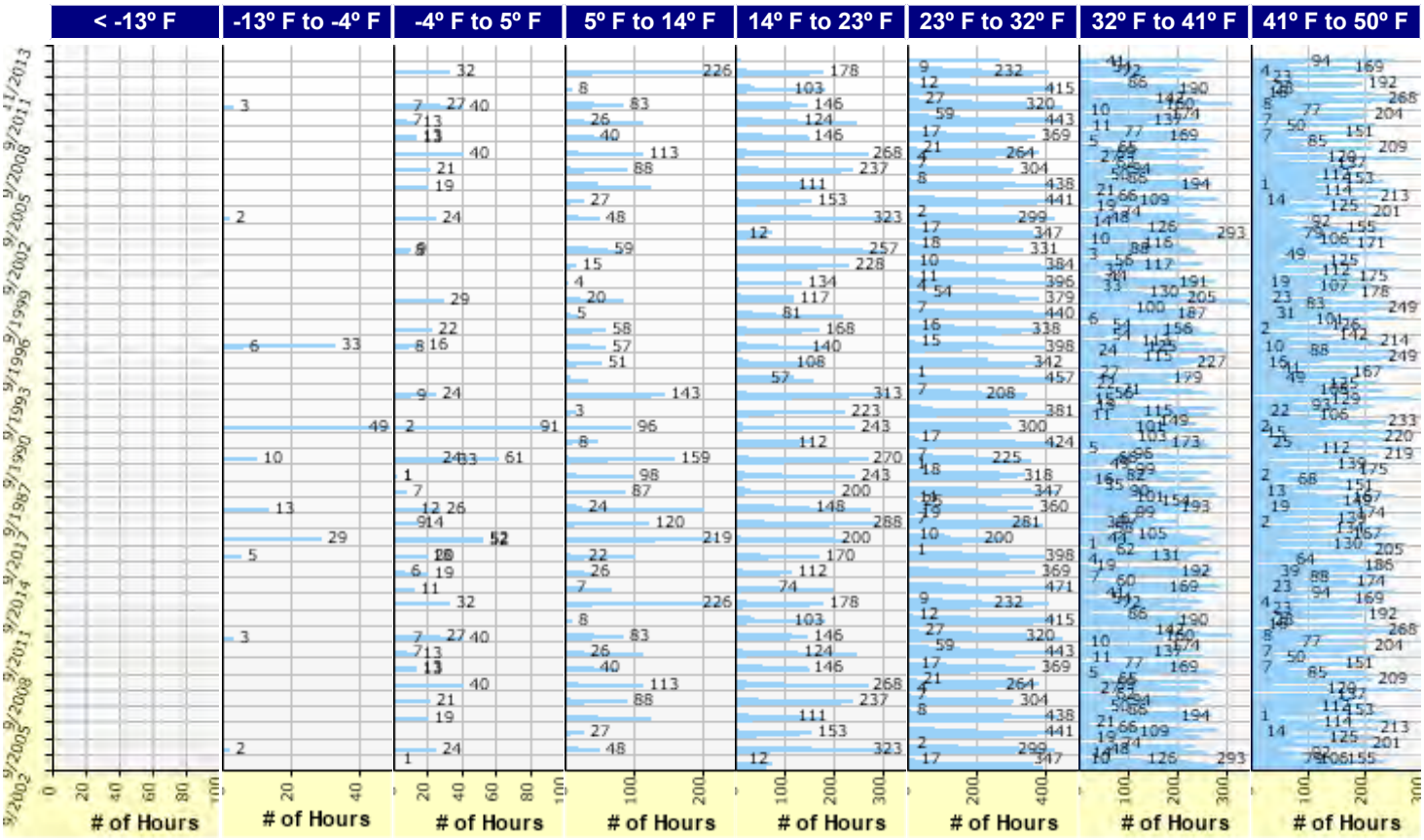


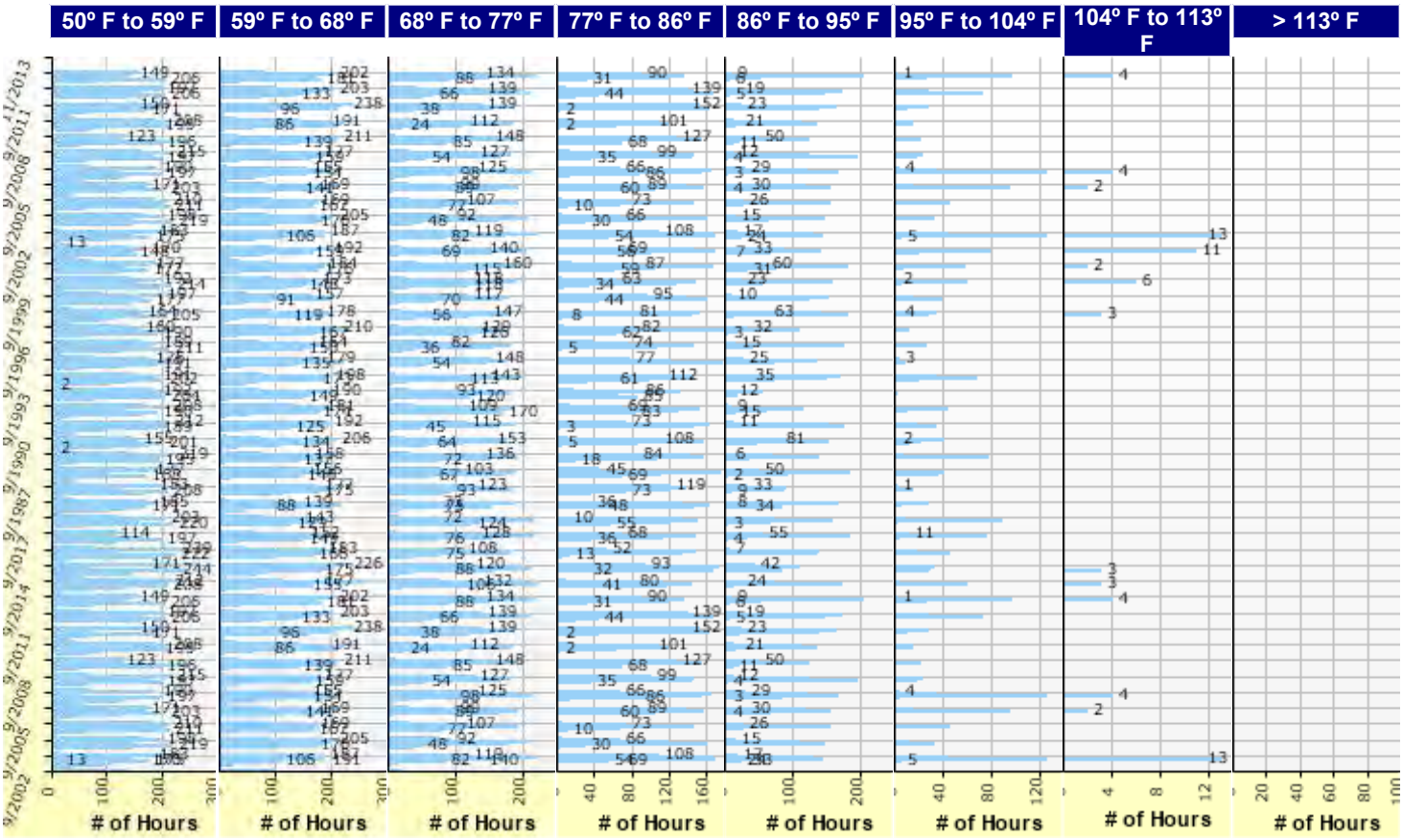






Hourly Air Temperature Distribution by Month:





Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False
Using G* based model (not nationally calibrated)	False
Is NCHRP 1-37A HMA Rutting Model Coefficients	True
Endurance Limit	-
Use Reflective Cracking	True

Structure - ICM Properties	
AC surface shortwave absorptivity	0.85

Layer Name	Layer Type	Interface Friction
Layer 1 Flexible : New HMA (PG 70-28)	Flexible (1)	1.00
Layer 2 Non-stabilized Base : Untreated Aggregate Base	Non-stabilized Base (4)	1.00
Layer 3 Non-stabilized Base : Recompacted Aggregate Base	Non-stabilized Base (4)	1.00
Layer 4 Subgrade : Subgrade	Subgrade (5)	-

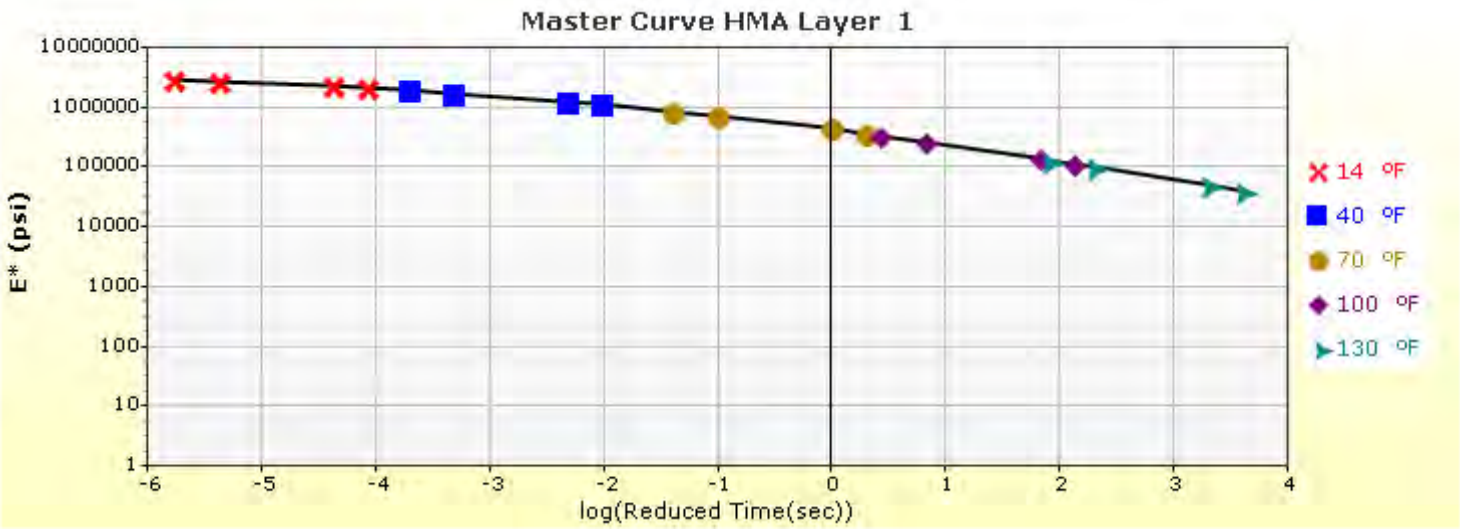
Thermal Cracking

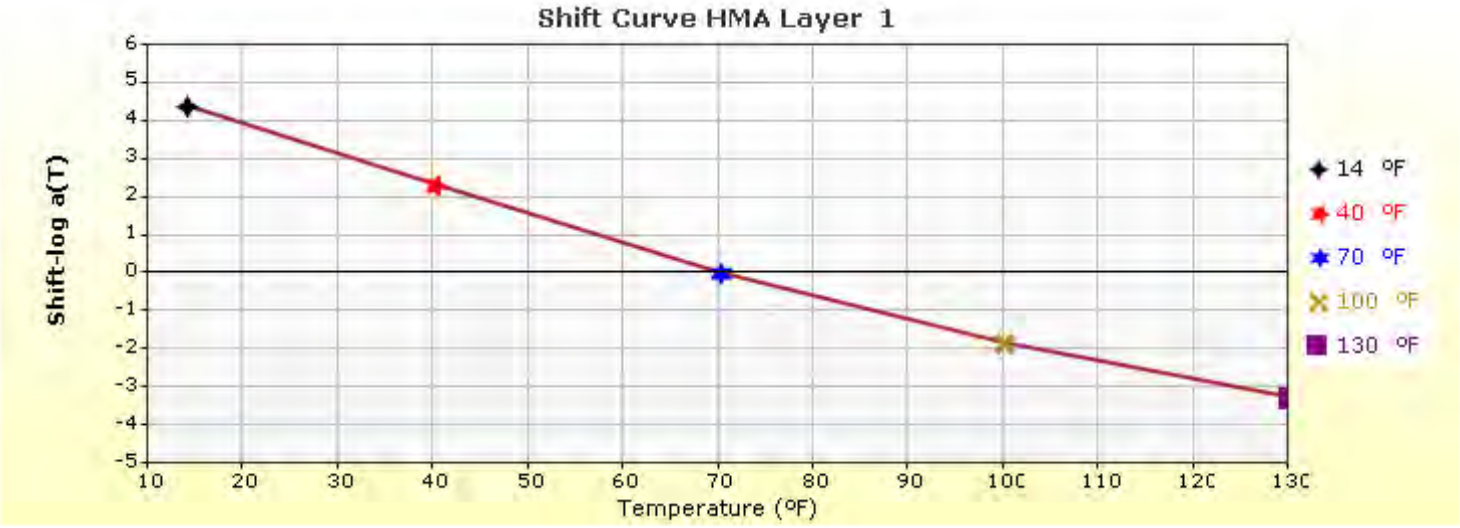
Thermal Contraction	
Is thermal contraction calculated?	True
Mix coefficient of thermal contraction (in/in/ºF)	-
Aggregate coefficient of thermal contraction (in/in/ºF)	5.0e-006
Voids in Mineral Aggregate (%)	19.1

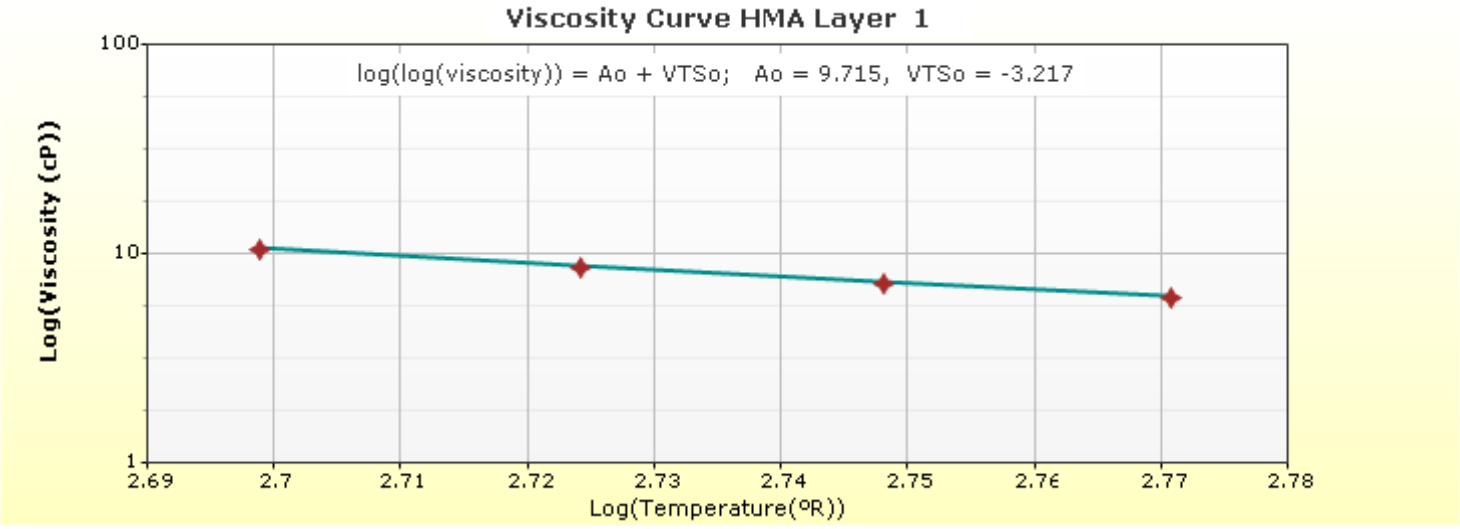
Indirect Tensile Strength (Input Level: 3)	
Test Temperature (ºF)	**Indirect Tensilte Strength (psi)**
14.0	435.12

Creep Compliance (1/psi) (Input Level: 3)			
Loading time (sec)	**-4 ºF**	**14 ºF**	**32 ºF**
1	4.62e-007	6.99e-007	9.57e-007
2	5.09e-007	8.18e-007	1.23e-006
5	5.78e-007	1.01e-006	1.71e-006
10	6.37e-007	1.18e-006	2.20e-006
20	7.01e-007	1.38e-006	2.82e-006
50	7.97e-007	1.70e-006	3.92e-006
100	8.78e-007	1.98e-006	5.04e-006

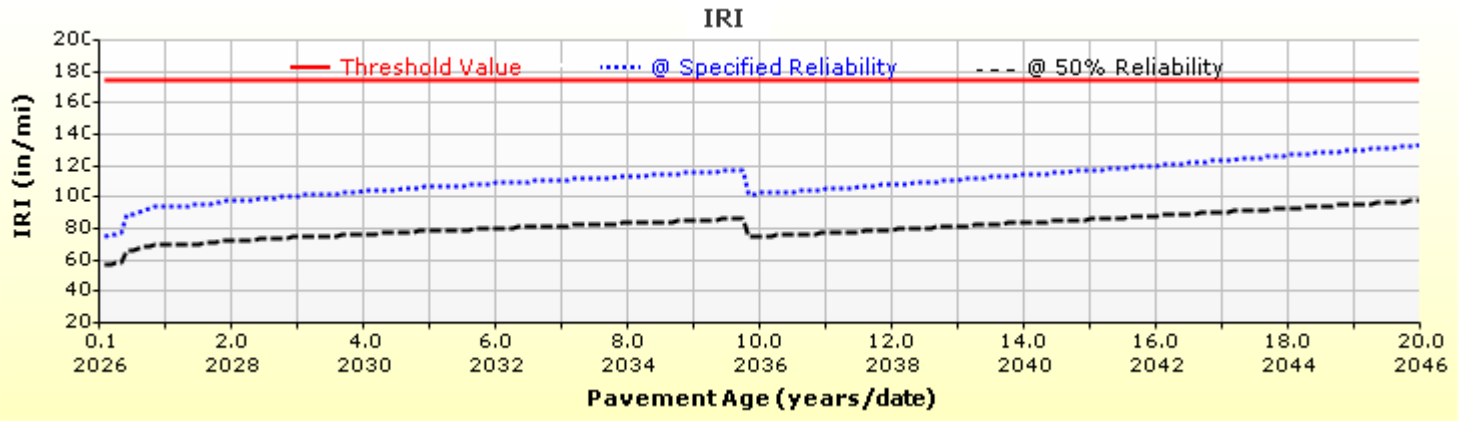
HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-28)

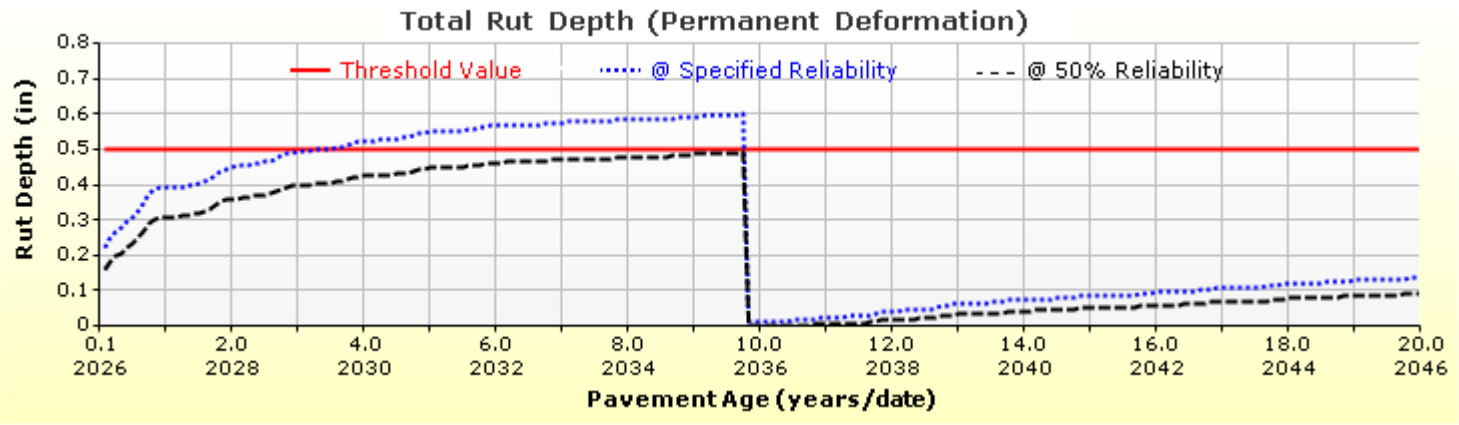


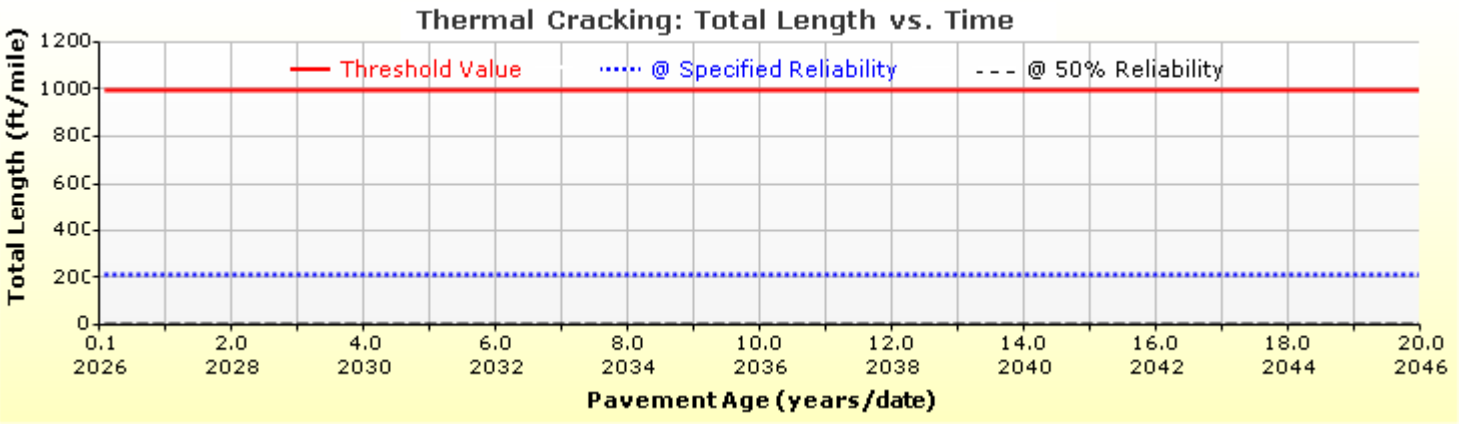


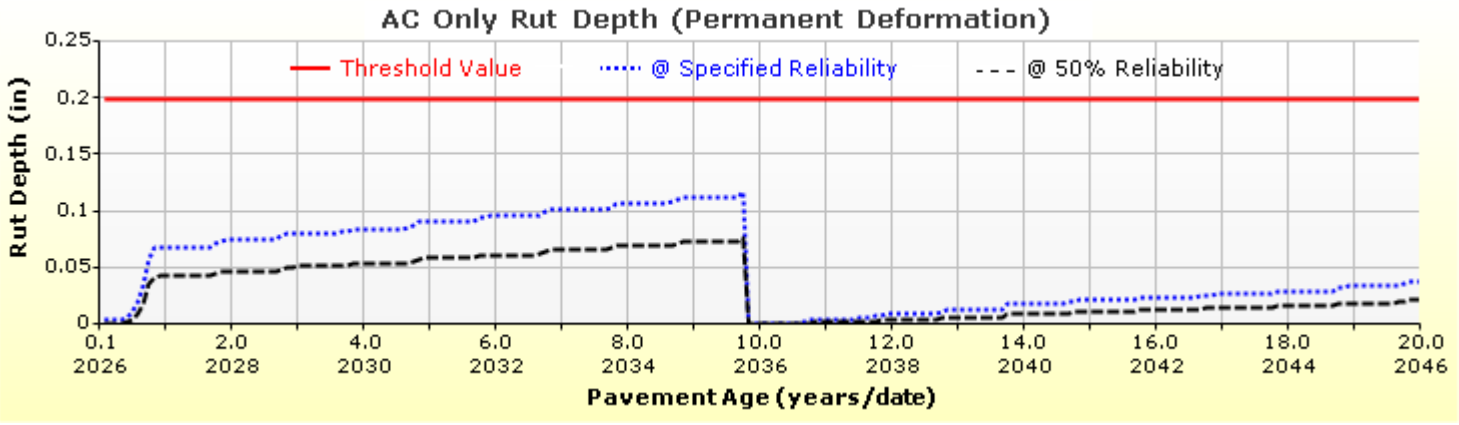


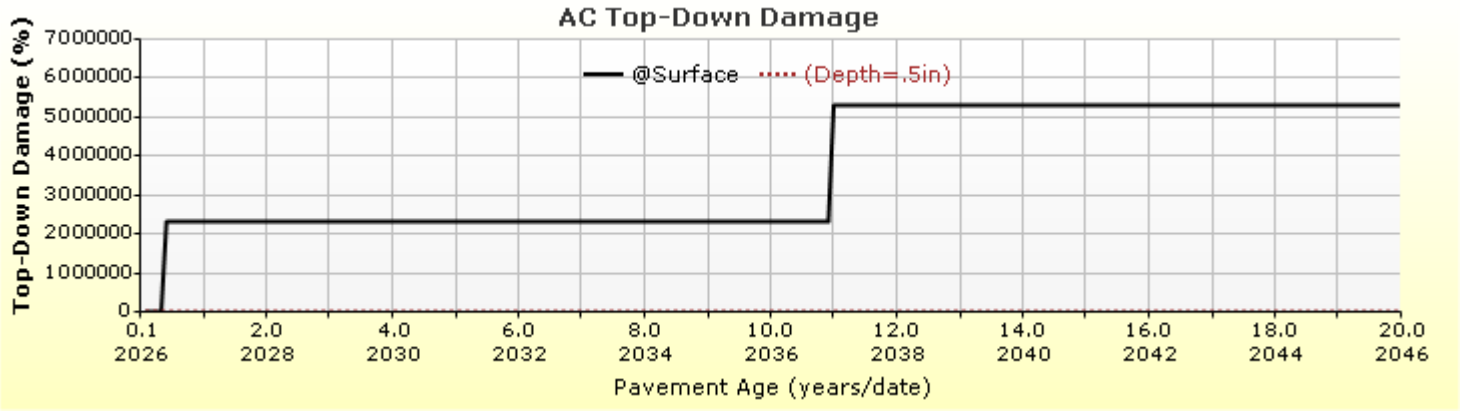
Analysis Output Charts

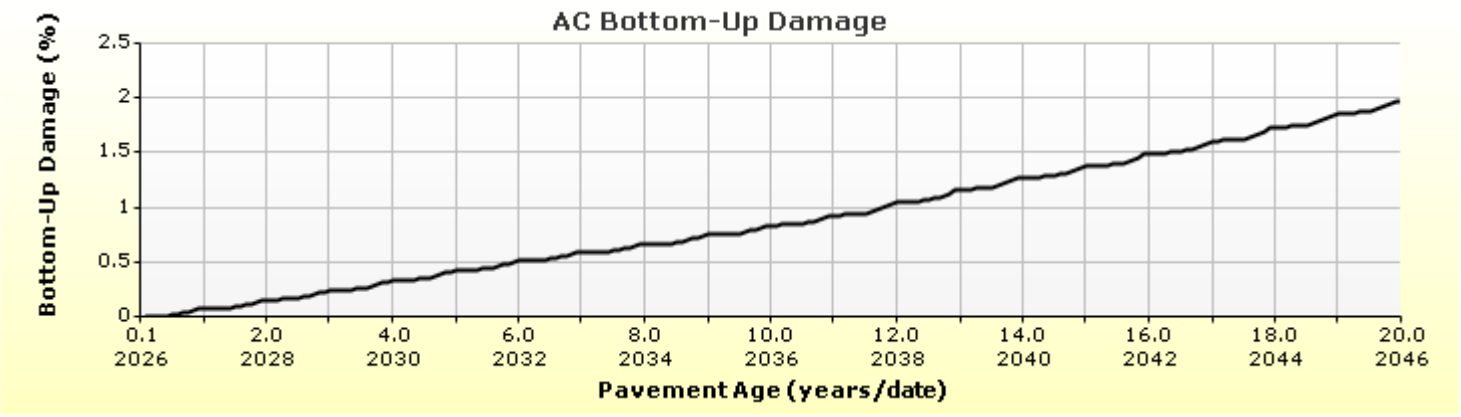


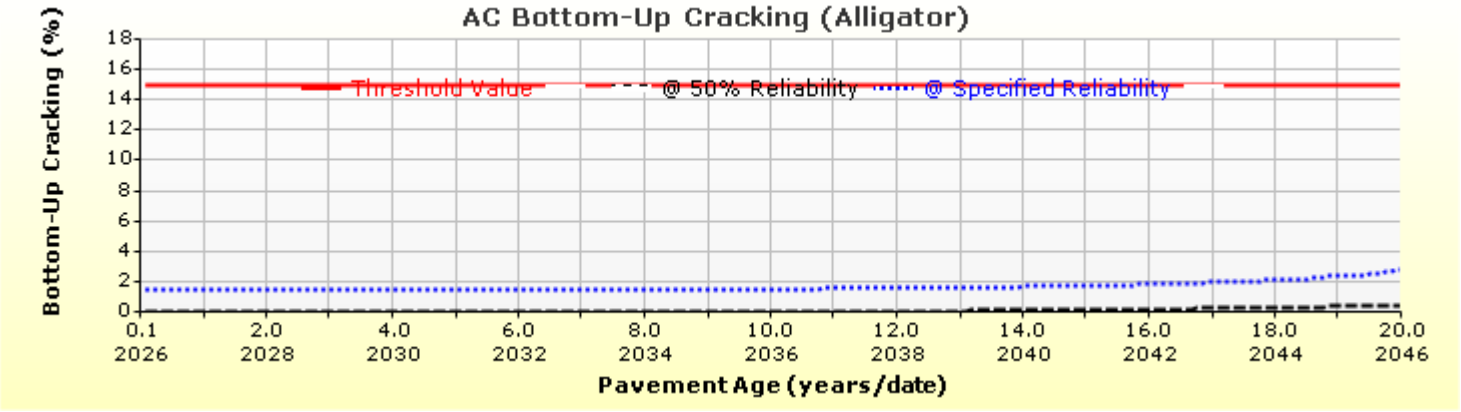


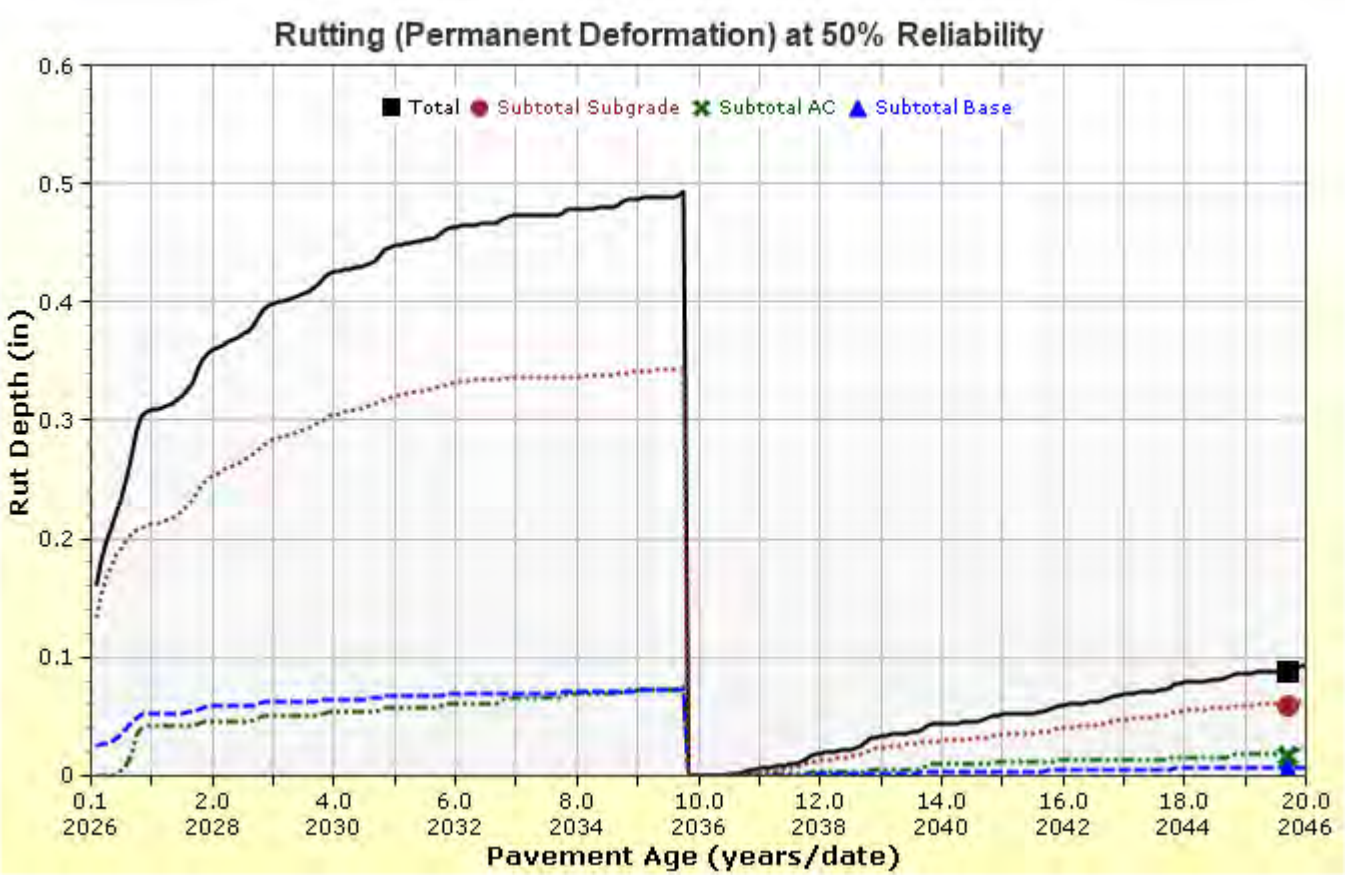


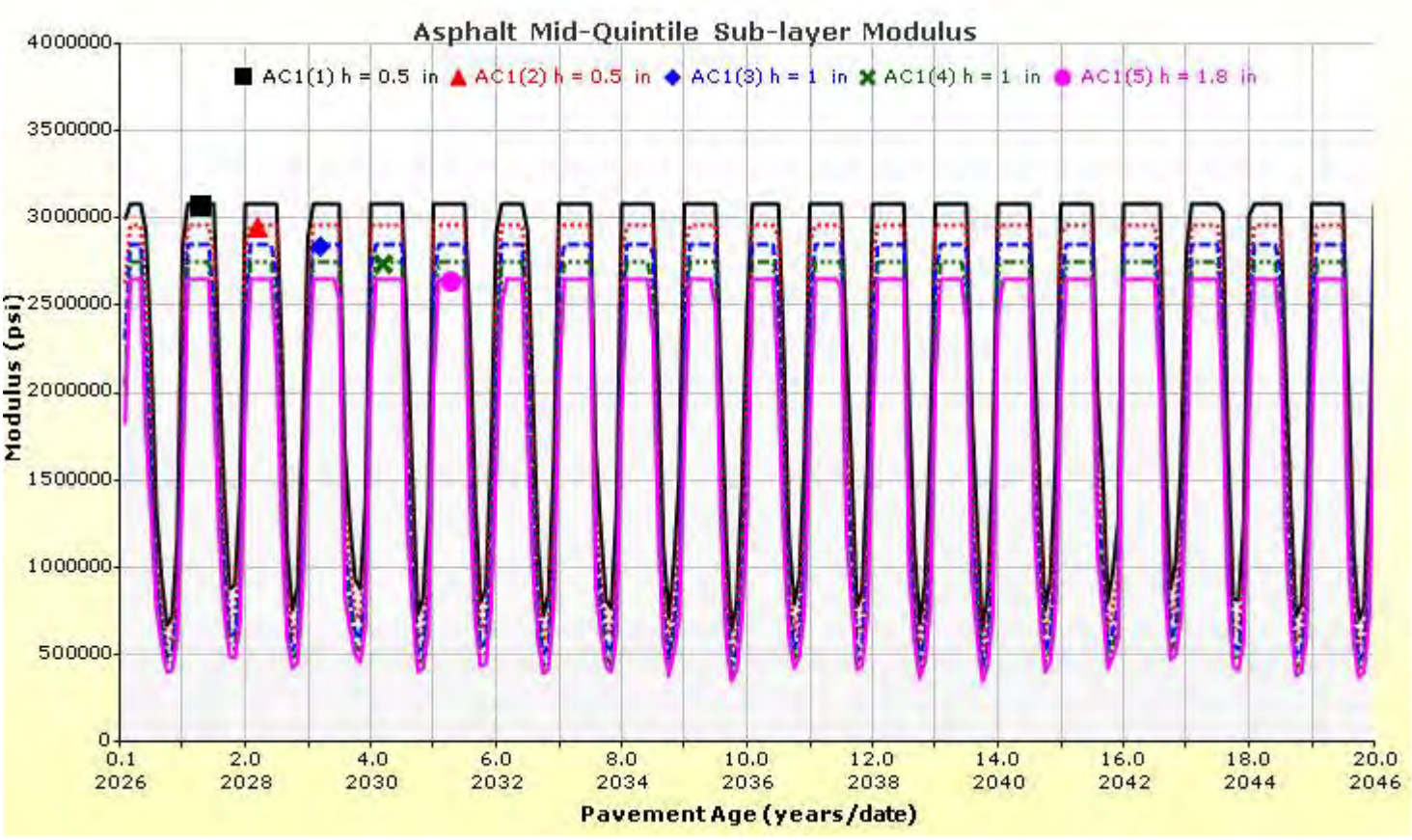


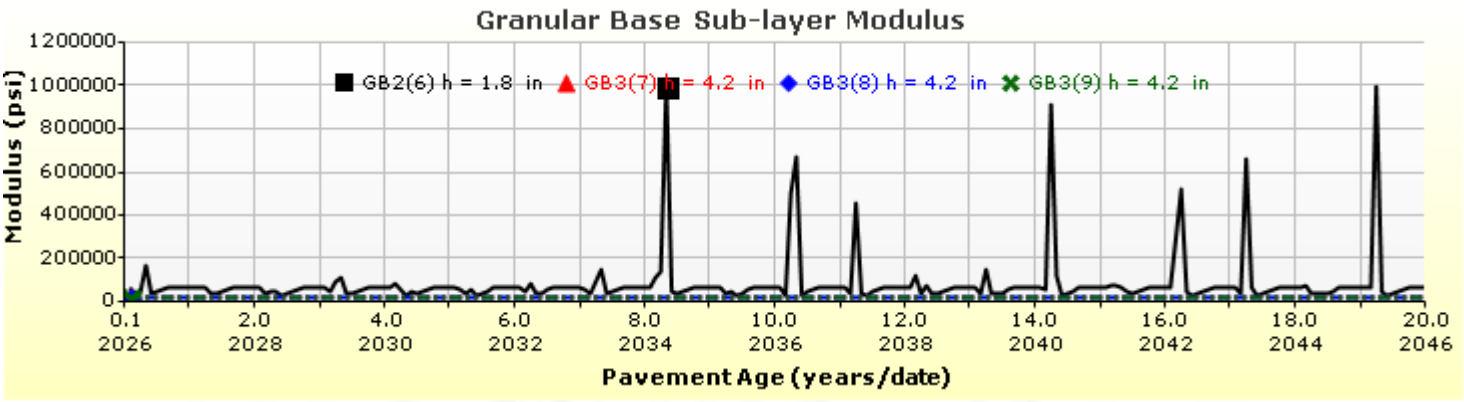

AC Top-Down Damage
Top-Down Damage (%)
@Surface
(Depth=.5in)
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)

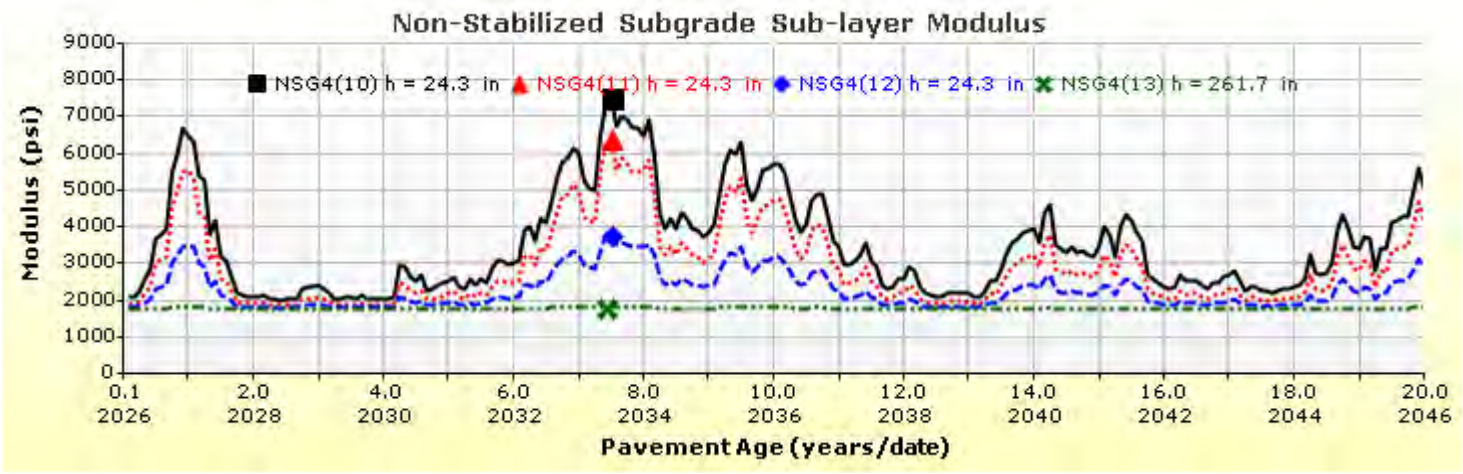

AC Bottom-Up Damage
Bottom-Up Damage (%)
2.5
2
1.5
1
0.5
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


AC Bottom-Up Cracking (Alligator)
Bottom-Up Cracking (%)
Threshold Value
@ 50% Reliability
@ Specified Reliability
18
16
14
12
10
8
6
4
2
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Rutting (Permanent Deformation) at 50% Reliability
Total
Subtotal Subgrade
Subtotal AC
Subtotal Base
Rut Depth (in)
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Asphalt Mid-Quintile Sub-layer Modulus
AC1(1) h = 0.5 in
AC1(2) h = 0.5 in
AC1(3) h = 1 in
AC1(4) h = 1 in
AC1(5) h = 1.8 in
Modulus (psi)
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
0.1 2026
2.0 2028
4.0 2030
6.0 2032
8.0 2034
10.0 2036
12.0 2038
14.0 2040
16.0 2042
18.0 2044
20.0 2046
Pavement Age (years/date)


Granular Base Sub-layer Modulus
GB2(6) h = 1.8 in
GB3(7) h = 4.2 in
GB3(8) h = 4.2 in
GB3(9) h = 4.2 in
Modulus (psi)
1200000
1000000
800000
600000
400000
200000
0
0.1 2026
2.0 2028
4.0 2030
6.0 2032
8.0 2034
10.0 2036
12.0 2038
14.0 2040
16.0 2042
18.0 2044
20.0 2046
Pavement Age (years/date)


Non-Stabilized Subgrade Sub-layer Modulus
NSG4(10) h = 24.3 in
NSG4(11) h = 24.3 in
NSG4(12) h = 24.3 in
NSG4(13) h = 261.7 in
Modulus (psi)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0.1 2026
2.0 2028
4.0 2030
6.0 2032
8.0 2034
10.0 2036
12.0 2038
14.0 2040
16.0 2042
18.0 2044
20.0 2046
Pavement Age (years/date)

Layer Information

Layer 1 Flexible : New HMA (PG 70-28)

Asphalt		
Thickness (in)	4.8	
Unit weight (pcf)	144.0	
Poisson's ratio	Is Calculated?	False
	Ratio	0.35
	Parameter A	-
	Parameter B	-

Asphalt Dynamic Modulus (Input Level: 3)

Gradation	Percent Passing
3/4-inch sieve	100
3/8-inch sieve	77
No.4 sieve	60
No.200 sieve	6

Asphalt Binder

Parameter	Value
Grade	Superpave Performance Grade
Binder Type	70-28
A	9.715
VTS	-3.217

General Info

Name	Value
Reference temperature (ºF)	70
Effective binder content (%)	11.6
Air voids (%)	7.5
Thermal conductivity (BTU/hr-ft-ºF)	0.67
Heat capacity (BTU/lb-ºF)	0.23

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-28)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Layer 2 Non-stabilized Base : Untreated Aggregate Base

Unbound	
Layer thickness (in)	1.8
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
40000.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Untreated Aggregate Base
Description of object	New Untreated Aggregate Base
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.2
Saturated hydraulic conductivity (ft/hr)	False	1.907e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.6

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	5.1359
bf	2.0746
cf	0.7463
hr	112.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	6.0
#100	
#80	
#60	
#50	
#40	
#30	
#20	
#16	
#10	
#8	40.0
#4	55.0
3/8-in.	
1/2-in.	
3/4-in.	95.0
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Layer 3 Non-stabilized Base : Recompacted Aggregate Base

Unbound	
Layer thickness (in)	12.6
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Annual representative values
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
23204.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Recompacted Aggregate Base
Description of object	Existing Untreated Aggregate Base
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	125.6
Saturated hydraulic conductivity (ft/hr)	False	7.98e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	8.4

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	2.4117
bf	2.0549
cf	0.7304
hr	116.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	8.0
#100	
#80	
#60	
#50	
#40	17.0
#30	
#20	
#16	
#10	40.0
#8	
#4	62.0
3/8-in.	
1/2-in.	
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Layer 4 Subgrade : Subgrade

Unbound	
Layer thickness (in)	Semi-infinite
Poisson's ratio	0.4
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
5544.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Subgrade
Description of object	Default material
Author	AASHTO
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	False

	Is User Defined?	Value
Maximum dry unit weight (pcf)	True	88.7
Saturated hydraulic conductivity (ft/hr)	False	8.101e-02
Specific gravity of solids	False	2.7
Water Content (%)	True	18.9

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	28.9905
bf	2.7710
cf	0.6334
hr	292.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	96.0
#100	
#80	
#60	
#50	
#40	98.0
#30	
#20	
#16	
#10	
#8	
#4	99.0
3/8-in.	
1/2-in.	
3/4-in.	
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Calibration Coefficients

AC Fatigue

$$N_f = 0.00432 * C * \beta_{f1} k_1 \left(\frac{1}{\varepsilon_1}\right)^{k_2 \beta_{f2}} \left(\frac{1}{E}\right)^{k_3 \beta_{f3}}$$

$$C = 10^M$$

$$M = 4.84\left(\frac{V_b}{V_a + V_b} - 0.69\right)$$

k1: 3.75	
k2: 2.87	
k3: 1.46	
Bf1: 0.02054	
Bf2: 1.38	
Bf3: 0.88	

AC Rutting

$$\frac{\varepsilon_p}{\varepsilon_r} = k_z \beta_{r1} 10^{k_1 T^{k_2 \beta_{r2}} N^{k_3 \beta_{r3}}}$$

$$k_z = (C_1 + C_2 * depth) * 0.328196^{depth}$$

$$C_1 = -0.1039 * H_{ac}^2 + 2.4868 * H_{ac} - 17.342$$

$$C_2 = 0.0172 * H_{ac}^2 - 1.7331 * H_{ac} + 27.428$$

Where:

$H_{ac} = total\ AC\ thickness(in)$

$\varepsilon_p = plastic\ strain\left({}^{in}/_{in}\right)$
$\varepsilon_r = resilient\ strain\left({}^{in}/_{in}\right)$
$T = layer\ temperature(^{\circ}F)$
$N = number\ of\ load\ repetitions$

AC Rutting Standard Deviation	0.24 * Pow(RUT,0.8026) + 0.001	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22	Br1:0.4 Br2:0.52 Br3:1.36

Thermal Fracture

$$C_f = 400 * N\left(\frac{\log C / h_{ac}}{\sigma}\right)$$

$$\Delta C = (k * \beta t)^{n+1} * A * \Delta K^n$$

$$A = 10^{(4.389 - 2.52 * \log(E * \sigma_m * n))}$$

$C_f = observed\ amount\ of\ thermal\ cracking(ft/500ft)$
$k = refression\ coefficient\ determined\ through\ field\ calibration$
$N(\,) = standard\ normal\ distribution\ evaluated\ at(\,)$
$\sigma = standard\ deviation\ of\ the \log\ of\ the\ depth\ of\ cracks\ in\ the\ pavments$
$C = crack\ depth(in)$
$h_{ac} = thickness\ of\ asphalt\ layer(in)$
$\Delta C = Change\ in\ the\ crack\ depth\ due\ to\ a\ cooling\ cycle$
$\Delta K = Change\ in\ the\ stress\ intensity\ factor\ due\ to\ a\ cooling\ cycle$
$A, n = Fracture\ parameters\ for\ the\ asphalt\ mixture$
$E = mixture\ stiffness$
$\sigma_M = Undamaged\ mixture\ tensile\ strength$
$\beta_t = Calibration\ parameter$

Level 1 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 1 Standard Deviation: 0.14 * THERMAL + 168
Level 2 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 2 Standard Deviation: 0.20 * THERMAL + 168
Level 3 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 3 Standard Deviation: 0.289 * THERMAL + 168

CSM Fatigue

$$N_f = 10^{\left(\frac{k_1 \beta_{c1} \left(\frac{\sigma_s}{M_r}\right)}{k_2 \beta_{c2}}\right)}$$

$N_f = number\ of\ repetitions\ to\ fatigue\ cracking$
$\sigma_s = Tensile\ stress(psi)$
$M_r = modulus\ of\ rupture(psi)$

k1: 0.972	k2: 0.0825	Bc1: 1	Bc2:1

Unbound Layer Rutting

$$\delta_a(N) = \beta_{s_1} k_1 \varepsilon_v h \left(\frac{\varepsilon_0}{\varepsilon_r}\right) \left| e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right|$$

$\delta_a = permanent\ deformation\ for\ the\ layer$
$N = number\ of\ repetitions$
$\varepsilon_v = average\ veritcal\ strain(in/in)$
$\varepsilon_0, \beta, \rho = material\ properties$
$\varepsilon_r = resilient\ strain(in/in)$

Base Rutting		Subgrade Rutting	
k1: 0.965	Bs1: 1	k1: 0.965	Bs1: 1
Standard Deviation (BASERUT) 0.1477 * Pow(BASERUT,0.6711) + 0.001		Standard Deviation (BASERUT) 0.1235 * Pow(SUBRUT,0.5012) + 0.001	

AC Cracking

AC Top Down Cracking

$$FC_{top} = \left(\frac{C_4}{1 + e^{(C_1 - C_2 * log_{10}(Damage))}}\right) * 10.56$$

c1: 7	c2: 3.5	c3: 0	c4: 1000

Top down AC Cracking Standard Deviation

200 + 2300/(1+exp(1.072-2.1654*LOG10(TOP+0.0001)))

AC Bottom Up Cracking

$$FC = \left(\frac{6000}{1 + e^{\left(C_1 * C_1' + C_2 * C_2' log_{10}(D * 100)\right)}}\right) * \left(\frac{1}{60}\right)$$

$$C_2' = -2.40874 - 39.748 * (1 + h_{ac})^{-2.856}$$

$$C_1' = -2 * C_2'$$

c1: 1.31	c2: 2.1585	c3: 6000

Bottom up AC Cracking Standard Deviation

1.13 + 13/(1+exp(7.57-15.5*LOG10(BOTTOM+0.0001)))

CSM Cracking

$$FC_{ctb} = C_1 + \frac{C_2}{1 + e^{C_3 - C_4 * log_{10}(Damage)}}$$

C1: 0	C2: 75	C3: 2	C4: 2

CSM Standard Deviation

CTB*1

IRI Flexible Pavements

C1 - Rutting
C2 - Fatigue Crack
C3 - Transverse Crack
C4 - Site Factors

C1: 40	C2: 0.4	C3: 0.008	C4: 0.015

US-30 CRABS

Design Inputs

Design Life: 20 years
Design Type: FLEXIBLE

Base construction: September, 2002
Pavement construction: October, 2026
Traffic opening: November, 2026

Climate Data Sources (Lat/Lon): 42.5, -114.375; 43, -114.375; 43, -115

Design Structure

Layer type	Material Type	Thickness (in)
Flexible	New HMA (PG 70-28)	4.8
NonStabilized	New CRABS	10.0
NonStabilized	Recompacted Aggregate Base	14.8
Subgrade	Subgrade	Semi-infinite

Volumetric at Construction:	
Effective binder content (%)	11.6
Air voids (%)	7.5

Traffic

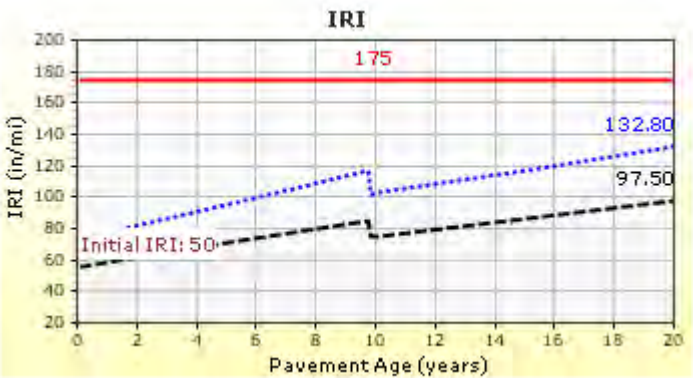
Age (year)	Heavy Trucks (cumulative)
2026 (initial)	1,330
2036 (10 years)	3,007,230
2046 (20 years)	7,048,710

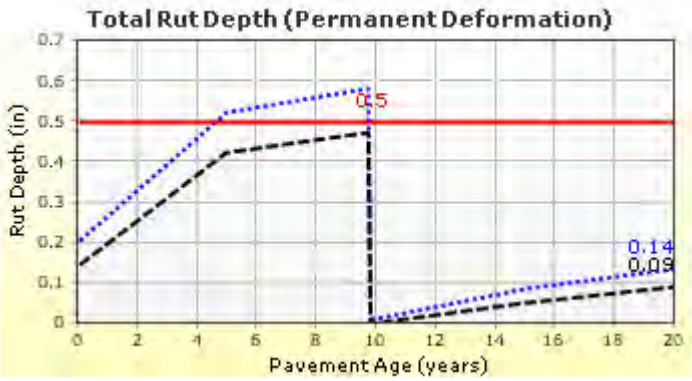
Design Outputs

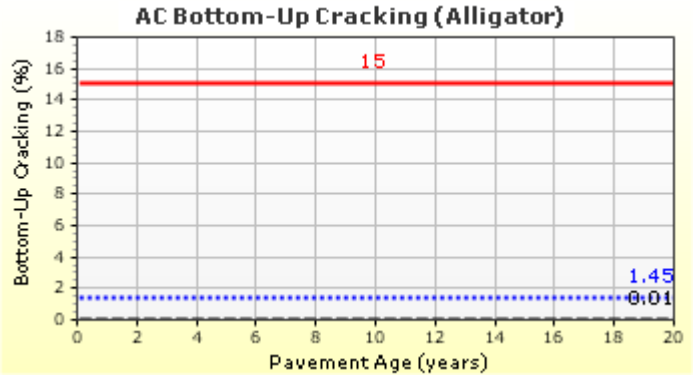
Distress Prediction Summary

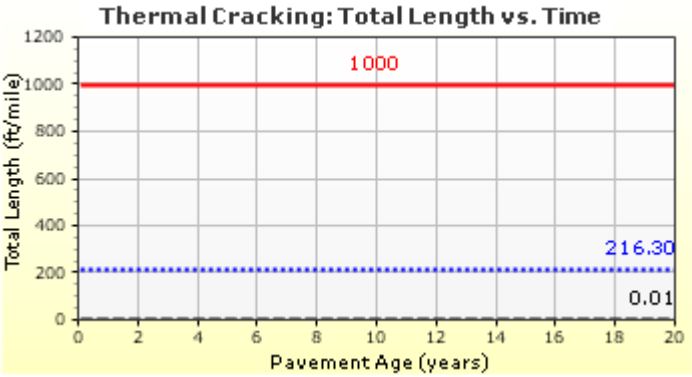
Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	175.00	132.76	90.00	99.76	Pass
Permanent deformation - total pavement (in)	0.50	0.14	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	1.45	90.00	100.00	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.05	90.00	100.00	Pass

Distress Charts





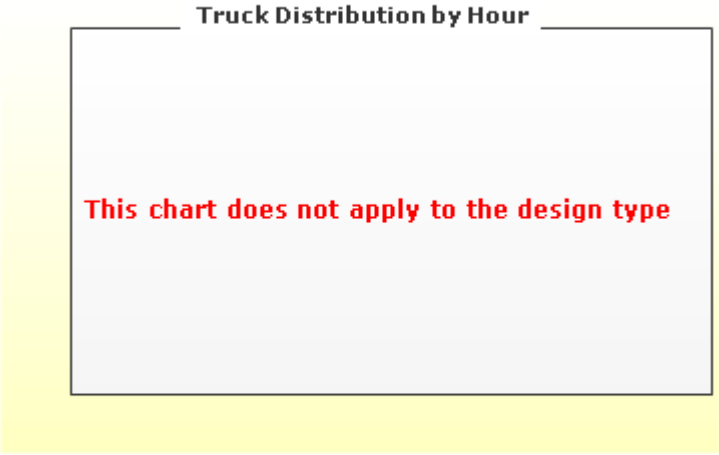


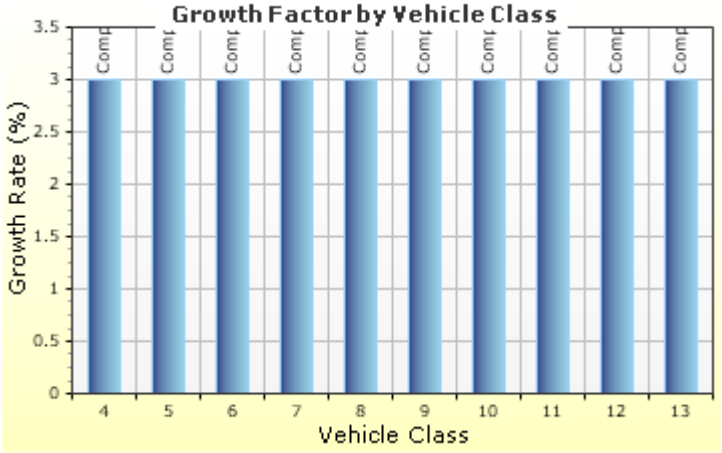


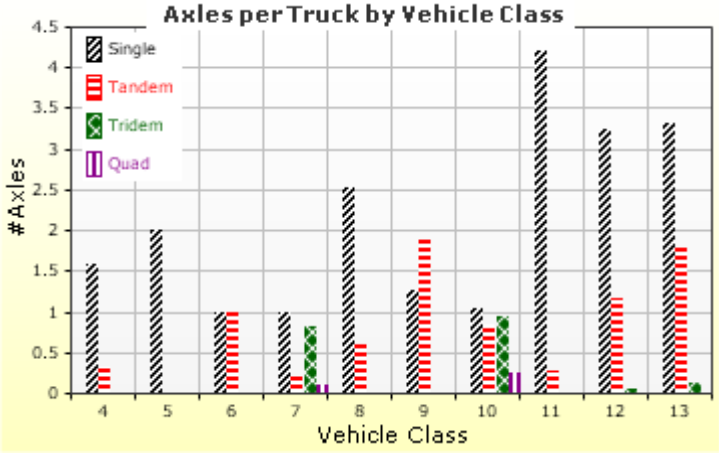
Traffic Inputs

Graphical Representation of Traffic Inputs

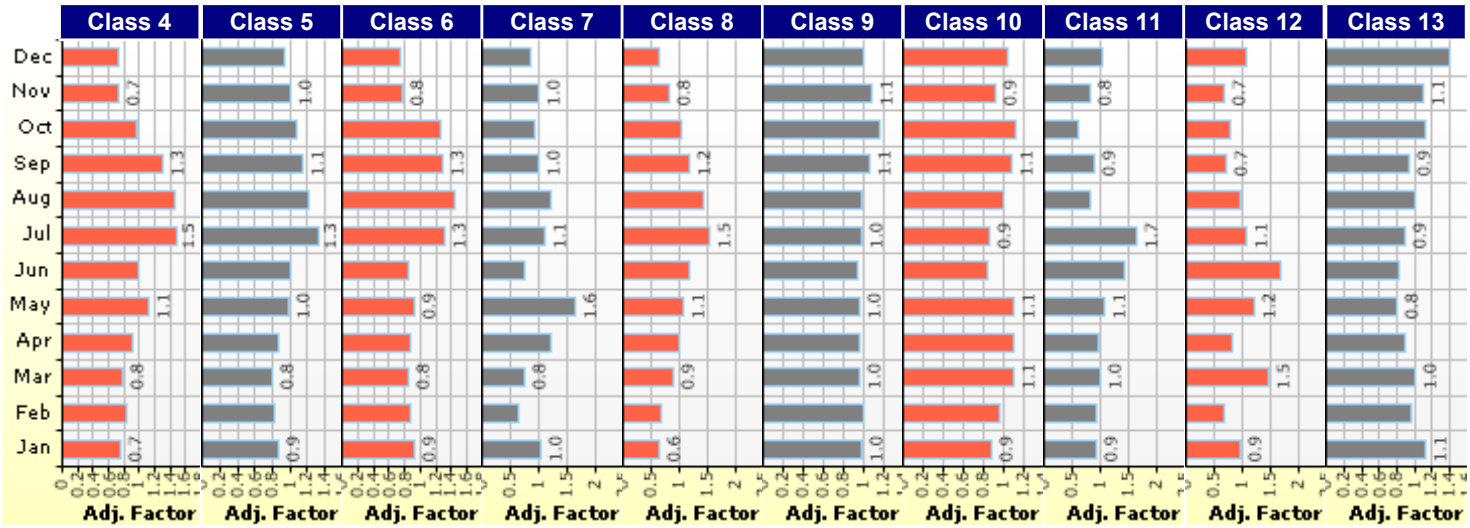
Initial two-way AADTT:	1,330	Percent of trucks in design direction (%):	60.0
Number of lanes in design direction:	2	Percent of trucks in design lane (%):	90.0
		Operational speed (mph)	35.0







Traffic Volume Monthly Adjustment Factors



Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
January	0.7	0.9	0.9	1.0	0.6	1.0	0.9	0.9	0.9	1.1
February	0.8	0.8	0.9	0.6	0.7	1.0	1.0	0.9	0.7	1.0
March	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.0	1.5	1.0
April	0.9	0.9	0.9	1.2	1.0	1.0	1.1	0.9	0.8	0.9
May	1.1	1.0	0.9	1.6	1.1	1.0	1.1	1.1	1.2	0.8
June	1.0	1.0	0.8	0.7	1.2	0.9	0.8	1.4	1.7	0.8
July	1.5	1.3	1.3	1.1	1.5	1.0	0.9	1.7	1.1	0.9
August	1.5	1.2	1.5	1.2	1.4	1.0	1.0	0.8	1.0	1.0
September	1.3	1.1	1.3	1.0	1.2	1.1	1.1	0.9	0.7	0.9
October	0.9	1.1	1.3	0.9	1.0	1.2	1.1	0.6	0.8	1.1
November	0.7	1.0	0.8	1.0	0.8	1.1	0.9	0.8	0.7	1.1
December	0.7	0.9	0.7	0.9	0.6	1.0	1.0	1.0	1.1	1.4

Distributions by Vehicle Class

Vehicle Class	AADTT Distribution (%) (Level 3)	Growth Factor	
		Rate (%)	Function
Class 4	0.35%	3%	Compound
Class 5	10.37%	3%	Compound
Class 6	9.84%	3%	Compound
Class 7	0.53%	3%	Compound
Class 8	2.64%	3%	Compound
Class 9	35.85%	3%	Compound
Class 10	13.36%	3%	Compound
Class 11	0%	3%	Compound
Class 12	0%	3%	Compound
Class 13	27.06%	3%	Compound

Truck Distribution by Hour does not apply

Axle Configuration

Traffic Wander	
Mean wheel location (in)	18.0
Traffic wander standard deviation (in)	10.0
Design lane width (ft)	12.0

Axle Configuration	
Average axle width (ft)	8.5
Dual tire spacing (in)	12.0
Tire pressure (psi)	120.0

Average Axle Spacing	
Tandem axle spacing (in)	51.6
Tridem axle spacing (in)	49.2
Quad axle spacing (in)	49.2

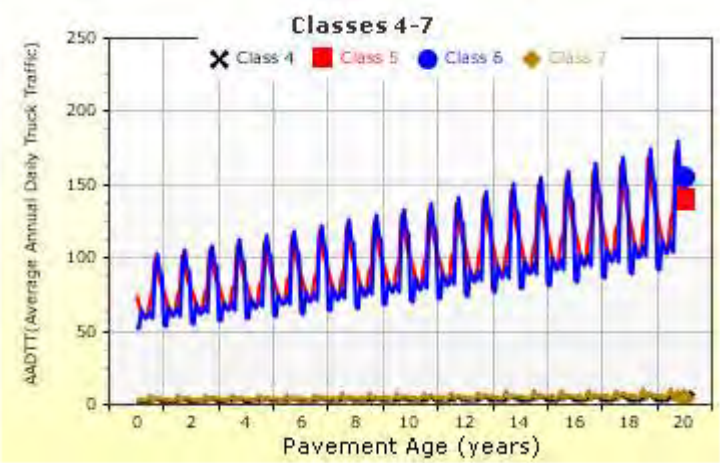
Wheelbase does not apply

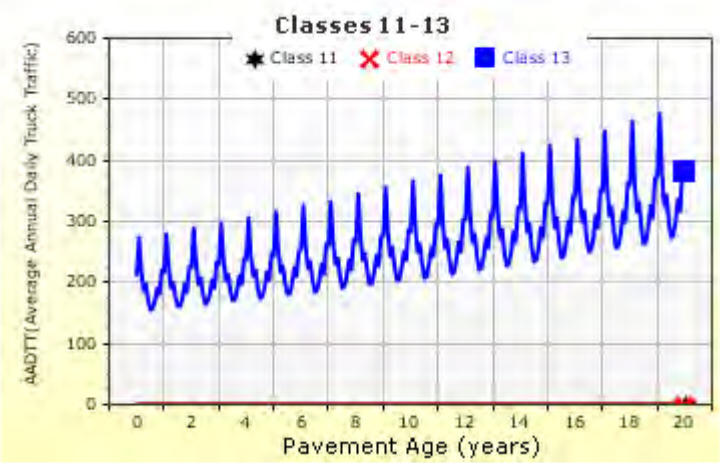
Number of Axles per Truck

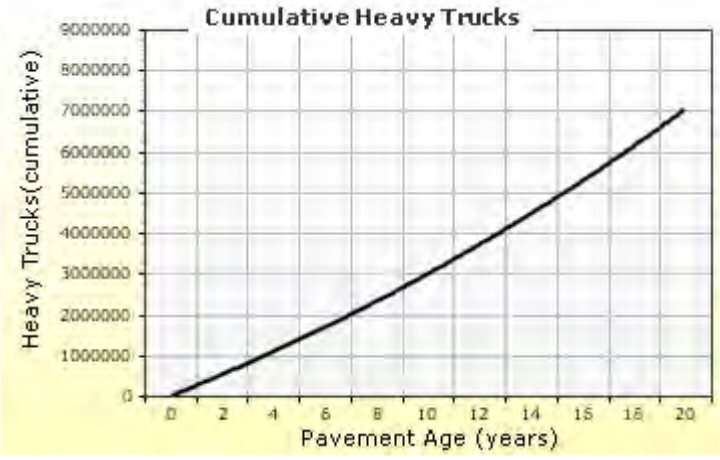
Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.59	0.34	0	0
Class 5	2	0	0	0
Class 6	1	1	0	0
Class 7	1	0.22	0.83	0.1
Class 8	2.52	0.6	0	0
Class 9	1.25	1.87	0	0
Class 10	1.03	0.85	0.95	0.26
Class 11	4.21	0.29	0.01	0
Class 12	3.24	1.16	0.07	0.01
Class 13	3.32	1.79	0.14	0.02

AADTT (Average Annual Daily Truck Traffic) Growth

*** Traffic cap is not enforced**



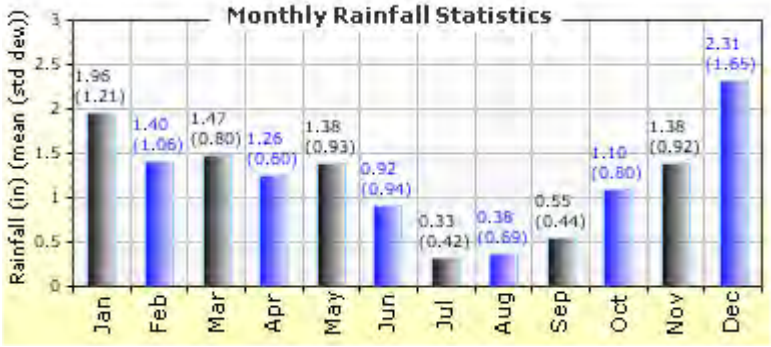




Climate Inputs

Climate Data Sources:

Climate Station Cities:	Location (lat lon elevation(ft))
US, ID	42.50000 -114.37500 3936
US, ID	43.00000 -114.37500 4064
US, ID	43.00000 -115.00000 3552

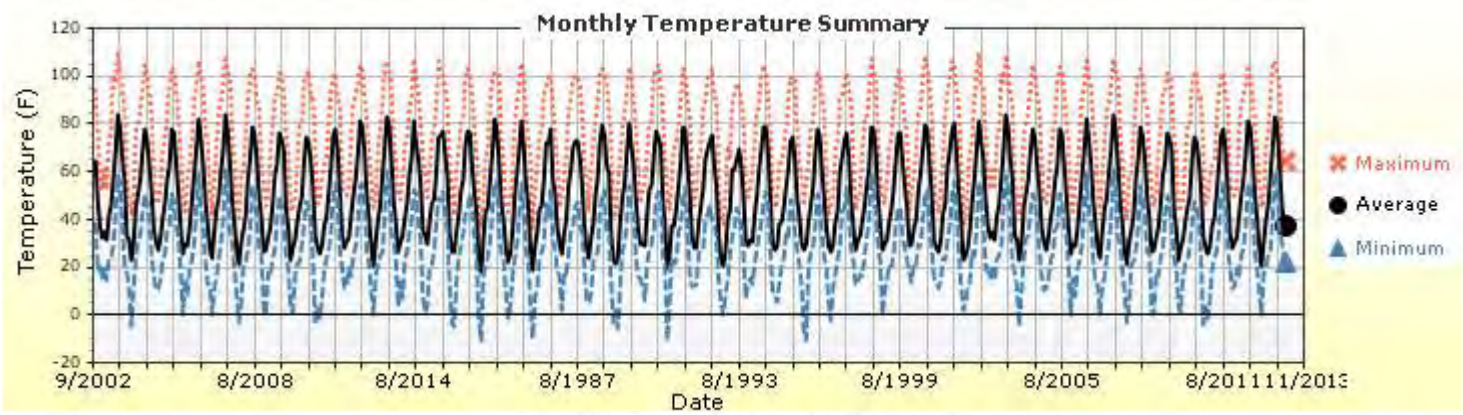


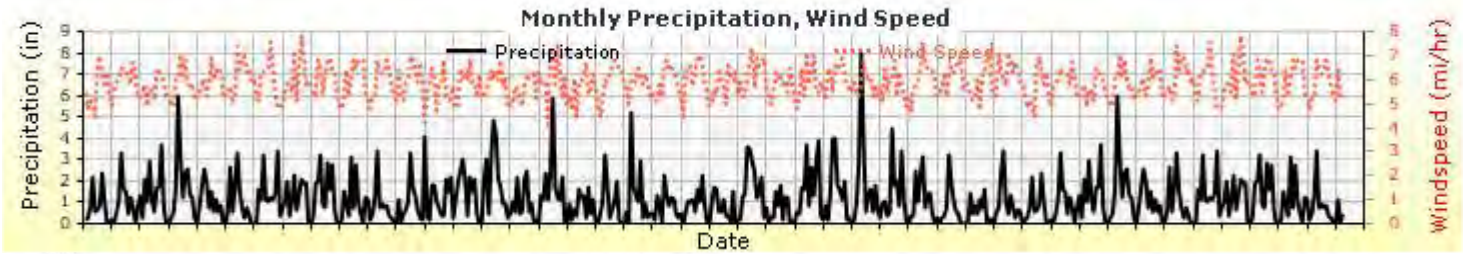
Annual Statistics:

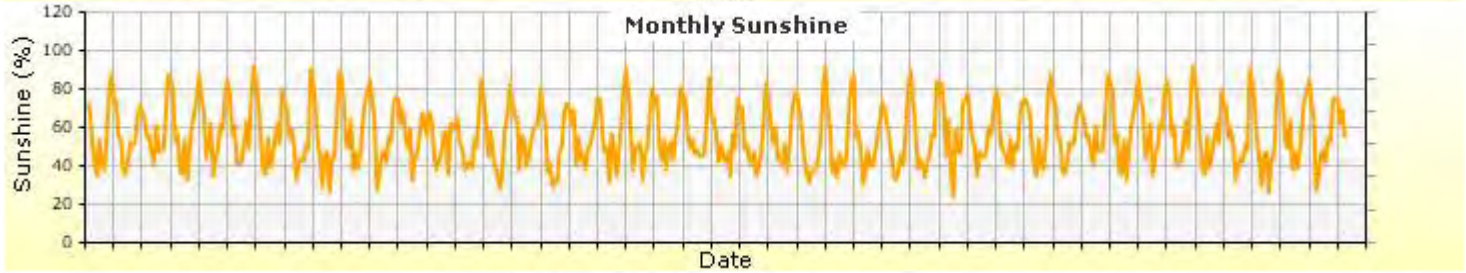
Mean annual air temperature (ºF)	50.08
Mean annual precipitation (in)	14.41
Freezing index (ºF - days)	440.07
Average annual number of freeze/thaw cycles:	114.77

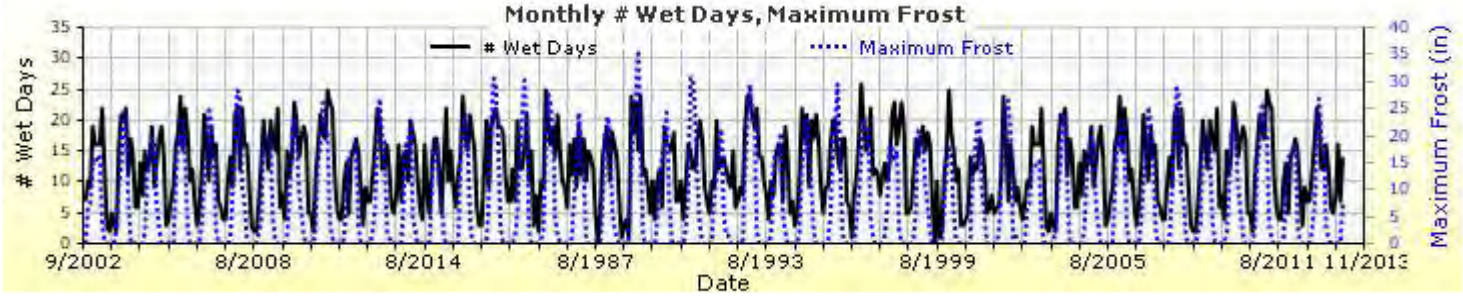
Water table depth (ft)	10.00

Monthly Climate Summary:

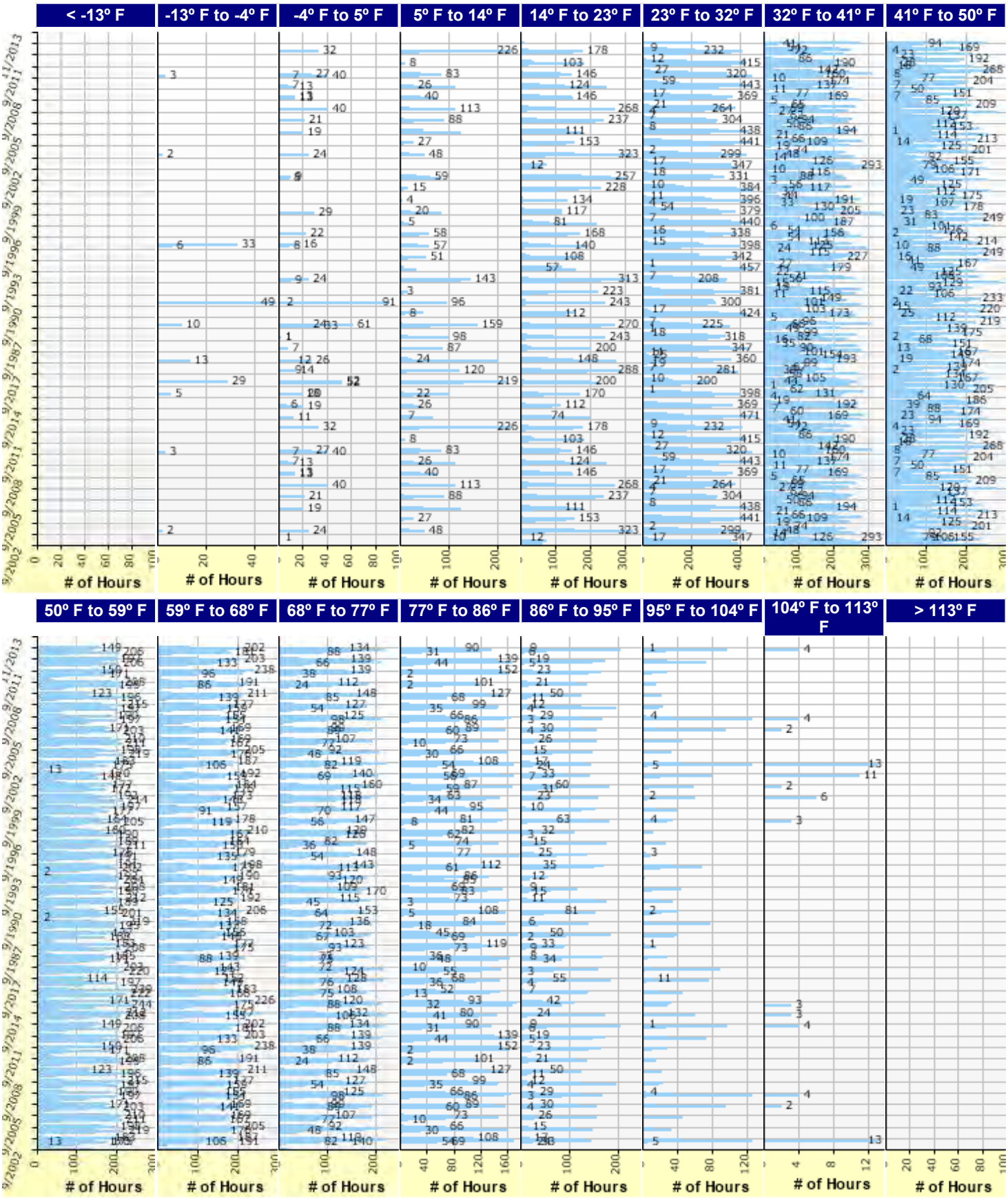








Hourly Air Temperature Distribution by Month:



Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False
Using G* based model (not nationally calibrated)	False
Is NCHRP 1-37A HMA Rutting Model Coefficients	True
Endurance Limit	-
Use Reflective Cracking	True

Structure - ICM Properties	
AC surface shortwave absorptivity	0.85

Layer Name	Layer Type	Interface Friction
Layer 1 Flexible : New HMA (PG 70-28)	Flexible (1)	1.00
Layer 2 Non-stabilized Base : New CRABS	Non-stabilized Base (4)	1.00
Layer 3 Non-stabilized Base : Recompacted Aggregate Base	Non-stabilized Base (4)	1.00
Layer 4 Subgrade : Subgrade	Subgrade (5)	-

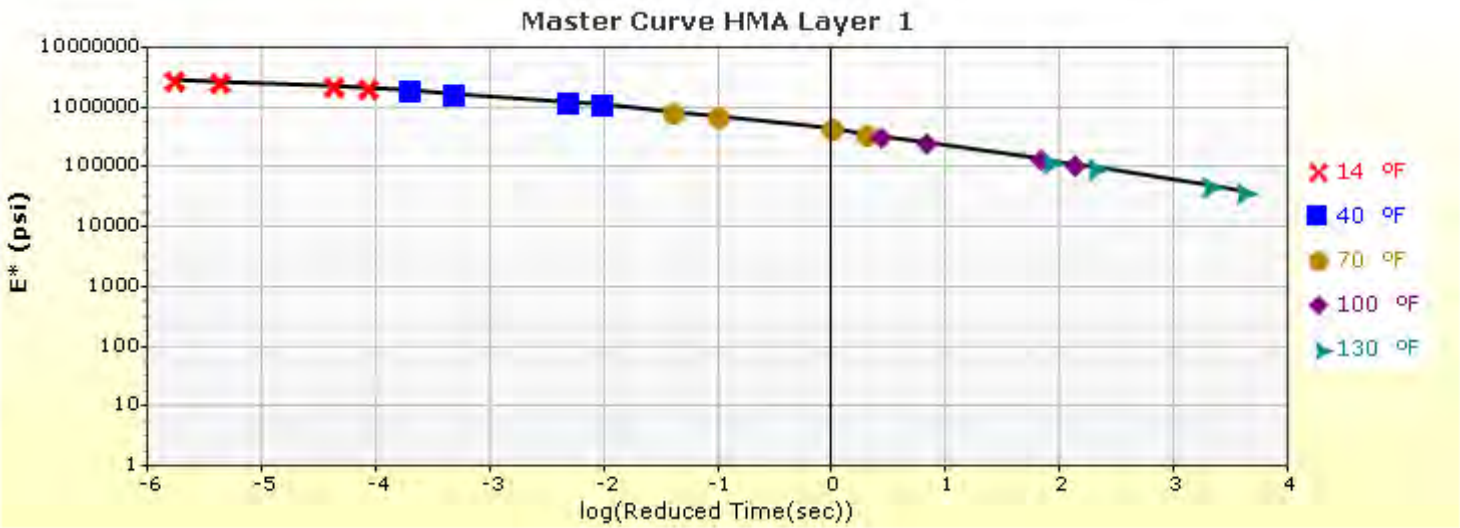
Thermal Cracking

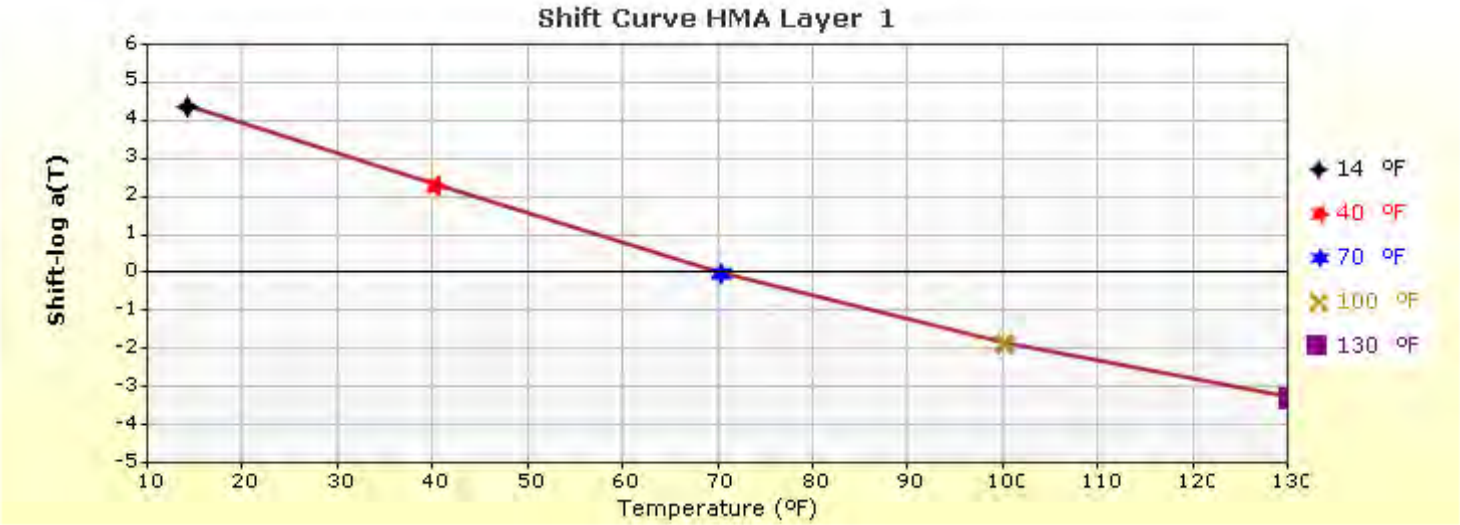
Thermal Contraction	
Is thermal contraction calculated?	True
Mix coefficient of thermal contraction (in/in/ºF)	-
Aggregate coefficient of thermal contraction (in/in/ºF)	5.0e-006
Voids in Mineral Aggregate (%)	19.1

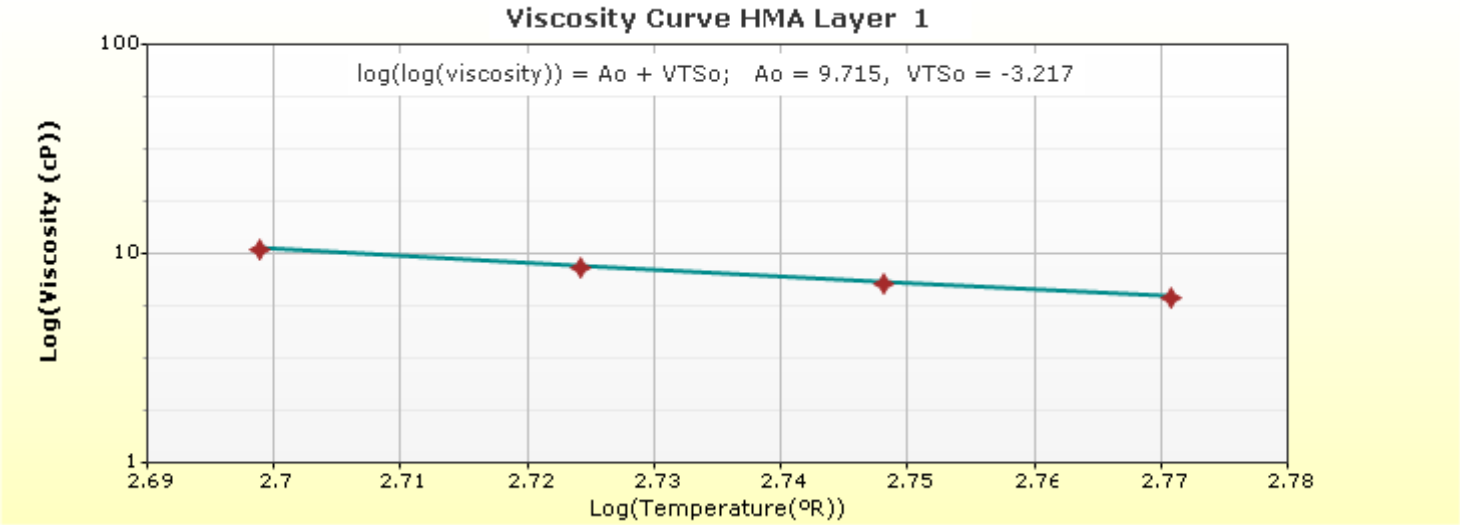
Indirect Tensile Strength (Input Level: 3)	
Test Temperature (ºF)	**Indirect Tensilte Strength (psi)**
14.0	424.72

Creep Compliance (1/psi) (Input Level: 3)			
Loading time (sec)	**-4 ºF**	**14 ºF**	**32 ºF**
1	4.62e-007	6.99e-007	9.57e-007
2	5.09e-007	8.18e-007	1.23e-006
5	5.78e-007	1.01e-006	1.71e-006
10	6.37e-007	1.18e-006	2.20e-006
20	7.01e-007	1.38e-006	2.82e-006
50	7.97e-007	1.70e-006	3.92e-006
100	8.78e-007	1.98e-006	5.04e-006

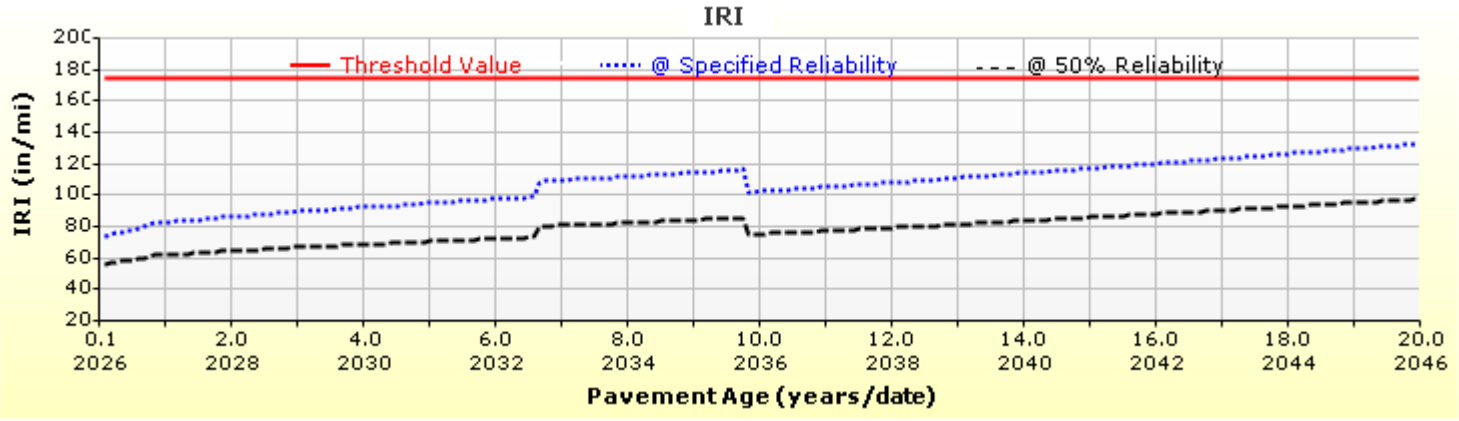
HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-28)

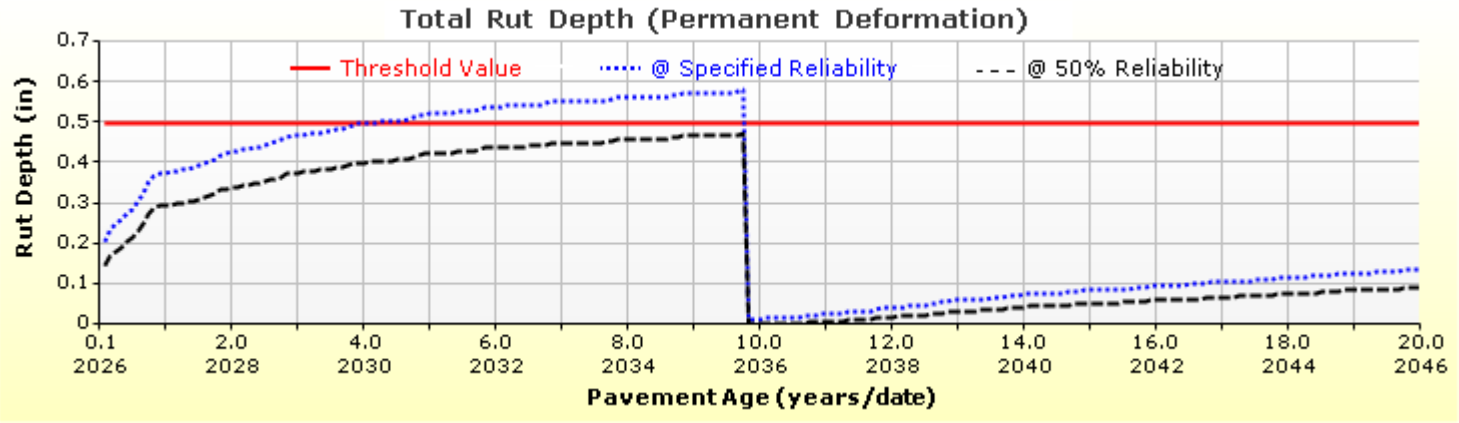


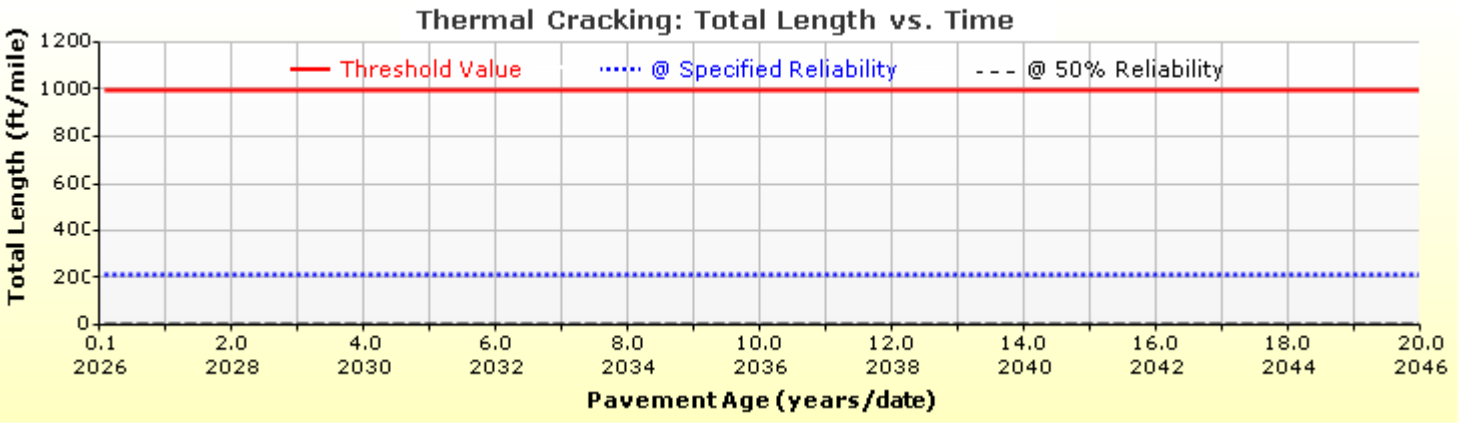


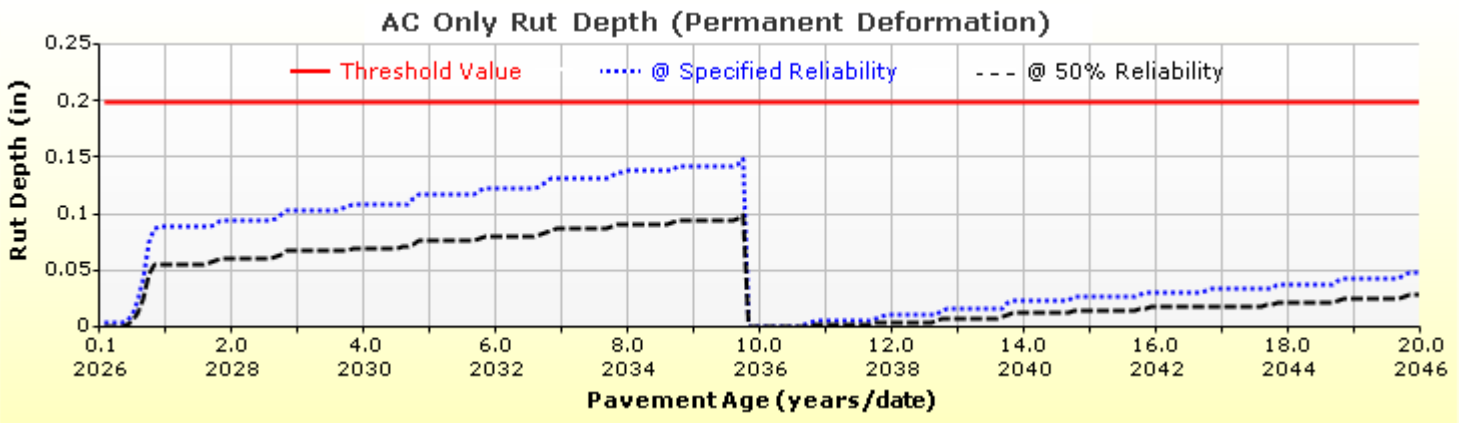


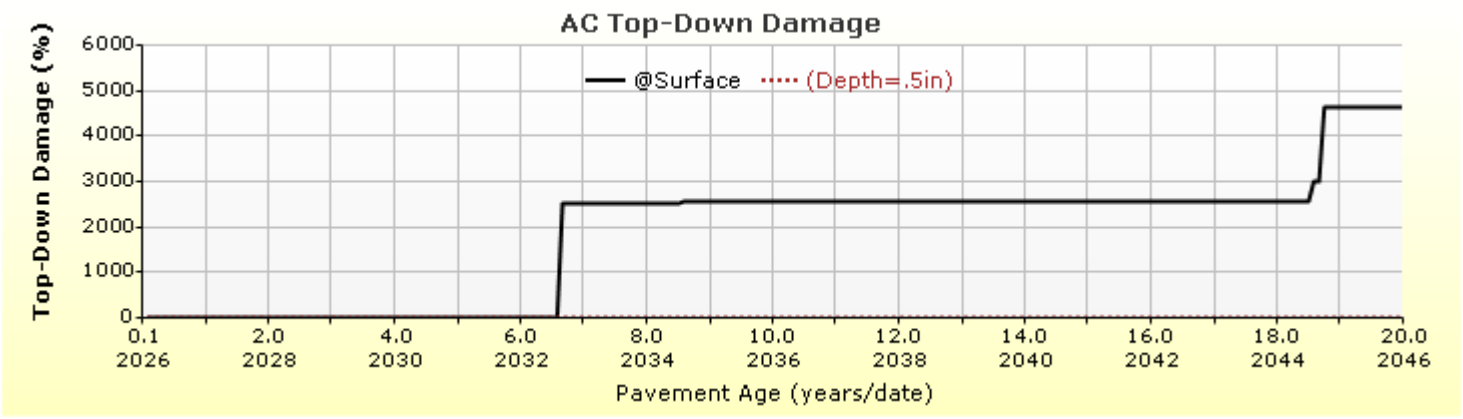
Analysis Output Charts

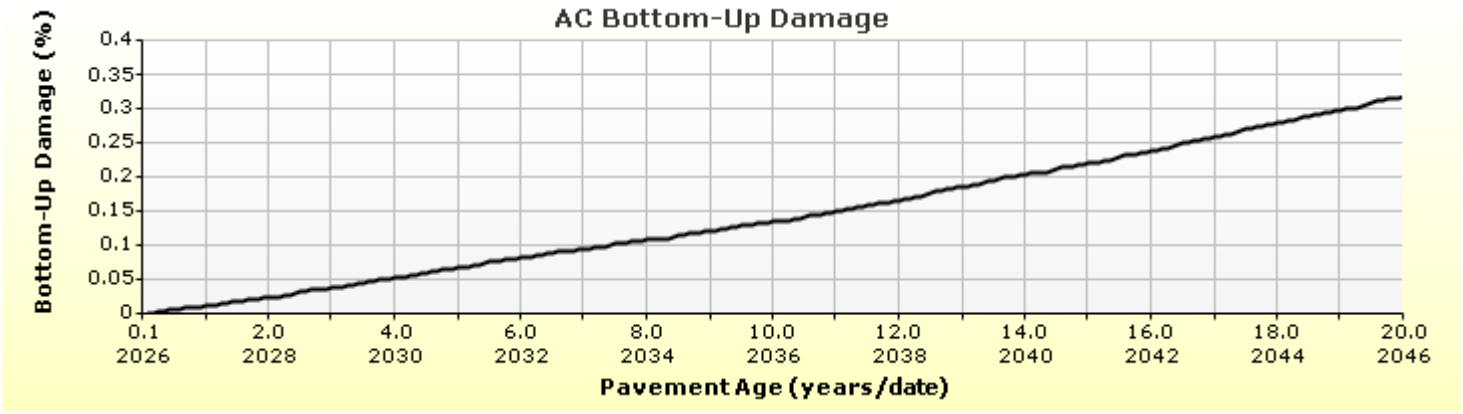


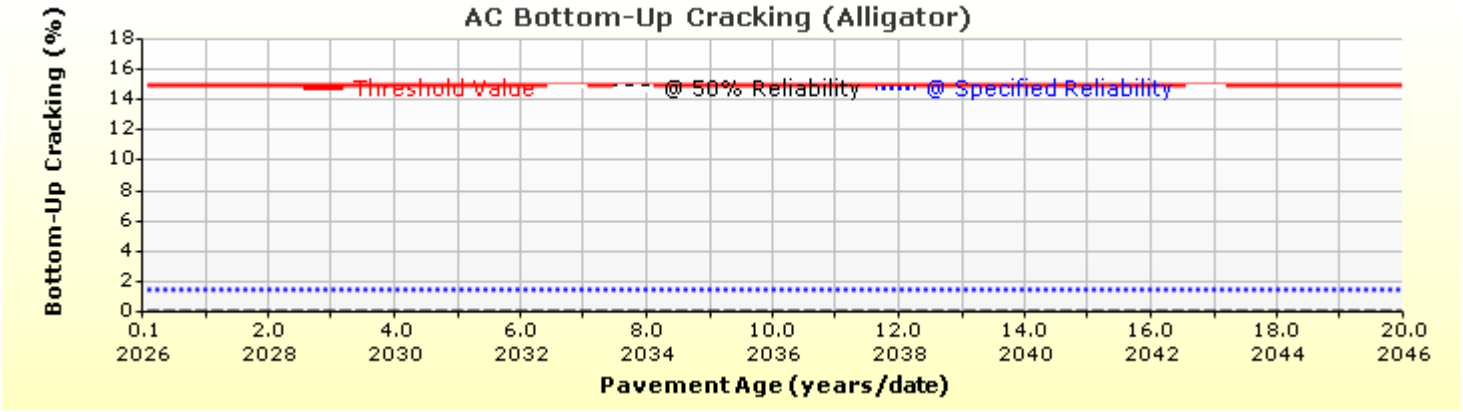


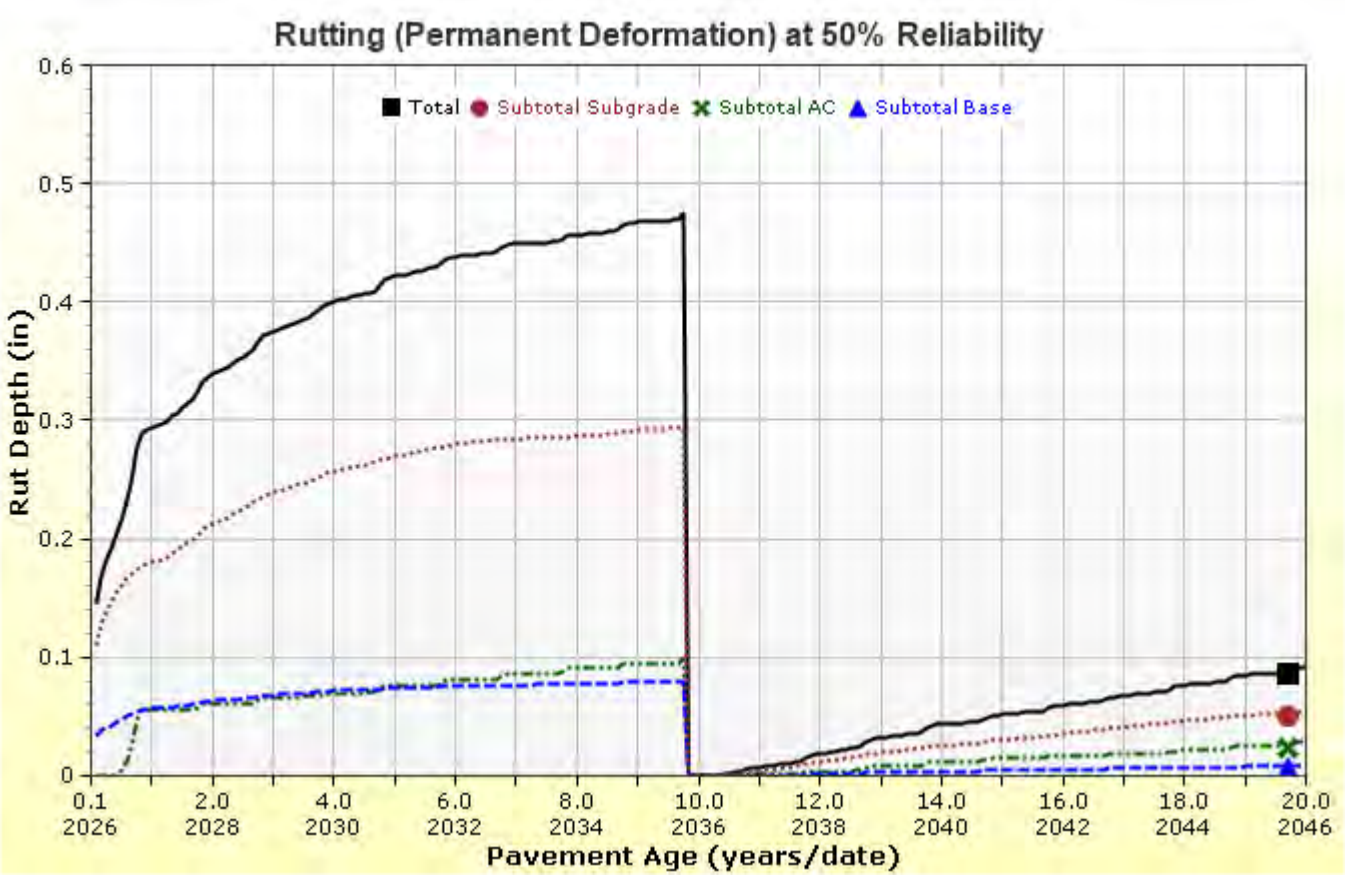


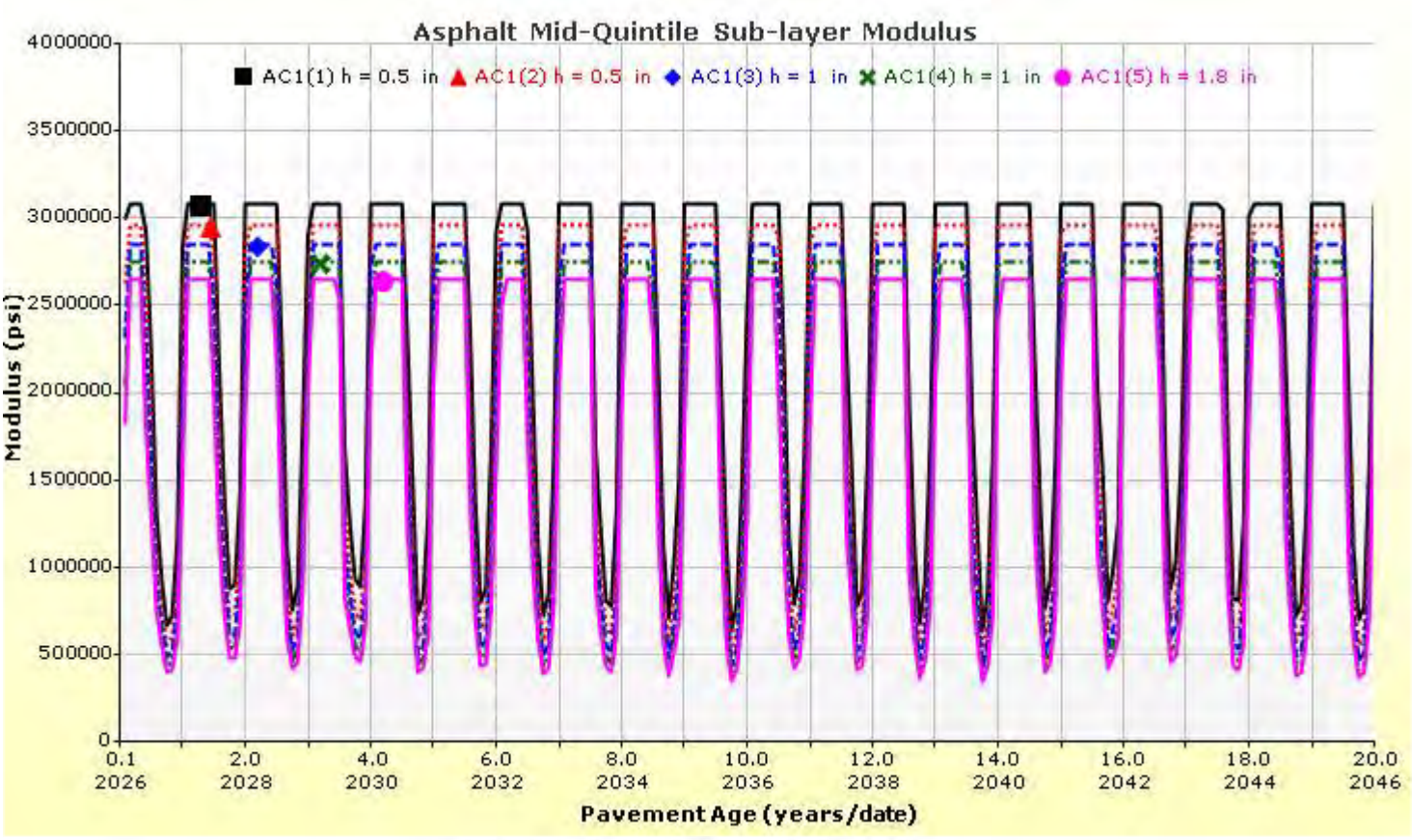


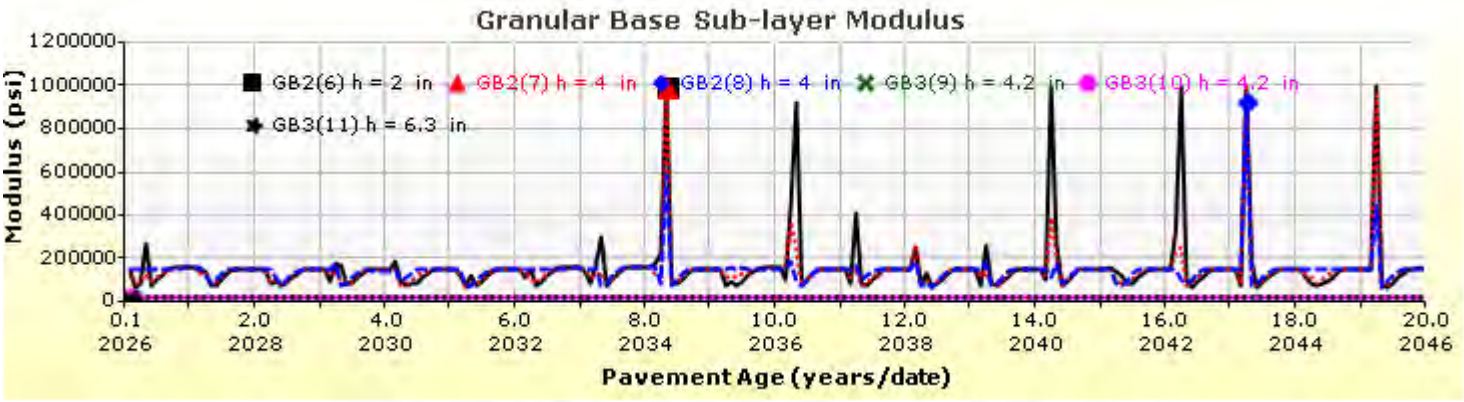

AC Top-Down Damage
Top-Down Damage (%)
@Surface
(Depth=.5in)
0
1000
2000
3000
4000
5000
6000
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)

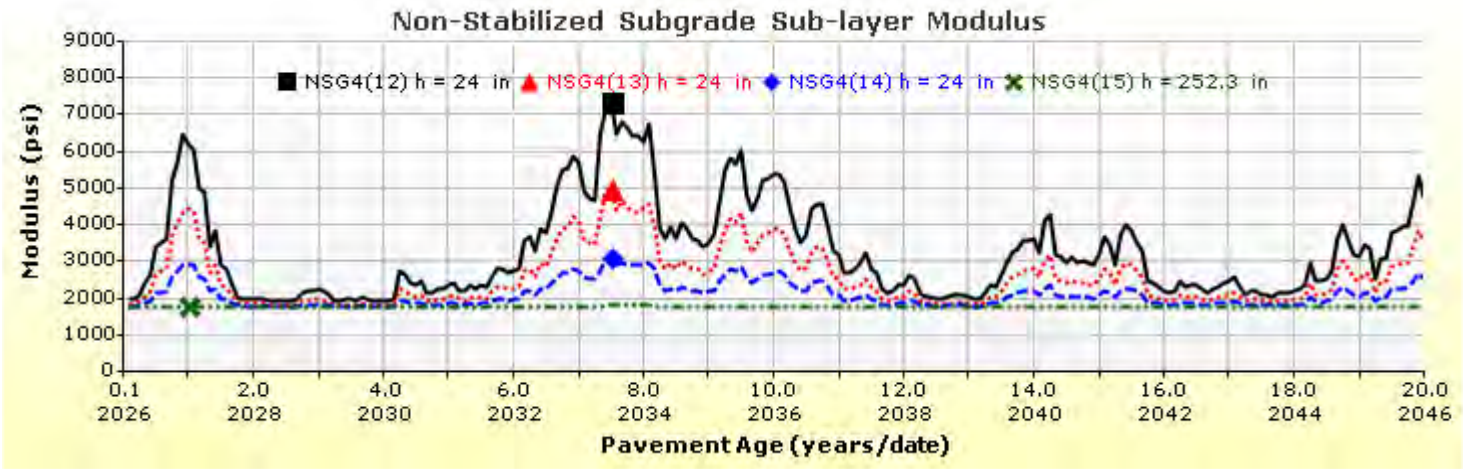

AC Bottom-Up Damage
Bottom-Up Damage (%)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


AC Bottom-Up Cracking (Alligator)
Bottom-Up Cracking (%)
Threshold Value
@ 50% Reliability
@ Specified Reliability
0
2
4
6
8
10
12
14
16
18
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Rutting (Permanent Deformation) at 50% Reliability
Total
Subtotal Subgrade
Subtotal AC
Subtotal Base
Rut Depth (in)
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Asphalt Mid-Quintile Sub-layer Modulus
AC1(1) h = 0.5 in
AC1(2) h = 0.5 in
AC1(3) h = 1 in
AC1(4) h = 1 in
AC1(5) h = 1.8 in
Modulus (psi)
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Granular Base Sub-layer Modulus
GB2(6) h = 2 in
GB2(7) h = 4 in
GB2(8) h = 4 in
GB3(9) h = 4.2 in
GB3(10) h = 4.2 in
GB3(11) h = 6.3 in
Modulus (psi)
1200000
1000000
800000
600000
400000
200000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Non-Stabilized Subgrade Sub-layer Modulus
NSG4(12) h = 24 in
NSG4(13) h = 24 in
NSG4(14) h = 24 in
NSG4(15) h = 252.3 in
Modulus (psi)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)

Layer Information

Layer 1 Flexible : New HMA (PG 70-28)

Asphalt		
Thickness (in)	4.8	
Unit weight (pcf)	144.0	
Poisson's ratio	Is Calculated?	False
	Ratio	0.35
	Parameter A	-
	Parameter B	-

Asphalt Dynamic Modulus (Input Level: 3)

Gradation	Percent Passing
3/4-inch sieve	100
3/8-inch sieve	77
No.4 sieve	60
No.200 sieve	6

Asphalt Binder

Parameter	Value
Grade	Superpave Performance Grade
Binder Type	70-28
A	9.715
VTS	-3.217

General Info

Name	Value
Reference temperature (ºF)	70
Effective binder content (%)	11.6
Air voids (%)	7.5
Thermal conductivity (BTU/hr-ft-ºF)	0.67
Heat capacity (BTU/lb-ºF)	0.23

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-28)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Layer 2 Non-stabilized Base : New CRABS

Unbound	
Layer thickness (in)	10.0
Poisson's ratio	0.4
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
90000.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	New CRABS
Description of object	New CRABS
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.2
Saturated hydraulic conductivity (ft/hr)	False	1.907e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.6

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	5.1359
bf	2.0746
cf	0.7463
hr	112.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	6.0
#100	
#80	
#60	
#50	
#40	
#30	
#20	
#16	
#10	
#8	40.0
#4	55.0
3/8-in.	
1/2-in.	
3/4-in.	95.0
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Layer 3 Non-stabilized Base : Recompacted Aggregate Base

Unbound	
Layer thickness (in)	14.8
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Annual representative values
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
15500.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Recompacted Aggregate Base
Description of object	Existing Untreated Aggregate Base
Author	
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	125.6
Saturated hydraulic conductivity (ft/hr)	False	7.98e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	8.4

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	2.4117
bf	2.0549
cf	0.7304
hr	116.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	8.0
#100	
#80	
#60	
#50	
#40	17.0
#30	
#20	
#16	
#10	40.0
#8	
#4	62.0
3/8-in.	
1/2-in.	
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Layer 4 Subgrade : Subgrade

Unbound	
Layer thickness (in)	Semi-infinite
Poisson's ratio	0.4
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
5544.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Subgrade
Description of object	Default material
Author	AASHTO
Date Created	
Approver	
Date approved	
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	False

	Is User Defined?	Value
Maximum dry unit weight (pcf)	True	88.7
Saturated hydraulic conductivity (ft/hr)	False	8.101e-02
Specific gravity of solids	False	2.7
Water Content (%)	True	18.9

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	28.9905
bf	2.7710
cf	0.6334
hr	292.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	96.0
#100	
#80	
#60	
#50	
#40	98.0
#30	
#20	
#16	
#10	
#8	
#4	99.0
3/8-in.	
1/2-in.	
3/4-in.	
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Calibration Coefficients

AC Fatigue

$$N_f = 0.00432 * C * \beta_{f1} k_1 \left(\frac{1}{\varepsilon_1}\right)^{k_2\beta_{f2}} \left(\frac{1}{E}\right)^{k_3\beta_{f3}}$$

$$C = 10^M$$

$$M = 4.84\left(\frac{V_b}{V_a + V_b} - 0.69\right)$$

k1: 3.75	
k2: 2.87	
k3: 1.46	
Bf1: 0.02054	
Bf2: 1.38	
Bf3: 0.88	

AC Rutting

$$\frac{\varepsilon_p}{\varepsilon_r} = k_z \beta_{r1} 10^{k_1} T^{k_2\beta_{r2}} N^{k_3\beta_{r3}}$$

$$k_z = (C_1 + C_2 * depth) * 0.328196^{depth}$$

$$C_1 = -0.1039 * H_\alpha^2 + 2.4868 * H_\alpha - 17.342$$

$$C_2 = 0.0172 * H_\alpha^2 - 1.7331 * H_\alpha + 27.428$$

Where:

$$H_{ac} = total\ AC\ thickness(in)$$

$\varepsilon_p = plastic\ strain\left({}^{in}/_{in}\right)$
$\varepsilon_r = resilient\ strain\left({}^{in}/_{in}\right)$
$T = layer\ temperature(^{\circ}F)$
$N = number\ of\ load\ repetitions$

AC Rutting Standard Deviation	0.24 * Pow(RUT,0.8026) + 0.001	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22	Br1:0.4 Br2:0.52 Br3:1.36

Thermal Fracture

$$C_f = 400 * N\left(\frac{\log C / h_{ac}}{\sigma}\right)$$

$$\Delta C = (k * \beta t)^{n+1} * A * \Delta K^n$$

$$A = 10^{(4.389 - 2.52 * \log(E * \sigma_m * n))}$$

$C_f = observed\ amount\ of\ thermal\ cracking(ft/500ft)$
$k = refression\ coefficient\ determined\ through\ field\ calibration$
$N(\,) = standard\ normal\ distribution\ evaluated\ at(\,)$
$\sigma = standard\ deviation\ of\ the\ \log\ of\ the\ depth\ of\ cracks\ in\ the\ pavments$
$C = crack\ depth(in)$
$h_{ac} = thickness\ of\ asphalt\ layer(in)$
$\Delta C = Change\ in\ the\ crack\ depth\ due\ to\ a\ cooling\ cycle$
$\Delta K = Change\ in\ the\ stress\ intensity\ factor\ due\ to\ a\ cooling\ cycle$
$A, n = Fracture\ parameters\ for\ the\ asphalt\ mixture$
$E = mixture\ stiffness$
$\sigma_M = Undamaged\ mixture\ tensile\ strength$
$\beta_t = Calibration\ parameter$

Level 1 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 1 Standard Deviation: 0.14 * THERMAL + 168
Level 2 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 2 Standard Deviation: 0.20 * THERMAL + 168
Level 3 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 3 Standard Deviation: 0.289 * THERMAL + 168

CSM Fatigue

$$N_f = 10^{\left(\frac{k_1\beta_{c1}\left(\frac{\sigma_s}{M_r}\right)}{k_2\beta_{c2}}\right)}$$

$N_f = number\ of\ repetitions\ to\ fatigue\ cracking$
$\sigma_s = Tensile\ stress(psi)$
$M_r = modulus\ of\ rupture(psi)$

k1: 0.972	k2: 0.0825	Bc1: 1	Bc2:1

Unbound Layer Rutting

$$\delta_a(N) = \beta_{s_1} k_1 \varepsilon_v h \left(\frac{\varepsilon_0}{\varepsilon_r}\right) \left| e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right|$$

$\delta_a = permanent\ deformation\ for\ the\ layer$
$N = number\ of\ repetitions$
$\varepsilon_v = average\ veritcal\ strain(in/in)$
$\varepsilon_0, \beta, \rho = material\ properties$
$\varepsilon_r = resilient\ strain(in/in)$

Base Rutting		Subgrade Rutting	
k1: 0.965	Bs1: 1	k1: 0.965	Bs1: 1
Standard Deviation (BASERUT) 0.1477 * Pow(BASERUT,0.6711) + 0.001		Standard Deviation (BASERUT) 0.1235 * Pow(SUBRUT,0.5012) + 0.001	

AC Cracking

AC Top Down Cracking

$$FC_{top} = \left(\frac{C_4}{1 + e^{(C_1 - C_2 * log_{10}(Damage))}}\right) * 10.56$$

c1: 7	c2: 3.5	c3: 0	c4: 1000

Top down AC Cracking Standard Deviation

200 + 2300/(1+exp(1.072-2.1654*LOG10(TOP+0.0001)))

AC Bottom Up Cracking

$$FC = \left(\frac{6000}{1 + e^{\left(C_1 * C_1' + C_2 * C_2' log_{10}(D * 100)\right)}}\right) * \left(\frac{1}{60}\right)$$

$$C_2' = -2.40874 - 39.748 * (1 + h_{ac})^{-2.856}$$

$$C_1' = -2 * C_2'$$

c1: 1.31	c2: 2.1585	c3: 6000

Bottom up AC Cracking Standard Deviation

1.13 + 13/(1+exp(7.57-15.5*LOG10(BOTTOM+0.0001)))

CSM Cracking

$$FC_{ctb} = C_1 + \frac{C_2}{1 + e^{C_3 - C_4 * log_{10}(Damage)}}$$

C1: 0	C2: 75	C3: 2	C4: 2

CSM Standard Deviation

CTB*1

IRI Flexible Pavements

C1 - Rutting
C2 - Fatigue Crack
C3 - Transverse Crack
C4 - Site Factors

C1: 40	C2: 0.4	C3: 0.008	C4: 0.015

FLEXIBLE PAVEMENT DESIGN - Idaho R-Value Method

Project Name:	**US-30, Blue Lakes Blvd to Eastland Dr**
File No:	**03393**
Date:	**January 19, 2021**
Roadway Segment:	**MP 218.638 to 219.579**
Strategy:	**Reconstruction**

	Layer Names
Layer 1:	HMA
Layer 2:	Untreated Base
Layer 3:	Granular Subbase
	Subgrade

		R-Values	
Layer 2:	Untreated Base	80	
Layer 3:	Granular Subbase	60	Expansion Pressure (psi)
	Subgrade	30	0.00

Traffic Index (T.I.): 12.5 → ESALs ≈ 15,810,000

Regional Climate Factor: 1.00 (Reference Figure 16-510.5.1 ITD Materials Manual)

		Material Substitution Ratios
Layer 1:	HMA	1.60
Layer 2:	Untreated Base	1.00
Layer 3:	Granular Subbase	0.85

	Layer Thickness				Gravel Equivalency	
Layer 1:	**HMA**					
	Required Thickness:	0.50	feet		GE1 Required:	0.80
	Recommended Thickness:	0.50	feet	6.0 Inches	GE1 Actual:	0.80
Layer 2:	**Untreated Base**					
	Required Thickness:	0.80	feet		GE2 Required	1.60
	Recommended Thickness:	0.80	feet	9.6 Inches	GE2 Actual	1.60
Layer 3:	**Granular Subbase**					
	Required Thickness:	1.41	feet		GE3 Required	2.80
	Recommended Thickness:	1.41	feet	16.9 Inches	GE3 Actual	2.80

Typical Subgrade Frost Group:	F4		Granular Subbase	D_{15}: .06 mm	Subgrade Type
Design Frost Depth:	24	Inches	on Subgrade	D_{85}: .01 mm	Silty
Required Ballast for Frost-Susceptible Subgrade:	70	% of Frost Depth		D_{15}/D_{85}= 6.00 >5	

Subgrade Separation Geotextile (Type III) Required

RECOMMMENDED BALLAST SECTION

HMA :	**0.50**		**6.0**		
Untreated Base :	**0.80**		**9.5**		
Granular Subbase :	**1.45**		**17.0**		
	2.75	**feet**	**32.5**	**inches**	

GE Required:	**2.80**	**feet**	
GE Provided:	**2.83**	**feet**	**OK**
Ballast Required to Counter Expansion Pressure:	**0**	**Inches**	
Ballast Provided:	**33**	**Inches**	**OK**
Ballast Required for Frost Protection:	**17**	**Inches**	
Ballast Provided:	**33**	**Inches**	**OK**

American Geotechnics

MEE

US-30 Flexible Reconstruction

Design Inputs

Design Life: 20 years
Design Type: FLEXIBLE

Base construction: September, 2026
Pavement construction: October, 2026
Traffic opening: November, 2026

Climate Data Sources (Lat/Lon): 42.5, -114.375; 43, -114.375; 43, -115

Design Structure

Layer type	Material Type	Thickness (in)
Flexible	New HMA (PG 70-28)	6.0
NonStabilized	Untreated Aggregate Base	9.6
NonStabilized	Granular Subbase	16.9
Subgrade	Subgrade	Semi-infinite

Volumetric at Construction:	
Effective binder content (%)	11.6
Air voids (%)	7.5

Traffic

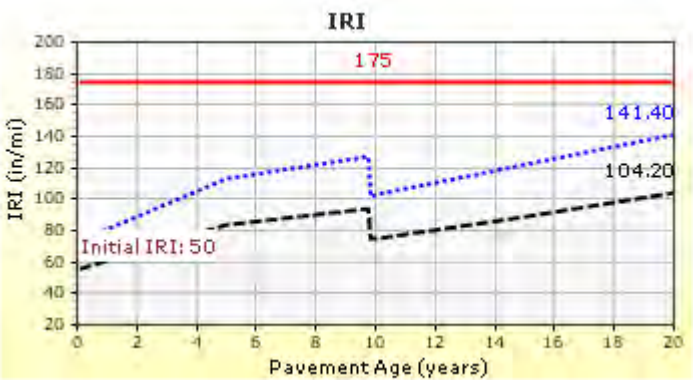
Age (year)	Heavy Trucks (cumulative)
2026 (initial)	1,330
2036 (10 years)	3,007,230
2046 (20 years)	7,048,710

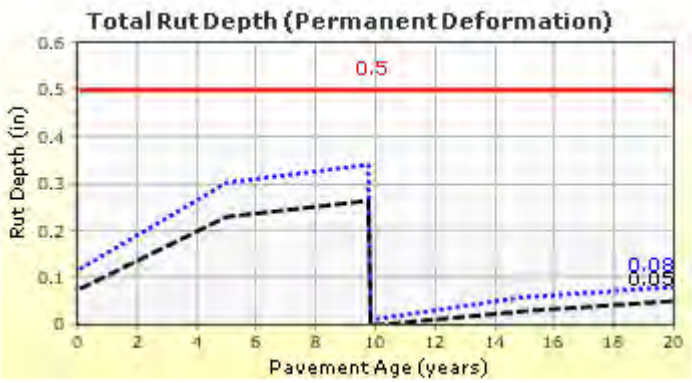
Design Outputs

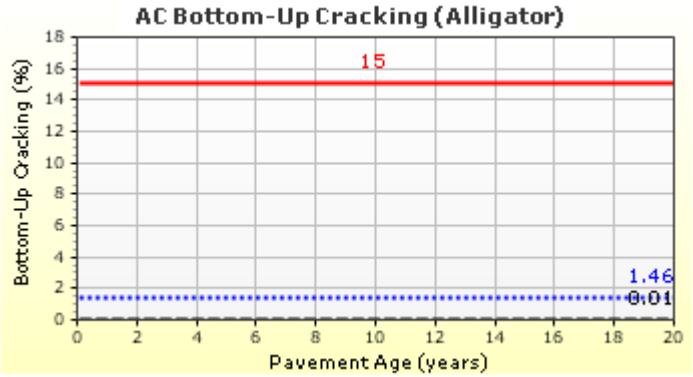
Distress Prediction Summary

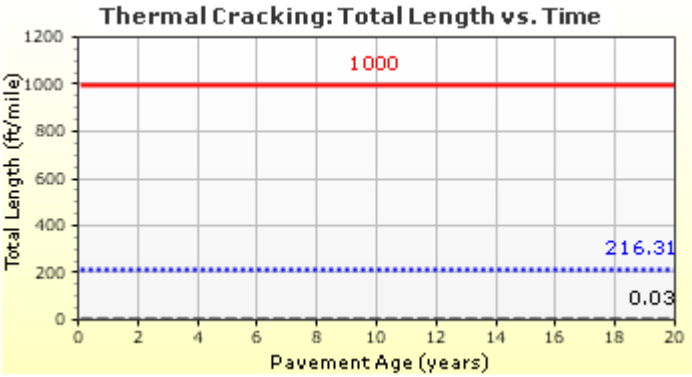
Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	175.00	141.42	90.00	99.26	Pass
Permanent deformation - total pavement (in)	0.50	0.08	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	1.46	90.00	100.00	Pass
AC thermal cracking (ft/mile)	1000.00	216.31	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.04	90.00	100.00	Pass

Distress Charts





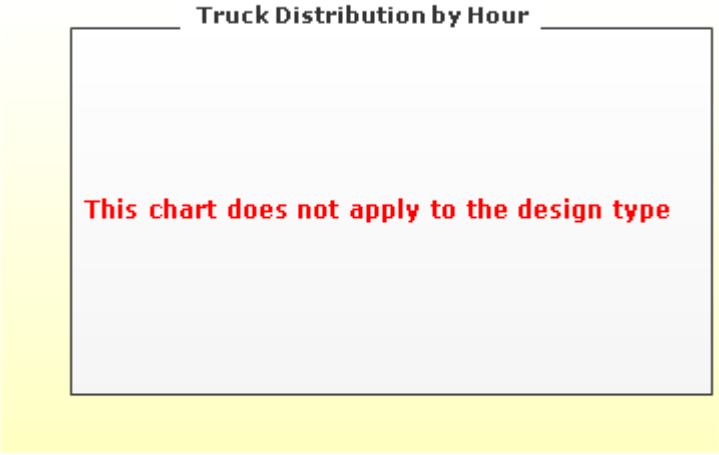


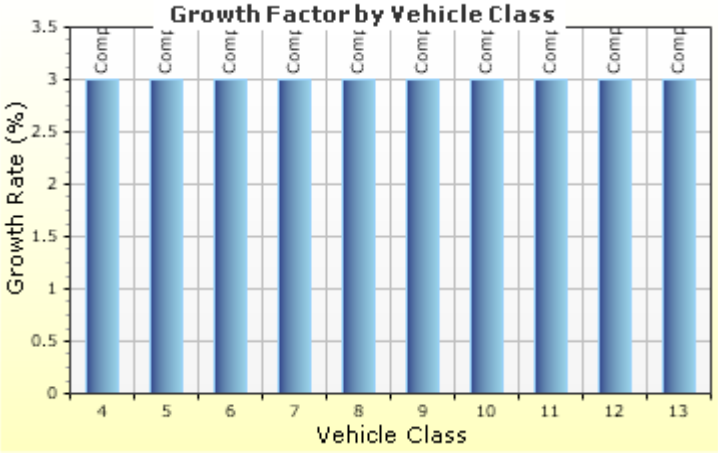


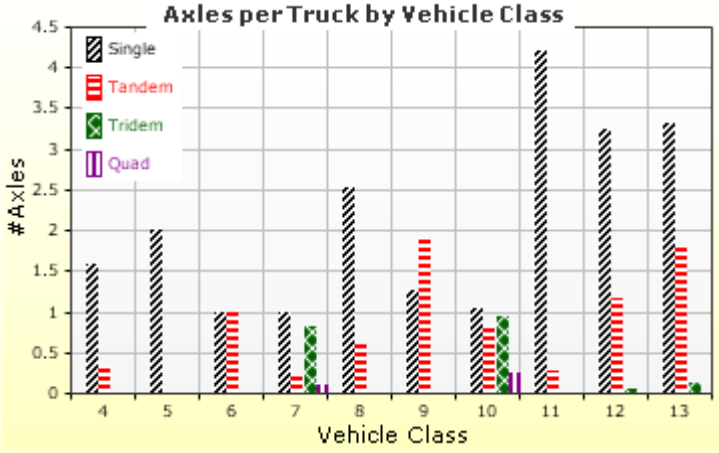
Traffic Inputs

Graphical Representation of Traffic Inputs

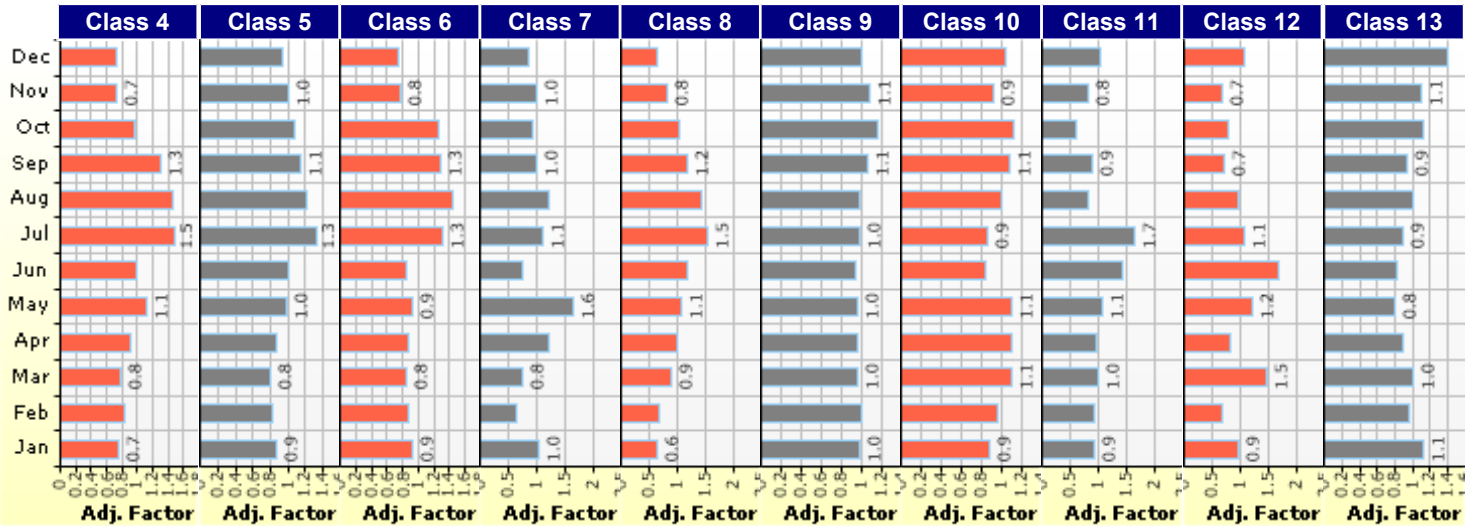
Initial two-way AADTT:	1,330	Percent of trucks in design direction (%):	60.0
Number of lanes in design direction:	2	Percent of trucks in design lane (%):	90.0
		Operational speed (mph)	35.0







Traffic Volume Monthly Adjustment Factors



Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month	Vehicle Class									
	4	5	6	7	8	9	10	11	12	13
January	0.7	0.9	0.9	1.0	0.6	1.0	0.9	0.9	0.9	1.1
February	0.8	0.8	0.9	0.6	0.7	1.0	1.0	0.9	0.7	1.0
March	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.0	1.5	1.0
April	0.9	0.9	0.9	1.2	1.0	1.0	1.1	0.9	0.8	0.9
May	1.1	1.0	0.9	1.6	1.1	1.0	1.1	1.1	1.2	0.8
June	1.0	1.0	0.8	0.7	1.2	0.9	0.8	1.4	1.7	0.8
July	1.5	1.3	1.3	1.1	1.5	1.0	0.9	1.7	1.1	0.9
August	1.5	1.2	1.5	1.2	1.4	1.0	1.0	0.8	1.0	1.0
September	1.3	1.1	1.3	1.0	1.2	1.1	1.1	0.9	0.7	0.9
October	0.9	1.1	1.3	0.9	1.0	1.2	1.1	0.6	0.8	1.1
November	0.7	1.0	0.8	1.0	0.8	1.1	0.9	0.8	0.7	1.1
December	0.7	0.9	0.7	0.9	0.6	1.0	1.0	1.0	1.1	1.4

Distributions by Vehicle Class

Truck Distribution by Hour does not apply

Vehicle Class	AADTT Distribution (%) (Level 3)	Growth Factor	
		Rate (%)	Function
Class 4	0.35%	3%	Compound
Class 5	10.37%	3%	Compound
Class 6	9.84%	3%	Compound
Class 7	0.53%	3%	Compound
Class 8	2.64%	3%	Compound
Class 9	35.85%	3%	Compound
Class 10	13.36%	3%	Compound
Class 11	0%	3%	Compound
Class 12	0%	3%	Compound
Class 13	27.06%	3%	Compound

Axle Configuration

Traffic Wander	
Mean wheel location (in)	18.0
Traffic wander standard deviation (in)	10.0
Design lane width (ft)	12.0

Axle Configuration	
Average axle width (ft)	8.5
Dual tire spacing (in)	12.0
Tire pressure (psi)	120.0

Average Axle Spacing	
Tandem axle spacing (in)	51.6
Tridem axle spacing (in)	49.2
Quad axle spacing (in)	49.2

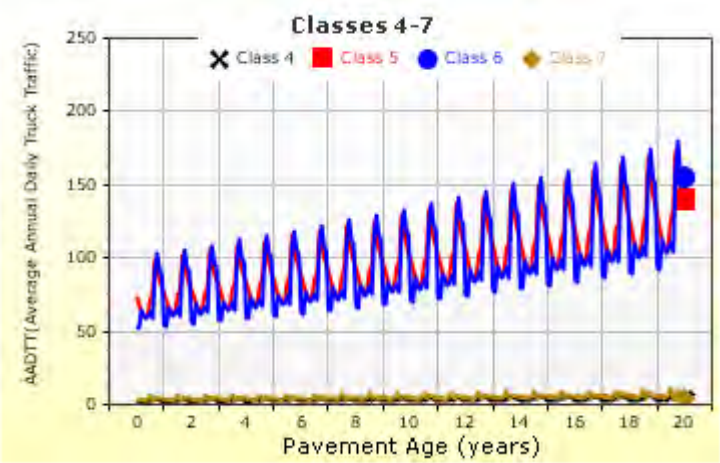
Wheelbase does not apply

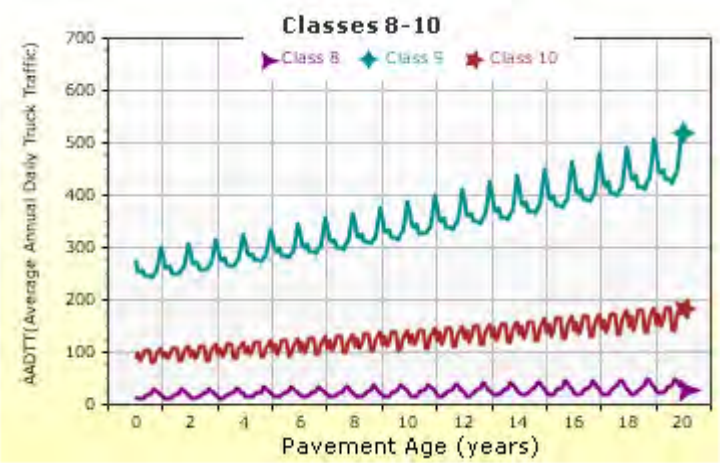
Number of Axles per Truck

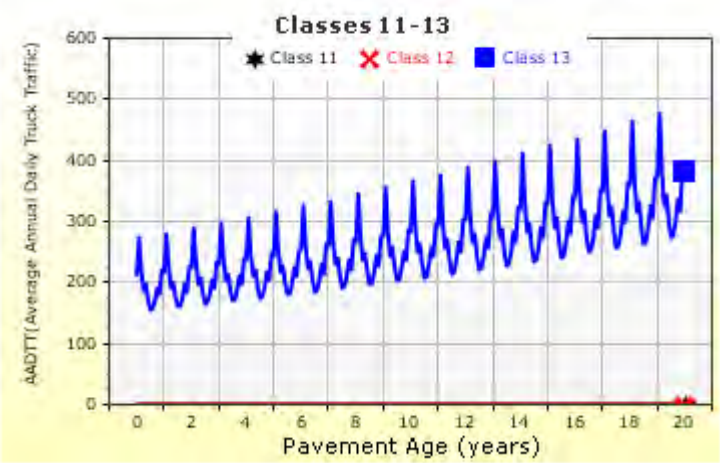
Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
Class 4	1.59	0.34	0	0
Class 5	2	0	0	0
Class 6	1	1	0	0
Class 7	1	0.22	0.83	0.1
Class 8	2.52	0.6	0	0
Class 9	1.25	1.87	0	0
Class 10	1.03	0.85	0.95	0.26
Class 11	4.21	0.29	0.01	0
Class 12	3.24	1.16	0.07	0.01
Class 13	3.32	1.79	0.14	0.02

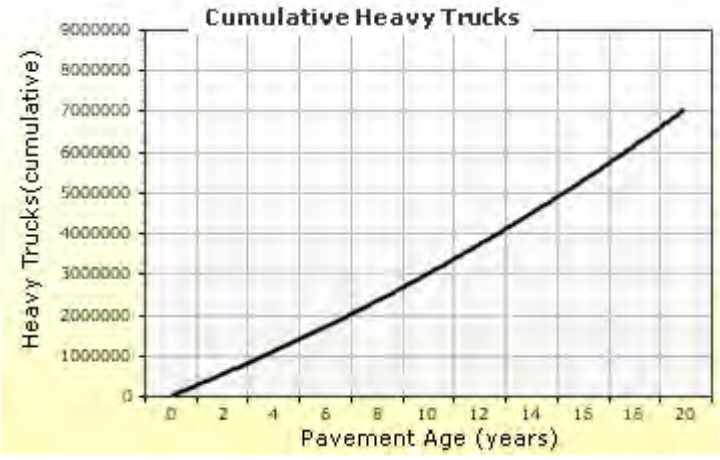
AADTT (Average Annual Daily Truck Traffic) Growth

*** Traffic cap is not enforced**









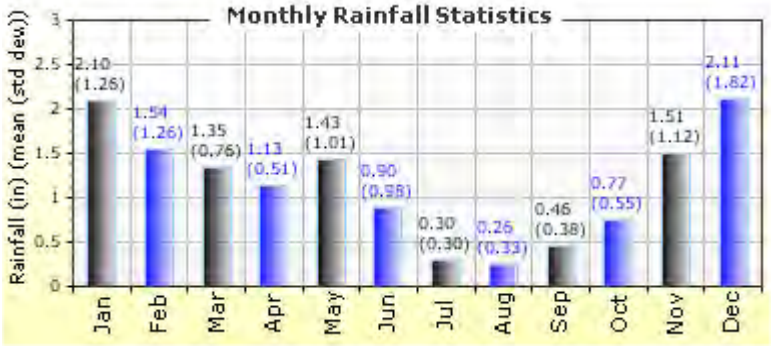
Climate Inputs

Climate Data Sources:

Climate Station Cities:	Location (lat lon elevation(ft))
US, ID	42.50000 -114.37500 3936
US, ID	43.00000 -114.37500 4064
US, ID	43.00000 -115.00000 3552

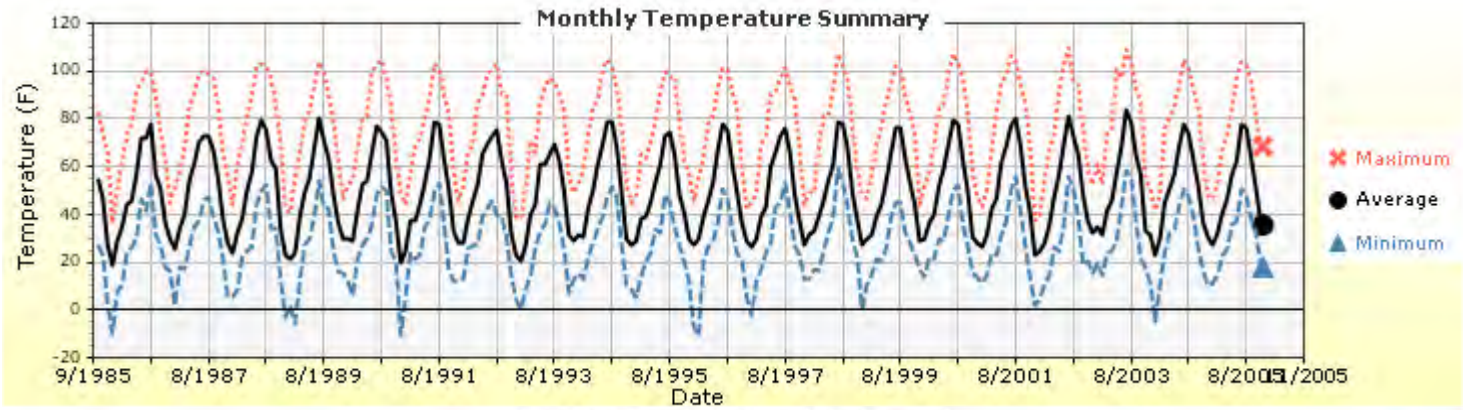
Annual Statistics:

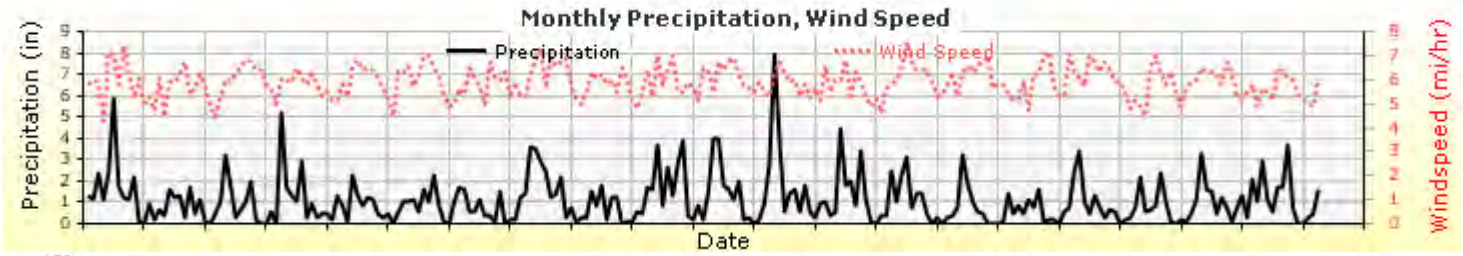
Mean annual air temperature (°F)	49.99
Mean annual precipitation (in)	13.87
Freezing index (°F - days)	431.49
Average annual number of freeze/thaw cycles:	114.69

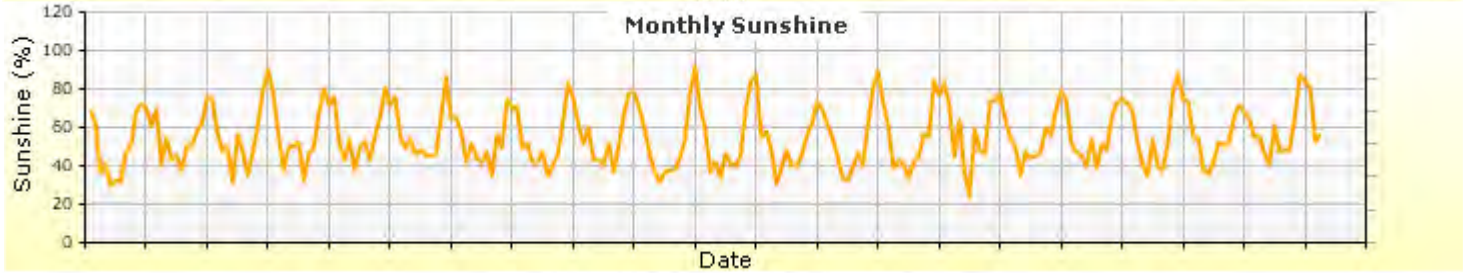


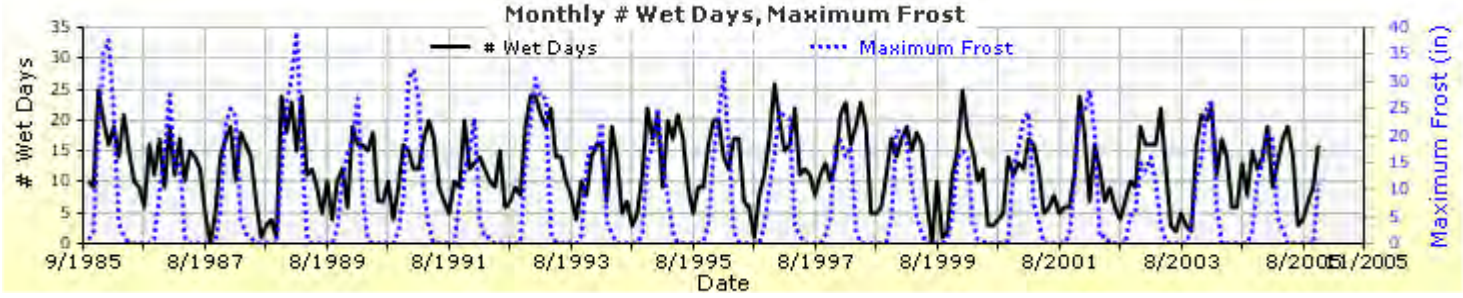
Water table depth (ft)	10.00

Monthly Climate Summary:

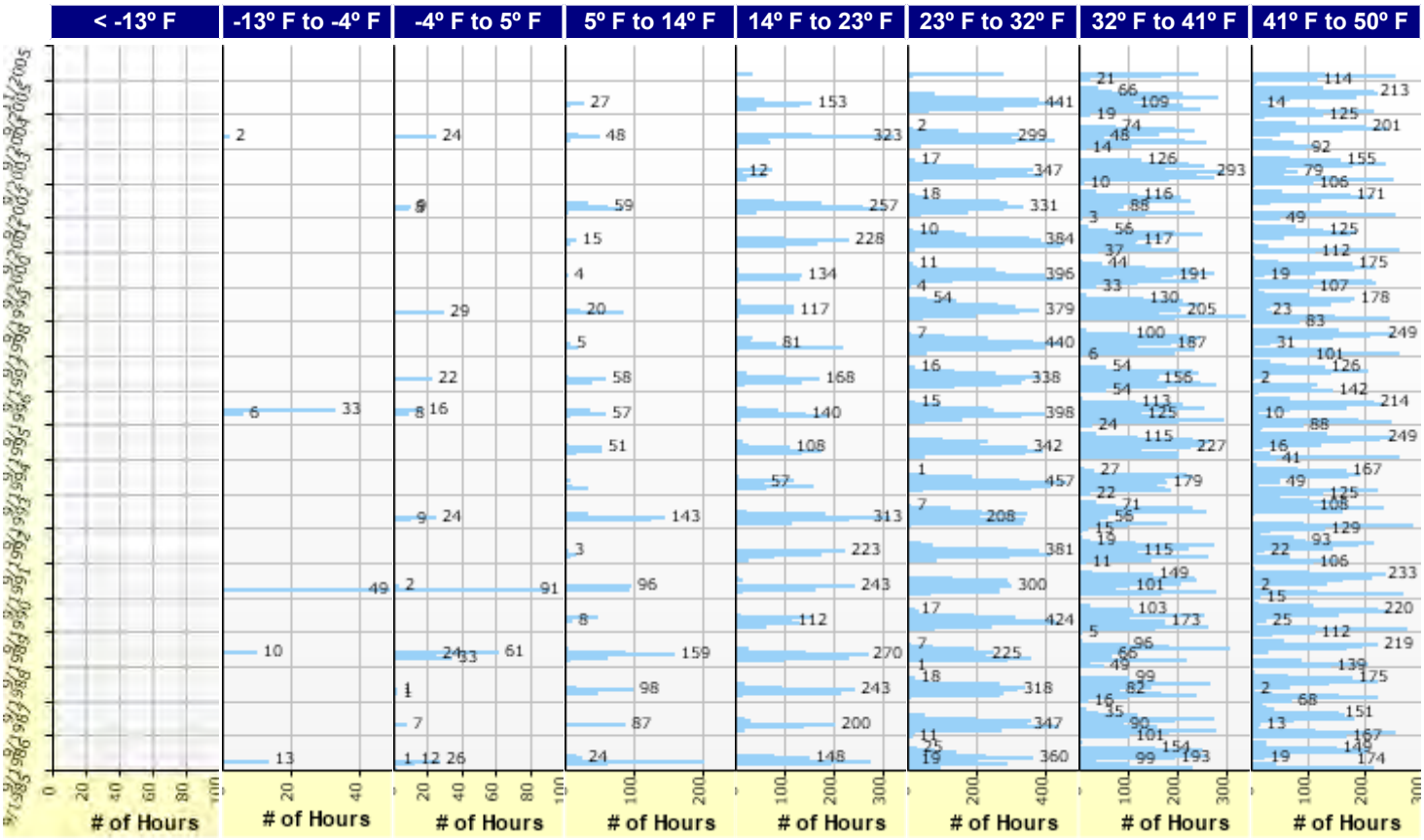


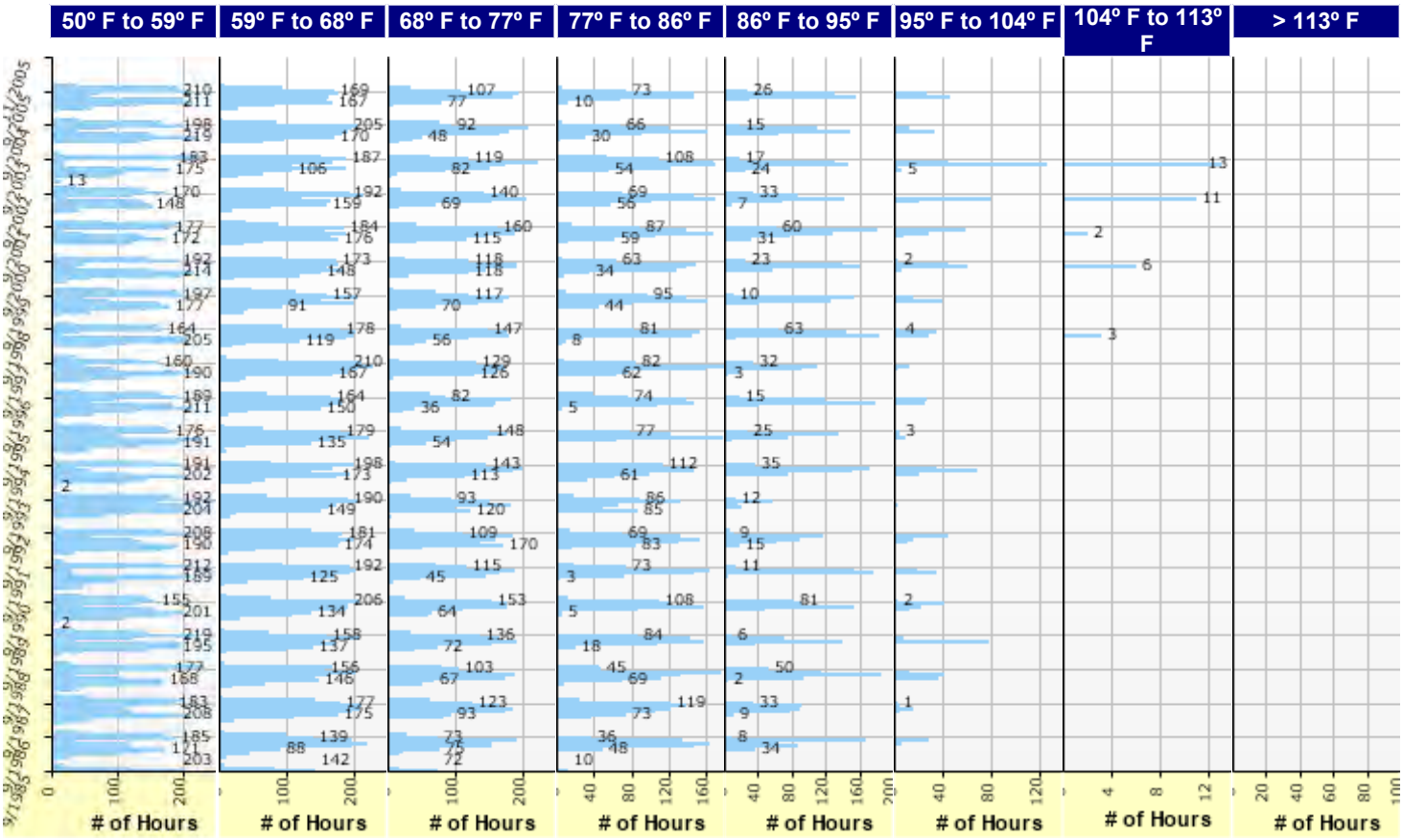






Hourly Air Temperature Distribution by Month:





Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False
Using G* based model (not nationally calibrated)	False
Is NCHRP 1-37A HMA Rutting Model Coefficients	True
Endurance Limit	-
Use Reflective Cracking	True

Structure - ICM Properties	
AC surface shortwave absorptivity	0.85

Layer Name	Layer Type	Interface Friction
Layer 1 Flexible : New HMA (PG 70-28)	Flexible (1)	1.00
Layer 2 Non-stabilized Base : Untreated Aggregate Base	Non-stabilized Base (4)	1.00
Layer 3 Non-stabilized Base : Granular Subbase	Non-stabilized Base (4)	1.00
Layer 4 Subgrade : Subgrade	Subgrade (5)	-

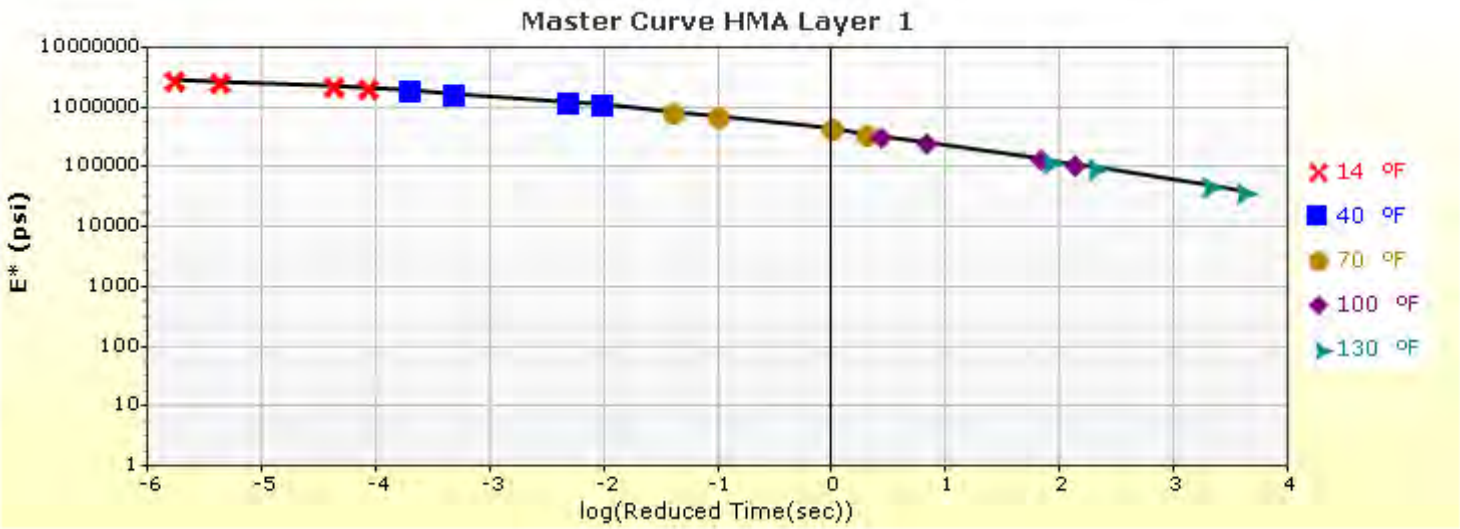
Thermal Cracking

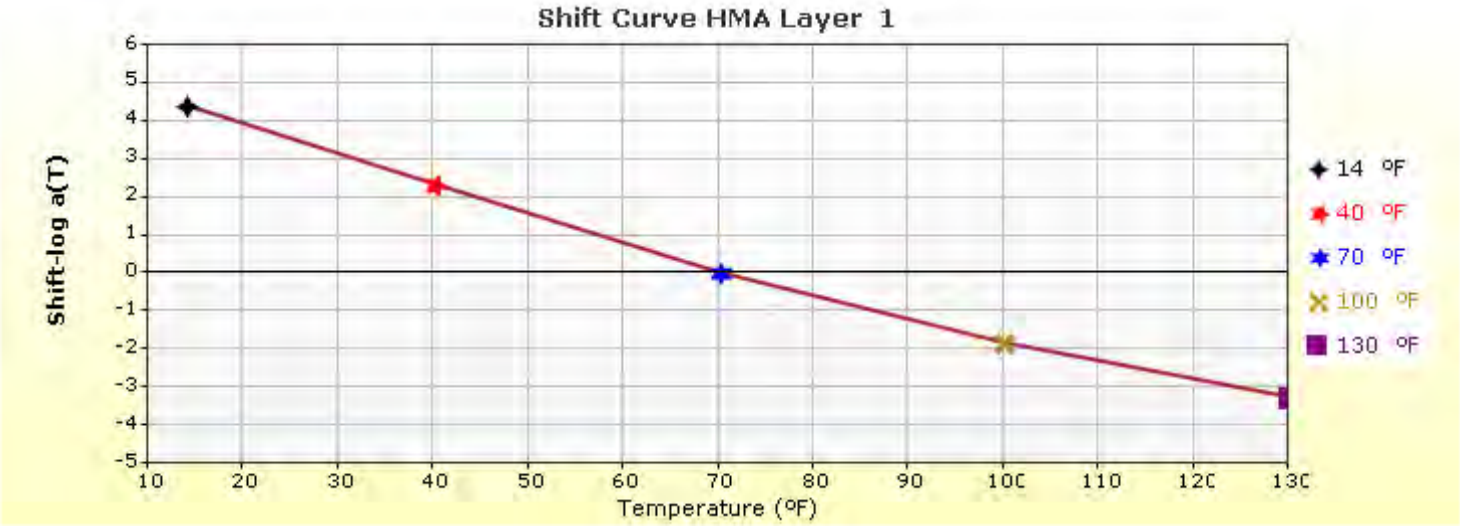
Thermal Contraction	
Is thermal contraction calculated?	True
Mix coefficient of thermal contraction (in/in/ºF)	-
Aggregate coefficient of thermal contraction (in/in/ºF)	5.0e-006
Voids in Mineral Aggregate (%)	19.1

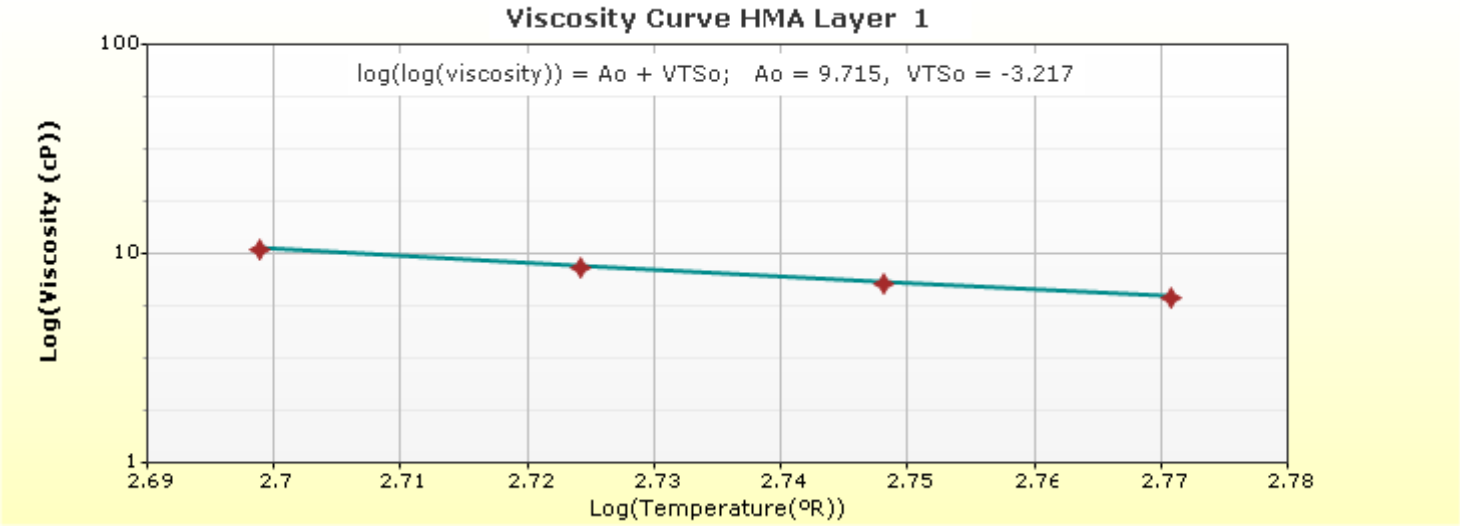
Indirect Tensile Strength (Input Level: 3)	
Test Temperature (ºF)	**Indirect Tensilte Strength (psi)**
14.0	424.72

Creep Compliance (1/psi) (Input Level: 3)			
Loading time (sec)	**-4 ºF**	**14 ºF**	**32 ºF**
1	4.62e-007	6.99e-007	9.57e-007
2	5.09e-007	8.18e-007	1.23e-006
5	5.78e-007	1.01e-006	1.71e-006
10	6.37e-007	1.18e-006	2.20e-006
20	7.01e-007	1.38e-006	2.82e-006
50	7.97e-007	1.70e-006	3.92e-006
100	8.78e-007	1.98e-006	5.04e-006

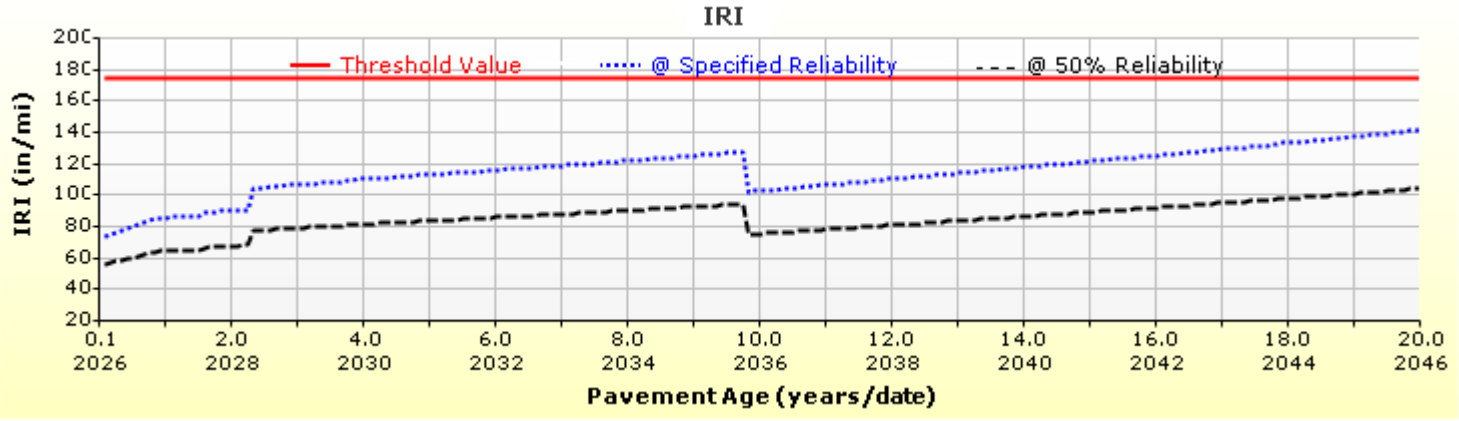
HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-28)

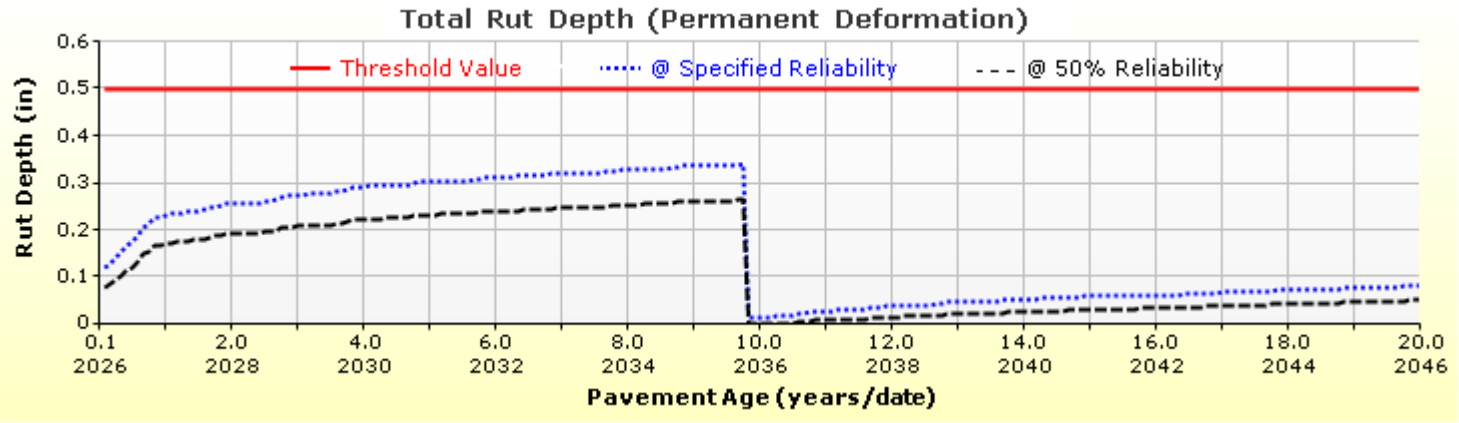


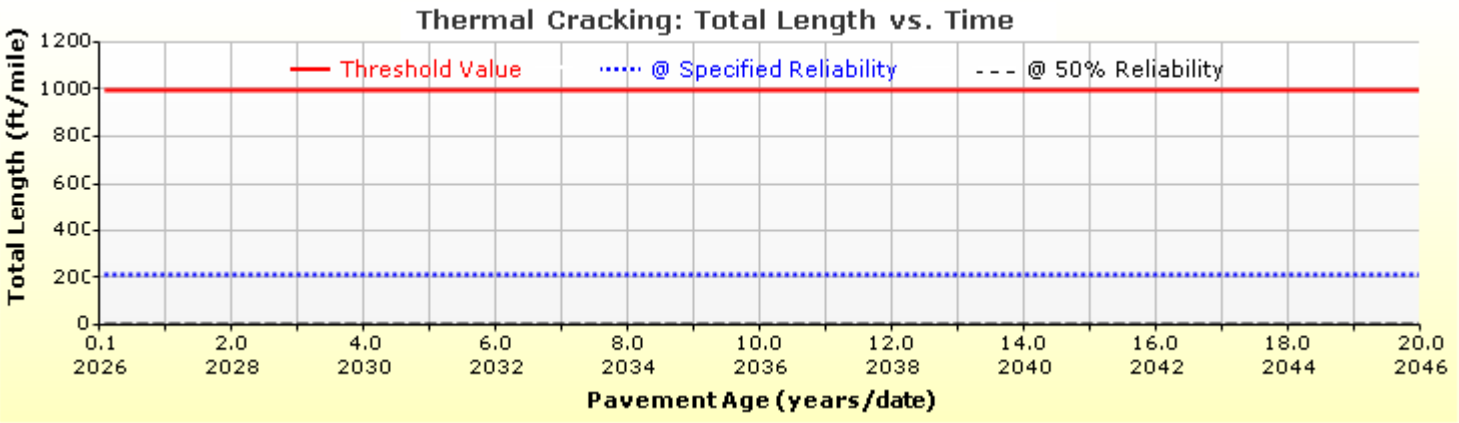


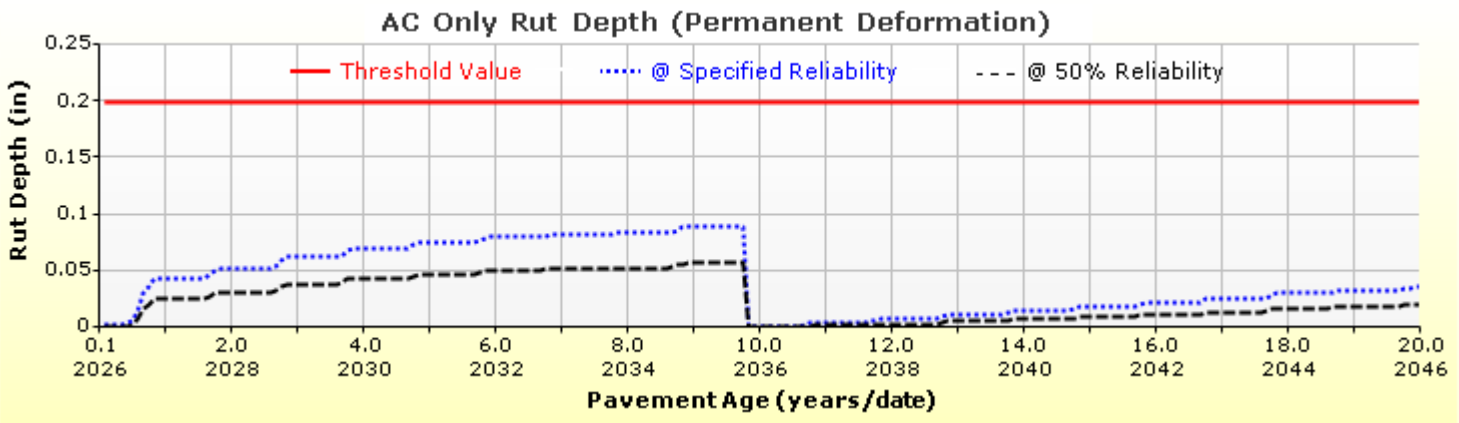


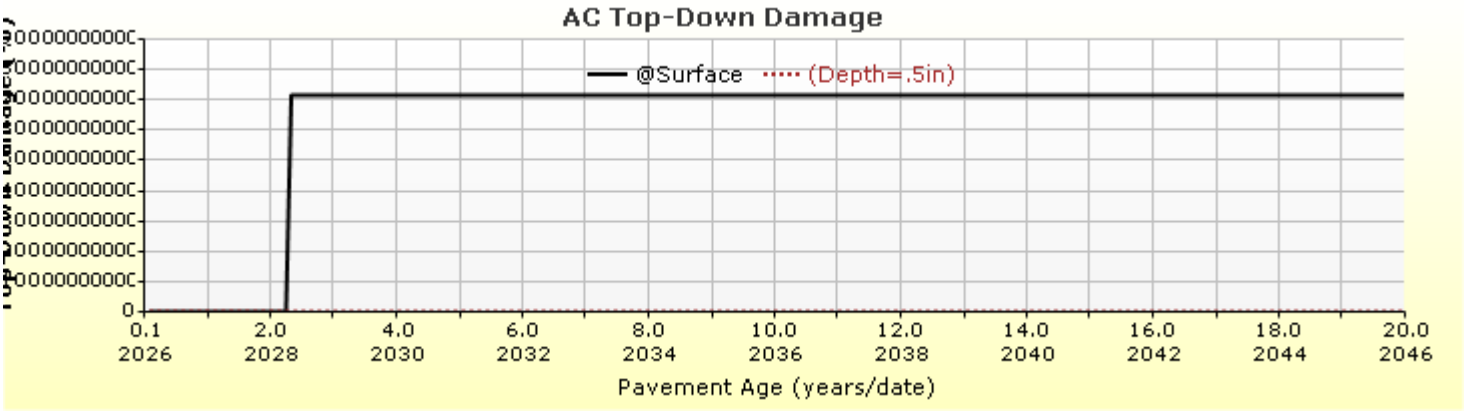
Analysis Output Charts

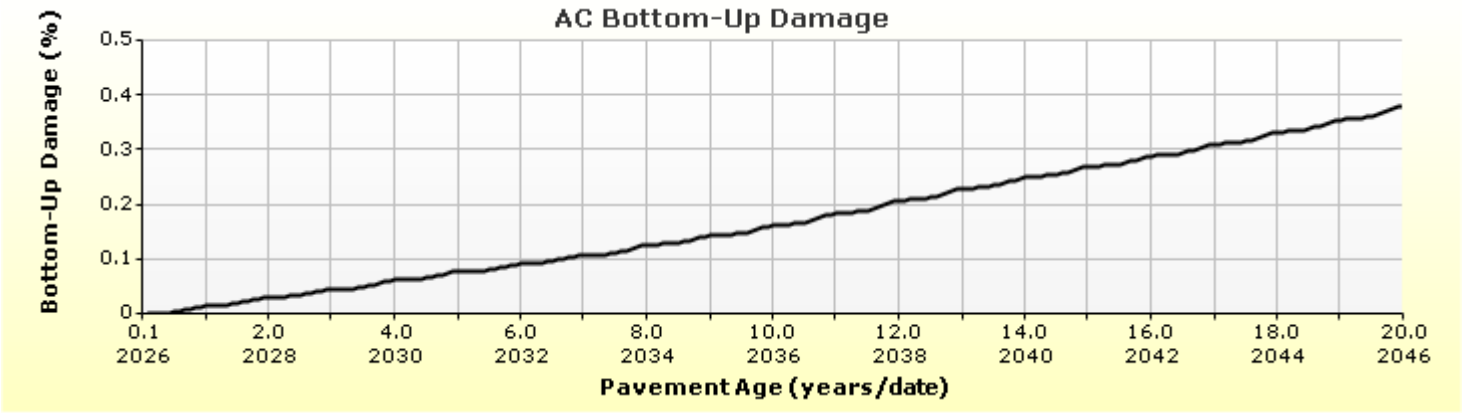


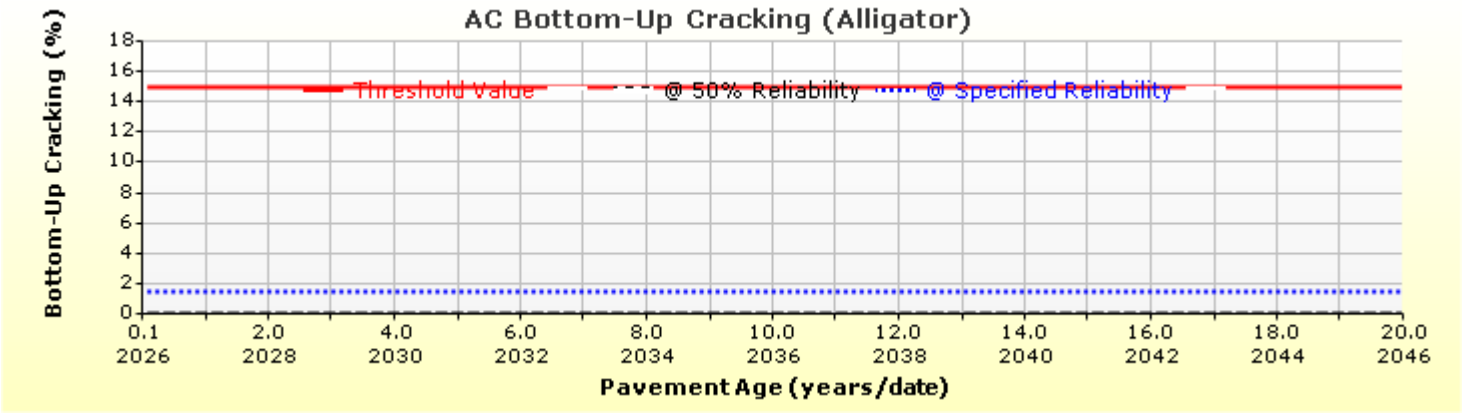


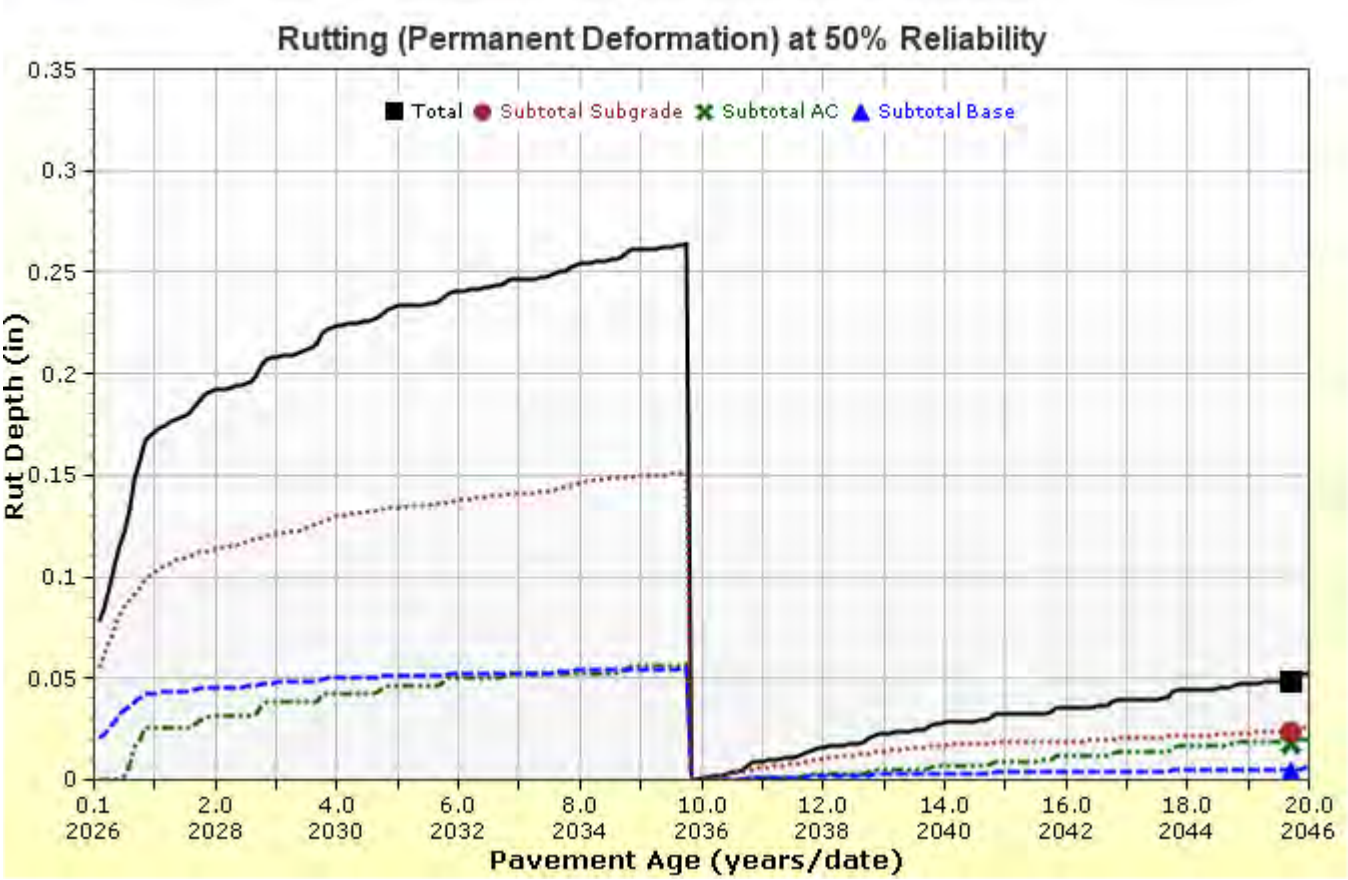


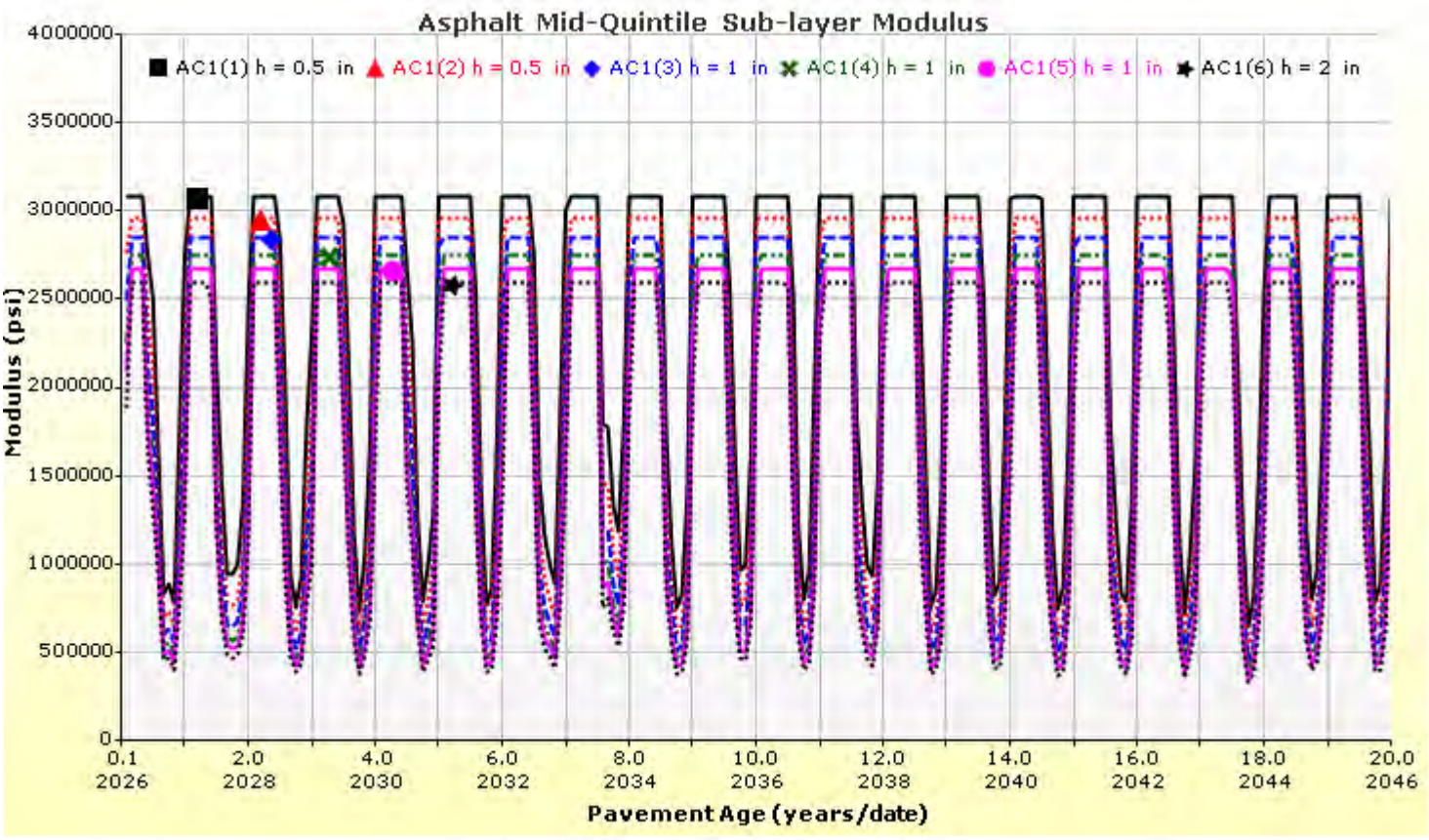


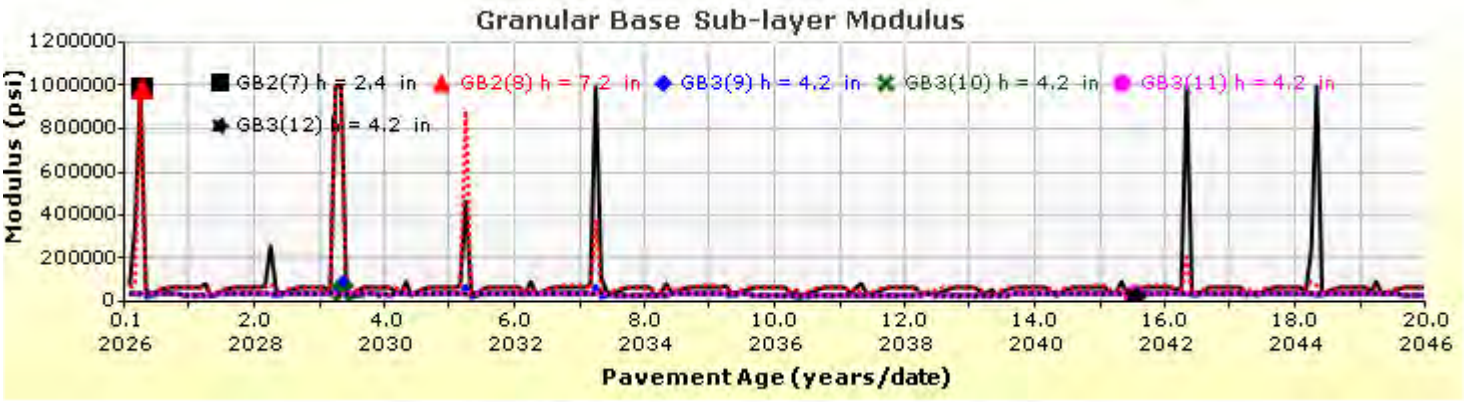

AC Top-Down Damage
@Surface
(Depth=.5in)
Pavement Age (years/date)

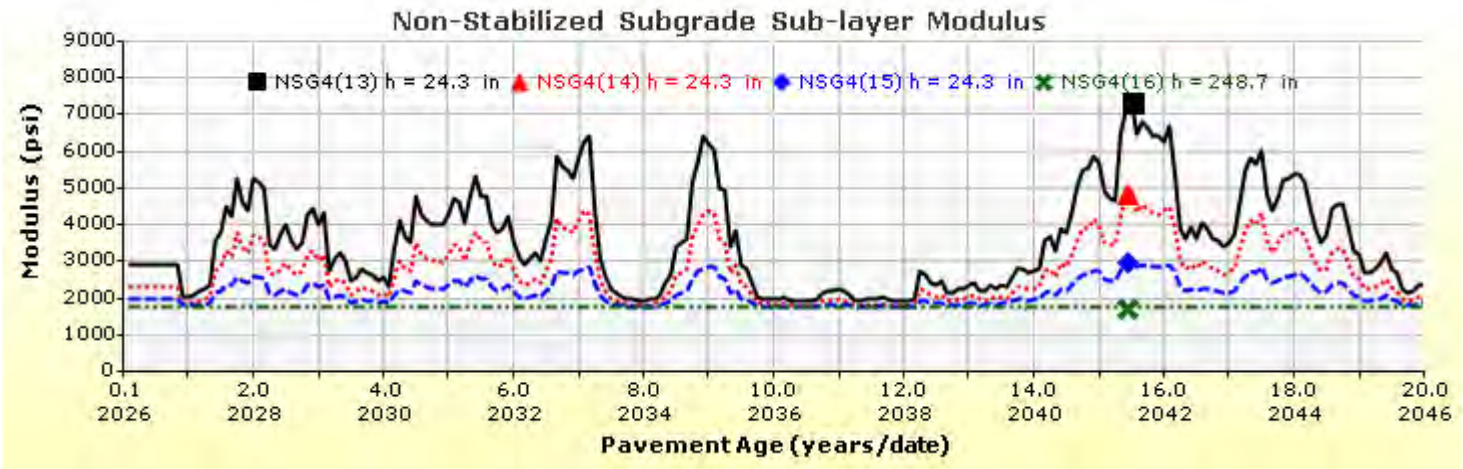

AC Bottom-Up Damage
Bottom-Up Damage (%)
Pavement Age (years/date)


AC Bottom-Up Cracking (Alligator)
Threshold Value
@ 50% Reliability
@ Specified Reliability
Bottom-Up Cracking (%)
Pavement Age (years/date)


Rutting (Permanent Deformation) at 50% Reliability
Total
Subtotal Subgrade
Subtotal AC
Subtotal Base
Rut Depth (in)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Asphalt Mid-Quintile Sub-layer Modulus
AC1(1) h = 0.5 in
AC1(2) h = 0.5 in
AC1(3) h = 1 in
AC1(4) h = 1 in
AC1(5) h = 1 in
AC1(6) h = 2 in
Modulus (psi)
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Granular Base Sub-layer Modulus
GB2(7) h = 2.4 in
GB2(8) h = 7.2 in
GB3(9) h = 4.2 in
GB3(10) h = 4.2 in
GB3(11) h = 4.2 in
GB3(12) h = 4.2 in
Modulus (psi)
1200000
1000000
800000
600000
400000
200000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)


Non-Stabilized Subgrade Sub-layer Modulus
NSG4(13) h = 24.3 in
NSG4(14) h = 24.3 in
NSG4(15) h = 24.3 in
NSG4(16) h = 248.7 in
Modulus (psi)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0.1
2026
2.0
2028
4.0
2030
6.0
2032
8.0
2034
10.0
2036
12.0
2038
14.0
2040
16.0
2042
18.0
2044
20.0
2046
Pavement Age (years/date)

Layer Information

Layer 1 Flexible : New HMA (PG 70-28)

Asphalt		
Thickness (in)	6.0	
Unit weight (pcf)	144.0	
Poisson's ratio	Is Calculated?	False
	Ratio	0.35
	Parameter A	-
	Parameter B	-

Asphalt Dynamic Modulus (Input Level: 3)

Gradation	Percent Passing
3/4-inch sieve	100
3/8-inch sieve	77
No.4 sieve	60
No.200 sieve	6

Asphalt Binder

Parameter	Value
Grade	Superpave Performance Grade
Binder Type	70-28
A	9.715
VTS	-3.217

General Info

Name	Value
Reference temperature (ºF)	70
Effective binder content (%)	11.6
Air voids (%)	7.5
Thermal conductivity (BTU/hr-ft-ºF)	0.67
Heat capacity (BTU/lb-ºF)	0.23

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-28)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	1/1/0001 12:00:00 AM
Approver	
Date approved	1/1/0001 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Layer 2 Non-stabilized Base : Untreated Aggregate Base

Unbound	
Layer thickness (in)	9.6
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
40000.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Untreated Aggregate Base
Description of object	New Untreated Aggregate Base
Author	
Date Created	1/1/0001 12:00:00 AM
Approver	
Date approved	1/1/0001 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.2
Saturated hydraulic conductivity (ft/hr)	False	1.907e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.6

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	5.1359
bf	2.0746
cf	0.7463
hr	112.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	6.0
#100	
#80	
#60	
#50	
#40	
#30	
#20	
#16	
#10	
#8	40.0
#4	55.0
3/8-in.	
1/2-in.	
3/4-in.	95.0
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Layer 3 Non-stabilized Base : Granular Subbase

Unbound	
Layer thickness (in)	16.9
Poisson's ratio	0.35
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
25000.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Granular Subbase
Description of object	New Granular Subbase
Author	
Date Created	1/1/2011 12:00:00 AM
Approver	
Date approved	1/1/2011 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	True

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	127.5
Saturated hydraulic conductivity (ft/hr)	False	2.635e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.4

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	9.9487
bf	1.1708
cf	0.9577
hr	115.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	7.5
#100	
#80	
#60	
#50	
#40	
#30	
#20	
#16	
#10	
#8	
#4	52.5
3/8-in.	
1/2-in.	
3/4-in.	
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	95.0
3 1/2-in.	100.0

Layer 4 Subgrade : Subgrade

Unbound	
Layer thickness (in)	Semi-infinite
Poisson's ratio	0.4
Coefficient of lateral earth pressure (k0)	0.5

Modulus (Input Level: 3)

Analysis Type:	Modify input values by temperature/moisture
Method:	Resilient Modulus (psi)

Resilient Modulus (psi)
5544.0

Use Correction factor for NDT modulus?	-
NDT Correction Factor:	-

Identifiers

Field	Value
Display name/identifier	Subgrade
Description of object	Default material
Author	AASHTO
Date Created	1/1/0001 12:00:00 AM
Approver	
Date approved	1/1/0001 12:00:00 AM
State	
District	
County	
Highway	
Direction of Travel	
From station (miles)	
To station (miles)	
Province	
User defined field 1	
User defined field 2	
User defined field 3	
Revision Number	0

Sieve

Liquid Limit	6.0
Plasticity Index	1.0
Is layer compacted?	False

	Is User Defined?	Value
Maximum dry unit weight (pcf)	True	88.7
Saturated hydraulic conductivity (ft/hr)	False	8.101e-02
Specific gravity of solids	False	2.7
Water Content (%)	True	18.9

User-defined Soil Water Characteristic Curve (SWCC)	
Is User Defined?	False
af	28.9905
bf	2.7710
cf	0.6334
hr	292.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	96.0
#100	
#80	
#60	
#50	
#40	98.0
#30	
#20	
#16	
#10	
#8	
#4	99.0
3/8-in.	
1/2-in.	
3/4-in.	
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	

Calibration Coefficients

AC Fatigue

$$N_f = 0.00432 * C * \beta_{f1} k_1 \left(\frac{1}{\varepsilon_1}\right)^{k_2\beta_{f2}} \left(\frac{1}{E}\right)^{k_3\beta_{f3}}$$

$$C = 10^M$$

$$M = 4.84\left(\frac{V_b}{V_a + V_b} - 0.69\right)$$

k1: 3.75	
k2: 2.87	
k3: 1.46	
Bf1: (5.014 * Pow(hac,-3.416)) * 1 + 0	
Bf2: 1.38	
Bf3: 0.88	

AC Rutting

$$\frac{\varepsilon_p}{\varepsilon_r} = k_z \beta_{r1} 10^{k_1 T^{k_2\beta_{r2}} N^{k_3\beta_{r3}}}$$

$$k_z = (C_1 + C_2 * depth) * 0.328196^{depth}$$

$$C_1 = -0.1039 * H_\alpha^2 + 2.4868 * H_\alpha - 17.342$$

$$C_2 = 0.0172 * H_\alpha^2 - 1.7331 * H_\alpha + 27.428$$

Where:

$$H_{ac} = total\ AC\ thickness(in)$$

$\varepsilon_p = plastic\ strain\left({}^{in}/_{in}\right)$
$\varepsilon_r = resilient\ strain\left({}^{in}/_{in}\right)$
$T = layer\ temperature(^{\circ}F)$
$N = number\ of\ load\ repetitions$

AC Rutting Standard Deviation	0.24 * Pow(RUT,0.8026) + 0.001	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22	Br1:0.3 Br2:0.52 Br3:1.36

Thermal Fracture

$$C_f = 400 * N\left(\frac{\log C / h_{ac}}{\sigma}\right)$$

$$\Delta C = (k * \beta t)^{n+1} * A * \Delta K^n$$

$$A = 10^{(4.389 - 2.52 * \log(E * \sigma_m * n))}$$

$C_f = observed\ amount\ of\ thermal\ cracking(ft/500ft)$
$k = refression\ coefficient\ determined\ through\ field\ calibration$
$N(\,) = standard\ normal\ distribution\ evaluated\ at(\,)$
$\sigma = standard\ deviation\ of\ the \log\ of\ the\ depth\ of\ cracks\ in\ the\ pavments$
$C = crack\ depth(in)$
$h_{ac} = thickness\ of\ asphalt\ layer(in)$
$\Delta C = Change\ in\ the\ crack\ depth\ due\ to\ a\ cooling\ cycle$
$\Delta K = Change\ in\ the\ stress\ intensity\ factor\ due\ to\ a\ cooling\ cycle$
$A, n = Fracture\ parameters\ for\ the\ asphalt\ mixture$
$E = mixture\ stiffness$
$\sigma_M = Undamaged\ mixture\ tensile\ strength$
$\beta_t = Calibration\ parameter$

Level 1 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 1 Standard Deviation: 0.14 * THERMAL + 168
Level 2 K: ((2.591 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 2 Standard Deviation: 0.20 * THERMAL + 168
Level 3 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319)) * 1 + 0	Level 3 Standard Deviation: 0.289 * THERMAL + 168

CSM Fatigue

$$N_f = 10^{\left(\frac{k_1 \beta_{c1} \left(\frac{\sigma_s}{M_r}\right)}{k_2 \beta_{c2}}\right)}$$

$N_f = number\ of\ repetitions\ to\ fatigue\ cracking$
$\sigma_s = Tensile\ stress(psi)$
$M_r = modulus\ of\ rupture(psi)$

k1: 0.972	k2: 0.0825	Bc1: 1	Bc2:1

Unbound Layer Rutting

$$\delta_a(N) = \beta_{s_1} k_1 \varepsilon_v h \left(\frac{\varepsilon_0}{\varepsilon_r}\right) \left| e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right|$$

$\delta_a = permanent\ deformation\ for\ the\ layer$
$N = number\ of\ repetitions$
$\varepsilon_v = average\ veritcal\ strain(in/in)$
$\varepsilon_0, \beta, \rho = material\ properties$
$\varepsilon_r = resilient\ strain(in/in)$

Base Rutting		Subgrade Rutting	
k1: 0.965	Bs1: 0.86	k1: 0.965	Bs1: 0.736
Standard Deviation (BASERUT) 0.1477 * Pow(BASERUT,0.6711) + 0.001		Standard Deviation (BASERUT) 0.1235 * Pow(SUBRUT,0.5012) + 0.001	

AC Cracking

AC Top Down Cracking

$$FC_{top} = \left(\frac{C_4}{1 + e^{(C_1 - C_2 * log_{10}(Damage))}}\right) * 10.56$$

c1: 3.3	c2: 0.825	c3: 0	c4: 1000

AC Bottom Up Cracking

$$FC = \left(\frac{6000}{1 + e^{\left(C_1 * C_1' + C_2 * C_2' log_{10}(D * 100)\right)}}\right) * \left(\frac{1}{60}\right)$$

$$C_2' = -2.40874 - 39.748 * (1 + h_{ac})^{-2.856}$$

$$C_1' = -2 * C_2'$$

c1: 1.31	c2: (0.867 + 0.2583 * hac) * 1 + 0	c3: 6000

Top down AC Cracking Standard Deviation	Bottom up AC Cracking Standard Deviation
200 + 2300/(1+exp(1.072-2.1654*LOG10(TOP+0.0001)))	1.13 + 13/(1+exp(7.57-15.5*LOG10(BOTTOM+0.0001)))

CSM Cracking

$$FC_{ctb} = C_1 + \frac{C_2}{1 + e^{C_3 - C_4 * log_{10}(Damage)}}$$

C1: 0	C2: 75	C3: 2	C4: 2

CSM Standard Deviation
CTB*1

IRI Flexible Pavements

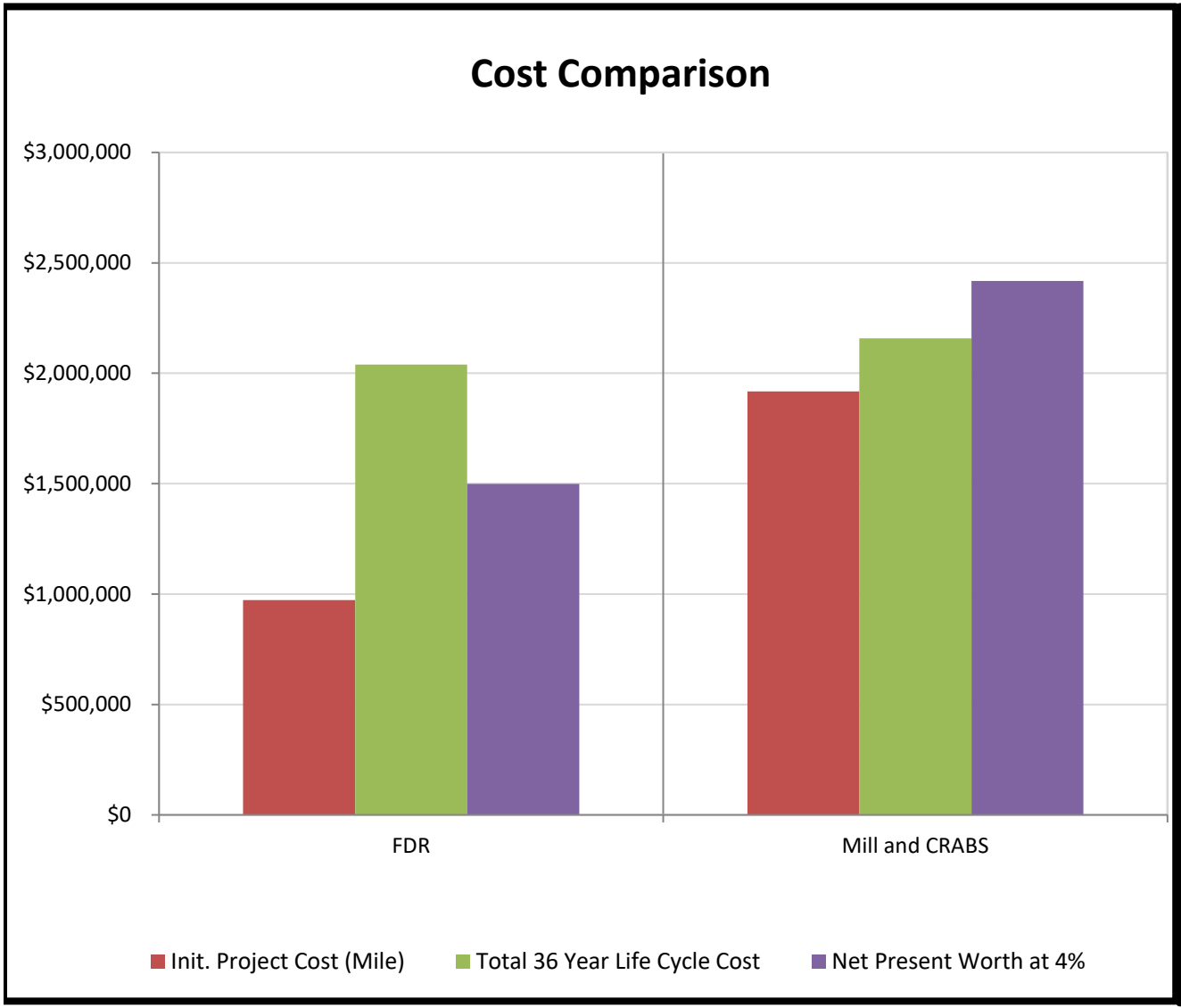
C1 - Rutting
C2 - Fatigue Crack
C3 - Transverse Crack
C4 - Site Factors

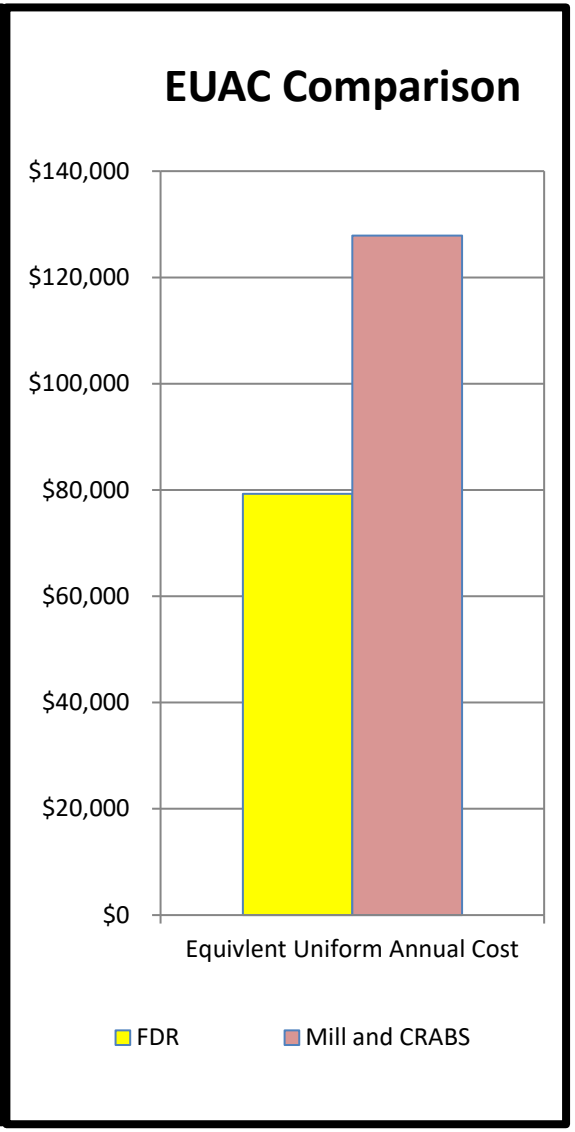
C1: 80	C2: 0.6	C3: 0.008	C4: 0.02

Appendix F

Life-Cycle Cost Analysis

Strategy	Init. Project Cost (Mile)	Total 36 Year Life Cycle Cost	Equivlent Uniform Annual Cost	Net Present Worth at 4%
FDR	$972,500	$2,038,800	$79,300	$1,499,100
Mill and CRABS	$1,917,300	$2,158,233	$127,900	$2,417,800





FLEXIBLE PAVEMENT WORKSHEET

FDR

PROJECT NAME	**US-30, Blue Lakes Blvd to Eastland Dr**
PROJECT NUMBER	**A022(215)**
KEY	**22215**

Material	Depth		Haul		Width		Weight / ft³		Cost	
Hot Mix Asphalt (HMA)	0.40	ft	10.00	mile	60.40	ft	150.00	lb	60.00	/ ton
Untreated Aggregate Base	0.18	ft	10.00	mile	60.98	ft	142.00	lb	15.00	/ ton
Preservation Mill/Inlay	0.15	ft	1.00	mile	60.00	ft				

Project Length	5,280	ft
Travel Lane Width	60.00	ft
Surface Width - Left Side	30.00	ft
Surface Width - Right Side	30.00	ft
Widen Width - Left Side		ft
Widen Width - Right Side		ft
Additional Borrow		cu.yard
Traffic Cross Overs		Ea.
Number of Edge Drains		Ea.
Longitudinal Cracks	1	Ea.
Transverse Cracks	165	/ mile
Foreslope Angle - Left	1	(H): 1(V)
Foreslope Angle - Right	1	(H): 1(V)
Excavation	0.58	ft
Subgrade Sep. Fabric Layer		ft
Future Pavement Geotextile		ft

LIFE CYCLE COST ANALYSIS		STANDARD TIME LINES	1-Dec-20
PROJECT NAME	**US-30, Blue Lakes Blvd to Eastlanc**	36 YEAR LIFE CYCLE	
PROJECT NUMBER	**A022(215)**	UNIFORM PROJECT COSTS PER MILE	
KEY	**22215**	(English units)	

FDR

YEAR		WORK	COST	PRESENT WORTH FACTOR	CAPITAL RECOVERY FACTOR	EQUIVALENT UNIFORM ANNUAL COST
0	-->	Initial Cost	$972,500	1.000	0.0529	$51,400
-						
-						
-						
-						
5						
-						
-						
-	-->	Seal Coat Driving Lanes	$91,500	0.731	0.0529	$3,500
-						
10						
-						
-	-->	Preservation Mill/InLay Year 12	$342,500	0.625	0.0529	$11,300
-						
-						
15	-->	Seal Cracks	$17,800	0.555	0.0529	$500
-						
-						
-	-->	Transverse Cracks	$17,800	0.494	0.0529	$500
-	-->	Seal Coat Driving Lanes	$91,500	0.475	0.0529	$2,300
20						
-	-->	Seal Cracks	$17,800	0.439	0.0529	$400
-						
-						
-	-->	Preservation Mill & Inlay-Year 24	$342,500	0.390	0.0529	$7,100
25						
-						
-	-->	Seal Cracks	$17,800	0.347	0.0529	$300
-						
-						
30	-->	Seal Cracks	$17,800	0.308	0.0529	$300
-	-->	Seal Coat Driving Lanes	$91,500	0.297	0.0529	$1,400
-						
-	-->	Seal Cracks	$17,800	0.274	0.0529	$300
-						
35						
-	-->	End Life - Salvage Value	$0	0.244	0.0529	$0
		TOTAL	$2,038,800		EUAC ----->	$79,300
				Total Net Present Worth @ 4%		$1,499,100

12/1/2020

LIFE CYCLE COST ANALYSIS
US-30, Blue Lakes Blvd to Eastland Dr
A022(215)
FDR

COST PER MILE SUMMARY:

INITIAL CONSTRUCTION:		
	Hot Mix Asphalt (HMA)	$717,600
	Untreated Aggregate Base	$123,400
	Traffic Cross Overs	$0
	Excavation	$40,000
	Additional Borrow	$0
	Edge Drains	$0
	Seal Coat at Year 1	$91,500
	Subgrade Sep. Fabric Layer	$0
TOTAL INITIAL		$972,500
	Seal Coat Full Width	$91,500
	Seal Driving Lanes	$91,500
	Seal Cracks	$17,800
PRESERVATION AT 12 YEARS:		
	Coldmill travel lanes	$19,400
	Hot Mix Asphalt Inlay	$213,800
	Seal coat full width	$91,500
	Seal cracks	$17,800
TOTAL 12 YEAR PRESERVATION		$342,500
PRESERVATION AT 24 YEARS:		
	Coldmill travel lanes	$19,400
	Hot Mix Asphalt inlay	$213,800
	Pavement Geotextile	$0
	Seal coat full width	$91,500
	Seal cracks	$17,800
TOTAL 24 YEAR PRESERVATION		$342,500
TOTAL 36 YEAR LIFE CYCLE COST (from Time Line Chart)		$2,038,800
EQUIVALENT UNIFORM ANNUAL COST (euac)		$79,300
TOTAL NET PRESENT WORTH AT 4% INTREST		$1,499,100

FLEXIBLE PAVEMENT WORKSHEET

Mill and CRABS

PROJECT NAME	**US-30, Blue Lakes Blvd to Eastland Dr**
PROJECT NUMBER	**A022(215)**
KEY	**22215**

Material	Depth		Haul		Width		Weight / ft³		Cost	
Hot Mix Asphalt (HMA)	0.40	ft	10.00	mile	60.40	ft	150.00	lb	60.00	/ ton
CRABS (2% Cement)	0.67	ft	10.00	mile	61.47	ft	132.00	lb	4.00	/ sq.yard
Coldmill	0.20		10.00	mile	60.00	ft				
Preservation Mill/Inlay	0.15	ft	10.00	mile	60.00	ft				#N/A

Project Length	5,280	ft
Travel Lane Width	60.00	ft
Surface Width - Left Side	30.00	ft
Surface Width - Right Side	30.00	ft
Additional Borrow		cu.yard
Traffic Cross Overs		Ea.
Number of Edge Drains		Ea.
Longitudinal Cracks	1	Ea.
Transverse Cracks	100	/ mile
Foreslope Angle - Left	1	(H): 1(V)
Foreslope Angle - Right	1	(H): 1(V)
Excavation		ft
Subgrade Sep. Fabric Layer		ft
Pavement Geotextile		ft
Estimated Salvage Value		$/t

LIFE CYCLE COST ANALYSIS		STANDARD TIME LINES	1-Dec-20
PROJECT NAME	**US-30, Blue Lakes Blvd to East**	36 YEAR LIFE CYCLE	
PROJECT NUMBER	**A022(215)**	UNIFORM PROJECT COSTS PER MILE	
KEY	**22215**	(English units)	

Mill and CRABS

YEAR		WORK	COST	PRESENT WORTH FACTOR	CAPITAL RECOVERY FACTOR	EQUIVALENT UNIFORM ANNUAL COST
0	-->	Rehab Initial Cost	$1,917,300	1.000	0.0529	$101,400
-	-->	Seal Coat Full Width	$91,500	0.962	0.0529	$4,700
-						
-	-->	Seal Cracks	$13,200	0.889	0.0529	$600
-						
5						
-	-->	Seal Cracks	$13,200	0.790	0.0529	$600
-	-->	Seal Coat Full Width	$91,500	0.760	0.0529	$3,700
-						
-	-->	Seal Cracks	$13,200	0.703	0.0529	$500
10						
-						
-	-->	Mill & Inlay Travel Lane	$337,900	0.625	0.0529	$11,200
-						
-						
15	-->	Seal Cracks	$13,200	0.555	0.0529	$400
-						
-						
-	-->	Seal Cracks	$13,200	0.494	0.0529	$300
-	-->	Seal Coat Driving Lanes	$91,500	0.475	0.0529	$2,300
20						
-	-->	Seal Cracks	$13,200	0.439	0.0529	$300
-						
-						
-	-->	24 Year Reconst Cost	$972,500	0.390	0.0529	$20,100
25						
-						
-						
-						
-						
30						
-						
-	-->	Seal Coat Driving Lanes	$91,500	0.285	0.0529	$1,400
-						
-						
35						
-	-->	End Life - Salvage Value	($1,514,667)	0.244	0.0529	($19,600)
		TOTAL	$2,158,233		EUAC ----->	$127,900
				Total Net Present Worth @ 4%		$2,417,800

12/1/2020

LIFE CYCLE COST ANALYSIS
US-30, Blue Lakes Blvd to Eastland Dr
A022(215)
Mill and CRABS

COST PER MILE SUMMARY:

INITIAL CONSTRUCTION:		
	Hot Mix Asphalt (HMA)	$717,600
	CRABS (2% Cement)	$1,108,200
	Traffic Cross Overs	$0
	Coldmill	$0
	Excavation	$0
	Additional Borrow	$0
	Edge Drains	$0
	Seal Coat at Year 1	$91,500
	Subgrade Sep. Fabric Layer	$0
	Pavement Geotextile	$0
TOTAL INITIAL		$1,917,300
PERIODIC MAINTENANCE		
	Seal Coat Full Width	$91,500
	Seal Driving Lanes	$91,500
	Seal Cracks	$39,600
PRESERVATION AT 12 YEARS:		
	Coldmill travel lanes	$19,400
	Hot Mix Asphalt Inlay	$213,800
	Seal coat full width	$91,500
	Seal cracks	$13,200
TOTAL 12 YEAR PRESERVATION		$337,900
PERIODIC MAINTENANCE		
	Seal Driving Lanes	$183,000
	Seal Cracks	$39,600
RECONSTRUCTION AT 24 YEARS		$972,500
SALVAGE VALUE (79%)		($1,514,667)
TOTAL 36 YEAR LIFE CYCLE COST (from Time Line Chart)		$2,158,233
EQUIVALENT UNIFORM ANNUAL COST (euac)		$127,900
TOTAL NET PRESENT WORTH AT 4% INTREST		$2,417,800

Appendix G

ITD's Comments and AGEO Response

Summary of Comments on 03393 - US-30 Blue Lakes to Eastland- Roadway Materials Report Draft_t1 ISSUED 12-14-2020 with ITD review.pdf

Page: 7

Author: thitchcock

ADA ramps will need to be done on this project, does this materials report need to address anything in regards to that?

AGEO Response: ADA ramps was not part of our scope of work, Normally Roadway Materials Reports do not address ADA ramp requirements. We can mention the ADA ramps in the introduction if ITD would prefer. The report was left unchanged.

Author: thitchcock

Actually, this project is intended to be a reconstruct. Base is anticipated to be reconstructed as well. I take it no samples/analysis was done on the base? If not, I think it would be beneficial to look into replacing the base.

AGEO Response: Lynn White stated that reconstruction was not part of the project charter. This part of the report was left unchanged. However, a flexible reconstruction design was added to the report in the appropriate sections.

Author: lwhite

We need to discuss the reconstruction option at ITD. Reconstruction is not in the project charter.

AGEO Response: No response necessary.

Page: 9

Author: lwhite

If we are just reconditioning the base, why is there mention of Granular Subbase

AGEO Response: The report was updated to remove the reuse of existing materials for granular subbase.

Page: 10

Author: lwhite

Should be Schedule I even though the design speed is low. Heavy truck traffic bouncing on pavement does quite a bit of damage to pavements, and we suspect many, many trucks on this section are already overweight.

AGEO Response: AGEO agrees, the smoothness schedule was changed to schedule I in the report.

Author: lwhite

Remove Granular Base if it is not part of this project

AGEO Response: The report was updated to remove granular subbase.

Page: 11

Author: lwhite

There is also a recommendation for the prime coat on the base. Please clarify so the designer can quantify # of applications of tack/prime coat

AGEO Response: The report was updated for a prime coat application on the base and a tack coat application between the HMA layers.

Page: 67

Author: lwhite

First time I've seen ASTM D6433. It's OK to follow along. Not sure that I really like it but it is pretty objective so I'll go with this

AGEO Response: No response necessary.