

DATE: January 17, 2023

JESSE BARRUS, P.E

&TO: DE 4

FROM: LYNN WHITE, P.E. MTLS E4 Program Number(s) A022(210)

Key Number(s) 22210

Program ID, County, Etc. US-93, MAIN ST, KETCHUM, BLAINE CO WA P204360

RE: FINAL ROADWAY MATERIALS REPORT (Materials Phases I(R)-II-III)

Your approval of the Final Roadway Materials Reports report is requested.

The scope of this project is the rehabilitation of SH-75 from MP 128.2 to MP 129.7. This report was prepared before the project was funded and assigned an official name. Therefore, the key number and project name on the report cover is different.

The report was prepared by Shannon Wilson (Formerly "*American Geotechnics*"), and is dated November 27, 2019.

Approval Recommended by

Insulito

District Materials Engineer

1-17-2023

Date

Report Approved by:

District Engineer

Date



Roadway Materials Report

(Materials Reports Phases I(R)-II-III)

State, FY19 D4 Materials Reconnaissance

(SH-75, River St to Clubhouse Dr)

Ketchum, Blaine Co., Idaho

ITD Key No. 18815

Prepared for: Idaho Transportation Department

November 27, 2019

November 27, 2019 File No 03224



Idaho Transportation Department, District 4 216 South Date St. Shoshone, ID 83352

Attention: Lynn White, P.E.

Roadway Materials Report

Materials Reports Phases I(R)-II-III

State, FY19 D4 Materials Reconnaissance

(SH-75, River St to Clubhouse Dr)

Ketchum, Blaine Co., Idaho

ITD Key No. 18815

Prepared by:

American Geotechnics



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 ITD FWD Data & ELMOD Back-Calculation Results
 Pavement Structure Layers Statistics
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- F AASHTOWare Pavement ME Results: Asphalt Removal and Replacement
 Flexible Reconstruction
 LTPPBind output



100.00 SUMMARY

100.01 Pavement Report

This pavement report includes the following sections prepared in general accordance with the *Idaho Transportation Department (ITD) Materials Manual* (ITD 2019).

- Section 100 Summary, offering an overview of the investigation
- Section 540 Pavement Structure Analysis, covering detailed engineering and economic considerations for the roadway rehabilitation
- Section 230 Soils, covering soil and rock conditions along the length of the project and geotechnical recommendations that may affect the project development
- Section 240 Pavement Estimating, identifying materials and providing estimating data necessary to develop plan quantities and cost estimates

This report covers the essential roadway components of the ITD Phase I(R), II, and III materials investigations process for development of a pavement rehabilitation strategy.

100.02 Purpose and Scope

This Pavement Investigation Report describes American Geotechnics' observations, field explorations, laboratory testing, and materials recommendations for about 1.5 miles of SH-75 from River St (Mile Post (MP) 128.2) to Clubhouse Dr (MP 129.7) in Ketchum, Idaho. Appendix A includes a vicinity map, site photographs, pavement condition survey, and a geologic map.

ITD classifies this segment of SH-75 as a rural minor arterial. The posted speed limit is 25 mph within the City limits and up to 65 mph beyond the City limits. The roadway consists of two to four lanes with intermittent curb, gutter, guardrail, parking, sidewalks, and residential approaches, which are mostly within the City of Ketchum. The existing lanes are 12 feet wide and are asphalt concrete (AC). Additionally, there are existing 8-foot wide parallel parking adjacent to the existing curb between River St and 10th St. The shoulder widths vary throughout the project.



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Due to the resort culture demanding minimal construction duration and minimal impact to the public, CRABS unacceptable rehabilitation alternative. Portland Cement Concrete replacement reconstruction is also unacceptable because of long cure time, poor detour route, and white concrete taking longer for snow to melt.

100.03 Summary of Recommendations

The project was divided into two segments because the existing FWD was only collected in SH-75 from River St to Saddle St. Thus, this SH-75 project was separated into Segment 1: River St (MP 128.2) to Saddle Rd (MP 129.3) and Segment 2: Saddle Rd (MP 129.3) to Clubhouse Dr (MP 129.7) where FWD was not collected. The design alternatives evaluated for each segment include:

- Full-Depth Asphalt Concrete Removal and Replacement
- Flexible Reconstruction

Based on the benefits listed in Section 540.05 Recommendations, American Geotechnics recommends *Full-Depth AC Removal and Replacement* for this project. This alternative includes the full removal of the existing AC, supplementing the existing base layer with new untreated aggregate base material as needed, and then tight grading and compacting to the required final base layer lines and grades, and placement of the new HMA surface course. Based on the analyses using AASHTOWare Pavement ME software, the anticipated service interval for this design alternative is 20 years. The following tables summarizes the design recommendations for this alternative.



Recommended Full-Depth AC Removal and Replacement (River St to Saddle Rd) **Design (20-Year Analysis) Pavement Design Element** Thickness (feet) Remove Existing AC (Average) 0.57 HMA (PG 70-34) 0.50 0.07 (1) 3/4" Untreated Aggregate Base, Type "B" (leveling course) 0.71 Average Undisturbed Existing Base/Subbase 0.00

Estimated Rise in Existing Roadway Profile

¹ 0.07 is the average leveling course thickness. The leveling course thickness may range from 0.00 feet to 0.50 feet thick.

Recommended Full-Depth AC Removal and Replacement (Saddle Rd to Clubhouse Dr) Design (20-Year Analysis)				
Pavement Design Element Thickness (feet)				
Remove Existing AC (Average)	0.79			
HMA (PG 70-34)	0.50			
³ / ₄ " Untreated Aggregate Base, Type "B" (leveling course)	0.29 (1)			
Average Undisturbed Existing Base/Subbase	1.06			
Estimated Rise in Existing Roadway Profile 0.00				
¹ 0.29 is the average leveling course thickness. The leveling course thickness may range from 0.07 feet to 0.64 feet thick.				



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540.00 PAVEMENT STRUCTURE ANALYSIS

540.01 Introduction

See Section 100.02 Purpose and Scope.

540.02 Methodology

Mechanistic-Empirical (ME) analyses and ITD design methodology (ITD 2014, 2015) were used to evaluate the existing pavement layers and design the rehabilitation recommendations.

The ME approach for this project was coupled with pavement borings, pavement deflection measurements from a falling weight deflectometer (FWD) and ground imaging from ground-penetrating radar (GPR).

540.03 Existing Pavement Conditions

Site Geology

The project area lies within the alluvial gravel deposits mapped as "Gravel terrace deposits of Big Wood River (Pleistocene)" and "Gravel deposits of side streams (Pleistocene)" in 2006 by the Idaho Geological Survey (Breckenridge and Othberg). The fluvial channel gravels are described as pebbly and cobbly, sandy gravels, sub angular to rounded clasts, deposited as glacial outwash. Finer surface material deposited from slope processes and smaller tributaries need to be identified. Appendix A contains a geological map for the area.

Construction History

According to ITD records, this segment of SH-75 was originally constructed in 1934. This project's roadway segment was overlaid in 1975 and 1992. A minor widening project was also done in 1992. There have been multiple maintenance interventions done on the roadway, with the last seal coat applied in 2011.

Visual Pavement Distress Survey

American Geotechnics performed a pavement distress survey for the project in July 2019, to identify pavement distresses in general accordance with the FHWA *Distress Identification Manual for the Long-Term Pavement*



Performance Program (FHWA 2014). The following table presents the dominant distresses observed during the visual pavement distress survey.

2019 Dominant Pavement Distresses					
Distress Type Severity Notes					
Fatigue (Alligator) Cracking	None				
Longitudinal Cracking – Wheel Path	Low to Med	10 to 90% of wheel path length; open and sealed cracks			
Longitudinal Cracking – Non Wheel Path	Low to Med	10 to 90% of line length; open and sealed cracks			
Transverse Cracking	Low to High	Spaced at 20- to 100-foot intervals; open and sealed cracks			
Surf	ace Deform	ation			
Bleeding	Med	In the wheel path			
Rutting	Med to High	Depths from 1/2" up to 2"			
Patching	Low to Med	Up to 15% of the wheel path			

ITD Pavement Condition Survey

Standardized pavement surface condition indices are routinely recorded along Idaho roadways describing pavement cracking, roughness, and rutting (ITD 2012), as part of ITD's Transportation Asset Management System (TAMS). The indices provide evidence to pavement engineers as to possible underlying causes of pavement failure. The tables below list ITD index threshold values (ITD 2017, *Pavement Performance Report*) for highway roads and the 2018 ITD TAMS data.

The ITD index threshold values indicate the project roadways have good to poor cracking, roughness is poor, and rutting is fair in the left wheel path and good in the right wheel path.

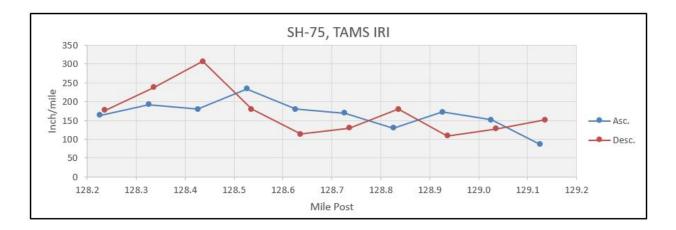


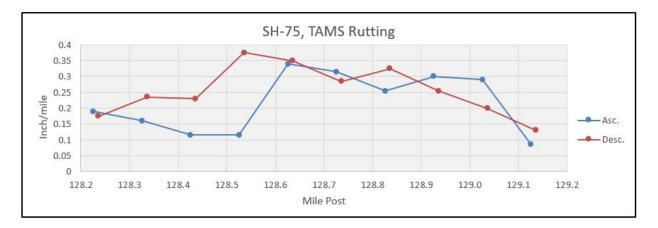
Pavement Condition Thresholds for ITD Highways (Flexible Pavement)				
Pavement		Thresholds		
Condition	Cracking Index	Roughness Index	Rutting	
Good	> 3.0	> 3.0	0.00" to 0.24"	
Fair	2.5 to 3.0	2.5 to 3.0	0.25" to 0.49"	
Poor	2.0 to 2.49	2.0 to 2.49	0.50" to 0.74"	
Very Poor	< 2.0	< 2.0	≥0.75″	

2018 TAMS Data						
	Cracking Index	Roughness Index ⁽¹⁾	Rutting (in.)			
Roadway Segment	(CI)		Left WP	Right WP		
MP 128.22 to 128.54	3.50	2.19	0.32 in.	0.11 in.		
MP 128.54 to 129.12	2.00	2.14	0.39 in.	0.12 in.		
MP 129.12 to 132.00	2.00	2.95	0.20	0.06		
¹ The following equation was used to convert International Roughness Index (IRI) data to ITD Roughness Indices (RI): RI=0.8722 e^(0.3863*5.075e^(-0.00455*IRI).						



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Based on the above thresholds values and the TAMS data, the existing pavement surface classifies as "Poor."

Borings

Seven roadway borings spaced from 500 feet to about 2,300-foot apart in the southbound lane were advanced to a depth of about 6 feet using the American Geotechnics drill rig. The purposes of the borings were twofold:

- 1. Provide an opportunity to examine the condition and quality of the buried materials and the nature of the native subgrade
- 2. Identify the near-surface bedrock or ground water, if encountered

Appendix B contains an Exploration Location Map, together with the boring logs and AC core photographs.

Bedrock was not encountered in any of the borings and groundwater was not encountered at the time of drilling.



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The boring logs were updated to include laboratory ASTM classification information. Laboratory test reports are in Appendix C.

Project Segmentation

The project roadway was divided into two segments because FWD was only collected in SH-75 from River St to Saddle St. Thus, this SH-75 project was separated into Segment 1: River St (MP 128.2) to Saddle Rd (MP 129.3) where FWD was collected and Segment 2: Saddle Rd (MP 129.3) to Clubhouse Dr (MP 129.7) where FWD was not collected.

GPR Pavement Structure Layer Imaging

American Geotechnics collected ground penetrating radar (GPR) images on June 6, 2019, to supplement boring explorations. A short-pulse GPR imaging system was used in general accordance with ASTM D4748 (2006). The components of the American Geotechnics GPR system include a controller and two antennas. The 2 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 design.

To assess pavement layer thicknesses and variability in the project roadway segment, the GPR data, when tied to the subsurface boring measurements, enabled a substantial understanding of the variability of the roadway pavement structure layers. Pavement structure layer data was evaluated from scans obtained at 4-inch intervals along the length of the roadway, with 512 samples per scan. As a result, this investigation provided over 12.1 million sample data points for this project. The following table summarizes the GPR results.

Pavement Layer Statistics using GPR					
		Thickne	ess (feet)		
Layer	Minimum	Mean	Maximum	Standard Deviation	
Segment 1. SH-7	75, River St to	Saddle Rd (N	IP 128.2 to MP	129.3)	
AC	0.25	0.57	1.07	0.13	
Base	0.02	0.18	0.60	0.08	
Subbase	0.01	0.52	1.33	0.18	



Pavement Layer Statistics using GPR					
		Thickne	ess (feet)		
Layer	Minimum	Mean	Maximum	Standard Deviation	
Segment 2. SH-75,	Saddle Rd to	Clubhouse Dr	(MP 129.3 to I	MP 129.7)	
AC	0.57	0.79	1.14	0.11	
Base	0.03	0.16	0.43	0.04	
Subbase	0.05	0.90	1.38	0.25	

Appendix D contains the GPR results for the existing pavement structure profile and statistics.

The GPR layer thicknesses were used as part of ME based analyses to backcalculate pavement structure layer moduli or stiffness at each FWD test location.

FWD Deflections and Layer Moduli

ITD provided the project's FWD deflection data with tests performed at approximately 250-feet intervals in both the ascending (northbound) and the descending (southbound) travel lanes' outside wheel path on September 5, 2019. After reviewing the deflection data and anticipated truck load limits, American Geotechnics selected the 12,000-lb drop load from each test sequence for analyses. All deflections were normalized to the 12,000-lb target load.

ELMOD6 software was used to facilitate the backcalculation of elastic moduli for the existing pavement layers. The following table shows the backcalculated moduli of the existing pavement structure. Appendix D includes the ELMOD backcalculation results.



Backcalculated Layer Elastic Moduli for Existing Pavement Layers						
LayerAscending. Mean (ksi)Descending Mean (ksi)Average (ksi)Average Standard Deviation						
AC ⁽¹⁾	334.7	385.8	360.3	190.4		
Base/Subbase	32.4	34.8	33.6	17.9		
Subgrade 18.6 21.2 19.9 7.7						
¹ Adjusted to Reference Condition (70° F).						

In all, the backcalculation results appeared to be plausible and had reasonable root mean square (RMS – quality check) error values.

Design C-Value

If the layer design resilient (or elastic) modulus values are backcalculated from FWD deflection basin tests, AASHTO guidelines require those values to be adjusted to laboratory conditions (AASHTO 2015). A ratio of the laboratory tested resilient modulus, M_r, to the backcalculated elastic modulus, E_{FWD}, or C-Value (M_r/E_{FWD}), is used to adjust the backcalculated moduli obtained from FWD deflection data for base and subgrade materials. The following table presents default, or input Level 3, C-Values applicable to the project to be used with layer elastic modulus values obtained from backcalculated FWD data. These values are also direct input values in the AASHTOWare Pavement ME software for design when FWD testing is performed.

Summary of Default C-Values for Use with Backcalculated Moduli ⁽¹⁾					
Layer Type	Location C-Value or Mr/E _{FWD} Rat				
Aggregate Base/Subbase	Below an HMA Layer	0.62			
Subgrade/Embankment Below an Unbound Aggregate Base 0.35					
¹ Manual of Practice, Table 10-8 (AASHTO 2015)					



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As shown above, the default C-Values suggested for design for some materials, especially subgrade soils below an unbound aggregate base, significantly reduce the E_{FWD} values. Some evidence shows these default C-Values to be overconservative (Baladi 2009).

To obtain a basic knowledge of the engineering properties of the materials that will affect the design, undisturbed samples (such as those obtained with thin wall samplers) should be taken, if possible (Von Quintas 1997). American Geotechnics collected thin-walled, subgrade samples adjacent to Borings AG-04. The purpose in collecting the subgrade sample was to investigate an opportunity to site calibrate the design C-Value for this roadway segment by testing an in-situ sample.

American Geotechnics performed resilient modulus testing in general accordance with AASHTO T307 procedures to represent the project subgrade. The testing included a series of 15 sequences of dynamic triaxial loading applications at various stress states per the AASHTO T307 procedure (AASHTO 1999). Linear regression analyses of the measured data determined the nonlinear elastic parameters (k₁, k₂, and k₃) used for the generalized resilient modulus model (AASHTO 2015).

To determine the in-situ resilient (or elastic) modulus from laboratory test results, the actual lateral and vertical stresses must be known and include the at-rest earth pressures (Von Quintas 1997). WinJULEA, a layered elastic analysis software, enabled evaluation of these stress values, and estimated stress states were evaluated for the subgrade condition. These values were then applied to the generalized resilient modulus model to determine a representative resilient modulus value for the subgrade soil.

To evaluate a project specific C-Value for design, the calculated subgrade resilient modulus value was compared to the backcalculated elastic value at the sample location. The following table summarizes the results from this analysis. Appendix C contains a C-Value summary report.



Summary of Design C-Value Evaluation Results					
Average Backcalculated Elastic Modulus at AG- 04 EFWD (ksi)Subgrade Resilient Modulus, Mr (ksi)C-Value or Mr/EFWD RatioDesign Resilient Moduli (ksi)					
19.9	13.8	0.84	16.7		

Based on our analyses, the design C-Value for the project increased through use of project samples for resilient modulus evaluation.

540.04 Analyses and Design

American Geotechnics used the AASHTOWare Pavement ME Design version 2.5.4 software for the pavement analysis and design (AASHTO 2019). The ME methodology uses physical material properties and theoretical models to predict stresses and strains from measurements obtained using a FWD.

Traffic Load

ITD planning provided traffic data in terms of ESALs (ITD 2019). The 20year calculated flexible equivalent single axle loads (ESALs) of 11,717,490. American Geotechnics installed traffic counters and collected traffic data from July 1st to July 17th 2019 to determine vehicle class distribution. The annual growth rate was adjusted to achieve the 20-year calculated ESALs in the ME analyses.

Appendix E contains the traffic data, truck class percentages, together with the traffic data summary.

Axle load distribution data was obtained from the Primary Loaded Truck Group (ITD 2014).

The standard deviation for design lane wander is +/- 10 inches (ITD 2012). Design truck tire pressure is 120 psi (ITD 2012). For the various strategies, detailed traffic input is contained within each of the ME output summaries in the appendices. Traffic inputs are based on the Idaho AASHTOWare Pavement ME Design User's Guide Version 1.1 (ITD 2014).

Climate

The project is situated at Latitude 43.68 and Longitude -114.36, with an elevation of about 5850 feet.



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For ME analyses, multiple local weather stations with similar elevations were selected using the Pavement ME software and provided detailed climate data to predict influence of local climate on the pavement structure.

For the various strategies, climate input is summarized within each of the ME analysis report summaries in the appendices.

Frost

Project subgrade soils generally classified as A-1-b Silty Soils and as A-2 and A-6 Clayey Soils. The subgrade has F4 frost susceptibility characteristics, as classified by the United States Army Corps of Engineers (US DOD 2001). Typical frost penetration is about 30 inches BGS at the project location. For partial-frost design over frost susceptible subgrades, US DOD recommends the total pavement structure be at least 70 percent of the typical frost penetration depth which is 21 inches.

Pavement Layer Design Elastic Moduli

The following table summarizes the elastic moduli for each pavement structure layer used in the AASHTOWare Pavement ME.

Pavement Layer Design Moduli						
Layer	Design Elastic Moduli (ksi)					
Untreated Aggregate Base	35.0					
Granular Subbase	25.0					
Existing Aggregate Base/Subbase	23.3 ⁽¹⁾					
Subgrade	16.7 ⁽²⁾					

¹ Existing base and subbase moduli were adjusted using a C-Value of 0.62 X (1.15 Base stiffening) in the AASHTOWare Pavement ME analyses, per AASHTO guidelines (AASHTO 2015).

² Backcalculated modulus values for existing subgrade soils were adjusted using C-Value of 0.84 in the AASHTOWare Pavement ME analyses.

The pavement design alternatives evaluated for this report included the following:

• **Alternative 1** – Full-Depth AC Removal and Replacement Rehabilitation (20-year analysis)



• Alternative 2 - Flexible Reconstruction (20-year analysis)

Appendix F contains the design results for each alternative.

Alternative 1 – Full-Depth AC Removal and Replacement

River St to Saddle Rd (MP 128.2 to MP 129.3)

This strategy includes the following activities:

- Fully remove the existing 0.57 feet (6.9 inches) of existing AC.
- Restore the base layer by supplementing the existing base layer with 0.07 feet (0.8 inches) leveling course of new untreated aggregate base material as needed, and then tight grade and compact to the required final base layer lines and grades.
- Compact the exposed base with at least 8 passes of a minimum 45,000-lb vibratory compactor.
- Place 0.50 ft HMA layer.



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Analyses show this alternative will provide 20 years of service. The following pavement structure conforms to ITD's performance criteria and reliability levels.

Design Inp	outs						
Design Life: Design Type:			ment construction:	June, 2024 July, 2024 August, 2024	Climate Da Sources (L	ta 43.5, -114.3 at/Lon) 43.5, -113.7 44, -113.75	75
Design Stru	cture					Traffic	
Layer typ	e Materia	al Type	Thickness (in)	Volumetric at Co	nstruction:	Age (year)	Heavy Trucks
Flexible	New HMA (P	G 70-34)	6.0	Effective binder	11.6	Age (year)	(cumulative)
NonStabilized	New & Existin		94	content (%)	000.000	2024 (initial)	1,560
	Base/Subbas	e		Air voids (%)	7.5	2034 (10 years)	4,047,120
Subgrade	Subgrade		Semi-infinite			2044 (20 years)	10,515,000

Distress Type		D Specified ability	Reliab	Criterion	
	Target	Predicted	Target	Achieved	Satisfied?
Terminal IRI (in/mile)	175.00	113.74	90.00	99.99	Pass
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	14.36	90.00	94.39	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.03	90.00	100.00	Pass

This strategy includes removal of existing materials and importing new materials to maintain the current profile. A maintenance event including a micro-mill and seal coat is assumed in 2034.

Saddle Rd to Clubhouse Dr (MP 129.3 to MP 129.7)

This strategy includes the following activities:

- Fully remove the existing 0.79 feet (9.5 inches) of existing AC.
- Restore the base layer by supplementing the existing base layer with 0.29 feet (3.5 inches) of new untreated aggregate base material as needed, and then tight grade and compact to the required final base layer lines and grades.



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- Compact the exposed base with at least 8 passes of a minimum 45,000-lb vibratory compactor.
- Place 0.50 ft HMA.

Analyses show this alternative will provide 20 years of service. The following pavement structure conforms to ITD's performance criteria and reliability levels.

Design Life: Design <mark>T</mark> ype:	sign Type: FLEXIBLE F		ase construction: avement construction: raffic opening:	June, 2024 July, 2024 August, 2024	Climate Dat Sources (La	ta 43.5, -114.3 at/Lon) 43.5, -113.7 44, -113.75	'5
Design Stru	cture					Traffic	
Layer typ	e	Material Type	Thickness (in)	Volumetric at Co	nstruction:	Age (year)	Heavy Truck
Flexible	N	ew HMA (PG 70-34)	6.0	Effective binder	11.6	Age (year)	(cumulative)
NonStabilized		ew & Existing	16.3	content (%) Air voids (%)	7.5	2024 (initial)	1,560
0.1		ase/Subbase	1 1 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	All Volus (%)	7.5	2034 (10 years)	4,047,120
Subgrade	S	ubgrade	Semi-infinite			2044 (20 years)	10,515,000

Distress Type		Specified ability	Reliab	Criterion Satisfied?	
	Target	Predicted	Target	Achieved	Satisfied?
Terminal IRI (in/mile)	175.00	113.64	90.00	99.99	Pass
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	12.30	90.00	99.95	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.03	90.00	100.00	Pass

This strategy includes removal of existing materials and importing new materials to maintain the current profile. A maintenance event including a micro-mill and seal coat is assumed in 2034.

Alternative 2 - Flexible Reconstruction (20-Year Analysis)

This alternative includes removing the existing roadway and constructing a new flexible pavement section. A single reconstruction design was used for both roadway segments as they have the same traffic and subgrade



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resistance values. The following tables shows the proposed pavement layer structure and results.

Design Life: Design Type:	20 yea FLEXIE		Paver	construction: nent construction: opening:	June, 202 July, 2024 August, 2	5	Climate Dat Sources (La	a 43.5, -114.: t/Lon) 43.5, -113. ⁻ 44, -113.75	75
Design Stru	cture							Traffic	
Layer typ	e	Material Typ	e	Thickness (in)	Volume	tric at Constr	uction:	Age (year)	Heavy Truck
Flexible	New HMA (PG 7		34)) 6.0	Effective binder content (%) Air voids (%)	sintaon	11.6		(cumulative)
NonStabilized	SV65	ntreated Aggrega ase	7.0			75	2024 (initial)	1,560	
NonStabilized		ranular Subbase		8.0		(10)	1.0	2034 (10 years)	4,047,120
Subgrade		ubgrade		Semi-infinite	-			2044 (20 years)	10,515,000
Design Ou Distress P	-	on Summary							
Distress Type				Specified bility Predicted	Rei	iability (%) t Achieved	Criterion Satisfied?		

	Target	Predicted	Target	Achieved	
Terminal IRI (in/mile)	175.00	112.99	90.00	100.00	Pass
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	11.32	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	0.03	90.00	100.00	Pass

This strategy includes removal of existing materials and importing new materials to maintain the current profile. After 10 years, a micro-mill and seal coat is assumed in 2034.

540.05 Recommendations

The Full-Depth AC Removal & Replacement Rehabilitation

(Alternative 1) is the preferred strategy. This recommendation is based on the preceding pavement design analyses, the use of recycled materials and anticipated lower impact to traffic and surrounding businesses. It is anticipated this alternative will provide the following benefits:

• Replace the old, deteriorated AC with new HMA and eliminate the potential for reflective cracking through the new HMA surface



- Retain and reuse the existing base material in the proposed pavement structure
- Provide an opportunity to densify and recompact the existing base layer prior to placing the new HMA surface course
- Maintain the existing roadway surface profile

	Summary of Recommended Design Strategies
Roadway Segment	Recommended Design
- SH-75 - River St to Saddle Rd	 Remove all the existing AC (0.57 feet) Restore the base layer by supplementing the existing base layer with average of 0.07 feet leveling course of new Untreated Aggregate Base tight grade and compact to the required final base layer lines and grades Compact the exposed base with at least 8 passes of a minimum 45,000-lb vibratory compactor. Prime coat base if base is to temporary support traffic. Overlay with 0.50 ft HMA
- SH-75 – Saddle Rd to Clubhouse Dr	 Remove all the existing AC (0.79 feet) Restore the base layer by supplementing the existing base layer with average of 0.29 feet leveling course of new Untreated Aggregate Base tight grade and compact to the required final base layer lines and grades Compact the exposed base with at least 8 passes of a minimum 45,000-lb vibratory compactor. Prime coat base if base is to temporary support traffic. Overlay with 0.50 ft HMA

540.06 References

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- Von Quintus, H. and Killingsworth, B. 1997. Design Pamphlet for the Determination of Design Subgrade in Support of the AASHTO Guide for the Design of Pavement Structures. Report No. FHWA-RD-97-083.
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End of Phase I Report



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230.00 SOILS

230.01 Introduction

See Section 100.02 Purpose and Scope.

230.02 Vicinity Map

A vicinity map is in Appendix A.

230.03 Soils Profile

See Section 540.03 Existing Pavement Conditions for a discussion of the subsurface drilling program and a generalized description of the pavement structure layers and subgrade conditions encountered.

This is a pavement rehabilitation project. A soils profile drawing was not prepared. Detailed boring logs are in Appendix B.

The following table summarizes the subgrade soil characteristics.

Sa	imple	Moisture	Atte	Atterberg Limits		Pa			
Location	Depth (ft)	(%)	LL (%)	PL (%)	PI	Gravel (%)	Sand (%)	Fines (%)	AASHTO Class.
AG-01	2.0'-4.0'	16.1	40	20	20	11	50	39.2	A-6
AG-01	4.0'-6.0'	17.4	45	21	24	7	51	42.5	A-7-6
AG-02	2.0'-4.0'					27	57	15.6	A-1-b
AG-04	4.0'-5.0'	4.4	24	17	7	56	30	13.9	A-2-4
AG-07	2.0'-4.0'					40	39	20.9	A-1-b

230.04 Borrow Source Data

Approved contractor-furnished sources are specified.

230.05 Aggregate Inventory Report

Approved contractor-furnished sources are specified.



230.06 Borrow and Aggregate Source Plats

Approved contractor-furnished sources are specified.

230.07 Soil Report Summary

A soil report summary is not necessary for rehabilitation projects.

230.08 Total Design Pavement Section

See Section 540.04 Analyses and Design for the preferred rehabilitation strategy.

230.09 Sub-subgrading

Sub-subgrading is not anticipated.

230.10 Grade Pointing

Grade pointing is not anticipated.

230.11 Special Placement

Special placement of materials is not anticipated.

The Contractor should anticipate that soft and moisture-sensitive subgrade soils could occur through the project. Soft and moisture-sensitive subgrade soils are prone to rutting or pumping under construction equipment, especially if these soils become wetter than their optimum moisture content at the time of construction. Therefore, the Contractor should protect these soils during construction activities and determine how best to achieve compaction. The Department will not pay for any excavation or replacement of excavated material below subgrade elevation made necessary from construction activities.

Additionally, during seasonally wet construction periods, the Contractor should take care to prevent proof rolling operations from excessively disturbing the moisture-sensitive subgrade.

230.12 Compaction

Class A compaction requirements should be specified.



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230.13 Slope Design Summary

The roadway will maintain the current grade elevation.

230.14 Slope Design

Soil cut or fill slopes on this project are not planned.

230.15 Embankment Foundation

Embankment foundations are not planned.

230.16 Surface and Subsurface Water

Surface water along the project is generally from precipitation runoff.

Groundwater was not encountered in the roadway borings.

230.17 Drainage

Any drainage ditches along the roadway should extend a minimum of 1 foot or the diameter of any pipe size below the bottom of the pavement structure section and maintain positive drainage as shown on ITD standard drawing A-2.

230.18 Retaining Walls

Roadside retaining walls are not planned.

230.19 Blanket Course or Filter Material

Blanket courses or filter materials are not anticipated.

230.20 Existing Roadway Material

Reuse of existing roadway base materials is recommended.

230.21 Abutment Embankment Material

Abutment embankment material is not planned.

230.22 Rock Subgrade

Rock subgrade or rock cuts are not planned.



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230.23 Topsoil

Topsoil, if required, will have to be imported.

230.24 Pipe

A pipe condition survey was not conducted for this investigation.

230.25 Riprap

Riprap is not planned.

230.26 Staged Construction

Staged embankment construction for settlement control is not anticipated.

230.27 Dust Abatement

The estimated volume of water for dust abatement is about 1,400 MG (1MG = 1,000 gallons), assuming 6 inches of water per square foot of disturbed area estimated for the project.

230.28 Seismic Design

Seismic design parameters are not needed for rehabilitation projects.

230.29 References

See Section 540.06 References.

End of Phase II Report



240.00 PAVEMENT ESTIMATING

240.01 Pavement Type and Smoothness Determination

Pavement type is Superpave HMA, Class SP-5.

We recommend constructing the project using a Schedule II Surface Smoothness (405.P).

240.02 Typical Section

The following table summarizes the typical section for the project.

Typical Section for Full-Depth AC Removal and Replacement (River St MP 128.2 to Saddle Rd MP 129.3)						
	Thickness	Layer	Materials			
	0.50 feet	Superpave Hot Mix Asphalt, Class SP-5; two equal lifts	Aggregate for Superpave HMA Pavement, ½-inch (703.05) Asphalt, PG 70-34 (702.01)			
	0.07 Feet (average)	Aggregate Base (303) Leveling Course	Aggregate for Untreated Base, ¾-inch Type B (703.04)			
	0.71 feet	Average Undisturbed Existing Base				
	¹ 0.07 is the average leveling course thickness. The leveling course thickness may range from 0 feet to 0.5 feet thick.					



Typical Section for Full-Depth AC Removal and Replacement (Saddle Rd MP 129.3 to Clubhouse Dr MP 129.7)						
	Thickness	Layer	Materials			
	0.50 feet	Superpave Hot Mix Asphalt, Class SP-5; two lifts	Aggregate for Superpave HMA Pavement, ½-inch (703.05) Asphalt, PG 70-34 (702.01)			
	0.29 feet (average) (1)	Aggregate Base (303) Leveling Course	Aggregate for Untreated Base, ³ / ₄ -inch Type B (703.04)			
	1.07 feet	Average Undisturbed Existing Base				
	¹ 0.29 is the average leveling course thickness needed. The leveling course thickness may range from 0.07 feet to 0.64 feet thick.					

DC medic is based on LTDDDind software (warsion 2.1) (2005) and s.00

PG grade is based on LTPPBind software (version 3.1) (2005) and a 98 percent desired reliability value. Appendix F includes the LTPPBind output.

240.03 Bases

Aggregate Base (303)

Aggregate for Untreated Base, 3/4-inch Type B (703.04)

Excavation and Repair of Soft Spot (205.03.D)

Combined areas of soft spot repair may total about 1,700 sy with 2 feet of sub-excavation.

Granular Borrow (205.02.B)

Subgrade Separation Geotextile, Type III (718.07)



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240.04 Pavement

Tack Coat (401) on New HMA

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

Prime Coat (402) for Untreated Aggregate Base (If temporary traffic allowed) Emulsified Asphalt, CSS-1h (702.03) at 0.27 gal/sy (residual rate of 0.9 gal/sy estimated)

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

Aggregate for Superpave HMA Pavement, 1/2-inch (703.05)

Asphalt, PG 70-34 (702.01) at 5.5% by weight of mix (estimated)

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

240.05 Surface Treatment

A surface treatment is not planned.

240.06 Aggregate Estimating Data

Superpave Hot Mix Asphalt (405)

Aggregate for Superpave HMA Pavement at 146 lb/cf, including asphalt (estimated)

Aggregate for Untreated Base (303)

Aggregate for Untreated Base at 135 lb/cf, including 7% water (estimated)

Granular Borrow (205.02.B)

Aggregate for Granular Borrow at 125 lb/cf, including 7% water (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 source, crushing operation, and mix designs. The contractor is solely responsible for determining actual unit weights based on the methods of production and providing adequate



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materials for the project plus any losses due to stockpile operations, out of specification (rejected) materials or other wastes.

240.07 Aggregate Sources

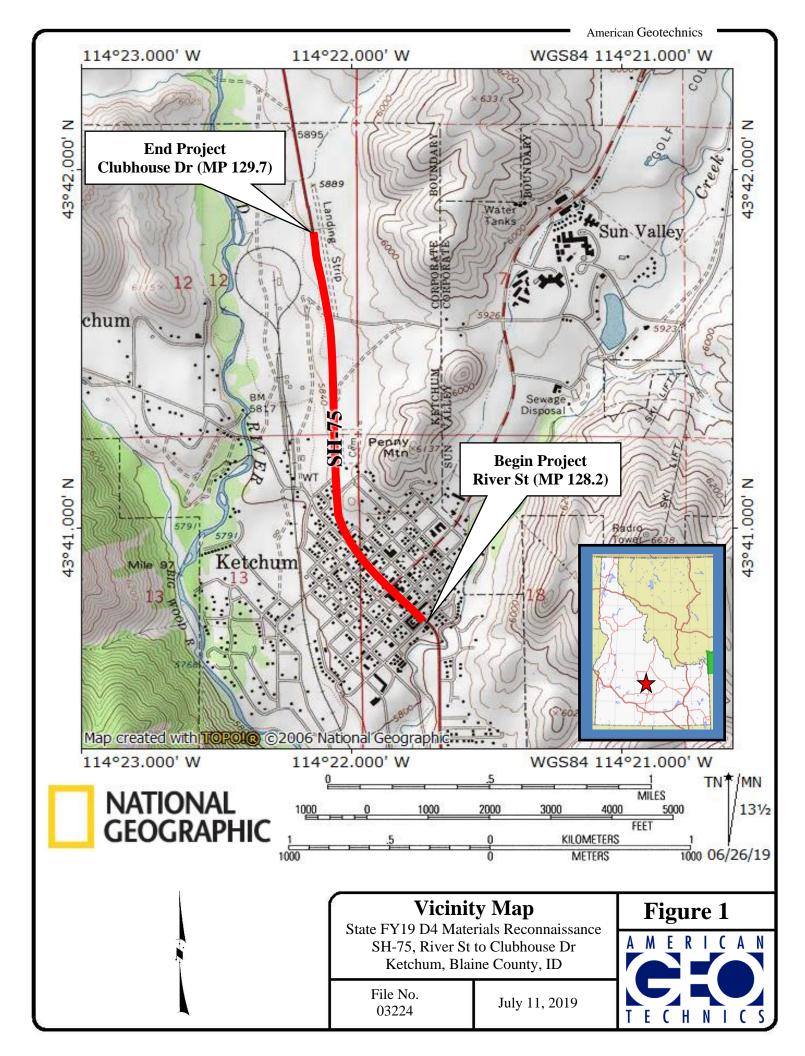
Approved contractor-furnished sources are specified for all aggregates.

End of Phase III Report



Appendix A

Vicinity Map Site Photographs Pavement Condition Survey Geological Map





Site and Pavement Distress Photographs

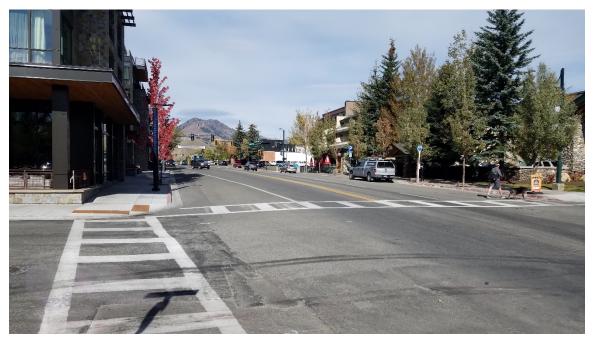


Photo 1: Looking north west on SH-75, from River St. Photo taken on 7/8/2019.



Photo 2: Looking north west on SH-75, from Saddle Rd. Photo taken on 7/8/2019.





Photo 3: Looking south east on SH-75, from Saddle Rd. Photo taken on 7/8/2019.



Photo 4: Looking south east on SH-75, from Clubhouse Dr. Photo taken on 7/8/2019.



Boring AG-01 Observed Pavement Distress ⁽¹⁾						
Distress Type	Severity	Notes				
Cracking						
Fatigue (Alligator) Cracking	None					
Longitudinal Cracking – Wheel Path	Med	> ¹ / ₄ " in, 75% of length - Open and sealed cracks				
Longitudinal Cracking – Non-Wheel Path	Low	< 1/4" in, 75% of length - Open and sealed cracks				
Transverse Cracking	High	50'-100' intervals – Open and sealed cracks				
Edge Cracking	None					
Block Cracking	None					
Patching and Potholes						
Patch/Patch Deterioration	None					
Potholes	None					
Surface Deformation						
Rutting	Depth up to	o 1/2"				
Miscellaneous						
Bleeding	Medium, in	n both wheel paths				

Long-Term Pavement Performance Program (FHWA, 2003).

Boring AG-02 Observed Pavement Distress ⁽¹⁾								
Distress Type Severity Notes								
Cracking								
Fatigue (Alligator) Cracking	None							
Longitudinal Cracking – Wheel Path	Med	> 1/4" in, 90% of length - Open and sealed cracks						
Longitudinal Cracking – Non-Wheel Path	Low	< 1/4" in, 90% of length - Open and sealed cracks						
Transverse Cracking	High	50'-100' intervals – Open and sealed cracks						
Edge Cracking	None							
Block Cracking	None							
Patching and Potholes								
Patch/Patch Deterioration	Med	15% in the study area, NB lane						
Potholes	None							
Surface Deformation								
Rutting	Depth up t	o 1"						
Miscellaneous								
Bleeding	Medium, le	ocalized areas mainly in the wheel paths.						
Note: (1) Distress observations were made and record Long-Term Pavement Performance Program (FHW)	U	al accordance with the Distress Identification Manual for the						



Boring AG-03 Observed Pavement Distress ⁽¹⁾						
Distress Type	Severity	Notes				
Cracking						
Fatigue (Alligator) Cracking	None					
Longitudinal Cracking – Wheel Path	Med	> 1/4" in, 90% of length - Open and sealed cracks				
Longitudinal Cracking – Non-Wheel Path	Med	> 1/4" in, 90% of length - Open and sealed cracks				
Transverse Cracking	High	50'-100' intervals – Open and sealed cracks				
Edge Cracking	None					
Block Cracking	None					
Patching and Potholes						
Patch/Patch Deterioration	Med	2% in the study area				
Potholes	None					
Surface Deformation						
Rutting	Depth up to	01"				
<u>Miscellaneous</u>						
Bleeding	Medium, lo	calized areas mainly in the wheel paths.				
Note: (1) Distress observations were made and record	rded in general	accordance with the Distress Identification Manual for the				

Long-Term Pavement Performance Program (FHWA, 2003).

Boring AG-04 Observed Pavement Distress ⁽¹⁾							
Distress Type Severity Notes							
Cracking							
Fatigue (Alligator) Cracking	None						
Longitudinal Cracking – Wheel Path	Low	< 1/4" in, 10% of length - Open and sealed cracks					
Longitudinal Cracking – Non-Wheel Path	Low	< 1/4" in, 10% of length - Open and sealed cracks					
Transverse Cracking	High	20'-50' intervals – Open and sealed cracks					
Edge Cracking	None						
Block Cracking	None						
Patching and Potholes							
Patch/Patch Deterioration	Med	10% in the study area					
Potholes	None						
Surface Deformation							
Rutting	Depth up to	1/2"					
Miscellaneous							
Bleeding	Medium, loc	calized areas mainly in the wheel paths.					
	rded in general	•					



Boring AG-05 Observed Pavement Distress ⁽¹⁾						
Distress Type	Severity	Notes				
Cracking						
Fatigue (Alligator) Cracking	None					
Longitudinal Cracking – Wheel Path	None					
Longitudinal Cracking – Non-Wheel Path	None					
Transverse Cracking	None					
Edge Cracking	None					
Block Cracking	None					
Patching and Potholes						
Patch/Patch Deterioration	None					
Potholes	None					
Surface Deformation						
Rutting	Depth up to	o 2"				
<u>Miscellaneous</u>						
Bleeding	Medium, lo	ocalized areas mainly in the wheel paths.				
Note: (1) Distress observations were made and reco	orded in genera	accordance with the Distress Identification Manual for the				

Note: (1) Distress observations were made and recorded in general accordance with the Distress Identification Manual for the Long-Term Pavement Performance Program (FHWA, 2003).

Boring AG-06Observed Pavement Distress (1)							
Distress Type Severity Notes							
Cracking							
Fatigue (Alligator) Cracking	None						
Longitudinal Cracking – Wheel Path	None						
Longitudinal Cracking – Non-Wheel Path	None						
Transverse Cracking	Low	20'-50' intervals – Open and sealed cracks					
Edge Cracking	None						
Block Cracking	None						
Patching and Potholes							
Patch/Patch Deterioration	None						
Potholes	None						
Surface Deformation							
Rutting	Depth up t	o 2"					
Miscellaneous							
Bleeding	Medium, l	ocalized areas mainly in the wheel paths.					
Note: (1) Distress observations were made and reco Long-Term Pavement Performance Program (FHW		al accordance with the Distress Identification Manual for the					

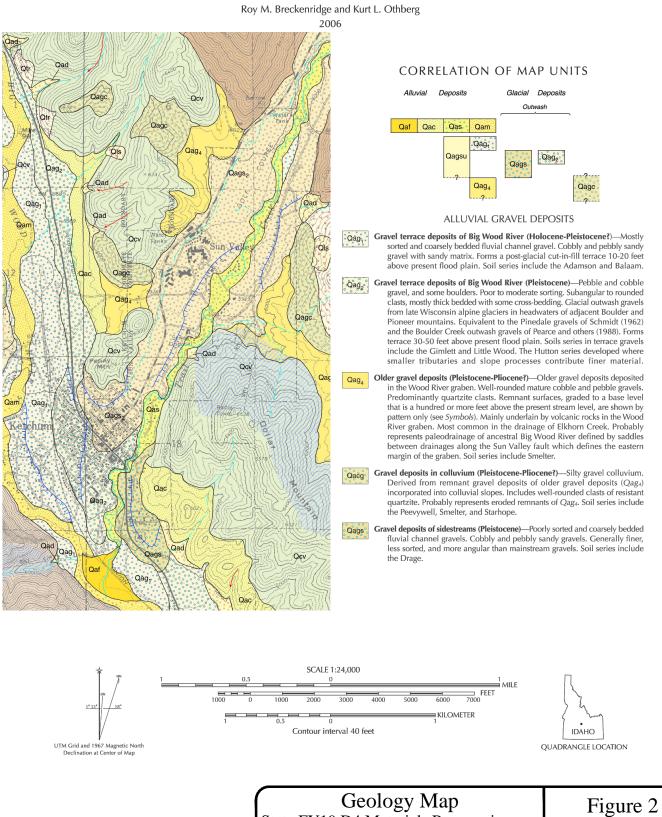


Boring AG-07 Observed Pavement Distress ⁽¹⁾						
Distress Type	Severity	Notes				
Cracking						
Fatigue (Alligator) Cracking	None					
Longitudinal Cracking – Wheel Path	None					
Longitudinal Cracking – Non-Wheel Path	None					
Transverse Cracking	Low	50'-75' intervals – Open and sealed cracks				
Edge Cracking	None					
Block Cracking	None					
Patching and Potholes						
Patch/Patch Deterioration	None					
Potholes	None					
Surface Deformation						
Rutting	Depth up to	1"				
Miscellaneous						
Bleeding	Medium, lo	calized areas mainly in the wheel paths.				
Note: (1) Distress observations were made and reco	rded in general	accordance with the Distress Identification Manual for the				

Note: (1) Distress observations were made and recorded in general accordance with the Distress Identification Manual for the Long-Term Pavement Performance Program (FHWA, 2003).

American Geotechnics

Surficial Geologic Map of the Sun Valley Quadrangle, Blaine County, Idaho



State FY19 D4 Materials Reconnaissance (SH-75, River St to Clubhouse Dr) Ketchum, Idaho

File No. 03224

September 17, 2019





Appendix B

Exploration Location Map Boring Logs Core Photographs



File No.	
03224	

250

SCALE IN FEET

750

July 11, 2019



METHOD: Hollow-Stem			A	MERICAN
DATE LOGGED: 6/30/201 LOGGED BY: David Wad	ey			
	GROUNDWATER: Groundwater not encountered on 6/30/2019			
LATITUDE: 43.69650518° LONGITUDE: -114.368984			T	ECHNICS
DEPTH (ft) TYPE - No. TYPE - No. RECOVERY %	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5	Asphalt Concrete- Dense; Interfaces at 0.16', 0.27', 0.42', 0.53'; Core recovery=0.72'.	0.74	0.74	Boring in the southbound lane just north of Boulder View Rd. An approx. one-foot gently downward sloped embankment to the
- 1.0 GB-02	Base (crushed)- Silty Gravel with Sand (GM)- About 45% hard, subangular to subrounded gravel to 1/2"; about 40% hard, fine to coarse, angular to subrounded sand; about 15% non-plastic fines; moist; dark brown.	0.23		east and west.
GB-03	Subbase (uncrushed)- Silty Gravel with Sand (GM)- About 50% hard, subangular to subrounded gravel to 1 1/2"; about 25% hard, fine to coarse, angular to subrounded sand; about 15% non-plastic to low plasticity fines; moist; dark brown.	0.94	1.91	
2.0 -2.5 3.0 SS-04 100 3.5	Clayey Sand (SC)- 50% hard, fine to coarse, angular to subrounded sand; 39% fines; LL=40, PL=20, PI=20; 11% hard, subangular gravel to 3/4"; ω = 16.1%; brown.	4.09		
4.0 BK-06 4.5 5.0 SS-05 68	51% hard, fine to coarse, subangular to subrounded sand; 42% fines; LL=45, PL=21, PI=24; 7% hard, subangular to subrounded gravel to 3/4"; o = 17.4%; brown.	4.00		
5.5				
6.0	Bottom of Boring at 6.0 ft on 6/30/2019		6.00	
6.0	Bottom of Boring at 6.0 ft on 6/30/2019.		6.00	
FILE NO.	PAGE 1 OF 1			BORING NO. AG-01

DAT LOG	e logo Ged B'	BED: (: Da	6/30/2 avid W	Vadley <u>GROUNDWATER:</u> Groundwater not encountered on 6/30/2019		A	MERICAN ECHNICS
	TUDE: GITUDE			51°		1	
DEPTH (ft)	TYPE - No.	RECOVERY %	ГІТНОГОЄУ	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
- 0.5	CR-07			Asphalt Concrete- Dense; Interfaces at 0.1', 0.25', 0.37', stripped below 0.52'; core recovery=0.52'.	0.57	0.57	Located in the southbound lane. An approx. five-foot gently downward sloping embankment to the west.
	GB-08		1 +	Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard,	0.27	0.84	An approx. four-foot gently downward sloping grassy
- 1.0 - 1.5	GB-09 GB-10			fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.	1.16		embankment to the east.
- 2.0				Silty Sand with Gravel (SM)-		2.00	Gravel is redish-brown in
- 2.5 - 3.0	SS-11	100		57% hard, fine to coarse, angular to subrounded sand; 27% hard, angular to subrounded gravel to 1"; 16% low to medium plasticity fines; brown; moist.	2.00		color
- 3.5				Clayey Gravel with Sand (GC)-		4.00	0.1' layer of broken rock at
- 4.5				About 45% hard, angular to subangular gravel to 1"; about 35% hard, fine to coarse, subangular to subrounded sand; about 20% low to medium plasticity fines; dark brown; moist.			4.4'.
- 5.0 - 5.5	SS-12	40			2.00		
- 6.0						6.00	
				Bottom of Boring at 6.0 ft on 6/30/2019.			

CR-13 Dense; Interfaces at 0.1; 0.21'and 0.36'; core recovery= 0.52'. 0.57 Iane. Toward east, leap prox. 15 feet then approx. 15 feet then approx. 15 feet then up 30% hard, fine to coarse, angular to subrounded gravel to 1/2'; about 10% 0.23 0.67 Iane. Toward east, leap cover the then up 30% hard, fine to coarse, angular to subrounded sand; about 10% 0.23 0.80 1.0 GB-15 Subbase (uncrushed): Poorly Graded Gravel with Silt and Sand (GP-GM)-About 45% hard, fine to coarse, subangular to subrounded sand; about 10% 0.23 0.80 1.5 Subbase (uncrushed): Poorly Graded Gravel with Silt and Sand (GP-GM)-About 45% hard, fine to coarse, subangular to subround sand; about 10% 1.50 Iane. Toward we beel shoulder then up slopes into driveway. 2.0 Poorly Graded Gravel with Silt and Sand (GP-GM)-About 65% hard, subrounded to subangular gravel to 1'; about 25% hard, fine to coarse, subrounded to subangular gravel to 1'; about 25% hard, fine to coarse, subrounded to subangular gravel to 1'; about 25% hard, fine to coarse, angular to subangular gravel to 1'; about 40% hard, fine to coarse, angular to subangular gravel to 1'; about 40% hard, fine to coarse, angular to subangular sand; about 10% hard, fine to coarse, angular to subangular sand; about 10% hard, fine to coarse, angular to subangular sand; about 10% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subangular to subangular sand; about 25% hard, subangular to subangular sand; about 25% hard, su	-114.36759 	95°	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials) Asphalt Concrete- Dense; Interfaces at 0.1', 0.21'and 0.36'; core recovery= 0.52'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.	U.57 U.23 U.23	0.57 0.80	REMARKS Boring in the southbound lane. Toward east, level for approx. 15 feet then slopes downward about four-feet. Toward west, level shoulder then upward
E 2 2 2 2 4 0 0 (Stratification lines represent approximate boundaries between materials) 2 3 3 3 4 3 4 3 4 3 4 <th>o N - 34 AL A-13 3-14 3-14 3-15 3-15</th> <th></th> <th>(Stratification lines represent approximate boundaries between materials) Asphalt Concrete- Dense; Interfaces at 0.1', 0.21'and 0.36'; core recovery= 0.52'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.</th> <th>U.57 U.23 U.23</th> <th>UEPTH</th> <th>Boring in the southbound lane. Toward east, level approx. 15 feet then slopes downward about four-feet. Toward west, level shoulder then upwa</th>	o N - 34 AL A-13 3-14 3-14 3-15 3-15		(Stratification lines represent approximate boundaries between materials) Asphalt Concrete- Dense; Interfaces at 0.1', 0.21'and 0.36'; core recovery= 0.52'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.	U.57 U.23 U.23	UEPTH	Boring in the southbound lane. Toward east, level approx. 15 feet then slopes downward about four-feet. Toward west, level shoulder then upwa
0.5 CR-13 Dense; Interfaces at 0.1', 0.21'and 0.36'; core recovery= 0.52'. 0.57 Lane. Toward east, leaptor. 15 feet then apport.	3-14 3-15		Dense; Interfaces at 0.1', 0.21'and 0.36'; core recovery= 0.52'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.	0.23	0.57	lane. Toward east, level approx. 15 feet then slopes downward about four-feet. Toward west, level shoulder then upwa
Base (crushed): Poorly Graded Gravel with Silt and Sand (GP-GM). 0.23 0.80 I.0 GB-15 Base (crushed): Application subrounded gravel to 1/2"; about 10% non-plastic fines; dark brown; moist. 0.23 0.80 I.5 Subbase (uncrushed): Clayey Sand with Gravel (SC): About 45% hard, fine to coarse, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist. 1.50 2.30 2.0 Poorly Graded Gravel with Silt and Sand (GP-GM). About 65% hard, subangular to subrounded gravel to 17"; about 25% hard, fine to coarse, subangular gravel to 1"; about 25% hard, fine to coarse, suborquider to subangular gravel to 1"; about 25% hard, fine to coarse, suborquider to subangular gravel to 1"; about 40% hard, subrounded to subangular gravel to 11/2"; about 40% hard, subrounded fine to coarse, angular to subangular gravel to 11/2"; about 40% hard, subangular to subangular gravel to 11/2"; about 40% hard, subangular to subangular gravel to 11/2"; about 40% hard, subangular gravel to 51/2"; about 40% hard, subangular to subangular gravel to 11/2"; about 40% hard, subangular gravel to 51/2"; about 40% hard, gravel fine to coarse, angular to subangular gravel to 11/2"; about 40% hard, gravel fine to coarse, angular to subangular gravel to 11/2"; about 40% hard, gravel fine to coarse, angular to subangular gravel to 11/2"; about 40% hard, gravel fine to coarse, angular to subangular gravel to 11/2"; about 40% hard, gravel fine to coarse, angular to subangular gravel to 11	3-15		About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist.		0.80	four-feet. Toward west, level shoulder then upwa
1.0 GB-15 Solo in fines; dark brown; moist Solo and solo and solo and, about 10% 1.5 Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic fines; dark brown; moist. 1.50 2.0 Poorly Graded Gravel with Silt and Sand (GP-GM)- About 65% hard, suborounded to subangular gravel to 1"; about 25% hard, fine to coarse, subrounded to subangular sand; about 10% Weathered basalt. 3.0 SS-17 48 1.70 1.70 4.0 Poorly Graded Gravel with Clay and Sand (GP-GC)- About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. 1.15 5.0 SS-18 68 Clayey Sand with Gravel (SC)- About 55% hard, subrounded (gravel to 1"; about 20% low plasticity fines; brown; moist. 0.85			non-plastic fines; dark brown; moist. Subbase (uncrushed)- Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subround sand; about 40% hard, subangular to subrounded gravel to 3/4"; about 15% non-plastic to low plasticity fines; dark brown; moist. Poorly Graded Gravel with Silt and Sand (GP-GM)-	1.50		
2.5 Poorly Graded Gravel with Silt and Sand (GP-GM)- About 65% hard, subrounded to subangular gravel to 1"; about 25% hard, fine to coarse, subrounded to subangular sand; about 10% Weathered basalt. 3.0 SS-17 48 1.70 3.5 Poorly Graded Gravel with Clay and Sand (GP-GC)- About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. 4.00 5.0 SS-18 68 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subangular sand; about 20% low plasticity fines; brown; moist. 0.85					1230	
4.0 Poorly Graded Gravel with Clay and Sand (GP-GC)- About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. 1.15 5.0 SS-18 68 5.15 5.0 SS-18 68 5.15 5.15 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low plasticity fines; brown; moist. 0.85	5-17 48		hard, fine to coarse, subrounded to subangular sand; about 10%	1.70		-
5.5 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low plasticity fines; brown; moist. 0.85	6-18 68		About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low	1.15		
			About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low	0.85		-
6.0 Bottom of Boring at 6.0 ft on 6/30/2019.		6///	Bottom of Boring at 6.0 ft on 6/30/2019.		6.00	
6.0		18 68		 About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low plasticity fines; brown; moist. 	About 50% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. 1.15 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low plasticity fines; brown; moist. 0.85	18 68 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 10% low plasticity fines; dark brown; moist. 1.15 18 68 5.15 Clayey Sand with Gravel (SC)- About 55% hard, fine to coarse, angular to subangular sand; about 25% hard, fine to coarse, angular to subangular sand; about 25% hard, subangular to subrounded gravel to 1"; about 20% low plasticity fines; brown; moist. 0.85

METHOD: Hollow-Stem Auger/ HQ Diamond Core

FILE NO.



ATITUDE: 43.68198978° .ONGITUDE: -114.3661838°	GROUNDWATER: Groundwater not encountered on 6/30/2019		T	
DEPTH (ft) TYPE - No. TYPE - No. RECOVERY % LITHOLOGY	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
CR-19 GB-20 GB-21 1.0 GB-21 	Asphalt Concrete- Dense; Interfaces at 0.1', and 0.24'; core recovery=0.42'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; tan; moist. Subbase (uncrushed)- Poorly Graded Gravel with Clay and Sand (GP-GC)- About 65% hard, angular to subangular gravel to 1/2"; about 25% hard, fine to coarse, subangular to subrounded sand; about 10% non-plastic to low plasticity fines; gray; dry. Silty Clayey Gravel with Sand (GC-GM)- 56% hard, subrounded to angular gravel to 1 1/2; 30% hard, fine to coarse, subrounded to angular sand; 14% fines; LL=24, PL=17, PI=7; o = 4.4%; brown.	0.42 0.15 0.32 3.11	0.42 0.57 0.89	Boring in southbound lan In-town with curb, gutter and sidwalks.
4.0 4.5 5.0 5.5 6.0	Clayey Sand with Gravel (SC)- About 50% hard, fine to coarse , subrounded to angular sand; about 30% hard, subangular to angular gravel to 1"; about 20% low plasticity fines; dark brown; moist. Poorly Graded Gravel with Sand (GP)- About 55% hard, angular to subangular gravel to 1 1/2"; about 40% hard, fine to coarse, angular to subangular sand; about 5% non-plastic fines; brown; moist. Poorly Graded Gravel with Sand (GP)- About 60% hard, angular to subangular gravel to 1 1/2"; about 35% hard, fine to coarse, angular to subangular sand; about 5% non-plastic fines; gray; moist. Bottom of Boring at 6.0 ft on 6/30/2019.	0.30	4.00 4.30 6.00	Driving split spoon beyon 4.5' becomes more difficult.

METHOD: Hollow-Stem Auger/ HQ Diamond Core DATE LOGGED: 6/30/2019 LOGGED BY: David Wadley



Asphalt Concrete-	LATITUDI				GROUNDWATER: Groundwater not encountered on 6/30/2019	1	T	
0.5 CR-25 Dense, Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom 0.43 In-town with curb, gualitid delaminated. 0.5 GB-26 Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)-About 60% hard, subangular to subrounded gravel to 12°; about 30% hard, fine to coarse, subangular to subrounded sand; about 50% hard, angular to subrounded gravel to 5/8°; about 10% low plasticity fines; brown; moist. 0.89 1.0 GB-27a Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del sand; about 30% hard, fine to coarse, subangular to subrounded gravel to 12°; about 35% hard, angular to subrounded gravel to 12°; about 35% hard, angular to subrounded gravel to 5/8°; about 10% low plasticity fines; brown; moist. 0.82 1.5 Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del sand; about 55% hard, angular to subrounded gravel to 5/8°; about 10% low plasticity fines; brown; moist. 1.68 2.0 GB-27b Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del gravel to 11/2°. 1.68 3.0 SS-28 43 Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del gravel to 11/2°. 3.50 4.0 Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del gravel to 11/2°. 3.50 3.50 5.0 SS-29 SS-29 SS-29 Interfaces at 0.21° and 0.31°; core recovery= 0.42°; bottom del gravel to 11/2°.	DEPTH (ft) TYPE - No.	TYPE - No.		ГІТНОГОСУ	(Stratification lines represent approximate boundaries	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0.5 GB-26 Base (crushed). Poorly Graded Gravel with Silt and Sand (CP-GM). About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. 0.39 1.0 GB-27a 1.5 GB-27b 1.5 GB-27b 1.6 S% hard, fine to coarse, subangular to subrounded gravel to 5/8"; about 10% low plasticity fines; brown; moist. 2.0 GB-27b 2.1 GB-27b 3.2 GB-27b 3.3 SS-28 4.3 GB-27b 4.5 GB-27b 5.0 SS-29 70 GB-27b		CR-25			Dense, Interfaces at 0.21' and 0.31'; core recovery= 0.42'; bottom	0.43	0.43	Boring in southbound lar In-town with curb, gutter and sidwalks.
1.0 GB-27a Image: Construction on plastic fines; dark brown; moist. 1.5 Subbase (uncrushed)- Poorly Graded Sand with Silt and Gravel (SP-SM). 1.5 About 55% hard, fine to coarse, subangular to angular sand; about 10% low plasticity fines; brown; moist. 2.0 GB-27b 2.1 GB-27b 2.2 GB-27b 3.0 SS-28 4.3 Image: GB-27b 4.4 Image: GB-27b 3.5 Image: GB-27b 3.6 SS-28 4.7 Image: GB-27b 4.8 Image: GB-27b 3.9 SS-28 4.3 Image: GB-27b 4.4 Image: GB-27b 5.0 SS-28 7.0 Image: GB-27b 3.5 Image: GB-27b 3.6 Image: GB-27b 3.7 Image: GB-27b 3.8 Image: GB-27b 3.5 Image: GB-27b 3.6 Image: GB-27b 3.7 Image: GB-27b 3.8 Image: GB-27b 3.9 Image: GB-27b 3.5 Image: GB-27b <td>0.5</td> <td>GB-26</td> <td></td> <td></td> <td>About 60% hard, subangular to subrounded gravel to 1/2"; about</td> <td>0.39</td> <td></td> <td></td>	0.5	GB-26			About 60% hard, subangular to subrounded gravel to 1/2"; about	0.39		
1.5SimilarS	1.0	GB-27a	-		non-plastic fines; dark brown; moist.			
2.0 GB-27b 2.5 3.0 SS-28 43 3^{10} C	1.5				35% hard, angular to subrounded gravel to 5/8"; about 10% low plasticity fines; brown; moist.	1.69		
2.5 As above except with coarser gravel to $1 \frac{1}{2}$. 3.0 SS-28 43 $\left \begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	2.0 GB-2	7b		₽Ĵ Ĵ	As above except with coarser gravel to 1" below 1'.	1.00		
$3.0 \qquad SS-28 43 e^{\left(\begin{array}{c} c \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\$	25	_				L	2.50	
$3.5 \\ 4.0 \\ 4.5 \\ 5.0 \\ SS-29 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 7$		SS-28	43	a del	As above except with coarser gravel to 1 1/2".			
$4.0 \\ 4.5 \\ 5.0 \\ SS-29 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 70 \\ 7$	3.5							
4.5 5.0 SS-29 70 $\begin{array}{c} \circ & \circ & \circ \\ \circ & \circ & \circ \\ \circ & \circ & \circ \\ \circ & \circ &$	4.0					3.50		
	4.5							
	5.0	SS-29	70					
	5.5							
6.0 Bottom of Boring at 6.0 ft on 6/30/2019.	6.0				Bottom of Boring at 6.0 ft on 6/30/2019.		6.00	

Amount of the provided for the precent in the provided for the provided for t	LATI	GED BY	43.67	799672	5° GROUNDWATER:		T	
CR-30 Dense; Interfaces at 0.18' and 0.25'; striped below 0.25'; core 0.48 In-town with cuth, and status 0.48 0.5 GB-31 Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2'; about 30% hard, fine to coarse, angular to subrounded gravel to 1/2'; about 30% hard, fine to coarse, angular to subrounded gravel to 1/2'; about 30% hard, fine to coarse, subangular to subrounded gravel to 1/2'; about 30% hard, fine to coarse, subangular to subrounded gravel to 17'; about 35% hard, fine to coarse, subangular to subrounded gravel to 17'; about 35% hard, fine to coarse, subangular to subrounded gravel to 17'; about 35% hard, fine to coarse, subangular to subrounded gravel to 17'; about 35% hard, angular to subrounded gravel to 17'; about 35% hard, fine to coarse, subangular to angular sand; about 10% low plasticity fines; brown; moist. 0.49 Luk sample got contaminated, the not coalected. 3.0 SS-34 67 1 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subangular to subangular sand; about 10% low plasticity fines; brown; moist. 0.35 4.00 4.0 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, angular to subangular sand; about 10% low plasticity clay; brown; moist. 0.35 4.00 5.0 SS-35 45 1 1 6.00 6.00	DEPTH (ft)	TYPE - No.		ГІТНОГОСУ	(Stratification lines represent approximate boundaries	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
0 0.23 0.25 0.25 0.49 1.05 1.0 0.01d Asphatic Concrete- Base (crushed). Poorly Graded Gravel with Silt and Sand (GP-GC)- About 60% hard, subangular to subrounded sand; about 10% non-plastic fines; dark brown; moist. 0.49 1.54 2.0 1.5 0.49 1.54 3.0 SS-34 67 1.1 1.1 4.0 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subrounded to angular sand; about 10% low plasticity fines; brown; moist. 2.46 4.00 3.0 SS-34 67 1.1 1.1 1.1 4.1 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subrounded to angular sand; about 30% hard, angular to subarounded to angular sand, about 30% hard, angular to subarounded to 11; about 10% low plasticity fines; brown; moist. 2.46 3.0 SS-34 67 1.1 4.00 4.0 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subrounded to angular sand, about 30% hard, angular to subangular gravel to 1/2°; about 25% low plasticity clay; brown; moist. 0.35 4.35 5.0 SS-34 45 1.65 6.00 6.00				. IN	Dense; Interfaces at 0.18' and 0.25'; striped below 0.25'; core recovery=0.40'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)-	0.11	0.48	In-town with curb, gutter and sidwalks.
1.5 Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 12"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. 0.49 1.54 2.0 Subbase- Poorly Graded Gravel with Clay and Sand (GP-GC)- About 55% hard, angular to subangular, hard gravel to 1"; about 35% hard, fine to coarse, subrounded to angular sand; about 10% low plasticity fines; brown; moist. Bulk sample got contaminated, the not collected. 2.5 Poorly Graded Sand with Silt and Gravel (SP-SM)- About 55% hard, fine to coarse, subrounded to angular sand; about 35% hard, angular to subangular gravel to 1"; about 10% low plasticity fines; brown; moist. 2.46 3.0 SS-34 67 4.00 4.0 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subrounded to angular sand; about 30% hard, angular to subangular gravel to 1/2"; about 25% low plasticity clay; brown; moist. 0.35 4.35 5.0 SS-35 45 1 1 1 5.5 1 1 1 1 1 6.00 1 1 1 1 1	1.0	GB-32			fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist.		0.05	
2.0 Aik brown; moist. Bulk sample got containated, the not collected. 2.0 Subbase-Poorly Graded Gravel with Clay and Sand (GP-GC)- About 55% hard, angular to subangular, hard gravel to 1"; about 35% hard, fine to coarse, subrounded to angular sand; about 35% hard, and, angular to subangular to angular sand; about 35% hard, fine to coarse, subangular to angular sand; about 35% hard, fine to coarse, subrounded gravel to 1"; about 10% low plasticity fines; brown; moist. 2.46 3.0 SS-34 67 1 About 55% hard, fine to coarse, subnounded gravel to 1"; about 10% low plasticity fines; brown; moist. 2.46 4.0 Clayey Sand with Gravel (SC)- About 45% hard, fine to coarse, subrounded to angular sand, about 30% hard, angular to subangular gravel to 1/2"; about 25% low plasticity clay; fine angular to subangular gravel to 1/2"; about 25% low plasticity clay; Foorly Graded Sand with Silt and Gravel (SP-SM)- About 50% hard, fine to coarse, angular to subangular sand; about 40% hard, angular to subangular gravel to 1 1/2"; about 25% low plasticity clay; Foorly Graded Sand with Silt and Gravel (SP-SM)- About 50% hard, fine to coarse, angular to subangular sand; about 40% hard, fine to coarse, angular to subangular sand; about 40% hard, angular to subangular gravel to 1 1/2"; about 25% non-plastic fines; brown; moist 0.35 4.00 5.0 SS-35 45 1.65 6.00 6.00	1.5				Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard,	0.49		
 4.0 4.10 4.10 4.10 4.10 4.10 4.10 4.10 4.11 4.15 4.15<td>2.5 3.0</td><td>SS-34</td><td>67</td><td></td><td>dark brown; moist. Subbase- Poorly Graded Gravel with Clay and Sand (GP-GC)- About 55% hard, angular to subangular, hard gravel to 1"; about 35% hard, fine to coarse, subrounded to angular sand; about 10% low plasticity fines; brown; moist. Poorly Graded Sand with Silt and Gravel (SP-SM)- About 55% hard, fine to coarse, subangular to angular sand; about 35% hard, angular to subrounded gravel to 1"; about 10% low plasticity fines;</td><td>2.46</td><td>i</td><td>contaminated, therefore</td>	2.5 3.0	SS-34	67		dark brown; moist. Subbase- Poorly Graded Gravel with Clay and Sand (GP-GC)- About 55% hard, angular to subangular, hard gravel to 1"; about 35% hard, fine to coarse, subrounded to angular sand; about 10% low plasticity fines; brown; moist. Poorly Graded Sand with Silt and Gravel (SP-SM)- About 55% hard, fine to coarse, subangular to angular sand; about 35% hard, angular to subrounded gravel to 1"; about 10% low plasticity fines;	2.46	i	contaminated, therefore
4.5 hard, angular to subangular gravel to 1/2"; about 25% low plasticity clay; brown; moist. - 4.35 Organics (wood compresent in sample depth of 4' and be brown; moist. 5.0 SS-35 45 -	4.0							Augered to 5.5' to recov
	5.0 5.5	SS-35	45		hard, angular to subangular gravel to 1/2"; about 25% low plasticity clay; brown; moist. Poorly Graded Sand with Silt and Gravel (SP-SM)- About 50% hard, fine to coarse, angular to subangular sand; about 40% hard, angular to subangular gravel to 1 1/2"; about 25% non-plastic fines;		4.35	Organics (wood chips) present in sample from depth of 4' and below. Basalt fragments preser
	6.0 L			<u></u>	Bottom of Boring at 6.0 ft on 6/30/2019.			1

	3.6792 : -114.3			Groundwater not encountered on 6/30/2019		T	
TYPE - No.	TYPE - No.	RECOVERY %	ПТНОГОСУ	MATERIAL DESCRIPTION (Stratification lines represent approximate boundaries between materials)	LAYER THICKNESS (ft.)	DEPTH (ft)	REMARKS
.5	CR-36 GB-37 GB-38 SS-40	83		Asphalt Concrete- Dense; Interface at 0.23'; delamination at 0.29'; core recovery=0.51'. Base (crushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 60% hard, subangular to subrounded gravel to 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% non-plastic fines; dark brown; moist. Subbase (uncrushed)- Poorly Graded Gravel with Silt and Sand (GP-GM)- About 55% hard, subangular to angular gravel to 1 1/2"; about 35% hard, fine to coarse, angular to subrounded sand; about 10% low plasticity fines; dark brown; moist. Silty Gravel with Sand (GM)- 40% hard, angular to subrounded gravel to 1 1/2"; 39% hard, fine to coarse, angular to subrounded sand; 21% non-plastic fines; brown; moist.	0.59 0.26 0.63	0.59	Boring in southbound lane In-town with curb, gutter and sidwalks. Oily smell
.0	SS-41	25		Poorly Graded Gravel with Clay and Sand (GP-GC)- About 60% hard, angular to subangular gravel to 1 1/2"; about 30% hard, fine to coarse, angular to subrounded sand; about 10% low plasticity fines; rusty brown; moist. Bottom of Boring at 6.0 ft on 6/30/2019.	2.00	6.00	





Scale in Inches

Core Photos



Photo 1: AG-01; CR-01; 0.0'- 0.72'.

Scale in Feet



Scale in Inches

Scale in Inches



Photo 2: AG-02; CR-07; 0.0'- 0.52'.



Photo 3: AG-03; CR-13; 0.0'- 0.52'.

Scale in Feet







Photo 4: AG-04; CR-19; 0.0'- 0.42'.



Photo 5: AG-05; CR-25; 0.0'- 0.42'.



Scale in Inches



Photo 6: AG-06; CR-30; 0.0'- 0.40'.



Photo 7: AG-07; CR-36; 0.0'- 0.51'.

Scale in Feet



Appendix C

Laboratory Test Reports Mr Test Results & Mr Design Spreadsheet



Project Information

Report to: ITD District 4 Project: State, FY19 D4 Materials Reconnaissance Report Date: 9-9-19 File No.: 03224

Material Information

Date Sampled: 6-30-19 Sampled By: David Wadley Date Received: 8-1-19 Date Tested: 8-1 to 9-2-19

SUMMARY OF LABORATORY RESULTS

Lab Number	Borehole	Sample Type	Depth (ft)	Water Content (%)	% Passing #200 Sieve	Liquid Limit (%)	Plasticity Index	Soil Type	Remarks
19-0448	AG-01	SS-04	2.0'-4.0'	16.1	39.2	40	20	SC	A-6
19-0449	AG-01	SS-05	4.0'-6.0'	17.4	42.5	45	24	SC	A-7-6
19-0450	AG-02	SS-11	2.0'-4.0'		15.6			SM	A-1-b
19-0452	AG-04	BK-22	4.0'-5.0'	4.4	13.9	24	7	GC-GM	A-2-4
19-0451	AG-07	BK-39	2.0'-4.0'		20.9			GM	A-1-b

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



Report to: Idaho Transportation Department, District 4 Project: State FY19D4 Material Reconnaissance KN18697 Report Date: 9/9/2019 File No.: 03224

	Material Information					
Date Sampled:	6/30/2019					
Sampled By:	American Geotechnics					
Date Received:	8/1/2019					
Date Tested:	8/1 to 9/2/19					

Test Results

Remolded Density and Moisture Content

Lab Number	Location	Depth (ft)	Dry Density (pcf)	Moisture (%)	Soil Type
19-0452	Composite	2'-5'	110.4	7.8	GC-GM

Reviewed By: Travis Thomsen

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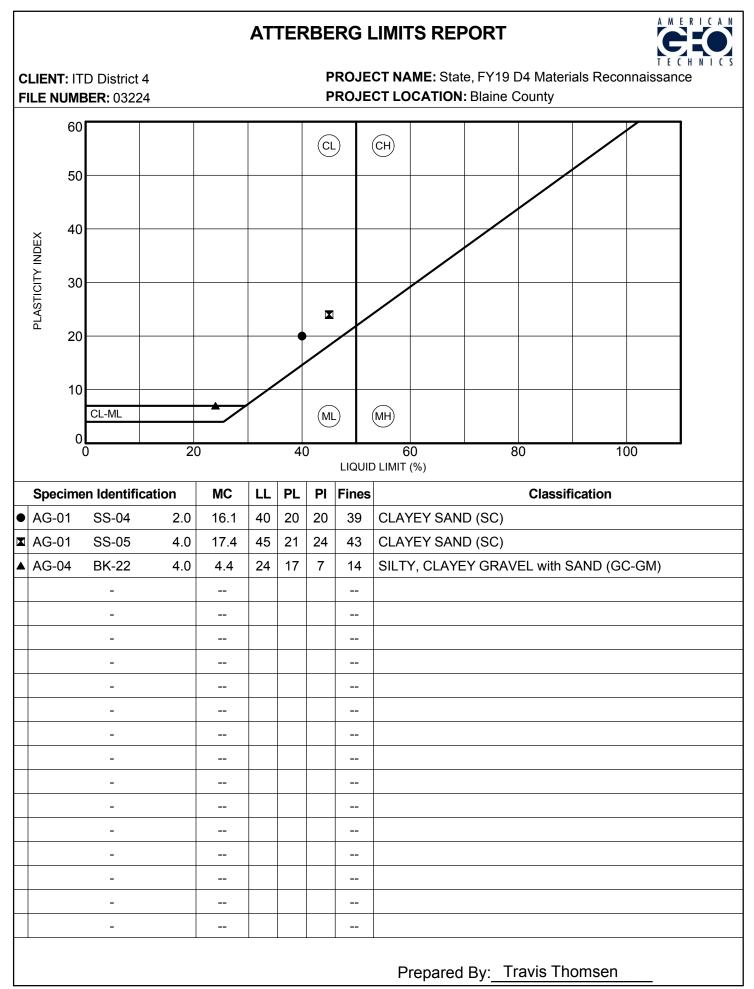
Report to: Idaho Transportation Department, District 4 Report Date: 9/9/2019 Project No.: 03224 Project: State FY19D4 Material Reconnaissance KN18697

Material Information

Date Sampled: 6/30/2019 Sampled By: American Geotechnics Date Received: 8/1/2019 Date Tested: 8/1 to 9/2/19 AASHTO CLASSIFICATION

Lab Number	Boring/Pit	Sample ID	Depth		AASHTO Classification
19-0448	AG-01	SS-04	2'-4'	A-6	Clayey Soils
19-0449	AG-01	SS-05	4'-6'	A-7-6	Clayey Soils
19-0450	AG-02	SS-11	2'-4'	A-1-b	Stone Fragments, Gravel and Sand
19-0451	AG-07	BK-39	2'-4'	A-1-b	Stone Fragments, Gravel and Sand
19-0452	AG-04	BK-22	4'-5'	A-2-4	Silty or Clayey Gravel and Sand
19-0452	AG-07	BK-39	1.5'-4'	A-2-4	Silty or Clayey Gravel and Sand

Reviewed By: Travis Thomsen

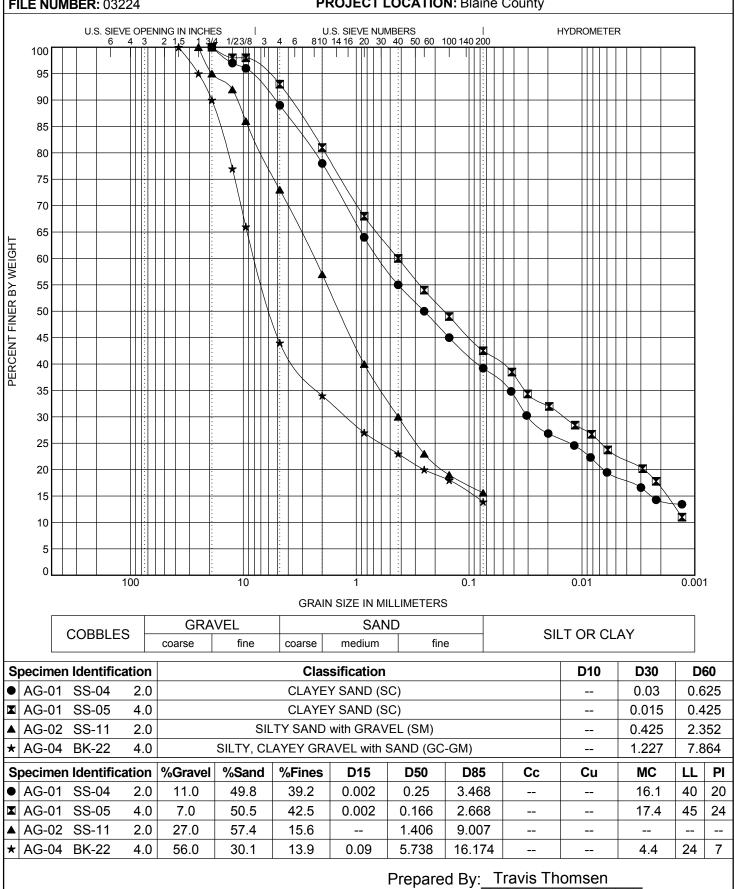


PARTICLE-SIZE DISTRIBUTION REPORT



CLIENT: ITD District 4 FILE NUMBER: 03224

PROJECT NAME: State, FY19 D4 Materials Reconnaissance **PROJECT LOCATION:** Blaine County

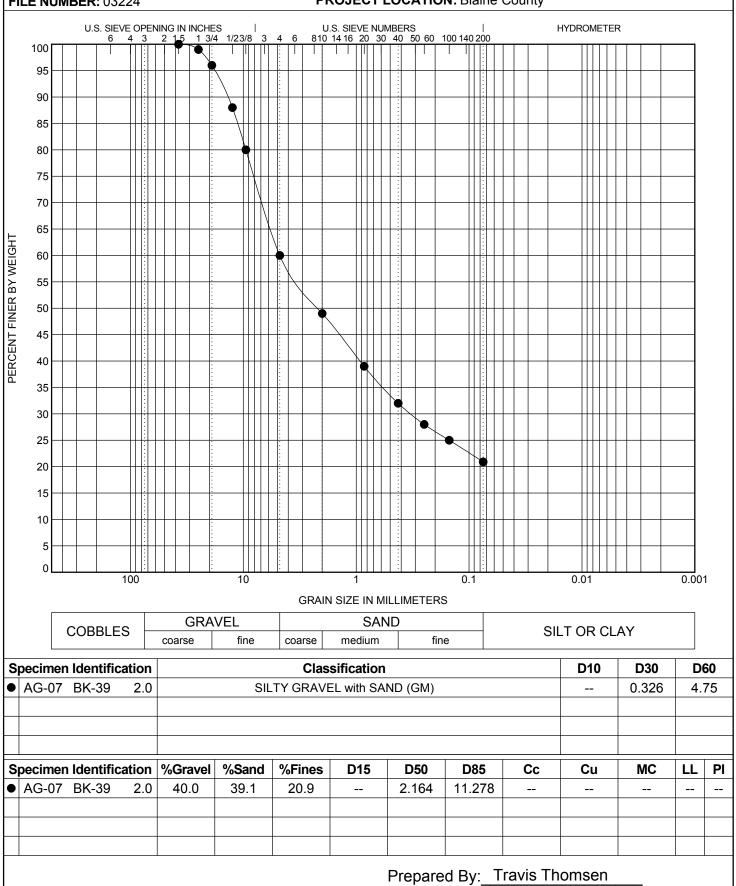


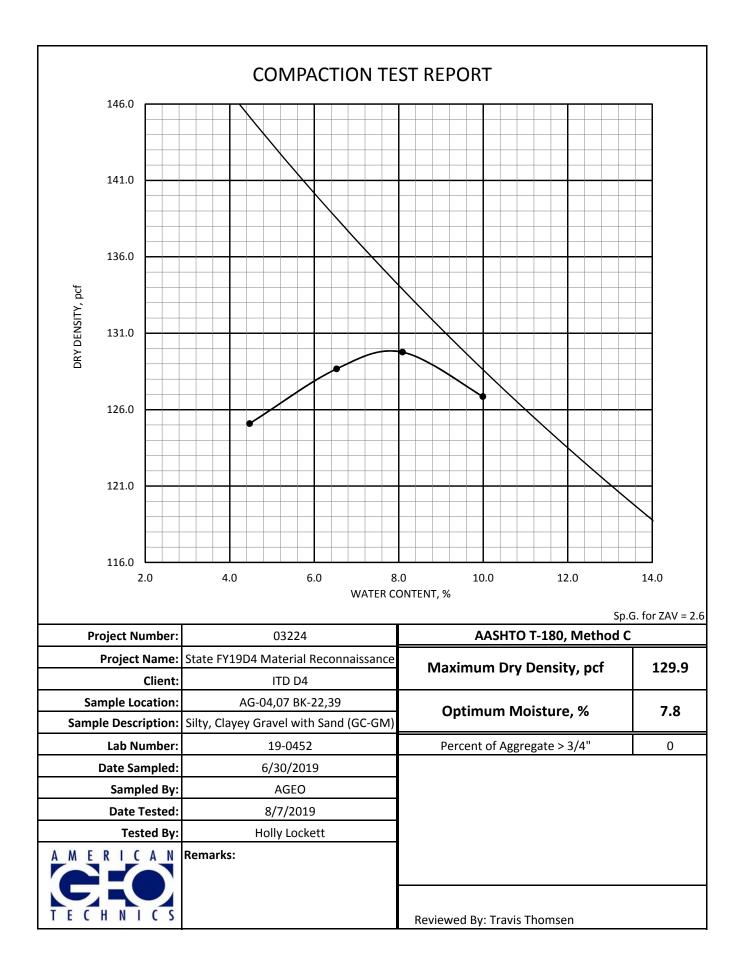
PARTICLE-SIZE DISTRIBUTION REPORT



CLIENT: ITD District 4 FILE NUMBER: 03224

PROJECT NAME: State, FY19 D4 Materials Reconnaissance **PROJECT LOCATION:** Blaine County





Client Name: ITD District 4 Project Name: State, FY19 D4 Materials Reconnaissance Project No: 03224 Report Date: 9/Sep/19



Material Information

Boring/Sample ID: AG-04&07 / BK-22&39 Material Type: Type-2 (Subgrade) Type of Sample: 4" Dia Remolded Dry Density (pcf): 110.4 95% Mod Specimen WC (%) 7.8 OMC Lab Number: 19-0446 AASHTO Clasification: A-2-4 Depth of Specimen (ft.): 3.50 Date Sampled: 20/Jun/19 Date Tested: 3/Sep/19

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	$\sigma_{\sf d}$	θ	T _{oct}	M _r	Pred. M _r
	<u>psi</u>	psi	psi	<u>psi</u>	<u>psi</u>	<u>psi</u>
1	6.00	2.04	20.06	0.96	32288	25942
2	6.00	4.03	22.05	1.90	21522	22971
3	6.00	6.18	24.20	2.91	18852	20235
4	6.00	8.30	26.31	3.91	17756	17944
5	6.00	10.24	28.25	4.83	17128	16130
6	4.00	2.01	14.02	0.95	20123	18919
7	4.00	4.04	16.05	1.90	15250	17305
8	4.00	6.15	18.16	2.90	14124	15712
9	4.00	8.18	20.19	3.86	13816	14320
10	4.00	10.18	22.19	4.80	13982	13068
11	2.00	2.01	8.02	0.95	12407	11498
12	2.00	4.06	10.06	1.91	10542	11391
13	2.00	6.12	12.12	2.88	10360	10990
14	2.00	8.13	14.14	3.83	10619	10476
15	2.00	10.11	16.11	4.77	11061	9887

Resilient Modulus Equation

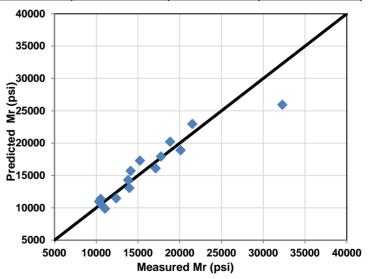
$$Mr = k_1 * Pa * \left(\frac{\theta}{Pa}\right)^{\kappa_2} * \left(\frac{\zeta oct}{Pa} + 1\right)^{\kappa_2}$$

Resilient Modulus Model Parameters

$$k_1 = 1675.333$$

$$k_2 = 0.891$$

$$k_3 = -3.539$$



Tested By: Travis Thomsen

Client Name: ITD District 4 Project Name: State FY19 D4 Materials Reconnaissance Project No: 03224 Report Date: 9/Sep/19 Boring/Sample ID: AG-04&07 / BK-22&39



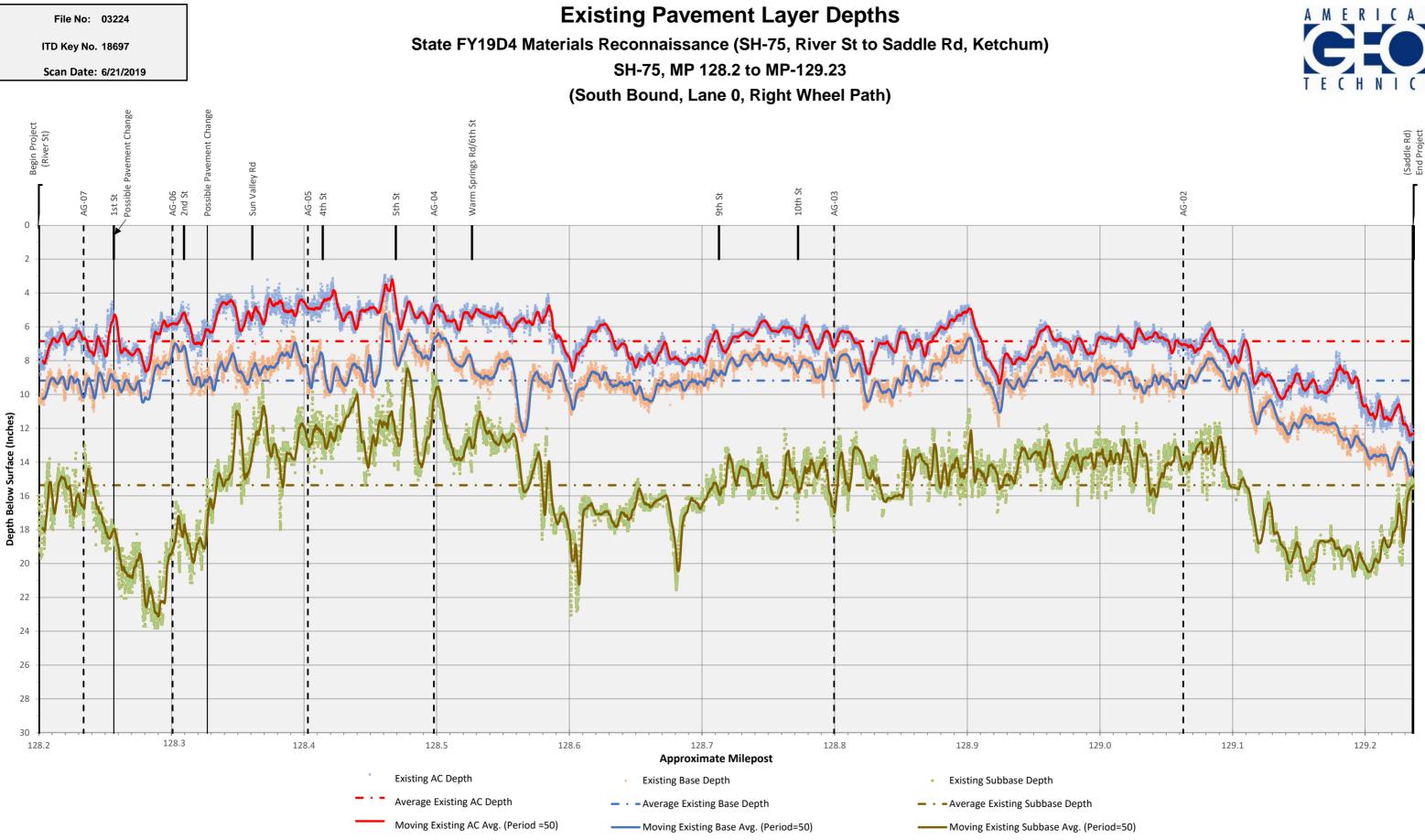
	Paver	ment Structure	Details		
Layer Number	Material Type	Layer Thickness (in)	Density (pcf)	Vertical Stress (psi)	Remar
1	Asphalt Concrete	6.9	145	0.58	
2	Base	2.3	143	0.19	
3	Subbase	6.2	135	0.48	
4	Subgrade	21.84	119	1.50	
		At-Rest Vertical	Stress (psi)	2.76	
	At-R	est Earth Pressu	e Coefficient	0.85	
		At-Rest Latera	. ,	2.34	_
			< Stress (psi)	7.45	_
	L	oad-Related Bull	. ,	1.05	_
			< Stress (psi)	8.50	_
		Octahedral Shea	. ,	0.20	_
		Octahedral Shea	. ,	0.10	
	Total	Octahedral Shea	· · ·	0.29	_
	Desilient	Atmospheric F		14.70	_
		lodulus from M _r E	• • • •	14090	-
	Design Subgra	ade Resilient Moc	iuius, ivi _r (psi)	13,800	
E					-
E	lastic Modulus from FWD		n, E _(FWD) (psi)	16,400	
E			n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$		_
		Back Calculation	n, E _(FWD) (psi)	16,400	-
34000		Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	-
34000	lastic Modulus from FWD	Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	-
34000 29000 24000	Astic Modulus from FWD	Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	-
34000 29000 24000	▲Confining Stress 6 psi ◆Confining Stress 4 psi	Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	-
34000 - 29000 - 24000 -	▲Confining Stress 6 psi ◆Confining Stress 4 psi	Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	
34000 - 29000 - 24000 - 19000 -	▲Confining Stress 6 psi ◆Confining Stress 4 psi	Back Calculation	n, $E_{(FWD)}$ (psi) $\frac{M_r}{=}$	16,400	

Reviewed By: MEE



Appendix D

GPR Pavement Structure Layers Thickness Profile ITD FWD Data & Elmod Back-Calculation Results Pavement Structure Layers Statistics



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



Existing AC Depth/Thickness Statistics

File No: 03224

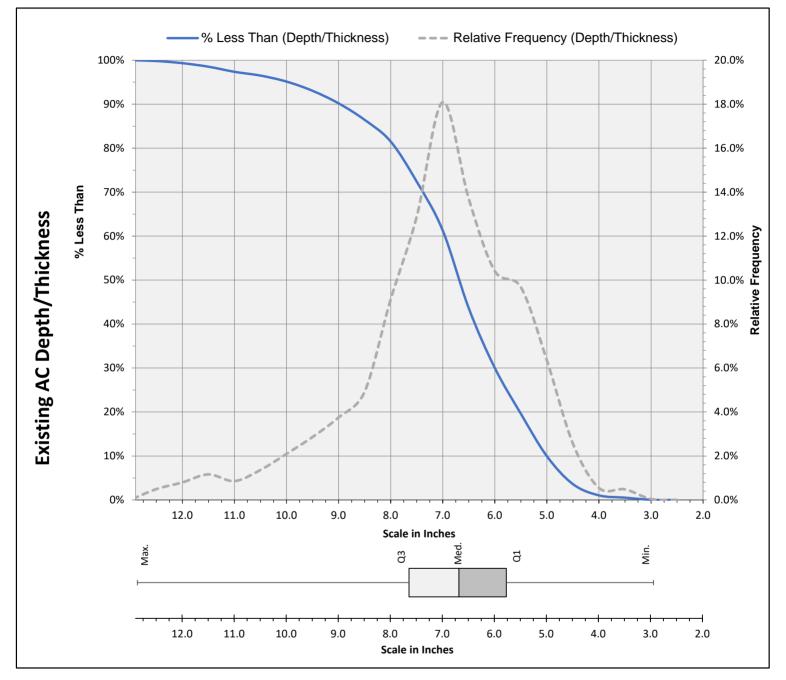
ITD Key No: 18697

Scan Date: 6/21/2019

State FY19D4 Materials Reconnaissance (SH-75, River St to Saddle Rd, Ketchum) SH-75, MP 128.2 to MP-129.23

(South Bound, Lane 0, Right Wheel Path)





Existing AC Depth/Thickness Statistics

Average= 6	5.9 in.	(0.57 ft.)
Max= 1	12.9 in.	(1.07 ft.)
Min= 2	2.9 in.	(0.25 ft.)
SD= 1	1.6 in.	(0.13 ft.)
Median= 6	5.7 in.	(0.56 ft.)
Q1= 5	5.8 in.	(0.48 ft.)
Q3= 7	7.6 in.	(0.64 ft.)
Total Number of Scans= 1	16421	

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Processed By Ben Alvarado Page 2 of 4

Existing Base Depth And Thickness Statistics

File No: 03224

Scan Date: 6/21/2019

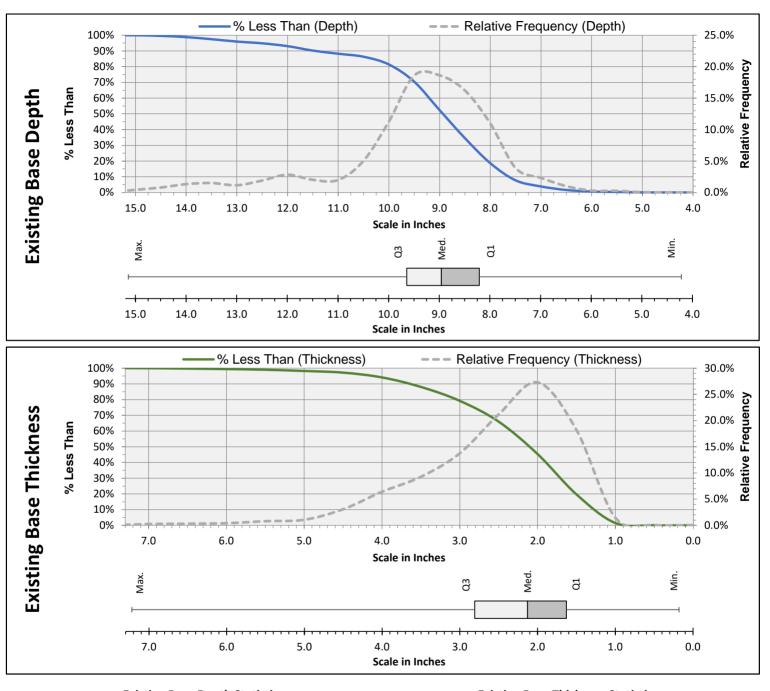
ITD Key No: 18697

State FY19D4 Materials Reconnaissance (SH-75, River St to Saddle Rd, Ketchum)

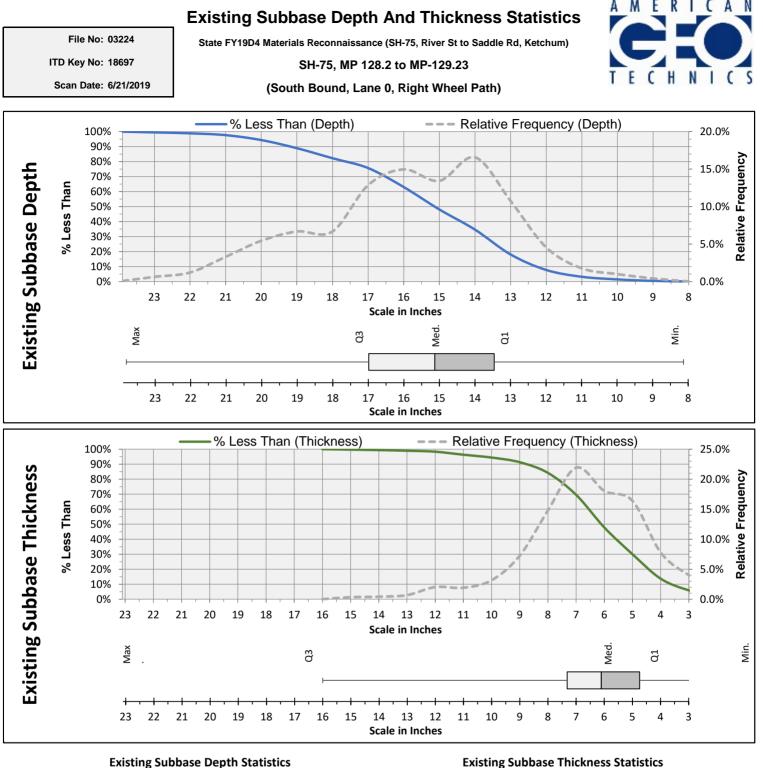
SH-75, MP 128.2 to MP-129.23

(South Bound, Lane 0, Right Wheel Path)

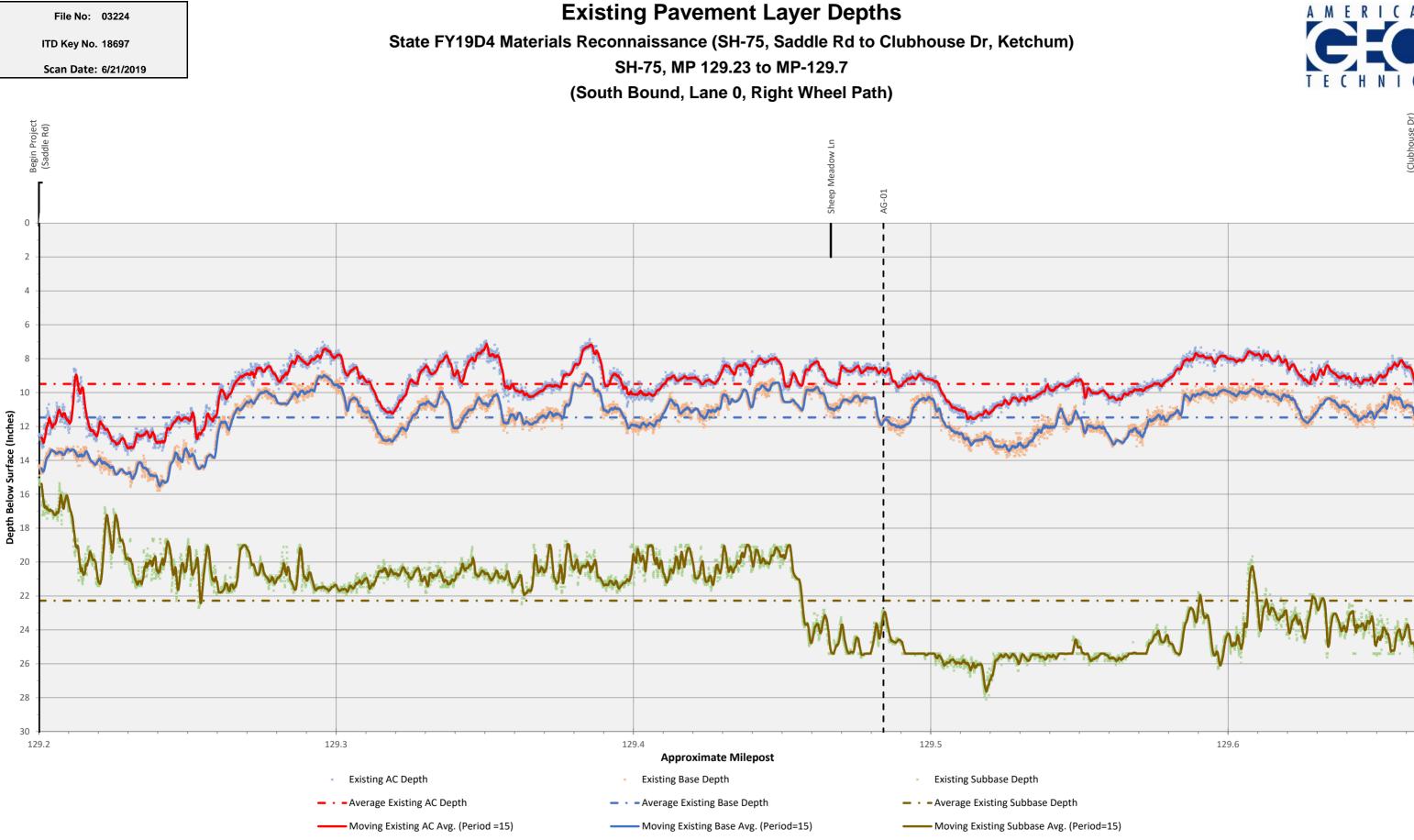




Existing Base Depth	Statistics	Existing Base Thickne	ess Statistics
Average= 9.2 in.	(0.76 ft.)	Average= 2.3 in.	(0.19 ft.)
Max= 15.1 in.	(1.26 ft.)	Max= 7.2 in.	(0.6 ft.)
Min= 4.2 in.	(0.35 ft.)	Min= 0.2 in.	(0.02 ft.)
SD= 1.5 in.	(0.13 ft.)	SD= 1 in.	(0.08 ft.)
Median= 9 in.	(0.75 ft.)	Median= 2.1 in.	(0.18 ft.)
Q1= 8.2 in.	(0.68 ft.)	Q1= 1.6 in.	(0.14 ft.)
Q3= 9.6 in.	(0.8 ft.)	Q3= 2.8 in.	(0.23 ft.)
Total Number of Scans= 16421			



Existing Subbase Dep	th Statistics	Existing Subbase Thick	ness Statistics
Average= 15.4 in.	(1.28 ft.)	Average= 6.2 in.	(0.52 ft.)
Max= 23.8 in.	(1.98 ft.)	Max= 16 in.	(1.33 ft.)
Min= 8.1 in.	(0.68 ft.)	Min= 0.2 in.	(0.01 ft.)
SD= 2.7 in.	(0.22 ft.)	SD= 2.2 in.	(0.18 ft.)
Median= 15.1 in.	(1.26 ft.)	Median= 6.1 in.	(0.51 ft.)
Q1= 13.5 in.	(1.12 ft.)	Q1= 4.7 in.	(0.4 ft.)
Q3= 17 in.	(1.42 ft.)	Q3= 7.3 in.	(0.61 ft.)
Total Number of Scans= 16421			



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



Existing AC Depth/Thickness Statistics

File No: 03224

ITD Key No: 18697

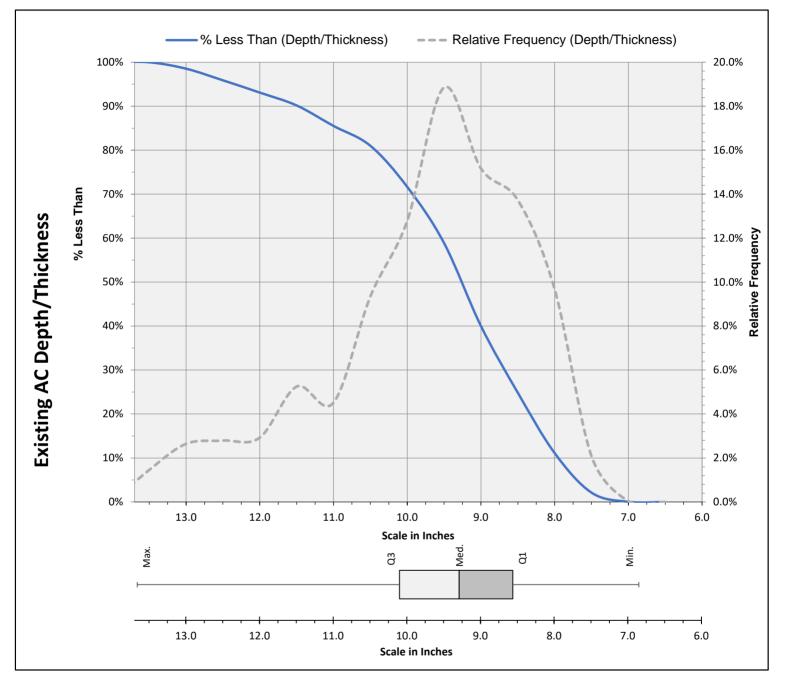
Scan Date: 6/21/2019

State FY19D4 Materials Reconnaissance (SH-75, Saddle Rd to Clubhouse Dr, Ketchum)

SH-75, MP 129.23 to MP-129.7

(South Bound, Lane 0, Right Wheel Path)





Existing AC Depth/Thickness Statistics

Average= 9.5 in.	(0.79 ft.)
Max= 13.7 in.	(1.14 ft.)
Min= 6.9 in.	(0.57 ft.)
SD= 1.3 in.	(0.11 ft.)
Median= 9.3 in.	(0.77 ft.)
Q1= 8.6 in.	(0.71 ft.)
Q3= 10.1 in.	(0.84 ft.)
Number of Scans= 7415	

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Total

Processed By Ben Alvarado Page 2 of 4

Existing Base Depth And Thickness Statistics

File No: 03224

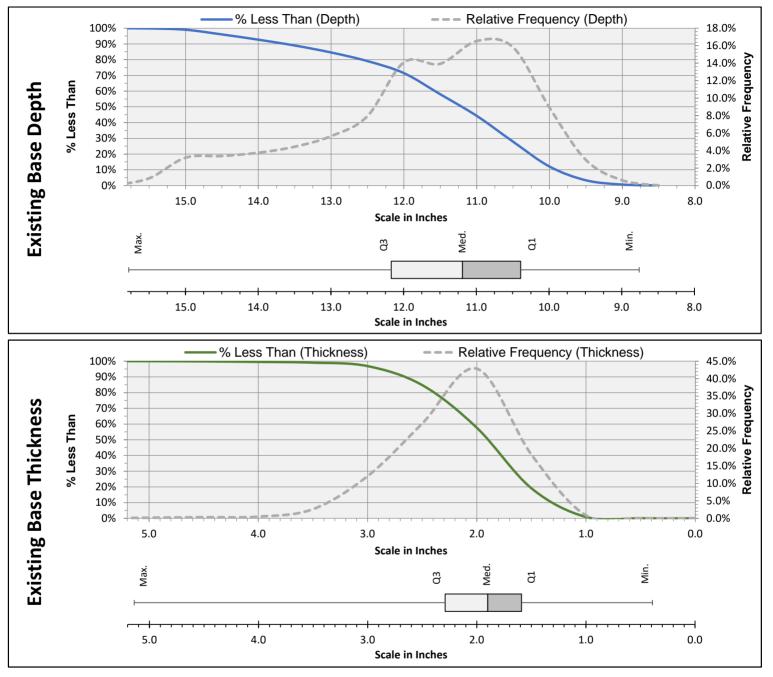
ITD Key No: 18697

Scan Date: 6/21/2019

State FY19D4 Materials Reconnaissance (SH-75, Saddle Rd to Clubhouse Dr, Ketchum) SH-75, MP 129.23 to MP-129.7

(South Bound, Lane 0, Right Wheel Path)





Existing Base Depth	Statistics	Existing Base Thickne	ess Statistics
Average= 11.5 in.	(0.96 ft.)	Average= 2 in.	(0.16 ft.)
Max= 15.8 in.	(1.32 ft.)	Max= 5.1 in.	(0.43 ft.)
Min= 8.8 in.	(0.73 ft.)	Min= 0.4 in.	(0.03 ft.)
SD= 1.4 in.	(0.12 ft.)	SD= 0.5 in.	(0.04 ft.)
Median= 11.2 in.	(0.93 ft.)	Median= 1.9 in.	(0.16 ft.)
Q1= 10.4 in.	(0.87 ft.)	Q1= 1.6 in.	(0.13 ft.)
Q3= 12.2 in.	(1.01 ft.)	Q3= 2.3 in.	(0.19 ft.)
Total Number of Scans= 7415			

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Existing Subbase Depth And Thickness Statistics

File No: 03224

ITD Key No: 18697

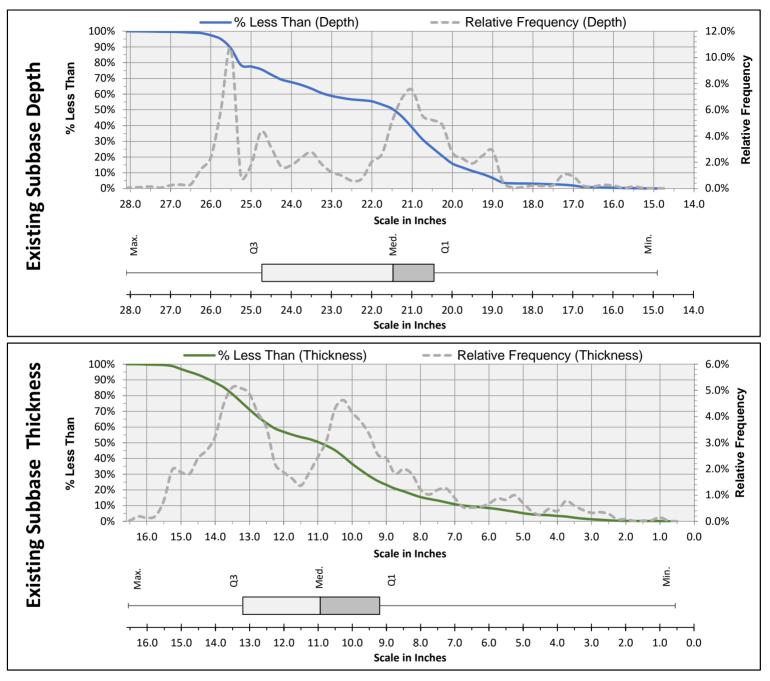
Scan Date: 6/21/2019

State FY19D4 Materials Reconnaissance (SH-75, Saddle Rd to Clubhouse Dr, Ketchum)

SH-75, MP 129.23 to MP-129.7

(South Bound, Lane 0, Right Wheel Path)





Existing Subbase Dept	th Statistics	Existing Subbase Thick	ness Statistics
Average= 22.3 in.	(1.86 ft.)	Average= 10.8 in.	(0.9 ft.)
Max= 28.1 in.	(2.34 ft.)	Max= 16.6 in.	(1.38 ft.)
Min= 14.9 in.	(1.24 ft.)	Min= 0.6 in.	(0.05 ft.)
SD= 2.5 in.	(0.21 ft.)	SD= 3 in.	(0.25 ft.)
Median= 21.5 in.	(1.79 ft.)	Median= 10.9 in.	(0.91 ft.)
Q1= 20.5 in.	(1.7 ft.)	Q1= 9.2 in.	(0.77 ft.)
Q3= 24.7 in.	(2.06 ft.)	Q3= 13.2 in.	(1.1 ft.)
Total Number of Scans= 7415			

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Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Project Name: State FY19 D4 Materials Reconnaissance

Calc. Date: 10/9/2019

Summary of Backcalulated Moduli (ksi)

--

Subbase Subgrade

18.6

6.3

File No.: 03224

Base

32.4

13.2

AC

(70°F)

334.7

196.5

Mean:

Standard Deviation:

Segment: SH-75, River to Saddle (MP128.2 to 129.2) Direction: Asc.

Summary of Input Data

Date of FWD Testing: September 5, 2019 PDAT used for Backcalculation (BELLS): 66

FWD Plate Radius: 5.905"

Distance	FWD Normalized	Pavement Deflections in Mils (inches from load plate)					Temperatures (Deg. F)			Layer Thickness (inches)			Backcalculated Elastic Modulus, E _{FWD} (ksi)						
(Miles)	Load (lbs)	D(0)	D(8)	D(12)	D(18)	D(24)	D(36)	D(60)	Asphalt BELLS	Asphalt Surface	Air	AC	Base	Subbase	AC (70°F)	Base	Subbase	Subgrade	RMS (%)
0.000	12000	13.43	10.64	9.11	7.28	5.71	3.36	1.40	71.2	78.8	57.2	6.9	5.5		669.4	35.3		20.9	2.8
0.051	12000	26.22	20.38	16.12	11.07	6.02	3.73	1.93	71.2	78.8	55.4	6.9	5.5		191.5	20.5		10.1	7.8
0.100	12000	20.74	15.30	11.91	8.48	6.13	3.61	1.74	72.2	80.6	55.4	6.9	5.5		225.0	31.9		17.6	0.7
0.157	12000	18.52	12.65	9.70	7.13	5.52	3.52	1.61	72.2	80.6	55.4	6.9	5.5		162.9	62.5		26.5	1.3
0.200	12000	18.94	13.70	10.71	7.24	4.77	2.51	1.13	70.3	77.0	55.4	6.9	5.5		254.5	28.9		15.8	1.2
0.239	12000	14.89	11.76	9.67	7.01	5.01	2.96	1.35	72.2	80.6	55.4	6.9	5.5		444.7	29.3		21.6	0.8
0.300	12000	11.52	9.04	7.22	5.09	3.70	1.96	1.17	72.2	80.6	55.4	6.9	5.5		612.9	33.7		25.1	1.0
0.400	12000	23.17	18.49	15.44	11.83	8.87	3.35	1.90	72.2	80.6	55.4	6.9	5.5		545.3	11.8		6.3	6.4
0.600	12000	19.91	13.54	10.44	7.56	5.72	3.58	1.75	71.2	78.8	55.4	6.9	5.5		193.2	39.5		25.0	0.4
0.600	12000	18.90	13.39	10.35	7.45	5.55	3.48	1.89	71.2	78.8	55.4	6.9	5.5		167.1	34.7		28.6	1.2
0.701	12000	23.07	16.62	11.93	7.98	5.75	3.55	1.80	71.2	78.8	55.4	6.9	5.5		146.5	27.6		20.7	2.6
0.801	12000	18.72	13.50	10.89	8.06	6.01	3.57	1.52	71.2	78.8	55.4	6.9	5.5		209.0	58.2		18.5	0.7
0.900	12000	25.37	19.28	14.91	10.63	7.68	4.41	1.90	70.3	77.0	55.4	6.9	5.5		189.4	22.9		13.6	0.9
1.000	12000	16.30	13.22	11.60	9.18	6.98	3.78	1.67	71.2	78.8	55.4	6.9	5.5		659.3	25.0		13.0	2.9
1.044	12000	19.25	15.20	12.29	9.16	6.74	3.83	1.76	71.2	78.8	55.4	6.9	5.5		350.2	24.2		15.9	1.2

RMS

(%)

2.1

2.1

Summary of FWD Data and Backcalculation Results

(ELMOD6 version 6.1.86)

Project Name: State FY19 D4 Materials Reconnaissance

Segment: SH-75. River to Saddle (MP 129.2 to 129.7) Direction: Dsc.

Calc. Date: 10/9/2019

Summary of Backcalulated Moduli (ksi)

File No.: 03224

AC RMS Subbase Subgrade Base (70°F) (%) Date of FWD Testing: September 5, 2019 385.8 34.8 Mean 21.2 1.4 PDAT used for Backcalculation (BELLS): 66 --22.5 FWD Plate Radius: 5.905" **Standard Deviation** 184.3 9.0 1.3 --Backcalculated Elastic Modulus, E_{FWD} Layer Thickness **Pavement Deflections in Mils** Temperatures FWD (inches) (inches from load plate) (Deg. F) (ksi) Distance Normalized (Miles) Asphalt Asphalt RMS Load (lbs) AC **D(0) D(8) D(12) D(18) D**(24) D(36) D(60) AC **Base** Subbase Base Subbase Subgrade Air BELLS Surface (70°F) (%) 12000 12.33 10.45 8.09 6.34 3.85 1.53 71.2 23.5 -1.050 14.08 78.8 55.4 6.9 5.5 727.6 14.4 1.2 -----1.004 8.51 5.75 71.2 78.8 5.5 282.2 12000 15.00 11.27 4.17 2.68 1.54 55.4 6.9 19.1 45.7 1.2 -------0.958 18.28 5.73 3.06 71.2 0.0 12000 14.43 11.63 8.13 1.36 78.8 55.4 6.9 5.5 372.1 20.6 15.6 -------0.90512000 19.61 14.54 11.10 7.36 4.89 2.69 1.32 71.2 78.8 55.4 6.9 5.5 245.9 26.3 16.4 1.4 -------0.85012000 21.8015.40 11.56 7.50 5.12 3.00 1.24 71.2 78.8 55.4 6.9 5.5 177.0 27.6 17.9 1.7 ----3.86 -0.798 30.28 20.21 7.19 12000 42.81 11.19 1.80 71.2 78.8 55.4 6.9 5.5 72.3 18.4 7.1 5.8 ----24.6 -0.74912000 12.22 9.93 8.29 6.43 4.96 3.02 1.55 71.2 78.8 55.4 6.9 5.5 657.3 30.8 1.8 ------0.70012000 12.22 9.70 8.04 4.65 2.83 1.30 71.2 6.9 586.8 28.6 6.13 78.8 55.4 5.5 ------31.3 1.6 -0.601 12000 18.86 14.41 12.12 9.25 7.09 4.41 1.89 71.2 78.8 6.9 5.5 293.6 36.7 19.3 1.2 55.4 -------0.50112000 18.11 13.15 10.36 7.40 5.40 3.18 1.57 71.2 78.8 6.9 5.5 236.4 40.4 20.4 0.7 55.4 -------0.40012000 15.29 12.48 10.69 8.41 6.53 3.94 71.2 78.8 6.9 5.5 521.1 1.66 53.6 42.4 17.0 1.2 ----

-0.301

-0.200

-0.100

0.000

12000

12000

12000

12000

16.93 14.17

18.37

16.94

14.96 11.98 10.32

14.56

13.90

12.11

12.07

12.01

9.27

8.31

9.23

9.94

7.09

6.65

7.17

8.18

4.24

4.29

4.29

5.63

2.01

1.97

1.88

2.99

71.2

71.2

71.2

71.2

78.8

78.8

78.8

78.8

53.6

53.6

53.6

53.6

6.9

6.9

6.9

6.9

5.5

5.5

5.5

5.5

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528.4

385.6

354.3

346.2

15.1

84.1

35.7

87.6

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19.7

19.6

16.6

17.9

0.8

0.9

1.2

0.6

Summary of Input Data

Roadway Materials Report State, FY19 D4 Materials Reconnaissance (SH-75, River St to Clubhouse Dr) ITD Key No 18815



Appendix E

Traffic Data Traffic Projection worksheet Traffic Data Summary 8/5/2019

Proj∉	ect number:		k	(ey number:				River St to Cl	ubhouse Dr		
	Route:	SH-75		RouteID:)2230ASH075	Fro	m Measure:	54.053	-	To Measure:	54.762
True	ck Density =	2 Medium	Last yea	ar with data:	2018	Cumulating E	SALs up to:	2044	Starting to C	Cumulate in:	2024
Year		ADTS			id Pavement E		,		ible Pavement	1	,
					rections	50% Dir			rections	50% Dir	
	Total	Pass	Comm	Year Value	Cumulative	50% Year	50% Cum	Year Value	Cumulative	50% Year	50% Cum
2018	14000	12800	1200					_		_	
2024	17430	15870	1560	1203	1203	601	601	650	650	325	325
2025	18000	16380	1620	1261	2463	630	1232	681	1331	341	666
2026	18580	16900	1680	1326	3789	663	1895	719	2050	359	1025
2027	19150	17410	1740	1392	5181	696	2591	751	2801	375	1400
2028	19720	17920	1800	1453	6634	727	3317	783	3584	392	1792
2029	20290	18430	1860	1522	8157	761	4078	816	4400	408	2200
2030	20860	18940	1920	1592	9749	796	4874	856	5256	428	2628
2031	21440	19460	1980	1656	11405	828	5703	890	6147	445	3073
2032	22010	19970	2040	1729	13134	864	6567	925	7071	462	3536
2033	22580	20480	2100	1795	14929	898	7465	960	8031	480	4016
2034	23150	20990	2160	1870	16799	935	8400	1003	9034	501	4517
2035	23720	21500	2220	1946	18745	973	9373	1039	10073	519	5036
2036	24300	22020	2280	2016	20761	1008	10381	1075	11148	538	5574
2037	24870	22530	2340	2094	22855	1047	11428	1112	12260	556	6130
2038	25440	23040	2400	2174	25029	1087	12515	1158	13418	579	6709
2039	26010	23550	2460	2246	27276	1123	13638	1196	14614	598	7307
2040	26580	24060	2520	2329	29605	1164	14802	1234	15848	617	7924
2041	27160	24580	2580	2403	32008	1202	16004	1273	17121	637	8561
2042	27730	25090	2640	2488	34496	1244	17248	1322	18443	661	9222
2043	28300	25600	2700	2574	37070	1287	18535	1362	19805	681	9902
2044	28870	26110	2760	2651	39721	1326	19861	1402	21207	701	10604

Traffic Projection Worksheet

Projec	t: SH-75, River St to Clubhouse Dr.					Date:	August 5, 2019	
	Flexible Pavement> Rigid Pavement>	Beginning Year: Beginning Year:	2024	Ending Year: Ending Year:		Analysis Period: (Years)	20 NA	
AM	ERICAN			Roadwa	y Segment			٦
C		SH-75						
	Lane Information							٦
	No. of Lanes in Design Direction % Split of Trucks in Design Direction % of Trucks in Design Lane	1 57% 100%						
	Total Traffic - Both Directions							
u	2024 AADT							
From ITD's AADT Projection Report	2044 AADT AADT for the Analysis Period							4
roj	Truck Traffic - Both Directions							
	% Truck Traffic							
s AADT Report	AADTT							
s A Re	Truck Density (H, M, L)							
2	Design Lane							
E	AADTT							hle
2	Traffic Index, TI							Flexible
-	Flexible Design ESALs Compound Annual Growth Rate							ш
	Flexible ESAL Projections - Both Directions							-
t	2024 Yearly and Cummulative ESALs	650,000						
ode	2044 Yearly ESALs	1,402,000						
Ř	2044 Cummulative ESALs	21,207,000						
tior	Design Lane							
jec	Flexible Design ESALs	11,717,490						
Pro	Traffic Index, TI Compound Annual Growth Rate	12.1						
ESAL Projection Report	Rigid ESAL Projections - Both Directions							+
E S	Yearly and Cummulative ESALs							
)'s	Yearly ESALs							
From ITD's	Cummulative ESALs							Riaid
Ш	Design Lane							~
с Ц	Rigid Design ESALs							
	Compound Annual Growth Rate							

American Geotechnics

Traffic Data Summary (by Vehicle Classification)



Project Name: State FY19 D4 Materials Reconnaissance Client: ITD File No.: 03224 Date Prepared: 10/7/2019

Segment: SH-75, River St to Clubhouse Dr

Traffic Count Duration: 14 days

Northbound															_
							Trips Per F	HWA Vehi	cle Class						
		1	2	3	4	5	6	7	8	9	10	11	12	13	
			Cars and			2-axle	3-axle	4 axle	<5-axle	5 axle	>6 axle	<6 axle	6 axle	>6 axle	
Date	Time	Motorcycle	Trailers	2-axle	Buses	6-tire	single	single	double	double	double	multi	multi	multi	Total
7/4/2019	24 Hrs	24	1924	784	12	502	3	0	83	6	0	1	0	0	3,339
7/5/2019	24 Hrs	28	2521	1104	19	680	5	0	106	3	0	1	0	0	4,467
7/6/2019	24 Hrs	43	2200	932	23	575	7	0	61	3	0	1	0	0	3,845
7/7/2019	24 Hrs	24	1571	638	28	367	3	0	57	1	0	2	0	0	2,691
7/8/2019	24 Hrs	27	1971	890	36	555	23	7	81	11	3	1	0	2	3,607
7/9/2019	24 Hrs	27	2127	991	31	635	19	16	75	11	1	3	0	0	3,936
7/10/2019	24 Hrs	39	2133	1050	49	638	4	9	111	13	3	2	0	1	4,052
7/11/2019	24 Hrs	23	2175	1126	36	695	14	4	139	14	2	1	0	0	4,229
7/12/2019	24 Hrs	32	2281	1203	44	727	11	6	144	5	4	0	0	0	4,457
7/13/2019	24 Hrs	27	2192	880	21	504	4	0	72	2	1	1	0	0	3,704
7/14/2019	24 Hrs	29	1636	697	25	414	2	0	54	3	0	1	0	0	2,861
7/15/2019	24 Hrs	27	1991	939	26	620	7	5	90	13	2	1	0	0	3,721
7/16/2019	24 Hrs	62	2135	938	37	656	51	9	90	11	0	5	0	0	3,994
7/17/2019	24 Hrs	37	2136	964	34	655	40	10	119	17	3	0	0	1	4,016
	TOTAL	449	28993	13136	421	8223	193	66	1282	113	19	20	0	4	52,919

Southbound															-
							Trips Per F	HWA Vehi	cle Class						
		1	2	3	4	5	6	7	8	9	10	11	12	13	
			Cars and			2-axle 6-	3-axle	4 axle	<5-axle	5 axle	>6 axle	<6 axle	6 axle	>6 axle	
Date	Time	Motorcycle	Trailers	2-axle	Buses	tire	single	single	double	double	double	multi	multi	multi	Total
7/4/2019	24 Hrs	15	1849	705	1	290	3	0	23	9	0	0	0	0	2,895
7/5/2019	24 Hrs	10	2638	1171	10	440	8	0	85	6	0	5	0	1	4,374
7/6/2019	24 Hrs	16	2505	1146	14	375	4	0	111	8	0	3	0	0	4,182
7/7/2019	24 Hrs	28	2182	1059	22	371	1	0	251	1	0	3	0	0	3,918
7/8/2019	24 Hrs	9	1999	1026	9	403	22	0	75	18	4	0	0	0	3,565
7/9/2019	24 Hrs	10	2195	1143	10	463	25	0	56	14	1	1	0	0	3,918
7/10/2019	24 Hrs	8	2082	1165	29	473	20	3	78	13	3	0	0	0	3,874
7/11/2019	24 Hrs	3	2186	1249	36	493	16	2	69	19	3	1	0	0	4,077
7/12/2019	24 Hrs	9	2183	1292	22	449	21	0	80	7	3	3	0	0	4,069
7/13/2019	24 Hrs	19	2087	980	8	316	4	0	97	2	1	2	0	0	3,516
7/14/2019	24 Hrs	11	2021	1007	14	344	2	0	170	2	0	0	0	0	3,571
7/15/2019	24 Hrs	10	2060	1082	8	446	15	0	75	20	2	1	0	0	3,719
7/16/2019	24 Hrs	5	2214	1027	13	473	41	6	84	14	1	2	0	0	3,880
7/17/2019	24 Hrs	8	2180	1126	8	501	32	0	68	18	3	0	0	2	3,946
	TOTAL	161	30381	15178	204	5837	214	11	1322	151	21	21	0	3	53,504

TOTAL Both Directions:	610	59374	28314	625	14060	407	77	2604	264	40	41	0	7	106,423
% of Total NB & SB:	0.57%	55.79%	26.61%	0.59%	13.21%	0.38%	0.07%	2.45%	0.25%	0.04%	0.04%	0.00%	0.01%	100%
Average Daily Traffic (ADT)(14 days):	44	4241	2022	45	1004	29	6	186	19	3	3	0	1	7,602
Directional Distribution Factors:	74%	51%	54%	67%	58%	53%	86%	51%	57%	53%	51%	50%	57%	
Percent Traffic in Design Direction:	50%													-
Commerical Average Daily Traffic (ADTT):				45	1,004	29	6	186	19	3	3	0	1	1295
Commercial Vehicle Class Distribution:				3.45%	77.57%	2.25%	0.42%	14.37%	1.46%	0.22%	0.23%	0.00%	0.04%	100%
Directional Distribution Factors:				67%	58%	53%	86%	51%	57%	53%	51%	50%	57%	
Percent Trucks in Design Direction:	57%													-

Roadway Materials Report State, FY19 D4 Materials Reconnaissance (SH-75, River St to Clubhouse Dr) ITD Key No 18815



Appendix F

AASHTOWare Pavement ME Results:

- Asphalt Removal and Replacement
 - Flexible Reconstruction

LTPPBind output



File Name: C:\Users\MEarl\Desktop\SH-75 AC Removal and Replacement (River to Saddle).dgpx



Design Life: 20 years FLEXIBLE Design Type:

Base construction: Pavement construction: Traffic opening:

June, 2024 July, 2024 August, 2024 **Climate Data** 43.5, -114.375 Sources (Lat/Lon) 43.5, -113.75 44, -113.75

Design Structure

				1
Layer type	Material Type	Thickness (in)	Volumetric at Constru	С
Flexible	New HMA (PG 70-34)	6.0	Effective binder	_
NonStabilized	New & Existing Base/Subbase	9.4	content (%) Air voids (%)	
Subgrade	Subgrade	Semi-infinite		

ction: 11.6 7.5

Traffic Heavy Trucks Age (year) (cumulative) 2024 (initial) 1,560 2034 (10 years) 4,047,120 2044 (20 years) 10,515,000

Design Outputs

Distress Prediction Summary

Distress Type) Specified bility	Reliab	Criterion Satisfied?	
	Target	Predicted	Target	Achieved	Satisfieur
Terminal IRI (in/mile)	175.00	113.74	90.00	99.99	Pass
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	14.36	90.00	94.39	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.03	90.00	100.00	Pass

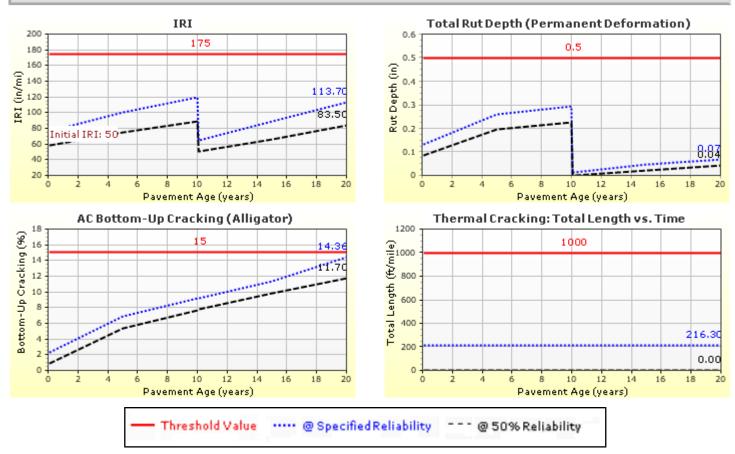


Design traffic (flexible pavements) = 11.68 million ESALs





Distress Charts

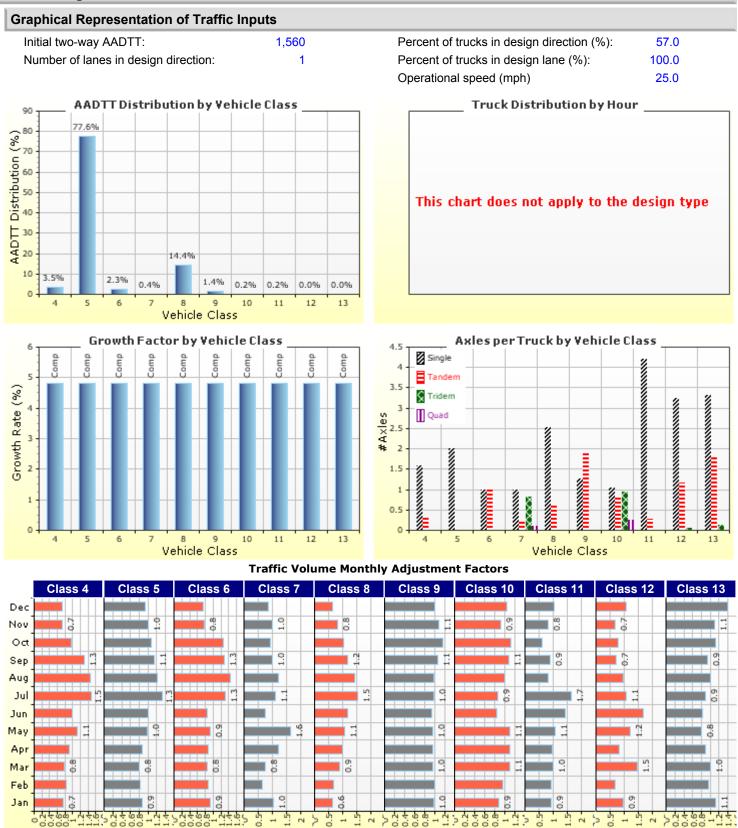




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Traffic Inputs



Adj. Factor

Adj. Factor Adj. Factor

Adj. Factor Adj. Factor Adj. Factor Adj. Factor Adj. Factor Adj. Factor Adj. Factor





Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month					Vehicle Class												
WOITIN	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 (%)	Growt	h Factor
	(Level 3) `´	Rate (%)	Function
Class 4	3.5%	4.8%	Compound
Class 5	77.6%	4.8%	Compound
Class 6	2.3%	4.8%	Compound
Class 7	0.4%	4.8%	Compound
Class 8	14.4%	4.8%	Compound
Class 9	1.4%	4.8%	Compound
Class 10	0.2%	4.8%	Compound
Class 11	0.2%	4.8%	Compound
Class 12	0%	4.8%	Compound
Class 13	0%	4.8%	Compound

Axle Configuration

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

Average Axle Spacing				
51.6				
49.2				
49.2				

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

Wheelbase	does not	apply

Truck Distribution by Hour does not apply

Number of Axles per Truck

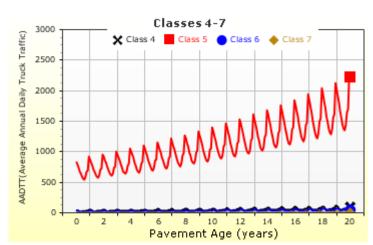
_					
	Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
	Class 4	1.59	0.34	0	0
	Class 5	2	0	0	0
	Class 6	1	1	0	0
	Class 7	1	0.22	0.83	0.1
_	Class 8	2.52	0.6	0	0
	Class 9	1.25	1.87	0	0
	Class 10	1.03	0.85	0.95	0.26
	Class 11	4.21	0.29	0.01	0
	Class 12	3.24	1.16	0.07	0.01
	Class 13	3.32	1.79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



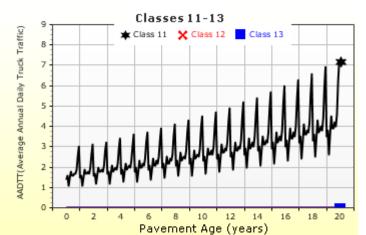


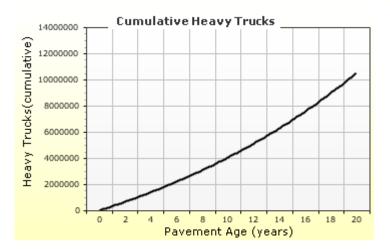
AADTT (Average Annual Daily Truck Traffic) Growth

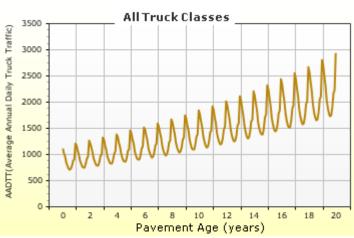
* Traffic cap is not enforced

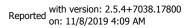














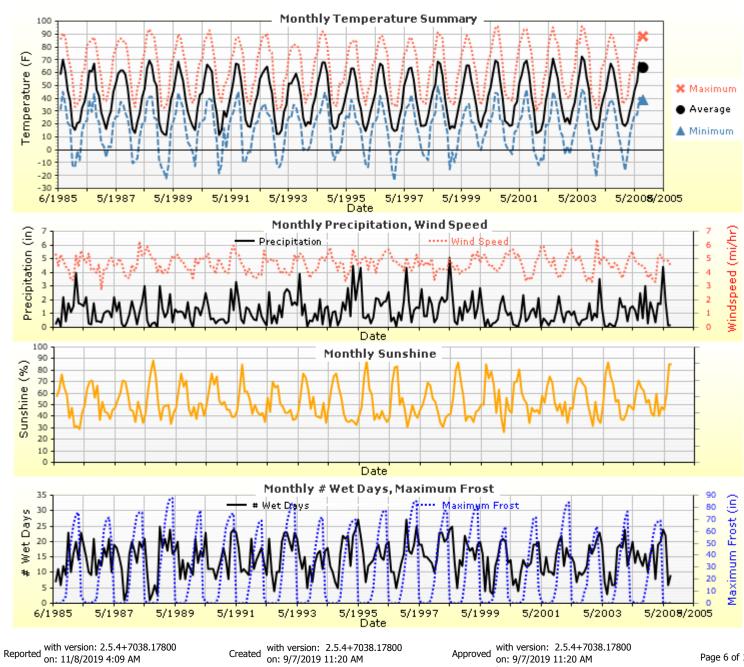


File Name: C:\Users\MEarl\Desktop\SH-75 AC Removal and Replacement (River to Saddle).dgpx

Climate Inputs

Climate Data Sources:		dev.))	1		_ M	onth	ly Ra	ainfa	ll Sta	tisti	cs			
Climate Station Cities: US, ID US, ID US, ID	Location (lat lon elevation(f 43.50000 -114.37500 569 43.50000 -113.75000 669 44.00000 -113.75000 634) 2.5 7 2 8 2 1.5 4 1 1 1	1	1.47 (0.95)	1.46 (0.96)	1.55	2.10 (1.29)	1.54 (1.20)	0.60	0.62	0.81	0.89 (0.81)	1.01 (0.71)	1.42 (0.99)
Annual Statistics: Mean annual air temperatur Mean annual precipitation (i			Jan	Feb	Mar	Apr	May	un	(0.44)	(0.61) 6 7	Sep	Oct	Nov	Dec
Freezing index (°F - days) Average annual number of	1430.7	W/at	er tabl	e dep	th								10	0.00
Monthly Climato Summ														

Monthly Climate Summary:



on: 9/7/2019 11:20 AM by:

Approved on: 9/7/2019 11:20 AM by:





Hourly Air Temperature Distribution by Month:

< -13º F	-13° F to -4° F	-4° F to 5° F	5° F to 14° F	14 1 10 20 1	23 F 10 32 F		41 1 10 00
			100		29	125	
- 4	-47		100	- 226	29 175 ²⁵⁸	72 195	
9	-915	-61	190	33 212	101 231	2	-13
		28	131	44 251	25	40 241	132 13
	<u>5</u> 17 33	- 98	194	-172	142	5 271	13
		31	-137	5 263	1295	35 288	13 14 1
			50	7 156	119 390	50 100 195	1
6	16 57	70	149	213	11 217 185	7 105	
	-26	25	135	2 242	26 185 188 ²⁵⁷	145 265	
8 17	20 42	107	195	26 199	2 185	-50 - 290	13
1	383	51	100	54	2 171 263 10 289	58 <mark>91</mark>	9 14
				- 11	10 289 29 240	130 228 138 206	-
	20	18	74	13 118	188 283	138 306 40 245	39 1 116
		9	174	7 220	162 ²²⁸	40 245	1
- 2	1jla 40	60	- 229	7 203	RR 169	273	
	-103	-11	16	48 228	2 143 307	58 120 1,38	25 1
11	-9 88			25 85	12 202 373	120 138 111 168 281	46
	39	94	-162	196	29 127 155	54 105	10 13
-55 -28	6 ¹⁰ 23 4755	117	141	33 185	120	7 53 283	
	58 34	46	117	206	12	53 201	23 97
	-6	5	73	212	63 13 289	41 227	- 128
				3	133	304	19 124
- 2	-226	1 47	96	29 148	10 239	23 5 ⁸⁰ 262	125
	24						
20		80 -	200-	200- 300-	100- 200- 300-		100-
		, 40 80 # of Hours	# of Hours	# of Hours	# of Hours		1
ୁ # of Hours	, 07 08 # of Hours	# of Hours	# of Hours	# of Hours	# of Hours	100- 200- 300-	# of Hou
10 20	20 20 60 80			# of Hours		300 300 300 # of Hours	# of Hou
역 원 원 # of Hours 50° F to 59° F	, 07 08 # of Hours	# of Hours	# of Hours	# of Hours	# of Hours	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 # of Hours 50° F to 59° F	* OF Hours 59° F to 68° F	# of Hours 68° F to 77° F	# of Hours 77° F to 86° F	# of Hours 86° F to 95° F	# of Hours	001 002 000 # of Hours 104⁰ F to 113⁰	1
9 8 9 # of Hours 50° F to 59° F 205- 68 196	+ of Hours 59° F to 68° F 98 82 98 82 184	# of Hours 68° F to 77° F	# of Hours 77° F to 86° F 7 -13	# of Hours 86° F to 95° F	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 9 # of Hours 50° F to 59° F 205 68 196 146 199 89	R Q	# of Hours 68° F to 77° F 68 	# of Hours 77° F to 86° F 7 -13 -44	# of Hours 86° F to 95° F 714 -4 -39 117	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 8 # of Hours 50° F to 59° F 205 68 196 146 199 89 177 108	R Q	# of Hours 68° F to 77° F 68° III3 30 130 130	# of Hours 77° F to 86° F 7 13 44 58	# of Hours 86° F to 95° F -714 4 39 117 -7 58	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 9 # of Hours 50° F to 59° F 205- 68 196- 146 199- 89 177- 108 173- 99	R Q B B # of Hours 59° F to 68° F 98 98 98 82 184 98 145 150 31 138 138	# of Hours 68° F to 77° F 68 	# of Hours 77° F to 86° F 7 -13 -44	# of Hours 86° F to 95° F -714 4 39 117 7 -2130	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 8 # of Hours 50° F to 59° F 205 68 196 146 199 89 177 108 173 99 194	R Q	# of Hours 68° F to 77° F 68° III3 30 130 130	# of Hours 77° F to 86° F 7 13 44 58	# of Hours 86° F to 95° F 714 -4 -4 -39 -117 -7 -58 -2130 -3045	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
# of Hours 50° F to 59° F 205 68 146 199 89 177 108 177 99 194 106 180	R Q	# of Hours 68° F to 77° F 68 113 30 130 130 111 18 119	# of Hours 77° F to 86° F 7 -13 -44 -58 	# of Hours 86° F to 95° F -714 4 39 117 7 -2130	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F # of Hours 50° F to 59° F 205 58 196 146 199 177 108 106 180 94	R Q	# of Hours 68° F to 77° F 68° III3 30 130 111 18 119 147 93 21	# of Hours 77° F to 86° F 7 -13 -44 -58 	# of Hours 86° F to 95° F 714 -4 -4 -39 -117 -7 -58 -2130 -3045	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 5 # of Hours 50° F to 59° F 205 68 196 146 199 89 177 108 173 99 194 106 180 94	R Q	# of Hours 68° F to 77° F 58 113 30 130 130 111 18 119 147 93	# of Hours 77° F to 86° F 13 44 58 54 43 6	# of Hours 86° F to 95° F -714 4 -39 -117 -7 -58 -2130 -3045 -9	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
# of Hours 50° F to 59° F 205- 68 196- 146 199- 89 177- 108 173- 99 194- 105 180- 94 200-	R Q	# of Hours 68° F to 77° F 58 113 30 130 111 18 119 147 93 21 6	# of Hours 77° F to 86° F 13 44 58 54 43 6	# of Hours 86° F to 95° F -714 4 -39 -117 -7 -58 -2130 -3045 -9	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
# of Hours 50° F to 59° F 2 05- 68 1 46 1 99- 89 177- 108 173- 99 194- 106 180 94- 200- 80 209- 70 199- 73- 199-	N Q	# of Hours 68° F to 77° F 68° III3 30 130 111 18 119 147 93 21 6 74 41 142	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 4 6	# of Hours 86° F to 95° F 714 4 7 7 58 2130 	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
50° F to 59° F 50° F to 59° F 106 199 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 108 177 109 170 109 209 70 199 2 50 179 199 2 50 179 179 179 179 179 179 179 179 179 179 170 179 170 170 179 170 179 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 170 1	N Q	# of Hours 68° F to 77° F 58 113 30 130 111 18 119 147 93 21 6 74 44 142 48	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 43 54 43 54 43 54 43 54 54 54 54 54 54 54 54 54 54 54 54 54	# of Hours 86° F to 95° F -714 4 -39 -117 -7 -58 -2130 -3045 -9 -3 -28 -37 -37	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F # of Hours 50° F to 59° F 205. 50° F to 59° F 146 196. 146 199. 177. 108 173. 99. 194. 106 180. 94. 200. 80 209. 70. 199. 70 199. 73. 199. 2 69. 202. 01 91. 91.	R Q	# of Hours 68° F to 77° F 68° III3 30 113 30 111 18 119 147 93 21 6 74 44 142 48 105	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 43 6 43 6 43 6 54 43 6 54 6 54	# of Hours 86° F to 95° F 714 4 7 7 58 2130 	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F # of Hours 50° F to 59° F 205. 58 196. 146. 199 177. 108. 106 180. 94. 99 194. 106. 94 209. 70. 70 199. 73. 2 69. 202. 91. 174. 132.	N Q	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 4 6 4 6 6 6 7 6 8 6 8 6 8 6 8 6 8 6 8 6 8 6 8	# of Hours 86° F to 95° F 714 4 	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F 50° F to 59° F 205 68 196 50° F to 59° F 106 199 199 99 194 106 180 94 200 80 209 70 199 73 199 2 69 202 91 174 132 193 92 193	R Q R R R R R R R R R R R R R R R R R	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 43 6 43 6 43 6 54 43 6 54 6 54	# of Hours 86° F to 95° F -714 4 -39 -117 -7 -58 -2130 -3045 -9 -3 -28 -37 -37	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F # of Hours 50° F to 59° F 205 58 196 146 199 194 106 99 194 106 99 194 209 70 199 194 2 69 209 70 199 2 91 174 132 91 174 132 92 191 174	R Q R # of Hours 59° F to 68° F 98 82 184 98 145 31 43 150 31 138 24 127 100 147 17 93 15 179 55 161 12 111 16 130 38 99 38 158 72 161	# of Hours 68° F to 77° F 68° III3 30 113 30 111 18 119 147 93 21 6 74 44 142 48 105 9 -58 11 121 27 48	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 4 6 4 6 6 6 7 6 8 6 8 6 8 6 8 6 8 6 8 6 8 6 8	# of Hours 86° F to 95° F -714 4 39 117 -7 -58 -2130 30.45 -9 3 -9 3 -9 3 -28 -1 20 -1 20 -1 20 -1 -20 -1 -1 -1 -1 -21 -21 -21 -21 -2	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 9 50° F to 59° F 205 68 196 108 173 99 194 106 180 94 200 80 209 70 199 2 69 202 91 174 193 2 69 202 91 174 132 92 191 84	R Q R # of Hours 59° F to 68° F 98 82 98 82 184 98 43 15 17 93 15 17 15 17 18 93 15 17 93 15 12 111 16 130 38 99 38 158 72 161 13	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 7 13 44 58 54 43 6 4 6 4 6 6 6 7 6 8 6 8 6 8 6 8 6 8 6 8 6 8 6 8	# of Hours 86° F to 95° F 714 4 	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F 50° F to 59° F 205 68 196 146 199 89 177 108 173 99 194 106 180 94 209 70 199 73 199 2 69 202 91 174 132 193 92 191 84 188 79 189	R R	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 7 13 44 58 43 6 43 6 43 6 4 5 4 6 7 6 6 7 6 7 6 7 6 7 7 1 6 7 7 1 6 7 7 1 6 7 1 1 6 7 1 1 1 1	# of Hours 86° F to 95° F -714 4 39 117 -7 -58 -2130 30.45 -9 3 -9 3 -9 3 -28 -1 20 -1 20 -1 20 -1 -20 -1 -1 -1 -1 -21 -21 -21 -21 -2	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F 50° F to 59° F 205 68 196 146 199 89 177 108 173 99 194 106 180 94 209 70 199 2 69 202 91 174 132 193 92 191 84 188	R Q	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 7 13 44 58 5 43 6 4 6 4 6 6 7 6 7 6 8 6 8 6 8 6 8 6 8 6 8 6 8 6	# of Hours 86° F to 95° F 714 4 -39 -2130 -2130 -9 -3 -9 -3 -228 -37 -28 -37 -28 -1 -20 -1 -20 -2 -26 -26	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
9 8 9 50° F to 59° F 205 68 196 108 173 99 194 106 180 94 200 80 209 70 199 2 69 202 91 177 108 173 99 194 200 209 70 199 2 69 202 91 174 132 192 191 84 188 79 189 154 158 140 140	N Q	# of Hours 68° F to 77° F 58 113 30 130 111 18 119 147 93 21 6 74 41 142 48 106 9 58 11 121 27 48 5 77 113 38 140 30	# of Hours 77° F to 86° F 7 13 44 58 43 6 43 6 43 6 4 6 5 4 6 7 4 6 7 6 7 6 7 6 7 7 6 8 6 7 7 8 5 7 7 8 5 7 8 5 7 8 5 8 5 8 7 7 8 5 8 5	# of Hours 86° F to 95° F -714 4 39 117 7 58 -2130 3045 -9 3 -228 -37 -27 3 -28 -37 -27 -33 -28 -37 -27 -33 -28 -37 -21 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -37 -37 -37 -37 -37 -37 -37	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F 50° F to 59° F 205 68 196 146 199 89 177 108 173 99 194 106 180 94 209 70 199 2 69 202 71 174 132 193 92 191 84 188 79 189 158 140 118 140	R Q R R Q R R Q R	# of Hours 68° F to 77° F 68°	# of Hours 77° F to 86° F 13 44 58 54 43 54 43 54 43 54 54 54 6 54 54	# of Hours 86° F to 95° F -714 4 39 117 7 58 -2130 3045 -9 3 -228 -37 -27 3 -28 -37 -27 -33 -28 -37 -27 -33 -28 -37 -21 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -28 -37 -37 -37 -37 -37 -37 -37 -37	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou
P R F 50° F to 59° F 205 68 196 108 177 108 173 99 194 106 180 94 200 80 209 70 199 73 199 69 202 91 174 132 193 92 191 84 188 79 189 158 110 206 156	R R	# of Hours 68° F to 77° F 58 113 30 130 111 18 119 147 93 21 6 74 41 142 48 106 9 58 11 121 27 48 5 77 113 38 140 30	# of Hours 77° F to 86° F 7 13 44 58 43 6 43 6 43 6 4 6 5 4 6 7 4 6 7 6 7 6 7 6 7 7 6 8 6 7 7 8 5 7 7 8 5 7 8 5 7 8 5 8 5 8 7 7 8 5 8 5	# of Hours 86° F to 95° F -714 4 39 117 -7 -58 -2130 3045 -9 3 -9 3 -28 -37 -9 -3 -28 -1 -28 -1 -2130 -1 -9 -3 -9 -3 -2130 -17 -17 -17 -17 -17 -17 -17 -17	# of Hours 95° F to 104° F	001 002 000 # of Hours 104⁰ F to 113⁰	# of Hou





Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False	Layer Name	ll avor Tyno	Interface Friction	
Using G* based model (not nationally calibrated)	False	Layer 1 Flexible : New HMA (PG	Flexible (1)	1.00	
Is NCHRP 1-37A HMA Rutting Model Coefficients	True	70-34) Layer 2 Non-stabilized Base :	Non-stabilized Base (4)	1.00	
Endurance Limit	-	New & Existing Base/Subbase	Subgrade (5)	 _	
Use Reflective Cracking	True				
Structure - ICM Properties					
AC surface shortwave absorptivity	0.85				



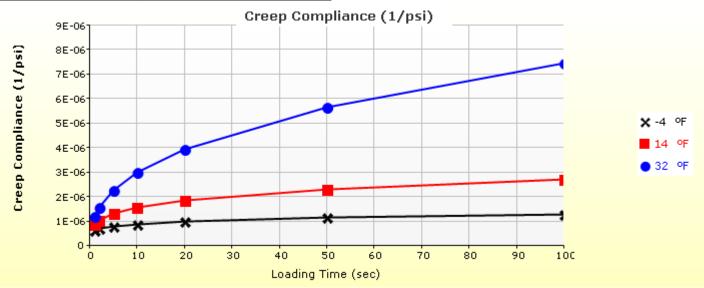


Thermal Cracking

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

Creep Compliance (1/psi) (Input Level: 3)						
Loading time (sec) -4 °F 14 °F 32 °F						
1	6.27e-007	8.90e-007	1.21e-006			
2	6.98e-007	1.05e-006	1.59e-006			
5	8.05e-007	1.32e-006	2.28e-006			
10	8.96e-007	1.56e-006	3.00e-006			
20	9.97e-007	1.84e-006	3.95e-006			
50	1.15e-006	2.30e-006	5.67e-006			
100	1.28e-006	2.73e-006	7.46e-006			

Indirect Tensile Strength (Input Level: 3)					
Test Temperature (°F) Indirect Tensilte Strength (ps					
14.0	490.85				

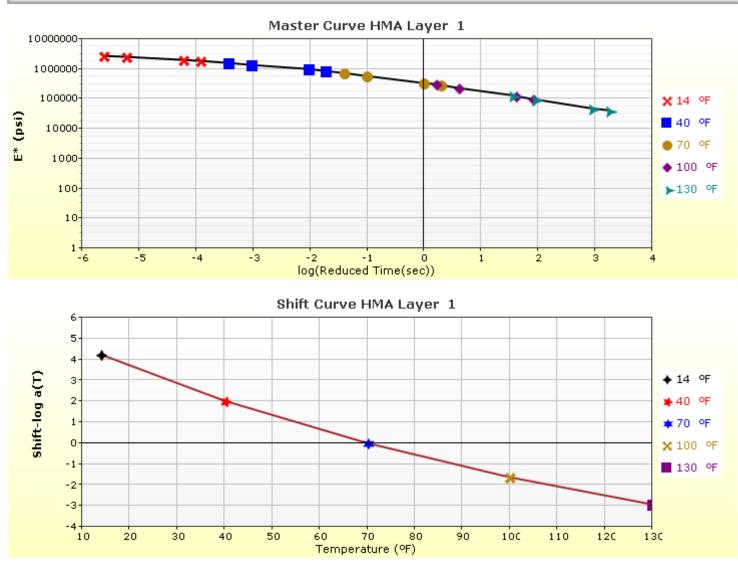




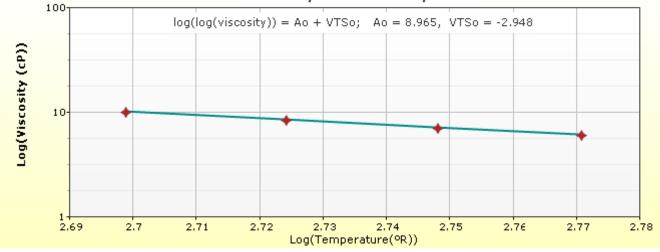


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HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-34)



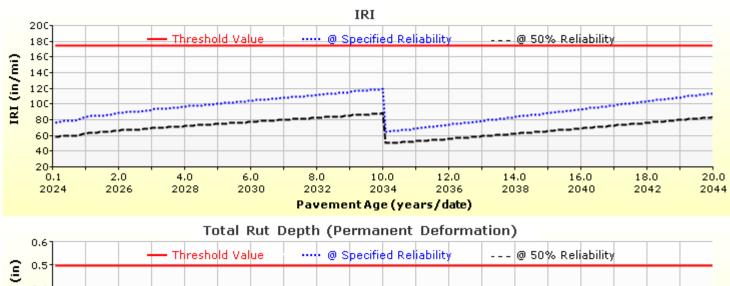






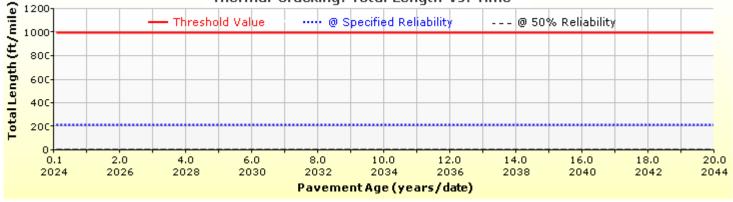


Analysis Output Charts









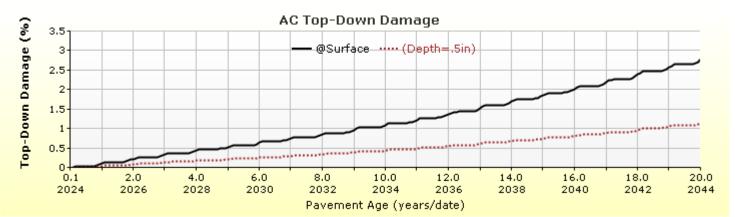


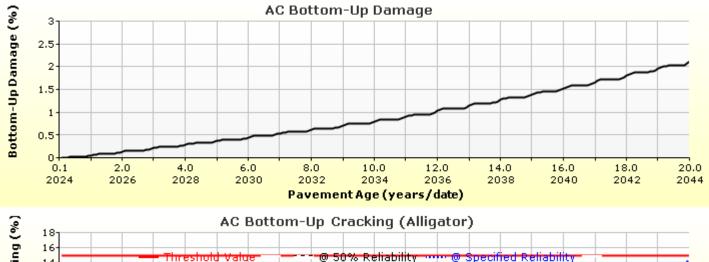


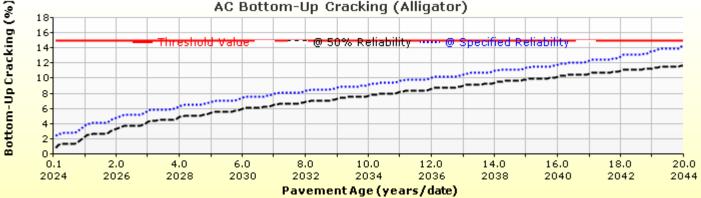
PvD



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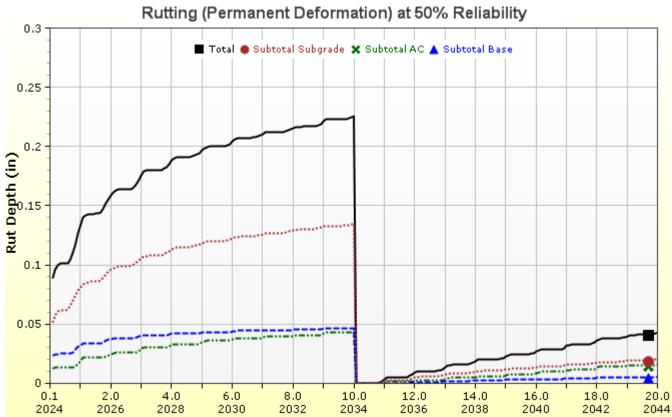








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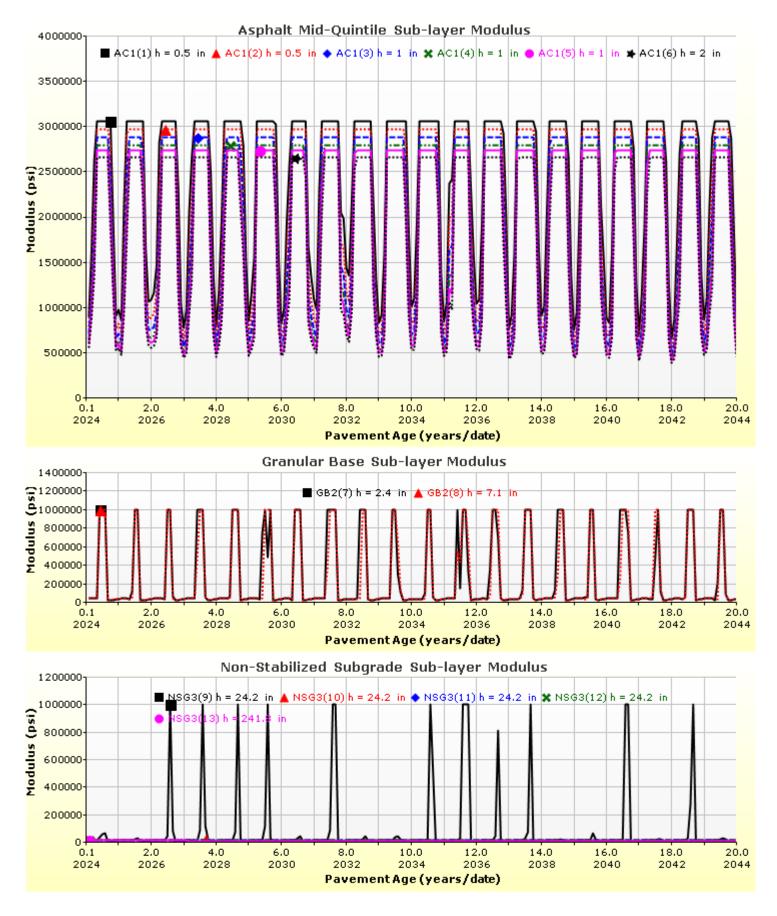


Pavement Age (years/date)





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AASHTOWare

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Layer Information

Layer 1 Flexible : New HMA (PG 70-34)

Asphalt		
Thickness (in)	6.0	
Unit weight (pcf)	144.0	
Poisson's ratio	Is Calculated?	True
	Ratio	-
	Parameter A	-1.63
	Parameter B	3.84E-06

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	70-34
A	8.965
VTS	-2.948

General Info

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

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-34)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	10/10/2019 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 : New & Existing Base/Subbase

Unbound	
Layer thickness (in)	9.4
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) 23345.0

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

Identifiers

Field	Value
Display name/identifier	New & Existing Base/Subbase
Description of object	Existing Untreated Aggregate Base
Author	
Date Created	10/10/2019 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

AASHTO

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	125.5
Saturated hydraulic conductivity (ft/hr)	False	5.57e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	8.5

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	5.3826
bf	2.0948
cf	0.7783
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	52.5
#4	
3/8-in.	
1/2-in.	95.0
3/4-in.	
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





Layer 3 Subgrade : Subgrade

Unbound			
Layer thickness (in)	Semi-infinite		
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) 17300.0

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	10/10/2019 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	40.0
Plasticity Index	20.0
Is layer compacted?	False

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	115.8
Saturated hydraulic conductivity (ft/hr)	False	8.941e-06
Specific gravity of solids	False	2.7
Water Content (%)	False	13.1

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False	
af	99.8852	
bf	0.7387	
cf	0.2720	
hr	500.0000	

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	39.0
#100	
#80	
#60	
#50	
#40	55.0
#30	
#20	
#16	
#10	78.0
#8	
#4	89.0
3/8-in.	96.0
1/2-in.	97.0
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





Calibration Coefficients

AC Fatigue				
$(1)^{k_2\beta_{f_2}}(1)^{k_3\beta_{f_3}}$	k1: 3.75			
$N_{f} = 0.00432 * C * \beta_{f1} k_{1} \left(\frac{1}{\varepsilon_{1}}\right)^{k_{2}\beta_{f2}} \left(\frac{1}{E}\right)^{k_{3}\beta_{f3}}$	k2: 2.87			
	k3: 1.46			
$C=10^M$	Bf1: (5.014 * Pow(hac,-3.416)) * 1 + 0			
$M = 4.84 \left(\frac{V_b}{V_c + V_b} - 0.69 \right)$	Bf2: 1.38			
$(V_a + V_b)$	Bf3: 0.88			

F	AC Rutting			
Γ	ε_p	1.	0	10

$\begin{aligned} \frac{c_p}{\varepsilon_r} &= k_z \beta_{r1} 10^{k_1} T^{k_2 \beta_{r2}} N^{k_3 B_{r3}} \\ k_z &= (C_1 + C_2 * depth) * 0.328196^{depth} \\ C_1 &= -0.1039 * H_{\alpha}^2 + 2.4868 * H_{\alpha} - 17.342 \\ C_2 &= 0.0172 * H_{\alpha}^2 - 1.7331 * H_{\alpha} + 27.428 \\ \end{aligned}$ $\begin{aligned} \text{Where:} \\ H_{ac} &= total \ AC \ thickness(in) \end{aligned}$		$\varepsilon_p = plastic strain(^{in}/_{in})$ $\varepsilon_r = resilient strain(^{in}/_{in})$ $T = layer temperature(^{F})$ N = number of load repetitions	
AC Rutting Standard Deviation 0.24 * Pow(RUT,0.8026) + 0.0		01	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22		Br1:0.3 Br2:0.52 Br3:1.36

Thermal Fracture						
$C_{f} = 400 * N\left(\frac{\log C/h_{ac}}{\sigma}\right)$ $\Delta C = \left(k * \beta t\right)^{n+1} * A * \Delta K^{n}$ $A = 10^{(4.389 - 2.52*\log(E*\sigma_{m}*n))}$	$\begin{split} C_f &= observed \ amount \ of \ thermal \ cracking(ft/500ft) \\ k &= refression \ coefficient \ determined \ through \ field \ calibration \\ N() &= standard \ normal \ distribution \ evaluated \ at() \\ \sigma &= standard \ deviation \ of \ the \ log \ of \ the \ depth \ of \ cracks \ in \ the \ pavments \\ C &= crack \ depth(in) \\ h_{ac} &= thickness \ of \ asphalt \ layer(in) \\ \Delta C &= Change \ in \ the \ crack \ depth \ due \ to \ a \ cooling \ cycle \\ \Delta K &= Change \ in \ the \ stress \ intensity \ factor \ due \ to \ a \ cooling \ cycle \\ A, n &= Fracture \ parameters \ for \ the \ asphalt \ mixture \\ E &= mixture \ stiffness \\ \sigma_M &= Undamaged \ mixture \ tensile \ strength \\ \beta_t &= Calibration \ parameter \end{split}$					
Level 1 K: ((3 * Pow(10,-7)) * Pow(MAAT,4.0319		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	9)) * 1 + 0	Level 3 Standard Deviation: 0.289 * THERMAL + 168				

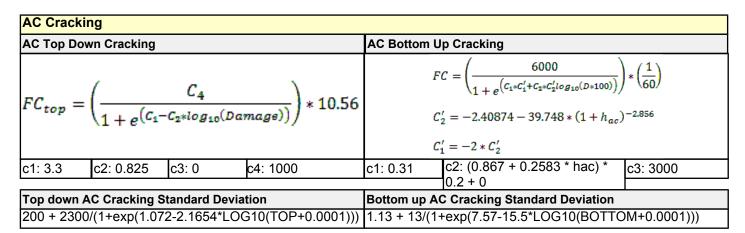
CSM Fatigue			
$N_f = 10^{\left(\frac{k_1 \beta_{c1} \left(\frac{\sigma_s}{M_r}\right)}{k_2 \beta_{c2}}\right)}$	$o_s = rensul$	er of repetitions to e stress(psi) llus of rupture(psi)	
k1: 0.972 k2: 0	0.0825	Bc1: 1	Bc2:1



AASHTOWare

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Unbound Layer Ruttir	Ig		
$\delta_a(N) = \beta_{s_1} k_1 \varepsilon_v h$	$\left \left(\frac{\varepsilon_0}{\varepsilon_r} \right) \right e^{-\left(\frac{\rho}{N} \right)^{\beta}} \right \qquad \begin{array}{c} N \\ \varepsilon_v \\ \varepsilon_0 \end{array}$	= permanent deformati = number of repetitions = average veritcal strain , β, ρ = material properti = resilient strain(in/in)	n(in/in) es
Base Rutting		Subgrade Rutting	
k1: 0.965	Bs1: 0.86	k1: 0.965	Bs1: 0.736
Standard Deviation (BA 0.1477 * Pow(BASERU		Standard Deviation (BA 0.1235 * Pow(SUBRUT	



CSM Cr	acking			IRI Flex	ible Paven	nents	
FC_{ctk}	$= C_1 + \frac{1}{1}$	C_2 + $e^{C_3 - C_4 * I}$	og ₁₀ (Damage)	C1 - Ru C2 - Fat	tting igue Crack	C3 - Trar C4 - Site	nsverse Crack Factors
C1: 0	C2: 75	C3: 2	C4: 2	C1: 80	C2: 0.6	C3: 0.008	C4: 0.02
CSM Sta	CSM Standard Deviation					15	
CTB*1							



SH-75 AC Removal and Replacement (Saddle to Clubhouse)



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Design Inputs

Design Life: 20 years FLEXIBLE Design Type:

Base construction: Pavement construction: Traffic opening:

June, 2024 July, 2024

August, 2024

Climate Data 43.5, -114.375 Sources (Lat/Lon) 43.5, -113.75 44, -113.75

Design Structure

Layer type	Material Type	Thickness (in)	Volumetric at (
Flexible	New HMA (PG 70-34)	6.0	Effective binder
NonStabilized	New & Existing Base/Subbase	16.3	content (%) Air voids (%)
Subgrade	Subgrade	Semi-infinite	

lumetric at Constr	uction:	
ective binder	11.6	
ntent (%)		2024
voids (%)	7.5	2034
		204

Traffic **Heavy Trucks** Age (year) (cumulative) 24 (initial) 1,560 4,047,120 4 (10 years) 4 (20 years) 10,515,000

Design Outputs

Distress Prediction Summary

Distress Type) Specified bility	Reliab	Criterion Satisfied?	
	Target Predicted		Target		
Terminal IRI (in/mile)	175.00	113.64	90.00	99.99	Pass
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass
AC bottom-up fatigue cracking (% lane area)	15.00	12.30	90.00	99.95	Pass
AC thermal cracking (ft/mile)	1000.00	216.30	90.00	100.00	Pass
Permanent deformation - AC only (in)	0.20	0.03	90.00	100.00	Pass

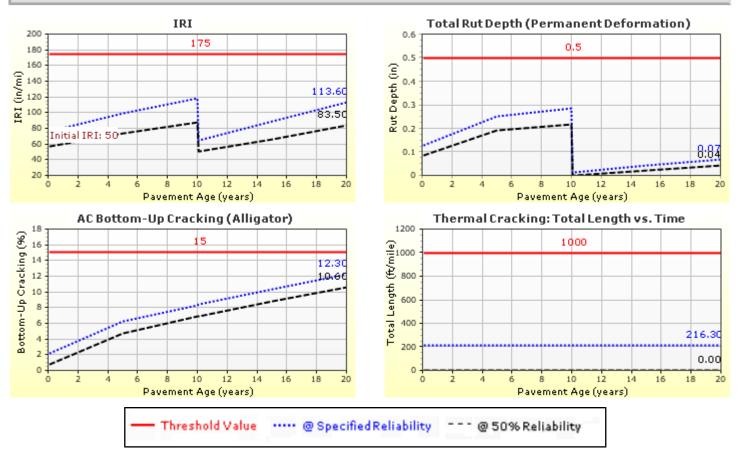
Design traffic (flexible pavements) = 11.68 million ESALs





File Name: C:\Users\MEarl\Desktop\SH-75 AC Removal and Replacement (Saddle to Clubhouse).dgpx

Distress Charts



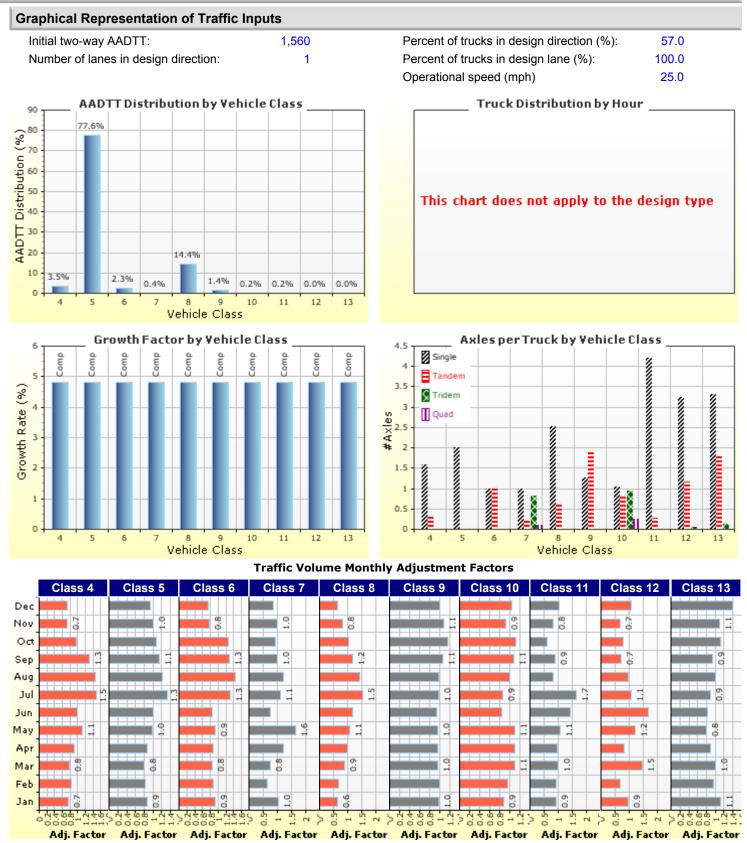


SH-75 AC Removal and Replacement (Saddle to Clubhouse)

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Traffic Inputs







Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month	Vehicle Class									
WOITTI	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 (%)	Growt	h Factor
	(Level 3)	Rate (%)	Function
Class 4	3.5%	4.8%	Compound
Class 5	77.6%	4.8%	Compound
Class 6	2.3%	4.8%	Compound
Class 7	0.4%	4.8%	Compound
Class 8	14.4%	4.8%	Compound
Class 9	1.4%	4.8%	Compound
Class 10	0.2%	4.8%	Compound
Class 11	0.2%	4.8%	Compound
Class 12	0%	4.8%	Compound
Class 13	0%	4.8%	Compound

Axle Configuration

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

Average Axle Spacing		
51.6		
49.2		
49.2		

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

Wheelbase	does	not apply	

Truck Distribution by Hour 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

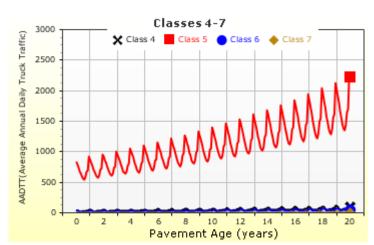




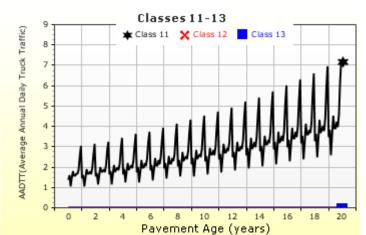
File Name: C:\Users\MEarl\Desktop\SH-75 AC Removal and Replacement (Saddle to Clubhouse).dgpx

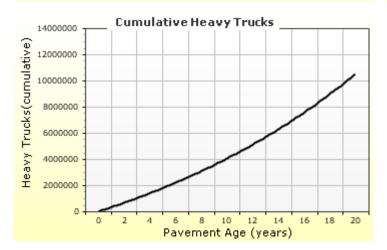
AADTT (Average Annual Daily Truck Traffic) Growth

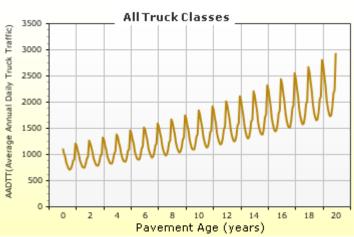
* Traffic cap is not enforced











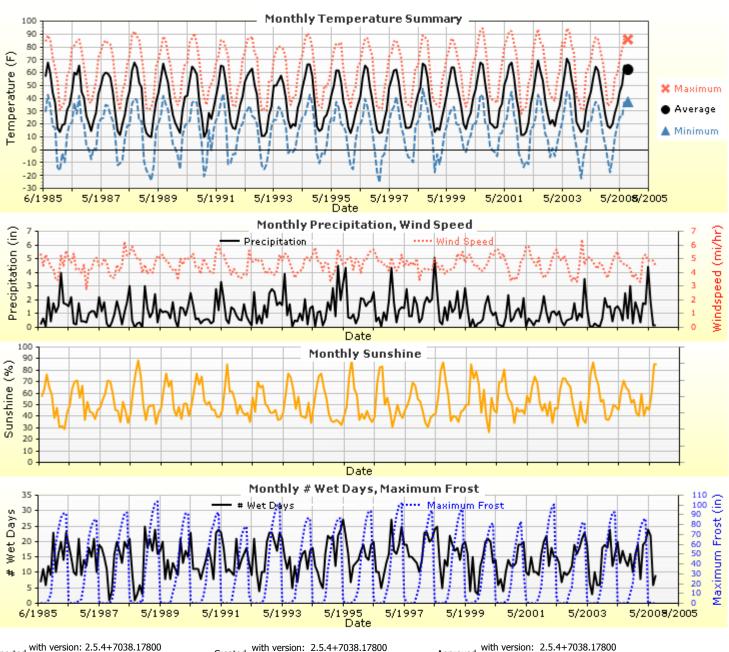




Climate Inputs

Climate Data Sources:		dev.))	1		_ M	onth	ly Ra	ainfa	ll Sta	tisti	cs				
Climate Station Cities: US, ID US, ID US, ID	Location (lat lon elevatio 43.50000 -114.37500 43.50000 -113.75000 44.00000 -113.75000	5697 6658	(in) (mean (std 1.2 1.2	1.37 (0.70)	1.47 (0.95)	1.46 (0.96)	1.55 (0.69)	2.10 (1.29)	1.54 (1.20)	0.60	0.62	0.81	0.89 (0.81)	1.01 (0.71)	1.42 (0.99)
Annual Statistics: Mean annual air temperature Mean annual precipitation (ir		9.08 4.79	Cainfall	Jan	Feb	Mar	Apr	May	un	(0.44)	(0.61) 6ny	Sep	0ct	Nov	Dec
Freezing index (°F - days) Average annual number of fr	, 167	0.83 3.87	Wate (ft)	r table	e dep	oth								10	0.00
Monthly Climate Summa															

Monthly Climate Summary:



Reported with version: 2.5.4+7038.17800 on: 11/8/2019 4:09 AM

Created with version: 2.5.4+7038.17800 on: 9/7/2019 11:20 AM by: Approved with version: 2.5.4+7038.17800 on: 9/7/2019 11:20 AM by:





Hourly Air Temperature Distribution by Month:

< -13º F	-13° F to -4° F	-4º F to 5º F	5° F to 14° F	14º F to 23º F	23° F to 32° F	32° F to 41° F	41° F to 50°
					48	138	
5	3715	27	5 121	73 258	189	43 193	15
9	2 1 1 2 4	74	4 -213	32 211	130 ¹⁹⁶	89115	-16
	3	- 47	15 160	41 249	193	20 249	104
- 2	12 ²⁷ 48	123	194	20 195	35 141 33 182	1 259	15
	3	- 39	170	15 258	188	14 273	16
			68	233	9 331	89	124
	17 65	105	155	16 223	126 172	133 243	
	6	-27	171	12 259	172 39 207	2 185	14
		126	206	36 212	207 248	72 255	119
11 20	6 30 58			84	122 250		15
10	32 56	71	96	34 137	47 293	132 215	4 15
	1 27	- 24	77	20 131	47 238 ³¹⁶	94 215 94 280	29 14 14
		26	201	8 233	180	32 225	-14.
6	1424 57	-89	246	16 183	52 110	1/0	
	-117	15	310	68 270	4 143 304		20 15
22	12 111	15	10	152	346	144 139 153	20 15
9	39	110	- 174	2 40 203	QR	39	- 21 127 15
810 30	71226 6676	117	149	51 178	8 191 31 122	86 275	139
510 55		48	144	1 210	31 198	89 227 89 227	13 107
	19 51			3 -	16 93	56 231	-13 -144
	-9	13	98	10 218	191 282	37 279	-135
3-7	-2404	1 55	111	48 135	13 283	30 279 80 224	112
						6 6 6	00
20.10.	20 20 20	0 7 8 9		, , , , , ,		, , , , ,	, 0
oı ≠ of Hours	9 9 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	# of Hours	of Hours	; 00, 00, 00, 00 # of Hours	001 00 00 00 # of Hours	; 001 02 02 #of Hours	
# of Hours	# of Hours	# of Hours	# of Hours	# of Hours	# of Hours	. 역 원 위 # of Hours 104º F to 113º	# of Hou
				# of Hours		# of Hours	
# of Hours	# of Hours	# of Hours	# of Hours	# of Hours	# of Hours	# of Hours 104° F to 113°	# of Hou
# of Hours 50° F to 59° F	# of Hours 59° F to 68° F	# of Hours 68° F to 77° F	# of Hours 77° F to 86° F	# of Hours	# of Hours	# of Hours 104° F to 113°	# of Hou
# of Hours 50° F to 59° F	# of Hours 59° F to 68° F 91 	# of Hours 68° F to 77° F	# of Hours 77° F to 86° F	# of Hours	# of Hours 95° F to 104° F	# of Hours 104° F to 113°	# of Hou
# of Hours 50° F to 59° F 184 70 187 129 88	# of Hours 59° F to 68° F 91 60 92 180 92 156	# of Hours 68° F to 77° F -58 	# of Hours 77° F to 86° F	# of Hours 86° F to 95° F	# of Hours 95° F to 104° F	# of Hours 104° F to 113°	# of Hou
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SH-75 AC Removal and Replacement (Saddle to Clubhouse)



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Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False	Layer Name	Layer Type	Interface Friction
Using G* based model (not nationally calibrated)	False	Layer 1 Flexible : New HMA (PG	Flexible (1)	1.00
Is NCHRP 1-37A HMA Rutting Model Coefficients	True	To-34) Layer 2 Non-stabilized Base :	Non-stabilized Base (4)	1.00
Endurance Limit	-	New & Existing Base/Subbase	Subgrade (5)	
Use Reflective Cracking	True		Subgrade (5)	-
Structure - ICM Properties]		
AC surface shortwave absorptivity	0.85]		





Thermal Cracking

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

Creep Compliance (1/psi) (Input Level: 3)					
Loading time (sec)	-4 °F	14 °F	32 °F		
1	6.27e-007	8.90e-007	1.21e-006		
2	6.98e-007	1.05e-006	1.59e-006		
5	8.05e-007	1.32e-006	2.28e-006		
10	8.96e-007	1.56e-006	3.00e-006		
20	9.97e-007	1.84e-006	3.95e-006		
50	1.15e-006	2.30e-006	5.67e-006		
100	1.28e-006	2.73e-006	7.46e-006		

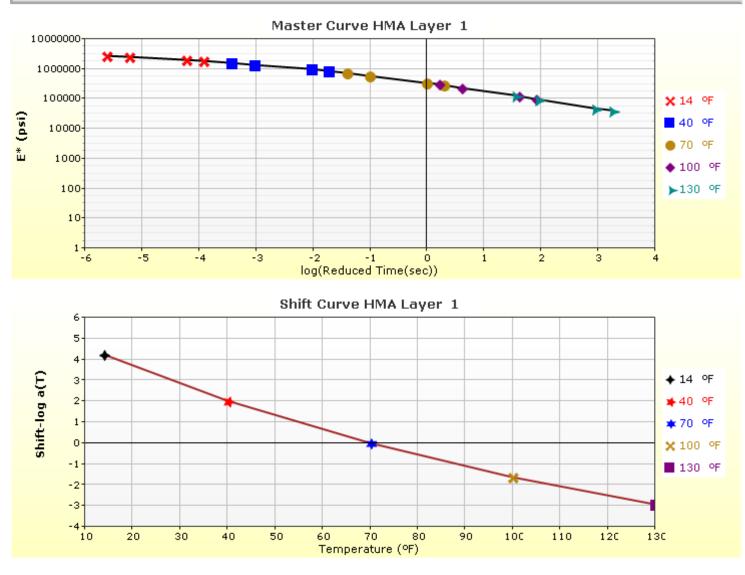
Indirect Tensile Strength (Input Level: 3)				
Test Temperature (°F) Indirect Tensilte Strength (psi				
14.0	490.85			



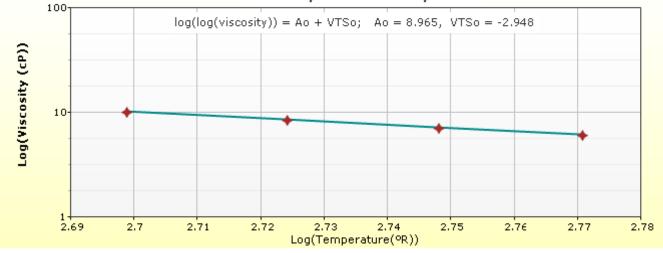


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HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-34)





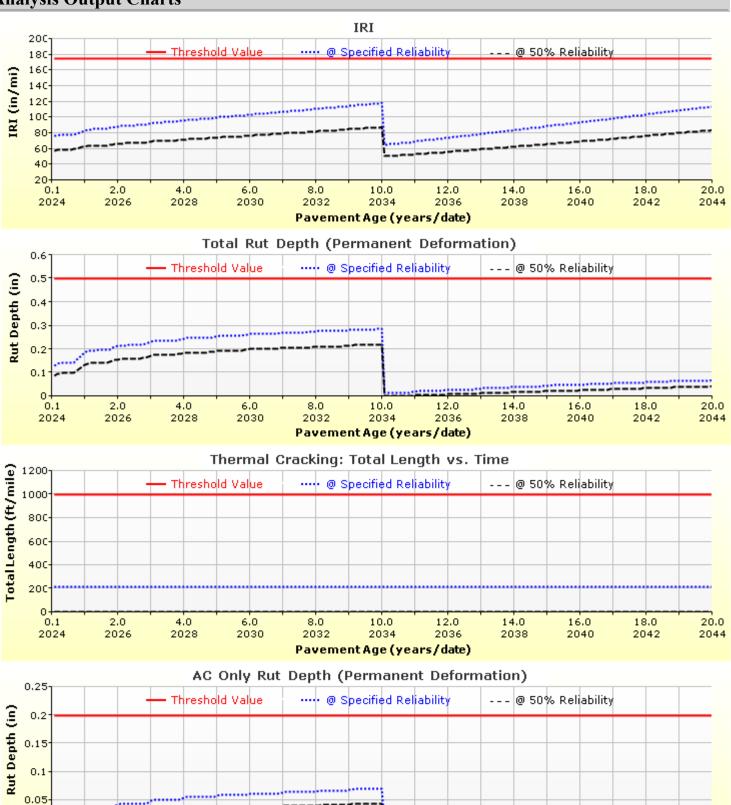


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Analysis Output Charts



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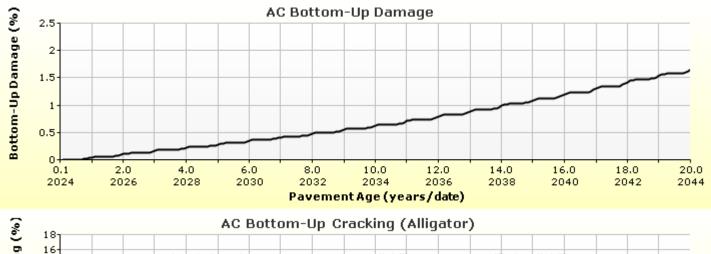
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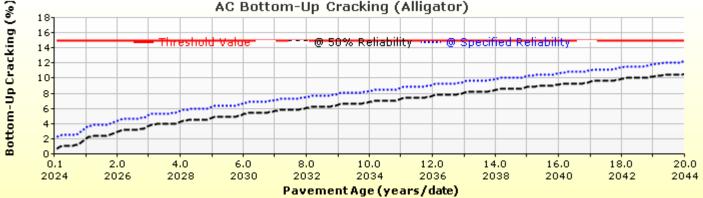
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SH-75 AC Removal and Replacement (Saddle to Clubhouse)



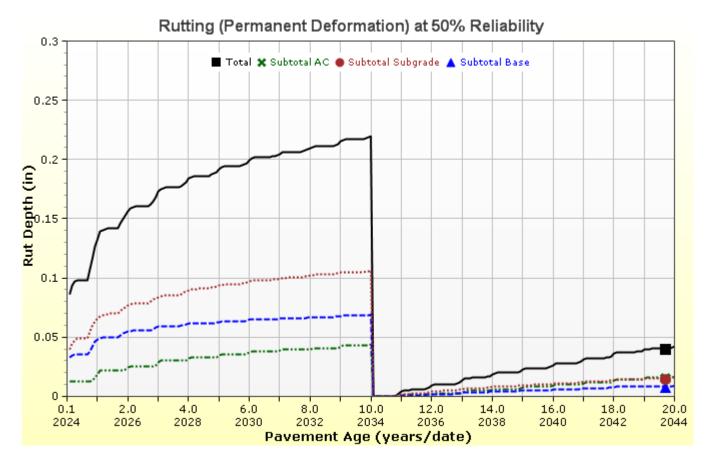








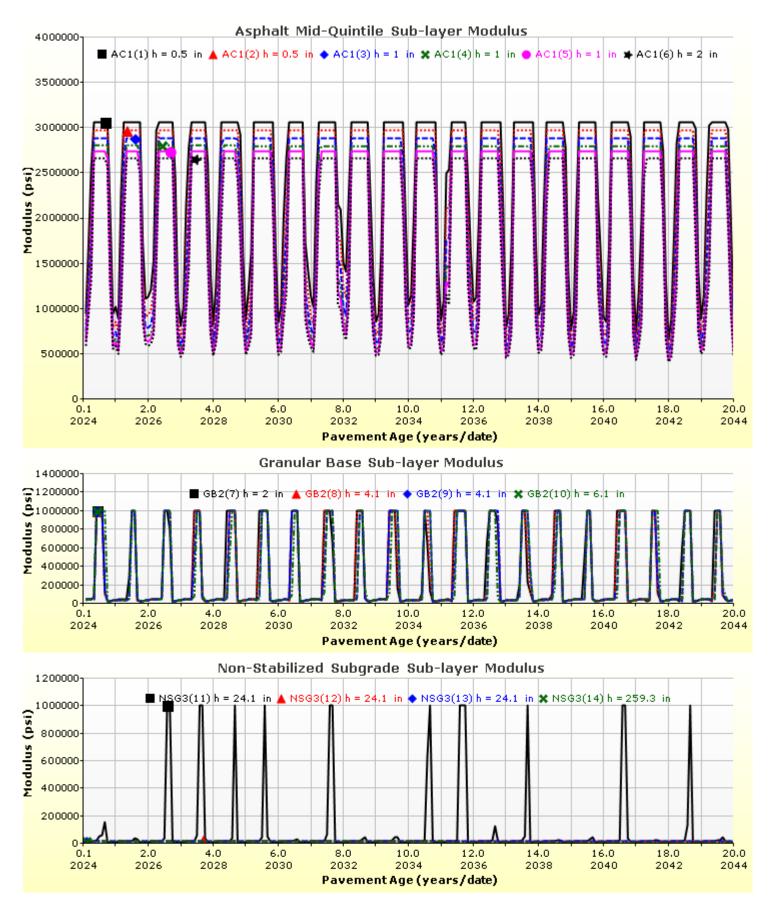






SH-75 AC Removal and Replacement (Saddle to Clubhouse)









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Layer Information

Layer 1 Flexible : New HMA (PG 70-34)

Asphalt					
Thickness (in)	6.0				
Unit weight (pcf)	144.0				
Poisson's ratio	Is Calculated?	True			
	Ratio	-			
	Parameter A	-1.63			
	Parameter B	3.84E-06			

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	70-34
A	8.965
VTS	-2.948

General Info

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

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-34)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	10/10/2019 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





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Layer 2 Non-stabilized Base : New & Existing Base/Subbase

Unbound				
Layer thickness (in)	16.3			
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) 23345.0

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

Identifiers

Field	Value
Display name/identifier	New & Existing Base/Subbase
Description of object	
Author	
Date Created	10/10/2019 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	125.5
Saturated hydraulic conductivity (ft/hr)	False	5.57e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	8.5

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	5.3826
bf	2.0948
cf	0.7783
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	52.5
#4	
3/8-in.	
1/2-in.	95.0
3/4-in.	
1-in.	100.0
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	



SH-75 AC Removal and Replacement (Saddle to Clubhouse)

File Name: C:\Users\MEarl\Desktop\SH-75 AC Removal and Replacement (Saddle to Clubhouse).dgpx

Layer 3 Subgrade : Subgrade

Unbound		
Layer thickness (in)	Semi-infinite	
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) 17300.0

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	10/10/2019 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	40.0
Plasticity Index	20.0
Is layer compacted?	False

AASHTOV

	Is User Defined?	Value
Maximum dry unit weight (pcf)		115.8
Saturated hydraulic conductivity (ft/hr)	False	8.941e-06
Specific gravity of solids	False	2.7
Water Content (%)	False	13.1

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	99.8852
bf	0.7387
cf	0.2720
hr	500.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	39.0
#100	
#80	
#60	
#50	
#40	55.0
#30	
#20	
#16	
#10	78.0
#8	
#4	89.0
3/8-in.	96.0
1/2-in.	97.0
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





Calibration Coefficients

AC Fatigue	
$N_{f} = 0.00432 * C * \beta_{f1} k_{1} \left(\frac{1}{\varepsilon_{1}}\right)^{k_{2}\beta_{f2}} \left(\frac{1}{E}\right)^{k_{3}\beta_{f3}}$	k1: 3.75
$N_f = 0.00432 * C * \beta_{f1} k_1 \left(\frac{-}{\varepsilon_1}\right) \qquad \left(\frac{-}{E}\right)$	k2: 2.87
	k3: 1.46
$C = 10^M$	Bf1: (5.014 * Pow(hac,-3.416)) * 1 + 0
$M = 4.84 \left(\frac{V_b}{V_a + V_b} - 0.69 \right)$	Bf2: 1.38
$(V_a + V_b)$	Bf3: 0.88

AC Rutting			
$\frac{\varepsilon_p}{\varepsilon_r} = k_z \beta_{r1} 10^{k_1} T^{k_2 \beta_{r2}} N^{k_2}$ $k_z = (C_1 + C_2 * depth) *$ $C_1 = -0.1039 * H_{\alpha}^2 + 2.46$ $C_2 = 0.0172 * H_{\alpha}^2 - 1.733$	0.328196 ^{depth} 368 * H _α — 17.342	$\varepsilon_r = resilie$ T = layer t	c strain(ⁱⁿ / _{in}) ent strain(ⁱⁿ / _{in}) emperature(°F) er of load repetitions
Where: H _{ac} = total AC thicknes	s(in)		
AC Rutting Standard Deviation	0.24 * Pow(RUT,0.8026) + 0.0	001	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22 Br1:0.3 Br2:0.52 Br3:1.30		

Thermal Fracture		
$C_{f} = 400 * N\left(\frac{\log C/h_{ac}}{\sigma}\right)$ $\Delta C = \left(k * \beta t\right)^{n+1} * A * \Delta K^{n}$ $A = 10^{(4.389 - 2.52*\log(E*\sigma_{m}*n))}$	$\sigma = standard deviation of the log of the depth of cracks in the parments C = crack \ depth(in)h_{ac} = thickness of asphalt \ layer(in)\Delta C = Change \ in the crack \ depth \ due to a \ cooling \ cycle\Delta K = Change \ in the stress \ intensity \ factor \ due to a \ cooling \ cycle$	
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		

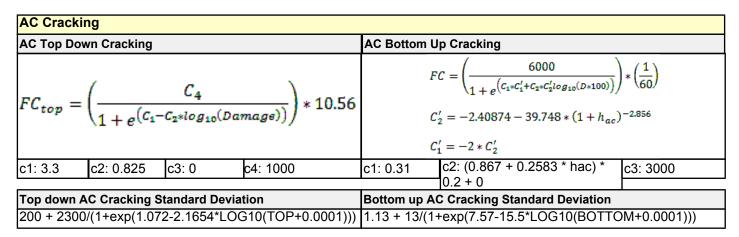
CSM Fatigue			
$N_f = 10^{\left(\frac{k_1 \beta_{c1} \left(\frac{\sigma_s}{M_i}\right)}{k_2 \beta_{c2}}\right)}$	$= 0_s - 1 ensurements$	er of repetitions to e stress(psi) lus of rupture(psi)	
k1: 0.972 k	2: 0.0825	Bc1: 1	Bc2:1



SH-75 AC Removal and Replacement (Saddle to Clubhouse)



Unbound Layer Ruttin	g			
$\delta_{a}(N) = \beta_{s_{1}} k_{1} \varepsilon_{v} h\left(\frac{\varepsilon_{0}}{\varepsilon_{r}}\right) \left e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right \qquad \sum_{\varepsilon_{0}}^{N} k_{1} \varepsilon_{v} h\left(\frac{\varepsilon_{0}}{\varepsilon_{0}}\right)^{\beta} \left e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right \qquad \sum_{\varepsilon_{0}^{N} k_{1} \varepsilon_{v} h\left(\frac{\varepsilon_{0}}{\varepsilon_{0}}\right)^{$		= permanent deformation for the layer = number of repetitions = average veritcal strain(in/in) β, ρ = material properties = 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		



CSM Cra	SM Cracking IRI Flexible Pavements						
$FC_{ctb} = C_1 + \frac{C_2}{1 + e^{C_3 - C_4 * log_{10}(Damage)}}$		C1 - Ru C2 - Fat	C1 - Rutting C3 - Transverse C2 - Fatigue Crack C4 - Site Factor				
C1: 0	C2: 75	C3: 2	C4: 2	C1: 80	C2: 0.6	C3: 0.008	C4: 0.02
CSM Sta	ndard Deviation	on					
CTB*1							



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Design Inputs

Design Life: 20 years Design Type: FLEXIBLE Base construction: Pavement construction: Traffic opening:

June, 2024 July, 2024 August, 2024 Climate Data 43.5, -114.375 Sources (Lat/Lon) 43.5, -113.75 44, -113.75

Design Structure

Layer type	Material Type	Thickness (in)
Flexible	New HMA (PG 70-34)	6.0
NonStabilized	Untreated Aggregate Base	7.0
NonStabilized	Granular Subbase	8.0
Subgrade	Subgrade	Semi-infinite

olumetric at Constr	uction:	
ffective binder ontent (%)	11.6	20
vir voids (%)	7.5	20
		20

Age (year) Heavy Trucks (cumulative) 2024 (initial) 1,560 2034 (10 years) 4,047,120 2044 (20 years) 10,515,000

Design Outputs

Distress Prediction Summary

Distress Type) Specified bility	Reliability (%)		Criterion Satisfied?	
	Target	Predicted	Target	Achieved	Satisfieu?	
Terminal IRI (in/mile)	175.00	112.99	90.00	100.00	Pass	
Permanent deformation - total pavement (in)	0.50	0.07	90.00	100.00	Pass	
AC bottom-up fatigue cracking (% lane area)	15.00	11.32	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	0.03	90.00	100.00	Pass	

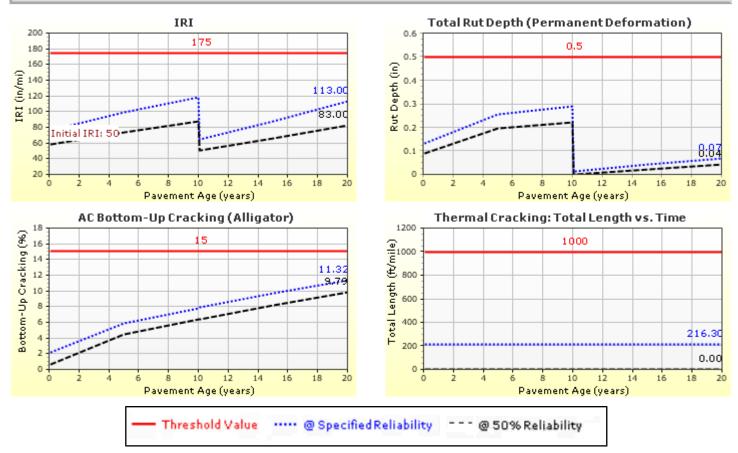


Design traffic (flexible pavements) = 11.68 million ESALs





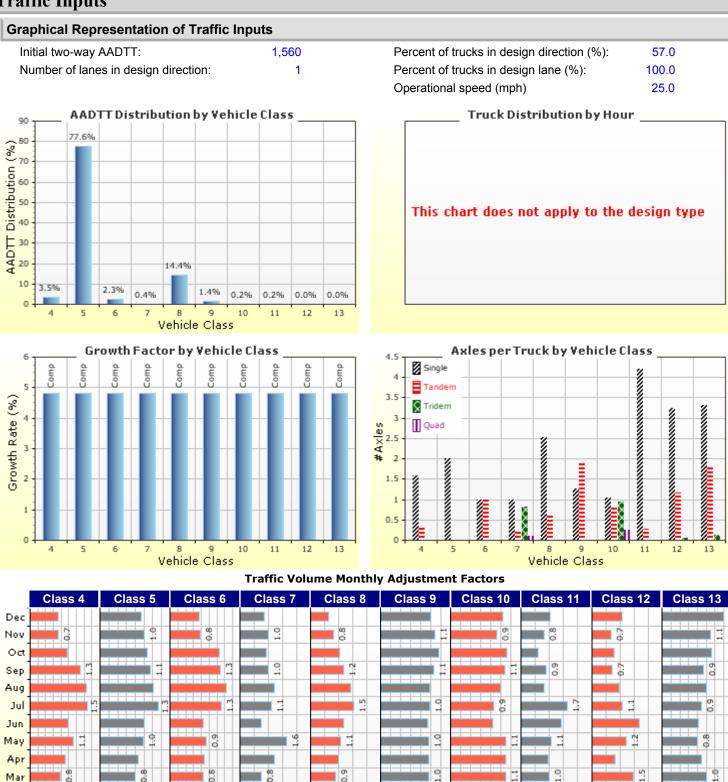
Distress Charts





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Tabular Representation of Traffic Inputs

Volume Monthly Adjustment Factors

Level 3: Default MAF

Month					Vehicle	e Class				
WOITH	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 (%)	Growt	h Factor
	(Level 3) `´	Rate (%)	Function
Class 4	3.5%	4.8%	Compound
Class 5	77.6%	4.8%	Compound
Class 6	2.3%	4.8%	Compound
Class 7	0.4%	4.8%	Compound
Class 8	14.4%	4.8%	Compound
Class 9	1.4%	4.8%	Compound
Class 10	0.2%	4.8%	Compound
Class 11	0.2%	4.8%	Compound
Class 12	0%	4.8%	Compound
Class 13	0%	4.8%	Compound

Axle Configuration

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

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

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

Wheelbase	does not	apply

Truck Distribution by Hour does not apply

Number of Axles per Truck

	Vehicle Class	Single Axle	Tandem Axle	Tridem Axle	Quad Axle
1	Class 4	1.59	0.34	0	0
1	Class 5	2	0	0	0
1	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

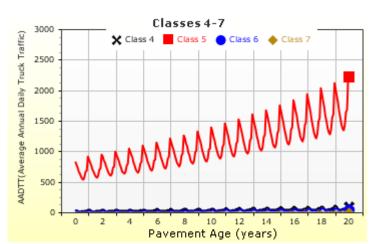
ASHTO



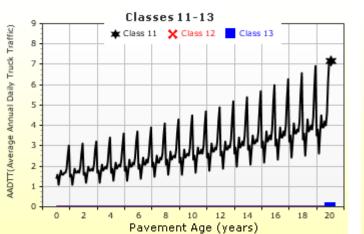


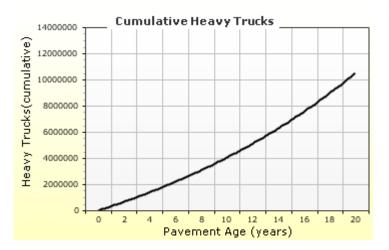
AADTT (Average Annual Daily Truck Traffic) Growth

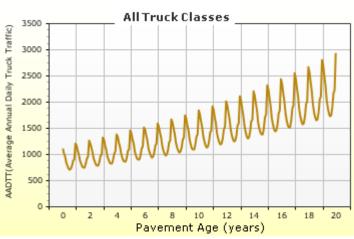
* Traffic cap is not enforced













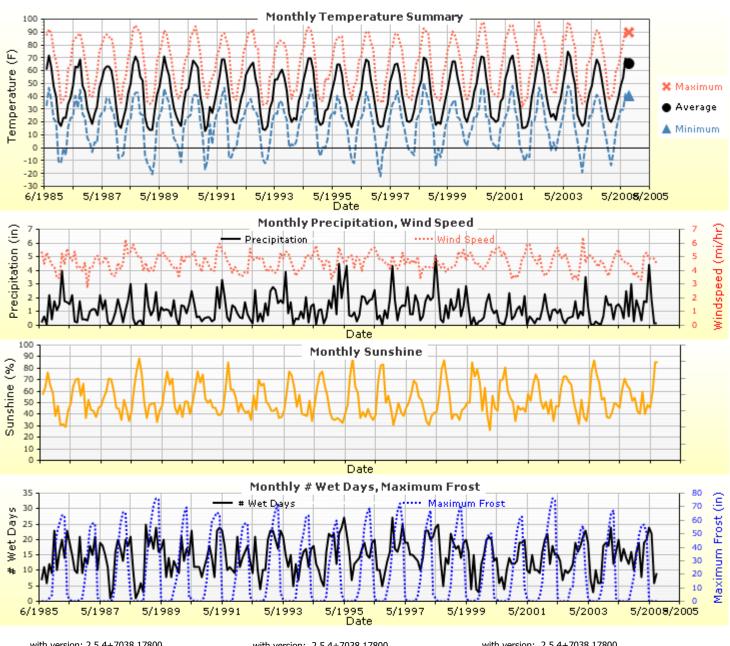


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Climate Inputs

Climate Data Sources:		Monthly Rainfall Statistics
Climate Station Cities: US, ID US, ID US, ID Annual Statistics:	Location (lat lon elevation(43.50000 -114.37500 56 43.50000 -113.75000 66 44.00000 -113.75000 63	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Mean annual air temperature Mean annual precipitation (in Freezing index (°F - days)	n) 14. 1223.	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Average annual number of f	•	83 (ft)

Monthly Climate Summary:



Reported with version: 2.5.4+7038.17800 on: 11/8/2019 5:05 AM

Created with version: 2.5.4+7038.17800 on: 9/7/2019 11:20 AM by: Approved with version: 2.5.4+7038.17800 on: 1/1/0001 12:00 AM by:





Hourly Air Temperature Distribution by Month:

< -13º F	-13	° F to -4		-4-	F to !		5-1			14*	F 10 2		230	'F ((41 1	10 0	<u> </u>
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				21				89		33	- 2	234		15	, 26	5	63	3	_ ,	56	_	126	-
	-38	23			72	2			186		183	5	14				2154		-			149 120	
				21				115		6		245	15	119	228	_	83		- 25		-	121	1
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Design Properties

HMA Design Properties

Use Multilayer Rutting Model	False	Layer Name	ll aver Tyne	Interface Friction	
Using G* based model (not nationally calibrated)	False	Layer 1 Flexible : New HMA (PG	Flexible (1)		
Is NCHRP 1-37A HMA Rutting Model Coefficients	True	70-34) Layer 2 Non-stabilized Base :	Non-stabilized Base (4)	1.00	
Endurance Limit	-	Untreated Aggregate Base Layer 3 Non-stabilized Base :	. ,		
Use Reflective Cracking	True	Granular Subbase	Non-stabilized Base (4)	1.00	
Structure - ICM Properties		Layer 4 Subgrade : Subgrade	Subgrade (5)	-	
AC surface shortwave absorptivity	0.85				



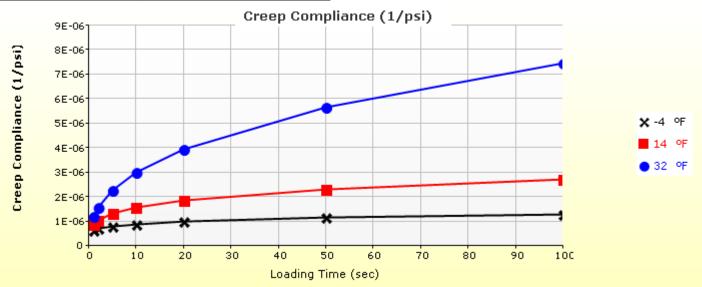


Thermal Cracking

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

Creep Compliance (1/psi) (Input Level: 3)										
Loading time (sec) -4 °F 14 °F 32 °F										
1	6.27e-007	8.90e-007	1.21e-006							
2	6.98e-007	1.05e-006	1.59e-006							
5	8.05e-007	1.32e-006	2.28e-006							
10	8.96e-007	1.56e-006	3.00e-006							
20	9.97e-007	1.84e-006	3.95e-006							
50	1.15e-006	2.30e-006	5.67e-006							
100	1.28e-006	2.73e-006	7.46e-006							

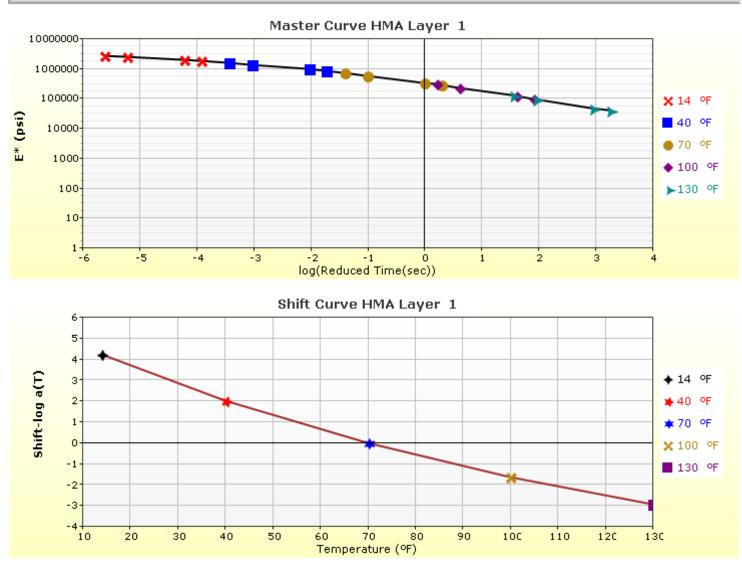
Indirect Tensile Strength (Input Level: 3)		
Test Temperature (°F) Indirect Tensilte Strength (p		
14.0	490.85	



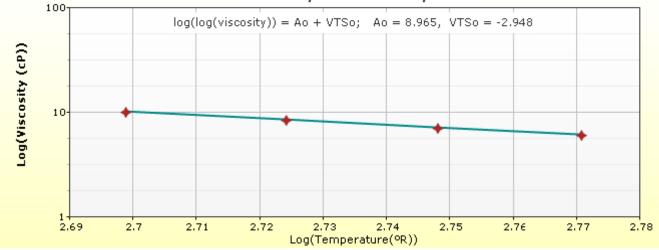


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HMA Layer 1: Layer 1 Flexible : New HMA (PG 70-34)







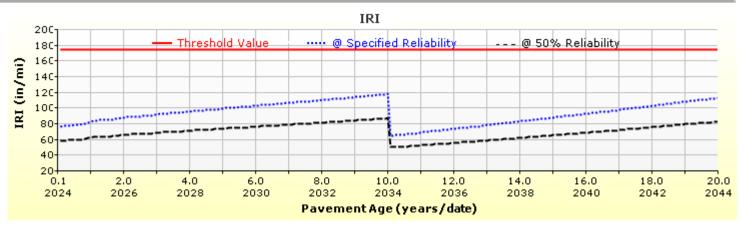
AASHTOV





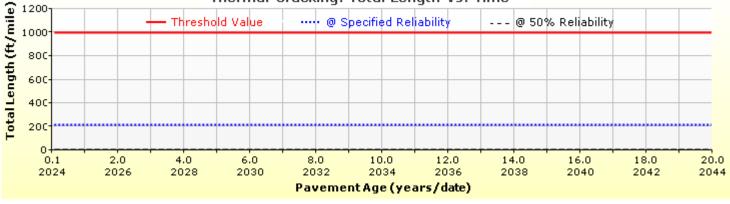
File Name: C:\Users\MEarl\Desktop\SH-75 Reconstruct (River to Clubhouse).dgpx

Analysis Output Charts







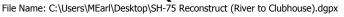


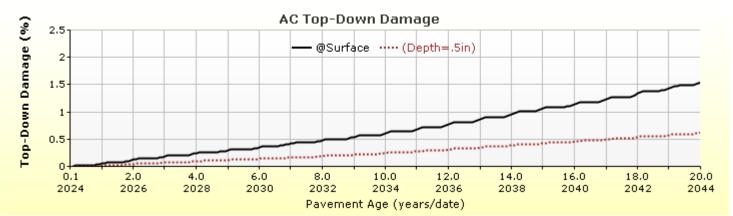


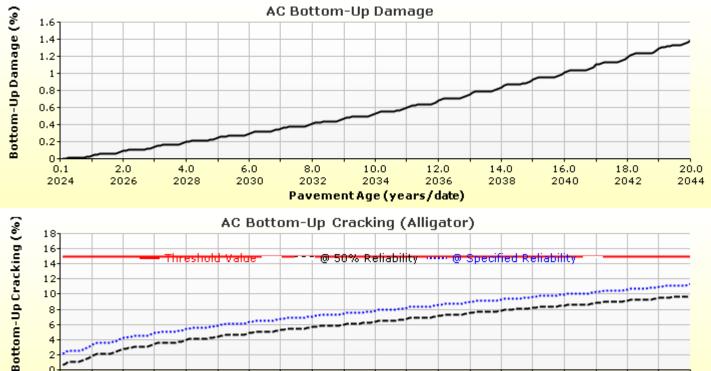


SH-75 Reconstruct (River to Clubhouse)









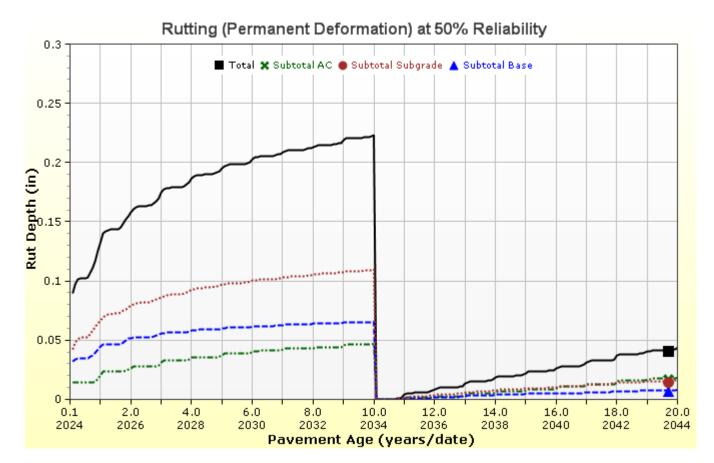


Pavement Age (years/date)





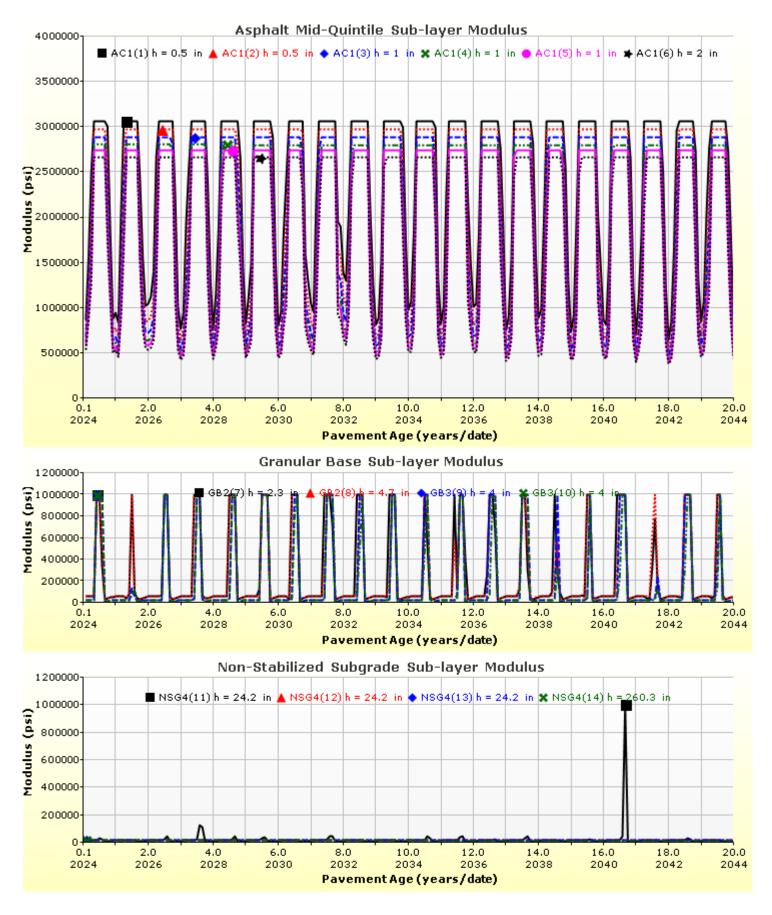
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Layer Information

Layer 1 Flexible : New HMA (PG 70-34)

Asphalt				
Thickness (in)	6.0	6.0		
Unit weight (pcf)	144.0	144.0		
Poisson's ratio	Is Calculated?	True		
	Ratio	-		
	Parameter A	-1.63		
	Parameter B	3.84E-06		

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	70-34
A	8.965
VTS	-2.948

General Info

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

Identifiers

Field	Value
Display name/identifier	New HMA (PG 70-34)
Description of object	New Superpave Hot Mix Asphalt
Author	
Date Created	10/10/2019 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





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Layer 2 Non-stabilized Base : Untreated Aggregate Base

Unbound	
Layer thickness (in)	7.0
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) 35000.0

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

Identifiers

Field	Value
Display name/identifier	Untreated Aggregate Base
Description of object	Existing Untreated Aggregate Base
Author	
Date Created	10/10/2019 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	126
Saturated hydraulic conductivity (ft/hr)	False	8.77e-03
Specific gravity of solids	False	2.7
Water Content (%)	False	8.2

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	1.7748
bf	2.2297
cf	0.6927
hr	116.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	8.0
#100	
#80	
#60	
#50	
#40	
#30	20.0
#20	
#16	
#10	
#8	40.0
#4	60.0
3/8-in.	
1/2-in.	95.0
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





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Layer 3 Non-stabilized Base : Granular Subbase

Unbound	
Layer thickness (in)	8.0
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	10/10/2019 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	127.7
Saturated hydraulic conductivity (ft/hr)	False	1.504e-02
Specific gravity of solids	False	2.7
Water Content (%)	False	7.3

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	5.6397
bf	1.9907
cf	0.7543
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.	95.0
1-in.	
1 1/2-in.	100.0
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





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Layer 4 Subgrade : Subgrade

Unbound	
Layer thickness (in)	Semi-infinite
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) 17300.0

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	10/10/2019 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	40.0
Plasticity Index	20.0
Is layer compacted?	False

	Is User Defined?	Value
Maximum dry unit weight (pcf)	False	115.8
Saturated hydraulic conductivity (ft/hr)	False	8.941e-06
Specific gravity of solids	False	2.7
Water Content (%)	False	13.1

User-defined Soil Water Characteristic Curve (SWCC)

Is User Defined?	False
af	99.8852
bf	0.7387
cf	0.2720
hr	500.0000

Sieve Size	% Passing
0.001mm	
0.002mm	
0.020mm	
#200	39.0
#100	
#80	
#60	
#50	
#40	55.0
#30	
#20	
#16	
#10	78.0
#8	
#4	89.0
3/8-in.	96.0
1/2-in.	97.0
3/4-in.	100.0
1-in.	
1 1/2-in.	
2-in.	
2 1/2-in.	
3-in.	
3 1/2-in.	





Calibration Coefficients

AC Fatigue	
$(1)^{k_2\beta_{f_2}}(1)^{k_3\beta_{f_3}}$	k1: 3.75
$N_{f} = 0.00432 * C * \beta_{f1} k_{1} \left(\frac{1}{\varepsilon_{1}}\right)^{k_{2}\beta_{f2}} \left(\frac{1}{E}\right)^{k_{3}\beta_{f3}}$	k2: 2.87
	k3: 1.46
$C=10^M$	Bf1: (5.014 * Pow(hac,-3.416)) * 1 + 0
$M = 4.84 \left(\frac{V_b}{V_a + V_b} - 0.69 \right)$	Bf2: 1.38
$(V_a + V_b)$	Bf3: 0.88

AC	Rutting

$\frac{\varepsilon_p}{\varepsilon_r} = k_z \beta_{r1} 10^{k_1} T^{k_2 \beta_{r2}} N^{k_3}$ $k_z = (C_1 + C_2 * depth) * 1$ $C_1 = -0.1039 * H_{\alpha}^2 + 2.48$ $C_2 = 0.0172 * H_{\alpha}^2 - 1.733$ Where: $H_{ac} = total \ AC \ thickness$	0.328196^{depth} $368 * H_{\alpha} - 17.342$ $1 * H_{\alpha} + 27.428$	$\varepsilon_r = resilie$ T = layer te	c strain(ⁱⁿ / _{in}) ent strain(ⁱⁿ / _{in}) emperature(°F) er of load repetitions
AC Rutting Standard Deviation	0.24 * Pow(RUT,0.8026) + 0.0	01	
AC Layer 1	K1:-2.45 K2:3.01 K3:0.22		Br1:0.3 Br2:0.52 Br3:1.36

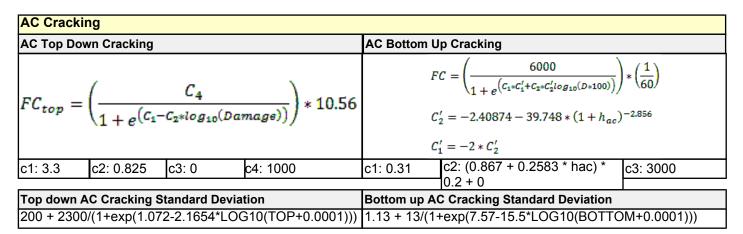
Thermal Fracture		
$C_{f} = 400 * N\left(\frac{\log C/h_{ac}}{\sigma}\right)$ $\Delta C = \left(k * \beta t\right)^{n+1} * A * \Delta K^{n}$ $A = 10^{(4.389 - 2.52*\log(E*\sigma_{m}*n))}$	$\dot{k} = refression coej$ $N() = standard noi \sigma = standard deviaC = crack depth(in)h_{ac} = thickness of\Delta C = Change in the\Delta K = Change in theA, n = Fracture parE = mixture stiffn$	asphalt layer(in) crack depth due to a cooling cycle stress intensity factor due to a cooling cycle cameters for the asphalt mixture ess uixture tensile strength
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,4.03	319)) * 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			
$N_f = 10^{\left(\frac{k_1 \beta_{c1} \left(\frac{\sigma_s}{M_r}\right)}{k_2 \beta_{c2}}\right)}$	$\sigma_s = Tensil$	er of repetitions to e stress(psi) .lus of rupture(psi)	
k1: 0.972 k2: 0.0	825	Bc1: 1	Bc2:1



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Unbound Layer F	Rutting		
$\delta_a(N) = \beta_{s_1} k$	$\left \varepsilon_1 \varepsilon_v h\left(\frac{\varepsilon_0}{\varepsilon_r}\right) \right e^{-\left(\frac{\rho}{N}\right)^{\beta}} \right $	$\delta_a = permanent de N = number of rep \varepsilon_v = average verite \varepsilon_0, \beta, \rho = material \varepsilon_r = resilient strai$	cal strain(in/in) properties
Base Rutting		Subgrade Rut	ting
k1: 0.965	Bs1: 0.86	k1: 0.965	Bs1: 0.736
Standard Deviatio 0.1477 * Pow(BAS	n (BASERUT) SERUT,0.6711) + 0.001		tion (BASERUT) SUBRUT,0.5012) + 0.001



CSM Cracking				IRI Flex	IRI Flexible Pavements			
$FC_{ctb} = C_1 + \frac{C_2}{1 + e^{C_3 - C_4 * log_{10}(Damage)}}$			C1 - Ru C2 - Fat	C1 - Rutting C2 - Fatigue Crack		C3 - Transverse Crack C4 - Site Factors		
C1: 0	C2: 75	C3: 2	C4: 2	C1: 80	C2: 0.6	C3: 0.008	C4: 0.02	
CSM Standard Deviation					ŗ			
CTB*1								

ASHTO

03224-PG.txt

State FY19 D4 Materials Reconnaissance

SH-75, River St to Clubhouse Dr

LTPPBind V3.1 PG Binder Selection Report (Date: 10/10/2019)

A=4 km B=29 km C=50 km D=51 km E=52 km Parameter Station ID ID4845 ID3417 ID3108 ID3110 ID7040 5472 Elevation, m 6781 4705 4663 4487 Degree-Days >10 C 2010 1687 2479 2315 2500 Low Air Temperature, C -27.8 -30 -31.5 -35.3 -28.4 Low Air Temp. Std Dev 4.3 4.2 5.2 4.1 4.1

Input Data

Latitude, Degree43.68Yearly Degree-Days>10C2198Lowest Yearly Air Temp., Deg. C-30.6Low Temp. Std. Dev., Deg. C4.4Base HT PG52

Traffic Adjustments for HT

Desired Reliability, Percent 98 Traffic Loading, Million ESAL 10 to 30 M. ESAL Traffic Speed Slow High Temp. Adjustment 15.5

PG Temperature	HIGH	LOW
PG Temp. at 50% Reliabilit	y 49.3	-22.5
PG Temp. at Desired Reliable	ility 52.4	-30.3
Adjustments for Traffic	15.5	
Adjustments for Depth	0.0	0.0
Adjusted PG Temperature	67.9	-30.3
Selected PG Binder Grade	70	-34