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Memorandum (Draft)

Date:	April 21, 2016
To:	Larry Wiser, FHWA
From:	Riaz Ahmad and Faizan Haq, iENGINEERING Corporation
Subject:	LTPP Climate Tool/LTPPBind Online – Beta Release
Project:	FHWA Contract DTFH61-14-C-00034

This memorandum provides highlights of the LTPP Climate Tool and LTPPBind that are now available for review for Beta testing. It includes information on new features and improvements to existing features that are integrated in the LTPP InfoPave website. New and updated features have been identified with a tab/label on the feature tile as follows:

LTPPBind Online	MERRA Climate Data for MEPDG Inputs	LTPPBind
PG grade selection according to AASHTO 323-13 and AASHTO 332-14 standards	Use this feature to download the HCD and station files for use with the AASHTOWare Pavement ME Design software.	PG grade selection according to AASHTO 323-13 with LTPP climatic data
New	Updated	

Where:

- New are new features included in this Beta release
- **Updated** are existing features that have been enhanced and are included in this Beta release
- No Tab/Label are existing features that are available in LTPP InfoPave

Please visit <u>http://dev.www.infopave.com</u> to access the Beta release for testing. The LTPP InfoPave notification bar at the top of the screen shows the release status of the website and contains a link to bug reporting as shown below:

Status: This feature/page is currently in Beta Release mode.

Bug Report 🗙

All the questions and bug reports can be submitted using this "Bug Report" feature. Please note that all the bugs should be reported by May 6, 2016. Please use Google Chrome as your primary browser for Beta testing. Certification of other desktop browsers is in progress.

Please note that LTPP InfoPave is not supported on mobile browsers.

Following is a brief summary of new and updated features available for Beta testing:

Data:

LTPP Climate Tool NEW – A new feature has been implemented on the LTPP InfoPave data hub which utilizes multiple data presentation options including climatic maps and graphs. A climatic map is presented on the user interface to visualize MERRA climatic data for temperature, precipitation, humidity, solar, and wind.



The LTPP Climate Tool provides three options to access MERRA climatic data. These three options are as follows:

- **Data By Location** MERRA cells can be selected using single point and area selection from the map
- **Data By Country** Collections of MERRA cells grouped by country or state of a country can be selected using dropdown lists
- **Data By Map** Download MERRA climatic data displayed on the Isotherm map in ESRI Shape File (.SHP) and Keyhole Markup Language (.KML) file formats

The LTPP Climate Tool also helps users to select MERRA Climatic data using a logical data classification.



Selected MERRA data can be submitted for data extraction using the existing LTPP InfoPave Data Bucket for the selected MERRA cells.

Data Bucket UPDATED – The existing LTPP Data Bucket feature has been enhanced to allow selection of MERRA data from the LTPP Climate Tool and submit it for data extraction. The Data Bucket also shows a summary of selected MERRA data under the "Selected Data Summary" section. This information also includes approximate size of the selected data set in number of records and file size.

Data	Data Bucket				
Data Bucket (3)	Selected Data (1)				
Data (1) Ancillary Data (0)	Structure ► Material - Layer Properties and Field Sampling (Test, M&R, Inventory) ► AC ► AC Binder (Test Results - Penetration, Viscosity, Specific Gravity): 462 Sections, 35425 Records, 81 Attributes				
Library (0) SQL Query (0)	Selected MERRA (2)				
MERRA (2)	Precipitation ► Daily: 9 Cells, 3294 Records, 10 Attributes				
Selected Data Summary	Precipitation ► Hourly: 9 Cells, 79056 Records, 9 Attributes				
Data: 35,425 Records Est. Data Volume: 5.01 MB	Export File Format			_	
MERRA Data: 82,350 Records Est. MERRA Data Volume: 5.67 MB	Please select file format for data bucket is ready for download or	a export and si r you can chec	ubmit Data Buck k the status of yo	et for extraction. You will recieve an e-mail notification when your data ur Data Bucket from My Data Extractions page in My LTPP.	
Export File Format: Microsoft Excel					
	Unit System: A 	s-Collected	 Metric 	US Customary	
Include values of coded data elements.					
	Submit for Data Extraction	Save	Clear	Continue to Select Data	

MERRA Data Extraction Service NEW – A new Windows service has been developed to process MERRA climatic data that is submitted for extraction through the Data Bucket. This service also creates a separate ZIP file package for download. As the volume of MERRA climatic data is huge, this new service is dedicated to process only MERRA data in an optimized way to improve the service throughput and prevent performance degradation issues.

The MERRA Data Extraction Service also communicates and integrates with the existing Data Extraction Service and Notification Processor. Functionality to cancel a submitted MERRA data extraction request is also implemented. This allows the users to cancel their MERRA data extraction request using My LTPP section on the LTPP InfoPave website.

Data Extraction Service UPDATED – The existing LTPP Data Extraction Service has been updated to communicate and integrate with the MERRA data extraction service.

Tools:

LTPPBind Online NEW – LTPPBind Online is a web-based tool to help highway agencies select the asphalt binder Performance Grade (PG) for a particular site based on the AASHTO M323-13 standard. Algorithms for high and low temperature are the same as LTPPBind 3.0/3.1 release. LTPPBind Online allows use of MERRA climatic data, LTPP climatic data, or user data for asphalt binder grade calculations. This feature allows the LTPP InfoPave users to perform the following tasks:

- Create a new project
- Select climatic conditions at their site
- Define the desired reliability level
- Adjust PG selection for different levels of traffic loading and speed
- Low-temperature binder selection based on original LTPP pavement temperature models
- High-temperature binder selection based on rutting damage
- Perform calculation and save the project

New Project					
Project Number 🕈	Project Title	Act	ions		
PG-001	Performance Grade 001	Open	Delete		
View 1 - 1 of 1	1	e 🛹 Page 1 C	of 1 ►> ►I 20 ▼		

Selecting "New Project" will allow to create a new project to perform binder grade calculations which is designed as a six step wizard as shown below:

General Project Information	General Project Information (Step 1 of 6)
Project Number: PG-001 Project Title: Performance Grade 001	Project Number: 📀	PG-001
Project Description:	Project Title: 📀	Performance Grade 001
Climatic Data Source	Project Description: 📀	
Latitude, Degree: Longitude, Degree:	-	
Climatic Data		
Lowest Yearly Air Temperature, °C: Low Air Temp Standard Deviation, °C: Yearly Degree-Days > 10 Deg. °C: High Air Temperature of high 7 days: Standard Dev. of the high 7 days:		Next
Target Rutting Depth		
Target Rutting Depth (mm):		
Temperature Adjustments		
Desire Reliability, %: Depth of Layer, mm: Base HT PG:	-	
Traffic Adjustments		
Traffic Loading ESAL, Millions: Traffic Speed (Fast: >70 km/h, Slow: 20-70 km/h):	-	
Steps of the LTPPBind Online wizard are a	is follows:	

1. General Project Information

- 2. Climatic Data Source
- 3. Climatic Data

- 4. Target Rutting Depth
- 5. Temperature Adjustments
- 6. Traffic Adjustments

Step 2 of the LTPPBind Online wizard allows users to select the climatic data source from four different options, i.e., MERRA, LTPP (Virtual Weather Station), LTPP (Automated Weather Station), and Manual as shown in the screenshot below:

Climatic Data Source (Step 2 of 6)			
Please select the data source from option below:			
MERRA 2			
LTPP (Virtual Weather Station)			
LTPP (Automated Weather Star	tion) 😨		
🔘 Manual 📀			
	Sele	ect Location	
Latitude, Degree: ? 44.45535			
Longitude, Degree: 2 -95.07843			
	Previous	Next	

Selecting the "MERRA" option allows the user to select latitude and longitude of a MERRA cell/location from a geographic map as shown in the screenshot below:



Similarly, the "LTPP (Virtual Weather Station)" option opens a pop-up dialog letting the user select the LTPP section from the available dropdown list as shown below. In this case LTPP sections are linked with Virtual Weather Stations.

Select Location
Please select the LTPP Section (linked with Virtual Weather Stations) from the dropdown lists below.
Select LTPP Section
State/Province: Alabama Section: 01-0101
Latitude: 32.6284 , Longitude: -85.2814
Select Cancel

Selecting the "LTPP (Automated Weather Station)" option allows the users to select the automated weather station from the geographic map as shown below:



Step 3 of LTPPBind Online retrieves and calculates the following climatic attributes/variables with the help of the selected data source:

- Lowest Yearly Air Temperature, °C
- Low Air Temp Standard Deviation, °C
- Yearly Degree-Days > 10 °C
- High Air Temperature of the high 7 days
- Standard Dev. of the high 7 days

The following screenshot shows step 3 pre-population of the above mentioned climatic variables:

Climatic Data (Step 3 of 6)		
Lowest Yearly Air Temperature, °C:	-29.19	
Low Air Temp Standard Deviation, °C	4.79	
Yearly Degree-Days > 10 Deg. ºC:	1704.04	
High Air Temperature of high 7 days:	32.19	
Standard Dev. of the high 7 days:	2.65	
	Previous	Next

Please note that using the "Manual" option does not retrieve and perform any calculations of the above mentioned climatic attributes for step 3.

This tool provides two procedures to calculate the PG grade, i.e., AASHTO M323-13 and AASHTO M332-14. After providing the required fields on the project setup wizard, the calculation can be performed. Results of the performed calculations are shown in the "Performance Grade" section and can be saved as a project.

Performance Grade			
AASHTO M323-13			
PG Temperature	High	Lov	v
Performance Grade Temperature at 50% Reliability	58.7	-2.3	•
Performance Grade Temperature at Desired Reliability	60.3	-7.8	}
Adjustment for Traffic	0.0		
Adjustment for Depth	0.0	-0.0	
Adjusted Performance Grade Temperature	60.3	-7.8	
Selected PG Grade	64	-10	
PG Grade	M323, PG 64-10		
AASHTO M332-14			
PG Temperature	High	Lov	v
NPerformance Grade Temperature at 50% Reliability	58.7	-2.3	•
NPerformance Grade Temperature at Desired Reliability	60.3	-7.8	}
Grade for expected traffic level and traffic load rate	S		
Selected PG Grade	64	-10	
PG Grade	M332, PG 64S-10		
		Drint	Save

Print Save

A print friendly report can be generated using the "Print" button.

MERRA Climate Data for MEPDG Input UPDATED – Existing MERRA Climate Data for the MEPDG Input feature has been enhanced to download MERRA climate data in a format that is being used as an input for the AASHTOWare Pavement ME Design Software. This feature is updated to allow the users to download the Historical Climatic Database (*.HCD) and Station files using the following two options:

- **By Section** This options allows users to select an LTPP section and download the corresponding HCD file.
- **By Map** This new option allows users to select any MERRA cells from the geographic map and download the corresponding HCD file.



This feature also provides an option to choose the unit system (US Customary, Metric) before data download.

My LTPP:

My Data Extractions UPDATED – This feature has been enhanced to handle the MERRA data extraction requests that are submitted from the LTPP InfoPave Data Bucket.

Refresh			Go X
Extraction Number	Date 🗟	Extraction Status	
010794	4/9/2016 5:13:55 PM	Completed	Download LTPP IMS Package Download LTPP MERRA Package
010720	4/8/2016 7:13:26 AM	Completed	Download LTPP IMS Package Download LTPP MERRA Package
010634	4/6/2016 9:50:40 AM	Completed	Download LTPP MERRA Package
010630	4/5/2016 9:35:34 AM	Completed	Download LTPP IMS Package
010623	4/5/2016 6:48:56 AM	Completed	Download LTPP IMS Package Download LTPP MERRA Package
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Since the LTPP Data Bucket feature can now contain both LTPP IMS data and MERRA data extraction items, the "My Data Extractions" feature has also been updated to show separate download links for LTPP IMS and LTPP MERRA packages.