

INDOT WATER STRIPPING SEVERITY EVALUATION SOFTWARE MANUAL

Version 1.0

January 2013

DISCLAIMER

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1 INTRODUCTION

The evaluation software "INDOT WATER STRIPPING SEVEIRTY EVALUATION (iMoisture)" was developed to aid the water stripping severity evaluation and incorporate INDOT subsurface condition evaluation process. Asphalt mixture is primarily composed of asphalt and aggregate. Aggregates should be completely coated by asphalt. Thus, the uncoated aggregate is an index of water stripping, iMoisture detects uncoated aggregates and quantifies the area in a sample by employing the digital image analysis technology.

2 INSTALLLATION GUIDE

2.1 BEFORE INSTALLATION

iMoisture was developed using ADOBE Flex technology and requires ADOBE AIR 3.5 to run the application. You can download ADOBE AIR 3.5 or newer version from http://get.adobe.com/air/.

In addition, you need to check that your computer has the following minimum requirements to run iMoisture:

Windows

- 2.33GHz or faster x86-compatible processor or Intel® Atom[™] 1.6GHz or faster processor for netbooks
- Microsoft® Windows® XP Home, Professional, or Tablet PC Edition with Service Pack 3; Windows Server® 2003; Windows Server® 2008; Windows Vista® Home Premium, Business, Ultimate, or Enterprise (including 64-bit editions) with Service Pack 2; or Windows 7
- 512MB of RAM (1GB recommended)

Mac OS

- Intel® CoreTM Duo 1.83GHz or faster processor
- Mac OS X v10.6, v10.7, or v10.8
- 512MB of RAM (1GB recommended)

2.2 INSTALLING IMOISTURE

To install iMoisture, follow these steps:

1. Download iMoisture installer from <u>https://engineering.purdue.edu/people/hyung.j.ahn.1</u>. The iMoisture installer icon should appear on your desktop.



2. Run iMoisture Installer by double-clicking on the iMoisture_Install icon on your desktop. Click the **Yes** button to continue. An application install status window should appear followed by an install completion window.

2	ZipInstaller	×
	Extracting files tk85.dll	
	Cancel	
	ZipInstaller	×
i	iMoisture has been successfully installed on your computer.	
	ОК	

3. You have finished installing iMoisture and an iMoisture icon shown below should now appear on your Windows desktop.



3 OVERVIEW

iMoisture interface consists of four major elements, namely Menu bar (1), Selection panel (2), General panel (3) and Analysis panel (4).

<u>A</u>		iMoisture	
View Tool I	(1) (4)		
	(2)		
÷	- 4 -		
General			
Date	ī/21/2013 ∨ (3)		
District	Crawfordsville 🔻		
Subdistrict	Cloverdale 🔻		
Road Name			
Direction	North		
R. P.	0 + 00 +		
Lane Location	Passing Lane Left 🔻		
Mid-Layer Depth Thickness	0.0 ≑ in.		
	0.0 🖨 in.		
Mixture Designation			
Note	Unknown		
Note			
Result			
S	ripped		
Agg	regate		
	Total		

3.1 MENU BAR

Application menus are located in the upper left corner of the window and consist of **View**, **Tool** and **Help**.

Δ			
View	Tool	Help	

3.1.1 VIEW

The figure below illustrates the **View** menu. This allows a user to switch between different display mode (i.e., overview, original, coated and uncoated) and displays the keyboard shortcuts designated for each tab.

Δ			
View	Tool H	elp	
F	Fit to Windo	w -	
(Overview	1	
(Original	2	
1	Aggregate	3	
1	Asphalt	4	
	4	-	÷ –

3.1.2 TOOL

The **Tool** menu allows a user to run **Wizard**, print report, and manually adjust the threshold value for the analysis. The function of Wizard and advanced controller are explained in detail in Ch. 3.4.

Δ		
View	Tool	Help
		Run Wizard
		Print Report
		Advanced Controller
	÷	- + -

3.1.3 HELP

The figure below illustrates the **Help** menu. This provides the manual and software version information.



3.2 SELECTION PANEL

The **Selection** panel allows a user to import digital image file(s) to be analyzed and displays the selected image. It is important that user imports correct digital image at each panel.

- • : imports digital image file(s)
- removes the selected digital image from selection tab





: the digital image of cut face should loaded here

View Tool Help	
Senaral 1/21/2013 ✓	
District Crawfordsville	
Subdistrict Cloverdale	
Road Name	
Direction North -	
R. P. 0 € + 00 €	
Lane Location Passing Lane Left	
Mid-Layer Depth 0.0 🐑 in.	
Thickness 0.0 😴 in.	
Mixture Designation Unknown 💌	
Aggregate Type Unknown 🔻	
Note	
Result	
Stripped	
Aggregate	
Total	

3.3 GENERAL PANEL

The **General** panel allows a user to input general information regarding specimen and location along with mixture and aggregate type. The District and Sub-district features are Indiana's, and mixture designation is based on the Indiana Design Manual Chapter 52 (1). In addition, the analysis results are displayed at the bottom.

A		iMoisture	
View Tool Help			
-			
General			
Date	1/21/2013 ¥		
District	Crawfordsville Cloverdale		
Subdistrict Road Name			
Direction	North 🔻		
R. P.			
Lane Location	Passing Lane Left 🔻		
Mid-Layer Depth	0.0 ≑ in.		
Thickness	0.0 🜩 in.		
Mixture Designation	Unknown 🔻		
Aggregate Type	Unknown 🔻		
Note			
Result			
s	tripped		
Agg	regate		
	Total		

3.4 ANALYSIS PANEL

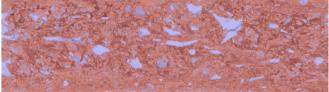
The **Analysis** panel presents analyzed digital images by the selected display mode and instantly updates as any changes occurs in selected values. It also features a **Wizard** option button in the left upper corner of the window, which allows a user to select the different threshold value. Finally, iMoisture allows a user manually control threshold value as an **Advanced Control** option.

<u>۵</u>	iMoisture
View Tool Help	
General Date 1/21/2013 V District Crawfordsville V	Wizard Overview Original Aggregate Asphalt
Subdistrict Cloverdale Road Name Direction North R. P. 0 + 00 + Lane Location Passing Lane Left Mid-Layer Depth 0.0 + In. 0.0 + Mixture Designation Unknown Aggregate Type Unknown Note	
Result	
Stripped 64.97 % Aggregate 53.22 %	
Total	

3.4.1 DISPLAY MODE

There are four different display modes are available, namely overview, original, coated and uncoated.

• Overview: displays coated and uncoated area in different colors over the original digital image



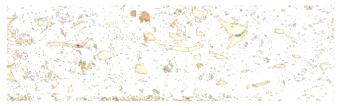
• Original: unprocessed original digital image is displayed



• Coated: only coated portion of the original image are displayed

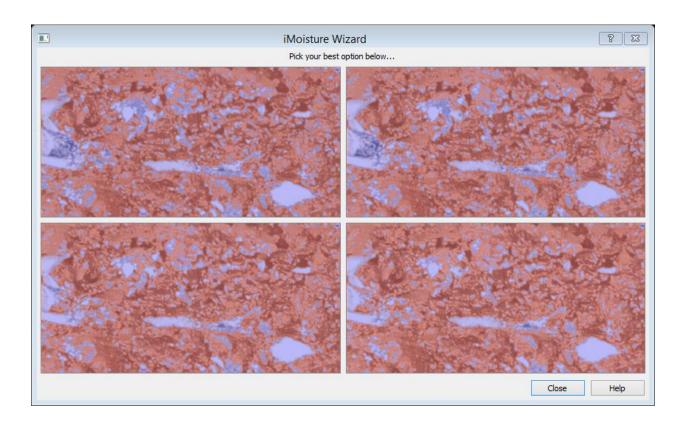


• Uncoated: only uncoated (stripped) portion of the original image are displayed



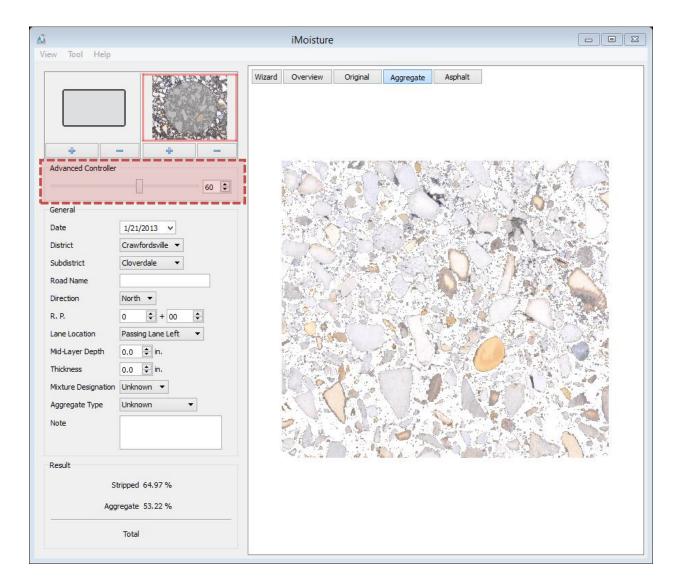
3.4.2 WIZARD

The **Wizard** option allows a user to select different threshold value to be used in the analysis. When a user clicks the wizard option, a new window is generated containing four different images processed with different threshold value. A user then can select the one separates the coated and uncoated portion best.



3.4.3 ADVANCED CONTROL

The **Advanced Control** option allows a user to manually adjust threshold value to be used in the analysis. The option can be accessed through **Tool** in menu bar. When a user clicks the option, a new control bar is generated containing threshold value, which ranges from 0 to 100. A user then can select the best threshold value that separates the coated and uncoated portion most accurately.



4 GETTING STARTED

4.1 LAUNCHING iMoisture

Run iMoisture by double-clicking on the iMoisture icon on your desktop or



in your Windows Start menu.

4.2 HOW TO TAKE DIGITAL IMAGE

Digital image is a vital part of iMoisture. The information below provides important requirements on how to take digital image to obtain the best result.

- Sufficient lighting should be provided when image is taken as iMoisture detects differences in reflection from different materials. In addition, it is imperative to have uniform brightness in digital images taken. However, it is difficult control lighting condition especially in the field. Use of light meter, which measures the amount of light, provides constant which is then used to determine the proper exposure for digital image. Consequently, digital image as if taken under uniform lighting condition can be obtained by adjusting digital camera settings based on the reading from the light meter.
- For digital camera positioning, Image should be taken while you set up or hold the digital camera perpendicular to the flat surface of the specimen. Example digital camera setup with the tripod is shown below.



4.3 HOW TO PREPARE DITIAL IMAGE

Image to be used with iMoisture should not contain any background or specimen edges. Edges can be negatively affect the analysis result as it is considered as uncoated material while they are simply displaying cut surfaces caused by coring process. Finally, either side of two split surfaces may be used. Crop the image so if it does not match the requirement, as shown below.

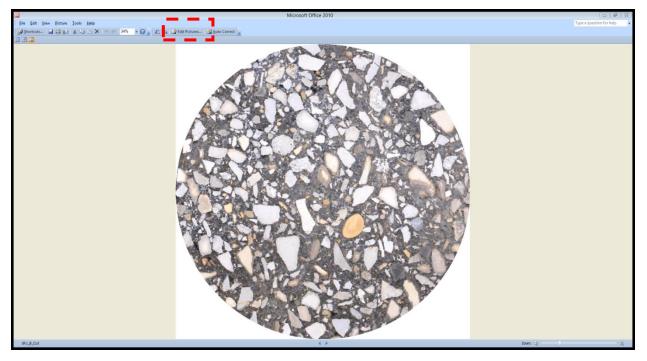
Incorrect	Correct

In order to crop picture, a user can choose any available software and there are many free open source software available (e.g., Gimp, Irfanview, and Paint.Net). Software available to all computers with Microsoft Office 2007 or newer version is Microsoft Office Picture Manager; thus, step by step procedure on cropping image is illustrated below using Microsoft Office Picture Manager (Name changes to Microsoft Office 2010 in Microsoft Office 2010).

To start editing the image, right-click on any photo and select **Open With**, from the list select Windows Office Picture Manager, if it is not given in the list, click on **Choose Default Program**. Now click on **Other Programs** and you will find it there.

New item New folder	ss • Properties & History	Select 88 Select	none selection		
New	Open	Sel	ect		
IR1.B.Cut IR3.F.B.DEMC HED	Preview Edit Edit with GIMP Set as desktop background Print Preview Rotate right Rotate left 7-Zip		IR2A	IR2A_B	IR2A_*
	Edit with Notepad++				-
	Open with	• 🇯			1
	Add to a Photo Stream		Paint Paint.NET		
	Share with	₩ 	Paint.ive i Photos		
0	Scan for threats				
	Send to	•	Windows Live Mo	ovie Maker	
	Cut	۲	Windows Live Ph	oto Gallery	
	Сору				
	Create shortcut		Microsoft Office		
	Delete Rename		Choose default p	rogram	
	Open file location				

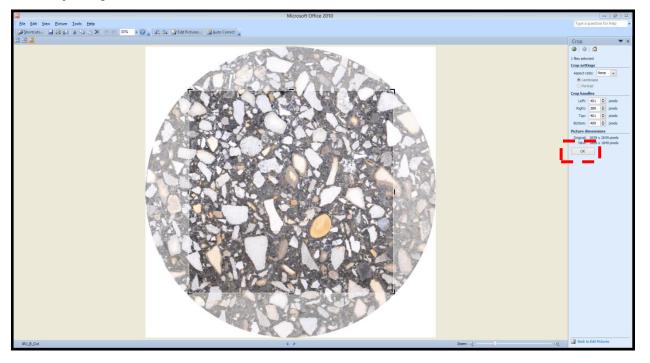
Once you have opened the image with Microsoft Office Picture Manager, click on **Edit Pictures**.



Edit Pictures toolbox will appear on the right side, now under **Edit** using these tools, click on **Crop**, and you will see multiple options.

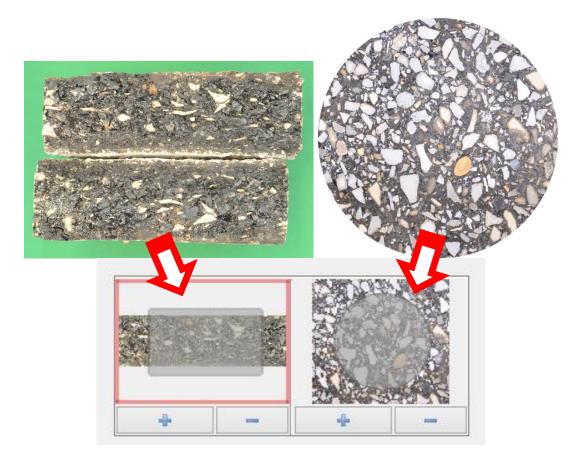
Edit Pictures 🛛 🔻 🗙	ī
	Crop
	🎯 🕲 🛣
1 files selected	1 files selected
Correct pictures automatically	
To automatically correct color and	Crop settings
brightness for the selected pictures, click Auto Correct.	Aspect ratio: None 🗸
	Landscape
Auto Correct	OPortrait
Edit using these tools	Crop handles
Brightness and Contrast	Left: 0 🚔 pixels
📀 Color	Right: 0 🖨 pixels
-🗗 Crop	Top: 0 🖨 pixels
🕑 Rotate and Flip	Bottom: 0 🖨 pixels
🐵 Red Eye Removal	Picture dimensions
Change picture size	Original: 2659 x 2659 pixels
2 Resize	New: 2659 x 2659 pixels
🚊 Compress Pictures	ОК

After adjusting the size, click **OK.**



4.4 DIGITAL IMAGE REQUIREMENT

iMoisture requires two different images to be loaded for the water stripping severity analysis. The first image is from cut face of specimen prior to IDT test and used for calculating the area covered with aggregate. The other image is from broken face of specimen after IDT test and used for quantifying the stripped aggregate area. The examples of each type of images are shown below. It is important that correct image type should be loaded into the right selection panel.



4.5 ANALYSIS EXAMPLE

The following example illustrates how to evaluate water stripping severity using iMoisture step by step. Procedures presented in this example are designed to help the first-time user to become more familiar with iMoisture, but hereafter a user may enter and edit values for each required input in any order.

4.5.1 STEP 1

A user can attach any type of image file with no size limit. The figure below illustrates how to add or delete image files.

To add image files, follow these steps:

1. Click the 🖶 button.

	iMoisture	
iew Tool Help		
Advanced Controler General Date 1/21/2013 V District Go ¢ Subdistrict Cloverdale V Road Name District Direction North V R. P. 0 ¢ + 00 ¢ Lane Location Passing Lane Left V Mid-Layer Depth 0.0 ¢ n. Thickness 0.0 ¢ n. Mixture Designation Unknown V Aggregate Type Unknown V Note Stripped 36.66 % Aggregate 53.22 % Total	Wizard Overview Original Aggregate Asphalt	

2. Select an image file and then click **Open**. It should be noted that a user can also use drag and drop to add an image file.

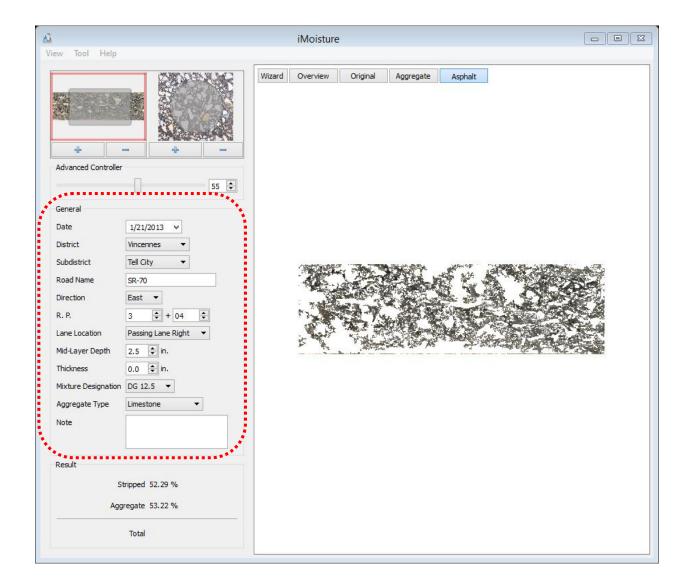
		select image file	(s).			83
	▹ Pictures ▷ SPR 3507 ▷ Core La	yer → GREEN → Cut	▶ 1	✓ C Search 1		Q
Organize 🔻 New folder					I -	•
 ★ Favorites ▲ Desktop ▲ Desktop ▲ Downloads ↔ Dropbox ※ Photo Stream ※ Recent places ※ Libraries ▲ Documents ▲ Music ▲ Pictures ▲ Videos Wideos Wideos Wideos Wideos Wideos Wideos 	1R1 1R2A	1R3A	IR3B			
Computer Y						
File name:	1R1			✓ All Files (* å) Open		ncel .:i

2	iMoisture	
View Tool Help		
Advanced Controller Advanced Controller Ceneral Date 1/21/2013 V District Crawfordsville V Subdistrict Cloverdale V Road Name Direction North V R. P. 0 V + 00 V Lane Location Passing Lane Left V Mid-Layer Depth 0.0 V nn. Mixture Designation Unknown V Aggregate Type Unknown V Note Result Stripped 36.66 % Aggregate 53.22 % Total	Wizard Overview Original Aggregate Asphalt	

To delete files, click the image, then click the button

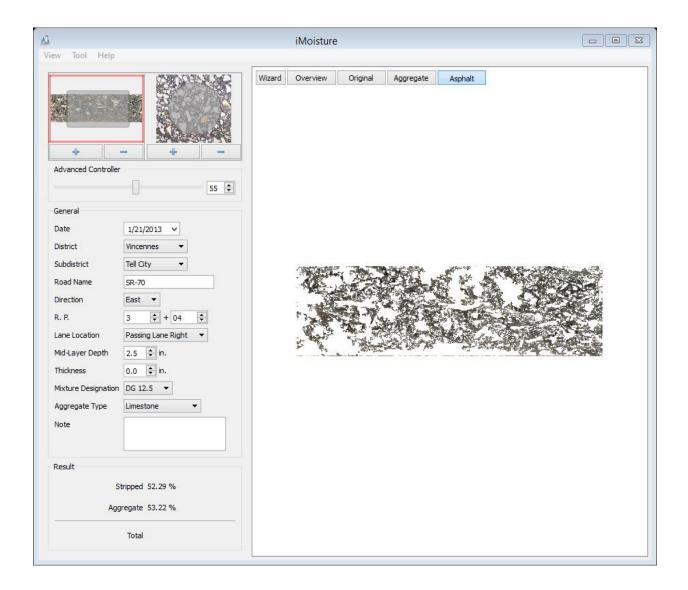
4.5.2 STEP 2

Enter location information, including lane location and layer depth, which is the depth measured from the midpoint of the layer to the surface. For district selection, a user can choose from one of six districts of Indiana. Once a district is selected, a list of subdistricts corresponding to the selected district becomes available.



4.5.3 STEP 3

Water stripping severity is automatically generated once the image file is loaded and selected from **Selection** panel. Review the processed images and use **Wizard** or **Advanced Control** option should a user need to make changes (Section 3.4.2 and 3.4.3).

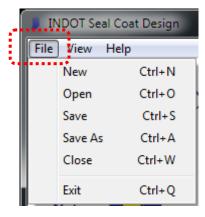


4.5.4 STEP 4

The last step is to save your work. You can save your work at anytime by typing the keyboard shortcut CTRL + S.

To save your work, follow these steps:

1. Click the **File** button.



2. Click either the **Save** or the **Save As**.

INDOT Seal Coat Design				
File View Help				
	New	Ctrl+N		
	Open	Ctrl+O		
Í	Save	Ctrl+S		
	Save As	Ctrl+A		
	Close	Ctrl+W		
	Exit	Ctrl+Q		

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