

INDOT WATER STRIPPING SEVERITY EVALUATION SOFTWARE MANUAL

Version 1.0

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DISCLAIMER

The contents of this manual do not necessarily reflect the official views or policies of the Indiana Department of Transportation (INDOT). The details in this manual are intended for reference only, not as specifications or design guidance. In the event that any information presented herein conflicts with the Indiana Design Manual, INDOT Standard Specifications or other INDOT policy, said policy will take precedence.

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

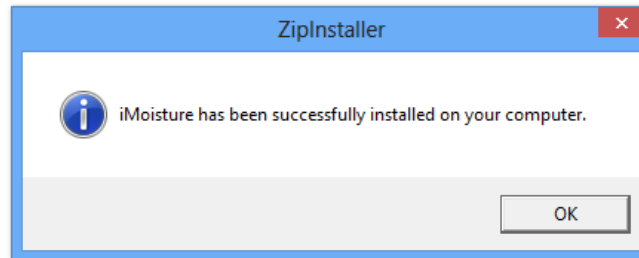
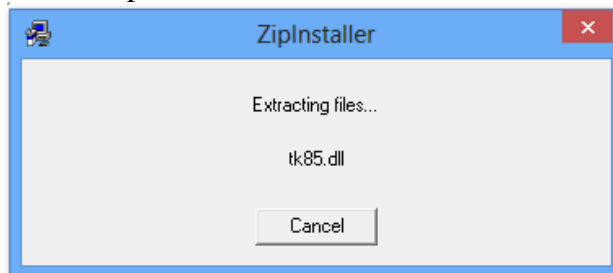
2.2 INSTALLING IMOISTURE

To install iMoisture, follow these steps:

1. Download iMoisture installer from <https://engineering.purdue.edu/people/hyung.j.ahn.1>. 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.

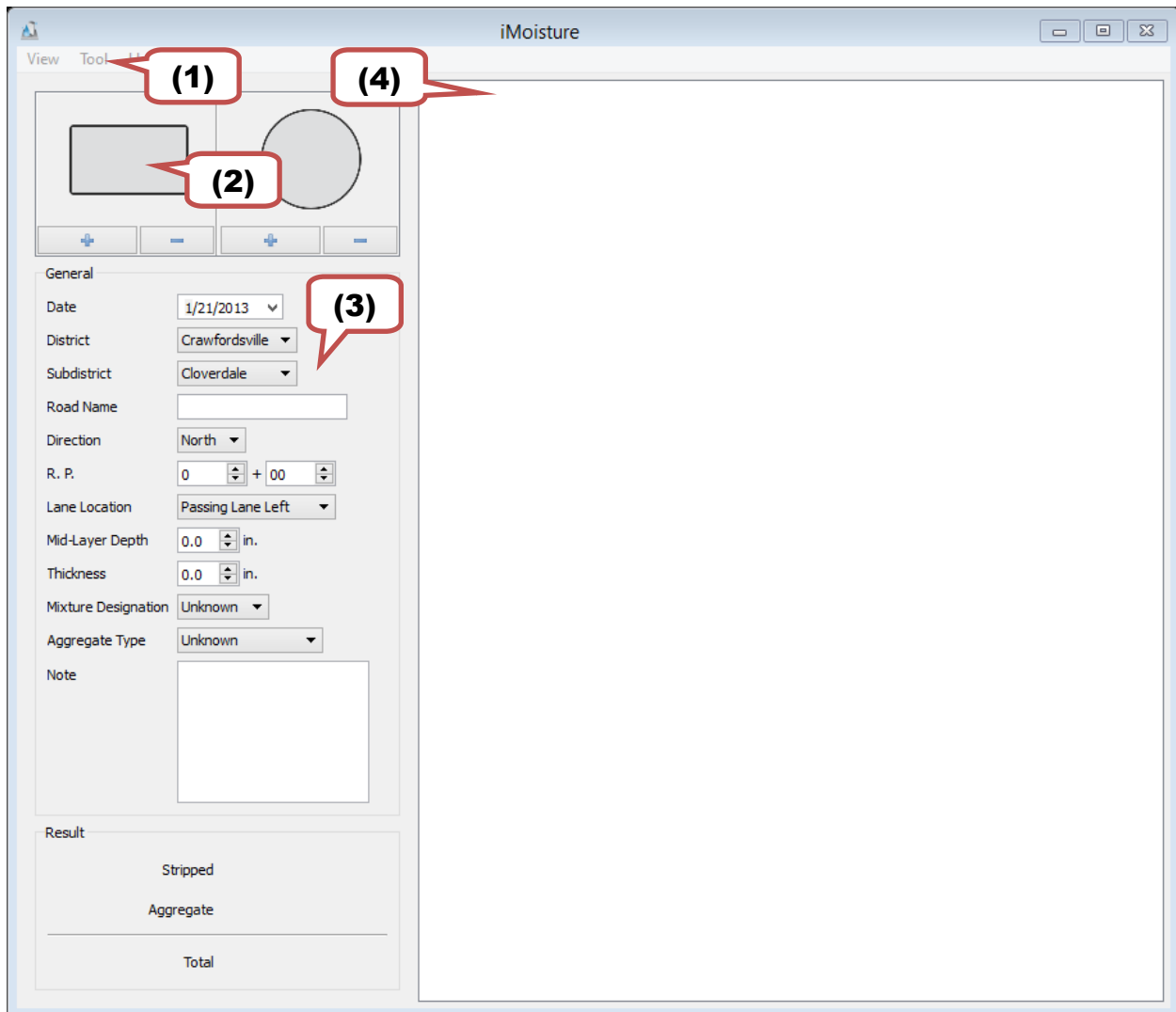


3. You have finished installing iMoisture and an iMoisture icon shown below should now appear on your Windows desktop.



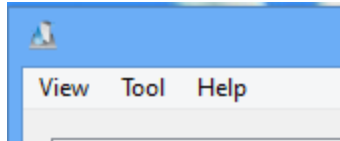
3 OVERVIEW

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



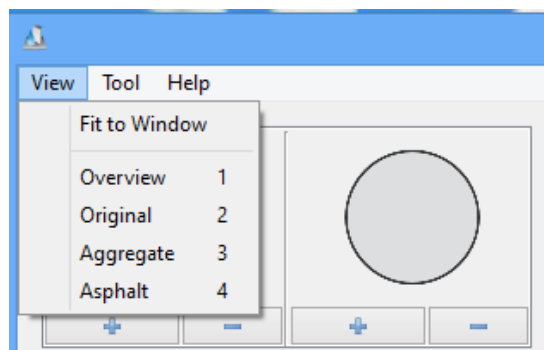
3.1 MENU BAR

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



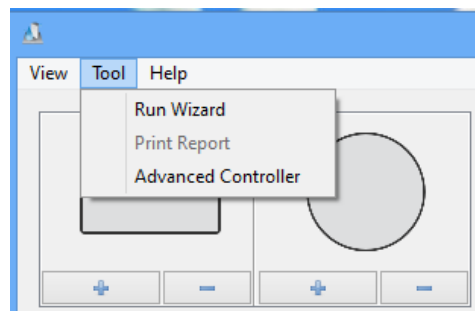
3.1.1 VIEW

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.



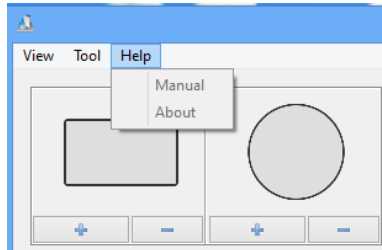
3.1.2 TOOL

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.





3.1.3 HELP

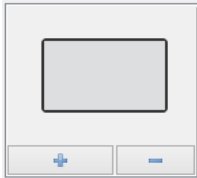
The figure below illustrates the **Help** menu. This provides the manual and software version information.



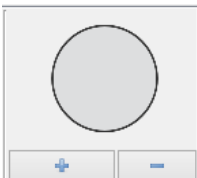
3.2 SELECTION PANEL

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.

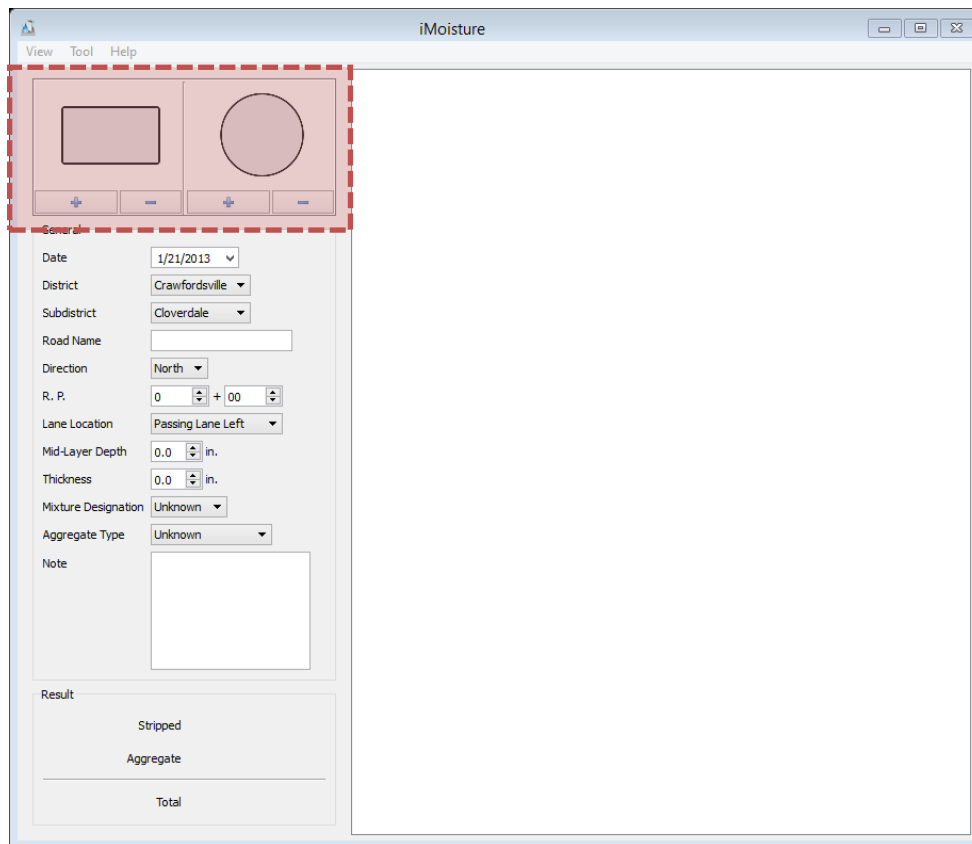
-  : imports digital image file(s)
-  : removes the selected digital image from selection tab



-   : the digital image of broken face after IDT should be loaded here

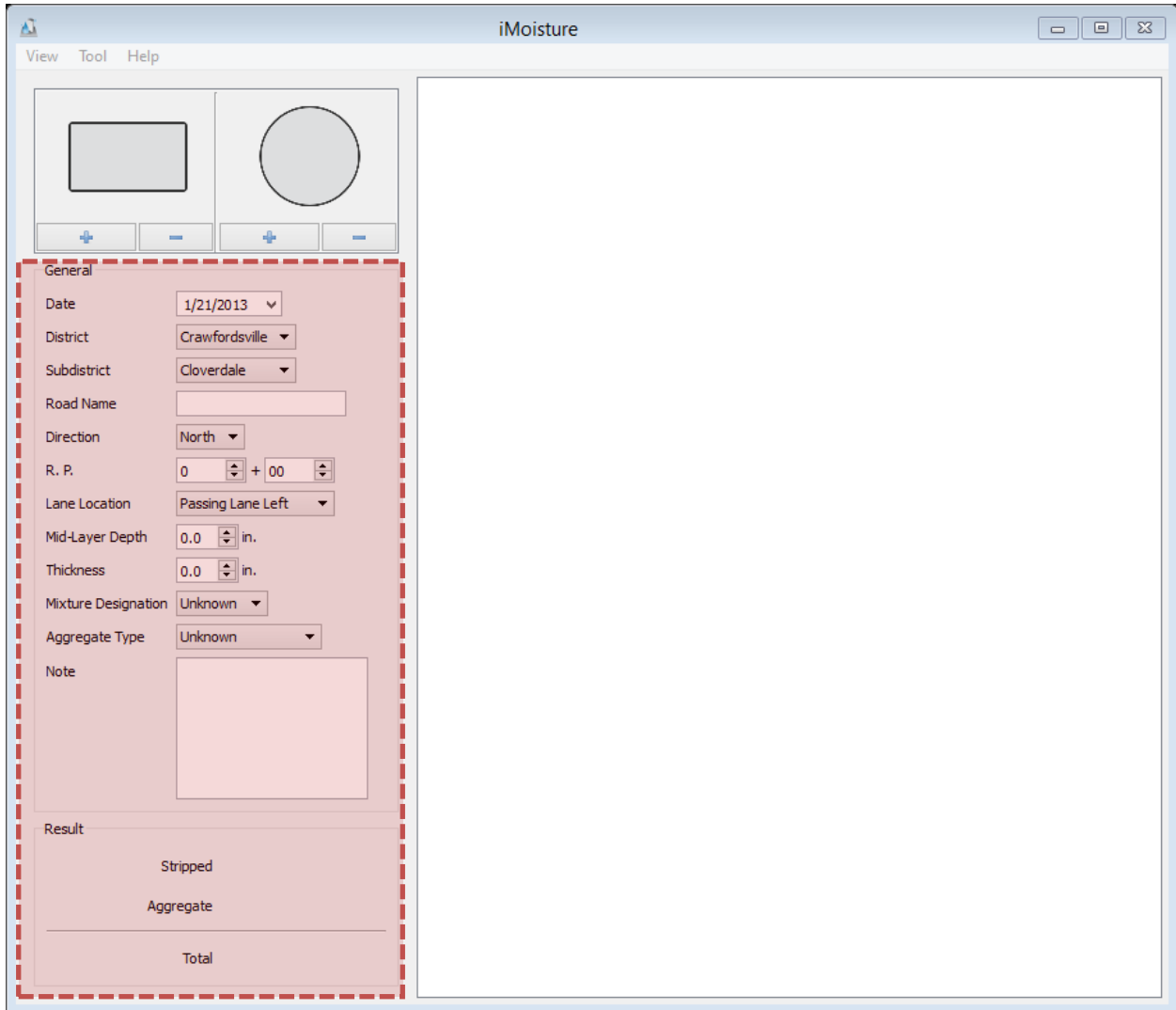


-   : the digital image of cut face should be loaded here



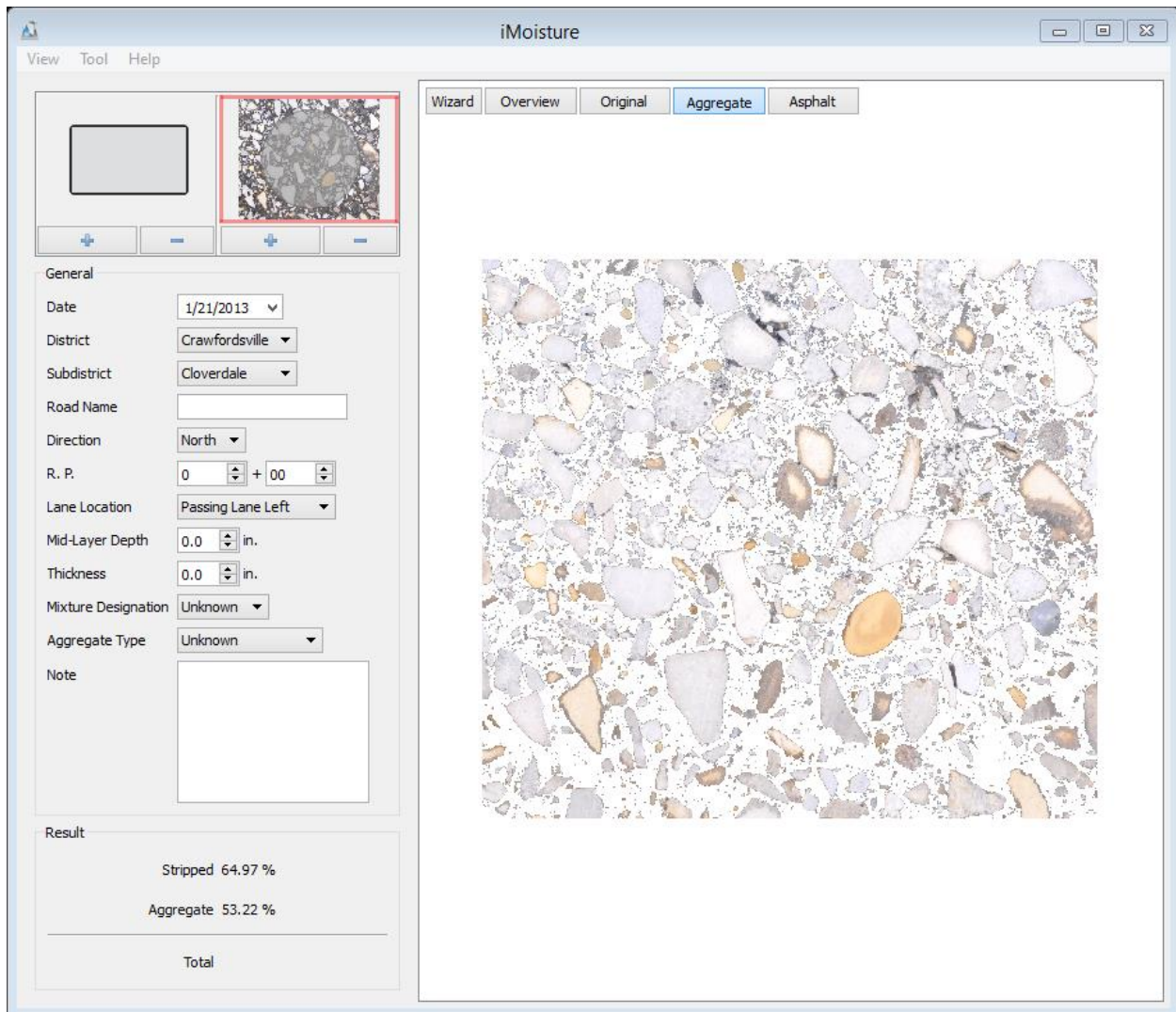
3.3 GENERAL PANEL

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.



3.4 ANALYSIS PANEL

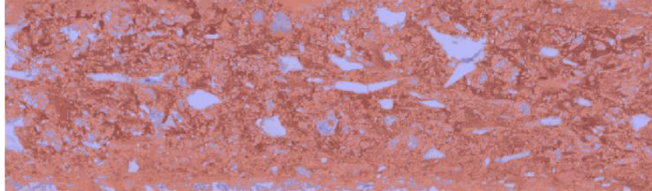
The **Analysis** panel presents analyzed digital images by the selected display mode and instantly updates as any changes occurs in selected values. It also features a **Wizard** option button in the left upper corner of the window, which allows a user to select the different threshold value. Finally,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



3.4.1 DISPLAY MODE

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

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



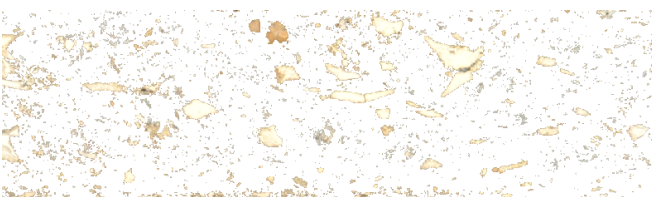
- Original: unprocessed original digital image is displayed



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

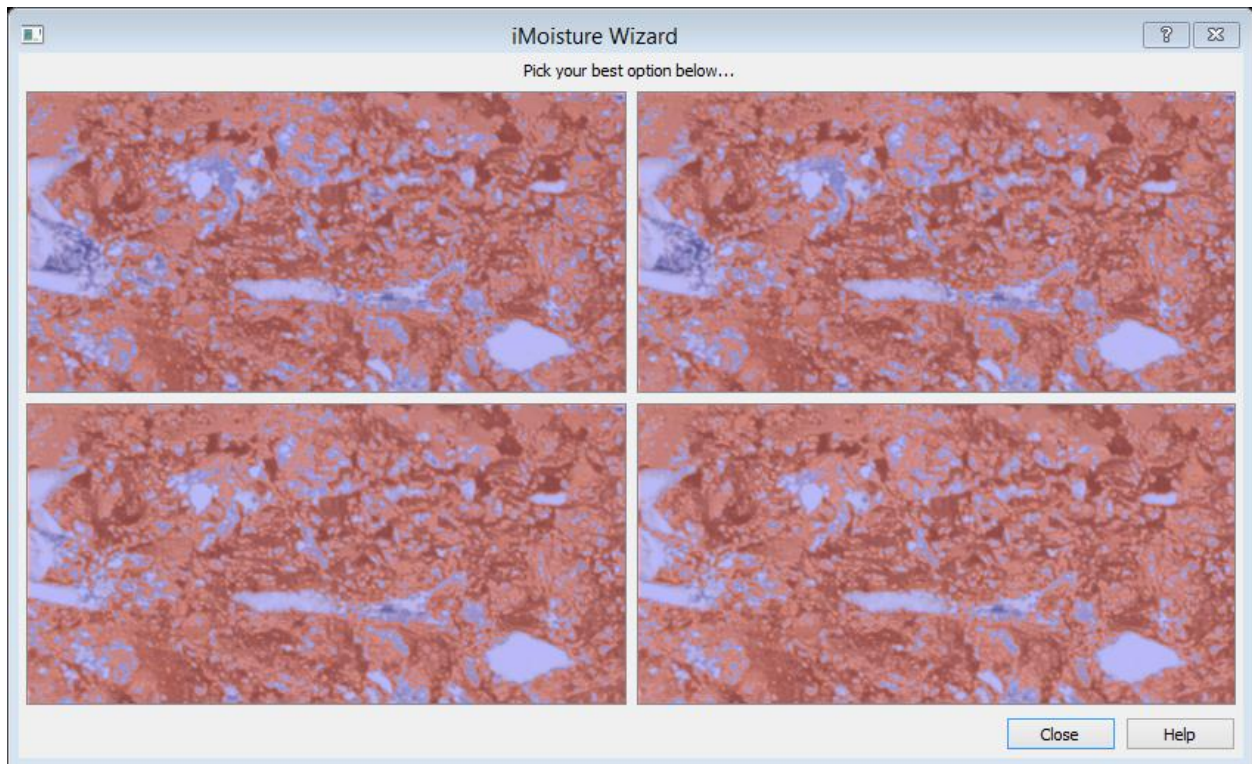


- Uncoated: only uncoated (stripped) portion of the original image are displayed



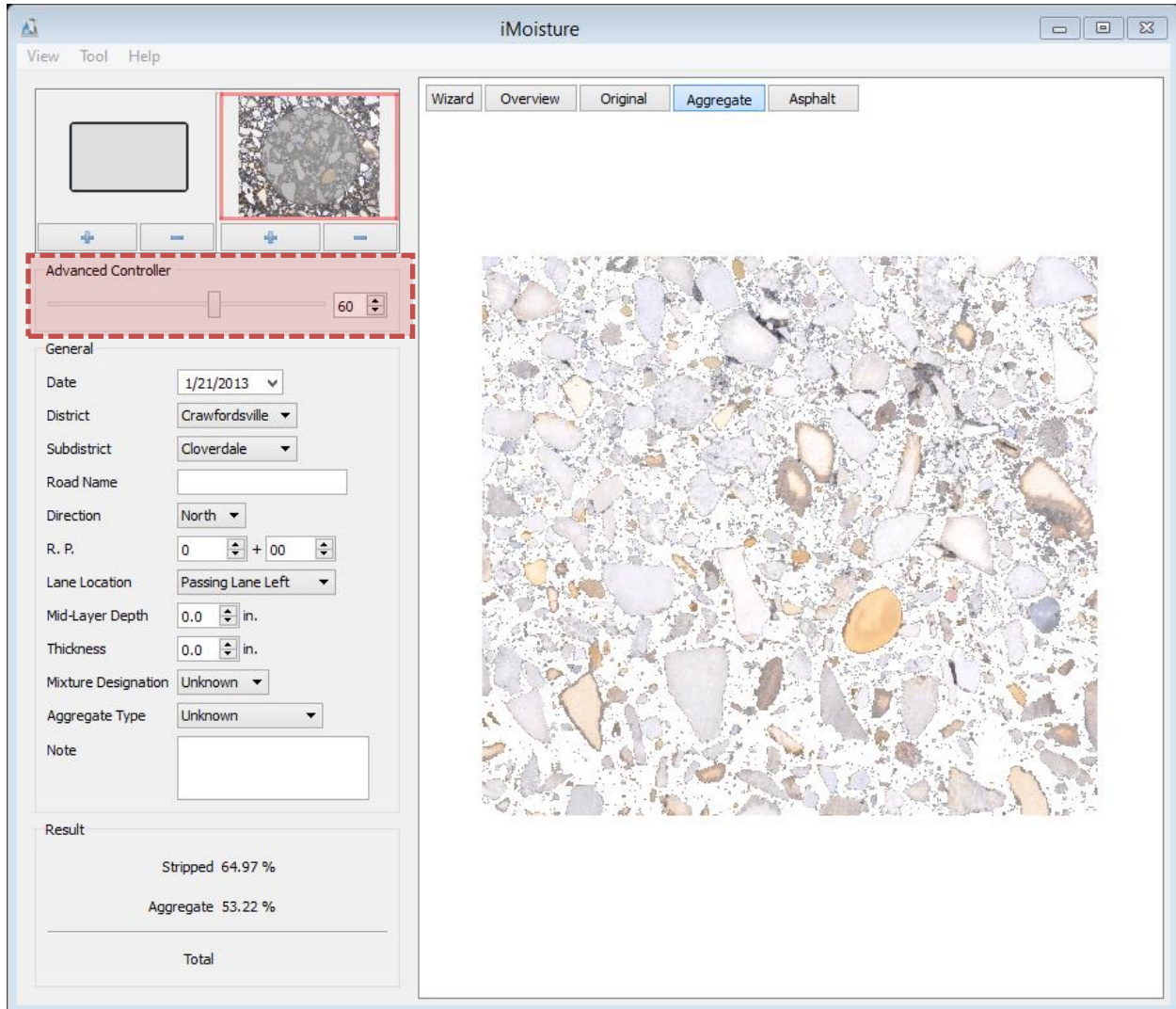
3.4.2 WIZARD

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

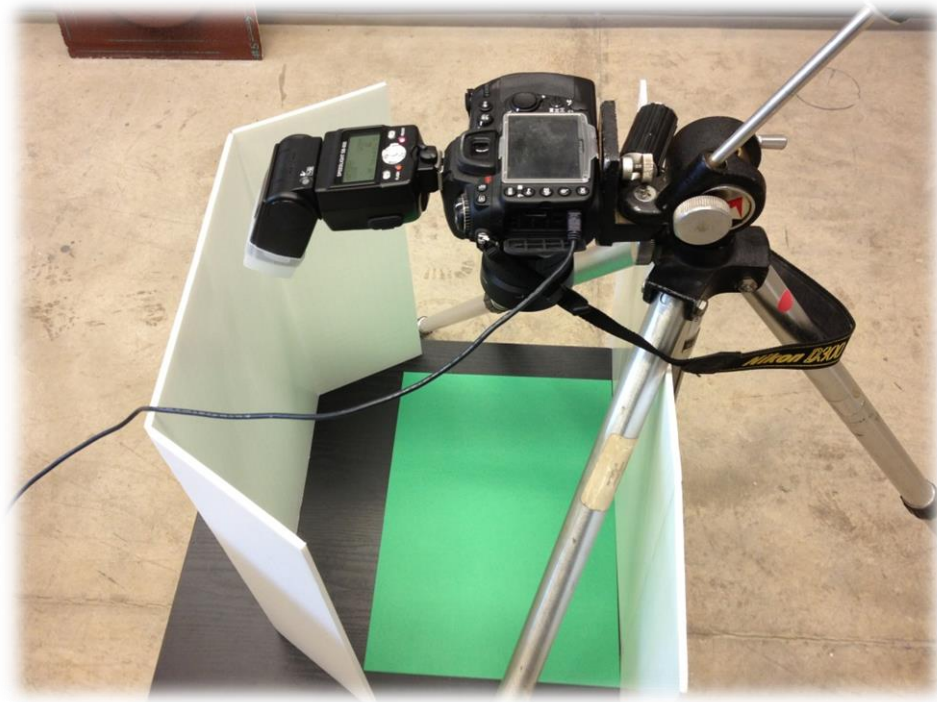


in your Windows **Start** menu.

4.2 HOW TO TAKE DIGITAL IMAGE

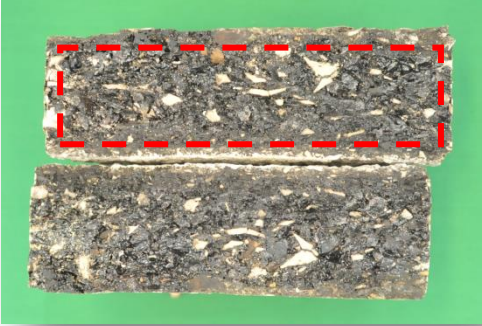

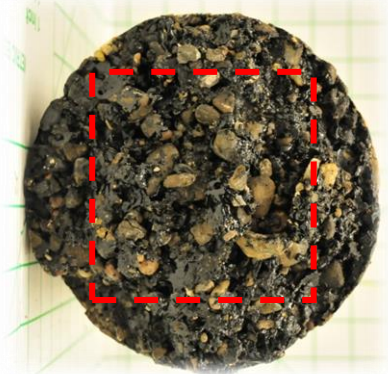

Digital image is a vital part of iMoisture. The information below provides important requirements on how to take digital image to obtain the best result.

- 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.



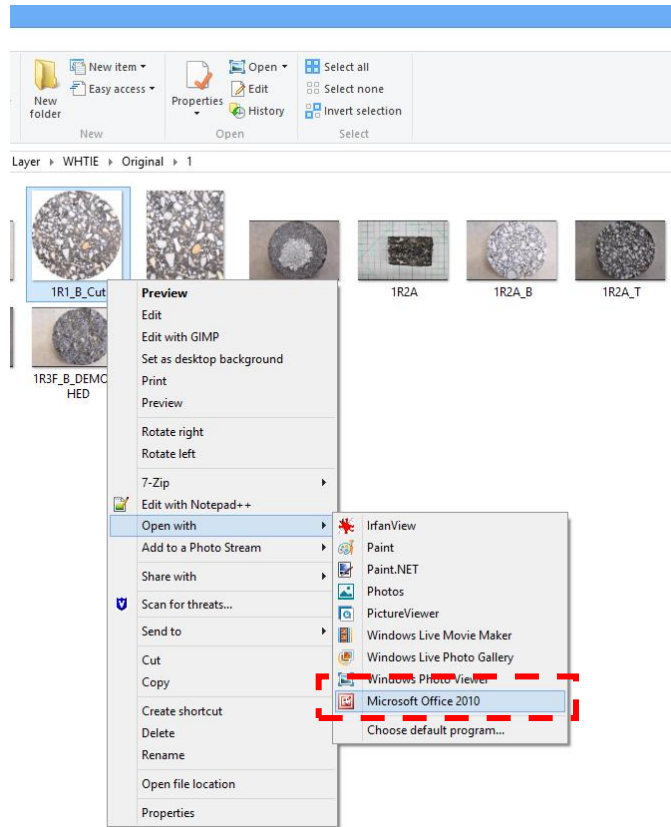
4.3 HOW TO PREPARE DIGITAL IMAGE

Image to be used with iMoisture should not contain any background or specimen edges. Edges can 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.

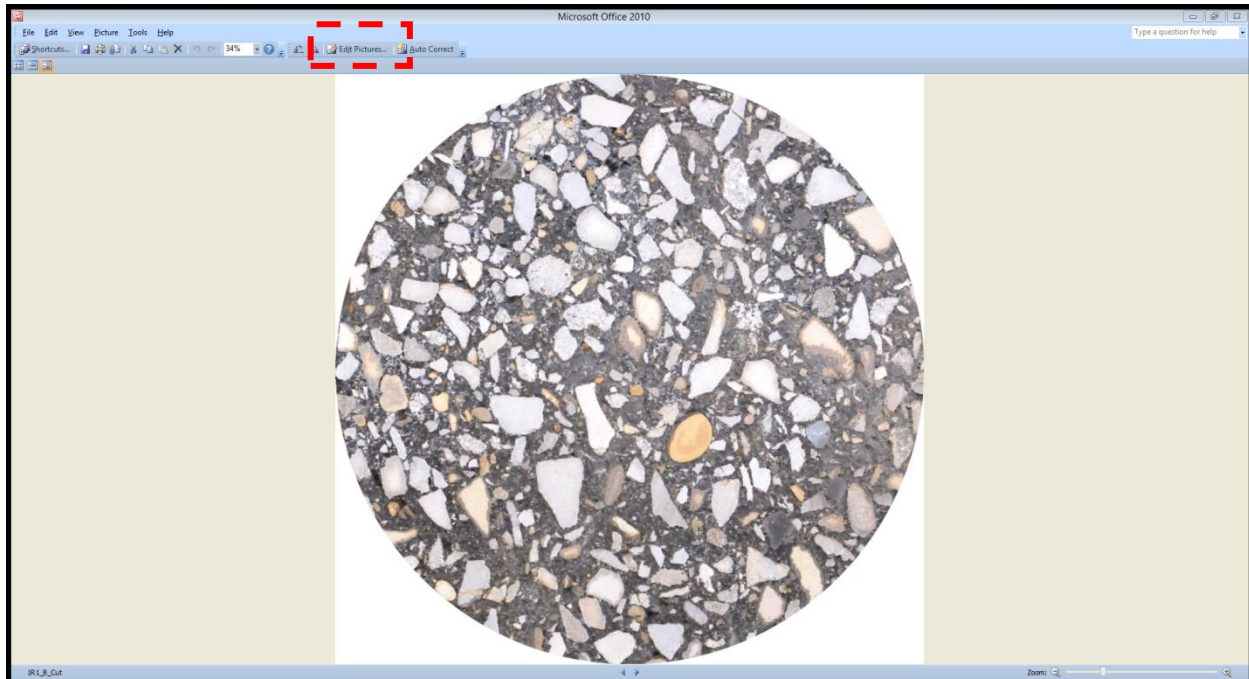
Incorrect	Correct
	
	

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).

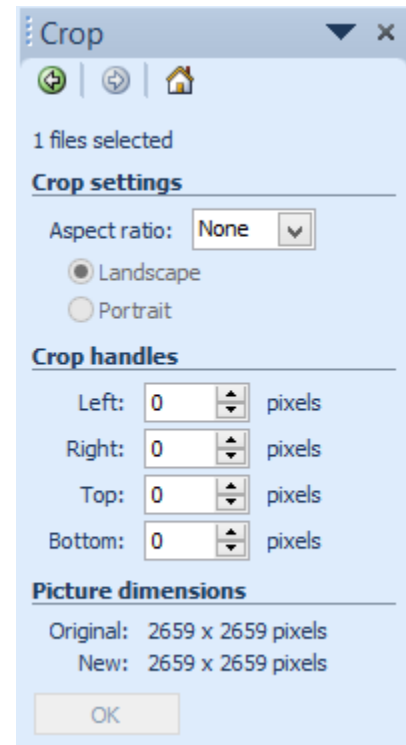
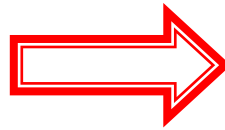
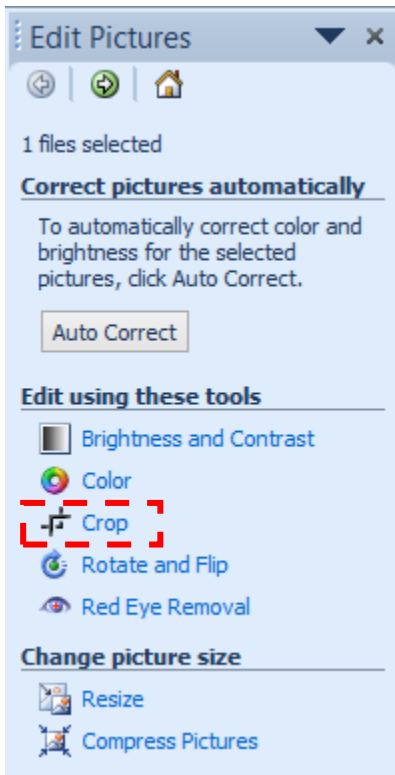
To start editing the image, right-click on any photo and select **Open With**, from the list select Windows Office Picture Manager, if it is not given in the list, click on **Choose Default Program**. Now click on **Other Programs** and you will find it there.



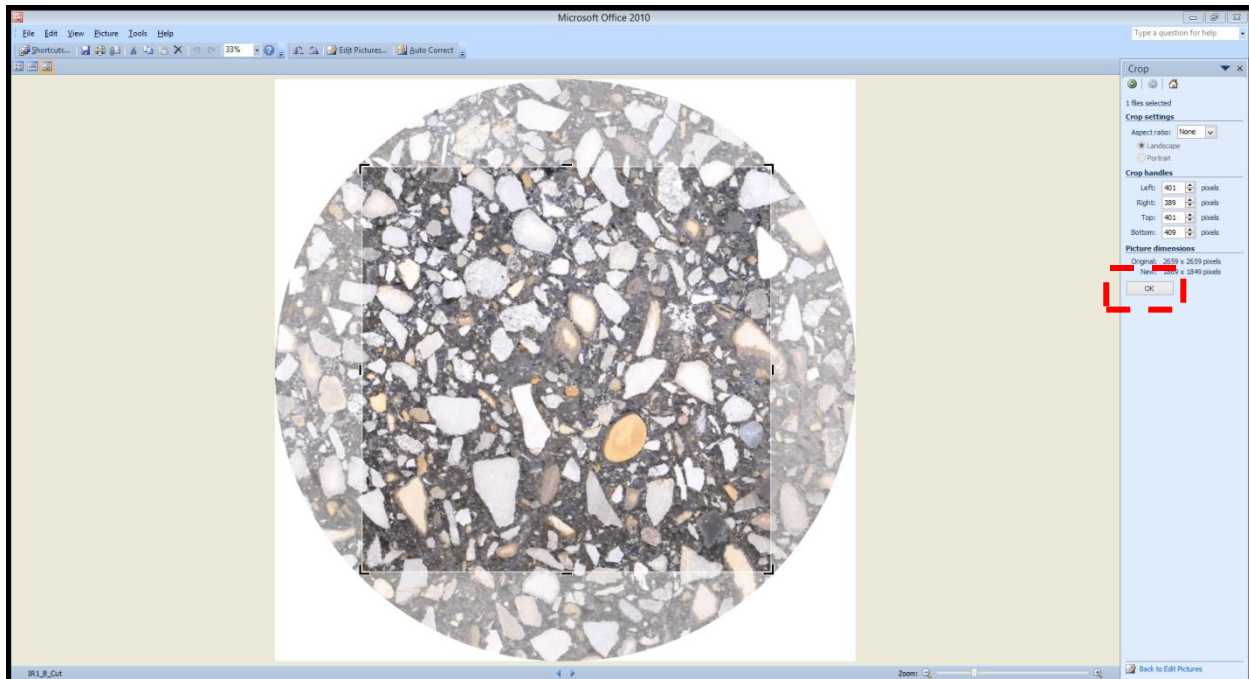
Once you have opened the image with Microsoft Office Picture Manager, click on **Edit Pictures**.



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

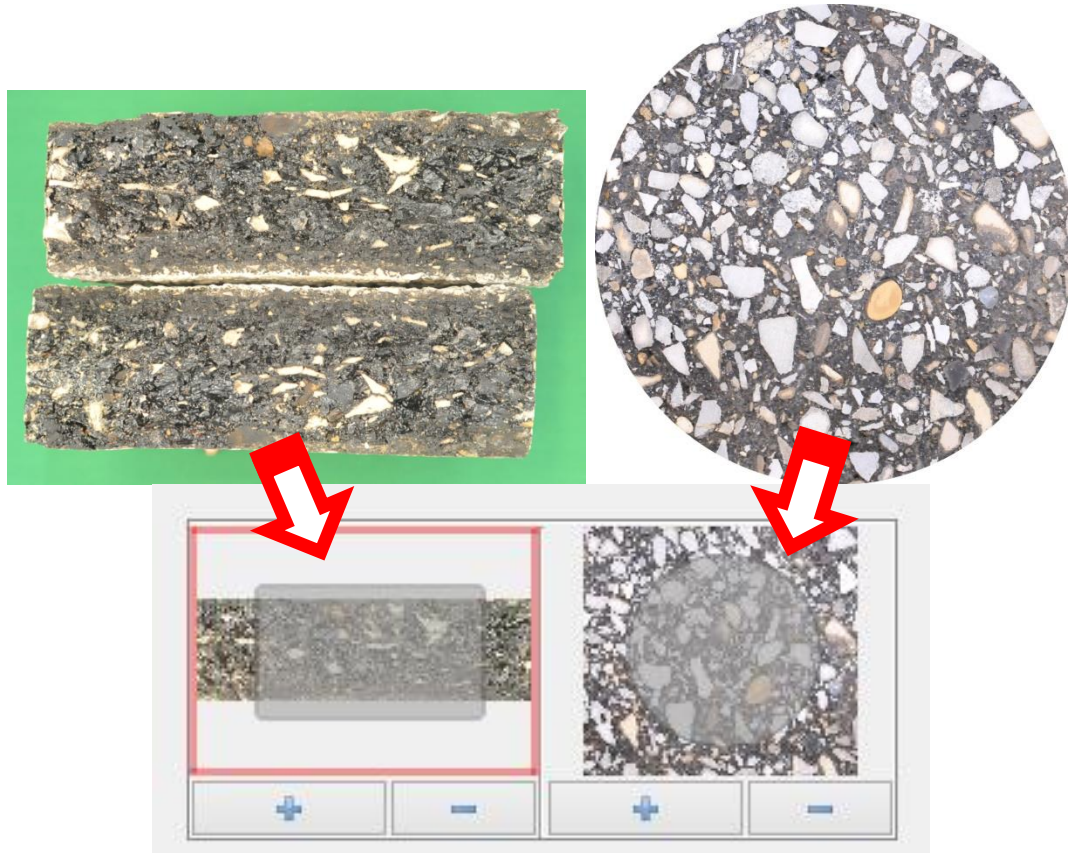


After adjusting the size, click **OK**.



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

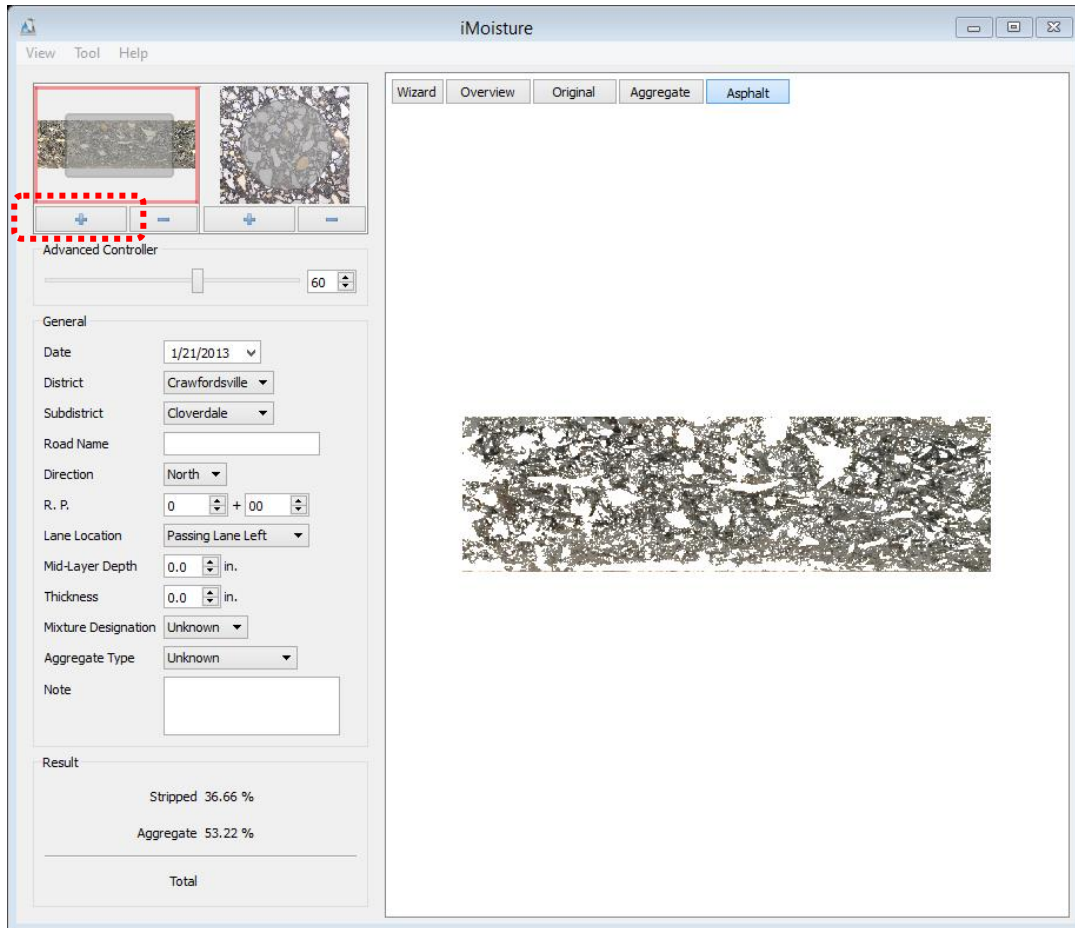
The following example illustrates how to evaluate water stripping severity using iMoisture step by step. Procedures presented in this example are designed to help the first-time user to become more familiar with iMoisture, but hereafter a user may enter and edit values for each required input in any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

4.5.1 STEP 1

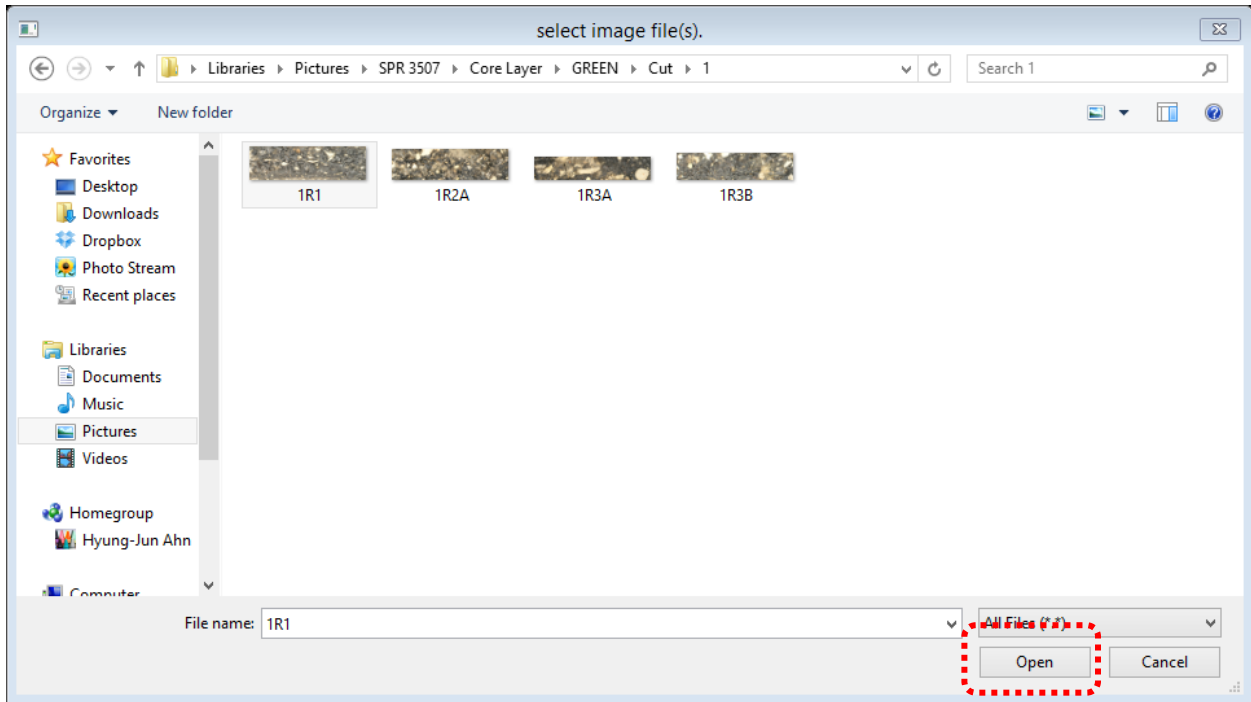
A user can attach any type of image file with no size limit. The figure below illustrates how to add or delete image files.

To add image files, follow these steps:

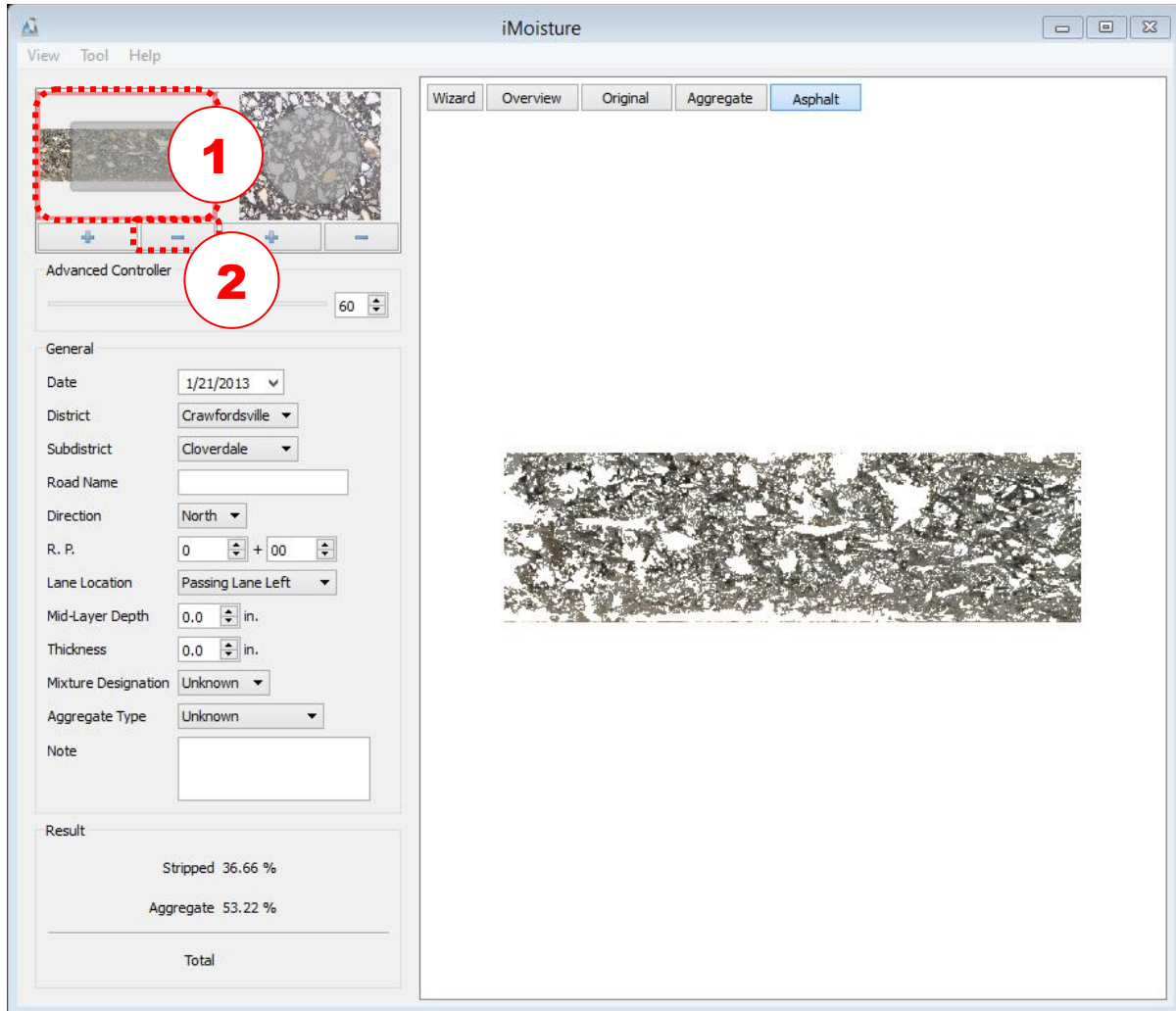
1. Click the  button.



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.

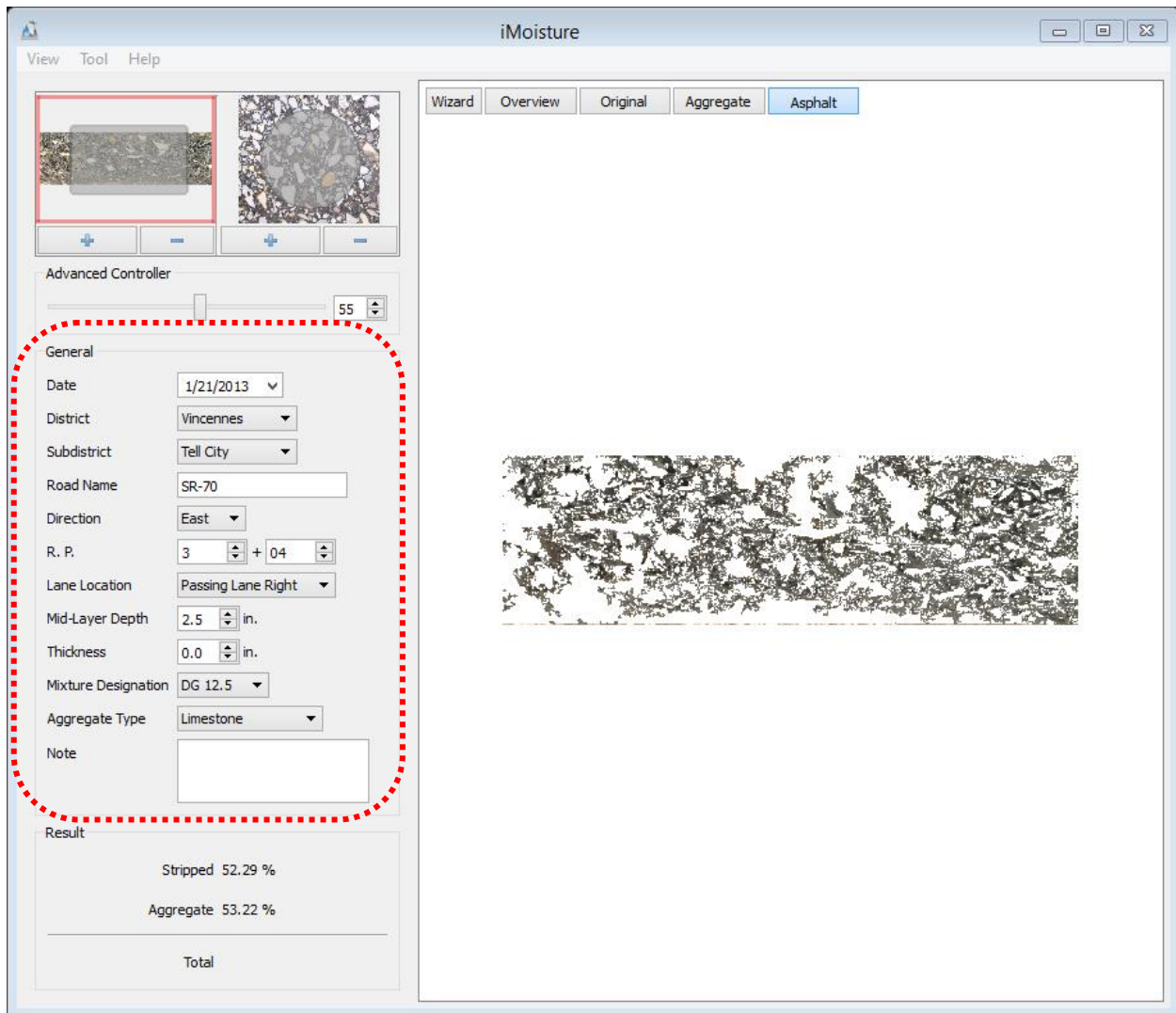


To delete files, click the image, then click the  button



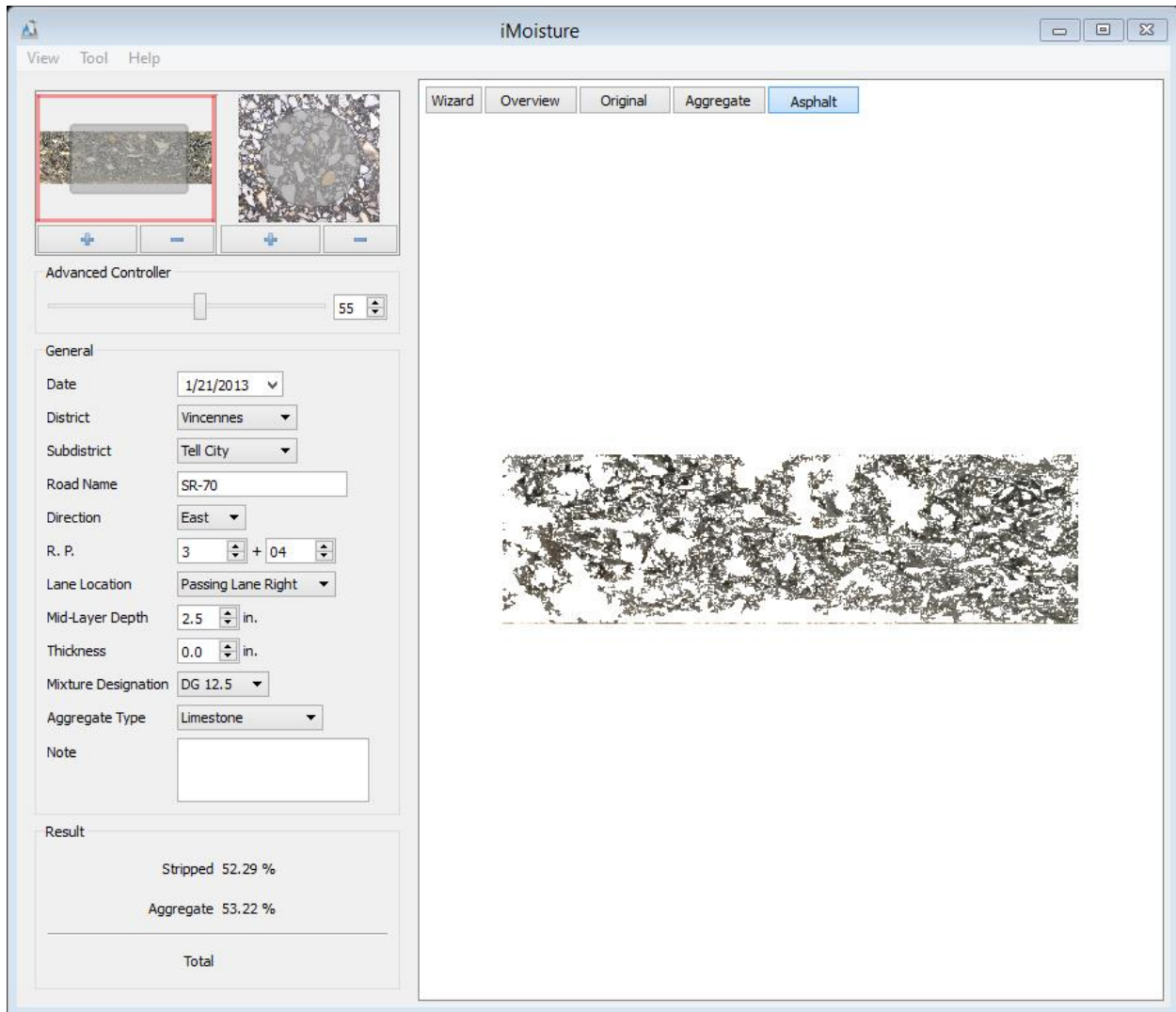
4.5.2 STEP 2

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).

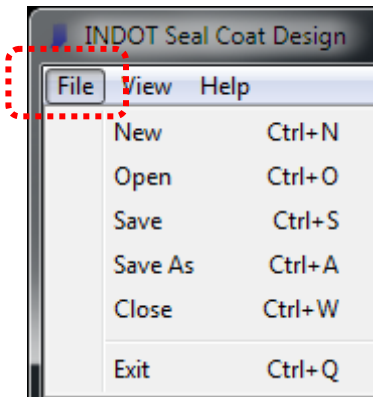


4.5.4 STEP 4

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**.

