Tools, Tips, and Workflows
Point Cloud Tasks – The I/O Manager
LP360

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As you read this, we are releasing LP360 2013.2, our second major release of LP360 for calendar year 2013 (yes, yes- I know it is 2014 already!). One of the main developments for this release has been extensive improvements to the Point Cloud Task (PCT) subsystem of LP360. The PCT system is a framework for executing (usually) repetitive or project-wide tasks such as ground classification and designating model key points.

We have now extended the PCT "engine" to allow easier "chaining" of tasks. This was motivated by our inclusion of the new Volumetric Analysis task (which we will discuss, in detail, in a future issue of GeoCue News). One of the improvements is better management of tasks that have input and output of non-point cloud data such as imagery and vectors. Over the course of the next several issues, we will detail how these new concepts work.

We will begin with a discussion of how a common task (extract point cloud statistics for quality checking) has changed under our new PCT model. I think that you will agree that it is a productivity enhancement.

Recall that in the previous version of LP360, running a PCT that involved a vector output resulted in a "Just in Time" (JIT) dialog that prompted you for a file name/location for storing the resultant vector file. This works fine unless you need to create a "macro" in which Task 2 needs to accept a vector input created as an output of Task 1. After many design discussions, we elected to solve this problem by adding an "Input/Output Manager" (IOM) to LP360.

Notice, in Figure 1, the new file field in the Statistics PCT dialog. This allows you to set the file name and output location of the statistics file prior to running the task.
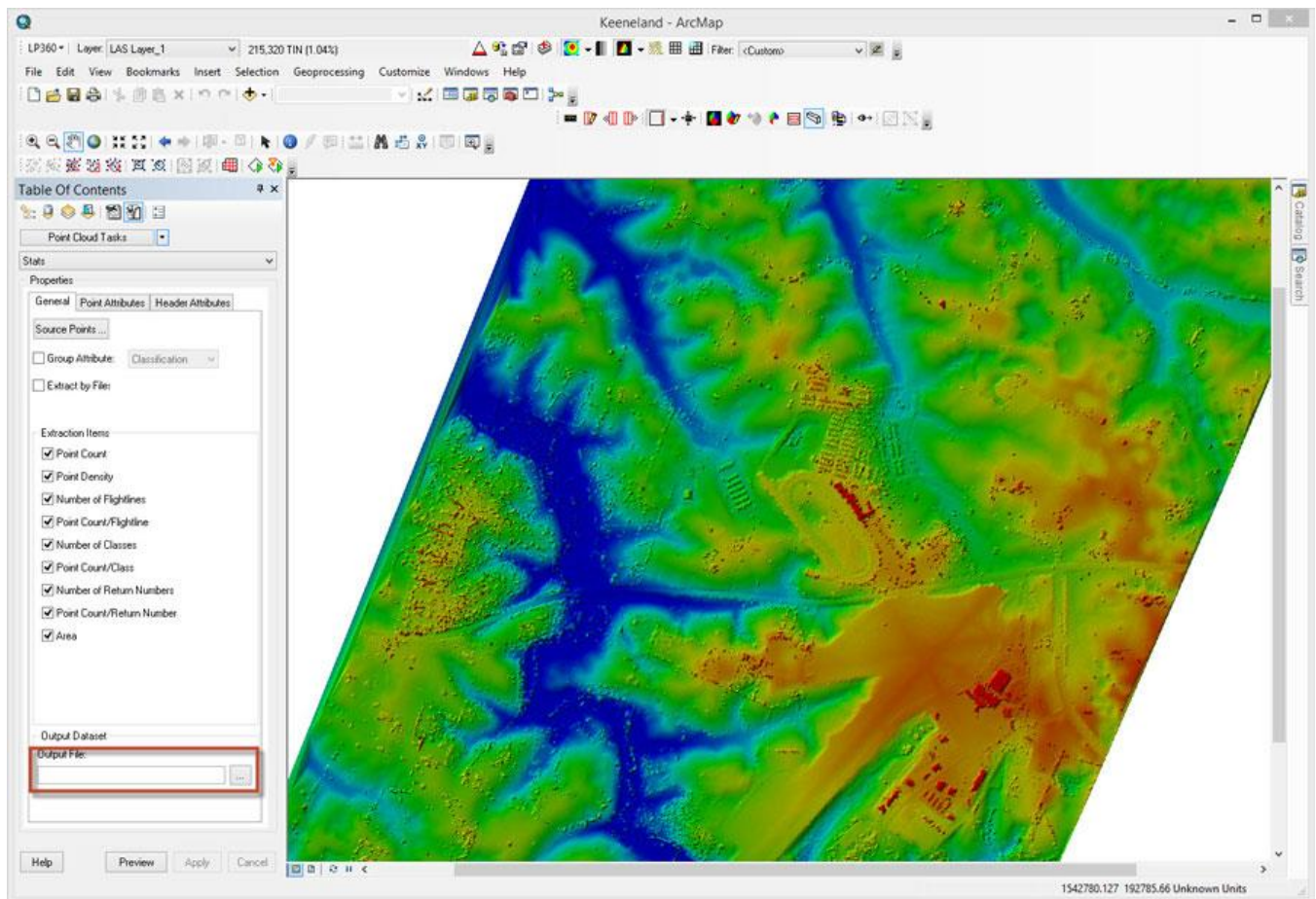
Figure 1: New Output file field on the Statistics PCT dialog

When you click on the button to the right of this field, the new Input/Output Manager (IOM) dialog is invoked (see Figure 2).
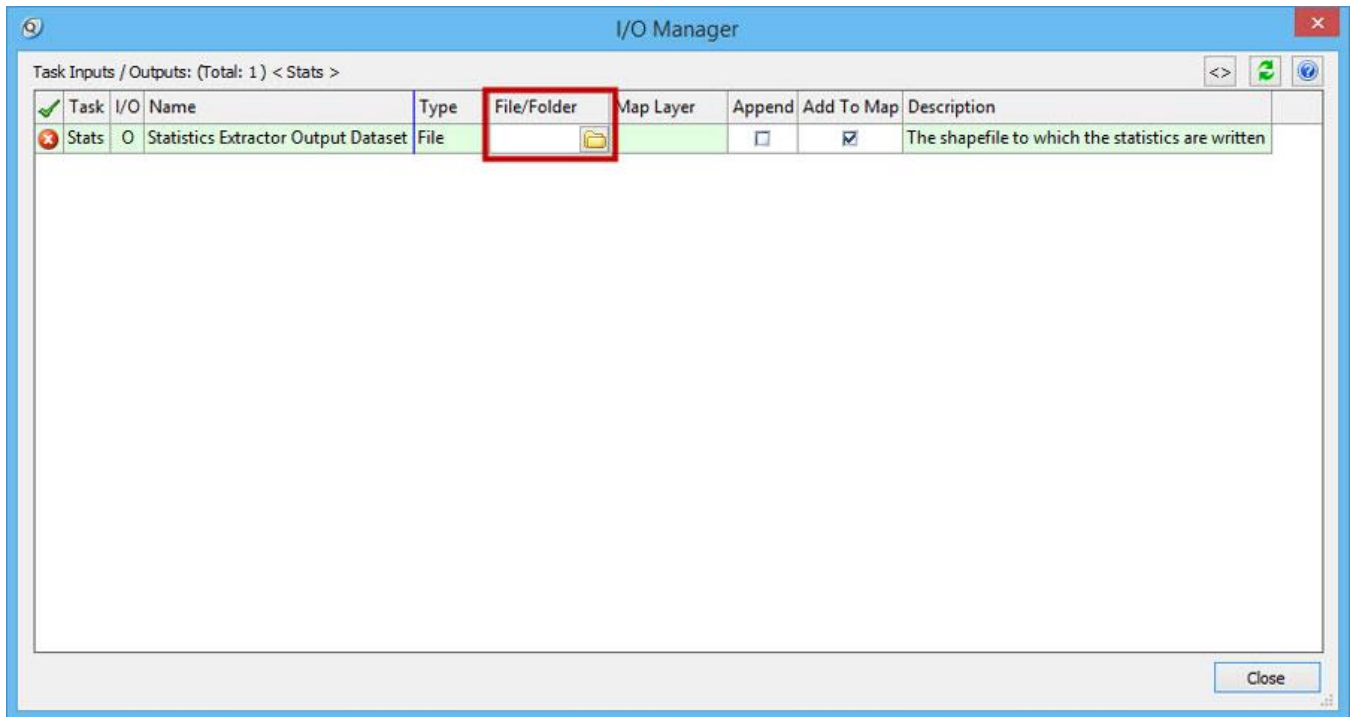
Figure 2: The Input/Output Manager (IOM) dialog

This new IOM allows setting of layers and files for both input and output. For our example, we are setting data for a single output file and therefore, we click in the File/Folder field of the IOM row. For complex tasks and/or macros, the IOM can have many rows. The row that contains the data for the selection you are currently working will be highlighted in green.

Setting the file and path is performed by clicking on the file folder icon. This takes you to a standard file browse dialog. From this dialog you can create both a new directory as well as specify the file name (see Figure 3). Note that the Point Cloud Task subsystem will create both files and paths for output parameters and thus you can directly key into the File/Folder area (since you obviously cannot browse for a non-existent path or file).
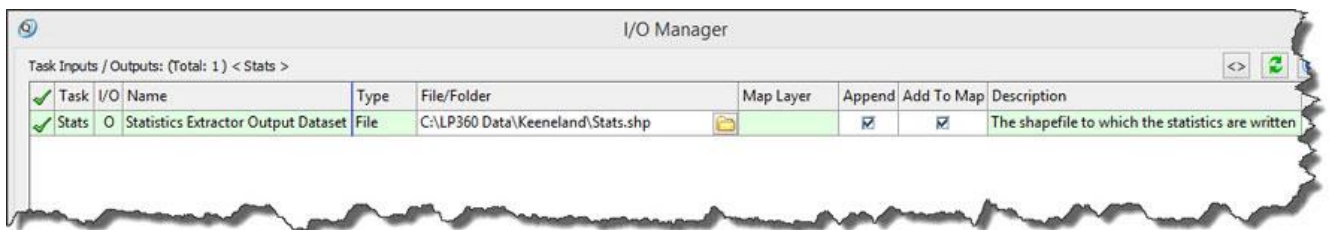

Figure 3: Setting the path and file name

Notice the two new features we have added via this dialog. The first is an "Add to Map" option (checked in Figure 3) that causes the created data to be immediately added to the Map View (as a layer). This is much more convenient than the prior requirement of needing to add the generated data via the "Add Data" tool of ArcGIS® (or the Add Data button in LP360 Standalone) after the PCT has completed.

The second option (listed first in Figure 3) is an option to "Append" to the data file. This means that if you execute the task multiple times, the subsequent runs will simply continue to append data to the same file rather than deleting the file and recreating. For example, if you check "Append" when running the point statistics task, each time you run the task by, for example, using the PCT Stamp tool, the stamp outline will be appended to your selected file and the layer in ArcGIS® (or LP360 Standalone) will automatically be updated with appended data. This is an extremely fast way to collect data when running selected statistics checks over a project.

One additional aspect of the IOM that is important is the idea of a "project path." We have added a variable to LP360 (all versions) called the "LP360_PROJECT_PATH". This is a "variable" that can be used in the IOM to allow you to "complete" relative paths. For example, I like to keep my projects organized in a hierarchical directory structure. The top level folder is named for the project itself (for example, "C:\LP360 Projects\Keeneland". So, for this example, I am working with a project called Keeneland. I then create a variety of subdirectories under Keeneland to hold various types of project data. For example, I create a "LAS" directory under "Keeneland" to hold point cloud data, a "Statistics" directory to hold the output of the statistics point cloud task and so forth. By using the idea of a Project Path, I can define a Point Cloud Task a single time and then use it, without modification, on any project.

To use a Project Relative path, first set the path using the "LP360" drop-down menu selector in the main LP360 toolbar (see Figure 4). Select the new "Project Settings…" option (note that "Project Settings…" is directly accessed from the File menu in LP360 Standalone).
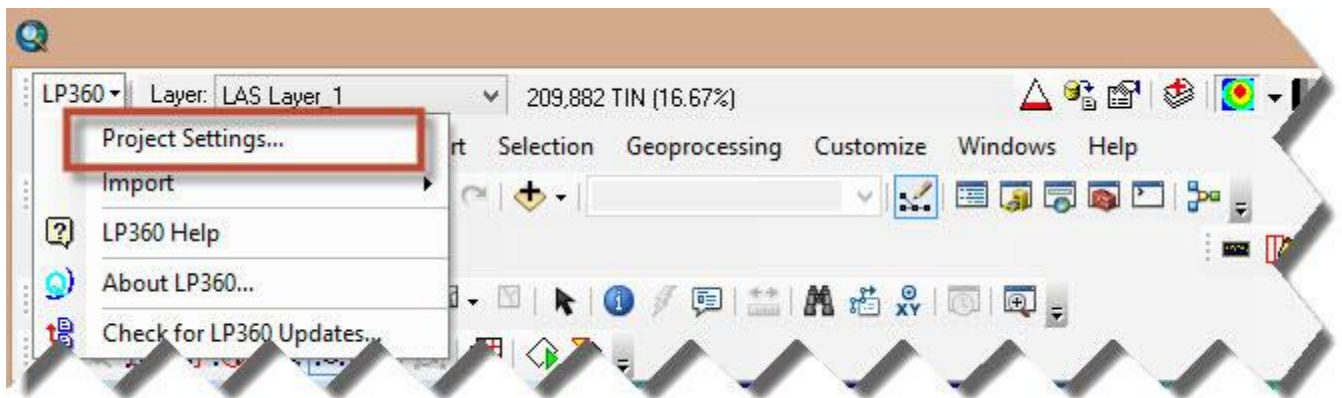

Figure 4: Locating the Project Settings... dialog

Selecting the "Project Settings…" menu item brings up the dialog for setting the Project Path (see Figure 5). Using this dialog, simple browse to the location you want to set as your Project Path. Note that this path can be any acceptable mapped drive or UNC path. I have set mine to "C:\LP360 Data\Keeneland" as previously discussed. Note that this path is saved in the ArcGIS "MXD" file so it need only be set once (in Standalone, we save this path in the Project Settings XML file should you choose to create one).
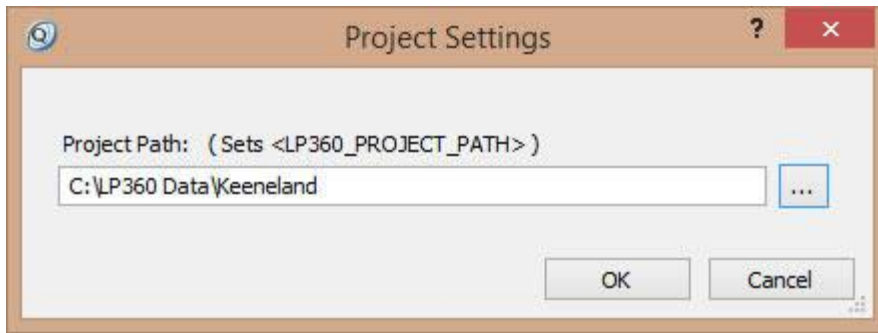
Figure 5: Setting the Project Path

OK, now with all of this preamble out of the way, let's see how this is used in the Input/Output Manager (IOM). You simply bring up the IOM (by clicking the tool to the right of Input and/or Output areas in PCT dialogs) and follow the steps outlined in Figure 6.
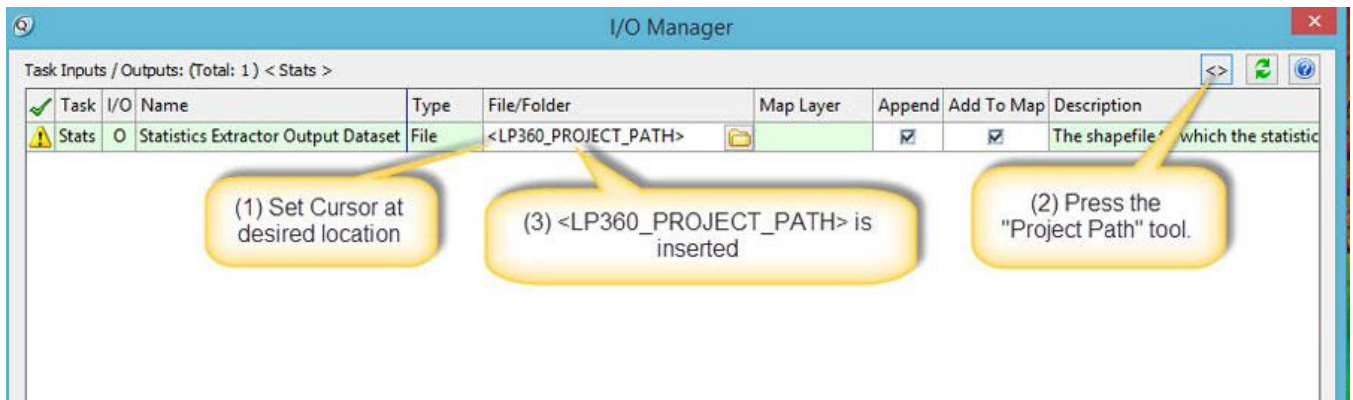

Figure 6: Inserting "LP360_PROJECT_PATH"

The inserted variable (called an Environment Variable) is substituted at the time the task is actually executed. This means that if you change the definition of this path using the LP360 Project Settings dialog, this variable will correspondingly change in IOM.

This allows you to construct Point Cloud Task definitions a single time and then use them for all projects. For example, notice in Figure 7 that I have appended "Vector" and the file name to the "<LP360_PROJECT_PATH>".
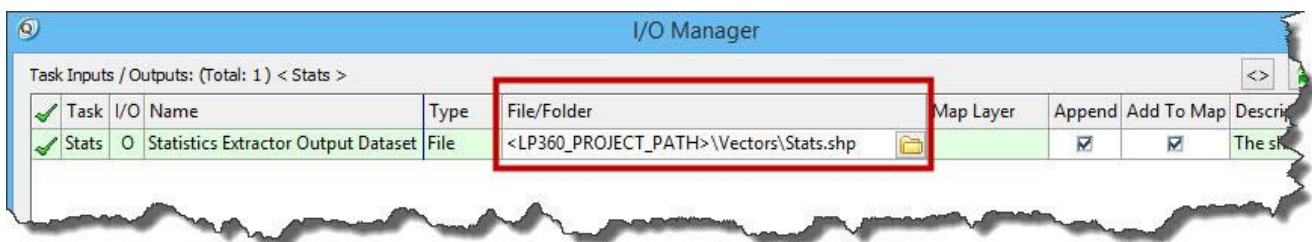

Figure 7: A generalized Path set in IOM

Now each time I run this point cloud task, a full path will be constructed from the value of LP360_PROJECT_PATH set in the Project Settings dialog with the rest of the specification, "\Vectors\Stats.shp" appended. For my current example, the full path becomes "C:\LP360 Data\Keeneland\Vectors\Stats.shp". Thus you can see that I can use this for any project by simply changing the specification for LP360_PROJECT_PATH. For the programmers among you, we are actually simply creating and using a local Windows environment variable. In fact, you can use any defined system environment variable (enclosed within angle, <>, brackets) in the IOM.

I would really appreciate getting feedback from you on this new capability within LP360. I am sure we have made some awkward decisions within the new Input/Output Manager (IOM) and we are committed to smoothing this out over time. One that I am glaringly aware of is that you can only edit the path of the currently selected item in the Point Cloud Task manager! This becomes pretty frustrating when you want to quickly modify a complex, chained set of tasks (a Macro). We will clean this up in a future experimental release.

In the next issue of GeoCue News, we will present the new implementation of Conflate Z as a point cloud task. This is a very cool new features that you will find incredibly useful.