

# 21st Annual GIS/CAMA Technologies Conference Chattanooga Convention Center

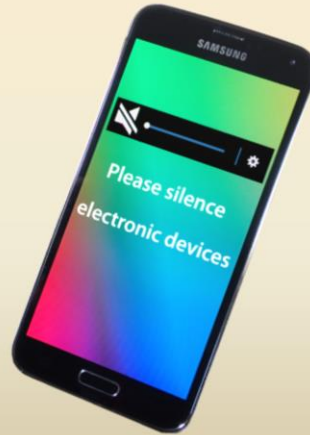


## Continuing Education (CE) Credit

Recertification Credit forms for CE credit can be collected from the Registration Desk on Thursday.

### Housekeeping

The conference proceedings will be available approximately 8 weeks after the conference.



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# Extracting and Preparing GIS Data for Disconnected Applications

Tennessee Comptroller of the Treasury



Ken Morrell  
Assessment Systems Manager  
Division of Property Assessments



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## Tennessee Comptroller of the Treasury

- Constitutional officer elected by a joint vote of both Houses of the General Assembly for a two-year term
- Duties include the audit of state and local governmental entities and participation in the general financial and administrative management and oversight of state government



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## Tennessee Comptroller of the Treasury

- Responsibilities also include property tax administration, oversight and assistance at the state level through...
  - Division of Property Assessments (Appraisal, Assessment, CAMA)
  - Office of Local Government (GIS, Mapping, Redistricting)
  - Office of State Assessed Properties (Public Utilities)
  - State Board of Equalization (Policy, Exemptions, Appeals)
- Property tax in Tennessee is a local tax. The state receives no revenue from the property tax.



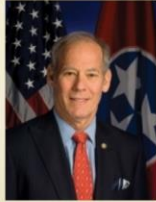
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## Tennessee Comptroller of the Treasury

### Mission

To make government work better.



Justin P. Wilson  
Comptroller of the Treasury

<http://www.comptroller.tn.gov/>



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## The Goal

- To extract GIS/CAMA data sets for use in a disconnected application
  - Extract feature classes from enterprise geodatabase
  - Project to a different coordinate system
  - Merge certain feature classes
  - Join with CAMA data extract to provide attributes
  - Output data to a runtime geodatabase
  - Script the process so it can be
    - Run as a scheduled task
    - Set up to run for multiple counties



## Python Script GetGISCAMARuntimeData.py

- Import modules

```
# Import modules
import datetime
prgstart = datetime.datetime.now()
import arcpy, sys, os, glob
from arcpy import env
```

- arcpy – Python interface to ArcGIS tools



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Python is an open-source programming language that has been embraced by ESRI for scripting GIS functions. The script we will be examining calls several different geoprocessing tools. The concepts in the script can be adapted based on the specific data requirements for a particular application.

Python code can be generated from Model Builder, and the results from running a geoprocessing tool displays the command line syntax that can be copied into and adapted to a Python script.





## Python Script GetGISCAMARuntimeData.py

- Get local variables from command line arguments

```
GetGISCAMARuntimeData.py 59 Marshall "Database Connections\DConn - GIS @  
Default @ EnterpriseGDB.sde" "C:\GISData\Marshall" N  
"C:\GISData\Marshall\MXD\ParcelLayers_Marshall.mxd" "C:\GISData\Marshall\Parcels"
```

```
# Get local variables from arguments:
```

```
conum = sys.argv[1] # 2-digit county number  
countyname = sys.argv[2] # county name  
GDB = sys.argv[3] # source geodatabase  
outpath = sys.argv[4] # output path  
reappr = sys.argv[5].upper() # include reappraisal CAMA data  
in_map = sys.argv[6] # MXD path and name for runtime content  
runtime_GDB = sys.argv[7] # Runtime geodatabase output path
```



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## Python Script Batch Program to Execute Script

- Batch program `GetGISCAMARuntimeData.bat`
  - Calls the Python script to run for one or multiple counties

*Command line sample for one county:*

```
GetGISCAMARuntimeData.py 59 Marshall "Database Connections\DConn  
- GIS @ Default @ EnterpriseGDB.sde" "C:\GISData\Marshall" N  
"C:\GISData\Marshall\MXD\ParcelLayers_Marshall.mxd"  
"C:\GISData\Marshall\Parcels"
```



## Python Script GetGISCAMARuntimeData.py

- Initialize other variables

```
# Initialize other variables  
tempGDB = outpath+"\\ "+countyname+"_CAMA.gdb"  
prgpath = os.getcwd()  
steptime = prgstart  
steptime2 = prgstart  
eltime = prgstart
```



## Python Script GetGISCAMARuntimeData.py

- Set variables for coordinate systems

```
## Set coordinate systems variables  
inputCS = arcpy.SpatialReference(prgpath+'\NAD 1983 StatePlane  
Tennessee FIPS 4100 (US Feet).prj')  
  
outputCS = arcpy.SpatialReference(prgpath+'\WGS 1984 Web  
Mercator (auxiliary sphere).prj')  
  
arcpy.env.outputCoordinateSystem =  
arcpy.SpatialReference(prgpath+'\WGS 1984 Web Mercator  
(auxiliary sphere).prj')
```



## Python Script GetGISCAMARuntimeData.py

- Set environment workspace to source geodatabase

```
##env.workspace =  
env.workspace = GDB
```



## Python Script GetGISCAMARuntimeData.py

- Create output folder if it does not exist

```
#Create output folder if it does not exist  
if not os.path.exists(outpath):  
    os.mkdir(outpath)
```

- Direct output to logfile and screen

```
#Direct output to logfile and screen  
f_outpath=str.replace(outpath,"\\","/")  
f_outfile=str.replace(outfile,"\\","/")
```



## Python Script GetGISCAMARuntimeData.py

- Define function for elapsed time for each step

```
#Define function for elapsed time of each step
def ElapsedTime():
    global steptime, steptime2, eltime
    steptime2 = datetime.datetime.now()
    eltime = steptime2-steptime
    print '    Completed (Elapsed time:
'+str(eltime.seconds//3600).zfill(2)+' ':'+str(eltime.seconds//60).zfill(2)+' ':'+str(
eltime.seconds%60).zfill(2)+'')
    steptime = steptime2
```



## Python Script GetGISCAMARuntimeData.py

- Define function for exception processing

```
#Define function for exception processing
def TryException(msg):
    import traceback
    print ' **' + msg
    ##print(e.message)
```





## Python Script GetGISCAMARuntimeData.py

- Create a class to handle program message output

```
class MyWriter:

    def __init__(self, stdout, filename):
        self.stdout = stdout
        self.logfile = file(filename, "w")

    def write(self, text):
        self.stdout.write(text)
        self.logfile.write(text)

    def close(self):
        self.stdout.close()
        self.logfile.close()

writer = MyWriter(sys.stdout, f_outpath+'/Logfile_'+countyname+'.txt')
sys.stdout = writer
```



This class sets up output to be directed to both the screen and a log file. This is an example of a function found through online research and inserted into the script.

## Python Script GetGISCAMARuntimeData.py

- List parameters to screen and logfile

```
##List parameters
print ''
print '*** Make GIS CAMA Data from SDE Geodatabase ***'
print ''
print 'Program Name: ' + sys.argv[0]
print 'Program Folder: ' + os.getcwd()
print 'County Number: ' + conum
print 'County Name: ' + countyname
print 'Input GDB: ' + env.workspace
print 'Output Path: ' + outpath
print 'Temporary GDB: ' + tempGDB
print 'Include Reappr: ' + reappr
print 'Map document ' + in_map
print 'Runtime GDB: ' + runtime_GDB
print ''
print 'Program Started: ' + prgstart.strftime("%m/%d/%Y
%H:%M:%S %p")
print ''
```



## Python Script GetGISCAMARuntimeData.py

- Update elapsed time

```
ElapsedTime()
```

- Report elapsed time for initializing the program

```
print 'Initiating program - Completed (Elapsed time:  
'+str(etime.seconds//3600).zfill(2)+'!'+str(etime.seconds//60).zfill(2)  
'+!'+str(etime.seconds%60).zfill(2)+''
```



## Python Script GetGISCAMARuntimeData.py

- Delete previous temporary file GDB

```
##Delete previous temporary file geodatabase  
print('Deleting previous temporary file geodatabase'),  
try:  
    arcpy.Delete_management(tempGDB)
```

```
    ElapsedTime()  
except Exception:  
    TryException('NOT SUCCESSFUL')
```

- **Try** and **except** clauses for each step for error handling
- **ElapsedTime()** and **TryException** functions after each step



## Python Script GetGISCAMARuntimeData.py

- Create temporary file GDB for processing

```
##Create file geodatabase  
print('Creating new temporary file geodatabase'),  
try:  
    arcpy.CreateFileGDB_management(outpath, countyname+"_CAMA")
```



## Python Script GetGISCAMARuntimeData.py

- Create feature classes in temporary file GDB

```
##Add source feature classes to file geodatabase
```

```
print ''
```

```
print'Adding feature classes...'
```

```
arcpy.env.workspace = GDB
```

```
list = ['Index400','Index100','Index50','Parcels','Acreage_Anno','Block_Num_Anno',  
'Control_Num_Anno','Easement_Anno','Exempt_Anno','Gas_Pipe_Anno',  
'Group_Corner_Anno','Lot_Num_Anno','Lot_Tract_Acreage_Anno','Misc_Anno',  
'Misc_Lines','Parcel_Anno','Parcel_Conflict_Anno','Parcel_Dim_Anno'...]
```





## Python Script GetGISCAMARuntimeData.py

- Determine feature data set for current item

for item in list:

```
if item in ('Index400','Index100','Index50'):
    fDataSet = '_MapIndex'
elif item in ('Parcels','Acreage_Anno','Block_Num_Anno','Control_Num_Anno','Easement_Anno','Exempt_Anno',
             'Gas_Pipe_Anno','Group_Corner_Anno','Lot_Num_Anno','Lot_Tract_Acreage_Anno','Misc_Anno','Misc_Lines',
             'Parcel_Anno','Parcel_Conflict_Anno','Parcel_Dim_Anno','Point_Symbols','ProposedROW_Anno',
             'RailRoadROW_Anno','Special_Int_Anno','StreetROW_Anno','Subdivision_Anno'):
    fDataSet = '_Cadastral'
elif item in ('Creek_Anno','EOP_Lines','Hydro_Lines','Hydro_Poly','Lake_Pond_Anno','River_Anno','Streets','Trees'):
    fDataSet = '_Planimetric'
elif item in ('City','City_Anno','Civil_Anno','Civil_Districts','County','County_Anno','Special_Districts'):
    fDataSet = '_Admin'
```



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## Python Script GetGISCAMARuntimeData.py

- Copy the source feature class to the file GDB

```
print(" "+item),
try: ## feature classes having selection criteria
    if item in ('Parcels'):
        arcpy.FeatureClassToFeatureClass_conversion(GDB+"\GIS."+
        countyname+fDataSet+"\GIS."+item+" "+conum,f_tempGDB,
        item+'_CAMA_A',"GISLINK > ' '),
    elif item in ('Index100'):
        arcpy.FeatureClassToFeatureClass_conversion(GDB+"\GIS."+
        countyname+fDataSet+"\GIS."+item+" "+conum,f_tempGDB,
        item,"TILE_TYPE <= 2"),
    else: ## feature classes not having selection criteria
        arcpy.FeatureClassToFeatureClass_conversion(GDB+"\GIS."+
        countyname+fDataSet+"\GIS."+item+" "+conum,f_tempGDB,item)
```





## If instead...

- If instead you were creating shapefiles, no temporary file geodatabase would be needed...
    - `arcpy.FeatureClassToShapefile_conversion`  
(source\_fc, outpath)
      - Names the shapefile the same as the source feature class
- OR
- `arcpy.FeatureClassToFeatureClass_conversion`  
(“Parcels\_59”,outpath,“Parcels.shp”,“PARCELID > ' '")
    - If you need to specify a different name or a selection criterion for the shapefile





## Python Script GetGISCAMARuntimeData.py

- Merge selected layers

```
## Merge selected layers
env.workspace = tempGDB ##Change workspace to working file geodatabase
print ' Merging Admin layers',
try:
    arcpy.Merge_management(["County","City"],tempGDB+"/Admin")
```



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## Python Script GetGISCAMARuntimeData.py

- Join Parcels feature class with CAMA extract (DBF)

```
## Join with CAMA data
env.workspace = tempGDB ##Change workspace to working file GDB
inputtable = 'Parcels_CAMA_A'
jointable = outpath+"\\camagisdata.dbf" ## Non-reappraisal CAMA data
joinfield = 'GISLINK'
print "
print("Joining IMPACT attribute data...")
try:
    arcpy.JoinField_management(inputtable,joinfield,jointable,joinfield)
```



## Python Script GetGISCAMARuntimeData.py

- Delete existing runtime geodatabase

```
## Create runtime geodatabase (runtime content)  
if in_map is not None and runtime_GDB is not None:
```

```
    # Delete runtime GDB output folder  
    if arcpy.Exists(runtime_GDB):  
        arcpy.management.Delete(runtime_GDB)
```



## Python Script GetGISCAMARuntimeData.py

- Create new runtime geodatabase
  - Temporary file geodatabase
  - Associated map document (MXD) defining layers, symbology, etc.

```
## Create runtime content
print "
print'Creating runtime geodatabase...!'
try:
    arcpy.CreateRuntimeContent_management(in_map, runtime_GDB, "#", "#",
    "DISPLAY", "NETWORK_DATA; FEATURE_AND_TABULAR_DATA",
    "NON_OPTIMIZE_SIZE", "ONLINE", "PNG", "1", "#")
```



## Python Script GetGISCAMARuntimeData.py

- Report total program time

```
# Report total program time
print "
prgend = datetime.datetime.now()
eltime = prgend-prgstart
print 'Program completed: ' + prgend.strftime("%m/%d/%Y %H:%M:%S
%p")+ " (Total elapsed time:
"+str(eltime.seconds//3600).zfill(2)+"'+str(eltime.seconds//60).zfill(2)+
'+str(eltime.seconds%60).zfill(2)'+
sys.stdout=sys.__stdout__
```





# Python Script GetGISCAMARuntimeData.py

Screen Output  
while the script is running...



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```
C:\Windows\system32\cmd.exe
C:\Documents\GIS\Apps\GetGISCAMData>echo off
C:\Documents\GIS\Apps\GetGISCAMData>GetGISCAMRuntimeData.py 59 Marshall "Database Connections\DConn - GIS @ Default @ TNBMP2NEW.sde" "C:\GISData\Marshall" "N "C:\GISData\Marshall\MXD\ParcelLayers_Marshall.mxd" "C:\GISData\Marshall\Parcels"

*** Make GIS CAMA Data from SDE Geodatabase ***
Program Name: C:\Documents\GIS\Apps\GetGISCAMData\GetGISCAMRuntimeData.py
Program Folder: C:\Documents\GIS\Apps\GetGISCAMData
County Number: 59
County Name: Marshall
Input GDB: Database Connections\DConn - GIS @ Default @ TNBMP2NEW.sde
Output Path: C:\GISData\Marshall
Temporary GDB: C:\GISData\Marshall\Marshall_CAMA.gdb
Include Reappr: No
Map document: C:\GISData\Marshall\MXD\ParcelLayers_Marshall.mxd
Runtime GDB: C:\GISData\Marshall\Parcels

Program Started: 02/16/2017 15:56:35 PM

Completed (Elapsed time: 00:00:19)
Initiating program - Completed (Elapsed time: 00:00:19)
Deleting previous temporary file geodatabase Completed (Elapsed time: 00:00:00)
Creating new temporary file geodatabase Completed (Elapsed time: 00:00:02)

Adding feature classes...
Index400 Completed (Elapsed time: 00:00:02)
Index100 Completed (Elapsed time: 00:00:02)
Index30 **NOT COMPLETED
Parcels Completed (Elapsed time: 00:00:24)
Acreage_Anno Completed (Elapsed time: 00:00:43)
Block_Num_Anno Completed (Elapsed time: 00:00:04)
Control_Num_Anno Completed (Elapsed time: 00:02:16)
Easement_Anno Completed (Elapsed time: 00:00:05)
Exempt_Anno Completed (Elapsed time: 00:00:16)
Gas_Pipe_Anno Completed (Elapsed time: 00:00:04)
Group_Corner_Anno Completed (Elapsed time: 00:00:16)
Lot_Num_Anno_ Completed (Elapsed time: 00:00:16)
```





# Python Script GetGISCAMARuntimeData.py

## Log File after the script is complete...



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```
Logfile_Marshall.txt - Notepad
File Edit Format View Help

*** Make GIS CAMA Data from SDE Geodatabase ***
Program Name: C:\Documents\GIS\Apps\GetGISCAMData\GetGISCAMARuntimeData.py
Program Folder: C:\Documents\GIS\Apps\GetGISCAMData
County Number: 59
County Name: Marshall
Input GDB: Database Connections\DConn - GIS @ Default @ TNBP2NEW.sde
Output Path: C:\GISData\Marshall
Temporary GDB: C:\GISData\Marshall\Marshall_CAMA.gdb
Include Reappr: No
Map document: C:\GISData\Marshall\WKD\ParcelLayers_Marshall.mxd
Runtime GDB: C:\GISData\Marshall\Parcel

Program Started: 02/16/2017 15:56:35 PM

Completed (Elapsed time: 00:00:19)
Initiating program - Completed (Elapsed time: 00:00:19)
Deleting previous temporary file geodatabase Completed (Elapsed time: 00:00:00)
Creating new temporary file geodatabase Completed (Elapsed time: 00:00:02)

Adding feature classes...
Index400 Completed (Elapsed time: 00:00:02)
Index100 Completed (Elapsed time: 00:00:02)
Index50 **NOT COMPLETED
Parcels Completed (Elapsed time: 00:00:24)
Acreage_Anno Completed (Elapsed time: 00:00:43)
Block_Num_Anno Completed (Elapsed time: 00:00:04)
Control_Num_Anno Completed (Elapsed time: 00:02:14)
Easement_Anno Completed (Elapsed time: 00:00:05)
Exempt_Anno Completed (Elapsed time: 00:00:16)
Gas_Pipe_Anno Completed (Elapsed time: 00:00:04)
Group_Corner_Anno Completed (Elapsed time: 00:00:16)
Lot_Num_Anno Completed (Elapsed time: 00:00:57)
Lot_Tract_Acreage_Anno Completed (Elapsed time: 00:00:05)
Misc_Anno Completed (Elapsed time: 00:00:12)
Misc_Lines Completed (Elapsed time: 00:00:11)
Parcel_Anno Completed (Elapsed time: 00:01:33)
Parcel_Conflict_Anno Completed (Elapsed time: 00:00:05)
Parcel_Div_Anno Completed (Elapsed time: 00:02:09)
Point_Symbols Completed (Elapsed time: 00:00:04)
ProposedRdW_Anno Completed (Elapsed time: 00:00:04)
RailroadRdW_Anno Completed (Elapsed time: 00:00:05)
Special_Inv_Anno Completed (Elapsed time: 00:00:04)
StreetRdW_Anno Completed (Elapsed time: 00:00:21)
Subdivision_Anno Completed (Elapsed time: 00:00:36)
Creek_Anno Completed (Elapsed time: 00:00:04)
EOP_Lines Completed (Elapsed time: 00:00:03)
Hydro_Lines Completed (Elapsed time: 00:00:07)
Hydro_Poly Completed (Elapsed time: 00:00:04)
Lake_Pond_Anno Completed (Elapsed time: 00:00:03)
River_Anno Completed (Elapsed time: 00:00:03)
Streets Completed (Elapsed time: 00:00:07)
Trees Completed (Elapsed time: 00:00:11)
City Completed (Elapsed time: 00:00:03)
City_Anno Completed (Elapsed time: 00:00:05)
Civil_Anno Completed (Elapsed time: 00:00:05)
Civil_Districts Completed (Elapsed time: 00:00:03)
County Completed (Elapsed time: 00:00:03)
County_Anno Completed (Elapsed time: 00:00:07)
Special_Districts Completed (Elapsed time: 00:00:02)
Merging Admin Layers Completed (Elapsed time: 00:00:02)
Geodatabase extraction: 02/16/2017 16:11:03 PM (GDB elapsed time: 00:14:28)

Joining IMPACT attribute data...
Completed (Elapsed time: 00:14:53)

Creating runtime geodatabase...
Completed (Elapsed time: 00:01:03)

Program completed: 02/16/2017 16:27:00 PM (Total elapsed time: 00:30:25)
```

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## Python Script GetGISCAMARuntimeData.py

- Log file

\*\*\* Make GIS CAMA Data from SDE Geodatabase \*\*\*

Program Name: C:\Documents\GIS\Apps\GetGISCAMADData\GetGISCAMARuntimeData.py  
Program Folder: C:\Documents\GIS\Apps\GetGISCAMADData  
County Number: 59  
County Name: Marshall  
Input GDB: Database Connections\DConn - GIS @ Default @ EnterpriseGDB.sde  
Output Path: C:\GISData\Marshall  
Temporary GDB: C:\GISData\Marshall\Marshall\_CAMA.gdb  
Include Reappr: No  
Map document: C:\GISData\Marshall\MXD\ParcelLayers\_Marshall.mxd  
Runtime GDB: C:\GISData\Marshall\Parcels

Program Started: 02/16/2017 15:56:35 PM

Completed (Elapsed time: 00:00:19)  
Initiating program - Completed (Elapsed time: 00:00:19)  
Deleting previous temporary file geodatabase Completed (Elapsed time:  
00:00:00)  
Creating new temporary file geodatabase Completed (Elapsed time: 00:00:02)



## Python Script GetGISCAMARuntimeData.py

- Log file (cont'd.)

```
Adding feature classes...
Index400    Completed (Elapsed time: 00:00:02)
Index100    Completed (Elapsed time: 00:00:02)
Index50     **NOT COMPLETED
Parcels     Completed (Elapsed time: 00:00:24)
Acreage_Anno Completed (Elapsed time: 00:00:43)
Block_Num_Anno Completed (Elapsed time: 00:00:04)
Control_Num_Anno Completed (Elapsed time: 00:02:16)
...
Streets     Completed (Elapsed time: 00:00:07)
Trees       Completed (Elapsed time: 00:00:13)
City        Completed (Elapsed time: 00:00:03)
...
Merging Admin layers Completed (Elapsed time: 00:00:02)
Geodatabase extraction: 02/16/2017 16:11:03 PM (GDB elapsed time: 00:14:28)
```



## Python Script GetGISCAMARuntimeData.py

- Log file (cont'd.)

```
Joining IMPACT attribute data...  
Completed (Elapsed time: 00:14:53)
```

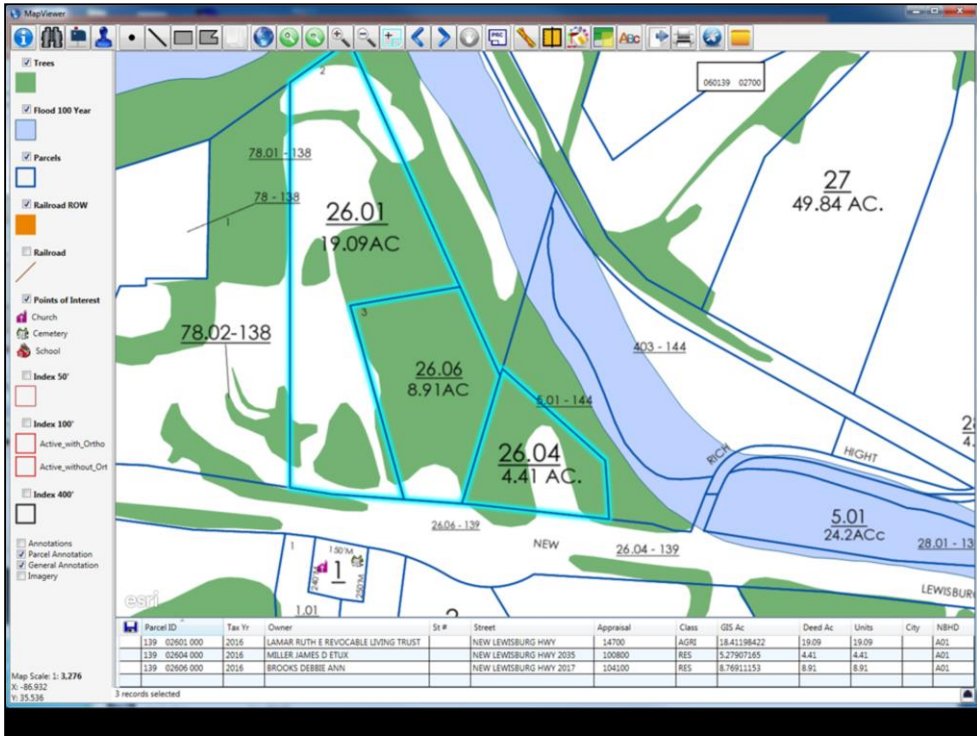
```
Creating runtime geodatabase...  
Completed (Elapsed time: 00:01:03)
```

```
Program completed: 02/16/2017 16:27:00 PM (Total elapsed time: 00:30:25)
```

## Additional Items Annotation and Orthos

- Multiple annotation feature classes are grouped into two feature classes
  - Parcel Annotation
  - General Annotation
  - Separate MXDs
  - Map packages (MPK) are generated
- Orthophotos are provided as tile packages (TPK)







# Questions



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