Fall Semester 2011

Geography 385
Introduction to ArcGIS Web Application Design

Instructor: Nathan Jennings

Final GIS Web Application Project

by

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I. Project Summary

The goal of this Web GIS project is to create a Web application that will allow a user to perform two geo-processing tasks. The first geo-processing task built into the Web application involves the interactive creation of buffers on existing data points. This process is accomplished by first virtually digitizing the points of interest on the Web application and then running a tool to create the desired buffers around the virtually digitized points. The second geo-processing task built into the Web application is a "Select by Location" tool that will select points on the Web application based on a specified location.

II. Project Description

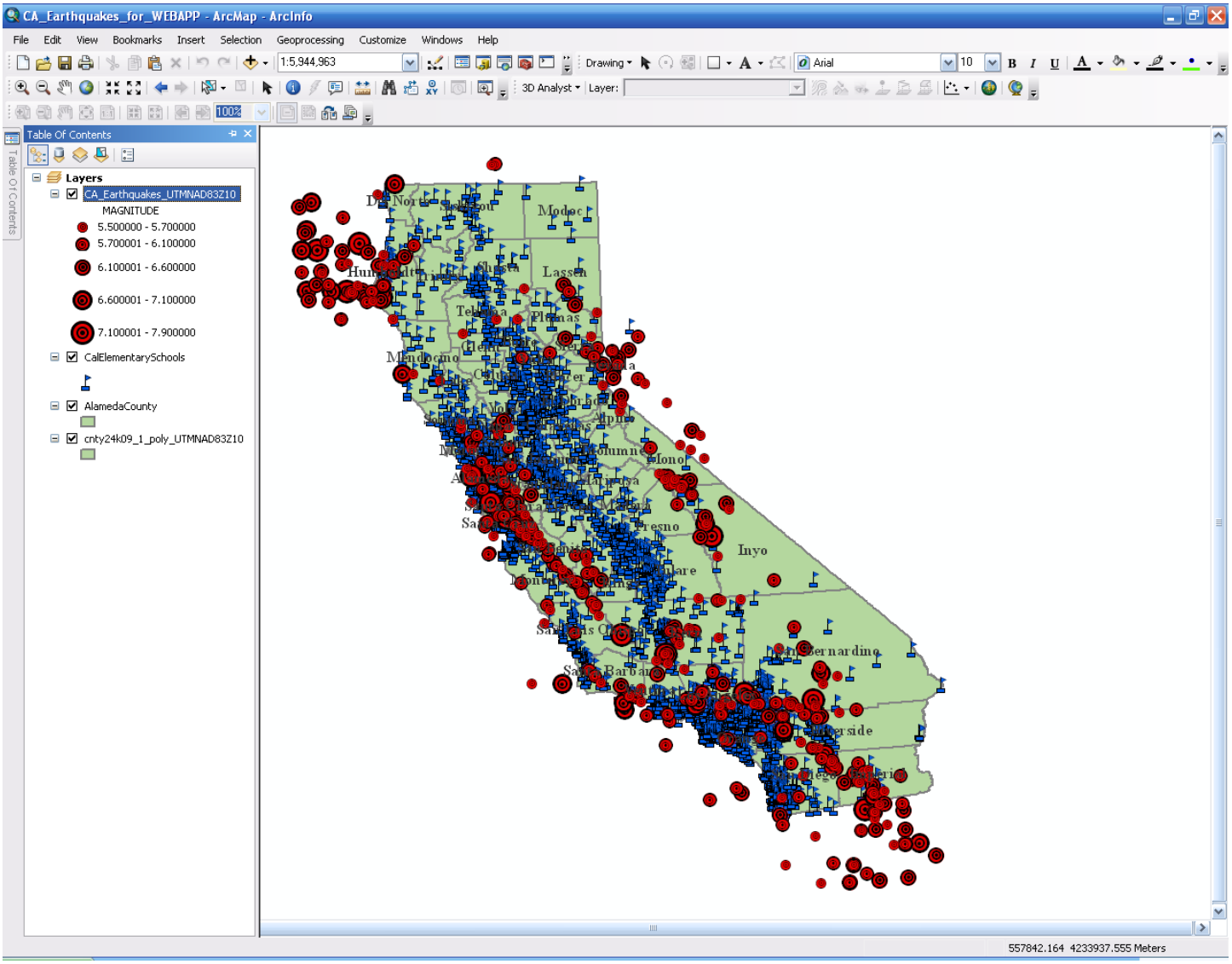
This project consists of a Web application that allows a user to create buffers and select features by location. To build a Web application with these capabilities requires the publishing of a map service and two geo-processing services. The map service serves as a base map to which the other two geo-processing services will be added as tasks when the Web application is created. The paragraphs that follow will provide a detailed description of the necessary steps taken to create the Web application.

Section A: Map Service

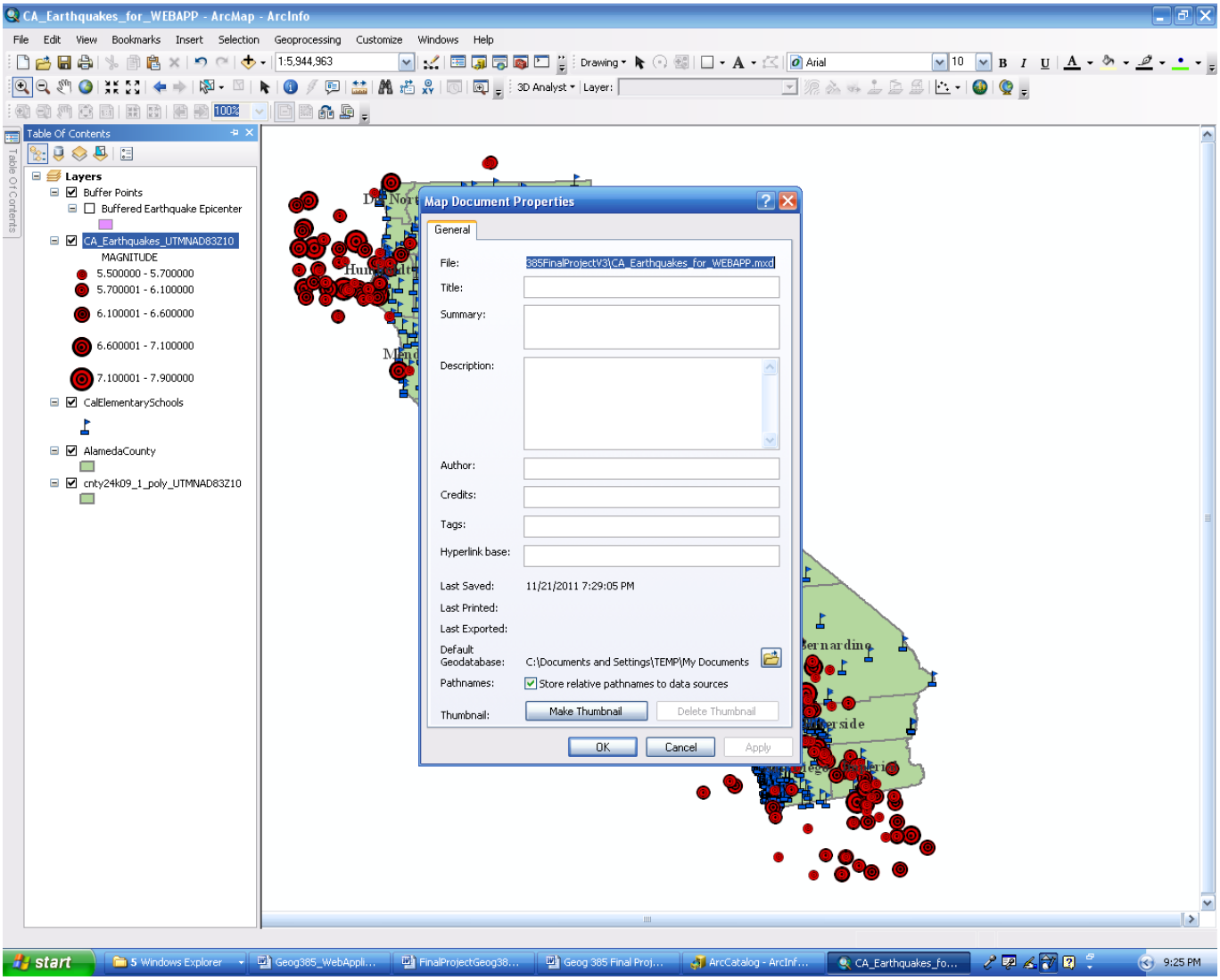
Part 1. Create a Map Document

The first step in this project was to open an ArcMap document and add the following layers to it: California counties, Alameda county, California elementary schools, and California earthquake epicenters. The source of the California counties dataset is the CAL-ATLAS website at (http://atlas.ca.gov/download.html#/casil/boundaries), the source of the elementary schools dataset is the CAL-ATLAS website at(http://atlas.ca.gov/download.html#/casil/location), and the source of the earthquake epicenter dataset is the California Geological Survey website at(http://www.conservation.ca.gov/cgs/rghm/quakes/Pages/MS49.aspx).

The map illustrates the locations of California earthquake epicenters with a magnitude greater than 5.5 that have occurred since 1800, the location of elementary schools, and the California counties boundary delineations.



After the symbology, layer visibility scale range, and the layer labeling scale range have been set, go to File in the Arcmap menu taskbar and click on Map Document Properties. On the Pathnames tab, check the Store Relative Pathnames to Data Sources option, and save the map as CA_Earthquakes_for_WEBAPP.



Part 2. Publish a Map Document as an MSD File

To publish the map document as a map service, add the Map Services Publisher Toolbar to the ArcMap document. Then, click the Publish Map Service Tool to publish the map document as an .msd file to the ArcGIS server.

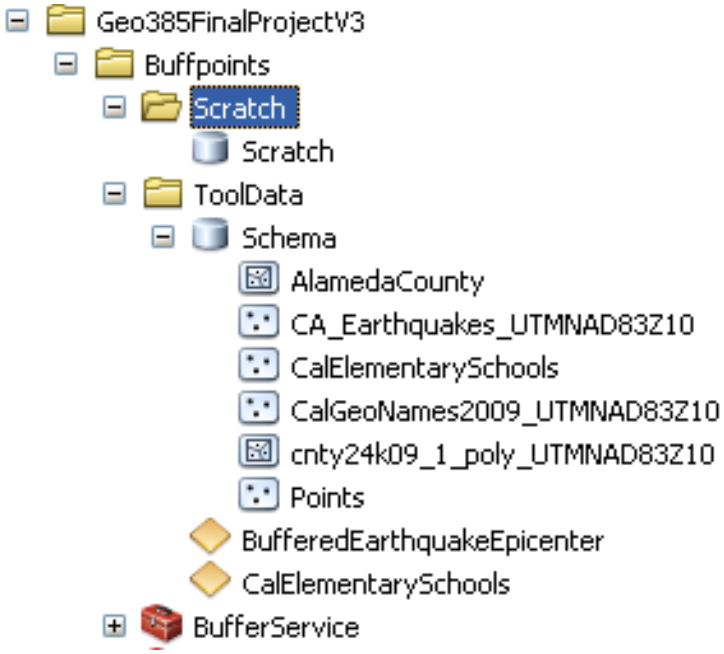
Section B: First Geo-Processing Service

The second step in this project is to build a model that will enable a user to buffer features during a Web application session. Before constructing the model it is necessary to create folders and geodatabases within those folders to organize the input and output dataset locations and make them accessible during the Web application session.

Part 1. Creation of Data Folders, Geodatabases, Files, and Toolbox

First a folder was created in ArcCatalog and it was named "BuffPoints", then another folder called "ToolData" was created within this folder. The next step was to create a geodatabase named "Schema" inside the "ToolData" folder. Within the "Schema" geodatabase a new point feature class named "Points" was created. The "Points" feature class was given the WGS 1984 World Geographic Coordinate System. This "Points" feature class will act as a container where the Web application virtually digitized points will be stored, it is our input dataset yet to be created interactively by the Web application user. Similar steps were then followed to create a folder named "Scratch" within the "BuffPoints" folder. In this "Scratch" folder, a geodatabase called "Scratch" was then created. The "Scratch" geodatabase acts as a container where the output buffered features will be stored when they are created.

After that, a toolbox labeled "BufferService" was created within the "BuffPoints" folder. This toolbox will hold the model that has all the required geo-processes, environment settings, input and output dataset properties, and parameters that will allow a user to buffer features during a Web application session. The data folder organization will look like the illustration below.



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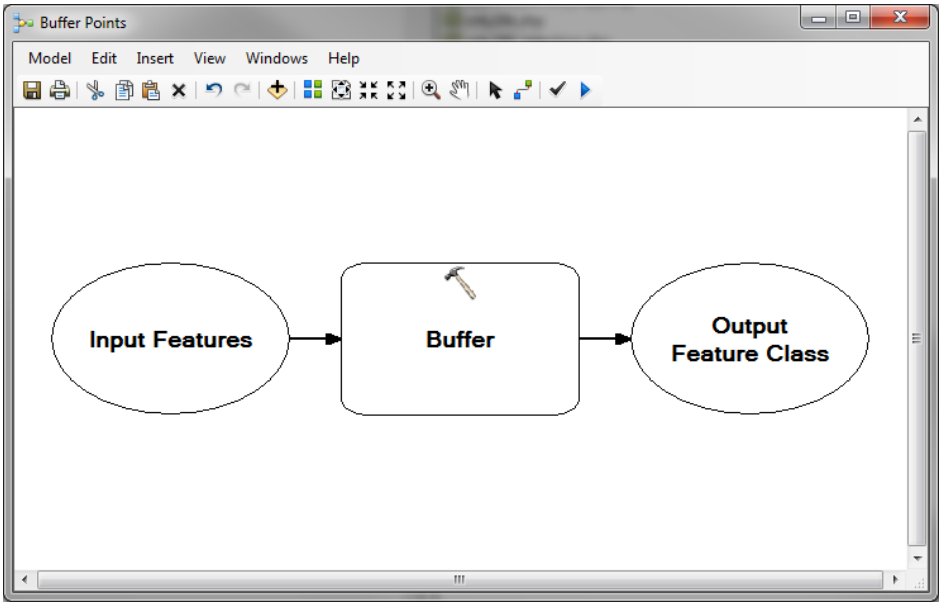
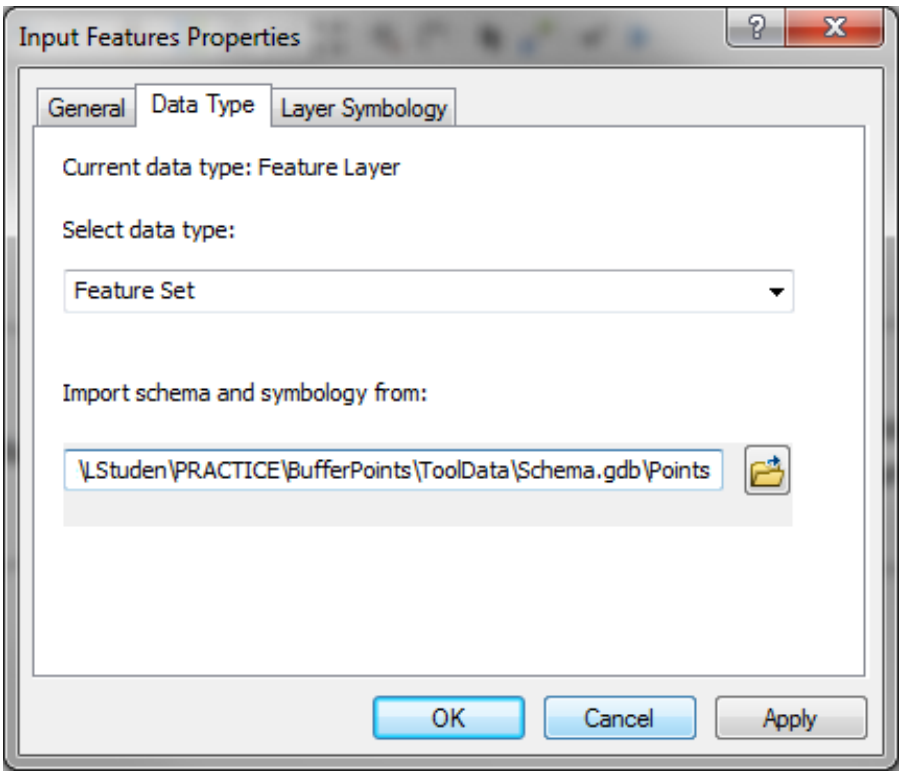
Part 2. Design of Geo-Processing Model (Buffer Point Features)

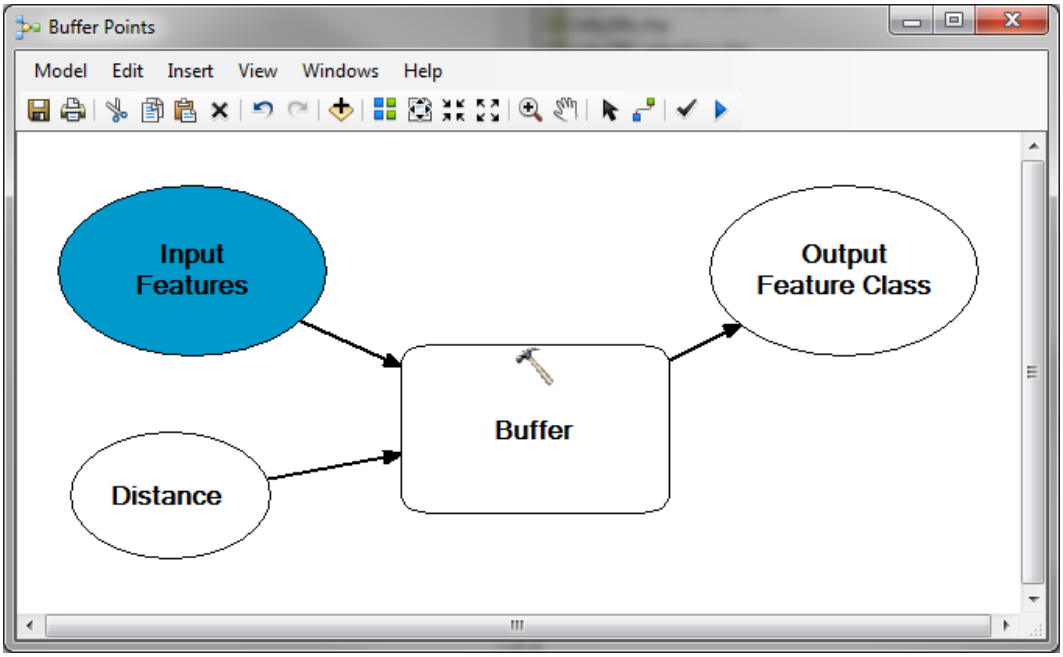
First create a new model within the "BufferService" toolbox, add the Buffer tool to the model, right-click the Buffer tool, go to the Make Variable From Parameter option and select Input Features.



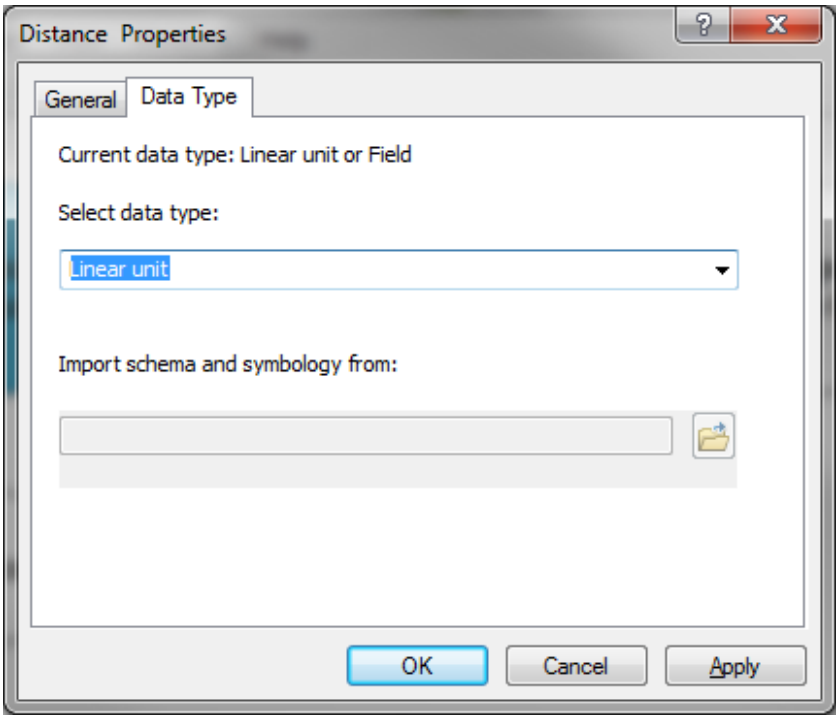
Right-click Input Features and select properties. Click the Data Type tab and choose Feature Set from the Select data type drop-down list. On the Import schema and symbology from box, browse to the "Points" feature class within the Schema geodatabase to find and set the data-path to the data for the Input Features variable.



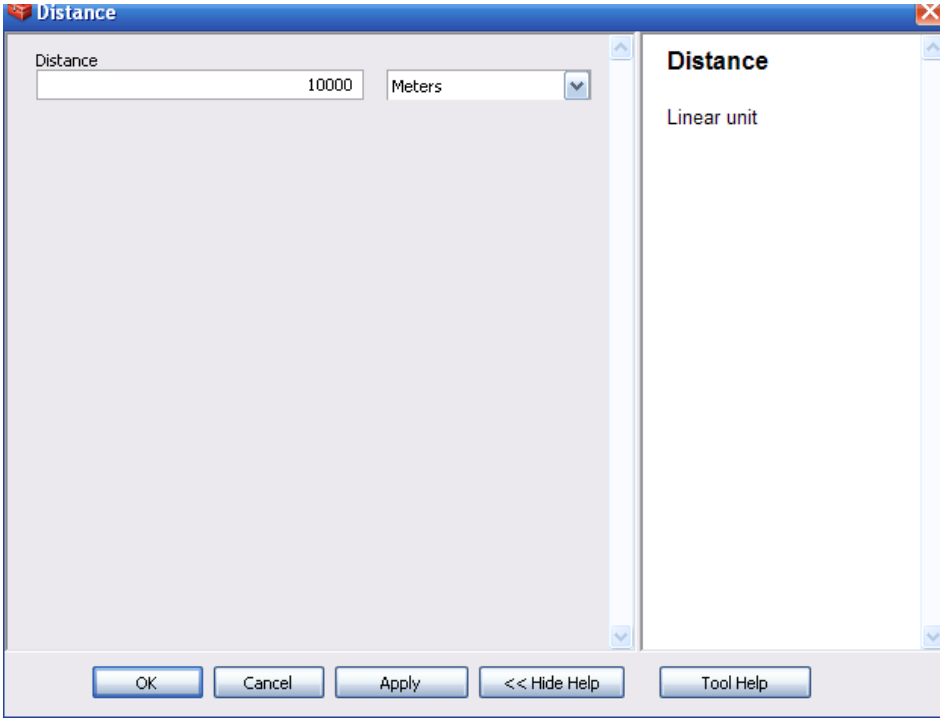
Click OK. Right-click the Buffer tool and point to Make Variable From Parameter to create a new model variable. Click the Distance [value or field] option from the Make Variable From Parameter menu, this creates a new variable named Distance [value or field]. Right-click the newly created variable and rename it "Distance".



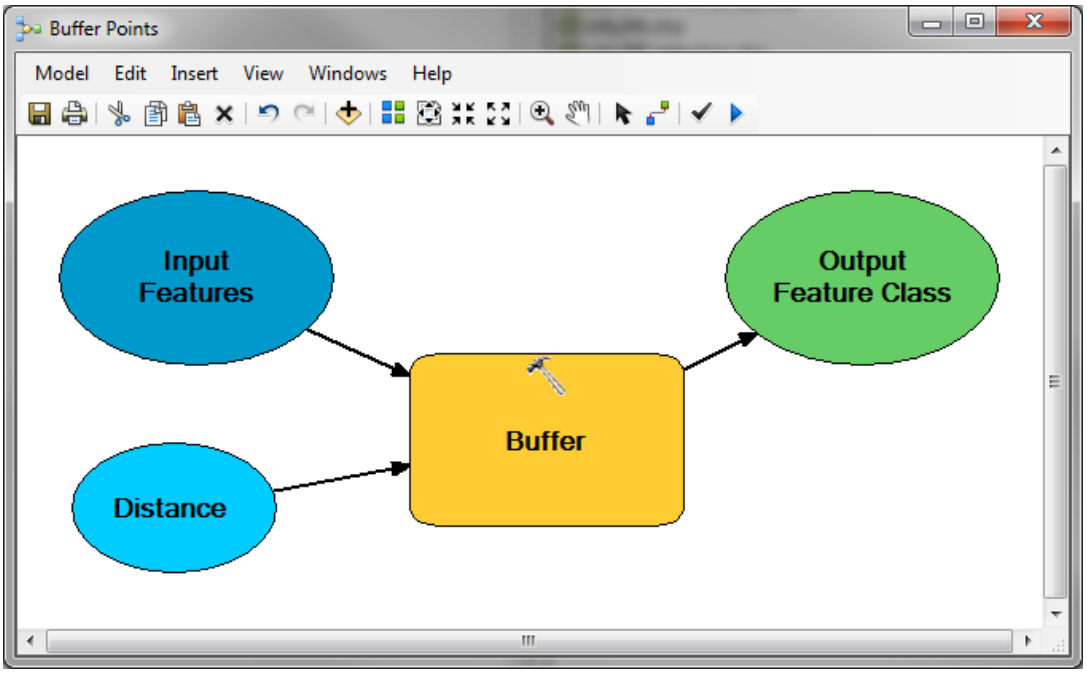
Right-click the newly created "Distance" variable and click Properties, click the data type and set the data type as linear.



Double-click the “Distance” variable and input the desired buffer distance, for this project the distance was set to10000 meters.



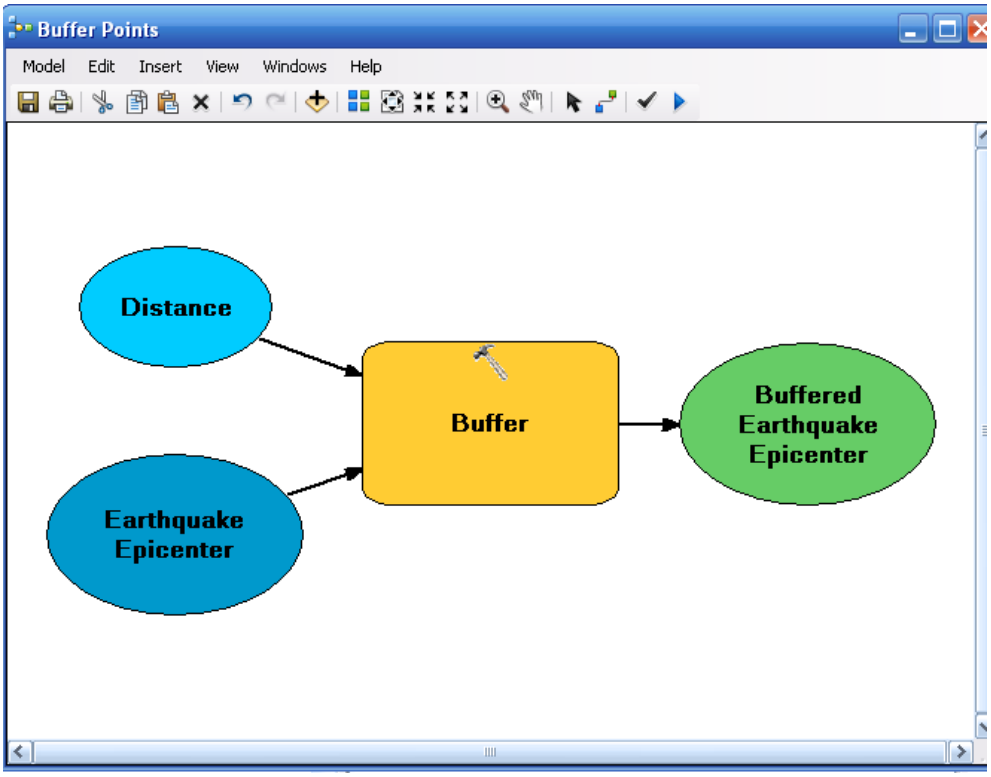
So far the Input Features variable, Distance variable, and Buffer tool parameters for the model have been set.



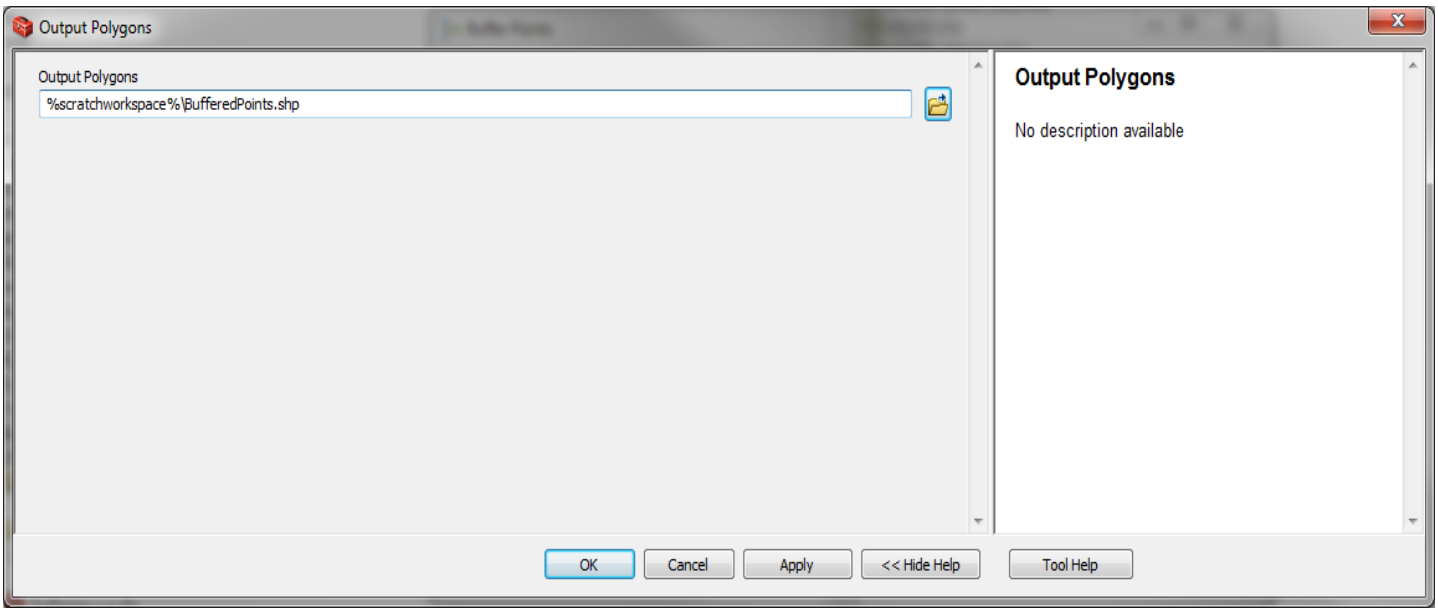
Right –click the Input Features variable again and rename it to Earthquake Epicenter.

The next step is to set the correct parameters for the Output Features variable.

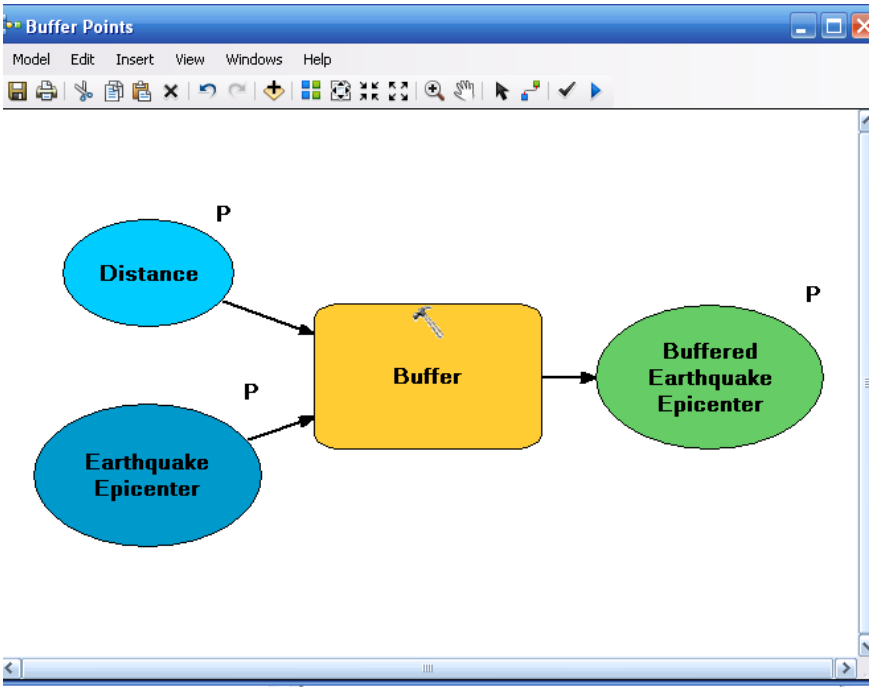
First, right-click the Output Features and rename it to Buffered Earthquake Epicenters.



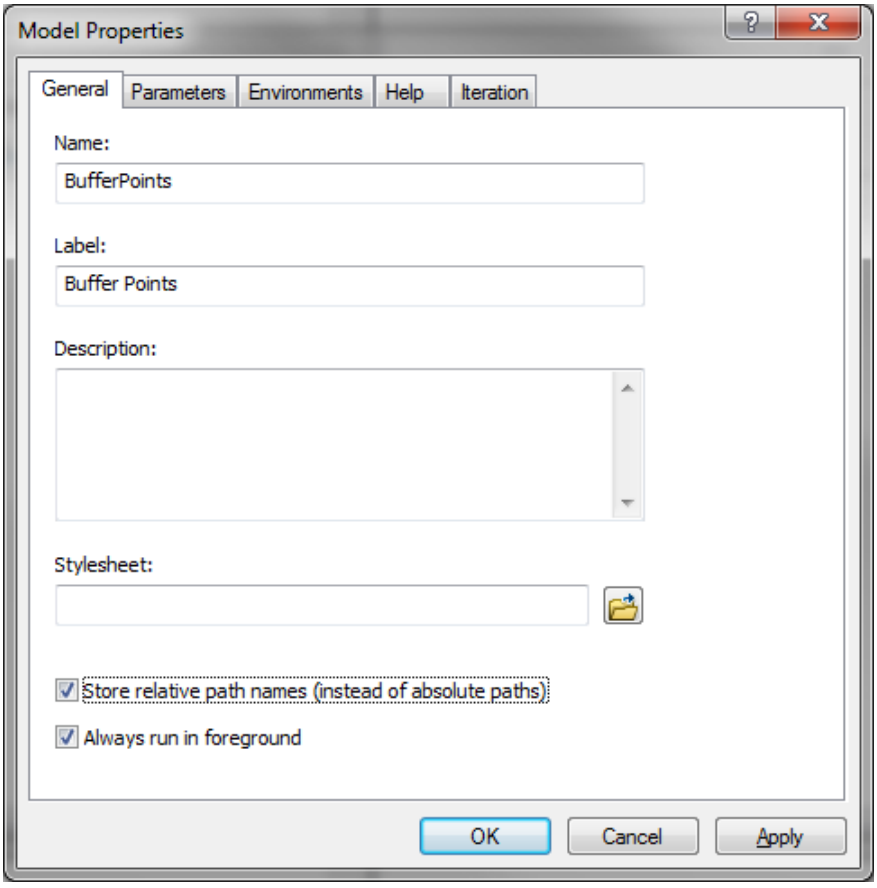
Next, double-click the Buffered Earthquake Epicenters variable and enter "%scratchworkspace%\BufferedPoints.shp". This string will name the Buffered Earthquake Epicenters model output , "BufferedPoints.shp" after the model is run, and place the output file inside the "Scratch" geodatabase within the "Scratch" folder in the "BuffPoints" folder.



Set the Earthquake Epicenter, Distance, and Buffered Earthquake Epicenter variables as Model Parameters by right-clicking on each of the features individually and selecting Model Parameter.



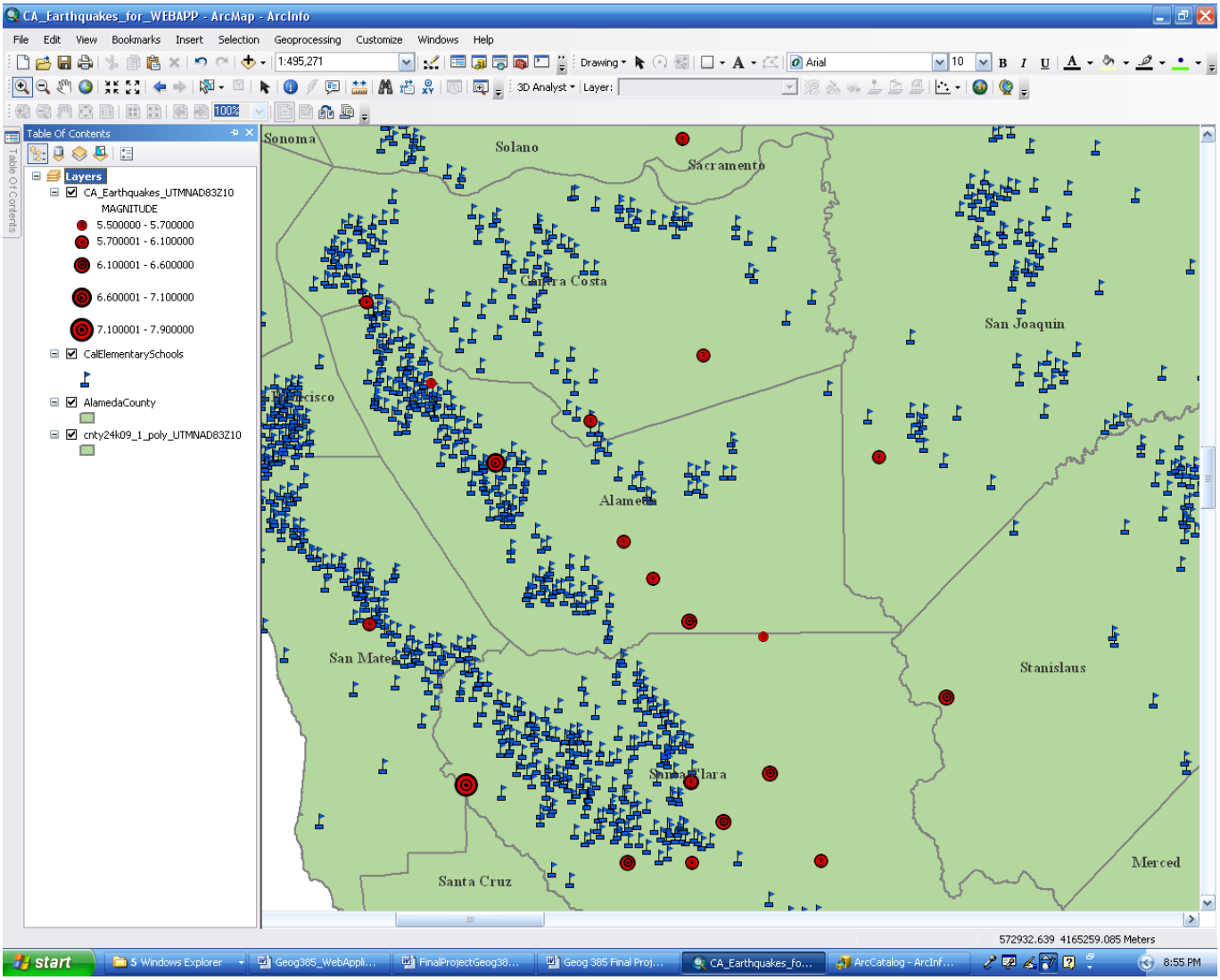
In the main ModelBuilder menu, click Model and click Model Properties. Set the name to BufferPoints, set the label to Buffer Points, and make sure that the Store relative path names option is checked. Click OK.



In the main ModelBuilder menu, click Model and click Save, then click Model again and click Close.

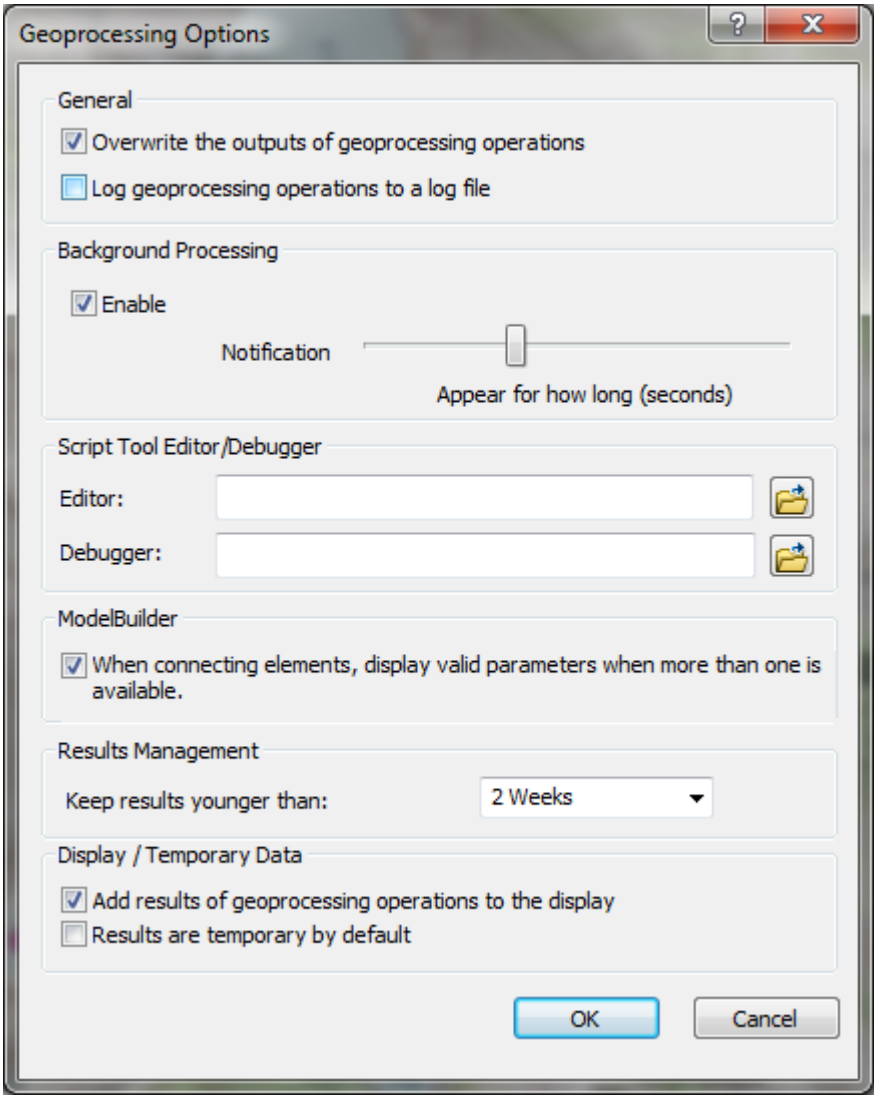
Part 3. Test Model in ArcMap

Open an existing map document.

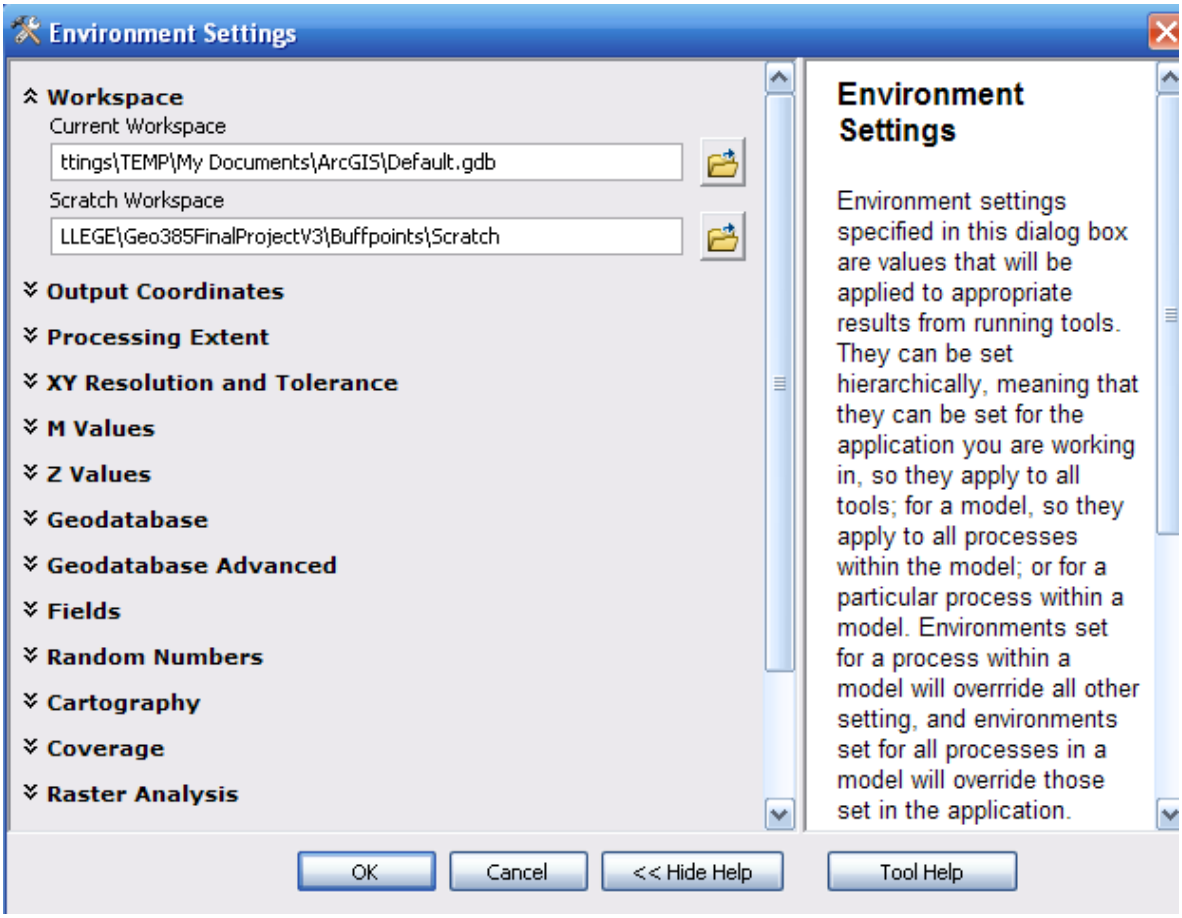


In ArcMap, use the Geoprocessing menu to open both the Geoprocessing Options and Environments Settings dialog boxes.

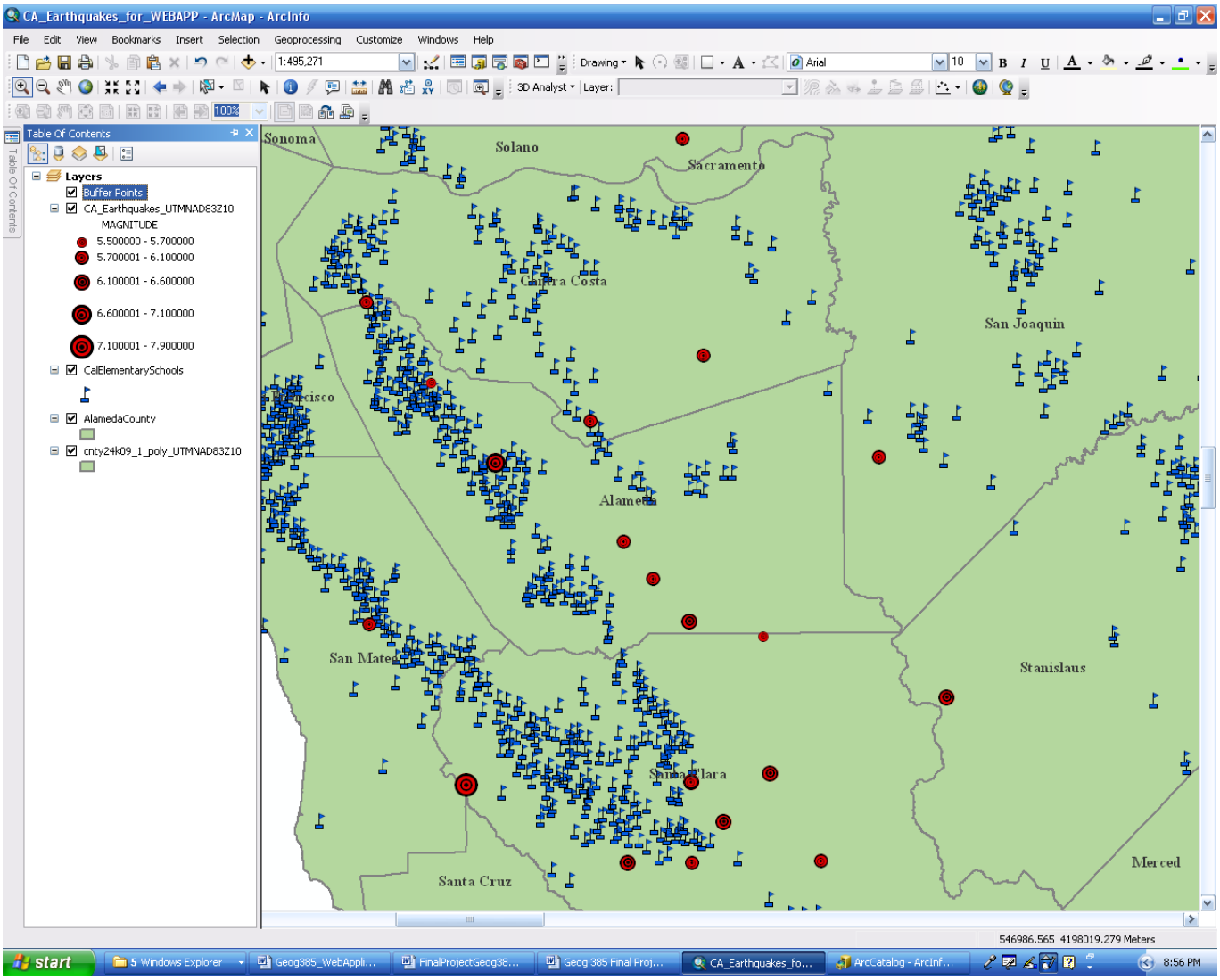
Under Geoprocessing Options, check the Overwrite the outputs of geoprocessing operations ckeck box and check the Add results of geoprocessing operations to the display check box.



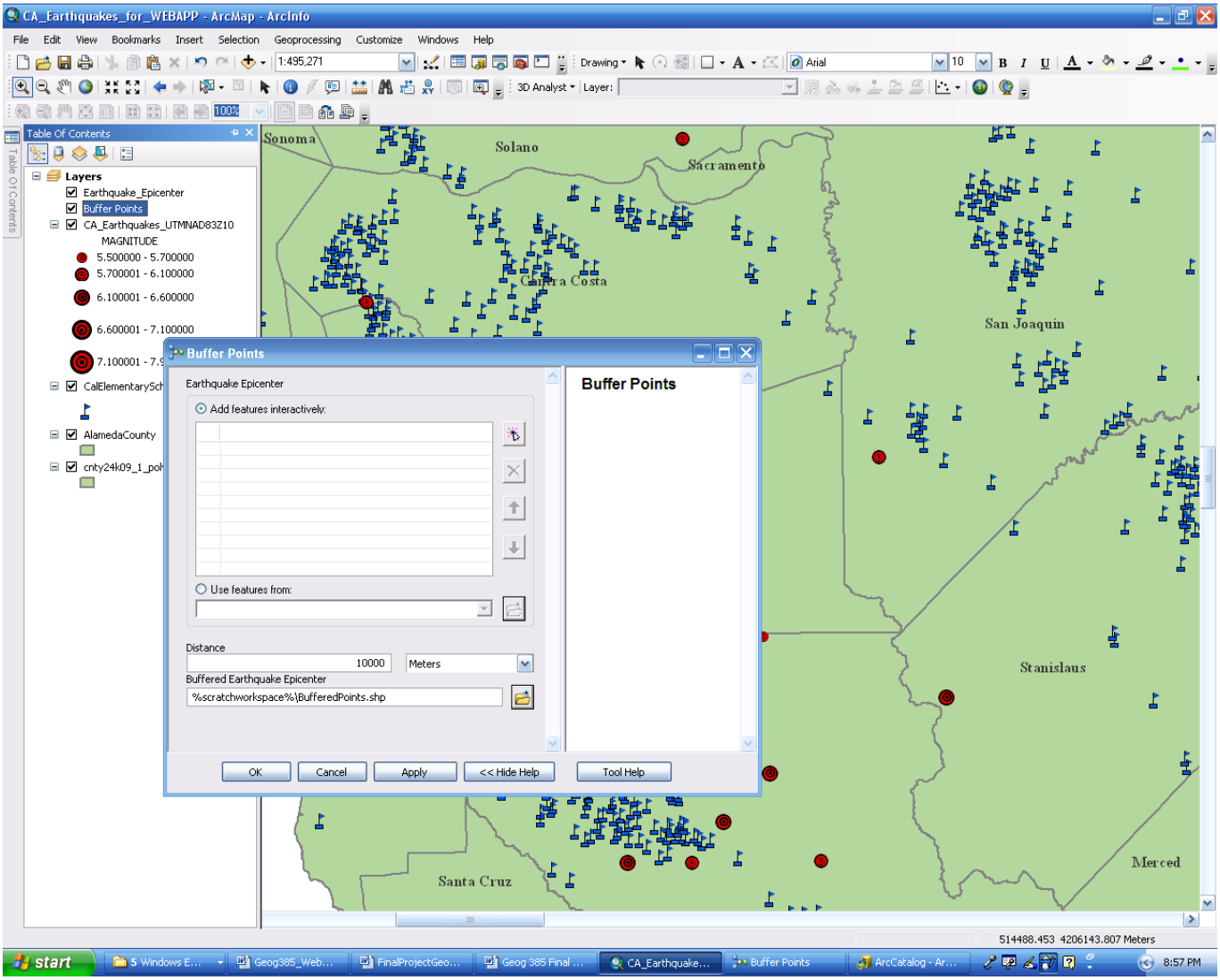
Under the Environment Setting, expand the Workspace category and set the scratch workspace to BufferPoints\Scratch.



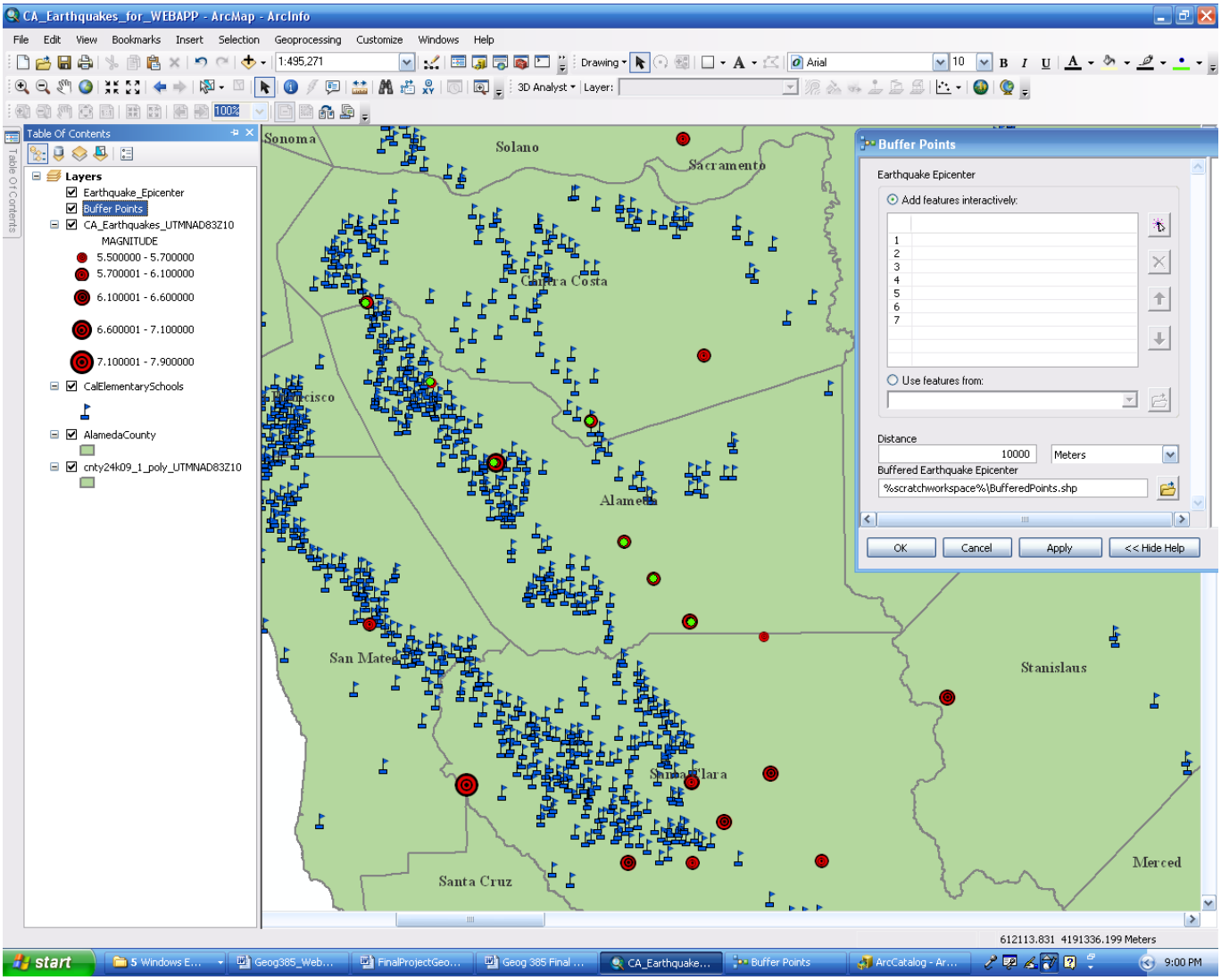
Add the Buffer Points tool to the ArcMap document. Do this by clicking the Add Data button in ArcMap and navigating to the BufferService toolbox created in the BufferPoints folder. Double-click the toolbox and add the Buffer Points tool to the map.



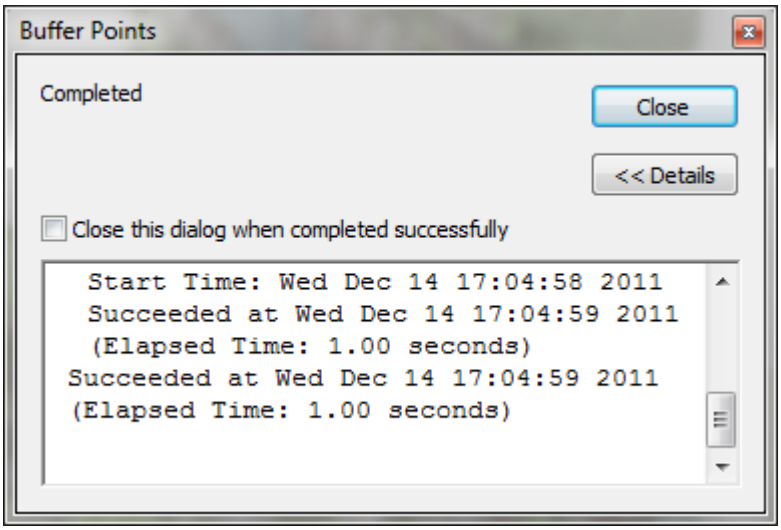
Right-click the Buffer Points tool layer in ArcMap and click open to open the tool's dialog box and test the model.

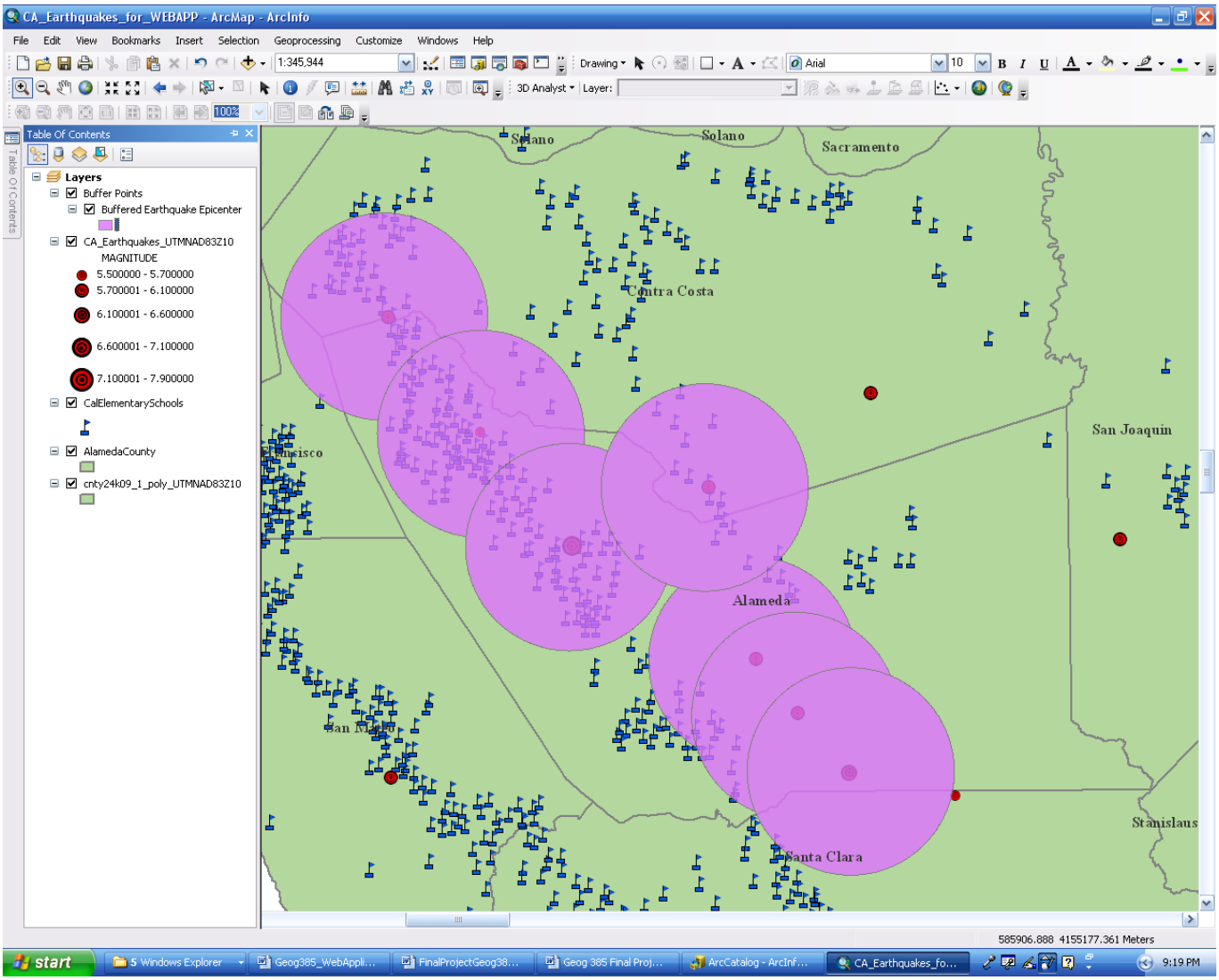


Click the Add Feature button in the tool's dialog box and select several point features.

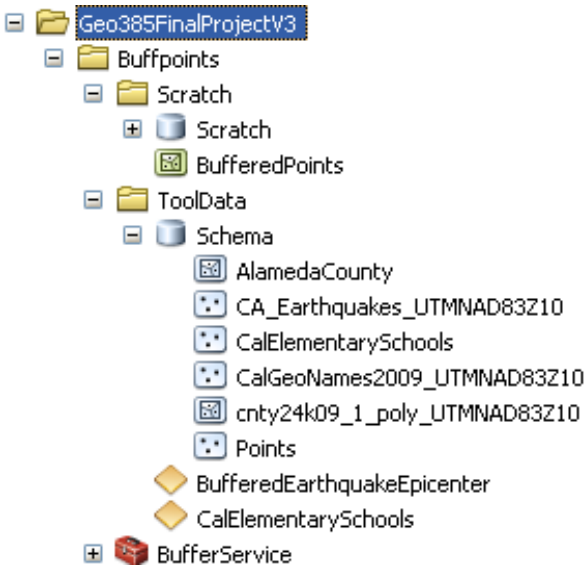


Click OK to run the geoprocessing model and see newly created buffered features.





The model runs successfully. The newly created BufferedPoints feature class has been created and it resides in the Scratch geodatabase inside the Scratch folder.



Part 4. Publish the Service

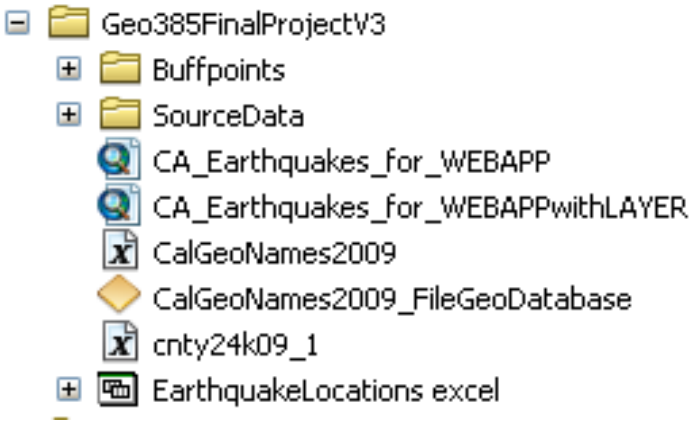
Right-click the BufferService toolbox in ArcCatalog and click Publish to ArcGIS Server. On the Publish to ArcGIS Server dialog box, choose the server to publish to. Name the service BufferService. Click Next, then Finish.

Section C: Second Geo-Processing Service

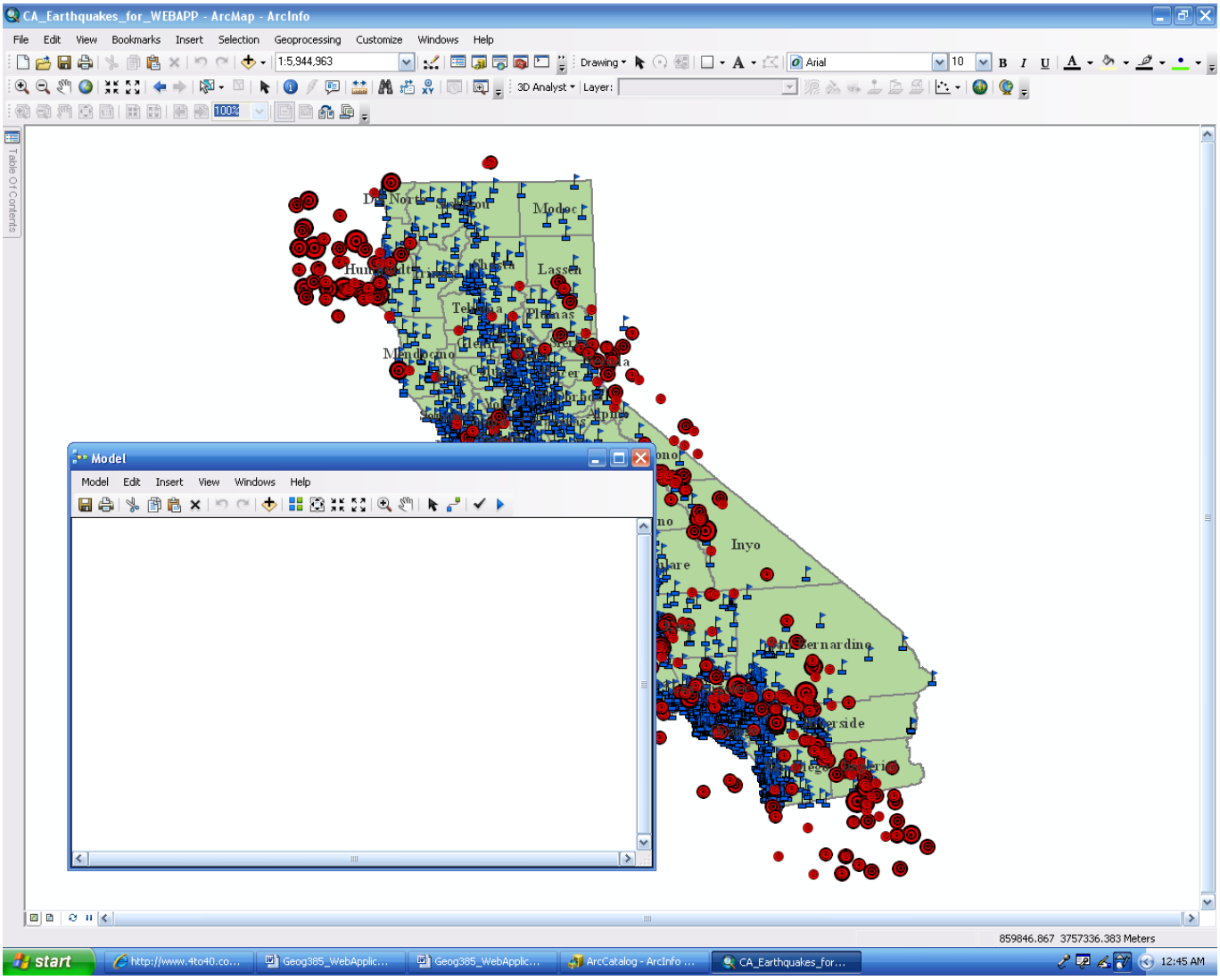
The third step in this project is to build a model that will enable a user to select features based on a specified location during a Web application session.

Part 1. Design of Geo-Processing Model (Select Features by Location)

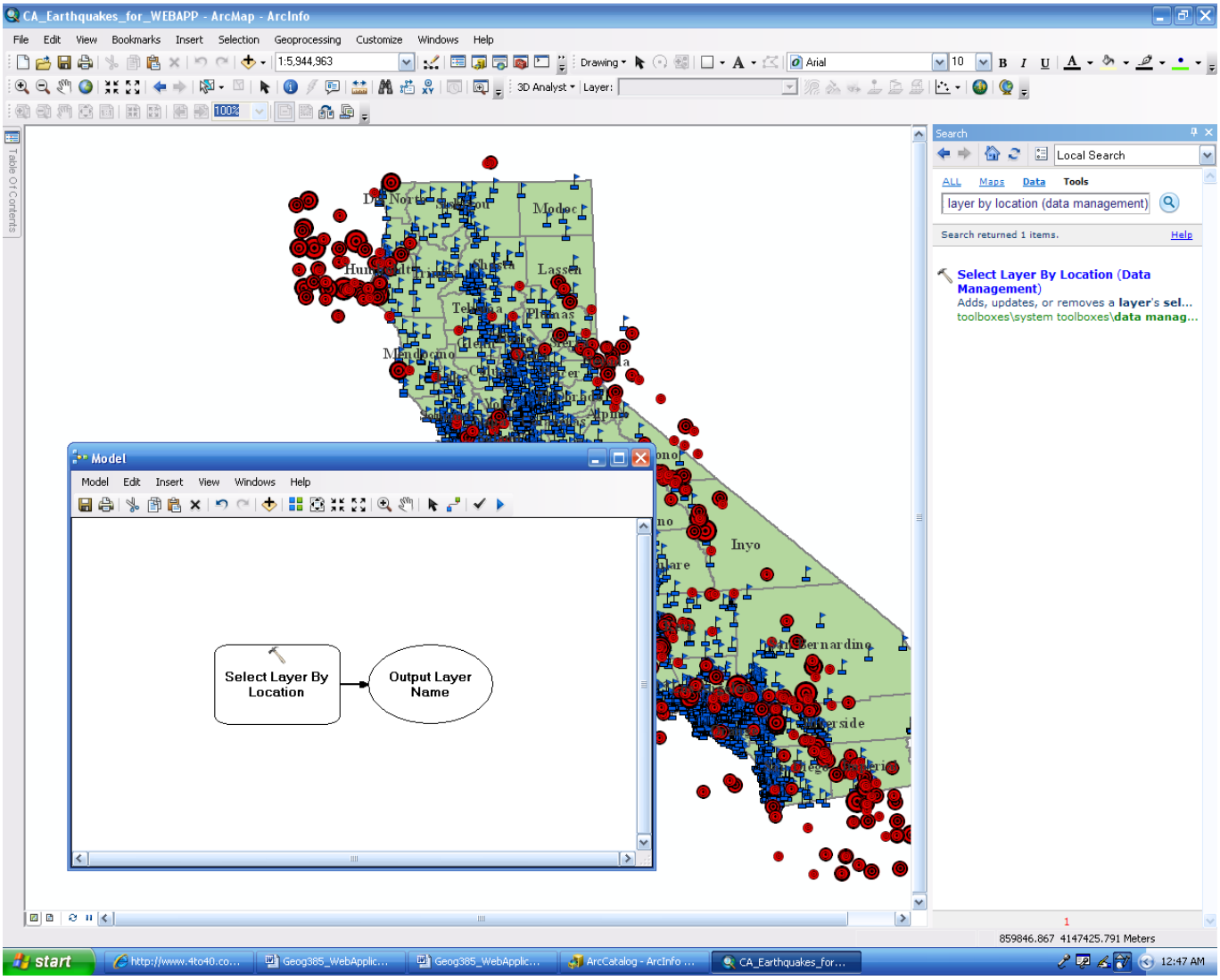
Open the ArcMap document CA_Earthquakes_for_WEBAPP that was used for publishing the map service. Save it as CA_Earthquakes_for_WEBAPPwithLAYER.



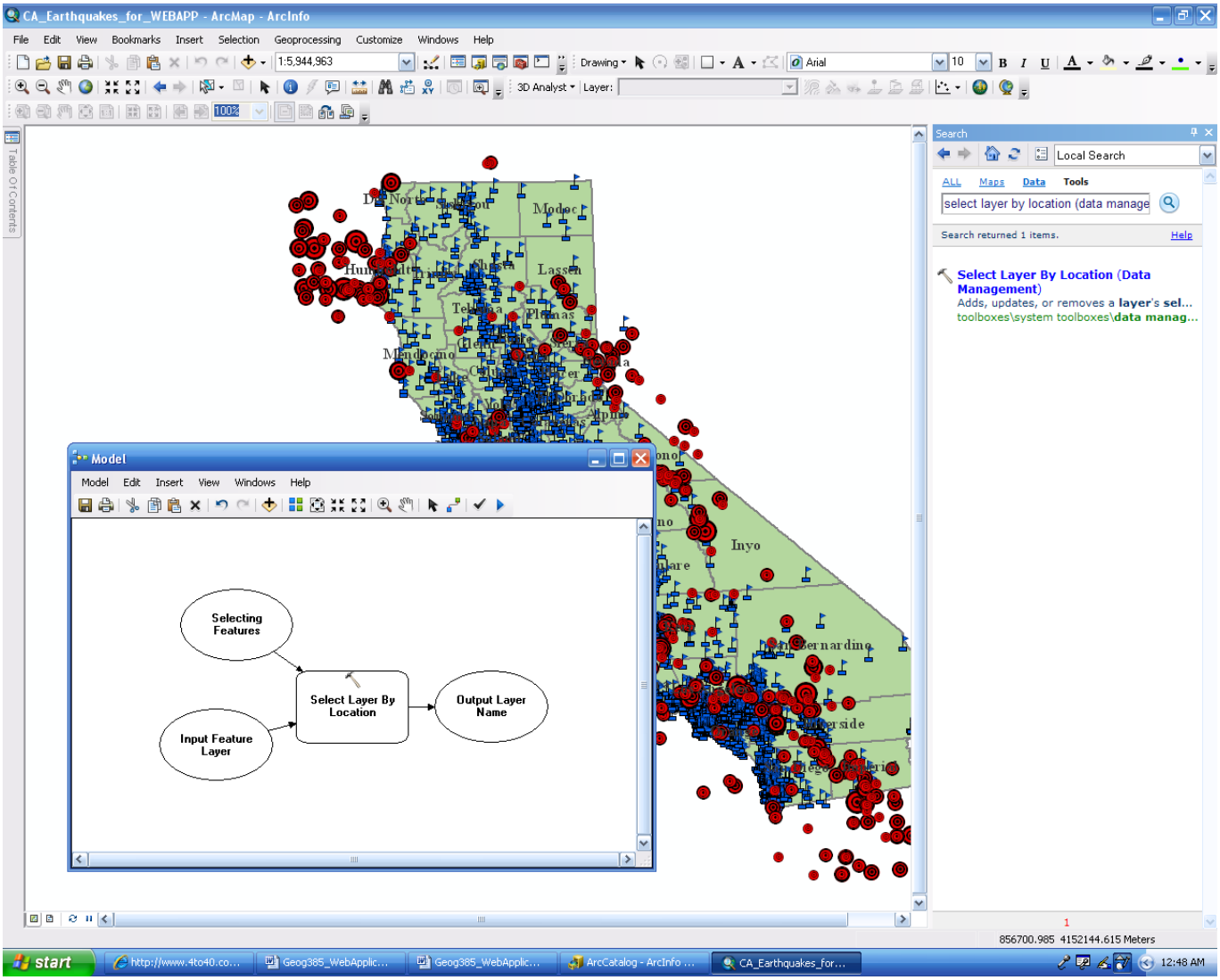
Add a model from the Menu toolbar in the ArcMap document.



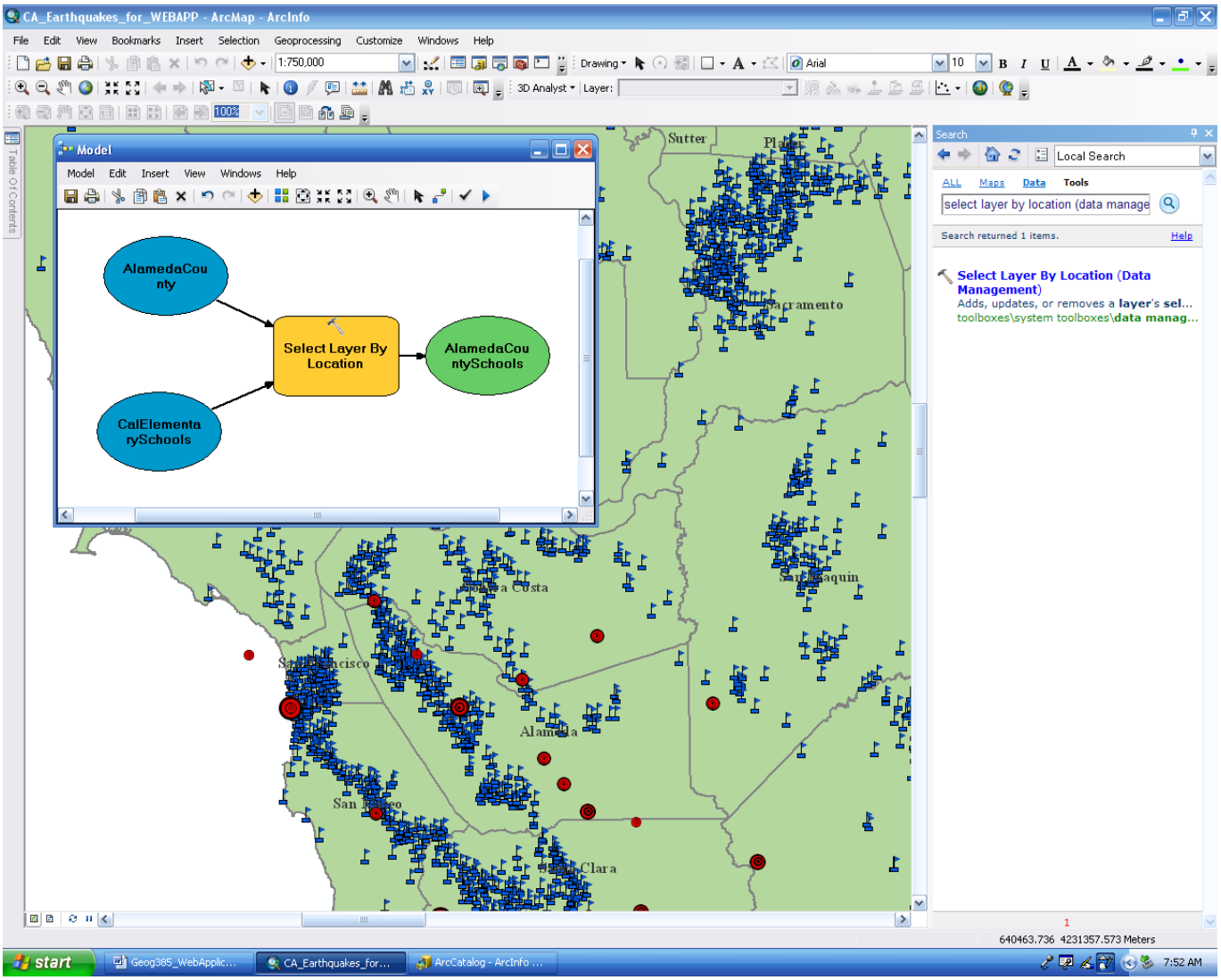
Add the Select Layer by Location tool to the map document.



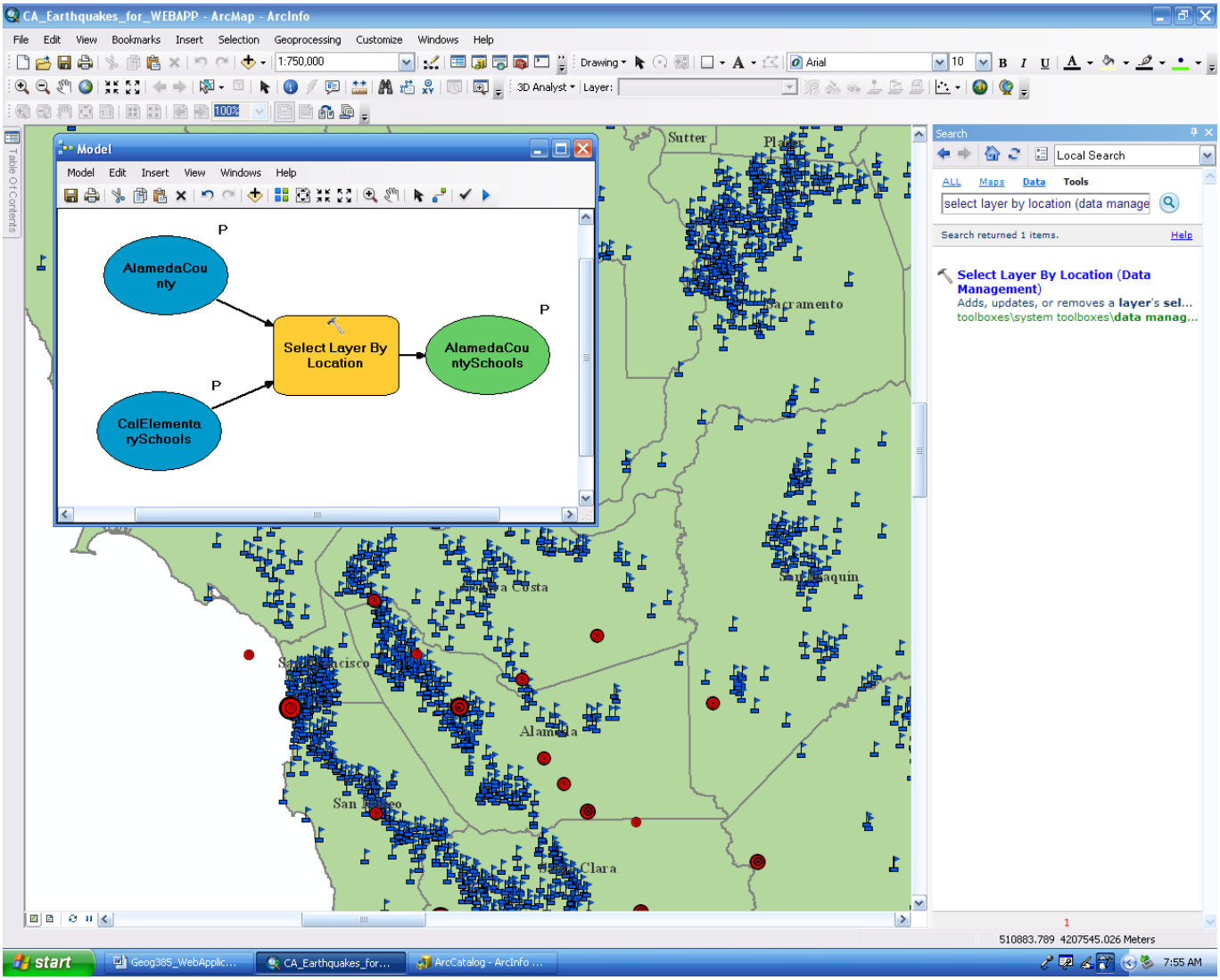
Right-click the Select Layer by Location variable then go to the Make Variable From Parameter option and select Input Features. Right-click the Select Layer by Location variable again but this time go to the Make Variable From Parameter option and select Selecting Features.



Right-click the Selecting Features variable and click Open, from the pull-down menu choose the ArcMap layer that will act as the target location layer that provides the extent to which other features will be selected from, in this situation, it is the AlamedaCounty layer. Then, right-click the Input Features Layer variable, and from the pull-down menu this time select the CalElementarySchools layer. This layer contains the features, in this case Elementary schools in California, that will be selected from a specified location, in this case, Alameda county.

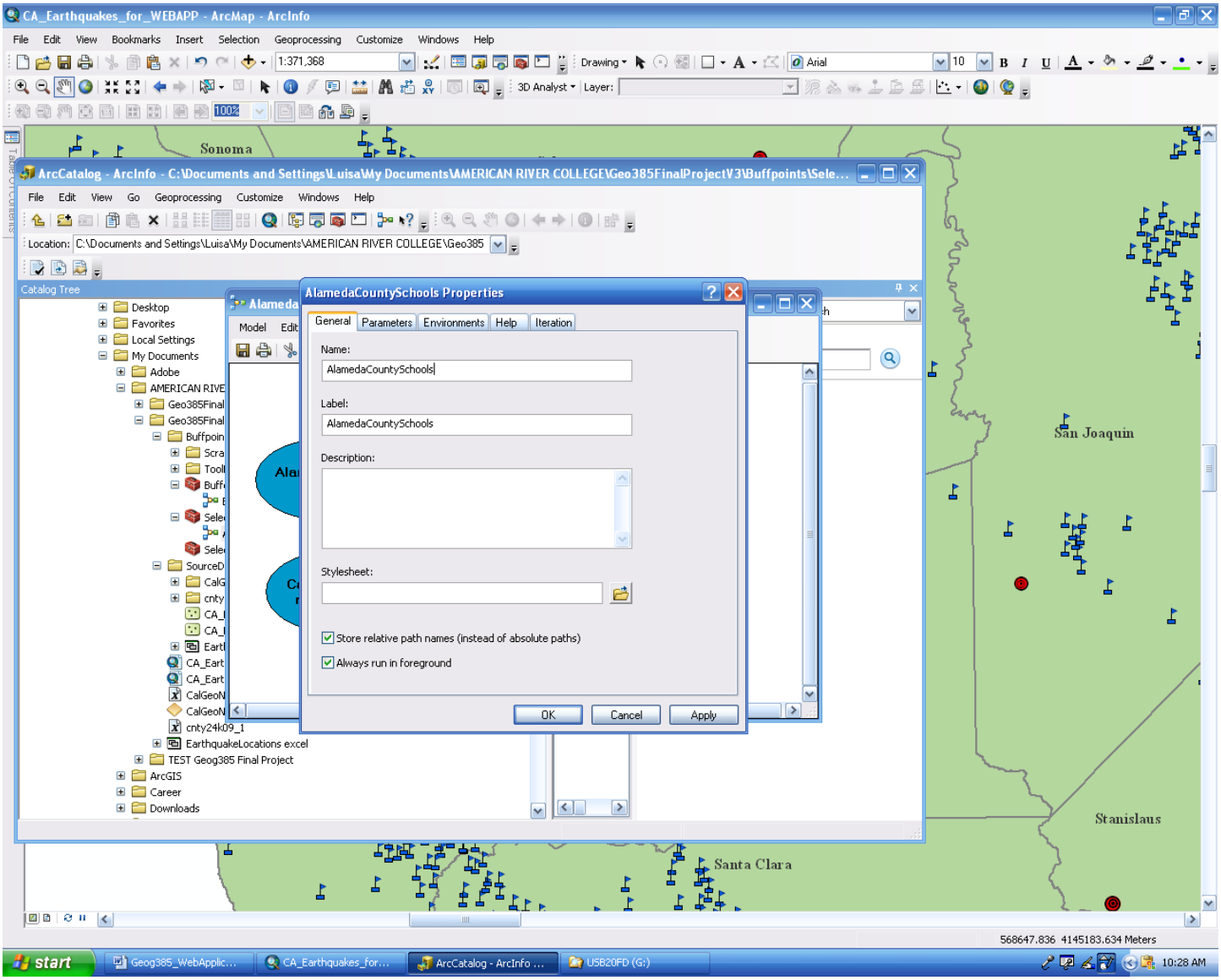


Next, right click each of the variables, AlamedaCounty, CalElementarySchools, and AlamedaCountySchools, individually and check Model Parameter.



Right-click the AlamedaCountySchools output variable and check the Add to Display option.

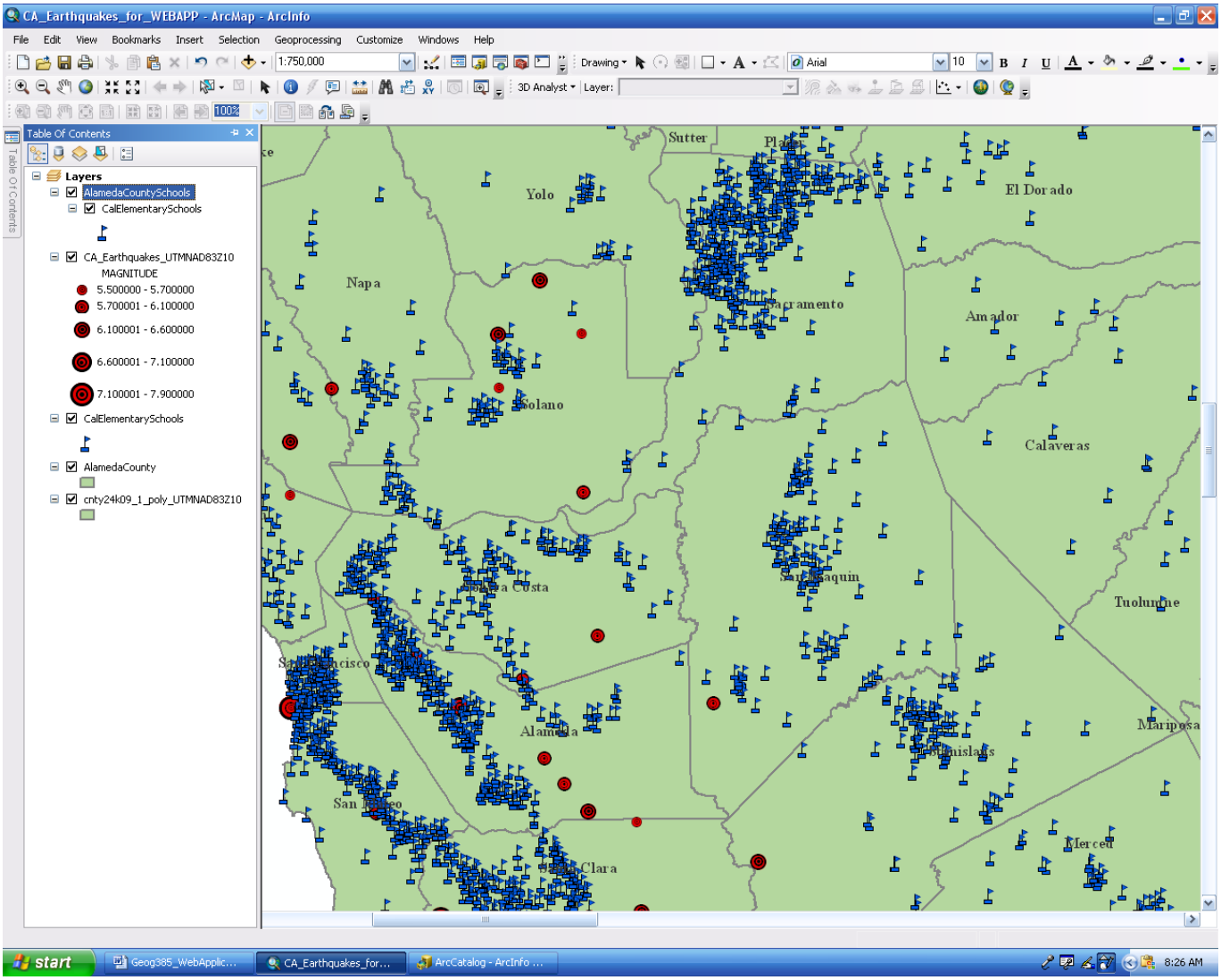
In the main ModelBuilder menu, click Model and click Model Properties. Set the name to AlamedaCountySchools, set the label to AlamedaCountySchools , and the Description to Schools in Alameda County, and make sure that the Store relative path names option is checked. Click OK.



In the main ModelBuilder menu, click Model and click Save, browse to the SelectbyLocation toolbox, click Model again and click Close.

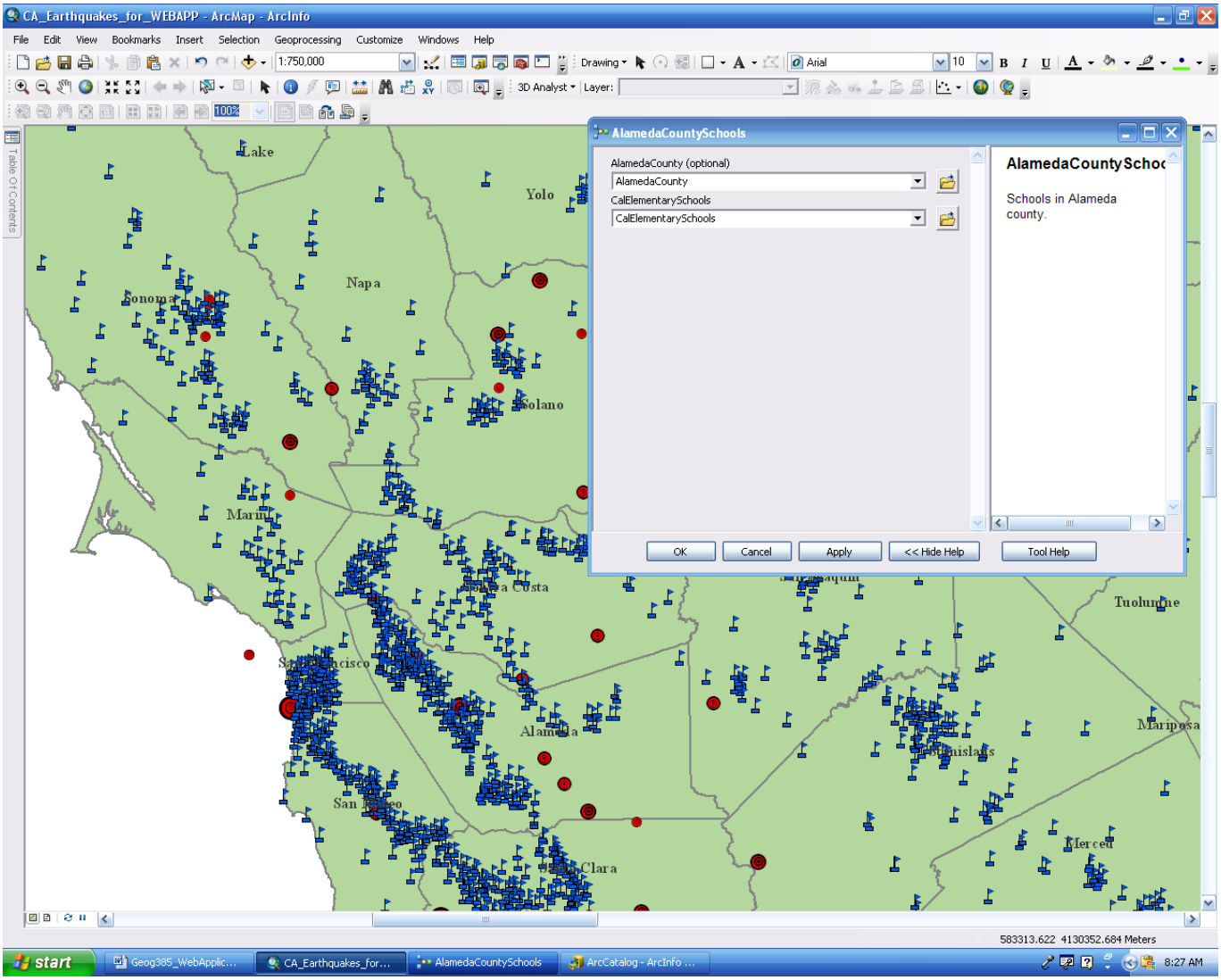
Part 2. Test Model in ArcMap

Add the AlamedaCountySchools tool to the ArcMap document. Do this by clicking the Add Data button in ArcMap and navigating to the SelectbyLocation toolbox created in the BufferPoints folder. Double-click the toolbox and add the AlamedaCountySchools tool to the map.



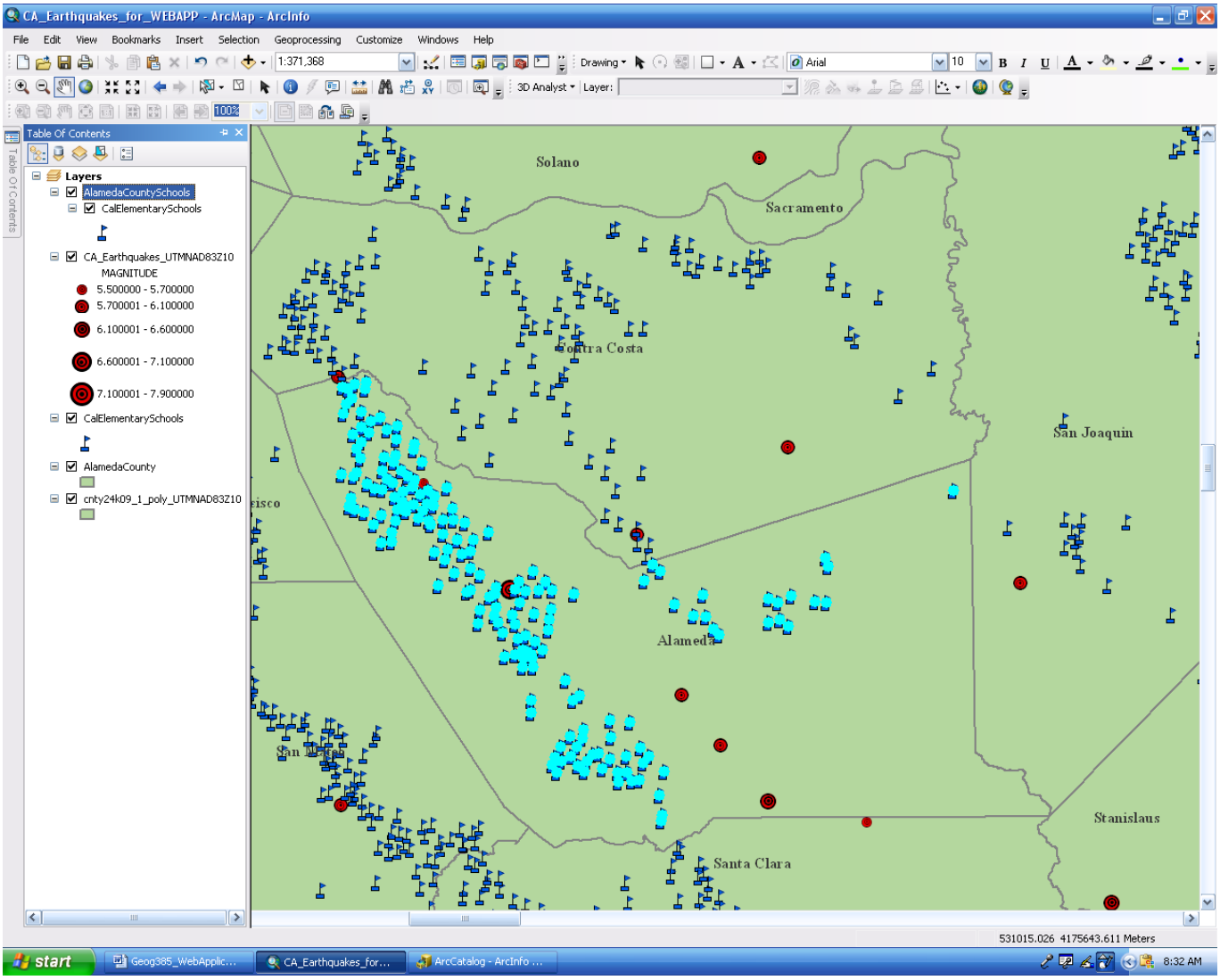
The AlamedaCountySchools tool layer appears as the top layer in the table of contents of the map.

Right-click the AlamedaCountySchools tool and click Open.



Click OK on the AlamedaCountySchools tool's dialog box.

The tool runs successfully. All the Elementary schools in Alameda county are selected.



Unselect all the selected features and save the map document with the AlamedaCountySchools, Select by Location tool layer embedded in the map. Give the map a name that reflects the incorporation of the tool layer as part of the ArcMap document. CA_Earthquakes_for_WEBAPPwithLAYER.

Part 3. Publish the Service

To publish the Select by Location geoprocessing service, a different publishing method than the one described above is utilized. This geoprocessing service, Select by Location, will be published as a tool layer within a source map document. The two items together, the tool layer and the source map document must exist simultaneously on the map document, for the Select by Location geoprocessing service to be published. This is because the Select by Location geoprocessing task can only access layers found in its source map document.
In ArcCatalog, under the ArcGIS Server instance, right-click and choose Add New Service. Give the service a name, SelectAlamedaSchools. Choose Geoprocessing Service as Type and click Next. Choose the Map option

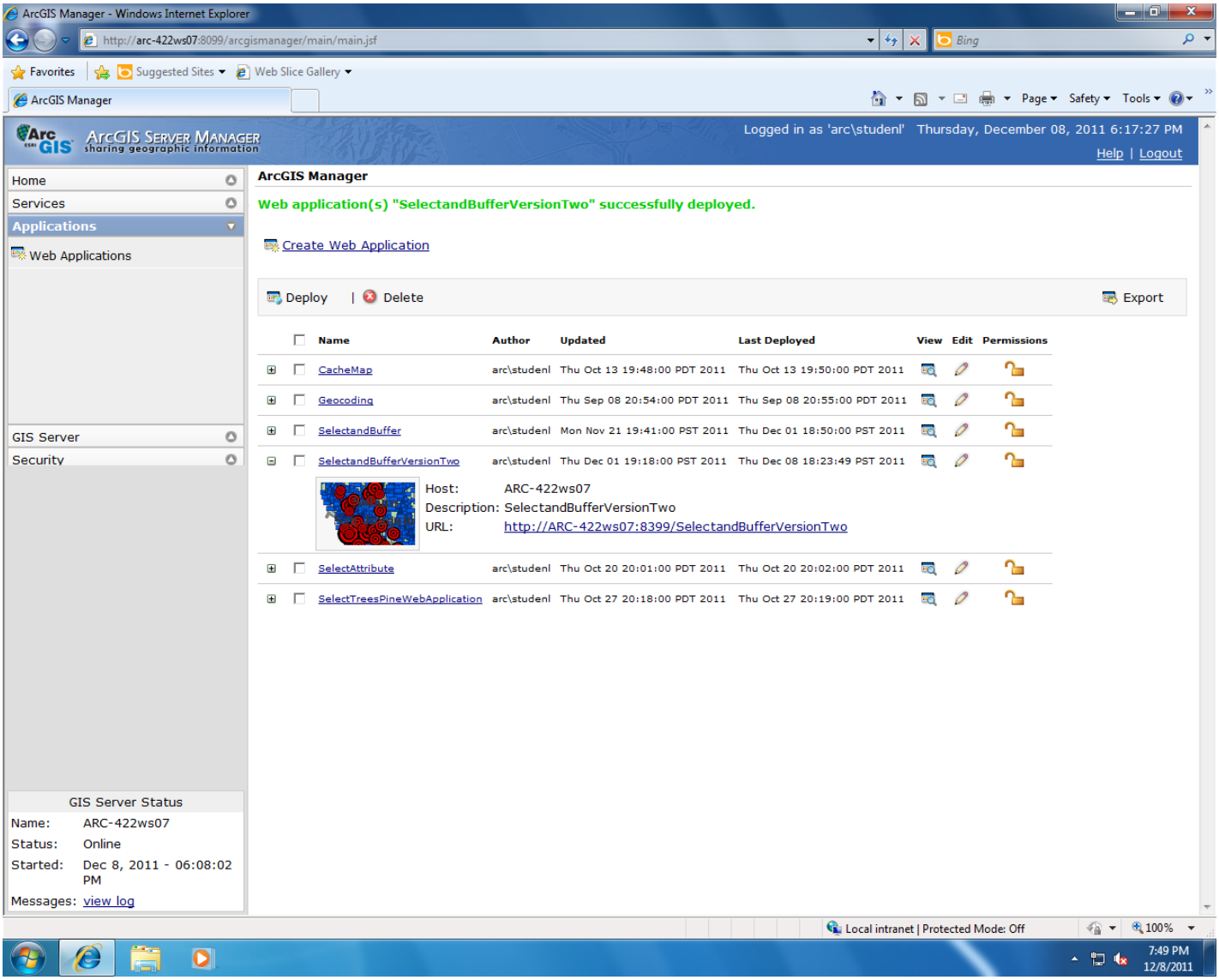
and browse for the MXD file from disk with the Select by Location, AlamedaCountySchools tool embedded in it, CA_Earthquakes_for_WEBAPPwithLAYER. Increase the number of Maximum Number of Records returned by the Server to 10000. Take the rest of the defaults. A new geoprocessing service is created in ArcCatalog.

Section D: Create Web Application

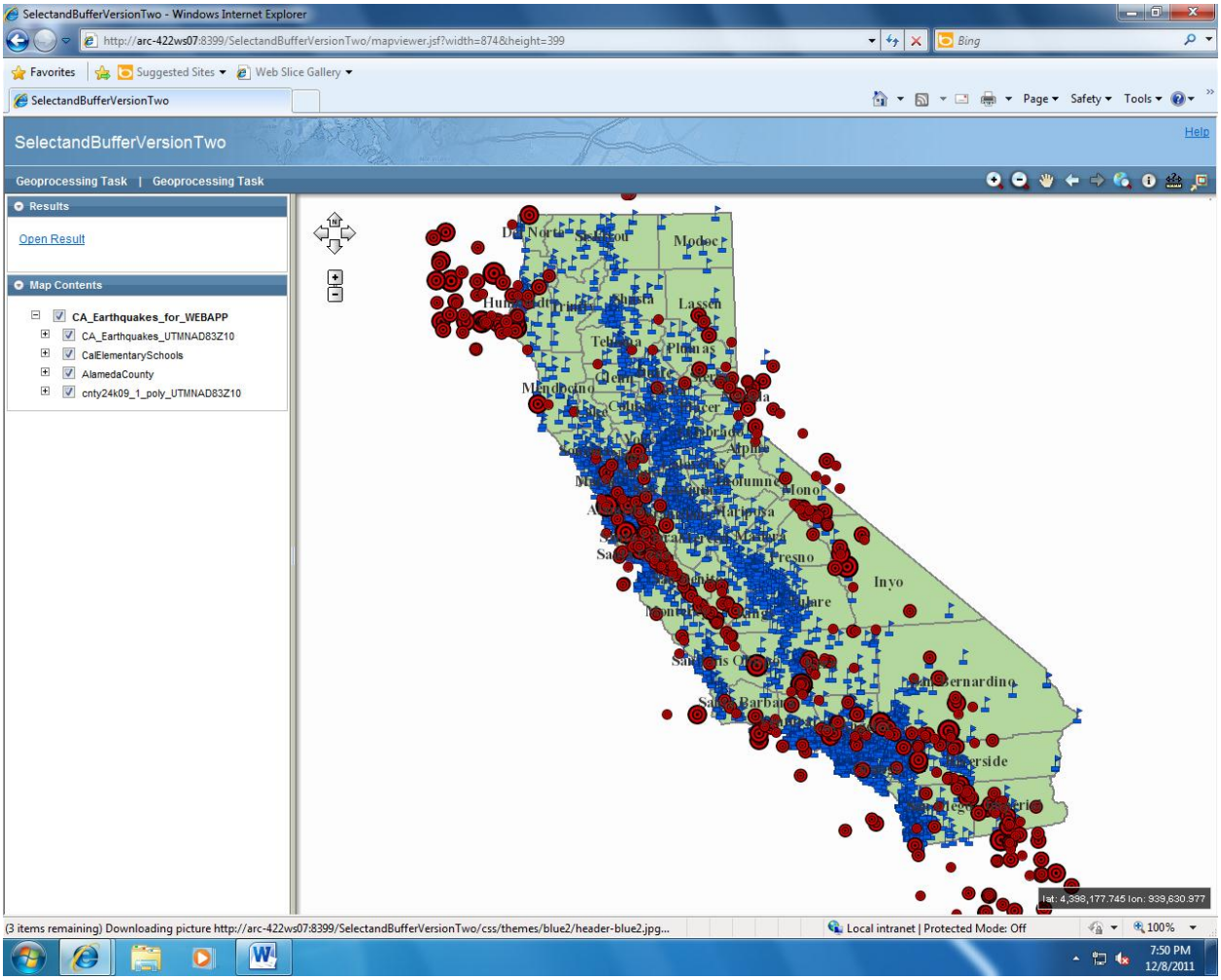
This Web application will allow a user to create buffers and select features by location. To build the Web application with these capabilities required the publishing of a map service and two geo-processing services. The map service serves as a base map to which the other two geo-processing services will be added as tasks as the Web application is created. The paragraphs that follow will provide a detailed description of the necessary steps to create the Web application.

First log in to ArcGIS Server Manager, click Create a Web application. In the name text box, type SelectandBufferVersionTwo as the name of the Web application. In the description text box, type Buffer Features Interactively and Select Features by Location. Click Next. Then click Add Layers and select the ArcGIS Server that contains the map service and two geo-processing services created earlier. First, choose the map service created in Section A, Part 1 of this document, namely, the CA_Earthquakes_for_WEBAPP MSD document and click add. Now click Close to return to the list of layers and click Next. This screen allows you to add tasks to your Web application. This Web application requires the addition of two geoprocessing tasks, the BufferService geoprocessing task and the SelectAlamedaSchools geoprocessing task. First the BufferService geoprocessing task will be added. Click Add New Task, Click on Supporting Services, select the Local connection showing the Web Server name, locate the BufferService geoprocessing toolbox and click on Buffer Points. Click Apply. Repeat the previous steps to add the second geoprocessing service. Click Add New Task, Click on Supporting Services, select the Local connection showing the Web Server name, locate the SelectbyLocation geoprocessing toolbox and click on SelectAlamedaSchools. Click Apply.

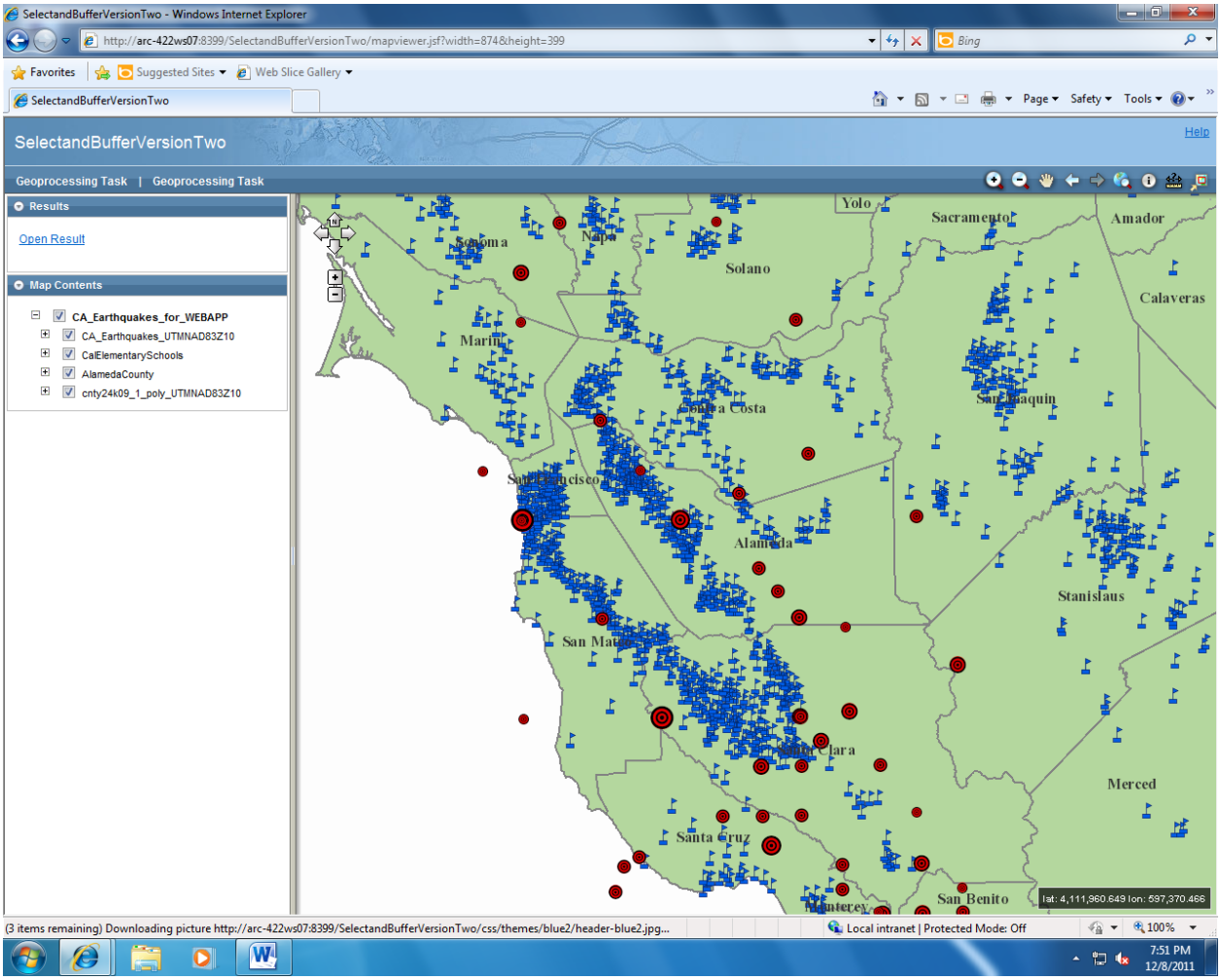
Click on the URL to bring up the newly created Web Application, SelectandBufferVersionTwo.



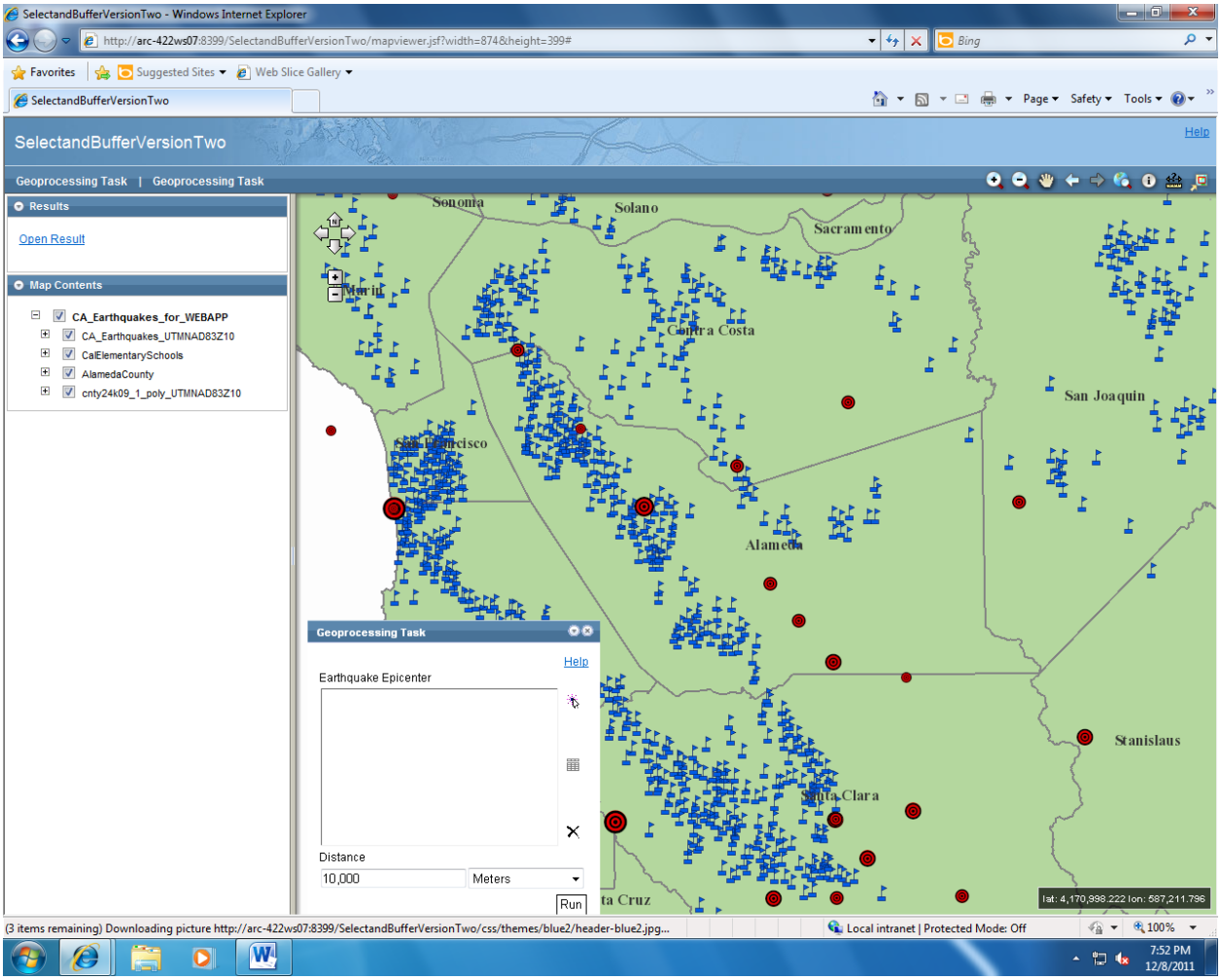
The Web application opens successfully.



Zoom in closer to Alameda county to see the geoprocessing capabilities of the two different geoprocessing tasks in more detail.

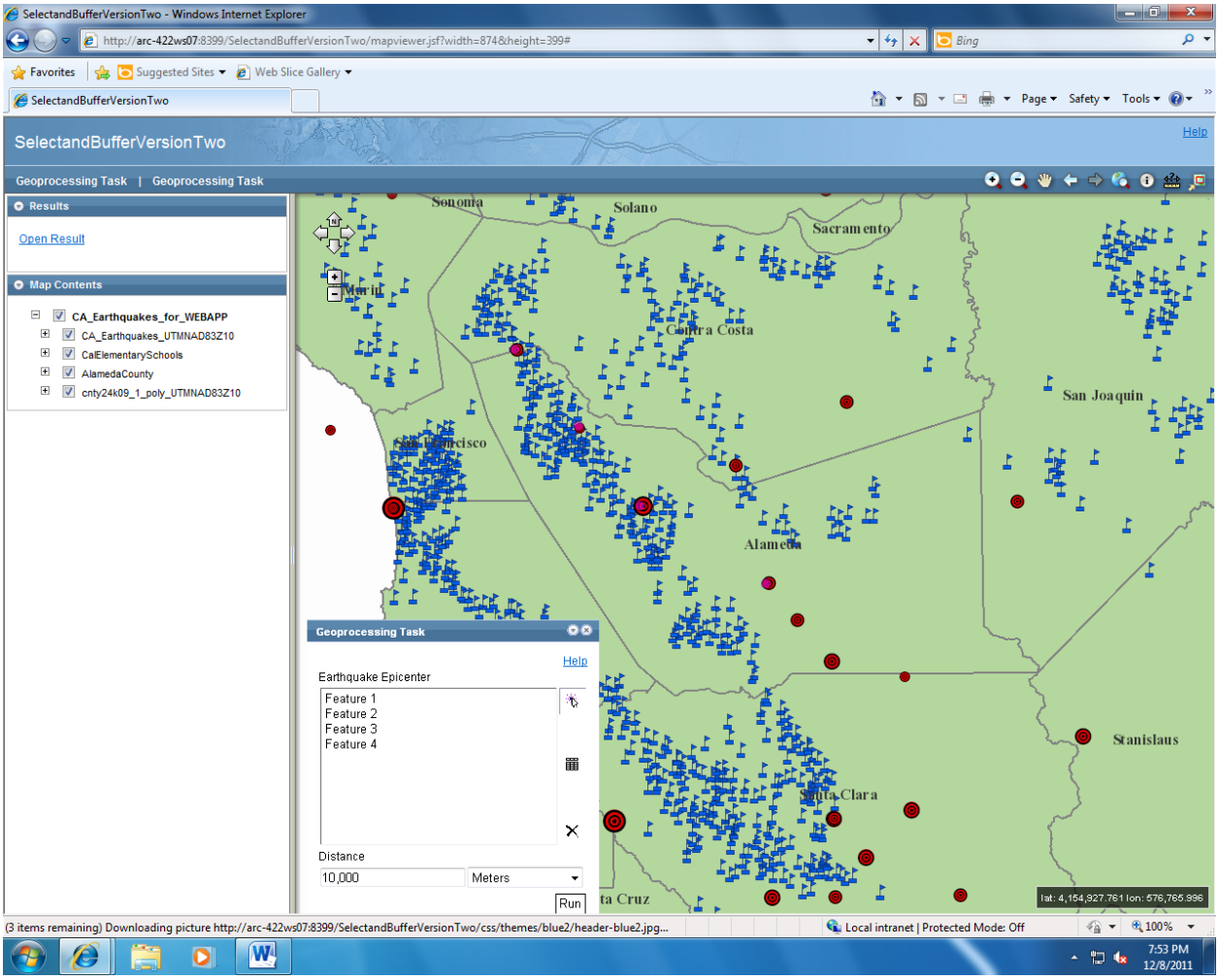


Click on the first Geoprocessing Task, this is the Buffer Points geoprocessing task. The labels for the Geoprocessing Task names where left as the default names, therefore do not reflect the names of the individual Geoprocessing Tasks, that is, Buffer Points and AlamedaCountySchools.



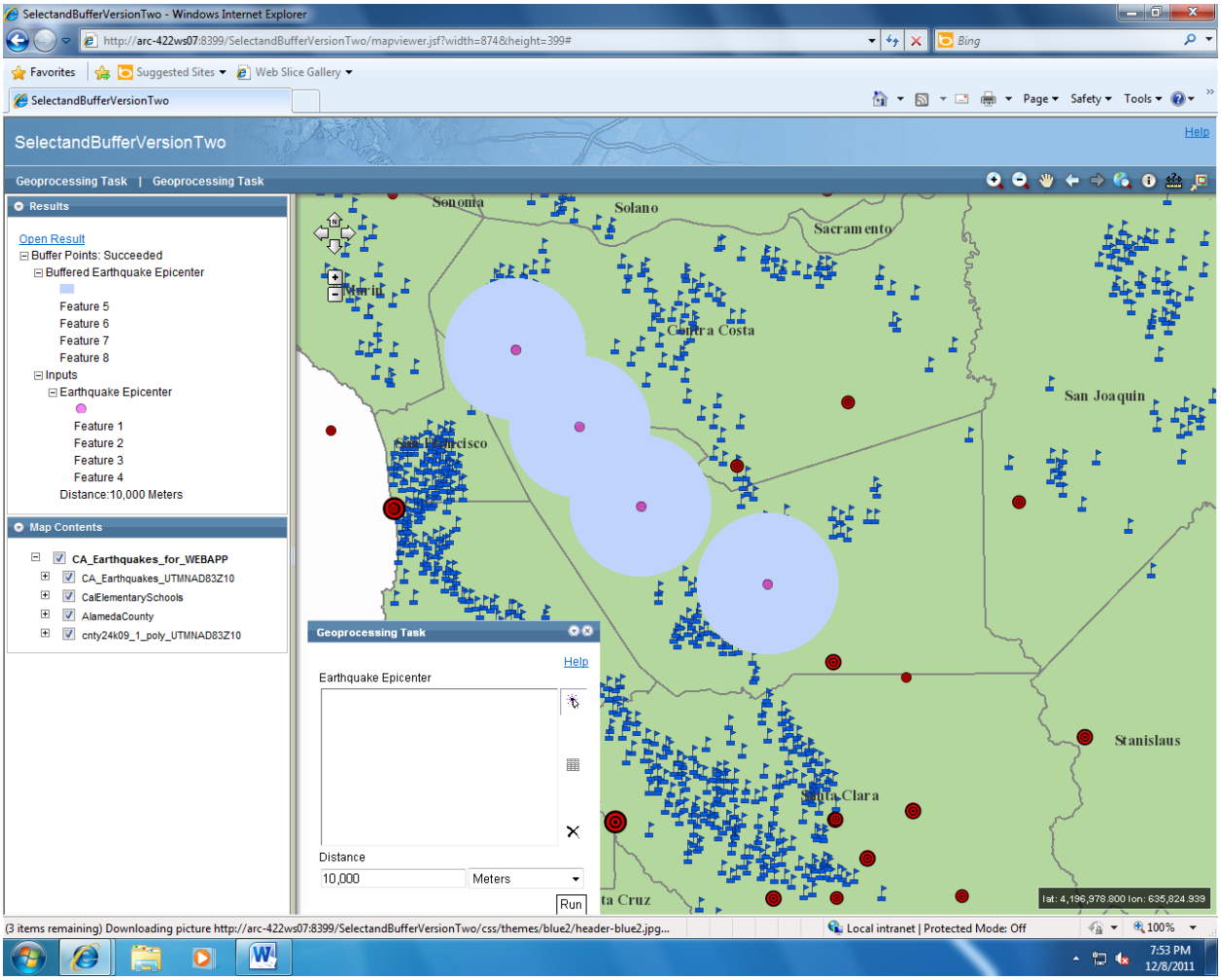
The Buffer Points geoprocessing task dialog box opens to allow the user to interactively select the points to be buffered.

Once the user has selected a few points, the dialog box shows the selected features. In this case, the selected features can not clearly be seen on the map because the selection color of the features happens to be the same color the features are symbolized with.

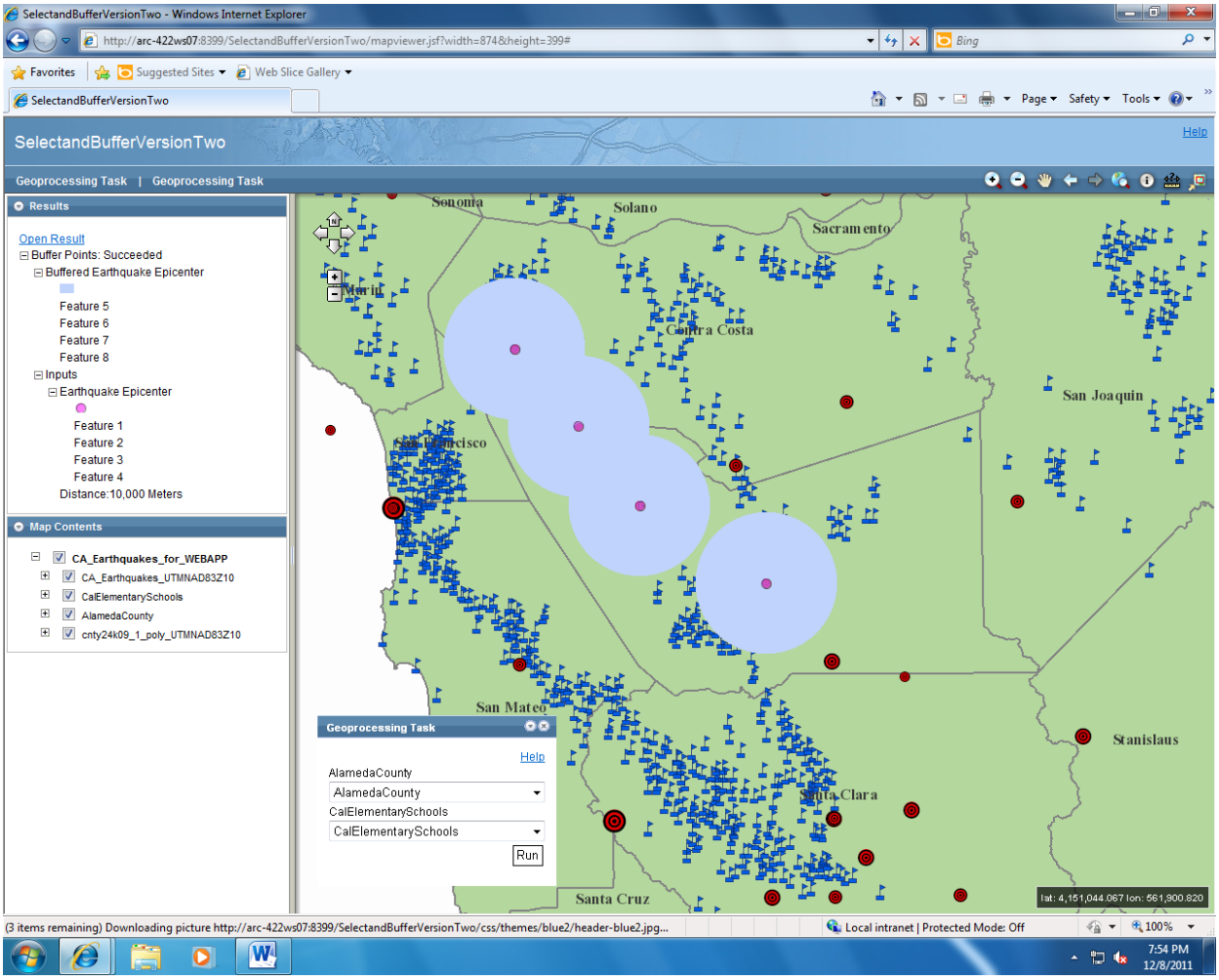


When the user is finished selecting point features on the Web application, the Run button may be clicked on the Geoprocessing Task dialog box to start the Buffer Points routine.

The geoprocessing routine runs successfully displaying a 10000 meter buffer around each of the selected point features.

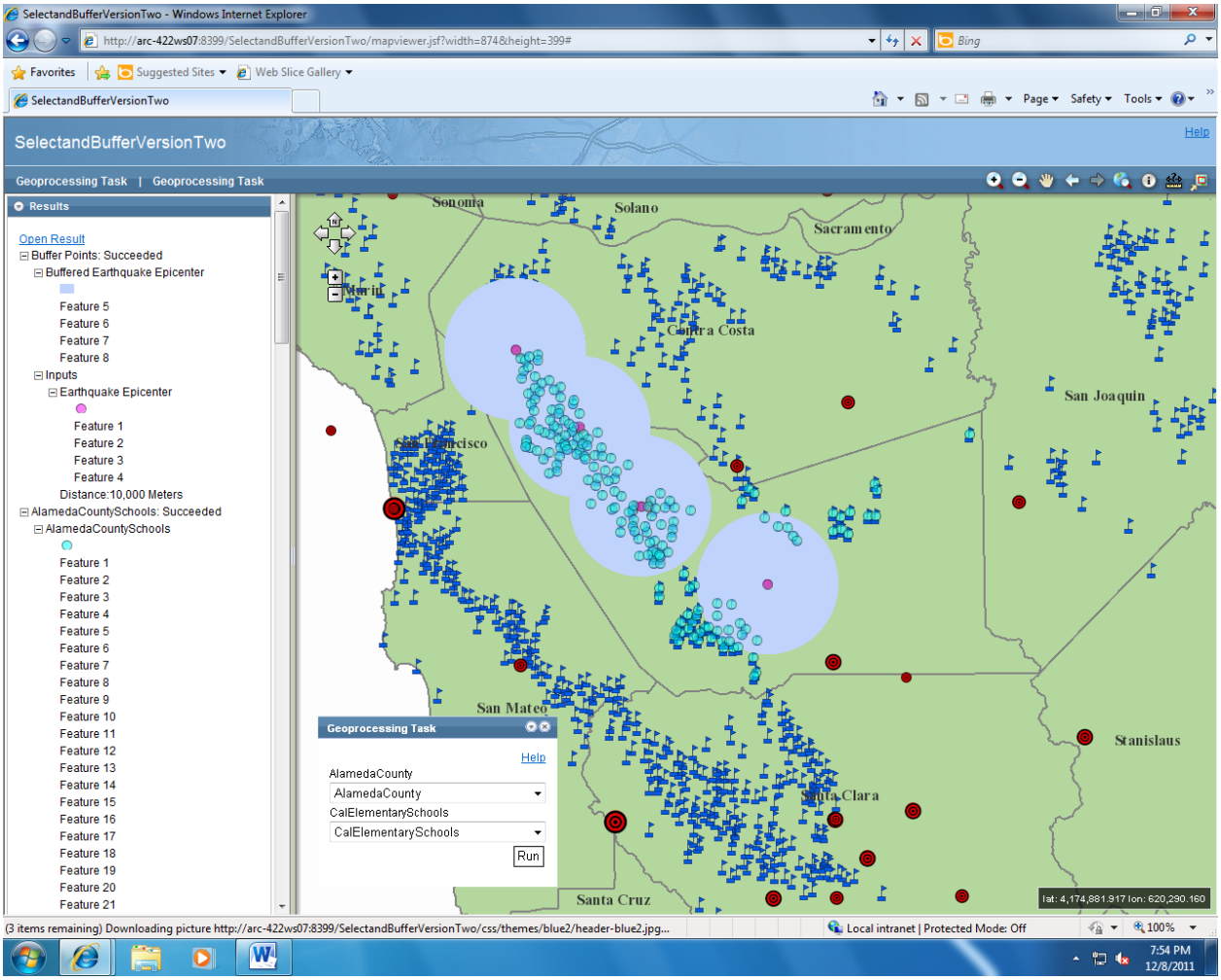


Next, the user clicks on the second Geoprocessing Task, this is the AlamedaCountySchools geoprocessing task that will select all the Elementary schools in Alameda county when the geoprocessing tool is run. When the user clicks the second Geoprocessing Task, the Geoprocessing Task dialog box opens.

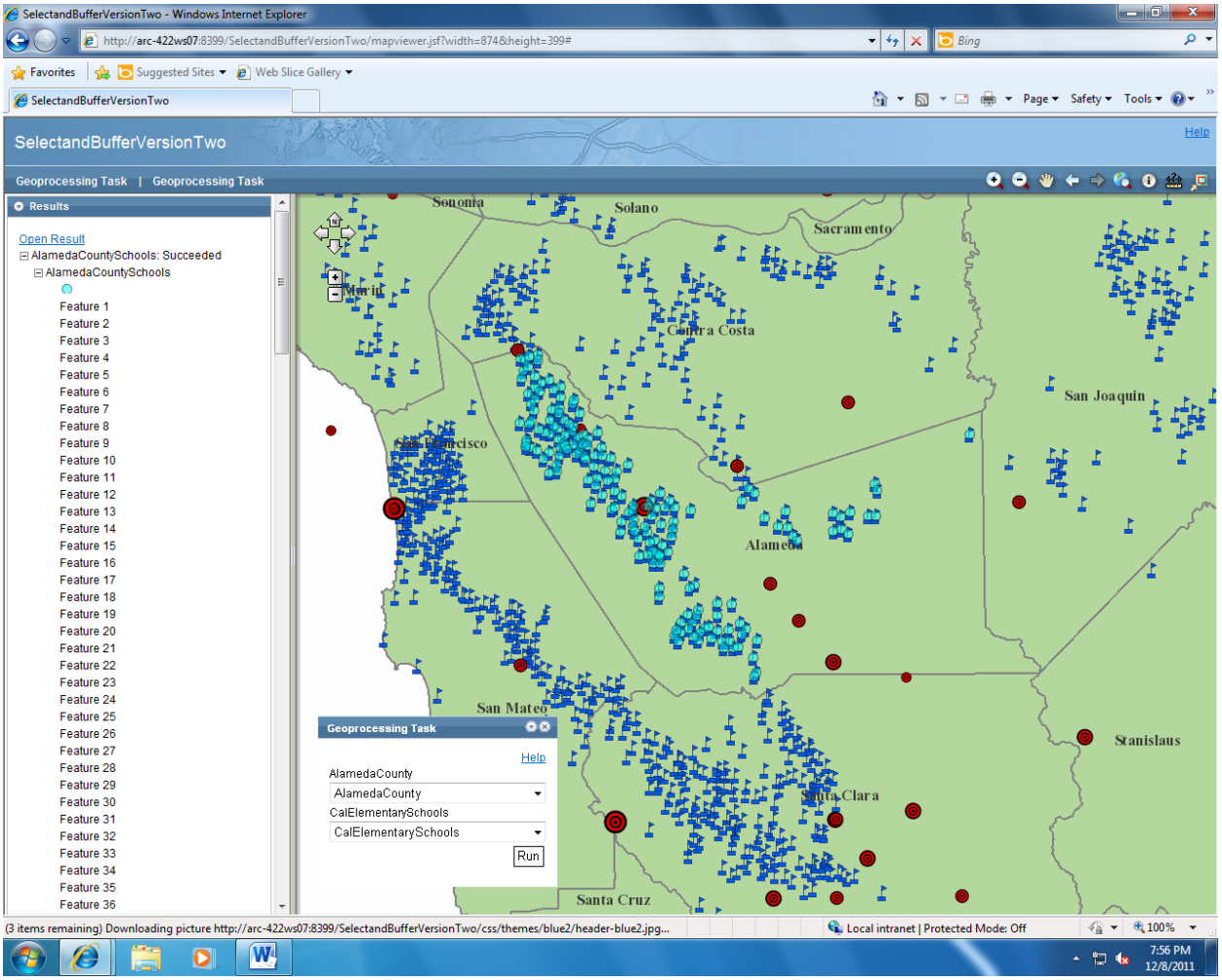


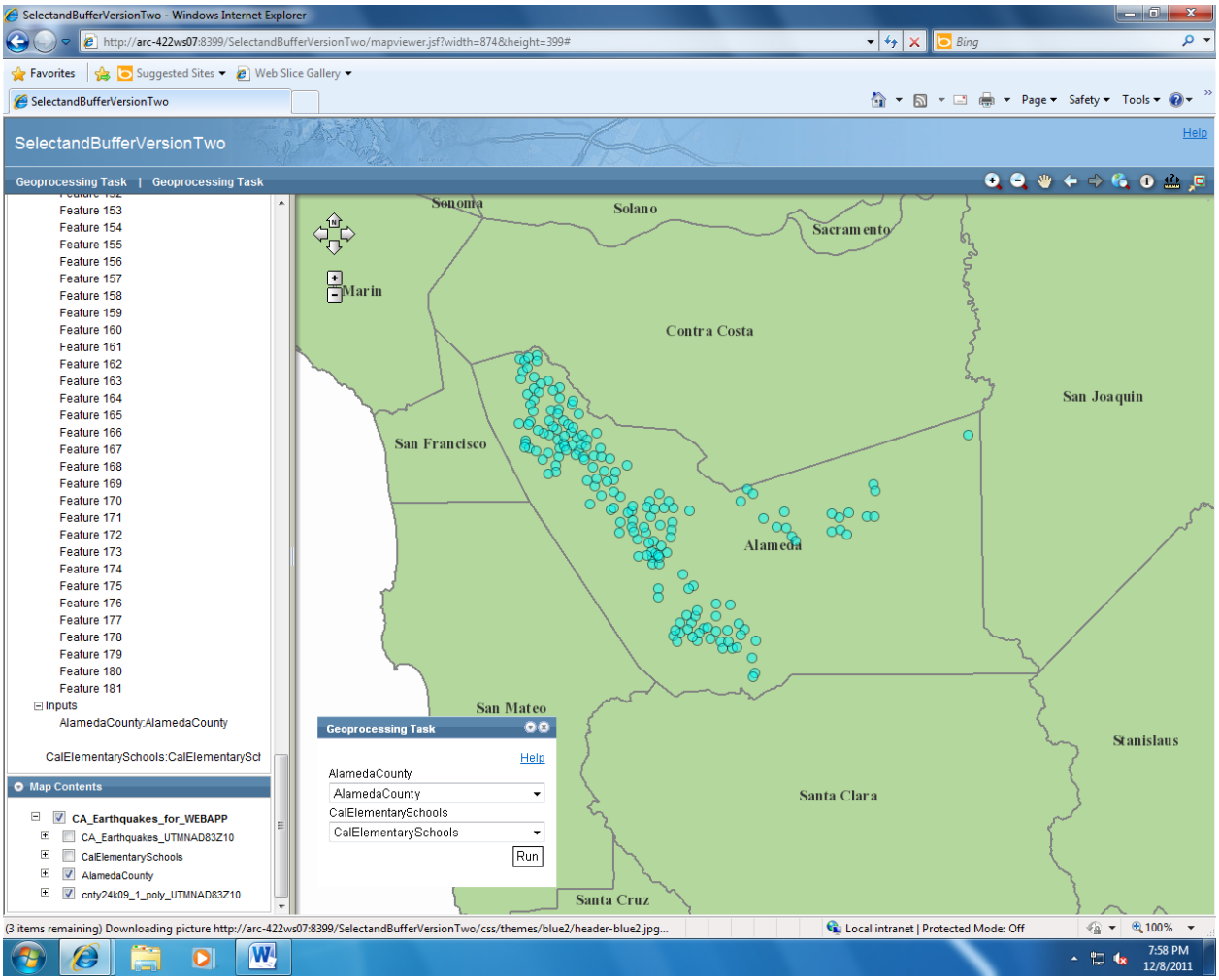
To run the geoprocessing routine, the user must click the Run button.

The geoprocessing routine runs successfully displaying all the Elementary schools in Alameda county.



The next two screen shots provide a better visual representation of the resulting Select by Location, AlamedaCountySchools, geoprocessing routine.




SelectandBufferVersionTwo - Windows Internet Explorer
http://arc-422ws07:8399/SelectandBufferVersionTwo/mapviewer.jsf?width=874&height=399#
SelectandBufferVersionTwo
Help
Geoprocessing Task | Geoprocessing Task
Feature 153
Feature 154
Feature 155
Feature 156
Feature 157
Feature 158
Feature 159
Feature 160
Feature 161
Feature 162
Feature 163
Feature 164
Feature 165
Feature 166
Feature 167
Feature 168
Feature 169
Feature 170
Feature 171
Feature 172
Feature 173
Feature 174
Feature 175
Feature 176
Feature 177
Feature 178
Feature 179
Feature 180
Feature 181
Inputs
AlamedaCounty:AlamedaCounty
CalElementarySchools:CalElementarySch
Map Contents
CA_Earthquakes_for_WEBAPP
CA_Earthquakes_UTMNAD83Z10
CalElementarySchools
AlamedaCounty
cnty24k09_1_poly_UTMNAD83Z10
Sonoma
Solano
Sacramento
Marin
Contra Costa
San Joaquin
San Francisco
Alameda
San Mateo
Stanislaus
Santa Clara
Santa Cruz
Geoprocessing Task
Help
AlamedaCounty
AlamedaCounty
CalElementarySchools
CalElementarySchools
Run
(3 items remaining) Downloading picture http://arc-422ws07:8399/SelectandBufferVersionTwo/css/themes/blue2/header-blue2.jpg...
Local intranet | Protected Mode: Off
100%
7:58 PM
12/8/2011