

巻末資料 5 GIS データ作成のマニュアル

*The Basic Manual for
the drawing Geologic Map
using ArcView Ver. 10.0*

Edition 0.2

JICA-GIS Project 2012

At GSD Zomba



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0. Set the Environment for the drawing

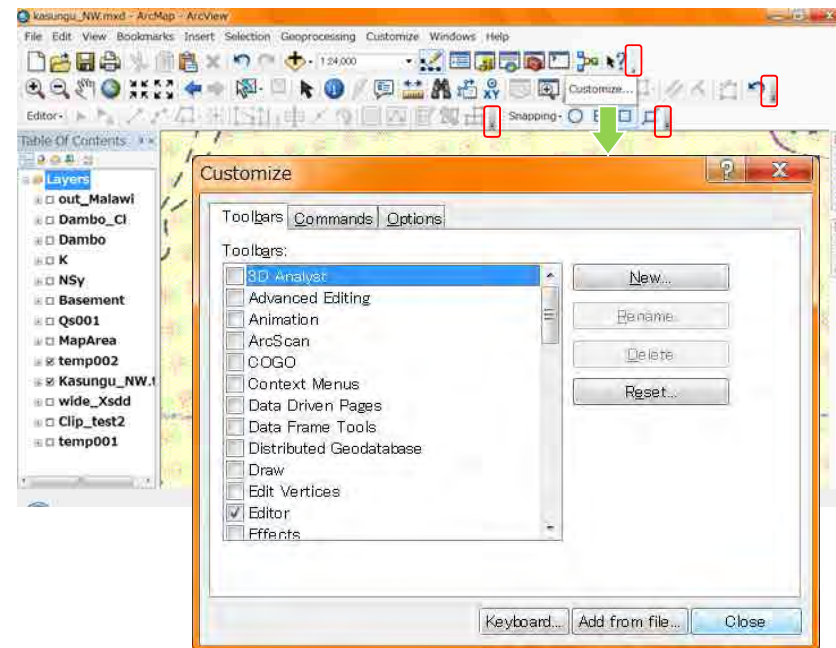
0-1. Start

You can create the environment of ArcView freely as you like. This drawing manual recommends and uses the following environment for the drawing. You have a good environment that you feel comfortable, you use the environment.

0-2. Customize Tool bars

Each tool bar has small space at the edge of tool bar. The space has small mark ▼ at the bottom of the space. Click the space, **Customize...** will appear.

Click **Customize...** . “Customize window” will appear.



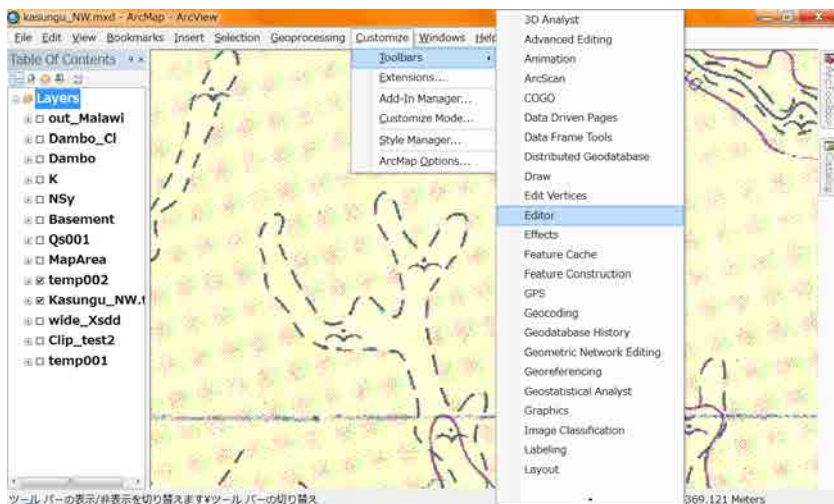
-Memo 1- useally no need

If no toolbars in your ArcView window, you can show tool bar from main menu.

Customize ⇒ Toolbars ⇒ select one tool bar (any tool bar OK).

The tool bar appears. After the appearance of a tool bar, you can go to **<2. Customize**

Tool bars>.



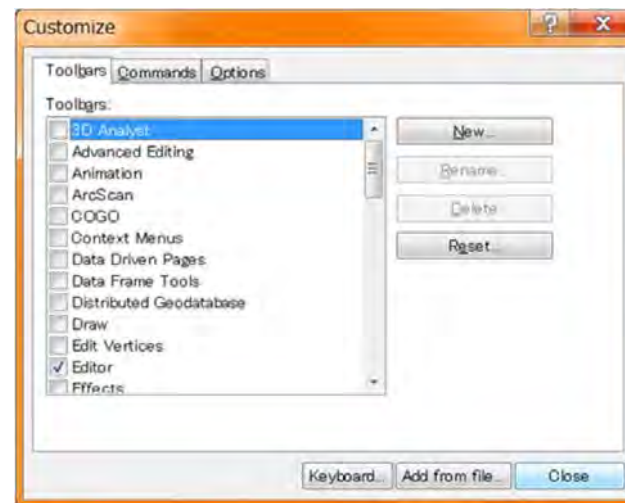
0-3. Set Tool bars

Select "Toolbars" Tab, Select (add check mark) followings,

- ✓ Edit Vertex
- ✓ Editor
- ✓ Main Menu (default selected)
- ✓ Snapping
- ✓ Standard
- ✓ Tools

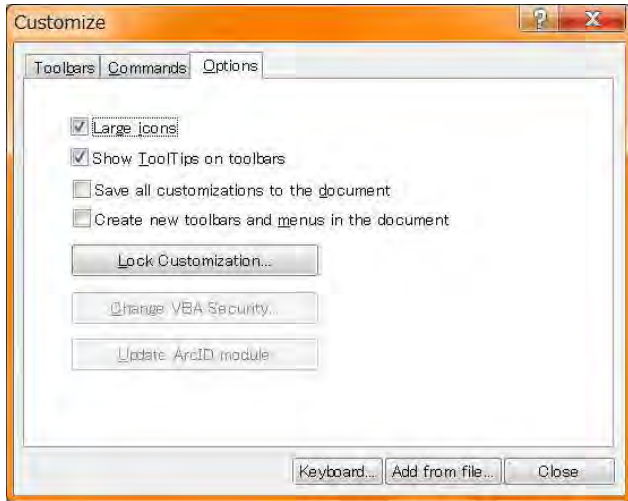
This manual recommends that the other tool bars are not selected (delete check mark).

Please do not close yet.




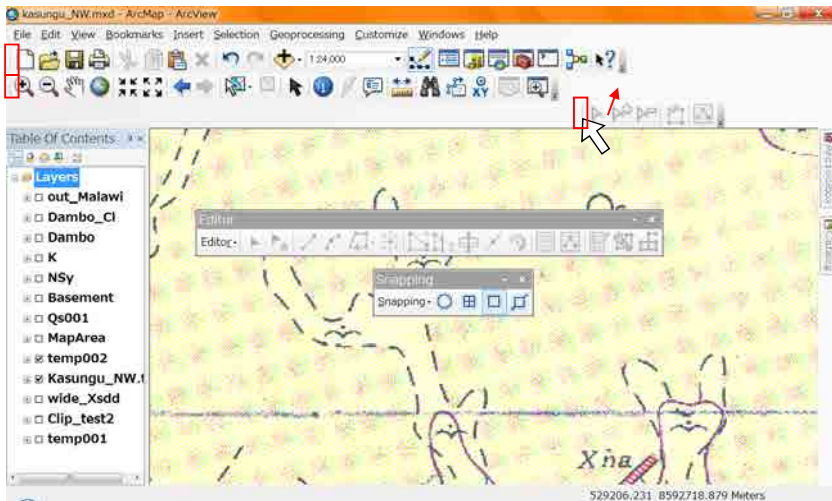
Select "Options" Tab, --- See a Figure at the top of next page ---


Add Check mark "Large icons", then "Close".

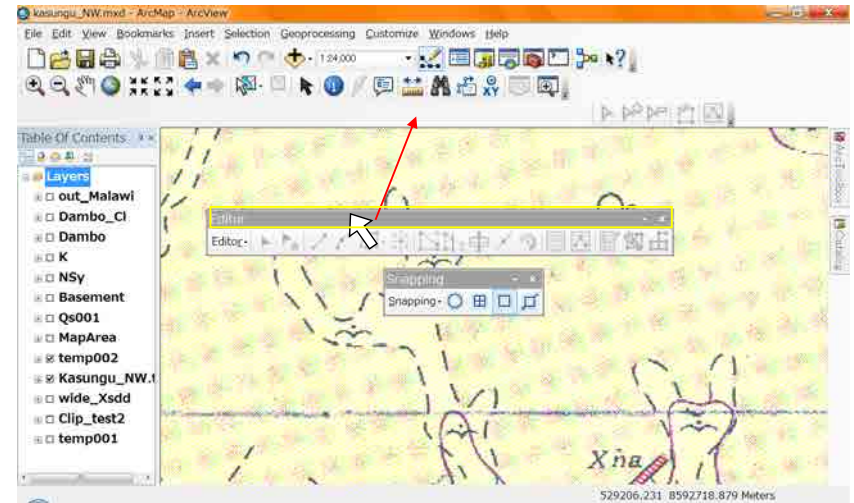


After closing, these “Tool bars” will be shown. But the position is not comfortable yet.

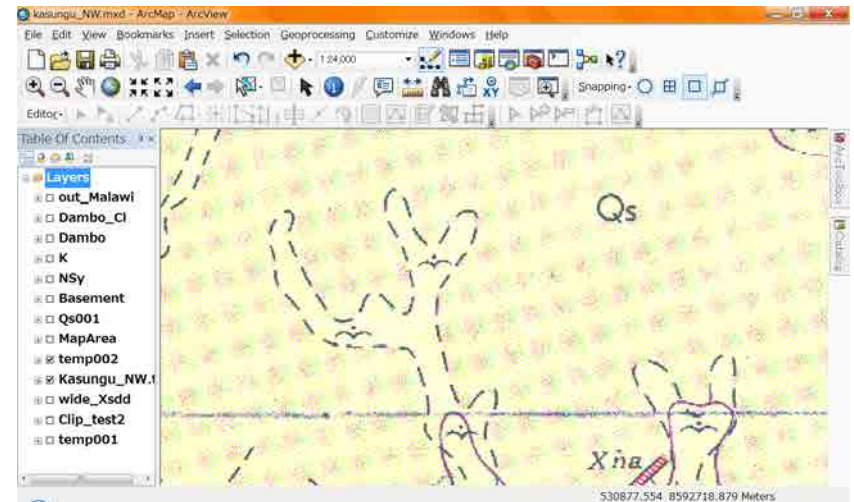
You can set all tool bars under main menu using “Drag”. If the tool bar you want to move is located under “Mein Menu”, you can “Drag” the small space at Left edge of the tool bar ( in this Figure).



If the tool bar you want to move is not located under “Mein Menu”, you can “Drag” the upper part of the tool bar ( in this Figure).

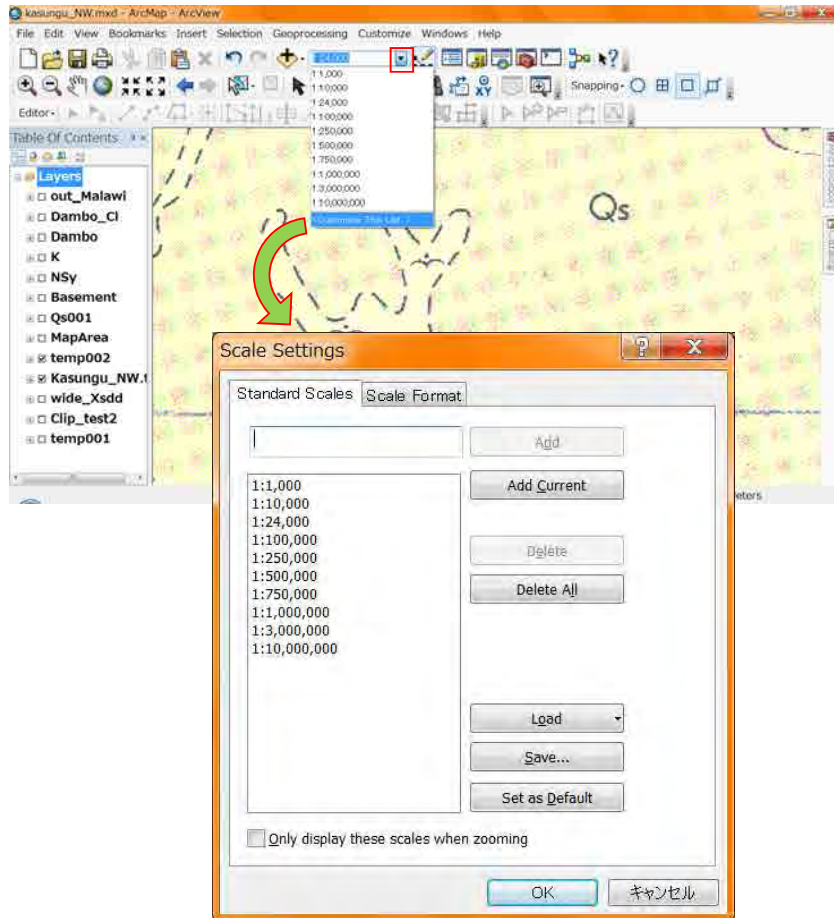


Set the tool bars similar as this figure.



0-4. Customize the Scale List

There is the “Scale Selector” in the “Standard Tool Bar”. Click the right edge of this “Scale Selector”. Then select “Customize This List”, So the “Scale Settings window” will appear.



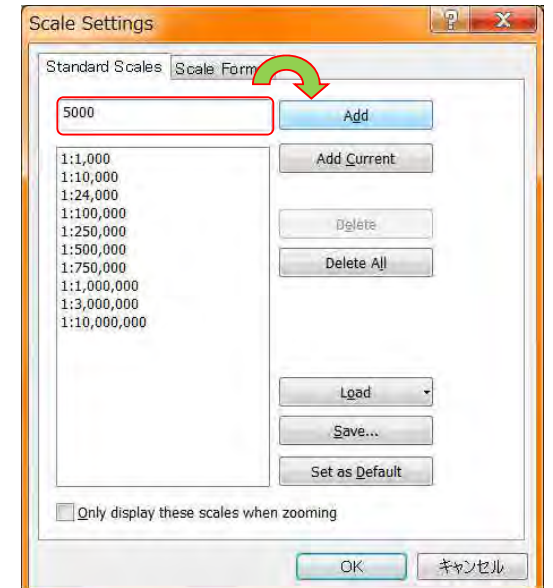
Enter 5000,

Click “Add”

Repeat 3 times

6000 and 8000

and 10,000.

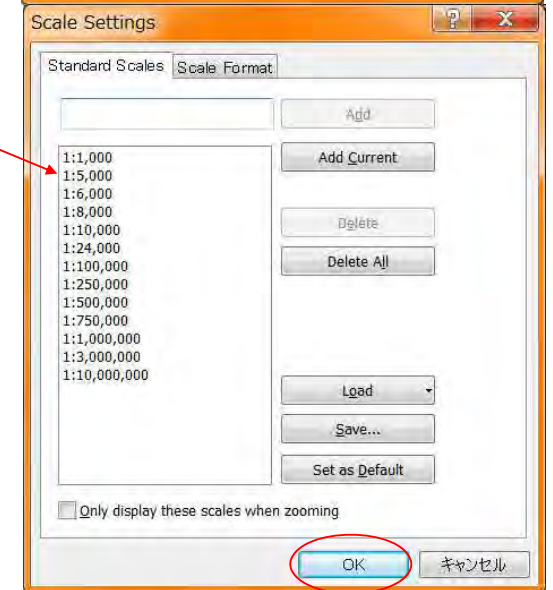


After Checking the list

has 1:5,000 and 1:6;000

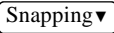
1:8,000 and 1:10,000

Click OK

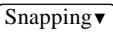


0-5. Set the snapping

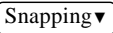
The snapping is convenient for the drawing. Use snapping from the “Snapping tool bar”.

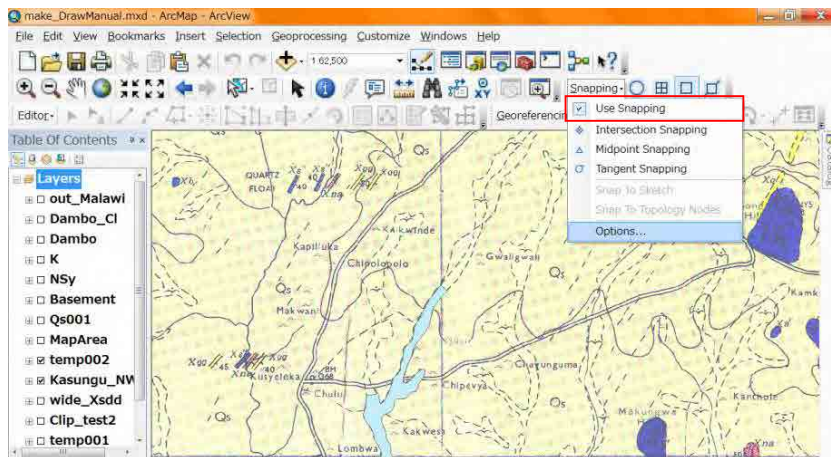
Click , if you can not see the check mark left side of “Use Snapping”,


it means that Snapping is Off. In this case, click

 ⇒ “Use Snapping” for the adding check mark. You can see the check

mark. It means that Snapping is On. When there is check mark, you do same

 ⇒ “Use Snapping”, the mark will disappear.



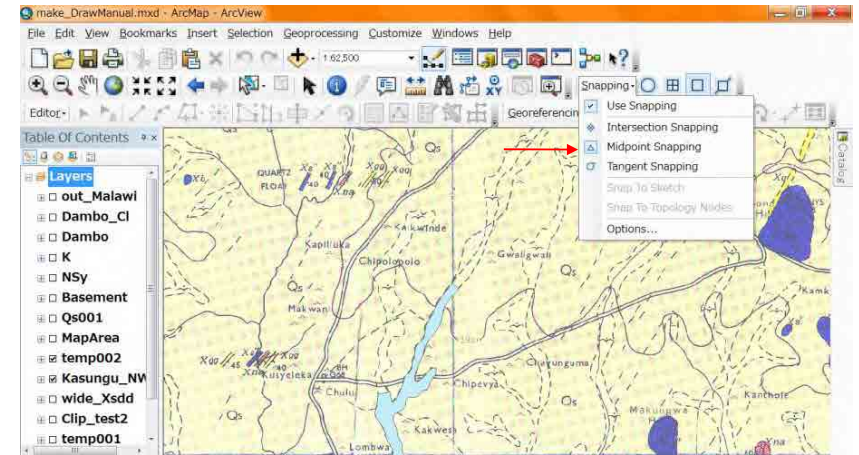
Set  “Use Snapping”. There are 3 lines under the “Use Snapping”,

“Intersection Snapping”, “Midpoint Snapping” and “Tangent Snapping”.

These are options of “Snapping”, in this manual we do not use these options.

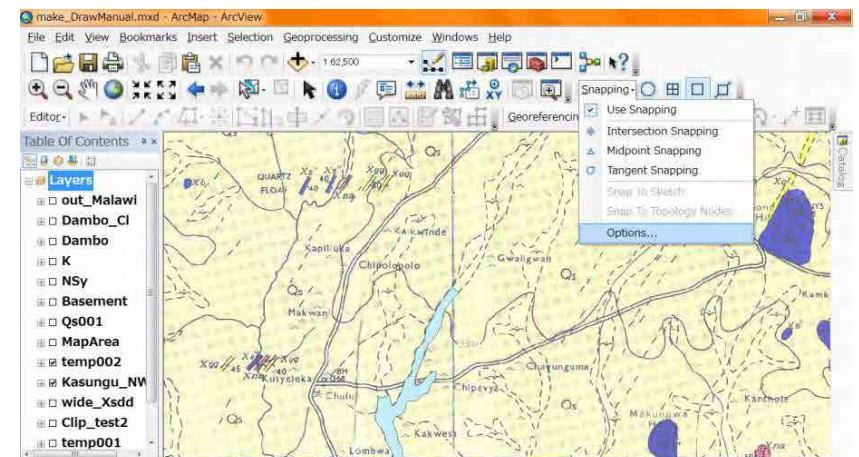
The “On” or “Off” of these options are shown by blue rectangle on the each line.

The following figure shows that “Midpoint Snapping” is “On”. In this case click “Midpoint Snapping” for “Off”.



Set 3 options [“Intersection Snapping”, “Midpoint Snapping” and “Tangent Snapping”]

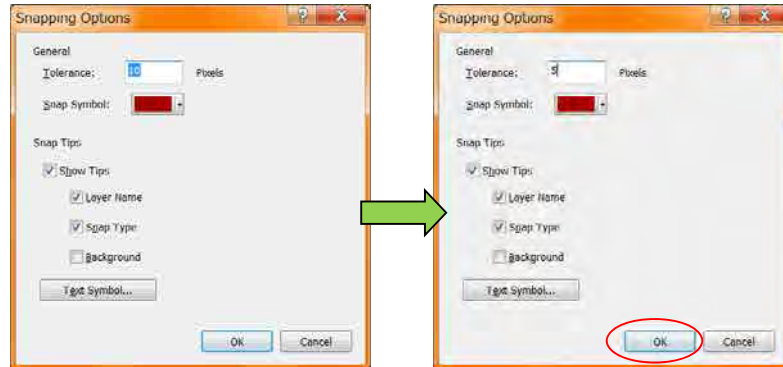
“Off” like as the following figure.



After the 3 options “Off”, set the other options. Click

Snapping ⇒ “Options...”. The “Snapping Options Window” will appear.

Set the “Tolerance” 5 pixels, and check “Snap Tips” as the right figure.



In the “Snapping Tool Bar” there are 4 more options. The blue rectangle means the option is “On” now.



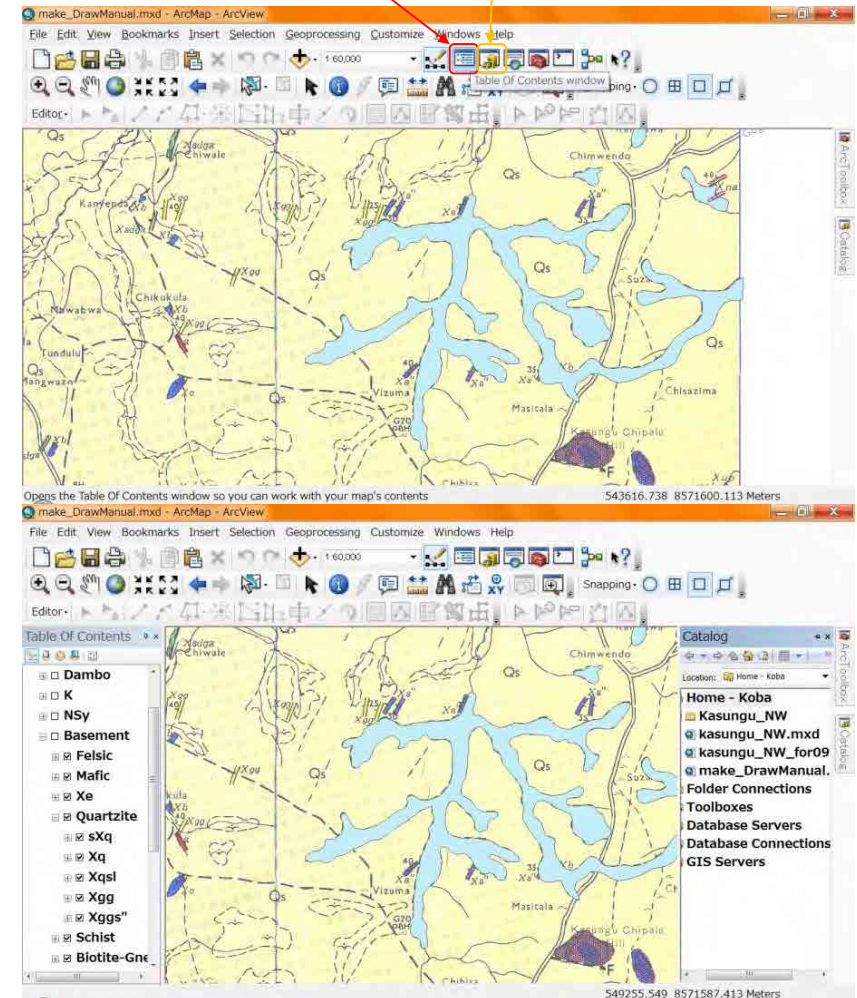
These 4 options are often used. But for the bigenners 1 option “Vertex Snapping” is enough. Set off the other 3 options using click.




0-6. Set Small Windows of ArcView




The small windows of “Table of Contents” and “Catalog” are necessary. If you can not see these windows in your ArcView window, Cilck this for “Catalog” and

for “Table of Contents” click this. After click the window will appear.




Each window has **X** sign and  sign on the top and right side of the small window.


Click **X** sign then the window will close.


 sign is “Auto Hide”. Click the sign, the sign will change  and .

 means “Always show”


 means “Hide automatically”


When the sign is , you can see the tab that is same name of the window.

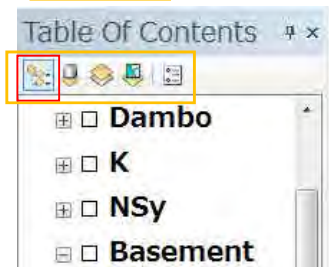
“Table of Contents” is used to use, Set to  “Always show”.

When the window is hidden by  “Hide automatically”,

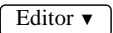
Click or mouse over the tab, the window will appear.

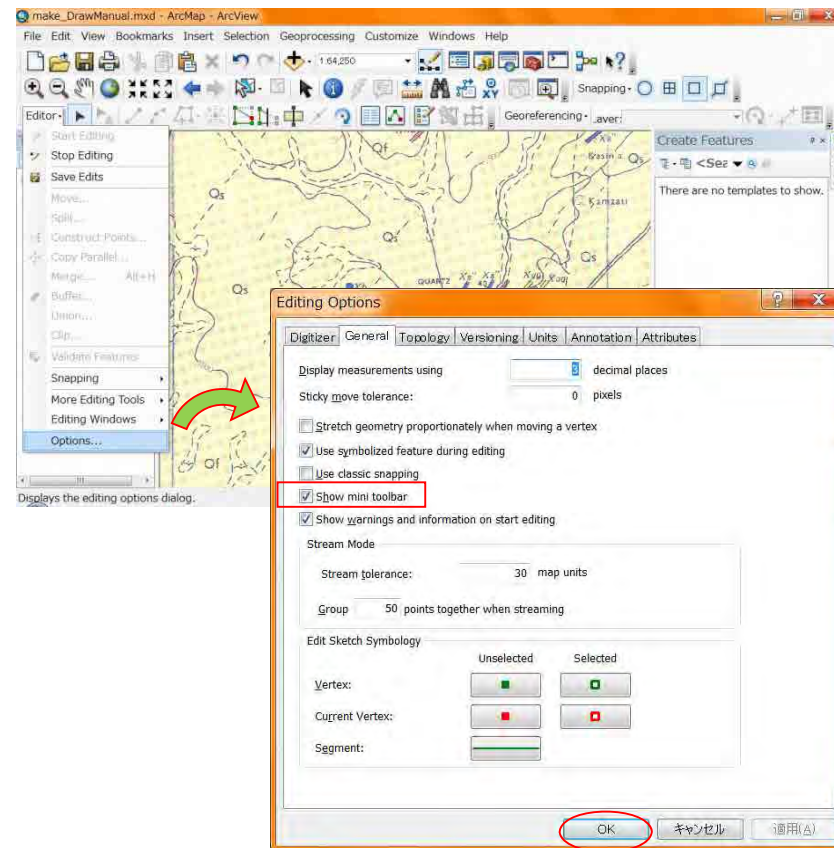
About “Table of Contents” window there are 5 modes. 

Use “List by Drawing Order” 



0-7. Set Editor Options

Click , select “Options”, “Editing Options” window will appear.



This manual recommends the followings.

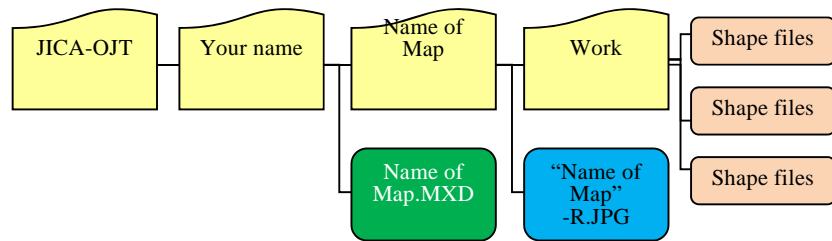
In the “General” tab remove the check mark at “Show mini toolbar”.

Click “OK”

0-8. Work folders

Finally all polygons and rectangles are joined to one layer (Shape File) with attribute data. When you draw different geology and you are the beginner, you would better to draw in the different layer (shape file). In this manual we use temp001 and temp002 layers and “Make_DrawManual.MXD” as an example.

On the actual job create and use layers named each index of geology. Before drawing you get one geologic map data (scanned and Georeferenced) and MXD file named the area of geologic map in your folder. In this manual we use “Koba” folder and “Kasung_NW” folder. On the actual job you use a folder it might be your name. There is a MXD file and a folder named geologic map.









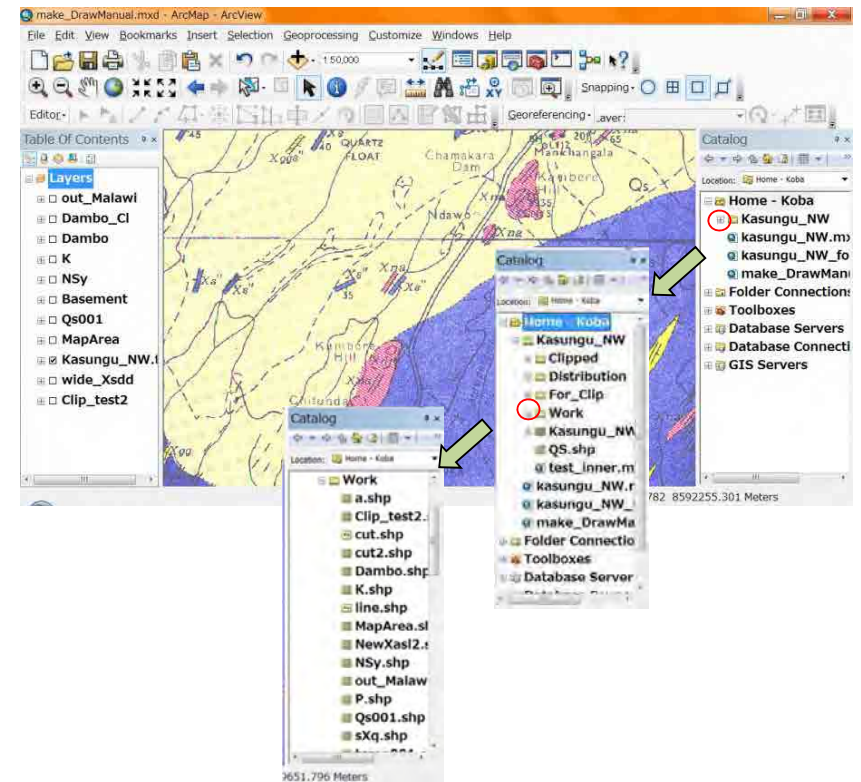
In the folder named geologic Map (Name of Map folder) there is a folder named work. Create New shape files in the Work folder.

OK. Open the MXD file named area of geologic map. Check tool bars and windows are settled. If they are not settled then start from 0-1, to 0-7, else continue (0-9).

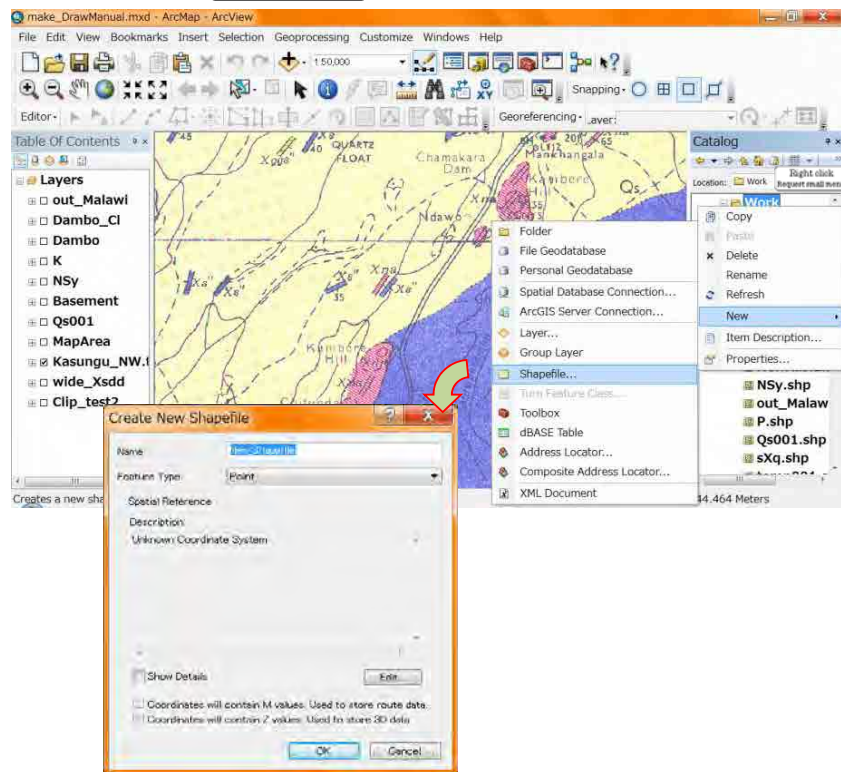
0-9. Create empty layers (Shape Files)

Check the “Catalog” small window. The upper part of the window there is a “Home-“ and your name folder. Here in after we call this folder “Home folder”.

The left side of the home folder if the sign is , you can see the child folder under the home folder. If not, there is a  on the left side of the home folder, Click the  sign. The sign will change from  to  and appear the child folder under the home folder. This action “Click  ” means open this folder. Open the folder named area of the geologic map. Open work folder.



On the Work folder, Right click, Request small menu, Select "New", Select "Shape file".

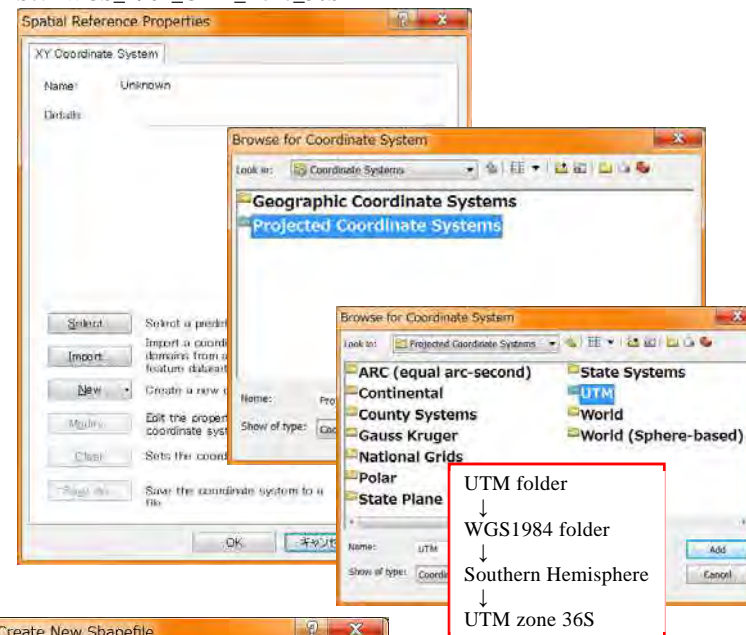


Create New Shapefile" window will appear. Enter the name as the index of each geology (Example. "Xss" or "Xa"), Select Feature Type as Polygon (for the line drawing select "Polyline"). At the beginning of the drawing, you create all empty shape files for each geology. Refer the image of geologic map.

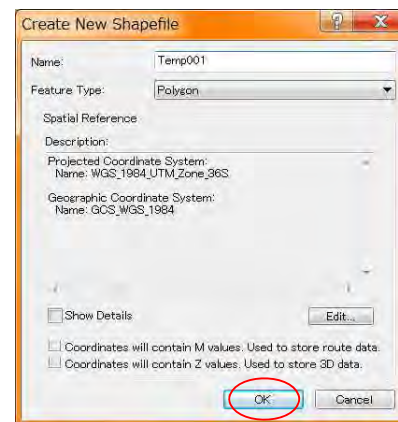
On the creating each Empty shape file, do not forget the setting of "Spatial Reference".

Click "Edit" then "Spatial Reference Properties" window will appear.

Set "WGS_1984_UTM_Zone_36S"



After setting Click "OK"



Do many times.

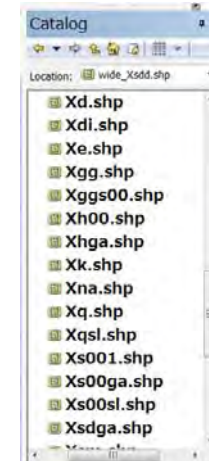
For creating

All geology.

For the shape file name you can not use ["] and space [].

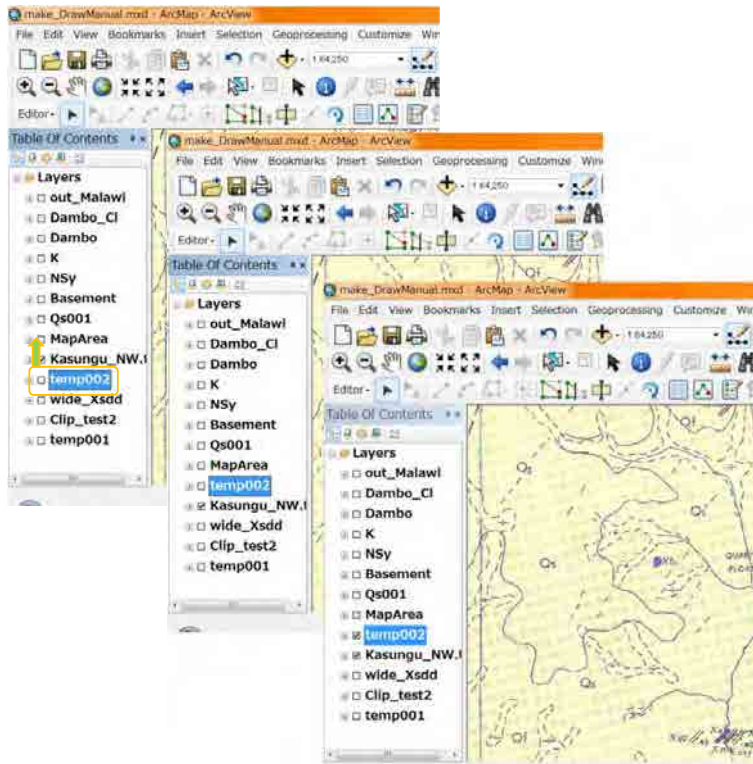
Use other characters.

Make "Polyline" shape file also. "fault" and "joint"



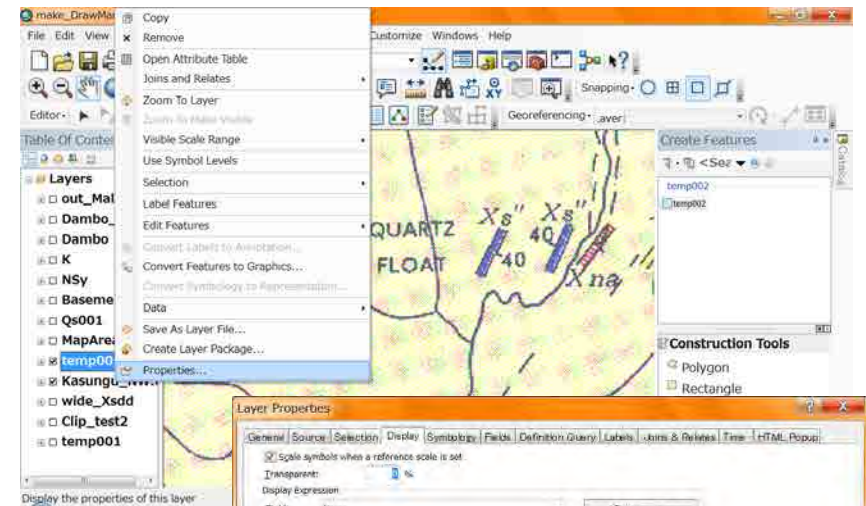
0-10. Set layers

If there is the layer (shape file) which you would like to draw, under the image layer (Geologic map scand and Georeferenced) in the “Table of Contents” window, drag the layer to the upper than the image layer.



Add the check mark on the editing layer and image only in the “Table of Contents” window. About the other layers remove the check marks. In this manual we use the layer (shap file) “temp001” and “ temp002” as a just example, you use the layer (shape file) named each index of geology.

On the name of layer, Right click, Request small menu, Select Properties...



“Layer Properties”

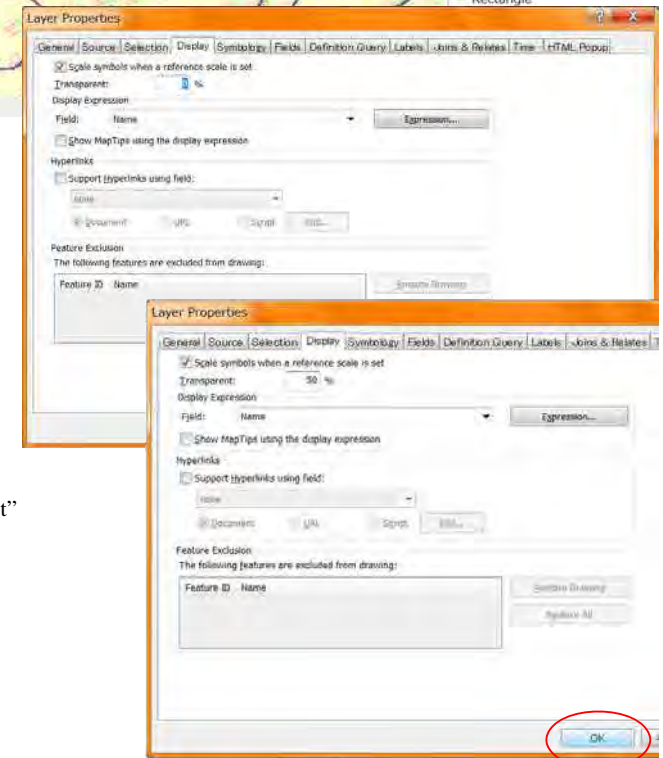
window will appear.

In the “Display”

tab, Set “Transparent”

50 %

Click “OK”

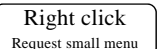




1. Start Editing

1-1. Start

You can select 1 method from following 2 methods.

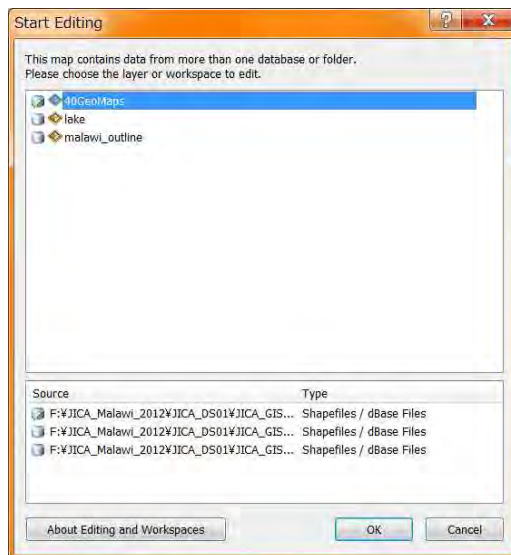
Method A: In the editor tool bar,  ⇒  Start Editing

Method B: On the name of layer,  Right click
Request small menu,  Edit Features,  Start Editing

“Start Editing window” will appear.

1-2. Start Editing window

You select the layer you will edit, click OK

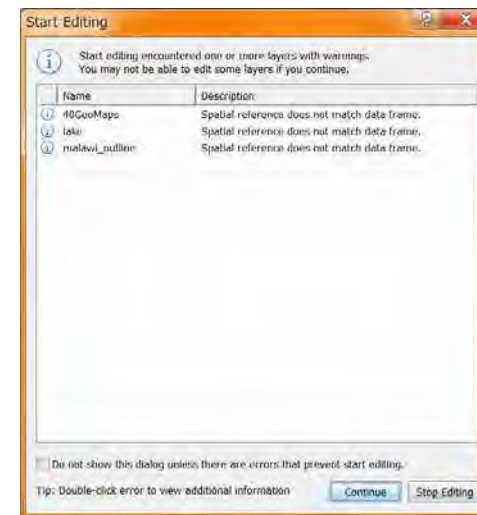


“Create Feature window” will appear.

-Memo 2- useally no need

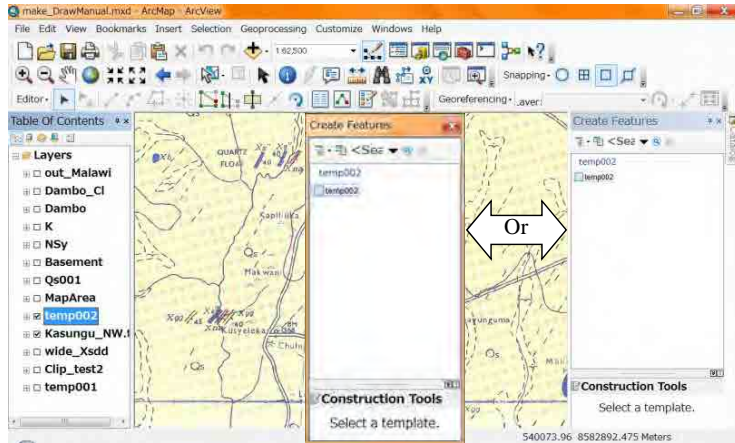
In some case, the dialog will appear. The Coordinate System may not match the Data Flame (Data View) and each Layer (Shape File). Check those Coordinate Systems.

<See Set Coordinate System>

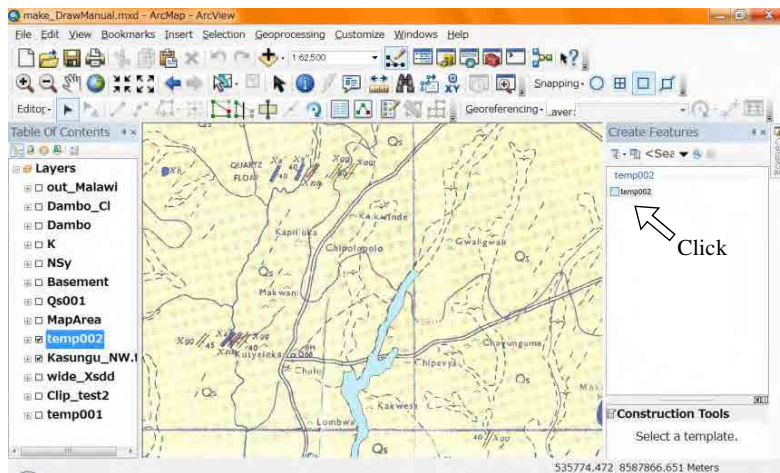


1-3. Create Feature window

The name of layer (Shape File) will appear in the upper part of “Create Feature window”.

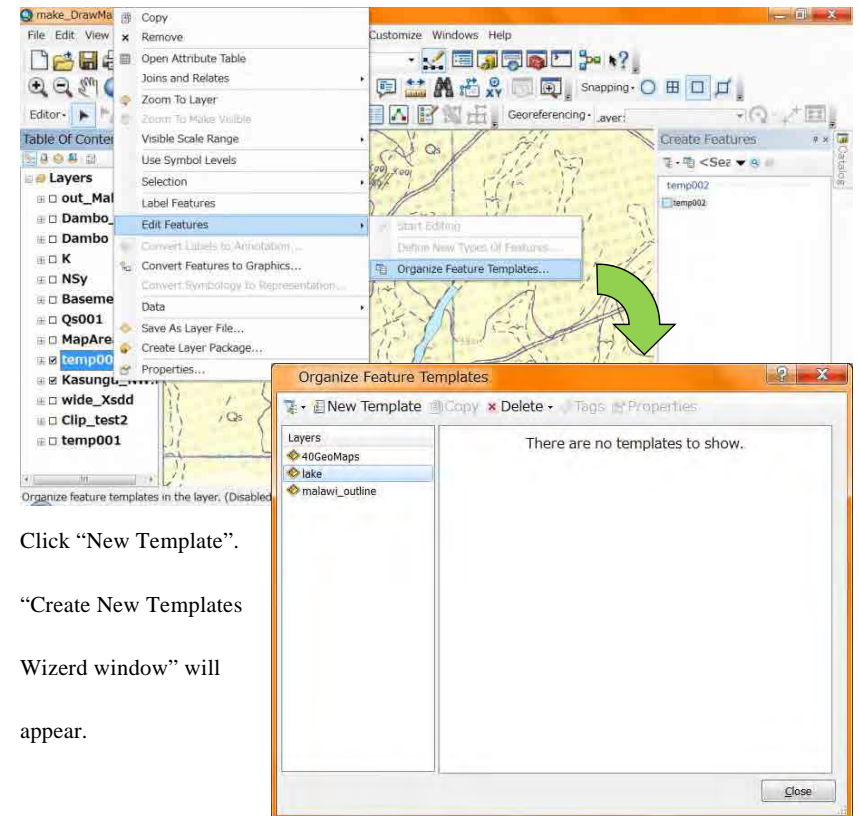


After selecting the name of layer (Shape File), some tools will appear in the lower part of “Create Feature window”. It is ready for Editing.



-Memo 3- useally no need

IF you can not see the name of layer which you would like to edit in the upper part of “Create Feature window”, the template is not ready. In this case organize feature template. On the name of layer (Shape File) Right click
Request small menu, select “Edit Features”, select “Organize Feature Templates”. “Organize Feature Templates window” will appear.

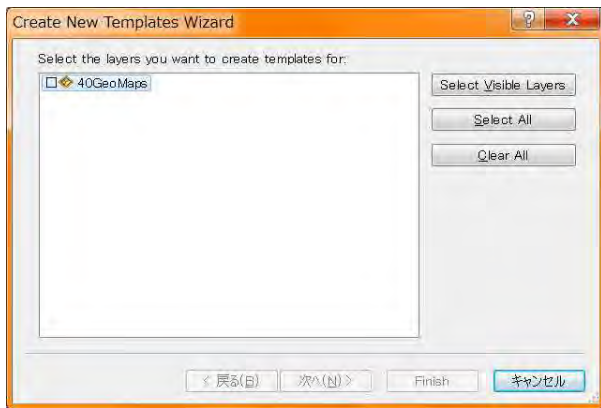


Click “New Template”.

“Create New Templates

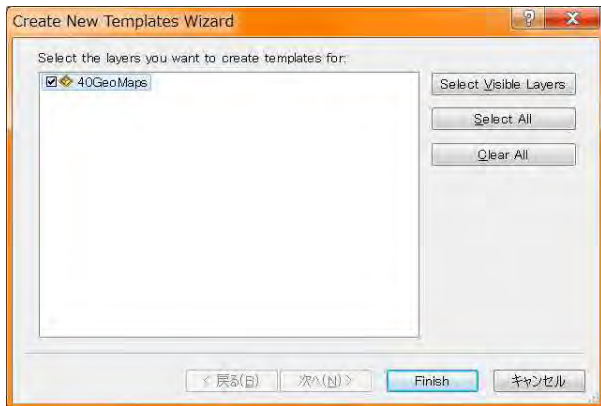
Wizerd window” will

appear.



Select (add check mark) the name of layer (Shape File).

Then click “Finish”.



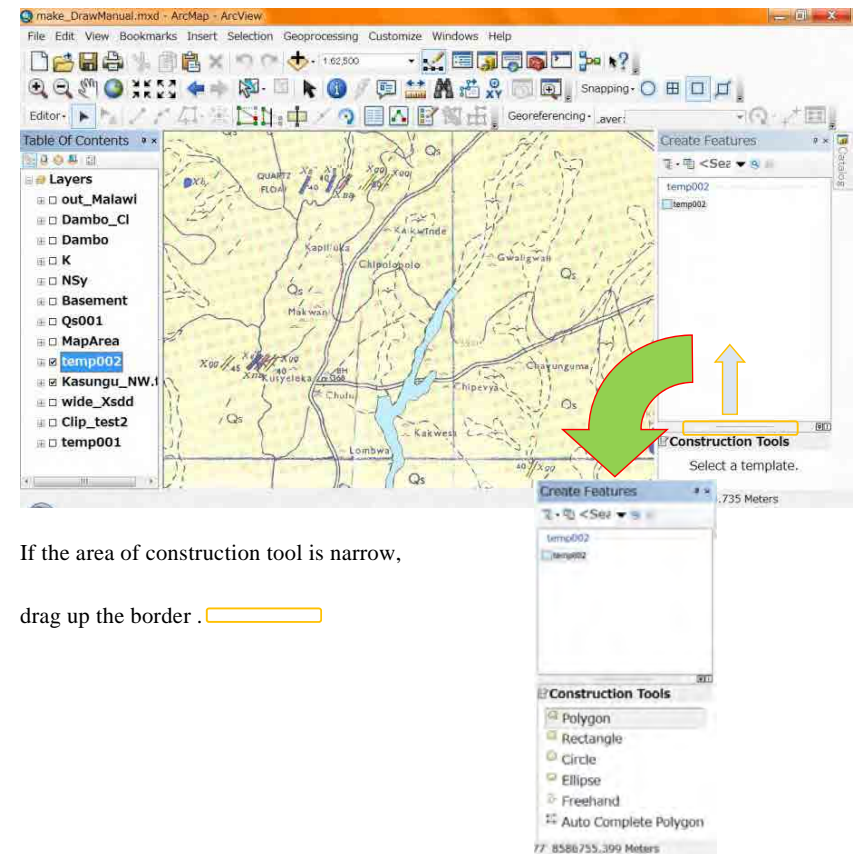
2. Draw Polygons

2-1. Start


After “Start Editing”, you can see the “Construction Tools” in the lower part of

“Create Feature window”. If not, < see 1. Start Editing> or see **Memo 4** in next

page.



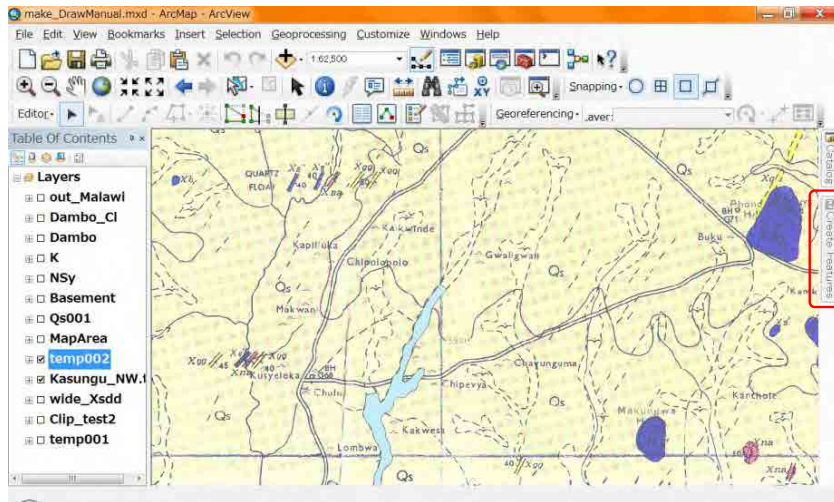
If the area of construction tool is narrow,



drag up the border . 


-Memo 4- useally no need

IF you have already done “Start Editing” and you can not see the “Create Feature window”, the window may hide. Check the right edge of ArcView window, there may a small tab. In this case, click or mouse over the “Create Features” tab.

the “Create Feature window” will appear.




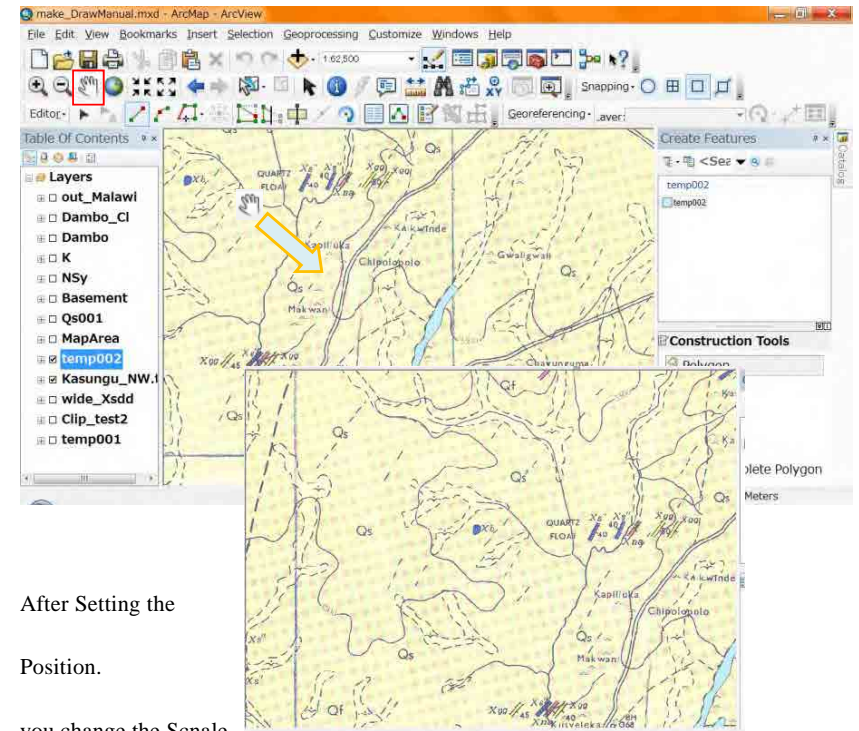
You want to be shown this window, click  . the sign will change to .

 means “Always show”.

About the detail see “0-6. Set Small Windows of ArcView”

2-2. Set the position and scale

The scale of the original geologic map is 1:100,000. “1:5,000 – 1:10,000” is good for the drawing polygons. Set the position where you draw to the center of data view using  tool .

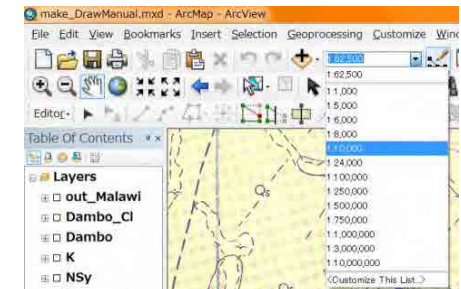


After Setting the


Position.

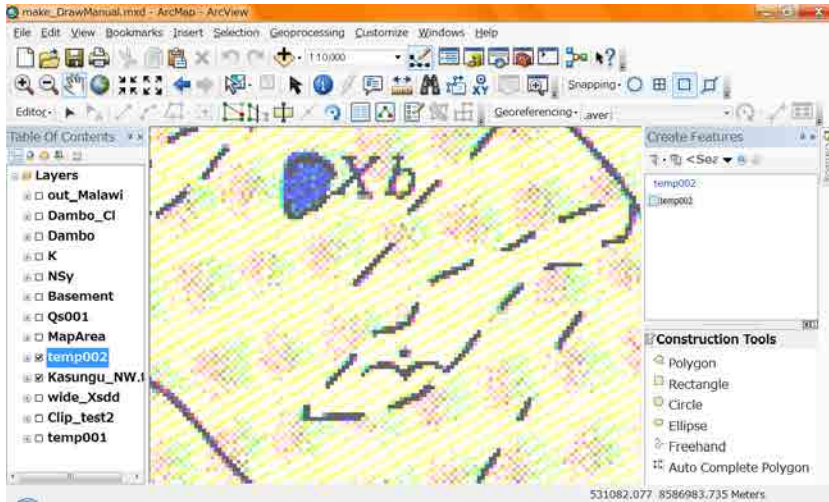
you change the Scale

to “1:10,000”.

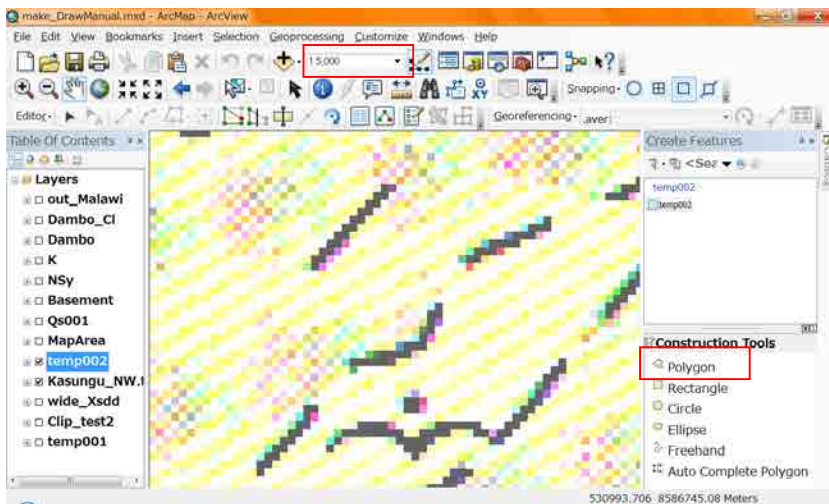


Can you see the Geologic unit which you will draw polygons? If not,

Move to good position using  tool. If you lost the present position, back to smaller scale and reset the position to the center of view.

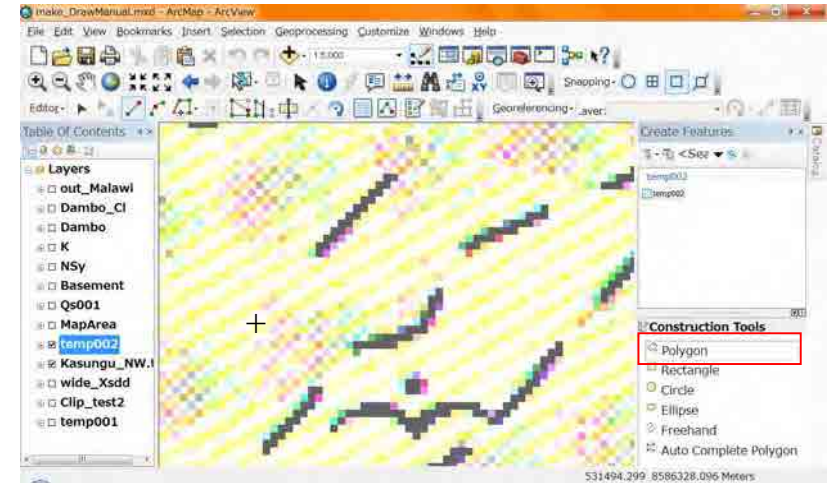


If you are the beginner, set the scale “1:5,000”.



2-3. Draw polygon

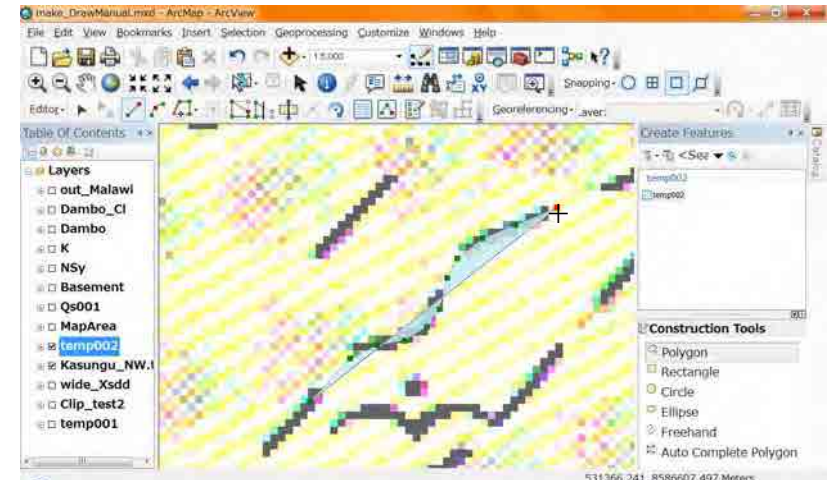
Select Polygon in the “Construction tools”. The indicator has changed to “+”.




Click on the boundary of geology 1 point by 1point like as the figure.

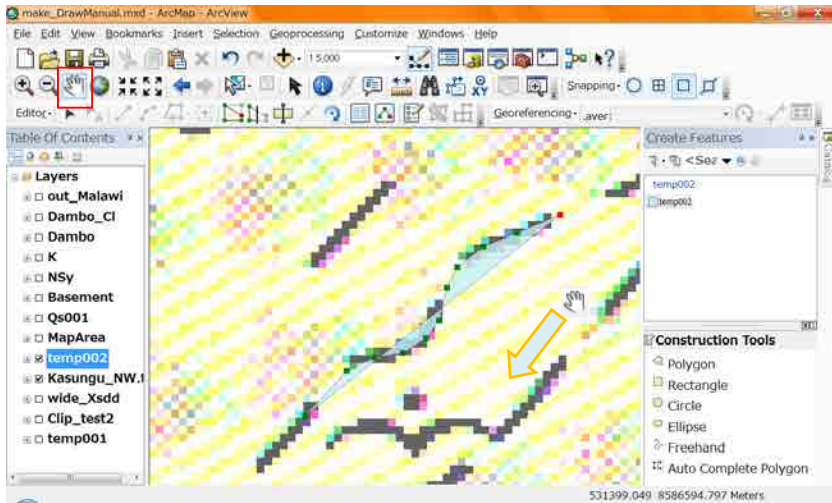
The interval of each point is important. The interval is too long the boundary will be

Zigzag. The interval is too short it spends long time for the drawing.

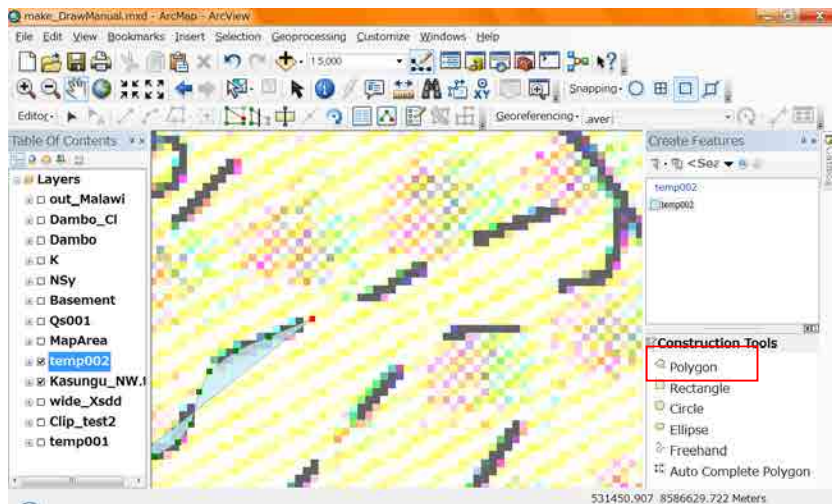


If you came to the edge of the view, Click 

Move the view. (instead of this method you may use the drag using center wheel of your mouse)



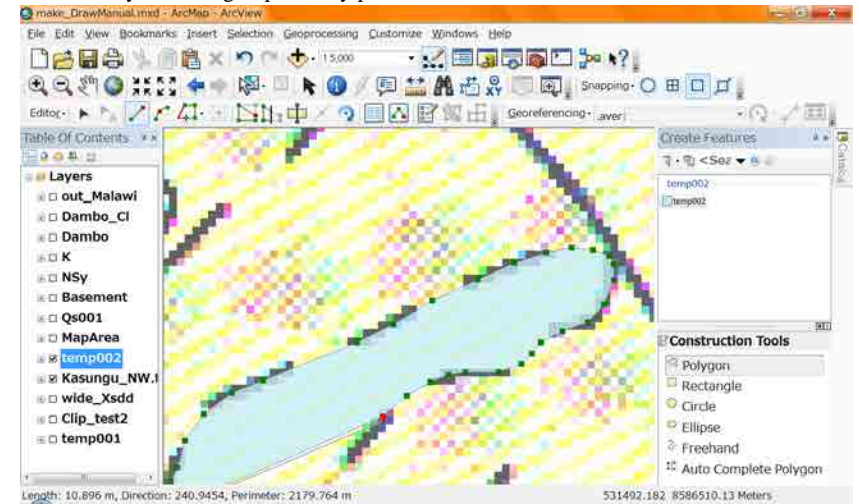
After moving the view , reselect “Polygon” tool in the “Construction tools” .



The indicator has changed to “+”.

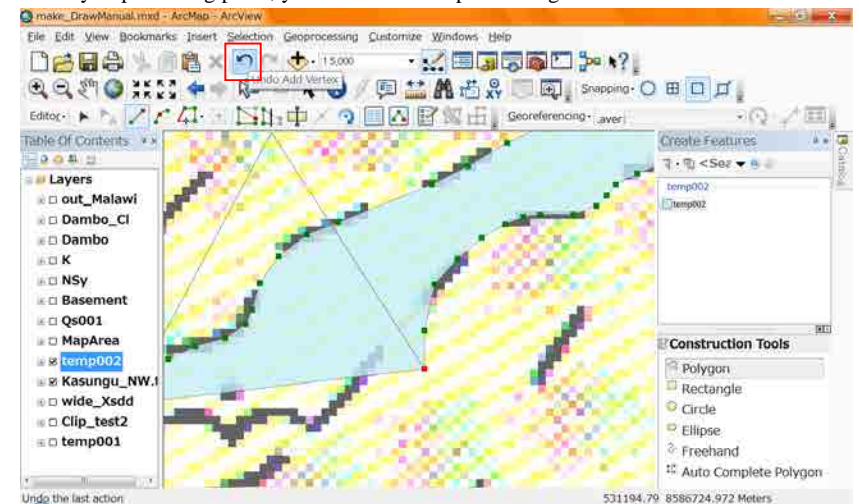
Continue the drawing.

The boundary curves tight, put many points.

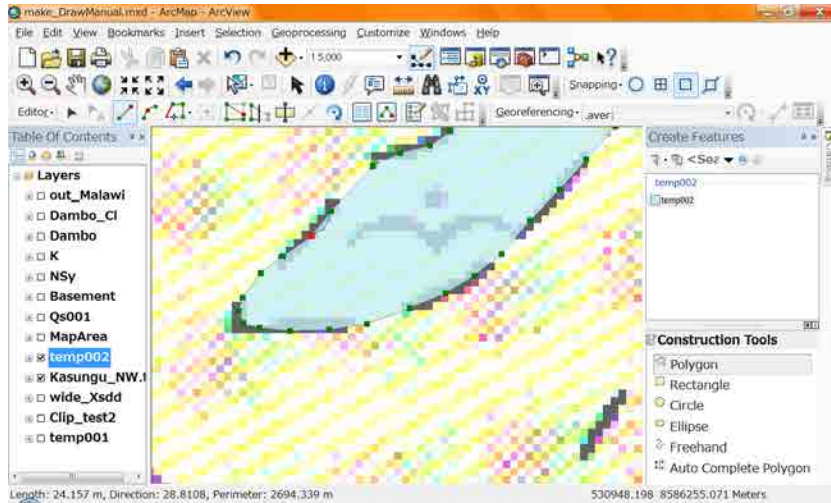


Continue the drawing. If you need moving the view, do same as before.

When you put wrong point, you can delete the point using “Undo”.

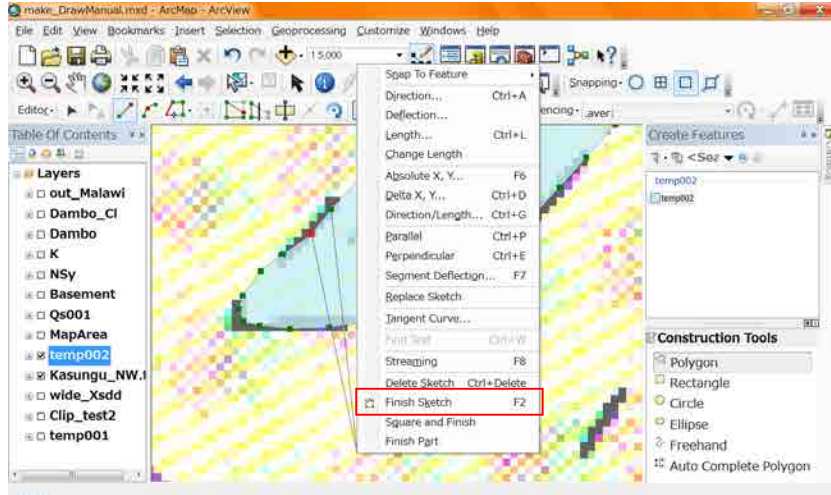


When you put enough point to draw a polygon,



Right click
Request small menu

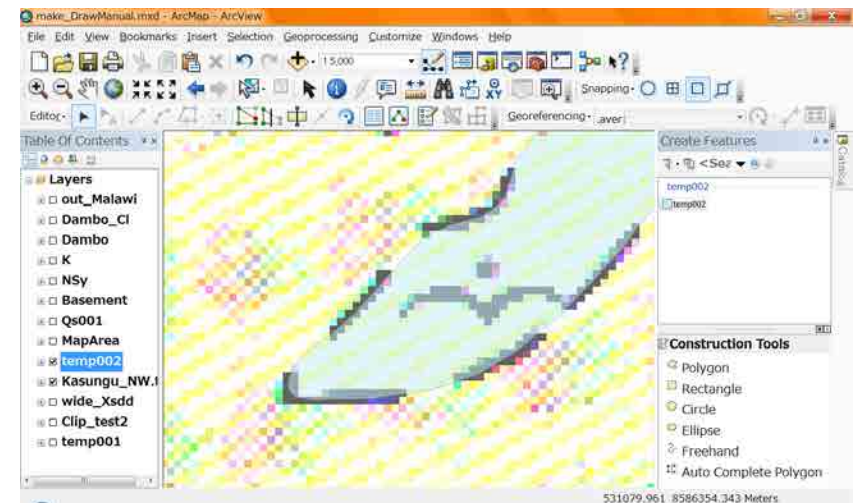
,the small menu will appear.



Select "Finish Sketch". You can finish the drawing.

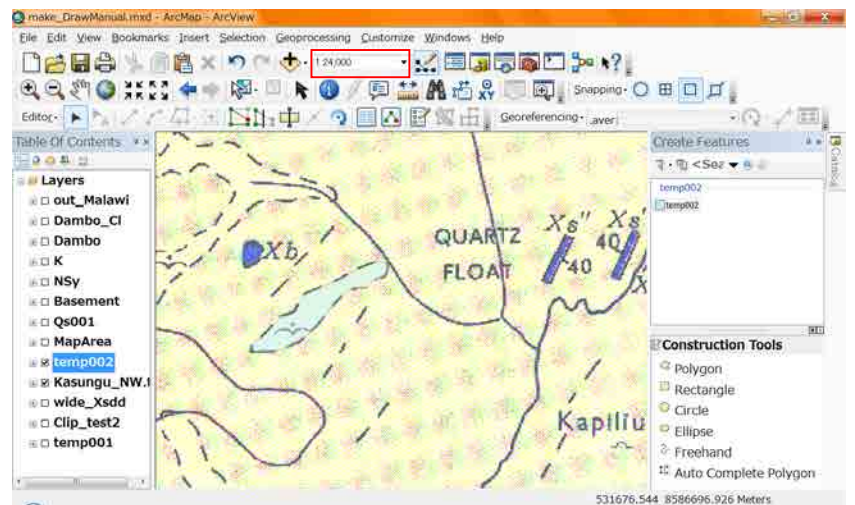
(instead of this method you may use "F2" key on your keyboard.)

Now you can see the polygon you drawn.



Change the View scale to "1:24,000".

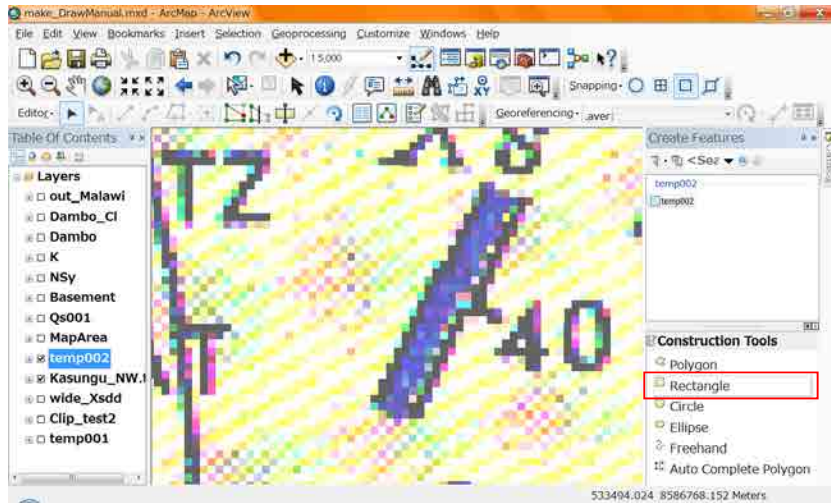
In the Smaller Scale. Check the smoothness of the polygon.



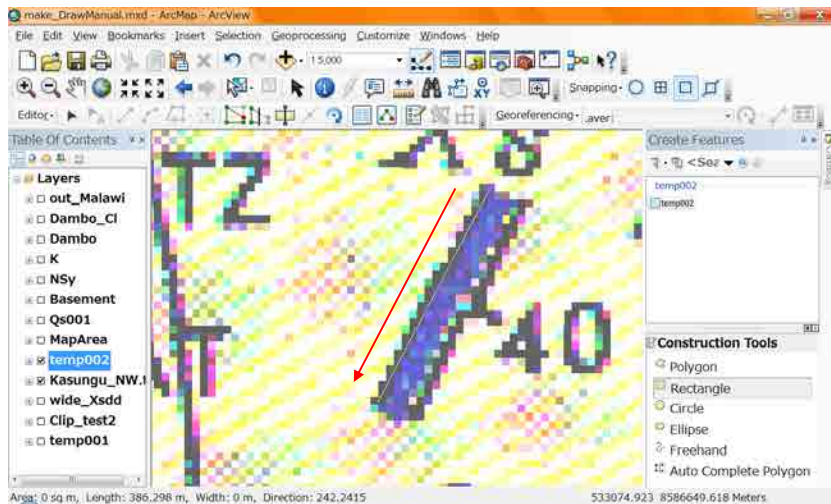
If it had enough smoothness, it is OK.

2-4. Draw Rectangle

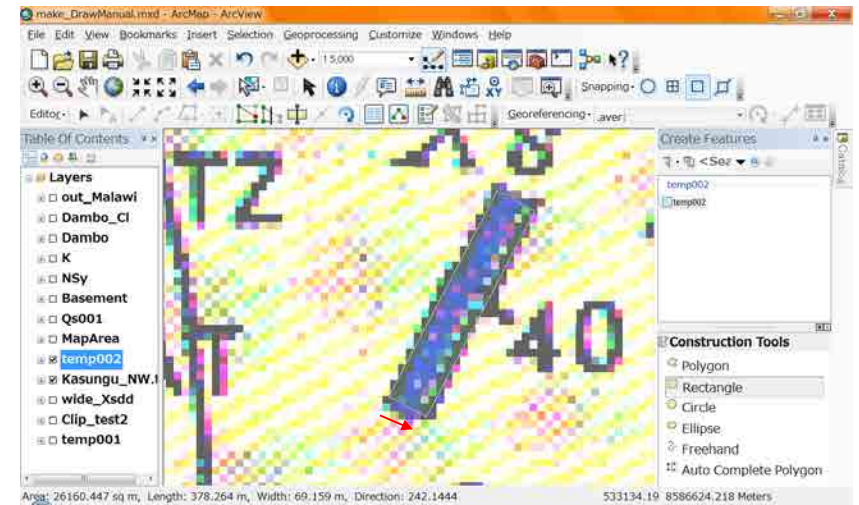
Select “Rectangle” in the “Construction Tools”. The indicator has changed to “+”.



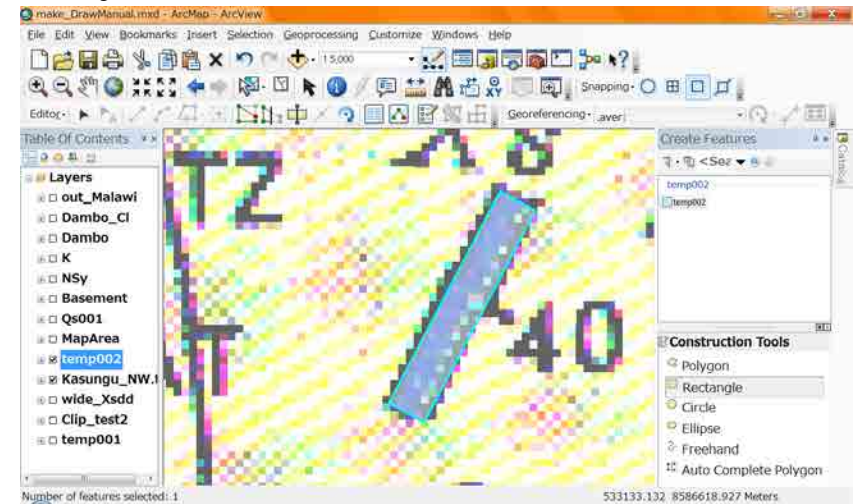
Click a corner of the rectangle you want to draw. Move along the longer side to next corner, then click the corner.



Move along the shorter side, At the corner click.

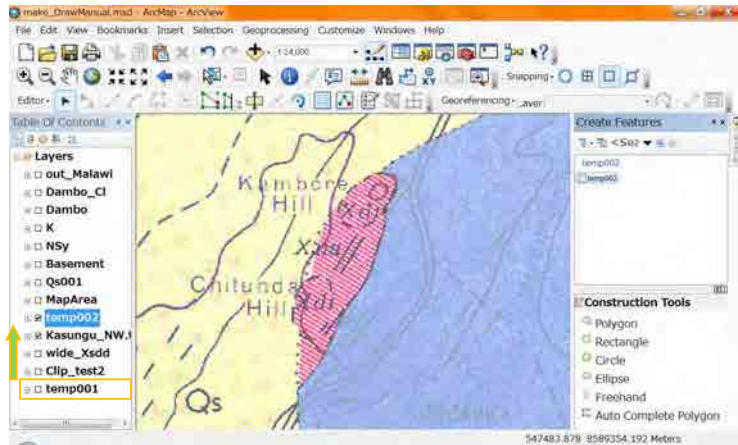


A rectangle draw.

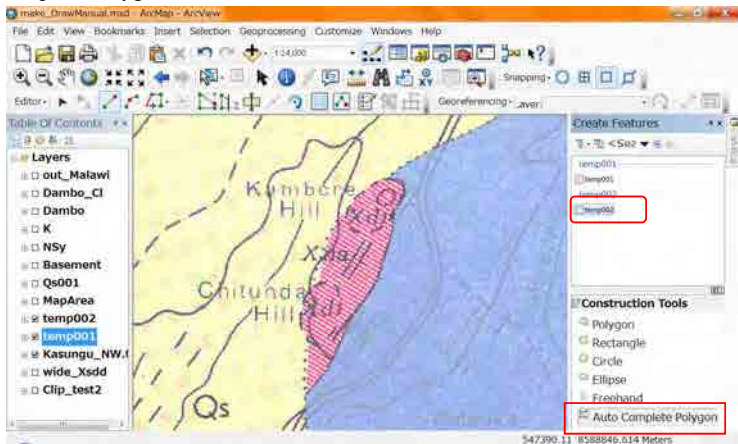


2-5. Draw adjoined Polygon

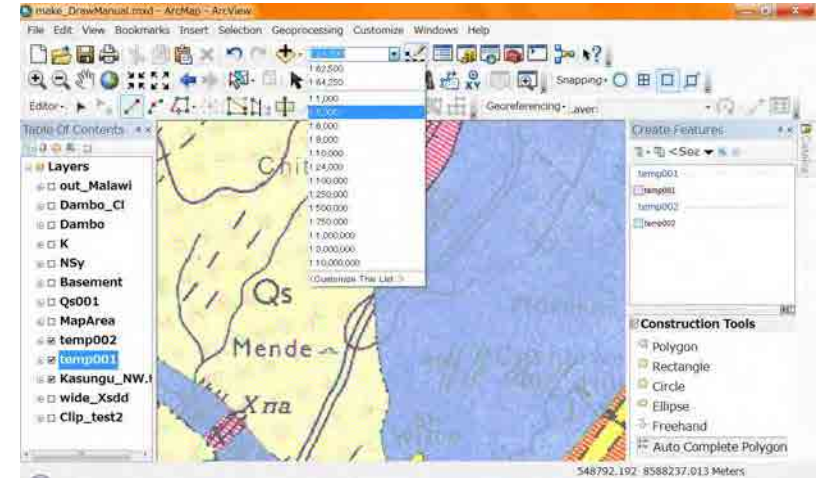
When you draw different geology and you are the beginner, you would better to draw in the different layer (shape file). Finally all polygons and rectangles are joined to one layer (Shape File) with attribute data. In this case we use temp001 layer. Darg “temp001” layer upper side of the image, and add check mark.



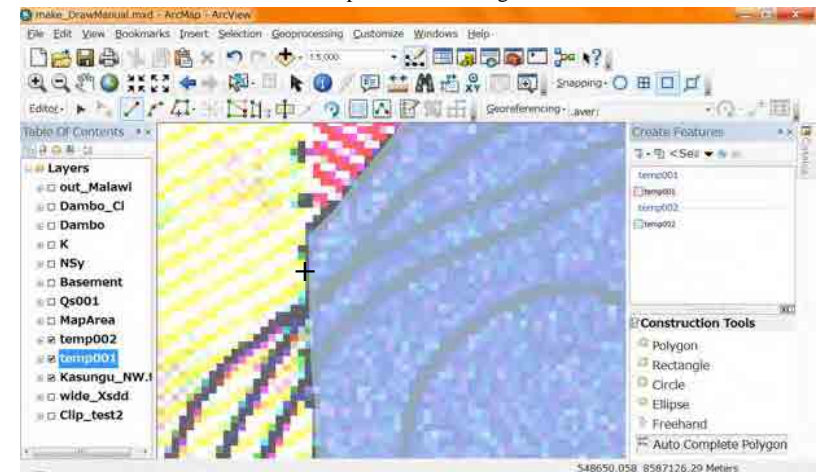
Select “temp002” in the “Create Features” window not “temp001”, and “Auto Complete Polygon” in the “Construction Tools”.




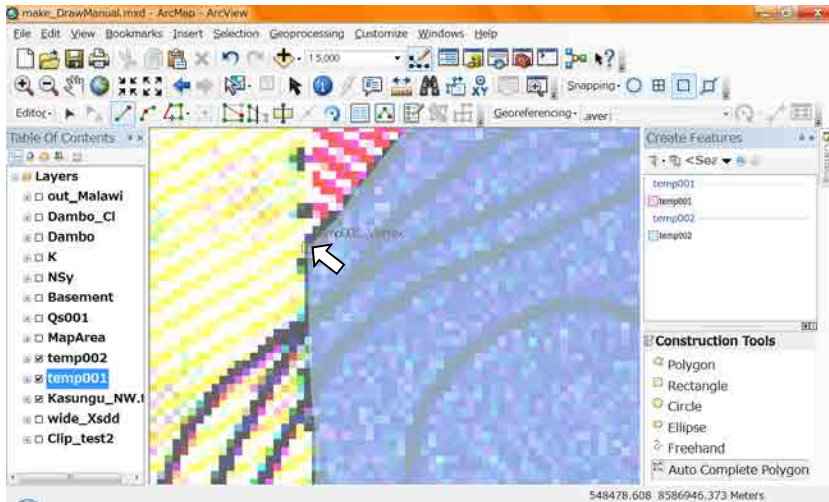
In this case you draw red colored unit as “temp 001” shape file, after drawing blue colored unit as “temp002” shape file. It is no need that you draw the boundary twice. Set the starting position to the center of the view for the drawing and set the scale to “1:5,000”.




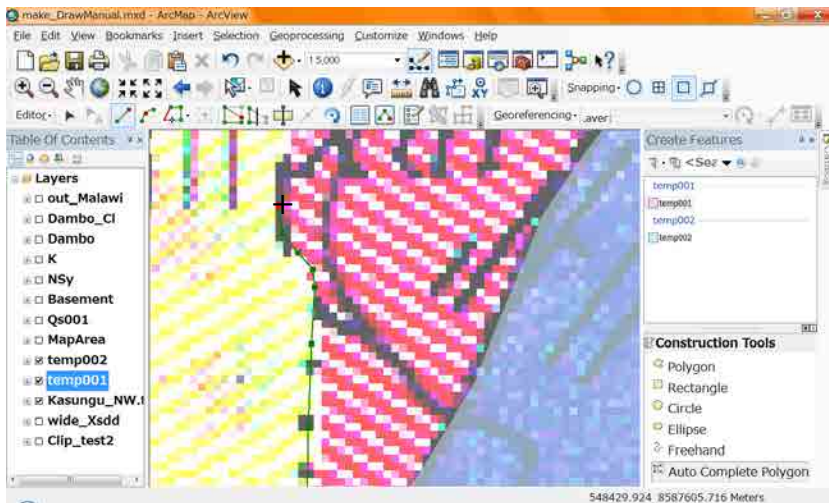
Move the “+” indicator to the near point for drawing.



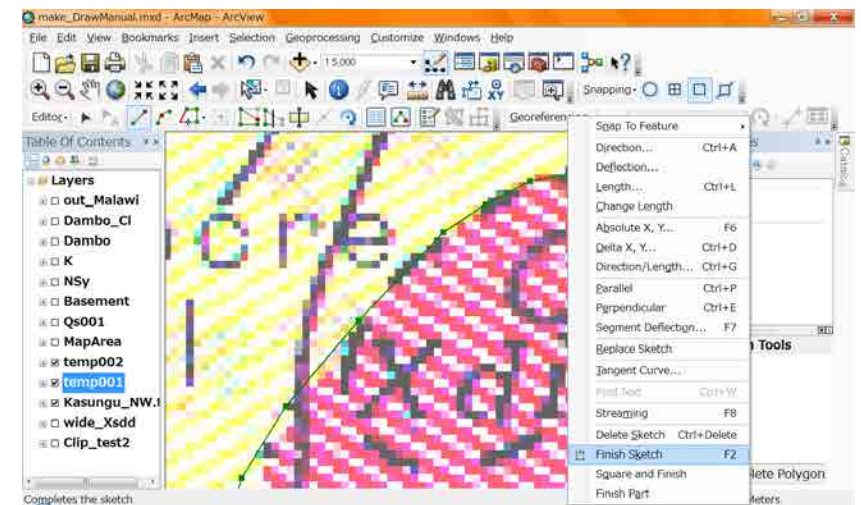
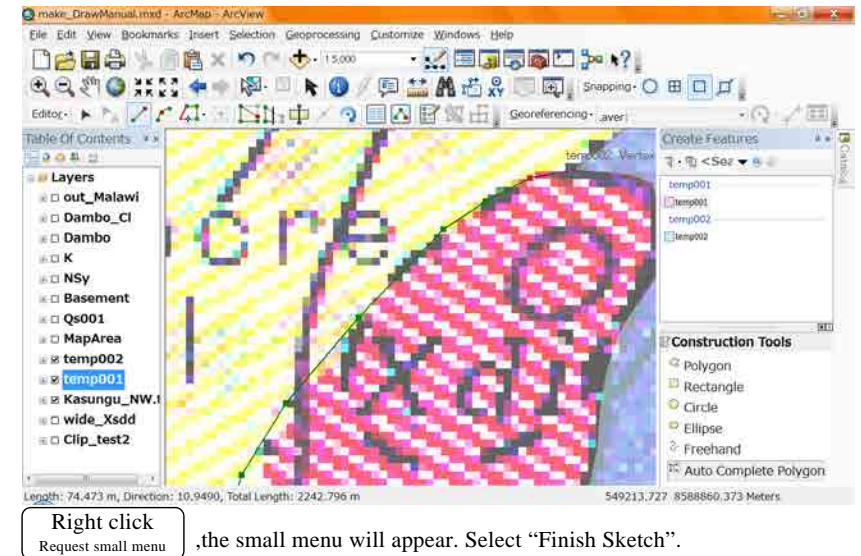
Brown rectangle appears on the point you put before (Vertex). And the arrow indicator , and the text which are Layer name and “Vertex” appears. Click the point, the starting point will be same point as the point you put before (Vertex).



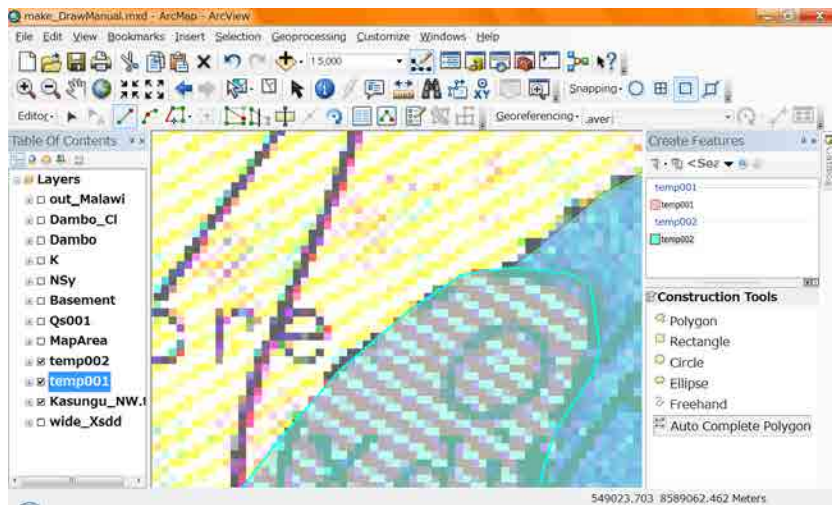
Draw like a polygon. Sometimes use  for the moving your view.



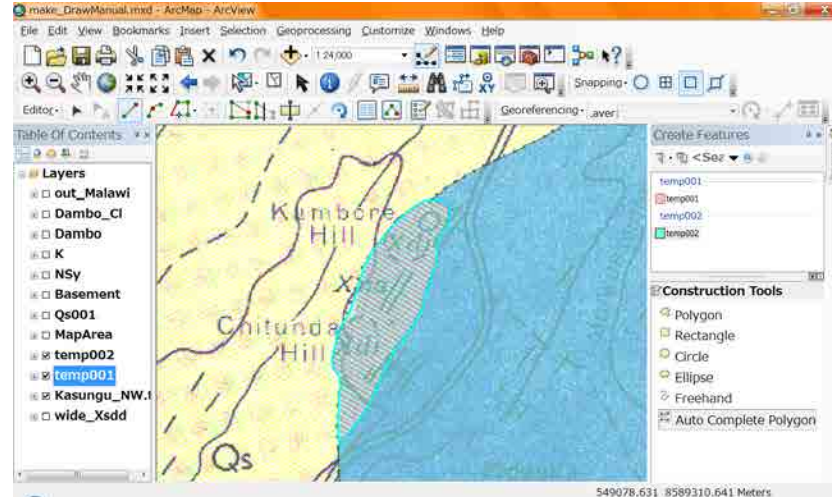
After the drawing new boundary, the indicator comes to the near ending point. The indicator will change, and brown rectangle and texts will appear like a starting point.



The polygon will appear. Check in the smaller scale (1:24,000).

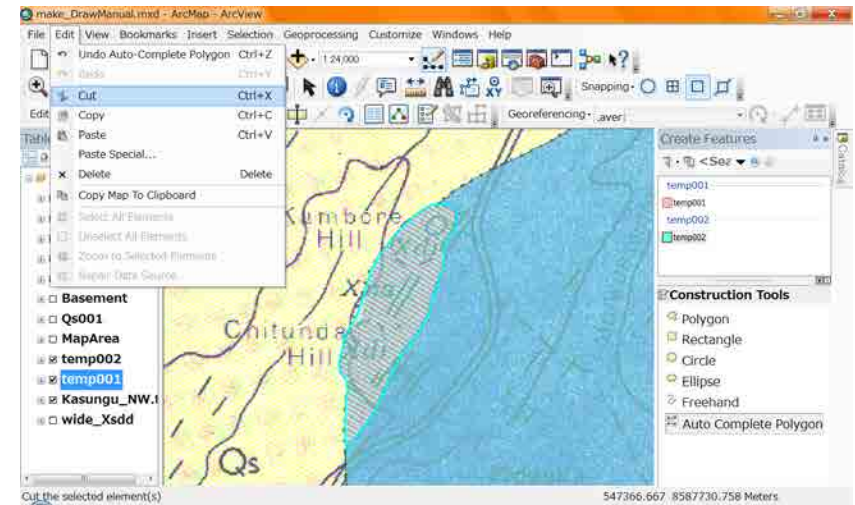


The New polygon is created beside the polygon you drawn before.

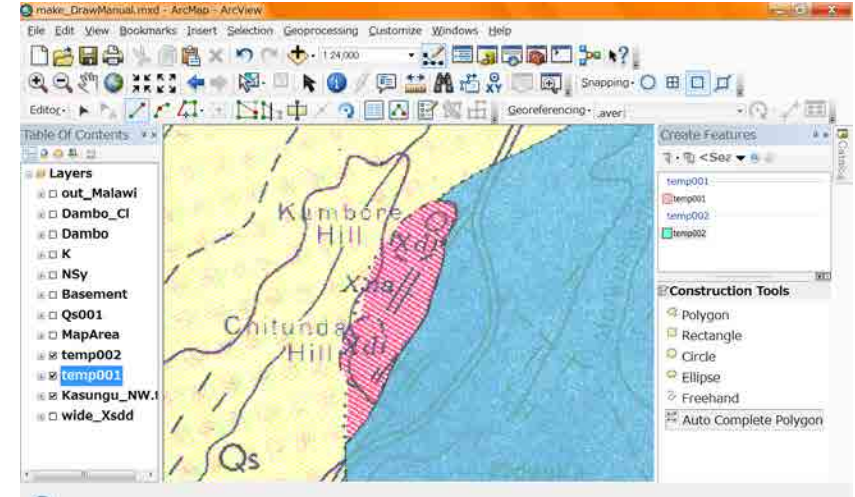


Now you have to move this created polygon from “temp002” to temp001” layer (shape file). New porygon is selected now, shown by light blue border.

From main menu bar, select “Edit”, select “Cut”. The new polygon will disappear.



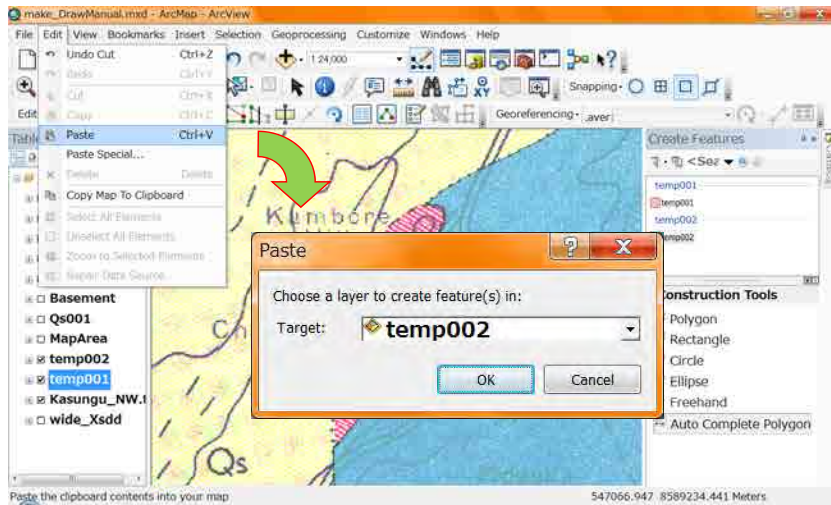
No need afraid.



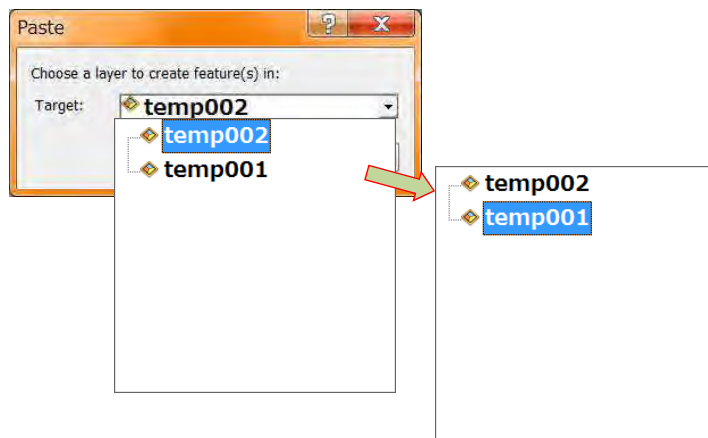
From main menu bar, select “Edit”, select “paste”.

Do not do the other action between “Cut” and “Paste”.

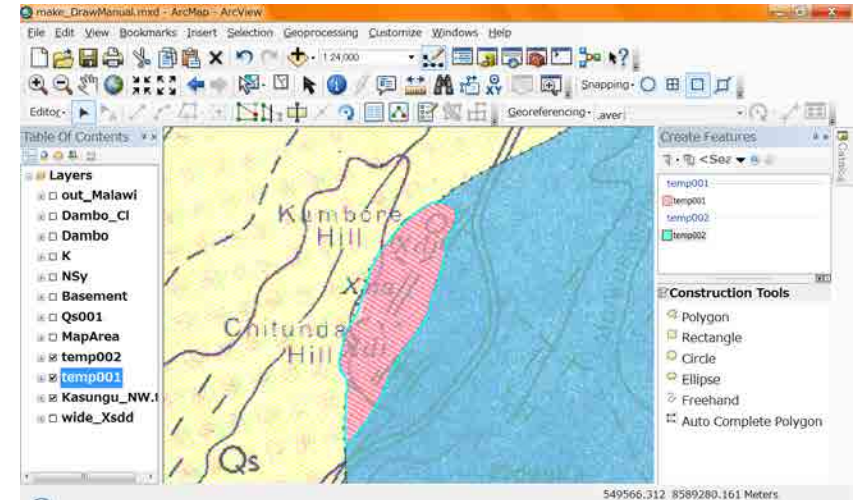
(instead of these action you may use the combination key “Ctrl+X” then “Ctrl+V”.)



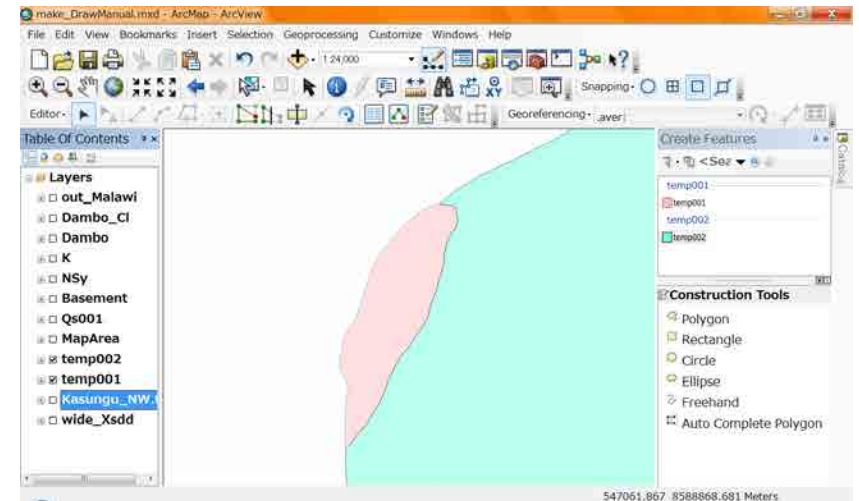
The small window “Paste” will appear. Select target to “temp001”.



The new polygon will appear as the “temp001” layer.



For the checking the result once hide the image layer, remove check mark of the image layer.

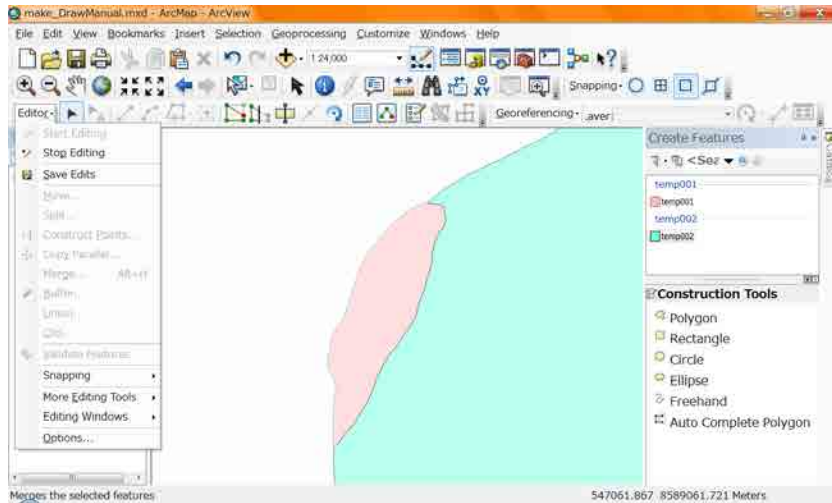


You can see the adjoined Polygon as the “temp001” layer.

2-6. Save edit

The polygons you drawn in the view is still temporal. Save to the shape file.

In the editor tool bar,   Save Edits



Before the happening (Example black-out) save the data for your data's safety.

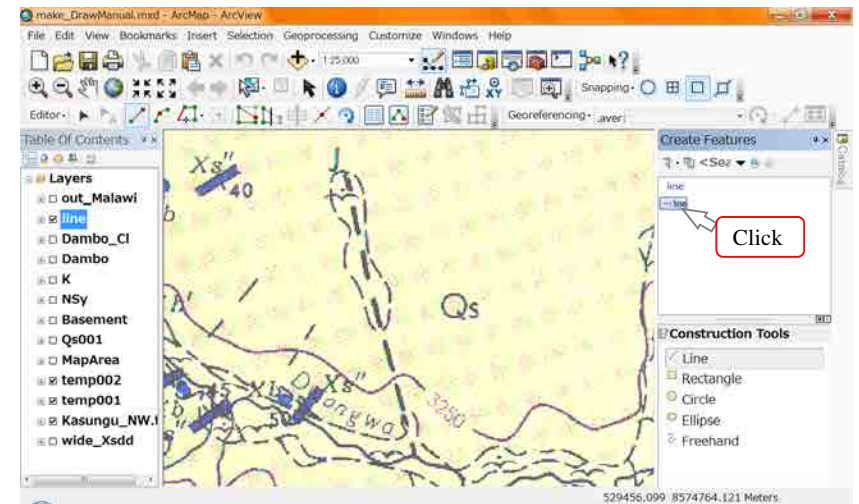
This save action is easy. Do often.

3. Draw Lines

3-1. Start

After "Start Editing", you can see the "Construction Tools" in the lower part of

"Create Feature window". If not, < see 1. Start Editing or see Memo 4 >.




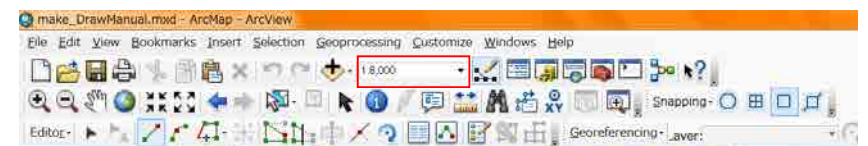
The kind of Construction tools is similar to Polygon's Tools. For the drawing line

(Fault or Joint) the "Line" tool is useful. Select "Line" tool in the "Construction

tools". The indicator has changed to "+"

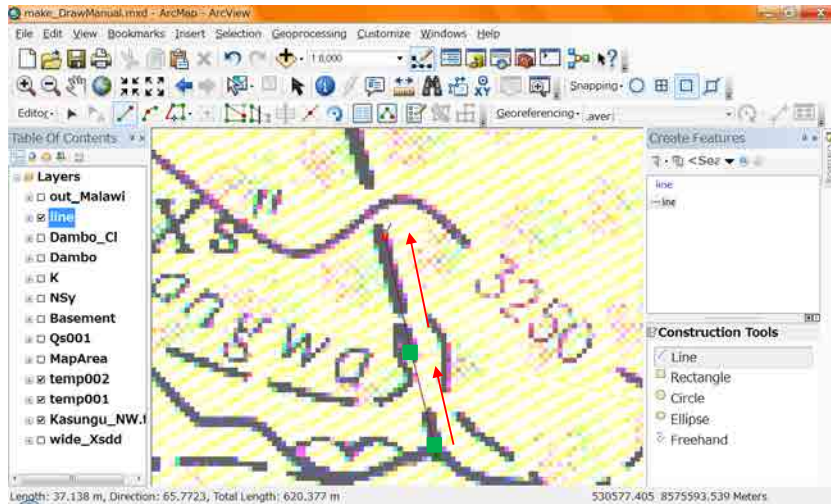
The scale of the original geologic map is 1:100,000. "1:8,000 – 1:10,000" is good for


the drawing Lines. Set the position where you draw to the center of data view using 



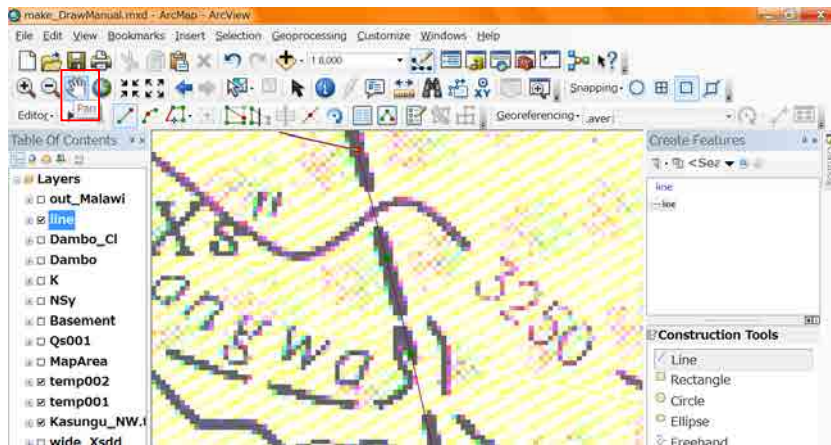
3-2. Draw

Put the point on the Fault or Joint line in the geologic map image using clicking.

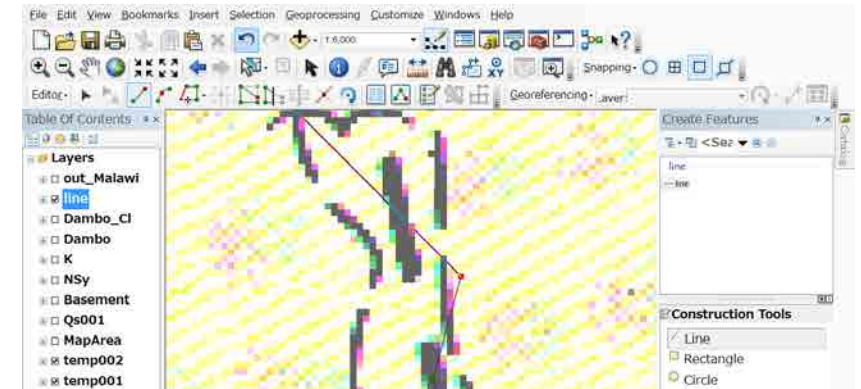


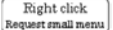
If you came to the edge of the view, Click 

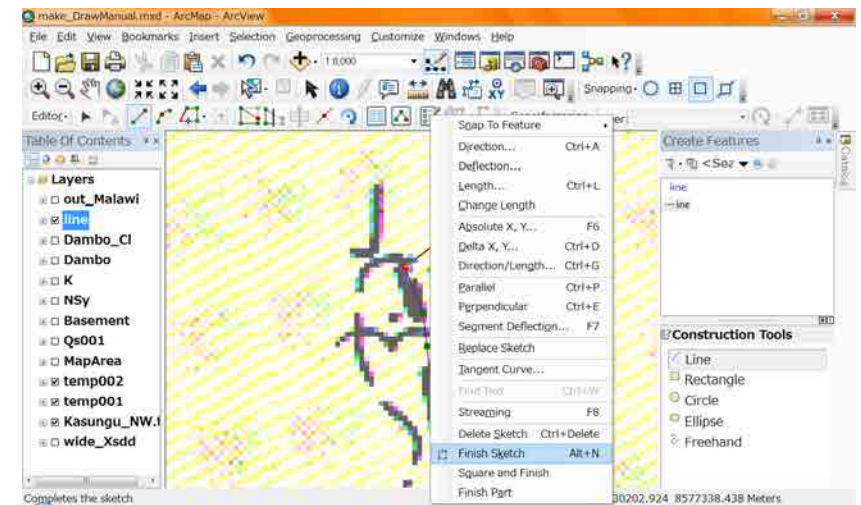
Move the view. (instead of this method you may use the drag using center wheel of your mouse)



When you put wrong point, you can delete the point using “Undo”.



When you put enough point to draw a line  ,the small menu will appear.



Select “Finish Sketch”. You can finish the drawing.

(instead of this method you may use “F2” key on your keyboard.)

In the Smaller Scale. Check the smoothness of the ine.


If it had enough smoothness, it is OK

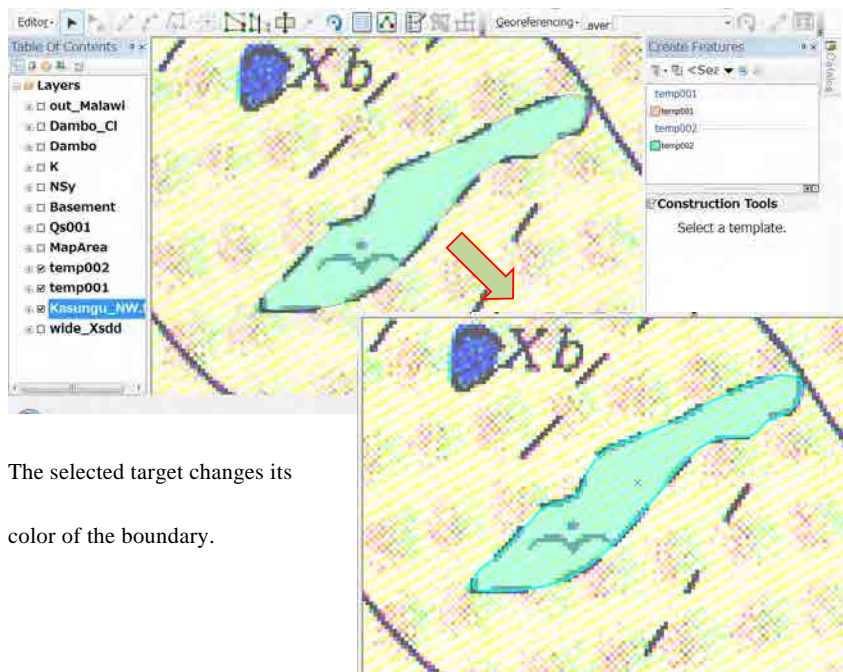
4. Edit Polygons and Lines

4-1. Select

After “Start Editing” (see 1.Start Editing), Click  in the “Editor toolbar”.

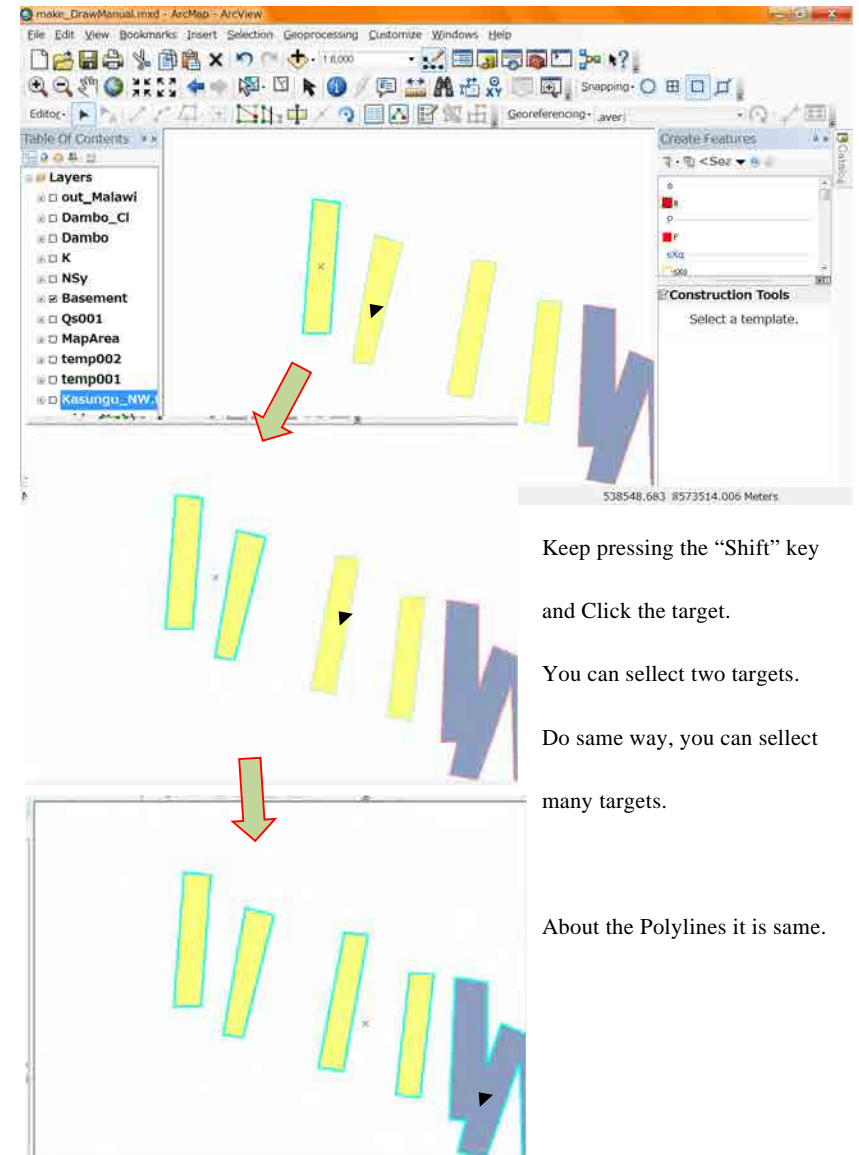


Clicking the  you will enter selection mode. This is basic for the “edit polygons and Lines”. In the selection mode you can select polygons and lines using click on the target.



The selected target changes its color of the boundary.

The plural targets are able to select using “Shift” key + Click on the target. For seeing clearly we hide the image layer. After selection one target, move on the second target.

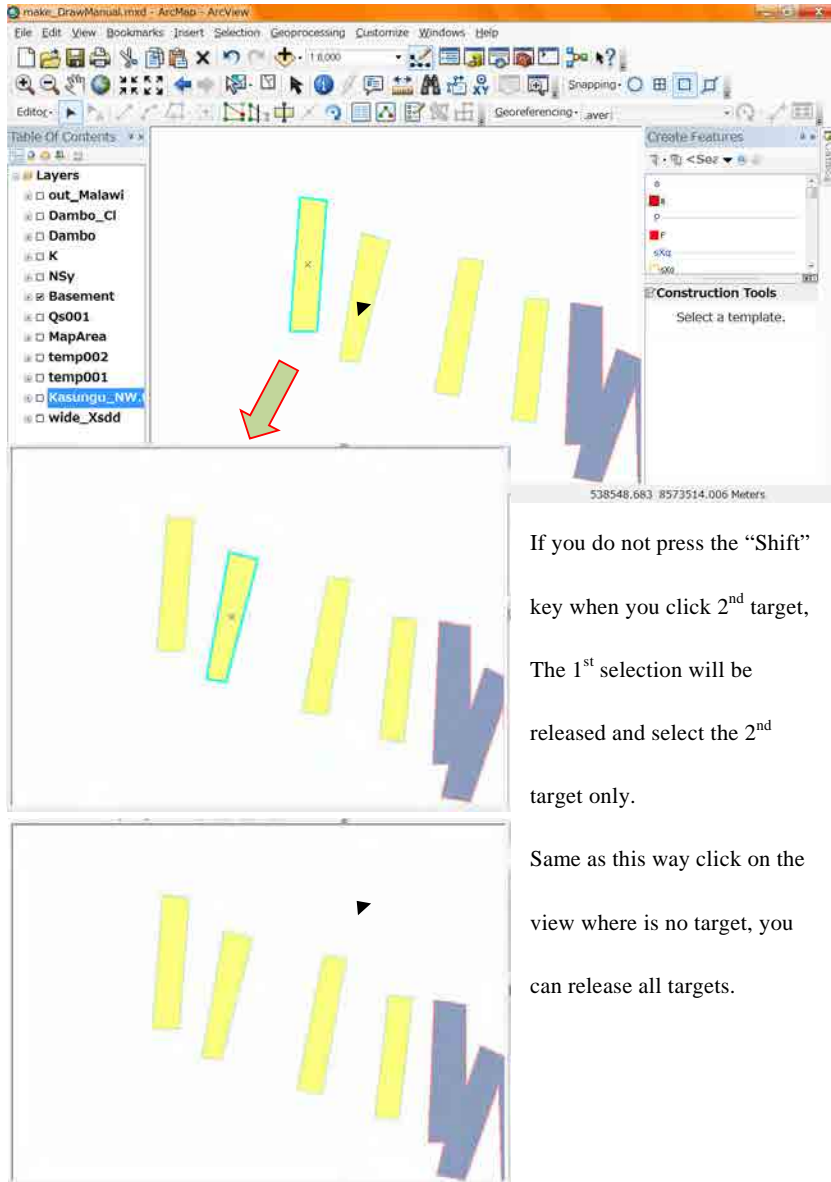


Keep pressing the “Shift” key and Click the target.

You can select two targets.

Do same way, you can select many targets.

About the Polylines it is same.

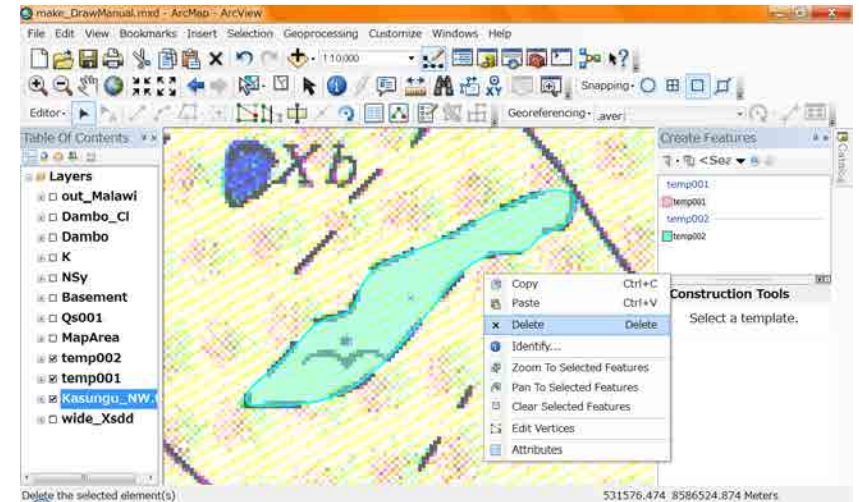


If you do not press the “Shift” key when you click 2nd target, The 1st selection will be released and select the 2nd target only.

Same as this way click on the view where is no target, you can release all targets.

4-2. Delete

After the selection Right click
Request small menu on the view, select “Delete”. You can delete the selected target. (instead of this method you can use the “Del” key on your keyboard or from “Main menu”, select “Edit”, select “Delete”).

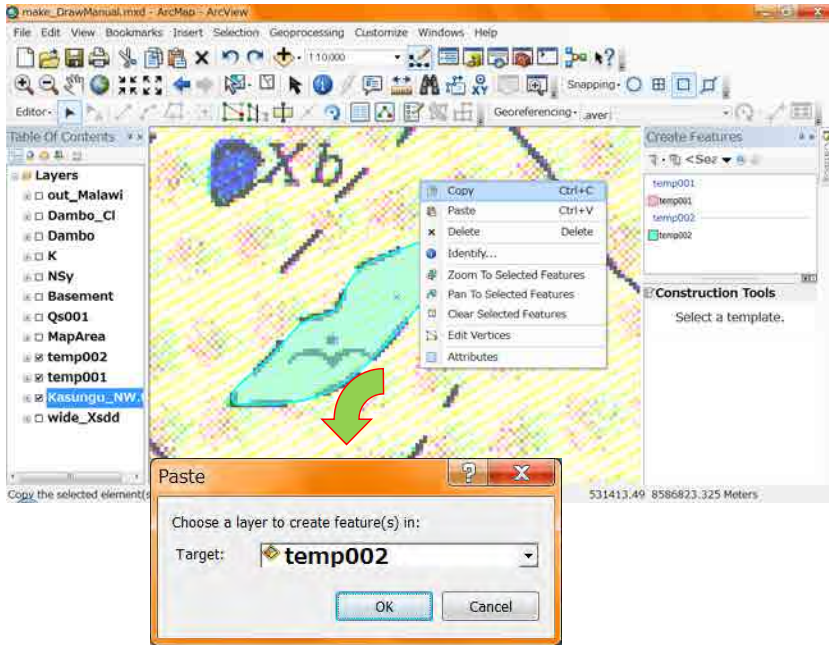


4-3. Copy and Paste

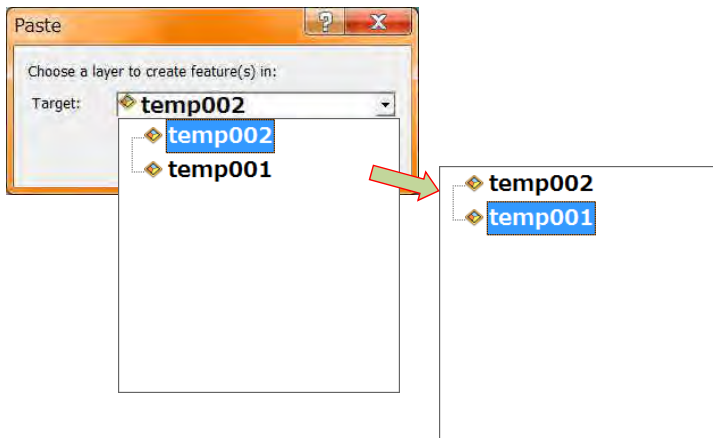
After the selection Right click
Request small menu on the view, select “Copy”. After this action

Right click
Request small menu again on the View, select “Paste”. You can Copy and Paste.

(instead of this method you can use from “Main menu”, select “Edit”, select “Copy” or “Paste”).




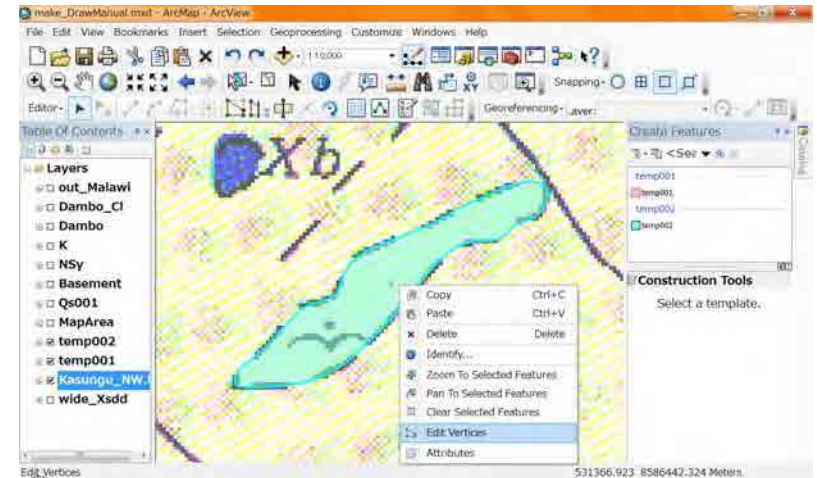
After the paste action “Paste” window will appear. Select target to “temp001”.



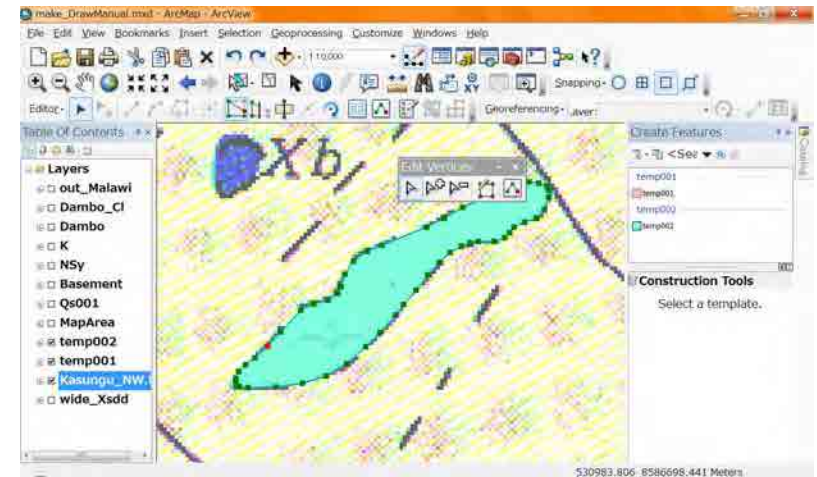
The new polygon copied one will appear as the “temp001” layer.


4-4. Edit Vertex


After selection Right click
Request small menu on the view, select “Edit Vertex”. After this action you enter the “Edit Vertex Mode”. Instead of this action you can use click 

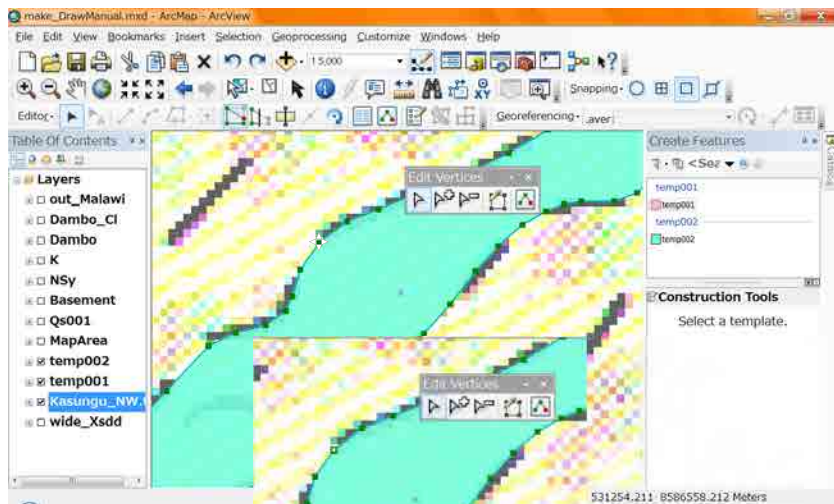


Many vertex will appear as green rectangles and a mini toolbar “Edit Vertices” will appear.




For moving the point (Vertex), use  . move to the point which you want to move.

The indicator will change to  , click the point.



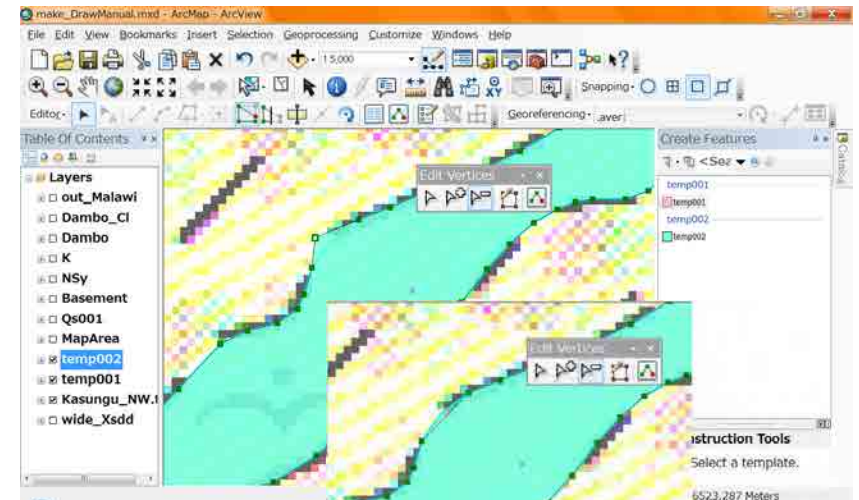
This means the point is selected for the editing vertex. You can move the point selected using mouse drag.

For the deleting the point (Vertex)


you use .

For the adding the point (Vertex)

you use .



After clicking 


the indicator will change 

On the point you want to delete

Click. The point (Vertex) will

Delete.

After clicking 

the indicator will change 

On the line you want to add the

point, Click.

The new point (Vertex) will appear,

and selected. If you want to move the point added new, drag the point to the place you would like to move.

-Knowledge- this is not a manual

You can understand polygons and polylines are composed by Vertices (points) from the above. And each 2 Vertices connected 1 straight line. They seem smooth curve that boundaries of polygons and polylines, but they composed the combination of many 2 vertices and 1 straight line.

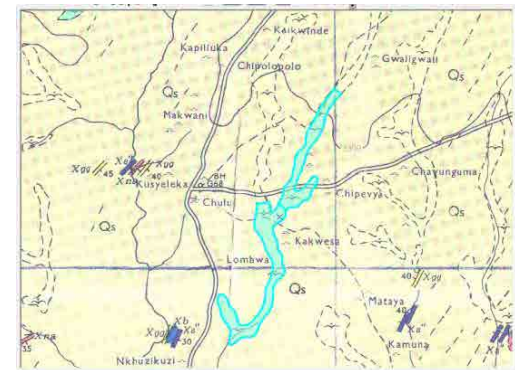
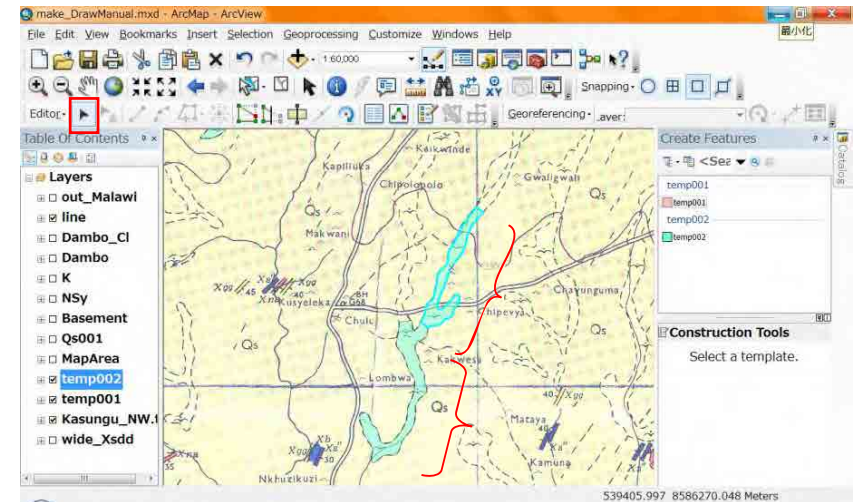
Each Vertex has X and Y value (coordinates).

Therefore we can look on the “Shape file” as a aggregate of many X, Y values.

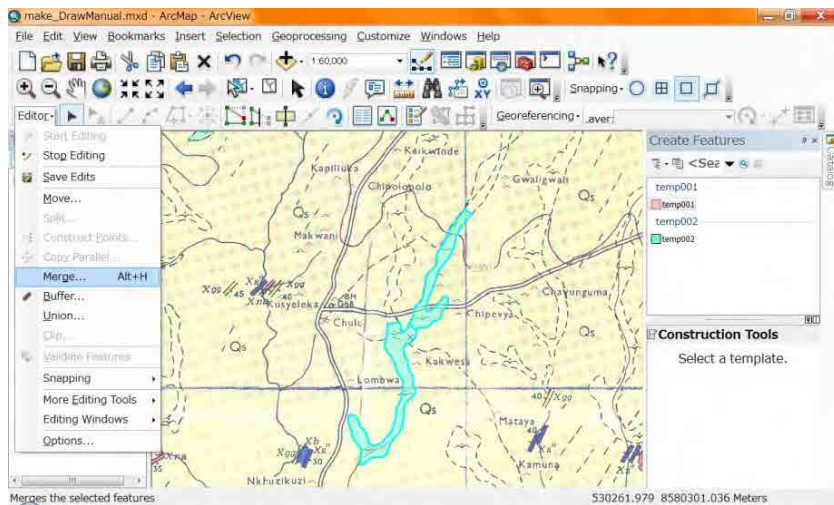
4-5. Merge polygons in Editor Tool

The “Merge” is one of the major technich for the drawing geologic map.

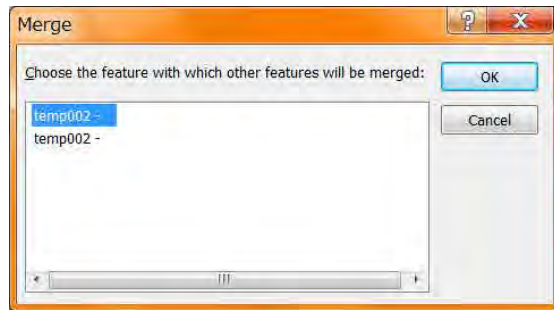
It is tough that you draw the long or wide area one time. In this case, You can draw little by little. After drawing, you can merge these small polygons. Select more than 2 polygons (see 4-1. Select).



In the editor tool bar, **Editor ▼** , Select “Merge...”.



The small window “Merge” will appear.

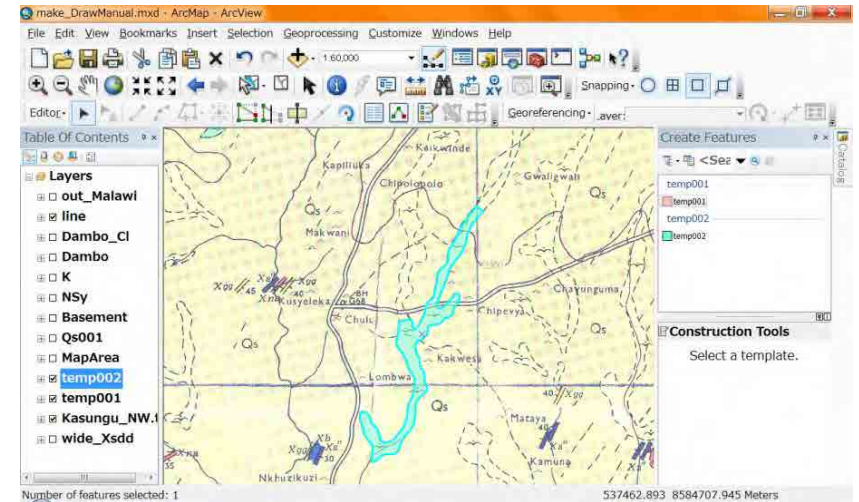


<Caution>

The “Merge” is good for the same layer. It can not merge from different layers.

In this window we can check “How many polygons and which layer you selected”.

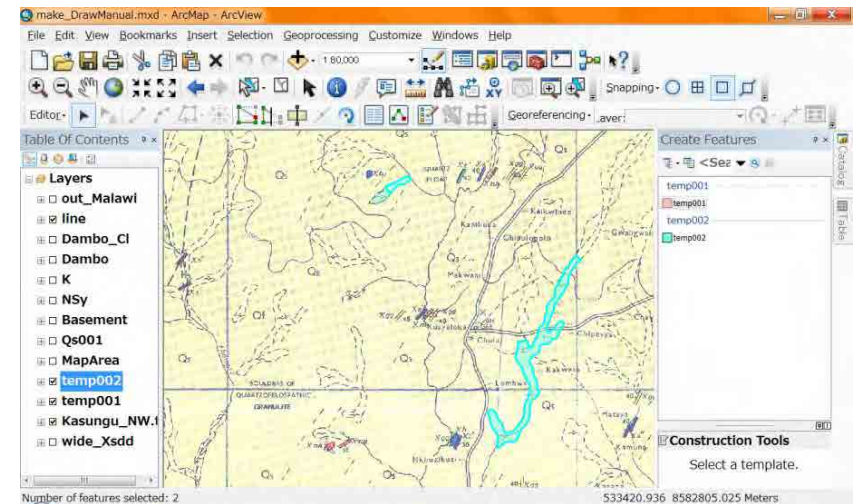
Click “OK” , 2 polygons are merged to 1 polygon.




<Information>

Take care. The “Merge” can merge Isolated more than 2 polygons.

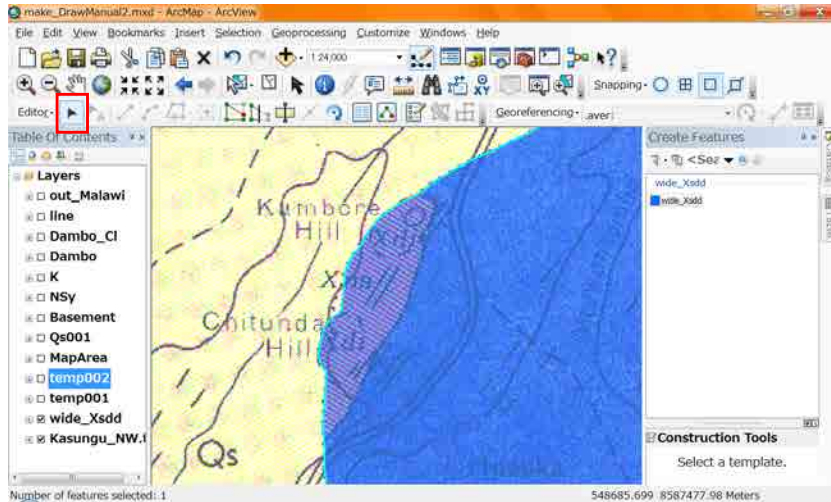
In the usual drawing do not merge isolated polygons.



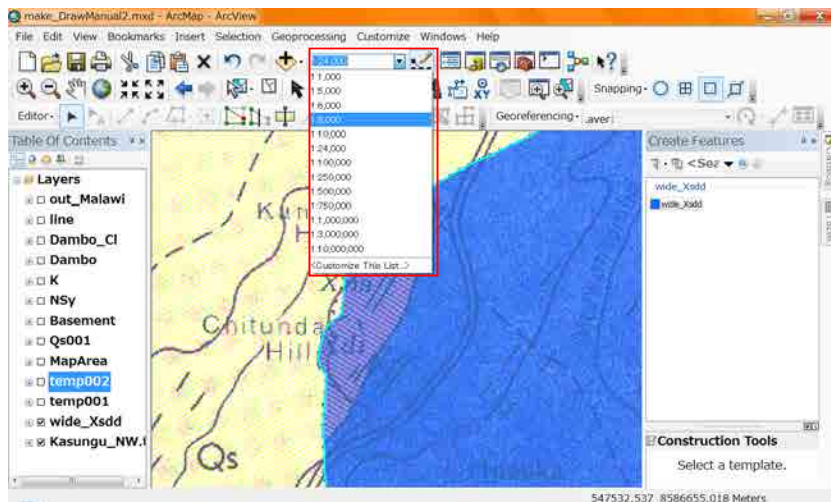
4-6. Cut polygons



You can cut polygons in reverse using “Cut Polygons Tool”. 


At first you select polygons that you would like to cut.

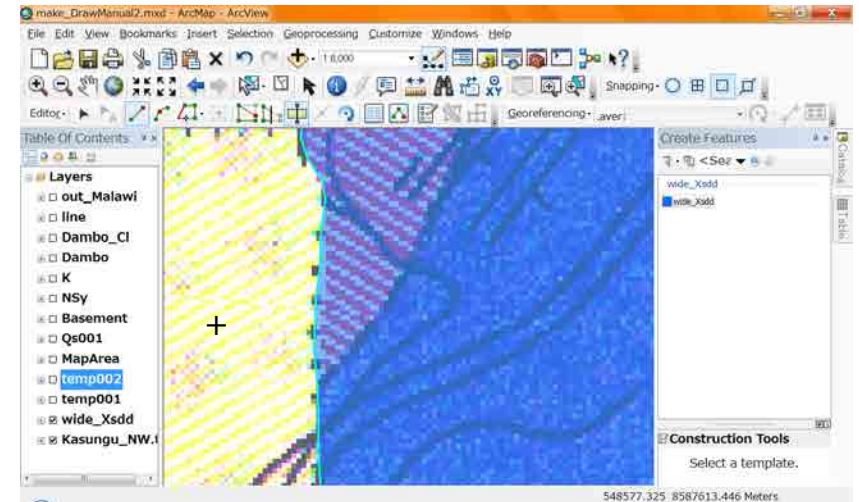



Set the scale bigger (1:8,000).




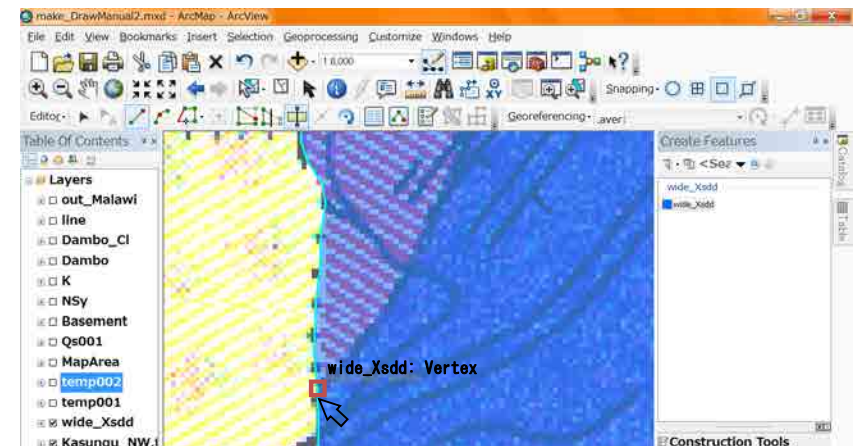
Set the position using , and then select “Cut Polygons Tool”  the indicator

will change to .




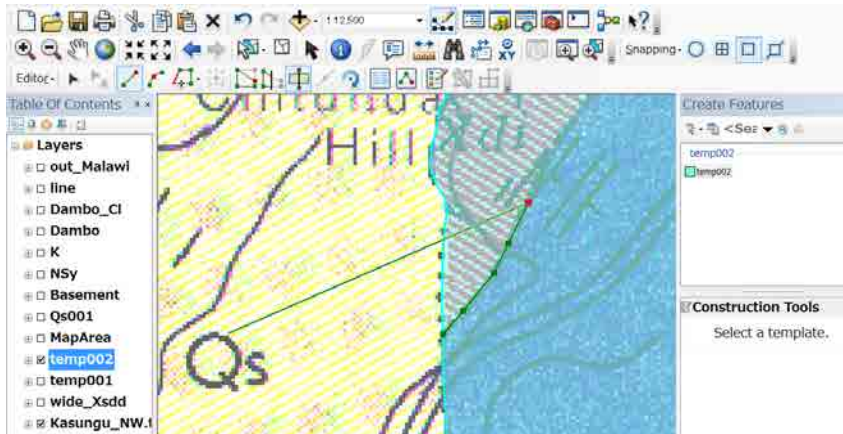
Mouse over to the start point for cut. The indicator changes to  and the 1 vertex is


shown by . and the texts layer name and “:Vertex” are shown near the point.


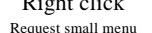
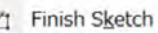


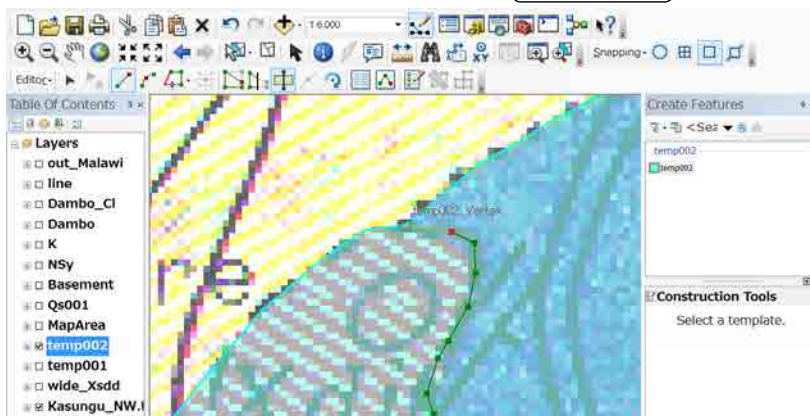
This is the effect of the snapping. Put pints on the line you would like to cut

Sometimes using  .

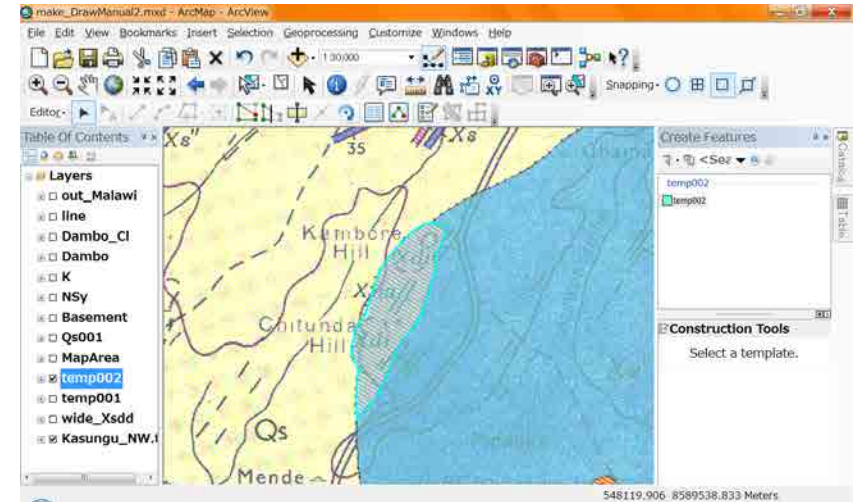


If you came to the end point, The indicator changes to  and the 1 vertex is shown

by  like the beginning. Click the final point, then  **Right click**
Request small menu  **Finish Sketch**



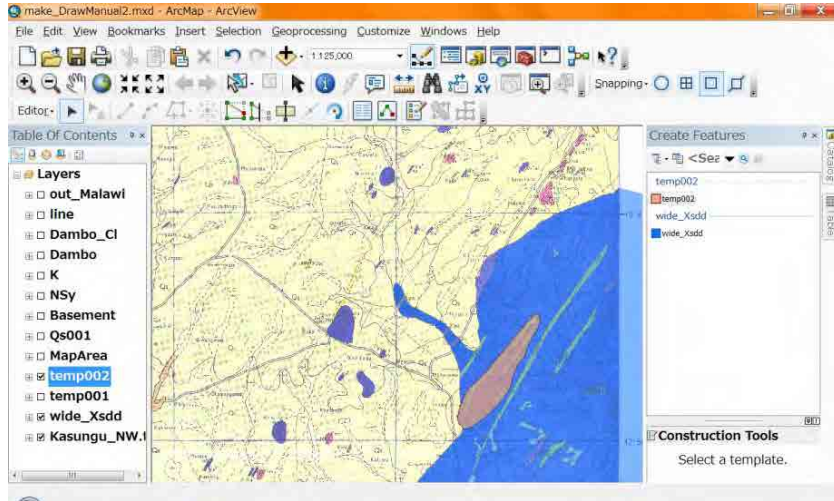
The polygon has divided 2 plygons.



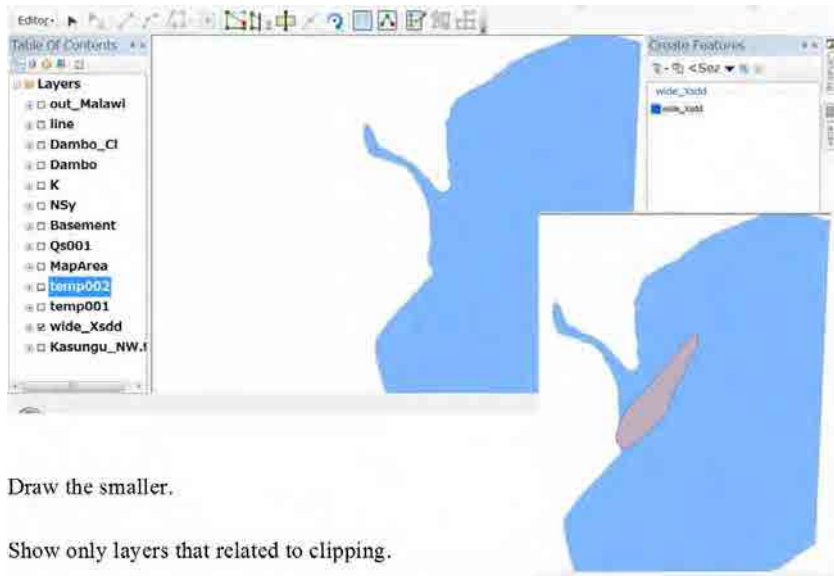
After selecting one polygon you cut off, you can delete or copy + paste (See 4-3. Copy and Paste).

4-7. Clip Polygons in Editor Tool

There is a smaller geology in the bigger geology. In this case, Draw the bigger.



After drawing large or wide area.

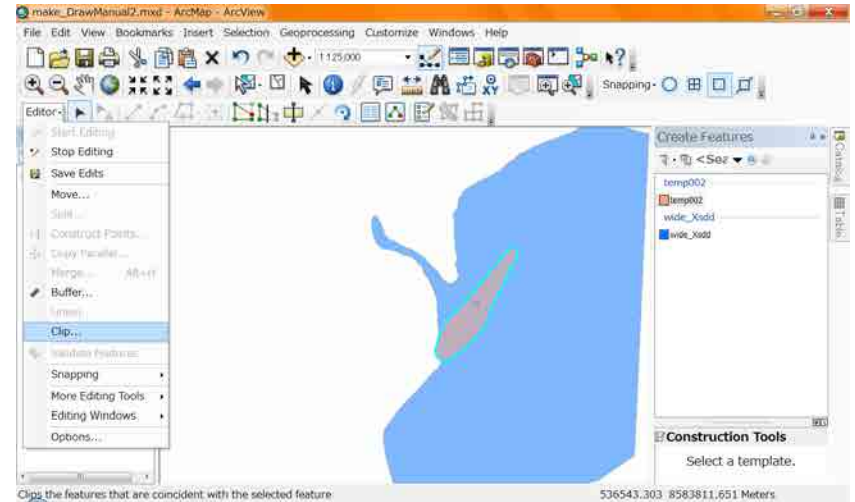


Draw the smaller.

Show only layers that related to clipping.

Hide the other layers. The layers shown will be clipped.

Select the small geology using . From the **Editor**, select "Clip..."



"Clip" window will appear. You usually select Buffer Distance = 0, then "OK".



The area of the smaller geology is

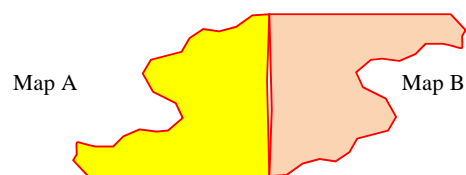
Deleted from the bigger geology.



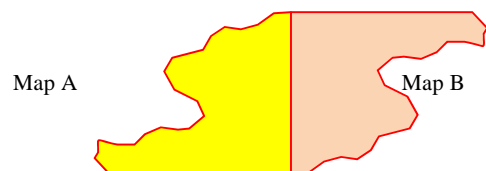
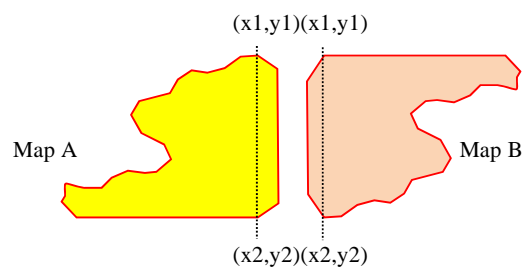
5. Drawing Techniques

5-1. Edge of the map

Usually a geologic map and the other map adjoin. When you draw a geologic unit which distributes the edge of map, you trace just the edge of map, it may bring a problem. It will be a small gap between 2 maps adjusted.



For the avoidance of this small gap, once you draw these geologic units wider than the map area, after the drawing you will cut off the outside of the map area using true longitude and latitude (numeric data).

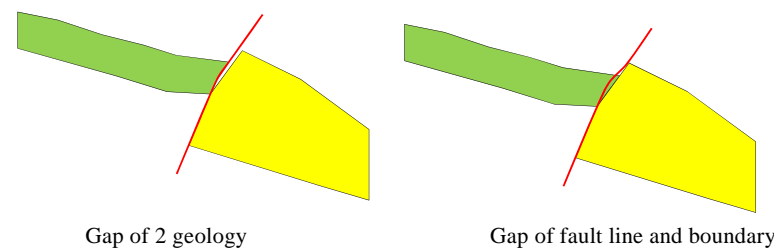


5-2. Fault

The faults approximate usually are drawn as the dashed lines in the paper map. But the faults laid contiguous line. In the ArcView you can change the line symbol easy.

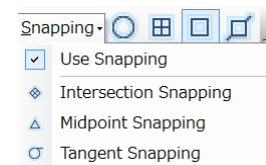
Draw the fault line as a contiguous Polyline.

Usually the faults cut some strata (geologic unit). In these cases the cut geology is bounded on the different geology and the boundary has to be the fault. The same reason of the edge of map there may be a gap between 2 different geology and fault line. You have to take care of these small gaps.



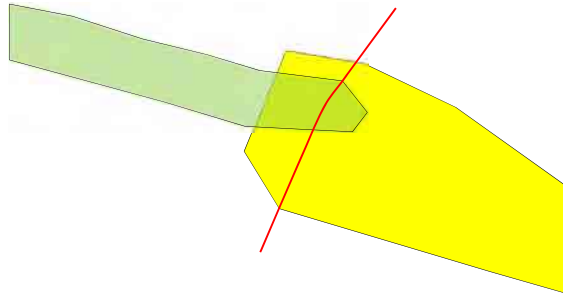
For the avoidance of these small gaps, you have two methods. About both methods it is important that the technique of the "Snapping".


Before drawing check the setting of "Snapping" (see 0-5. Set the Snapping)

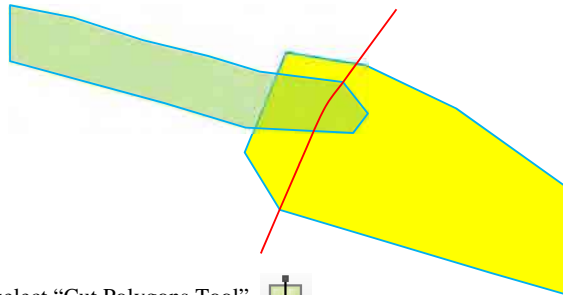


<Method A> Cut Polygon using the Vertices of fault line shape

Draw geologic unit over the fault line. Draw the fault line as polyline. When you cut the geology, remember the point (Vertex) you put for the drawing fault.

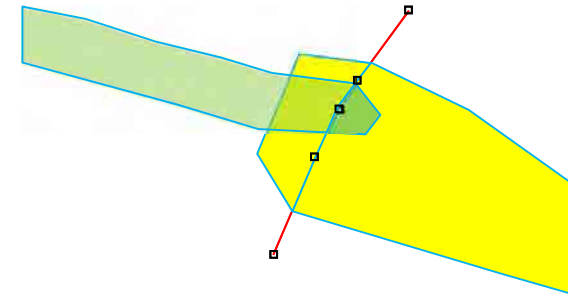
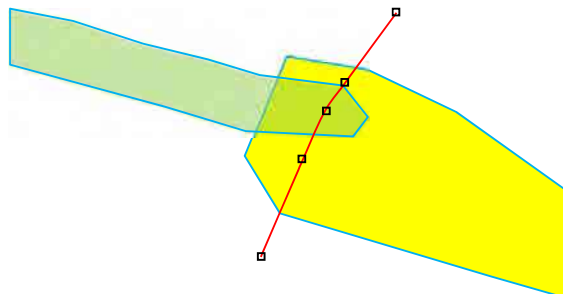


Select Polygons you would like to cut using 

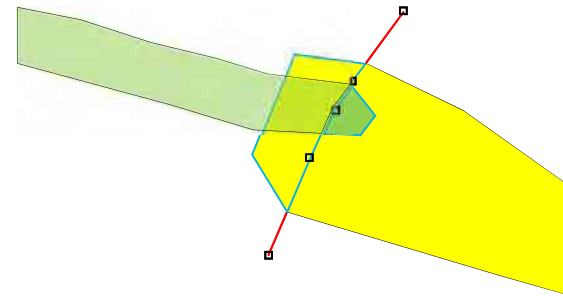



Then select "Cut Polygons Tool" 

The indicator will change to . Follow the fault line using "Snapping"

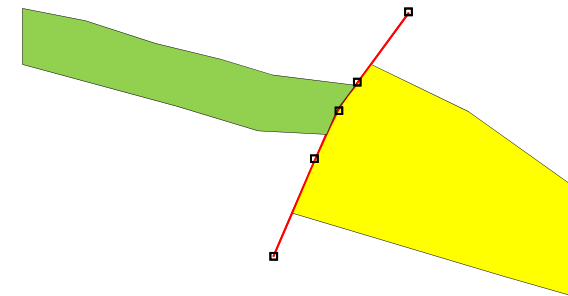


After following the fault line, Right Click, "Finish Sketch". The polygons are cut.



Select Polygons you would like to cut off using . After selection

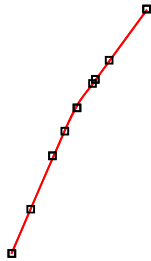
Right Click, "Delete" or "Delete" key on your keyboard.



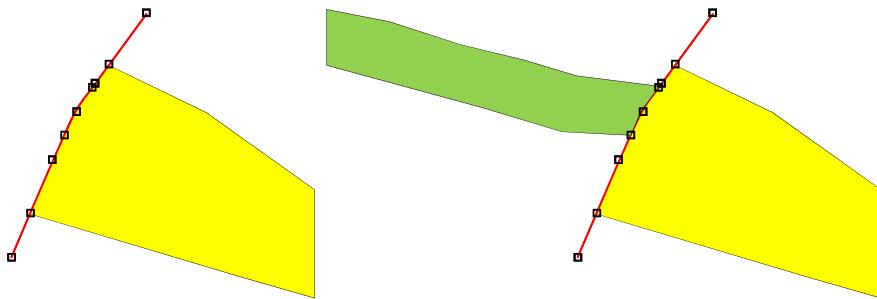
These geology cut by the fault line.

<Method B> Draw on the same Vertices of the Fault.

Draw the fault line as a polyline. When you draw the fault, put the points (Vertices) on each crossing point of the geologic boundary and the fault.

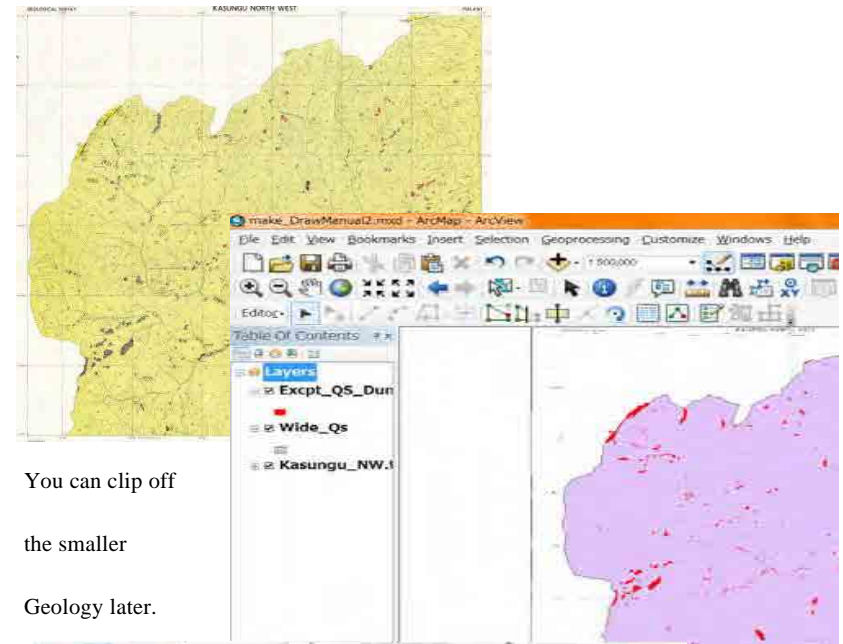


After the drawing fault line, Draw geologic unit. When you draw the boundary among the fault, put all same points on the fault using the “Snapping”. By the putting all same points, it will be completely same that the baoundary and fault line. Do same way for the other side too. You can understand the impotance of the putting points on the crossing point

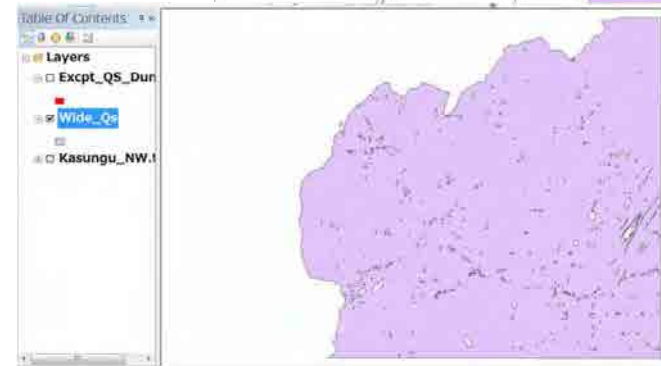


5-3. Major geologic unit in the map

Some Geologic map has the major geologic unit. In this case draw the major one at onece. For example this is the area of Kasungu North west. In this map Qs (Qauternary sand) distriutes widely.



You can clip off the smaller Geology later.



5-4. Out of Malawi

The national bouders laid in some of geologic maps and gelygy is not drawn out side of Malawi. So the distributions of each geologic unit cut by the national bouders.

For the smooth drawing of national bouders, this manual recommends to draw a polygon of the out side of Malawi, and draw each geology bigger same as the edge of Maps. After the drawing of each geology, you can cut off the outside of Malawi using the polygon and the “Clip” technique.

6. Unify to one Shape file

6-1. Clip the overlapped area

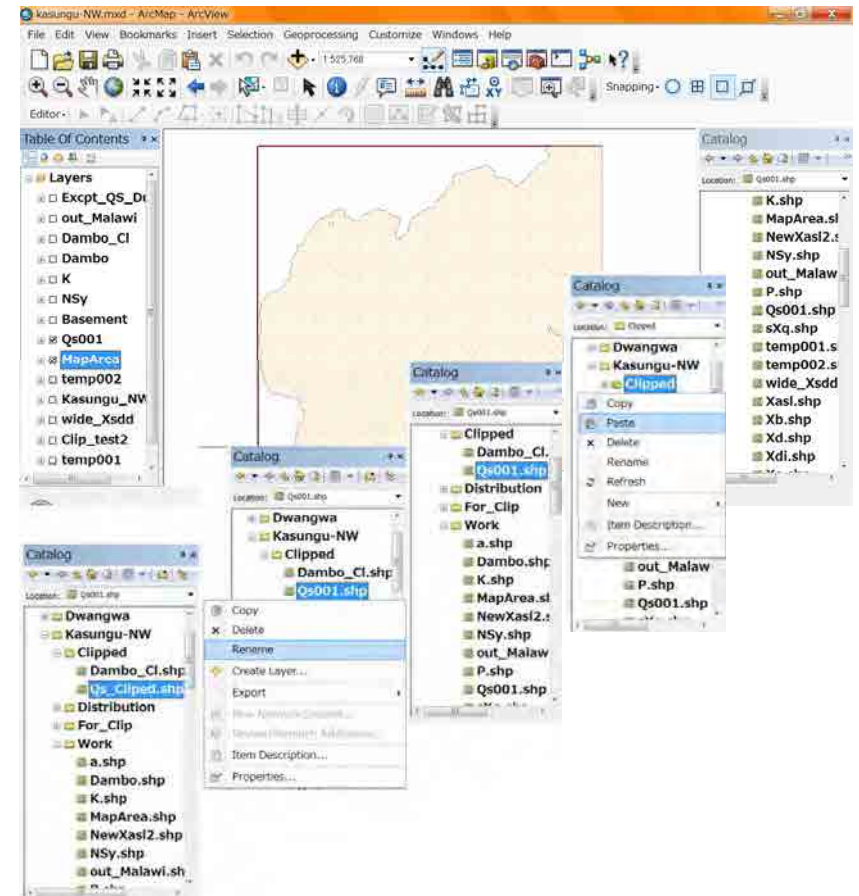
The major geology was drawn as a area included other smaller geology. Copy the major shape file to the other folder (Example. Clipped). In the Catalog window

Right click
Request small menu

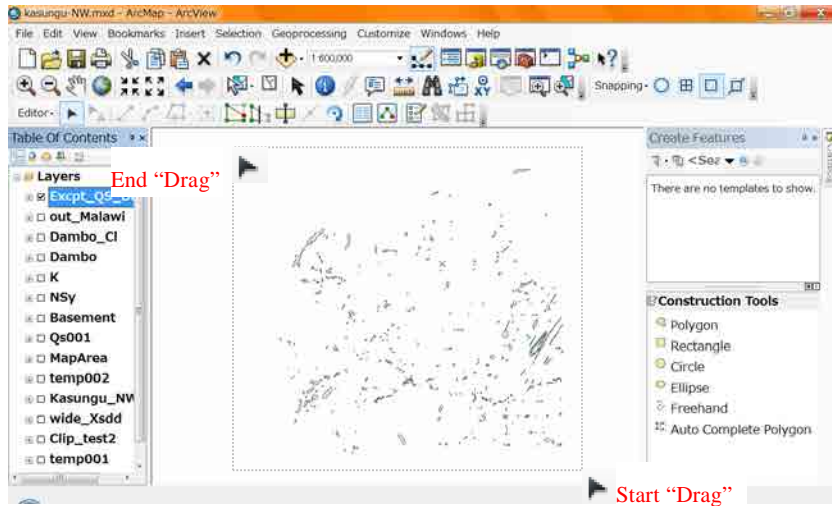
on the layer (Shape File), select “Copy”. On the folder “Clipped”

Right click
Request small menu

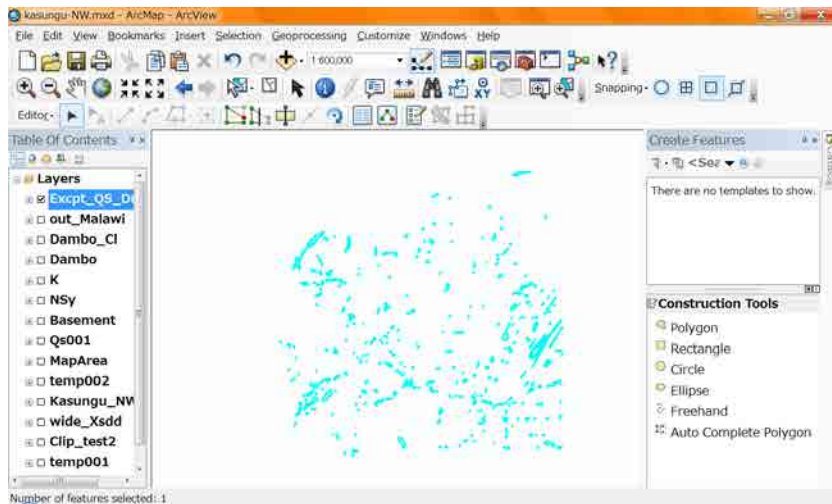
Select “Paste”. Copied Shape File is appeared. Then rename the copied Shape file.



The smaller geologic unit is drawn one or some layers. Make a temporarily shape file which is joined all smaller geologic unit for "Clipping" using "Copy and Paste" technique (see 4-3. Copy and Paste) in the same folder (Ex. Cliped).



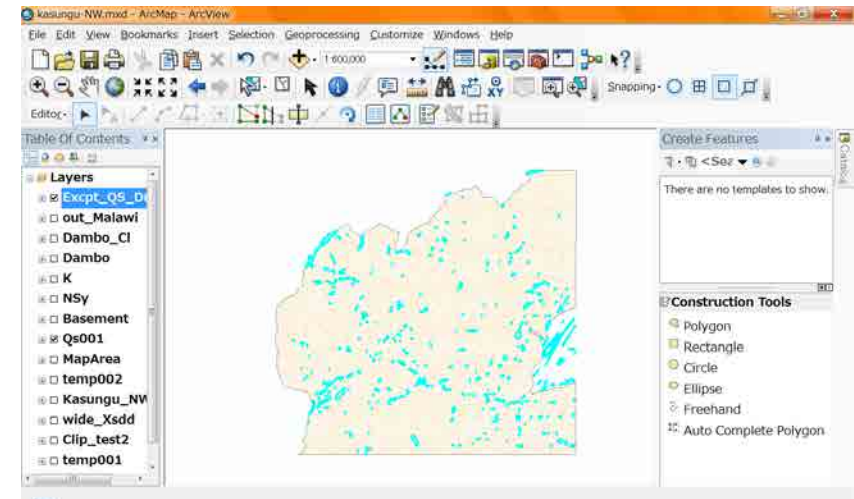
Start Editing for the joined temporarily shape file. Select all polygons at once using



After Selecting all polygons for "Clipping", merge to one polygon using "Merge" (See 4-5. Merge polygons in Editor Tool). The merged polygon is isolated, but this is one polygon. You can clip the area of smaller geology from the major geology at once.

Show only 2 layers which the copied major geology and merged smaller geology.

Select smaller geology which is merged to one polygon. Then Clip. After clipping this manual recommends that to delete the temporarily file.



Cliped Geology

6-2. Open attribute table

Each shape file of All geology have to unify to one Shape File. After the unifying each geology have to identify by the attribute data. The attribute data is stored in the attribute table of each Shape File. Before unifying you add the data to the attribute Table. To see and edit these data you open the attribute table of each Shape File. To open attribute table, on the layer name (shape file) Right click
Request small menu, select “Open

Attribute Table”. The table window will appear

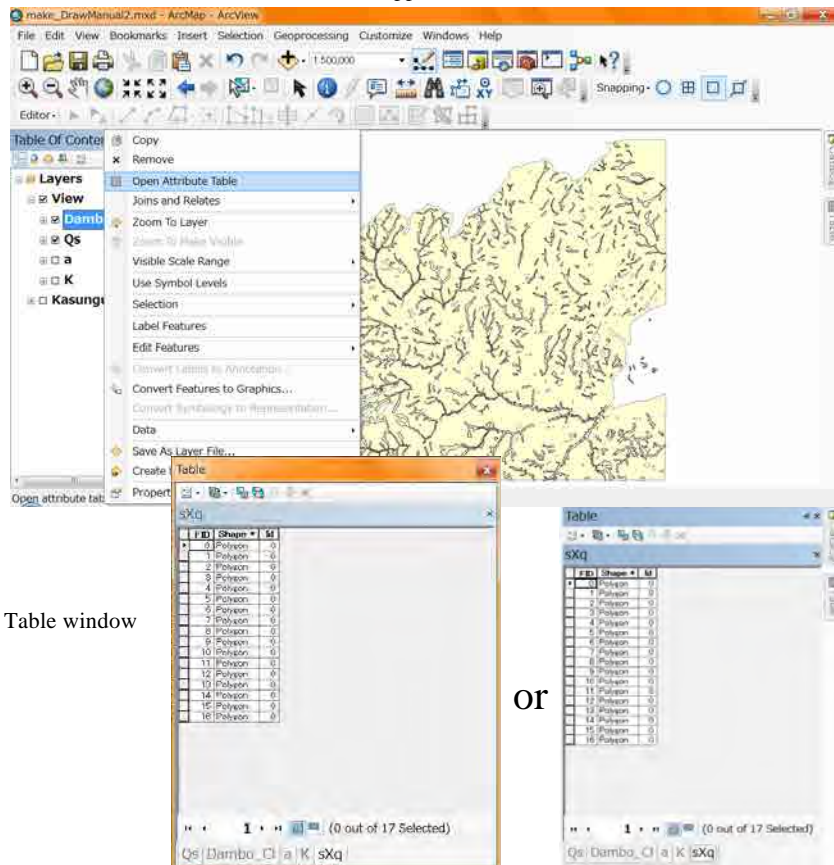
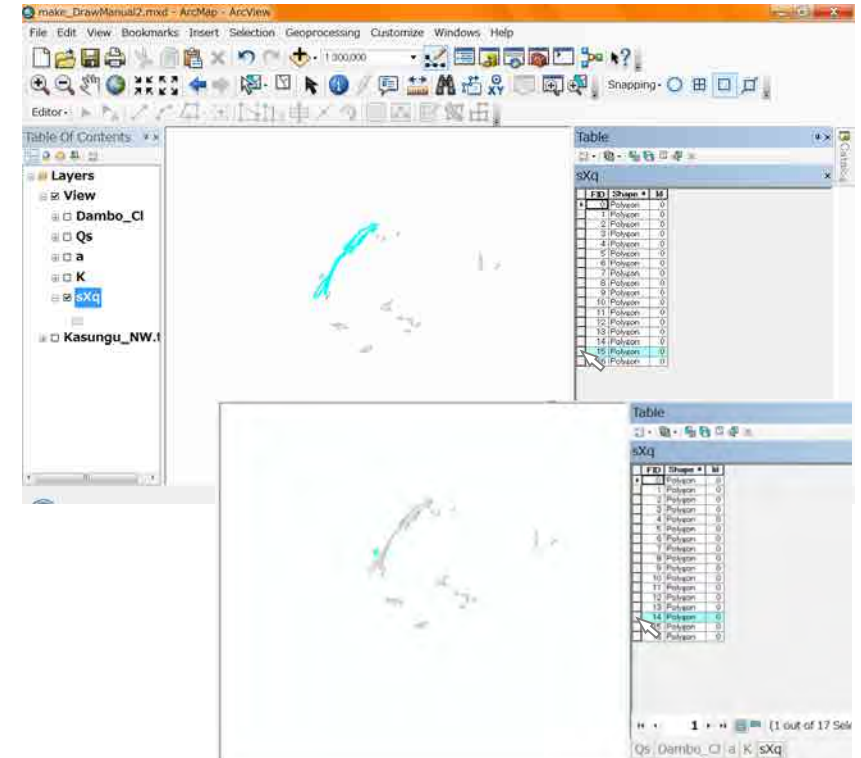


Table window

OR

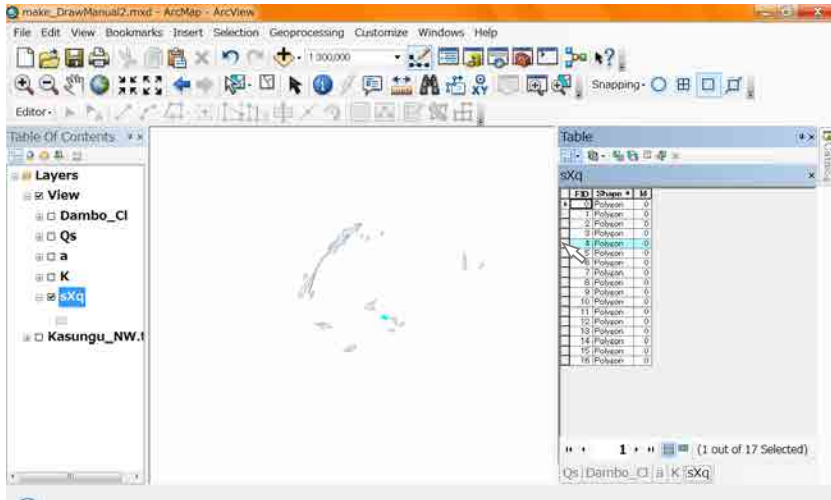
Each line of the attribute table means each polygon or polyline. The row (we call it “Field”) is the attribute data. When you select 1 line in the table, you click left side of each line.



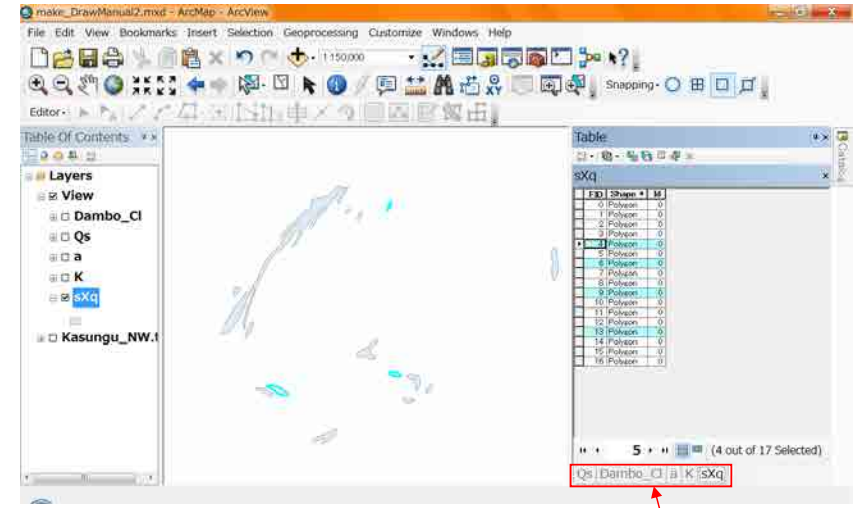
If you select one line, the line color is changed to light blue and one shape (Polygon or Polyline) is selected and its color is changed.

You can select lines and shapes (Polygon or Polyline), not only one.

After selecting one line in the table, if you keep pressing “Shift” key in your keyboard, and click the other line, from the first clicked line to this time clicked line will be selected.

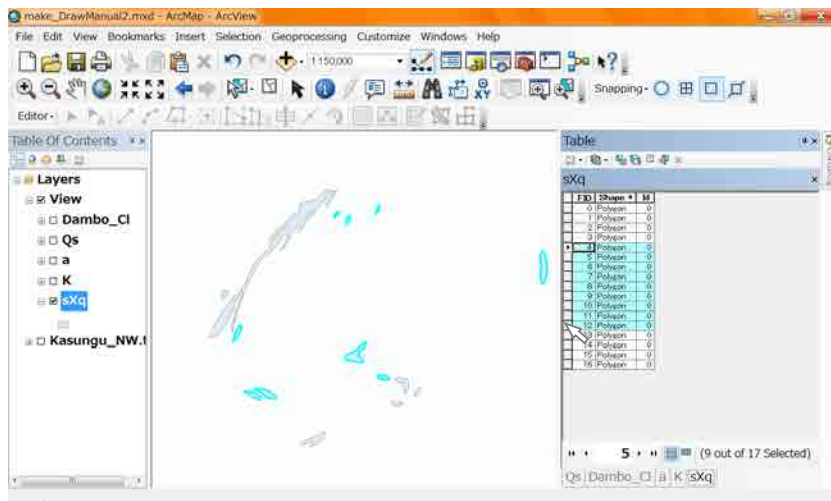


The selection of the plural lines is not only continuous. If you want to select discontinuously, you use pressing “Ctrl” key in your keyboard and click the other line.




The opening of the attribute table is not only one.

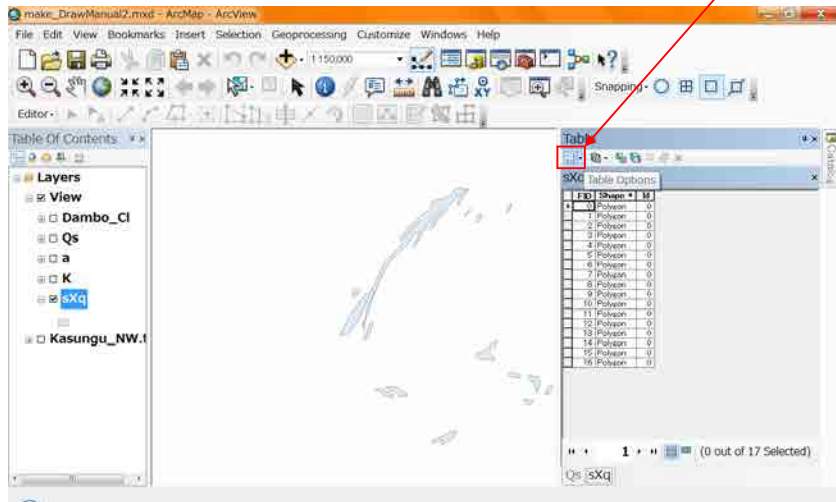
You can see one or some tabs at the bottom of table window. This example is opening 6 tables.



6-3. Add Field "Geo_ID"

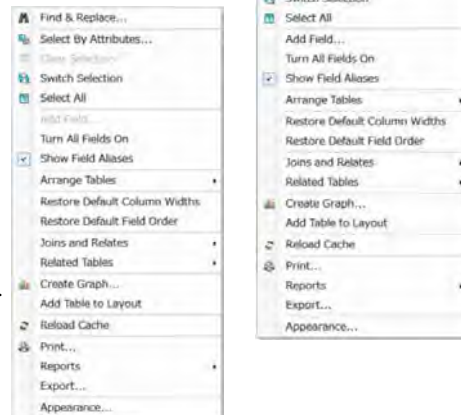
For adding the data to each shape (polygon or polyline), first of all you have to add the field (row) as a container. For adding the field to the attribute table click this icon 

This is a menu for the table window.



The menu will appear

Select "Add Field", "Add Field" window will appear.



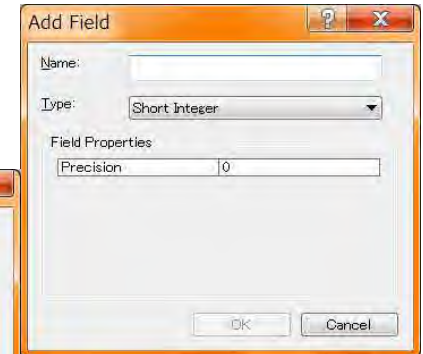
If you can not select

"Add Field"

you might start editing.

For the adding field stop editing.

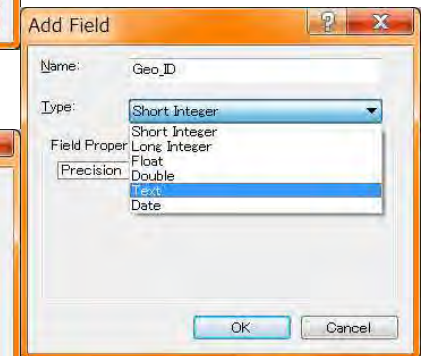
This is "Add Field" window.



Top of "Add Field" window

Input Name as "Geo_ID"

Select Type as "Text"

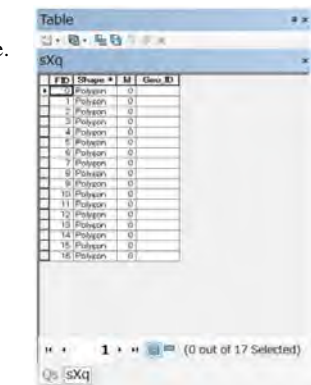


Input 8 as "Length"

Click "OK".

You can add a field "Geo_ID" to the table.

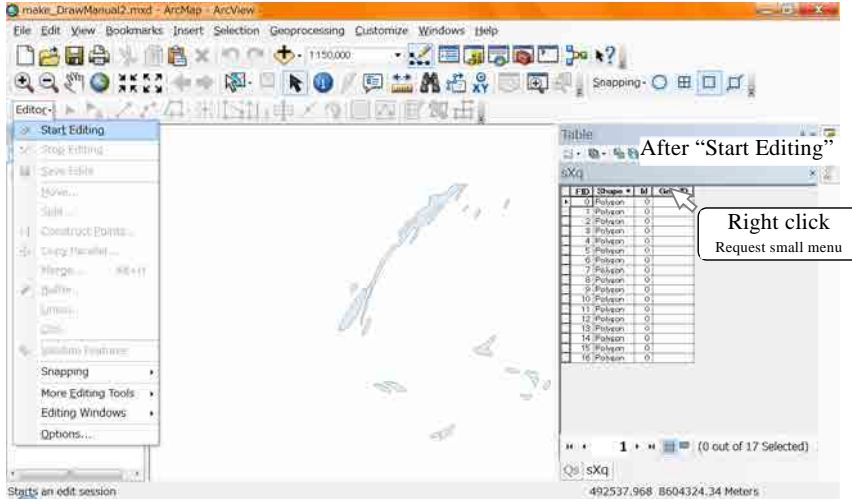
Now it is ready for adding data.



6-4. Field Calculator

It is convenient for adding data to use “Field Calculator” in this case.

Before adding data you have to start editing (see 1. Start Editing).

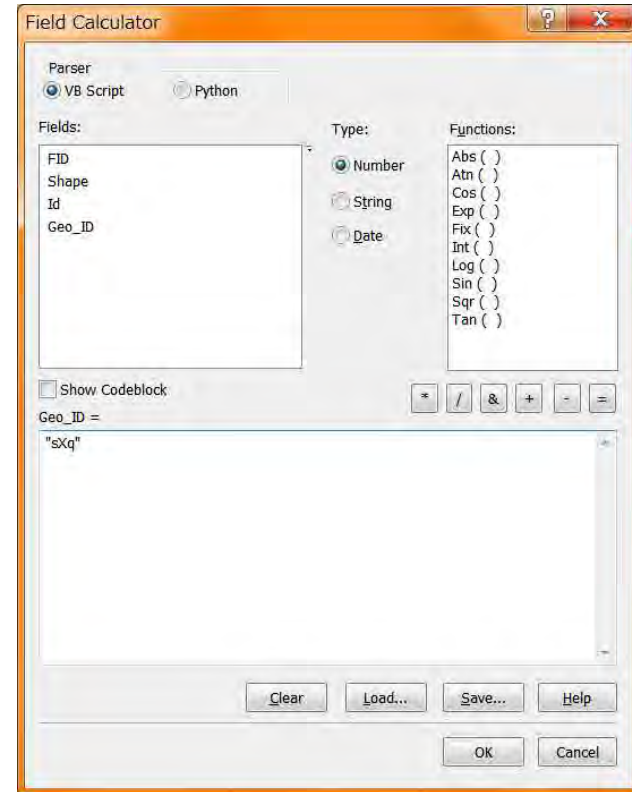
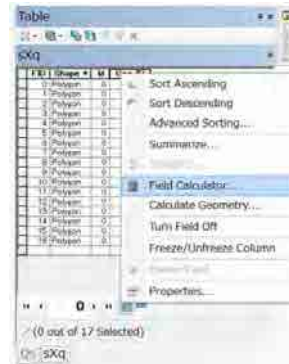


Right Click on the name of field “Geo_ID” for requesting small menu. Select “Field Calculator”



“Field Calculator” window will appear.

You do not use the upper half this time.



Input the index of geology same as the paper

Geologic map that is surrounded by “ ”.

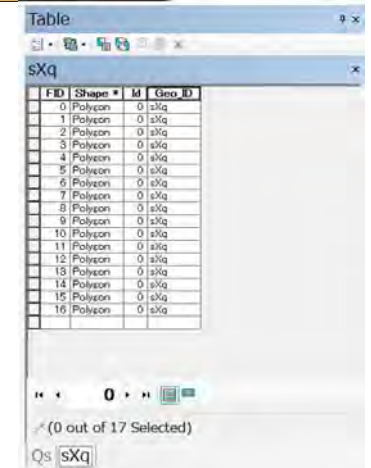
This example is “sXq”.

After entering Click “OK”.

“sXq” is entered to all lines.

You could enter the data successfully.

Do for all shape files.



If the table has only one line,
 you can enter the data directly to the cell
 after clicking the cell.



6-5. Merge in geoprocessing

This is almostly the final stage of the unifying to one shape file.

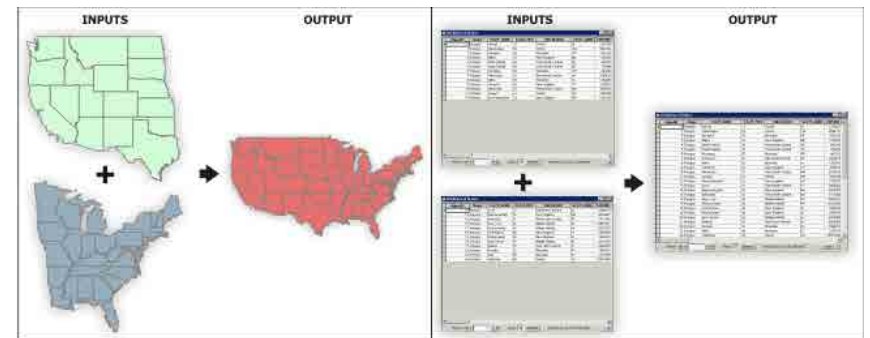
“Merge in geoprocessing” and “Merge in Editor Tool”, these use same word “Merge”.

But the functions (works) of these are not same at all. The function(work) of “Merge in Editor Tool” is making one polygon from plural polygons in the same layer (Shape File). On the other hand the function(work) of “Merge in geoprocessing” is making a new layer (Shape File) from plural layers (Shape Files) with keeping data of original layers (Shape Files).

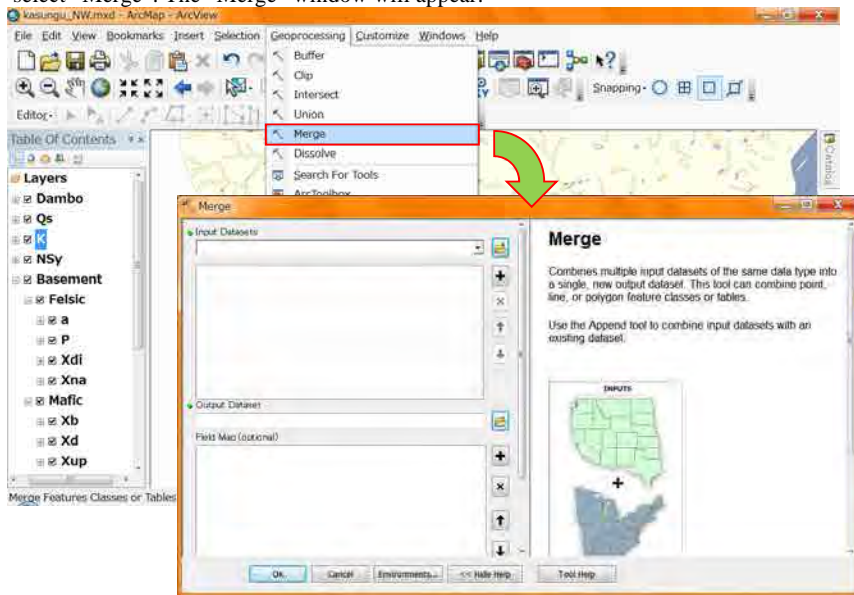
<Merge in Geoprocessing from Help of ArcView>

Combines multiple input datasets of the same data type into a single, new output dataset. This tool can combine point, line, or polygon feature classes or tables.

Use the Append tool to combine input datasets with an existing dataset.



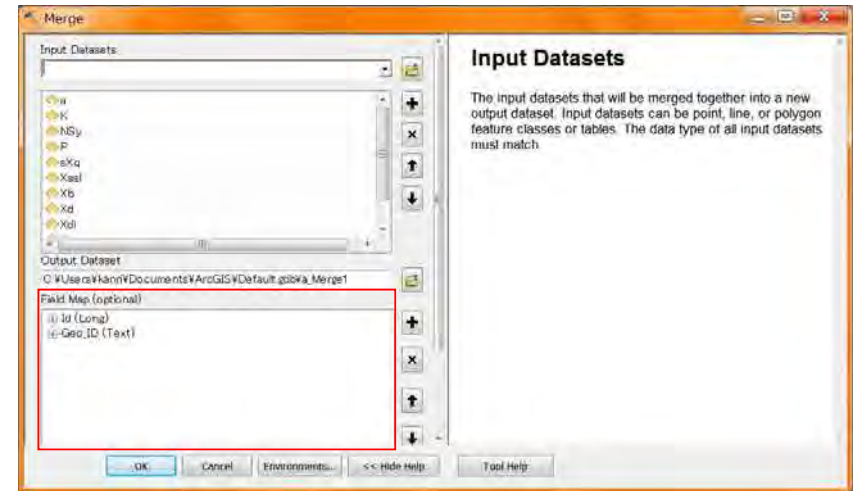
Now start “Merge in geoprocessing”. Select “Geoprocessing” in the main manu. Then select “Merge”. The “Merge” window will appear.



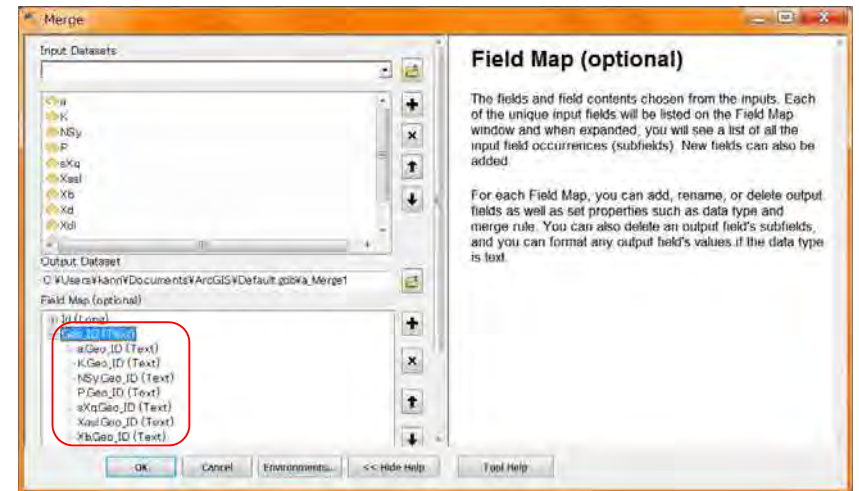
Select all layers (shape files) for the unifying in the blank under “Input Datasets”, using ▾ .



During Selecting the layers, check the “Field Map” which laid in the bottom half of this window. There is ⊕ left side of “Geo_ID”, Click ⊕ .

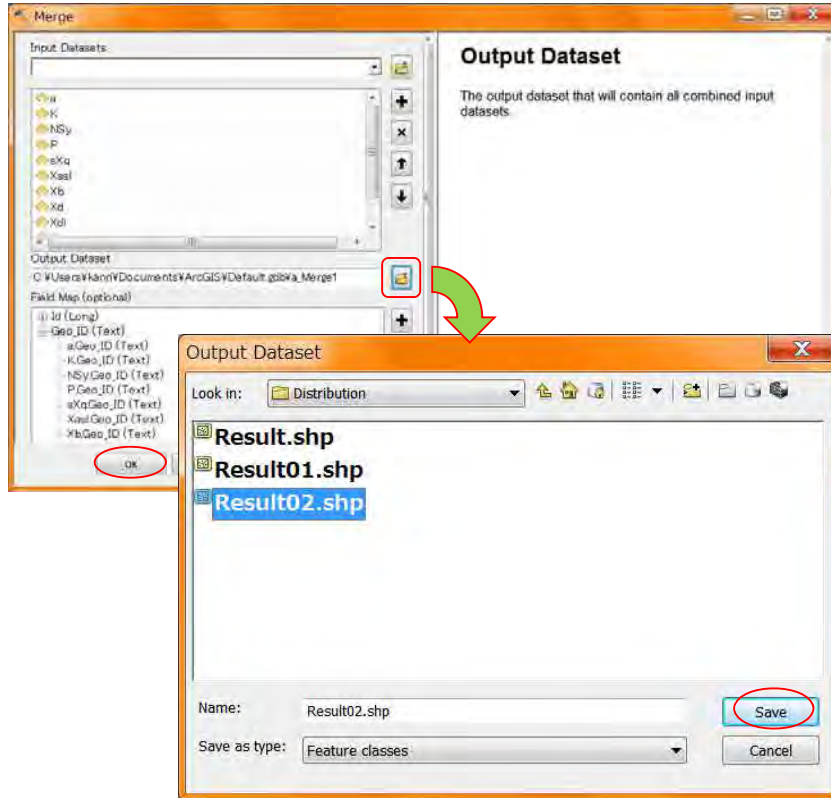


You can see the list of [layer’s Name, Geo_ID, (Text)].



This means these data will join to one field in the new Shape File.

If there is other field name which is similar to “Geo_ID”, you made wrong field name for the layer. In case, check the attribute table of original layer (shape file).



After checking the “Field Map”, input the “Output Dataset”.

Then click “Save”, “OK”.

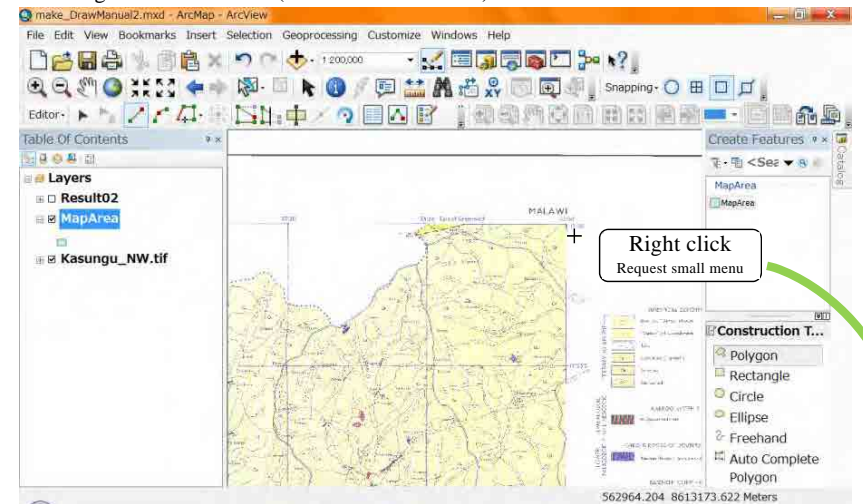
You can get the merged (unified) shape file.

7. Check and setup polygon

7-1. Edge of map

For the cutting off the outside of map, this manual recommends to make a new shape file of map area. Create a new empty polygon shape file named “MapArea” using the

“Catalog” tab and window (see from 0-9. To 2-3.).



Select “polygon” in the “Construction Tools”, then right click near a corner of map.

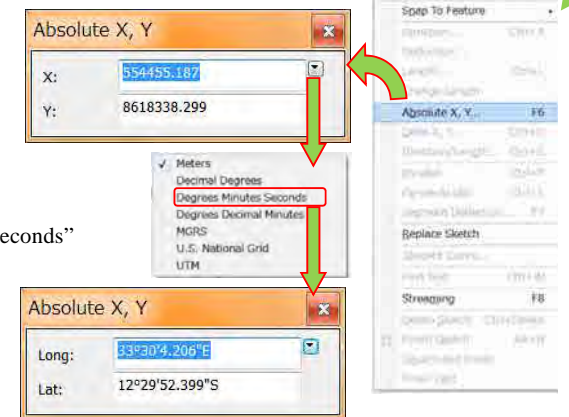
Select “Absolute X,Y...”.

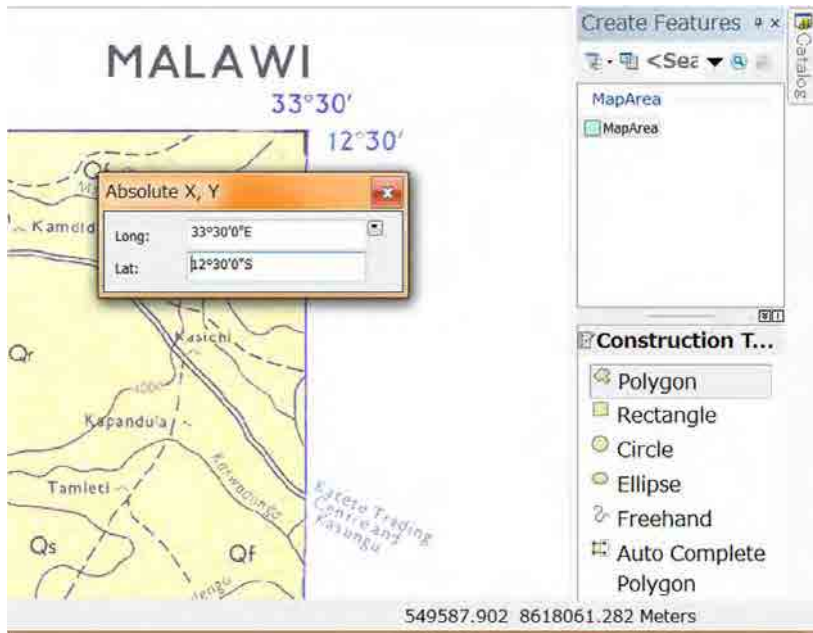
“Absolute X,Y” window

will appear. Click .

Select “Degrees Minutes Seconds”

The numbers will change.





Enter absolute longitude and latitude of the corner. When enter the number do not break format of number especially “E” and “S”. After entering the numbers, press “Enter” key in your keyboard. The point will appear in your view. Repeat 3 times more on the other 3 corners of map area, make a rectangle of map area.

After drawing the polygon of map area, stop editing with save edits.

And add data for the shapefile which you unified.

Remove the image of geologicmap.

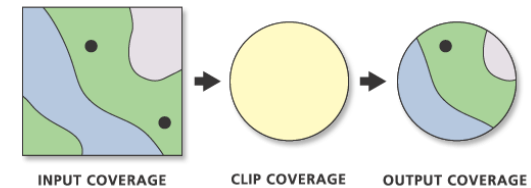
“Clip in geoprocessing” and “Clip in Editor Tool”, these use same word “Clip”.

But the functions (works) of these are not same at all. In the using “Clip in geoprocessing” the target area is deleted and outside of the area remains.

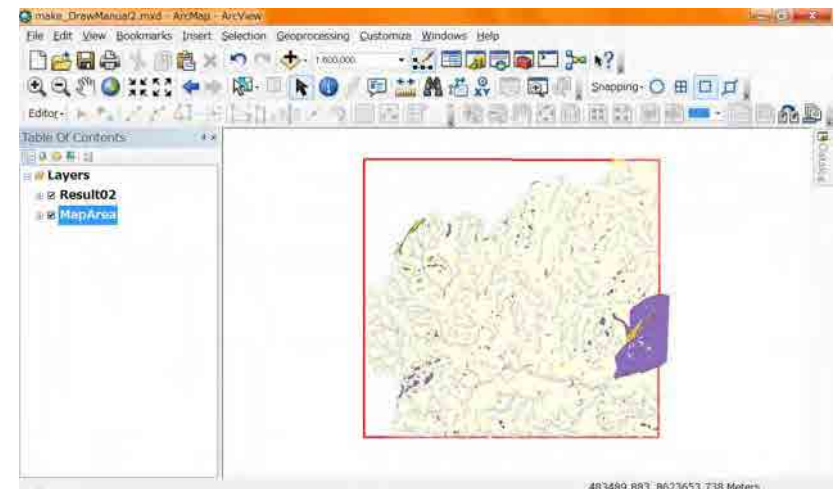
But in the using “Clip in geoprocessing” the target area remains and outside of the area is deleted.

<Clip in Geoprocessing from Help of ArcView>

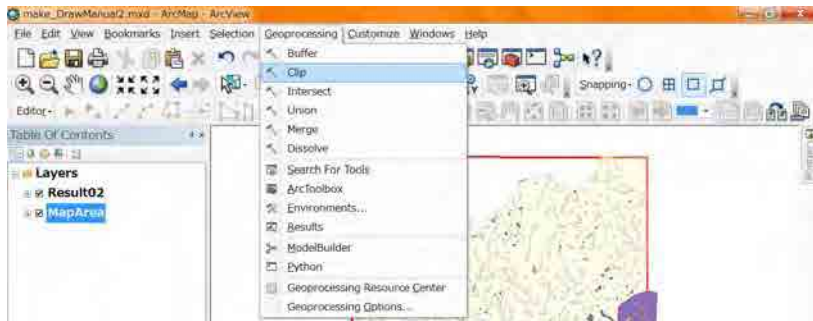
Use this tool to cut out a piece of one feature class using one or more of the features in another feature class as a "cookie cutter". This is particularly useful for creating a new feature class—also referred to as study area or area of interest (AOI)—that contains a geographic subset of the features in another, larger feature class.



From now delete the outside of map area using “Clip in Geoprocessing”.



Select “Geoprocessing” in the main menu, then select “Clip”.

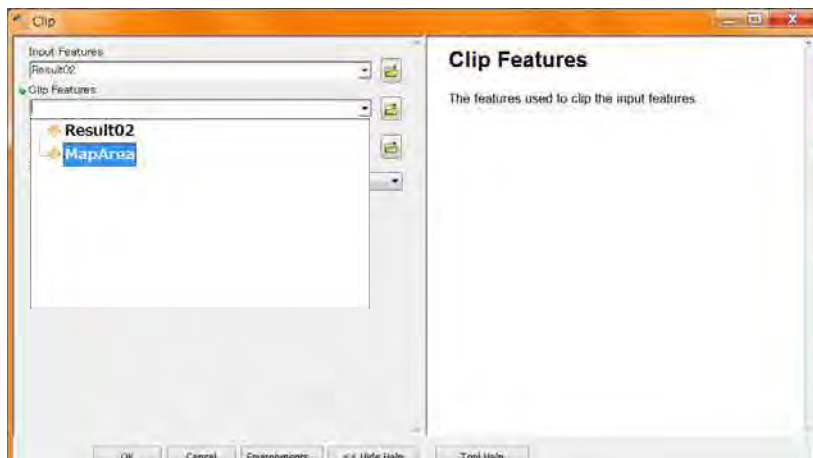


“Clip” window will appear.

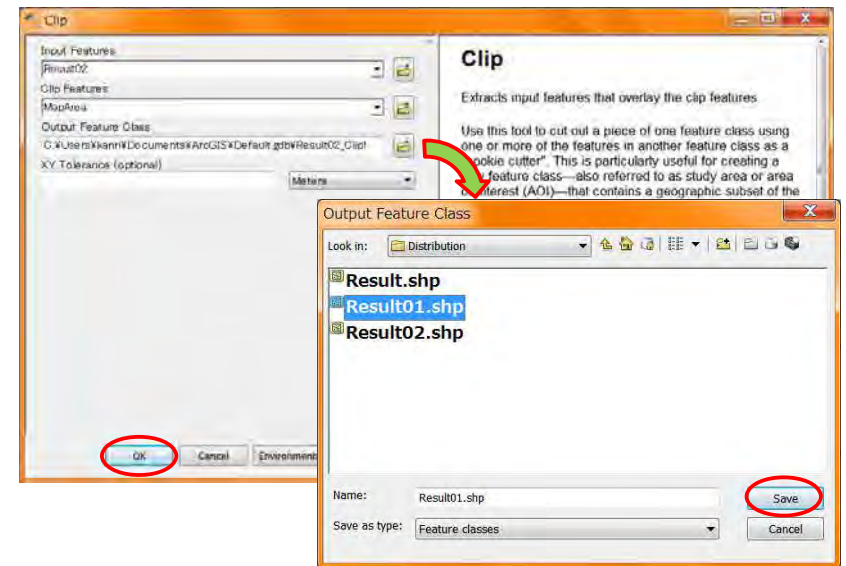
Select unified layer (shape file) as “Input Features” using ▾ .



Select “MapArea” layer (shape file) as “Clip Features” using ▾ .



Set the file location and the name of shape file.



Then click “Save” and “OK”.



The Clipped layer (shape file) will appear.

<for a change>

By the way if you have enough free time, consider the method for deleting the outside of map area using “Cut polygon” tool and numeric coordinates.

7-2. Gap of polygons

For checking the gap of polygons you use the polygon of the map area and the outside of Malawi. This is the reason which this manual recommends to make these polygons.

The basic flow of checking the gaps of polygons is

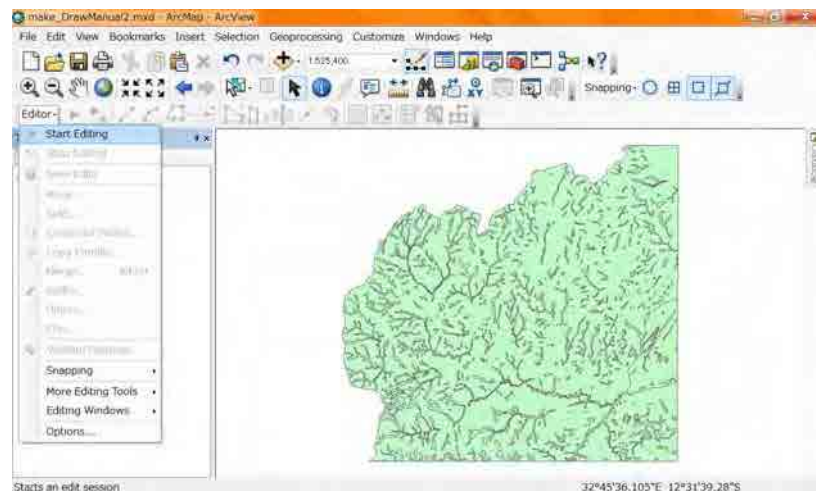
1. Copy polygons from unified, clipped layer to the map area layer.
2. Merge polygons which copied to the map area layer.
3. Clip (Editor tool bar) map area polygon by merged polygon.

<optional there is a area of outside malawi>

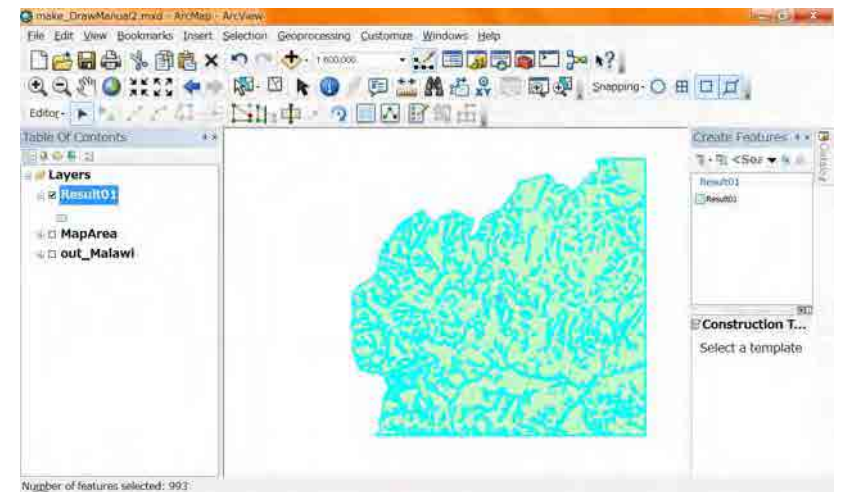
4. Clip (Editor tool bar) map area polygon by outside Malawi polygon.

If you draw with no gap, there is no polygon. The remaining polygon means the gap.

See the procedure. Prepare 3 layers (unified clipped distribution, Map area, Outside of Malawi). Show and Strat editing about unified clipped distribution layer.



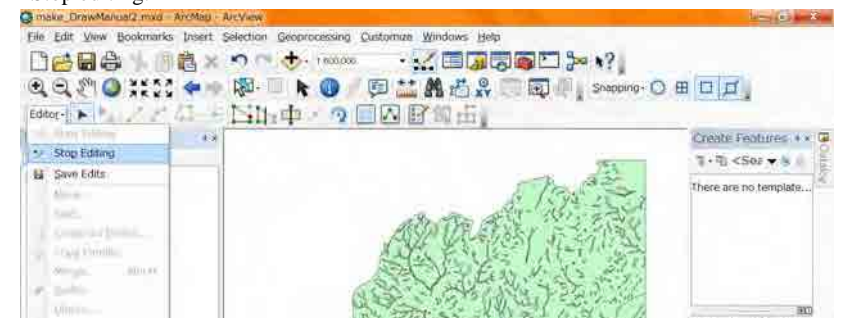
Select all polygons.



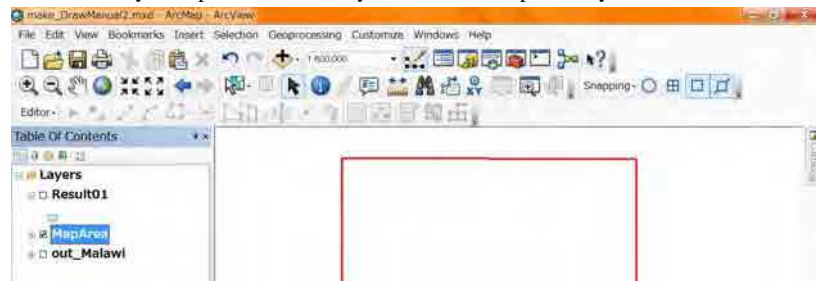
Copy all polygons.



Stop editing.



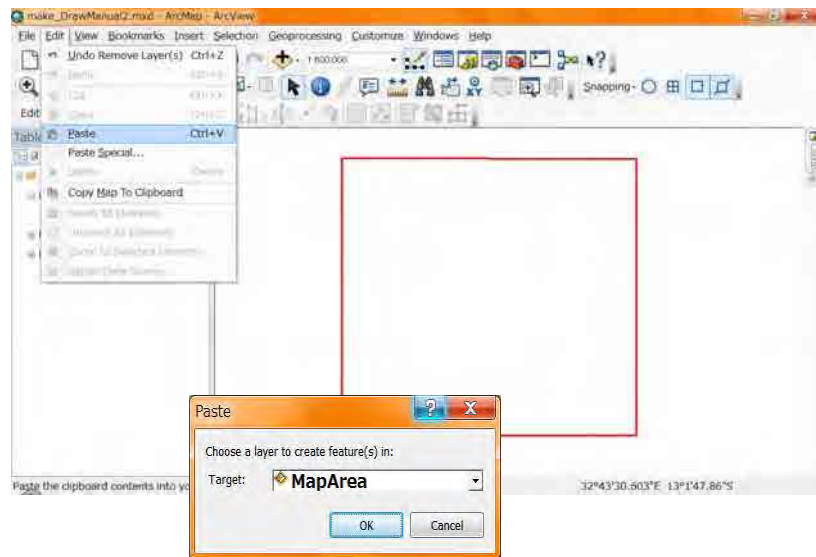
Hide the unified clip distribution layer. Show the map area layer.



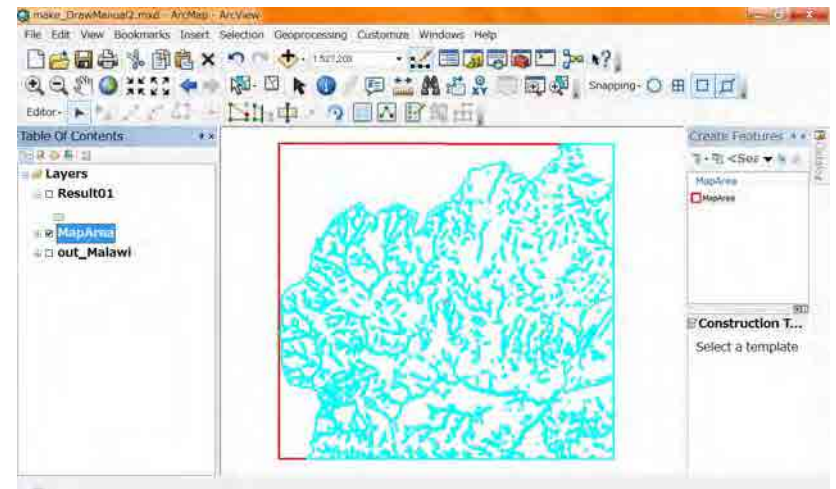
Start editing about the map area layer.



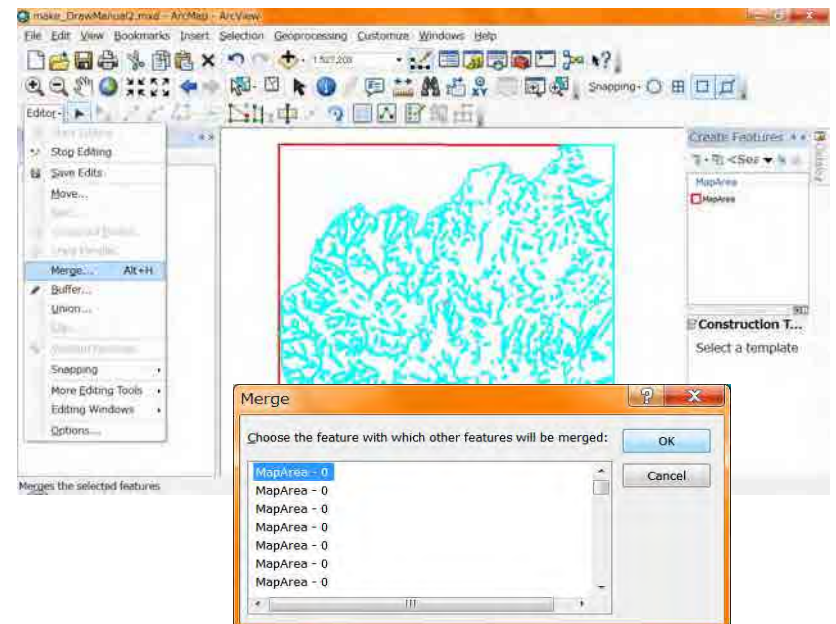
Paste to the map area layer.



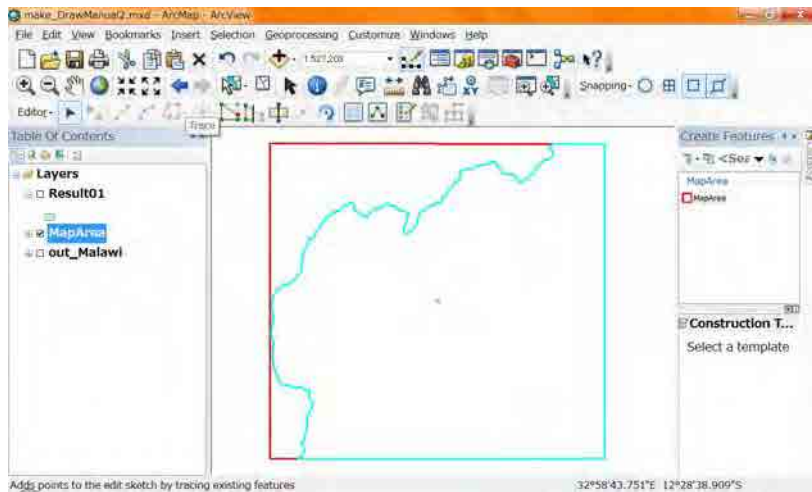
The distribution polygons are paseted and selected.



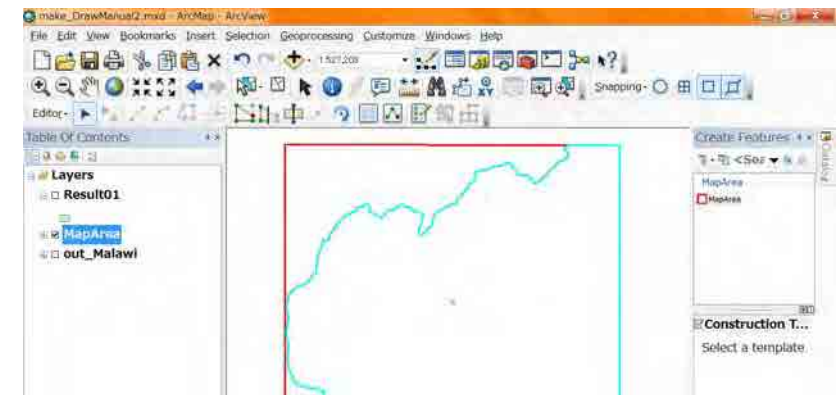
Merge (in the editor tool) to make one area you drawn for the distribution.



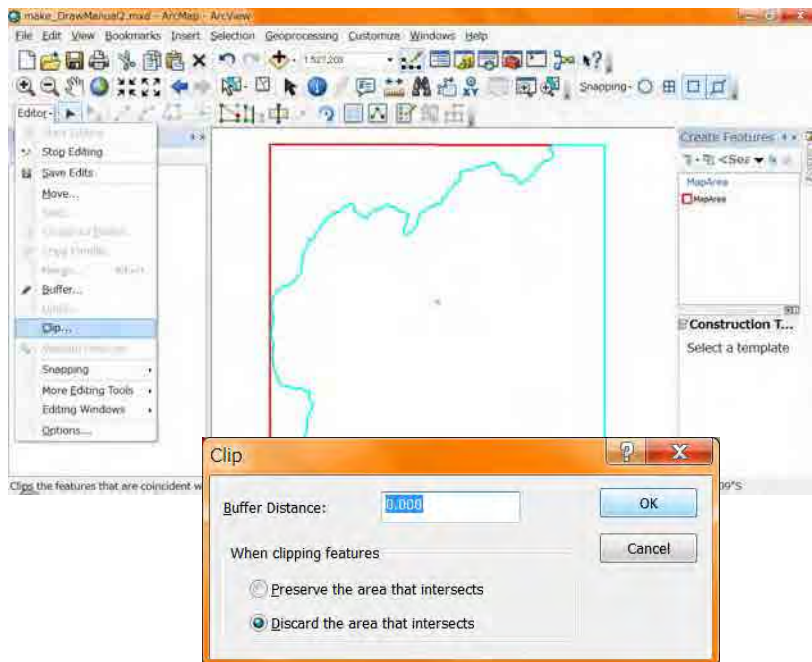
Merged. Selected a merged polygon.



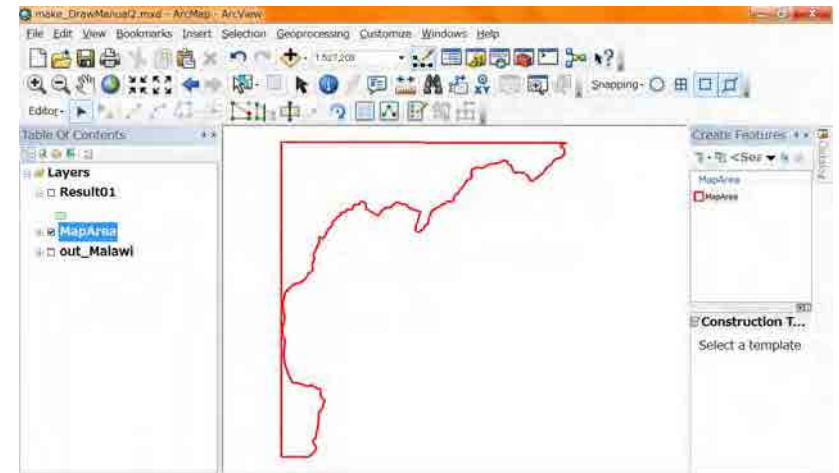
The area you drawn for the distribution is deleted from the map area.



Clip (in the editor tool)



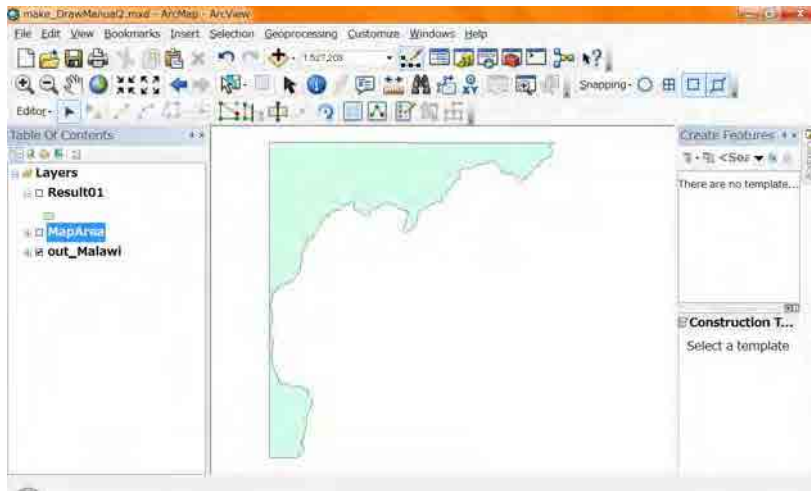
Delete the area you drawn for the distribution



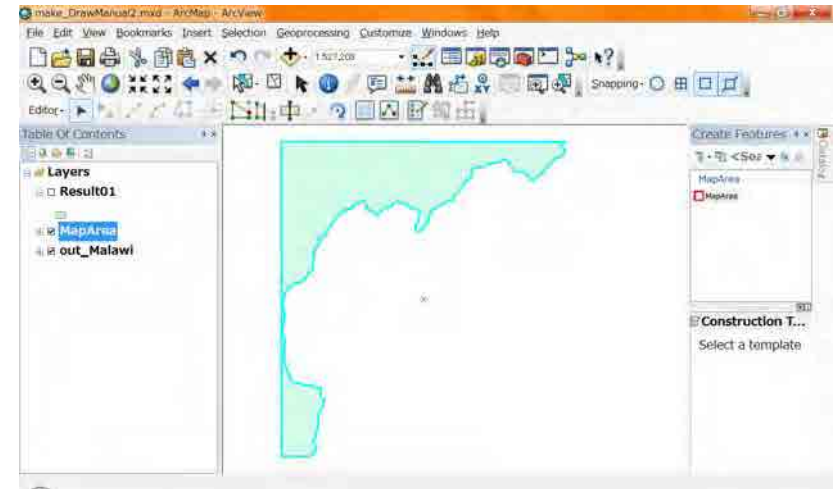
If the map area dose not include the outside of Malawi, you check the polygons remain or not. No polygon remain it is OK. The polygon remained means the gap.

If there is the area of outside of Malawi continue the option.

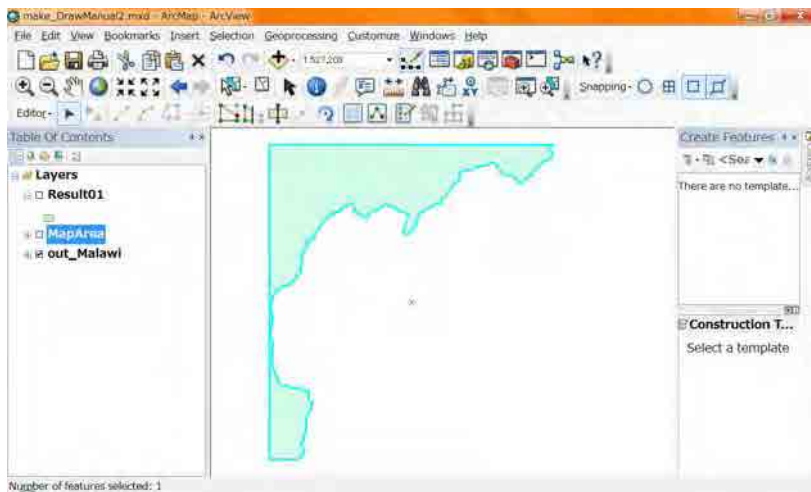
Show the outside of Malawi and hide the map area.



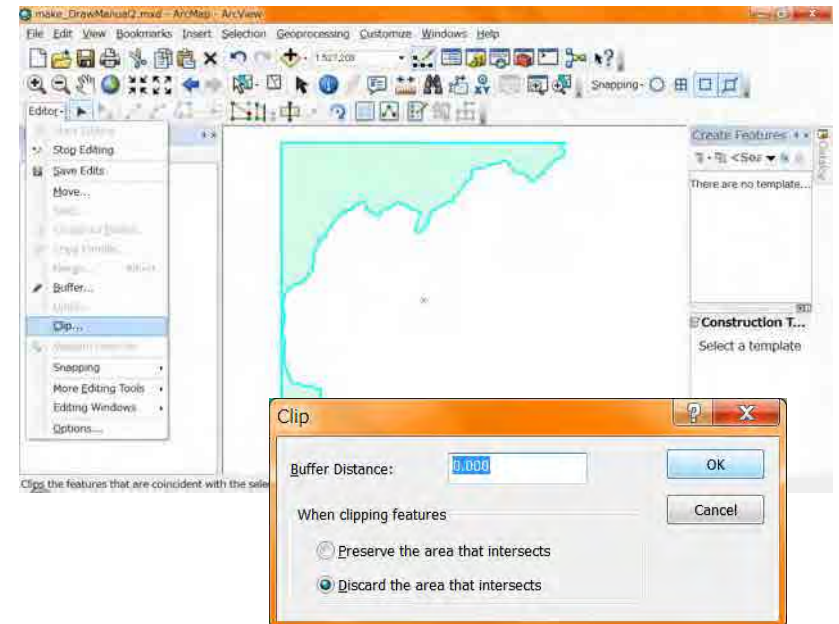
Show the map area.

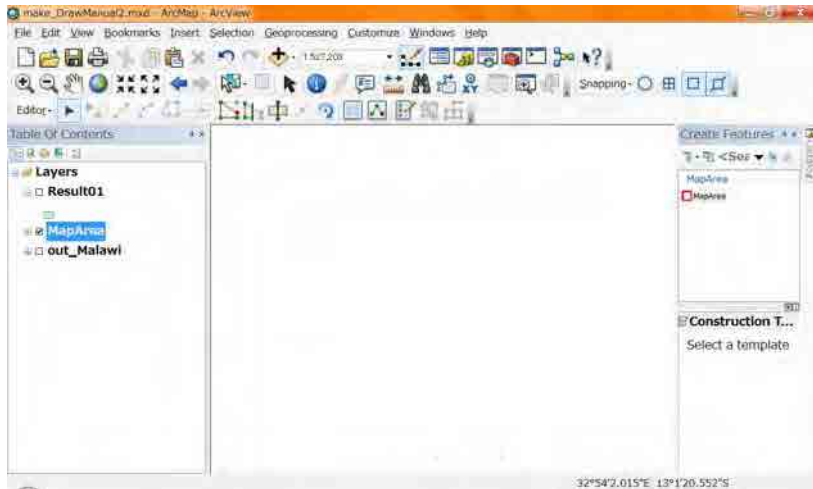


Select the outside of Malawi.



Clip (in the editor tool)



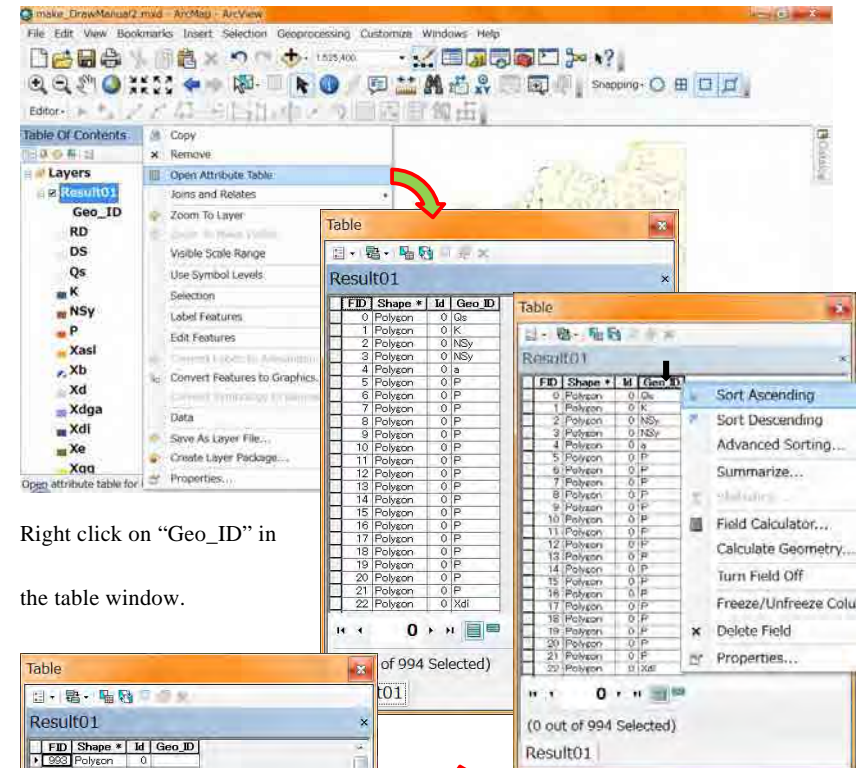


Check the polygons remain or not. No polygon remain it is OK. The polygon remained means the gap.

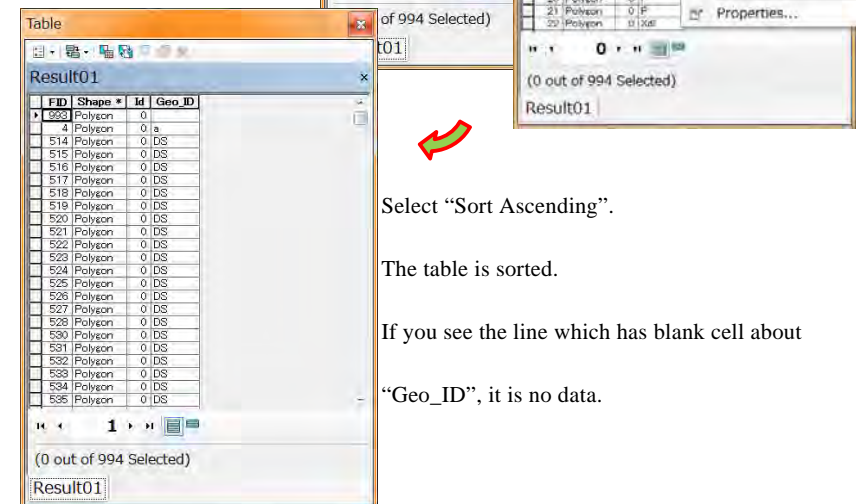
For repairing the gap, copy the polygons to the distribution layer you drawn. And add the data of "Geo_ID" to the attribute table.

7-3. Check the Data of "Geo_ID"

For checking the data of "Geo_ID", open the "Attribute Table".




Right click on "Geo_ID" in the table window.

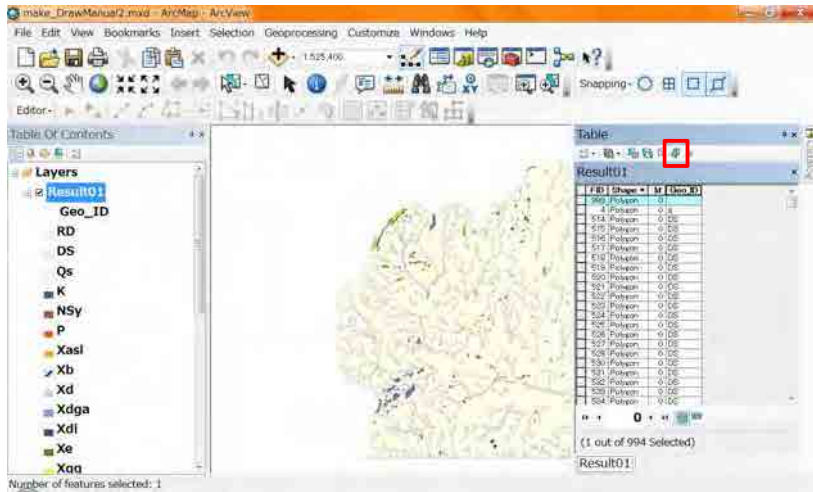


Select "Sort Ascending".

The table is sorted.

If you see the line which has blank cell about "Geo_ID", it is no data.

Select one line, then click  .



The view is zoomed to the polygon. You can easily understand the geology (Geo_ID) of the area. Enter correct “Geo_ID” after start editing.

