REPUBLIC OF TOGO
DGC:DIRECTION GENERALE DE LA CARTOGRAPHIE

THE STUDY ON ESTABLISHMENT OF TOPOGRAPHIC DATABESE IN TOGO

Final Report

(Manuals)

September 2013

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

PASCO CORPORATION
AERO ASAHI CORPORATION

EI
JR
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Introduction

This manual is about the indoor technology transfer（"Aerial triangulation", "Digital plotting", "Digital compilation", "Map symbolization", "Digital data structurization" ） in this project. In consideration of technical levels of the DGC members who attended the indoor technology transfer, this manual was prepared with emphasises on following main points.

- A basic operation for those who use the softwere for the first time
- An operation about basic work at each stage of map making in this research
- It plays a role as a guideline for searching an official manuals of each softwewre（Due to its tremendous amount of information, the official manual is not suitable for inexperienced users to look up some basic operations）
- Visualizing each settings and inputting procesure by capturing screen image

This manual was prepared within an exercise of each indoor technical transfer. Some extra components are added into the manuals when everybody gets stuck on certain points during the exrcise.

Table of Contents

Aerial Triangulation

Chapter 1 Aerial Triangulation

Open LPS(ERDAS Imagine)

1-1 Aerial Triangulation for Aerial photos

1-1-1 Work Flow of Aerial Triangulation for Aerial photos

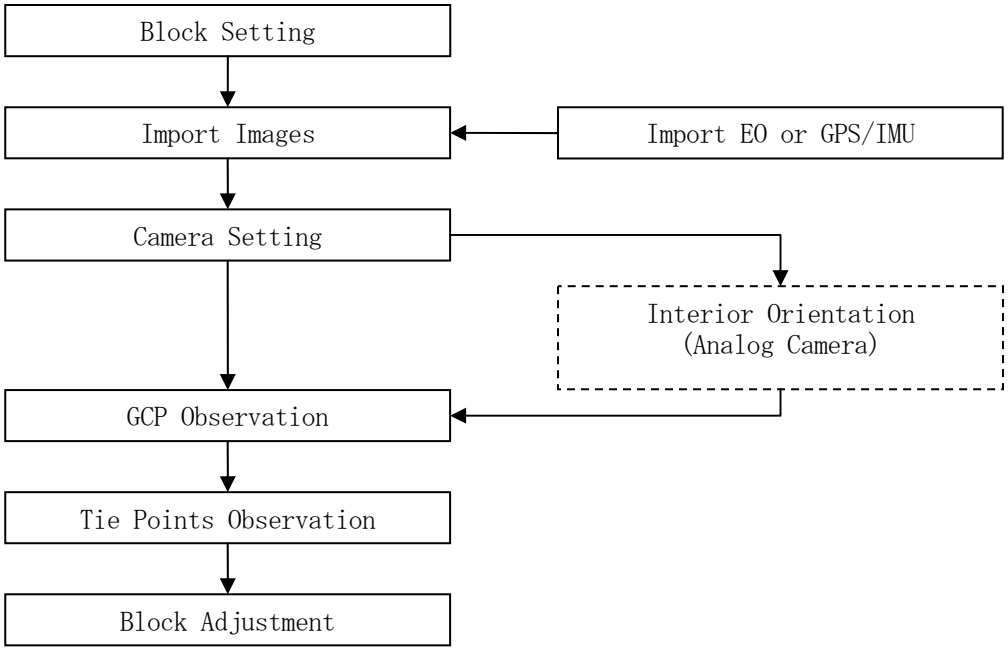


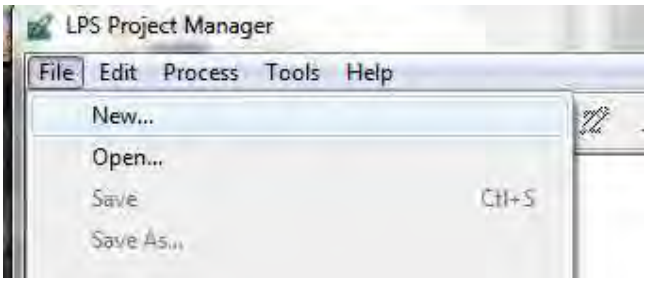
Figure 1 Basic Work Flow of Aerial Triangulation

1-1-2 Block Setting

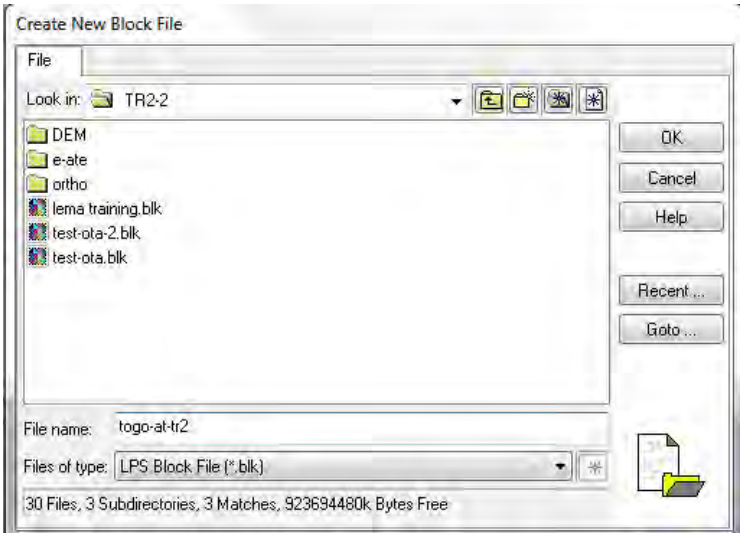
(1) Open New Block

Open LPS

Create New Block (Project)

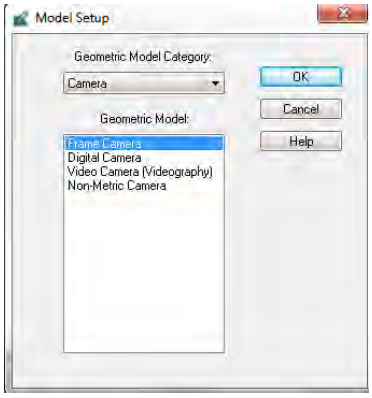


Input Block name (EX: “togo-at-tr2”)

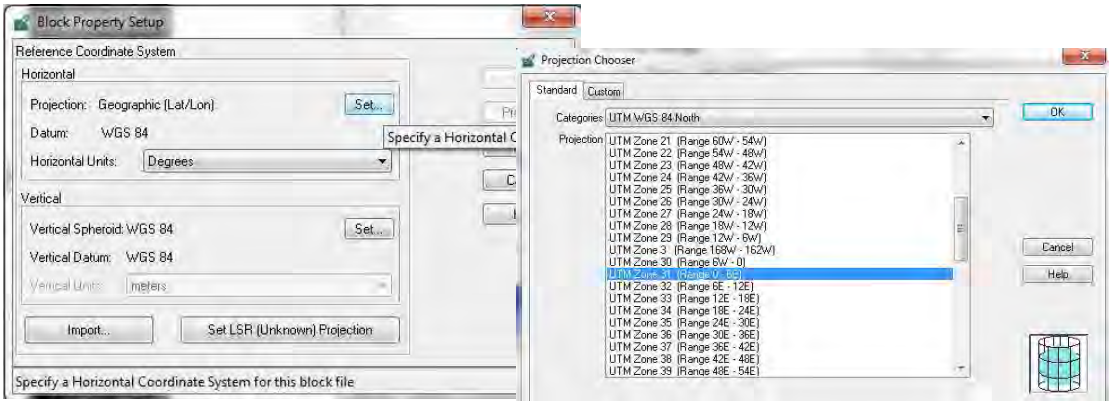


(2) Select Camera Type (See 1-4 for “Camera Setting”)

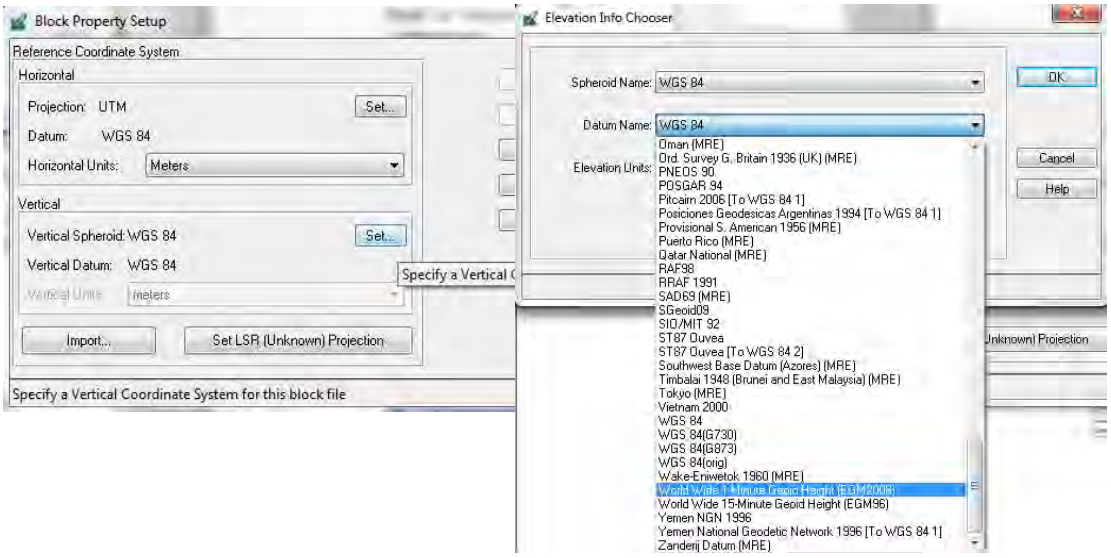
Select “Frame Camera” for “analogue camera”.



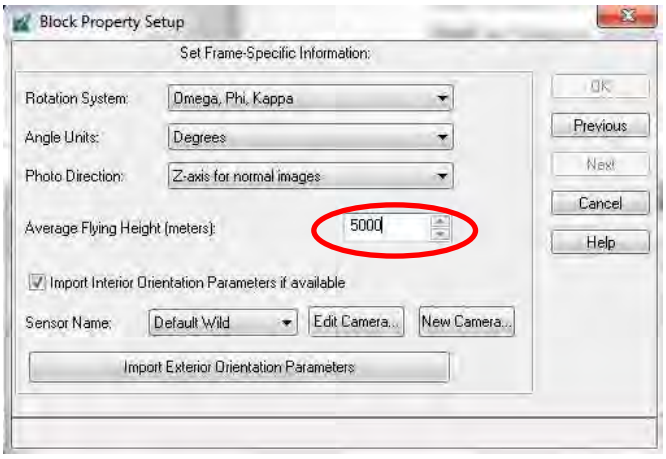
Select Horizontal Coordinate System after clicking “Set” in “Standard” tag, then select “UTM WGS 84 North” as “Categories” and select “UTM Zone 31” as “Projection”



Select Vertical Coordinate System (Spheroid: WGS84, Datum: EGM2000) , then “OK”

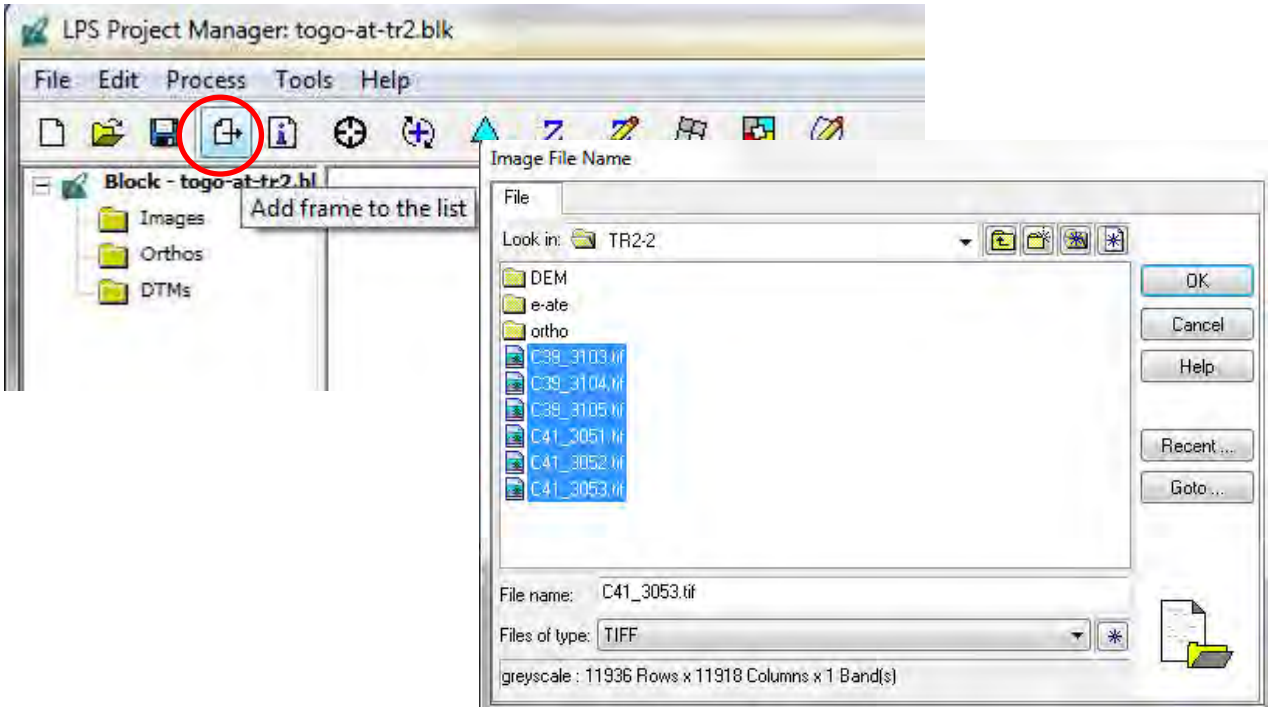


Click “Next” and Input Flight Height as 5,000m then “OK”.



1-1-3 Import Images

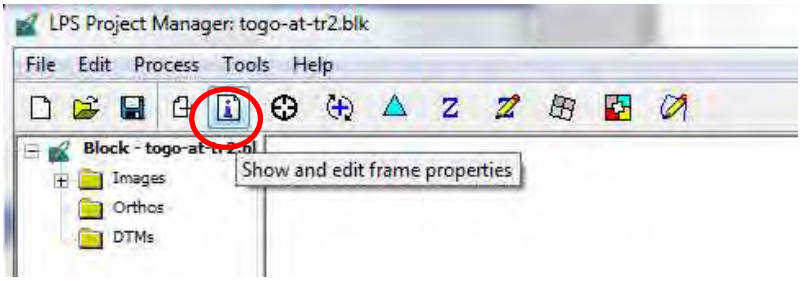
Click “Add frame” and move into the work Folder and after choosing “Files type”, select images.



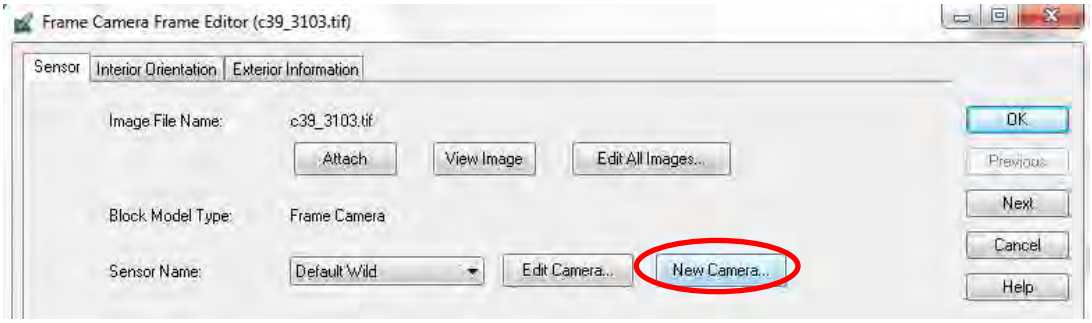
1-1-4 Interior Orientation

(1)Camera Setting

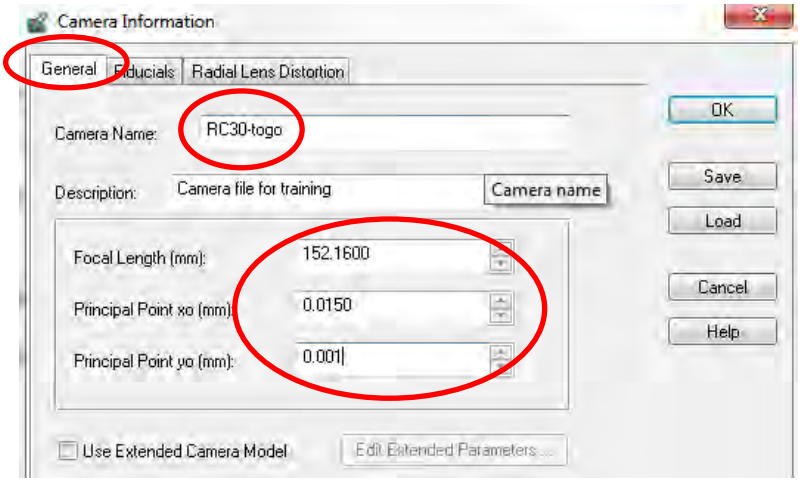
Go to Interior Orientation



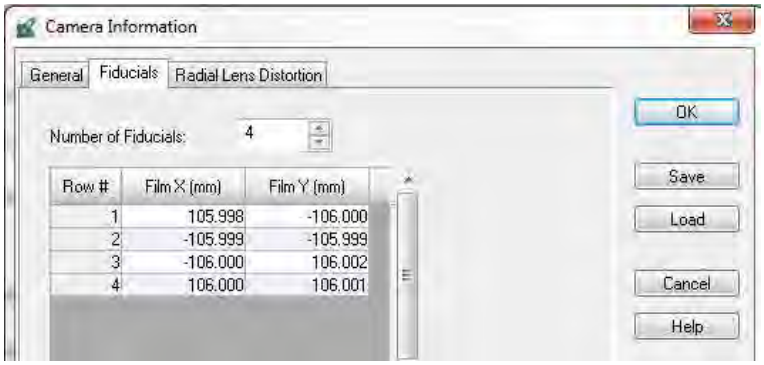
Create Camera file



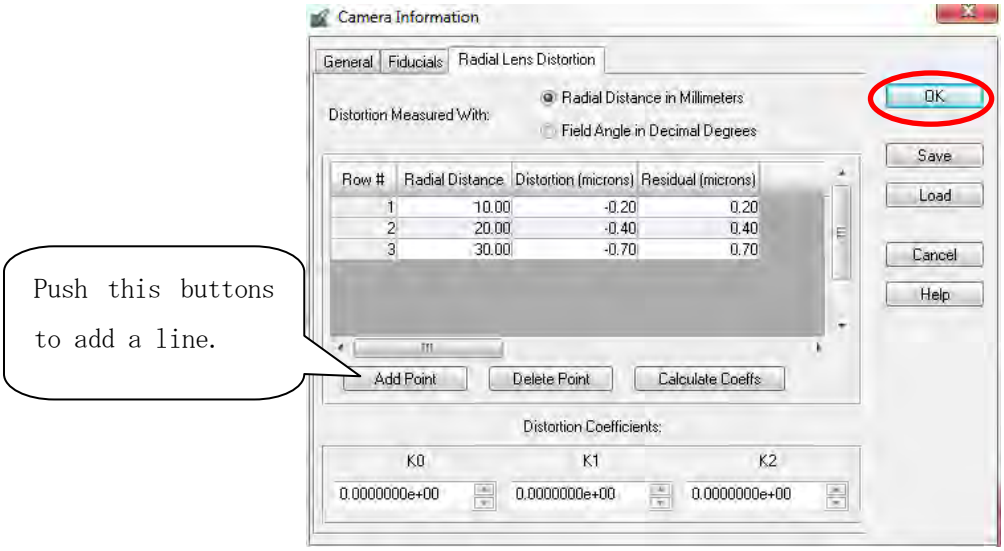
Input “Name”, “Focal length”, “Principal Point(x,y)” from Camera calibration file in “General” tag.



Input “Fiducial Coordinates” in “Fiducials” tag (In case of Frame Camera).

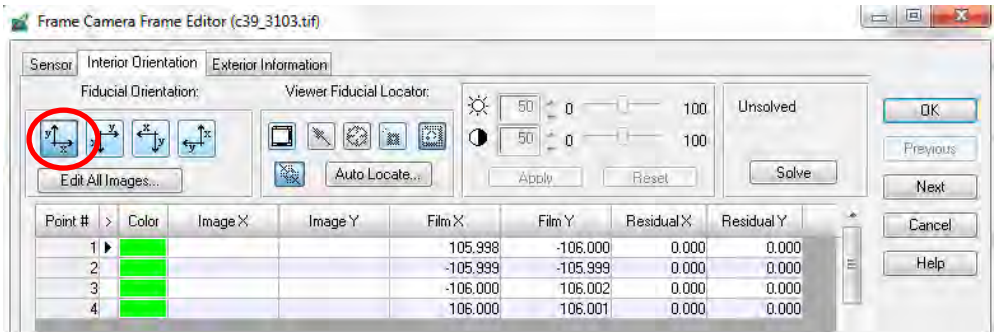


Input “Distortions” (In case of Frame Camera). And “OK”

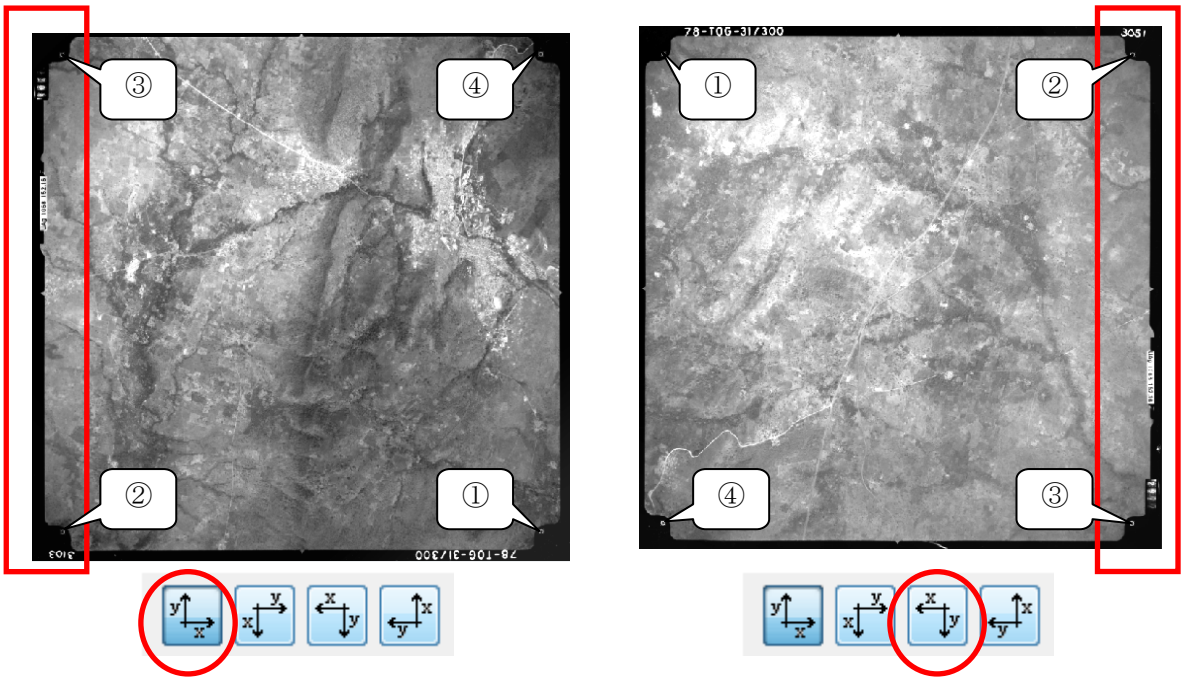


(2) Interior Orientation

Go to “Interior Orientation” tag and set the direction of all images.

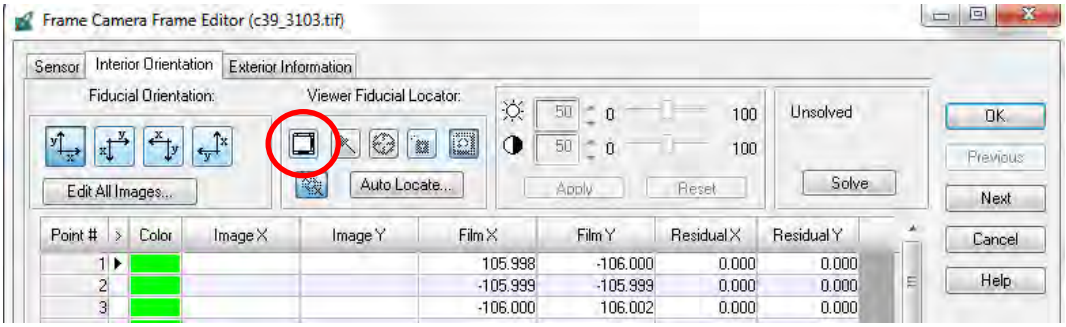


Label

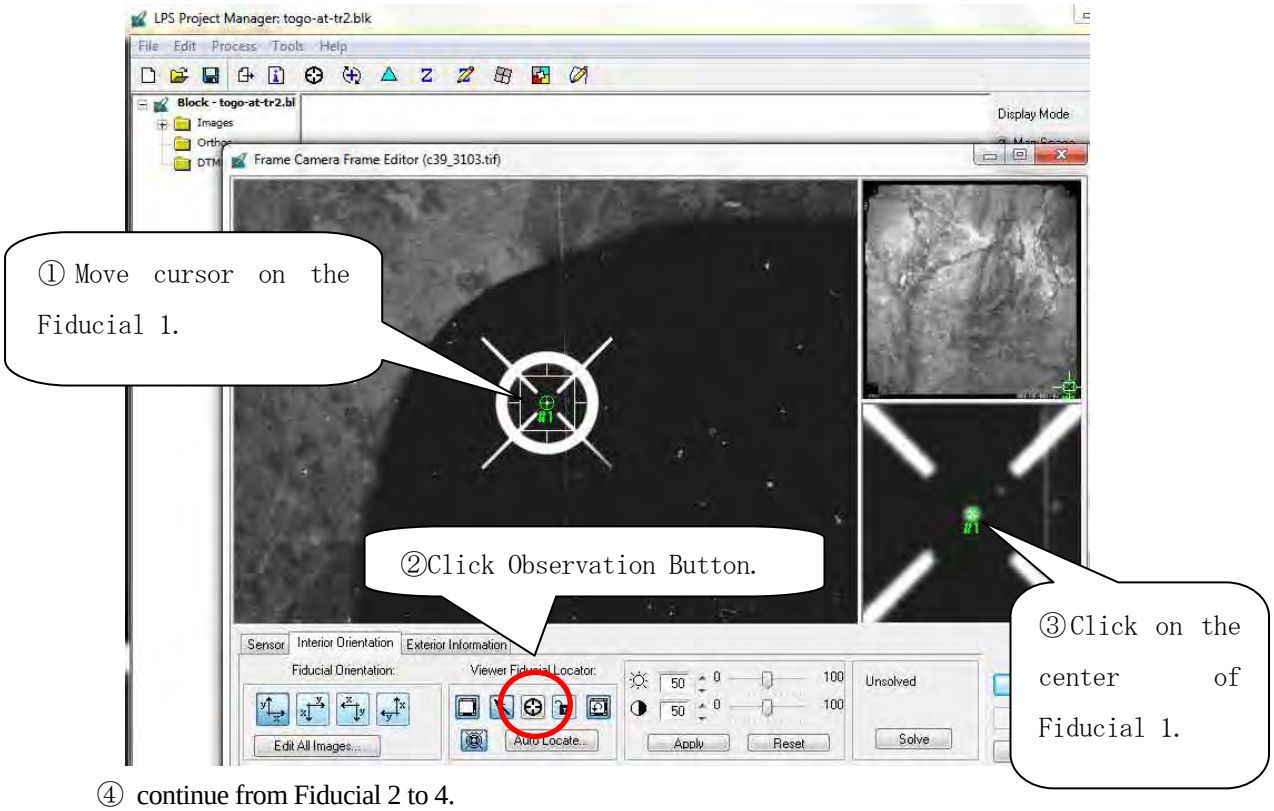


Label

Open Interior Orientation Viewer on the first image.



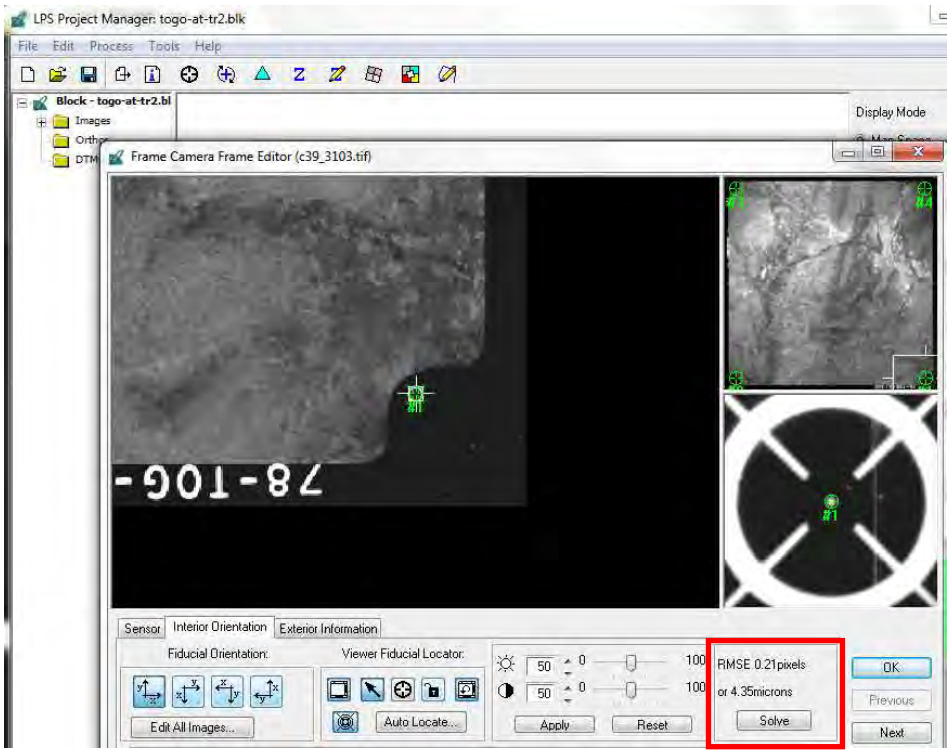
Open Interior Orientation Viewer.



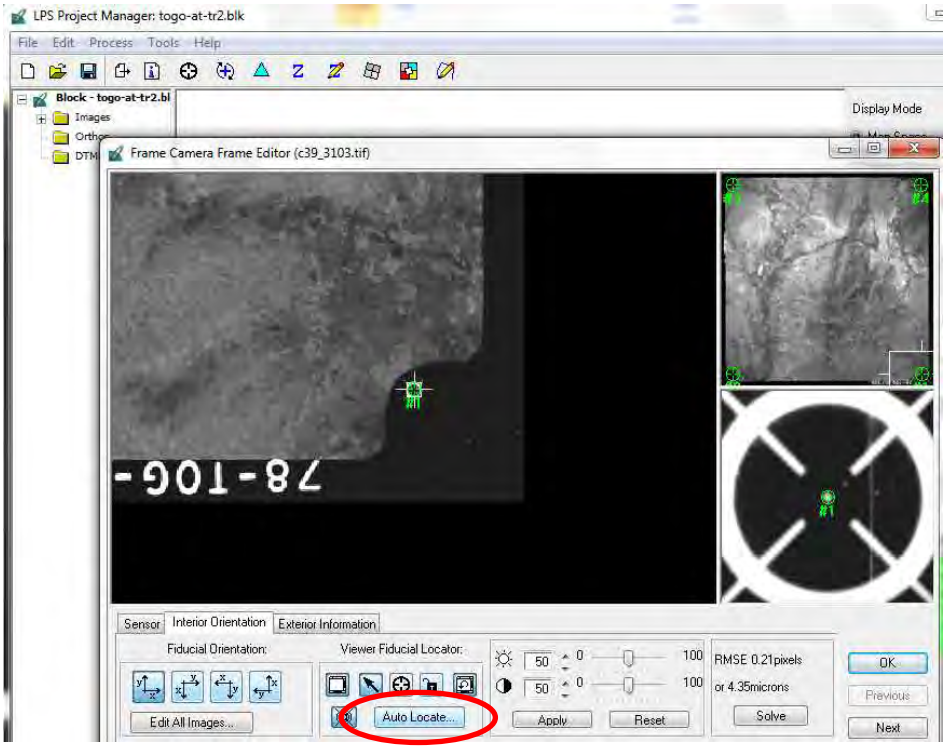
④ continue from Fiducial 2 to 4.

After the observation of all 4 points, If the result clear the tolerance(0.03mm), go next.

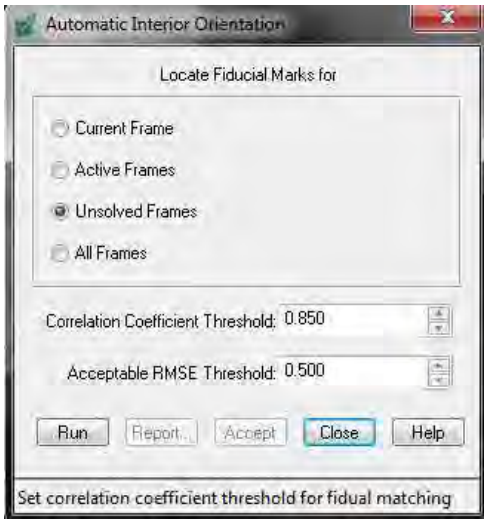
(In this case, 7.3 microns is less than 0.03mm=30 microns)

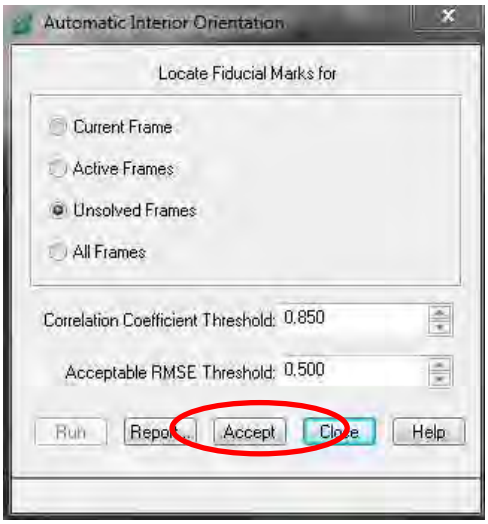


Continue Observation of fiducials for all remaining images. In case of automatic “Interior Orientation”, one image must be observed and the direction of images must be checked.



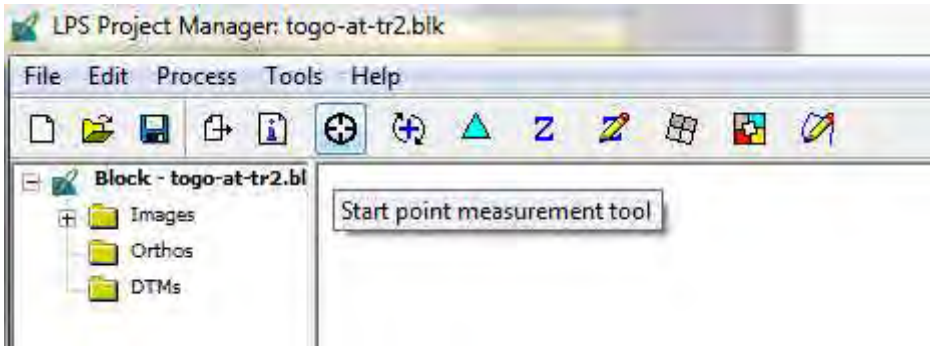
After, “Automatic Interior Orientation”, click “Accept”.



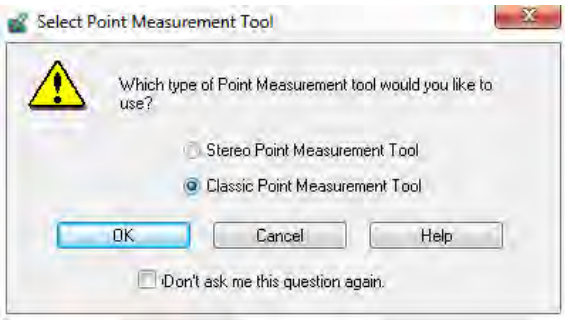


1-1-5 GCP Observation and Tie points Observation

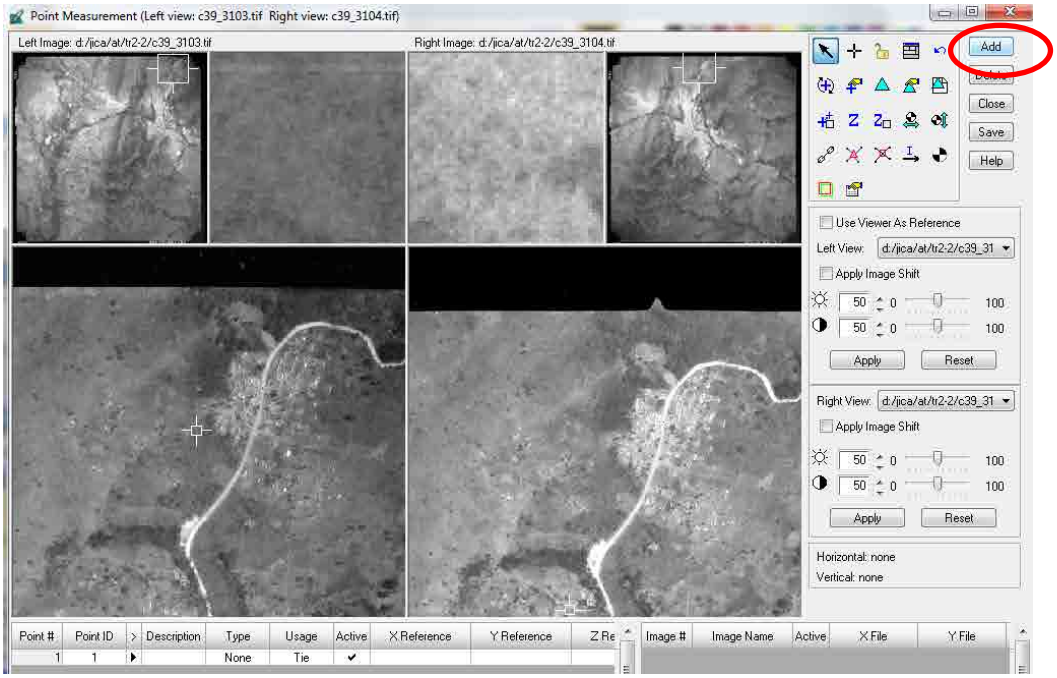
Go to Points measurement tool



Select “Stereo” (Stereo-view work) or “Classic” (Mono (Split)-view work).



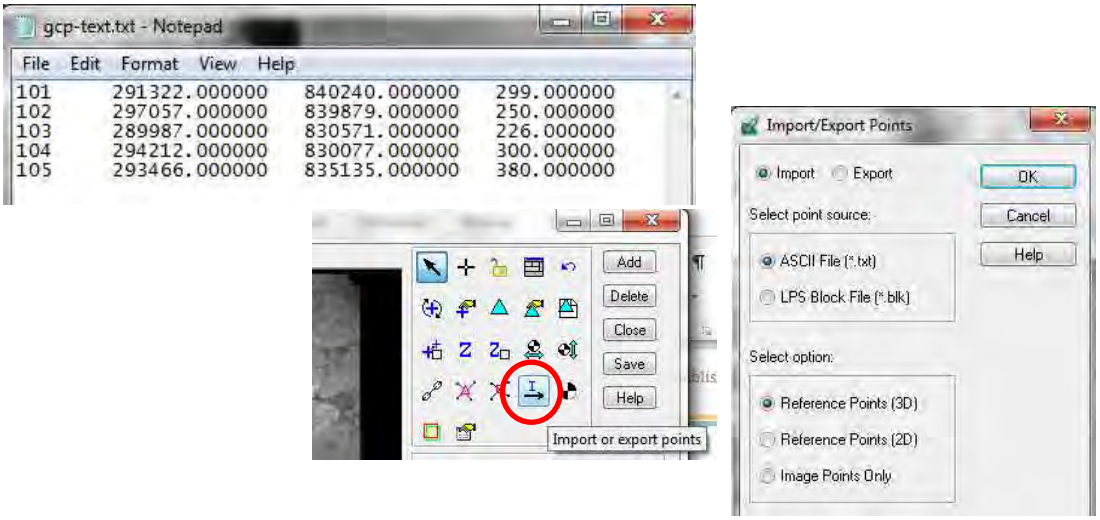
Click “Add” to input new GCP



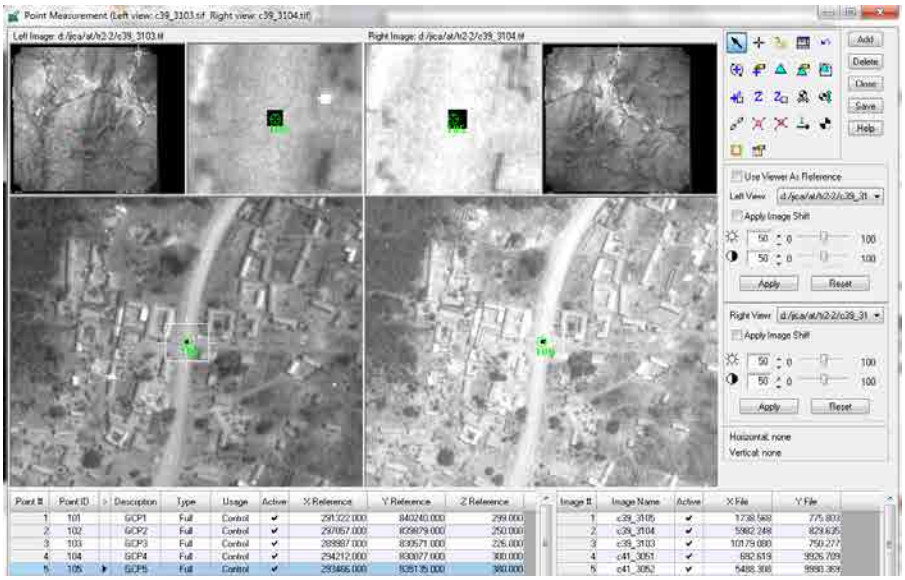
Input “Point ID” with number, “Description” with character, Type as “Full”, X, Y, Z coordinate of GCP. Then continue input of all points.

Point #	Point ID	>	Description	Type	Usage	Active	X Reference	Y Reference	Z Reference
1	101	▶	GCP1	Full	Control	✔	291322.000	840240.000	299.000

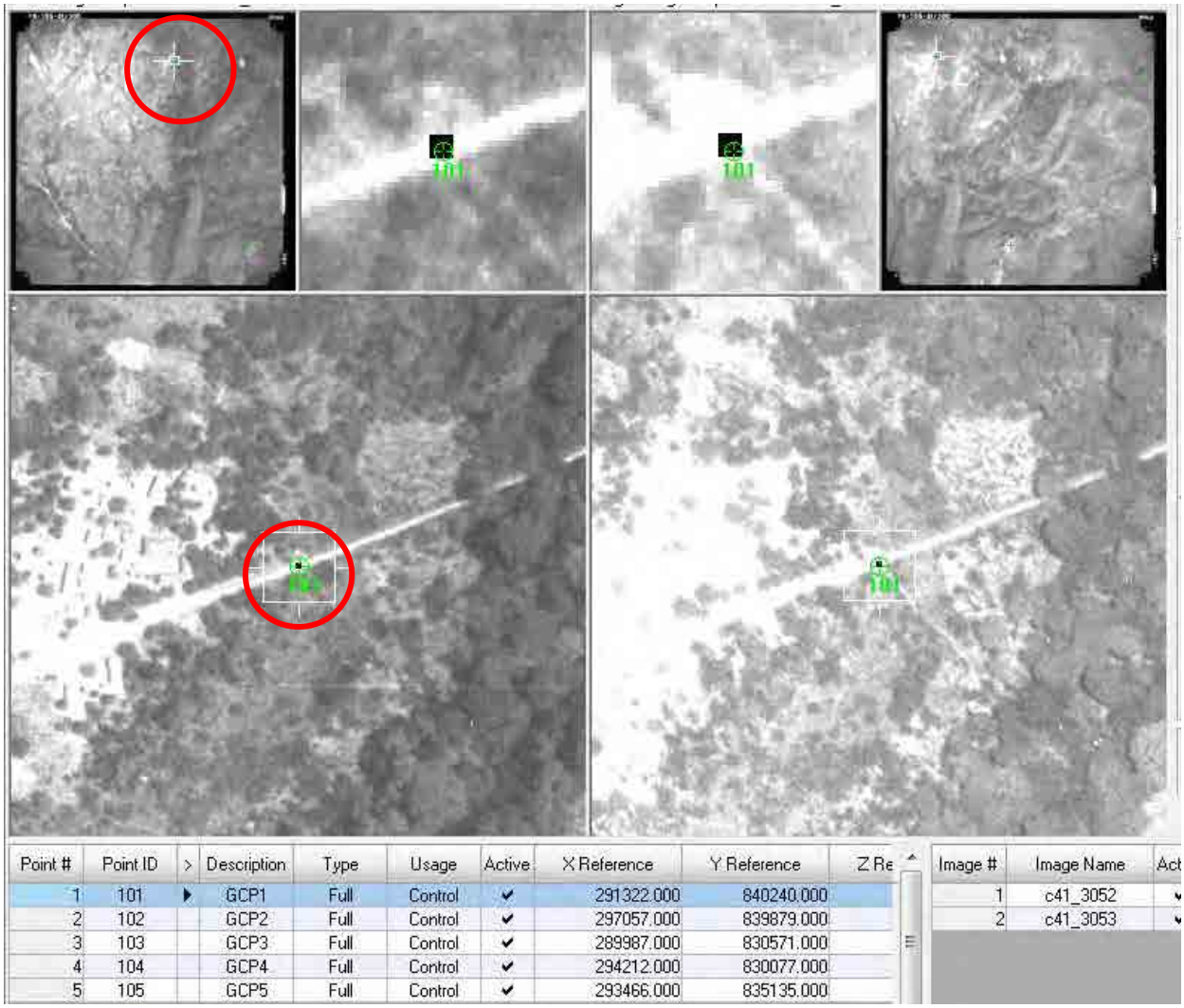
If a text file of “GCP” exists as below, import the file by” Import points” icon.



Then all GCP shall be observed manually. In case a GCP locates on 6 images, 6 images must be observed.



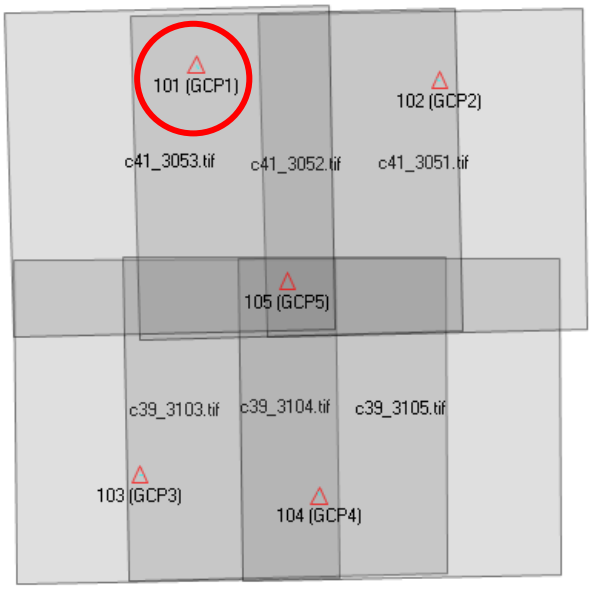
<GCP1>



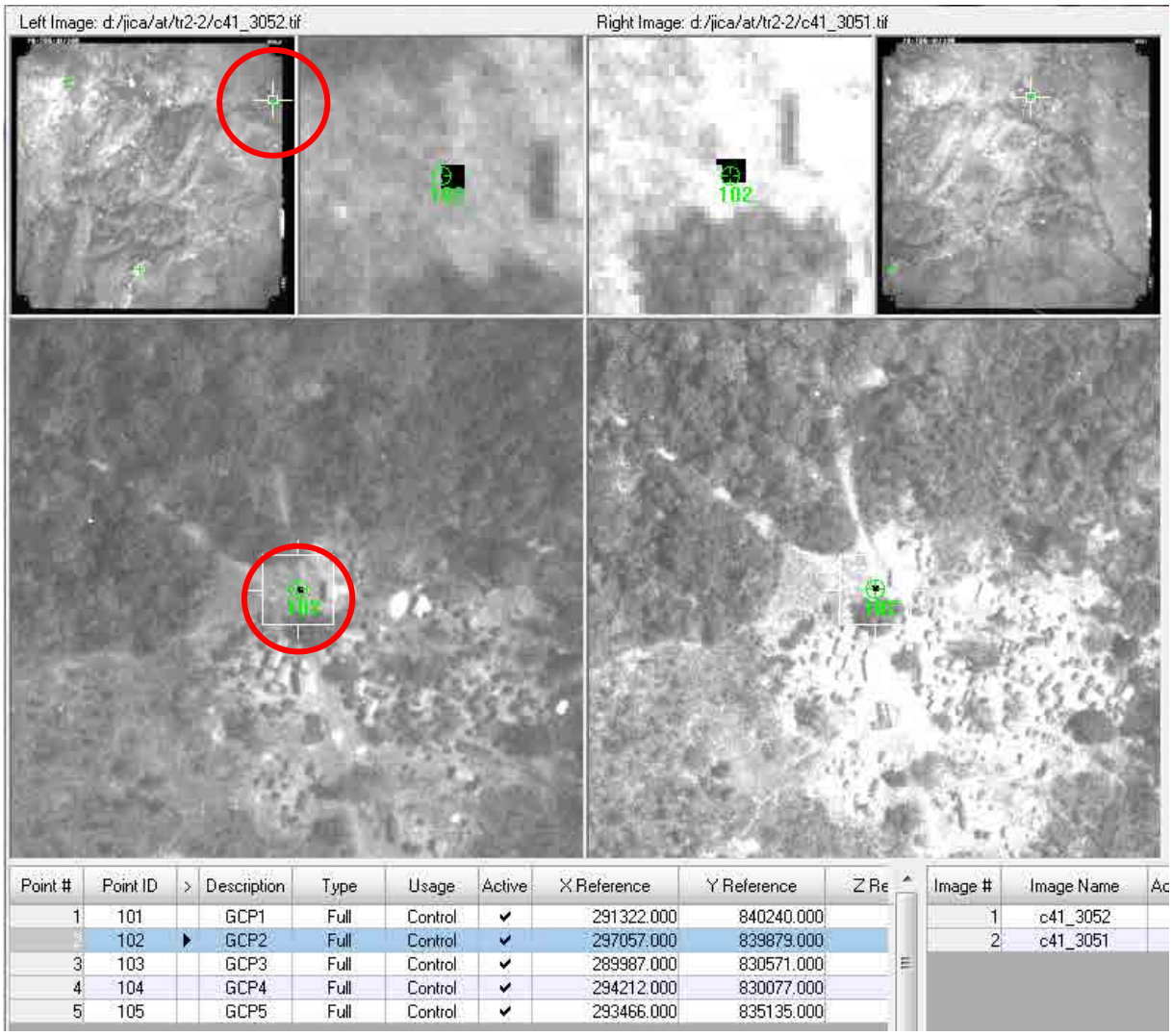
Point #	Point ID	>	Description	Type	Usage	Active	X Reference	Y Reference	Z Re
1	101	▶	GCP1	Full	Control	✔	291322.000	840240.000	
2	102		GCP2	Full	Control	✔	297057.000	839879.000	
3	103		GCP3	Full	Control	✔	289987.000	830571.000	
4	104		GCP4	Full	Control	✔	294212.000	830077.000	
5	105		GCP5	Full	Control	✔	293466.000	835135.000	

Image #	Image Name	Act
1	c41_3052	
2	c41_3053	

X: 291322.0, Y: 840240.0, Z: 299.0



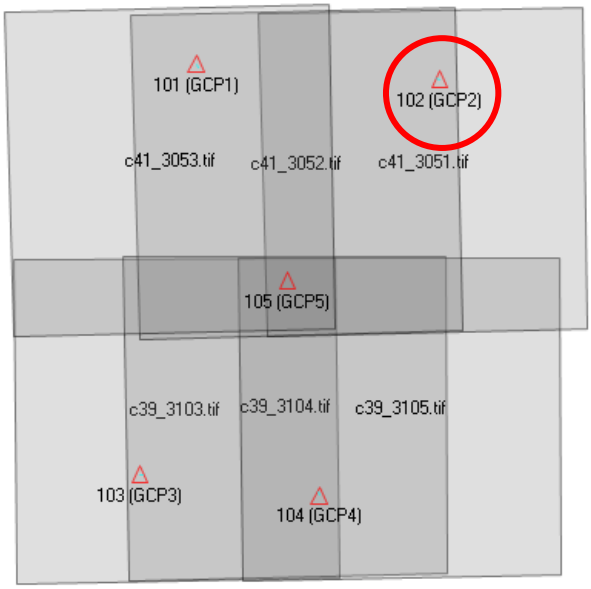
<GCP2>



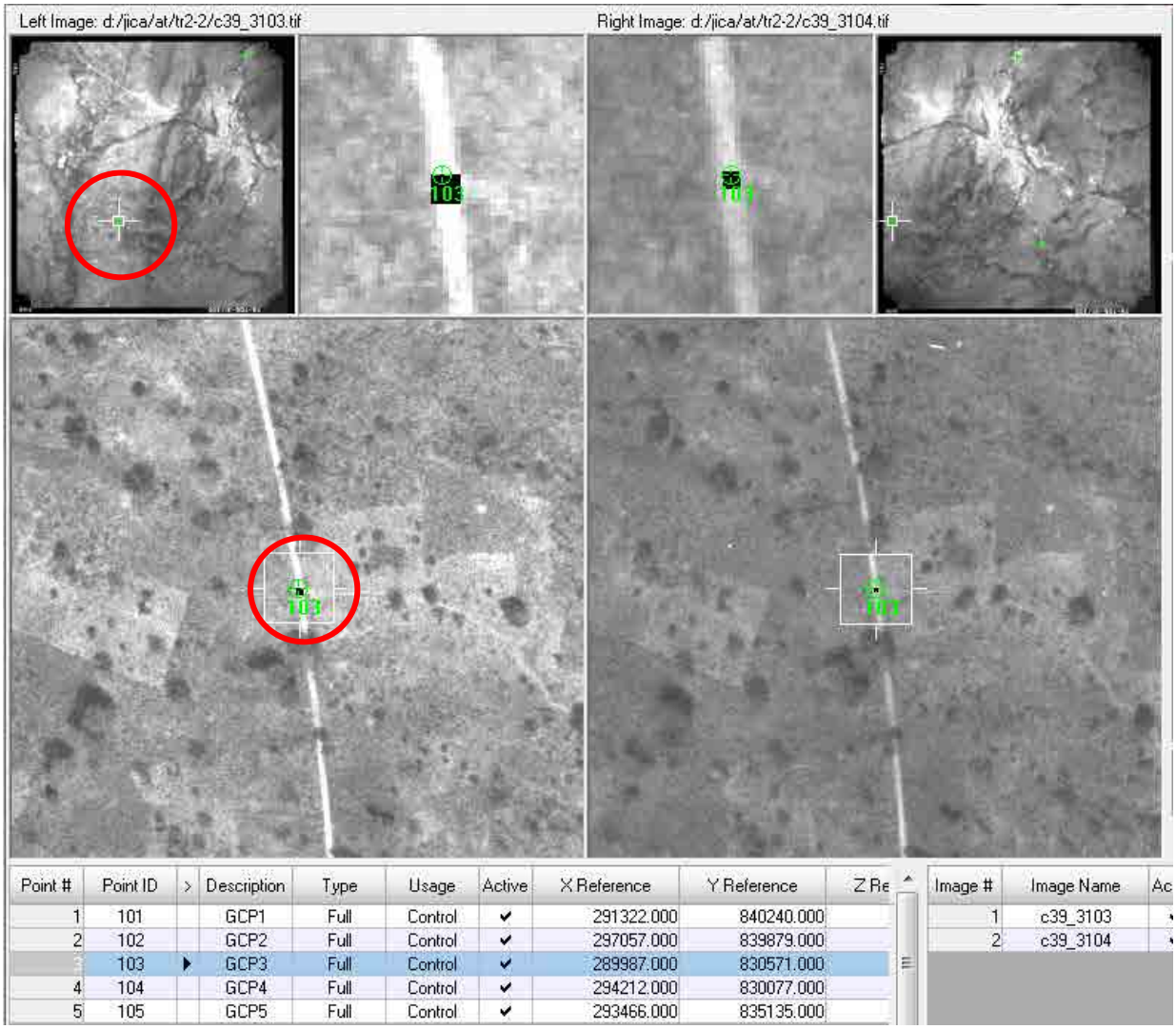
Point #	Point ID	>	Description	Type	Usage	Active	X Reference	Y Reference	Z Re
1	101		GCP1	Full	Control	✔	291322.000	840240.000	
	102	▶	GCP2	Full	Control	✔	297057.000	839879.000	
3	103		GCP3	Full	Control	✔	289987.000	830571.000	
4	104		GCP4	Full	Control	✔	294212.000	830077.000	
5	105		GCP5	Full	Control	✔	293466.000	835135.000	

Image #	Image Name	Ac
1	c41_3052	
2	c41_3051	

X: 297057.0, Y: 839879.0, Z: 250.0



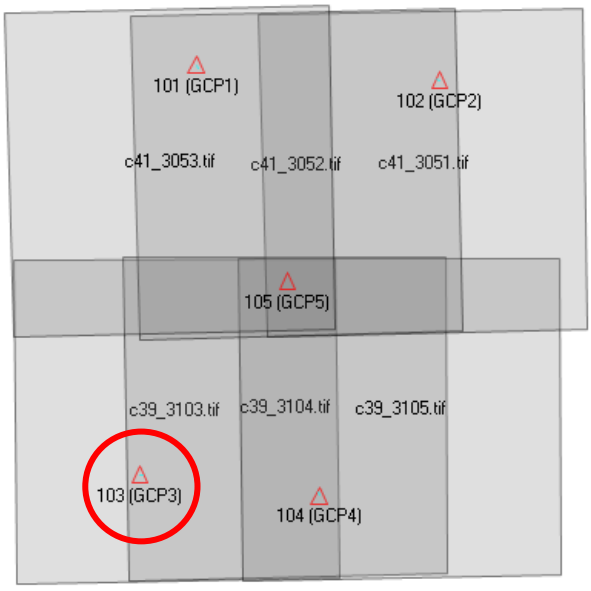
<GCP3>



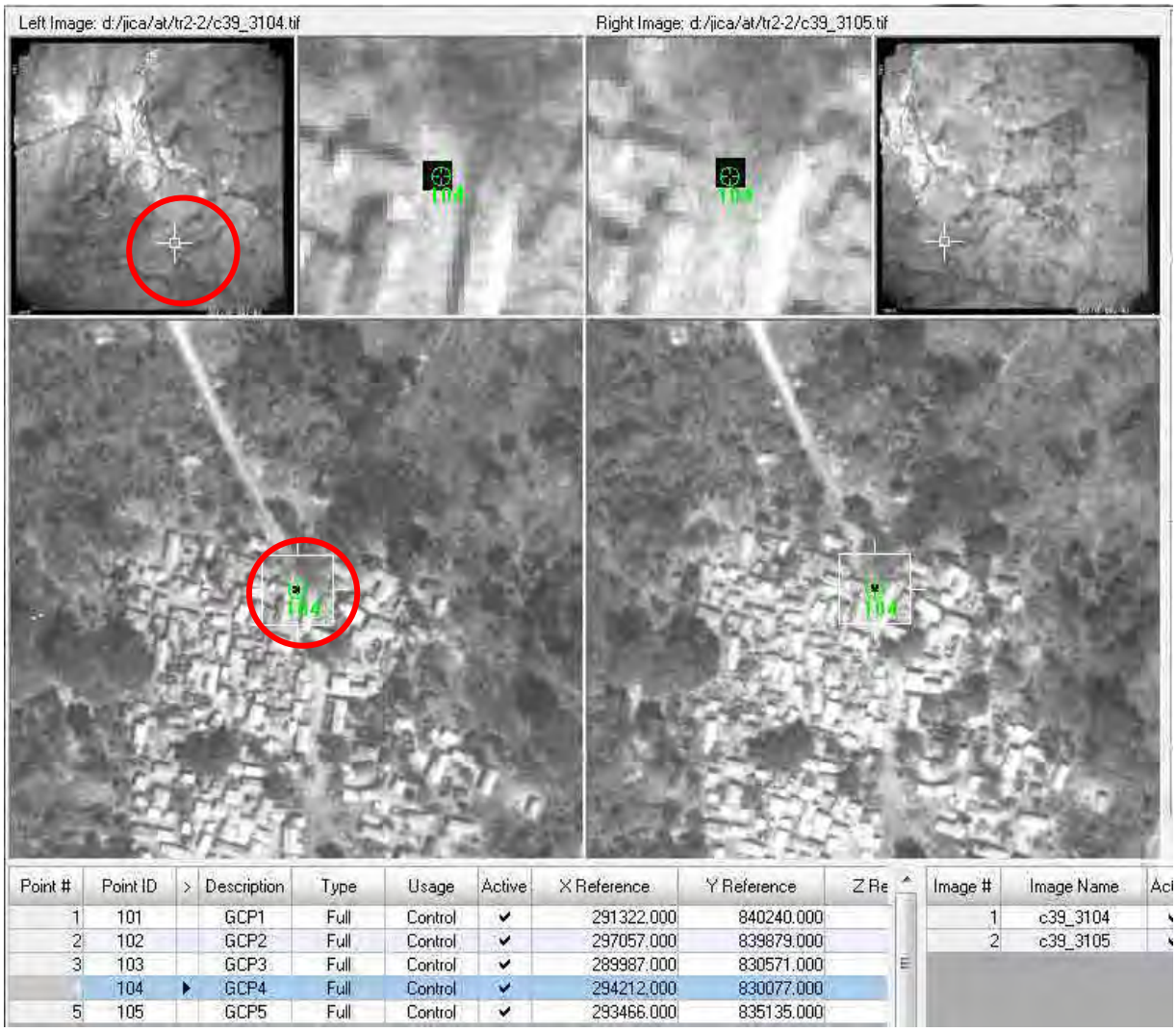
Point #	Point ID	Description	Type	Usage	Active	X Reference	Y Reference	Z Re
1	101	GCP1	Full	Control	✔	291322.000	840240.000	
2	102	GCP2	Full	Control	✔	297057.000	839879.000	
3	103	GCP3	Full	Control	✔	289987.000	830571.000	
4	104	GCP4	Full	Control	✔	294212.000	830077.000	
5	105	GCP5	Full	Control	✔	293466.000	835135.000	

Image #	Image Name	Ac
1	c39_3103	
2	c39_3104	

X: 289987.0, Y: 830571.0, Z: 226.0



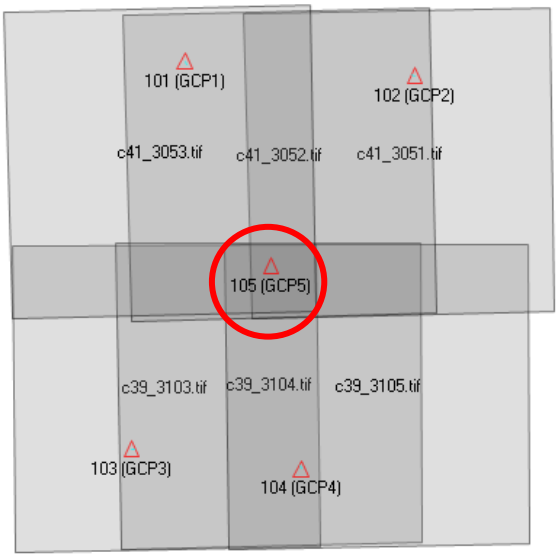
<GCP4>



X: 294212.0, Y: 830077.0, Z: 300.0

<GCP5>

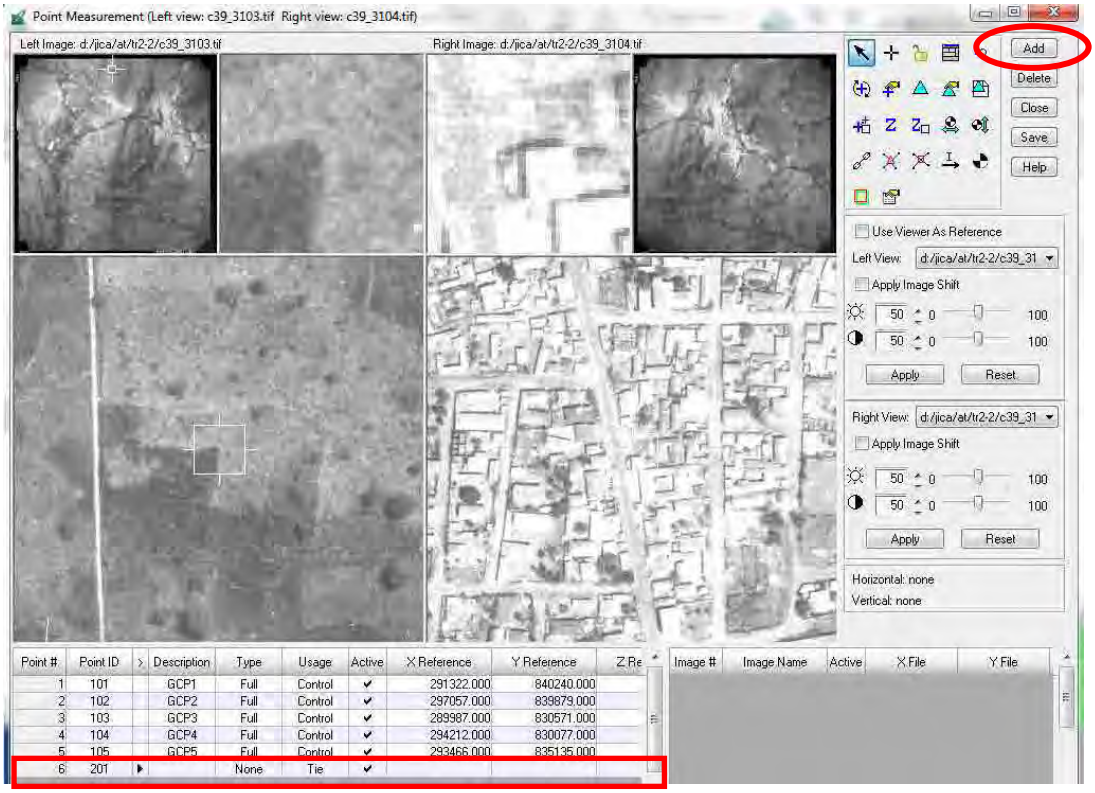
X: 293466.0, Y: 835135.0, Z: 380.0



1-1-6 Tie points Observation

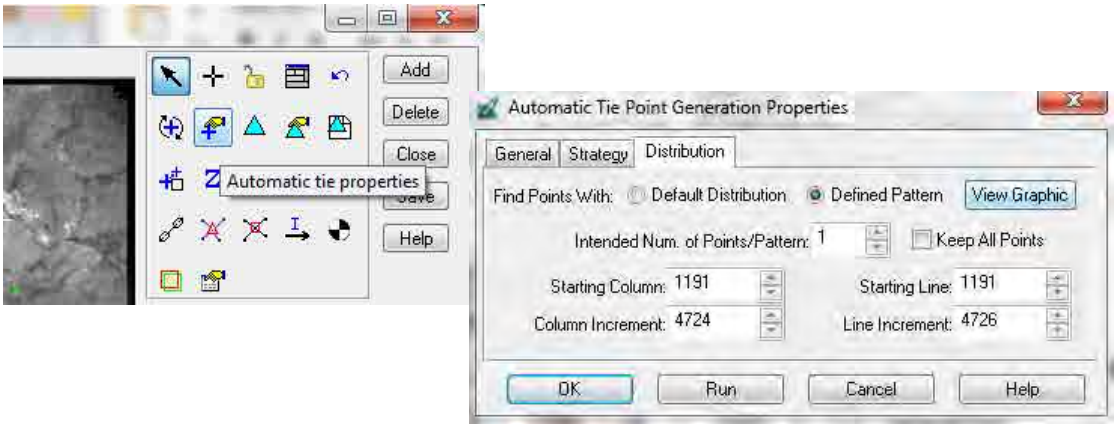
(1)Manual Tie points measurement

Add tie points (Type: None, Usage: Tie) and measure on image one by one same as GCP.

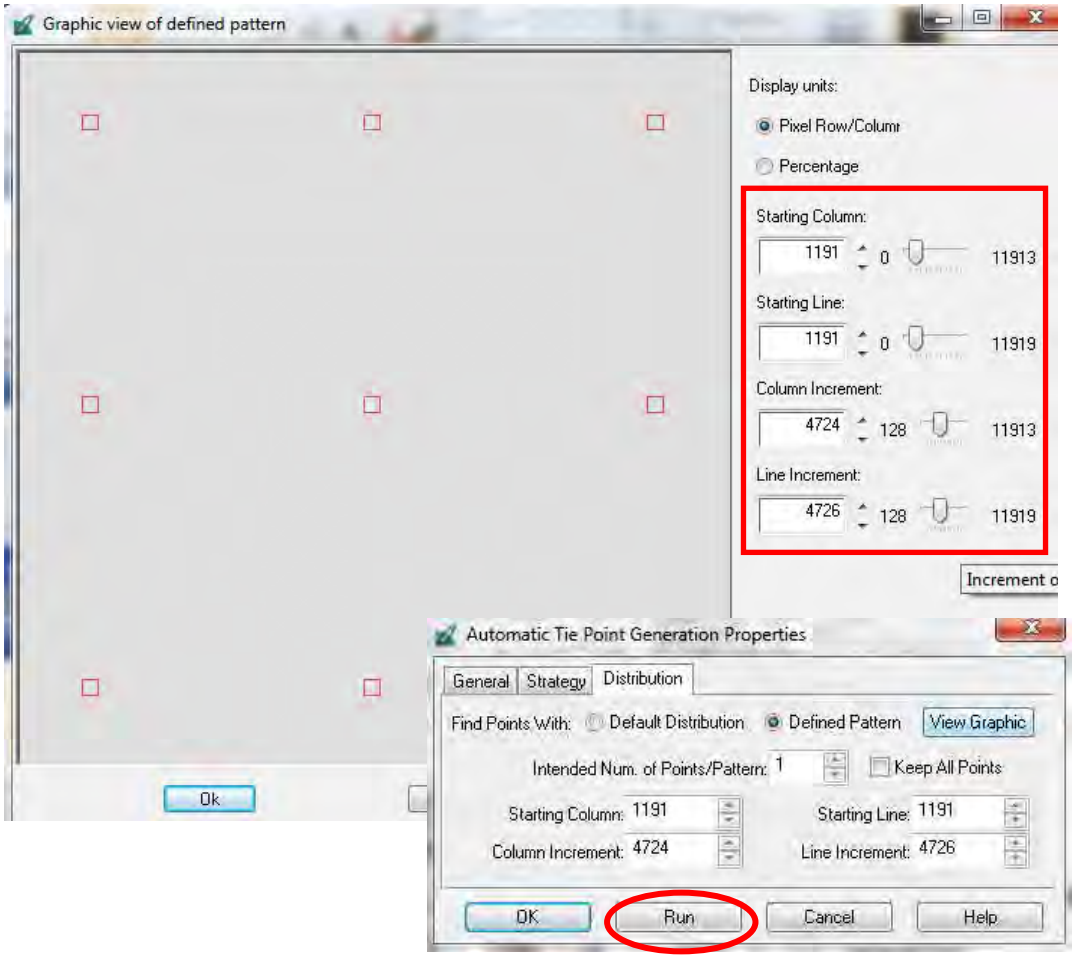


(2) Automatic Tie points measurement

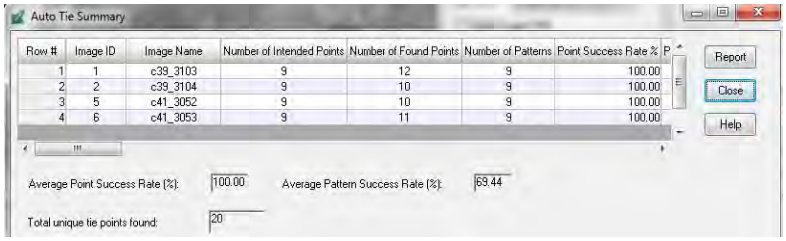
Click “Automatic tie properties” and go to “Distribution” tag, then click “View Graphic””.

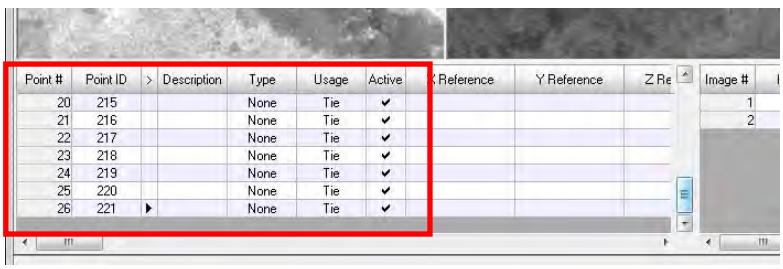


Set allocation of tie points visually, then “RUN” or click  icon.



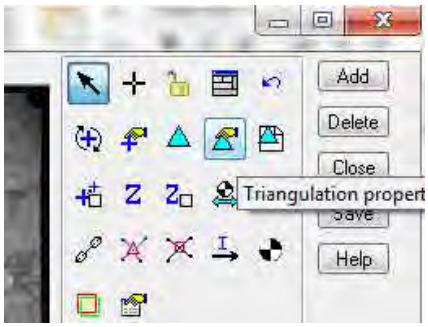
Check result and “Close” then added tie points can be seen in the point measurement window.



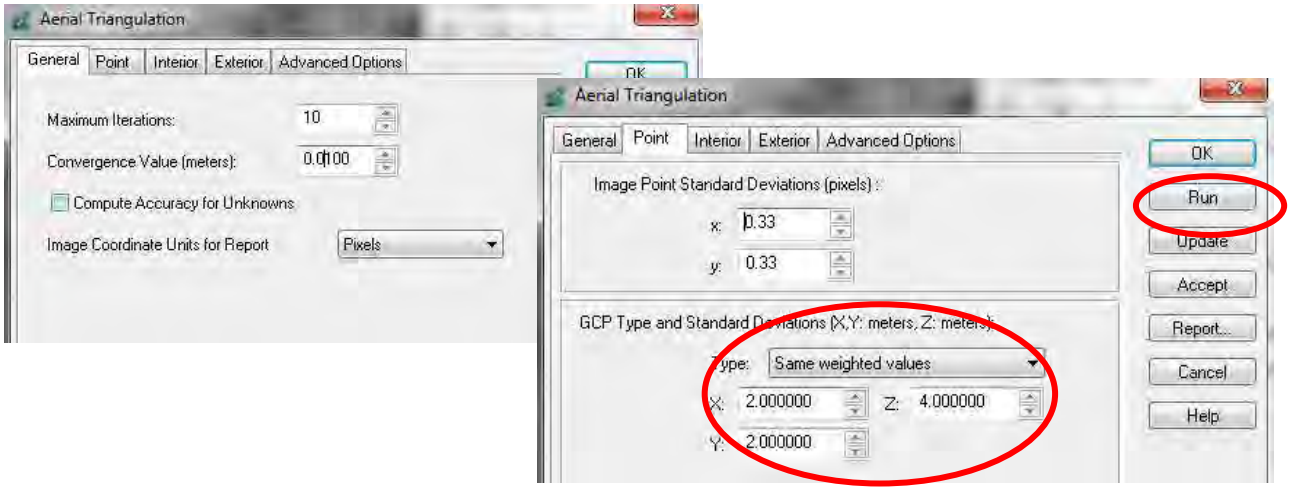


1-1-7 Block Adjustment

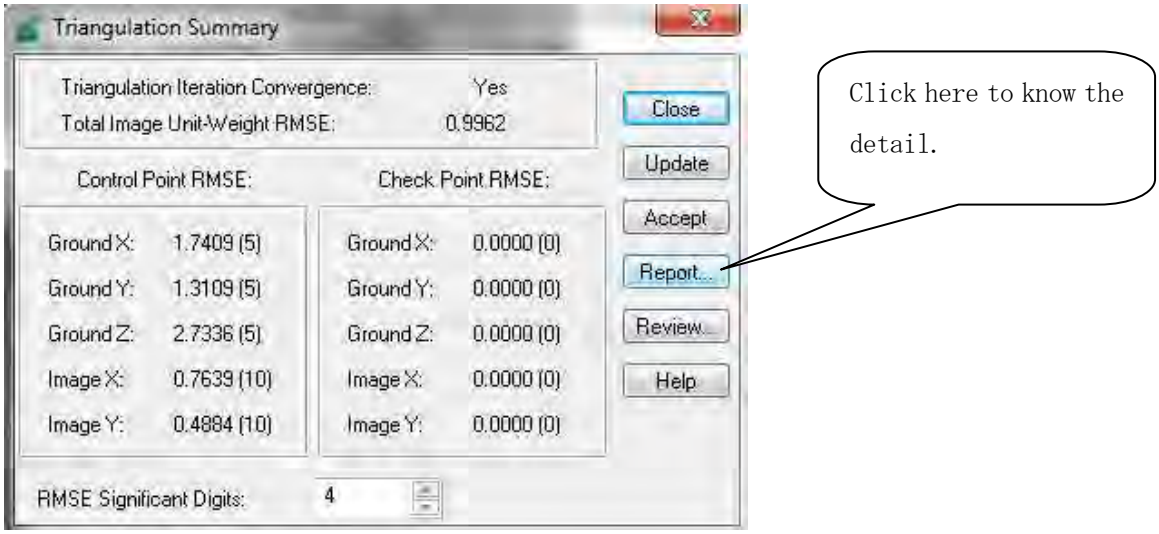
Go to “Triangulation Properties”.

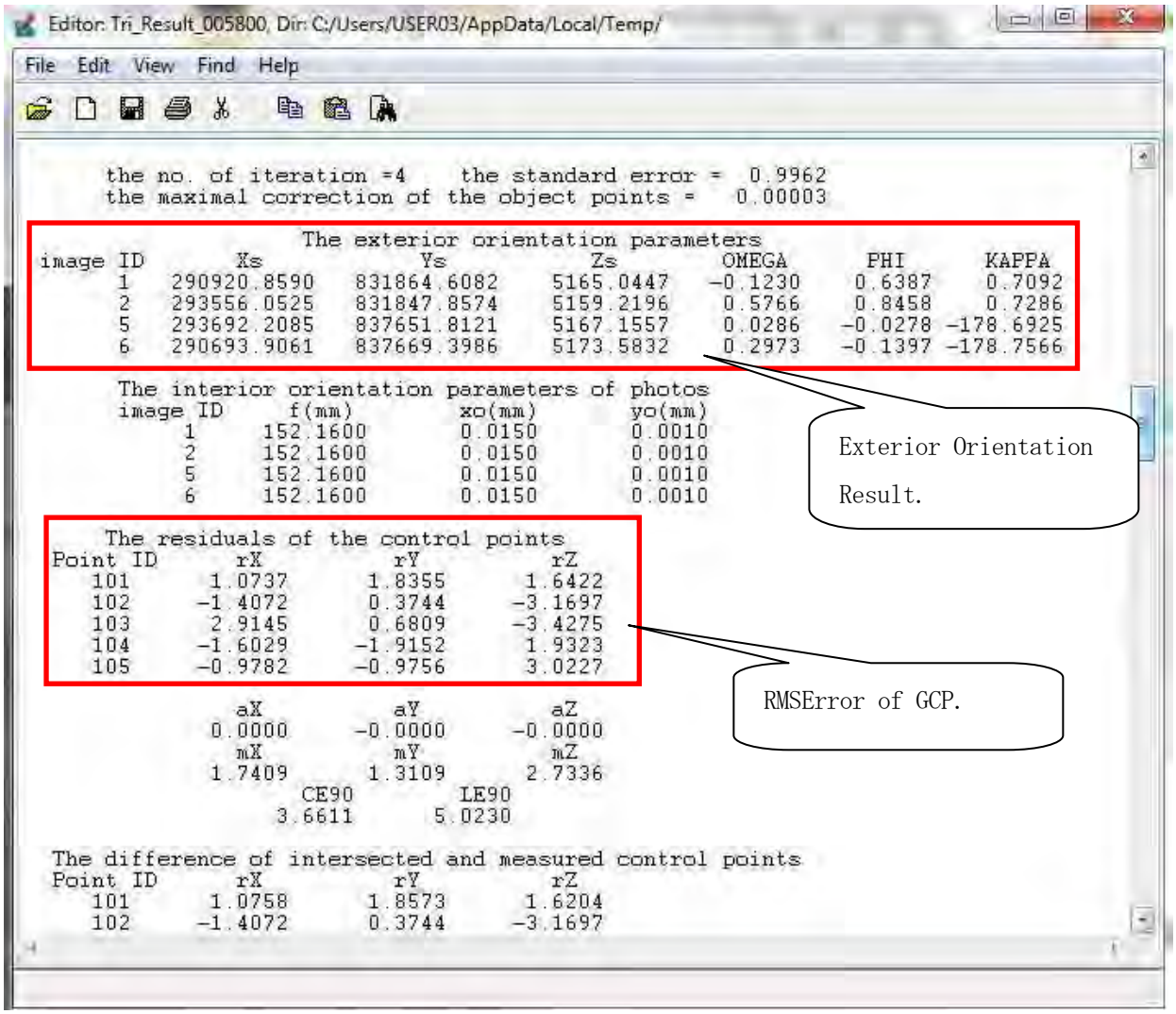


Set Adjustment Parameter in “General” tag and “Point” tag. Tolerance depends on “Flight height”, “Image resolution” etc. Then click “Run” or click.  icon.



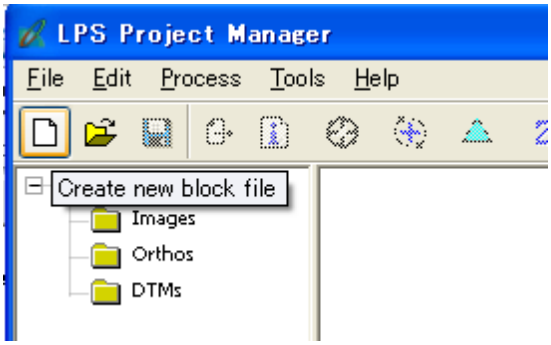
Check Result



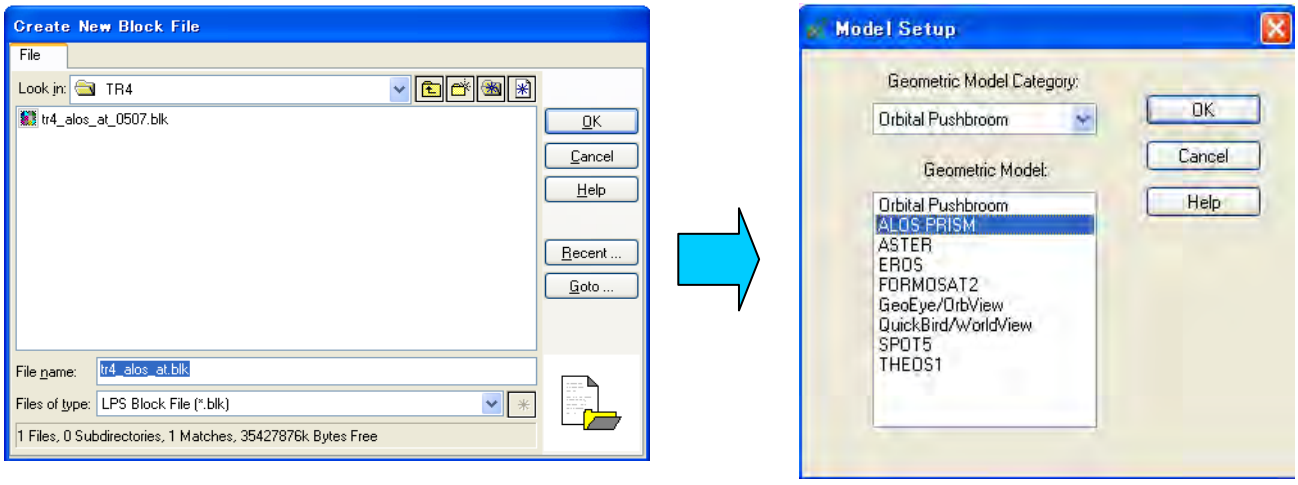

Editor: Tri_Result_005800, Dir: C:/Users/USER03/AppData/Local/Temp/
File Edit View Find Help
the no. of iteration =4 the standard error = 0.9962
the maximal correction of the object points = 0.00003
The exterior orientation parameters
image ID Xs Ys Zs OMEGA PHI KAPPA
1 290920.8590 831864.6082 5165.0447 -0.1230 0.6387 0.7092
2 293556.0525 831847.8574 5159.2196 0.5766 0.8458 0.7286
5 293692.2085 837651.8121 5167.1557 0.0286 -0.0278 -178.6925
6 290693.9061 837669.3986 5173.5832 0.2973 -0.1397 -178.7566
The interior orientation parameters of photos
image ID f(mm) xo(mm) yo(mm)
1 152.1600 0.0150 0.0010
2 152.1600 0.0150 0.0010
5 152.1600 0.0150 0.0010
6 152.1600 0.0150 0.0010
The residuals of the control points
Point ID rX rY rZ
101 1.0737 1.8355 1.6422
102 -1.4072 0.3744 -3.1697
103 2.9145 0.6809 -3.4275
104 -1.6029 -1.9152 1.9323
105 -0.9782 -0.9756 3.0227
aX aY aZ
0.0000 -0.0000 -0.0000
mX mY mZ
1.7409 1.3109 2.7336
CE90 LE90
3.6611 5.0230
The difference of intersected and measured control points
Point ID rX rY rZ
101 1.0758 1.8573 1.6204
102 -1.4072 0.3744 -3.1697
Exterior Orientation Result.
RMSError of GCP.

1-2 Aerial triangulation for ALOS Satellite Images

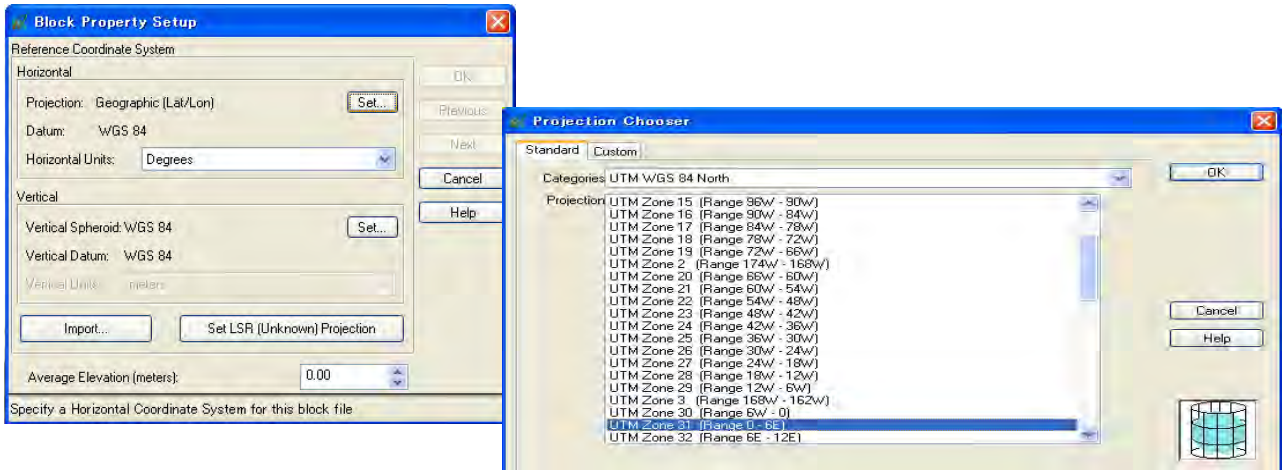
1-2-1. Create Project (Block File) for Satellite



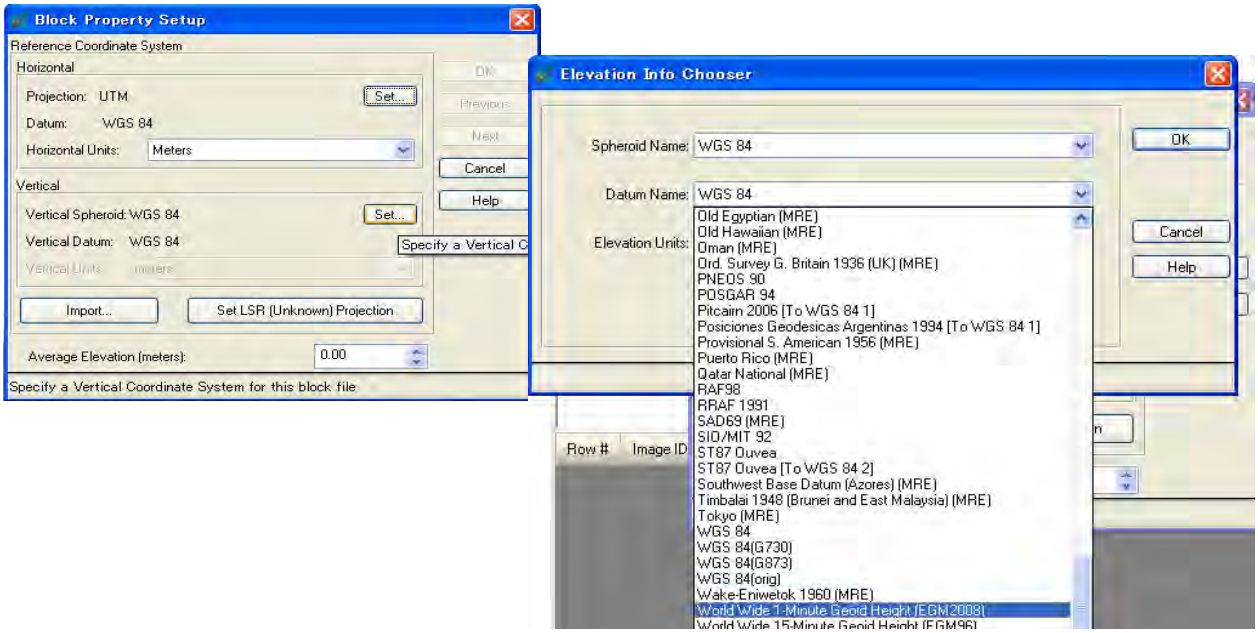
Newly Input a filename.



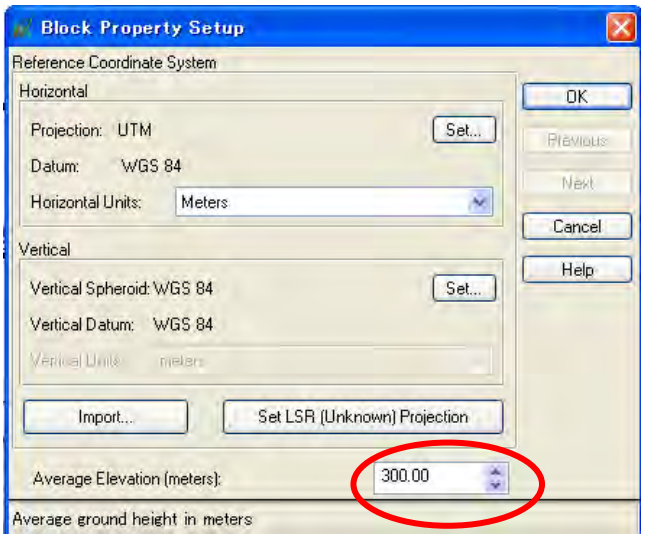
Set “Horizontal Coordinate System” Ellipsoid as “WGS84”, Projection as “UTM Zone 31N”



Set “Vertical Coordinate System” EGM 2008.

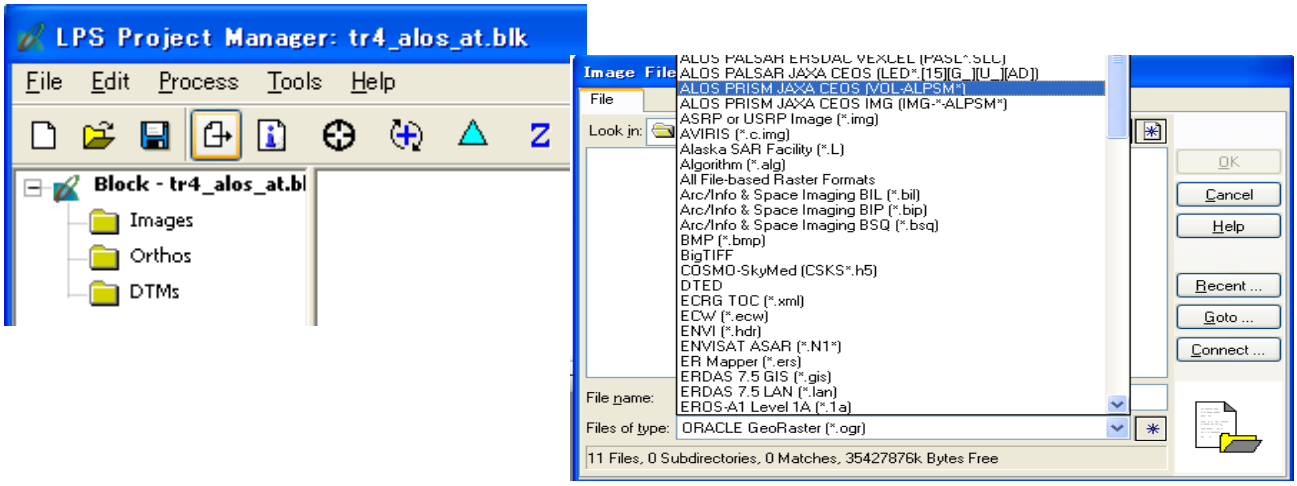


Input Average Elevation

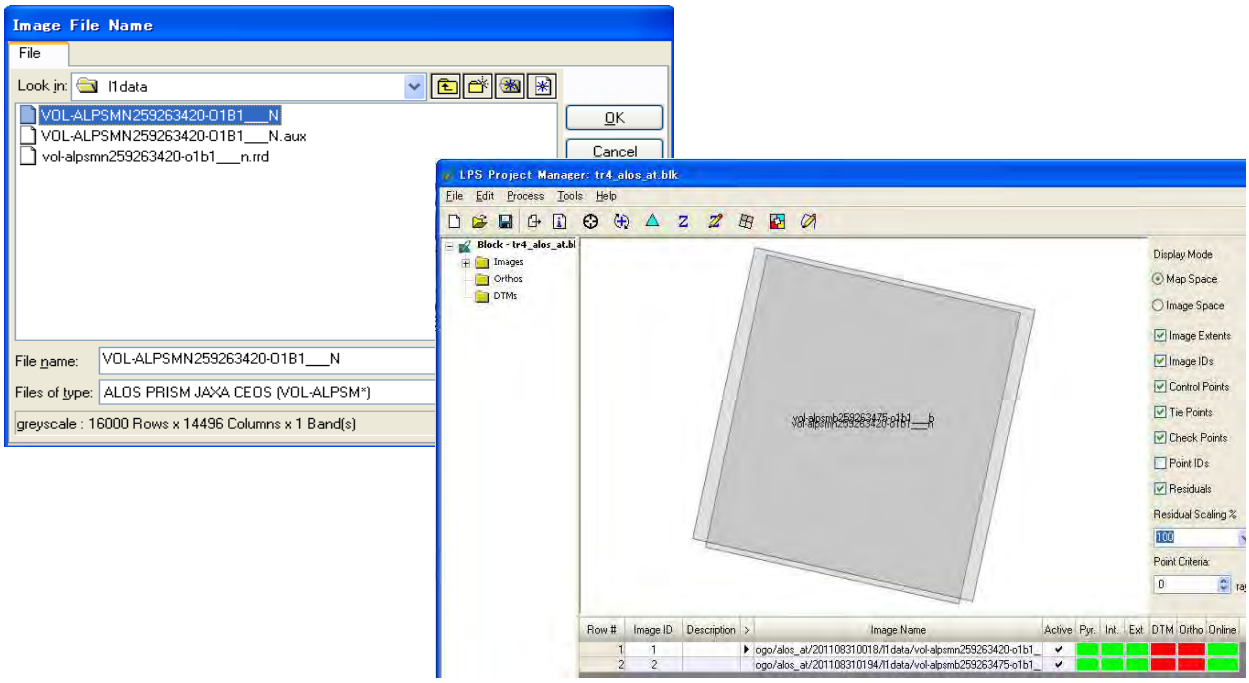


1-2-2. Import Image files

Click “Image import button” and “set file type” as “ALOS PRISM JAXA CEOS (VOL-ALPSM*)”

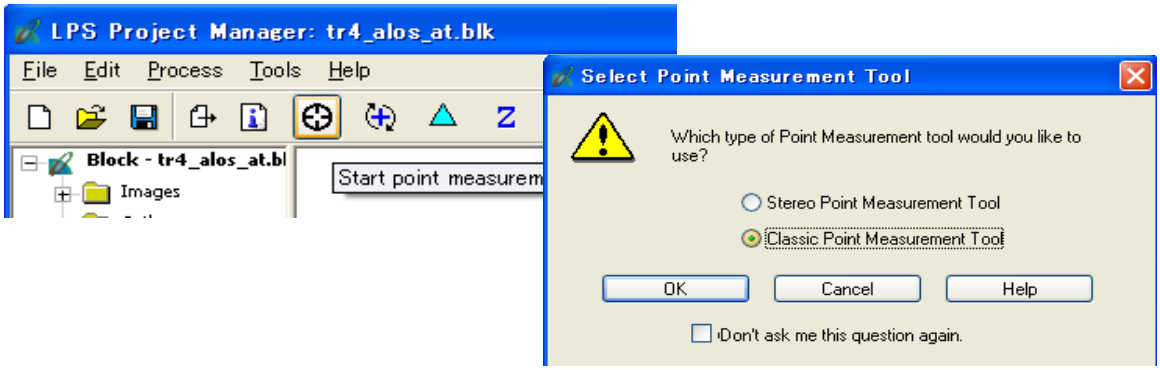


Choose file until all necessary images are imported.

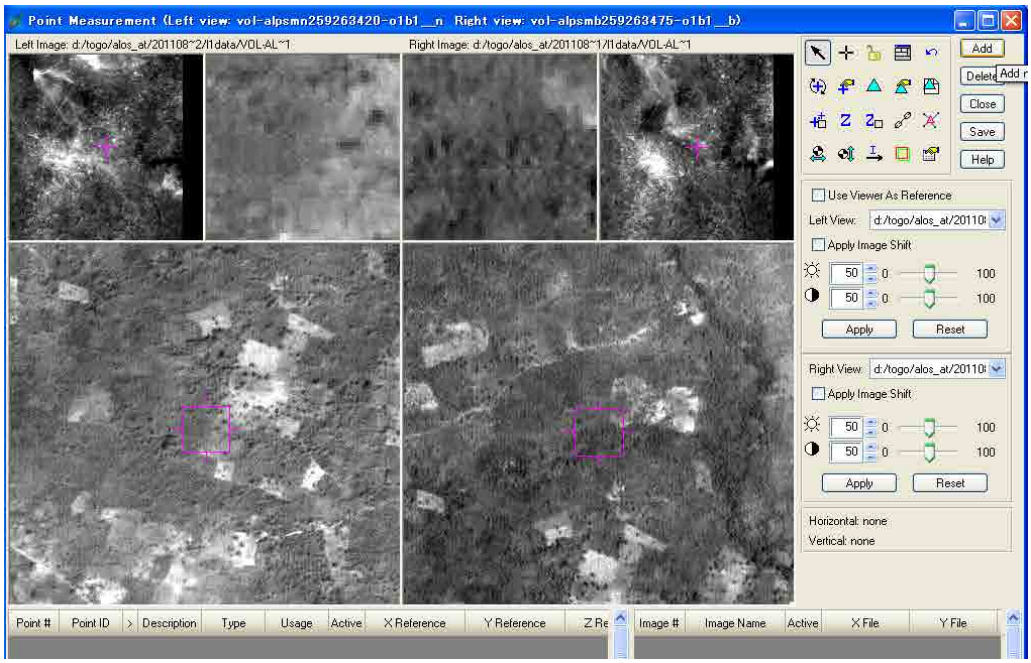


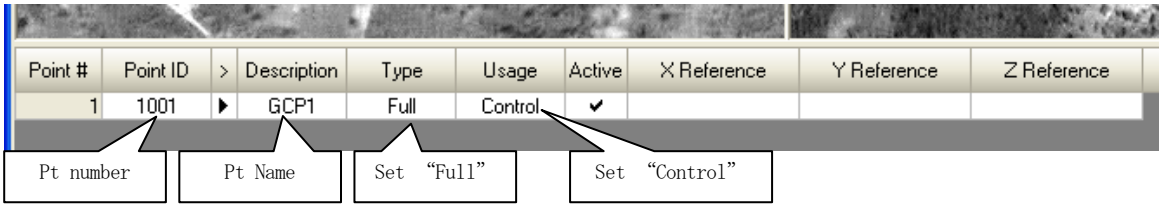
1-2-3. GCP Observation

Click “Point Measurement Tool” and Choose Classic one.

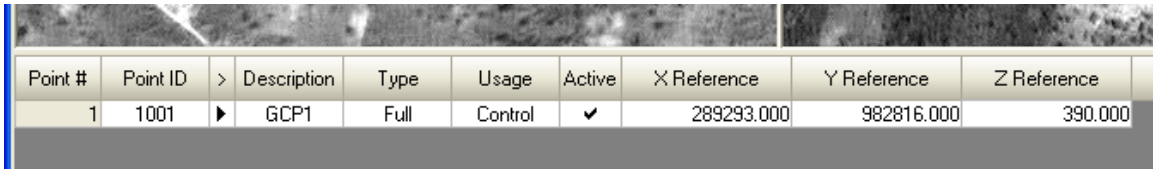


Add a GCP by “Add ”Button.



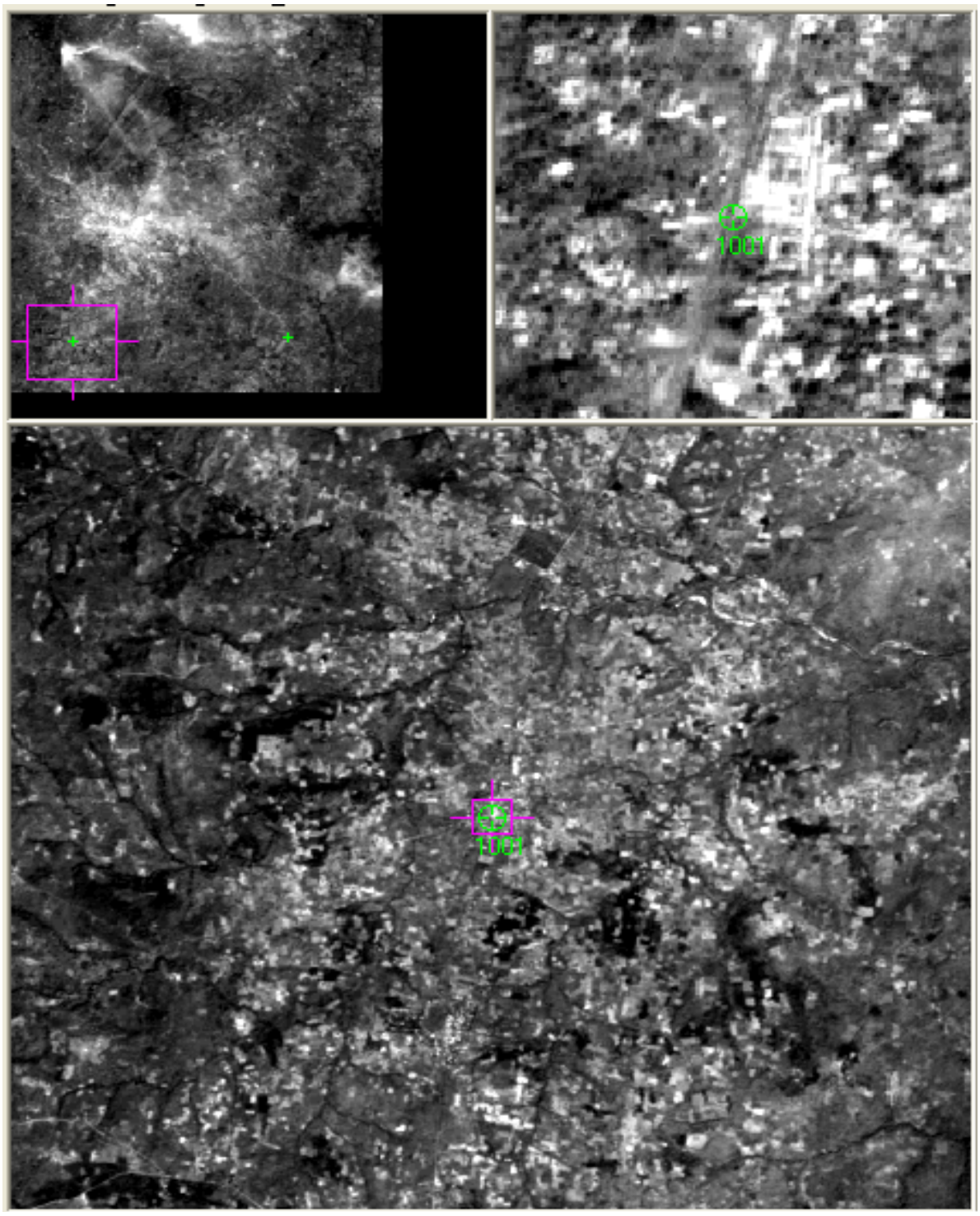


Then Input “X”, “Y”, “Z” of GCP

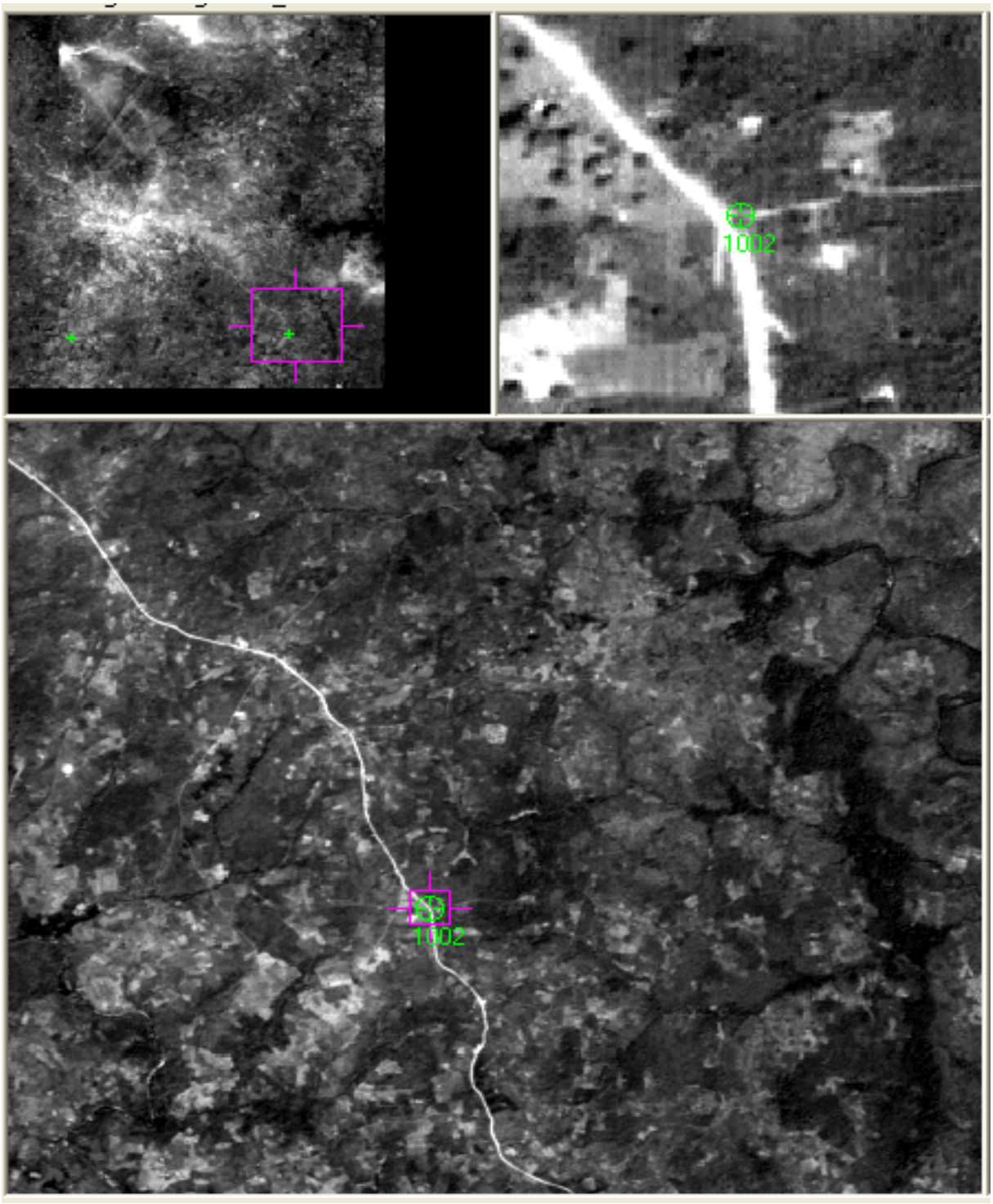


<GCP1: x, y, z = 289293m, 982816m, 390m >

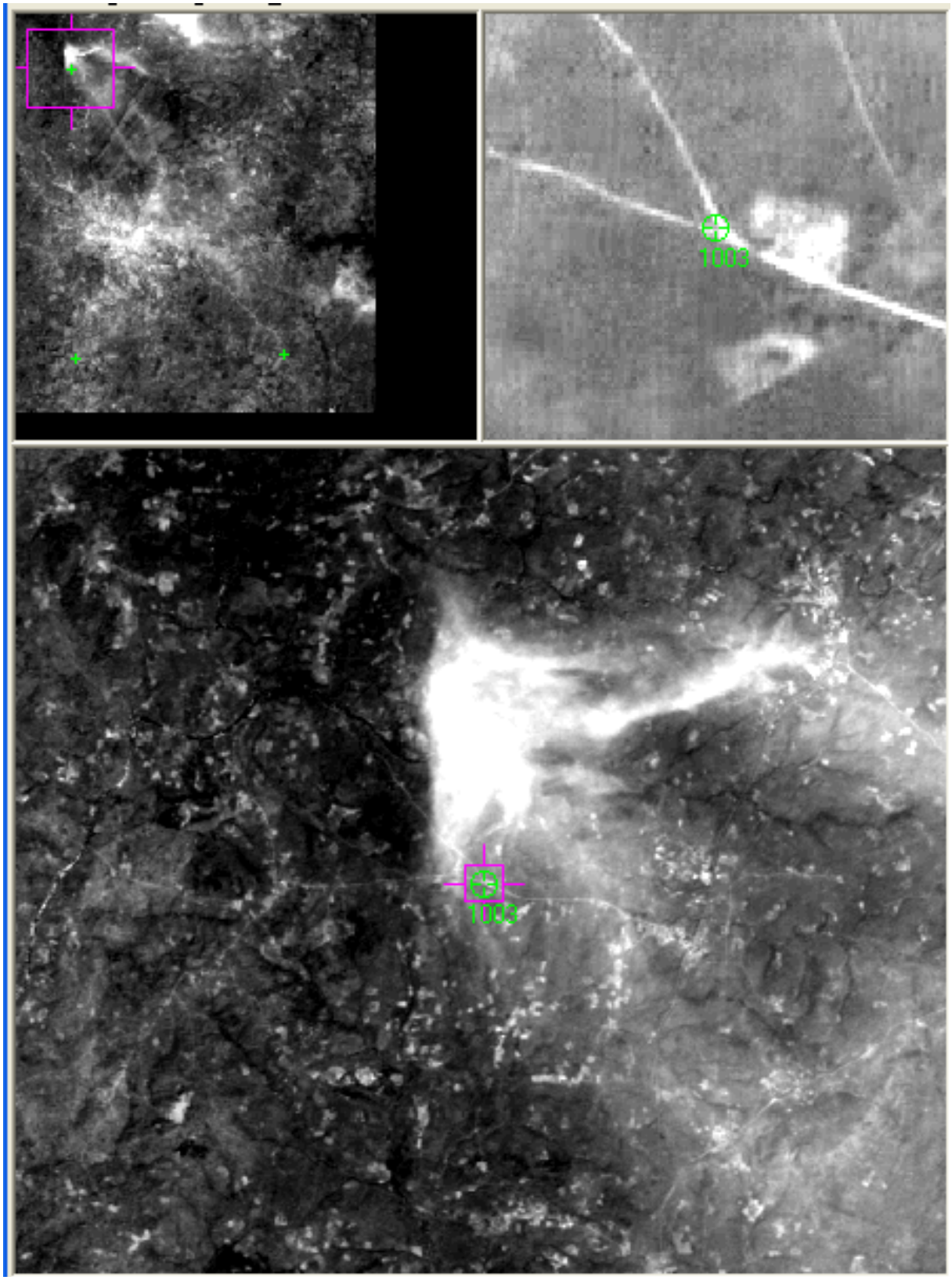
Add point and input “ID”, “Description” → “Type”, “Usage” → input coordinates → Observe point



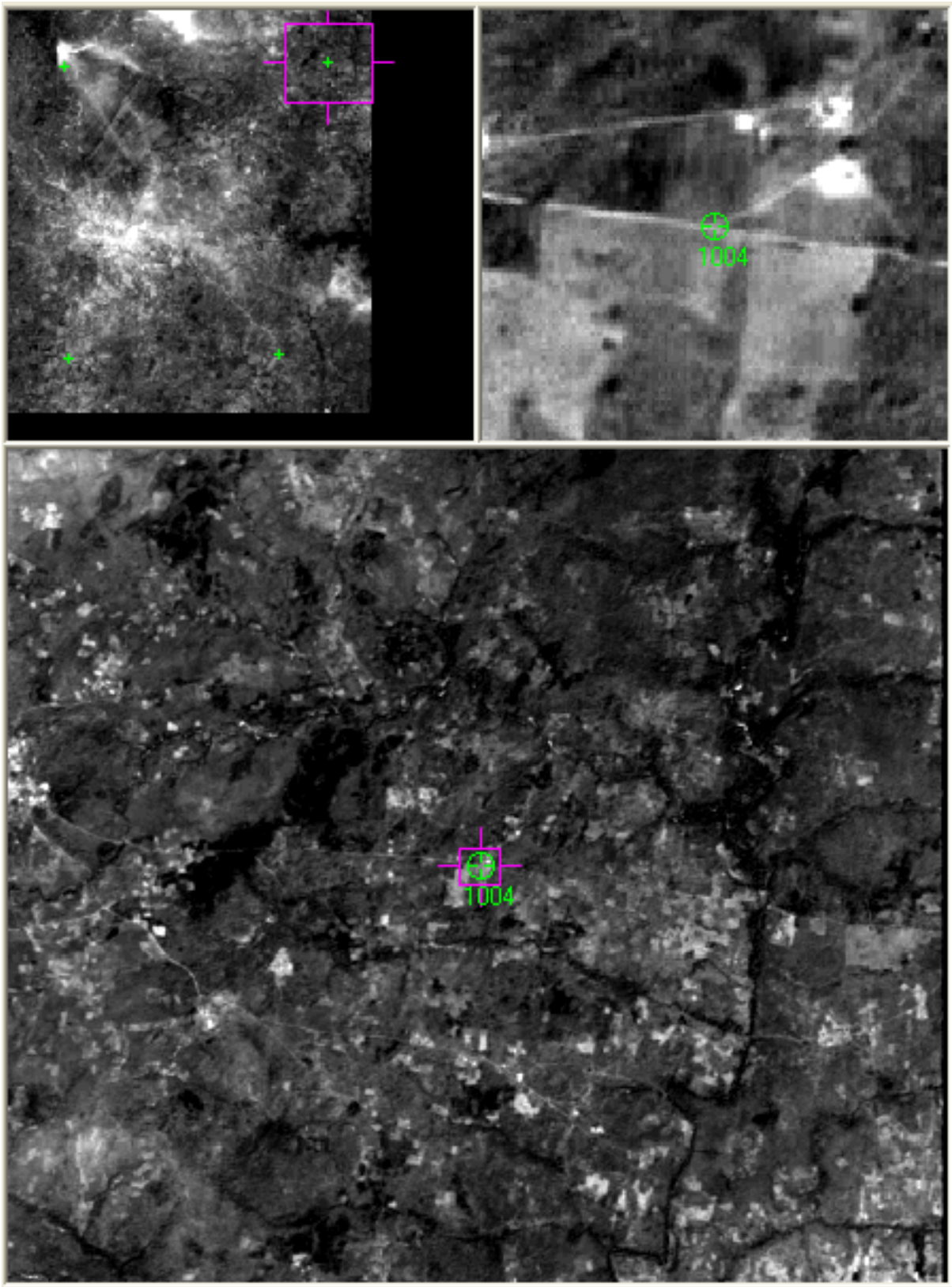
<GCP2: x, y, z = 310173m, 978691m, 330m >



<GCP3: x, y, z = 295197m, 1011640m, 410m >

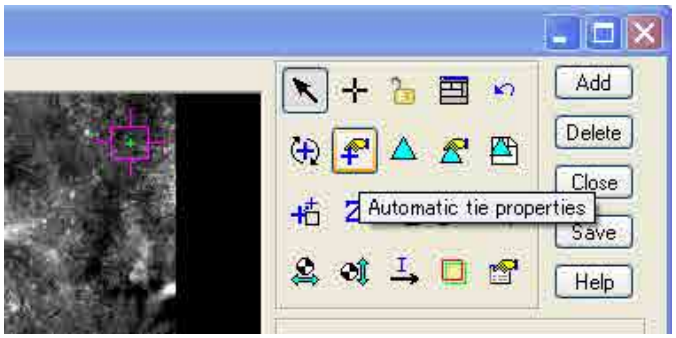


<GCP4: x, y, z = 321203m, 1006362m, 345m >

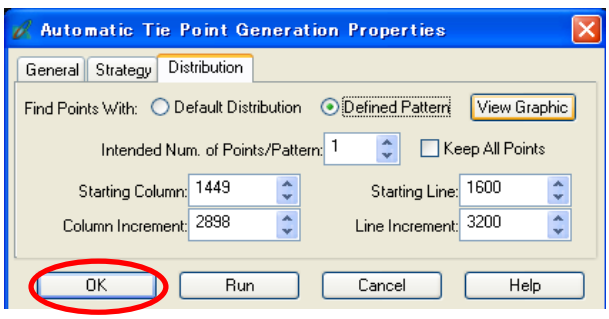


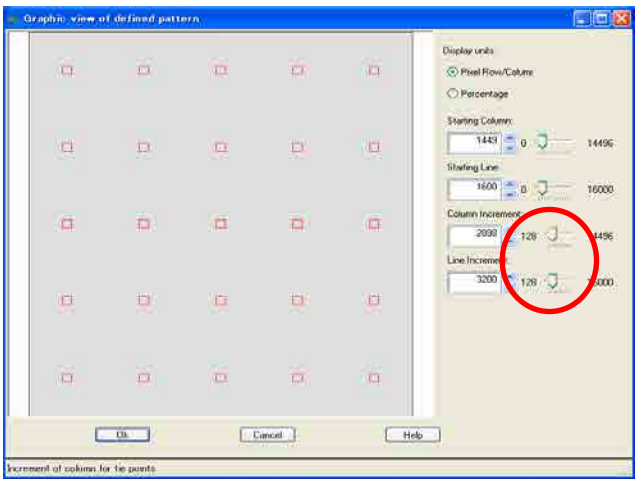
1-2-4. Tie Points Measurement (Automatic)

Click “Automatic tie Properties” for setting strategy.

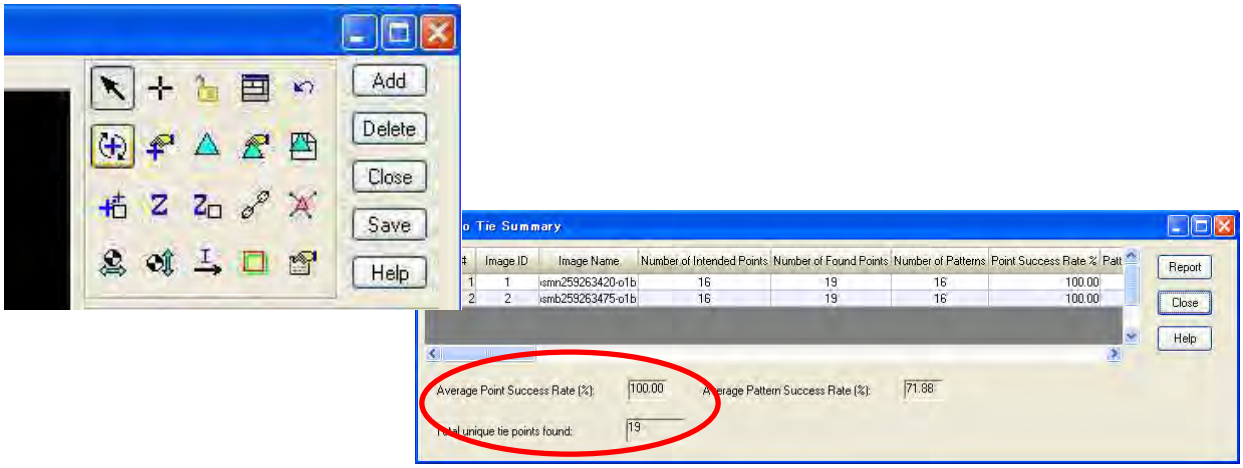


Set preferable layout of “Tiepoints” by View Graphic then “OK”.



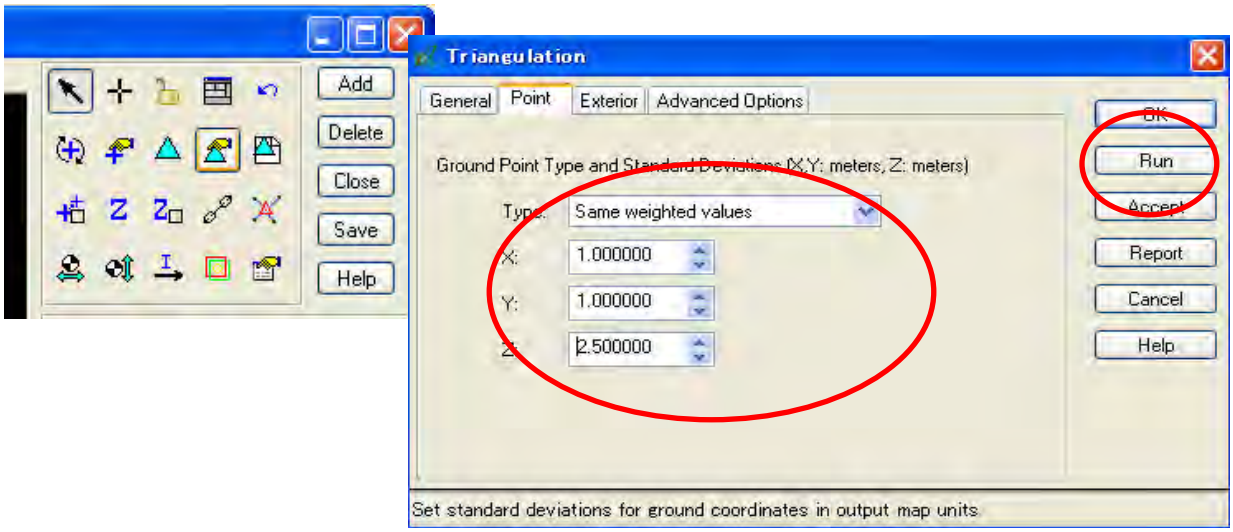


Click “Automatic tie Process” and after processing, check result.



1-2-5. Adjustment (Calculation)

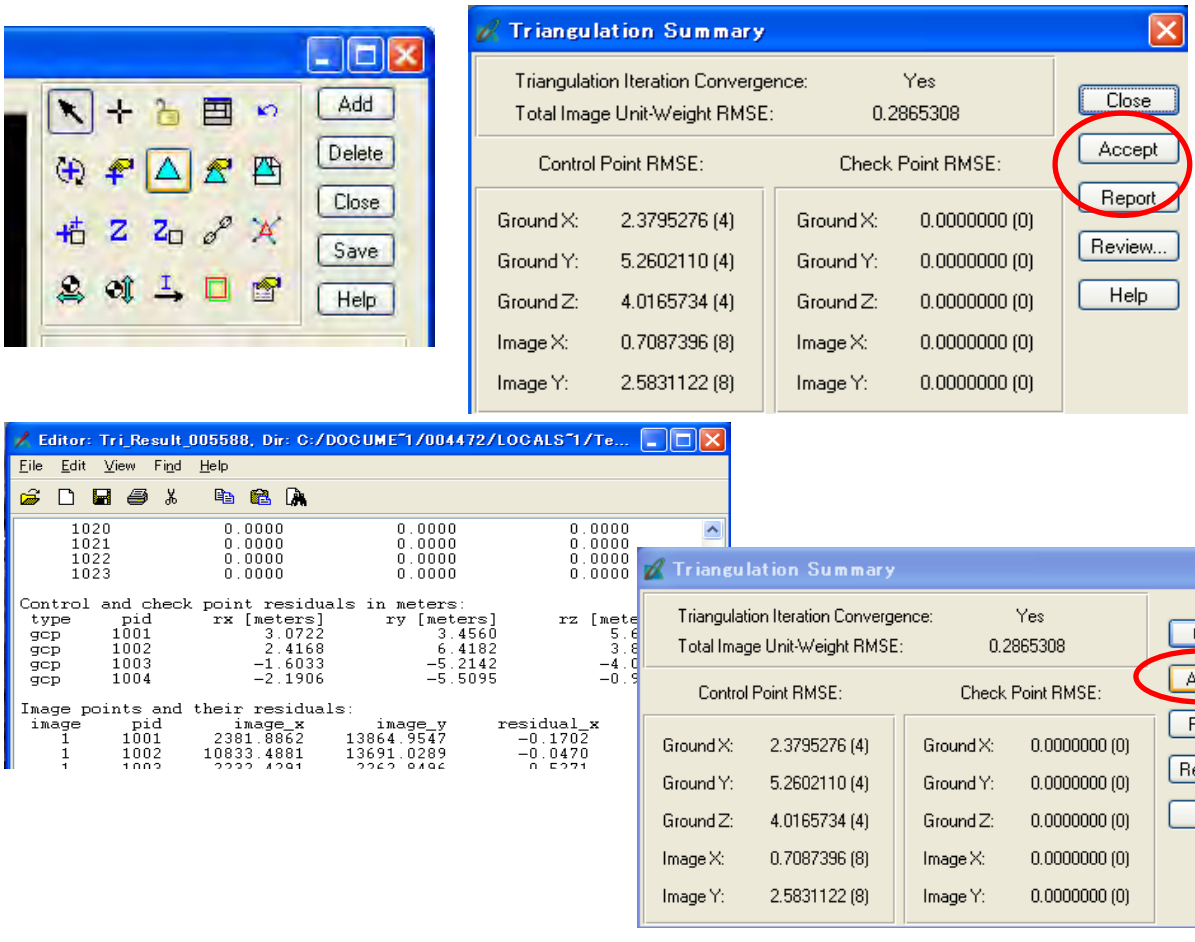
Click “Triangulation properties” button for setting parameters.



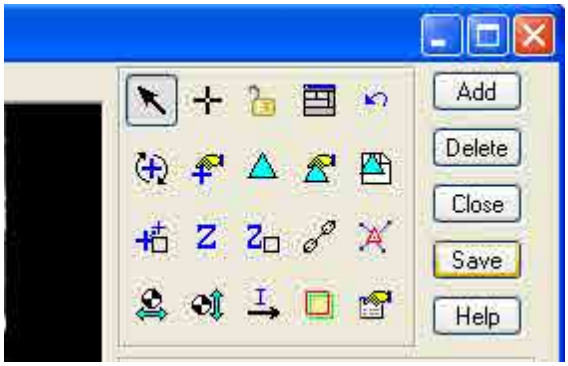
Click “Perform Triangulation” button for RUN “AT”.

If the error is not acceptable, click “Report” to check wrong points.

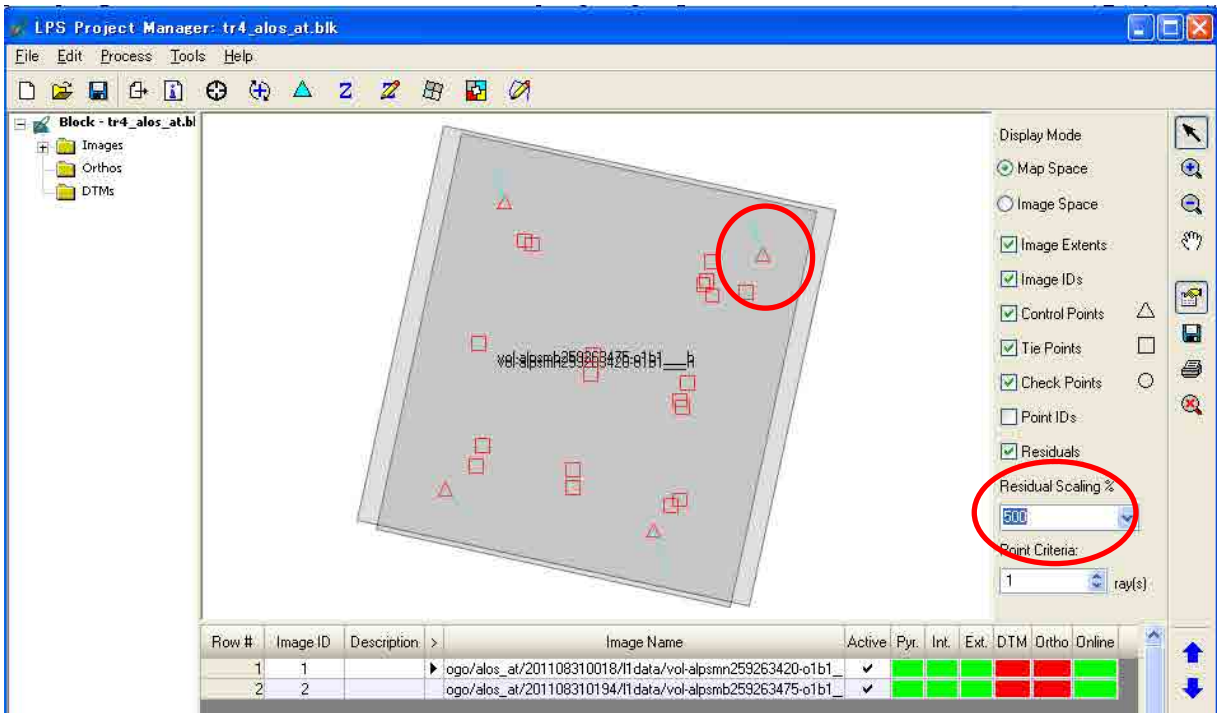
Re-measure the point and continue until the error becomes acceptable then “Accept”.



Save and Close



Bigger error is showed by longer line(Blue one).



Chapter 2 DTM and Orthophoto Creation

2-1 DTM and Orthophoto Creation

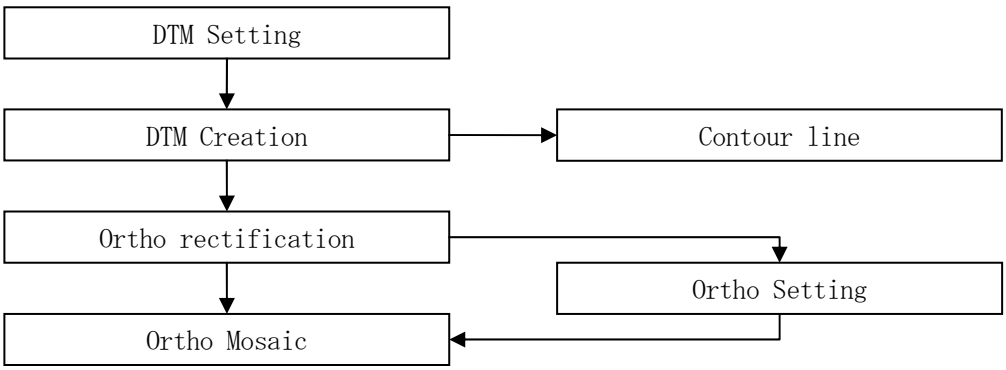
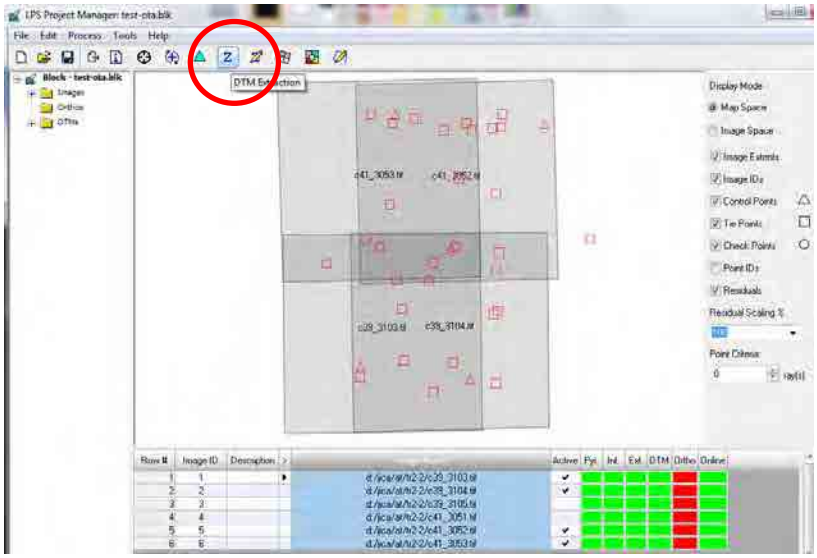


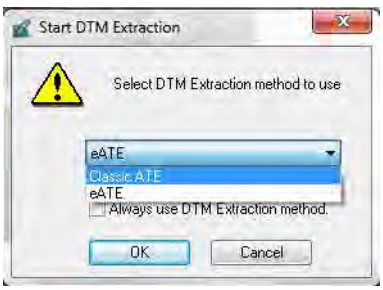
Figure 2 Basic Work Flow of DEM and Orthophoto Creation

2-2 DTM Setting

Active images which are necessary for this work then click “DTM Extraction”.



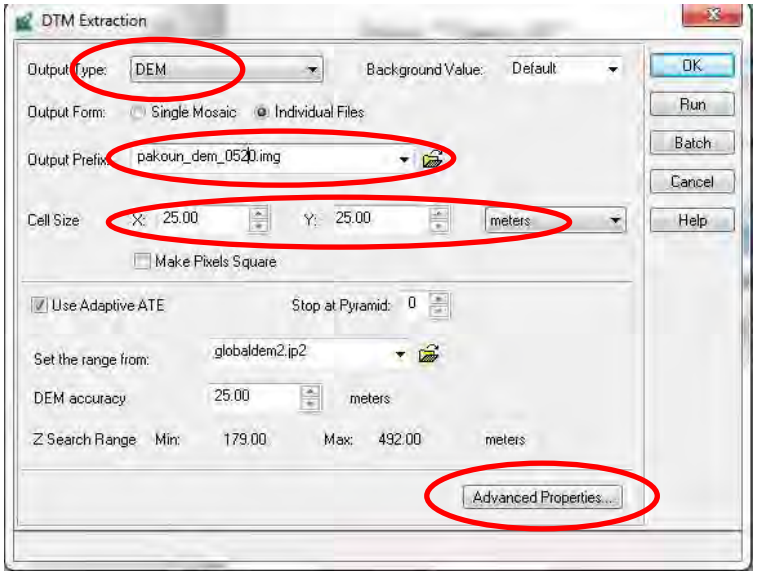
Choose “Classic ATE”.



Select type (DEM, TIN, Shape, ASCII) then set folder and file name for output.

Also input Cell size (DEM interval) of output.

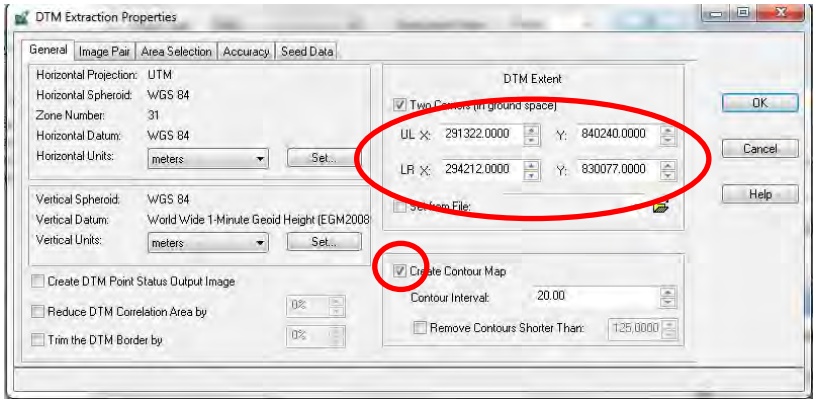
After above setting, Click "Advanced Properties"

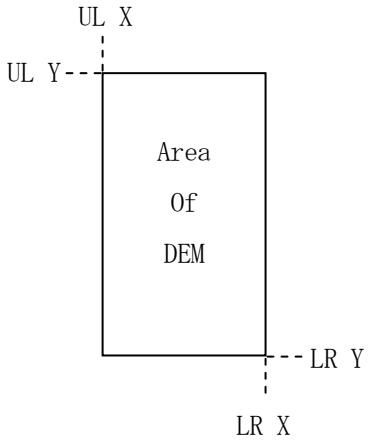


<Go "General" Tag>

Check the "Coordinate System" and Set Area of "DEM" by Upper Left XY ,Lower Right XY.

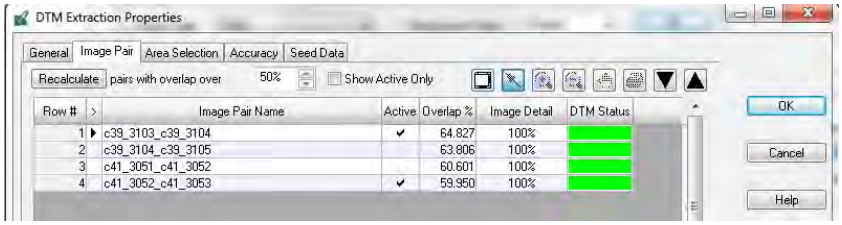
If you need "Contour line" at a same time, Check "Create Contour Map" (a contour line shape file over the same area as DEM will be created automatically).





<Go "Image Pair" Tag>

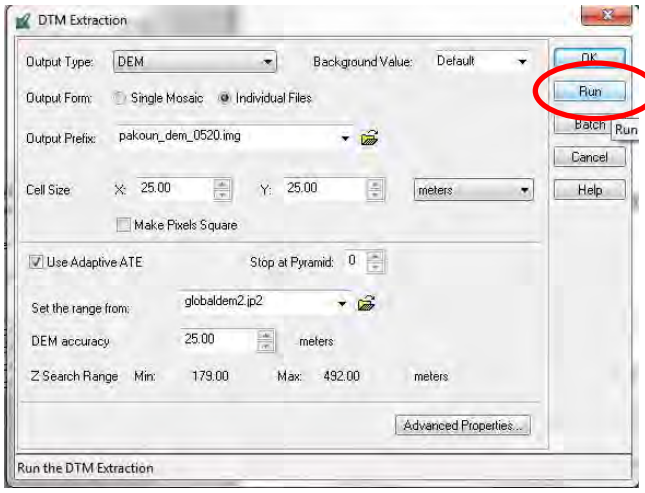
Check Image pairs which are used for DEM creation. Then "OK".



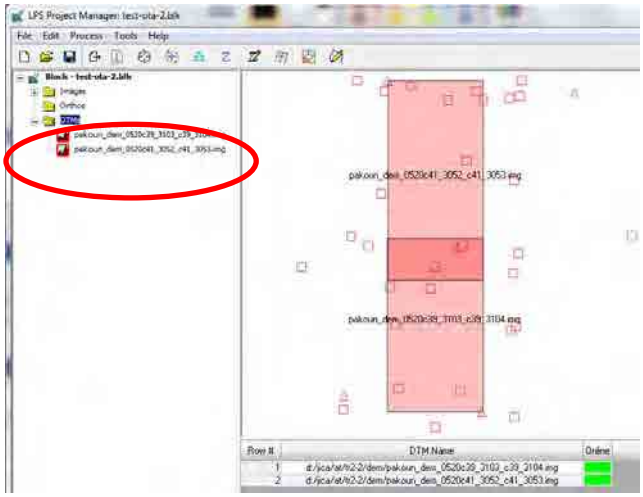
2-3 DTM Creation

< "RUN" DTM Extraction>

When the "RUN" icon is clicked, the process is start and the calculation needs time (depends on the "Area", "Image volume", "Cell Size", etc).

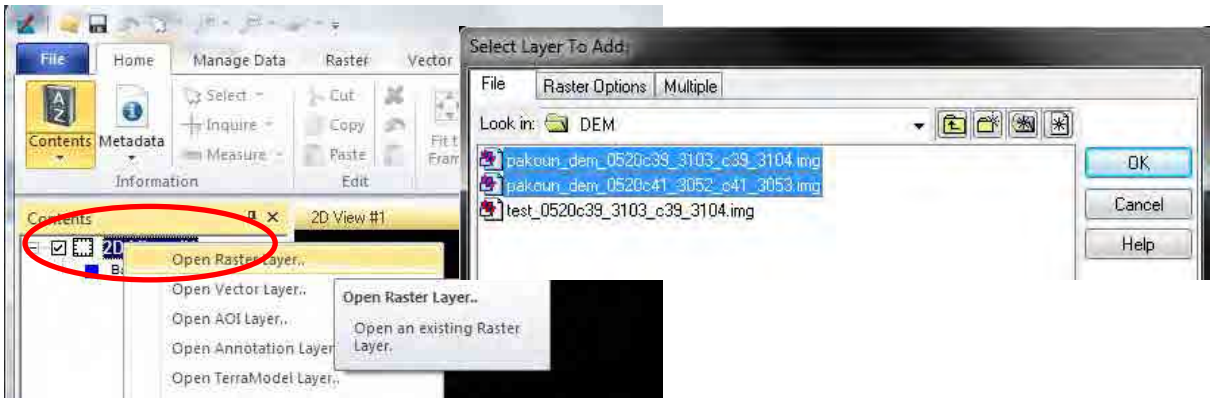


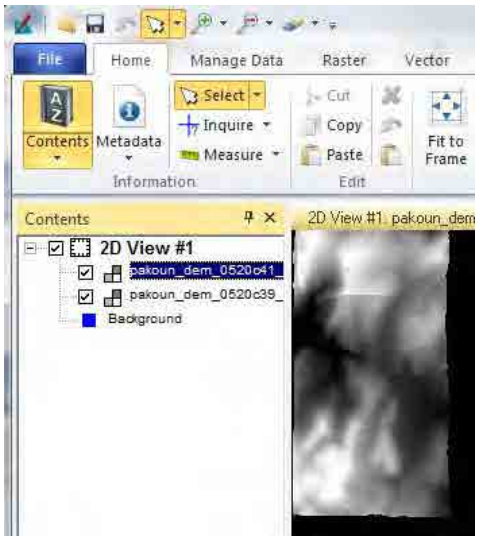
After Extraction of DEM, The created DEM appears.



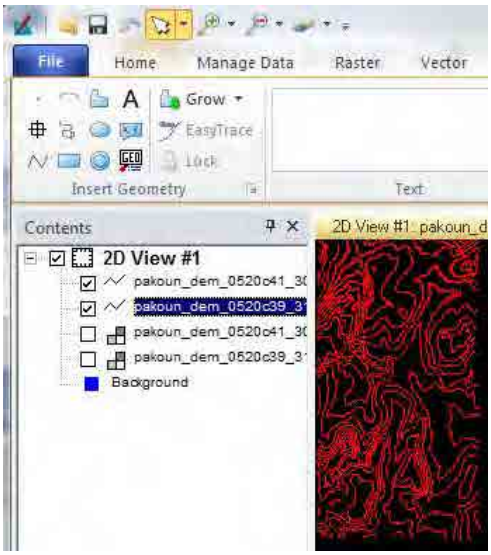
The created DEM can be seen also in "ERDAS Imagine".

Right click on "2D View #1" then select "Open Raster Layer" and choose the DEM files.





About seeing "Contour line", "Open Vector Layer" in above window.

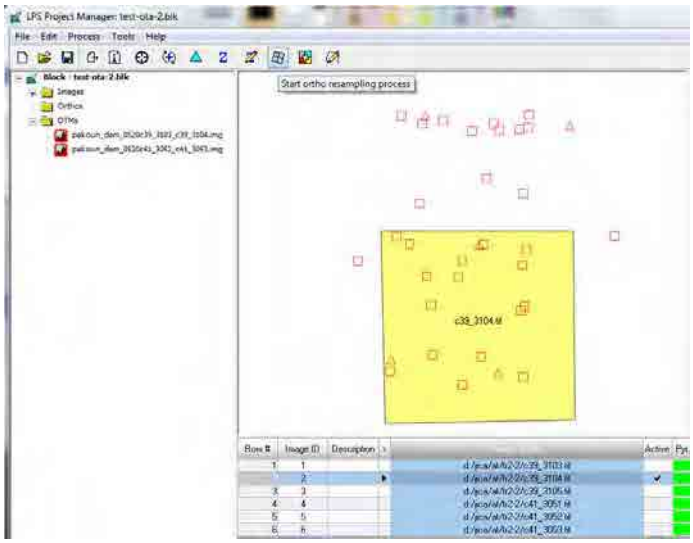


Chapter 3 Orthophoto Creation

3-1 Ortho Rectification

In this work, Each images shall be ortho rectified one image by one image.

Choose an image which are necessary for this work then click “Ortho Resampling Process”.



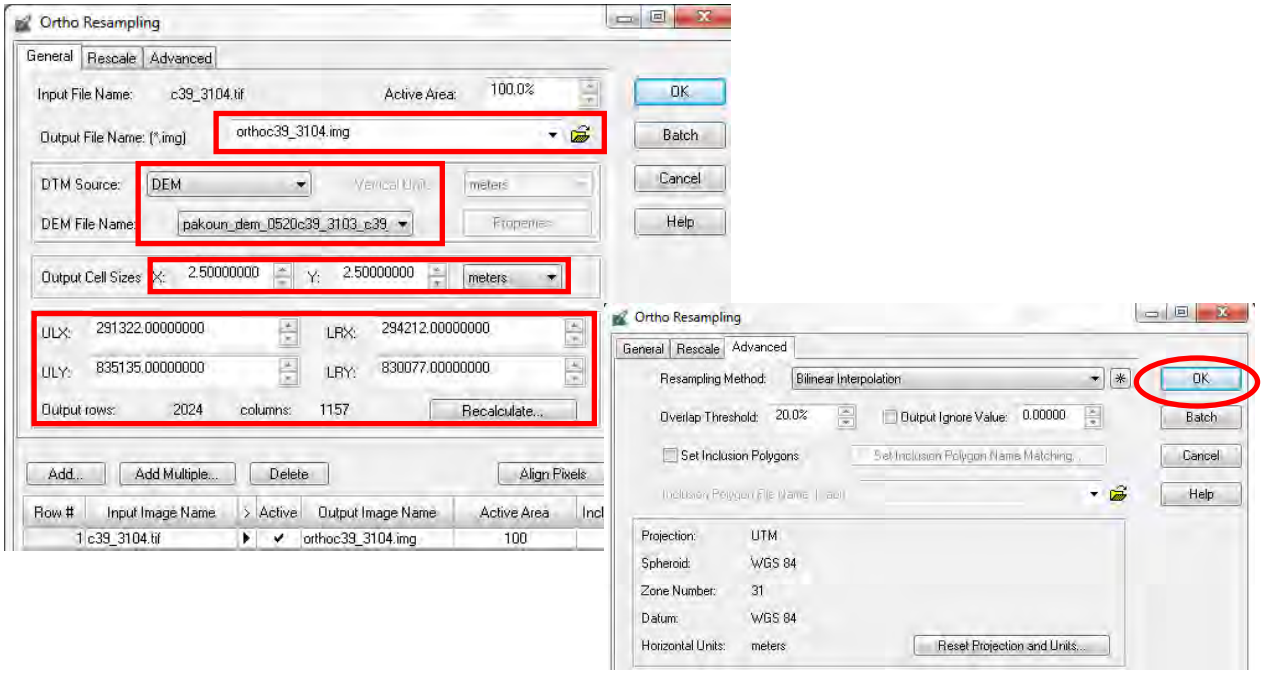
Set folder and file name for output.

Choose DTM format and DTM file

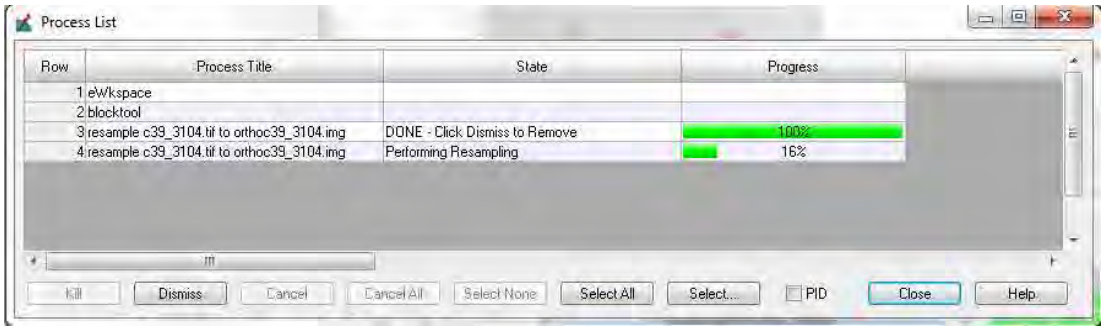
Input “Output Cell size” (GSD of Ortho Image) and area by Upper Left XY , Lower Right XY.

Then go “Advanced” Tag and set “Overlap threshhold” if necessary.

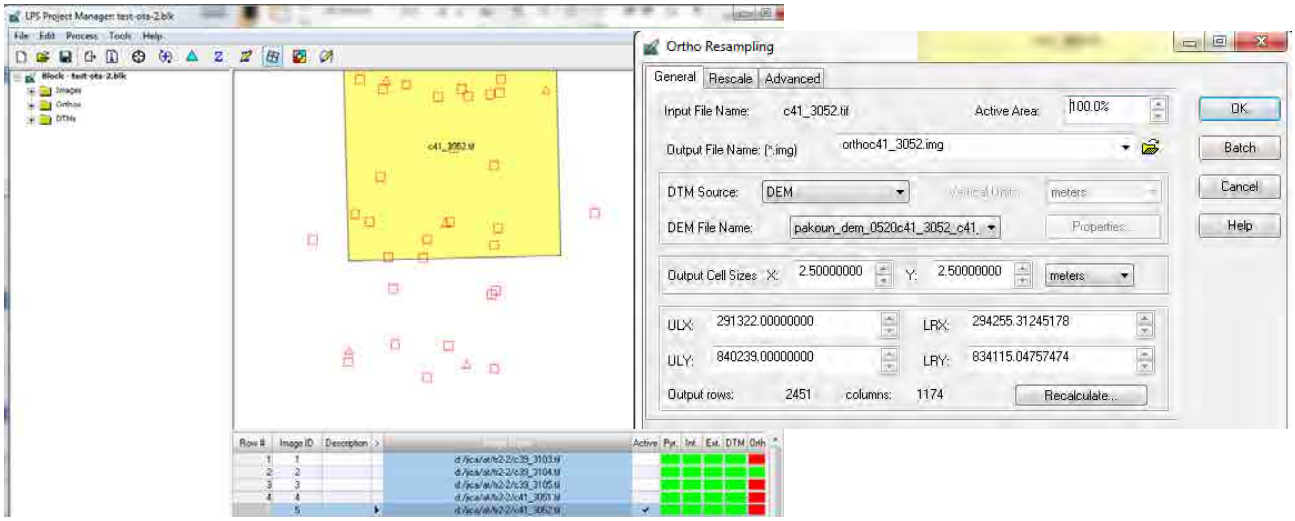
After above setting, Then “OK”.



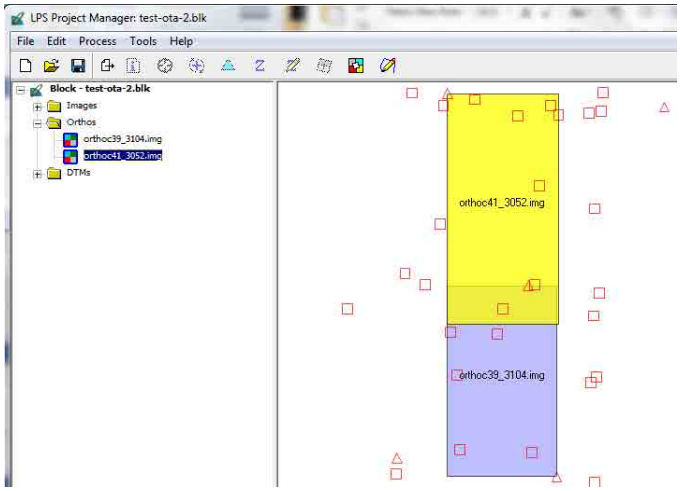
After the processing (ortho image creation is 100% finished), "close" the window.

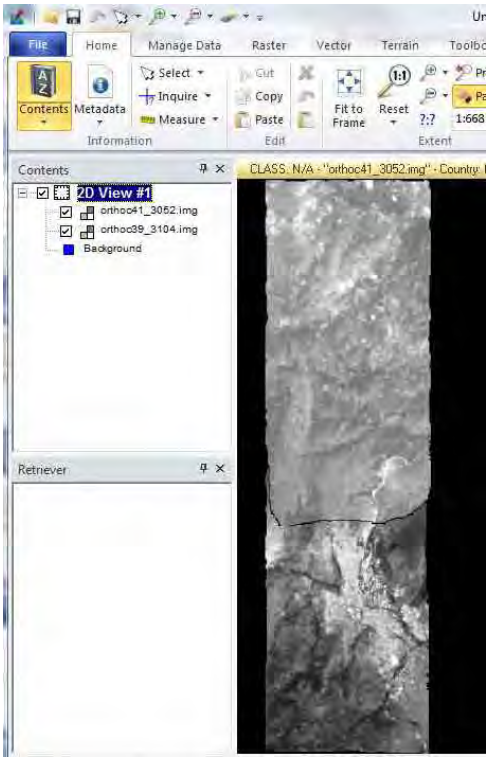


Continue the same process on the other images necessary.



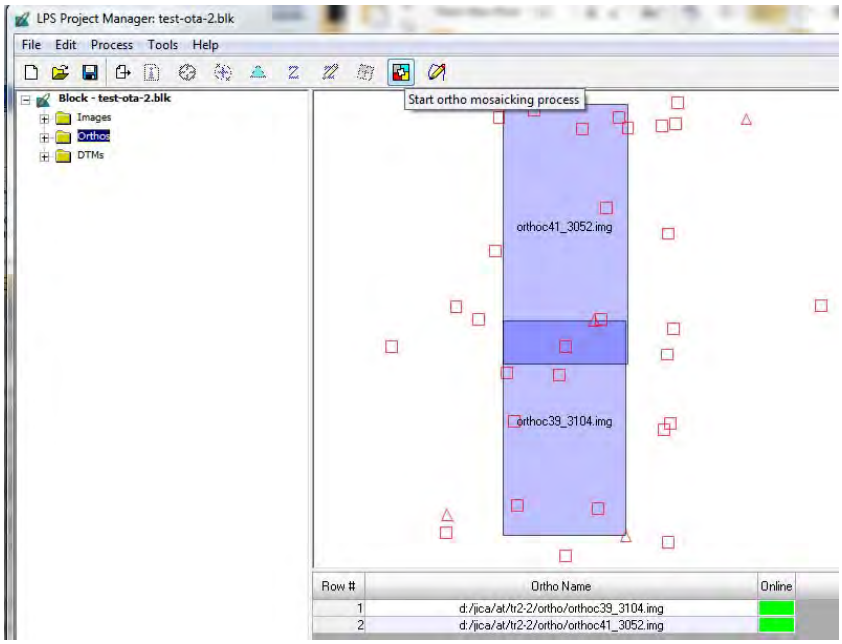
Check the result (in LPS or ERDAS Imagine).



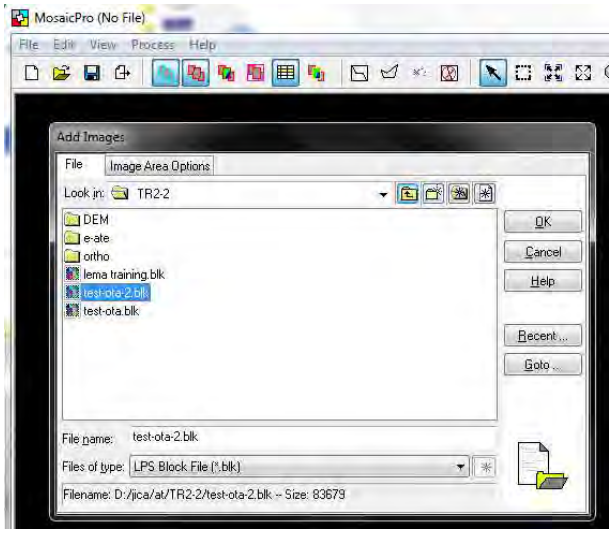


3-2 Ortho Mosaic

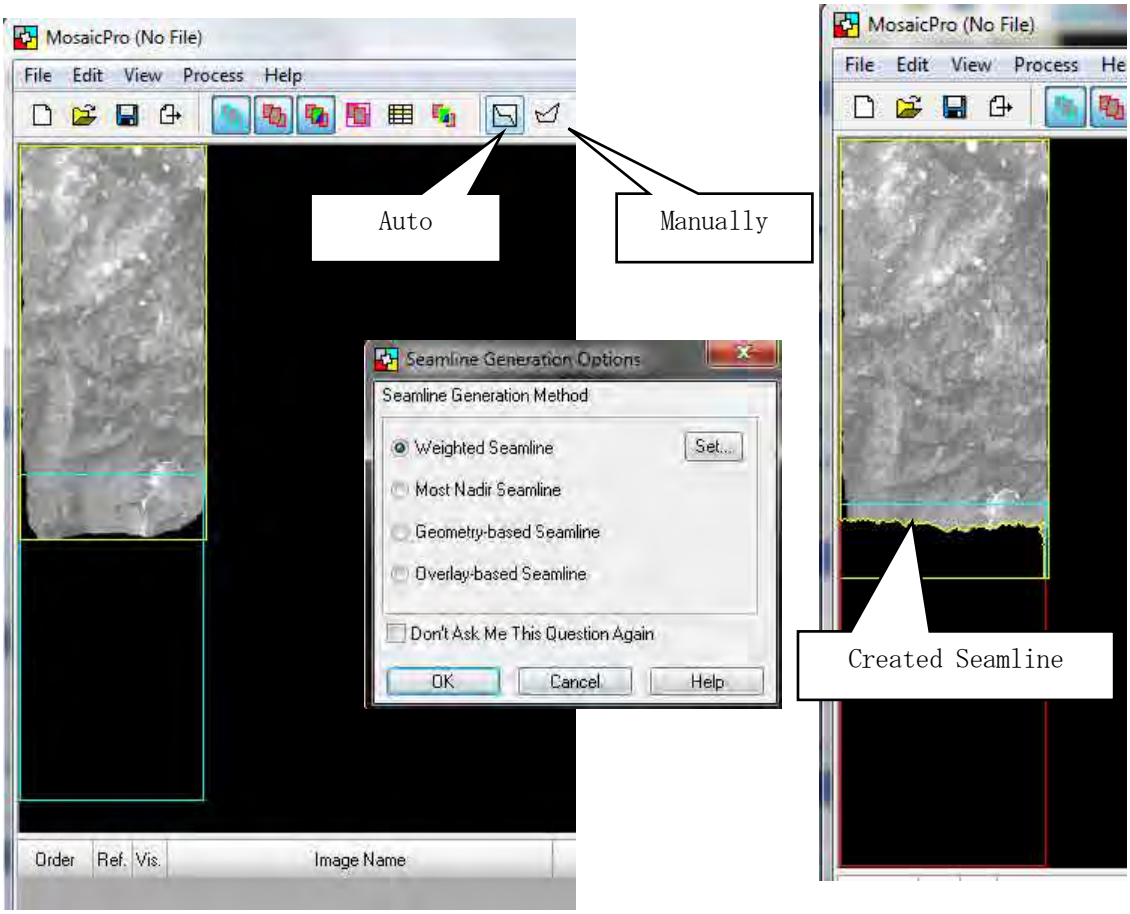
Click “Start Ortho Misaicking process”



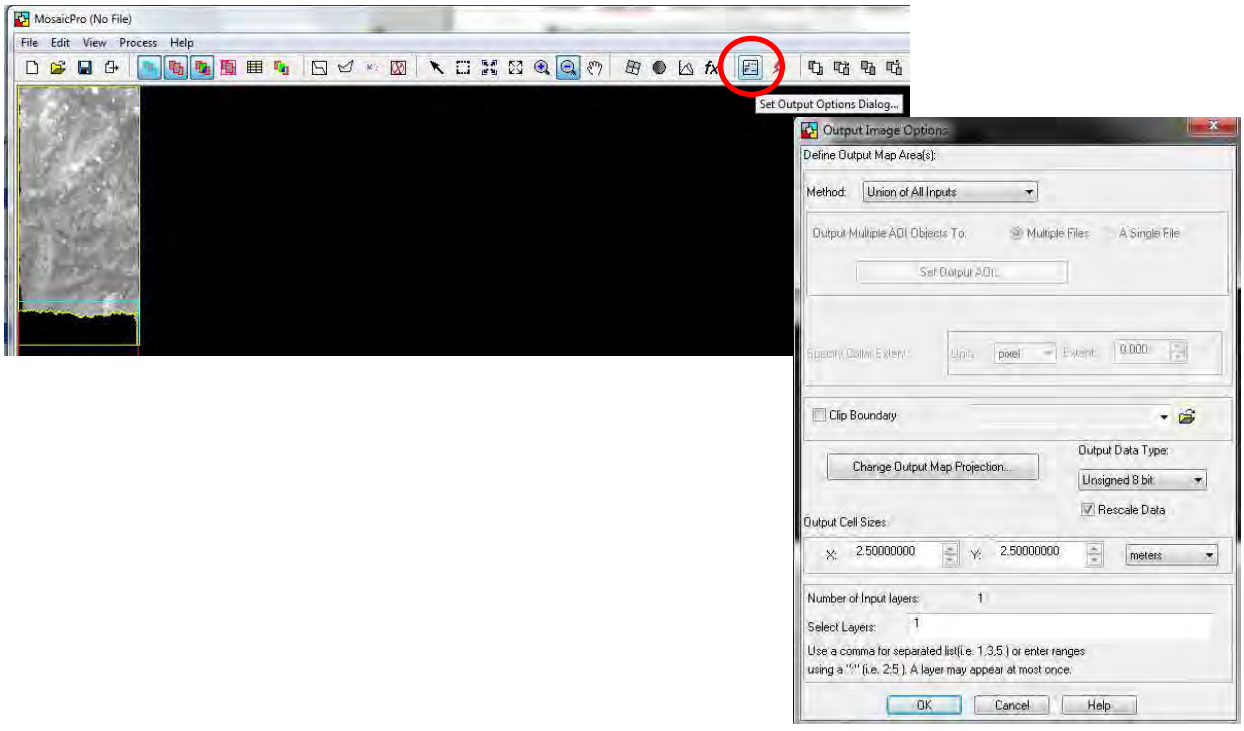
Choose “block file” in “MosaicPro” window and check “Use Entire (all) image” in “Image Area Options” tag. Then “OK”



Choose “Seamline” (Mosaic line; boundary between images) method.

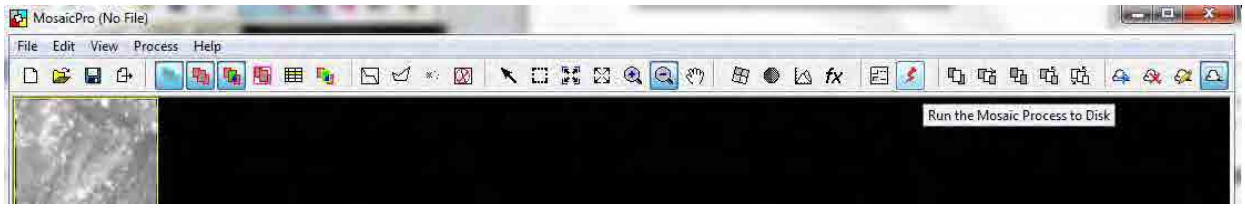


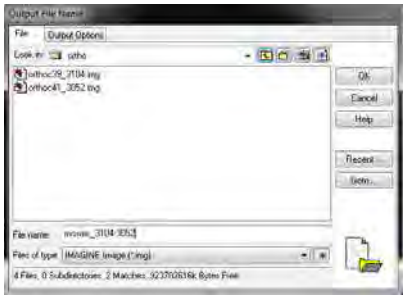
Click “Set output Option”. Set area and Cell size if necessary.



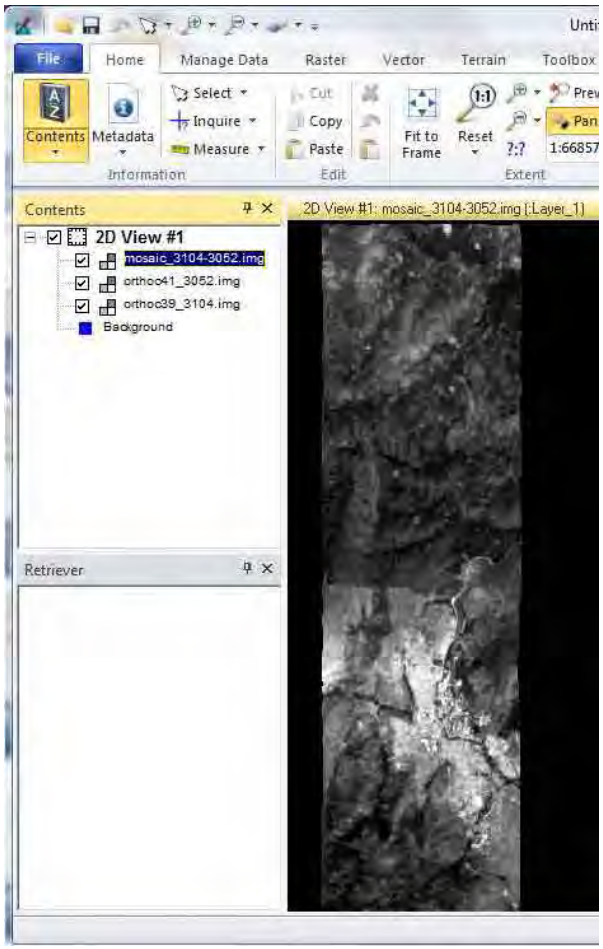
Click “Run the Mosaic Process” then choose folder and name for output image and “OK”.

If the process is finished, “close” window.





After finishing the Mosaic, check result (mosaicked image) in the “ERDAS Imagine”.



Period

Digital Plotting

Chapter 2-1 Digital Plotting Software Manipulation

1-1 Microstation Basic Manipulation

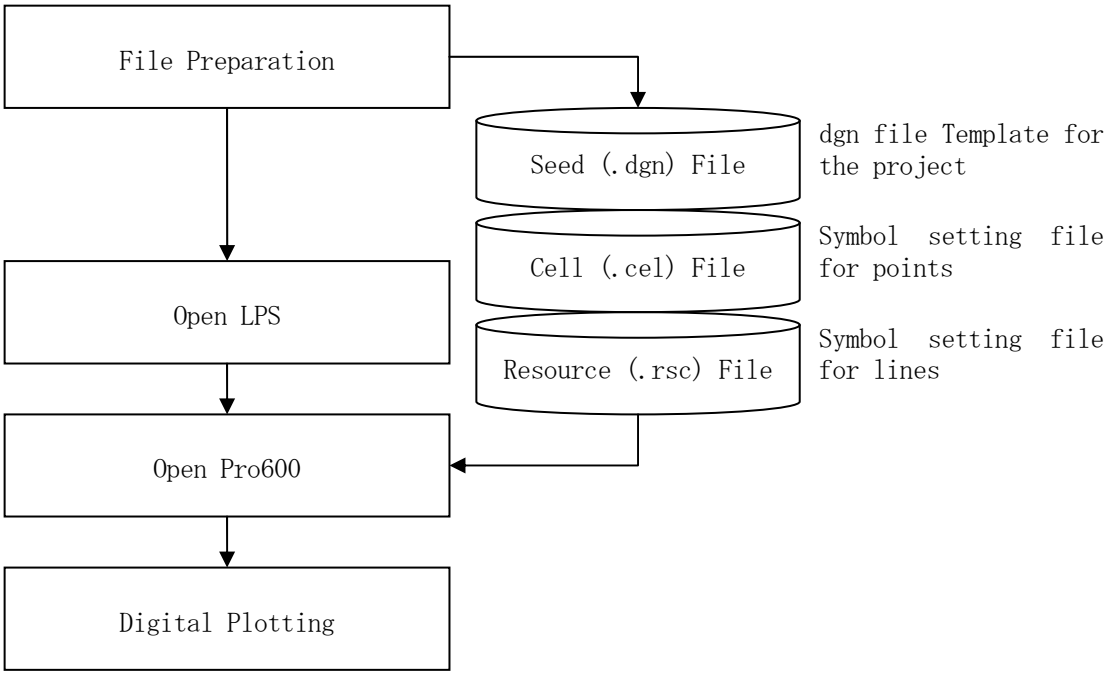
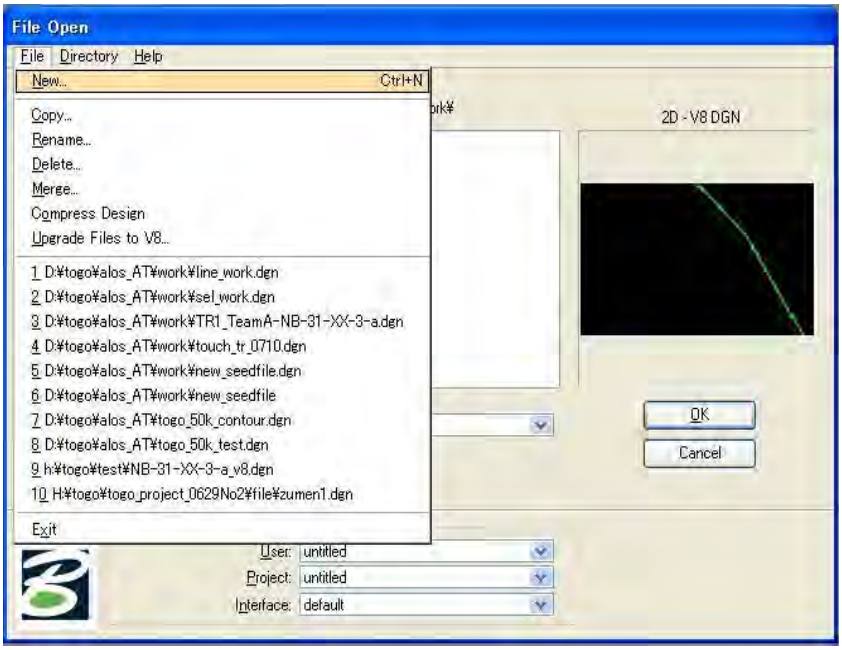


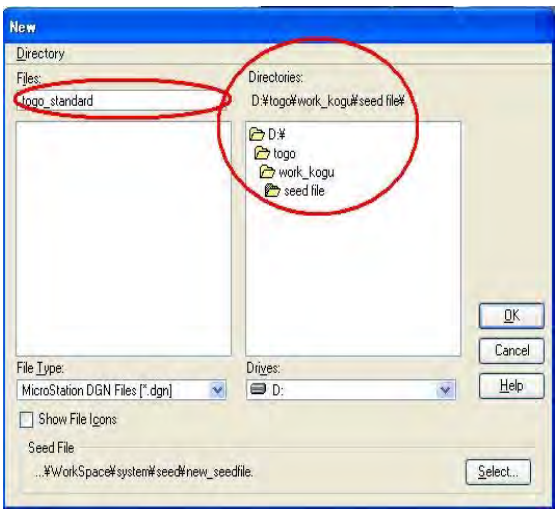
Figure 1 Basic Work Flow of Digital Plotting

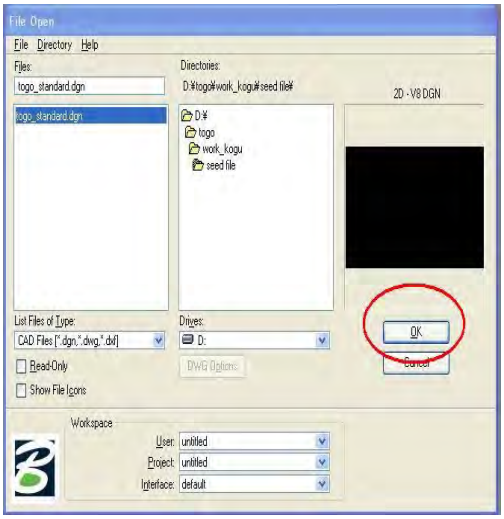
1-1-1. Seed file setting (Scale, Grid, etc)

Open Microstation V8i, and File -> New



Choose work directory and input file name, then “OK”.

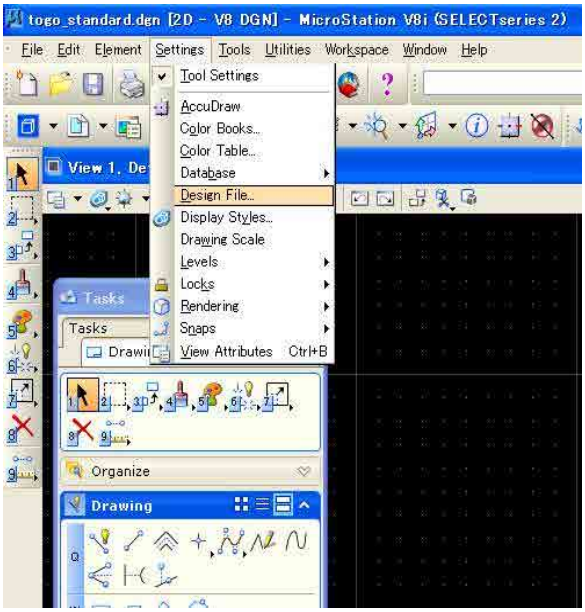


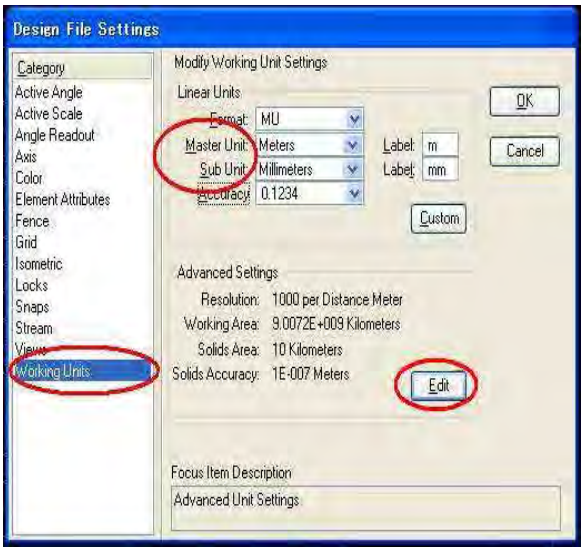


Setting -> Design file

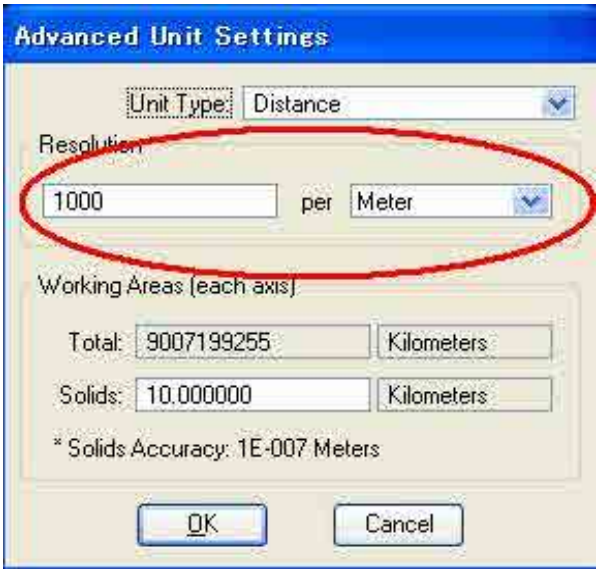
Select “Working Unit” and set as follow, then “Edit”

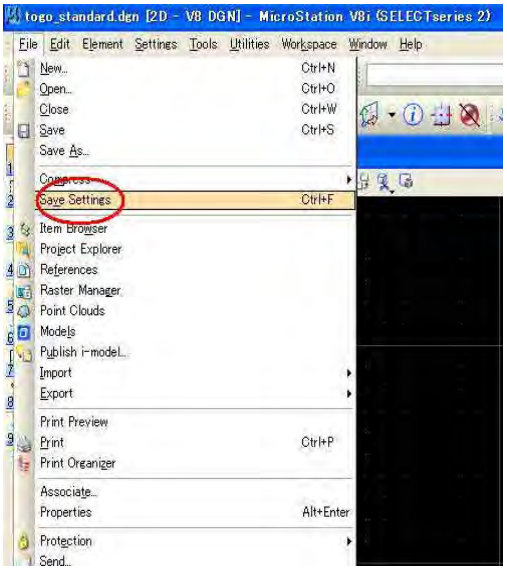
- Format : MU
- Master Units : Meters
- Sub Units : Millimeters



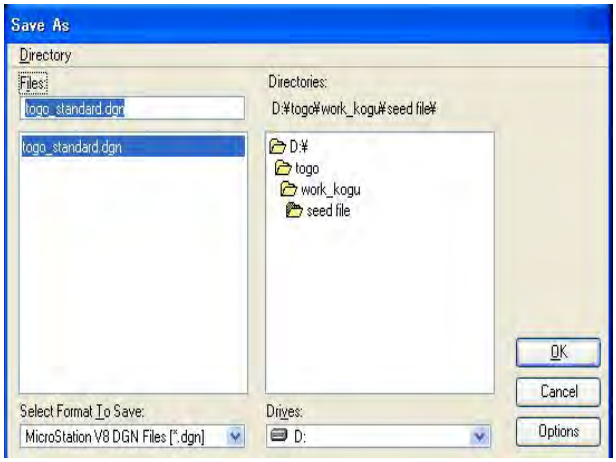


Set Resolution then “Save Setting” From File.





Save DGN File.

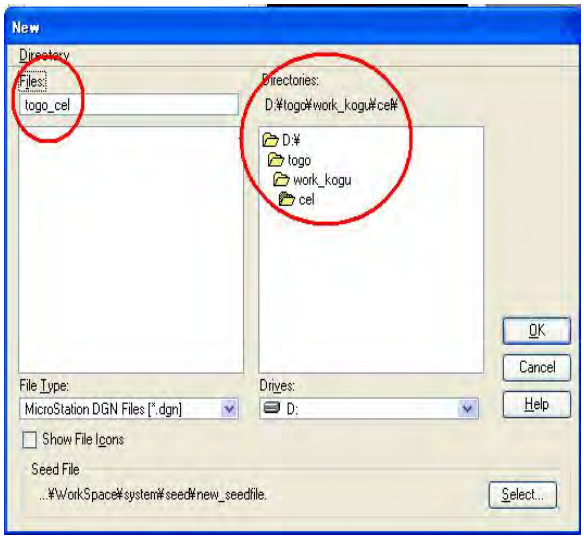


1-1-2. Cell File Setting (setting file for "symbols" defined in the "SYMBOLIZATION SPECIFICATION".)

Open MicroStation V8i

File/new

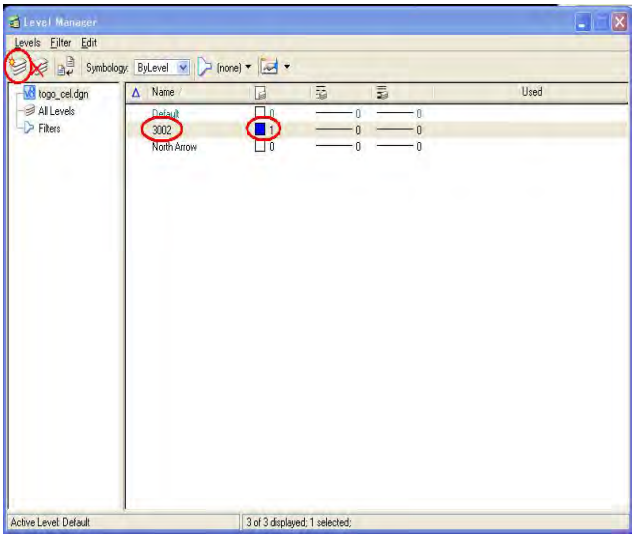
Choose work directory and input name of "New Cel file"



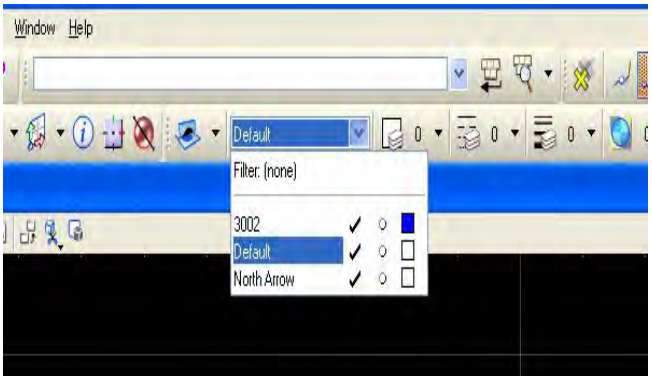
< Exercise (3002 Building)>

(1) Open Level Manager

(2) Create New level



(3) Set "layer 3002" as Active



(4) Draw Shape

① Place Smartline

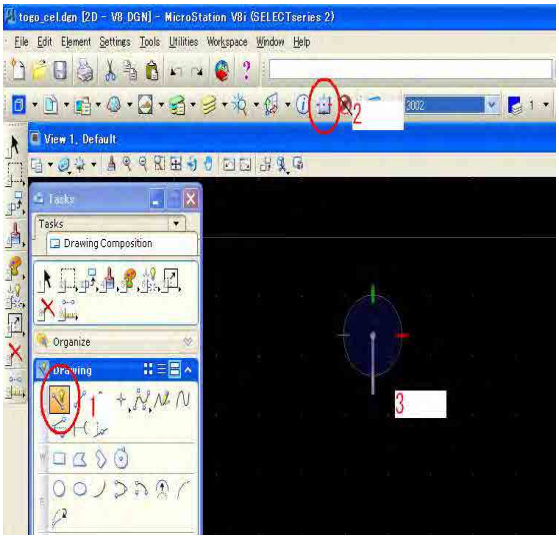
② Toggle Accudraw

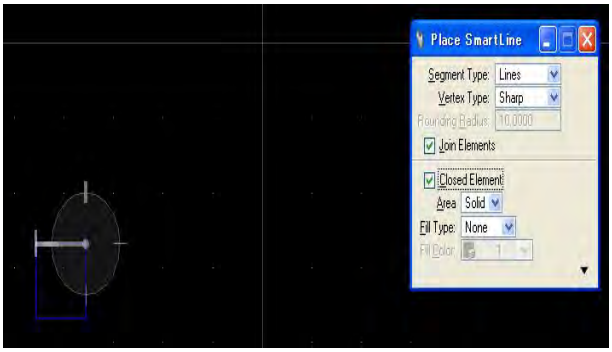
③ Input 1(mm) as "Y" Direction

④ Input 1(mm) as "X" Direction

⑤ Input 1(mm) as "X" Direction

⑥ Snap to start point

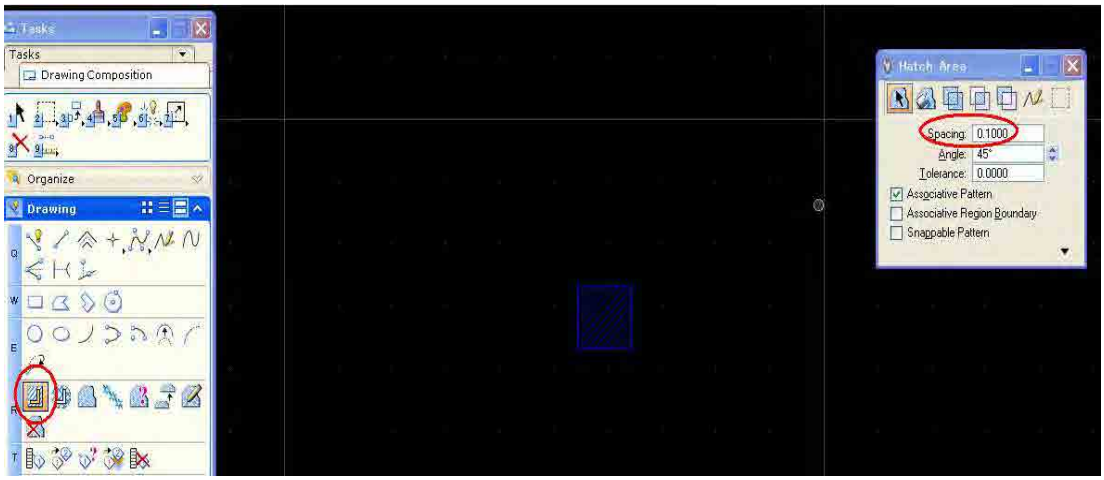




(5) Hatch inside the Drawn Shape

Select "Hatch area" and Set "Spacing "as 0.1 then click on the target.

And click window (to decide).

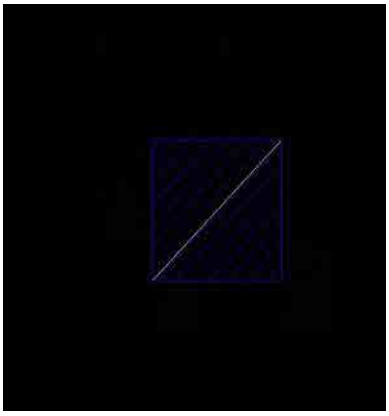


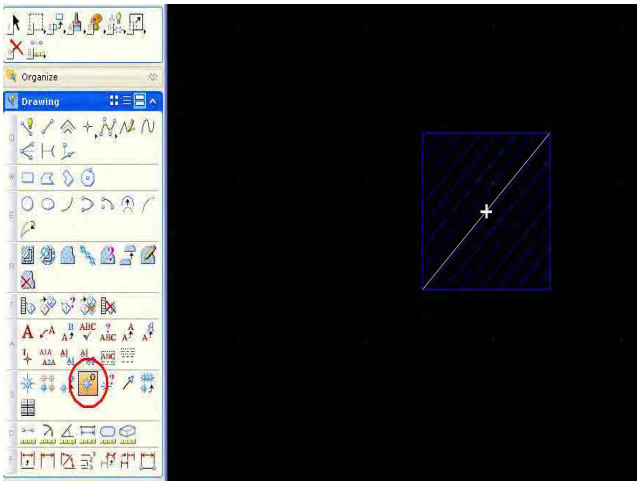
(6) Set Origin (Origin Point)

① Snap setting “shift”

② Draw a “Diagonal line”

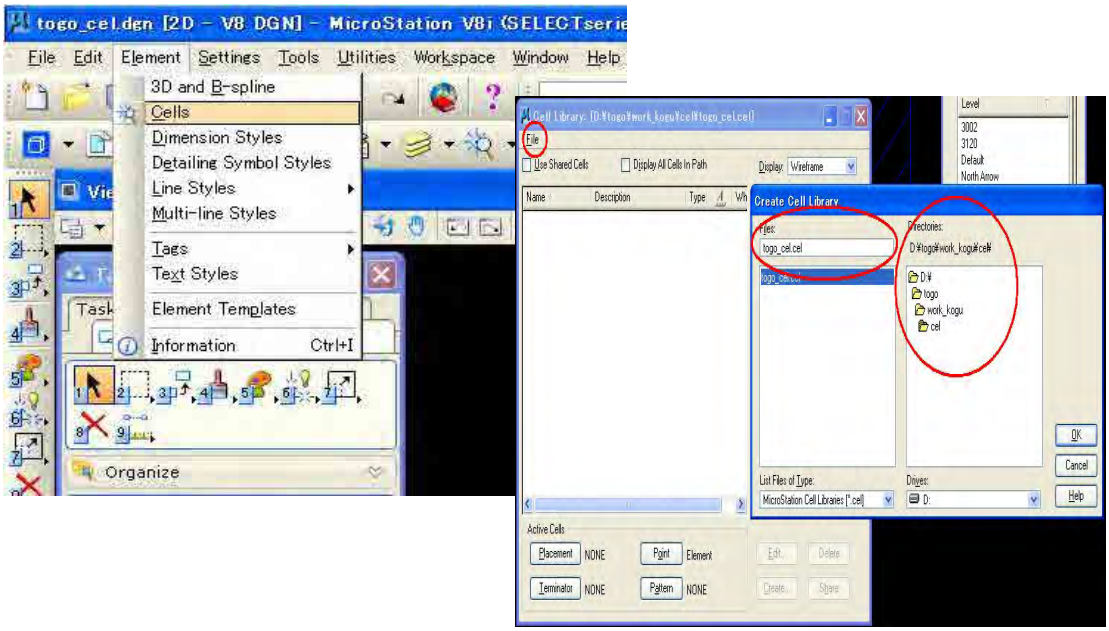
③ insert point (Midpoint of the “Diagonal line”)



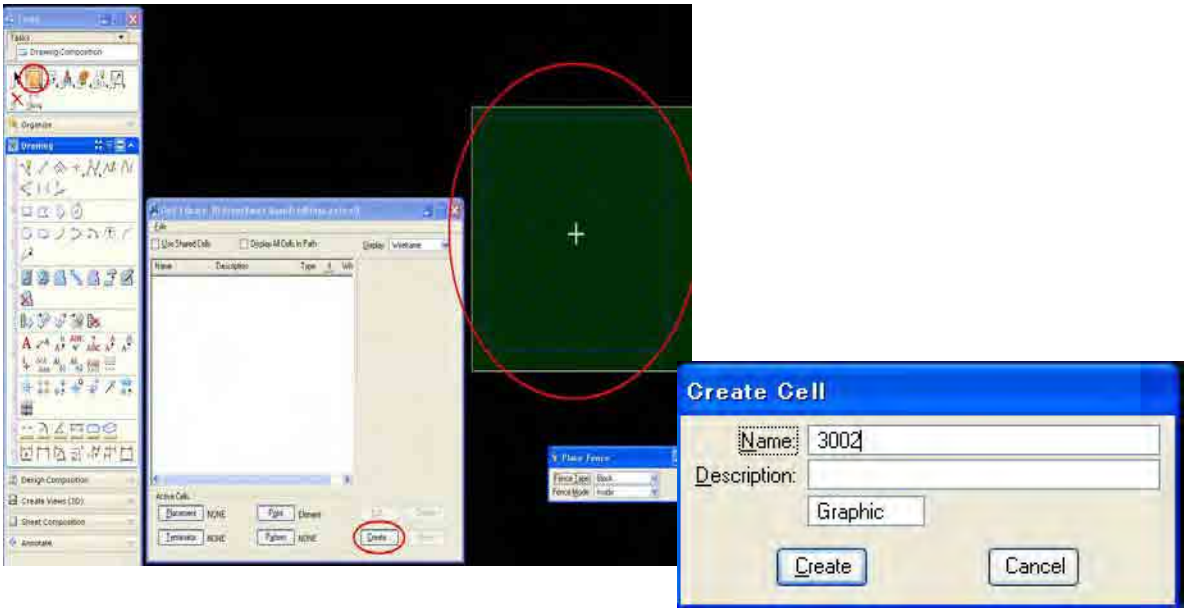


(7) Registration

Element -> Cells, then Select Directory and input name.



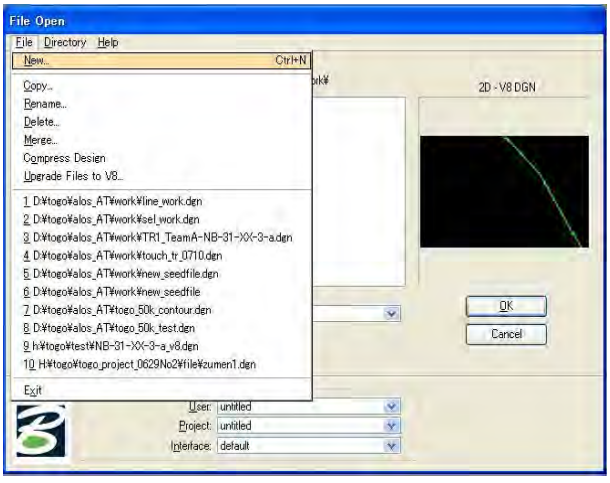
Place fence to include the shape and click “Create”. Then Input Name as 3002.

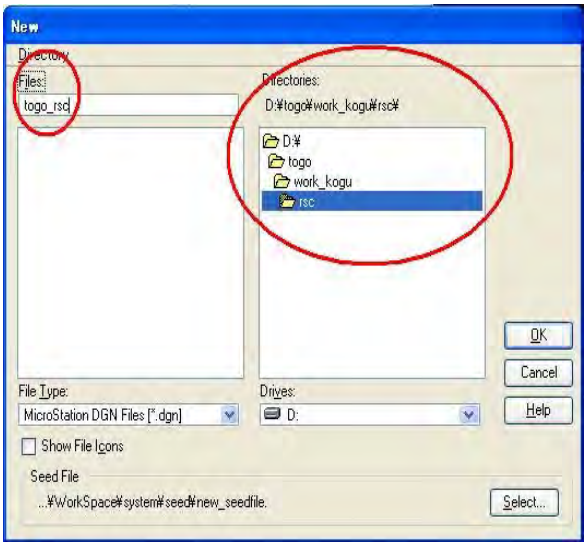


1-1-3. RSC (Resource) File Setting (setting file for "line type(color, style, weight)" defined in the "SYMBOLIZATION SPECIFICATION".)

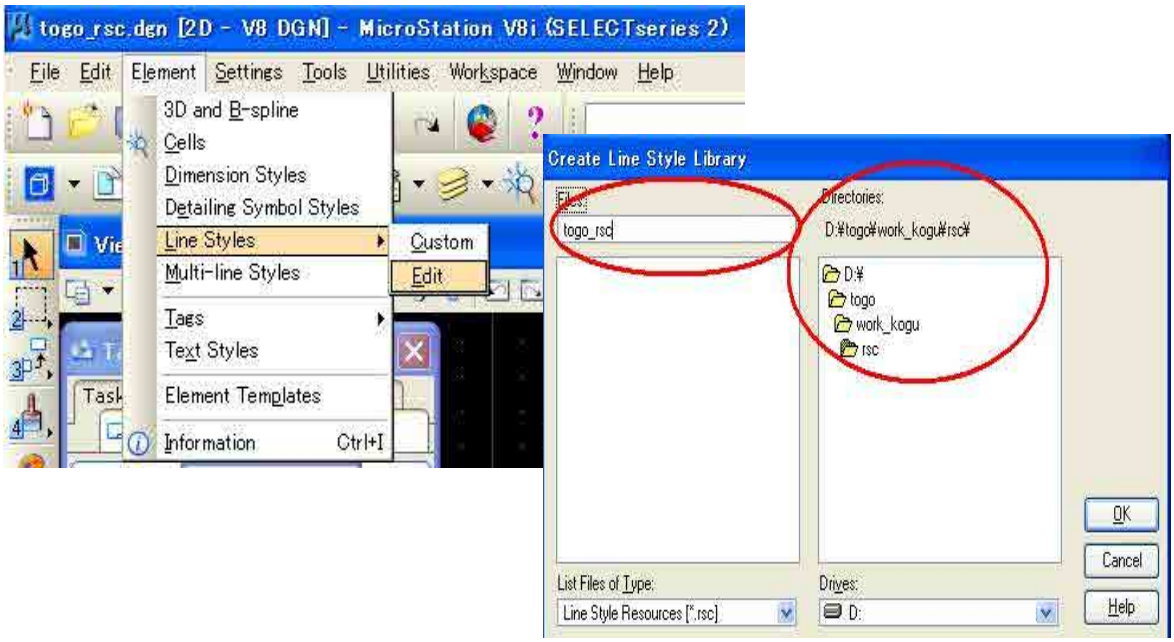
Open MicroStation V8i

File -> new, then Choose work directory and input name of “New RSC file”

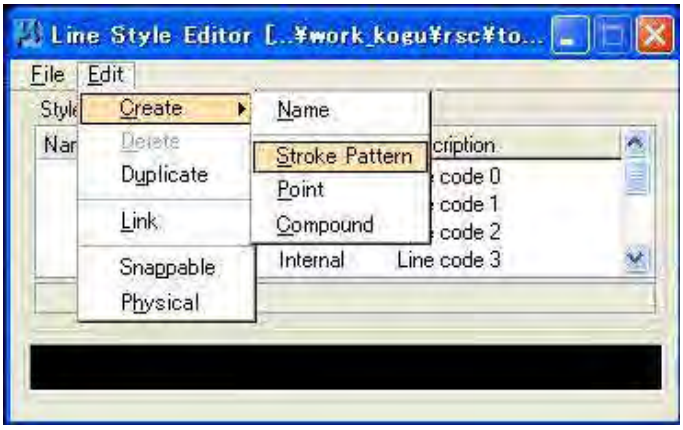




Element -> Line Styles -> Edit, then select the created file.

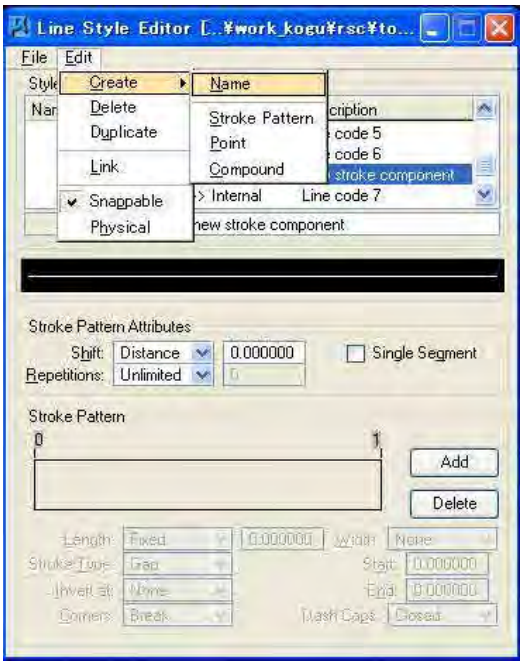


Edit -> Crate -> Stroke Pattern

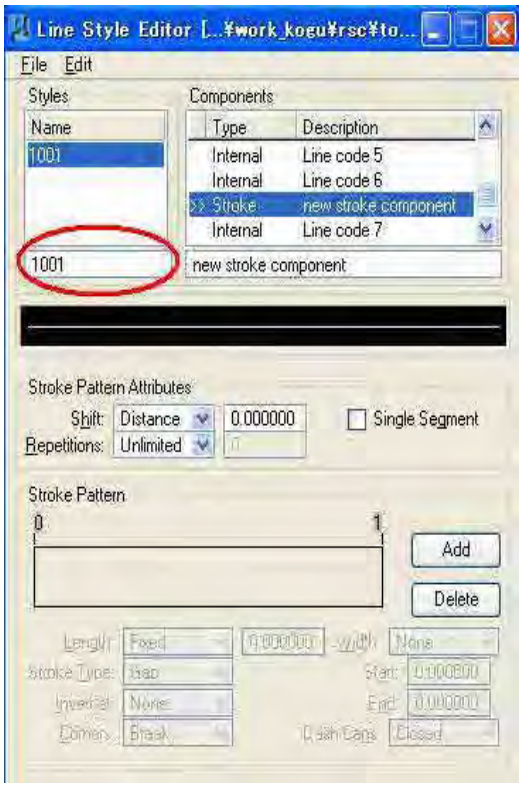


< Exercise 1 (1001 Boundary between countries)>

(1) Open "Line Style Editor", then Edit -> Crate -> Name Open Level Manager



(2) Input newly "Style Code" as 1001 and Select "Stroke" as Line Type.



(3) Create Pattern

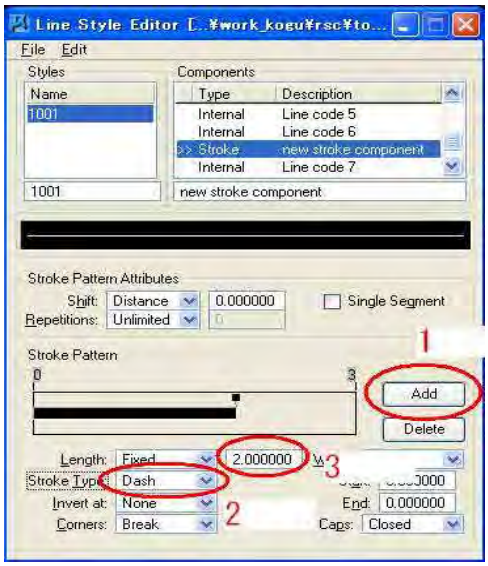
① 1 st Dash (Line: 2.0mm)

② 1 st Gap (Space: 0.6mm)

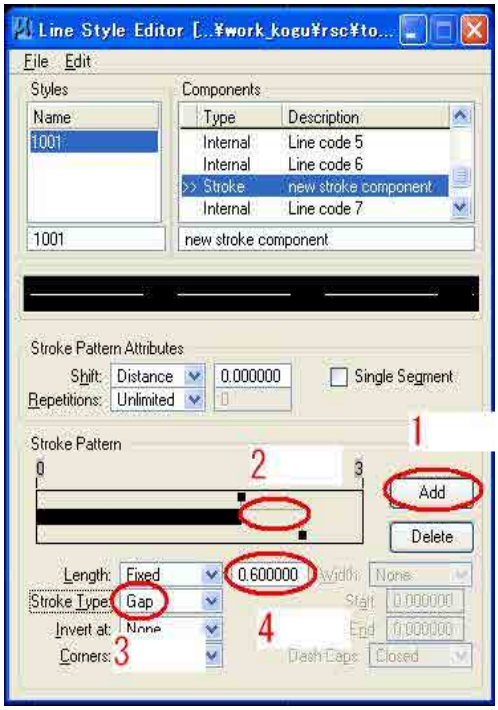
③ 2 nd Dash (Line: 0.3mm)

④ 2 nd Gap (Line: 0.6mm)

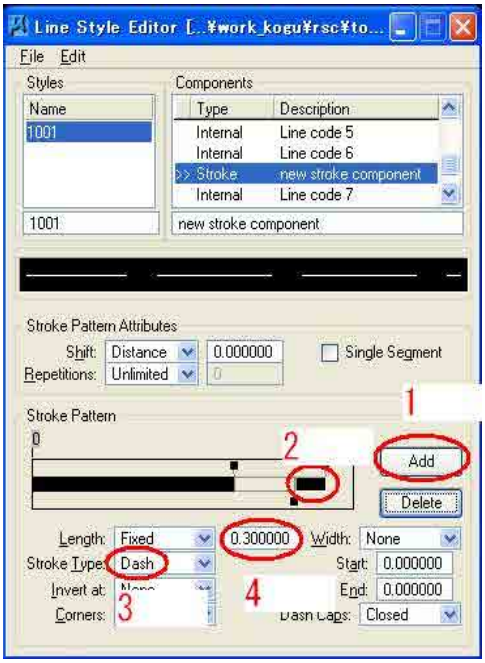
① Click “Add” , then Choose “String Type” as “Dash” and input 2.0 in “Length”



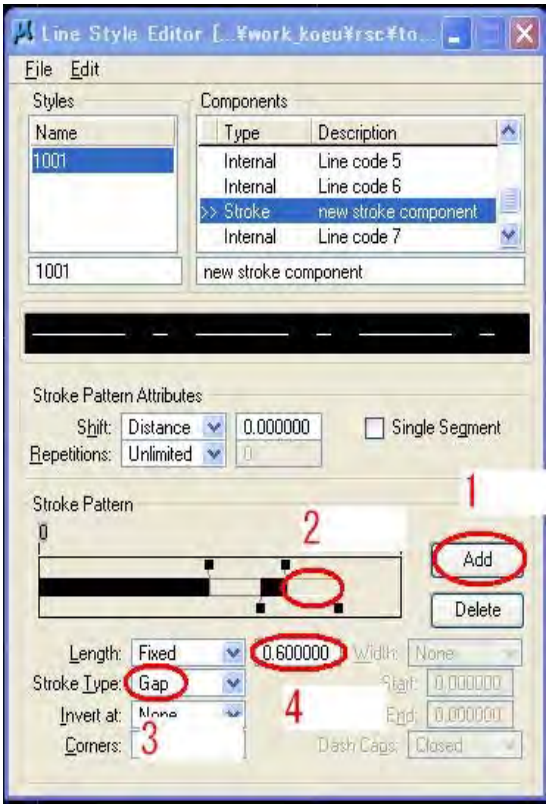
② Click “Add” , then Choose “String Type” as “Gap” and input 0.6 in “Length”



③ Click “Add” , then Choose “String Type” as “Dash” and input 0.3 in “Length”



④ Click “Add” , then Choose “String Type” as “Gap” and input 0.6 in “Length”

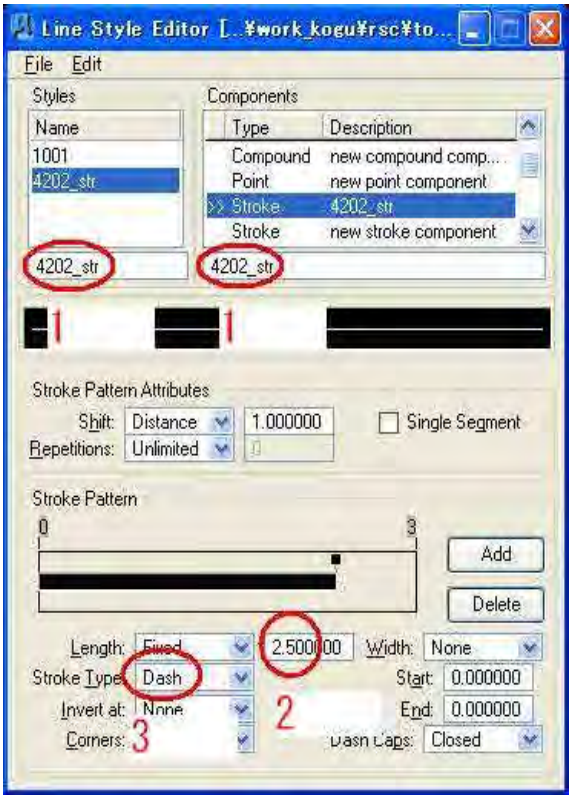


Save RSC(Resource) file.

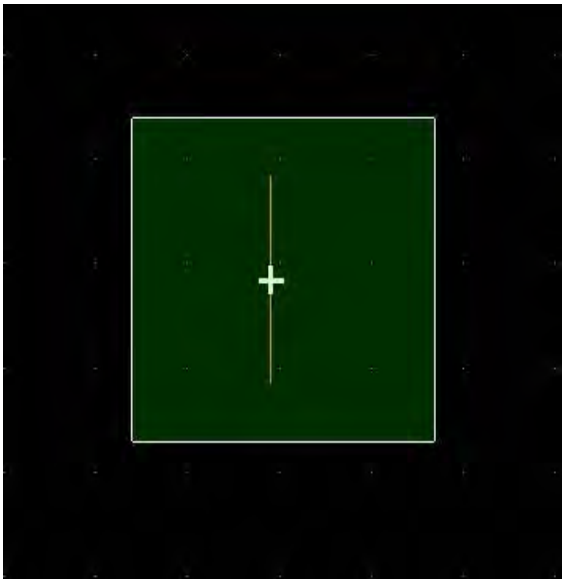
< Exercise 2 (4202 Planting fence)>

(1) **Cerate Line Stroke_component:** Input newly "Style Code" as "4202_str" and input"4202_str" as Component.

(2) Click "Add" , then Choose "String Type" as "Dash" and input 2.5 in "Length"

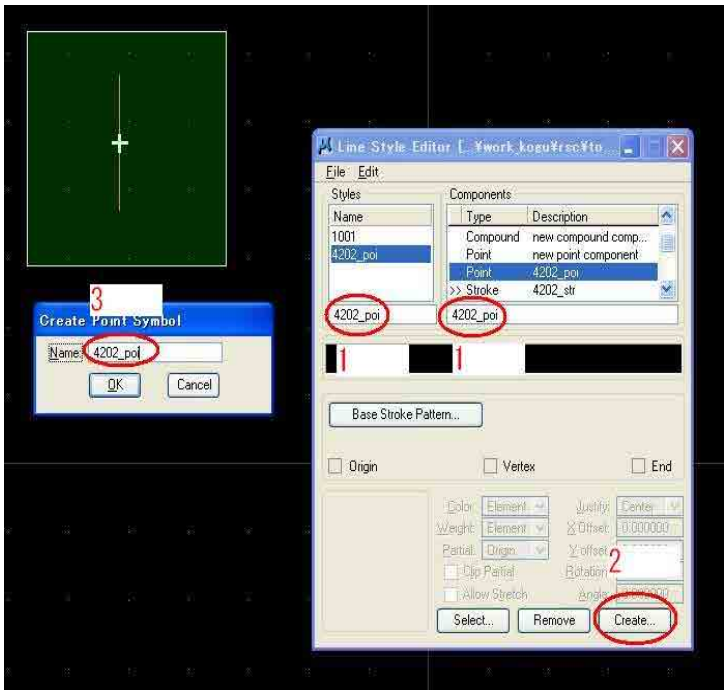


(3) **Cerate Line Point_component:** Draw "Nip-line" , with a length 2.0mm to Y direction. And put insert point on "midpoint".

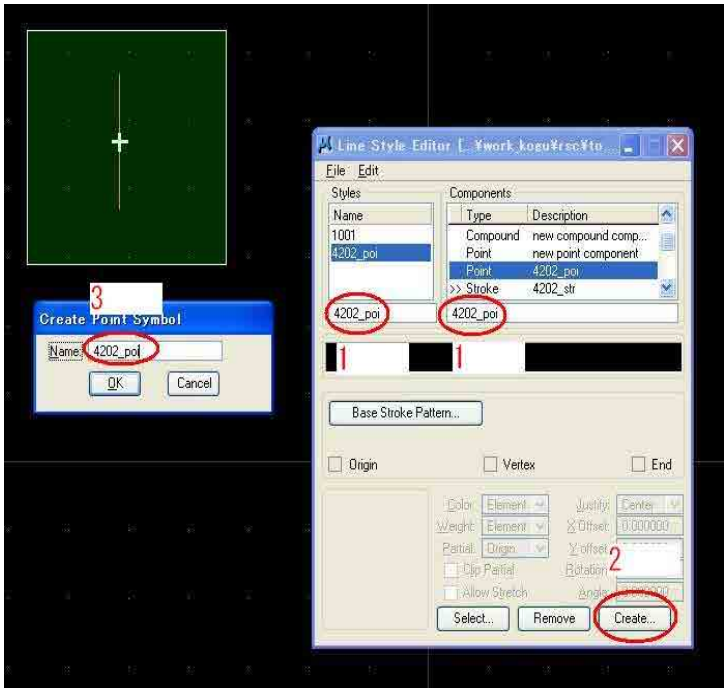


(4) Edit -> Create ->Point, Then input name as “4202_poi” and Input “4202_poi” as Component.

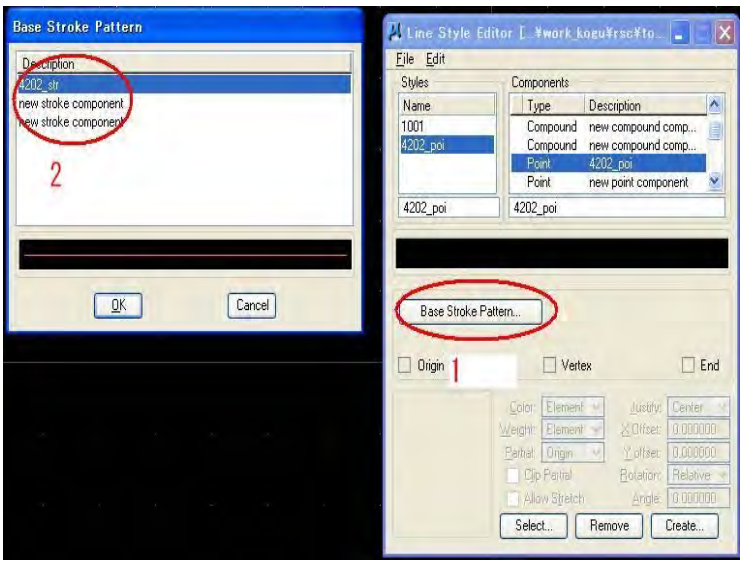
(5) Click “Create” and click “OK” in “Create Point Symbol” window.



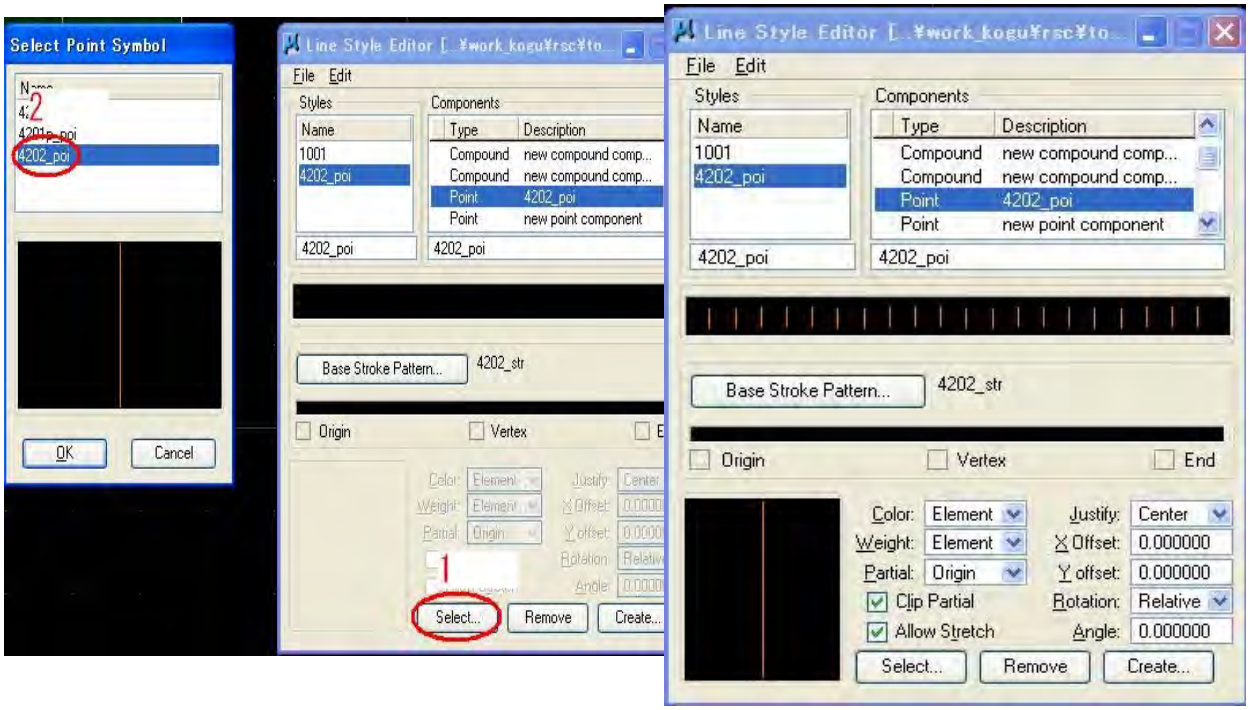
(6) Click “Base Stroke Pattern” and choose “4202_poi” as stroke. Then click “OK” in “Create Point Symbol” window.



(7) Click “Base Stroke Pattern” and choose “4202_str” in “Base Stroke Pattern” window.

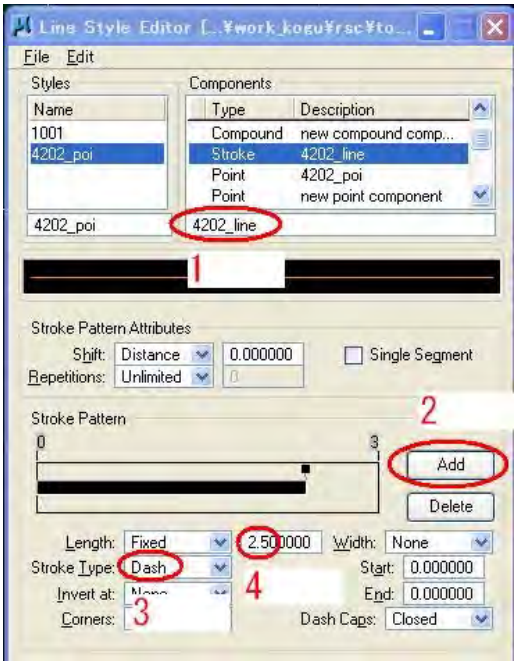


(8) Click “Select” Button and choose “4202_poi” in “Create Point Symbol” window. And Select “4202 point-stroke pattern”.

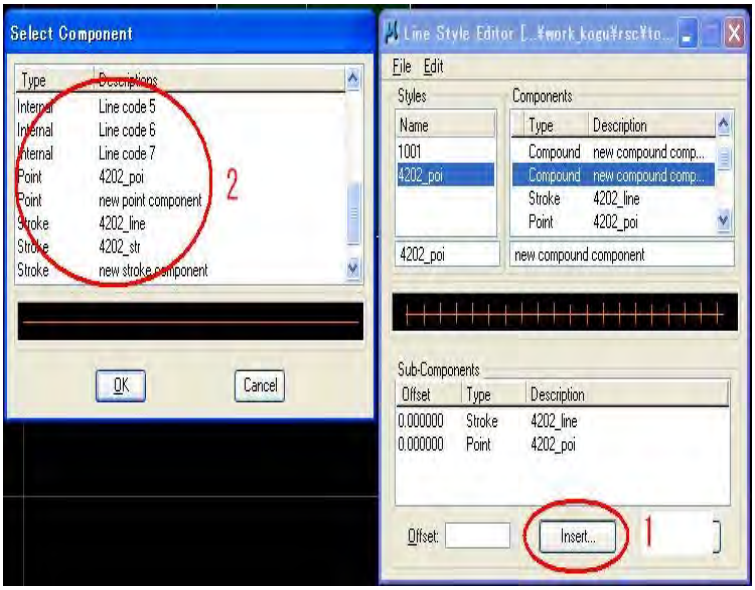


(9) **Create Line component :** Edit ->Create -> Stroke Pattern , then Select “4202_poi” as Name” and input “4202_line” as component.

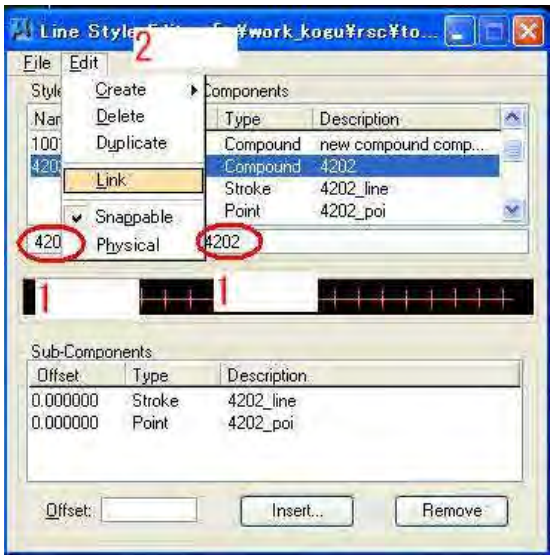
(10) “Add” , then Choose “String Type” as “Dash” and input 2.5 in “Length”



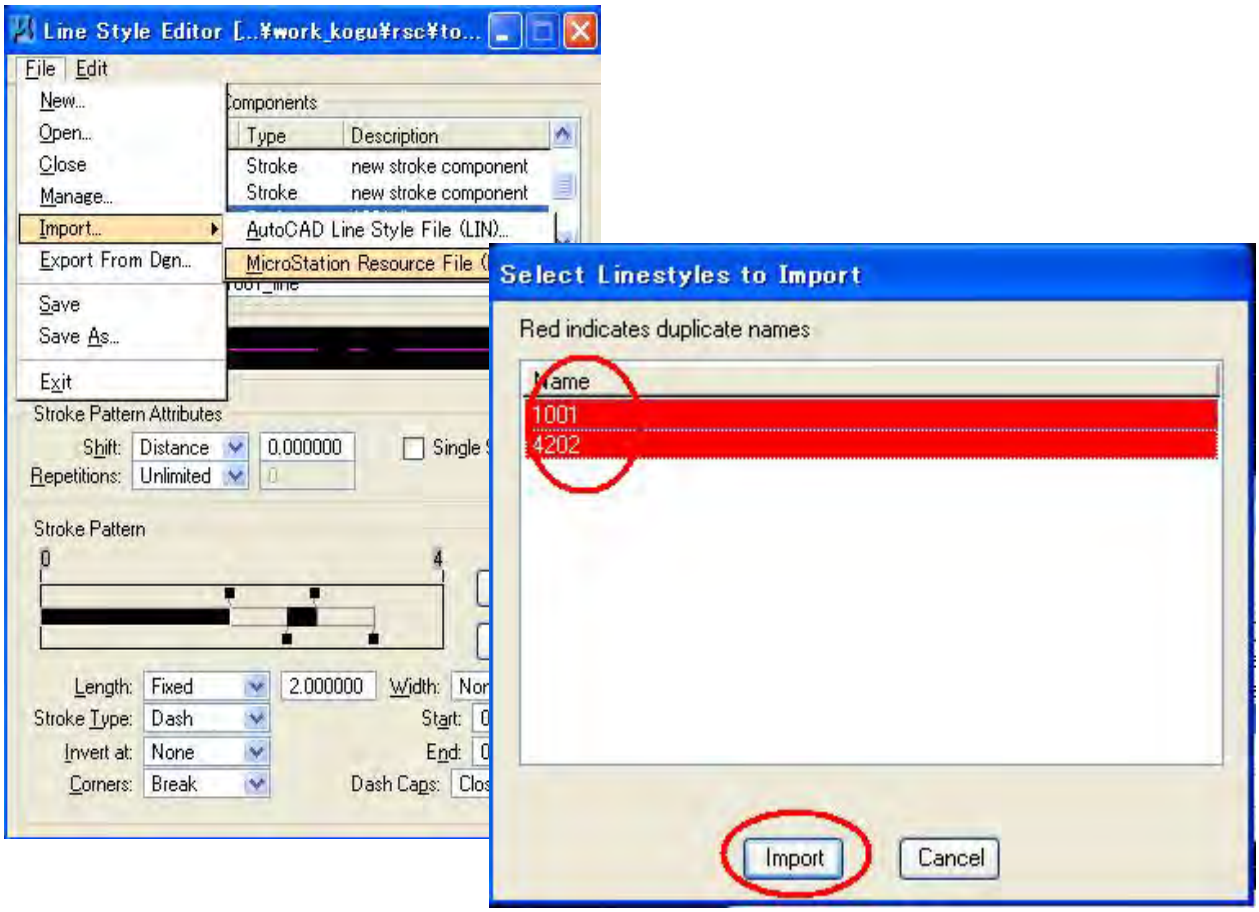
(11) Edit -> Create -> Compound , Click “Insert” and Select “4202_poi” and “4202_line”. Then “OK”



(12) Input “4202” as Name and input “4202” as Component. Then Edit ->link. After that, File -> Save.



(13) File -> Import -> MicroStation Resource File (RSC), then Select Code name and click “Import”.

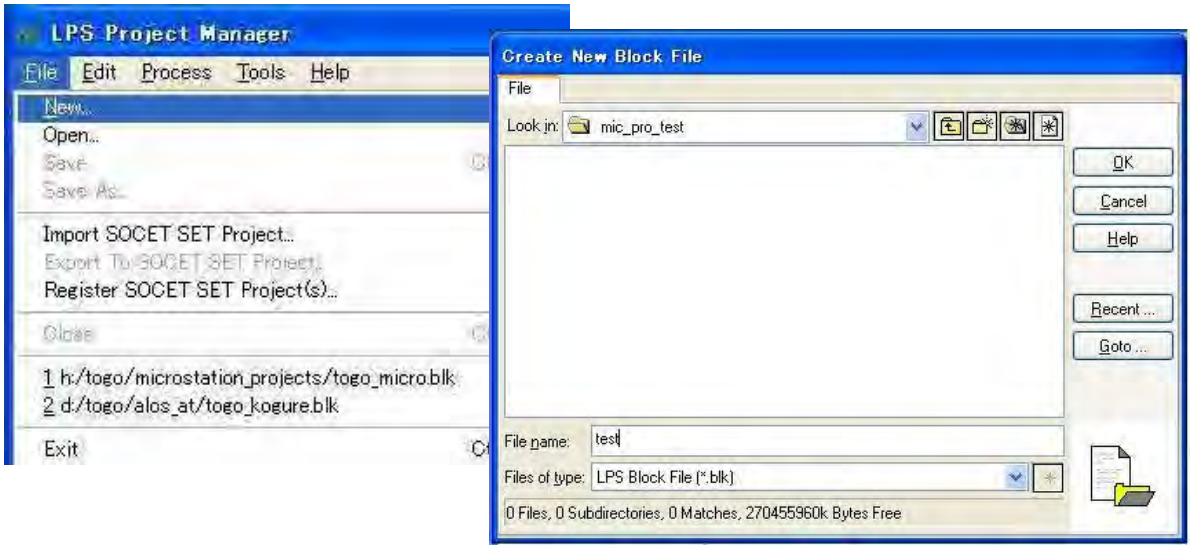


1-2 Microstation and LPS and Pro600

1-2-1. LPS Setting

(1) Open LPS 2011

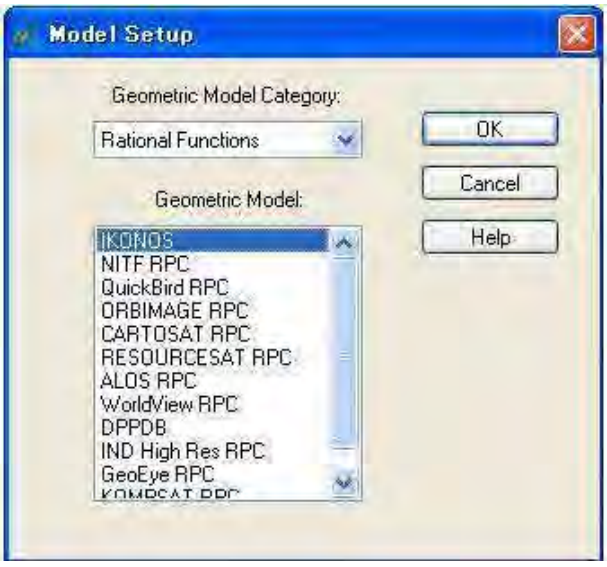
(2) File -> New, Input new file name



(3) Model Setup

Geometric Model Category: Rational Functions

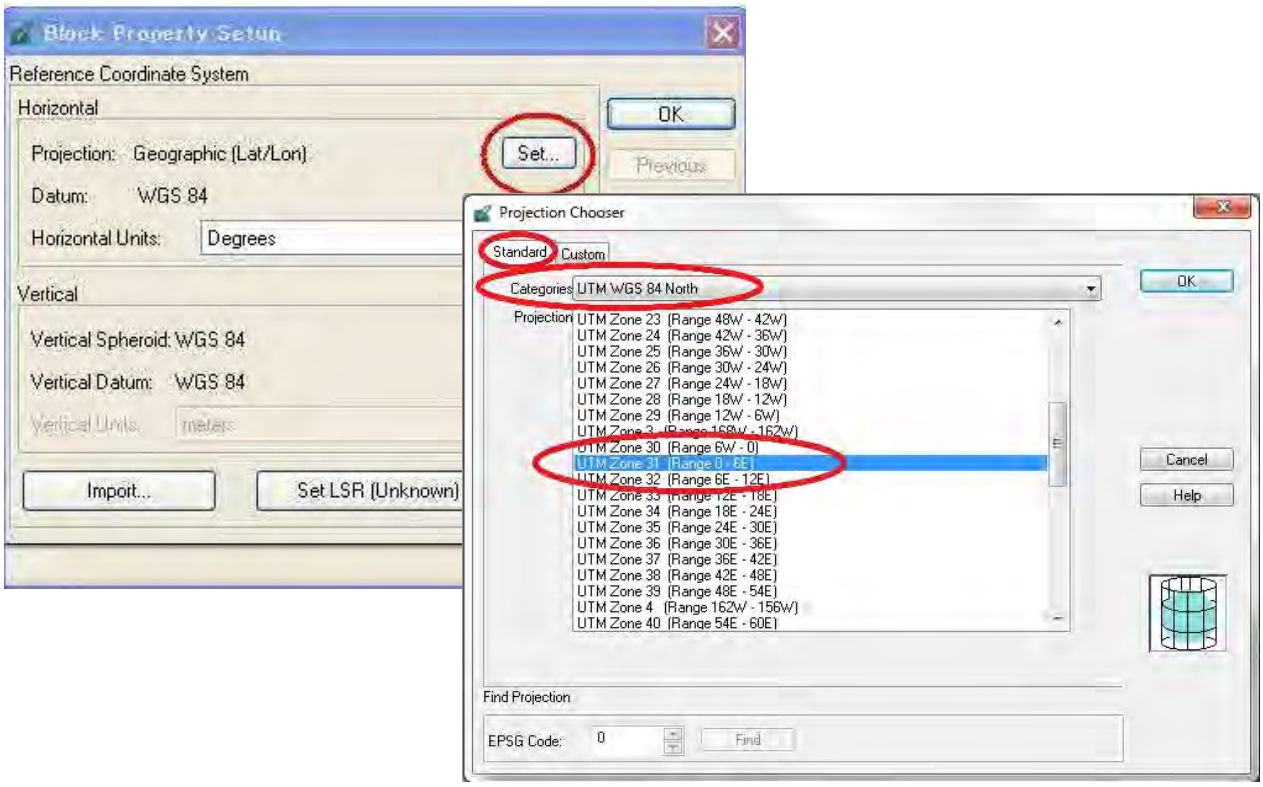
Geometric Model IKONOS



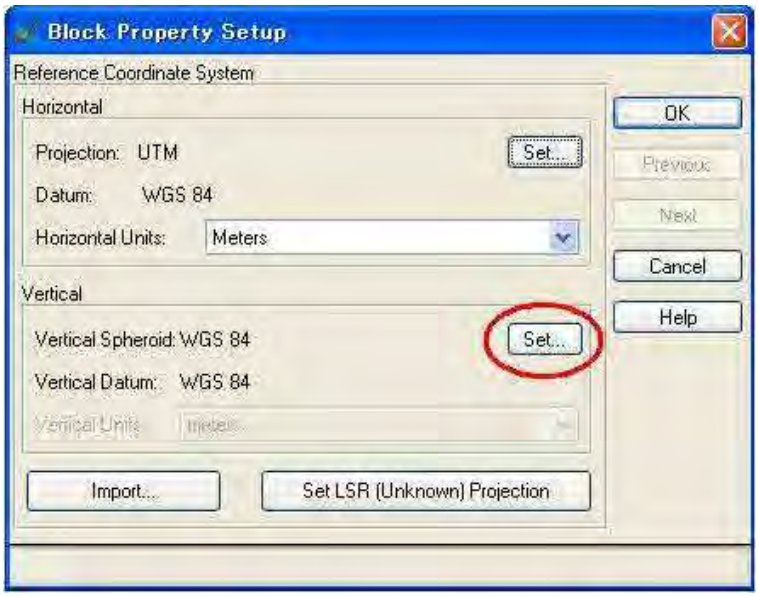
(4) Coordinate System Setup

Click “Set” for Horizontal Setting and go to “Standard” tag.

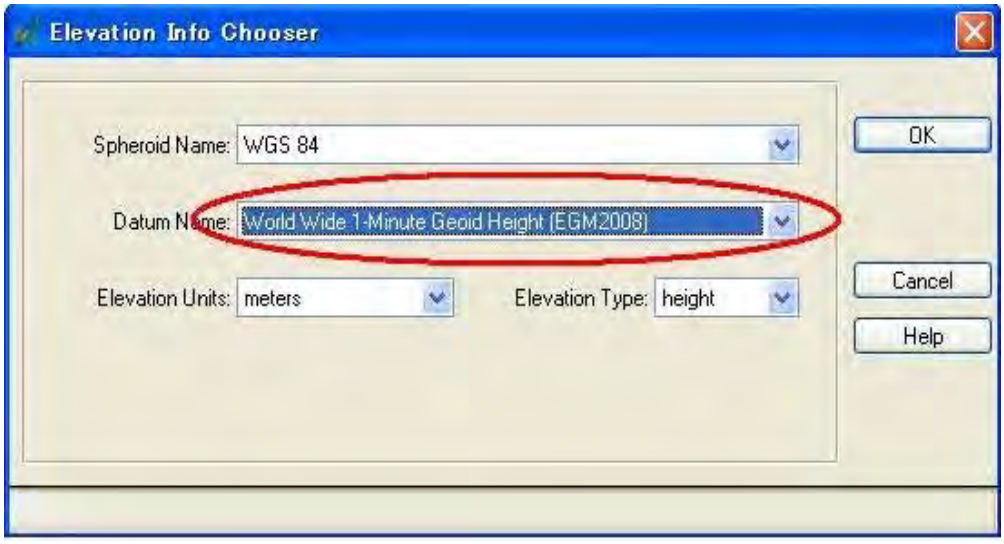
Select “UTM WGS 84 North” from “Categories” and Select Zone 31 as “Projection”.

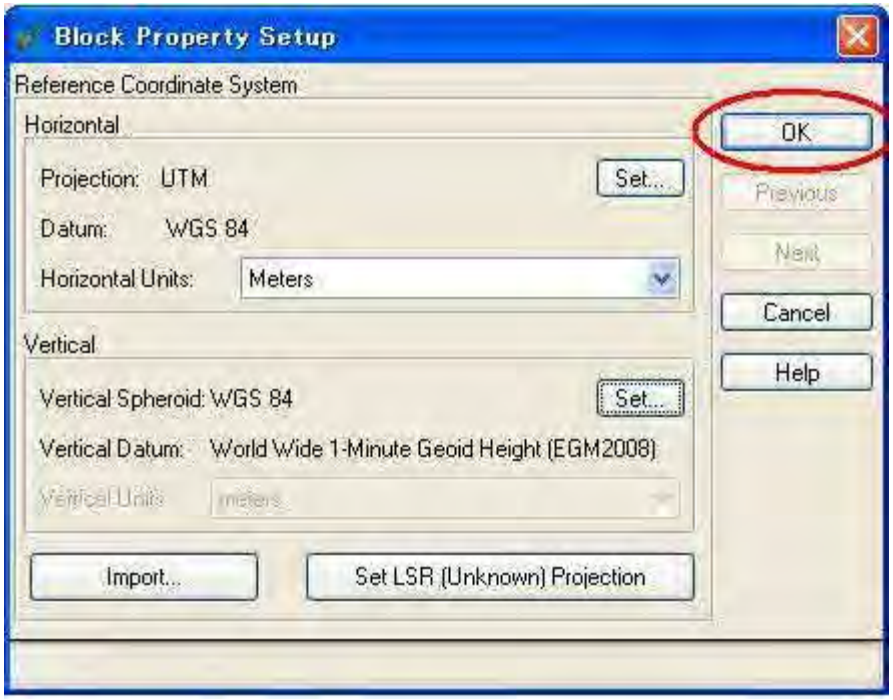


Click “Set” for Vertical Setting and go to “Standard” tag.



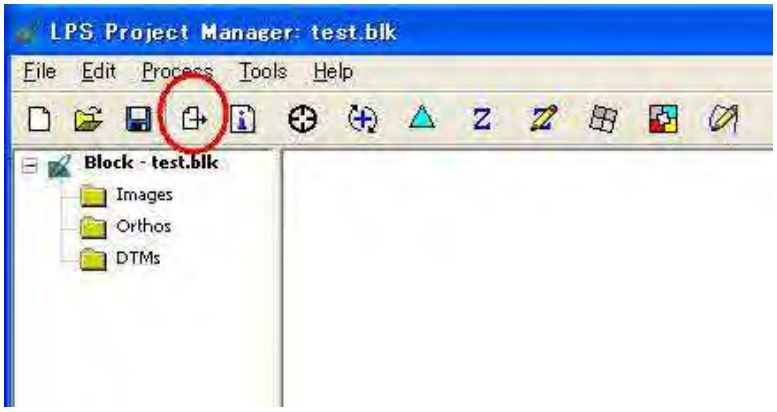
Select “WGS 84 North” from “Spheroid Name” and Select “World Wide 1-Minute Geoid Height {EGM2008} “as “Datum Name”. Then click “OK”.



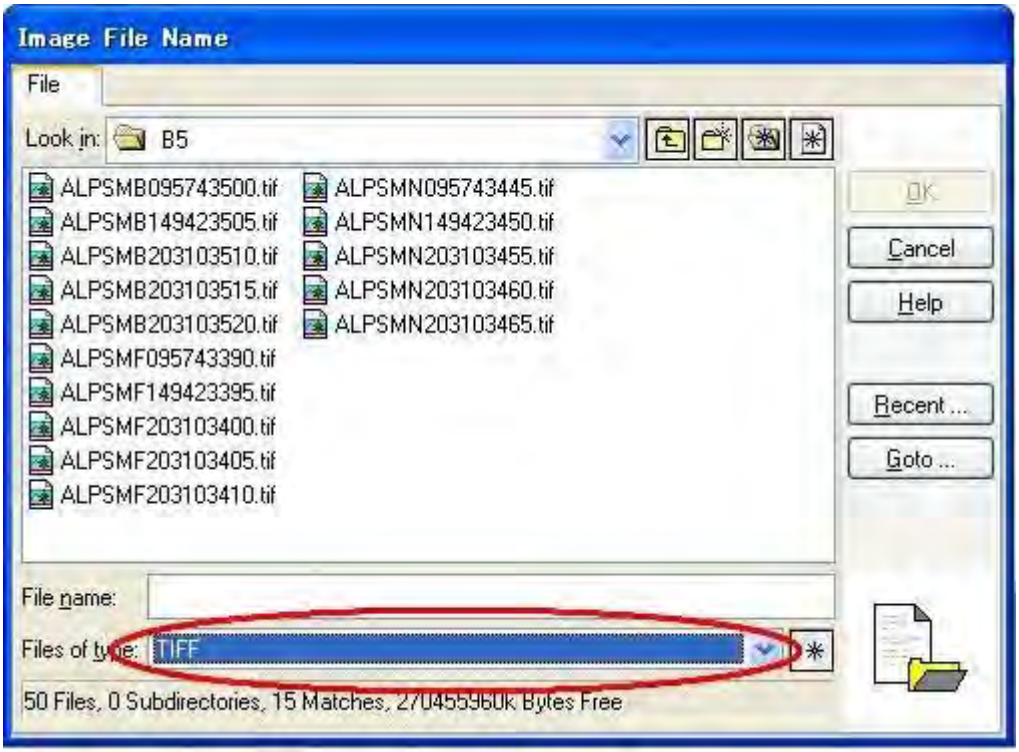


(5) Import Images

Click “Import Frame” Button.

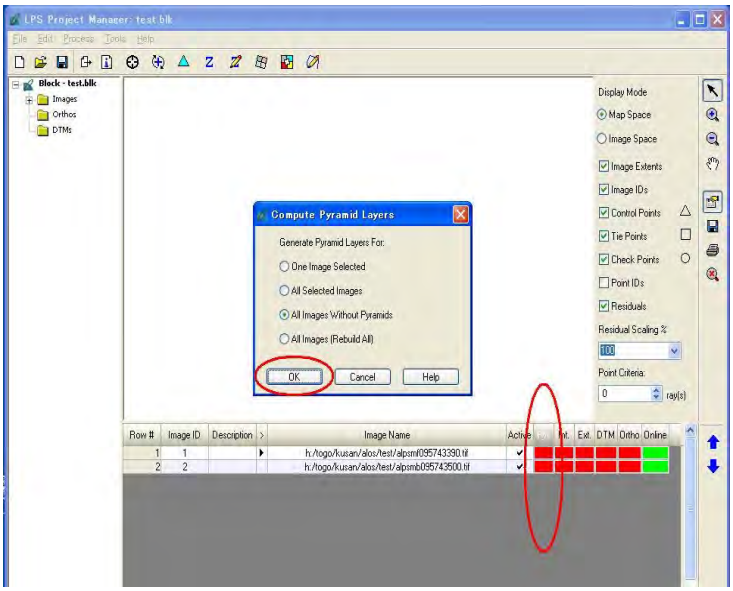


Select “TIFF” format from “File of type”.

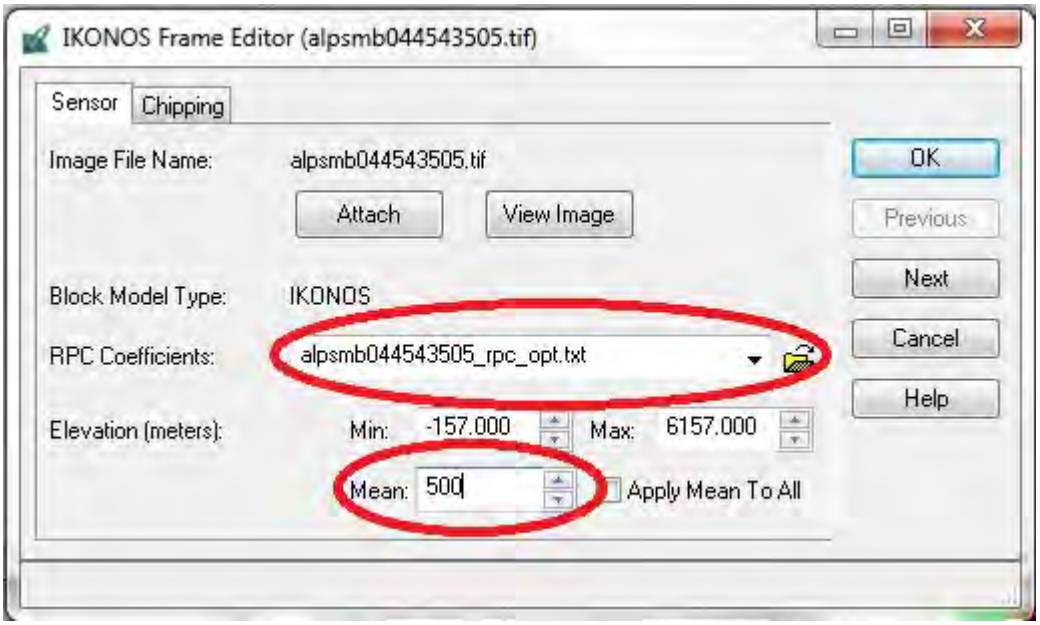


(6) Image setting

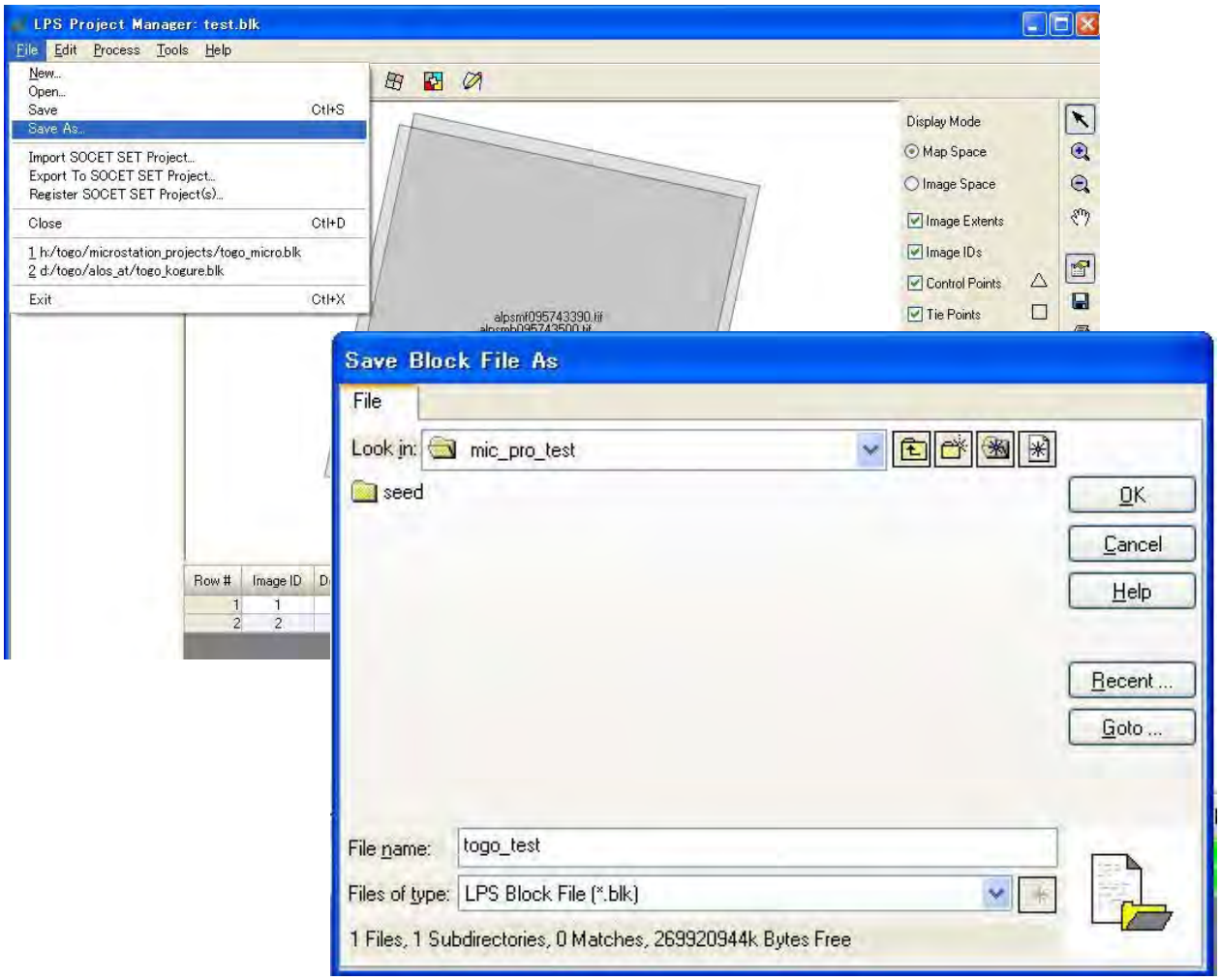
Click "Pry.", Then Choose "All Images Without Pyramids" to create pyramid file. Then "OK"



Click "Int.", Then Select RPC file in "RPC Coefficients" corresponding to imported image in "IKONOS Frame Editor". And set 500m in Mean elevation.

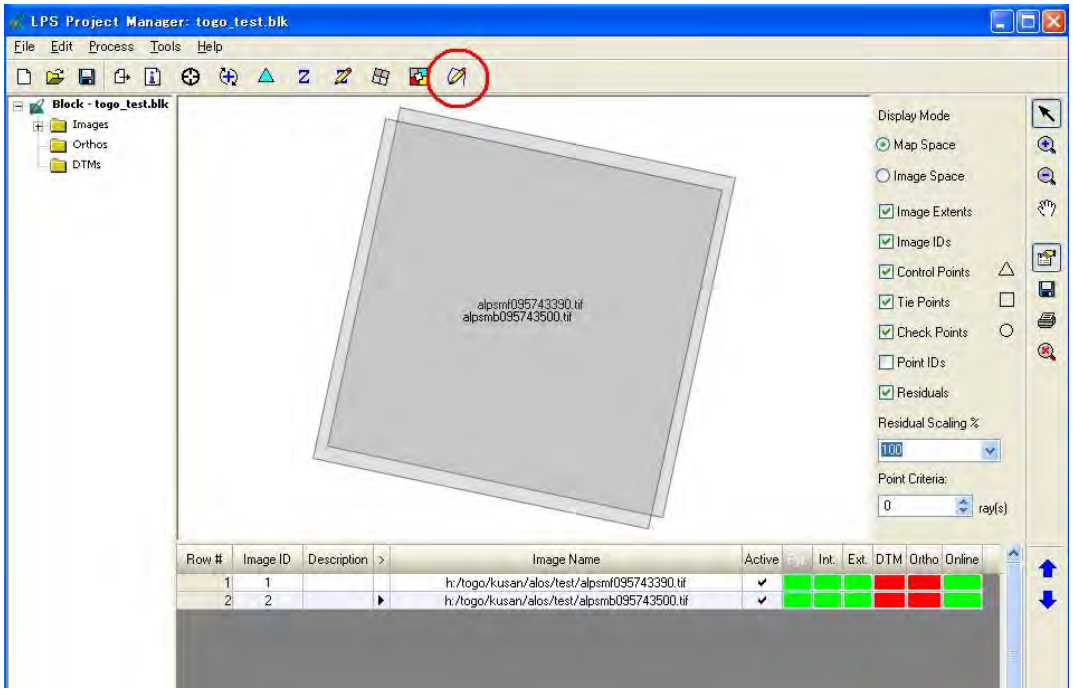


(7) Save Block file

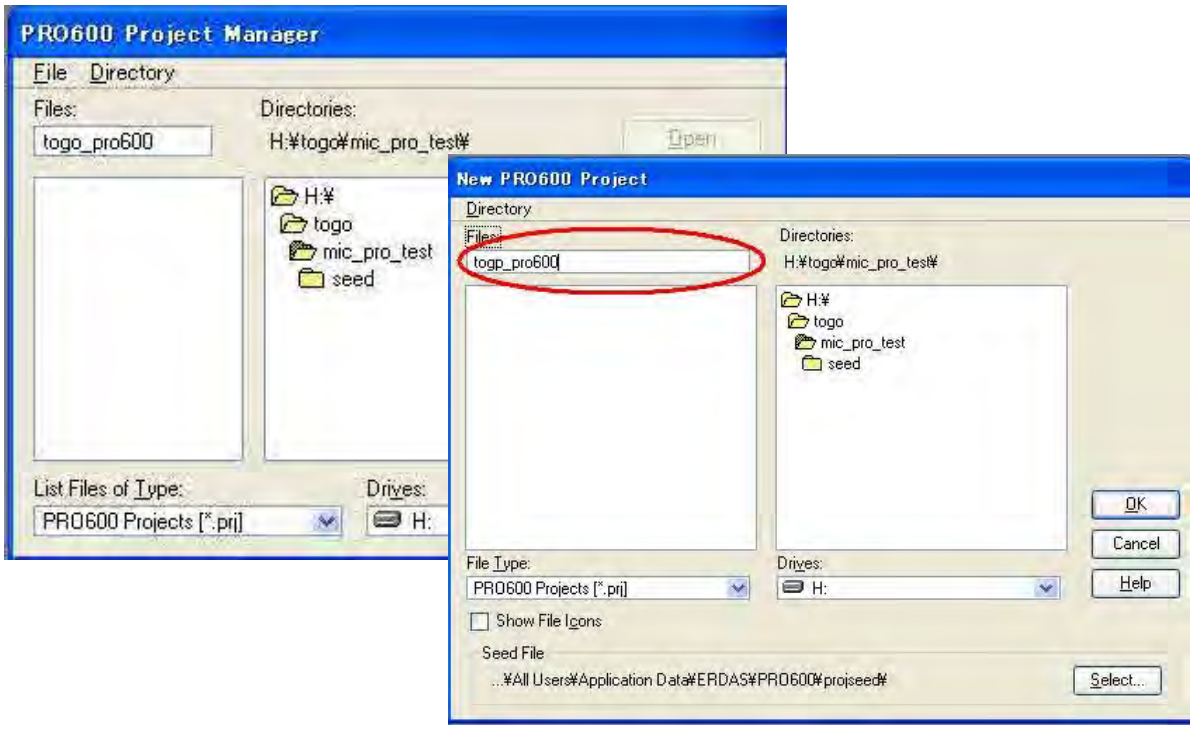


1-2-2. Stereo Plotting Function(Pro600 Setting)

(1) Click "Start Feature Collection Application" Button.

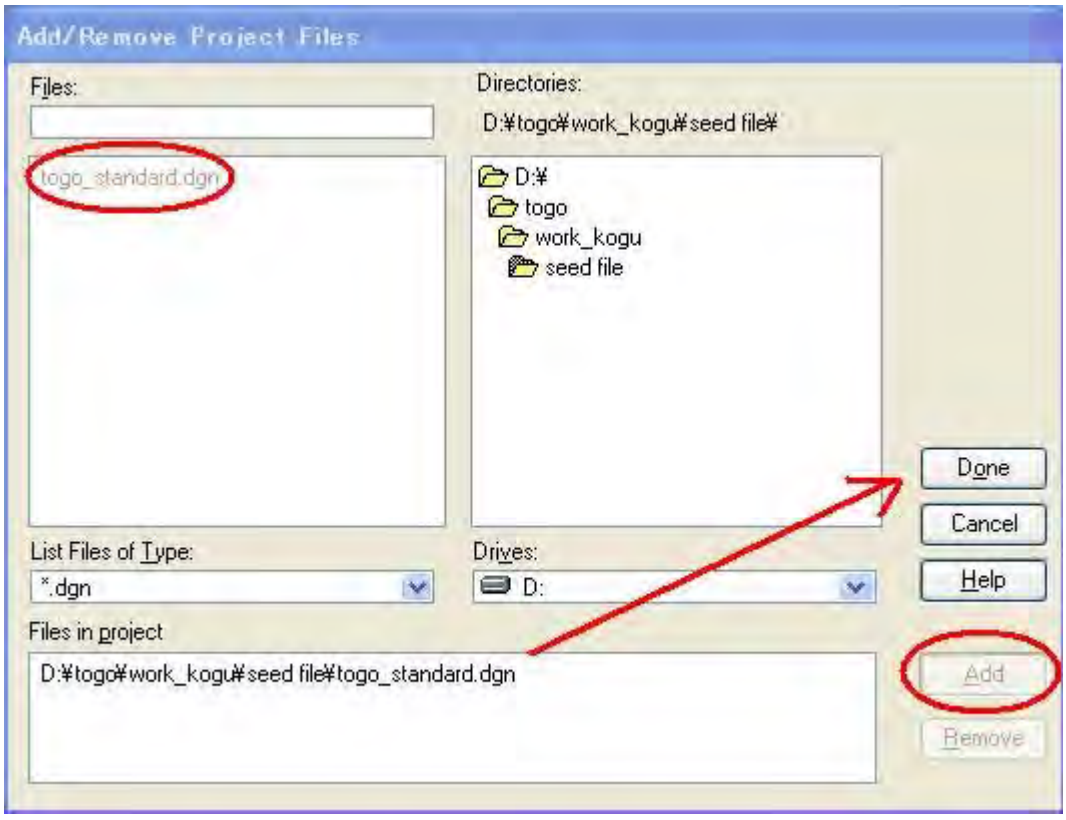


(2) Click "New" and go to work Directory, then input file name. And "OK".

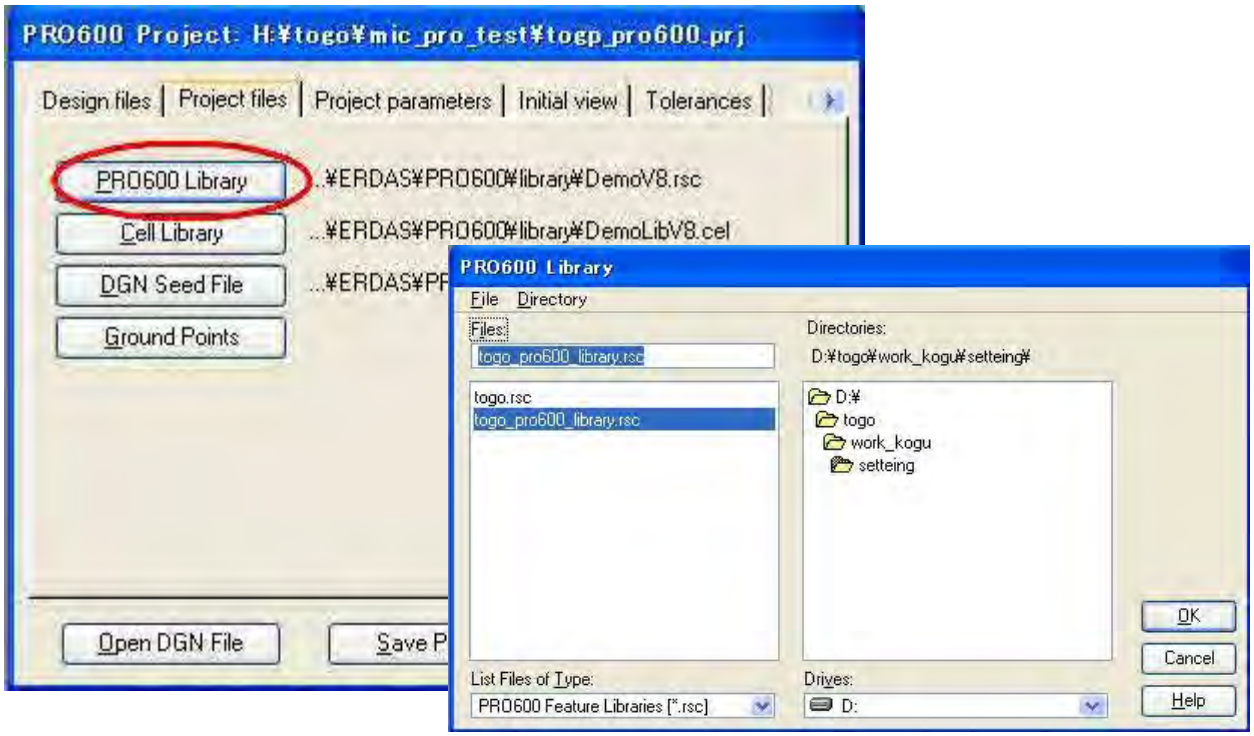


(3) Go to "Design files" tag, and Click "Add/Remove File".

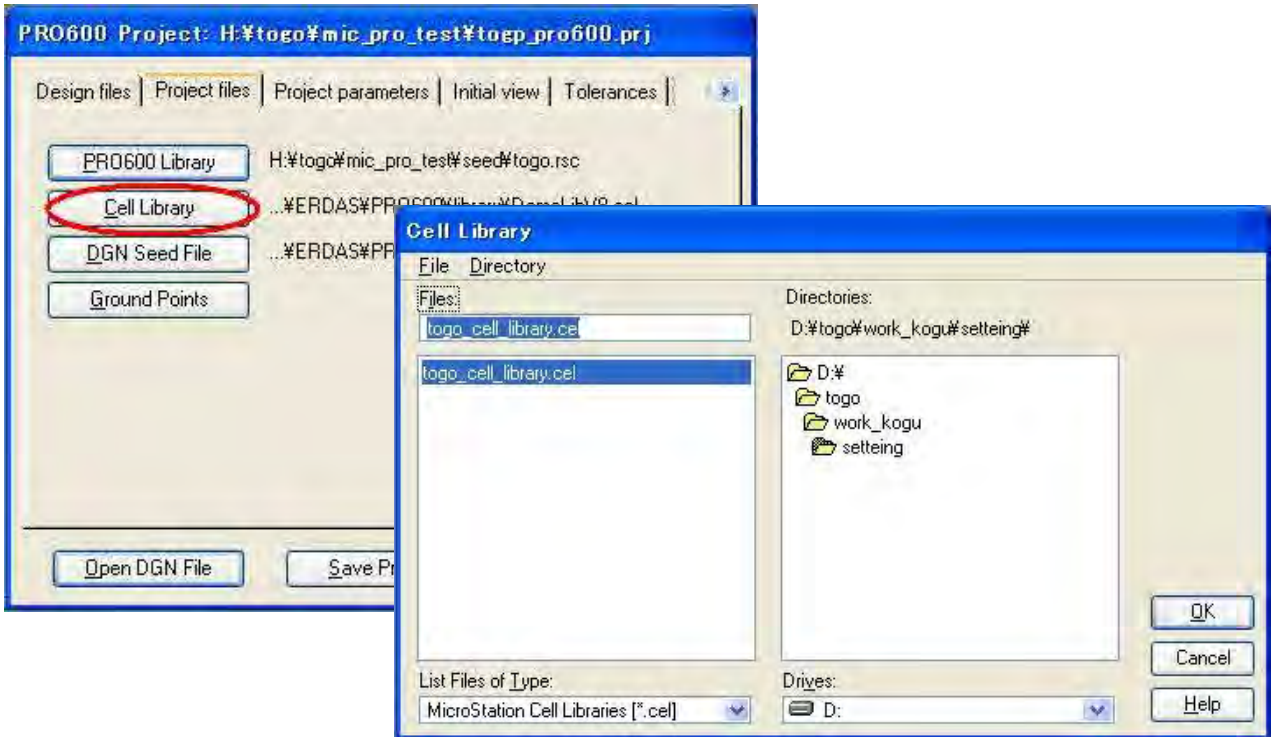
(4) Choose "togo_standard.dgn", then click "Done".



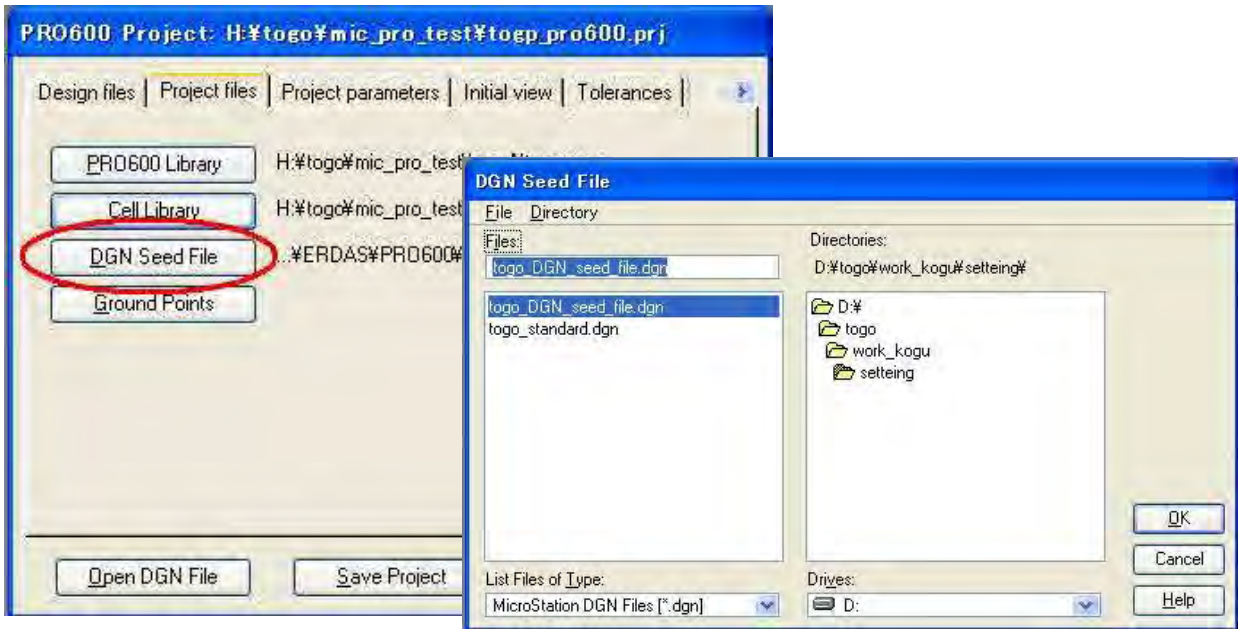
(5) Go to "Project files" tag, and Click "PRO600 Library". And Choose "togo_pro600_library.rsc".



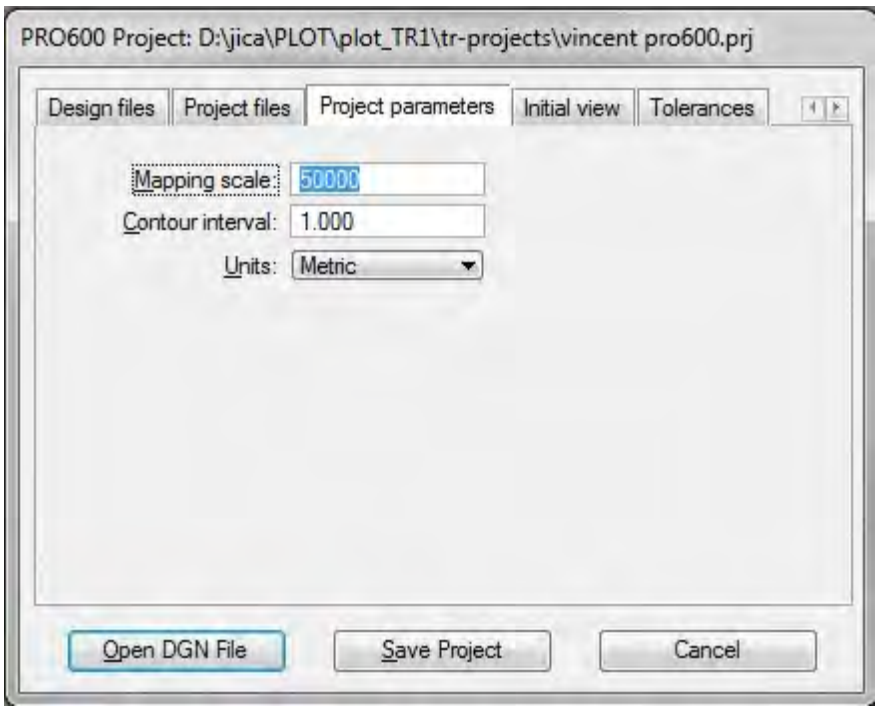
(6) Click "Cell Library", then Choose "togo_cell_library.cel".



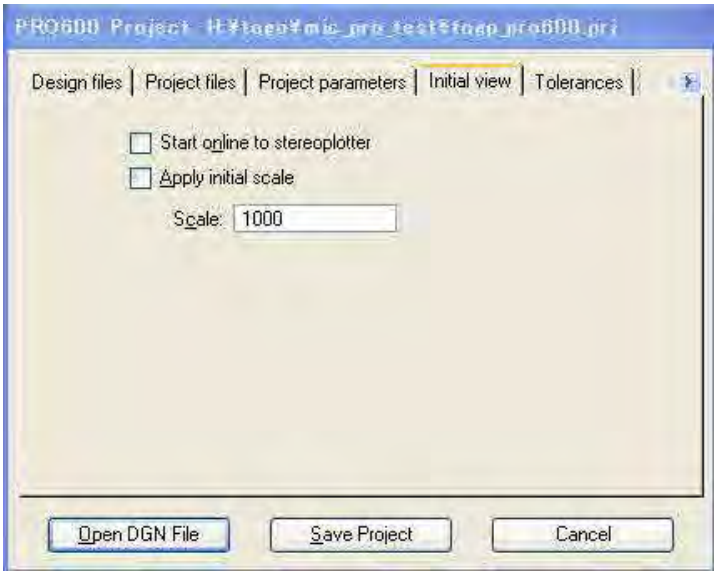
(7) Click "DGN Seed File", then Choose "Togo_DGN_seed_file".



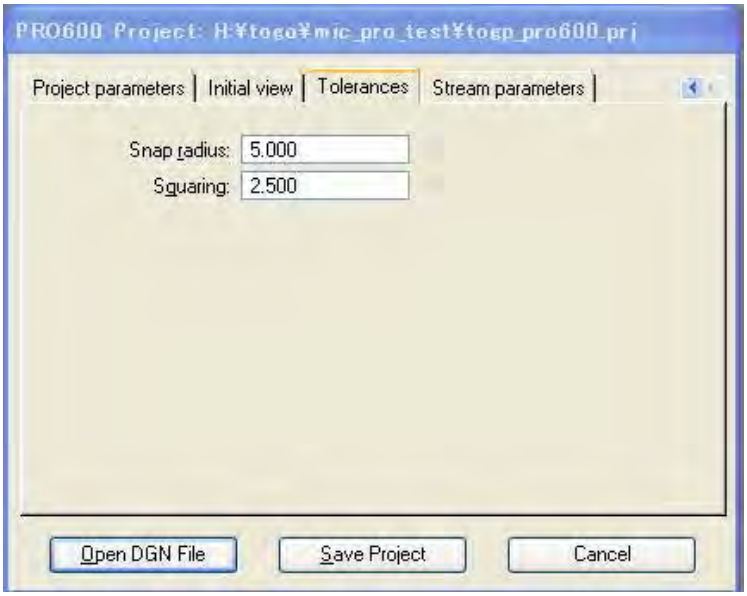
(8) Go to "Project parameters" tag, and input 50000 in Mapping scale.



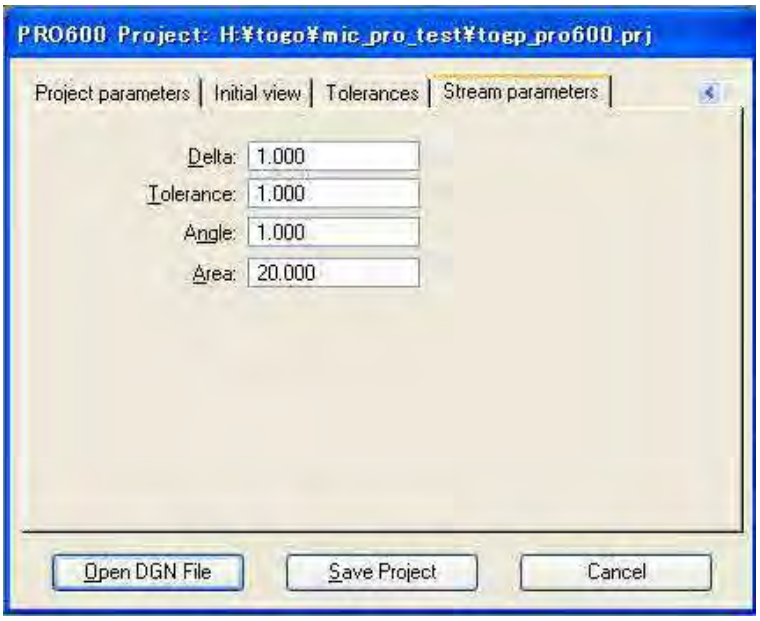
(9) Go to "Initial view" tag, and input 1000 in Scale.



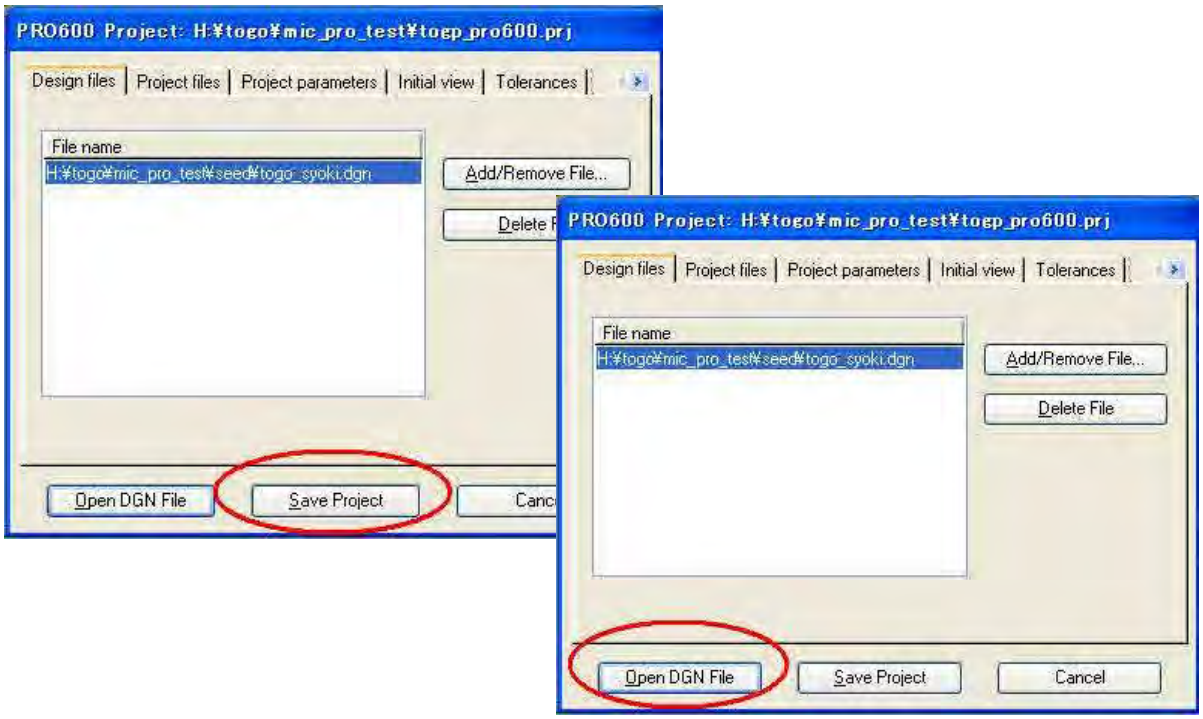
(10) Go to "Tolerance" tag, and input values as follow.



(11) Go to "Stream parameters" tag, and input values as follow.

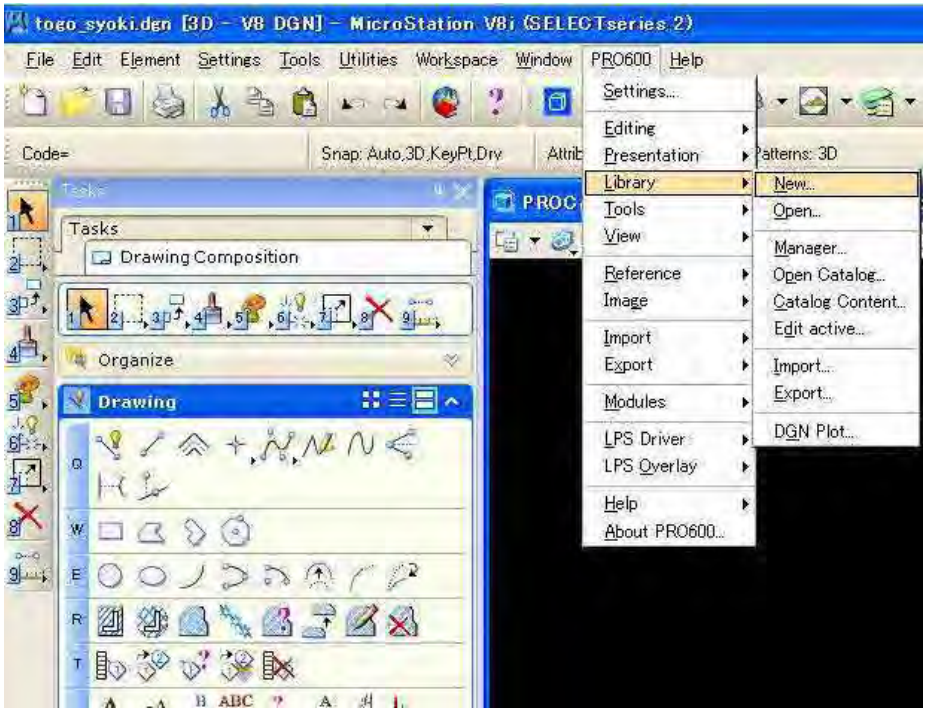


(12) Click "Save Project", and click "Open DGN File".

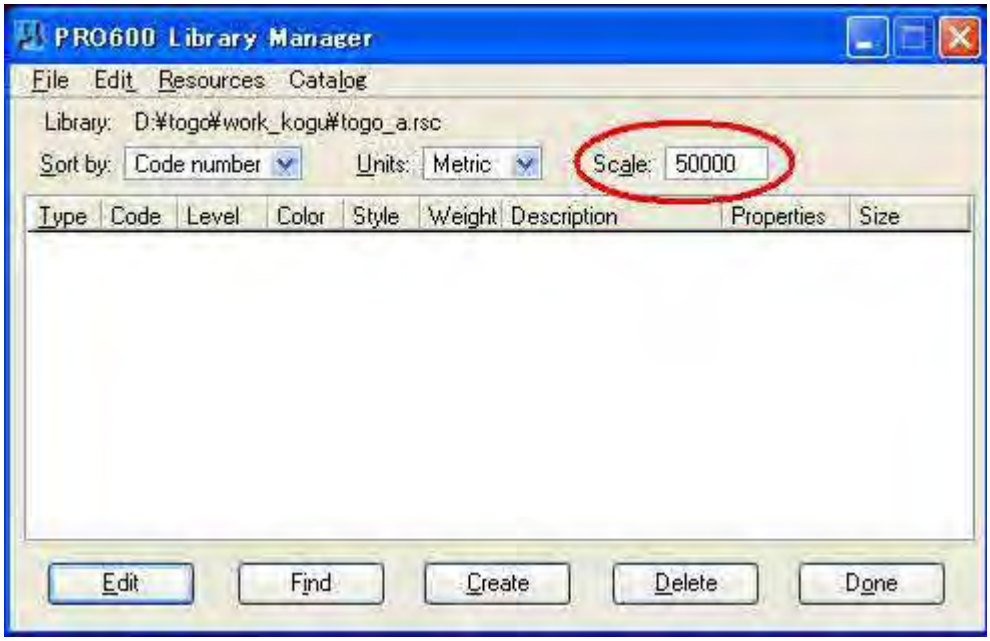


1-2-3. Microstation Setting

(1) PRO600 -> Library -> New



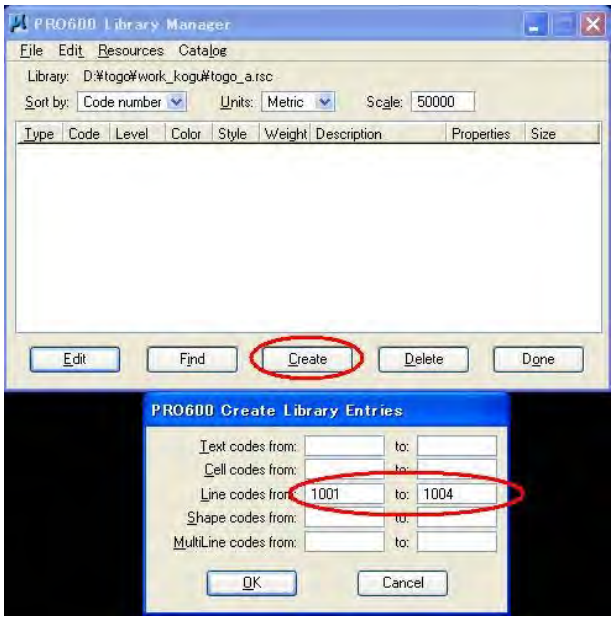
(2) Input scale as 50000 in "Pro600 Library Manager" window.



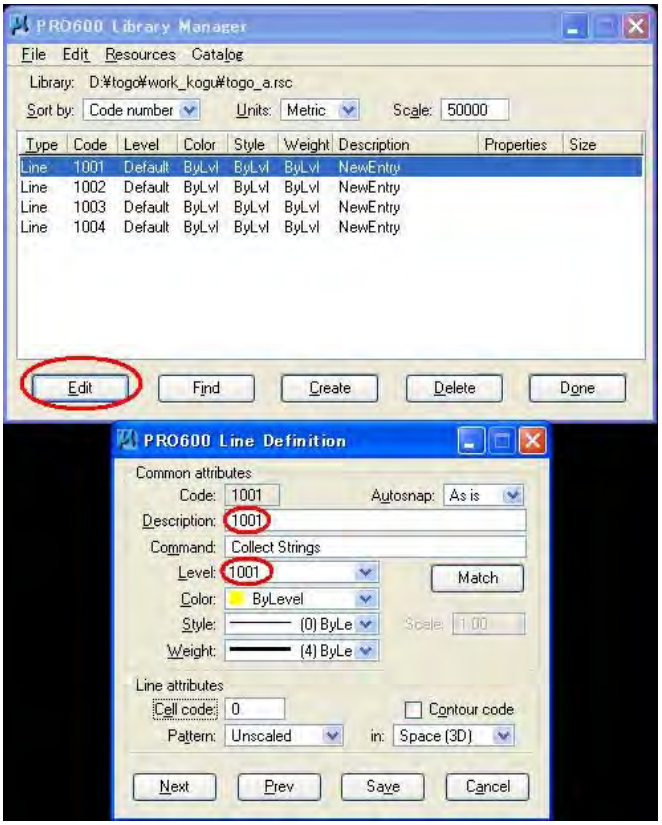
(3) Entry Line Code Library.

Click “Create” Button and input Line codes (Left: minimum code in consecutive code, Right maximum code in consecutive code)

In case of 1001, 1002, 1003, 1004: Input min(1001) in left and input max(1004) in right

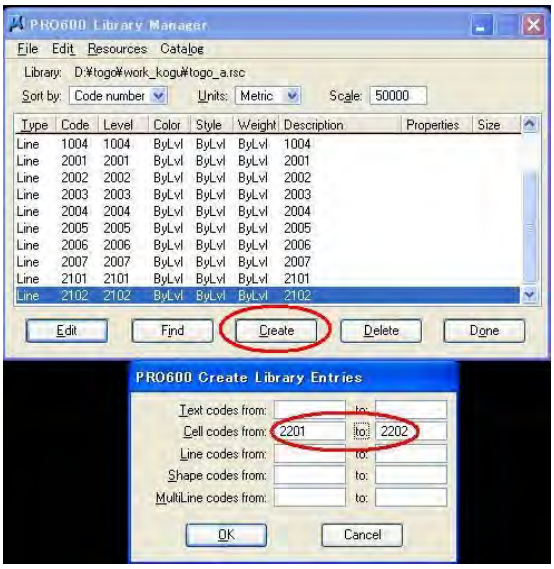


Click “Edit” and input values as follow to define Lines, Then click “Next”.

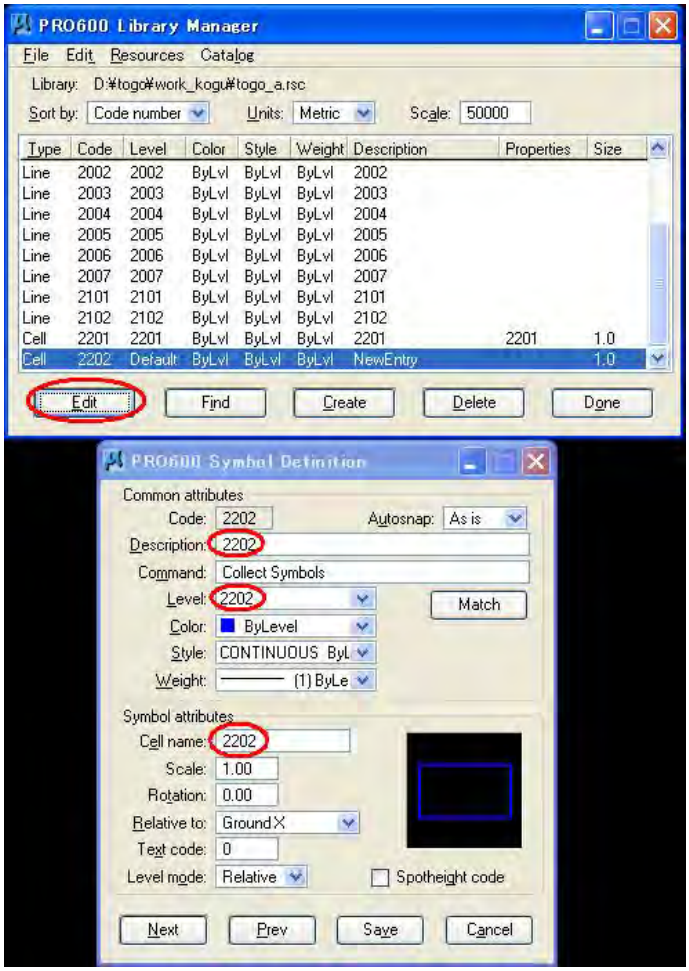


(4) Entry Cell Code Library.

Click “Create” Button and input Cell codes.

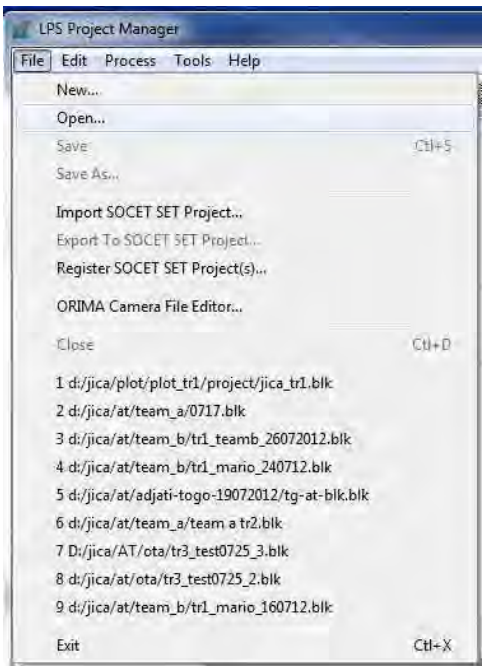


Click “Edit” and input values as follow to define Symbol with 1.0 Scale.

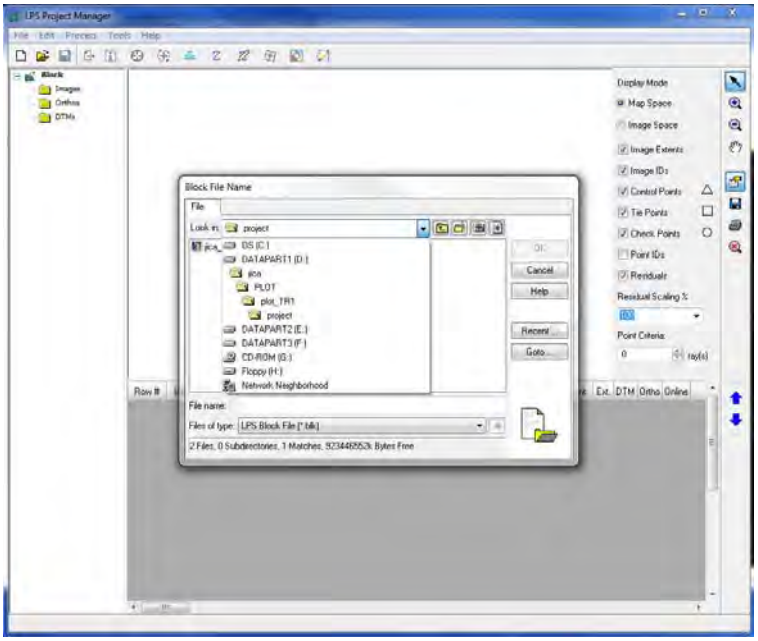


1-2-4. Open work file for Digital Plotting

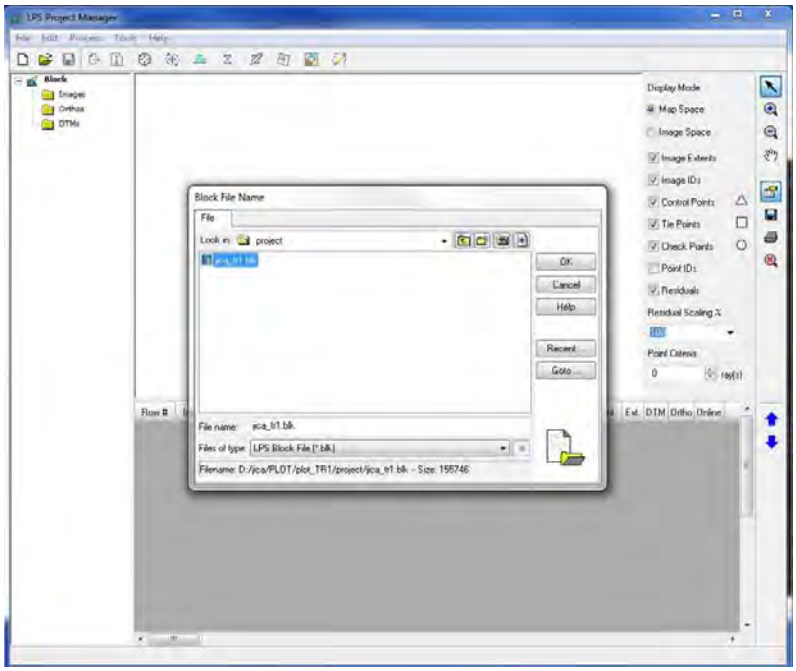
(1) Open LPS2011, File -> Open..



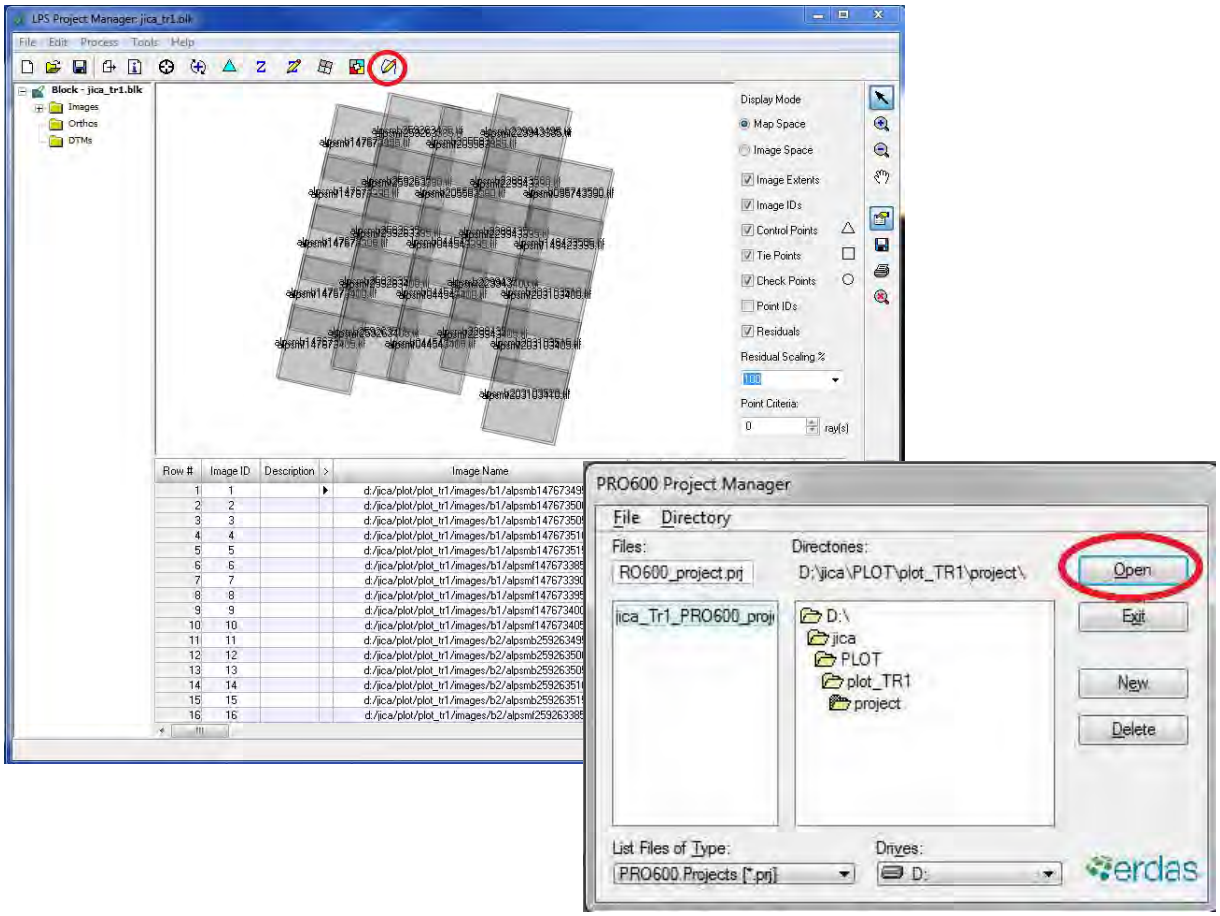
(2) Go to D:/jica/PLOT/plot_TR1/projects.



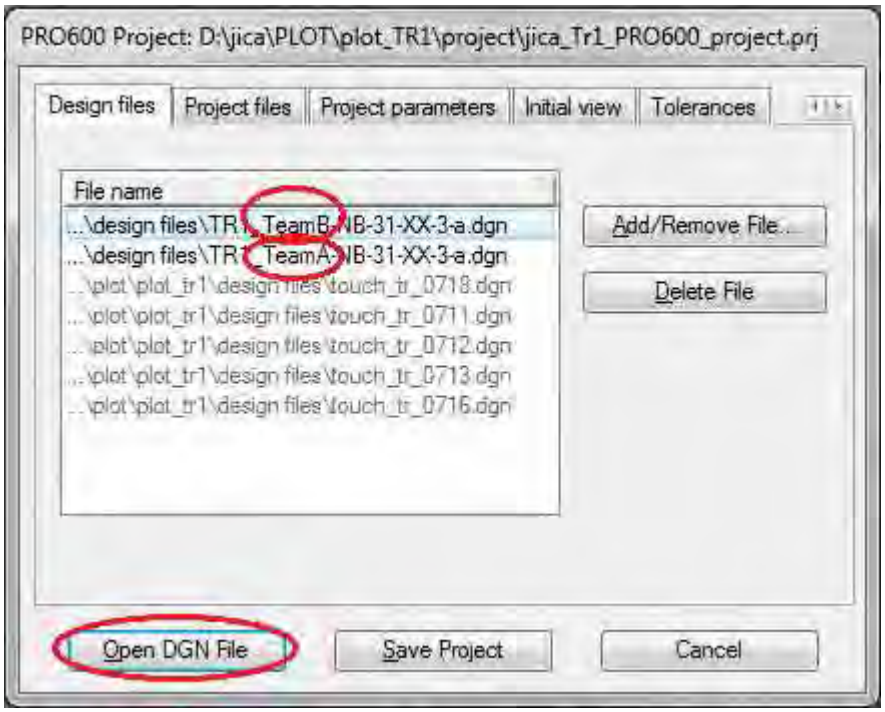
(3) Select “Jica_tr1.blk”, then OK



(4) Click “Start Feature Collection Application” Button. And Open “jica_Tr1_PRO600_projects.prj”.



(5) Select “teamA” or “teamB” select Open DGN FILE.



Period

Chapter 2-2 Digital Plotting Work Manual

1-1 Work Flow of Digital Plotting

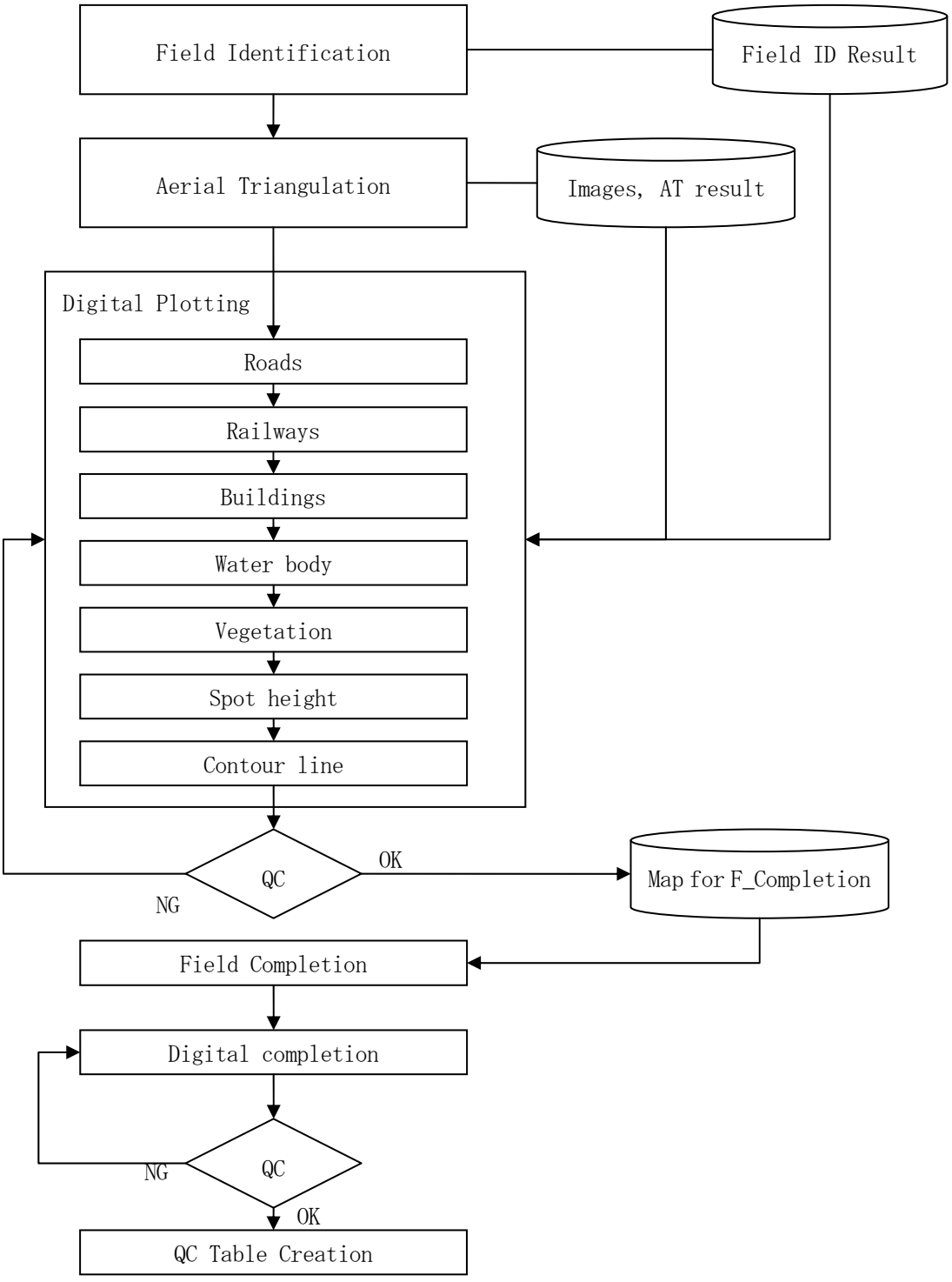


Figure 1 Basic Work Flow of Digital Plotting

1-2 Plotting method of each Feature

(1) Road

Basically, the order of plotting goes form major class to minor class.

About the classification of road, result of Field Identification and existing map shall be referred.

- Trace paved roads (2001, 2002) -> Unpaved major roads, unpaved second road (2003, 2004)
- Track roads, Footpaths (2006, 2007) -> Roads under construction (2005)

(2) Railroad and their Structures

About the classification of functional / un functional railway, result of Field Identification shall be referred.

- Railway (2020, 2102) -> Structures (2201, 2202, 2203)

(3) Buildings

When public buildings are plotted, the result of Field Identification shall be referred for their attributes.

- Small Buildings (3002) -> Large Buildings (3001)
- Build up Area (3010)

(4) Water Bodies

About the classification of rivers, existing map shall be referred.

- Lakes, Ponds, Mares (5001, 5004) -> Structures for water body (5204, 5305)
- Rivers (5101, 5102, 5103)

(5) Vegetation and their boundary

About the classification of vegetations, height of trees, color and size on images, relation to water body shall be referred.

(6) Spot heights

Spot height (7302) must be put on the crossroad, somewhere higher then other, lower than other with an interval of 4cm on the map.

(7) Contour lines

Contour lines must be plotted to express the shape of ridge and river.

Period

Digital Compilation

Chapter 3 Digital Compilation Work Manual

1-1. OUTLOOK OF GIS DATA PREPARATION BY BENTLEY MAP

<CONTENTS >

1-1-1 After the stereo plotting,, the data will be subjected to the preparation for GIS data which is called "DATA EDITING" works.

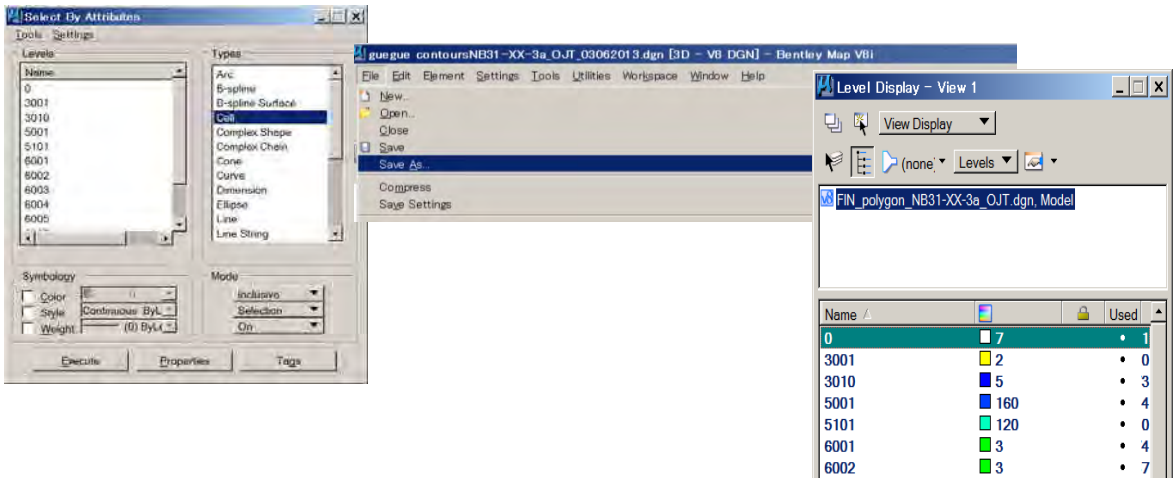
Main procedure of the "DATA EDITING "

(1)Data separation which is separated from the stereo plotted data into LINE, POINT and 3D FEATURES.

The data separation works might be used "Select by attributes" commands, "Save as" and "Layer manipulation".

"Save as"

"Layer manipulation"



- LINE data are for roads, rivers, limits, scaled buildings, etc.
- POINT data are for houses and remarkable symbols which are schools, churches, markets and so on.
- 3D FEATURS data are for contours, control points and spot heights, etc.

(2)Converting the line data to 2D whose is 0m elevation.

As for converting 0m might be used "AZ=0" key in commands, tentative click by mouse and Scale Z value 0.0000001.

"AZ=0" key in commands

Scale Z value 0.0000001.

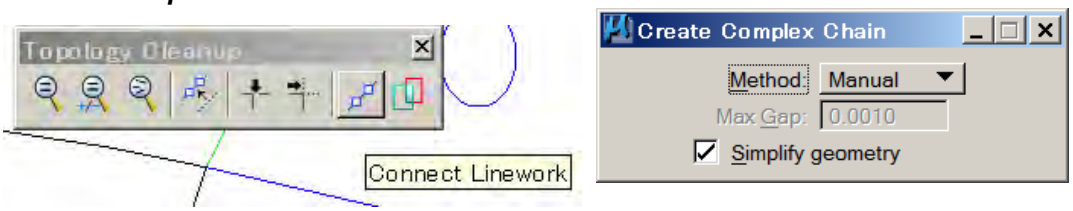
- The line data should be converted to 0m elevation attributes.

(3)Connecting line

For Connecting line might be used "Connect line network" commands or using ArcGIS Arc tool Box in "Dissolve. For the partial connecting might be used "Create Complex Chain" with check in ☑ "Simple Geometry.

"Connect line network"

"Create Complex Chain"

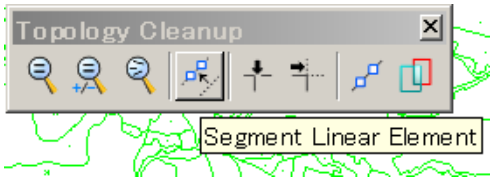


- When Bentley MAP is used, the operation must be done with one by one layer in order to avoid unexpected merging between layers.
- Before connecting line, the "Shape" elements, "Complex chain" and "Complex Shape" should be dropped.

(4)Splitting at intersections

By using "Segment Linear Elements" command could be split line at once. Before using this commands might be placed fence.

"Segment Linear Elements"



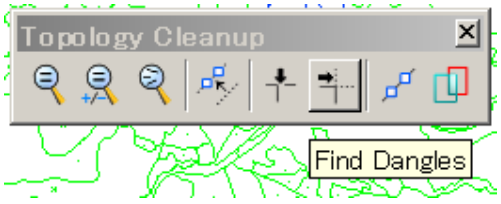
- The line data should be split at intersections.

(5)Detecting the errors (Data cleaning)

When detecting the errors might be used "Find Gap, "Find Dangle" commands. Before using this commands might be placed fence.

"Find Gap"

"Find Dangle"



- The small gaps whose distance less than 0.2mm-0.3mm on the map could be fixed under "Repair all" mode. If using large number of the tolerance value under the "Repair all" mode would bring to be changed inappropriate elements shape.
- When the tolerance value of errors detection should consider into the map scale. In case of large scale map should be entered small value.
- When using the large tolerance value would be detected many number of the error.
- When detecting the dangles might be flagged all line's tips which are starting or ending of line.

(6)Retouching the errors (Data cleaning)

After detecting the errors should be carried out retouching each error. For retouching works, might be used "Trim", "Extend", "Modify elements", "Add, Remove vertex" or any other functions of modify commands.

- As for the retouching errors might be required cartographical judgments and "eye checking"
- The error which is judged to not require retouching with cartographical judgments might be called "correct error" or "OK error".
- For example of "The OK error"; when the Dangles errors are detected starting or ending of points which is case of river, road and so on. As for the Gap errors are found short segments which are shorter than the tolerance value. It should be connected with next line.
- After retouching the errors should repeat works of "4" to "6" until it will not be detected the errors other than "the OK error".

◆ **Without this Data cleaning works the line, polygon data for GIS could not be create. The Data cleaning works is so hard that it will make you feel too troublesome. However it could not be avoided to make GIS data.**

1-1-2 After the Data cleaning, the data will be carried out preparation for GIS data which is called "POLIGON TOPOLOGY CREATION" works.

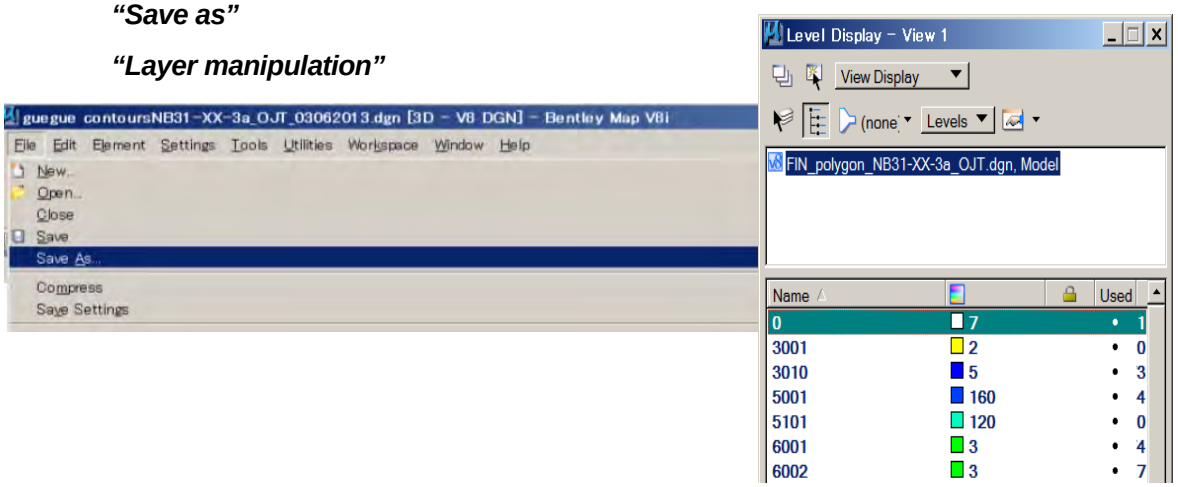
Main procedure of the "POLYGON TOPOROGY CREATION"

(1)Cell separation which is distinguished cells for using the Polygon topology.

The Cell separation might be used "Level Display", "Save as" and Layer manipulation.

"Save as"

"Layer manipulation"



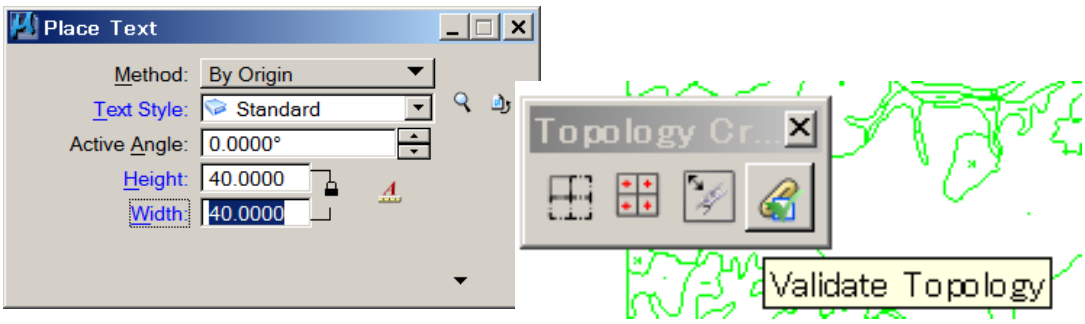
- After saving file for the Polygon making, the unnecessary Cells which are point features symbols are deleted.
- In the Polygon making, the cells are called centroids
- A polygon must have a centroid inside of itself that is called the Polygon Topology.

(2)Validate topology

"Validate Topology" might be placed Fence. After detecting the errors could save the results. Text size for the Validation results might be used in "Place Text" window.

"Place Text"

"Validate Topology"

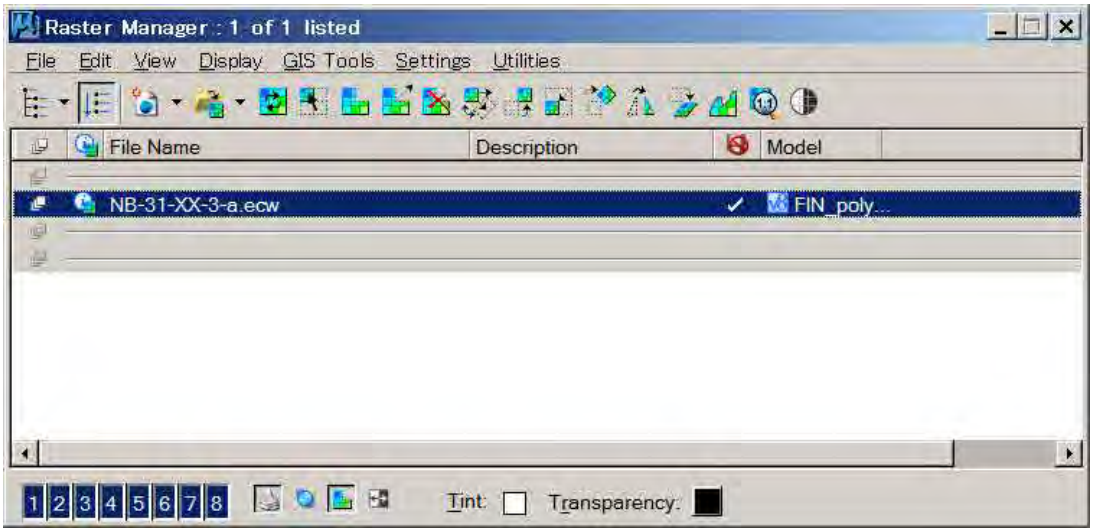


- Text size for the detected errors might be visible size, which is depending on map scale, for example 30m-50m.
- The results of Validation will show the texts and lines which are coming from edge of each uncorrected polygon topology entry.

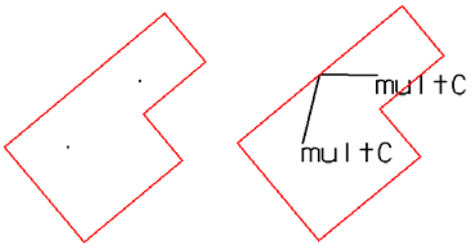
(3)After the Validate topology will carry out the retouching results of validation.

As for the validation "Texts" which are meaning type of topology errors. By using image reference "Raster Manager" could identify appropriate vegetation, land cover for appropriate a certain area.

"Raster Manager"

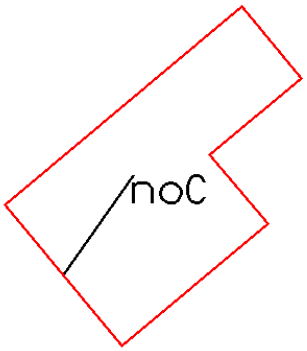


- **multA:** There is nothing not much.
- **MultC:** it will be many errors. There is two or more "centroid" in the area.



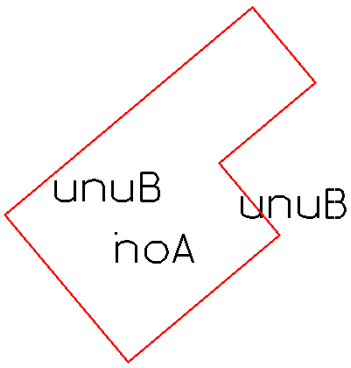
- **noA:** When it marks line inside feature which the area is incomplete, it will have to enclose for the "centroid"

- **noC:** When there is not any “centroid” into the area.

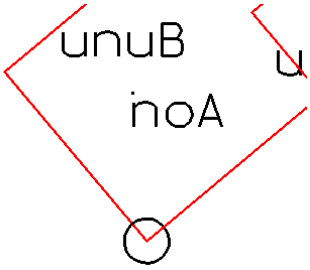


- **unuB:** It appears that the line of the boundaries of polygon is incomplete, so that the polygon is not formed.

- The following case often happens.



- However, the line and centroid looks like to be completed apparently



- If the portion of a circle is zoom in….Being such as this….However, such an error will be detected from finished data cleaning data.

- When the retouching the errors might be required to draw line or modify again.
- When the retouching the errors might be referenced “Orthophoto image”

Outlook of data extraction from enhanced ALOS image	
Feature	Appearance
Road	Improved and paved road are straight line and its edges are clear with uniform width. In case of inferior roads which are track and such like, it has mincing winding shape with unclear edge and straightens.
River	River looks like black bold line. In case of savanna area, it is having besides trees or bush that looks like bold black line. When the river got dry, the besides vegetation cannot be seen or it looks like spares dots or so on.
Swamp	Swamp area's appearance is black and gray area, of which center is black outer and gradually becoming gray towards outer. The edge is naturally dissipating.
Lake, ponds	When one feature is containing water or moister, its appearance looks like black from image. Perennial lake or pond have a certain clear edge other hand seasonal is unclear. In case of artificial reservoir, it has clear edge or surrounded track which is used for maintenance. Fish pond or hatchery, salt bet looks like tiled uniform rectangles or polygons.
Cultivation	Cultivation has patched mosaic texture such like half random pattern. Swidden cultivation is having black patched mosaic texture after burnt.
Bush or spars trees	Difficult to be extracted, because trees height cannot be identify from the Orthophoto.
Forest	Always black and covered with tree's crown, the texture is like rough carpet, however it is difficult to distinguish from low tree and bush. Because trees height cannot be identified from the Orthophoto.
Rice field	Rice field appearance is as unified rectangle and if contained water it is black, when after harvesting or resting the field are showing gray color. In case of large field, it has track which is also called "course way" for maintaining the field and working.
Dwelling area	Dwelling areas which are town, village such like are white color or light gray because of the fact that the ground has not vegetation and that the area has been developed for building houses. Commonly these areas are rotating by road junction or along main road or community road which is daily used by dwelling people.
Building	It is too hard to identify each house, In case of large building or some of big facility which consist of many big building, it is possible to extract under fine image condition.

(4)Repeat the Validate Topology

After retouching the errors should repeat works of "3" until it will not be detected the errors.

- In case of the Polygon topology error validation has not exception such like "OK" errors.

◆ **Without these Polygon topology validation works, polygon data for GIS could not be create. The Polygon topology validation works is so hard that it will make you feel too troublesome. However it could not be avoided to make GIS data.**

1-1-3 After the Polygon topology creation, the data will be subjected to the preparation for GIS data, which is called "POLIGON CREATION" works.

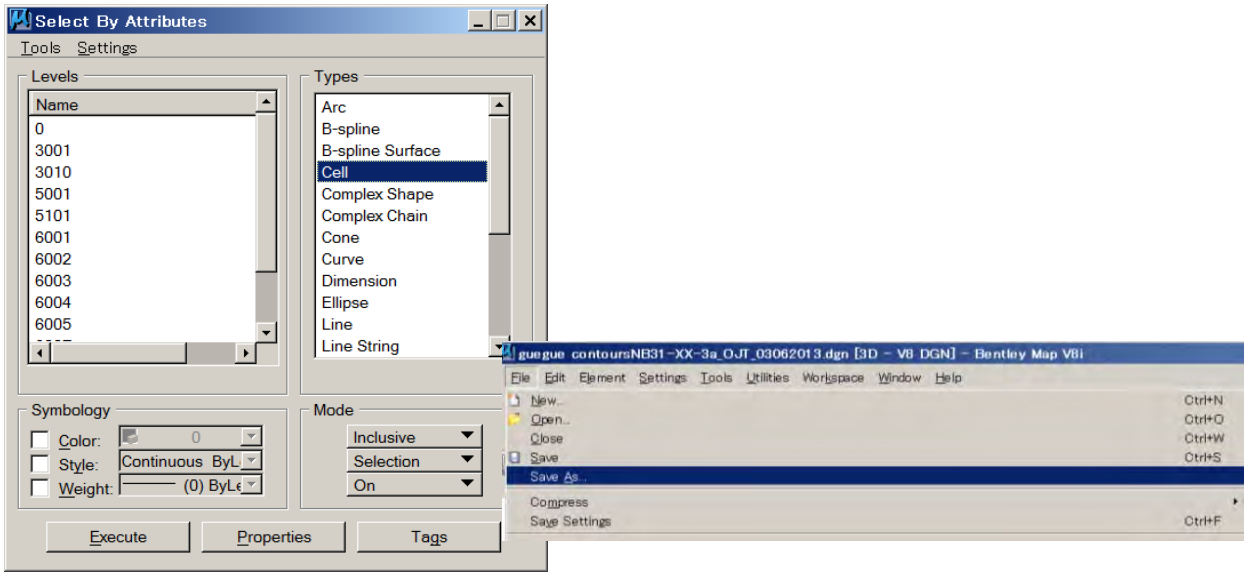
Main procedure of the "POLYGON TOPOROGY CREATION"

(1)Make sure to validate topology then the data should save as for the Polygon creation.

"Save as" ," Select By Attributes" commands

"Select by attributes"

"Save as"

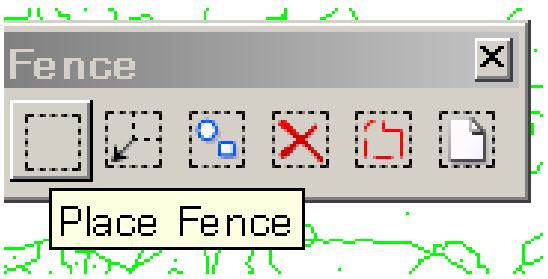


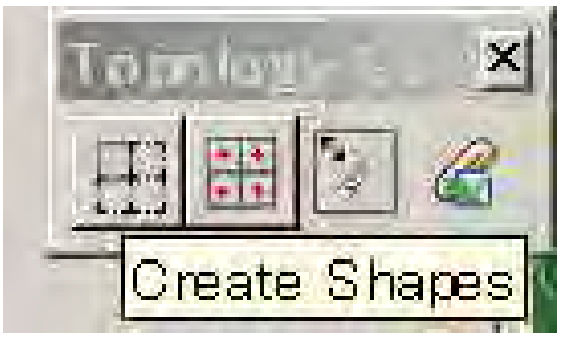
- After saving as for the polygon creation would be changed layering that is unified all line data with a certain layer for example "0_line".

(2)For example. Turn On 2 layers which are a "0_line" layer and a kind of centroid Layer 6003. ***"Place Fence", "Create Shapes" commands***

"Place Fence"

"Create Shapes"





- After creating shapes, number of created shapes are shown at the bottom information window.
- The Polygon creation must show the line layer and target centroid layer.
- When showing 2 or more centroid layers it would be created showing layers shape in active layer at the same time.

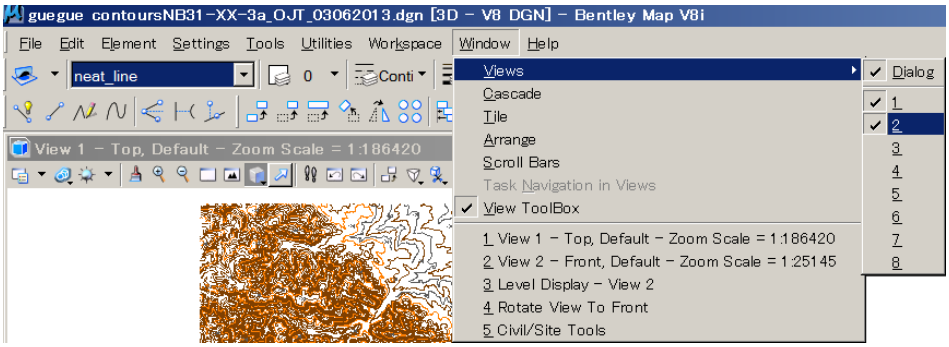
1-1-4 After the stereo plotting,, the elevation of separated contour data will be subjected to checking and retouching for GIS data

Main procedure of the “CONTOUR RETOUCHING”

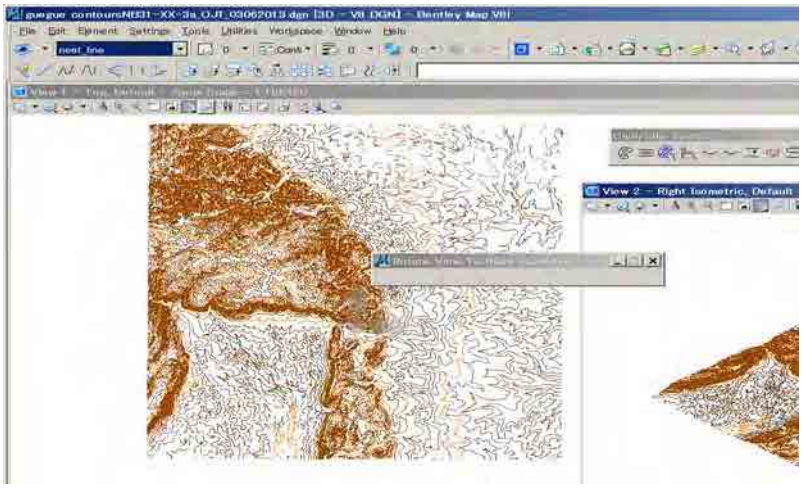
(1)Finding incorrect contour elevation.

From “Window”, “Views” commands then select “2” another view window whose name is “2” with Iso-metric view.

“Window”, “Views” commands then select “2” another view



View “2” with Iso-metric view.



- These two views might arrange horizontal or vertical displacement.
- View 2 should rotate view front from “View Rotation”.
- After “View Rotation” coming to front view, incorrect elevation contours could be easily found.

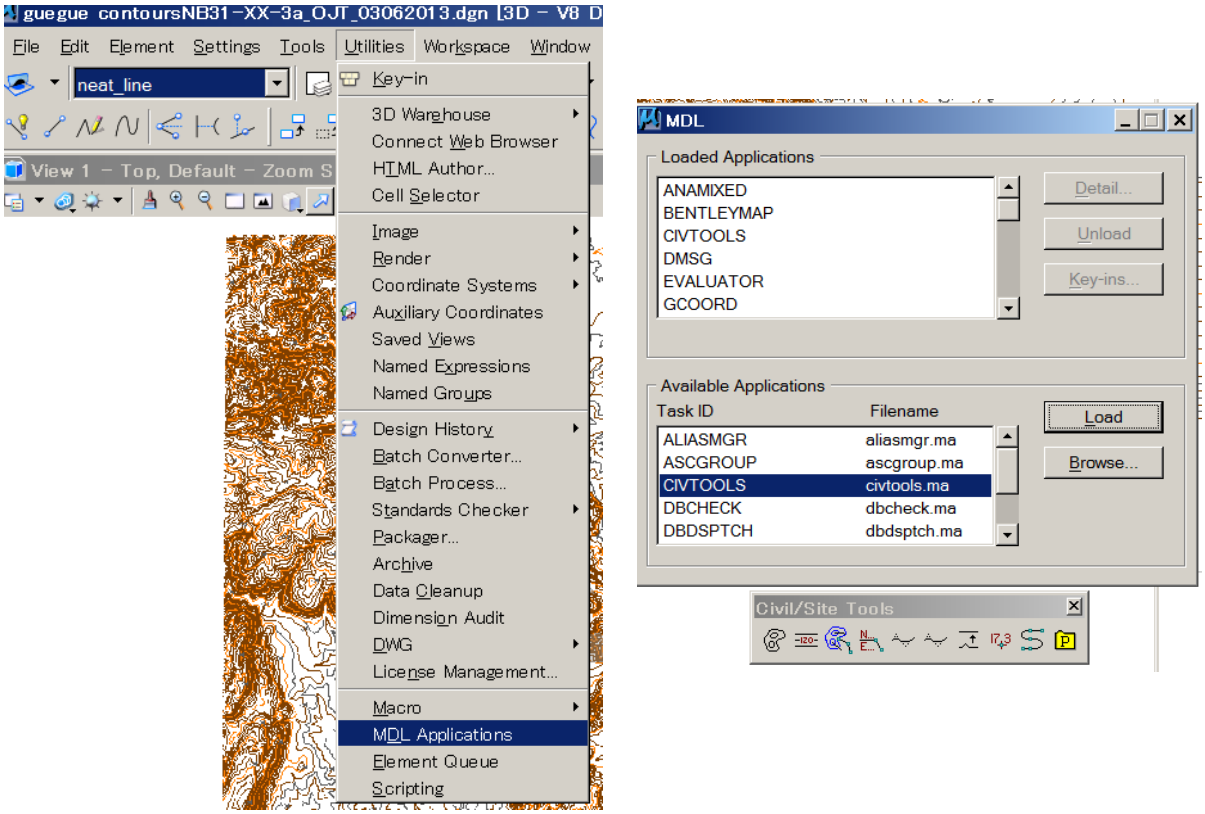
(2)Retouching to correct elevation

By using “CIVTOOLS” from Utilities in “MDL Applications”.

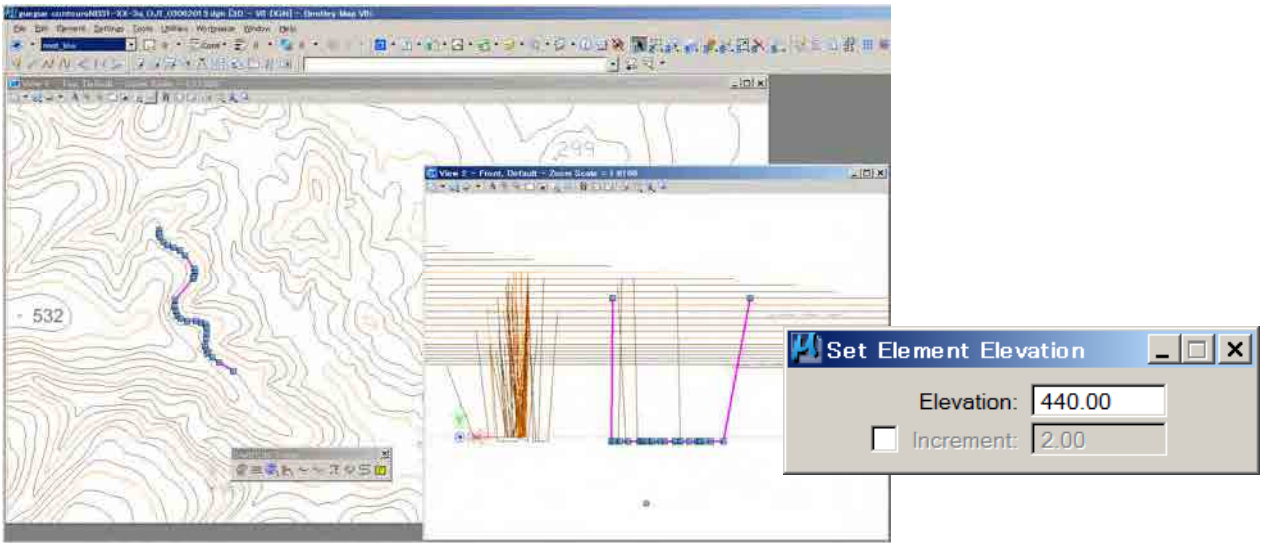
Incorrect one can be retouched to right one by “Set Element Elevation”

From Utilities in “MDL Applications”.

“MDL Applications”



- Select incorrect contour in the “Front view” then location of incorrect contour can be recognize in the “Top view” window with zooming out or in.
- Zoom in to the incorrect contour then select neighbor correct one which is continuing to in correct contour at starting or ending in order to verify correct elevation value.
- Enter the correct value in the “Set Element Elevation” then click wrong contour. For example when the right value is 440.0m.



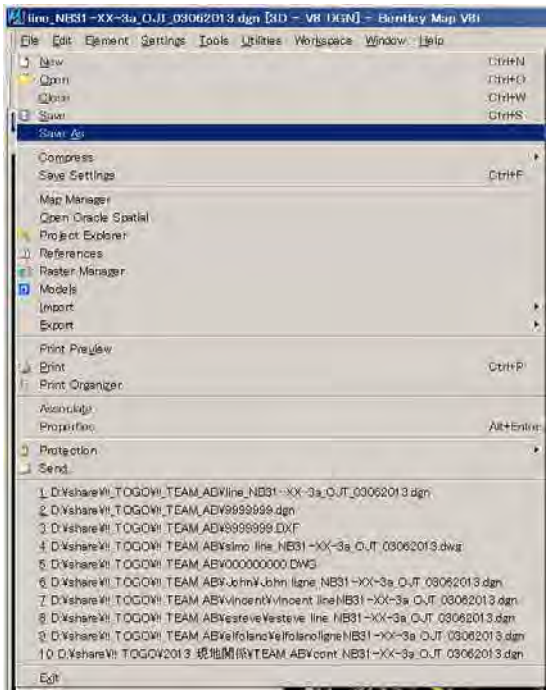
◆ **Above-mentioned operation should be repeated until wrong contours would disappear in display.**

1-2. LINE CONNECTING PROCEDURE

Before splits at the line intersection should connect any lines in each layer.

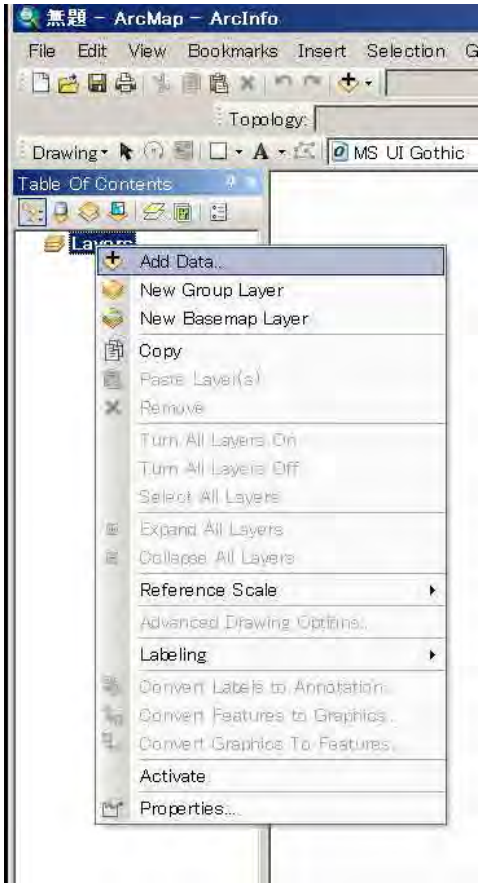
1-2-1 Line connecting procedure by ArcGIS and Level status setting back to the previous one.

(1)Your “dgn” file “Save as” .dwg file.

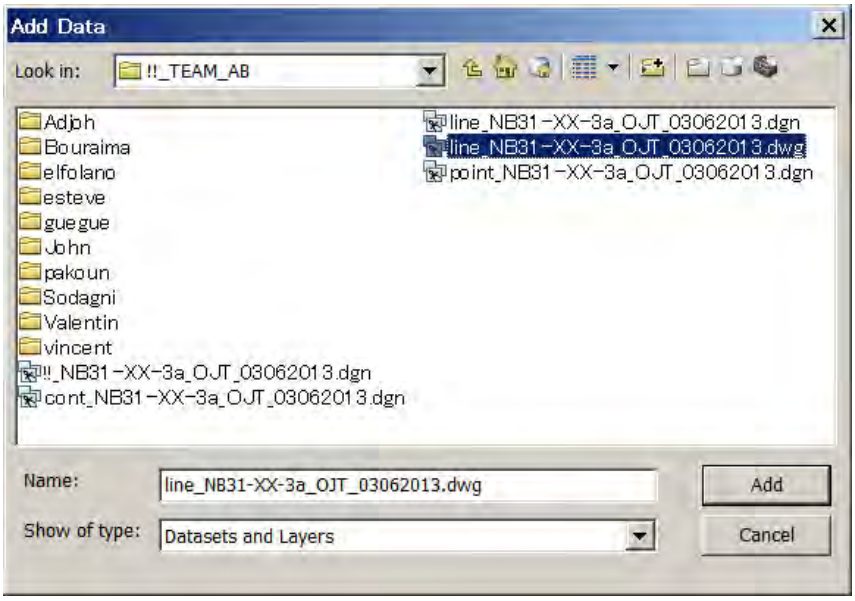


(2)Select “dwg” from pull-dawn

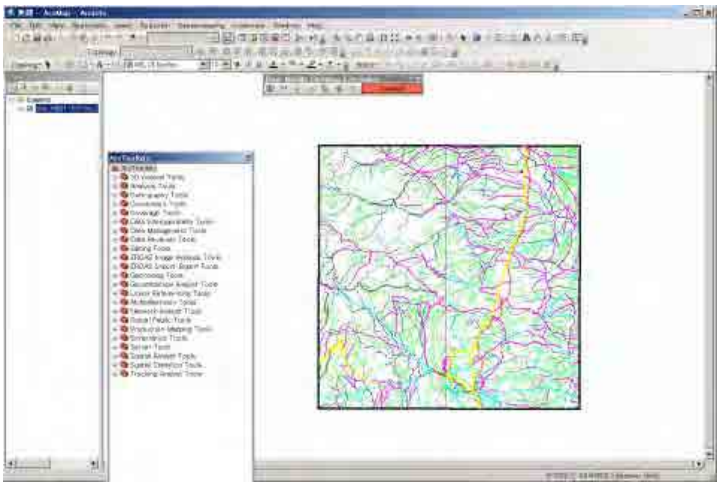
(3)Open ArcGIS, then add data which is saved “dwg” file



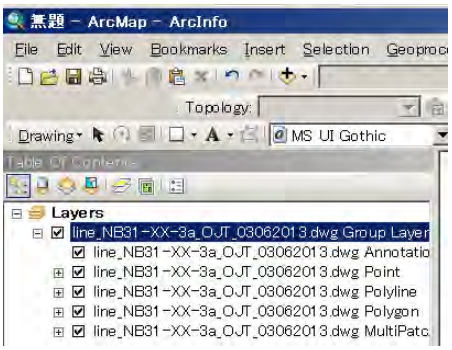
(4)Select your “dwg” file. Then click add

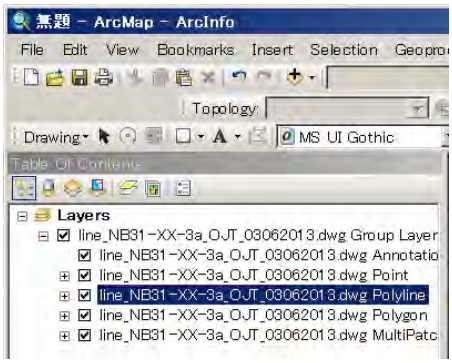


(5)It will add your “dwg” file

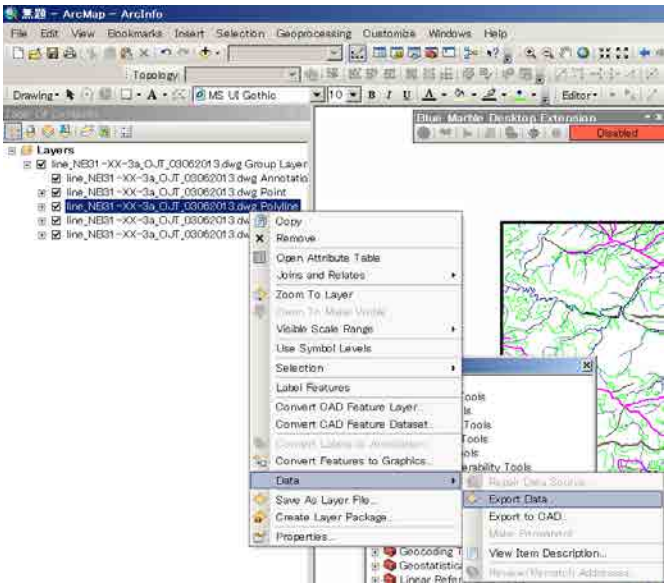


(6)Open dwg file in the table of contents then select Polyline layer

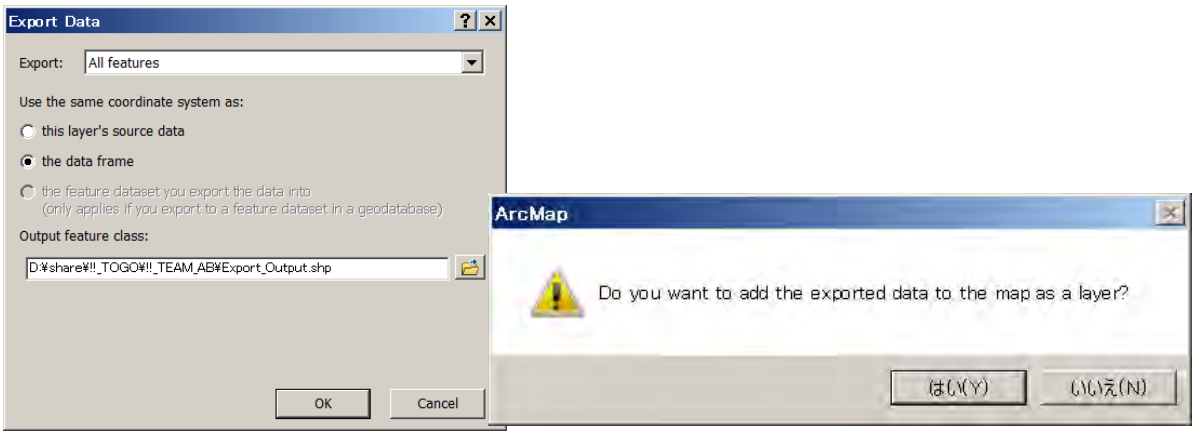




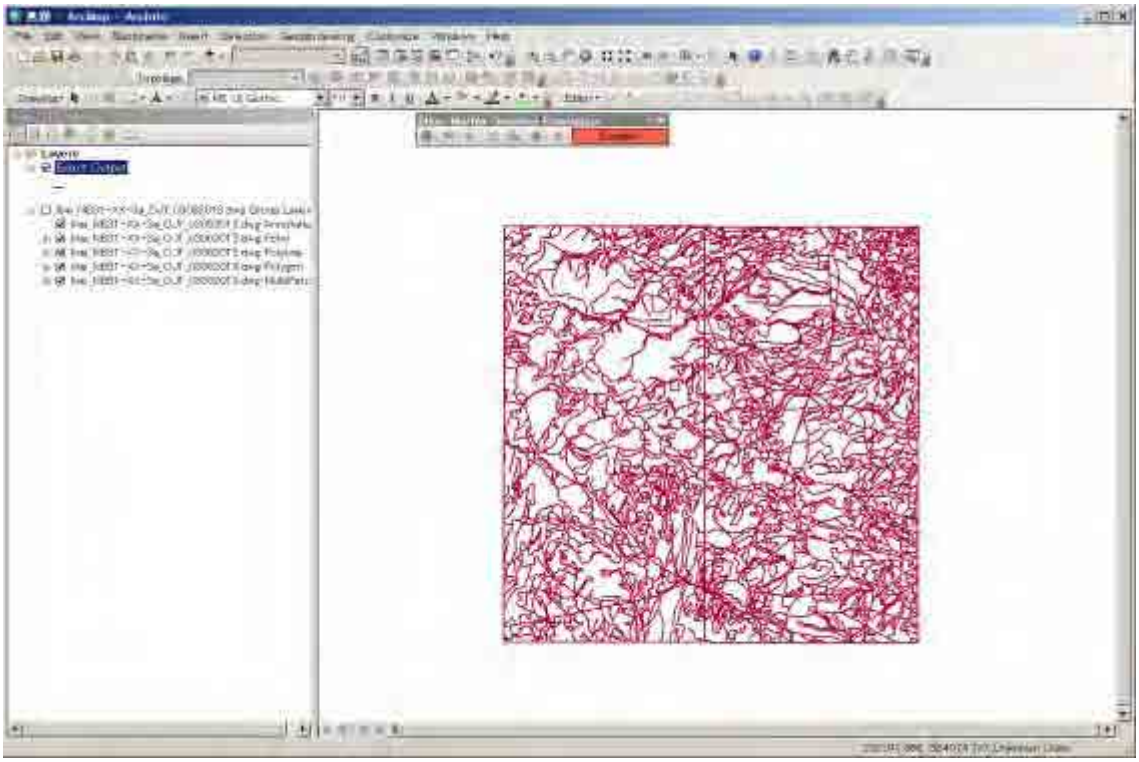
(7)Click right bottom then proceed Export data



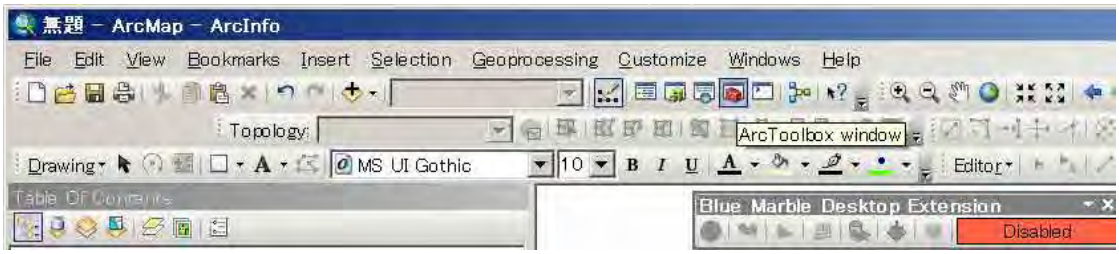
(8)Make sure to go your directory then give the mane to your SHP file and click “Yes”.



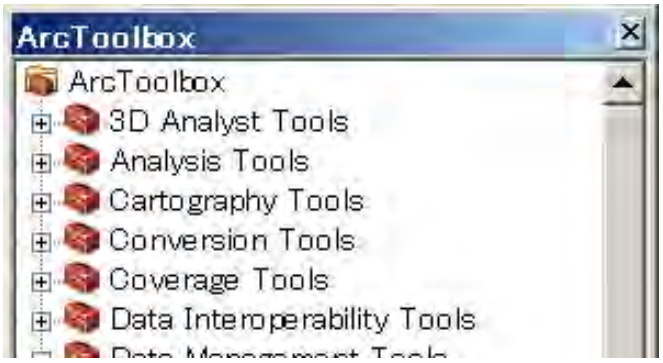
(9)Now adding, new SHP file which was saved from your DWG with one color



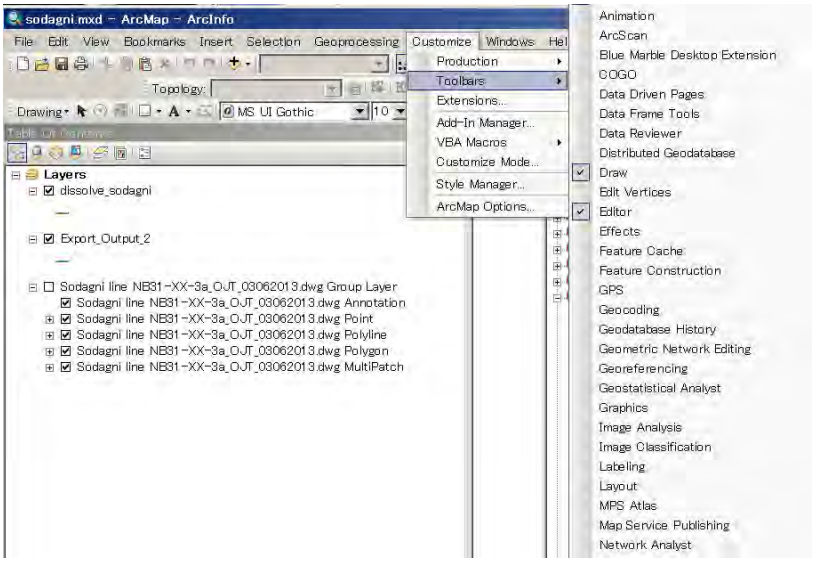
(10) Show arc Tool BOX from the menu bar.



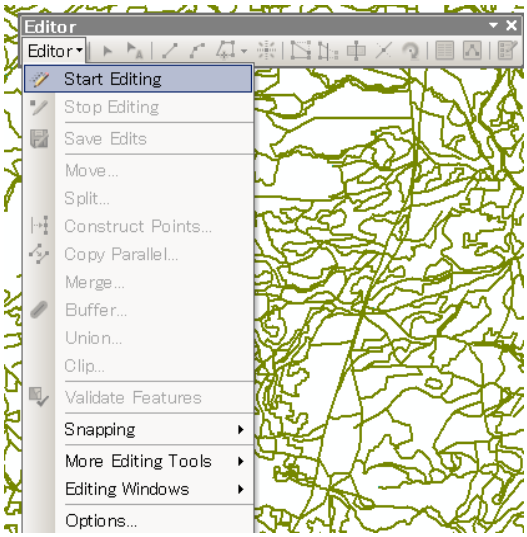
(11) Arc Tool Box will come out.



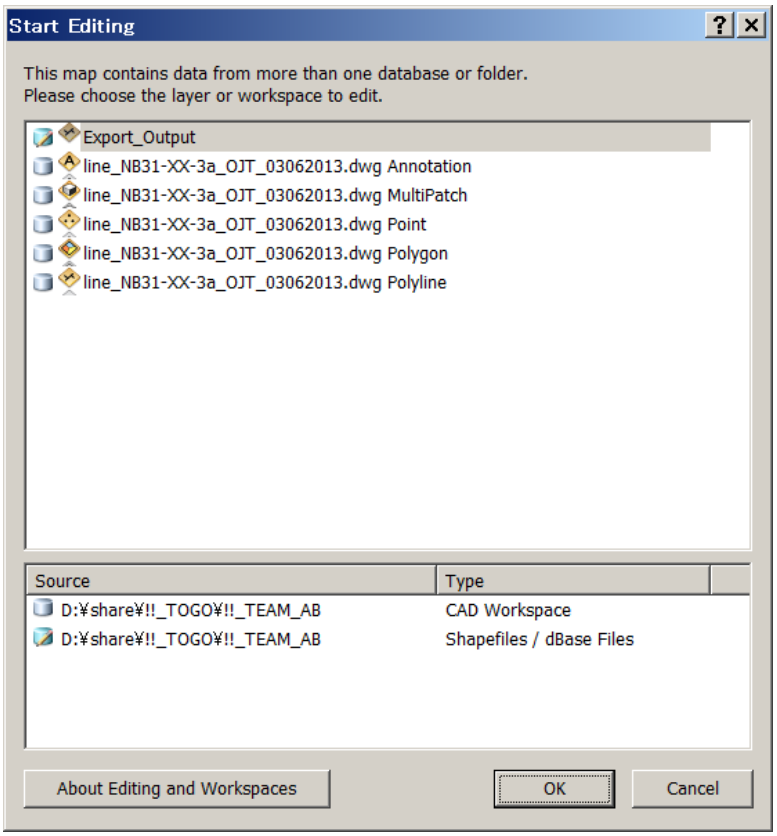
(12) Start Editing from editor tool bar, select your SHP file. Then click OK (*If you lost "Toolbar" you could find any "Toolbar" from Menu bar / Customize / Toolbars/ Then select them.*).



In case of this selected "Editor" from "Start Editing"

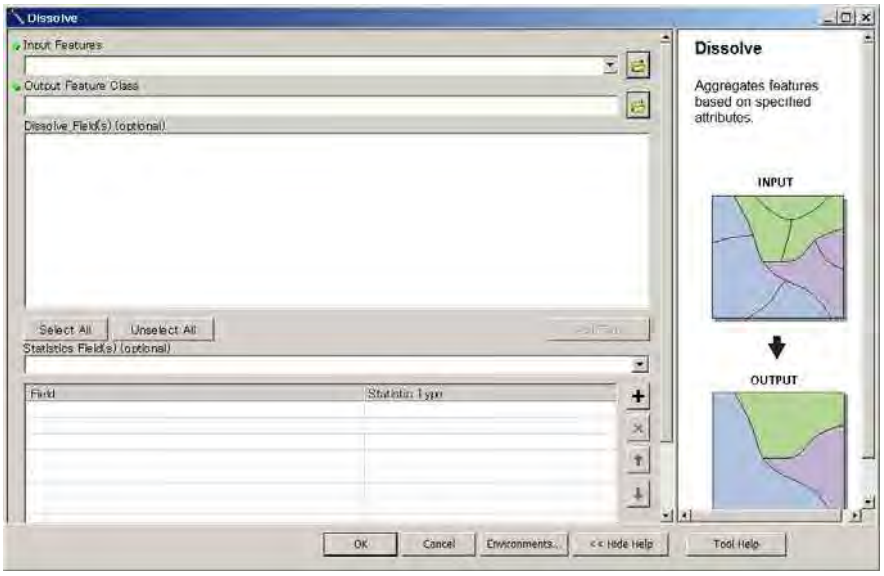


(13) Then select target SHP file which is Export Output. (example)

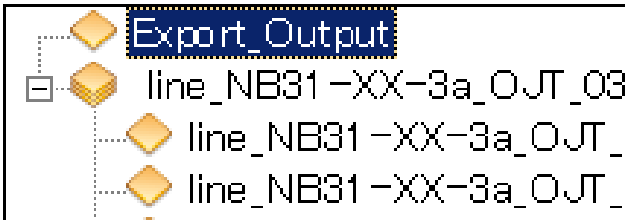


(14) Select Data Management Tools / Generalization / Dissolve then Open

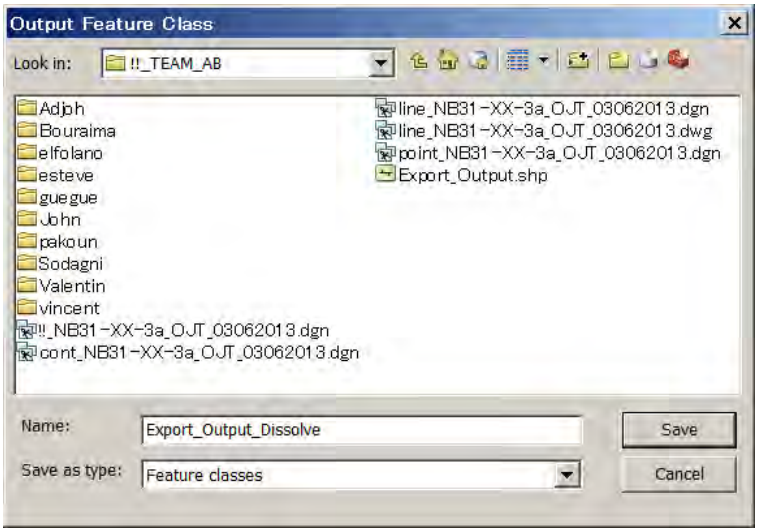
(15) Dissolve window will open.(“Input Features”, “Output Features”, “Dissolve Fields” must input by yourself)



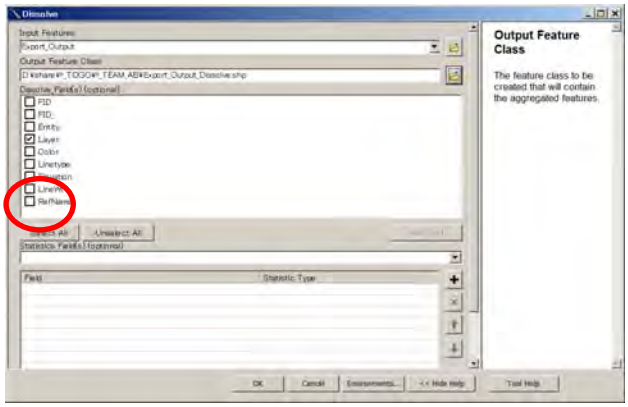
(16) In the Dissolve window, you can select you SHP file which is exported from “dwg”.

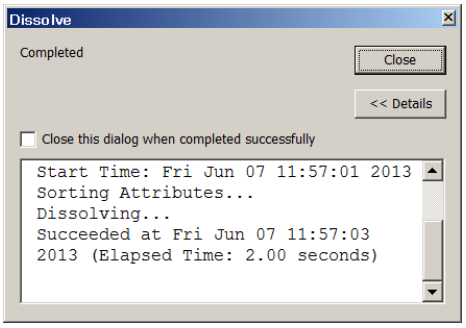


(17) Make sure to go your directory then give the mane to your SHP file.(*As for SHP file naming cannot use; -, space, +, and so on. Under score”_” can use naming*)

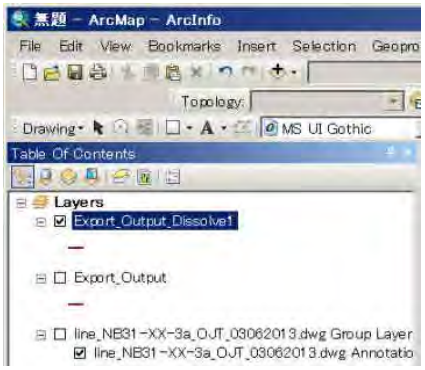


(18) Dissolve Filed should be “Layer”. Connect lines at once in same layer. Then click “OK” and “Close”.

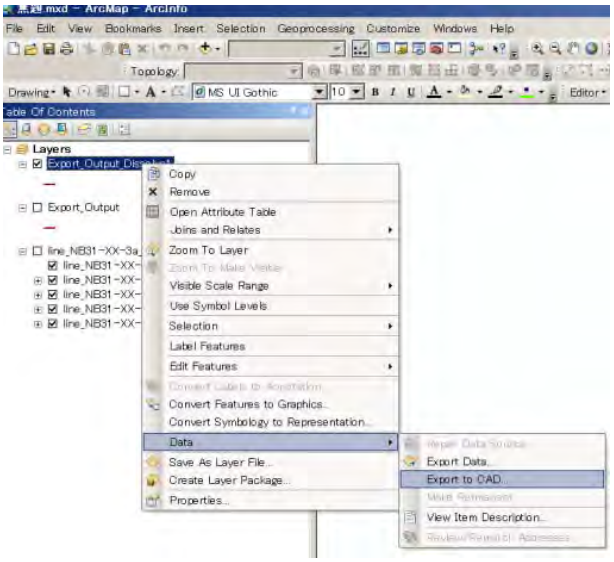




(19) Added dissolved SHP in your “Table of contents”



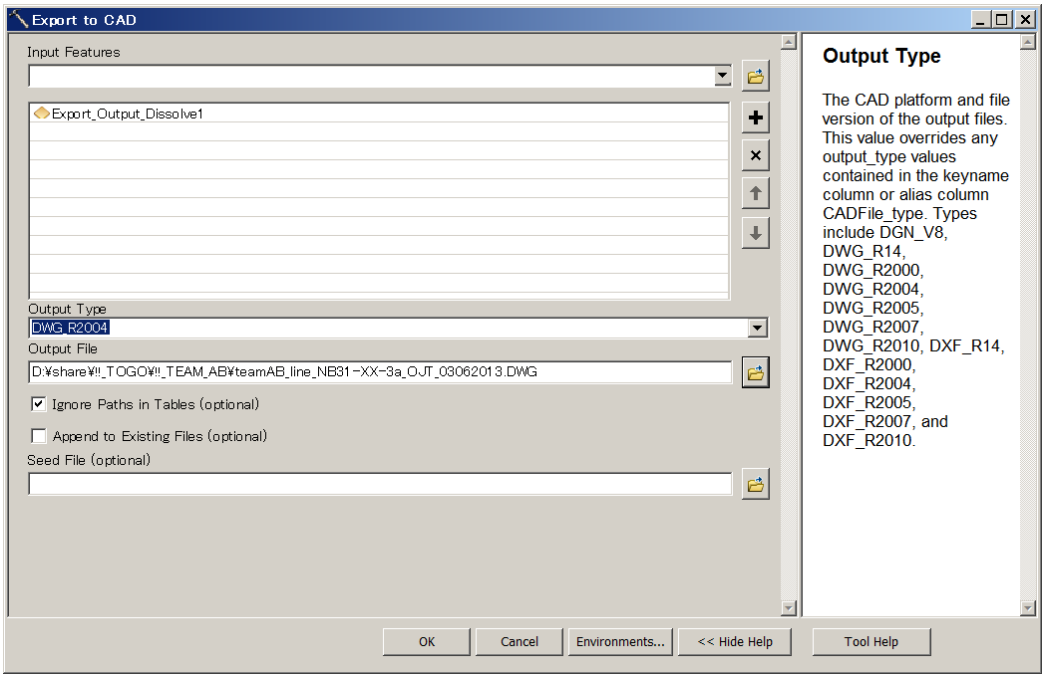
(20) Click right bottom then proceed “Export to CAD”



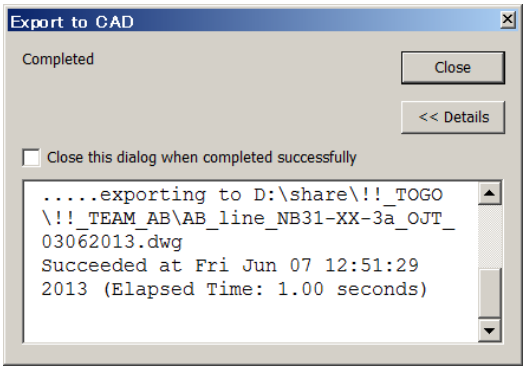
(21) Click right bottom then proceed “Export to CAD”

The “dwg” file versions are available many type, you can select appropriate one.

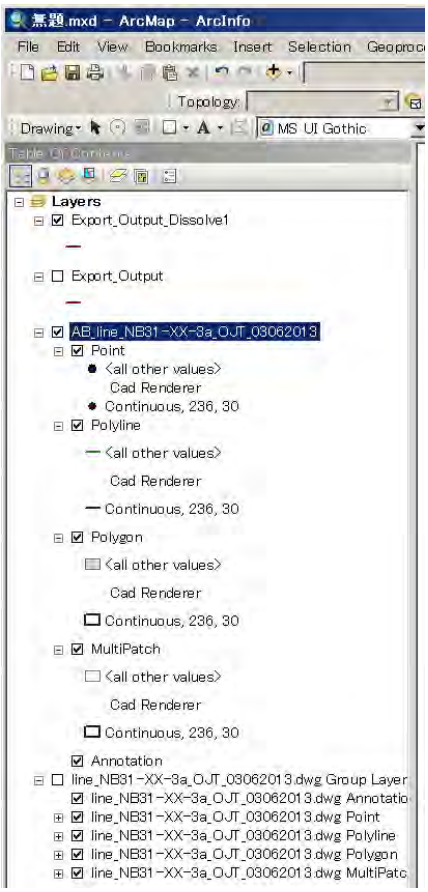
This time, 2004 might be recommended, then click OK.

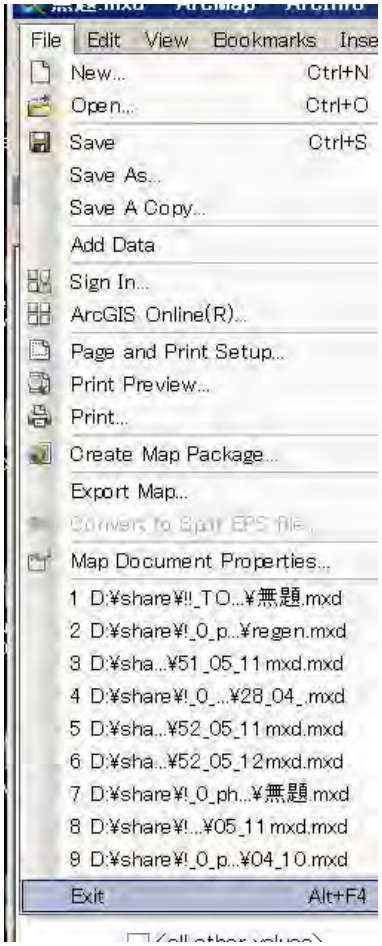


(22) After exporting to CAD, it will appear completed window then click close.



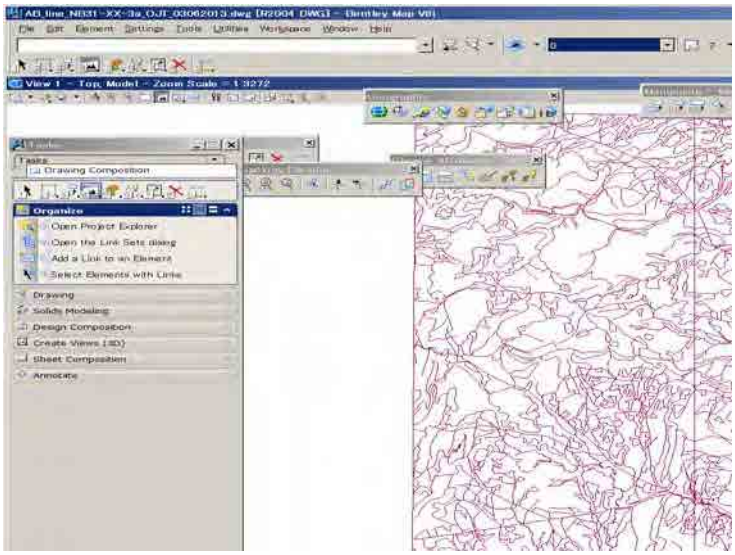
(23) You can see Exported dissolved dwg file in your table of Contents. After that, exit ArcGIS.



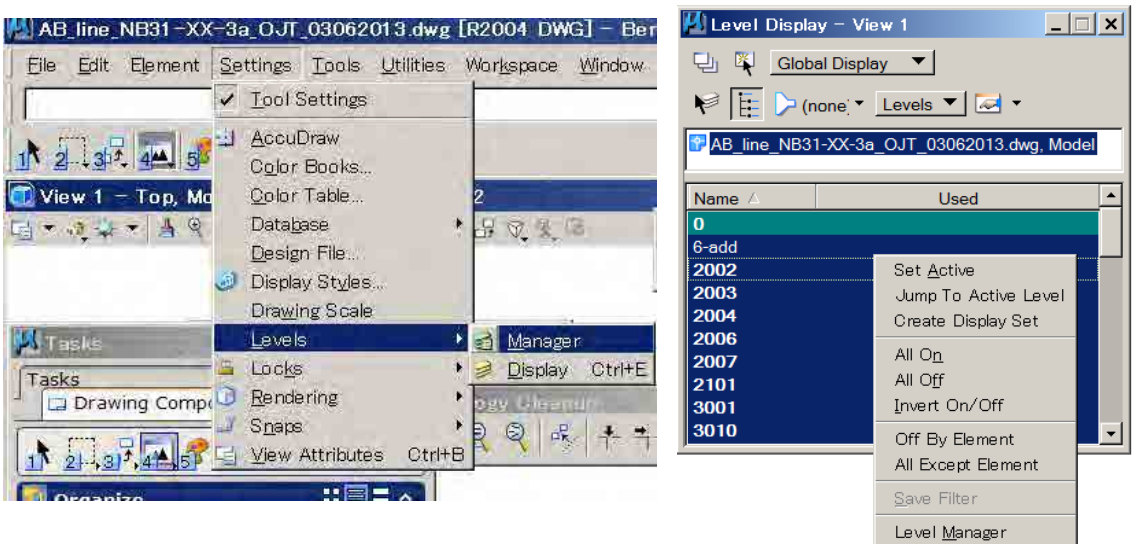


(24) Open the “exported dissolved dwg” by Micro station.

You might be aware of the dwg file changed only one color.

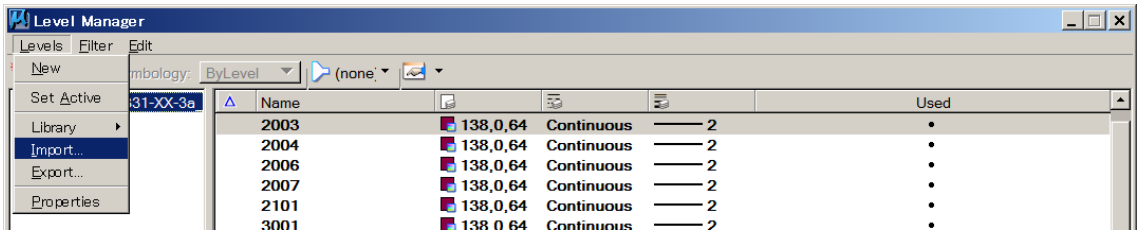


(25) From menu bar / Setting / Level / Manager, then" Level manager window" will appear.

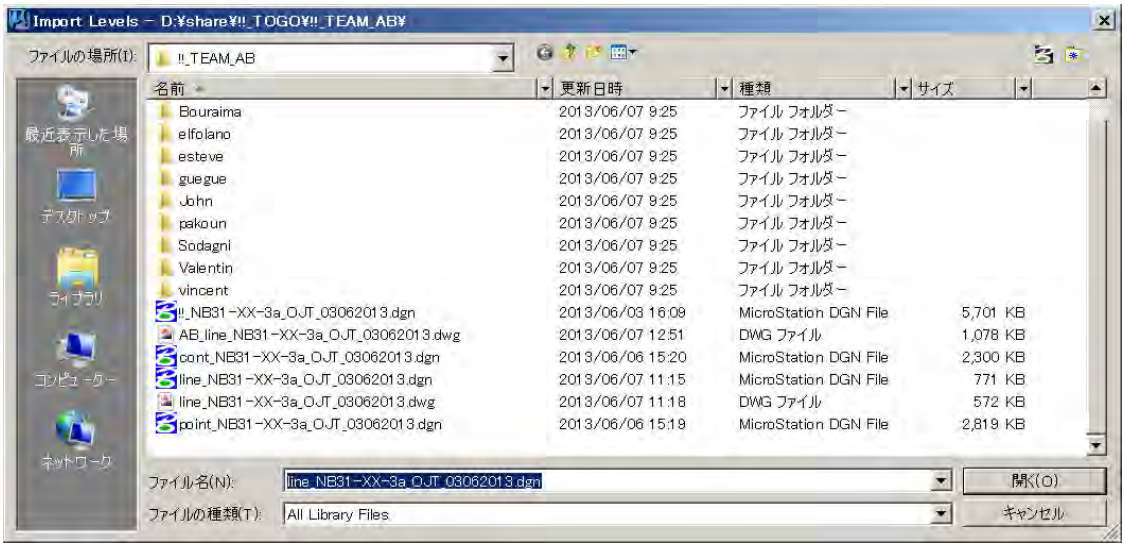


Or click right button on "Level display window", then "Level Manager".

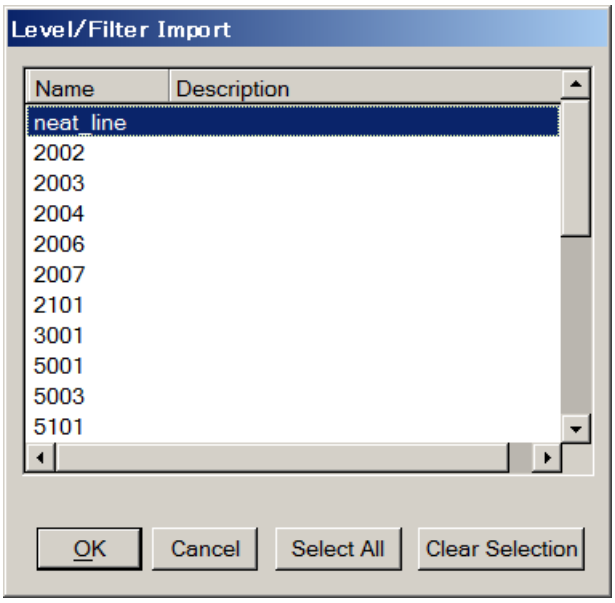
(26) From menu bar in the Level Manager / pull-dawn / Import



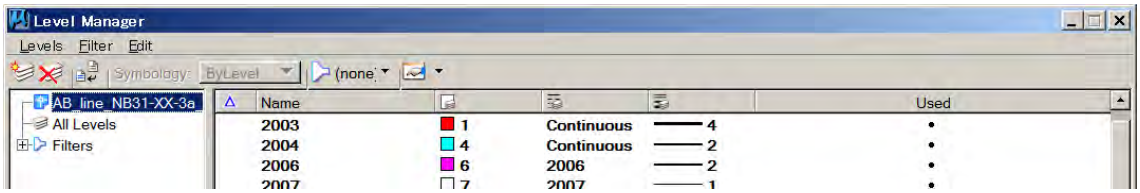
(27) Make sure to go your directory, then select "Original DGN file"

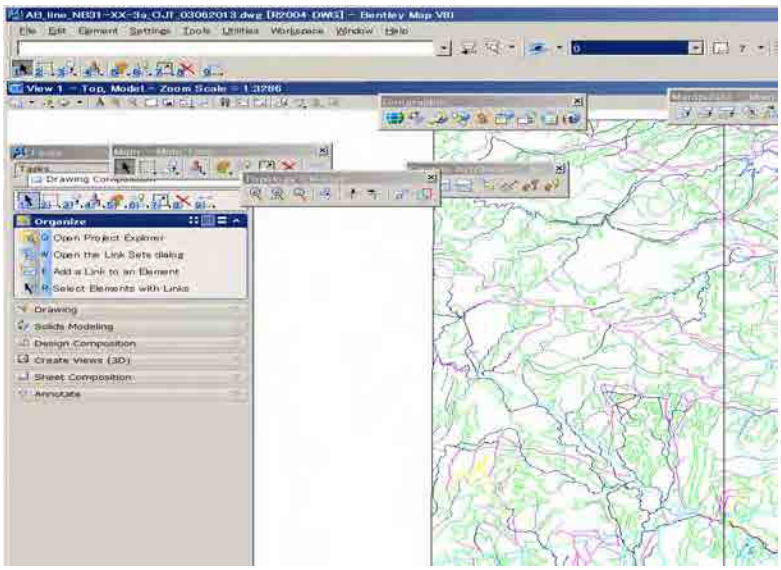


(28) Level / Filter Import window will appear, then Click “Select all” and then click “OK”

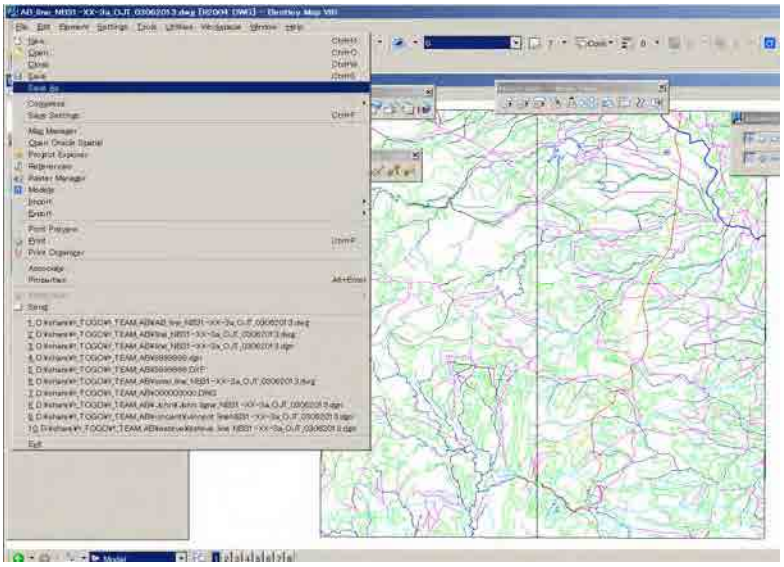


(29) Your dissolved dwg file color will change as previous looking





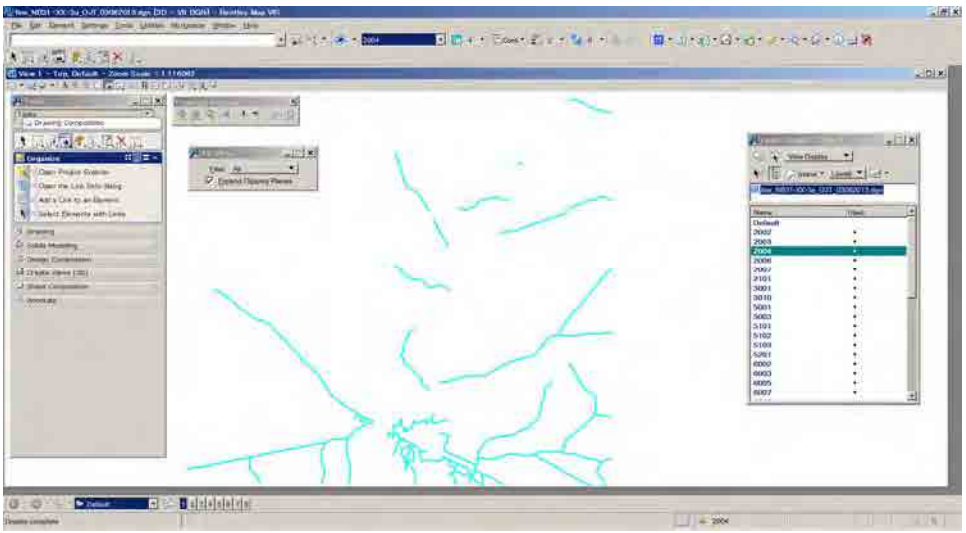
(30) Then save as DGN file again.



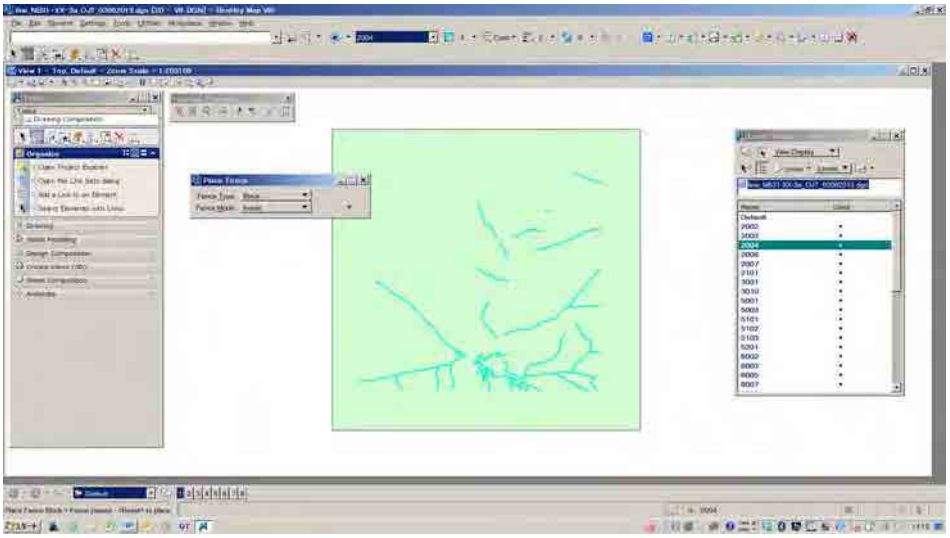
Note: Closed lines such as polygons will become “shape” elements under this method. They might be dropped and connected before data cleaning.

1-2-2 Line connecting procedure by Bentley MAP function

(1)Make sure to show a layer in your current file. For example 2004.

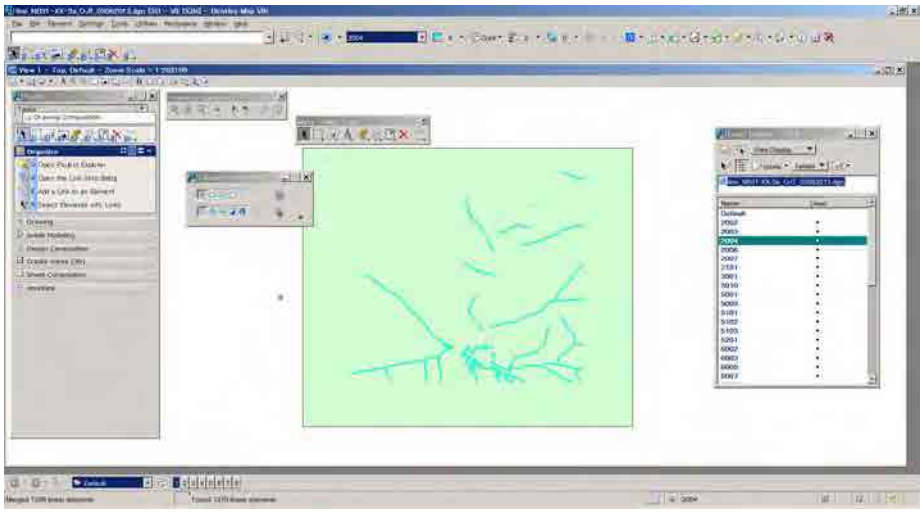


(2)Place “Fence” with dragging in your display



(3)Click “Connect Line network” from Topology Cleanup

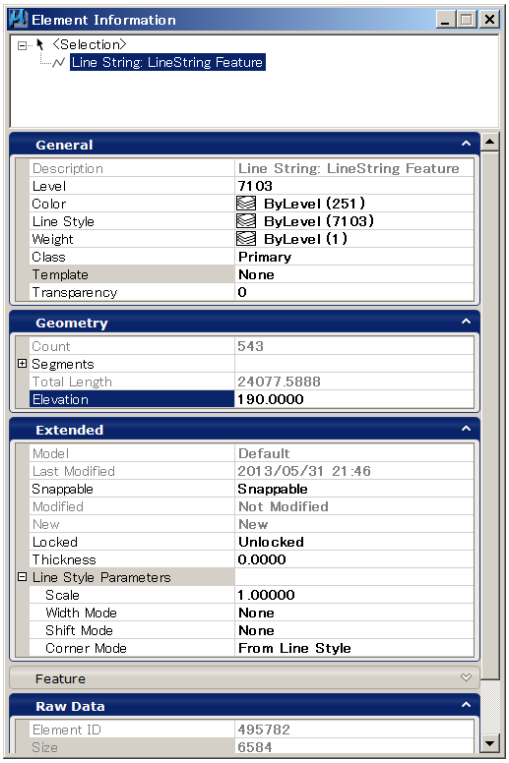
(4)Then Click left button, and then right button.



After that, you can see the results of connected line numbers in the bottom left of Bentley MAP.

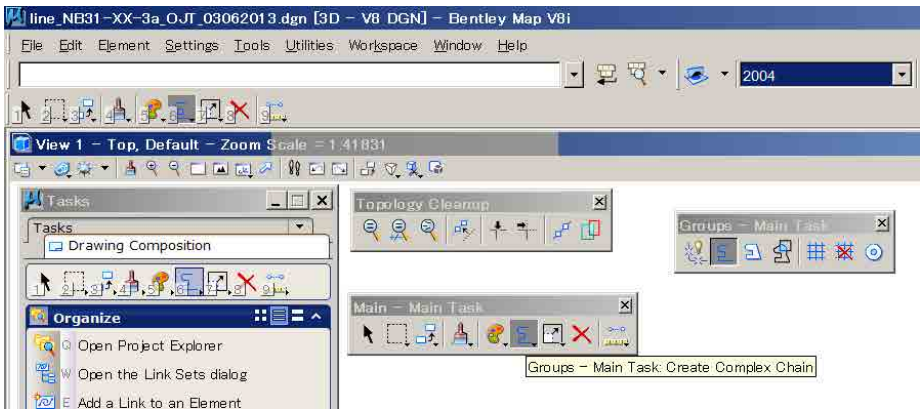
(5)This operation will be repeated to each layers. At the connecting, it must not show 2 or more layers, it will bring to merge between two layers.

Note: when the lines have elevation attribute such as contours, this method cannot be used ; Elevation value will be lost. Elevation value should be entered from "Element Information" window in "Geometry at Elevation"



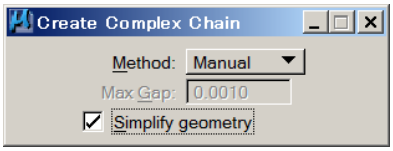
1-2-3 Line connecting procedure by Bentley Microstation

(1)Click Create complex chain from Group – Main task or Main – Main Task



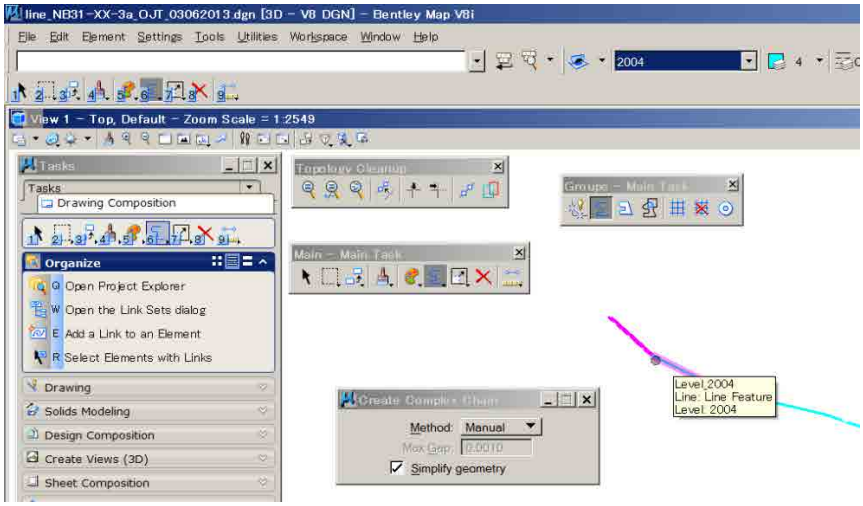
(2)Create Complex Chain window will appear then check in ☑" Simplify geometry"

If without check in, the connected line will be complex chain elements.



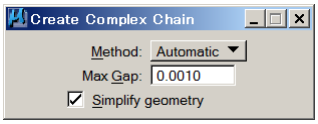
(3)Click each segment from start with in turn.

You can connect each line segments or each smart line elements.

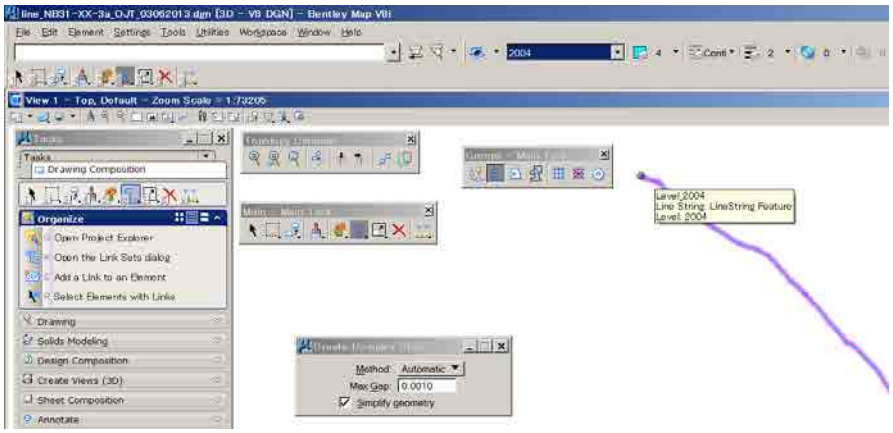


1-2-4 Another method of complex chain creation

(1)Check in ☑" Simplify geometry" and change method to Automatic



(2)Click "start segment" will be following the line.



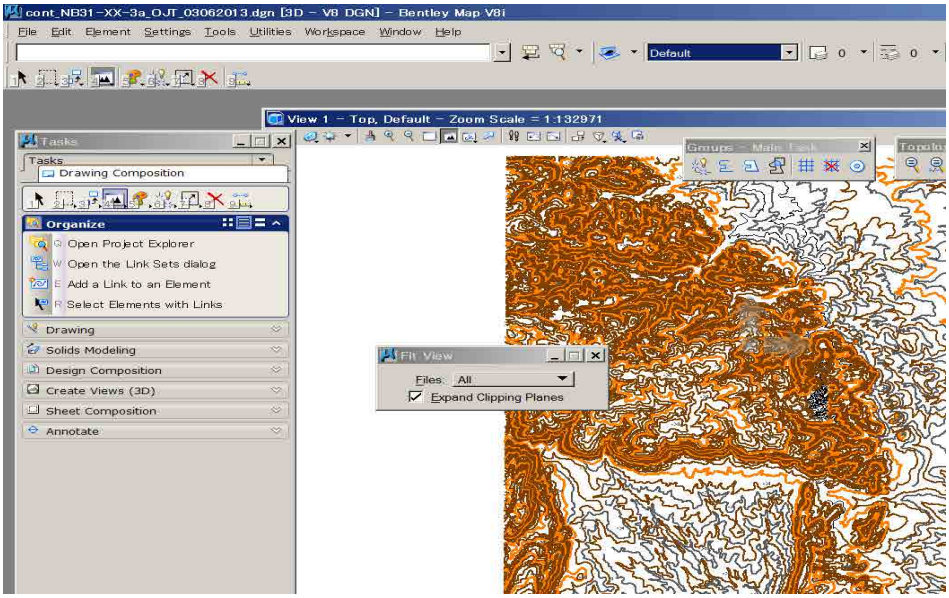
Note: The connected line can keep elevation attributes under this method.

1-3. CONTOUR RETOUCHING

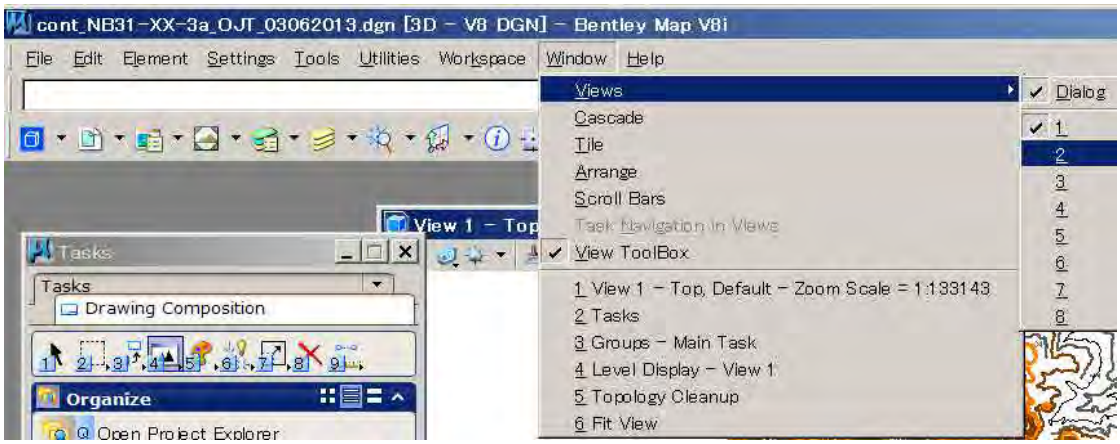
After “Stereo plotting”, the contour data might have contained errors which are missed, jumped far away elevation attributes.

1-3-1 Contour retouching procedure by MDL Application “CIVTOOLS” in Micro station

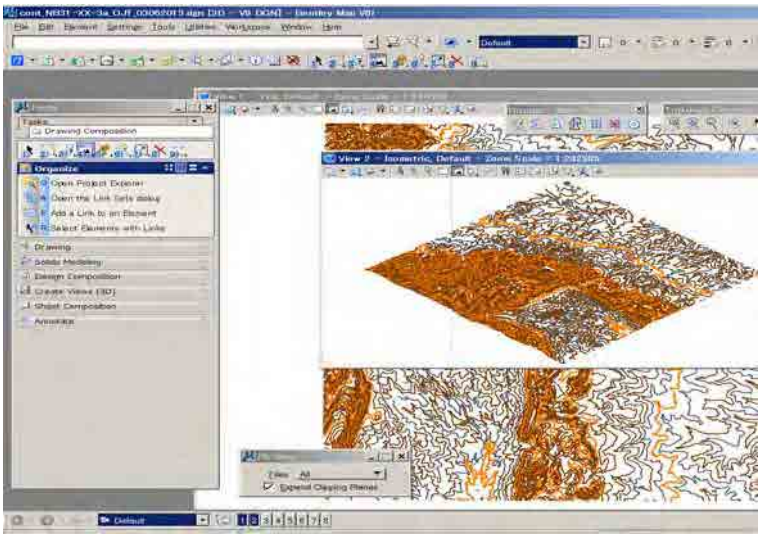
(1)Open your contour line file.



(2)From menu bar / Window / Views then from the Pull-dawn / select “2” or any numbers.

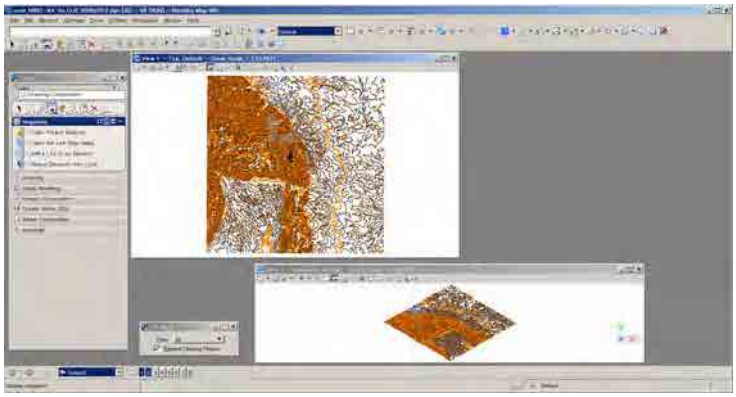


(3)New view window which is “2” or your selected number’s one will open.



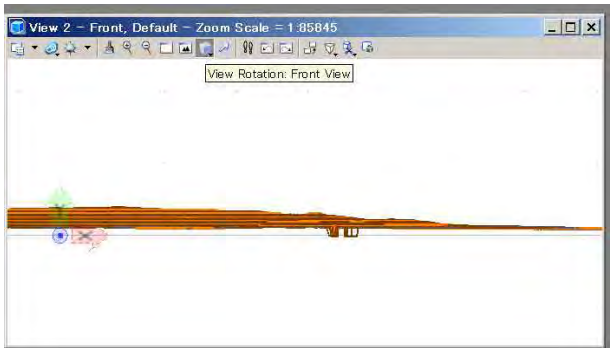
(4)Arrange both windows sizing such as vertical or horizontal position as you like.

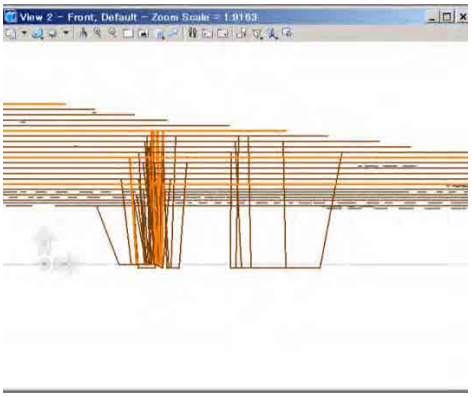
Then click “Fit view” in order to see all elements. Then “Save setting” or “Ctrl+F”



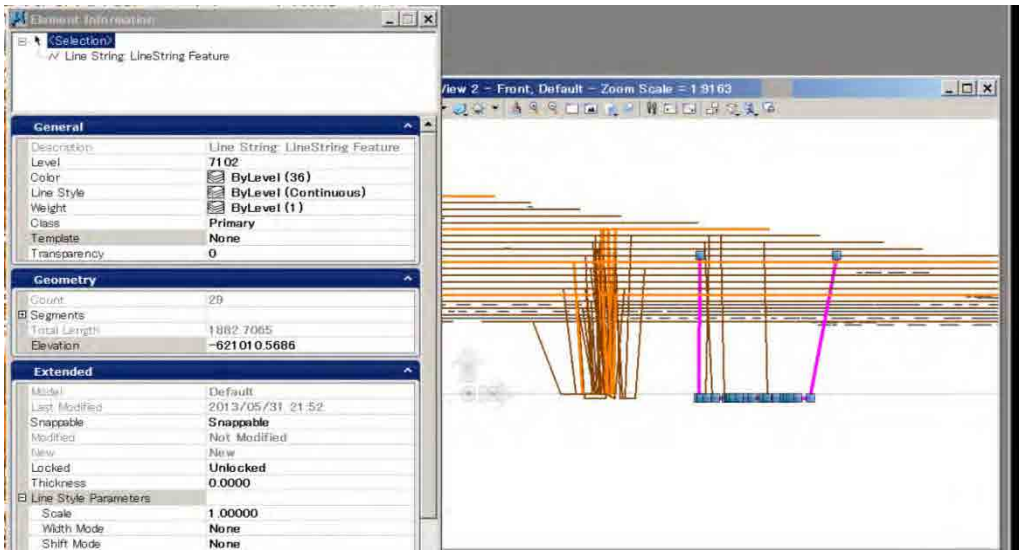
(5)Click “the View 2” window in order to turn active, then click “View Rotation: Front view.

You can easily understand strange shape contours which are having bad elevations then zoom in them part.

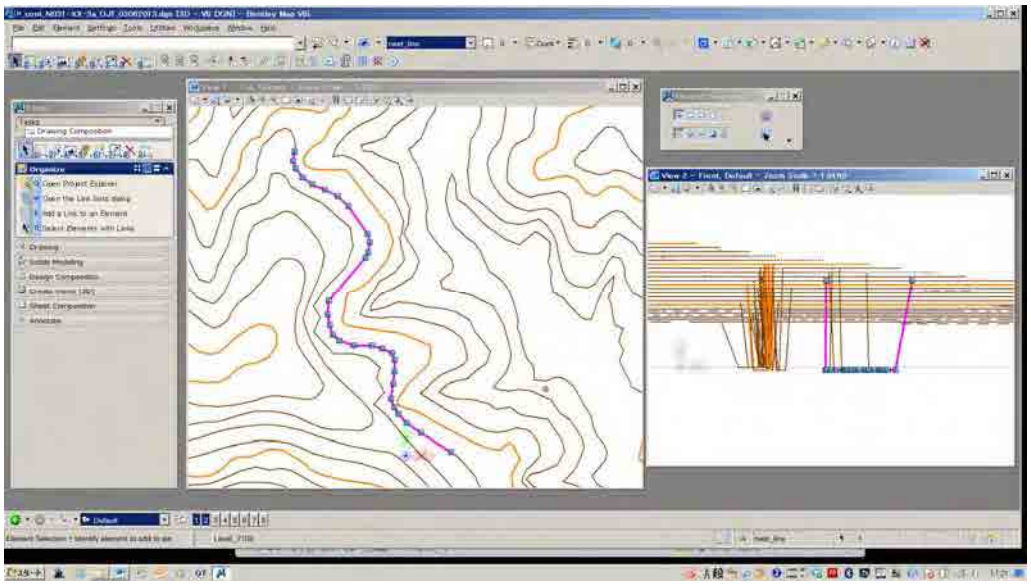




(6)Select a bad contour in your front window then click “Element Information” from menu bar then you can see the contours elevation in the “Element Information” window which is showing “-621010.5686 m” now.

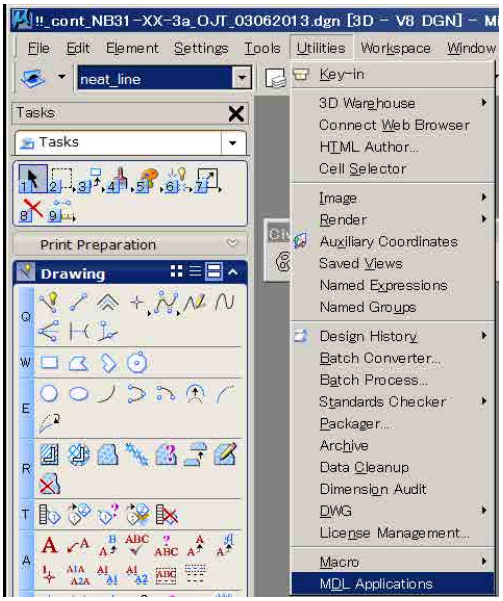


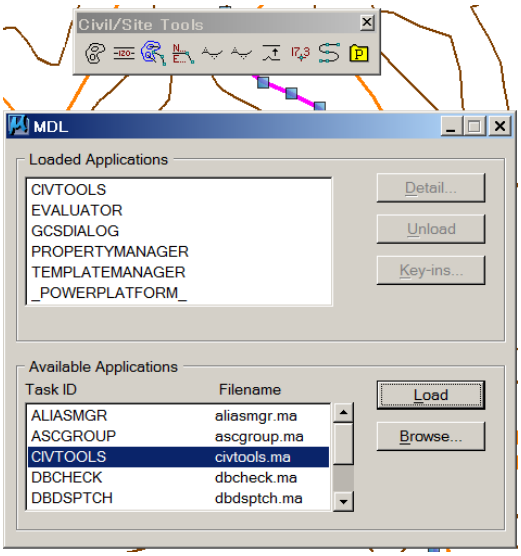
(7)Turn the View 1 “Top view” window, you can see place of the contour line in Top view.



(8)From menu bar select / Utilities / pull-dawn / MDL Applications then" MDL "window will appear. And then select "CIVTOOLS" in Available Applications window. After that close "MDL" window.

MDL Applications are supplied by "Bentley website "or other website such as forum which are regarding CAD software whose are some of Free or Share soft.



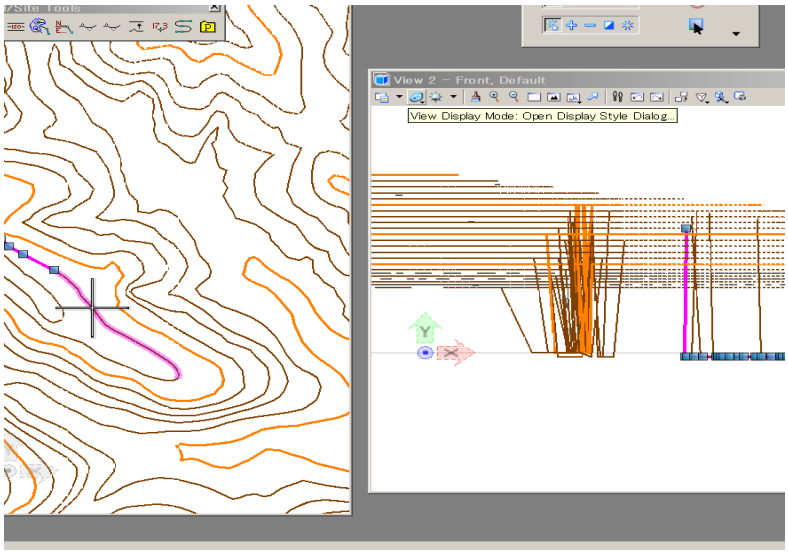


1-3-2 How to retouch the bad elevation contours

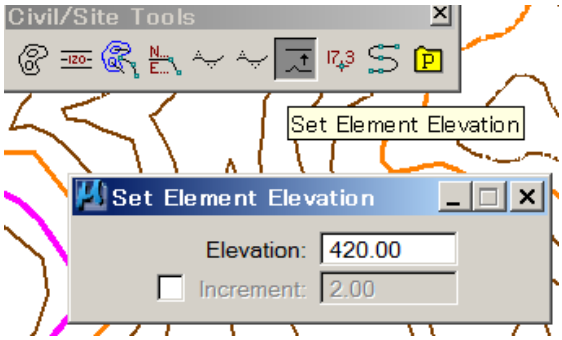
(1)Select bad a contour from “Front view window”, it will be selected “Top view window” as well.

You can see the position of bad contour in your “Top view window” now. Then tentative click on a right contour line which is connecting with bad contour line in order to know the “correct elevation”

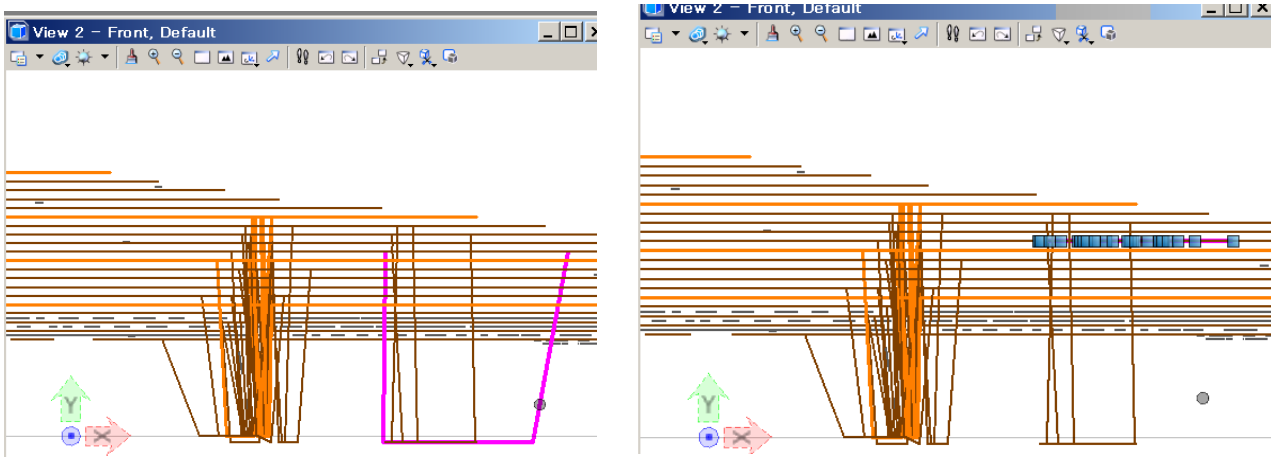
In case of following Image, the correct elevation is 420.0000m, which can be see at the bottom information bar.



(2)Click “Set Element Elevation” from “CIVTOOLS” menu bar. “Set Element Elevation” window will be activated then you enter the number of the correct “Elevation” such as 420.00 give in previous procedure with “Tentative click”. Then click on selected bad contour, which will change into the correct elevation.



(3)Then click on selected bad contour will change to the correct elevation. After changing the corrct elevationn in" Front view".



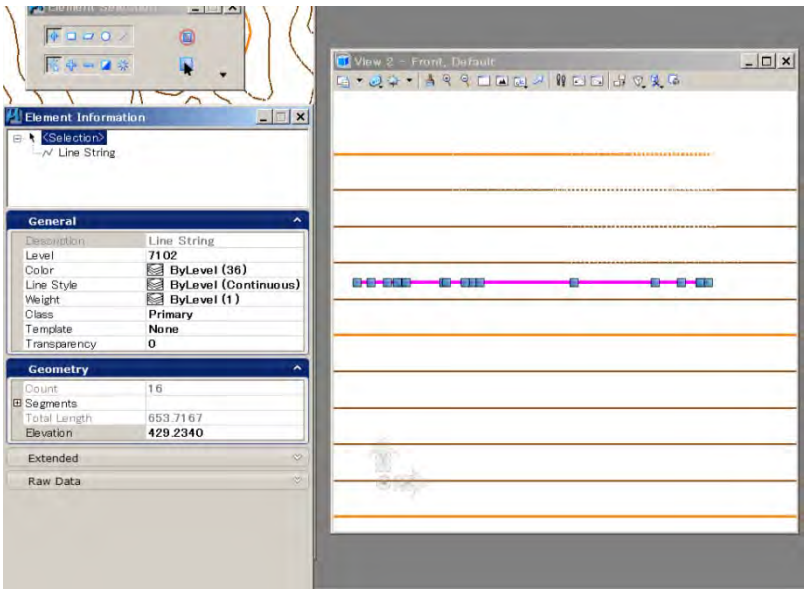
(4)Operation "1 to 3" should be repeated until coming to an end.

(5)After retouching the bad contours, you can connect each contour if necessary.
It might be reference with the line connecting procedure.

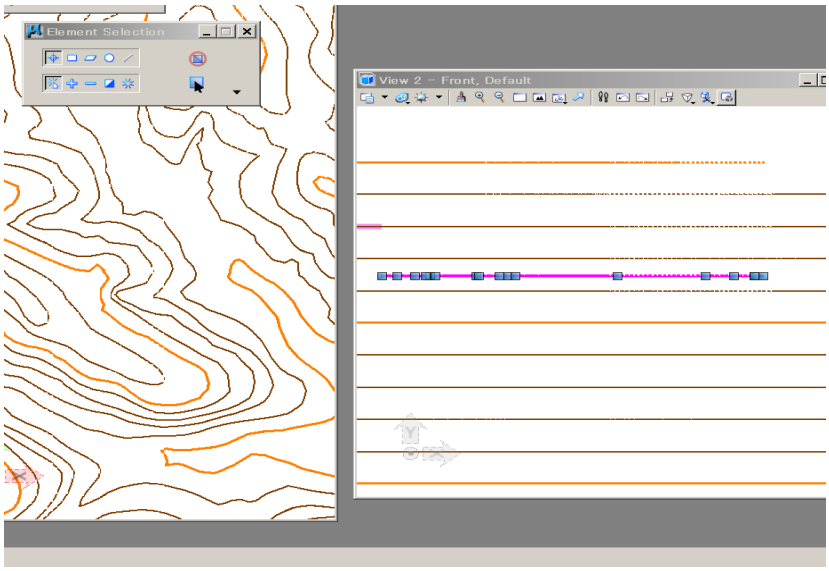
1-3-3 Other method to retouch the bad elevation contours.

Note: this method cannot fix the intensity elevation errors which are likely -125261.235 and 7878945.435456 such as beyond the general nature.

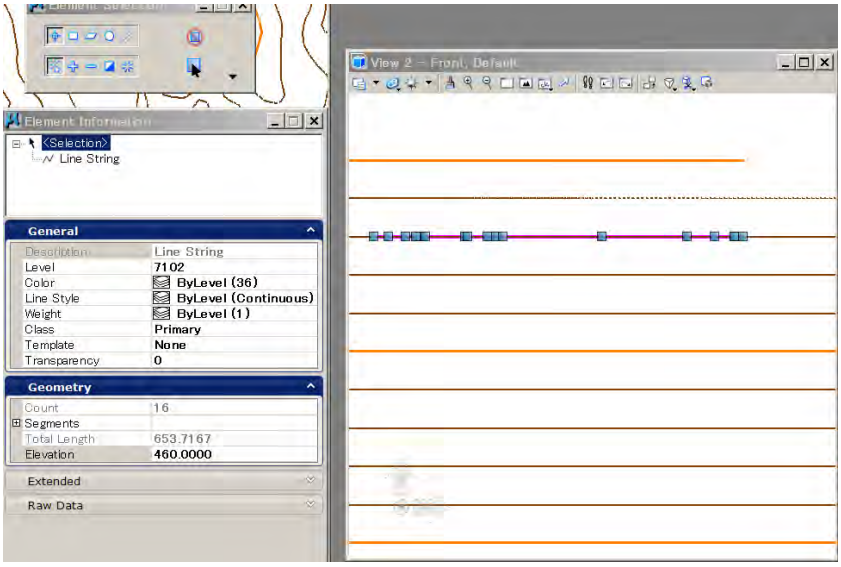
(1)Select incorrect contour which is between upper and lower in "Front view", in this case 429.2340m, it can know in "Element Information"



(2)Check correct elevation from connecting right contours. By using the “tentative click” on a right contour line which is 460m.



(3)Then you enter the correct elevation number such as 460m on “Element Information” in Geometry at Elevation window.



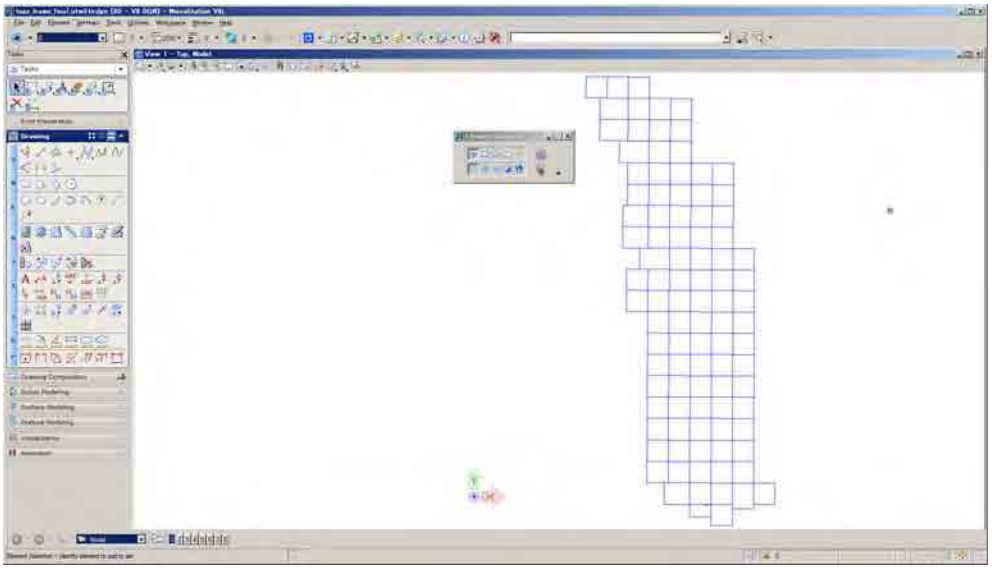
(4)Operation “1 to 3” should be repeated until coming to an end.

(5)After retouching the bad contours, you can connect each contour if necessary.
It might be reference with the line connecting procedure.

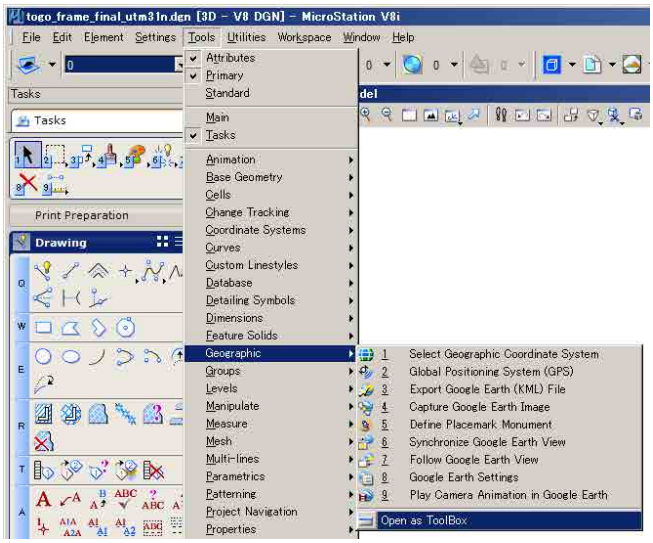
1-4. OUTLOOK OF GEOGRAPHIC COORDINATE SYSTEM TRANSFORMATION BY BENTLEY MAP

1-4-1 Identify the Geo-Coordinate system in current works.

(1)Open a certain file in which geo-coordinate system will be transformed.



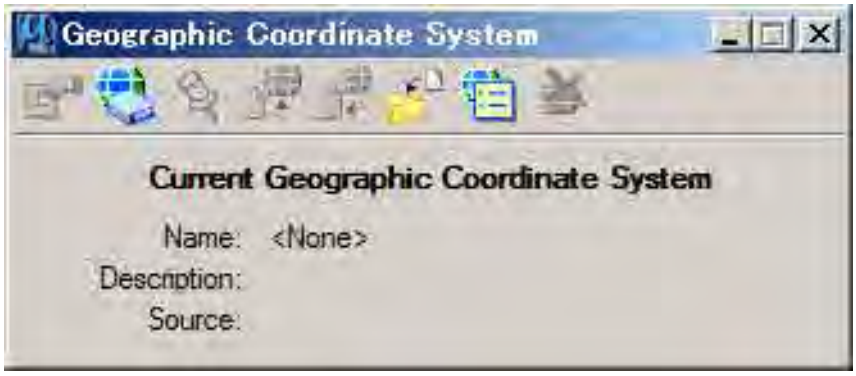
(2)Select “Geographic” from menu bar then Click “Open as Toolbox”.



(3)"Geographic" Tool box will appear. Select left button

(4)Click left button "Select Geographic Coordinate System"

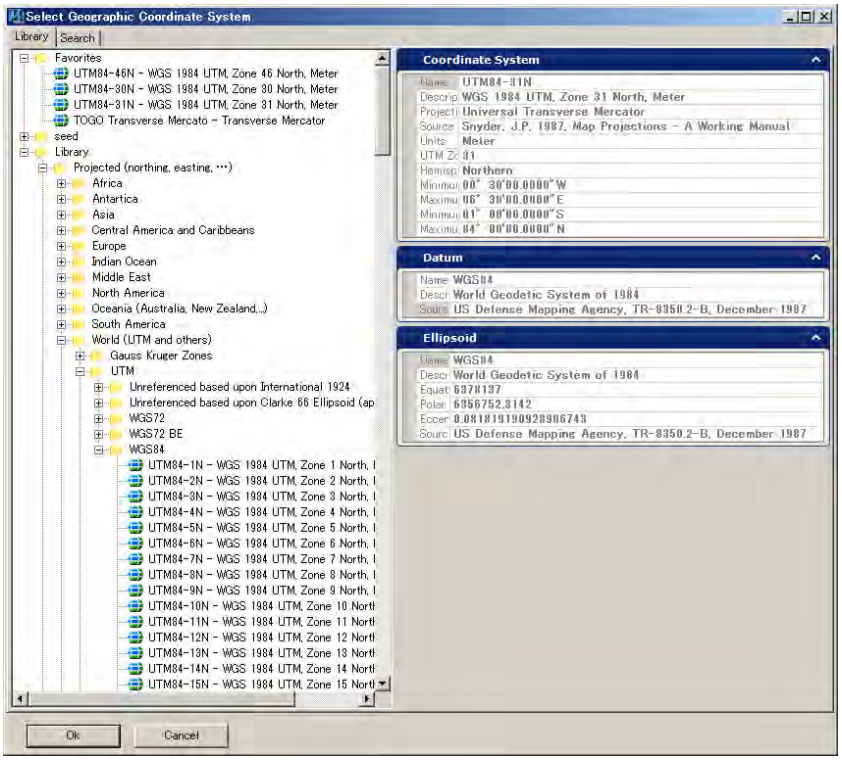
(5)"Geographic Coordinate System window" window will come up.



(6)Click "From library"

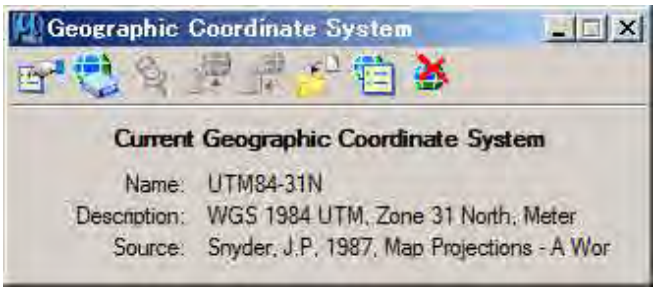
(7)Select current souse Coordination system from library.

In case of TOGO, WGS84 UTM31 might be selected because it covers almost entire TOGO area. Then Click OK.



(8)"Geographic Coordinate System window" window will show selected coordination system's information.

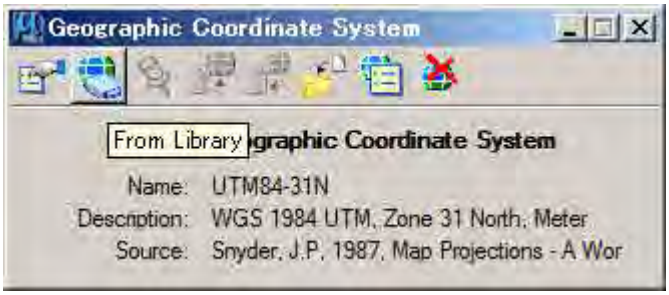
If you do not need the Geographic Coordinate System, it could be detach by click the most right icon.



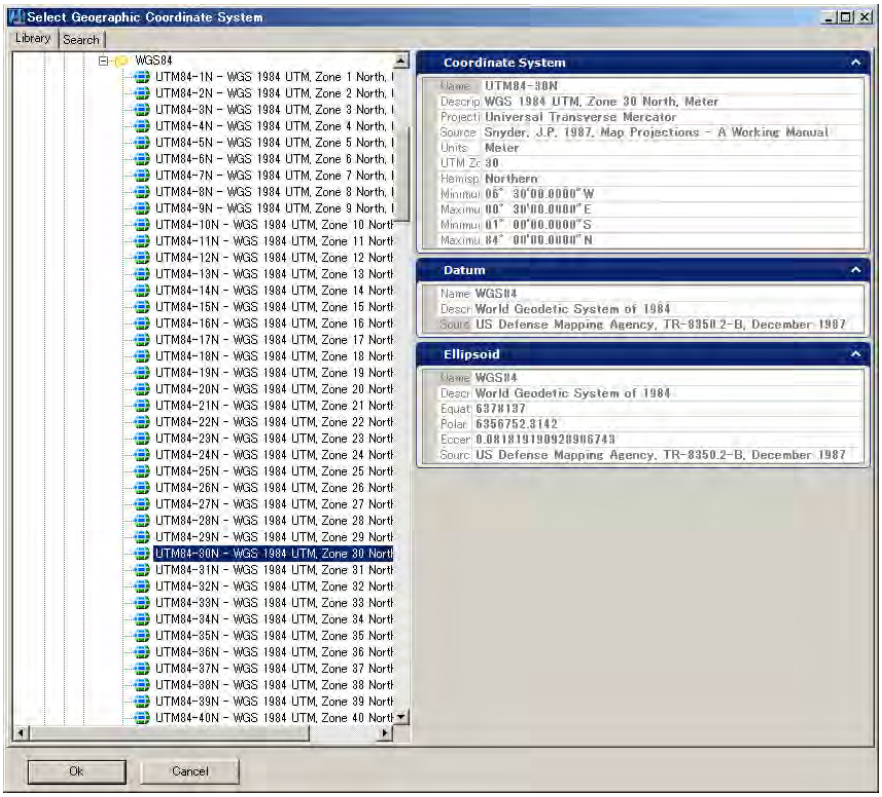
Now your current file is identified : WGS84 UTM31.

1-4-2 Identify the Geo-Coordinate system for transformation of current works.

(1)Open “From Library”

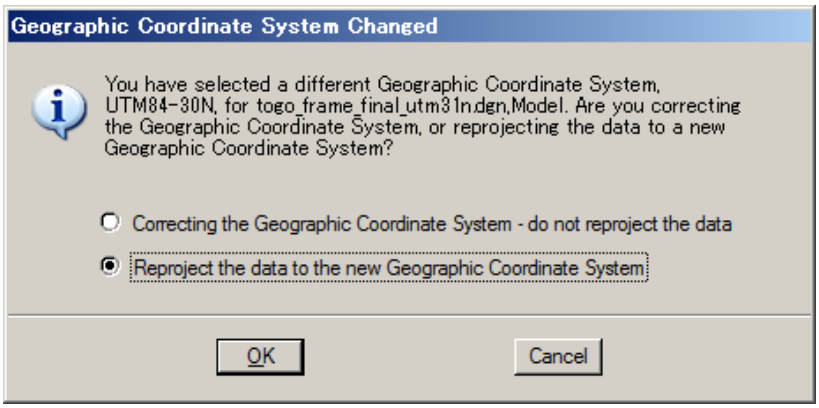


(2)Select target geo-coordinate system. For example, WGS84 UTM zone30 because western part of TOGO is covered by UTM 30.

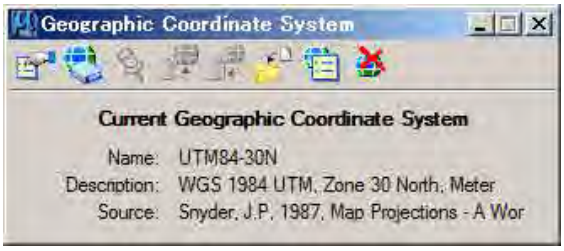


(3)"Geographic Coordinate System Changed window" window will come up, then select button below. The current works will transform from UTM31 to 30 zone.

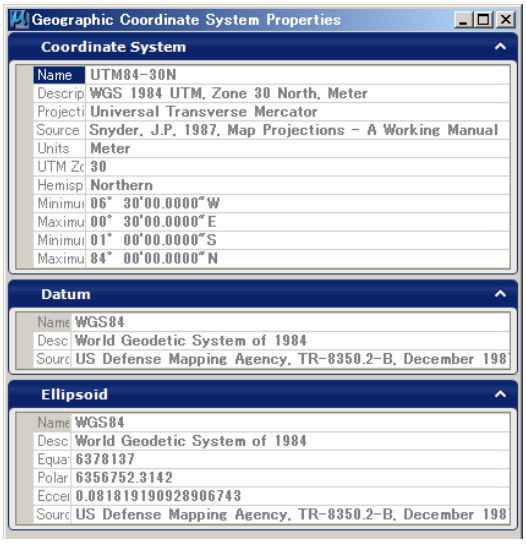
If you don't need to transform the current works select upper button. In this case the coordinate system is only assigned.



(4)Now changed UTM zone is selected as Geographic Coordinate System.



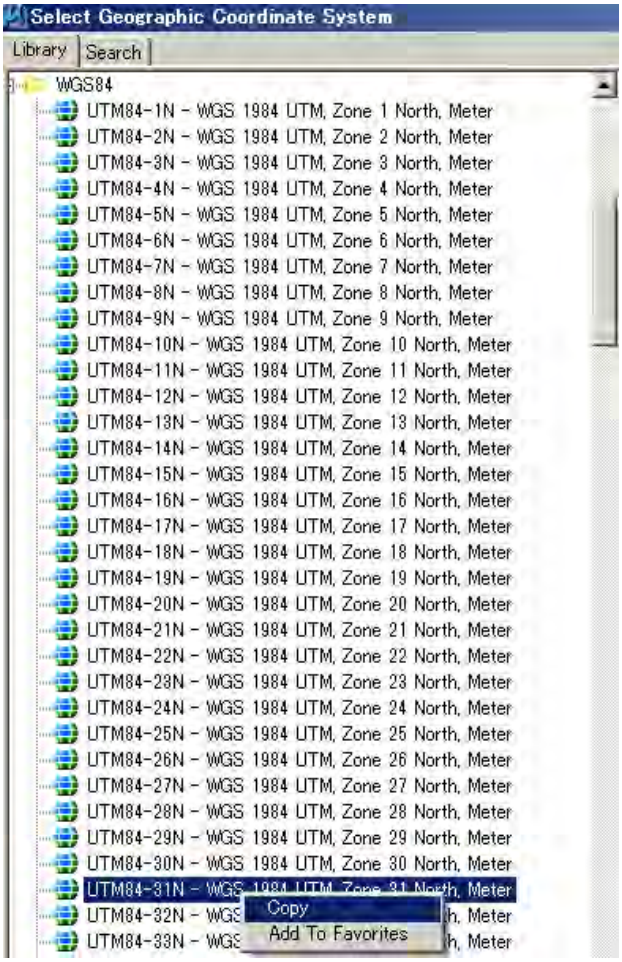
(5)Click the most left button, the detail of current Geographic Coordinate System can be seen.



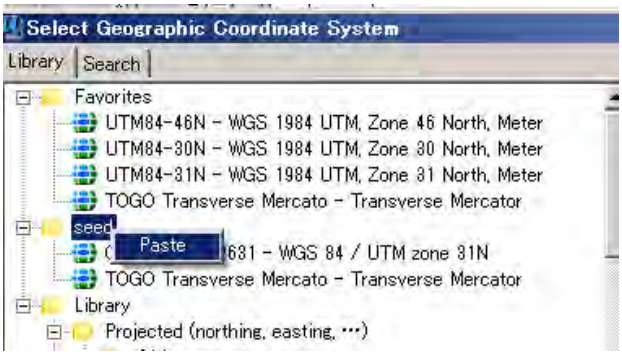
Now your current file was transformed to WGS84 UTM30 from UTM31

1-4-3 Create the New Geo-Coordinate system.

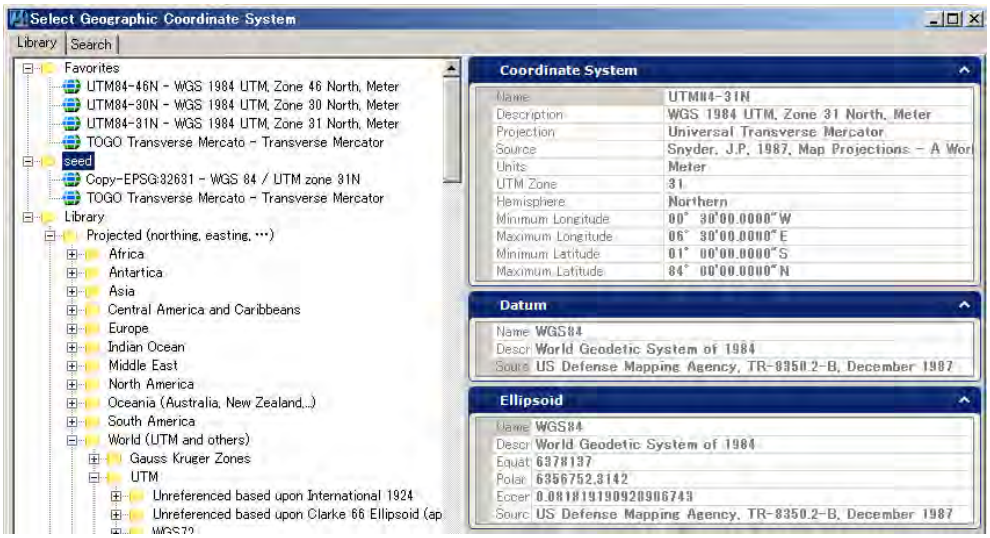
(1)Select a Geographic Coordinate System from library for example “UTM84-31N” then right click “Copy”



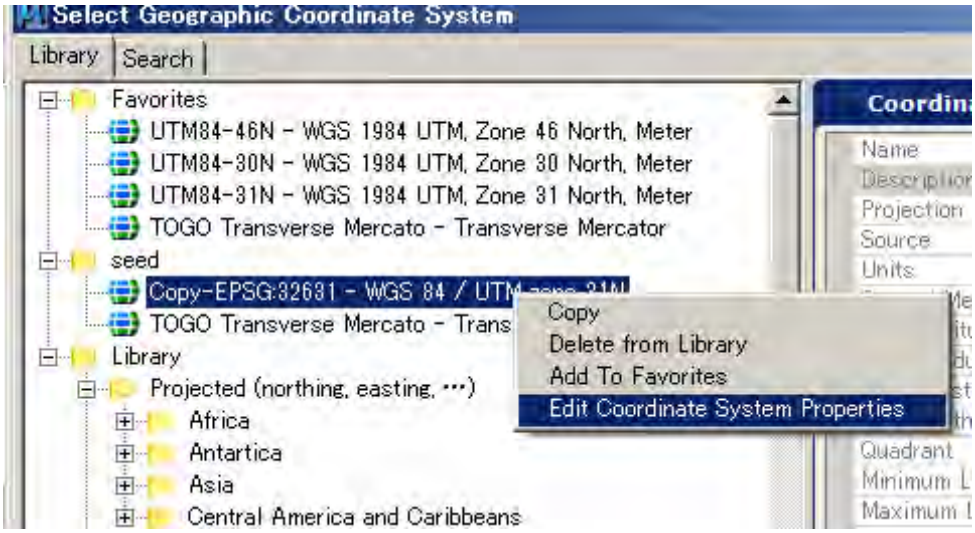
(2)Then ”Paste” into seed folder or own folder



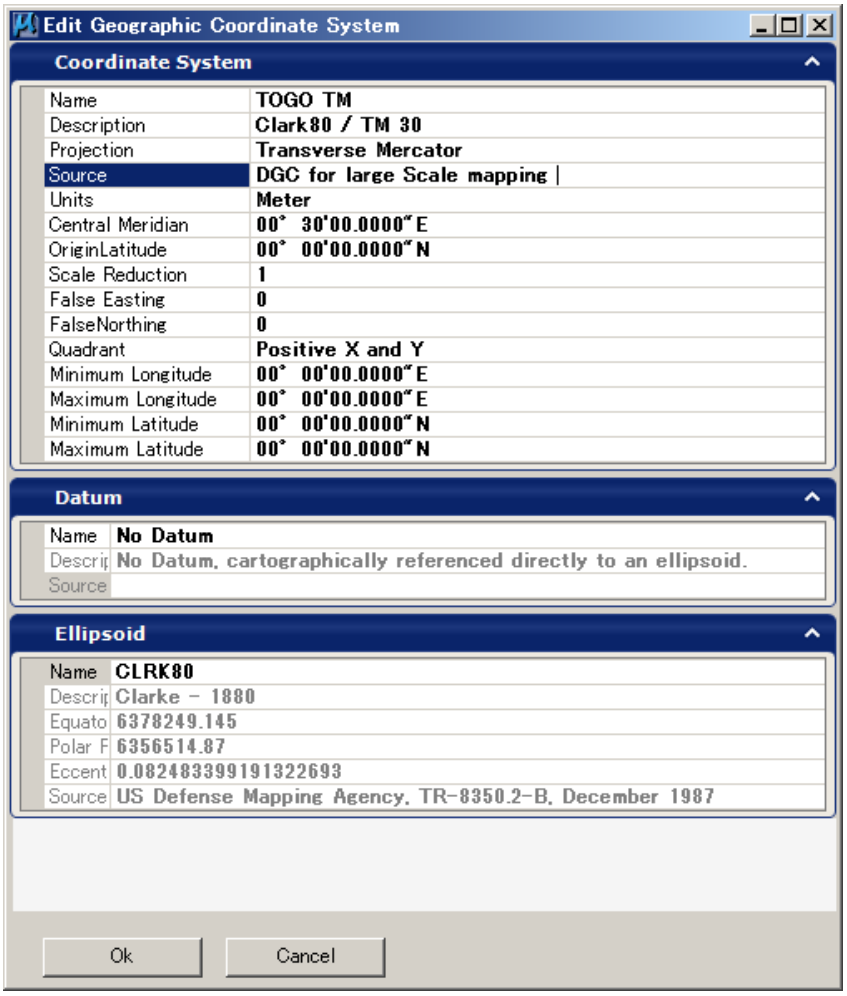
(3)After pasting, the copied" Geographic Coordinate System" is pasted as Copy-EPSG:32631 WGS 84 / UTM zone 31N.



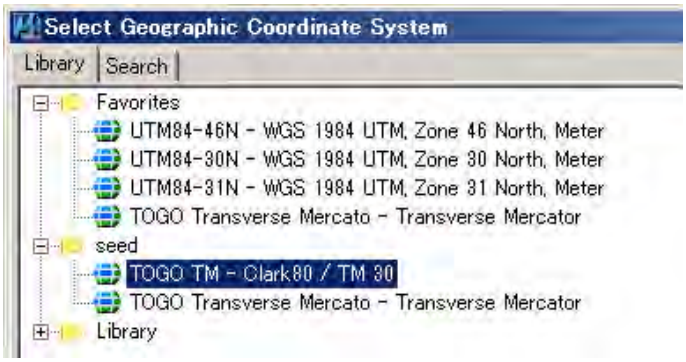
(4)Select Copy-EPSG:32631 WGS 84 / UTM zone 31N from seed folder then right click "Edit Coordinate System Properties"



(5)"Edit Coordination System Properties" window will come up then you can modify the property of coordination. When modifying it, you should enter official authorized data into each window then click "OK" For example this time below window (this is not official) . It might be used Datum "Point 58".

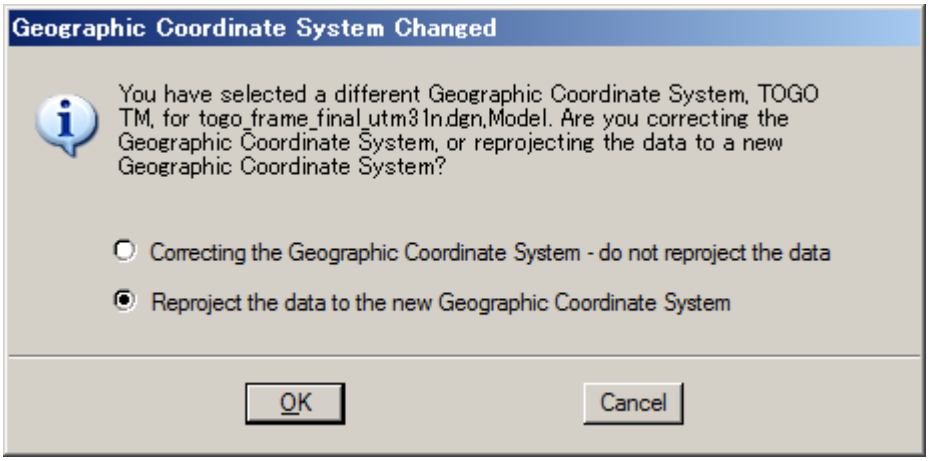


Now the new Coordination System is registered in seed file then select new one after that click "OK"

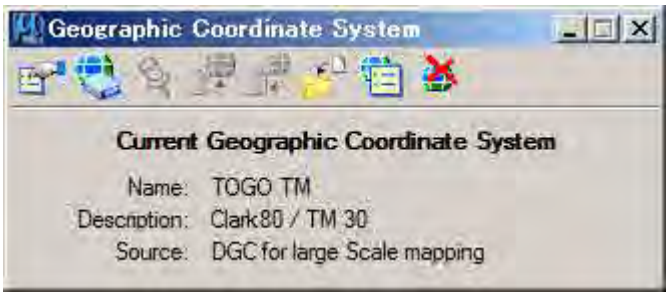


(6)"Geographic Coordinate System Changed window" window will come up then select below button. The current works will transform UTM31 to TOGO TM.

If you don't need to transform the current works select upper button. In this case the coordinate system is only assigned.



(7)The current works file will be transformed to TOGO TM which is created as new geo coordinate system. You can recognize the data have been changed in display.



After transforming the geo coordinate system it must be checked whether the data transformation results are appropriate or incorrect.

Period