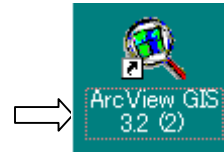# 1 BASIC OPERATION

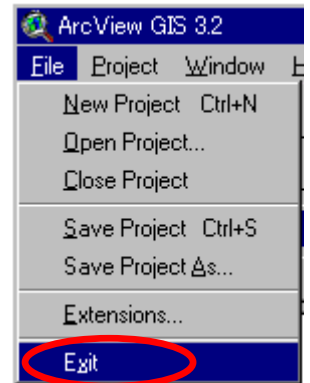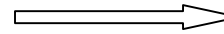## 1.1 START AND QUIT

(1) Starting GIS system

       Operation : Double click ArcView3 icon on the desktop.

(2) Quitting GIS database system

       Operation : Select "Exit" of "File" in tool bar.

1.2 PROJECT WINDOW

ArcView has a "Project window" which gives us icons of **Views**, **Tables**,

Charts, **Layouts** and **Scripts** for easy accessible.
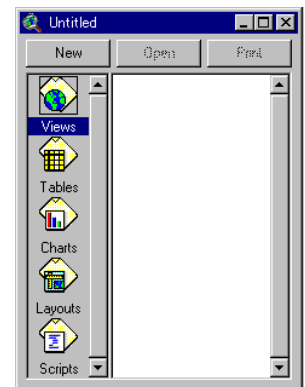
    Views   : Themes display in this window.

    Tables   : Attribute tables or import tables display in this window.

    Charts   : Created charts display in this window.

    Layouts   : Create layouts for printing displays in this window.

   Scripts   : Create programs or import scripts display in this window.

1.3 BASIC KNOWLEDGE OF ARCVIEW FILES

1.3.1 THEME

    We can use four (4)) types features for the theme.

        - Point Feature : Well, hospital, station, etc.

        - Line Feature : Road, river, water supply system, lineament, etc.

        - Polygon Feature : Administrate boundary, catchment, etc.

        - Grid : This theme is utilized for map calculation and chart creation with "Spatial Analyst".

    Only one feature can be use for one theme (We cannot mix different features in the same theme).
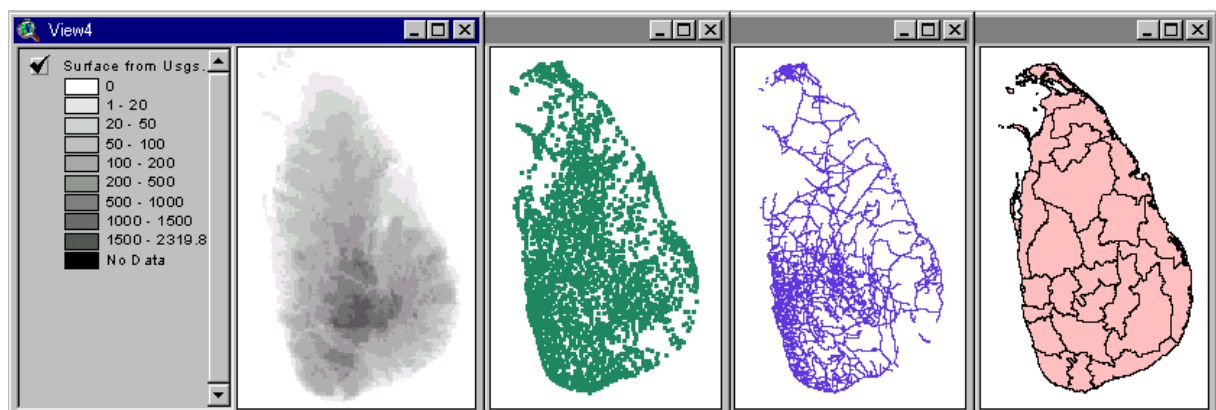
Grid (Elevations)	Point (Villages)	Line (Roads)	Polygon (Districts)

    Theme files, which are called Shape files, consist of three or five files as follows.

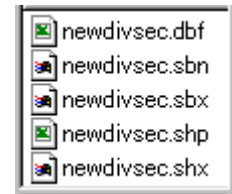   *.shp : Coordination of the feature is written in this file.

M - 13

*.shx : Information of the feature diagram is written in this file.

<u>*.dbf : Attribute data of the feature is in this file.</u>   normally these three files

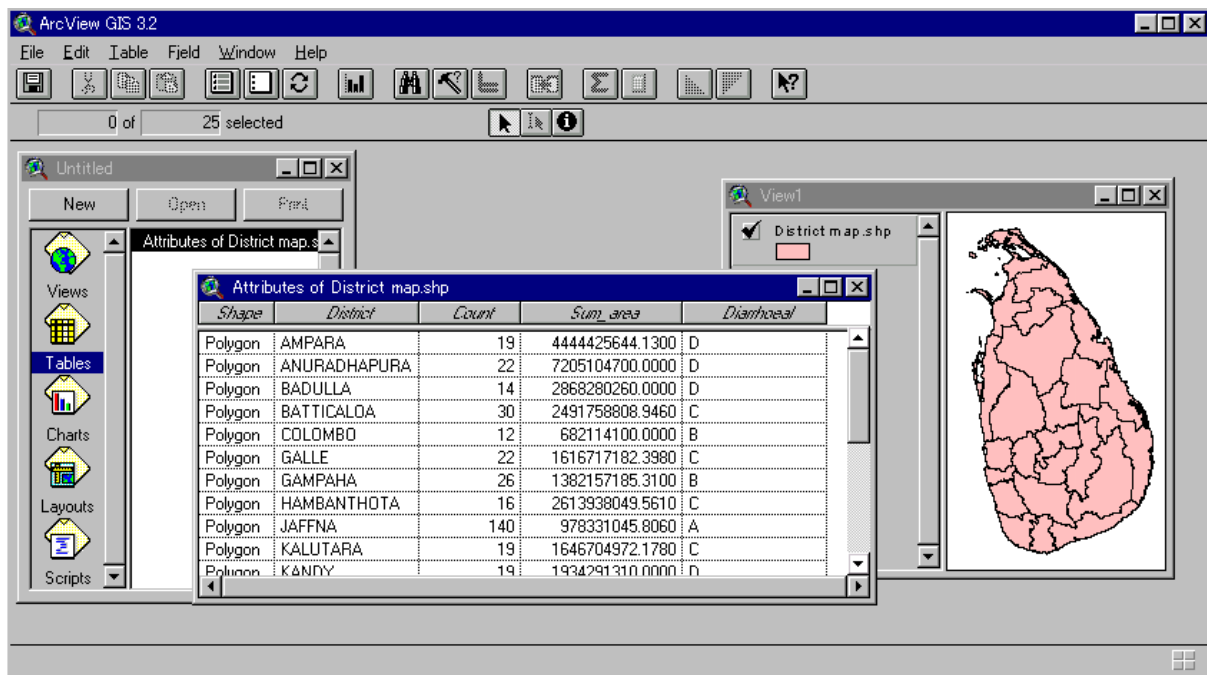*.sbn , *.sbx : It is made after spatial unification.

*.ain , *.aih : It is made after linking tables.

<u>If you want copy or move the theme, you need to put these files in the same folder.</u>

1.3.2 ATTRIBUTE TABLE

A table that can record optional information (ID, coed No, area, population, rain fall, etc) is attached on each theme.
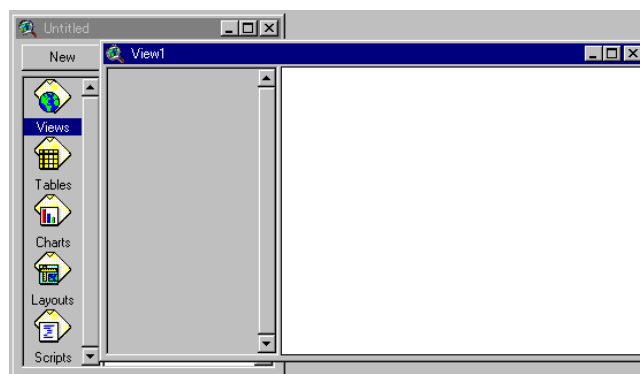

1.4 DISPLAY AND DELETE THEME
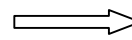
1.4.1 DISPLAYING THEME ON "VIEWS" WINDOW

Source data are in the "arcviewusage2"folder.

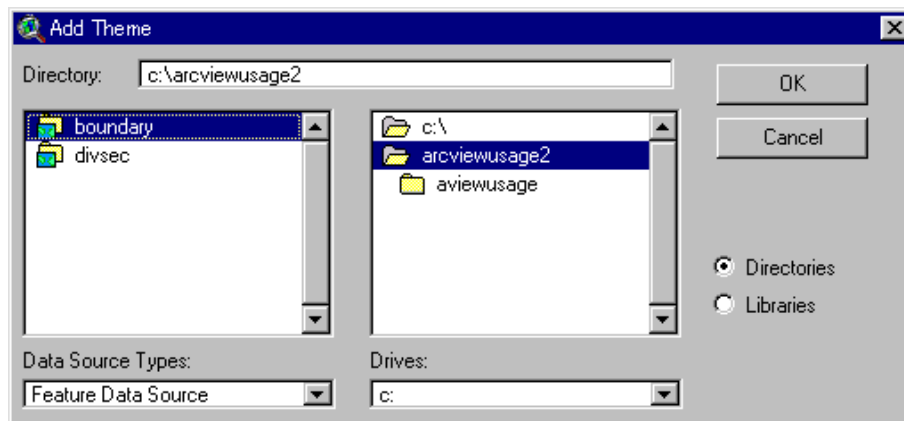Operation 1 : Start ArcView (Double click "ArcView" icon).

Operation 2 : Double click "View" in "Project" window, then View window will be open.
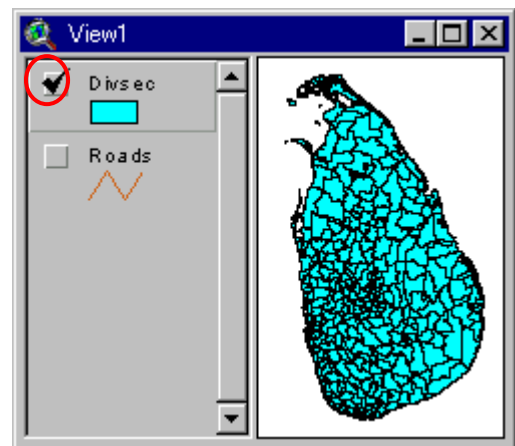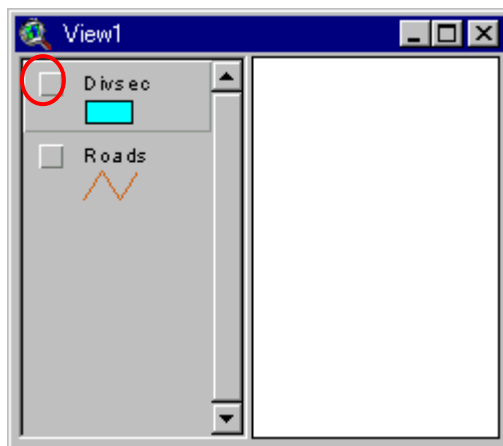
Operation 3 : Clic "AddTheme" button of tool bar.

Operation 4 : Select optional Theme, and click "OK". Ex) "divsec", "roads"

Operation 4 : If you check the check box of left upper of the theme title, theme will display or hide.
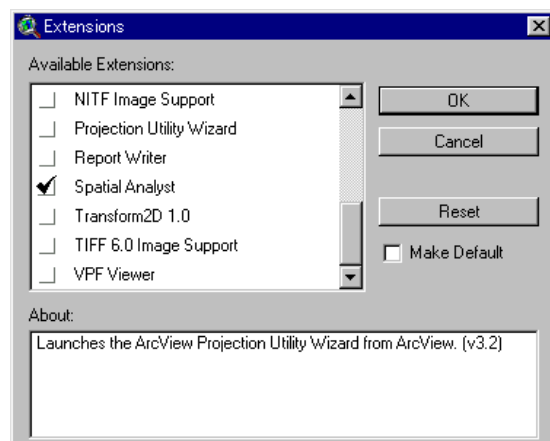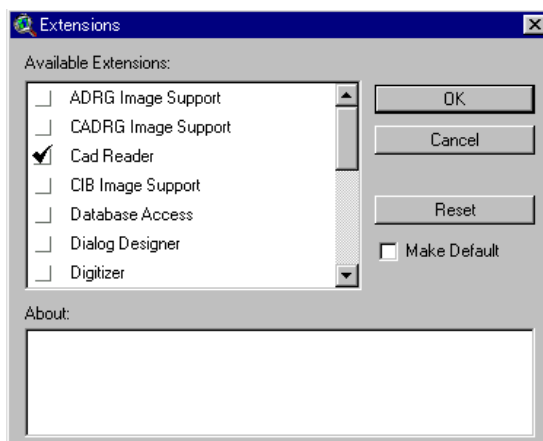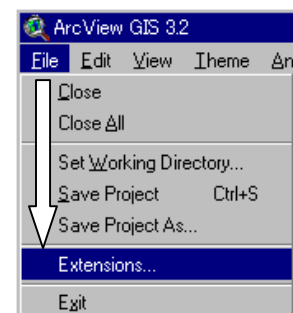
It is necessary to check specific extensions to display different types of data source, such as grid (spatial analyst), drawings (Cad Reader), and image (IMAGINE image support) data.

Operation 1 : Select "Extension" of "File" in menu bar.

Extension window will open.

Operation 2 : Select optional extension , and click "OK".

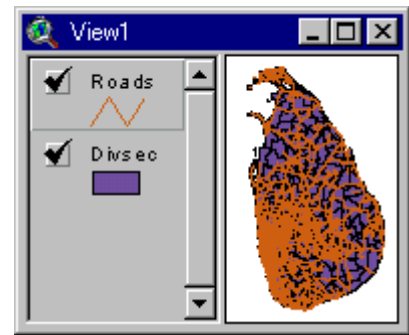### 1.4.2 DELETING THEME FROM "VIEWS" WINDOW

Operation 1 : Select deleting theme on "Views" window

Operation 2 : Select "Delete Themes" of "Edit" in menu bar.

Operation 2   Operation 1

1.5 OPERATION OF LEGEND EDITOR

If you want to display theme classified with color or symbol, you can select it in Legend Editor.

1.5.1 OPENING LEGEND EDITOR

Operation 1 : Double click title of the objective theme in Views window. Ex) "Divsec"
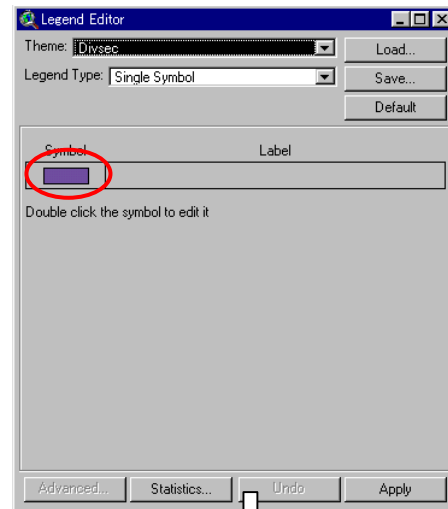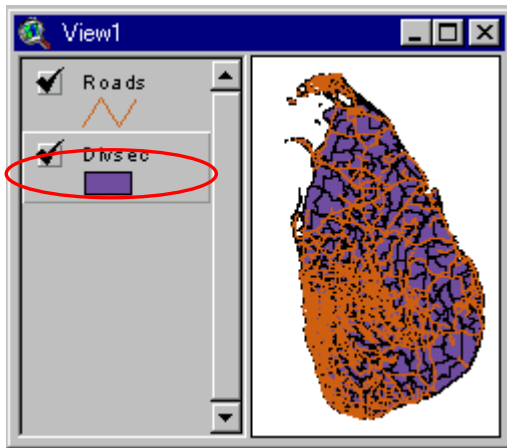
Operation 2 : If you want to change symbol type,

double click the symbol of "Legend Editor".

"Symbol window" will be open.

Symbol window has five palette windows for symbol selection.

Fill Palette   Pen Palette   Marker Palette   Font Palette   Color Palette

M - 16

- **Fill** Palette applies only for Polygon theme.

- **Pen** Palette applies only for Line theme.

- **Marker** Palette applies only for Point theme.

- **Font** Palette applies for all types of label Text.

- **Color** Palette applies for all theme or text.

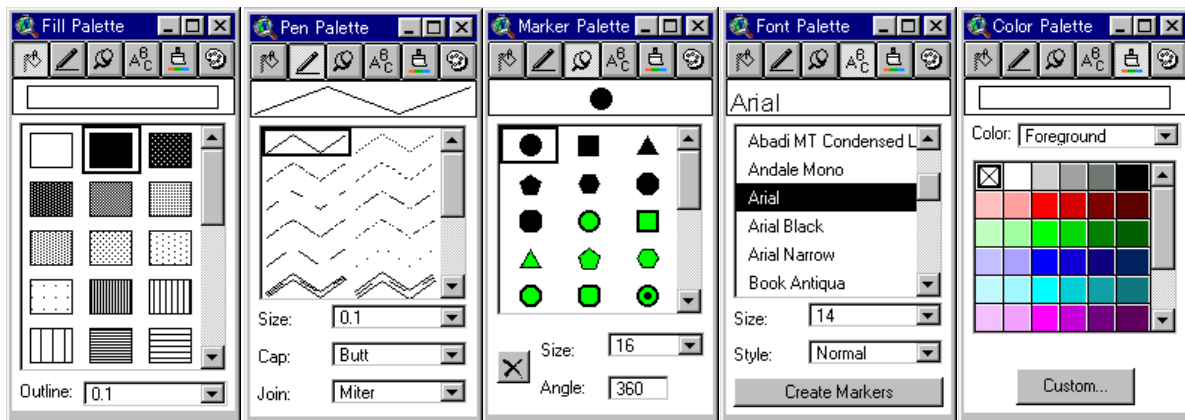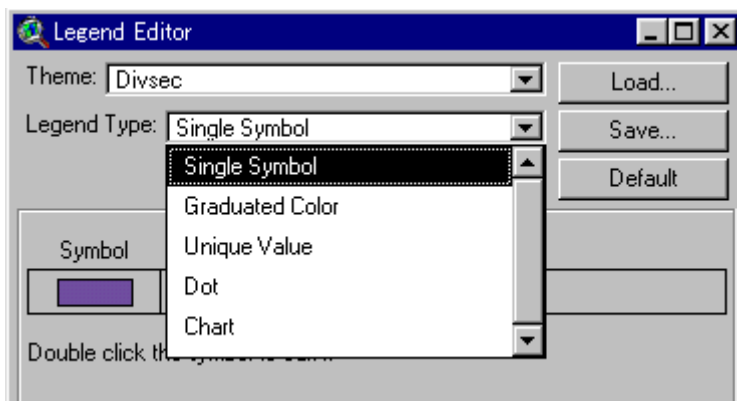## 1.5.2 LEGEND TYPE

You can select five legend types using field value in attribute table. Ex) Using Theme "Divsec"

Operation : Select legend type in pull down menu of "Legend Type".

(1) Single Symbol

This type is adopted for default symbol. You can change fill color and outline color using color palette.
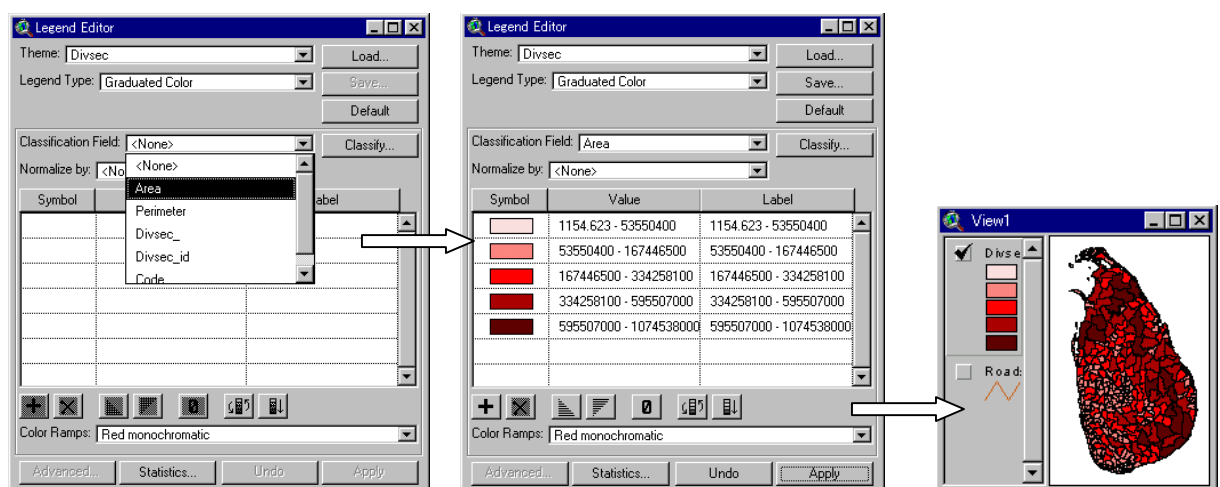
(2) Graduated Color

This type classifies the theme in graduated value using graduated color.

Operation 1 : Add "Divsec" theme theme to "Views" window, and display theme.

Operation 2 : Open Legend editor

Operation 3 : Select "Graduated Color" in "Legend Type"

Operation 4 : Select "Area" field in "Classification Field", and Click "Apply".

M - 17

(3) Unique Value

This type classifies the theme in value of attribute table using optional color

        Operation 1 : Select "Unique Value" in "Legend Type"

        Operation 2
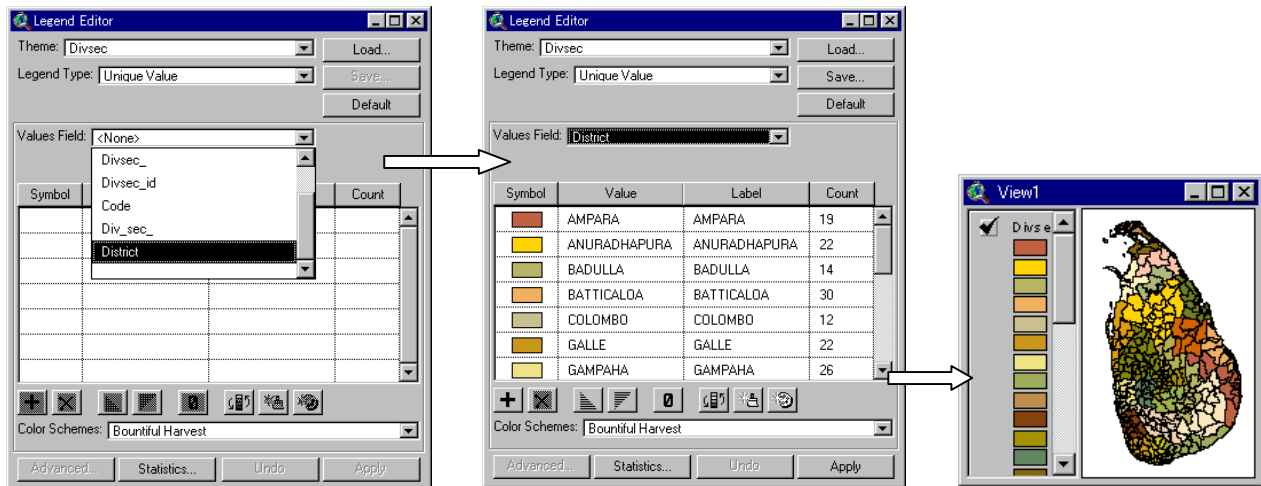
        : Select "District" field in "Classification Field"

1.6 DISPLAY TABLE AND OBTAIN INFORMATION

1.6.1 DISPLAY TABLE

If you click "Open Theme Table" button in tool bar, attribute table will open.

1.6.2 OBTAIN INFORMATION

If you click active shape displayed on the "Views" window, while "Identify" button is pressing, the information of selected shape will be display in the "Identify Result" window.

M - 18
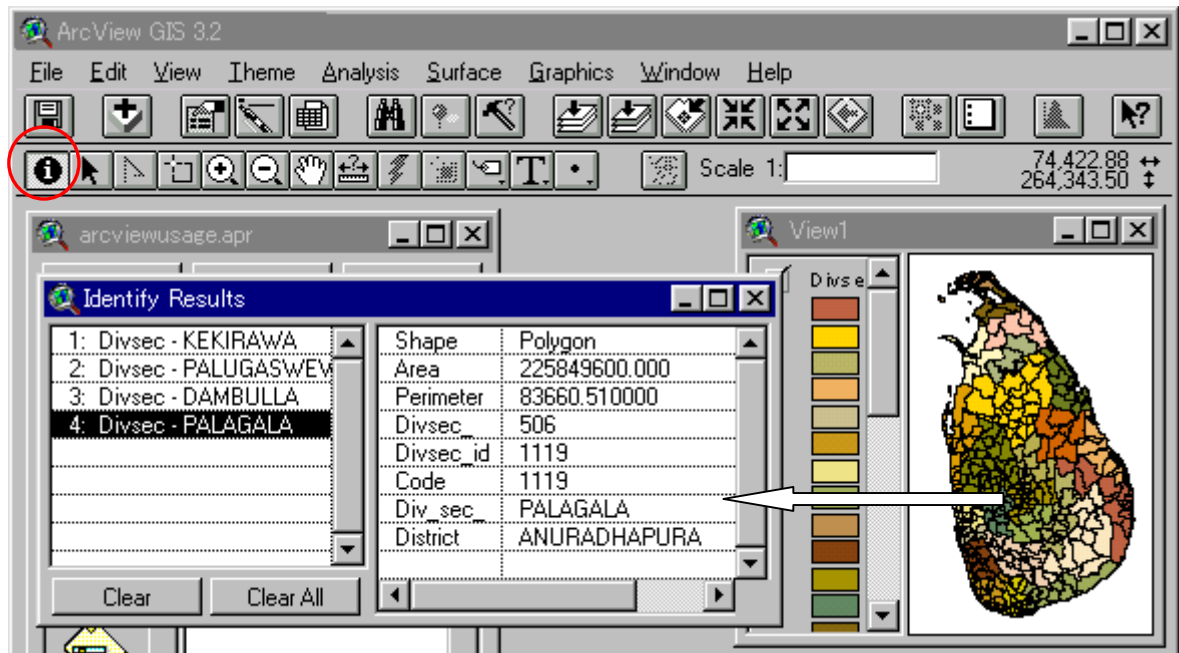
1.7 LAYOUT OPERATION

1.7.1 SETTING OF THE MAP UNIT

Operation 1 : Select "Properties" of "View" in menu bar.

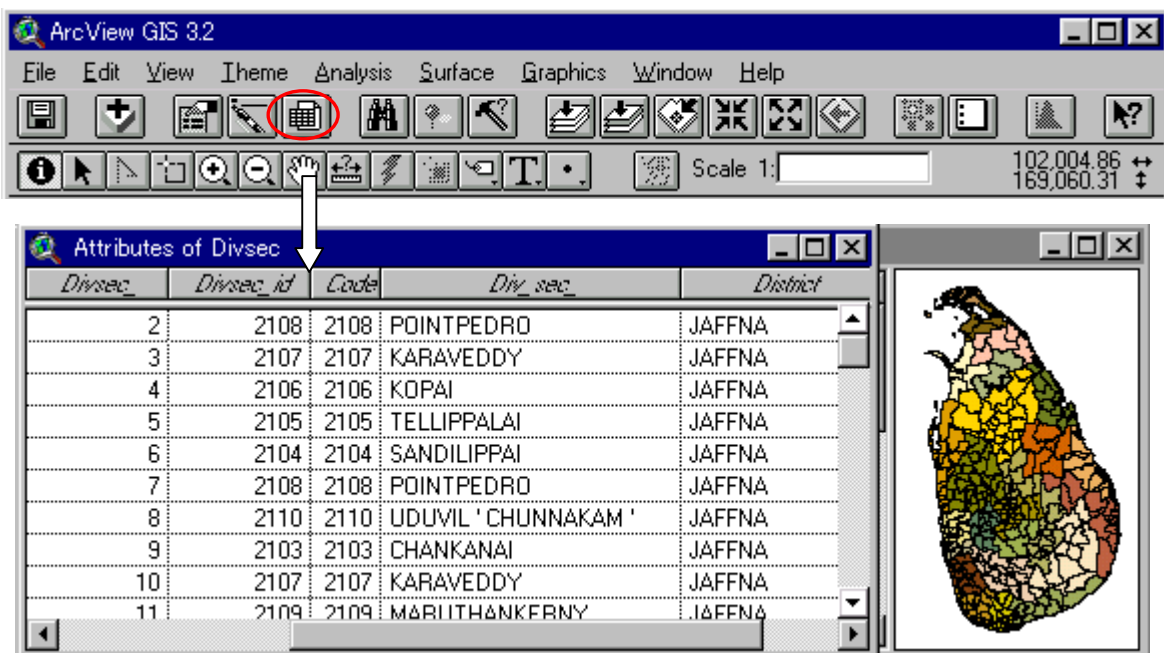Operation 2 : Select "meters" for "Map Units".

　　*) Sri Lanka National Grid is used in meters unit.

Operation 3 : Select Distance Unit.

　　*) This unit is reflected to measure distance.

After this setting, you can see the map scale in menu bar.

1.7.2 ALLOCATION OF THE OBJECTIVE ITEMS

Operation 1: Double click "Layouts" in Project window, then layout window will open.

Operation 2 : Allocate the objective items using layout button.
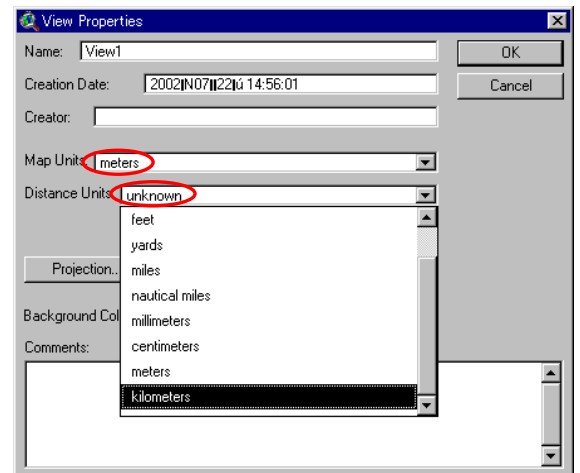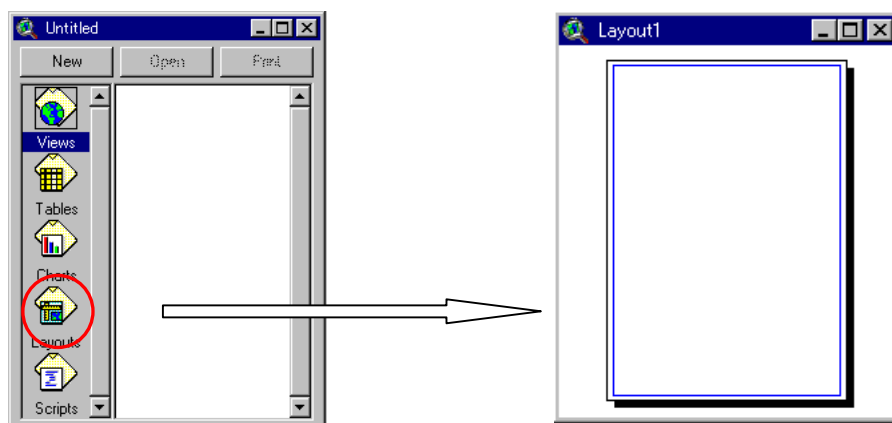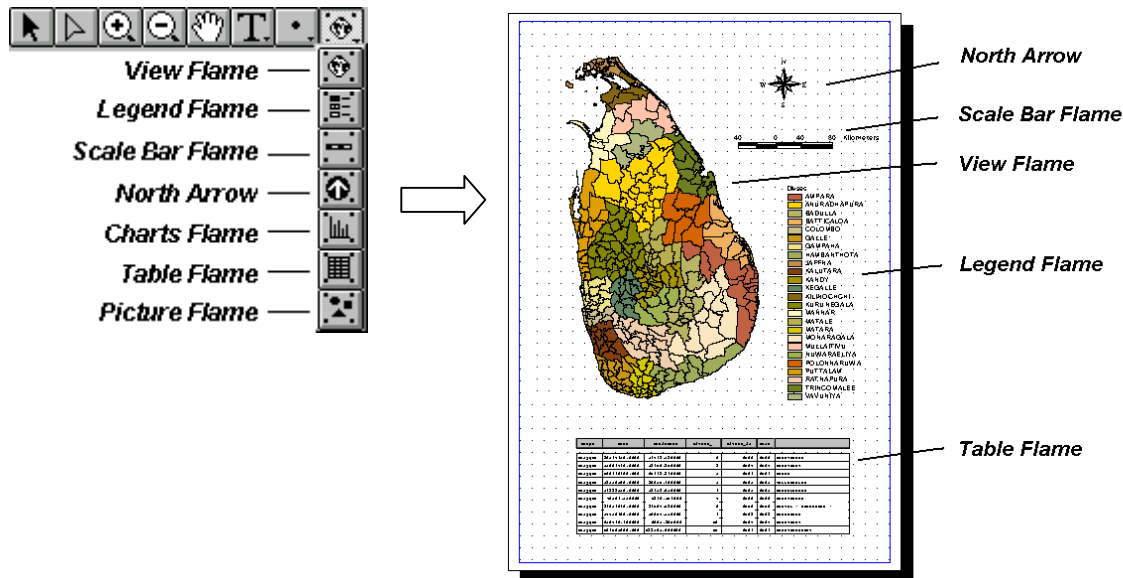

1.8 PRACTICE

Q.1 Display the map of DSD boundary of Monaragala and Hambantota (by using "mon-han_DSD.shp")

Q.2 Classify each district by color

Q.3 Add road theme (road 250 study.shp)

Q.4 Obtain Identification of Hambantota DSD

Q.5 Show the attribute table of "mon-han_dsd"

Q.6 Classify the roads using code field.

1.9 SAVE PROJECT

"Save Project" keep present working condition. You can use "Save Project" from all windows.

Operation 1 : Select "Save Project" of "file" in menu bar.

Operation 2 : Select saving folder and input file name. Click "OK".

M - 20

2. TABLE OPERATION AND CALCULATION

2.1 TABLE OPERATION

2.1.1 TABLE EDIT

Open New View, and add theme. Ex) "mon-ham_dsd.shp"

1) Start Editing

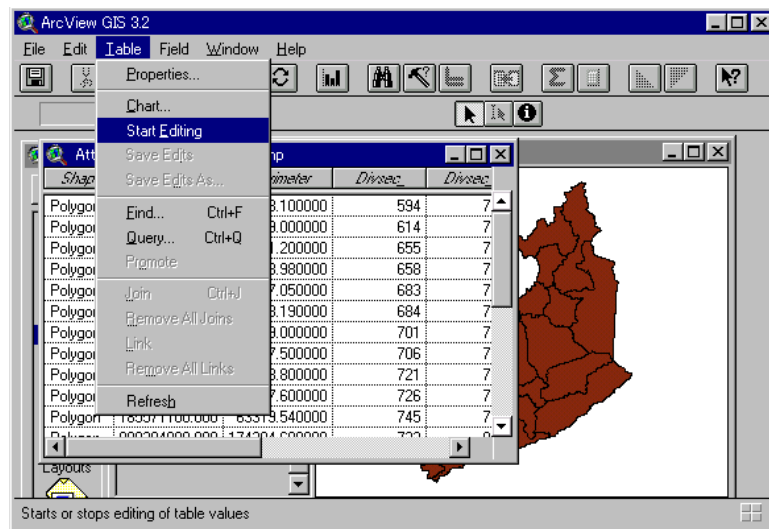Operation 1 : Select objective Theme, and display table.

Operation 2 : Select "Start Editing" of "Table" in Menu Bar

2) Input Data

If you want to change the value of cell, click "Edit" tool.   →

3) Stop Editing

Operation : Select "Stop Editing" of "Table" in tool bar.

* Changing the field name of the table is not possible.

2.1.2 IMPORT TABLE

The tabular database include coordinate field, which can be imported to ArcView.

(1) Import data in Text format

Operation 1 : Select "add table" of "Project" in Menu bar
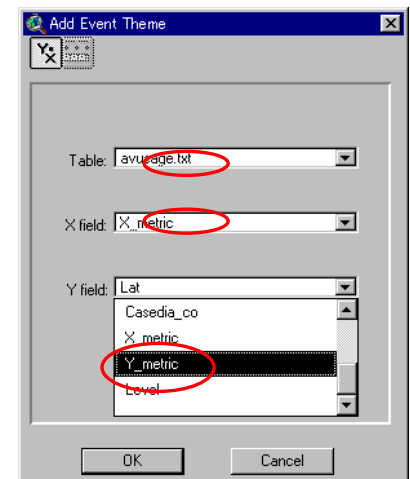
from Project Window.

Operation 2 : Select objective tabular data. Ex) "arcviewusage2.txt".

Operation 3 : Back to View window.

Operation 4 : Select "Add Event Theme" of "View" in menu bar.

Operation 5 : Select "avusage.txt" for "Table" field.

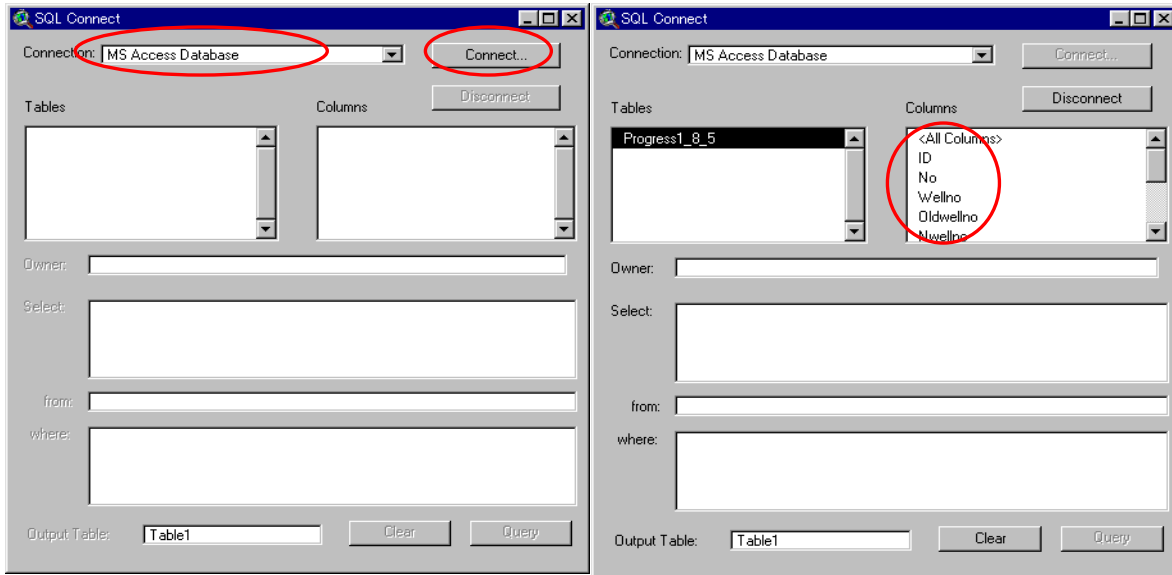Operation 6 : Select "X_metric" and "Y_metric" for X,Y fields. Click OK.

After these operations points will display in View window.

M - 21

(2) Import data in Access format

Operation 1 : Select "SQL Connect" of "Project" in menu bar from "Project Window".

Operation 2 : Select "MS Access Database" in "Connection" field, and click "Connect".

Operation 3 : Select objective database. ex) "AVUsage.mdb"

Operation 4 : Select import items from "Columns" window in SQL Connect. Ex) Wellno, X-metric, Y-metric

Operation 5 : Click "Query". Table1 will be open into "table" window.

Operation 6 : Follow "Operation 3 to 6" of text format for other operations.

(3) Create Shapefile

If you want to save imported data, You have to convert it as ArcView format (shape file).

Operation 1 : Select imported theme of view window

Operation 2 : Select "Convert to Shapefile" of "Theme" in Menu bar.

Operation 3 : Select saving folder and type the file name, and click "OK". Ex) TW1

2.1.3 TABLE JOIN

Two tables are able to integrate using field classified in same role. This function is used for obtain tube well data from well database.

Operation 1: Import two tables using "SQL Connect" from "WRB TW Database.mdb".

Output Table Name	Table Name	Items to Import
Table 2	WELL ID	WELLNO, X-metric, Y-metric
Table 3	WELL Construction	WELLNO, Total Depth, SWL, Final Yield

Operation 2 : Select "WELLNO" fields for key in both table.

Operation 3 : Display destination table (WELLID table), click "Join" icon in tool bar.

Operation 4 : Select "Add Event Theme" of "View" in Menu bar from "View" window.

Operation 5 : Select "Convert to Shapefile" of "Theme" in Menu bar. Ex) TW2
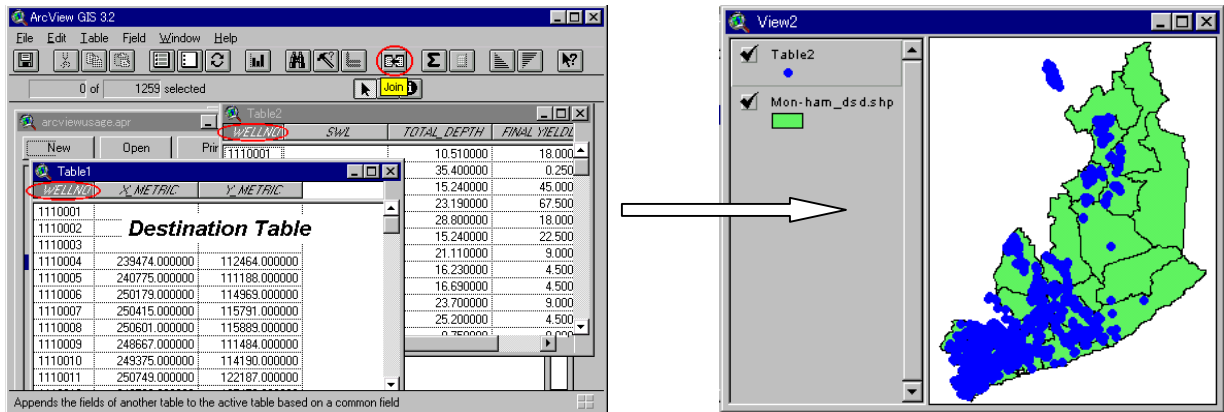
2.2 TABLE CALCULATION
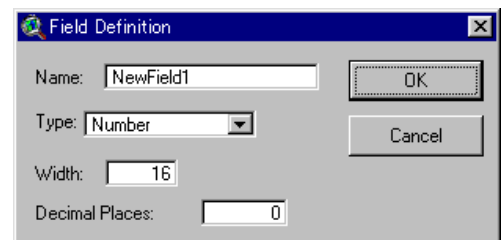
2.2.1 PREPARATION OF OUTPUT FIELD

Operation 1 : Display attribution table. Ex) "mon-ham_dsd.shp"

Operation 2 : Select "Start Editing" of "Table" in menu bar.

Operation 3 : Select "Add Field" of "Edit" in menu bar.

Operation 4 : Select field definition as below and click "OK".

Ex) Name : Areasqkm
    Type : Number
    Width : 16
    Decimal Place : 5

2.2.2 FIELD CALCULATE

Operation 1 : Select output field of attribute table

in "mon-ham_dsd.shp". Ex) Areasqkm

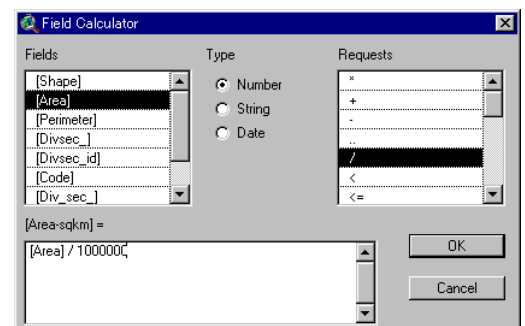Operation 2 : Select "Calculate" of "Field" in menu bar

Operation 3 : Making formula ([Area]/1000000).

Results will be placed in "Areasqkm" field

Reference Formula

a) Area of the poligon : [Shape].ReturnArea

b) X coordinate of the point : [Shape].GetX
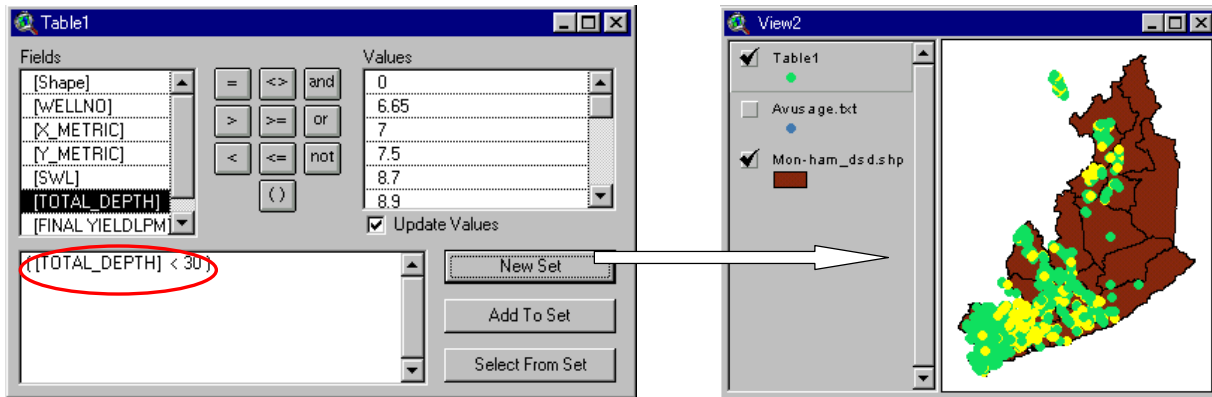

3. DATA SELECTION

3.1 DATA SELECTION BY FIELD VALUE

3.1.1 SELECTION USING QUERY

Ex) Selection of the wells that depth are less than 30m.

Operation 1 : Select tube well theme in "view" window

Operation 2 : Select "Query" of "Theme" in menu bar. The Query window will open.

M - 23

Operation 3 : Set formula of definition ([Total_Depth] < 30), and click "New Set"

The wells that depth is less than 30m will be selected as yellow color.

If you click "Clear Selected Feature" icon, selections are canceled.

3.1.2 SELECTION USING DEFINITION

Operation 1 : Select tube well theme on view window. ex)Table 2

Operation 2 : Select "Properties" of "Theme" in Menu bar. Theme Properties window will open.

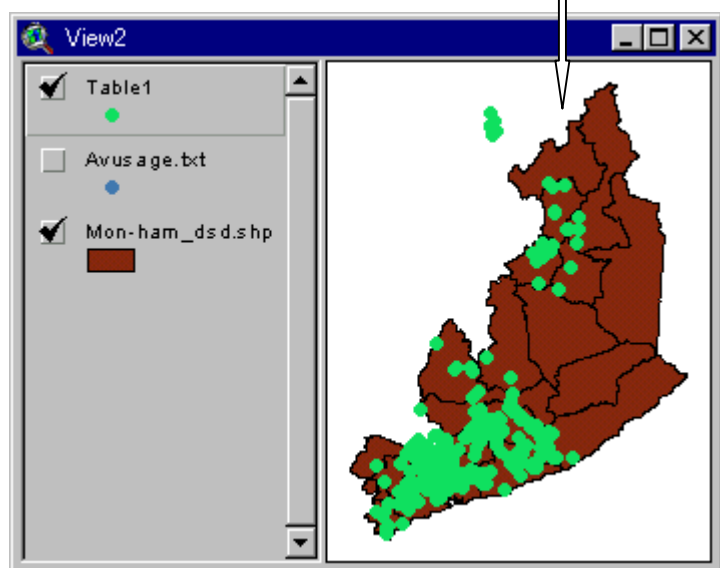Operation 3 : Click definition icon, then "Query Builder" will open.
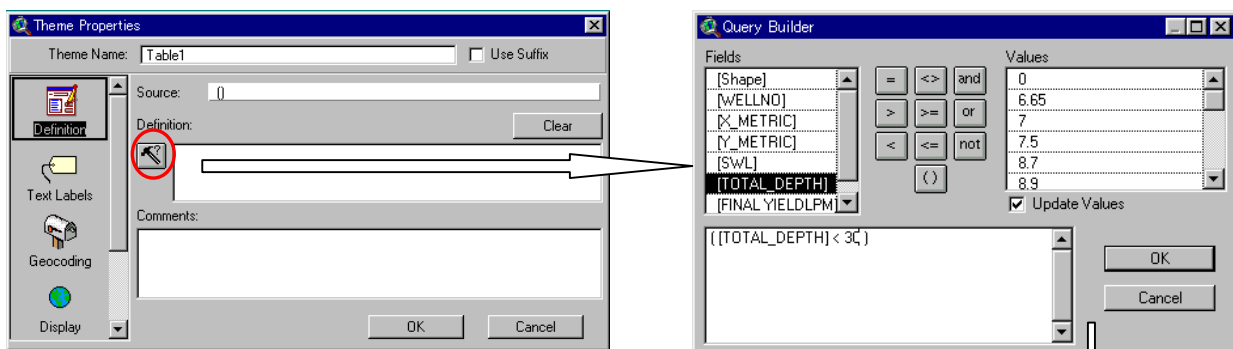
Operation 4 : Set formula of definition ([Total_Depth] < 30), and click "OK"

Defined wells are displayed as right

The points, which are not selected aren't indicated is peculiarity of this function.

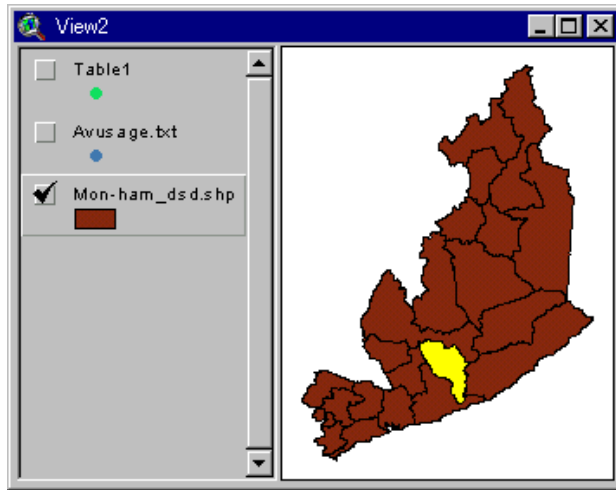You can cancel selection to click "clear" in "Theme Properties" window.

3.2 DATA SELECTION BY OVERLAY THEME

3.2.1 SELECTION USING FUNCTION OF "SELECT BY THEME"

Ex) Select wells in optional DSD area (using mon-ham_dsd.shp & TW2)

Operation 1 : Display view window which include boundary and Wells.
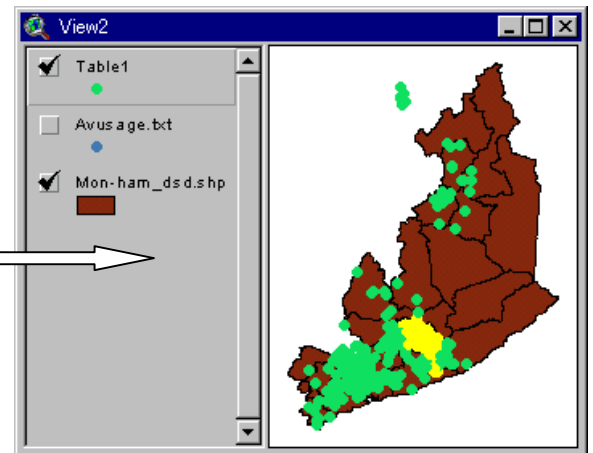
Operation 2 : Select objective DSD using "Select Feature" button.   →

Operation 3 : Select Tube Well Theme

Operation 4 : Select "select by theme" of "Theme" in Menu bar.

"Select By Theme" window will open.
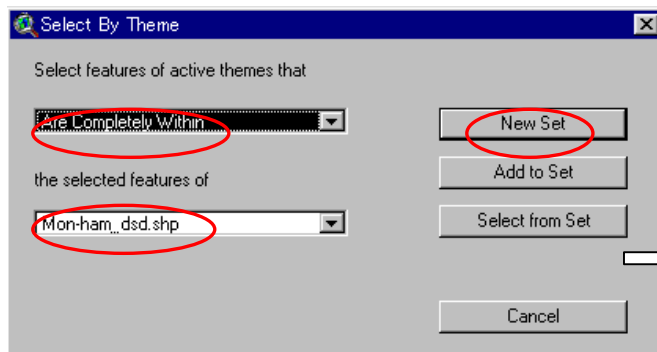
Operation 5 : Select "Are Completely Within" for first cell.

Operation 6 : Select "mon-ham_dsd.shp" for second cell, and click "New Set".

The wells located in selected area will be selected.

You can cancel selection to click "Clear Selected Feature" icon.

M - 25

3.2.2 SELECTION USING "GEOPROCESSING WIZARD".

"Clip Theme" function of "GeoProcessing" clips input theme by polygon theme,
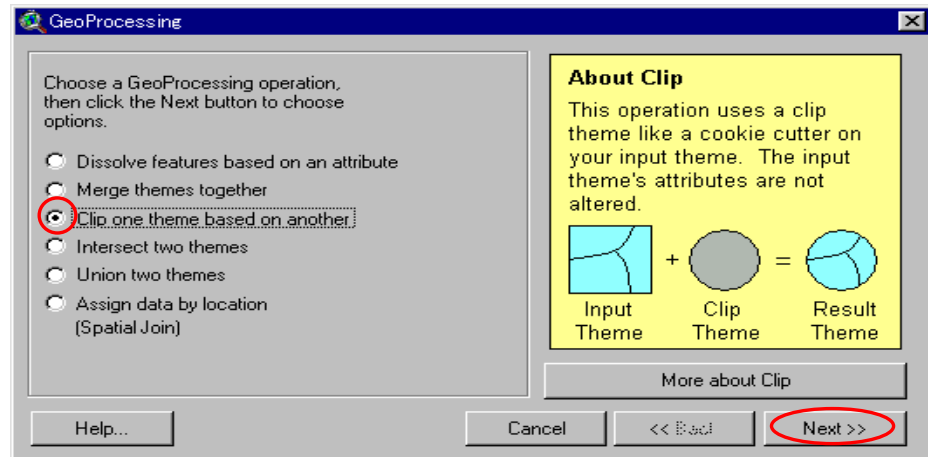
Operation 1 : Install "GeoProcessing" extension.

Operation 2 : Select "GeoProcessing Wizard" of "View" in Menu bar.

Operation 3 : Select "Clip one theme based on another", and click "Next".
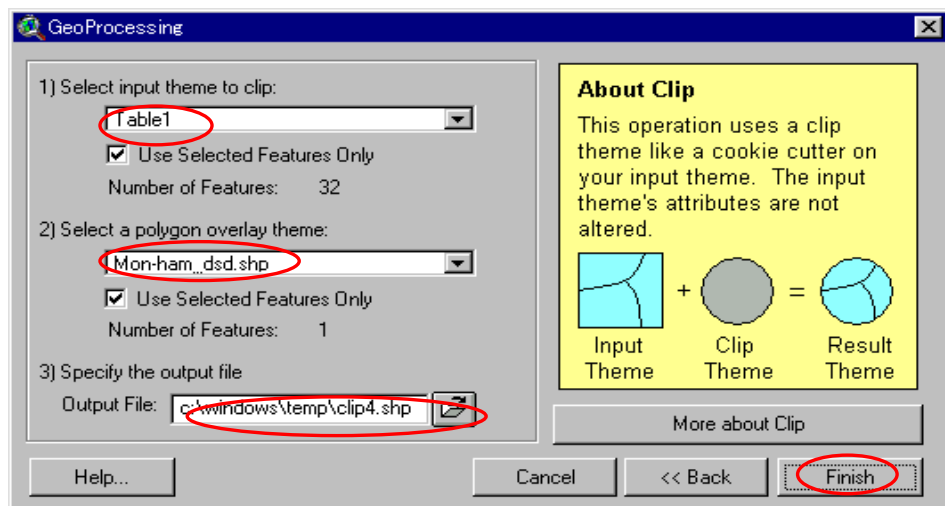
Operation 4 : Select input theme.

    Ex) TW2

Operation 5 : Select a polygon overlay theme

    Ex) mon-ham_dsd

Operation 6 : Select output folder and file name

    Ex) folder : arcviewusage

    File name : TWDSD

Operation 7 : Click "Finish".

You can get new feature as right window.

M - 26

4. UTILIZATION OF SELECTED FEATURE

4.1 EXPORT ATTRIBUTE TABLE
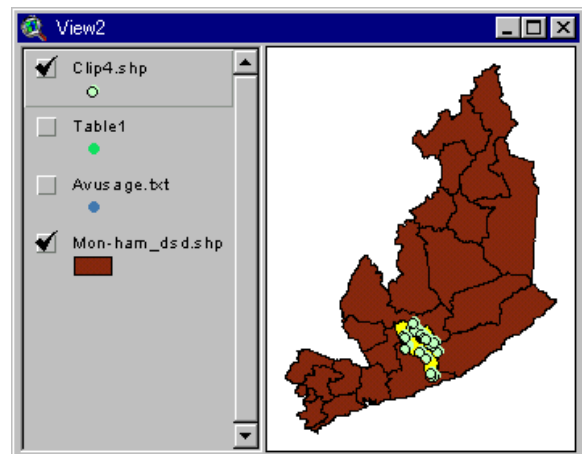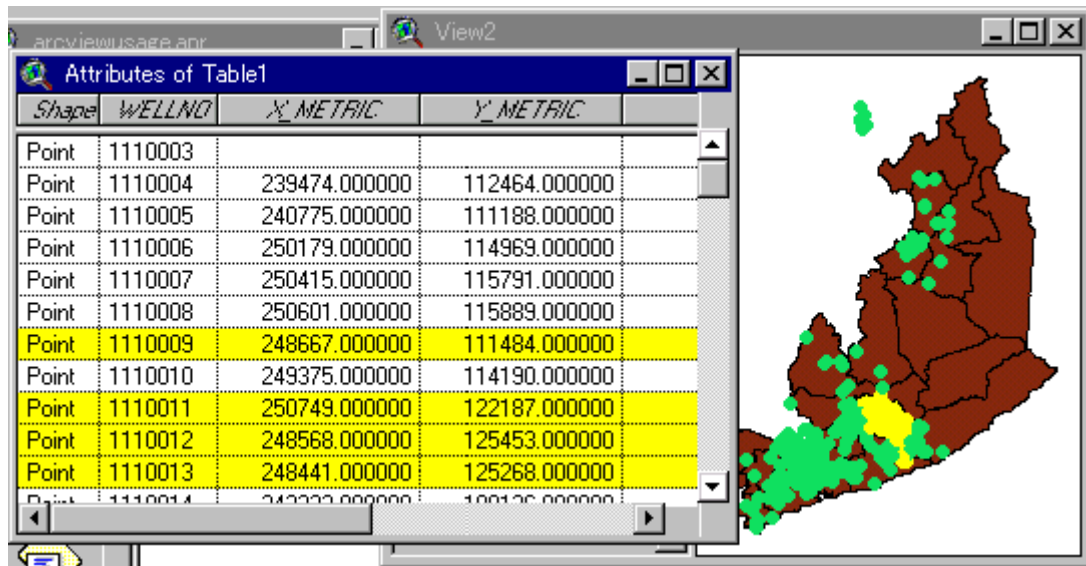
Operation 1 : Select objective theme and open attribute table.

Selected records are shown by color yellow.

Operation 2 : Select "Export" of "File" in Menu bar. "Export Table" window will open.

Operation 3 : Select export file format.

Operation 4 : Select output folder & input file name.

You can get table of selected records.

Statistical analysis can be done by using the export table.
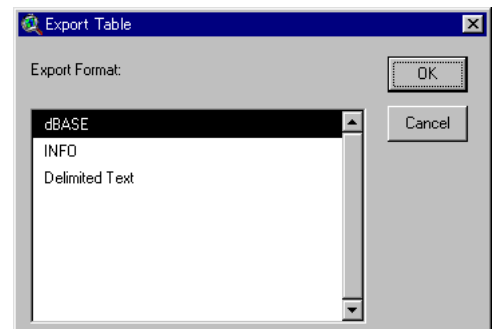
4.2 CREATE NEW SHAPE FILES

Selected feature can be created as new Shapefile.

Operation 1 : Select objective Theme on Views window

Operation 2 : Select "Convert to Shapefile" of "Theme" in Menu bar

Operation 3 : Select save folder and save name. Click "OK". Ex) file name : TW3

Operation 4 : Dialogue box will open after conversion. Click "Yes". New Theme will be added to the view.

4.3 CREATE CONTOUR

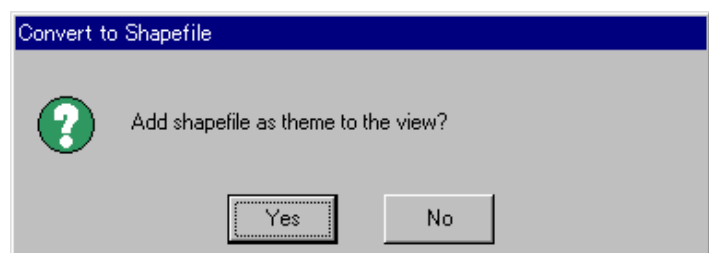You can create contour line using the point data which have the field of the numerical value.

Operation 1 : Select point theme on view window.

Ex) TW3.shp

Operation 2 : Select "Create Contours" of

"Surface" in Menu bar.

Operation 3 : Select output cell size manually.

Our map unit is meter.

Operation 4 : Select output area

Ex) Same as theme "TW3".

Rows and Columns are selected automatically.

Operation 5 : Click "OK"

"Interpolate Surface" window will open.

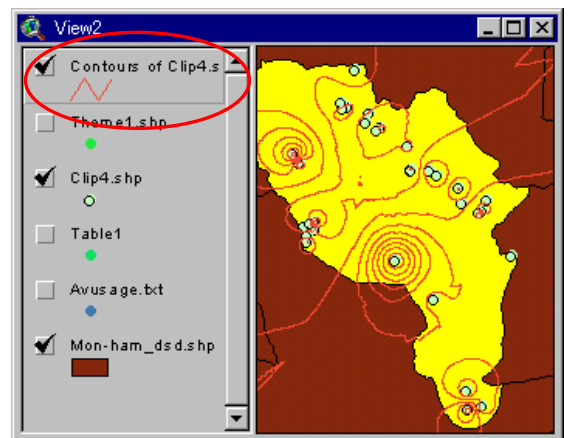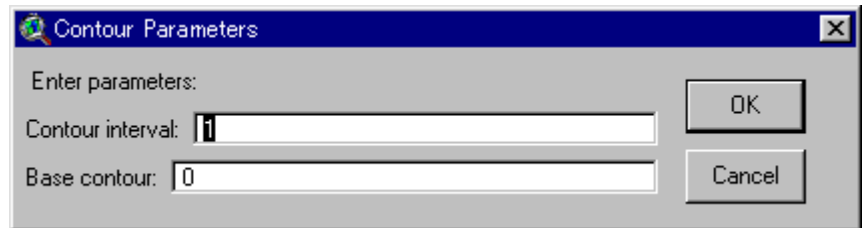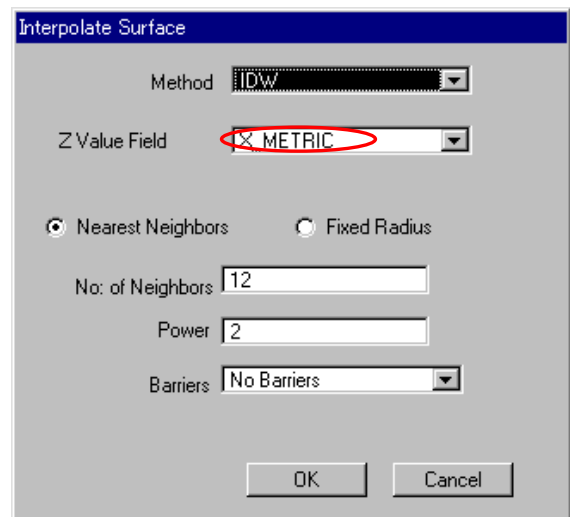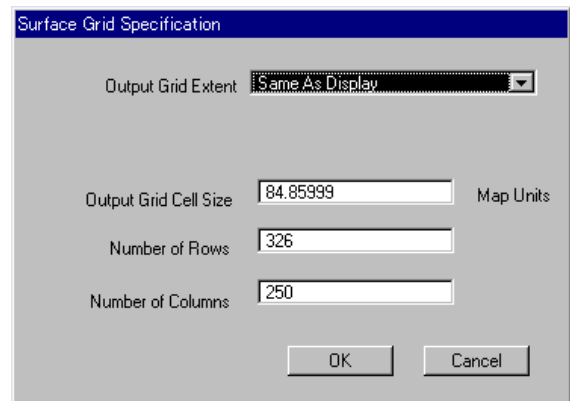Operation 6 : Select "Z value Field". Click "OK"

Ex) SWL

"Contour Parameters" window will open.

Operation 7 : Set "Interval" and "Base contour"

Ex) Interval : 1, Base Contour : 0

Operation 8 : Click "OK", then calculation will start.

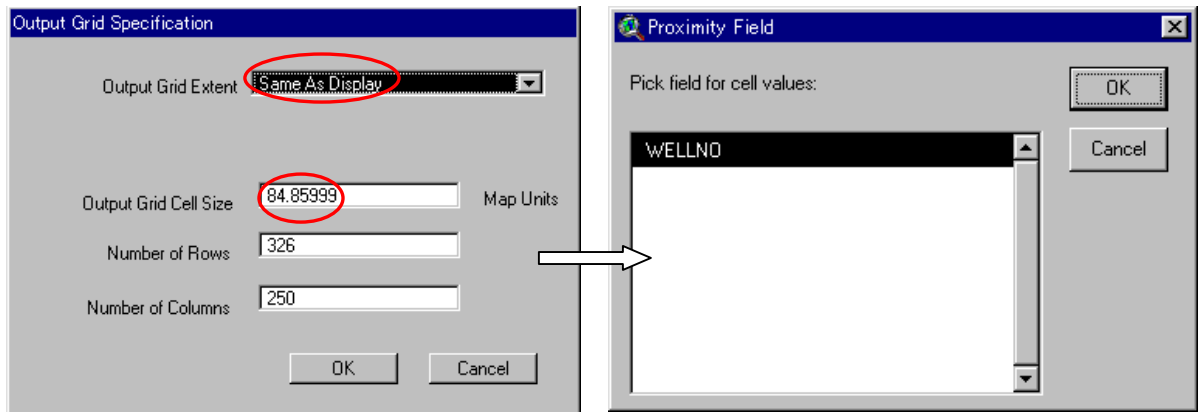Created contour lines are added in view window

M - 28

4.4 PROXIMITY ANALYSIS (THIESSEN DIVISION)

This analysis creates proximity area from point or line feature.

Operation 1 : Select point or line theme in view window. Ex) TW3

Operation 2 : Select "Assign Proximity" of "Analysis" in Menu bar.

"Output Grid Specification" window will open.

Operation 3 : Select output grid area and cell size.- Click "OK".

"Proximity field" window will be open.

Operation 4 : Select "Pick field for cell values" for identify output record. – Click "OK".
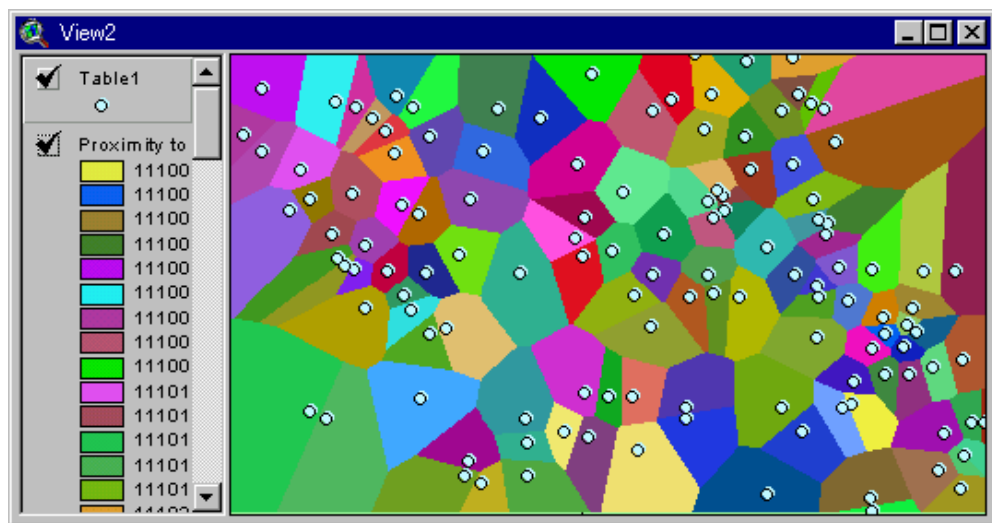
4.5 CREATE GRID

Grid theme is utilized for "Map Calculation". Procedure is similar to "Create Contour".

Operation 1 : Select point theme on view window. Ex) TW2

Operation 2 : Select "Interpolate Grid" of "Surface" in Menu bar.

"Output Grid Specification" window will open.

Operation 3 : Select output "Cell Size" manually in meter.

Operation 4 : Select "Output Grid Extent" for output area. Ex)same as "mon_ham_dsd.shp"

M - 29

Rows and Columns are selected automatically.

If you want to use "Map Calculation" function, you have to select same "Output Grid Extent" and same "Cell Size" for each grid.
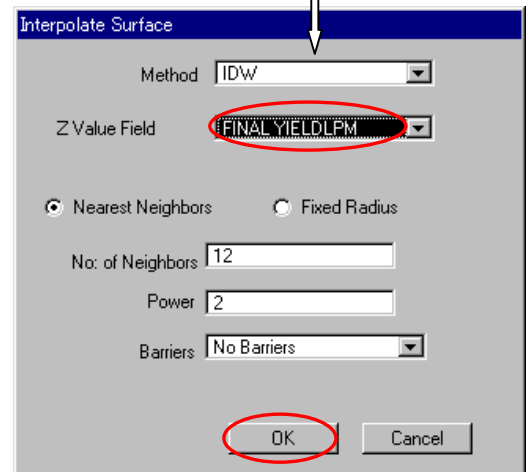
> Operation 5 : Click "OK"
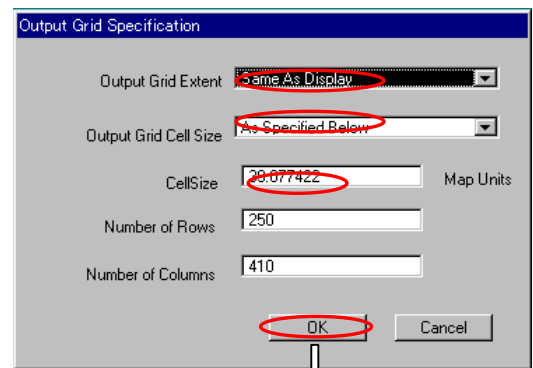
"Interpolate Surface" window will open.

> Operation 6 : Select "Z value Field". Click "OK"
>
> > Ex) FINAL YIELDLPM

After calculation, the result is exported in graduated monochrome color to the view window.
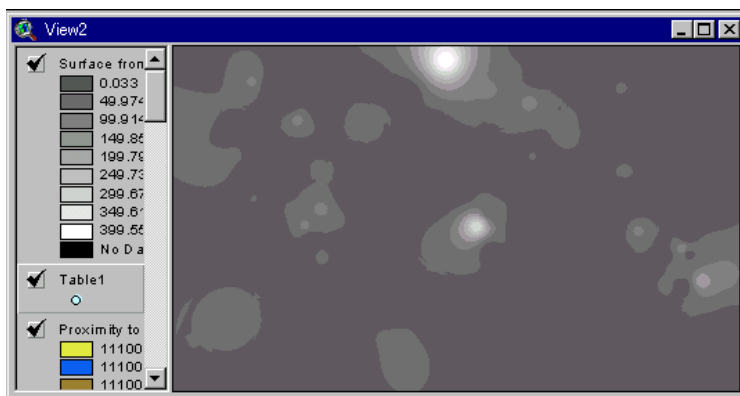
5. EVALUATION METHOD FOR RELATIONSHIPS OF THE MULTIPLE THEME USING "MAP CALCULATION"

"MapCalculation" is used for total evaluation of several themes. Grid theme is applied for Map Calculation.

5.1 PREPARATION OF GRID THEME

There are three methods to create Grid theme.

5.1.1 CONVERT TO GRID

All types of shape files can convert to Grid type. However, polygon theme is useful for map calculation.

> Operation 1 : Select polygon theme in view window.   Ex) mon-ham_dsd.shp
>
> Operation 2 : Select "Convert to Grid" of "Theme" in Menu bar.
>
> Operation 3 : Select saving folder and input file name and click "OK".
>
> > "Conversion Extent" window will open.

Operation 4 : Select "Output Grid Extent" and Cell Size. Click "OK"

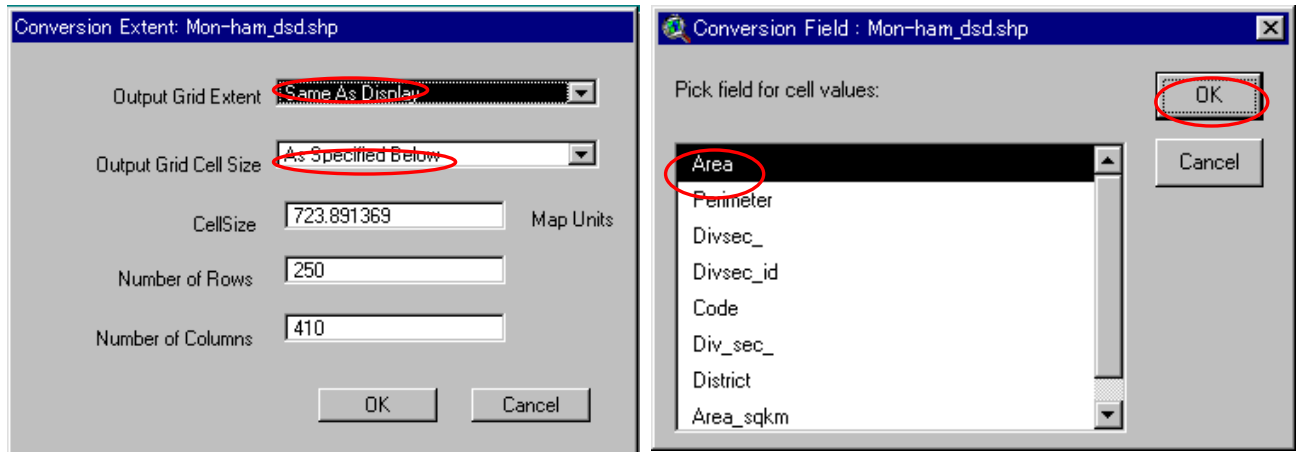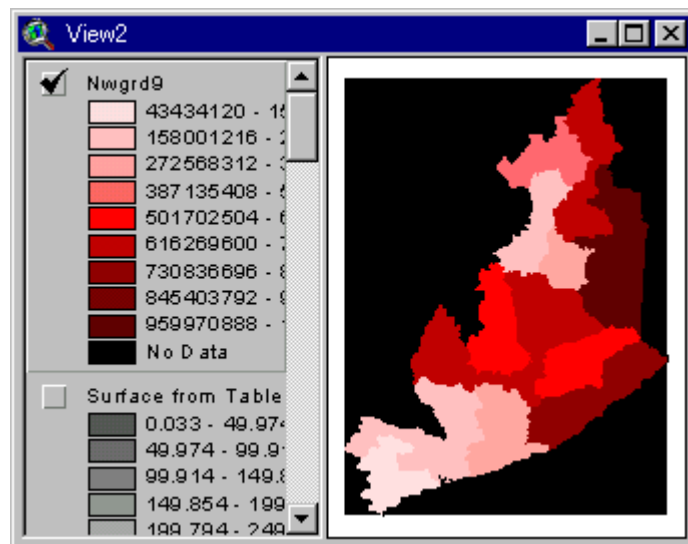| Conversion Extent: Mon-ham_dsd.shp	
Output Grid Extent	Same As Display
Output Grid Cell Size	As Specified Below
CellSize	723.891369 Map Units
Number of Rows	250
Number of Columns	410

OK   Cancel

Conversion Field : Mon-ham_dsd.shp

Pick field for cell values:

- Area
- Perimeter
- Divsec_
- Divsec_id
- Code
- Div_sec_
- District
- Area_sqkm

OK   Cancel

"Conversion Field" window will open.

Operation 5 : Select "Pick field for cell values".   Ex) Area

Converted Grid theme will be shown in view window.

View2

Nwgrd9
- 43434120 - 15
- 158001216 - 2
- 272568312 - 3
- 387135408 - 5
- 501702504 - 6
- 616269600 - 7
- 730836696 - 8
- 845403792 - 9
- 959970888 - 1
- No Data

Surface from Table
- 0.033 - 49.974
- 49.974 - 99.91
- 99.914 - 149.8
- 149.854 - 199.
- 199.794 - 249.

5.1.2 ASSIGN PROXIMITY----- REFER TO 4.4

5.1.3 INTERPOLATE GRID----REFER TO 4.5
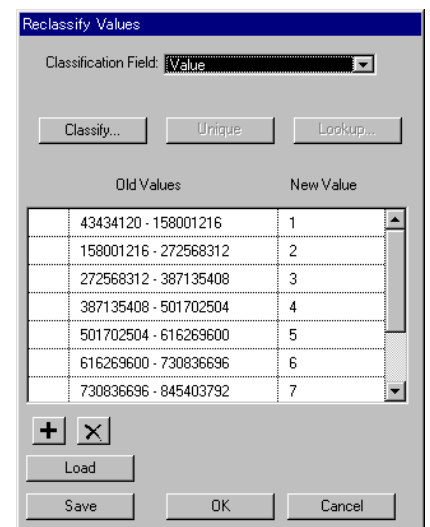
5.2 RECLASSIFY

Before "Map calculation", classification value change to integer number using "Reclassify" function.
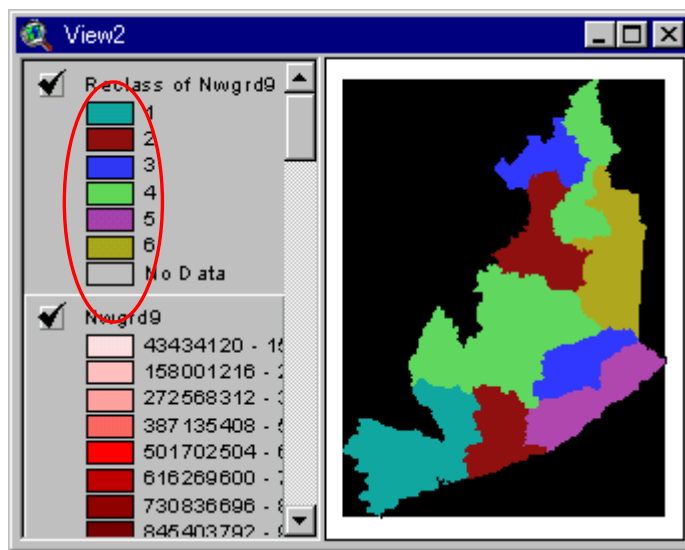
Operation 1 : Select objective Grid theme in view window.

Operation 2 : Select "Reclassify" of "Analysis" in Menu Bar.

"Reclassify Values" window will open.

Operation 3 : Input "Old Values" and "New Values". Click "OK".

Reclassify Values

Classification Field: Value

Classify...   Unique   Lookup...

Old Values	New Value
43434120 - 158001216	1
158001216 - 272568312	2
272568312 - 387135408	3
387135408 - 501702504	4
501702504 - 616269600	5
616269600 - 730836696	6
730836696 - 845403792	7

+ X
Load
Save   OK   Cancel

M - 31

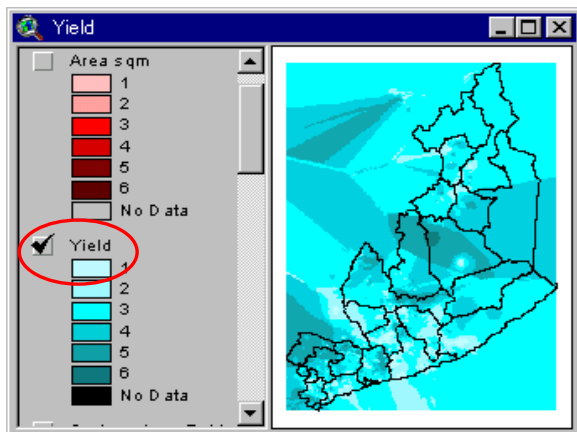Operation 4 : Convert to Shapefile as "Area sqkm"

5.3 MAP CALCULATION

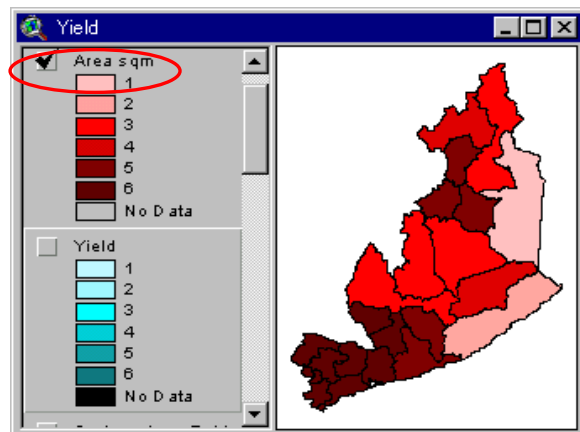Two or more themes can be overlayed to make a new theme.

Operation 1 : Prepare two or more grid themes in the same view window.

Theme 1 : Create yield grid using TW2 theme. And Reclassify.

Theme 2 : Area sqkm is created in Subsection 5.2.
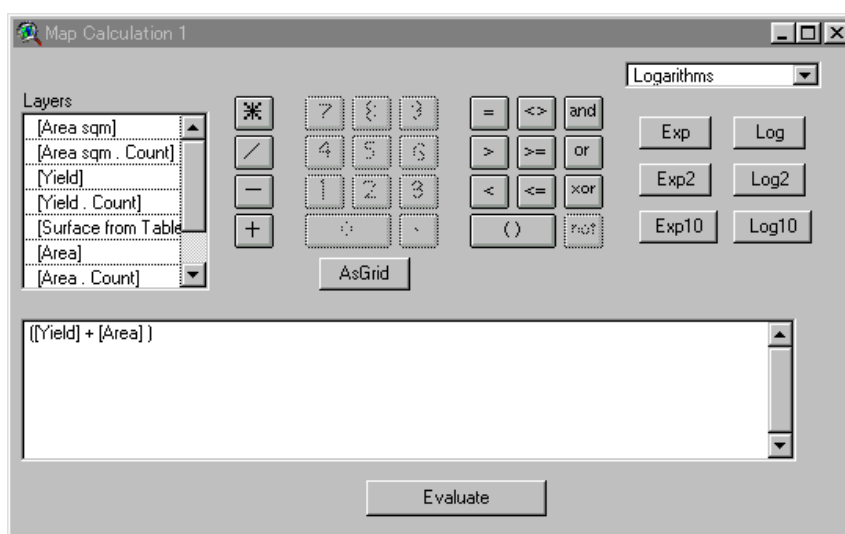

ex) Yield : High value show high well yield (**A**).   Area : High value show small DSD (**B**)

If calculate (**A** value + **B** value), high value area indicate the area which quantity of water per unit area is large.

Operation 2 : Select "Map Calculator" of "Analysis" in Menu bar.

"Map Calculation" window will open.

Operation 3 : Input formula of calculation into the bottom window.

    Ex) ([Yield] + [Area])

Operation 4 : Click "Evaluation"

The theme "Map Calculation1" will be added in the view window.