



4.05.01 CLUP Base Map Components & Preparation

A Base Map displays the fundamental data set (e.g. barangay boundaries, roads, schools, etc.) that is used to make sector data more meaningful. At a glance, a good Base Map should easily answer the question that we ask (“Where?”) when we look at a Base Map. A user should be able to relate the roads, landmarks and all other places and features found in the Base Map to the mental pictures he sees when a user looks at a map. Displaying or analyzing the base data with the sector data assists the user in making more effective and well-informed decisions.

The content of a Base Map depends on the user of the map and his intended use. The GIS Cookbook deals with the Base Map used for CLUP preparation and does not tackle the other base map as defined by other entities. The base map shall serve as a template for different mapping requirements where all other thematic maps may be overlaid for analysis. Thus, it shall aid the planners in coming up with the CLUP. It is important for the mapmaker and also the target custodians of these data to understand the procedural steps in the production of base maps, the hierarchy of the sources of data and some understanding about the data.

This Chapter will deal with the concepts and generic procedures in preparing the GIS base map needed for CLUP. The following are the three major items to be discussed:

1. **Components of an appropriate base map** – This includes a list of the base map features needed to be captured, sources for these data, important components of the base map output and their description.
2. **Procedural steps in the GIS base map preparation** – These are the general steps in converting your data into digital form. It shall guide us where to look for our data, what to do with this data, and what important things to consider when capturing data for the GIS base map.
3. **Steps in securing Help for the base map preparation** – The LGU shall have to make a self-assessment on their capability to produce the first version of a GIS base map. Otherwise, help from the government or a private entity to prepare the base map may be secured using the following procedure below. In this case, the city/municipality shall acquire/provide the primary or secondary data for the administrative boundary as shown on Table 2 that further shows the hierarchy of secondary data to be captured.

CLUP Base Map Features and Components

A base map is characterized by the information reflected on it. The information needed for the CLUP Base map, are the features listed below. In building the CLUP GIS, there are two forms of Base Maps. The first one is in digital form composed of many different layers of digital files for each feature of the base map. This is the build-up form for the base map as a result of converting the different sources of features of the base map. Once all of the required features are converted into digital form, a printed version is created, and this is the second form of the base map.

The layout of the printed base map should have all the considerations and elements discussed in this chapter employed in its design. Both forms of the base map (digital



and printed versions) should have the same features found, while the components will have a different form, and most will be found on both (North Arrow and tick Marks are usually not shown in the digital version). The components discussed in this chapter deals on how they should be in the printed form.

Base Map Features

The following features are recommended to be included in the base map (the objects in brackets are useful but might be difficult to capture in the first version of the Base Map): For consistency, it should be observed that the base map features are named in singular.

Table 1: Base Map Features

Base Map Features	Source in priority order:
Administrative	
Provincial Boundary	Land Registration Authority (LRA) Provincial Index Map (PIMS), National Mapping and Resource Administration (NAMRIA) Administrative Map
Municipal Boundary	Refer to Table 2: Hierarchy of Secondary Data and Source , Items 1-8
Barangay Boundary	Refer to Table 2: Hierarchy of Secondary Data and Source ,, Items 3,4 and 8
(Municipal Water Boundary)	RA 8550 (The Philippine Fisheries Act of 1998), NAMRIA Coast and Geodetic Surveys, Land Management Bureau (LMB)
Natural	
Shoreline, River, Stream, Creek	LGU, Topomap (NAMRIA)
Dam, Pond, Lake, Sea	LGU, Topomap (NAMRIA)
Natural Landmark	LGU, Topomap (NAMRIA)
(Other natural imposed barrier that obstructs access, like steep slope, etc.)	LGU, Topomap (NAMRIA)
Man Made	
Road: National; City/Municipal; Barangay, (Trail)	LGU, Topomap (NAMRIA)/



Base Map Features	Source in priority order:
Railway	LGU, Topomap (NAMRIA)
Airport	LGU, Topomap (NAMRIA)
Seaport/Harbor	LGU, Topomaps (NAMRIA)
Built-Up area in a generalized manner	Satellite Imagery, Aerial Photograph, City-Proper definition by LGU
City/Municipal Hall	LGU
Barangay Hall	LGU
Other landmark such as a church, or other building which is well known to citizens	LGU
Names	
Name of Surrounding Provinces (if applicable)	LGU, NSO, Administrative Map (NAMRIA)
Name of Surrounding Municipality	LGU, Administrative Map (NAMRIA)
Name of Barangay	Barangay Boundary Index Map (BBIM) LMB, Tax Map (LGU)
Name of Major River, Lake, Dam and Bay	LGU, Topomap (NAMRIA)
Name of Major Road	LGU, Topomap (NAMRIA)
Optional	
(Contour Lines)	Topomap (NAMRIA)
(Cadastral Maps)	Cadastral Maps (LMB)

Output CLUP Base Map Components

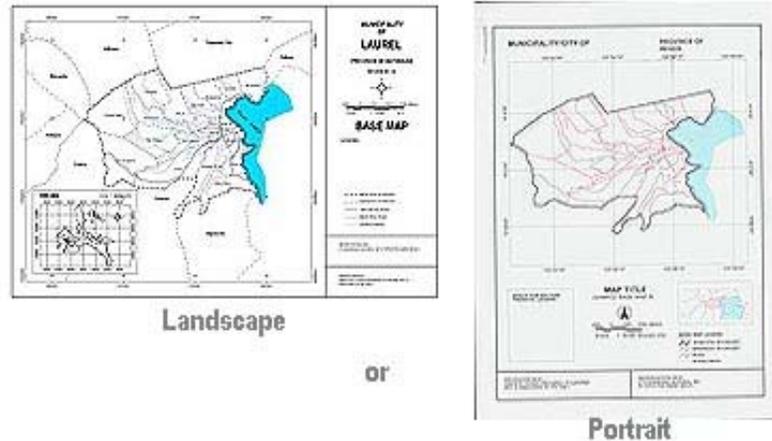
An important output of the CLUP GIS is the output maps in printed form. This printed Base Map will be the form used and circulated more often than the digital format. It is important that the printed maps have a uniform format and appropriate contents to make them more useful for the user.



Keys to Creating the CLUP Base Map

This component shows the important considerations in printing the base map for the CLUP document.

First is to analyze the size and shape of the LGU in relation to the presentation format:



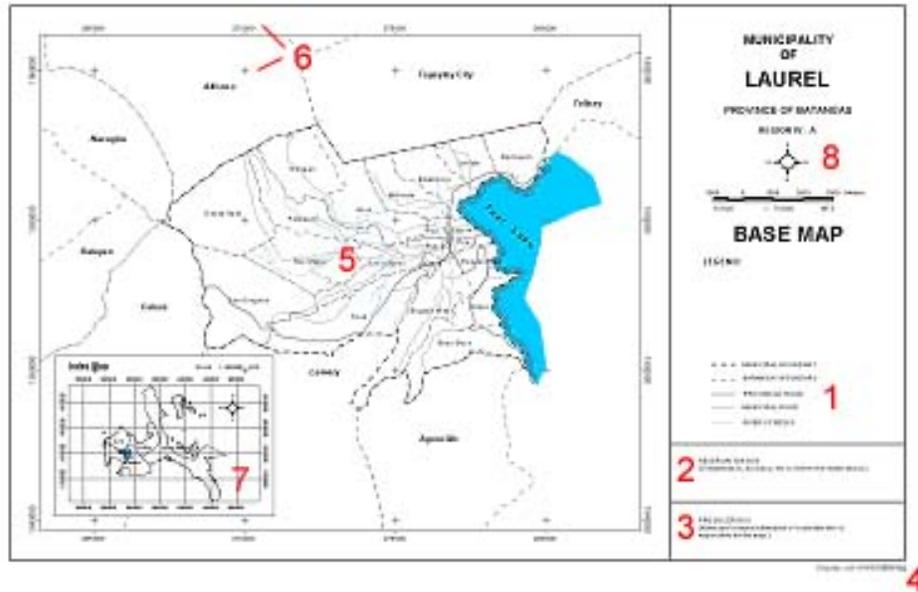
In most cases the CLUP maps will end up in a report, in which case it is important to take note of the following:

1. A printed map smaller than A3 is not recommended. An A3 printer is recommended in the hardware set-up, which is an excellent peripheral for graphics reproduction. An A3 format will in most cases be sufficient to present thematic maps and it may easily be folded in an A4 report.
2. Fonts and symbols should be readable from A3 to A0.
3. If symbols cannot be distinguished properly in A3, a simplified version may be needed. Use recognized scales, e. g. 1: 100,000 instead of 1: 97,361. Use increments of 10,000.
4. Color is used widely in the GIS environment. However for reproduction purposes a black and white version of the color codes will be included in the toolbox. To simplify and unify the preparation of the Integrated Development Plan (IDP), mapping templates have been prepared and are found in the Toolbox: Chapter 6. There is one template for LGUs that are conveniently framed by a landscape format (most common) and another for a portrait layout.

Elements of the Output Base Map

An understanding of the elements of the CLUP base map is essential. These elements shall not only be used for the base map but shall also apply to all maps that will be printed from the GIS.

The layout of the Base Map consists of the following elements (the numbers shown in red):



1 Legend

The order of symbols should be as shown in the Base Map features Table. In most cases the Base Map will form the background to thematic/sector information and the Base Map legend should be placed under the thematic legend. It should also be noted that political boundary disputes should be reflected.

2 Reservations

In many cases there will be reservations to the completeness, accuracy, source of map, date of compilation, etc. to inform the reader about. Consequently, there should be a frame where this type of metadata can be inserted.

3 Producer

Name and contact information of the custodian who is responsible for the map should be found in case the reader requires more information about the map.

4 Date of Printing

The date of preparation shall be found for the user to be able to evaluate the timely accuracy.

5 Map Window

The map window shall occupy the largest area of the map.

6 Graticules and Tick Marks

Corresponding Tick Marks and Graticules with coordinates (geographic or plane) shall be applied on the map window frame for reference.



7 Index Map Window

Sometimes there is a need for an Index Map. Normally there is always an 'empty corner' in the Map Window, where the small Index Map can be framed. The Index Map should contain the Provincial Map marking the area of the City/Municipality for the Municipal Base Map or the City/Municipal Map marking the area of the Barangay, as the case may be.

8 North Arrow, Scale, Datum and Projection

The scale of the map will be presented in two ways: numeric such as 1: 50,000 and a scale bar in metric unit (e.g. meter). Projection and datum are usually placed below the scale bar.



An outdated land-use map. An updated version is found in the GIS but was not used

Note

After reviewing a number of maps in existing CLUPs, it has been observed that special attention must be paid in checking whether the scale bar and numeric scale is in accordance with the map scale. The GIS software sometimes fails to automatically adjust the scale information when enlargement or reduction is made. The producer of the map should ensure that the numeric scale and scale bar of the layout is adjusted when enlargement or reduction is made.

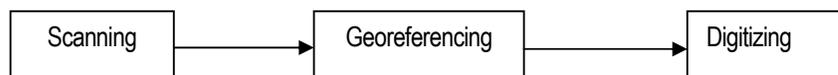
It has been observed that in most LGUs that have a working GIS, very few maps have been displayed. Besides being included in the document, there has been very limited distribution among stakeholders, as manifested by the absence of these maps in their

offices. Though the data and large size printers are available, no maps are shown on walls of the municipal offices. This reveals the lack of appreciation and the will to disseminate these maps. In order to popularize the use of spatial information in planning, copies should be printed and displayed prominently on the walls. If the producer is concerned about the accuracy of the map or plan, the word 'draft' can always be applied.

Steps in Preparing a GIS Base Map for CLUP

The following steps show the generic procedure in the preparation of a GIS Base map showing the various data sets which the LGU should acquire. Data may be in two forms, the technical description and the paper map.

The capture of data from the technical description involves a more direct step of encoding the numerical data into the computer that is then converted to points or shapes. The capture of data from paper maps involves three steps described below:



For data captured using GPS, scanning and georeferencing will not be necessary, and will be processed digitally.



It is also recommended to use the Projection and Datum of the source during Georeferencing. Re-projection should be done on the digitized layer or output vector file.

When combining different layers from these different sources, it will be noted that there will be discrepancies in dataset even if it pertains to the same features. Roads digitized from Cadastral Maps will not coincide with the same road taken from a NAMRIA Topomap, even if these layers were set to have the same projection and datum. If corrections or adjustments will be done either by the LGU or a consultant, documentation for the adjustments should be made and attached to the metadata. Any errors or discrepancies found on the source maps should be reported and consulted to concerned agency.

The implementation of PRS 92 should also be considered when preparing the base map. LMB and NAMRIA, which are listed as the sources for administrative boundaries, are now implementing and converting their dataset into PRS 92. If the dataset for an LGU is already in PRS 92, they should ask assistance from Geodetic Engineers or concerned agencies like NAMRIA so that their other datasets can also be adjusted accordingly.

Administrative Boundaries

Data for administrative boundaries may come in two forms, technical descriptions and paper maps. The hierarchy of secondary data is described in the table below. This is to give the user a better understanding of the data that they have in relation with other data. The hierarchy considers first the legal implication of the administrative boundary source and then the accuracy. It means that the Proclamation or Legislation, whether considered erroneous or not, should have more weight as a boundary source unless updated by legal proceedings or procedures. Other sources available for the LGU, like NAMRIA topomaps, should have less weight, compared to the Proclamation. The output base map is not intended for Internal Revenue Allocation (IRA) purposes. Boundary conflicts should be captured and saved in a separate layer and should be consulted or settled with concerned agencies.

Table 2: Hierarchy of Secondary Data type & Source

Secondary Data Type	Source
1. Legislation or Proclamation creating the City/Municipality with approved survey and technical description	Land Management Bureau (LMB), National Archives or Malacañang Library
2. Legislation or Proclamation creating the City/Municipality without approved survey but with technical description	LMB, National Archives or Malacañang Library
3. Approved Political Boundary Survey (PBS)	LMB, Department of Environment and Natural Resources - Regional Office Land



Secondary Data Type	Source
	Management Sector (DENR-LMS)
4. Municipal Boundary Index Maps/Barangay Boundary Index Maps (MBIM/BBIM), Cadastral Maps	LMB, DENR-LMS
5. Land Registration Authority (LRA) Municipal Index Maps/Provincial Index Maps (MIMS/PIMS)	Land Registration Authority (LRA)
6. Land Classification (LC) Maps	National Mapping and Resource Information Agency (NAMRIA)
7. NAMRIA 1:50,000 Topographic Maps. Use larger scale (1:5,000 1:10,000, 1:25,000) planimetric or topographic map if available.	NAMRIA
8. NSO Data, Tax map, Data that the LGU provide for IRA	National Statistics Office (NSO), Local Government Unit (LGU)

Capture Data from Technical Description/Coordinates

Technical Descriptions of boundaries may be in the form of Line Bearing or Coordinate (Geographic or Grid). Data in this form may come from items 1, 2, or 3 of The Hierarchy of Secondary Data Type and Sources. These may be actual survey data for the boundaries or the ground coordinates for the boundary monuments. Positional values or coordinates of ground control points used in the map must be acquired from the LMB or DENR Regional office, if the data is in line-bearing form or local coordinate system. Any values in local coordinate system should be converted into grid coordinates. Request the boundary computations with points already given in plane coordinates.

POINT	LATITUDE	LONGITUDE	
MBM-19, Cad-299-D,	14 deg 29 min 16.2 sec N.,	120 deg 58 min 53.7 sec E.,	in the Coastal Road
thence to MBM-18, Cad-299-D,	14 deg 29 min 12.5 sec N.,	120 deg 59 min 01.4 sec E.,	on Quirino Ave.
thence to MBM-17, Cad-299-D,	14 deg 29 min 08.9 sec N.,	120 deg 59 min 06.3 sec E.,	
thence to MBM-16, Cad-299-D,	14 deg 29 min 07.4 sec N.,	120 deg 59 min 12.7 sec E.,	
thence to MBM-15, Cad-299-D,	14 deg 28 min 58.7 sec N.,	120 deg 59 min 23.6 sec E.,	
thence to MBM-14, Cad-299-D,	14 deg 28 min 39.8 sec N.,	120 deg 59 min 23.1 sec E.,	
thence to MBM-13, Cad-299-D,	14 deg 28 min 35.6 sec N.,	120 deg 59 min 37.9 sec E.,	
thence to MBM-12, Cad-299-D,	14 deg 27 min 31.5 sec N.,	121 deg 00 min 00.7 sec E.,	
thence to MBM-11, Cad-299-D,	14 deg 27 min 16.7 sec N.,	121 deg 00 min 29.7 sec E.,	
thence to MBM-10, Cad-299-D,	14 deg 26 min 58.4 sec N.,	121 deg 00 min 45.1 sec E.,	
thence to MBM-9, Cad-299-D,	14 deg 26 min 19.1 sec N.,	121 deg 00 min 59.7 sec E.,	
thence to MBM-8, Cad-299-D,	14 deg 26 min 14.4 sec N.,	121 deg 01 min 22.9 sec E.,	
thence to MBM-8, MCada-393-D,	14 deg 25 min 45.3 sec N.,	121 deg 01 min 15.3 sec E.,	
thence to MBM-7, MCada-393-D,	14 deg 24 min 15.3 sec N.,	121 deg 00 min 39.3 sec E.,	
thence to MBM-6, MCada-393-D,	14 deg 23 min 28.9 sec N.,	121 deg 00 min 38.2 sec E.,	
thence to MBM-5, MCada-593-D,	14 deg 22 min 10.2 sec N.,	121 deg 00 min 31.5 sec E.,	
thence to MBM-4, MCada-593-D,	14 deg 21 min 02.5 sec N.,	121 deg 00 min 23.6 sec E.,	
thence to A,	14 deg 21 min 07.5 sec N.,	121 deg 00 min 13.4 sec E.,	

LRA Form No. PIA
30 March 1978

TIE LINES

FROM B.L.M. I. SAN FELIPE
NERITO CORNER I.

LOTS	BEARINGS	DISTANCES
S - A	N 72° 30' E	1936.86M
B	N 72° 30' E	1936.86 "
C	N 72° 30' E	1959.54 "
D	N 72° 30' E	1959.54 "
E	N 72° 43' E	1937.39 "
F	N 72° 43' E	1937.39 "
G	N 72° 42' E	1960.74 "
H	N 72° 42' E	1960.74 "
I	N 72° 31' E	1922.44 "
BDRY.	N 72° 12' E	1972.28 "

Examples of data in the form of Technical Description



For Line Bearing/Coordinate

For Line Bearing data, CAD software is popularly used but there are some GIS software that have utilities for capturing this type of data. Use the plotted version of the map if line bearing technical description is only accurate up to the nearest minute. Most line bearing TDs are rounded to the nearest minute and will not normally close. If only line bearing is available, do boundary computation and distribute the error of closure. If this is not possible seek assistance from the source agency to convert these into grid coordinates, or from a Geodetic Engineer to ensure that the correct procedure has been applied to the adjustments.

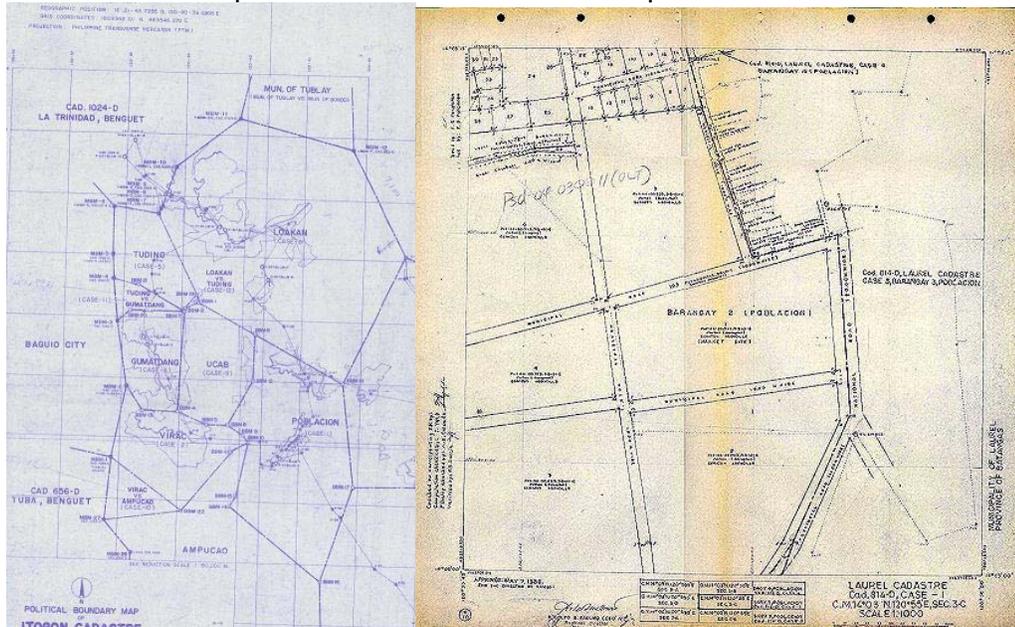
Methods differ from software to software. **Refer to toolbox...**, for the example using GIS tools. For coordinate dataset, the following procedures should be followed:

- 1) Encode into GIS software the Technical Description. Depending on the software used, the following steps may be performed.
 - a) Create a table (e.g. spreadsheet, text editor, database) having fields for Point Name, Latitude and Longitude for Geographic Coordinates or Northing and Easting;
 - b) Encode the values into the table;
 - c) Save as Text (Tab delimited) file;
 - d) Import the text file into the GIS software and plot the data.
- 2) Create the corresponding line and/or polygon feature from the encoded data depending on the software used
- 3) In case there are gaps, overlaps or disfigured polygons perform the following steps:
 - a) Re-check the values used with the original data. Re-encode and perform appropriate procedures in **steps a and b** if errors in encoding are found.
 - b) If no errors are found or the same discrepancies are still found on the output map, perform **steps d and e** with the original data.
 - c) Copy the data and rename it to create a new file. Perform appropriate corrections in this dataset but include in the metadata and all reservations where these data are used that these are adjusted outputs and indicating the source and basis of adjustments in the metadata.
 - d) Inform the appropriate agencies for these errors for possible inquiries and corrections.
- 4) Label or encode the feature name as they are being digitized. Save into different files following the recommended naming convention.
- 5) Create metadata for each feature type created.



Capture of Data from Paper Maps

This procedure refers to paper maps with plotted administrative boundaries from sources listed as items 4,5,6 and 8 of Table 2. They are the plotted paper maps of the boundaries from surveys. These datasets usually come in monotone color (black ink in white paper or blueprint). If the map also includes technical description/coordinates, refer to section 1 'Capture data from Technical Description'.



Sample Political Boundary Survey and Cadastral Map

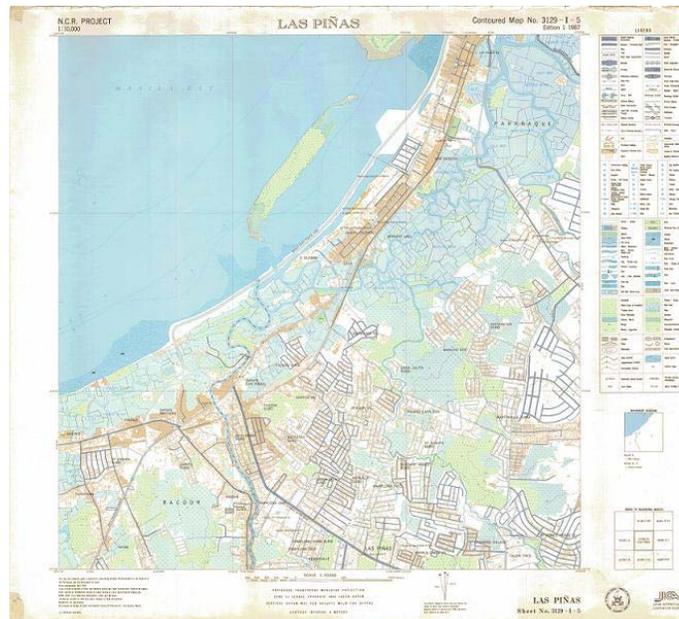
1. Inspect the map. Make sure that it contains tick marks with coordinates. There should be at least 4 tick marks with coordinates, but more should be identified if possible. Make sure that the tick marks selected are visible.
2. Get familiarized with the projection and datum of the maps. For example, cadastral maps are in PTM (or PRS 92 if fully established) and in Luzon Datum with zone depending on the Province. See for example [Chapter 4.21.07](#) for technical data on these items.
3. Prepare the maps for scanning. Smoothen all folds and crumpling. Fix and align torn out portions if any.
4. Scan the map. Refer to Chapter 4.21.04 for sample procedure and recommended settings.
5. Check for image distortions and clarity of map features and make sure that the tick marks or reference points to be used are clearly visible on the scanned image. Rescan if necessary.
6. Save the scanned image in JPEG format with at least 30% compression in grayscale.
7. Georeference the image. A minimum of four tick marks is required but use all possible tick marks as map control points. See to it that the points are evenly distributed. See Chapters 4.21.05 (about georeferencing) and 7.03.01 (tutorial).



8. Crop the image. Remove areas outside the neat lines of the map with the software if possible. Resample the image. Save the georeferenced images using a different name and file format readable to the digitizing software to be used.
9. Load the georeferenced image into the GIS software to be used for digitizing and perform heads-up digitizing.
10. Create the municipal boundaries layer first as a polygon. Digitize the boundaries from the georeferenced image. Save the file following recommended naming convention. In case of boundary conflict/disputes, create a different layer for this area, label and save it accordingly
11. Create the barangay boundaries from the same source being used for the municipal boundaries. Use tools to split or append polygon if available with the software.
12. Label or encode the feature name as it is being digitized. Barangay names should be labeled as attributes. Make sure to save the barangay layer created as a different file and not overwrite the municipal boundary file used as base. Follow recommended naming convention.
13. Create metadata for each feature type created.

Use of NAMRIA Topographic Paper Maps

This procedure refers to NAMRIA Topographic Maps, but use larger scale planimetric or topographic maps if they are already available. The administrative boundaries indicated in their topographic maps were derived from the LMB/LMS or are indicative. If these boundaries mentioned are not found in the map, the maps can be used to aid the LGU in identifying its boundaries. When using the 1: 50,000 Topographic Maps, refer to the DAO – 2006-12 before digitizing. It is recommended that these procedures be followed during scanning and digitizing from these sources to ensure compatibility with the Seamless Database. The LGU may seek technical help in using these procedures since this is a highly technical document. However, if the LGU is not able to do so, refer to the much simpler procedures below.



Sample NAMRIA Topographic Map

1. Be familiar with the projection and datum of the maps. These topographic maps are in UTM zone 51 and in Luzon Datum.
2. Prepare the maps for scanning. Smoothen all folds and crumpling. Fix and align torn out portions.
3. Scan the map. Colored scanning is recommended.
4. Check for image distortions and clarity of map features and make sure that the tick marks or reference points to be used are clearly visible on the scanned image. Rescan if necessary.
5. Save the scanned image in JPEG format or the file format used by the georeferencing software. If JPEG is the desired format, compression ratio can be adjusted if necessary as long as the required features can still be identified and distinguished.
6. Georeference the image. A minimum of four tick marks is required but use all possible tick marks as map control points. See to it that the points are distributed evenly.
7. Crop the image. Remove areas outside the neat lines of the map with the software if possible. Resample the image. Save the georeferenced images as a different file following recommended naming convention and file format read by the digitizing software.
8. Load the georeferenced image into the software for digitizing and perform heads-up digitizing. RMS value should be at most 0.2 of the map scale.
9. To delineate the indicative administrative boundaries, refer to '5.2.1.2 of Capture of data from Paper Maps' procedures j, k and l. If no administrative boundaries can be identified on the map, use visible features on the georeferenced image as guide for digitizing.



10. For each of the features needed, create a different layer with the appropriate feature type. Follow the data type required in Chapter 6. Label or encode the feature name it is being digitized. Save into different files following the recommended naming convention.
11. Create metadata for each feature type created.

Natural and Man-Made Features of the Base Map

When using the 1: 50,000 Topographic Maps, refer to the DAO – 2006-12 before conducting digitization. It is recommended that these procedures be followed during scanning and digitizing from these sources to ensure compatibility with the Seamless Database. The LGU may seek technical help in using these procedures since this is a highly technical document. However, if the LGU is not able to do so, refer to the much simpler procedures below.

1. Refer to the paragraphs above for scanning and georeferencing.
2. Refer to '**Standards for Base Map objects (IATFGI Standards)**' to identify for the necessary feature type to use for each required feature.
3. For each of the features needed, create a different layer with the appropriate feature type. Follow the data type **required in Chapter** .
4. For roads, streams, creeks and rivers, create polyline layers. If the feature is thick in some parts, digitize at the center of the feature. Create a separate polygon layer for some roads and rivers represented as areas in the 1:50,000 topographic maps.
5. For features like schools, barangay halls, landmarks, etc., which can be identified on the map, create a point layer. If not identifiable and handheld GPS survey is not possible, use the scanned map in locating the position of the feature if possible with the resolution of the scanned image used. However it is advised to do primary survey for these features for validation and accuracy using GPS.
6. Label or encode the feature name as it is being digitized. Save into different files following the recommended naming convention.
7. Create metadata for each feature type created.

Data Collection using GPS

1. Read Chapter 4.19.03 'How to Use GPS in CLUP Data Preparation' for procedures for GPS Survey.
2. Apply the necessary adjustments and settings to the GPS device. Consult the GPS user manual for recommended settings. Set datum to WGS 84 and Latitude/Longitude readings to Degrees-Minutes-Seconds (ddd-mm-sss). This will be useful when transforming the data into PRS 92 when it is fully implemented but would still allow for the conversion into the old Luzon Datum where majority of the data is referred.
3. See the Chapter 7.13.01 on how to encode/download GPS readings into the GIS. Two options are presented: 1) download GPS reading using a cable; 2) Encode manually in the absence of cable in a GIS software.
4. For each of the features needed, create a different layer with the appropriate feature type. Follow the data type required in Chapter 7. Label or encode the



feature name while it is digitized. Save into different files following the recommended naming convention.

5. Create metadata for each feature type created.

Capture of Names

In some cases, it is necessary to create a separate name or label set for the base map. When there are a lot of layers, the labels tend to clutter when the auto-label function is used thus creating a cluttered map which is harder to read.

Other Features

Contour Lines from NAMRIA Topographic Maps

Refer to NAMRIA procedures for Standard Seamless Digital Topographic Database. (DAO 2006-12)

Cadastral Maps

Cadastral Maps are good datasets to have for the LGU. Though the process of converting these maps is tedious and probably costly to the LGUs that do not have manpower and equipment, it is useful not only for CLUP preparation use, but also for the use of other offices in the LGU such as the Assessor's Office.

Recommended Layout for the Output CLUP Base Map

Dimension and font sizes for the layout are found in [Chapter 4.21.03](#) of the Toolbox.

Steps in Securing Help for Preparing a GIS Base Map

The base map is a fundamental dataset for LGUs thus must be done in a correct way. In case the LGU does not have the capability to do this, it will need help to prepare a first version of the Base Map. The LGU may opt to request the services of a GIS expert whether in the government or private sector. The LGU should first try to consult with NAMRIA whether they can make their base map for them. If NAMRIA is unable to help, the LGU may then find a private entity to do the job for them.

The following major steps are recommended in acquiring help:

1. The LGU procures the service of a GIS expert / consultant, using the '**ToR for Digital Base Map Preparation**', A template is found in the Chapter 4.04.03.
2. The GIS expert / consultant will submit a proposal to confirm the 'assignment' and include the cost for doing the job;
3. A contract is signed based on the ToR;
4. The GIS expert / consultant prepares a draft based on existing available in-house data, which is sent to the LGU. The Base Map data will be generated from various sources by data encoding, scanning and digitization. These data sources will include technical descriptions, boundary computations, etc;
5. If the LGU is capable, it conducts a survey to capture complementary data using a handheld GPS;
6. If the LGU is not yet capable to undertake the data capturing field survey, it is recommended that the expert / consultant hired do the job is assisted by the municipal staff as agreed in the ToR.



7. Depending on the GIS skills available inhouse, the LGU will either complete the data capturing, input the data into the GIS and send it to the expert / consultant for finalization or let the GIS expert / consultant do the job;
8. The GIS expert / consultant prepares a final draft, which among other things specifies the 'reservations' and ensuring that the base map is in the geographic reference system that is to be used in the Philippines. The output map shall be checked to ensure that the information requirements of the municipality are met. Revisions of the outputs will be performed if any defects are detected during the checking.
9. The final draft is turned over to the LGU that approves the final version.