CHAPTER II

MAPPING AND AERIAL PHOTOGRAPHY

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INTRODUCTION

Among the questions most often asked by county Boards of Supervisors is; “Why do we need mapping and aerial photography?” The answer is simple. It is necessary to accurately account for all the land and buildings in a county for taxation purposes and to do so fairly and equitably. The key word is “accurately”. If a high degree of accuracy applies then fairness and equity follows all the way through the entire mapping and appraisal process.

The appraisal of property is the basis for the taxation of real property in the State of Mississippi. Aerial photography and mapping are the first steps in the mass appraisal process. This chapter of the manual endeavors to introduce, describes, and explains all of the various aspects and procedures involved in aerial photography and mapping. Many of the concepts overlap, therefore, much information on singular topics is found throughout the chapter. Important words and terms are capitalized for easier recognition.

All counties in the State of Mississippi maintain a system of property ownership mapping, or "cadastral" mapping. There has been wide disparity in the methods and designs among mapping systems within the State, the result of a lack of standards during reappraisal. Now, at least the major criteria that are critical to mapping, and consequently, the appraisal of property, are standardized, namely, the time intervals for flying new photography, photo enlargement format, and map scales. There are many other aspects to mapping that must not be neglected.

It is recognized that there are no two counties exactly alike in all characteristics; however, the primary use of the maps is universally the same-to accurately account for all the land and buildings in the county. Therefore, since our purpose is "equalization", there needs to be more consistency among mapping systems to insure fairness, accuracy, and the same high level of services to all taxpayers. It is to everyone's benefit to strive for greater standardization in the future. Thence, standardized specifications, contracts, requests for proposals, billing procedures, forms, etc., could all be readily available and product quality could be more easily verified and ensured by anyone who works with mapping, regardless of where they are employed in the state. The fact is staff and personnel come and go, and eighty-two different mapping systems are costly for the counties to manage and maintain when there are so many special circumstances to learn and deal with. In addition, there are a variety of services and levels of service available to the taxpayers from county to county when all counties should maintain high levels of service.

Now, in this technological age, there arises a new challenge, that being, the use of computers to perform the once manual task of producing maps and maintaining the mapping systems. However, whether a county's methods are manual or digital, or a combination of the two, the end products and services of a tax assessment mapping system are identical, specifically, to provide a visual representation of a geographic portion of the earth to determine accurately the ownership, location, size, use, and access to every parcel of ownership in a county and the structures they contain.

Though the maps maintained for appraisal purposes by the tax assessor are special purpose maps, the maps have other important uses. The sale of maps generates thousands of dollars of county revenues. All counties should take advantage of this asset and actively offer the maps for sale to the general public. Other users will be property owners, realtors, surveyors, attorneys, engineers, planners, developers, other government agencies - the list is endless. The usefulness of the maps (and revenues they generate to pay for maintenance, equipment, etc.) is limited only by the imaginations of those who produce and maintain them. Hence, we have seen the development of GIS (Geographic Information Systems) which incorporates tremendous data analysis capabilities with computer assisted mapping systems and many "layers" of all types of other information. There are numerous automated mapping systems currently in use or under development by the counties and if the tax assessor's mapping is to be maintained by a GIS or data processing department, then they must provide the assessor with updated maps and the necessary map and aerial photo copies. If an assessor is to maintain the maps "digitally", all that may be really necessary is a PC (personal computer); a computer assisted drafting software (CAD), an operator, and suitable printing devices. The necessary records may be maintained manually or digitally, as long as any record can be reproduced on a standardized format and on the required medium.

A state of affairs where users can obtain maps quickly and easily in some counties but not in others (as has been the case) should be considered unacceptable, and is a matter to be addressed by the tax assessors. Obviously, then, a blueline copy machine (or digital reproduction devices), ownership mylars, and photographic enlargements must be kept in or quickly available to the assessor's office. In addition, the conveyance records, i.e. deeds and map work cards, should also be kept on site for quick and easy reference.

The major and basic components of an ownership mapping system are easily identifiable. They are:

1. Aerial Photography or Imagery
2. Ownership (Cadastral) Maps
3. Mapping Maintenance

Within these three broad categories can be grouped all of the procedures, products, components, and materials of the mapping system. All counties have heretofore mapped - most of them with at least some standards of uniformity. Therefore, most have the necessary basis upon which the future of all mapping will be determined. If attention has been paid to all of the details of an effective mapping maintenance program, and the initial mapping project was performed to good standards, then possibly, extensive re-mapping efforts may be avoided in the future. Under some circumstances some counties will find it necessary to re-map, or recompile the maps, and if all records have been carefully and properly maintained i.e., map work cards and deeds, a great deal of time and money will be saved.

COMMON SURVEYOR'S MEASUREMENTS

7.92 Inches	1 Link
25 Links	1 Rod
4 Rods	1 Chain
66 Feet	1 Chain
640 Acres	1 Sq. Mile
36 Sq. Miles	1 Township
1 Sq. Mile	1 Standard Section
5280 Feet	1 Mile
1760 Yards	1 Mile
80 Chains	1 Mile
4840 Sq. Yards	1 Acre
43560 Sq. Feet	1 Acre

AERIAL PHOTOGRAPHY

All counties must use aerial photography as a "base" for the ownership maps. The photographs must be enlarged onto sheets of plastic called MYLAR in order to provide a larger picture of each area represented by the photograph. This medium serves as the visual representation of the ground over which the ownership maps are drawn. In addition, each enlargement must be RECTIFIED, a process that corrects the enlargements so that measurements from the enlargements will correspond accurately to actual ground surface distance. Among the deficiencies regarding aerial photography as it currently exists among the counties is:

Source of the photography. Only vertical rectified photography meeting specifications is acceptable. Soil Conservation Service photography is not acceptable.

Negative and enlargement scales. Photograph scale is a function of film, altitude, and camera lens focal length and must be stringently controlled to achieve correct coverage and optimum enlargement quality. Enlargements must be at approved scales.

Distortion and scale deviations. Distortion is deviation from true scale in a photograph due to effects of aircraft tilt and terrain variations and requires each enlargement to be rectified during the enlargement process.

Enlargement format. Enlargements must be on photosensitive mylar to allow visualization on a light table for mapping purposes and reproduction by the blue-line copy process. Paper-back enlargements will not permit this.

Flight line and map sheet layout. Each enlargement must contain coverage of predetermined areas conforming to flight line design, section, township, and range, and enlargement scale.

Base mapping. Base mapping is performed on a transparency laid over the enlargement. The enlargement should remain clear of markings except for registration marks. Then maps will not have to be re-compiled when new photography is flown and new enlargements are obtained.

Aerial photography is the most crucial element of the mapping process. The quality of the aerial photography determines largely the accuracy of the ownership map. IF THE ORIGINAL PHOTOGRAPHY UPON WHICH THE OWNERSHIP MAP WAS BASED WAS INFERIOR, THEN AN INFERIOR MAPPING PROJECT WAS PERFORMED AND SUBSEQUENT PHOTOGRAPHY ENLARGEMENTS CANNOT BE MADE TO CLOSELY MATCH THE OWNERSHIP MAPS. This means that new enlargements cannot be rectified to fit the existing ownership maps. Then massive mapping changes will be necessary, or the county will no longer have the advantage of having ownership maps that match the photography. If the original photography was of high quality, then, experience has shown that new photography can be enlarged and rectified to closely match the ownership map. Of course, the advantage of this is that not only are the original lines and acreage computations accurate, but also the ownership maps can be overlaid on the enlargements and copied so that both the ownership map and the photo image can be reproduced on one copy, called a COMPOSITE, for the benefit of appraisers and all other users.

Counties periodically acquire new photography and upgrade their mapping systems to show new features and to correct deficiencies that exist in their current projects or upgrade their systems where they have become neglected or obsolete. When significant work or revisions are involved, many times it is necessary for the county to distribute REQUESTS FOR PROPOSALS (RFP's) and specifications to prospective contractors as a basis to submit their bids to perform the specified work. The SPECIFICATIONS are a detailed set of job requirements and procedures, a "blueprint" so to speak, that identifies exactly what is to be performed by the contractor(s) of the project. Usually distributed with the specifications is a CONTRACT MAP that identifies all of the areas that are applicable to the contract with the area of coverage for each map delineated. This is also used for planning aerial photography as far as identifying which scale maps are necessary for all areas of the jurisdiction, and in the end, may be adapted to become the county's INDEX MAP, whereby, with a quick visual reference, one can tell which map(s) contain any property or area in the county. If a county has a good county-wide index map, this would make a very good flight map for the next aerial photography project. An index map is necessary for each scale representative in the county's maps. The importance of planning to the aerial photography and mapping projects cannot be over-stated. The county must work closely with all contractors to clarify specifications and the particular requirements of each project. In addition, it is important that a county be able to identify their needs to the contractors, and not rely solely on the contractors to tell them what they need.

First, when a county has decided to acquire new photography, it must be considered whether the existing map scales are to be maintained or if there are areas where the map scale must be changed to accommodate areas of growth and development or to meet mapping standards. This is necessary in order to ensure that all areas of the county are flown at the correct altitudes so that enlargements to the correct scale(s) may be obtained. Map scale is one of the most important determinations to make in pre-flight aerial photography planning. Scale is expressed as a ratio of measurement of distance on a photograph or enlargement to a measure of distance on the earth’s surface. An

ENGINEER'S SCALE is an instrument used to measure distance on a map. Rural areas are to be flown at an altitude of 12,000 feet. This is to provide a film negative at a scale of one inch equals two thousand feet. From this photo negative is produced the enlargement at a scale of one inch equals four hundred feet, for mapping purposes. This negative will also produce enlargements of one inch equals two hundred feet. Urban and populated areas are to be flown at an altitude of 3,000 feet. This will produce a negative at a scale of one inch equals five hundred feet. From this negative are produced enlargements of one inch equals one hundred feet, and one inch equals fifty feet (usually business districts). These are expressed as larger scales because the parcels are much smaller and more numerous and must be enlarged more in order to see them clearly. Negatives can only be enlarged so much and still clearly show ground detail, hence the reason for the two photograph altitudes.

The required map scales for ownership mapping are as follows:

SCALE	APPLICATION
One inch equals 100 feet (1-100)	Urban centers/incorporated areas
One inch equals 50 feet (1-50)	Commercial/business districts (optional)
One inch equals 200 feet (1-200)	Populated rural areas (optional)
One inch equals 400 feet (1-400)	Sparse/moderate rural areas

ENLARGEMENTS are defined as sheets of photosensitive mylar (polyester plastic) that have been "exposed" to a light source projected through a film negative to produce the image of ground detail. RECTIFIED ENLARGEMENTS are those that have been produced on a table or surface that can be tilted in a configuration to compensate for the distortion created by the tilt of the aircraft when the exposure is made. The translucent qualities of the mylar enlargements allow them to be reproduced on paper by a special copying device called a BLUELINE MACHINE that every county assessor's office should have.

Parcel size and population density are two major factors in selecting map scale. Anticipated growth may be another. Enlargements are required for all mapping but under certain circumstances, some areas may be mapped at a larger scale than the corresponding enlargement, i.e. rural subdivisions, hunting/fishing camps, or other remote populated areas where low-level photography may not be feasible to acquire. These are called INSERT MAPS and may be appropriate alternatives, but care must be taken to match map boundaries with surrounding maps of a different scale and to delineate them accurately on index maps.

AERIAL PHOTO AND MAP SCALES

HIGH LEVEL: 12000 FEET ALTITUDE
Standard Lens Focal Length=6 Inches
Negative Scale: One Inch Equals 2000 Feet (12000/6)
Enlargement Scales: One Inch Equals 400 Feet, Enlargement Factor 5 (2000/400)
One Inch Equals 200 Feet, Enlargement Factor 10 (2000/10)

LOW LEVEL: 3000 FEET ALTITUDE
Standard Lens Focal Length=6 Inches
Negative Scale: One Inch Equals 500 Feet (3000/6)
Enlargement Scales: One Inch Equals 100 Feet, Enlargement Factor 5 (500/100)
One Inch Equals 50 Feet, Enlargement Factor 10 (500/50)

Mathematical Relationship:
Altitude/Focal Length = Negative Scale
Negative Scale x Focal Length = Altitude
Altitude/Negative Scale = Focal Length
Negative Scale/Enlargement Scale = Enlargement Factor

SOURCE DATA

At the beginning of a mapping project before the first line can ever be drawn, source data must be researched and collected. SOURCE DATA is defined as deeds, plats, surveys, other maps, and any information that can be used to determine the ownership and location of properties, boundaries, and other map features. COMPILATION is using this information to draw lines and features on the map, and a COMPILER is one who performs this task. The most common example of source data is deeds. General Land Office surveys (GLO's) and recorded subdivision plats are on record in county courthouses, as are many other records. Highway right-of-way maps can be obtained from the county or state highway departments. Railroad right-of-way maps can be obtained from the railroad companies. United States Geological Survey topographic maps commonly referred to as "quad sheets" or "quadrangles", can be obtained from the Mississippi Geological Survey office in Jackson. These maps are widely used for section line placement and map layout planning for mapping projects. Other unrecorded source data can be obtained from surveyors, engineers, real estate brokers, attorneys, property owners, or any other source of information that can be used to verify property boundaries and ownership. Through time and experience, a compiler (one who draws maps) will learn of other sources of valuable information specific to his/her own area.

Before mapping is begun the source data information such as the aforementioned deeds, surveys, etc., are filed together in an order applicable to the procedures to be used by the compilers. One example of pre-compilation source data collection is to copy the deeds listed in the tax roll references. The location of the properties is determined by comparing the legal descriptions with the index map. Then the map numbers are written on the deeds and they are sorted by map number, thence ready for the compiler(s) to begin compilation. This process is called SPOTTING. The data collection phase must be well organized from beginning to end. The collection and organization of source data can result in substantial savings of time and money if done correctly prior to the beginning of the actual mapping process. A deed is written evidence of an executed contract for the conveyance of property. Often, an experienced compiler must make a determination of the validity of a deed. Training and experience are necessary for a compiler to perform the task accurately and correctly. To aid in the determination of the validity and disposition of any deed instrument to be used in mapping, a MAP WORK CARD must be created and filed for each parcel in the county. These cards must be on printed format and be maintained in map and parcel number order, as must all other appraisal records. Each map work card will contain information pertinent to the parcel such as name(s) of owners, property description, acreage or dimensions, deed book and page, date of conveyance, and other information, but not values or appraisal data. Applicable deeds are attached to the map work cards, as well as each new deed that effects the disposition of the property. At least three deeds should remain attached to the cards or all deeds for at least a five year period if there are more than three transactions affecting a parcel within that period. However, space must be provided on the map work card for recording the references of all past deeds that affect a parcel, and these references must be maintained. The map work card serves as a chain of title in the determination of the validity of a deed, clarifies property interest of a transaction, and is useful to identify such details as contiguous ownership. In addition, if an area or county ever has to be re-mapped, then the necessary records and deeds will already be available, thereby, avoiding a great deal of expense in reproducing them.

TYPES OF CONVEYANCES

FEE SIMPLE TITLE is the highest level of property ownership and guarantees the owner(s) full rights of possession and disposition within the limits of law and governmental regulations. Under principles derived from ENGLISH COMMON LAW, rights can be conveyed in whole or in part by various types of conveyances.

A DEED is evidence in writing of the conveyance of real estate from one party to another. Its purpose is to identify property, the rights being conveyed, the parties to the conveyance, and to serve as public notice that the conveyance has occurred.

COMMON CONVEYANCE INSTRUMENTS IN THE STATE OF MISSISSIPPI

Warranty Deed - The most common type of conveyance is the WARRANTY DEED. It guarantees that the conveyor has legal and marketable title to the real estate, that there are no unstated encumbrances on the property, and that the property cannot be taken by a party with better title. If these warranties are breached, the grantor (seller) can be held liable for damages to the buyer (grantee).

Special Warranty Deed - Another commonly used deed is the SPECIAL WARRANTY DEED. It is similar to the warranty deed, except the grantor only gives warranty against defects of title that occur while he is owner of the property. The property may still be subject to past mortgages or liens, for example.

Quitclaim Deed - Another commonly used instrument in the State of Mississippi is the QUITCLAIM DEED. Under a quitclaim deed, the grantor makes no warranties but only transfers whatever title or interest he currently holds to the property. Rights in the property held by others or acquired by the grantor or others in the future may still be valid.

Deeds of Trust - In conjunction with deeds of conveyance are the commonly used DEEDS OF TRUST. A deed of trust is a written instrument by which a mortgage interest in property is granted to a lender to secure the repayment of a sum of money or the performance of other conditions. The borrower (mortgagor) remains the owner unless he or she defaults on the terms of the mortgage in which case the lender (mortgagee) may foreclose under legal claim to the property.

Trustee's Deed - If foreclosure occurs, the property may then be conveyed by public sale to the highest bidder by TRUSTEE'S WARRANTY or TRUSTEE'S QUITCLAIM DEED.

Administrator's or Executor's Deed - In the event of death of a property owner, a person may be appointed by legal will or by a court to settle, dispose, or distribute, the estate of the deceased whereby this party is given authority to convey title to the property.

Adverse Possession - It is possible to acquire fee simple title to property by means other than conveyance by a process called ADVERSE POSSESSION. Adverse possession is an involuntary transfer of title against the owner's will and usually involves a ruling by the appropriate court through legal proceedings. To have adverse possession, there must be actual occupancy of the land, open and notorious, for a prescribed length of time.

Mineral, Timber, and Royalty Deeds - These types of conveyances are commonly used in the State of Mississippi and convey an interest or rights in property which are considered to be personal property rights rather than fee simple title in real property and, therefore, not mapped.

BASE MAPPING AND COMPILATION

A BASE MAP is defined as a map upon which other information is added to make a map for a specific purpose. In this case, the base map will be an aerial photograph enlargement, commonly referred to as a SCREEN. This term means that when an enlargement is made, a fine mesh material, or "screen" is laid over the photosensitive mylar to diffuse the light and create the tiny dots that appear as a photo image in the mylar. It controls the dot size and density or "dot matrix" for the best quality picture and produces the continuous tone photo image, that is, no extremely light or dark areas, which will then produce quality blueline prints. The enlargement is used as the base map; however, no actual drawing is performed directly on the "screened enlargement". Only permanent features such as section corners or registration "tic" marks are permitted on the enlargements. Also acceptable are non-photo pencil section and sectional division lines on the enlargement which do not show on blueline copies and can easily be removed later. The section and sectional division lines are determined from the most reliable source available such as the USGS Quadrangle maps. Using the "quads" as a general reference, the section lines and corners are indicated on the base map, carefully compared with the original GLO surveys for section size and dimensions, and any discrepancies noted on a SECTION HEADER CARD, for future reference. A section header card is to be included at the front of each map work card file for each map and will show such information that pertains to each section such as size and dimensions as surveyed and computed.

After the section lines and division lines, that is, the quarter section and quarter-quarter section lines, are drawn, other permanent information can be mapped. It should be noted that sectional division lines generally should be equal and proportional within each section so that acreage computations will be equitable for equal divisions. Actual mapping and compilation should never be performed directly on the enlargements. This will severely limit the usefulness of the enlargements in the future. Actual mapping and compilation will be performed on a clean clear mylar overlay work map, or an accurate reproduction of the enlargement such as might be produced by a vacuum table copy. Other permanent features and information will be added such as right of ways and streams, and then compilation will begin.

Compiling the ownership boundaries is plotting the boundary lines of each individual parcel of land over the base map in its true geographical position. Naturally, a base map showing the physical detail will make it easier and quicker for the compiler to identify the location of the property and to locate the POINTS OF BEGINNING (POB) of deeds surveys, etc. A compiler must always keep in mind the importance of the map to the field appraiser. This is the primary purpose of the maps though they will be used for many other purposes. The compilation phase is of utmost importance. This is where assessments are corrected for past errors and omissions, and the compiler must make every effort to map each parcel accurately and correctly. Many deeds contain errors which do not invalidate them and the compiler must often make decisions as to the intent of the deed. A description of procedures to deal with legal description deficiencies is included at the end of the chapter.

The compiler is to account for all land within the area he is mapping, eliminate any double assessments, and clear any conflicts in descriptions, from the best information available. He should never attempt to solve boundary disputes as these must be settled by the property owners or the courts. A compiler must be familiar with basic drafting equipment such as the protractor, engineers scale, compass, drawing instruments, and various types of pens, pencils, erasers, and other equipment. The compiler must understand map scale, distance and measurement, and direction and bearing.

TYPES OF LEGAL DESCRIPTIONS

Ownership mapping in the State of Mississippi is by "fee simple title" and the mapper may be required to make some determination as to the validity of a deed. This is one reason why a "chain" of deeds must be kept in the files. There are numerous requirements for a deed to be valid. One of the most important is an accurate description of the property being conveyed. As a general rule, the description must be clear enough that the land can be identified by the evidence of the description. Most deeds will contain one of the following types of descriptions:

(A) GOVERNMENT SURVEY
(B) METES AND BOUNDS
(C) LOT, BLOCK, AND SUBDIVISION
(D) INFORMAL DESCRIPTION (Name of Property)

PRIORITY OF CALLS

Legal descriptions of property boundaries do not always plot according to the physical features of the map due to errors, omissions, or ambiguities. The courts have ruled that errors in a legal description do not necessarily invalidate the deed. Therefore, there will be instances when interpretation must be used to most accurately determine property boundaries. In those instances where a parcel cannot be clearly delineated by the legal description, available survey data, or plats, the following priorities of calls may be utilized:

(A) NATURAL BOUNDARIES
(B) MAN-MADE MONUMENTS
(C) ADJOINING OWNERS
(D) DISTANCE
(E) COURSE (DIRECTION)
(F) AREA

For instance if a deed said "go two hundred feet to the edge of the road right of way" but the scaled distance was two hundred and fifty feet, the line most likely should end at the road right of way. (Note: The courts have held that the omission of a section number may be sufficient to invalidate a conveyance instrument. Most counties notify a property owner promptly if an error is discovered in the description.) In the event property boundaries cannot be located by one of the above procedures, an effort shall be made to contact someone knowledgeable of the property or a "field

check" shall be made in an attempt to establish property boundaries. In either event, a standard field check form should be used to describe the efforts made to resolve the problem, a copy of which shall be attached to the map work card, describing what was done, the name of the field person, the date, and the persons talked to. Such forms shall be maintained for future reference in the event any questions should arise.

RECONCILIATION

Whenever a new mapping project, or changes to an existing project is undertaken, it is extremely important to plan for the completion of the project in advance. A process of reconciliation is necessary. Reconciliation can be complicated and expensive, or simple and efficient, depending on the preparation for the process. RECONCILIATION, essentially, is a comparison of the existing land roll with a revised list, or roll, generated by the process of mapping. The purpose is to identify new parcels, unassessed properties, eliminate double assessments, and ensure that every parcel mapped is included on the land roll. Reconciliation is also a continuing and integral part of the map maintenance process.

Whenever changes occur in a county which necessitate changes to a mapping system, such as new photography, map scale changes, corporate or taxing district boundary changes, they might involve changes to parcel numbers and/or boundaries. If parcel numbers are changed care must be taken to preserve the previous parcel numbers for identification and tracking purposes. Most often, these are carried forward for some years at the end of the property description. These changes must also be incorporated into the system by maintenance procedures. Assessors should ensure that a cross-reference list is generated any time parcel numbers change so that any parcels can be readily identified in the future.

ACREAGE AND DIMENSIONS

All map work cards must provide spaces to show acreage, both deeded and calculated. When all property boundaries for a given parcel have been plotted as accurately as possible, the acreage determinations must be made and shown in the appropriate spaces. A deeded acreage will be shown if specified in the deed. If the parcel has changed since the original description was written, such as a sell-off, road widening, etc., then the deeded acreage becomes void, and will not be shown. Many parcels will require that acreage be computed, unless the parcel is a standard sectional division, in which case, the acreage shall be determined according to the size of the section and, therefore, each sectional division. If a section has been divided into proportional quarters and quarter-quarters, then each division will contain an equal amount of area which will be more accurate than an acreage computed by any other means. A standard
section will contain 640 acres. When divided by four each quarter will contain 160 acres. When divided by sixteen, each quarter-quarter will contain 40 acres. Non-standard sections, except fractional or odd shaped sections, should be treated the same way.

For parcels other than those that are sectionally divided parcels an acreage computation is necessary. Scaled dimensions (as measured with an engineer's scale) may be used to determine the area of a parcel as long as the parcel is a square, rectangle, or can be divided wholly into right triangles. Then the area can be computed into square feet and divided by 43560, the number of square feet in one acre, to determine the amount of acreage in the parcel. This "computed" acreage shall be shown as the calculated acreage. The procedures for designating acreage on the map work card and map are as follows:

1. Show deeded acreage if specified and valid.
2. Determine computed acreage.
3. If computed acreage is outside a pre-determined variance from deeded acreage, both must be shown.
4. If deeded acreage is not valid or not specified, then only calculated acreage is necessary.

According to IAAO (International Association of Assessing Officers) when calculated acreage varies from the deeded acreage, the following sliding scale shall be used in determining the acreage(s) to be placed on the map work card and map:

Over 1 acre up to 10 acres	5% difference
Over 10 acres up to 40 acres	4% difference
Over 40 acres up to 160 acres	3% difference
Over 160 acres up to 640 acres	2% difference

For ownership mapping in the State of Mississippi acreage below one acre need not be shown. All calculated acreage should be rounded down to the nearest tenth from one to ten acres, the nearest half from over ten acres to fifty acres, and the nearest acre above fifty acres. All acreage computations shall be performed by the previously described square foot method, or by ELECTRONIC DIGITIZER or POLAR PLANIMETER. Acreage variances shall be computed by comparison with actual deeded acreage, however, deeded acreage will only be shown rounded down to the nearest tenth. All references to acreage in the brief property descriptions will be to the appropriate acreage of which the property will be assessed, followed by "less right of way", if area for public road is deducted from the total acreage. Both acreage must be shown whenever right of way is deducted from the parcel (unless the deeded acreage is void). Tax exempt properties, for mapping purposes, will be treated the same as all other properties, except they will be labeled.

Dimensions of all parcels under one acre will be shown. Dimensions shall be determined from the deeds, plats, surveys, etc. When lot dimensions are not specified, then the dimensions shall be scaled and placed on the map work card and map followed by the suffix "s". When scaled dimensions vary from deeded, platted, or surveyed dimensions, then only scaled dimensions rounded to the nearest foot need be shown if the difference is greater than one-twentieth of one inch of the map scale. The discrepancy will be noted in the appropriate space on the map work card. Note: Under certain circumstances dimensions may be shown on parcels greater than one acre.

INKING

The final step upon completion of mapping is the INKING process. This may take place as soon as each map is compiled, edited, reconciled, and all acreage, dimensions, and calculations are checked and included. All errors must have been corrected and questions of ownership and boundary lines resolved to the greatest extent possible.

Maps must be delivered to the appraisers in order for them to begin their task of data collection. The inking procedure is the step that provides them with the necessary maps. The final maps must be produced on a durable, permanent, yet reproducible medium. The aforementioned "mylar" material is well suited for this purpose as well as for making the photographic enlargements; however, in this case, MYLAR is defined as sheets of translucent, stable, polyester plastic, with an emulsion (coated) surface that allows it to take ink, whereas otherwise, on smooth mylar the ink would smear and "bead". This mylar must be three or four mills thick for durability purposes, yet light weight enough for easy handling and storage. By the time completed and finalized maps are ready and available for inking, the necessary mylars, complete with legends, have been ordered and received. They are then placed on top of the completed work maps and all the compiled lines and data are traced permanently onto the mylar surface in ink with a LEROY (or equivalent) drafting set with lettering templates and basic drafting tools. Thereafter, the mylars must be carefully handled, protected, and preserved to avoid wear and tear. They should easily last in excess of fifteen years if properly handled and stored. A professional draftsperson is not required for mylar inking but one must be experienced with the use of drafting and inking instruments. Only mapped features are to be inked on the mylars to the exclusion of building symbols and all other unnecessary information (The field appraisers should include the building symbols on the map copies that they use for field appraisal purposes.) Specifications are used to designate which pens to use to ink all features. When the ink is dry and the mylars have been inspected for errors and omissions, they are then ready for use to provide maps for appraisal work for many years to come. Thereafter all maps are reproduced by placing the inked mylar over the corresponding enlargement and both run through the "blueline" copy machine together. The result is a COMPOSITE map copy which shows ground detail and features along with all ownership features and information. The copies are then ready for use by the appraisers. (Of course, if desired, only the mylar or the enlargement may be reproduced.) The mylars are periodically "updated", that is, changes that occur to properties during the course of the year, are inked onto the mylars to provide accurate assessment information for the following year's land roll. This step becomes a routine part of the mapping maintenance process.

MAPPING MAINTENANCE

Once a mapping project has been completed it is necessary to properly maintain it. If any of the components are omitted from the maintenance process it will eventually have to be replaced or remedied, possibly at tremendous expense. Whether a county maintains its mapping system in-house or engages the services of a contractor, the process is basically the same. Either way, the sale of maps to the general public will be a source of considerable revenue and every county should take full advantage of a map sales/distribution program. All mylars, enlargements, map work cards, and related mapping materials should be kept permanently in the assessor's office and adequate space must be available.

An organized, efficient, MAPPING MAINTENANCE program should be routine and simple. It mainly involves making periodic ownership and boundary line changes to the maps and map work cards. This can be performed on a weekly, monthly, quarterly, or annual basis, or any schedule that is feasible for the county, depending on the number of changes that occur.

THE MAINTENANCE PROCESS

The first step requires copying the deeds that are recorded in the public records of the Chancery Clerk. Some counties copy every deed that is recorded; others copy only the deeds that involve FEE INTEREST that is ownership interest, if someone knowledgeable can make that determination. Whichever method is chosen, all deeds should be LOGGED in a MAPPING CHANGE LOG, a record kept by the mapper of every deed that is recorded, to ensure that none are missed, among other uses. It is important that a working arrangement be established with the Chancery Clerk and all other persons and offices which might have responsibilities regarding changes which would affect property in the county. (Conveyance procedures sometimes vary among counties so that probated wills or other documents must also be included in the mapping maintenance process.)

The listing in the log should include the deed book and page, the type of change, the location of the property, the date the change was made, and a parcel number. Sometimes it is necessary for a parcel to have a parcel number prior to the change actually being worked. The log also serves as an account of what action was taken with any particular transaction. (The log may be useful for sales information, parcel numbers for homestead applications, etc.)

After all incoming documents have been listed in the log, they should be sorted or separated by map number so they can be worked as a group. Often a number of deeds affecting the same parcel will be filed for record at separate times. It is helpful to have them all together to avoid having to change the same property numerous times during the same maintenance period. This process, as in the original project, is called "spotting", that is, identifying the parcels location from the index map and writing it on the deed. The applicable portion of the legal description is usually highlighted for this purpose. When the copying, logging, and sorting, have been accomplished, the process of making the changes to the work maps which have been produced for this purpose can begin.

BASIC MAINTENANCE FUNCTIONS

Mapping maintenance is using the deeds that are recorded during the year to make changes to the maps as indicated in the deeds. Basic functions to be performed are SPLITS, CONSOLIDATIONS, PICKUPS, SIZE CHANGES, and CANCELLATIONS (deletions). Each function can be performed only with the proper documentation such as deeds, plats, surveys, etc. When a system is installed and the maps have been put to use, a set of blue-line copies will be made on which to perform the maintenance. All of the periodic maintenance work will be performed on the work maps and checked and verified before changing or "updating" the mylars. If a system is maintained on a daily, weekly, or monthly basis, it may also be more advantageous to update the base mylars periodically depending on the needs of each county. If there are numerous changes in one or more particular areas it would probably be better to update the corresponding mylars only annually or semi-annually. This would prevent constant re-working, erasing, and re-inking the mylar and prolong its use and quality.

When the mylar is updated, all lines which are no longer representative of the current status of the land are removed, and with the mylar placed over the work map, the new lines and information are traced onto the mylar in the same manner as the original inking process. At the end of a taxing period, new field maps may be run showing the previous year's changes for the appraisers to use for their annual appraisal maintenance. Building symbols can easily be traced from an old map to a new one with the aid of a light table.

Maintenance work maps can be used for more than one year by using a different colored pencil in order to distinguish each year's changes. Whatever period of time is chosen to make new work maps, the mylar base maps should reflect all changes made since the last set of copies was made. Old maps should be stored until it is certain that they are no longer useful for any reference purpose.

CHANGE ORDER FORMS

In working any maintenance function, records should be established to document or justify the action. All changes should be written on a CHANGE ORDER FORM or maintenance work order Information on the change order should include the date of change (the date the change was worked), the authority by which the change was made (deed book and page), the type of change made (name change, split, etc.), the parcel number, and the initials of the person making the change(s). The forms are then routed through the maintenance procedure and filed for future reference and verification. Always perform the work first in its entirety before completing the change order form. Never file the map or release it to another before completing all functions of each change.

SPLITS

A SPLIT is performed when someone sells or "splits off" part of a piece of property, or whenever a parcel is divided for any reason. The first step is to read the deed, then plot or draw the new description on the work map. Then calculate the acreage of both the new parcel and the remaining parts of the old parcel and compare it to the deeded acreage, if one is given. Adjoining parcels should be checked for contiguous ownership in case the buyer already owns adjacent property. Acreage, dimensions, or any other applicable information is added or changed on the work map. A new parcel number is assigned to the split parcel by using the number of the original parcel and adding the split designation such as .1, .001, -1, (whatever the usual procedure) following the old parcel number. For example if parcel 12 is 10 acres and 3 acres are sold, the split portion would become parcel 12.1 or 12-1 and parcel 12 would remain on the 7 acres retained. The size and description of parcel 12 would, of course, change. A new map work card must be made for the new parcel and the existing map work card for the old parcel must be corrected. It must be remembered that the land roll will be prepared to represent the actual status of all properties in the county at the end of the maintenance year.

CONSOLIDATIONS

CONSOLIDATIONS should be done to joint properties acquired by an owner to reflect a single parcel of ownership, because the size of a property determines the unit value at which it is appraised, and because it is more expedient to value a single tract of land than several small tracts of various sizes that are contiguous. A consolidation will consist of two or more properties. The size, description, etc., will be changed to reflect all the information of the old parcels combined into one, but the combined parcel may retain the parcel number of one of the old parcels. A new map work card should be prepared showing the new information with all of the deeds attached as well as the old cards to account for the gap created in the sequence of parcel numbers. Also a note explaining the consolidation should be included in the "notes" section of the map work card. Where contiguous parcels cross section lines, map boundaries, major highways or thorough-fares, or urban streets, these parcels will be split and indicated as contiguous by parcel hooks or dashed lines where appropriate.

SIZE CHANGES

SIZE CHANGES occur due to splits, consolidations, road and waterway projects, and many other reasons. This is handled much the same as previously described except usually no new parcel is created. When this occurs the reason or authority for the change is noted on the change order, the map work card is corrected and any applicable deeds, surveys, etc., are attached to the map work card, and the change is completed on the map. The change order form is routed through the proper channels so that the change can be made to the assessment records and the roll will reflect the new information. Size change may affect the value of a parcel, and the appraiser will then determine what adjustments to make.

SUBDIVISIONS

SUBDIVISIONS are, in effect, a multiple split of a large tract and should be worked the same with a few minor differences. The subdivision plat will be drawn on the map. A split will be worked for each lot, however, in some instances, depending on situations and circumstances such as an under-developed or slow developing subdivision, the property may be mapped under combined ownership of lots as applicable to each individual owner. For example, lots 1 through 15 of Tall Pines Subdivision may be mapped under single ownership, with applicable deeds, surveys, etc., attached. Subdivisions may occur anywhere within a county and it is the mapper's responsibility to lay out the entire subdivision accurately within its physical, geographical location on the map. The assessor and appraiser can help determine an area's growth and developmental potential and decide the best procedures to follow.

A subdivision will usually be assigned a SUBDIVISION CODE NUMBER to facilitate identification and taxing district decisions; and if enough lots and blocks are present, may require the mapper to assign "block identifiers", in addition to platted lot and block numbers. A recommended procedure is to use the "island" principle; that is, to visualize each block, surrounded by streets or subdivision boundaries, as an "island", designated with a BLOCK IDENTIFIER such as "Block No. 1", "Block No. 2", and so forth. A parcel number then might be "72A-12-01-001", meaning, "Map No. 72A, Section 12, Block 1, Parcel 1". However, the property description on the map work card and property record card (PRC) might be "Lot 1, Block 1 Rosy Acres Sub". Another acceptable method of assigning map block numbers is to divide the map by major thoroughfares, streets, or district boundaries, depending on plat layouts and parcel density. Always keep in mind that every parcel has a map work card, a property record card, and a parcel number assigned to facilitate an orderly field review process by the appraisers. This means that the property record cards, which contain the "inventory" of every structure on every parcel, should be numbered and filed generally in the logical order in which the appraiser will look at the cards and the corresponding property.

It is important to recognize the distinction between the parcel number and the property description. The "BRIEF LEGAL DESCRIPTION" is written on the map work card in the appropriate space and is carried over to the property record card and the land roll. It may contain abbreviated or additional information besides what is in the legal description, mainly to include additional data to aid in locating the property in the field or on the map. The PARCEL NUMBER is an arbitrarily assigned identifier, unique to each parcel, to help the appraisers identify each parcel, and move from one parcel to another in an orderly sequence. The subdivision identifier code number must not be a part of the parcel number, since it is mainly for taxing district determination. If it is used, confusion will result in the field review process by the duplication of lot and block numbers. Subdivision parcels must be identified by the name of the subdivision, the block and lot numbers, as well as the parcel numbers. Each subdivision boundary will be clearly delineated on the map, as will the name of the subdivision. The subdivision code number may be shown in the map margin. (Many counties produce a cross-reference listing of subdivisions, their code numbers, and the map(s) on which they can be located.) The PARCEL NUMBER will be the same on the map work card, property record card, and land roll. All files shall be in map and parcel number order.

CANCELLATIONS

Occasionally, it becomes necessary to remove a parcel from the land roll when it is found that a parcel no longer exists. In instances where property is found to be double-assessed, covered by a public water way, taken in by a road right of way, etc., it should be removed from the land roll. Be sure that adequate documentation or notes substantiate the cancellation and the map work card is retained in the files. The change form will be routed through the system as any other change, and the parcel will be deleted from the map, land roll, and property record cards.

PICK-UPS

If an existing parcel of property is discovered to be omitted from the land roll it must be included or "picked up". This can be a situation that exists through error, accretions, abandoned rights of way, or other reasons. Unassessed property is commonly discovered on the outside borders of maps where map boundaries are poorly "matched", and along delineated boundaries of "insert" maps, where areas are mapped at a scale larger than the available photography. Maps should be routinely inspected for "match" error during the maintenance process and all maps should contain "match sheet" number notations in each margin. The procedure for PICK-UPS is the same as the initial mapping procedure. Ownership must be established, deed copies acquired, the property plotted, size calculated, map work card made, parcel number assigned, and maintenance form completed, to be sure that it is added to the land roll. The parcel number should be a split code from an adjacent property to maintain good "parcel flow" for field review purposes. Notations of the pickup must be included on the map work card to explain what was done.

UPDATING MYLARS

When all the changes for a year, or a maintenance period, have been completed, then the mylars will be updated. Updating the mylar map is the process of placing the mylar over the base work map and removing by erasure or other process all the lines, numbers, features, etc., which are no longer representative of current conditions. Then, the mylar is traced in ink to show all the new lines, numbers, features, etc., now needed to reflect the updated status of the work map. Quality maintenance work will provide a good set of current mylars that can continue to be used and reproduced for many years.

LOCATOR AND REFERENCE SYSTEMS

After all maps and map work cards are completed and finalized, the ownership data and information necessary to generate property record cards and ultimately, a land roll is available. This information is the source of the data base for the entire appraisal and maintenance systems. As an extension of this information, for continuous reference purposes, a COMPUTER PRINTOUT or INDEX CARD FILE system must be provided to be used as a locator and information source. The printout or index card file will be a record of every parcel of property in the county. There will be one produced with all properties arranged alphabetically by ownership,

and one with all properties in geographical order, that is, by map and parcel number in land roll order. Each must be maintained or reproduced annually to reflect current land roll status. One set will be used for locating property by the owner's name, and the other set for locating property by geographic location. The map change order file will be used as a supplemental reference source to identify changes that occur during the maintenance year.

NEW PHOTOGRAPHY AND DIGITAL LINE TRANSFER

The question is often asked, "When is new photography necessary?". There is no specific answer. The need for new photography probably becomes evident from many sources, not the least of which is the indicators of assessment performance. If measures of regressivity or progressivity become increasingly skewed this may be indicative that a county-wide review effort is needed to adjust appraised values and new aerial photography may be necessary for an effective appraisal update.

One of the greatest determinants in deciding if new aerial photography is needed is the quality of the current project. How good or bad is the existing photography? Things to consider are age, photographic clarity, distortion, coverage, condition, format, scale, or any factors relating to photography. Other considerations include the amount of new growth and construction, changes in land use (i.e. cut-over timber), quality of past appraisal maintenance, and the availability of funds. Age is not a good indicator of photographic obsolescence without considering additional factors. However, generally, fifteen years is approaching the absolute limit of usability for any county. If new photography is needed, the question arises "will new mapping have to be performed?" If the ownership mylars are expected to match the new photography, then some degree of re-compilation may be necessary. However, some counties have flown new photography and acquired enlargements rectified to fit the ownership mylars with good results. If care is taken in this process, minimal ownership changes may be necessary. But, at the same time, the county should ensure that the existing map is not based on severely distorted photography (or no photography) to begin with. It is also important to ensure that in the future no mapping is performed directly on the enlargements.

Numerous counties have endeavored to create a digital map base by "digitizing" the ownership mylars. This process, called "DIGITAL LINE TRANSFER", involves laying the ownership map on an electronic digitizing table and by using a hand held instrument, transferring the base map features to a computerized data base. (An optical scanning procedure has also been used successfully.) This then allows ownership map maintenance to be performed by computer assisted means and maps to be reproduced by electronic printing and plotting devices. Other "layers" can be created and maintained, or only certain features may be reproduced, thereby contributing a great deal of flexibility to the system. Also, a tabular data base correlated to a map data base allows analytical capabilities that would not be possible with a manual mapping system (For instance, calculating the number of acres of each soil type of a parcel). But, again, digital line transfers will not match new photography exactly, and some line changes may be necessary unless the transfer is performed over new rectified enlargements.

GEOGRAPHIC INFORMATION SYSTEMS AND ORTHOPHOTOGRAPHY

Many agencies of government at all levels use maps to create a visual reference system to graphically display relevant information. The development and widespread use of computers has led to the rapid growth of GEOGRAPHIC INFORMATION SYSTEMS, more commonly referred to by the acronym "GIS". GIS is the application of computers to the analysis of spatially oriented data, that is, information that can be stored, retrieved, analyzed, and displayed geographically referenced to its true location on the earth's surface. The data is both graphic (maps) and non-graphic (tabular information). Much of the information used by government agencies is geographically referenced to points of known location by a system of coordinates. For instance, any point on earth can be identified by latitude and longitude. Many other reference systems are currently in use. By using geographically known locations, GIS can correlate data from different sources into a single map base, such as sectional divisions, ownership boundaries, soils, roads, and streams. This data can be displayed separately in "layers", or combined and analyzed according to user requirements. The number of potential layers is unlimited, and the uses of GIS now include mapping and appraisal for tax assessment purposes.

Though complicated, technical, and expensive, some GIS capabilities are now being realized within the assessor's office on the local level in select areas of the state. However, any agency contemplating building a GIS must weigh its needs against its capabilities. GIS is not a necessity, or even practical, for most assessment offices, and for assessment purposes alone, is beyond most assessor's needs. However, through the cooperative efforts of several branches of government, or users, it will soon be a reality in numerous counties. Perhaps, in the not too distant future, all counties may be able to acquire at least some of the components of a GIS. (Note: CAD, computer assisted drafting, in itself is not considered GIS)

A detailed discussion of GIS is far beyond the scope of this manual, but a brief description of the steps in building a GIS is appropriate. First of all, a good base map referencing system is crucial. Otherwise, the purpose of a GIS would be defeated, in that all of the many and varied "layers" would not reference accurately to one another. The degree of accuracy, or the positioning of geographic features regarding their relationship and configuration to one another on a representative (graphics) map, is dependent on the cost allocated to this phase of the process. The geographic base may be any representation of the earth's surface, i.e., USGS "Quads", satellite imagery, Department of Transportation (DOT) maps, or rectified aerial photography, to name a few, but for GIS purposes and accuracy requirements, a highly specialized and technical form of aerial photography called ORTHOPHOTOGRAPHY is predominantly used. Briefly, Orthophotography involves the "paneling" of ground control points (points of known location by grid coordinates) so they will be visible on a photograph. Then aerial photography is flown to very exacting standards. Then stereoscopic pairs of photographs are oriented and viewed together to produce another photograph with distortion removed by the stereoscopic three-dimensional effect. ANALYTICAL TRIANGULATION corrects the photograph by orienting the control points to their true configuration and distance to one another by trigonometric operations. This degree of accuracy cannot be achieved by conventional vertical photography; hence, it does not lend itself well to GIS. For the GIS to be usable, all the desired information layers must be captured digitally, that is, by digital code that enables the computer to display or reproduce the data, by a digitizing or scanning process. The GIS hardware, software, and database, will serve to fulfill the

needs of the users of the GIS. (NOTE: Traditional Orthophotography is now generally considered obsolete and has become replaced with digital Orthophotography.)

SOIL MAPS

Another set of maps required by each county is the SOIL MAPS. Soil maps serve as an overlay to the aerial photo enlargements and ownership mylars for the purpose of identifying the soil types contained within each parcel of ownership by areas distinguishable as wooded or open (uncultivatable or cultivatable). Agricultural lands, whether farmland or forest land are appraised at "use" value, a value determined by the income generated by the commercial production of crops or timber, as opposed to "market" value. The assessor must determine on a case by case basis whether land is eligible for use value or is held in ownership for some other purpose. Soil map requirements are much less stringent than ownership maps, as they are used solely for the purpose of displaying the forest site capability classes A, B, C, D, and E, and the soil capability groups I, II, III, IV, and V, for each soil type.

Soil maps are relatively cheap and easy to produce. The easiest and most inexpensive way to make them is to obtain the Soil Survey booklets published by the U. S. Department of Agriculture Natural Resources Conservation Service which contain the mapped soil surveys for each county in the state. Those counties must use U. S. Corps of Engineer River Basin Studies, which are much less detailed and accurate. (When soil surveys become available, counties must replace the River Basin Study maps.) Once the booklet is obtained, the soil surveys are copied by photo copy machine to cellulose or acetate (overhead) transparencies. Some cutting and taping is necessary. These then, are displayed by an overhead projection device onto an ownership mylar attached to a wall, and then adjusted to match the section lines and corners. Then projected soil lines are traced onto the new mylar. When the tracing process is finished, the new mylars will show the section corners, numbers, and soil lines, at 1:400 scale, the same as the ownership mylars. The soil divisions, or "units" will then be identified by forest site class and soil capability group, according to the soil symbols contained on the soil surveys. Finally, all the information on the new soil mylars is drawn permanently. The forest site classes and capability groups are determined for each of the soil classes by the Mississippi Agricultural and Forestry Experiment Station. The per acre land values for each class are according to one of seven soil zones or "RESOURCE AREAS" in the State of Mississippi. These values are provided annually to each tax assessor. (Note: Counties should ensure that the map scales of areas eligible for ag-use are coordinated with soil maps.)

The mylar format is the only format that is acceptable (accept for counties with digital soil layers). The soil maps must be overlaid on the ownership mylar and aerial enlargement whenever a change to a property occurs to determine the cultivatable and uncultivatable acres and the soil designations for valuation purposes. Users will find that some experience with photo interpretation is necessary. If produced correctly, the soil maps are: 1) permanent, 2) reproducible, 3) maintenance free, 4) durable. (NOTE: Blueline copy soil maps and photo enlarged soil maps are unacceptable.)

INDEX MAPS

Index maps are required for the entire county and for the cities and towns. By reference to the index maps, one can identify which ownership map contains any area of the county.

The index maps should be made on the same type of photo-sensitive mylar as the photograph enlargements from Department of Transportation (DOT) maps of one inch equals one mile scale. These DOT maps show the entire county on one side and the incorporated areas on the other. It may be necessary to obtain two maps in order to reproduce both sides, or index maps may be made from each side. However, for the incorporated areas, some cutting and piecing together may be necessary to show the desired areas.

After the mylar index maps are produced, then the areas depicting the coverage of each map are inked directly on them with the map numbers shown in the centers. Counties with digital mapping systems may be able to plot index maps if a sufficient county-wide map base has been digitized.

DIGITAL MAPPING SYSTEMS

Current digital mapping systems now in use or under development range from basic Auto-Cad manipulation and editing of digital files combined with some manual operations and record keeping, to extensive and complex integration of advanced software and hardware applications with the capability of highly automated data analysis functions. For the present, with regards to "digital mapping", it is stipulated that automated mapping systems shall have the capability within the assessor’s office to produce and reproduce on demand all of the required documents, maps, photographs, copies, and materials described in this chapter, at the prescribed sizes, scales, and formats, and on the prescribed mediums (paper, mylar, etc.), as so determined to be appropriate by the Mississippi Department of Revenue, and for any purposes deemed necessary.

SPECIFICATIONS

As previously stated, SPECIFICATIONS are a detailed set of job requirements and procedures to follow in the performance of a mapping project, or any phase thereof, such as aerial photography, Orthophotography, ownership mapping, inking, line transfers, Geographic Information Systems (GIS), and mapping maintenance. Due to characteristic differences that exist from county to county, various procedures and methods will be employed to reach the same ends. Hence contractual differences will occur. Specifications must be an integral part of any work to be performed by a county, by contract or otherwise, however, regardless of the means employed, the general criteria outlined in this manual and in the STATE SPECIFICATIONS will apply statewide, and will be considered "standard" for every county in the state. The STATE SPECIFICATIONS are available from the Office of Property Tax of the Department of Revenue and specify the general requirements for aerial photography, ownership mapping, and the maintenance of the mapping programs, and are modeled after the STANDARD ON CADASTRAL MAPS and PARCEL IDENTIFIERS as set forth by the IAAO.

Specifications for aerial photography for tax mapping purposes in the State of Mississippi are provided to the counties to be used for the acquisition of new photography and rectified enlargements. Before specifications can be provided an evaluation of the existing ownership mapping system must be performed. Standards of Acceptance as adopted by the Department of Revenue require minimum photography accuracy to the standards of the original ownership map base if the original accuracy is approved. If that is the case, then the existing ownership mylars will serve as the “control” for the production and rectification of new photograph enlargements. Then the new enlargements will take the place of the old ones and the maps that do not match will be corrected. The intention of this process, essentially, is to duplicate the old photography. It is important that the old photography was carefully rectified. If so, a much better match will be achieved. Even so, since the conditions of the previous photography cannot be duplicated exactly, such as exposure points along the flight line, tilt of the aircraft, etc., even the best photography cannot be duplicated perfectly.

In the event it is determined that the old photography was not rectified, or insufficiently so, then it will not be feasible to try to duplicate it with new photography. Virtually none of the maps will match, making it necessary to recompile all of the ownership maps. In this case, it is best to use some other means of control to rectify the new enlargements, and since the maps must be recompiled anyway, to do so on corrected photography. In addition, this will largely solve the “match” problem of future aerial photography projects.

The method of rectification necessary to produce photography of sufficient accuracy for mapping purposes is to use the UNITED STATES GEOLOGICAL SURVEY QUADRANGLE topography maps, referred to as “QUADS”. These are maps based on high altitude aerial photography and produced from stereo imagery so that most of the distortion is removed to achieve a high degree of scale accuracy. To use these maps for control, a new aerial negative is projected onto a viewing screen or board. Distance measurements are taken between features on the quads. Then the viewing screen is tilted until the measurements from the same features

visible on the new photograph are the same as those taken from the quads. Then a new sheet of photo-sensitive mylar is exposed to produce the enlargement. The number of measurements required is dependent upon the degree of distortion allowable.

Another means of rectification that has been used recently, especially by counties choosing a digital format, is to electronically "digitize" the control features of the quads, i.e. roads, streams, section corners, etc., plotting these features to the appropriate scale, thereby providing a medium to control the new enlargements. Not only is an accurate enlargement achieved, a seamless county-wide map base may also be produced.

Another factor to consider in the development of specifications is scale changes that may be needed to certain areas within the county due to development, corporate limit changes, etc. Then a combination of rectification methods will be necessary since there may not be an existing ownership map available for control. There will also be a new map to compile when the new enlargement is produced.

The final product to be discussed here is the PHOTOGRAPH MOSAIC INDEX. The mosaic index is exactly what the term suggests a mosaic of photographs assembled from selected contact prints to show the entire county (and cities) in one large photograph. Among the purposes of the mosaic are:

1. To quickly verify photo coverage.
2. To verify flight lines.
3. To verify photo quality.
4. To detect excessive "crab".
5. To identify which photograph contains any area of the county.
6. To provide a visual representation of the entire county.
7. To provide a reproducible representation of the entire county.

The cost of the mosaic may add several hundred dollars to the cost of the overall project, however, since a photo index of some type must be produced, the photo mosaic provides the additional uses listed above and is well worth the extra cost.

CONCLUSION

This portion of the manual endeavors to cover the basic functions, procedures, terminology, and processes of the mapping program. Necessarily, a great deal of detail is omitted. The skills and knowledge of the mapping professional can only be attained through years of learning and practical experience. Most jurisdictions employed various methods in the initial mapping efforts and consequently, many variations exist in the procedures and systems currently in use. Among these are map sheet sizes, map coverage areas, map numbering systems, map layout schemes, index maps, use of map work cards, and map sales programs, to name just a few. All jurisdictions should exchange information and ideas and continuously strive to achieve standardized programs that fully utilize the potential of a comprehensive and carefully planned mapping system. Only then can the expense of maintaining and improving the mapping system be justified.