Photogrammetry and Comprehensive City Planning for the Small Community

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FEDERAL assistance programs offering fiscal aid to small municipalities have induced many communities within recent years to enter fields of planning endeavor that in the past could not have been afforded financially. The foregoing statement is not meant to infer that planning programs were not needed. But, that immediate monetary problems of the smaller cities, affecting schools, streets, hospitals, libraries, sanitation, police and other current municipal responsibilities were first considerations. As a consequence, there remained very limited or no funds for city fathers to investigate area potentials or to obtain the much needed Comprehensive City Plan with its guidelines for a progressive future.

To digress it seems wise to briefly list major aspects of a Comprehensive Plan for those who may not be acquainted with all the various work phases.

A plan takes into consideration the following:

1. *General Features of the Community* including location, historical summary, geology, topography, soils, climatic summary.
2. *Population*, including population trends characteristics, distribution and density, and estimated future population.
3. *Economic Analysis including*
   Section I.: *Existing Economic Base*, dealing with manufacturing, agriculture, finance, retail trade, wholesale trade, employment and basic employment.
   Section II: *Industrial Potential*, involving transportation, facilities, fuel and power, proximity to markets, natural resources, land for industry, community attitude, labor for industry and estimated future labor potentials
   Section III: Summary of conclusions.
4. *Existing Land Use*, including land use categories, comparative land uses, residential, commercial, industrial, public and semi-public, streets and alleys, and vacant lands.
5. *Housing*, including:
   Section I: *Inventory of Existing Housing:* a general summary of housing conditions, the visual survey and problem housing areas.
   Section II: *A Suggested Housing Program:* public understanding and cooperation, tools of the program, codes and ordinances, neighborhood analyses, problem areas, treatment of substandard housing, conservation of satisfactory housing, improvements through the urban renewal program and housing families displaced by urban renewal action.
6. *Major Thoroughfares Plan*, including problems from the past, objectives, future streets, street classification, regional traffic pattern, planning for neighborhoods, marginal access roads, major thoroughfares plan and priorities.
7. *Public Utilities*, including:
   Section I: *Water System:*—analysis of existing system, proposed water system, water pressure requirements, general recommendations, and staged development of the proposed system.
   Section II: *Sanitary Sewerage System:*—existing facilities, proposed sanitary sewerage system, and staged development.
   Section III: *Storm Drainage:*—the existing facilities, future requirements, proposed system and staged development.
   Section IV: *Electric Power and Natural Gas:*—present and future needs of these systems.
   Section V: *Refuse and Garbage*
8. *Future Land Use:*—neighborhood planning, planned residential areas, land for industry, land for commerce and other land use categories.
9. *Central Business District:*—current problems, parking general recommendations and public transportation.
10. *Community Facilities*, including
    Section I: *Public Buildings*, general location and existing facilities.
    Section II: *Public Schools*, a general treatment of existing school facilities, enrolment trends, projected enrollments and proposed school plan.
    Section III: *Recreational Facilities*, a general treatment of existing facilities, future needs and a proposed recreational plan.
11. *Public Improvements Program*, including a schedule of improvements, summary of recommended improvements and recommended staged development, cost estimates, sources of funds for proposed improvements and condensed statement and projected budgets.

The above outline of the many and varied

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items included in a comprehensive plan is included in this paper to point out the inherent complexity of these studies and to bring to mind many areas where photogrammetry can be of valued assistance.

The need for an adequate programming of small municipalities' future course of development has long been recognized as important, and necessary in the attainment of sound national growth. In 1954, under Section 701 of the Housing Act of 1949, Federal financial assistance was made available to communities of less than 25,000 population. The purpose of such Federal Aid was to stimulate formation of planning bodies on the local government level and to assist smaller communities in the solution of comprehensive planning problems. In 1959, the Urban Planning Assistance Program again was changed to include municipalities of less than 50,000 population. Today, although the procedure differs for communities of more than 50,000 population and those of less than 50,000, practically all types of urban areas may benefit in varying degree from the Federal assistance program.

Ours is a growing nation, experiencing both a changing and expanding economy with a constantly increasing population. And, while a possible result of this development could be the amalgamation of metropolitan areas with supporting suburbias into unitized masses known as "interurbias" (or other terminology, depending on viewpoint), the small community is still an area requiring individual treatment and consideration. Though its problems may not be as dramatic as those now encountered in many of the more densely populated sections of the country,—such as the northeastern Atlantic seaboard or the rapidly growing California complexes,—the problems are still quite real and, if not solved, will in time exert a noticeable influence on future economic health of the nation.

For a period of time following the Federal enactments, the rate at which municipalities sought assistance was low. However, in the past few years, there has been a more general public acceptance of the program and an increased use by the smaller urban communities. One of the more urgent and pressing needs to develop from the comparatively recent surge in planning interest has been the requirement of adequate maps at suitable scales. Maps, by providing a workable instrument for recording and evaluating data, serve as an acceptable means of meeting many of the requisites involved in the study of land and its use.

Due to a multiplicity of factors, every community and urban locale will have varied and different basic map requirements. Those cities with permanent commissions or agencies established for the responsible conduct of planning and attendant objectives normally have and are maintaining a basic series of suitable maps. The degree of completeness will vary with the financial capability of individual agencies and with the local concept of planning importance. Where commissions are (1) newly created, (2) not an established function of local government, or (3) sporadic in application of effort, needed maps and other planning data are often incomplete or outdated. The problem of obtaining current information is one demanding immediate attention for the smaller urban community without financial capacity in the past for supporting a full-time planning staff or to prepare and maintain complete, up-to-date base maps.

Usually the aerial photograph is the most efficient method of securing an immediate maplike representation of both natural features and man's improvements. For the trained observer of such a photograph a wealth of information is apparent. Revealed are such as: soil characteristics, geological formations, vegetation types, drainage features, power line locations, pipelines, highways, etc. Even to the untrained eye, areas of urban development are discerned readily; also woodlands and agricultural lands. With the aerial photographs of the proper scales available to them, municipal authorities have at hand a form of planimetric map current in all visible detail. And, when used in controlled mosaic form the photos present a complete picture of the area to be planned. The guesswork and assumptions often encountered in smaller communities concerning the actual physical location of specific improvements does not exist or are much less in amount and importance.

An actual use illustrates the value of photographs in land use planning. During the initial phases of a preliminary land use survey for a small urban community, it was noted that the position of streets as indicated by the base map (a reduced version of the City's official lot and block map) did not agree with ground positions actually occupied. Some streets were located entirely outside the limits of the approved rights of way. Others were constructed where rights of way for streets did not exist. Many streets had been used for such a period of time, that permanency had been given to present locations by structures and other land improvements. This

condition was brought to the attention of the proper authorities. With the official lot and block map, which earlier had been considered complete and which now was proved to be fallible came a realization of necessity of reappraisal of basic reference maps and of the adequacy of other data possessed by the City. There was convincing evidence that planimetric maps showing actual location of all important cultural features did not exist. For the community to obtain these base maps by conventional ground survey methods would require considerable additional time and require an expenditure exceeding that justified for the work to be performed. The alternative was aerial photography. This could be procured at a photo-scale of $1'' = 800'$ and it would be suitable for photogrammetric compilation with requisite field control, at a cost the municipality could reasonably assume. Also it would be a reliable source for obtaining both planimetric and topographic base maps. For the preliminary study, due to flatness of the terrain, a mosaic prepared at the desired scale provided an adequate and satisfactory base for recording and plotting existing land uses of the planning area.

Aerial photography was also used in the preparation of a parking study. During the field work a definite difference of opinion developed as to how much off-street parking space was now being utilized and how much space would be needed to satisfy present and near-future demands. Photographs originally at the scale of $1'' = 800'$ but enlarged to a scale of $1'' = 100'$, were carefully studied. The painted markings of parking spaces were readily discerned. Spaces and parked vehicles located in the rear of stores, along alley-ways, in parking lots and in all areas considered off-street, were counted and then field checked. It was evident that many of the vehicles observed on the photograph were technically illegally parked.

The revised inventory of off-street parking, based on aerial photography, indicated that more area must be provided than was originally anticipated. The excess was caused by the immediate need of providing additional legal space for vehicles now utilizing areas not intended for parking purposes.

In developing a structures inventory during conduct of a neighborhood analysis, it became apparent that extremely crowded conditions combined with poor weather required more time for field work than had been intended. To expedite the work aerial photographs were enlarged to a scale of $1'' = 200'$. Building counts were made of each block by the office staff. Both count and photographs at the enlarged scale were taken into the field to record structural condition. This method resulted in a much faster survey, completion of the work within the budget, and compliance with time schedules despite bad weather.

An interesting sidelight to this study occurred during presentation of the "Neighborhood Analysis" report at a joint meeting of the planning commission, Mayor of the City and City Commissioners.

An area of one-story residences (rental property) in poor structural condition, and constructed so closely together that a person had difficulty walking between the buildings, was being discussed from a fire hazard standpoint. The density of dwelling units ranged from 20 to 25 per half acre. This created practically an intolerable condition. One Commissioner questioned the accuracy of the building count as he personally did not know of any area within the City that reached the reported density. He was informed that this density had been double-checked in our office. Aerial photographs enlarged to a scale of $1'' = 100'$ had been prepared. The density of structures was so great that there were no trees or other vegatation to block detail in photographing the area. Structures were so enlarged that even an untrained person could easily distinguish and count them. As an aid a template $\frac{1}{2}$ acre square at photo scale had been prepared on clear film. Placement of the template on the photo enlargement permitted the commissioners to make their own count of the dwellings. There were no further questions concerning density.

Summary

A more general acceptance of the Federal planning assistance program by smaller cities and municipalities has caused an increased demand for engineering and planning services in areas that have long been dormant, and where problems have become acute.

As a means of expediting the work at hand a general program of educating the public to the various practical uses of aerial photography appears to be in order. Very capable individuals in their respective fields have told the author that without expensive instruments operated by trained personnel with years of experience, aerial photographs would possess little value. Many still do not realize that ability to read and to interpret an aerial photograph can be an ability commonly enjoyed by all. While practically everyone can read a road map the photograph is still something essentially good but presently used

only under special conditions and far less than the photo makes possible.

Photogrammetry can be one of the most useful tools in the continued economic growth and development of our country. But if photogrammetry is to be fully utilized as a planning and engineering tool, in the progressive development of the smaller communities of this country, as well as in the larger cities, there must be demonstrated the many various applications which can be of beneficial nature to these municipalities. In this manner the greatest good can be derived, and the maximum possible service rendered to the nation.

*A Spectral Reflectance Study Using A Wedge Spectrograph**

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ABSTRACT: *The wedge spectrographic method of measuring the spectral reflectance of airphoto subjects employs a wedge spectrograph and a standard white reflectance surface. This method uses the sun for the source of light. Although time of day and atmospheric conditions affect the composition of sunlight, it is calibrated by exposing a spectrogram of the standard white reflectance surface within ten seconds of obtaining the test surface spectrogram.*

The standard surface can be fixed conveniently within two feet of the spectrograph slit while the object distance may be varied from a few feet to several thousand feet. Thus, the wide range of possible object distances combined with extreme portability make the wedge spectrograph a convenient instrument for both airborne and terrestrial studies of spectral reflectance.

INTRODUCTION

THE property of a material to selectively reflect certain components of incident light and to absorb or transmit the remainder is termed *spectral reflectance*. For this reason, materials have characteristic colors. The complex nature of rock formations cause analytical methods of spectral reflectance determination to be quite difficult. Hence, spectral reflectance is measured directly.

By the proper selection of film and filter the sensitization of an aerial camera may be adjusted, to be most sensitive to certain regions of the spectrum. When the reflectance properties of a formation and its background are known, the formation may be emphasized by photographing in the regions of the spectrum where the greatest contrast occurs.

Data for a wide variety of films and filters may be obtained from photographic equipment manufacturers. Spectral reflectance information, however, is available only for a limited number of specific types of rocks, vegetation, and artificial materials.[1,2] Since season, degree of weathering, and moisture conditions affect reflectance properties, it is

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