LAND-USE PLAN

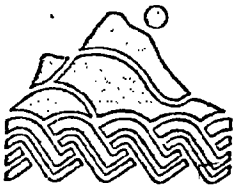
Final Draft

BUREAU OF PLANNING
GOVERNMENT OF GUAM
AGAÑA, GUAM

Guam. Bureau of Planning.

PRELIMINARY FOR REVIEW ONLY

LAND-USE PLAN GUAM



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Bureau of Planning
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Glossary of Abbreviations Found in the Text

AAFB	Andersen Air Force Base
AICUZ	Air Installation Compatible Use Zone
APC	Area of Particular Concern
BP	Bureau of Planning
CPC	Central Planning Council
CZM	Coastal Zone Management (Guam Coastal Management Program)
CDP	Comprehensive Development Plan
CEIP	Coastal Energy Impact Program
CHP	Comprehensive Highway Plan
COE	U.S. Army Corps of Engineers
DLM	Department of Land Management
DPR	Department of Parks and Recreation
DPS	Department of Public Safety
DPW	Department of Public Works
EDA	Economic Development Administration
GEPA	Guam Environmental Protection Agency
GHURA	Guam Housing and Urban Renewal Authority
GPA	Guam Power Authority
HUD	Housing and Urban Development
LUC	Land-Use Commission
NAS	Naval Air Station
NCS	Naval Communications Station
OEDP	Overall Economic Development Plan
PUD	Planned Unit Development
PUAG	Public Utilities Agency of Guam
SDRC	Subdivision and Development Review Committee
SPC	Seashore Protection Commission
UOG	University of Guam
WRRC	Water Resources Research Center
208	Areawide Wastewater Management Plan
305	Coastal Zone Management Program, Planning and Development
404	11 < Army Corps Engineers Permit Program for

TPC → SPC ← Territorial Planning Commission

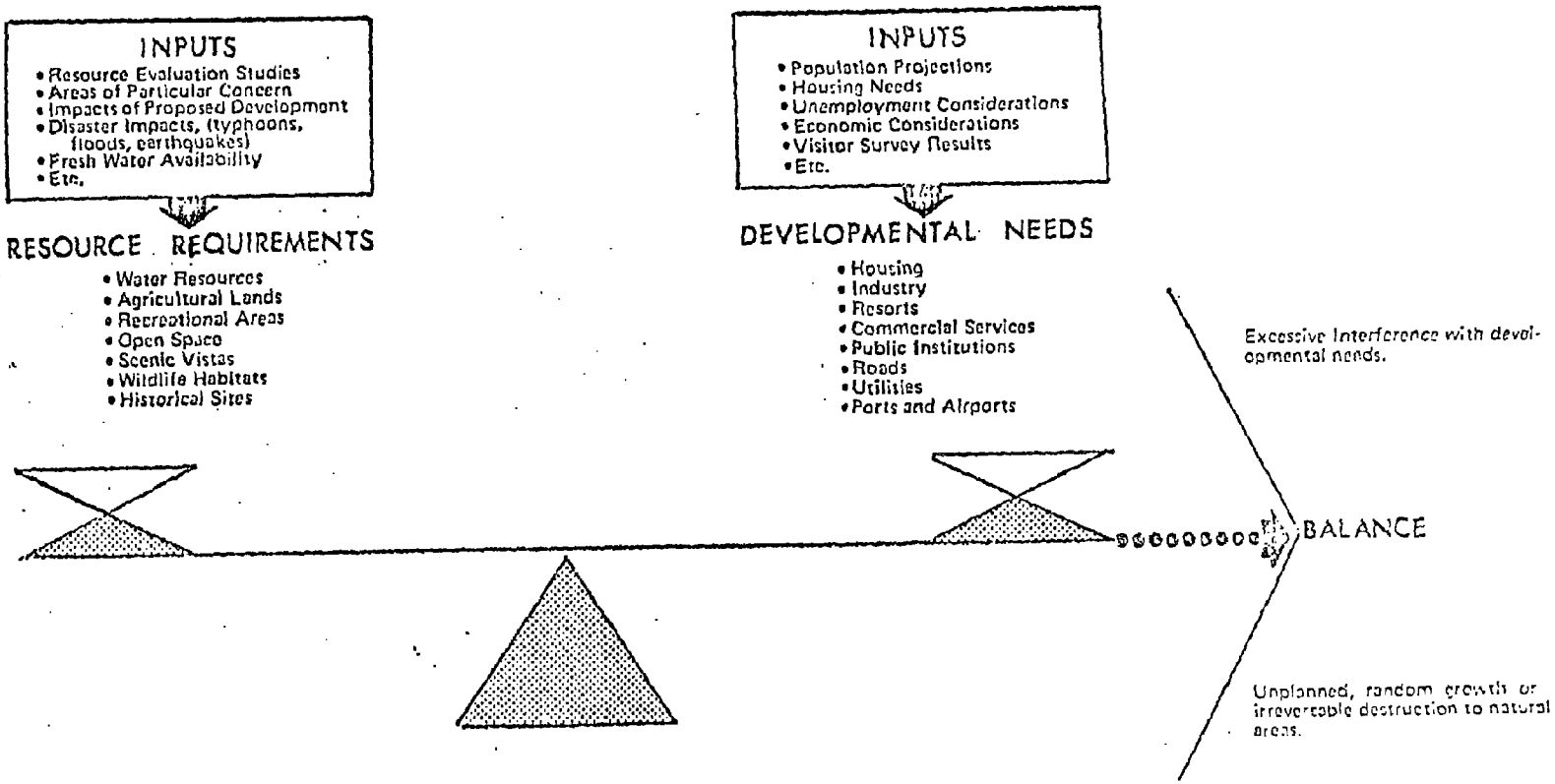


Figure 1 Planning for a Balanced Resource Use to Meet Both Resource and Developmental Requirements

I. OVERVIEW

A. Purpose

The most important factor determining the quality of our environment is the use we make of our land and water resources. It is the purpose of the Land-Use Element of the Comprehensive Development Plan to establish a long-range (20-25 year) blueprint for development on Guam. Envisioned growth takes place in a manner which reflects the need for expansion in all social and economic sectors but, at the same time, recognizes the need for establishing guidelines for growth in areas where unplanned development would have a significant negative impact upon the well-being of the people of Guam.

A "blueprint" for land and water use is not a fixed plan. Like the growth it seeks to guide, it is dynamic, flexible, and subject to revision as the myriad of factors influencing development themselves change.

B. A Question of Balance

If the island of Guam were much larger, if we had a great abundance and variety of resources, and if the population growth were much lower, we would not have to worry as much about what type of development should occur and where. Since Guam is small (212 square miles), much of the land is owned by the Federal government (31.5%), resources are few and limited, and the growth rate relative high, we must seek a balance of proposed development against the public benefit gained from that development. Due to our limited land area, we must assure that this balance recognizes both the needs for growth, and the location of that growth in areas which can support it without producing unacceptable impacts on both the land and people of Guam. (See Fig 1.)

This "balancing test" is the central issue of planning. The Land-Use Element, as well as other elements of the Comprehensive Development Plan must be able to apply the balancing test to all aspects of development in order to have a workable plan which does not arbitrarily restrict the rights of the people.

C. Definition of Land-Use Element

The Land-Use Element is an integral part of the broader planning process involved in the "Comprehensive Development Plan" as defined by Public Law 12-200. While the Comprehensive Development Plan defines future development in the terms of all determinants of growth and change (economic, political, social, and physical), the land-use part of the overall plan is the physical interpretation of those other elements of the plan on the geographic areas of Guam. It is primarily concerned with the arrangement and types of land use, their impact upon the environment, and relation to community development.

Basically, the planning process consists of a number of conceptually distinct phases as shown in Figure 2.

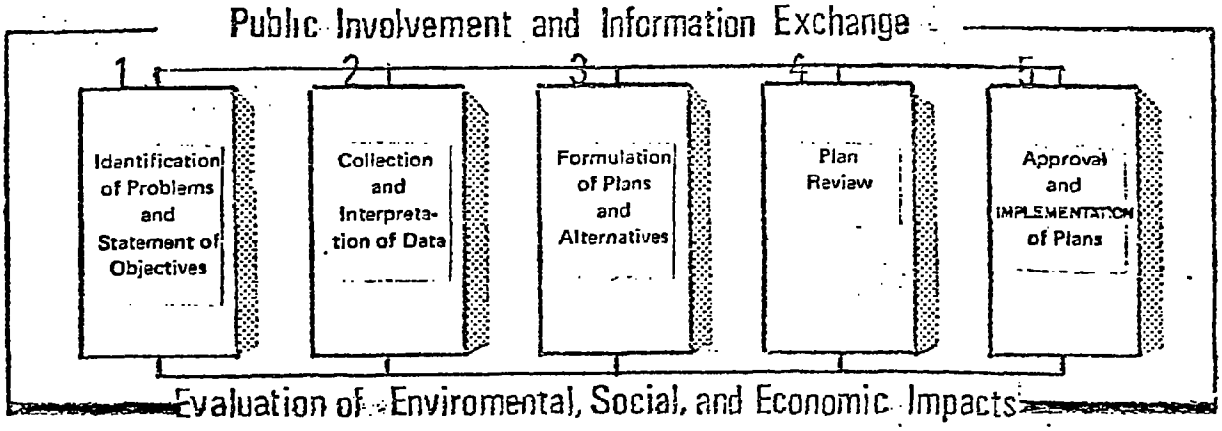


Figure 2 The Land-Use Planning Process

D. The Overall Task and Determination of Goals

The major objective which a Land-Use Element attempts to address can be expressed in a single statement: "to organize, coordinate, and guide the process of growth-caused development so as to protect what the people of Guam most value as the environmental, cultural, and aesthetic characteristics of the island while meeting the essential needs of an increasing population." The following goals relative to the land-use planning effort were established through a questionnaire survey technique which solicited public opinion concerning a number of selected goal statements taken from a wide range of existing planning documents and statements by government officials and political spokesmen:

1. Land-Use: Strive for an environment that promotes the general health and welfare, provides for all land uses and a choice among living, working, cultural, and recreational opportunities.

2. Natural Resources: Develop Guam's natural resources according to a balanced management program. This involves rational use of renewable and non-renewable resources and protection of those areas, both natural and man-made, which are critical to our health, safety and welfare. (This goal has been amended to support the objectives of various agencies involved in the management of Guam's natural resources).

3. Recreation: Develop Guam's recreational resources to satisfy, the desires of visitors and residents, and to preserve the island's scenic vistas, historic sites, natural areas, and beaches.

4. Cultural Heritage: Preserve and promote Guam's historical and archaeological heritage and varied cultural character so that future generations may understand their past as well as their development as a society.

5. Housing: Assure that safe, sanitary housing is available and within the financial reach of every family.

6. Economy: Continue on the road to self-sufficiency and manageable economic growth by developing a broad basic economy emphasizing military activity, small business, tourism, agriculture, and fishing.

Goals do not describe a final product design, rather they set the direction which, people of the community, feel should be the priorities of their government. Although citizen participation was substantially less than desired, the fact that land use, recreation, and natural resources were second ranked after education and employment indicates a significant desire by the people of Guam to improve the process by which land-use decisions are made.

E. Statement of Objectives

Public Law 12-200 as amended directs that "the Government of Guam shall initiate a systematic, continuous, farsighted planning policy. . ." To that end, the Bureau of Planning was established to achieve certain objectives in a Land-Use Element.

- Determine the extent that our natural resources limit urban and rural development.
- Plan for preservation of the natural charm and character of Guam within the framework of a growing population and modern technology.
- Establish generalized areas of land use within an urban, rural, agriculture, conservation, and resort context.
- Provide guidelines for relocation of insufficient or inappropriate major uses.
- Plan for a high quality environment.
- Recommend creative legislation regulating the use of land for the protection of future generations.

F. Specific Tasks

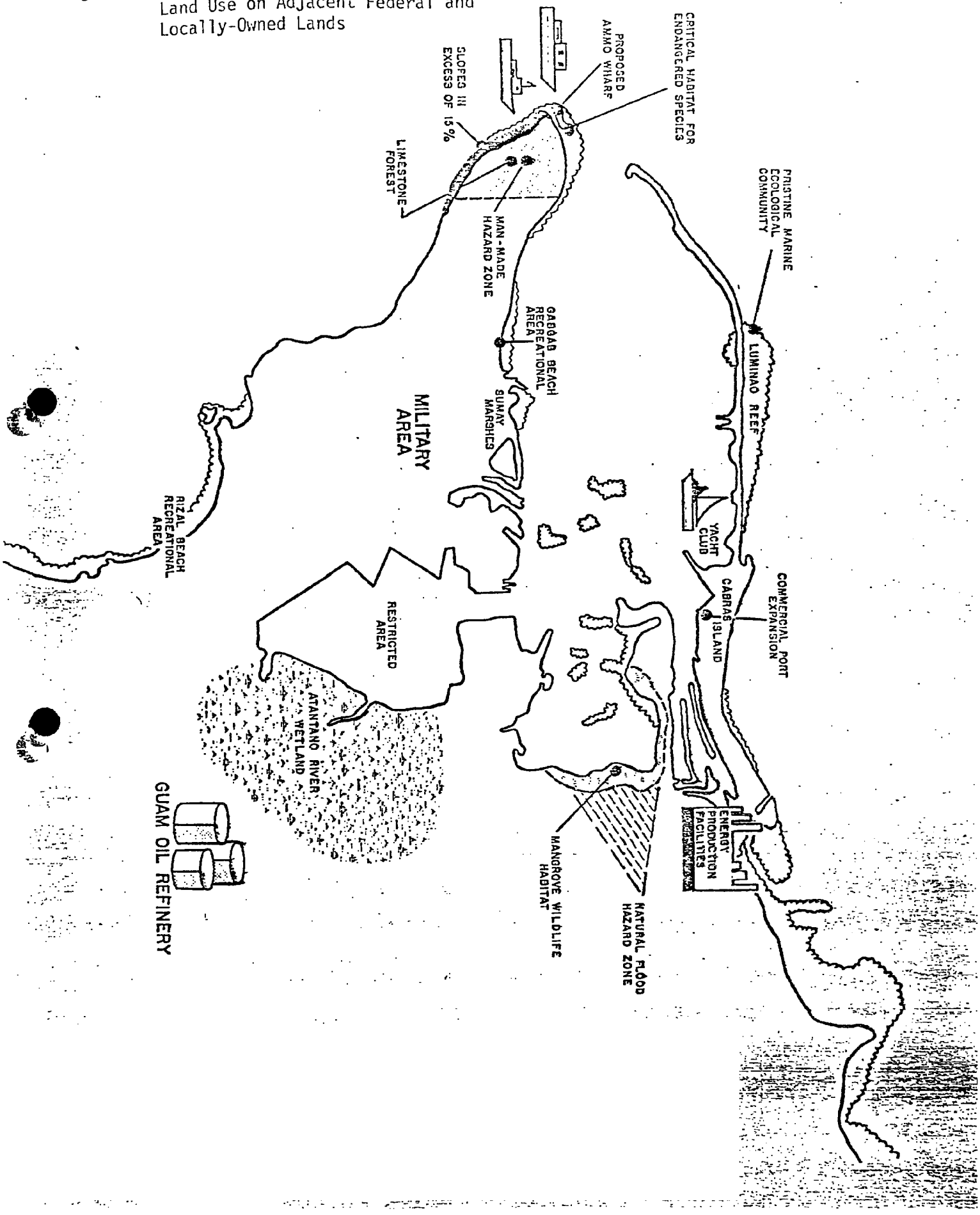
- Establish designations for general distribution and location of the use of land.
- Include a statement on population density and building intensity for the various districts and other areas covered by the plan.
- Include a statement on regulatory devices governing the use, development, and subdivision of land.
- Develop a Community Design Element (separate but closely related to the Land-Use Element) showing recommended designs for community and neighborhood development and redevelopment.
- Develop a Conservation Element for the conservation, development, and utilization of natural resources.

G. Related Comprehensive Plan Elements

The Land-Use Element cannot be developed as a separate entity. It reflects the findings and recommendations of several elements, which, when combined, constitute the Comprehensive Development Plan. The other closely related elements which are incorporated as much as possible into the Land-Use Element are the:

- Transportation Element
- Regulatory Element
- Public Building Element
- Housing Element
- Recreation Element ← Historic Preservation Element
- Safety Element
- Five-Year Proposed Capital Improvements
- Five-Year Socio-Economic Plan
- Such additional elements as related to the physical development of the Territory.

Figure 3 Comprehensive Planning Seeks Compatible Land Use on Adjacent Federal and Locally-Owned Lands



II. APPROACH

A. The Land-Use Element's preparation required at the outset a statement of policies which serve to guide the formulation of specific plans. Considerable time has been spent reviewing both existing and proposed legislation, existing and proposed resource management programs under development by other agencies, and the various federal guidelines requiring the inclusion of a Land-Use Element for future programs. Following is a series of policy statements and rationales indicating the direction the Land-Use Element emphasizes relative to:

1. Urban Development
2. Shoreline Development
3. Rural Development
4. Agricultural Development
5. Public Access
6. Recreation
7. Housing
8. Transportation
9. Expansion and Siting of Major Facilities
10. Coastal Water Quality
11. Fragile and Hazardous Land
12. Water Supply Land ← 13. Conservation of Natural Resources
14. Lands with Mineral Extraction Potential
15. Air Quality
16. Visual Quality
17. Sedimentation and Erosion

B. Policy Guidelines of the Bureau of Planning

It shall be the policy of the Government of Guam, through the implementation of the Land Use Element to:

URBAN DEVELOPMENT

Policy 1: Encourage concentration of high-intensity, high-density development in areas of existing urban or urbanlike development as indicated on the districting map, and to ensure that such development is compatible with adjacent land and water uses.

Rationale: In order to remedy the past practices of haphazard and fragmented placement of residential, commercial, and industrial development, and to promote a rational pattern of growth, the Government of Guam must encourage the concentration of high-intensity use in already developed areas having additional capacity for future development. The existing patterns of unwarrented urban sprawl resulting from strip zoning along major transportation networks must yield to a more efficient land-use pattern which would prevent development from encroaching, project by project, into rural, agricultural, and conservation areas; or areas of particular concern. Limited capital improvements funding dictates that high-intensity growth must be channeled into areas within or immediately adjacent to the existing infrastructure net. The government cannot afford to continue the trend of providing expensive infrastructure such as sewer or major water lines, etc. to

outlying developments or subdivisions located in areas removed from existing residential, employment, or commercial centers. At the same time, within identified urban districts, commercial and industrial uses must be concentrated in areas where conflict from adjacent land uses can be avoided. For example, an R1 or R2 use designation should not be considered compatible with areas having particularly hazardous characteristics such as a primary airport sound or accident potential zones.

SHORELINE DEVELOPMENT

Policy 2: Encourage only development, adjacent to the shoreline, which is both consistent with the intent of the Seashore Protection Act and directly dependent on the proximity to the ocean shore for the use proposed. The activity must not adversely affect public access to or along the shore.

Rationale: One of the most unfortunate results of urban sprawl and strip commercial/industrial development has been the placement of a number of enterprises directly adjacent to potential beach and shore recreation areas. Often this development bears little or no relationship to the shore itself creating a pattern of non-complimentary use which not only hinders access to public recreation areas, but creates an unsightly, (and at time hazardous), conglomeration of development. Such land-use patterns destroy both the aesthetic and visual appeal of the shoreline, as well as prevent a multiple-use approach which could be highly beneficial to people living within adjacent urban areas.

RURAL DEVELOPMENT

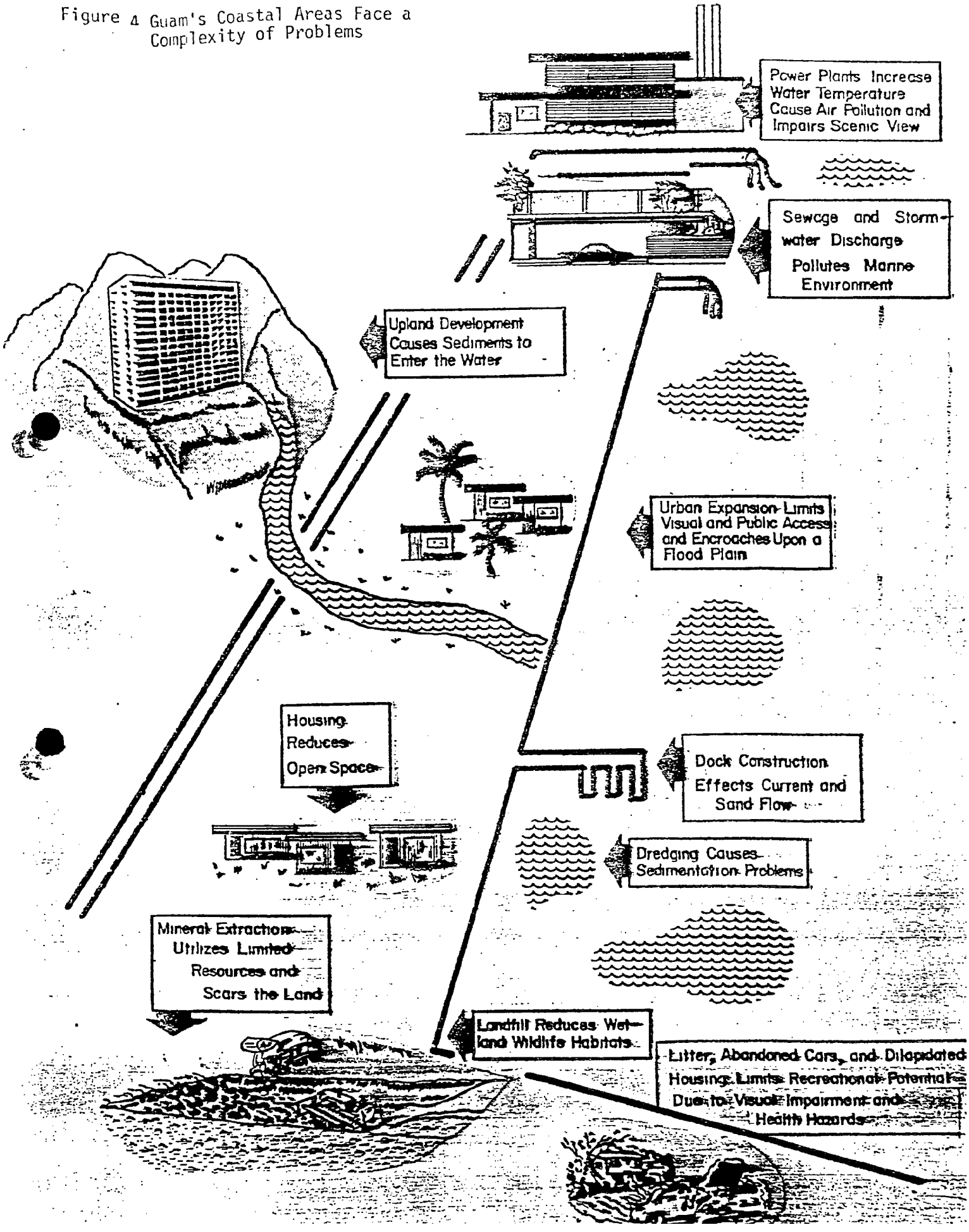
Policy 3: Designate areas, for the most part adjacent to urban areas, where future urban expansion can occur with reasonable certainty, and promote only that type of growth within these "rural" areas which would not irrevocably commit that land to a use inconsistent with future urban expansion.

Rationale: In line with encouraging efficient development of urban-type use within the urban district, the time will arrive when areas are not available for further development. At such time, contiguous areas to the urban district can be provided with infrastructure capable of supporting urbanlike development. In the interim, should any high-intensity development be planned for designated rural districts, the developer will be charged with provision of adequate infrastructure according to the rules and regulations for the type of development being proposed.

AGRICULTURAL DEVELOPMENT

Policy 4: Conserve lands under or having a potential for intensive agricultural development.

Figure 4 Guam's Coastal Areas Face a Complexity of Problems



Rationale: The present emphasis of the government's "Green Revolution" is aimed at developing Guam's capability of becoming productive rather than consumptive in the area of fruit and vegetable production. Whether or not this effort will be successful will be determined by a number of factors such as availability of irrigation water and related infrastructure, provision of real economic incentives to potential farmers (e.g. crop insurance, tax incentives, loan availability, income guarantees), the ability of a fledgling agricultural industry to compete favorably with imported foods, natural hazards, and the ability of farmers to establish a cooperative comprehensive production plan. Despite these difficulties, the present and short run policy for agriculture will be development oriented. Therefore, there must be a parallel policy within land-use planning to encourage only agriculture oriented development to take place in lands with a production potential. This policy can be seen in the intent of several programs such as agricultural leasing, agricultural preserves, and cooperative agreements with the military for use of federal lands for agricultural production. If and when this policy is altered in the future, these lands can be designated for alternative types of development. However, with the amount of land already available for high-intensity development, an irreversible commitment of lands with an agricultural development potential to other uses is discouraged.

PUBLIC ACCESS

Policy 5: Ensure the public right of unrestricted access to all territorial ocean shore, recreation areas, parks, scenic overlooks, conservation areas, and areas under the control of the Territory of Guam; and to encourage, through cooperation with the Federal government, access to those areas under federal control which should be available to citizens of Guam.

Rationale: Traditional patterns of land ownership permitted unrestricted access to many areas of the island. Section 13451 of the Government Code declares "that it is the public right to have unrestricted access to the ocean shores of Guam for the common use by all the people of Guam." Certain types of development on property adjacent to the ocean shore have both restricted access to the ocean shore, and through approval of development not consistent with a multiple-use concept of the ocean shore, destroyed portions of the shore for any land-based use by the public. Declared conservation areas are, in some cases, inaccessible due to lack of trails, roads, or other means of access. Certain areas under control of the Federal government are prime recreational areas, yet are not open to the general public. Recent coordination among the Air Force, Navy, and Government of Guam has provided additional access to areas such as NCS Beach; however, access to other areas such as Ritidian Beach, Fena Reservoir, and others remains restricted. While the Bureau of Planning and the Government of Guam recognize the need for certain security precautions, future pressures for additional recreational areas must be considered with respect to portions of the island under federal control; and the number of people benefiting from such designations.

RECREATION

Policy 6: Increase recreational opportunities for all citizens of Guam, while protecting fragile coastal and inland areas which may be irreversibly harmed by unplanned development.

Rationale: Several reports, most notably, the Bureau of Planning's Survey Attitudes Towards Land-Use Planning have strongly supported public awareness of the need for increased recreational facilities now and in the future. Generally, certain types of recreational facilities can be consistent with even the most sensitive areas of particular concern. The major concerns relative to recreation will continue to stress the following areas and emphasize that:

a. Development of high-impact recreational facilities (ex. race tracks and marinas) must be compatible both with surrounding land uses and the natural environment.

b. Adequate recreation areas for high-density residential areas are provided within the boundaries of the proposed development, or at least are easily accessible to the residents within such an area, including opening access of the island's many military recreational facilities to the public.

c. The limited recreational resources are developed (or preserved) for future uses. These would include beaches, wildlife and marine conservation areas, scenic overlooks, parks, and historic sites considered to be of recreational value.

d. Community recreational areas are provided to adequately meet the need for such facilities as well as being located in areas suitable for such development.

e. Major development within Apra Harbor be carried out in a manner which addresses a multiple-use concept for shore and water recreation.

f. Tourism-related recreational facilities be located and developed according to well-planned objectives, and have a minimum negative impact upon the environment.

The Bureau of Planning is now and will continue to be closely coordinated with the activities of the Department of Parks and Recreation in planning and providing input for proposed recreational development.

HOUSING

Policy 7: Allow well-planned development of higher density residential lots in designated urban districts which are provided with functioning sewer, water, power, and road systems, and where surrounding land uses would not be incompatible with high-density residential use.

Rationale: It is recognized that traditional housing patterns have centered around single-family housing and the extended family. However, due to inflationary pressures on housing costs, scarcity of land with full services, and fractional or substandard lot problems, the government must address a means for provision of decent and adequate housing for a growing population. The increase of apartment dwellers from 10% to 22% since 1970 indicates that, while perhaps not an optimum solution, higher density residential development may be the only means of providing adequate housing. For this reason, legislation prepared by the Bureau of Planning recommends that lots from 2500-5000 sq.ft. may be feasible under certain circumstances if properly planned. Cluster housing and small-lot housing, often requires more attention to be given to recreational areas and landscaping. In reviewing proposals for such development, close attention will be given to these considerations. In rural, agricultural, and conservation districts as well as urban districts with lower intensity zoning, minimum lot sizes are specified. Small lots (2500-5000 sq.ft.) will not be allowed at any location, but rather will be evaluated on a PUD approach to avoid the development of potential blight areas by over crowding.

TRANSPORTATION

Policy 8: Support the development of a balanced transportation system including the reconstruction of primary and secondary roads in poor condition, the implementation of a mass transit system and the introduction of a pedestrian and bicycle system as alternatives to a dependence on the automobile, within the context of the Land-Use Plan such that efficient, safe, and reasonably economic solutions to existing transportation problems are realized.

Rationale: The extreme geographic constraints on development, relatively small size of the island, population concentration in relation to work centers, and the size of the projected population necessitates an efficient transportation system. To meet the transportation needs of the island by the year 2000, both major highway reconstruction and modification of present attitudes toward transportation will have to take place. For the most part, the Department of Public Works Comprehensive Highway Plan (CHP) provides a balanced approach to these considerations. The Bureau of Planning's Districting Map reflects what planners see as the physical distribution of population, and supporting economic activity to the year 2000, and generally agrees with future traffic demands outlined in the CHP. As avoidance of unwarranted sprawl is a major objective of the Land-Use Plan, the Bureau will closely examine each highway proposal towards meeting this objective. In addition, major new and proposed reconstruction activities will be examined closely, relative to severe environmental impacts. The foremost examples of these are:

a. Camp Watkins Road to Agana, Piti (widening of Marine Drive)
b. Talaguac Road Extension
c. Route 15 to Route 4 Connector

Our concern with "b" and "c" lies in the fact that these proposed roads pass directly through the Chalan Pago-Ordot aquifer recharge area. Extensive development of this area is not recommended until such time as the nature of the groundwater occurrence is fully understood, or that proper sewering is available. Widening Marine Drive, adjacent to the shoreline, must be examined and designed for minimum impact to the shore and marine environment and maintenance of public access to the seashore. Available mass transit as well as alternative modes of individual transportation must be vigorously pursued if Guam wants to avoid a transport system crisis in the next 5 to 10 years.

EXPANSION AND SITING OF MAJOR FACILITIES

Policy 9: Designate and plan for specific siting of major facilities, public and private, such that the optimum use of limited land resources can be realized with minimum impact on the environment and minimum disruption of surrounding or adjacent land use.

Rationale: Guam is fortunate in one sense by being of a size such that location of major facilities can be programmed with some degree of certainty. The major Land-Use Element concerns relative to major facility siting will be:

a. Energy Production and Transmission
b. Petroleum Refining
c. Commercial Port
d. Airport
e. Mineral Extraction and Processing
f. Solid Waste Disposal
g. Sewage Treatment Facilities
h. Major Reservoir Sites

Generally, the location of all these facilities has been determined to the year 2000. Further discussion of this topic appears in Chapter V, Sections A and C.

COASTAL WATER QUALITY

Policy 10: Eliminate polluting discharges into the island's coastal waters.

Rationale: The effects of polluting discharges into the island's coastal waters has been well documented through the efforts of many Government of Guam agencies, in particular GEPA and the University of Guam Marine Lab. The task of eliminating 100% of all discharges into coastal waters is, of course, not feasible. However, the majority of the polluting discharges can be eliminated through planning which is more responsive to potential environmental and economic consequences. The Bureau of Planning shall be guided by this and other policies developed by GEPA and other agencies aimed at the elimination, or at least

at the elimination, or at least mitigation of negative impacts, of polluting discharges brought about by:

a. Discharge of sewage effluents
b. Sedimentation and erosion runoff
c. Storm water runoff
d. Thermal discharges
e. Oil and toxic spills
f. Dredging and filling
g. Pesticides and chemicals

Standards controlling allowable limits within the above categories have been or will shortly be developed by GEPA, and will be enforced by GEPA. The Bureau of Planning will be developing certain overall performance guidelines for areas of particular concern (see Chapter V, Section B), however, these will be based upon already developed rules and regulations for such things as sedimentation and erosion, etc.

FRAGILE AND HAZARDOUS LAND

Policy 11: Ensure that development of fragile areas shall not diminish the natural or cultural value of an area through irreversible development. Identified hazard areas shall not be developed in ways that would pose unreasonable risk to the health, safety, or welfare of the people of Guam. Note: The specific categories of lands under this policy are addressed under Chapter V, Section B, Group (a).

Rationale: As indicated on the Districting Map, sufficient lands for residential, commercial, and industrial growth exist without having to irreversibly alter fragile areas, or areas of particular concern relative to unique and fragile environmental considerations. By the same measure, extensive development in identified hazard areas, such as floodplains, erosion-prone areas, airport crash and sound zones. Karst formations, or major fault areas will not be condoned without adequate safeguards for the persons using such areas.

WATER SUPPLY LAND

Policy 12: Fresh water resource lands shall be protected from development having irreversible or potentially harmful impacts upon the capacity of such lands to provide an adequate supply of pure water for consumption, irrigation, or other uses.

Rationale: Fresh water is one of the major growth limitations to the island. Although blessed with an excellent aquifer, (the Gyben-Herzenburg lens system as identified in John F. Mink's Groundwater Resources of Guam: Occurence and Development) we must continue to emphasize conservative development in these areas, as well as protection of watersheds with the potential of providing surface reservoirs in the southern half of the island. Until such time as the physics of the aquifer is fully understood, the government will continue to discourage intensive development in these areas.

CONSERVATION OF NATURAL RESOURCES

Policy 13: It shall be the policy of the Government of Guam to make the highest and best use of the island's limited renewable and non-renewable natural resources for the long-term good of the people. The resources that are considered in this category include fisheries, wildlife, minerals, outdoor recreation, range, timber, water, and wilderness.

Rationale The natural resources of Guam are limited to the island's 212 square miles and offshore marine areas. Presently, and more so in the future, intense demands will be placed on these natural resources. Long-range decisions concerning the optimal use of these resources must be made in order to maintain a viable economy and a pleasant environment for the people. This is preferable to utilizing the natural resources for the immediate short-term gain of a few individuals.

LANDS WITH MINERAL EXTRACTION POTENTIAL

Policy 14: Ensure that lands, identified as having significant potential for mineral resources, shall not be designated for intensive development. Lands identified as being environmentally, historically, or otherwise having additional value shall not be developed for extraction purposes unless an extremely strong case can be presented by the developer based on indisputable evidence that no alternative sites are available.

Rationale: Guam does not have extensive mineral resources; those that do exist are generally recognized as limestone, sand, some basaltic aggregate, or other relatively low value deposits. For this reason, identified areas suitable for extractive use should not be encroached upon by high density development which would either limit ongoing or potential use, or create a potential nuisance or health and safety hazards in the area of proposed development. Inversely, if potential sites are located upon or adjacent to uses not compatible with an extractive operation, the site should not be developed unless the developer can prove to the satisfaction of the Land-Use Commission or involved government agencies that no acceptable alternatives exists. (See Chapter V, Section B, Group (a).

AIR QUALITY

Policy 15: Ensure that various programs dealing with land-use planning and management seek to achieve air quality goals as defined by GEPA by using such air quality standards developed as guidelines for high-impact use locations.

Rationale: Land-use planning and management must reflect the goals of clean air efforts in the face of pressures for future industrial growth and development. Like other pollution problems, such as wastewater and solid waste disposal, air quality will continue to have a profound effect upon the island's economy especially if tourism remains a major contributing factor to the economic welfare of the island. Clean air, in this light, should be considered a major resource of the island. While agencies involved in both functional and long-range land-use planning will not be the enforcement power behind clean air regulations, they will be constantly involved in promoting the type and location of high-impact uses which are consistent with clean air guidelines and regulations.

VISUAL QUALITY

Policy 16: Prevent destruction, impairment, or other degradation of the island's scenic and visual resources.

Rationale: Visual or scenic considerations of an area are most difficult to define since subjective rather than objective criteria must be used to define "quality." Rather than attempting to come up with a set of objective criteria to 'measure' visual or aesthetic quality, the land-use planning policy is to avoid certain practices that obviously create unsightly or incompatible use, such as sprawl and strip development, incompatible use with either the character or the land or surrounding use, unnecessary interference

of land-to-sea or land-to-land vistas, objectionable sign or advertisement placement, etc. While such rules and regulations do exist which address such subjects as signs, height limitations, and blockage of view on the land-sea interface (Seashore Protection Act), the lack of an in-force master development plan indirectly allows development inconsistent with the intent of these regulations. It is the aim of the land-use districting approach, the regulation of areas of particular concern, the development of a community design plan, revised and strengthened enforcement mechanisms, and eventually, revised zoning standards and maps, to resolve these issues.

SEDIMENTATION AND EROSION

Policy 17: Demand strict adherence by all proposed development to erosion and sedimentation guidelines, encourage development in areas not prone to erosion hazards, and support practices to lessen the erosion potential of all land areas.

Rationale: A great deal of damage has been documented to the reefs of Guam as well as loss of valuable topsoil due to thoughtless or improper development during construction phases of building activities. In an area subject to a relatively high rainfall as well as frequent major storms, these practices cannot be condoned. Fortunately, Guam does not face major shoreline erosion problems due to the geologic formation of the island. The above policy has been applied in several instances, in designating, as conservation lands, certain areas which could possibly have been utilized at a marginal level for another use, such as agriculture. Further, the Land-Use Element encourages the widespread planting of trees, shrubs, and other erosion preventative measures by both government agencies and private individuals.

C. Alternatives

1. Overview

Public Law 12-200 provided enough flexibility in the development of a Land-Use Element to allow a number of alternative approaches. Certain federally-funded programs requiring a Land-Use Plan, as well as providing funds for the actual planning, provided additional guidelines as to the overall design. These include the HUD 701 Planning Information Systems, EDA 302 State Planning Program, the Disaster Preparedness Planning Program, and Coastal Zone Management Program. Many approaches have been considered; following are discussions of the major alternatives considered. (See Figure 5 .)

2. Alternatives of Approach

a. Continue to guide development according to an updated version of the 1966 Master Plan, considering problems identified in the Greenleaf-Telesca/Ahn 1972 Land-Use Section "Summary of Problems and Opportunities."

Discussion: The 1966 Master Plan was a monumental effort in that it was the first attempt on Guam to designate specific areas for certain types of development, suggest development patterns considering open space, conservation areas, etc; establishing a zoning system and mechanisms for the resolution of conflicts and appeals for zoning decisions. The main reasons for not being able to "update" this plan center around the facts that:

1. The incredible growth rate in the five-year period (1968-1973) following the plan's completion produced pressures for development, immigration problems, etc., in excess of the plan's scope.

2. Inadequate funding in the area of Land Management for such things as legal description of land parcel boundaries, updated ownership maps, and updated zoning (delineation of all zoning changes, conditional uses, PUD's granted) has prevented, in many cases, an accurate assessment of facts having a bearing on a commission decision for allowing or not allowing development. (These of course are still major stumbling blocks for implementation of any effective plan in the future.)

3. Modifications of the plan through approval of marginally acceptable development have established a pattern of growth inconsistent with high growth rates being experienced on Guam.

b. Institute an island-wide zoning system similar to the 1966 Master Plan, but emphasizing more specific zoning regulations for the "agriculture zone" which is essentially a "catch all" for all lands not zoned for other purposes.

Discussion: If a sufficient data base were available, dealing with such considerations as individual community objectives, population, growth, up-to-date soil and geologic information, hazard areas, aquifer recharge areas, etc., this would be the best alternative. However, lack of accurate data, lack of a system of checks and balances relative to the overall decision-making process, as well as such high-priority programs as the Green Revolution and major sewer/wastewater infrastructure development, suggested that specific island-wide zoning is premature at this time. Public Law 12-200, in recognition of these considerations, called for "generalized areas of land use within an urban, rural, agricultural, and conservation context."

c. Update the 1966 Master Plan plus introduce a "districting concept" for areas of generalized land-use classification.

Discussion: The introduction of the Bureau of Planning's concept of "districting" is sound for reasons enumerated in Paragraph (a) preceding. However, the limitations caused by modification of the 1966 Master Plan discussed in Paragraph (a) would rule out this approach.

d. Institute a "no zone" approach within the context of a generalized land-use classification system of urban, rural, agricultural, and conservation.

Discussion: This is a viable approach at first analysis. The major drawback, however, is that an extremely detailed set of performance standards for all possible types of development is required for a "no zone" approach which, for example, could conceivably locate heavy industrial activity adjacent to a high-density residential use. The results of uniformly posing such stringent standards could produce a sizeable disincentive for needed commercial and industrial activity. Development of such performance standards is well beyond the capabilities of the Government of Guam at the present time.

e. Institute an intermediary planning process, between the districting approach, such that unavailable data could be developed, existing data analyzed, and which could serve both as a long-range, 20-25 year conceptual development plan, serving as a basis for the next task of an updated zoning approach.

Discussion: This proved to be the most viable alternative, Generally, the approach used consisted of:

1. Development of base maps (the uniform mapping system) and expansion of a land-use data base for use in the overall planning process.

2. Drawing upon all areas of government and public sector expertise, and developing maps and supporting data indicating areas of generalized land use, or districting maps.

3. Identification of island-wide "areas of particular concern" which must, for various reasons, receive closer attention relative to development pressures than a generalized use classification would provide.

4. Development of a "Community Design Element" (as specified in P. L. 12-200) to serve as a long-range development plan for the island. Although a separate document from the "Land-Use Element," the concepts included will be inseparable, as well as providing a base for future zoning of the urban district.

III. PHYSICAL AND CULTURAL CONSIDERATIONS

A. Physical Setting

1. General

Guam is the southernmost and largest island in the Marianas Chain, an archipelago in the Southwest Pacific. It lies 13 degrees 28'29"N and 144 degrees 44'55" E at Agana, the capital city on the central western coast. The island is approximately 30 miles in length with a northern width of 8 1/2 miles and a maximum southern width of 11 1/2 miles. Northern and southern land areas taper at the central waist to a width of 4 miles. Excluding reef areas, the land area is 212 sq. miles or 550 sq. kilometers. The axis of the island is in a northeast-southeast direction. Guam is generally classified as a high island with 12 small islands along the reef. [redacted] large offshore island is Cocos Island. The island is a raised portion of the barrier reef encircling an atoll-like lagoon.

One

2. Climatic and Seismic Conditions

Generally, the climate on Guam is warm and humid regardless of the time of year. The relative humidity commonly exceeds 84% at night, all year long, and the average humidity is at least 66% every month. The daytime temperatures are commonly between 83 and 88 degrees with night temperatures falling to the mid-seventies during the coolest part of the evening. The two distinct climatic seasons on Guam are the wet and dry season. The dry season is generally from January to May and the wet season from July to November. December and June are considered transitional months. The mean annual rainfall ranges from approximately 80" along the coast to 95" for the higher mountainous areas; (20-24%) falls in the dry season and 63-66% in the wet season. The remaining rainfall occurs during the transitional months. A great deal of variation in rainfall can occur from year to year. In 1952, a maximum of 145.45" was recorded with a minimum of 60.42" of rain recorded in 1955. Severe droughts are a normal occurrence on Guam. The period of greatest drought hazard is February through April. Inversely, intense rainfall can occur with tropical storms or typhoons. Small-scale storms or squalls can occur at anytime with varying frequency and character. Major storms or typhoons, with winds greater than 65 knots, have made direct hits on Guam. The likelihood of typhoons is greatest during July through September; however, as evidenced by the last direct hit, they may occur during any month. On May 21, 1976, Typhoon Pamela devastated the island with recorded sustained winds of 115 mph and recorded gusts to 159 mph.

Located 70 miles northwest of the Marianas Trench, Guam is subject to earthquakes and seismic sea waves at presently unpredictable frequency and intensity. Devastating sea waves have been absent during recorded history. Numerous earthquakes and tremors have occurred with the most damaging quake being recorded in 1902. Guam is structurally divided into six blocks by seismic fault zones that are defined by distinct divisions in the land surface.

3. Northern Guam

The northern half of Guam is geographically characterized by a raised limestone plateau with a maximum elevation of 600 feet which gently slopes downward in a southwestern trend to less than 100 feet in the central mid-section of the island. The northern limestone is composed of the consolidated remains of reef coral and sediments. The northern limestone terraces and cliffs represent an ancient barrier reef, with the inland limestone terrain comprised of the sedimentary remains of the lagoon sediments. The coastal limestone is hard and valuable for mineral extraction. The central limestone is extremely permeable, thus rainfall quickly soaks into the ground and recharges three main aquifer areas. A lens of freshwater floats upon saltwater and provides the bulk of the island's freshwater supply.

A very thin soil layer covers most of the northern limestone and hosts forest vegetation known as the limestone forest. The limestone forest is comprised of large trees that form a canopy for understory shrubs, herbs, epiphytes, and lianas. Many of the plants grow from bare limestone. Many of the areas of limestone forest have been cleared by wartime efforts and postwar urban and military developments. The remaining areas are concentrated along coastal slopes and represent the critical habitat for many of Guam's endangered plants and animals.

The northern limestone plateau is interrupted by volcanic upthrusts at Barrigada Hill and Mt. Santa Rosa. The volcanic basalt is exposed at Mt. Santa Rosa and has resulted in the buildup of lateritic clay soil along an adjacent inland area. This region represents the only major sector of agriculturally developable land in the northern half of the island.

4. Central Guam

Geologically, the central waist of Guam, from Agana Bay to Pago Bay, represents a transitional zone between the northern limestone and southern volcanic formations. The limestone in this area is sediments argillaceous or yellowish in color from the volcanic [redacted] that mixed with the white reef coral during the later development of the northern reef adjacent to the older southern volcanics. The relief features are characterized by sloping hills that are intersected by low-lying basins that are periodically flooded during the wet season. They appear as grassy flats and are important for recharge of the central aquifer. The central aquifer is the smallest lens, yet least affected by saltwater intrusion. It reaches the surface at Agana Springs and disperses water over a floodplain or wetland wildlife habitat, known as Agana Swamp, which eventually flows into Agana Bay via Agana River--the northernmost river on Guam.

Despite the small land area, geologic characteristics and unique ecology of Central Guam, the area is the location of the major concentration of urban development on the island. Approximately 30% of the island's population resides in this small land area. Commercial, industrial and residential development has expanded from Agana, the major trade center and seat of both governmental and religious power structures.

5. Southern Guam

The southern half of the island is geologically characterized by two distinct volcanic formations that developed in different geologic eras. The Alutom formation or mountainous ridge adjacent to Central Guam, is the oldest formation. The highest peak is Mt. Alutom at 1,076 feet. The southern range, known as the Umatac formation is characterized by high peaks or a cuestal ridge that is steep on the seaward side and gently slopes inland toward the interior basin where the two formations merge. The highest peak is Mt. Manglo at 1,250 ft. The rugged upland surfaces of volcanic areas are weathered. Exposed volcanic rock and conspicuous erosion scars are present. Major land areas, however, are covered with savannah grasslands that have adapted to the dry and nutrient deficient clay soils of the upper slopes. Water quickly drains from sloped surfaces and forms a surface drainage pattern that comprises the freshwater resources of Southern Guam. A relatively small amount of rainfall soaks into the underlying rock strata. More than 40 rivers and streams form a surface drainage pattern that dissects the volcanic regions. These rivers flow into the sea at coastal embayments where floodplains and wetlands typify the estaurine areas. A heavy growth of tropical vegetation borders the inland areas of rivers and represents a plant community known as the ravine forest. Sharp divisions between the savannah grasslands and ravine forest lends a particularly aesthetic contrast to Southern Guam. The southern uplands are some of the only expanses of unspoiled terrain on Guam.

Only 24% of the island's population resides in southern communities because of terrain restrictions. Village centers are most often along coastal lowlands with a traditional lifestyle and architecture producing a sharp contrast with northern and central urban development patterns. The reliance on farming and fishing for subsistence is more persistent in the south. Topographic, geologic and ecological conditions have caused the deposition of fertile soil into southern interior basins. Large tracts of prime agricultural lands lie between the southern communities of Inarajan and Talofofo. Other portions of the interior basin, where the two major volcanic formations meet, however, are characterized by eroded reef coral that forms a jagged Karst topography. These areas are concentrated on federally restricted property near the Fena Reservoir, a man-made reservoir that supplies 10% of the island's water consumption.

6. Coastal Features

Being a small island, with human settlement concentrated along coastal areas, the dynamic features and processes that occur at the shoreline or ocean-land interface are among the most important natural resources on Guam. Much of Guam is surrounded by coral reef, a diversified ecological community that is represented by different types in different locations. The northern coastline is generally characterized by an immediate reef front at the base of steep cliffs. However, as sandy beaches occur, the presence of a reef flat becomes more prevalent along central and southern shores. The reef flat is a level base of limestone that consists of the remains of ancient reef coral that has built seaward to the present offshore reef front of living coral. The reef front suppresses the force of all except the largest storm waves and contributes to the buildup of sand along the beaches. As a transition between the reef and beach, the reef flat area is sometimes exposed during low tides, however, it represents an important shelter for many small fish, shellfish, crustaceans, algae and other forms of sea life.

Two barrier reefs, which encircle lagoon areas, are represented on Guam. Cocos Island, at the southern extreme is a relatively pristine area that is important as an area for both schools of juvenile deepwater fish and the species associated with the coral community. The existing and potential use of the area is recreational.

Apra Harbor, another barrier reef located along the central-west coast, still represents important underwater resources. The outward appearance, however, is vastly different than seen at Cocos Island. The offshore Cabras Island and Luminao Reef have been linked and covered with surface development to form the Glass Breakwater. Apra Harbor is the only deepwater port on the island. As the major port area, it serves both the military and civilian communities. Being a strategic location and situated on major trade routes, the harbor is the focal point of the most sea traffic and transshipment in the Western Pacific. Industrial development, in this area, increases yearly to meet islandwide demands for imported supplies and energy development.

Natural shoreline configuration is generally represented by rocky coastline, sandy beaches, mangrove mudflats and river estuaries. The rocky coastline comprises 62% of Guam's shoreline. It is characterized by steep, uplifted limestone terraces and cliffs with a lower bench terrace covered with a growth of marine organisms. Many cliffline areas are characterized by a waterline niche that is cut by algae, limpets and chitons.

The sandy beaches of Guam comprise a significant portion of the shoreline, 31%. They are sloping landforms composed of unconsolidated sand, gravel, broken shells, coral and foraminifera.

They extend landward from the water's edge to a distinct break in the landform or to a point where terrestrial vegetation covers the substrate. They extend seaward as far as the sandy bottom is appreciably affected by tide, currents and wave movements.

Mangrove mudflats are represented in only two locations on Guam. An extensive stand of mangrove species has been increasing in size along the inner shore of Apra Harbor. The other area of mangrove shoreline is along the extreme southern coastline between Merizo and Inarajan, along the inner shoreline of Cocos Lagoon. They assist in natural shoreline stabilization and represent an important ecological community.

Guam's shoreline is interrupted by numerous bays, most of which are associated with estuaries or river mouths. The surrounding river valleys and immediate edge of the river are wetland communities. A diversity of aquatic plant and animal species rely on the specific environment of estuarine areas. The constant inundation of water also makes these areas valuable for aquaculture development. Beach areas at river mouths are usually formed by a combination of reef material and riverine substances that originate from inland areas. Thus, beaches at embayments have a higher content of soil and organic material than the white sandy beaches.

B. Historical and Cultural Setting

Approximately 1500 BC, the precontact Chamorros migrated from the direction of islands in Southeast Asia and established multiple chiefdoms. The island was territorially divided and individual royal families, who traced ancestry through a female line, ruled over the common people. The Chamorros flourished with an advanced fishing, horticultural and hunting society. A remarkable diversity of stone age tools, utilizing natural materials such as shell, bone, wood and fibers, characterized their adaptive technology. Sporadic warfare among chiefdoms added to the characteristics of the life-style. Much cultural reconstruction, however, is speculative and based upon comparisons with similar Pacific cultures and the analysis of remains such as artifacts and skeletons or area features such as the latte stone house supports. From archaeological evidence, it is estimated that the population grew to 80-100,000 members or relatively the same number of people as inhabit the island today.

Ferdinand Magellan discovered Guam, for the Western World, in 1521. Rapid colonization by Spanish conquistadores followed, accompanied by a period of warfare, disease and missionization. The population rapidly declined and a Chamorro Mestizo culture emerged as Guam was established as a link in the early trade route between Mexico and the Philippines. The remaining population was centralized in Agana and barrios developed within the city. Many new customs were introduced from Spain, Mexico, the Philippines and other island groups. Major changes in technology took place with the introduction of steel. Ovens replaced underground firepits. Catholicism dominated

beliefs in ancient spirits and new foods were introduced. There was a major shift from growing rice to growing corn. These changes happened so rapidly, that historical reports are scarce and brief.

During the Spanish Colonial Period, from 1521-1899, new styles of architecture appeared on Guam. Due to World War II and the effects of time, many original Spanish structures were destroyed and only remnants remain. They include Santa Aqueda, Ft. Soledad, Plaza de Espana and Spanish bridges. The bridges, constructed of hand-hewn stones, are seen in Taleyfac, Taelayag, Sella Bay and Agana.

World War II, which added to the disappearance of many structures, left its own unique relics that now have historical value. Massive artillery, tanks and important battle sites and command posts add another link in the chain of events that lead to the present. Though the Japanese Occupation was relatively short-lived, its impact on the body of cultural knowledge and physical appearance of the island environment was profound. Many existing communities and land-use patterns have developed in response to infrastructure that was originally constructed to service military facilities. Communities such as Talofofo developed around civilian wartime camps. Many coastal areas, such as Agana and Agat had to be completely cleared of rubble and subdivided. Still other communities such as Santa Rita, developed as residents were relocated as a result of land aquisition by the U.S. military.

Presently, many people value the traditional architecture of southern villages and desire to retain their present appearance. Inarajan's historic district represents the last remaining concentration of building styles and character with a prewar [redacted] flavor. Though this adds to the scenic character of the island, many homeowners wish to improve their property and utilize modern building materials. Many areas of Guam reflect a period of technological transition from frame houses and tin roofs to typhoon-proofed, concrete-based structures. An increasing incidence of subdivision development denotes a trend toward insular neighborhoods and a Western lifestyle.

Land-use patterns and trends affect over 100,000 residents, approximately half of which are of Chamorro Guamanian heritage. Throughout multiple phases of colonial heritage, the Chamorros have adapted to the pressures of introduced lifestyles. They still retain a body of knowledge concerning the island's traditional use of land and sea resources.

A traditional facet of Chamorro culture, the land tenure system, considerably affects the course of development. Within many families, there are multiple owners of property. When several heirs all own title to a single parcel of land, conflicting interests often necessitate non-development. Distribution of land to heirs can also encourage residential development, when for example, land

may be a prime agricultural district. Often, landowners all live together in a traditional extended family relationship. Several generations of relatives often reside in adjacent houses. The system of land ownership on Guam is typical of the Pacific. Since the Chamorro Guamanians have been exposed to varied phases of colonial dominance through the years, they have adapted land-use traditions as a countercheck against overdevelopment of land on a fragile sea-bounded island.

In Yona and Sinajana, two central communities on Guam, urban renewal has changed this style of living. Low-cost housing tracts and proposed urban renewal in other communities will enhance this urbanization process that changes social and economic patterns. Urban renewal and subdivision planning involves sensitive judgements as to whether extended family settings, shared outdoor cookhouses, and random traditional village appearances should yield to a more systematically planned and structurally sound environment. Land uses are importantly planned with maximum public input as developmental change sometimes poses a threat to the island's cultural diversity.

One such activity that is prevalent on Guam and must be considered in resource planning and management is fishing. There are few full-time fishermen today as existed in precontact times. In earlier years, a majority of residents were occupied full-time in fishing and its associated technology. With the introduction of industrially manufactured items and alternative employment, less time is spent in fishing. However, despite the decline in the number of full-time fishermen, there is still an abundance of part-time fishermen. A large volume of knowledge exists concerning local fish names, fish habitats and the use of a variety of traditional fishing methods, particularly net fishing.

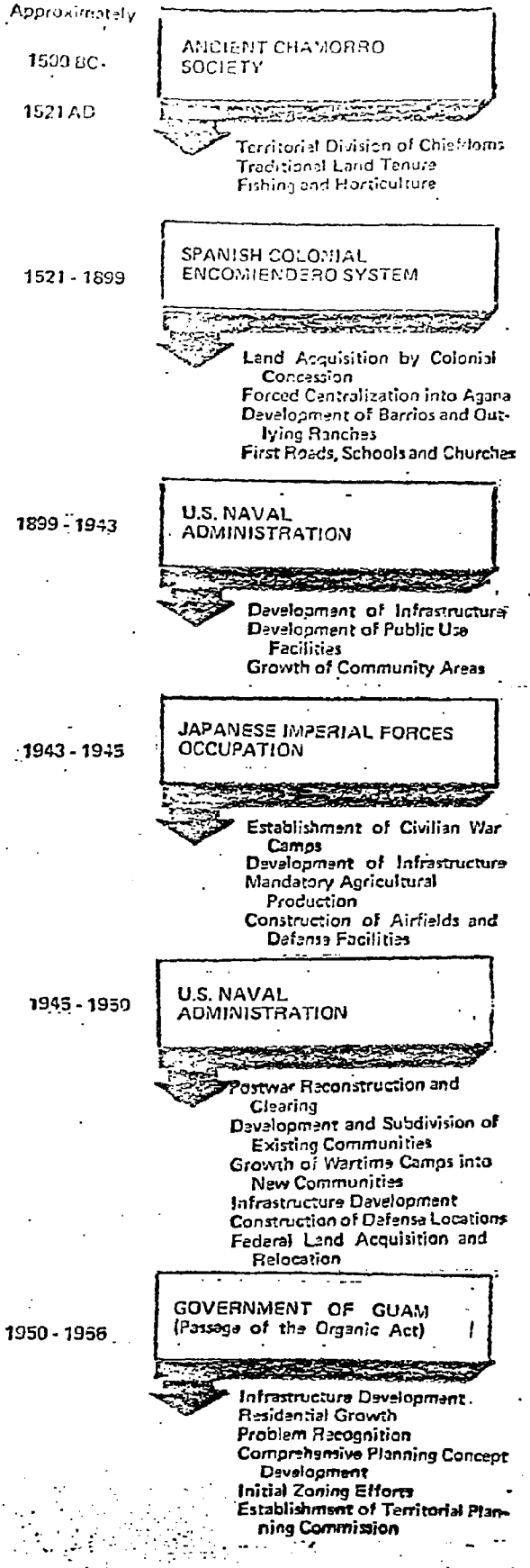
As planning often denotes areas of preservation, the Chamorro culture also has traditional environmentalists that act in a conservative manner. These are the taotaomona or spirits of the island's ancient inhabitants. It is a widespread belief that the spirits live in the wild and bring illness upon those who would wantonly destroy part of the environment. They reward those who would respect their jungle and reef habitat with a good food catch. The spirits are believed to favor large banyan trees as their abode. Often, bull-dozer operators will leave an area with a banyan tree untouched. This in itself is a factor thwarting development.

If it felt that an illness is spirit-caused, the island resident may go to the traditional curers, known as suruhanos, for treatment with an ancient system of medicine. A central facet of the treatment is the use of medicinal herbs. The suruhanos and other residents have a tremendous store of knowledge concerning valuable medicinal flora. There is knowledge of the ethnobotanical value of plants in every plant community on Guam. Ethnobotanical use involves the use of an herb, weed, shrub, tree or vine for food, medicine or material culture. Some trees such as the coconut are used for multiple

purposes. The establishment of districts and areas of particular concern on Guam, is not only essential for the maintenance of many endangered and threatened plants and animals, but preserves the cultural knowledge and identity of island residents.

The need for cultural considerations in planning and management is probably more evident on Guam than in many mainland areas, where planners and managers are most often a typical community member and precisely aware of the local frame of reference or perceptions of resource use. On Guam, planners, government officials and developers must utilize information on a wide range of aspects of traditional island life in order that land and water resource use blend with local patterns of acceptable behavior.

Figure 5 A History of Land Use and Planning on Guam



1966 - 1972

GOVERNMENT OF GUAM
(Lifted Security Ban)

MASTER PLAN, TERRITORY OF GUAM
Land Use and Zoning
Circulation and Transportation
Parks and Recreation
Public Service and Facilities
Public Buildings
Community Design
Urban Renewal

Physical Development
Policy Implementation
Increased Enforcement
Increased Mainland and Foreign Investment
Increased Industrial and Residential Development
Increased Governmental Control of Infrastructure

1972 - 1977

GOVERNMENT OF GUAM

GUAM MASTER PLAN: PROBLEMS OPPORTUNITIES AND ALTERNATIVES

Increased Industrial Development
Tourist Industry Growth
Problem Recognition
Data Collection
Increased Enforcement
Subdivision Control
Seashore Protection
Typhoon Restoration
Agricultural Growth
Increased Comprehensive Planning

Population
Land-Use
Housing
Circulation
Economics
Parks and Recreation
Social Factors
Health Services
Public Education
Environmental
Infrastructure
Military

Projected

1977 - 2000

GOVERNMENT OF GUAM
(Planning funded by HUD, CZM, and EDA)

COMPREHENSIVE DEVELOPMENT PLAN

Input

Long-term, Islandwide Responsible and Coordinated Regulatory Enforcement, Decision-Making Planning and Policy-Making by Federal, GovGuam and Private Interests

Input

COE Reservoir Plans
COE Harbor Plans
Historic Preservation Plan
Seashore Park Plan
Seashore Reserve Plan
Parks and Recreation Plan
Government Subdivision Plans
Urban Renewal Plans
Low-Cost Housing Plans
Disaster Preparedness Plans
Transportation Plan
Waste Water Facilities Plan
Capitol Improvements Projects
Housing Element
Growth Policy
Statistical Abstracts
Visitor's Survey
Overal Economic Development Plan

Public Participation
Land-Use Districting
Delineation of Areas of Particular Concern
Community Design
Revised Zoning
Legislative Revision
Land-Use Opinion Survey
Population Projections
Federal Lands Survey
Street Atlas
208 Program
Reef Studies
Mineral Extraction Study
WRRC Studies
Marine Lab Studies
Aquaculture Study
AICUZ Studies
Pristine Community Studies
Flood Hazard Studies

IV. GROWTH AND CHANGE CONSIDERATIONS

A. Introduction

As previously experienced, a Land-Use Plan quickly becomes obsolete if various factors that influence land use are not adequately assessed. The rapid population and economic growth and the subsequent change in land-use patterns during the last 10 years, generally, were beyond local control (e.g., disasters and immigration) or beyond local anticipation (e.g., tourism growth). These occurrences have rendered the [redacted] Master Plan obsolete in many areas. 1966

During this period, local attitudinal changes have also occurred. Living patterns, traditionally centered around the extended family, are giving way to an urban orientation characterized by proximity and or convenience to employment centers and public facilities and services. Employment patterns have shifted from primary sectors such as agriculture to the tertiary sectors of tourism and government. Special needs of the elderly, low income, etc., are becoming public concerns as opposed to traditional familial responsibilities. This section will discuss some of the demographic, social, and economic factors that determine land-use patterns and present various trends that the Land-Use Plan will address. Figures 6 -12 depict economic trends and factors which are discussed in length in the OEDP.

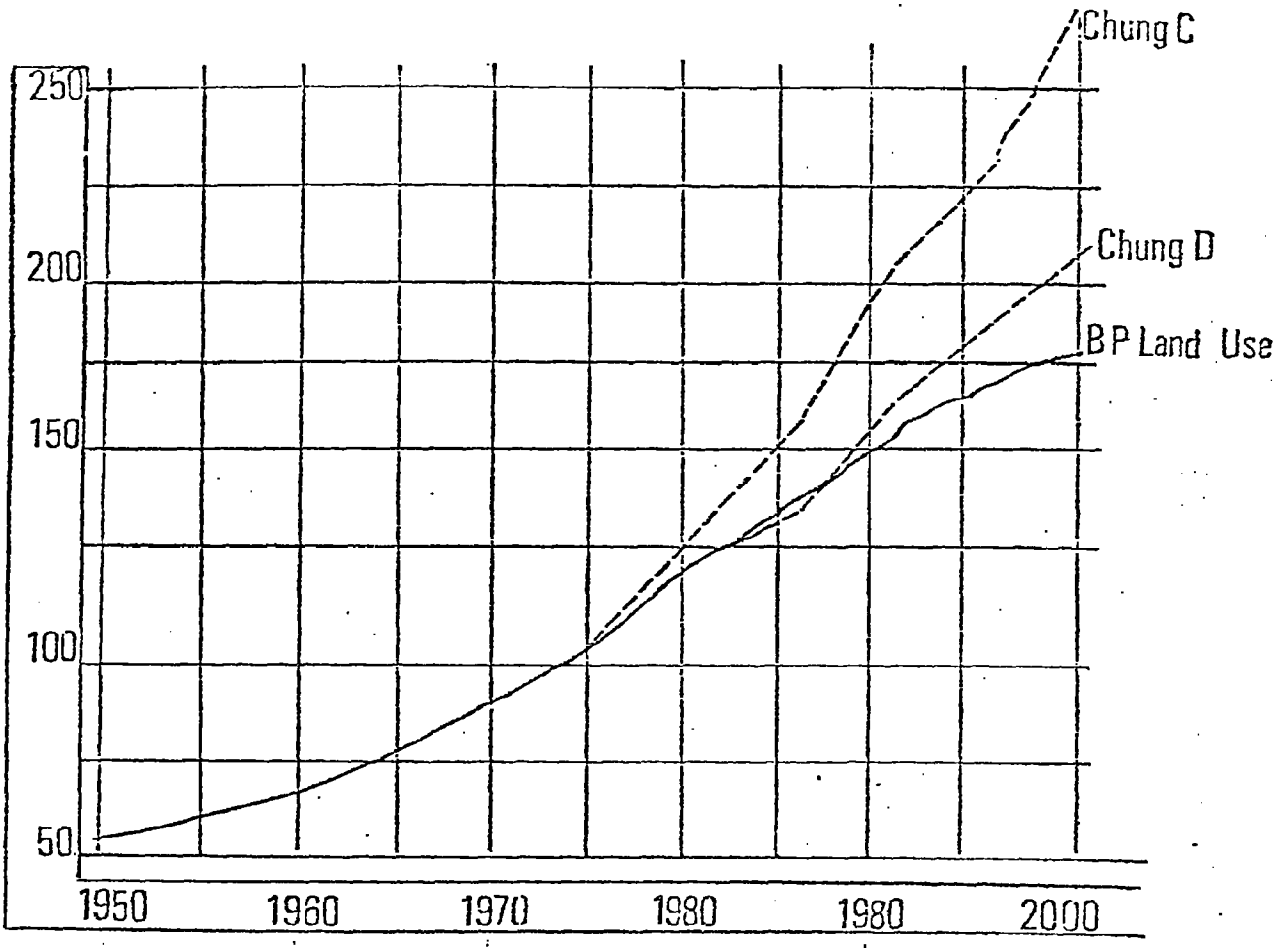
B. Population

The population of Guam is in a constant state of change, shift and relocation, and is closely related to Guam's economic situation. These two factors are instrumental in shaping both the form and function of particular areas on Guam. Section C deals with the overall trends of population and Section D addresses economic growth. While planners are often criticized for not having one definite set of applicable population statistics, we can only base our projections on existing data. On Guam, these figures will continue to be periodically revised until a sufficient data base can be established to make more definite projections which will only have to be revised at the time of a census. Present data provides us with ranges of projections which vary significantly. We can only narrow these ranges down to those limits that existing parameters indicate.

C. Projections for Population Growth

Although the 1970 census provided base data for the preparation of population projections, a final analysis was not completed. The Bureau of Planning recognized the need to prepare an interim set of projections which could be used by the numerous agencies in their planning efforts. Memoranda prepared by the Bureau and approved by the Department of Commerce and Bureau of Labor Statistics provided estimations of island-wide population growth based on the data generated by the 1970 census. This series of three population projections were developed by Professor Roy Chung, a demographer, and Quinton-Budlong (QB), a firm contracted to prepare a portion of the 1972 Guam Master Plan. The three provide a useful range of island-wide population projections to the year 2000. (See Table 1 and Figure 6 .)

Figure 6 Population Projections for Guam



It is difficult, if not impossible, however, to apply the island-wide growth rates used in these projections to specific municipalities and areas within municipalities. Planners at GEPA, PUAG, and DPW, as well as the Bureau of Planning, encountered difficulties especially in wastewater infrastructure planning when growth rates applied to specific areas; for example, indicated pipe sizing much too large for the existing population.

Table 1 . Selection of Population Projections, 1970-2000*

		1970	1975	1980	1990	2000
1.	Chung (D) (no military)	85,380 (63,380)	105,400 (83,400)	126,000 (104,000)	165,400 (143,400)	206,660 (183,660)
2.	QB (B) (no military)	89,890 (67,890)	106,310 (84,310)	126,956 (104,956)	179,352 (157,352)	236,000 (214,000)
3.	Chung (C) (no military)	85,380 (63,380)	107,400 (85,400)	132,200 (110,200)	198,000 (176,000)	268,000 (246,660)
4.	BP L-USE (no military)		106,700 (84,700)			188,500 (167,500)

* Note: Parentheses ( ) indicate that the constant 22,000 military population is not included.

Using aerial photos, completed in 1975, actual densities of recent housing developments, data relative to planned developments, as well as certain geographic constraints to development, the Bureau of Planning, in cooperation with several agencies developed area-specific growth projections. While the overall projection (Line 4, Table 1) is somewhat less than the Chung Series D, (Line 1), planners feel these figures are the most realistic available, as far as planning for the type and intensity of growth to occur in the next 25 years.

Table 2 A Summary of Municipality Growth Rates to the Year 2000
*(See Appendix No. 1 for specific Community areas).

Municipality	Estimated Existing Population	Projected Population Year 2000
Umatac	700	1,600
Agana	1,094	2,550
Asan	1,440	2,700
Piti	1,570	2,645
Merizo	1,635	2,580
Inarajan	1,790	2,765
Agana Heights	2,125	4,000
Talofofo	2,155	2,675
Sinajana	2,545	4,750
Chalan Pago-Ordot	2,762	4,958
Santa Rita	3,200	5,050
Mongmong-Toto-Maite	4,022	5,100
Yona	4,098	8,460
Agat	4,230	9,450
Mangilao	5,694	19,482
Barrigada	5,818	11,474
Yigo	6,097	13,600
Tamuning	11,849	27,500
Dededo	21,877	36,250
TOTALS	84,701	167,589

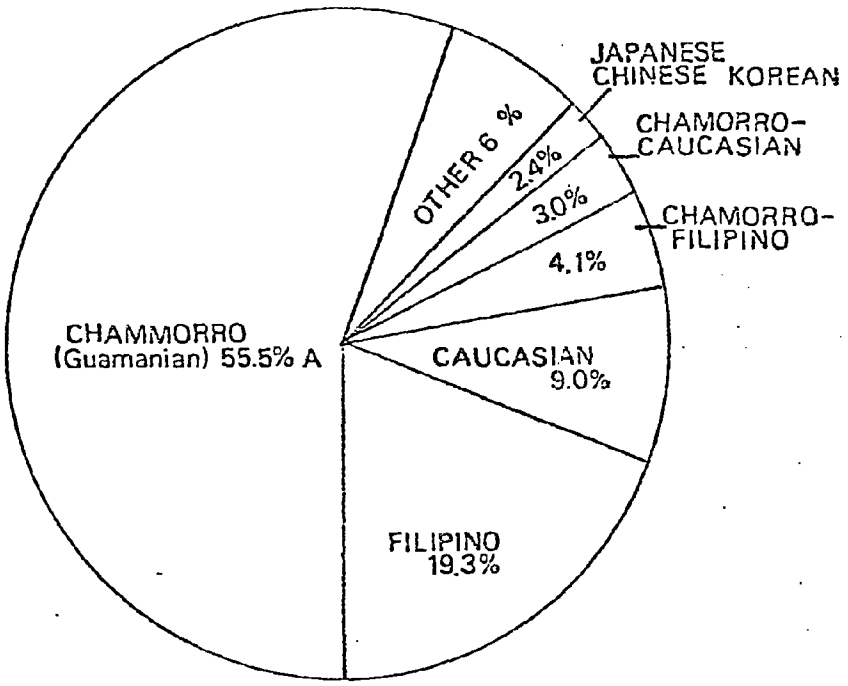
* Does not include military personnel and dependents.

Table 3 Population Changes and Percentages in Northern, Central and Southern Guam

	Present	Percentage of Present	Projected	Percentage of Projected	Percentage Increases *
North	42,333	49.98	86,684	51.74	104.77
Central	21,990	25.96	43,680	26.07	98.64
South	20,378	24.06	37,225	22.22	82.67
TOTALS	84,701	100.00	167,589	100.00	

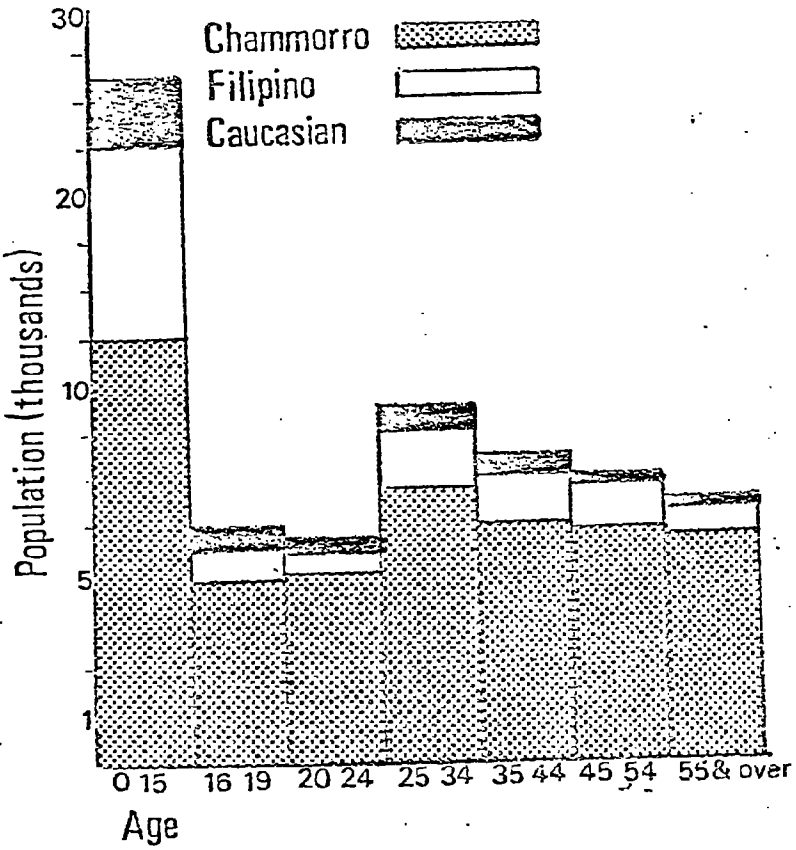
* $\frac{\text{Projected-Present}}{\text{Present}} \times 100$

Figure 7. Pie Chart Showing the Ethnic Composition of the Civilian Population of Guam, September, 1975.



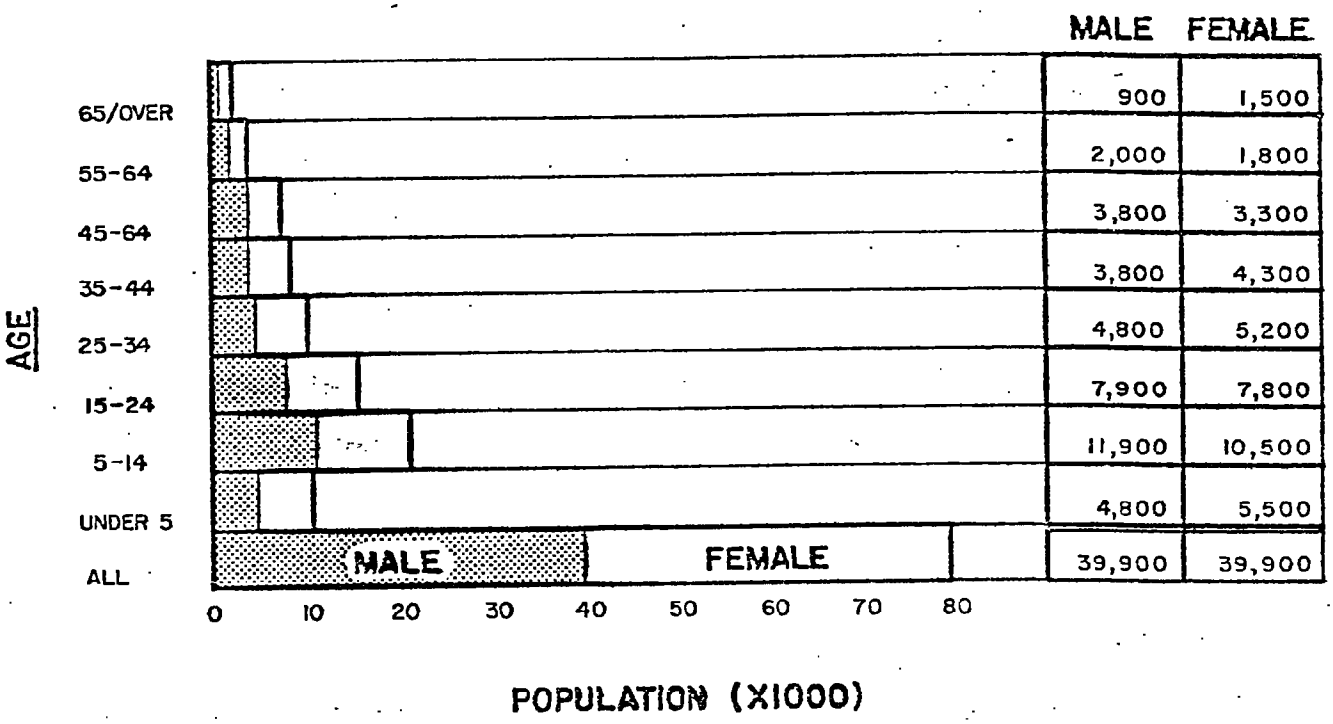
Source: Bureau of Labor Statistics

Figure 8 Ethnic Population by Age Group



Source: Bureau of Labor Statistics, Government of Guam

Figure 9 Sex Composition of Population by Age Group



Source: Bureau of Labor Statistics, Government of Guam

D. The Economy

1. Principal Economic Activities (See Figure 10)

The largest economic sector of the community is government. Excluding military employment of civilians, federal and local government employees on-payrolls totalled 10,800, or one-third of the total employment of 31,500. Including the military, total public employment approaches 15,000 workers, or almost half the workforce.

a. The Construction Industry

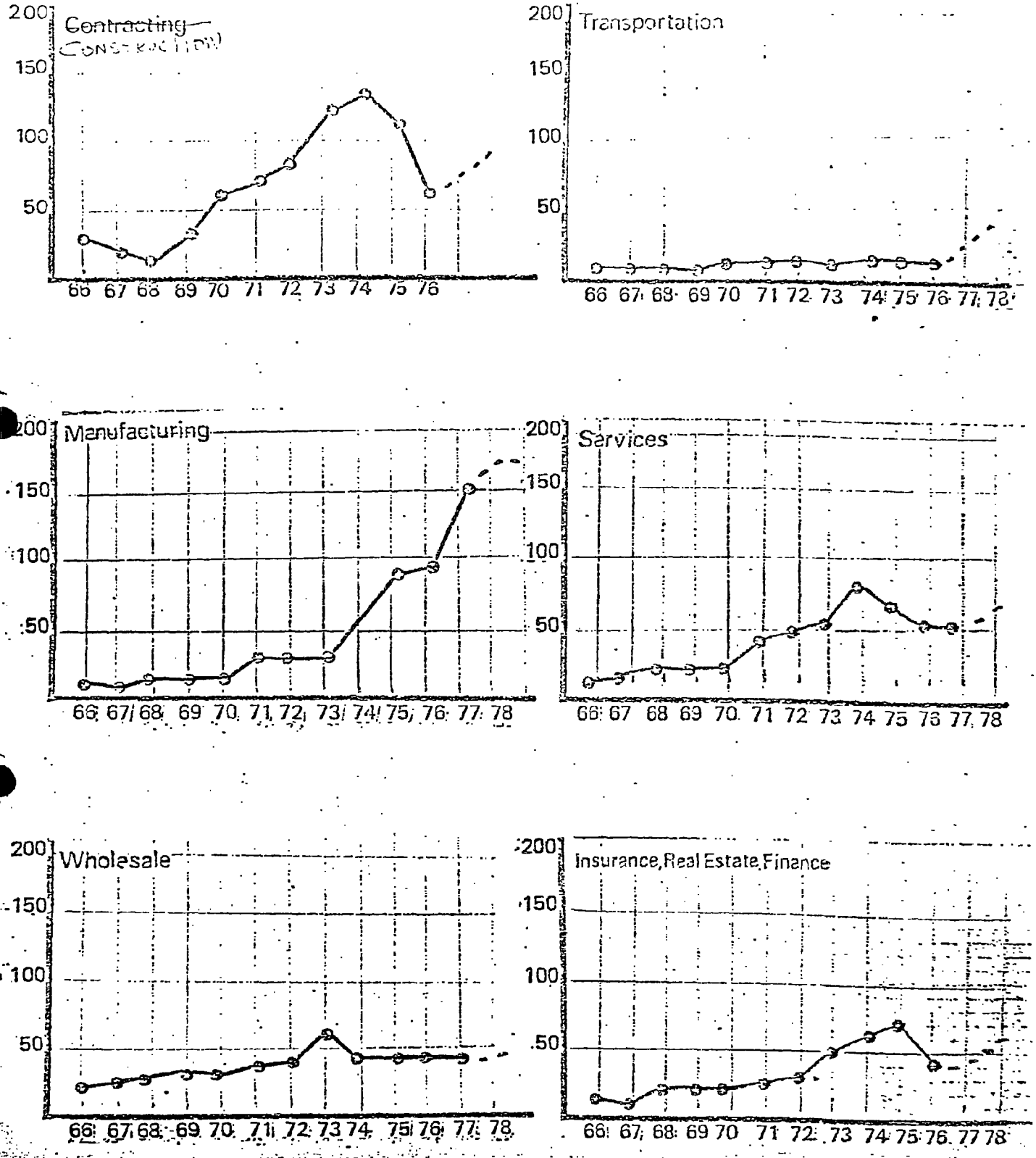
The economic impact of public expenditure goes further than direct employment. At present, the construction industry with 3,500 employees is almost entirely dependent on the public sector as a result of the continuing recession. At one time, it was the largest private sector industry with over 8,000 employees. Now, residential construction consists largely of completing projects begun a few years ago and post-typhoon Pamela reconstruction, as private sector investment in new buildings has slowed dramatically.

The island's infrastructure systems are inadequate to serve the island's population and constitute a definite constraint to economic growth. Overall, roads are in a poor-to-fair state although recently completed reconstruction has improved the situation somewhat. The telephone system is archaic. An estimated forty percent of the water drawn from various sources is lost in the distribution system. The sewage disposal system has serious deficiencies, although projects being developed in coordination with GEPA should alleviate the situation in the near future. The island's power facilities are adequate at the present, but there are serious management problems as well as cash flow difficulties which have resulted in fiscal obligations for new facilities not being met. This together with the power grid's susceptibility to typhoon damage, and other factors such as aging equipment and lack of adequate personnel training could mean serious problems in the near future.

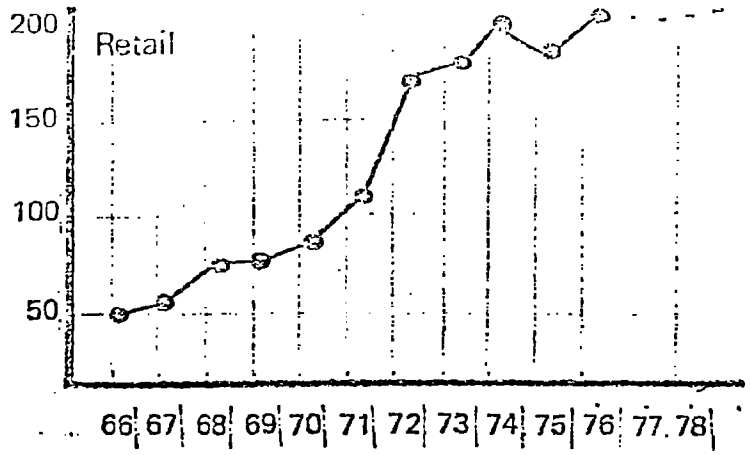
To alleviate problems, a power hardening project by GPA is currently in progress. Construction will begin in 1979 and will consist of replacing

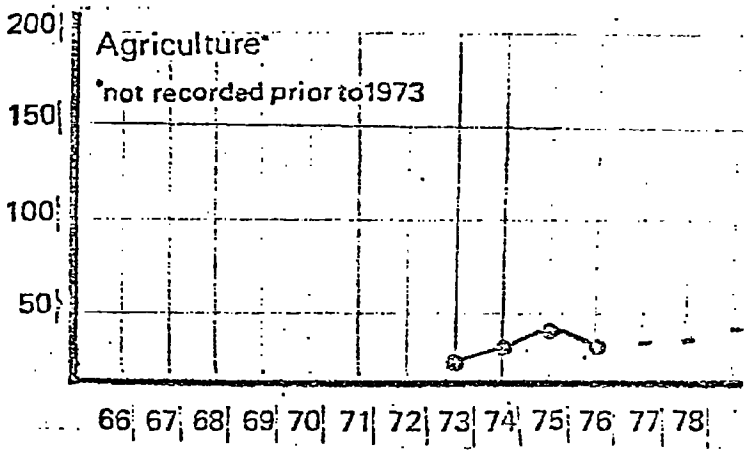
If funding and management requirements can be met by the local government, enough projects are proposed to support the construction industry for some time. For example, a $36 million sewer project is nearing planning and design completion. The USEPA is supplying 75% of the funding for the construction of treatment plants and trunk lines, while the local government and individuals will have to pay for collector lines and home connections. A $27 million loan has been approved by the Rural Electrification Administration for the construction of a phone system, only 10% of which will be composed of existing equipment.

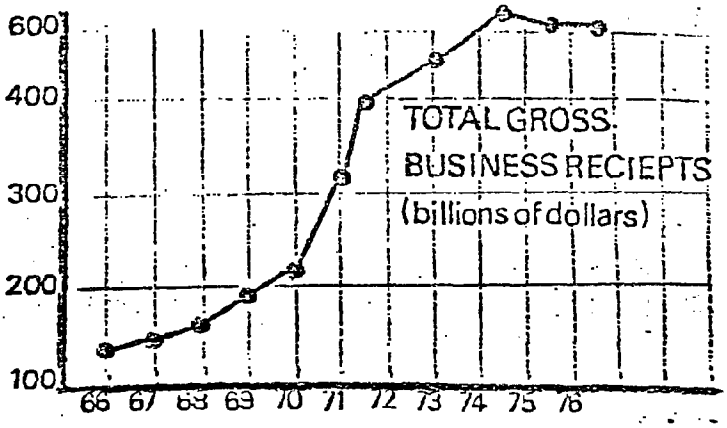
Figure 10 Gross Business Receipts by Sector, FY 1966-1976
(in millions of dollars)



Source: Department of Commerce, Government of Guam


200
150
100
50
Retail
66 67 68 69 70 71 72 73 74 75 76 77 78


200
150
100
50
Agriculture*
*not recorded prior to 1973
66 67 68 69 70 71 72 73 74 75 76 77 78


600
400
300
200
100
TOTAL GROSS
BUSINESS RECIEPTS
(billions of dollars)
66 67 68 69 70 71 72 73 74 75 76

Several roadway reconstruction and water projects are underway or completed, while others are awaiting funding. The immediate prospects for activity within the construction industry are almost entirely dependent on public expenditure for infrastructure. Locally, available funding can be expected to finance only a small fraction of the required projects.

One advantage of temporary support of the construction industry with public projects is the relative ease of implementing and enforcing environmental regulations as those pertaining to erosion and siltation, or fugitive dust emissions. Fugitive dust emissions are the only widespread air pollution problem on Guam with the island average being 2 to 3 times federal standards (sulfur and nitrogen oxides are well below federal standards). Because of heavy rainfall, the fringing coral reefs can be literally smothered to death by siltation from erosion or dredging without proper environmental safeguards. As shown by recent interaction between the Government and the contractors responsible for the dredging of the new Agana Small Boat Harbor, local agencies are prepared to force compliance with siltation and other construction related environmental protection regulations. If the construction industry is based on public projects for the next couple of years, environmental protection practices can change from imposition to habit.

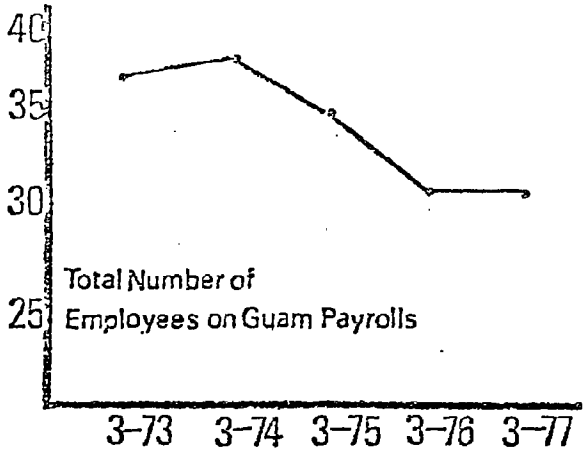
b. The Retail and Wholesale Trades

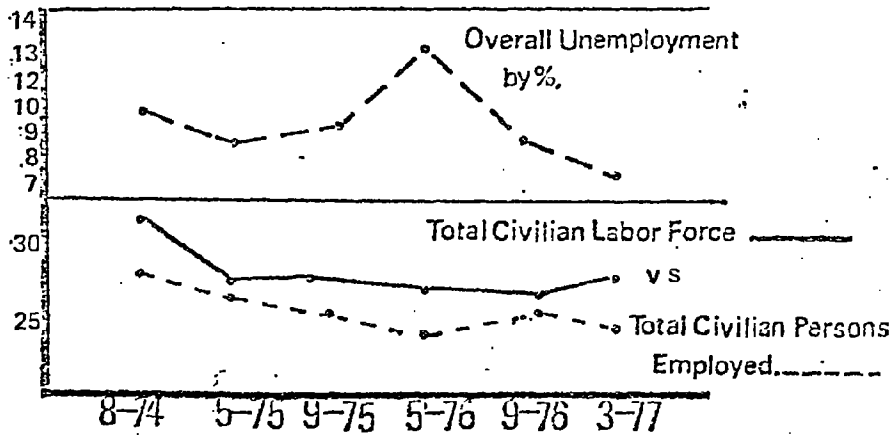
In terms of payroll and gross receipts, the largest industry in the private sector is wholesaling and retailing. This industry, which employs 5,600 people (more than agriculture, manufacturing, transportation, public utilities, finance insurance, and real estate combined), is principally dependent on the household expenditures of the resident population and, to a lesser degree, on tourist expenditures. Significant growth has not occurred in the retail and wholesale trades in the past 4 years as Guam faced the worldwide recession, the energy crisis, and an overall decline in tourism.

Table 4 . Average Number of Employees in Retail and Wholesale Trades

Average 1973:	5,525
Average 1974:	5,400
Average 1975:	5,850
Average 1976:	5,450
Average 1973-1976:	5,550

Figure 11 Employment on Guam





Source: Bureau of Labor Statistics, Goverment of Guam

As in any area with a rapidly expanded population, there is a definite growth potential for the wholesaling and retailing trades. Considerable Congressional sympathy, recently, in evidence for reducing the level of subsidization of the military exchange and commissary system could also have a direct and positive impact upon this sector of the economy. If the overall level of subsidization is reduced by Congress, growth in excess of normal expansion could be expected.

c. The Service Industry

The largest single business group in the service industry is the hotel industry, which accounted for 33% of the service industry's FY 1976 gross receipts, and one-third of the industry's employment throughout 1973-1976. The number of employees-on-payrolls in the service industry has remained stable in the past four years, averaging a steady 4,000 workers. The only noticeable drop in employment occurred immediately after Typhoon Pamela in June 1976. Apparently, some of the workers which were laid-off were never rehired, as hotel industry employment has been steady, but below previous levels. (The average monthly hotel employment figure for January-May was 1,540, versus a virtually constant 1,300 for June-December). Overall service industry employment, however, is quite close to previous levels.

Comparing the total gross receipts of the personal services, business services, auto rental and other service industry groups to those of the hotel industry, and taking a conservative estimate of the portion directly or secondarily resulting from tourism, it is clear that tourism is the major component of the service industry, and is the source of half of the industry's revenues.

The service industry's growth potential lies in three areas. One is the increasing sophistication and interdependence of the business community, which can be expected to continue and accelerate as the basic infrastructure and level of utilities services improves. The second and third are the expansion of the economy as a whole, and tourism as an individual sector.

d. Tourism

From 1967-1974, tourism grew rapidly and was a major contributor to the construction and economic boom of that period. In an economy, with as large a public sector as Guam's, government revenues resulting from tourism have an immediate

and widespread effect on the island. The major sources of revenues are the 10% hotel occupancy tax, the 4% gross receipts tax, and income tax collections on employees.

There are several major problems in the tourism industry. One is that the level of infrastructure facilities and services act as a constraint to business activity in this industry as in any other. Secondly is a distinct lack of tourist destinations. Basically, there are three tourist activities on Guam: the hotel activities and facilities, which include restaurants, nightclubs, Tumon beach tennis, swimming pools, and shops; the round-the-island tour bus ride with stops at scenic overlooks, historic sites, Cocos Island etc; and gift shopping.

Generally speaking, the government is not, and should not be the business of entertaining tourists. Several major public projects, such as the Public Market and Agana Marina, have "joint-use" as tourist destinations. There are many smaller projects, related to outdoor recreation, which can also serve as destination areas for tourists. The best the government can do is to improve the overall climate for tourism, by such projects as those listed above, and by facilitating private investment. The actual job of entertaining tourists is the responsibility of the private sector.

There is reason to believe that the decline in tourist arrivals has reached its lowest level. The initial economic impacts of the oil embargo and its disasterous effect on the Japanese economy in 1975-1976 has reached its lowest point, and a recovery from the short-term effects has concluded. Hopefully, this indicates that the number of visitor arrivals will soon begin to rise.

A more objective evaluation can be determined by an examination of the average rate of tourist arrivals. There were 239,682 tourists in 1975, and 201,344 in 1976; thus a decrease in 38,000 tourists, or 16%. At the 1975 rate of arrivals, the 38,000 tourists can be viewed as 8.2 weeks worth of tourism. Guam was entirely closed to tourism for three weeks following the May 1976 typhoon. Further, the recovery in the rate of arrival being gradual and spread over more than one month, was another three weeks of tourism lost to Guam. Lastly, a Pan Am strike in Tokyo which necessitated the cancellation of many charter flights was another two weeks of lost revenues. These losses totalling eight weeks can

account for almost the entire drop in tourism between 1975 and 1976. There are other second and third-order effects which may belie this agrument. By August 1977, when the visitor arrivals for the first six months of the year will be known, any stabilization or recovery in tourism should be documentable. In the long run, temporary declines should level out and tourism should continue to grow, although at a slower rate, and increase its contribution to the local economy.

e. Military

Military activity has played a major role in the economy of Guam. It is a major source of employment and income for the island. In March 1974 the recorded civilian employment on military reservations exceeded 7,300 and currently the military represents about one quarter of all direct employment on Guam. In Fiscal Year 1976, military expenditures on Guam totalled $193.4 million. Of this amount, approximately 74.2% or $143.5 million covered military and civilian employee payrolls, 11% or $21.3 million provided for construction and $28.6 million for other local expense.

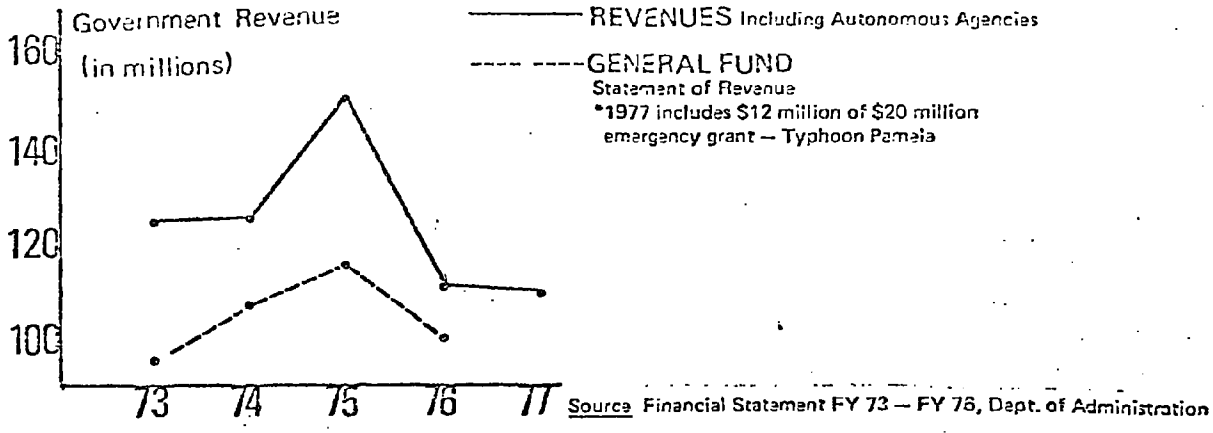
Various other contributions to the community and economy are attributable to the military role on Guam. Military on-the-job training, both formal and informal, contributes to the development of labor skills, which may be of value to the civilian community. Also, the military frequently assists the Government of Guam in handling certain types of need or emergencies. In addition, basic facilities such as power, water, and medical services, are shared with the local civilian community when needs arise. Given the strategic importance of Guam and the declining military presence in Asia, all indications point to a continuing influence by the military establishment to the economic stability of the island.

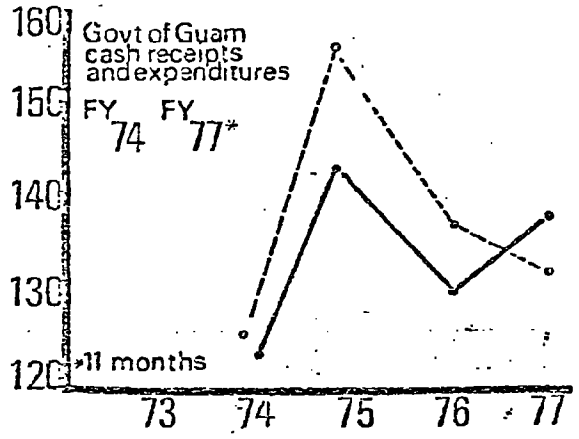
f. Private Investment and Local Government

Facilitating private investment consists of conducting public financial transactions in an effective and consistent manner, providing detailed plans-of-action for public programs so as to reduce uncertainty, and operating public utilities in a manner that is not detrimental to customers and providing infrastructure facilities (such as roads) which promote economic activity.

Encouraging private investment is generally a question of such techniques as tax advantages, operating subsidies, and providing capital in the form of lands (often at reduced rates of interest), loan guarantees, or direct investment.

Figure 12 Government of Guam, Revenues and Expenditures





Source: News From the Governor, Office of the Governor, May, 1977.

The effects of these investment incentives are usually extremely difficult to measure, given the limited amount of economic planning information on Guam. As a result, the existing incentives, such as the tax concessions offered the hotels, have never been assessed except in the most subjective terms. There is not even a known estimate of the amount of revenue foregone by the incentives.

Because these investment incentives are not assessible in terms of their projected or actual past impact , it is concluded that for the immediate future, public resources would be better spent subsidizing the private sector by concentrating on improving the performance of the public sector.

E. Industries for Growth: Agriculture and Transshipment

There are two industries which are only in the first stages of development and have potential for long-term growth and stability: agriculture and transshipment.

The problems encountered in the development of transshipment are subject to the most simple and straightforward solutions to any development issue on Guam. Commercial Port expansion is required to meet the basic and growing needs of the community, and can be done to such a scale as to allow the immediate and rapid growth of transshipment. Land acquisition, in terms of returning very small portions of the Navy-owned Apra Harbor to the community, is the main obstacle to development. In the case of the airport and air cargo transshipment, the existing facilities are sufficient for the most immediate future. Pan American Airways is instituting 747 freighter service to Guam, and should the cargo operations continue to expand, additional facilities will be required in the next few years. Transshipment, both by air and sea, represents immediately realizable economic growth for the island, and entirely new sources of income. Both ports are administered by autonomous agencies with sole responsibility for their operation, and the management of each port is prepared to continue implementation of clearly required expansion. The Land-Use Element specifically supports expansion of the Commercial Port given certain development considerations which are heeded. (Chapter V, Section C, Group A.)

The concept of a major oil-transshipment facility is presently being actively investigated for location on Guam. The proposed concept includes offloading facilities and storage capacity for a 90-day supply of crude oil for Japan. While certain economic benefits would accrue to the island, the vast and irreversible commitment of resources must be analyzed before any decision is made. With expanded refinery capacity and related petrochemical industry location which inevitably follow the location of such a facility, trade offs may include the entire tourism industry, as well as introduction of extremely high hazard potentials from oil spills to increased levels of air and water pollution. Too little is known at present to put forth even a cursory prediction on the feasibility of such a facility.

The agriculture industry has broad economic potential, far in excess of the current level of activity. Development of the industry will require a high level of public and private investment and coordination. Basic data on the resources and activities of the industry are presented in the Development Program for Agriculture in the island's Overall Economic Development Plan (June, 1977). Detailed development planning for the industry, financed by an EDA State Planning Grant, is underway. The industry has been steadily growing, and well-directed large-scale public investments can greatly accelerate the rate of growth. By import replacement, this industry can enhance the economic impacts of tourism and military spending.

The number of employees on payrolls in transshipment and agriculture are very small. Both industries could grow and become major employers in the years to come.

V. LAND-USE PLAN

This section outlines the distribution of projected use of the land area of Guam by utilizing the mechanism of land-use districting and providing development guidelines for general land use. District definitions encourage optimal use within different land areas as the most general level in progression toward more specific land-use delineations. Definition and discussion of areas of particular concern (APCs) and revised zoning standards follows this section.

A. Land-Use District (See Districting Map)

This is a land area identified by its development potential, existing characteristics and environmental restrictions or ecological complexity. Districts are suitable for four general types of use: Urban, Rural, Agricultural, or Conservation.

1. Urban district. Those areas characterized by intensive, high density use including residential, commercial, and industrial uses as well as public facilities and designated park areas. Boundaries of urban districts include lands now in urban use and a sufficient reserve area for forseeable urban growth.

   Urban development within defined districts does not promote "urban sprawl." Random urban development shows lack of design, compactness and efficiency. Compactness does not mean that urban uses are tightly squeezed or in monotonous rows. It means that uneven distribution of unused land in a random arrangement becomes available for open-space, recreation, or additional areas of urban development. Many urban districts desperately need planned insular growth for better aesthetic design, traffic circulation, infrastructure, public institutions, parks, and increased social cohesiveness through neighborhood relationships. Thus, designation of urban areas outlines areas where not only urban development, but urban improvement may also be warranted. Cluster Development, as described in Bill 234, Section 17 (17605.1, Government Code), is one measure of improving urban district development patterns while at the same time decreasing the cost of developing residential units to provide less expensive units.

   Within urban and other districts, there will be designated Areas of Particular Concern (APCs) which would generally include areas where natural resource value (including areas suitable for intensive development, such as ports, power facilities, etc.) or where hazards play an important role in determining the suitability of land for particular uses. Designated urban districts are those where the Government of Guam is now providing, or has projected, expansion of infrastructure (roads, power, water, sewer, and other services) which would enable an area to support high-density development.

2. Rural District. Those areas of probable future expansion of urban districts and primarily characterized by mixed, low-density residential lots and agricultural use. Maximum density (other than certain specific areas existing with a higher density) should not exceed

one dwelling per one-half acre, where an urban level of services, structures, streets, and concentration of people are absent.

Rural districts are typically identified by a traditional lifestyle and appearance which includes backyard farming and extended family households. Though adjacent to urban districts as areas for potential expansion of urban growth, they provide a setting for residents who wish to engage in traditional subsistence on a family level. Rural expansion into agricultural or conservation districts, rather than urban development of existing areas of rural density, however, is discouraged as the random spatial relationships within rural areas are generally inefficient in regards to ratio of land-use to houses per acre.

Within designated rural districts, the Government of Guam is not committed to providing such urban-level services as sewers, road improvements for all lots, or water and power other than a basic level until such a time as the designation is changed to urban. If urban development is proposed and accepted as compatible to the rural district by various overseeing agencies and commissions, the developer should be charged with the responsibility of providing all infrastructure if the rural district is retained.

3. Agricultural District. (See also Chapter V, Group A.) Those areas characterized by reasons of topography, relationship to water resources, soils, existing development and other related characteristics as having an existing or potential capacity of intensive cultivation. Agricultural activities include four basic elements: field farming, livestock and poultry production, aquaculture, and forestry. Hydroponics is a form of agriculture; however, self-contained environmental controls can permit its use within an urban or rural district. Included in the definition of agricultural land use are services and facilities and uses related to the above elements, but not limited to, farm residences, storage facilities, animal shelters, and roadside markets for the sale of agricultural products. Open-space areas and small-scale recreational facilities are clearly compatible with agricultural land use.

The primary development guideline for agricultural areas involves the discouragement of urban level density within an agricultural district. A necessary amount of infrastructure and residences must accompany agricultural land use. However, excessive development, of roads and residences, particularly when land-grading or soil removal is in effect, begins to degrade and dissect large tracts of land and agricultural acreage begins to assume rural or urban characteristics.

To meet current or future self-sufficiency demands, the preservation and responsible use of prime agricultural land is of critical importance for the economic well-being of the island population.

The delineation of agricultural districts has specifically been limited to land areas that are fairly level and contain adequate soil conditions. Soil data is concerned with depth, texture,

drainage, stoniness, and fertility. The proximity to watershed areas (irrigation sources) enhances agricultural growth potential within individual district areas. Agricultural land, however, is kept at a buffered distance from major surface drainage rivers or aquifer recharge areas due to the potential adverse effects of pesticides, fertilizers, and slaughterhouse leachates on water quality.

4. Conservation District. Those areas necessary for protecting watersheds and water resources, preserving scenic and historic areas; providing parklands, wilderness and beaches; conserving indigenous plants, fish and wildlife; preventing floods and soil erosion; and enhancement of forestry development potential. These are usually open-space areas whose existing openness, natural condition or present state of use would enhance abutting or surrounding communities. They are usually more specifically classified as various areas of particular concern and permitted uses would include those existing uses within these designated areas. Such uses may include limited agriculture, dwellings, resort development, parks, non-intensive recreation areas, open space, aquaculture, or other uses not determined to produce irreversible adverse impacts. The scenic vistas and detailed beauty of conservation districts are resources of immeasurable value. Undeveloped areas provide a place for nature observation, scientific study, and preservation of the overall aesthetic appearance of Guam. Conservation districts not only enhance the quality of life for the island resident, but entice the economically important tourist.

The above district delineations and definitions are derived from a wide range of data such as environmental research, public involvement, and aerial photography. As land areas of optimal growth direction or preservation requirements, they retain a degree of flexibility in response to changing demands and unpredictable events. They are basically intended as a decision-making tool for the wide range of government officials and private individuals involved in the direction of land uses which ultimately have fundamental effects on an island-wide society and the finite resource supply.

B. Areas of Particular Concern (APCs)

1. Overall Definition. An area of particular concern or APC is a term applied to a specific geographic area where either natural resource values, geologic constraints or hazards play an important role in determining the capability or suitability of the land for particular uses.

2. Purpose. The purpose of the APCs is to provide an additional management capability to ensure responsible development in areas either having a high degree of environmental sensitivity or that are, or will be, subject to intense development pressures in the near future.

*Designation of areas of particular concern through a Land-Use Plan is not simply a method of identifying areas where no growth should occur. The purpose of designation is to call attention to the importance of the area designated. In many cases, it will be possible to permit development which is regulated so as to be compatible with the basic environmental or renewable resources values or safety problems of the land in question. While it is true that uncontrolled or incompatible development would result in significant damage to the environment, life, or property, or the long-term public interest, it is equally true that some acceptable way to develop or use many such areas can be found; others must remain virtually unused or unoccupied if their values are to be preserved.

While it is impossible to precisely define "responsible development" to the satisfaction of all land users, it is possible to identify the goals and policies under which development can be guided, as well as the constraints which these APCs pose as relative to impacts both upon the safety and welfare of the people of Guam and the APCs themselves.

3. Policy. The policy guiding overall management of APCs can be drawn from dozens of policy statements from the government codes and rules and regulations ranging from air and water quality to erosion and sedimentation. Generally, the overall policy which guides the delineation of APCs and will guide the development of specific performance standards for these areas is: "To minimize the impact of proposed development upon specific areas which, by their value as a natural or public use resource, or fragile nature, must receive special management attention."

4. Basic Criteria and Management. For the purpose of initial delineation, four basic criteria were applied to the land areas of Guam in order to formulate an exhaustive list of potential APCs.

- Transitional areas where further development or restoration is called for, or intensely developed areas requiring particular scrutiny for further development.

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* Source: Land: State Alternatives for Planning and Management. The Council of State Governments, Lexington, K.Y., April, 1975, p.54.

- Areas having significant natural values.

- Areas which have definite and identifiable hazardous characteristics, if developed without proper consideration.

- Areas having significant value for public use or well-being.

After applying these general criteria, a more specific breakdown of potential APCs was developed. This appears in the following Subsection (5). Under the envisioned management program as outlined in Section 1 of Bill 233, the Central Planning Council will have the ultimate authority in designating APCs after delineation and draft development guidelines have been developed by the Bureau of Planning and agencies involved in land-use enforcement such as the Departments of Land Management, Public Works, Agriculture, Parks and Recreation, and the Guam Environmental Protection Agency.

It must be noted that the maps within this document do not define exact locations of APCs. These maps are "conceptual," showing general locations. Due to the impossibility of reducing a 1:25000 scale map to an 8 1/2 x 11 format, the definitive maps may be viewed at the Bureau of Planning. A complete atlas of these areas will be prepared for all concerned agencies in the near future.

5. Study Breakdown of Areas of Particular Concern.

Group (A). Resource Development Sites. Areas of significant topographic or geologic resources for agricultural, commercial, or industrial support.

- Mineral Extraction
- Industrial and Commercial Support
- Agricultural Support

Group (B). Facilities Requiring Shoreline Location. Areas where development and facilities are dependent upon access to coastal waters or areas of urban concentration where shoreline utilization and water use are highly competitive.

- Resorts
- Marinas and Boat Service Facilities
- Educational Institution
- Sewage Disposal Storm Drain Sites
- Public Parks and Beaches
- Surfing Sites

Group (C). Hazard Areas. Areas of significant hazard if developed.

- Airport Accident Potential and Sound Zones
- Flood Hazard Zones
- Slide and Erosion Zones
- Seismic Fault Zones

Group (D). Freshwater Resources. Areas that protect, maintain, or replenish Guam's freshwater resources.

- Freshwater Resources

Group (E). Unique Terrestrial Ecosystems. Areas of high natural productivity or unique and fragile natural habitats for living resources, including plants, wildlife, fish, and interrelated trophic levels of the food chain critical to their well-being.

- Terrestrial Pristine Ecological Communities
- Wildlife Refuges
- Proposed Critical Habitats
- Limestone Forests
- Wetlands
- [redacted]

Group (F). Unique Marine Ecosystems. Marine areas of high productivity and unique or fragile interrelationships between marine organisms.

- Marine Pristine Ecological Communities
- Coral Reefs

Group (G). Cultural and Recreational Areas. Areas of substantial cultural or recreational activity, value and opportunity.

- Village Recreation Areas
- [redacted] Park Areas
- Historic and Prehistoric Sites
- Scenic Vistas

Group (H). Other Areas of Proposed Development. Areas proposed for development on a scale likely to have an economic, social, environmental, or other impact of island-wide significance including but not limited to existing or planned blight area redevelopment or renewal, residential development of 50 or more units in size, or planned agricultural subdivision.

- Subdivision Development Areas

6. Discussion of Approach. The development of the APC approach as a means of more closely managing specific resources was brought about by a number of considerations. Among these:

   - The need to identify and delineate those resource, land forms and associated development potentials for special consideration.
   - The need to consolidate for planning purposes the wide variety of programs concerned with specific resources.
   - The need to consider the extent and limitations of specific resources when faced by projected development pressures.
   - The need to modify and develop an effective management system for the allocation of these scarce, finite, unique, or fragile resources in the future.

The concept of APCs is not new. A number of states and nations have developed programs concerned with the allocation of resources which are subject to existing and projected growth pressures. Many programs having a larger land area than Guam have taken a purely "preservationist" approach to APCs and often limit definitions to pristine or unique environmental areas which should be protected from all development. Rather than limit the scope of the concept to protecting a particular marsh, waterfall, or lagoon, the decision was made to use the approach to establish a comprehensive management program for all resources considered to be of "particular concern." The resources covered under this concept range from areas currently exposed or projected to face intensive developmental pressures (Cabras Island, East Agana) to those which should be "preserved" in the strict sense of the word (Tarzan Falls, Cocos Lagoon). Also included are hazard areas which may limit otherwise suitable development (air crash and sound zones, seismic fault zones, floodplains), and areas with production potential for such activities as agriculture and tourist resort development.

7. Areas of Particular Concern. Synopsis, Statements of Envisioned Development or Expansion, and Suggested Performance Guidelines.

Group (A). Resource Development Sites

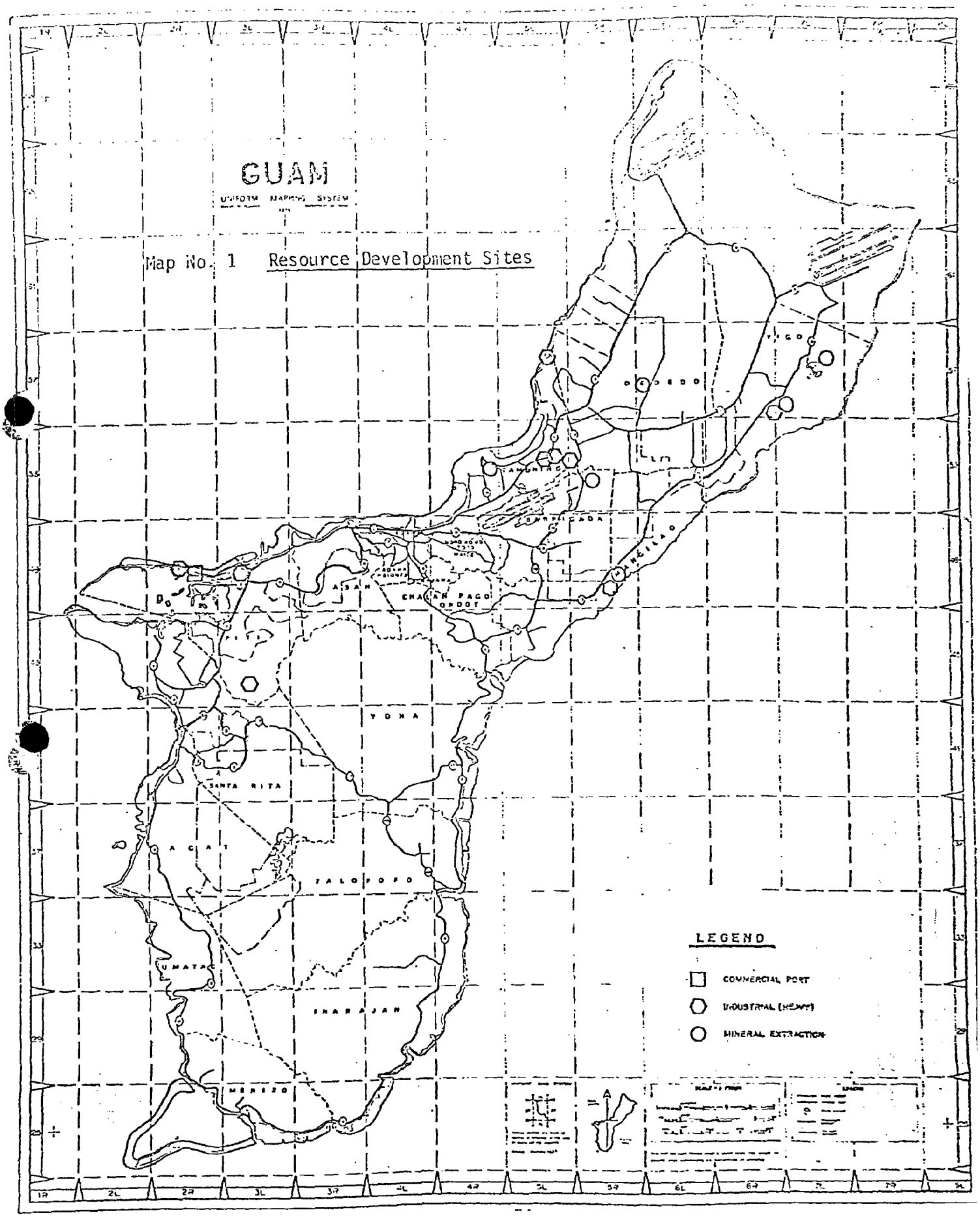
Mineral Extraction (See Map No. 1)

Synopsis. Comprised primarily of limestone, sand, and a potential of limited hard volcanic aggregate deposits, the island's mineral deposits have already been significantly developed. Major extraction activities are presently located on the northeast coastline of the island. Illegal extraction of beach sand from several areas is slowly being halted.

Envisioned Development. According to studies currently underway and discussions with producers, supplies of limestone and sand are adequate to meet the island's needs for the next 20 years without significantly expanding extraction operations to other areas of the island. Short-term operations such as repair of the Glass Breakwater, using the Cabras Island quarry, can be expected. The Department of Public Work's Skid Reduction Program is presently engaged in an analysis of potential extraction sites for hard aggregate (basalt) in the southern part of the island. Initial geologic investigations of volcanic aggregate resources are not encouraging in relation to the occurrence of a superior grade of unweathered basalt in the Northern Marianas (Pagan Island). A report will be released in October, 1977 addressing the specifics of these issues.

Performance Guidelines. The following guidelines indicate:

- Existing extractive activities shall adhere to air, water quality, and erosion-sedimentation standards established by GEPA.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 1 Resource Development Sites
YONA
SANTA RITA
AGAT
TALOFOFO
UMATAC
INARAJAN
MERIZO
LEGEND
COMMERCIAL PORT
INDUSTRIAL (HEAVY)
MINERAL EXTRACTION

- Major new development of mineral extraction sites shall be closely evaluated relative to impacts on existing landforms, adjacent land use, and shall be designed to minimize adverse aesthetic impacts.

- Actual extraction shall be undertaken in a pattern such that once the land is no longer in extractive use, it will be suitable for urban development or open-space use, e.g., terracing for a residential subdivision use vs. a hazardous and unsightly pit.

- The economic feasibility of proposed mineral extraction sites shall be closely examined such that a project will have a definite probability of success before land is irreversibly committed for that purpose.

- Lands proposed for high-population-density or urban-like development shall not be committed for extraction purposes unless such action would be directly compatible with the proposed urban development.

- Lands having significant ecological, historical, agricultural, or aesthetic values shall not be used for extraction purposes unless the developer can prove that no alternative sources exist as well as proving that the proposal is vital to the health and welfare of the entire island.

- Beach strand mining for sand according to Government Code and/or Executive Order shall no longer be considered an acceptable use of the shoreline whether or not the resources are located on private property.

- All coral or other dredging operations, below the Mean High Water Mark, shall fully adhere to existing local and federal statutes and minimally require an approved EIA before commencement of any operation.

Industrial and Commercial Support (See Fig. 13 and Map No. 1)

Power Production and Transmission Facilities (See Appendix No. 2)

Synopsis. A recently completed study, Future Power Production and Transmission Alternative Plans, Guam, U.S.A., indicates that Cabras Island will, in all probability be the site for future power production facilities. The existing Government of Guam site has sufficient land area for two additional steam plants. Thereafter, the adjacent site of the existing Piti plants can be utilized as the present production facilities will probably be going off-line in 1994. Considerations

of alternative production methods such as thermal gradient, solar, and wind generation are being considered, but are still too experimental to be subject to a great degree of planning consideration.

Envisioned Expansion. It is indicated in the above mentioned study that GPA's present land holdings are adequate for expansion of bulk fuel oil storage tanks adjacent to the existing pair of 268,000 gallon tanks. Additional tanks will be required at the time Tank No. 4 is programmed for installation at the Cabras site. According to the study, no major changes or additions are required for fuel oil delivery, or transfer of pipeline systems for power plant fueling needs up to the year 2000. The existing 115KV transmission line and planned expansion will provide adequate voltage for Guam's power needs to the year 2000. Right-of-way widths depend on a conductor configuration which will probably remain in a two-circuit, vertical configuration (100 feet or greater) depending upon the span and height of the towers.

Future emphasis in power transmission line developments should be on underground burial of lines in relation to visual aesthetics. Economic Costs however is major obstacle, facing underground placement of facilities.

Performance Guidelines. Performance standards for sites of production facility development will be based on the following guidelines:

- Commercial Port or other private enterprise location shall not interfere with projected area requirements for future energy facility location or around the present Piti or Cabras units.

- Applicable local and federal standards for air and water quality shall be strictly enforced.

- Impacts of thermal discharge (cooling water) into the Piti Channel shall be lessened, with future units disposing of heated water into the ocean rather than the harbor.

- The water area adjacent to the existing production and storage facilities shall remain open to public access, and GPA planning shall encourage multiple-use, especially recreational boating, anchorage, etc. within these water areas, and replacement of any access or damaged facilities incurred in the process of expansion.

- Any proposed dredging activities shall be carried out in such a manner as to minimize siltation damage to surrounding marine communities. Silt screens as well as proper timing of dredging activities shall be implemented in conformity with erosion control and water quality standards enforced by GEPA.

Commercial Port (See Fig. 13)

Synopsis. The Commercial Port of Guam is located on Cabras Island and occupies 33 acres deeded to the Government of Guam by the Navy. Only 9 acres are presently used as a container and marshalling yard while 90% of the cargo off-loaded is in containers. The present area, the single gantry crane, and 2,700 linear feet of pier are totally inadequate for present activity which, over the last three years, has averaged around 700,000 tons of cargo off-loaded per annum.

Envisioned Expansion. Plans for expansion include:

- Immediate development of 24 acres opposite the present port facility for additional container handling space.
- Redesign and relocation of the access road to the northern edge of Cabras Island.
- Leveling of terrain in and around the area of proposed expansion.
- Development of an additional 800 feet of docking space to the east of the present docking facilities, and relocation of the feed mill.
- Long-range development of approximately 4000 feet of additional dock space to the west of the existing Commercial Port (opposite what is now the Yacht Club anchorage and oil storage tanks).
- Relocation and expansion of the Yacht Club facilities to the area east of the proposed 800 feet pier/dock extension.
- Shifting of some of the existing industry for more efficient use of the area.
- Erection of additional warehousing facilities.
- In addition, several new industrial-use locations are being considered for location in the Commercial Port area.
    - Tuna transshipment and fish processing facility
    - Scrapyard
    - Re-bar rolling plant
    - Storage and warehousing

Superport (See Fig. 13)

Synopsis and Possible Development. Recently, interest has awakened on Guam for the location of transshipment and storage

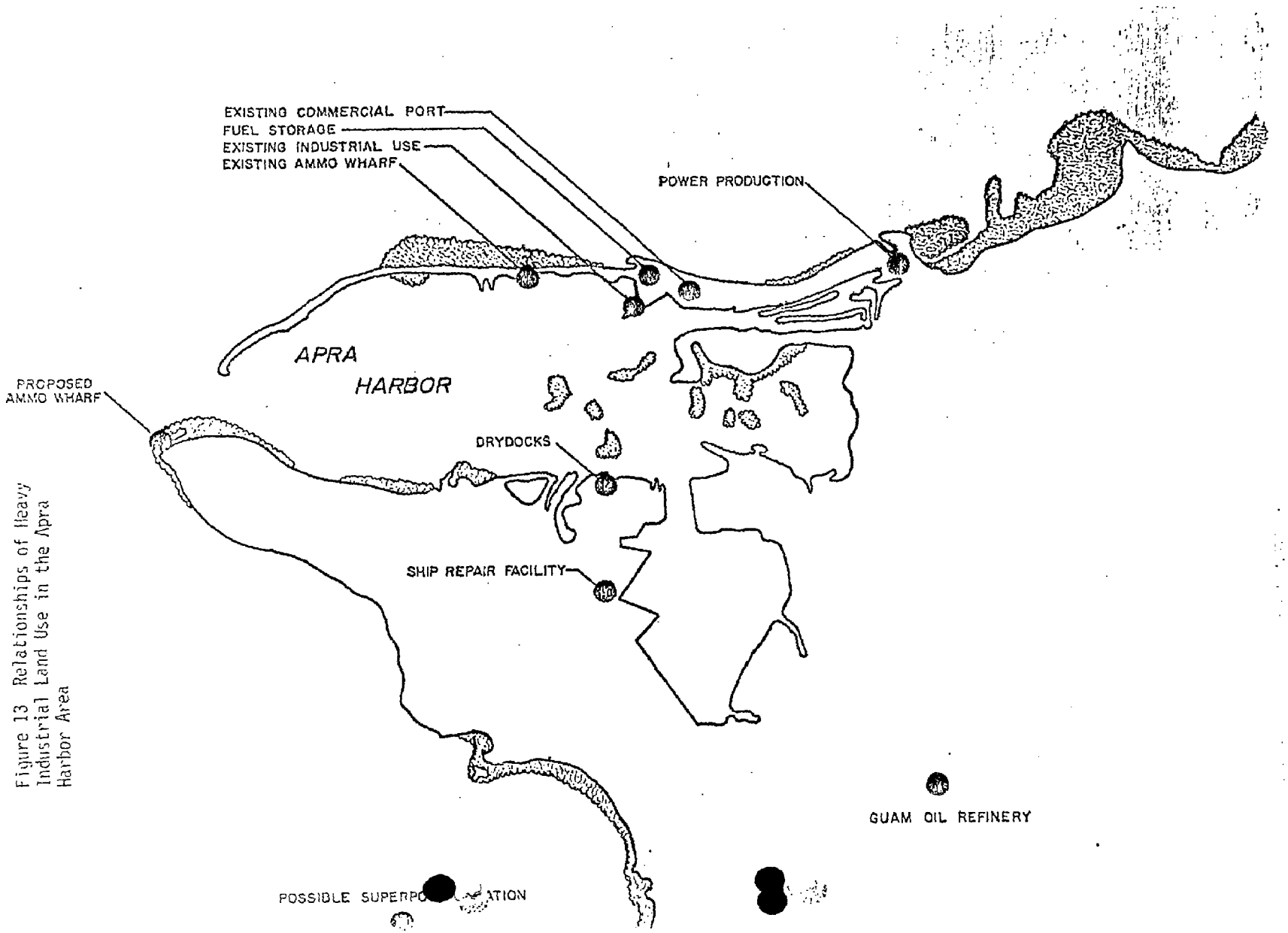


Figure 13 Relationships of Heavy Industrial Land Use in the Apra Harbor Area

facilities, for a 90-day supply of oil, for Japan. While the decision will ultimately rest with the people of Guam, the Bureau of Planning can only recommend that a thorough examination of the proposal considering the real (not imagined) economic benefits to Guam are weighed against the sizeable irreversible commitments that such a massive undertaking demands. Considerations must address:

- The location and impacts of off-loading and support facilities such as a fixed mooring island, and tug/supply boat staging areas.
- The impacts of a major oil spill, the ability of local agencies to manage the effects, and spill prevention measures at all stages of the operation.
- A detailed analysis of the real impact on employment, e.g., will outside labor or local hire be used in the construction and maintenance of facilities.
- The increased demand and impacts of secondary industrial development, especially oil refining, accompanying such development.
- The impacts of increased activity and tremendous land area, both on the Agat shoreline and the land surrounding present GORCO facilities, required for off-loading and storage.
- The increased demand for island infrastructure and public facilities (roads, power, water, and communications).
- The life span or active life of the storage facilities due to a declining world oil supply in comparison with the permanent and irreversible commitment of both shoreside and inland land and water resources; e.g., will the commitment of land for such facilities be worth the 20-40 years it will be in operation.
- The strategic impact of location of such a facility; e.g., effects on military defense developments.

Performance Guidelines. Performance standards for development of port facilities will be based on the following guidelines:

- Applicable local and federal air and water quality, sedimentation and erosion standards shall be strictly enforced.

- Environmental Impact Assessments will be required for all major developments directly affecting fresh and marine waters and associated flora and fauna; addressing the social, economic, and environmental effects of proposed development.

- An adequate system of prevention and immediate reaction to potential oil or other toxic spills shall be developed to deal with increased activities within the port area.

- Construction activities shall be carried out in such a way as to minimize the damage to the environment, historic sites, or existing recreation areas.

- Land alteration and construction practices shall include provisions of screening by landscaping of objectionable or unsightly industrial activities from public rights-of-way and any adjacent residential areas which may be adversely impacted upon by such development, as well as replacement or relocation of public-use recreational facilities altered or destroyed as a result of expansion activities.

- Provision of free public access to areas within the port such as the Glass Breakwater, Luminao Reef, and beach and boating facilities will be required.

- A park or multi-recreational facility shall be retained for public use west of the present Hotel Wharf including Glass Breakwater, the adjacent beach, and Luminao Reef.

Agricultural Support (See Districting Map)

Synopsis. Even though Guam is relatively "land poor," prime agricultural land is available for use. All of Guam's land is districted into urban, rural, conservation, or agricultural use. This is essential for an island society, as there is a limited amount of land. The potential for agriculture on Guam must improve if self-sufficiency is a valued objective.

On Guam, the present executive administration took the name Green Revolution, and although Guam does not have a large agrarian society, the concept's main objective of enhancing agricultural production was deemed applicable and desirable on Guam.

Two documents have been recently completed by the EDA Section within the Bureau of Planning. They are the Growth Policy for Guam and the Overall Economic Development Plan for Guam.

The growth policies generally discuss the multitude of factors relating to development of various industries on Guam and outline the major objectives and directions the Government of Guam should take to meet these objectives. As a plan, the OEDP more specifically outlines the methods, funding, and incentives needed for development of these industries. Both documents address agriculture as an industry in which growth and development can benefit the island society.

Districting Methodology. Utilizing a wide range of available data, the Bureau of Planning has delineated the prime agricultural land. The major potential agricultural areas are in Inarajan, Malojloj and Talofofo. Smaller areas are in Yona, Merizo, and Umatac. The only area of agricultural land in the northern half of the island is located in Yigo. Inland of Mt. Santa Rosa, soil that has developed as a result of the abrasion of volcanic material, has been deposited in the areas between Lupog and Mataguac. The total amount of agricultural land that has been districted is approximately 15.5 square miles. With an island of 212 square miles of land surface, the potential agricultural land is roughly 7.3% of the island. This does not sound like much land, however, only small amount is currently used for agricultural production and if preserved for agricultural use, it is enough to meet long-range objectives for agricultural growth. With the designation of prime agricultural lands, the needs of farmers can be better realized by governmental agencies and private interests.

Three main factors are utilized in the delineation of agricultural districts. These are aerial photographs that depict topography, soil data, and climate. Land classification has been greatly facilitated by a set of aerial photographs that were taken in 1975. Aerial photos, with an overlay of contour lines, show such features as slopes, rivers, and existing areas of cultivation. Lands that are level or gently sloping are well adapted for agriculture. The climate, mostly rainfall, is an important factor in agricultural development, as rainfall is not only needed for crops, but for the replenishment of watershed areas that are necessarily proposed for irrigation purposes. (See Fig.14 .) Soil data is the basic element in the delineation of agricultural land. The major source of soil data is the Military Geology of Guam, a document prepared by the U.S. Army Corps of Engineers in conjunction with the U.S. Geological Survey in 1959. There have been no exhaustive studies of agricultural land since this date, so this engineering soils study is the basic source of data. Soil data more specifically analyzes five soil characteristics:

1. Soil Texture. Texture refers to the proportion of sand, silt, and clay in a soil and affects the water-holding and nutrient retention properties, as

well as the workability of the soil. Medium-textured soils are most desirable for crops. Fine-textured soils can be desirable for wet crops such as taro. Coarse-textured soils such as coral sands are not suitable for crops unless excessive irrigation and fertilizer is used.

2. Soil Depth. Depth refers to the thickness of the soil layer that is available to the roots of plants. Deeper soils provide a larger volume of soil from which the plants can obtain moisture, nutrients, and anchorage.

3. Soil Drainage. Drainage refers to the rapidity and the extent of removal of excess water from the soil. Soils that are well drained are best suited for most crop production. Special crops such as taro and rice can be cultivated on poorly drained soils.

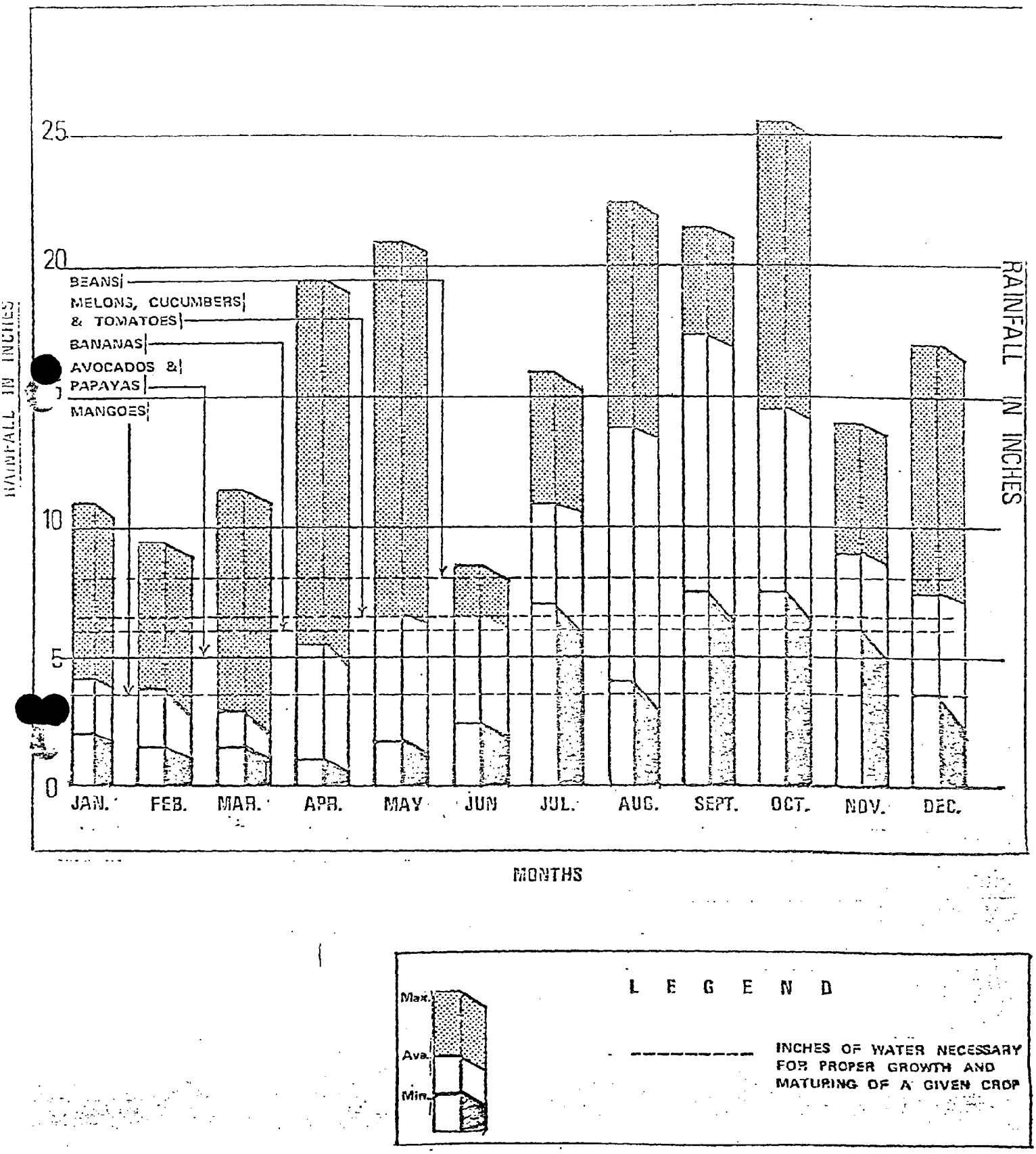
4. Stoniness. Stones in the soil profile or on the surface affect the use of the land, especially if tillage machinery is used. Rocks can hinder or prohibit the use of such machinery.

5. Soil Fertility. Fertility refers to the capacity of the soil to provide the required nutrients to the crop for optimum growth. Some lands require large quantities of fertilizer to maintain optimum crop yields. Soil tests are used to determine the degree of soil fertility.

All of the above considerations are utilized in the delineation of Agricultural Districts. It is a distinct possibility that, in the long-range future, worldwide flood demands may force Guam to become more self-sufficient. For this reason, prime agricultural lands must be preserved. The agricultural uses, depicted on Community Design Maps, have been approved first by residents themselves.

Agricultural Irrigation Needs. The availability of water is the most critical input that would enhance agricultural growth potential. Water of good quality is essential for all agricultural operations and some potential agricultural lands do not have an adequate supply of water to meet irrigation demands during the dry season. Droughts are a common occurrence on Guam and, as indicated in the graph of rainfall, a [redacted] periods of minimum and sometimes even average rainfall are insufficient [redacted]r. The graph was part of A Report Covering the Domestic and Agricultural Irrigation Water Supplies of the Island of Guam Which Indicates the Need for Conservation Areas. (See Fig. 14.) The report was prepared in 1970 by Austin, Smith and Associates, Inc. for PUAG. As the lengthy title suggests, watershed or reservoir areas are essential for

Figure 14 . Monthly Rainfall for an Eleven Year Period Using the Years 159-1969 Inclusive and Based on the Guam W.B. Rainfall Station



Source: A Report Covering the Domestic and Agricultural Irrigation Water Supplies of the Island of Guam Which Indicates the Need for Conservation Areas, Austin, Smith and Assoc. for PIIAC 1970

agricultural growth. Reservoir and watershed sites have been proposed by the U.S. Army Corps of Engineers for the Umatac, Inarajan, Geus (Merizo) and Ugum (Talofofo) Rivers. The planning for the Ugum River Reservoir is furthest towards completion. Implementation could potentially supply the largest sectors of agricultural land in the south with irrigation water. The Hydrological Study for Potential Water Supply Reservoir, Ugum River, Territory of Guam was recently completed by Sunn, Low, Tom and Hara for the U.S. Army Corps of Engineers. The study was conducted to determine the surface water availability and storage requirements for the Ugum River basin. Water from the basin would be used to serve the domestic consumption needs to the Year 2040 for the southern districts of Yona, Talofofo, Inarajan, Merizo, Umatac, and Agat. A recommended dam site was presented in the study. Further planning, involving impacts on the flora and fauna of the area are still forthcoming before feasibility and implemetation would occur. All of the Corps' proposed watersheds are depicted on the Community Design maps that are being prepared for this element of the Comprehensive Development Plan. (See also Chapter VII, Section A.)

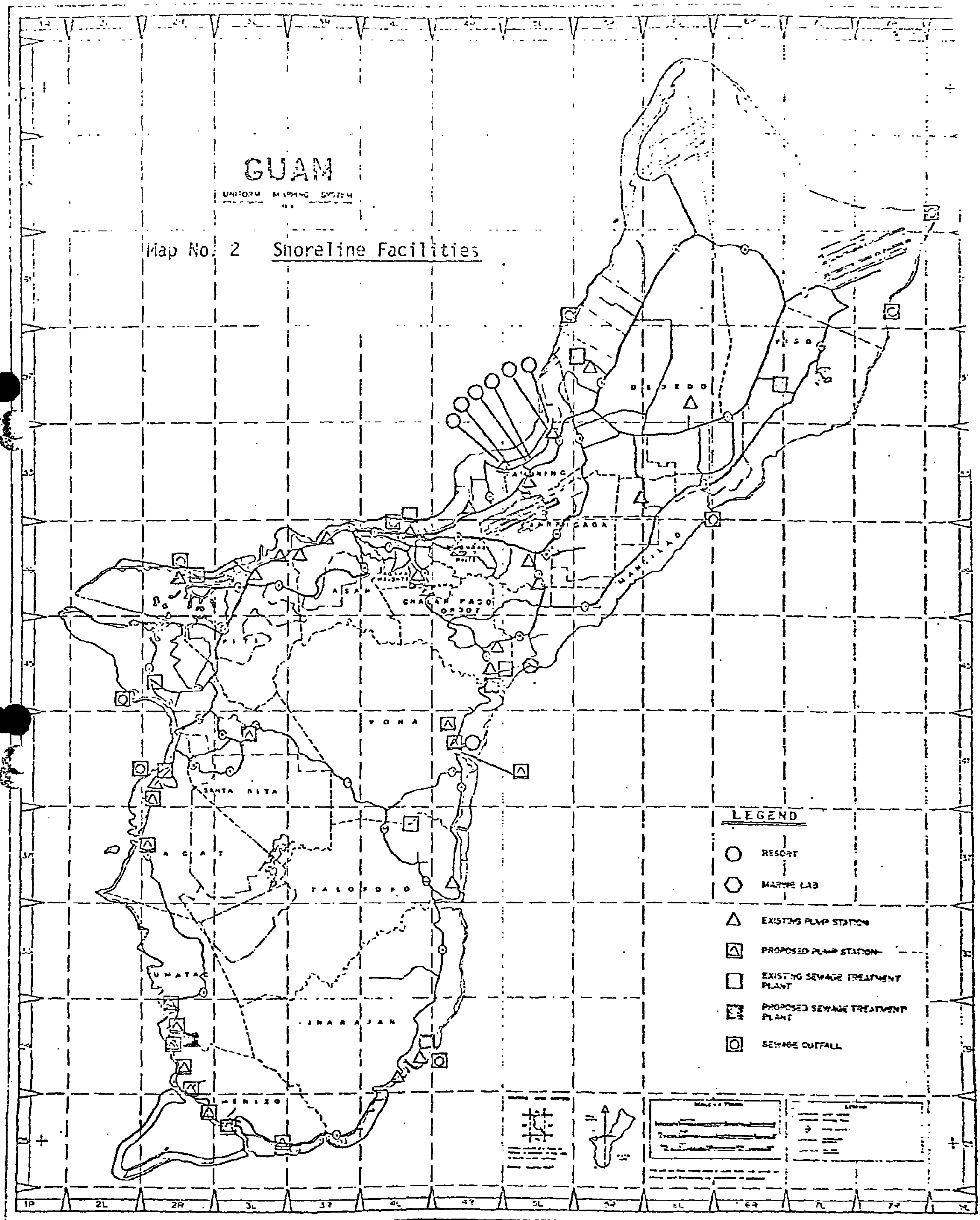
Group (B). Facilities Requiring Shoreline Location

Overview

In relation to Policy 2, relative to the location of facilities adjacent to the shoreline, certain areas of the shoreline are considered APCs for the purpose of ensuring compatible growth without destroying the character or accessibility of the shore. While it is recognized that there will always be pressure for the location of private dwellings, adjacent to the shore, it is the high-intensity uses of a nature not complimentary to the immediate use of the shore which are of the most concern. The following categories should be considered as having a priority for location, adjacent to the shore, not including power production or port facilities which are treated under Group (A) preceding:

Resorts (See Map No. 2 and Tamuning Community Design Map)

Synopsis. The most valuable component of the private sector of Guam's economy is its tourist industry. Every year, thousands of tourists come to enjoy the scenic beauty of different historical and natural areas of Guam. When resort areas are delineated, protection of natural areas must be facilitated such that the needs of tourists can be more adequately met. Resort areas, though centralized, are located in areas of high scenic beauty, where recreational and consumer demands can both be obtained.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 2 Shoreline Facilities
DEDEDO
YIGO
TAMUNING
BARRIGADA
MANGILAO
ASAN
AGANA HEIGHTS
CHALAN PAGO ORDOT
PITI
YONA
SANTA RITA
AGAT
TALOFOFO
UMATAC
INARAJAN
MERIZO
LEGEND
RESORT
MARINE LAB
EXISTING PUMP STATION
PROPOSED PUMP STATION
EXISTING SEWAGE TREATMENT PLANT
PROPOSED SEWAGE TREATMENT PLANT
SEWAGE OUTFALL

Boating, Fishing, Aquaculture and Associated Services and Activities (See Map No.11)

Synopsis. Boating, recreational and commercial fishing, and related water-oriented activities will continue to create a demand for areas immediately adjacent to the shoreline. Commercial fishing and/or aquaculture activities can be expected to create additional pressures in the future. To meet increasing demands, expansion of present boating facilities must take place. For example, the Agana Marina, proposed Agat small boat harbor, Merizo Public Dock, and various launch ramp sites and other projects such as aquaculture developments all attest to a growing demand for shoreline locations. Environmental, aesthetic, and socio-economic considerations must be closely considered in all expansion proposals, as well as analysis of the secondary impacts of such development.

Educational Institutions and Facilities (See Map No.2)

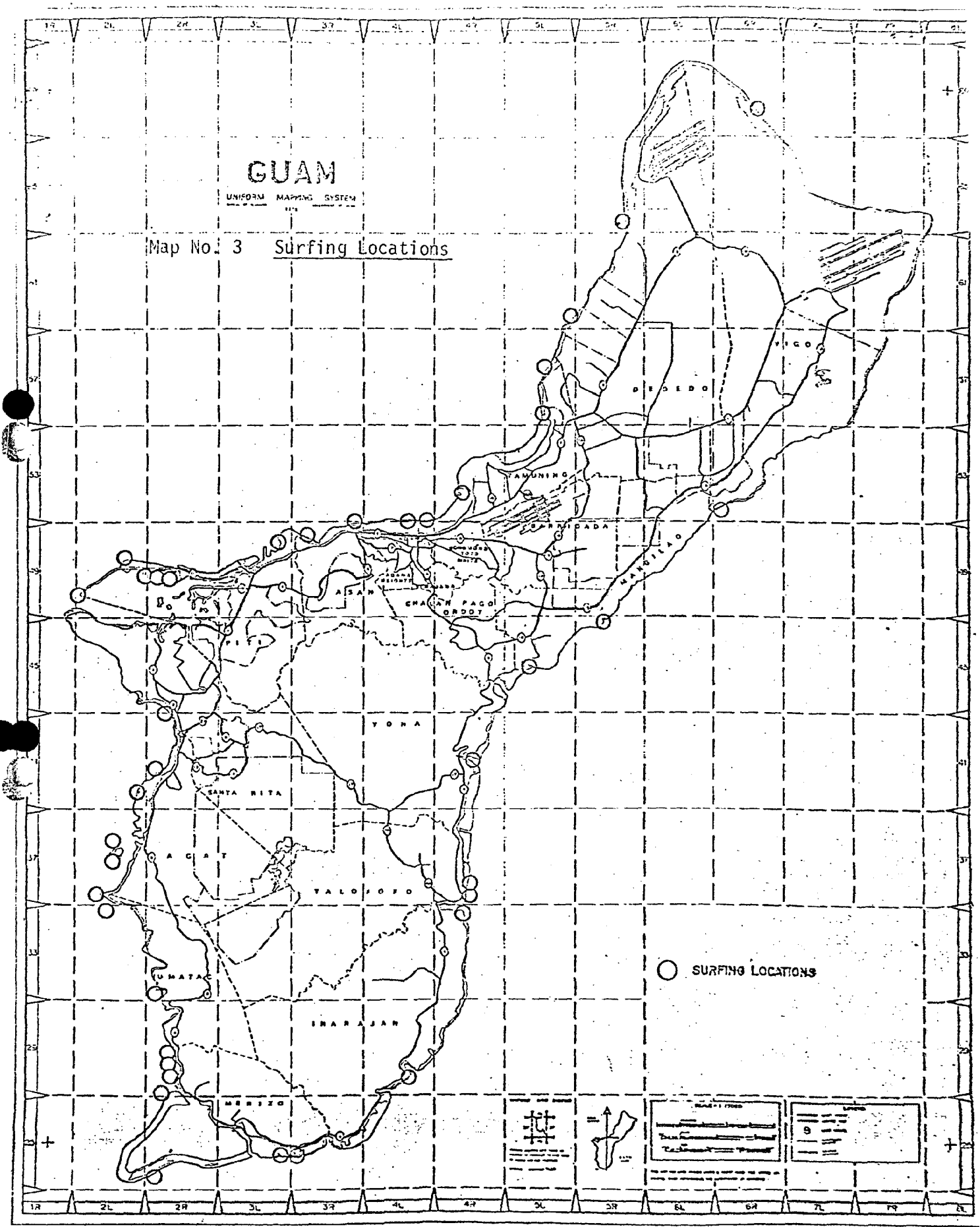
Synopsis. Presently, the University of Guam's Marine Laboratory is the only educational facility requiring a location immediately adjacent to the shore. Expansion of the facility, or establishment of others such as aquariums and similar activities would require a shoreline location.

Parks and Beaches (See Map Nos.11 and12 ; and Table 6)

Synopsis. A basic component of island living is time for leisure and recreation. Large, centralized locations facilitate activities such as fiestas, sports, picnicking, or relaxation. These areas provide open space, structures and utilities which not only add convenience, but also protect against recreational misuse of other more ecologically sensitive conservation areas. When maintained, public parks and beaches can be aesthetically pleasing and more appropriate for this type of land use than natural areas which tend to become spoiled by some forms of recreational activity or developed areas which lack sufficient space. This is not to imply that all recreational facilities must be located on the shoreline, rather, a public use, particularly water oriented, should be given priority over a use which involves location of a facility which does not compliment the nature of the shoreline.

Surfing Sites (See Map No.3 and Appendix No.3)

Synopsis. While offshore diving and surfing sites are not usually negatively affected by shoreline facility location, structures such as piers or boat harbors often intrude upon these sites. Care should be taken to avoid, if possible, unnecessary intrusion upon these areas enjoyed by a sizeable number of enthusiasts.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 3 Surfing Locations
DEDEDO
YIGO
AMUNING
MANGILAO
ASAN
PITI
AGAT
SUMATAC
INARAJAN
MERIZO
SURFING LOCATIONS

Waste Disposal and Stormwater Drains (See Map No.2)

Synopsis. The economic factors of waste disposal systems usually demand an ocean outfall. Other methods such as land disposal for small treatment plants have, perhaps through a misunderstanding of the concept, been emphatically rejected by the citizens of Guam. Given the technology of waste treatment, the proper depth siting of outfalls and the proper trenching of pipes, there should not be an adverse environmental impact from secondarily treated waste effluent. Storm drains on the other hand should be discouraged as a means of draining parcels of land adjacent to the shore. Water quality conscious, land-based percolation methods are encouraged given persistent pollution problems associated with several storm drains, particularly in the Tumon resort area.

Performance Guidelines. The following guidelines shall apply to facilities requiring, or professing to require a shoreline location:

- Developers proposing high-intensity residential, commercial, industrial, or other uses not complimentary to a shoreline location must prove to the satisfaction of the Land Use Commission (See Chapter IV, Section B) that the location is suitable for the proposed development and that proper design considerations would eliminate negative impacts of such development.

- For seashore location of high-intensity use not according to the Land-Use or Community Design Elements of the Comprehensive Development Plan (CDP), the developer must provide proof that such development is consistent with the CDP; and that proper procedures are followed for redistricting, Seashore Protection Permits and other mechanisms to protect these resources.

- The guidelines provided by the Seashore Protection Act, as amended, must be followed for all development falling within the Seashore Reserve.

- Public access to those usable portions of the shoreline must be provided by the development which would otherwise block such access.

- Shoreline development shall not interfere with along-shore access by placement of structures, including but not limited to fences, seawalls, groins, fill, wave absorbers, piers, docks, or other structures.

- Where structures such as marinas, seawalls, ramps, etc., must by nature interfere with along-shore access, an alternative path must be provided by the developer.

Maps No. 4 +5
being completed

- Storm-drain discharge into waters adjacent to recreational beaches or onto reef flats shall be discouraged as a means of lot drainage. On-site ponding basins or other means of runoff disposal shall be encouraged.

- Structures or activities which alter natural shoreline processes shall be permitted only when designed to lessen or eliminate adverse impacts upon the natural shoreline or when it is determined by the LUC that public interest would be better served by protecting existing structures than protecting natural shoreline processes.

- When determined feasible and sensitive to shoreline resources, structures shall be built to withstand the potential force of storm waves and typhoon force winds.

Group (C). Hazard Areas

Airport Accident Potential and Sound Zones (See Map No. 4,5 and Fig.15)

Synopsis. Accident potential and airport and sound zones, unlike most areas of particular concern, are not areas to be preserved for their ecological or historical significance. The nature of airport technology has produced noise levels and accident potential zones that require specific performance standards. Noise levels can be incompatible with human activity and wildlife preservation and hazard zones can necessitate low-population density oriented land-use activities in certain areas adjacent to airfields. The Guam International Airport and its adjacent areas of specific noise levels and accident potential zones comprise this area of particular concern. Because a military airfield adjoins the Guam International Airport, federal consistency is of major importance in this area. Coordination of local and federal planning involves both the Bureau of Planning and the U.S. Navy Program of Air Installation Compatible Use Zones (AICUZ).

Expansion. According to a new Master Plan being developed, several expansion projects are taking place at the NAS Guam International Air Terminal. These include:

- Air terminal improvements.

- Interim airlines cargo building.

- Land acquisition up to 26 acres at an estimated cost of $2 million.

- Aircraft-related improvements (completed during 1976, $3.5 million) including three aircraft spots, taxiways, lighting and fueling facilities, runway stabilization, fencing, service and maintenance ramp.

- Implementation of the traffic circulation plan and consolidation of GAA offices (both underway).

Details and the specifications of these projects can be obtained from the Guam Airport Authority, the purpose of discussion being the wider implications on surrounding land use which must accompany expansion, as well as promoting adjacent land uses which are compatible with aircraft operations at the airport.

Performance Guidelines. The problems caused by landing and takeoff of aircraft are not going to diminish in the near future. The Navy is presently engaged in an AICUZ study for NAS, Agana; and the Air Force has completed a similar study for AAFB. The objective of these studies is to determine how aircraft flight patterns can best be designed to minimize negative impacts on surrounding development. The land-use pattern must reflect these impacts with improved zoning designations within identified crash and noise hazard zones. Map No. 4 shows a preliminary pattern for operations.

Figure 15 indicates the uses which will be encouraged within affected areas. As the study for NAS is not scheduled for completion until a later date, the actual redesignation of permitted uses cannot be completed until that time. However, it is expected that the performance standards for aircraft crash and sound zones will follow the recommendations by only permitting the uses specified in Fig. 15 to occur within the zones identified by the final recommendations of both plans. Performance standards for land use, adjacent to airport operations, and falling within potential hazard zones, will be based on the following guidelines:

- Uses compatible with the identified hazard zone delineations shall be reflected in a revised zoning map.
- Existing non-compatible uses (particularly in the Mongmong-Toto-Maite area) will be permitted to continue as a non-conforming use.
- At such time as a present non-conforming use ceases, the use designated for such parcels of land shall be consistent with the hazard area use standards.
- There will be no variance permitted in primary crash and noise zones insofar as location of high-population-density uses.
- A maximum effort will be made to alter present takeoff-landing procedures to produce the least impact on existing uses. This involves modification of takeoff and landing approach angles and reduction of night landings and takeoff.

Figure 15 LAND USE COMPATIBILITY MATRIX FOR AIRPORT SOUND AND HAZARD ZONES

Source: U.S. Navy AICUZ Program

- A maximum effort will be made to utilize noise reduction devices for jet engine testing. This and the above standard are actual requirements within the AICUZ Program.

- As operations at the airport change, a maximum effort will be made to ease restrictions created by present and expected use patterns.

Flood Hazard Zones

Synopsis. As surface drainage patterns on steep slopes merge into major rivers, the amount of water flow and concentration of sediments increases. The course of rivers inevitably leads to the ocean along coastal lowlands. Dispersal of water over a floodplain area retains freshwater resources and some sediments are distributed over land areas rather than into the sea. At one time, floodplains were valued and utilized as rich soil areas for wet crops such as rice.

During periods of adverse weather conditions that bring persistent rainfall, the natural and developed drainage systems can overflow even further into adjacent flat terrain at the base of a drainage slope. The dispersal of flood water is often confined to natural wetland habitats, but in some cases, can overflow into developed areas of human settlement. If improperly used, floodplains can become problem areas as a result of deterioration of flood-damaged structures and the recurrence of public expense for relief and repair of flood-damaged facilities. When floodplains are left open, practically no flood losses occur. However, because floodplains are level and level land is in high demand on a small island, much development has already occurred in flood hazard zones or further encroaches upon floodplain areas. Performance guidelines for development in historically proven flood hazard zones seeks to prevent damage to property and the quality of human life. The U.S. Army Corps of Engineers is the primary agency involved in the delineation of flood hazard zones and undertakes projects for flood control. This is not only vital for the protection of both the environment and population, but also the economy as federally subsidized flood insurance requires local delineation and management of floodplain areas in order to be qualified for aid under the Federal Disaster Assistance Administration in the event of disaster.

Performance Guidelines.

- Open-space uses such as parks, wetlands, agriculture, and parking are encouraged as low-population and low-structural density uses in defined flood hazard zones.

- Existing urban development within flood hazard zones shall be permitted as a non-conforming use until such time as structural or non-structural measures of flood control reduce the hazard area such that non-conforming uses are no longer within a flood prone area.

- Proposed urban development within flood hazard zones shall be planned as such that land alteration does not increase the flood hazard zone (causing it to extend over adjacent, previously non-hazardous areas).

- The proposed development shall be planned as such that structures are flood resistant and the possibility of human injury due to flood conditions is negligible.

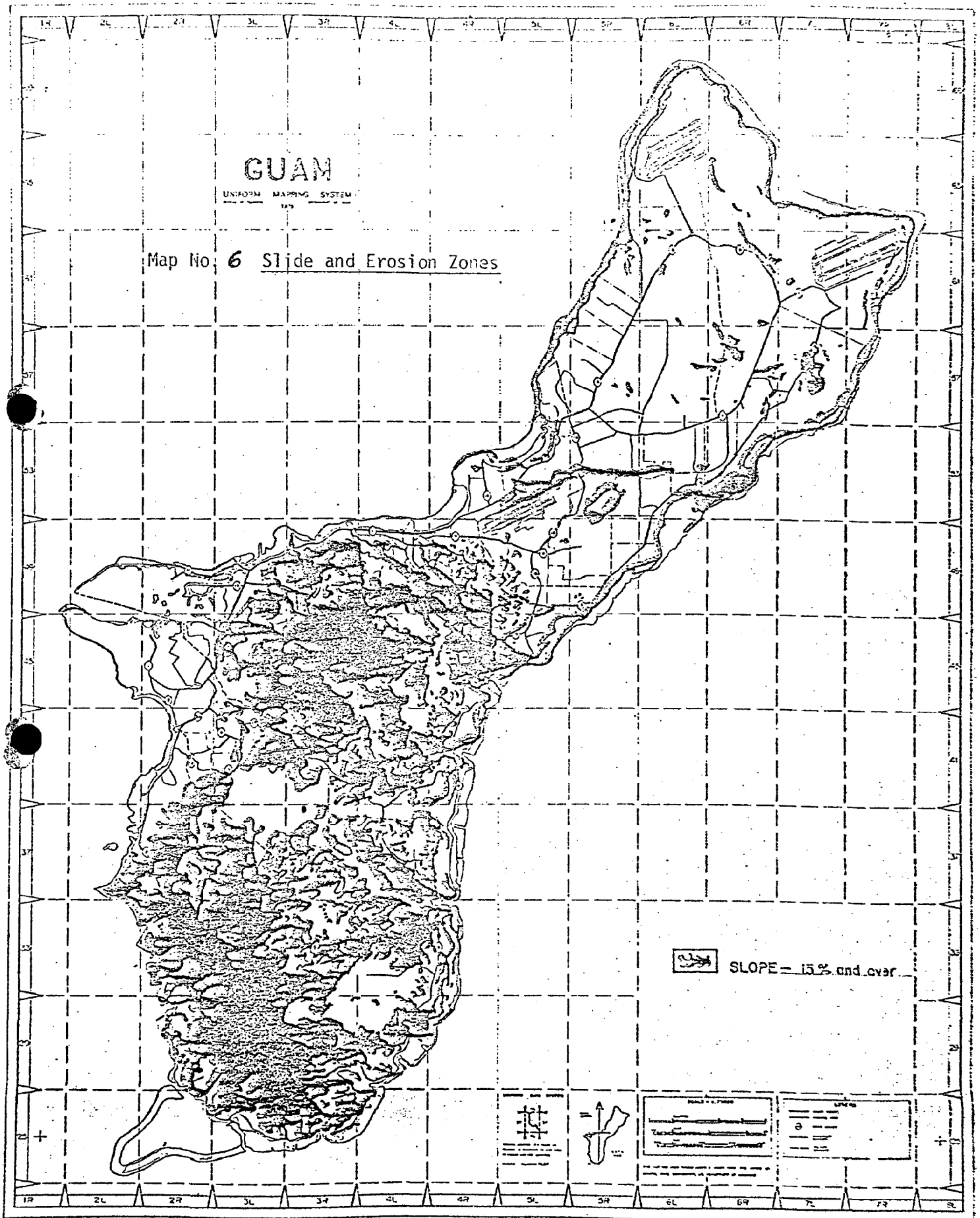
- Flood control measures such as dikes, channelization or revetments shall be planned as such that floodplain support of a wetland wildlife habitat does not become adversely affected, unless the extent of the hazard to human life and the economy are determined more important, than natural ecology, in a thorough EIA.

Slide and Erosion Zones (Slopes in Excess of 15%) (See Map No. 6 and Fig.16)

Synopsis. With a few exceptions, large-scale development has not yet occurred on steep lands. In the future, however, population increase and demands for more housing (urban expansion) may seek hillsides as development occupies available level terrain (ex. Barrigada Heights). Often home-builders and resort developers wish to take advantage of the vistas obtained from higher terrain. A historical preference for flatland as being more feasible for development could change as a result of economic pressures for use of land once considered marginal as far as development potential. Therefore, performance guidelines must facilitate protection of slopes as an extremely important area of particular concern.

Approximately half of Guam's total acreage (43%) has a slope in excess of 15%. Steep terrain generally occurs on the savannah grasslands of the southern half of the island and on coastal cliffs and terraces. Because of a multiplicity of problems that can occur with land-use activity on hillsides and clifflines, open space is encouraged as the predominant land use. The majority of sloping terrain has been designated as conservation districts because the terrain and vegetation constitutes a natural watershed, an aesthetic resource, and an important area for recreational activities such as hiking and observation of ecological habitats. The vegetation, wildlife, drainage patterns, soil conditions, and underlying geology all suggest an emphasis on open space rather than urban or agricultural development in steep areas.

Construction on hillsides can promote erosion which destroys protective vegetative cover, limits land use, and degrades water quality and visual appearance. Unplanned development can also lead to landslides and increases flood hazard areas. The weight of structures on steep hillsides can cause unstable


GUAM
UNIFORM MAPPING SYSTEM
Map No. 6 Slide and Erosion Zones
SLOPE = 15% and over

soils to "slump" and weaken foundations. In extreme cases, mud slides may cause building damage and/or threat to human life. When ground cover is disturbed or removed during development, exposing the soil, potential for erosion has been introduced. As the surface area available for absorbtion of rain water is reduced by impervious surfaces (roofs, roadways, parking lots, etc.), runoff is increased and the potential for erosion increased along with it. As a rule, slopes are more easily eroded than level lands; the extent of erosion during construction and prior to soil stabilization is substantially increased on steep terrain. Septic tanks and leaching fields installed on steep slopes are more subject to failure than similar installations in more level landscapes. Where provision is made for public power, water, telephone, or sewage systems, the difficulties and costs are significantly greater on steep slopes. In addition, the acreage requirements for roads and even for structures increases in slope. In short, land area cannot be used as efficiently on steep slopes as on level land. Efficiency is related to cost and some costs of developing land on steep slopes have to be borne by the public, as local government must maintain roadways or other utilities or when erosion, water sedimentation, or slide damage occurs.

*Topography. The topographic characteristics of an area are one of the most important determinants of the suitability of the area for residential land use development. The ratings for land-use topography are as shown in Table 5 .

Slopes in the 2% to 5% range are steep enough to provide for good surface drainage and interesting siting, and yet flat enough so that no significant site development problems will be encountered. Some drainage problems may be encountered in the 0% to 2% range, but these can be readily overcome unless there is a large expanse of absolutely flatland. The site plan in the 5% to 10% range may be more interesting than in the 2% to 5% range, but will be more costly to develop. Slopes

Table 5 : TOPOGRAPHY RATINGS

Rating	Slope, in percentage
(a) Rural Residential	
optimum	2 to 5
satisfactory	0 to 2 and 5 to 10
marginal	10 to 20
unsatisfactory	20+
(b) Urban Residential	
optimum	0 to 5
satisfactory	5 to 10
marginal	10 to 20
unsatisfactory	20+

* Source: Kiefer, Ralph W., "Terrain Analysis for Metropolitan Fringe Area Planning." Journal of the Urban Planning and Development Division; Dec., 1967, p. 122.

over 10% present problems in septic tank filter field layouts that will be difficult to overcome. In addition, street development costs will be significantly higher than in the 0% to 10% range. Severe limitations in domestic sewage disposal and street development will be encountered on slopes over 20%.

Performance Guidelines. A general guideline for land use in slide and erosion zones is that all proposed and existing development shall adhere to the Erosion Control Standards established and enforced by the Guam Environmental Protection Agency. Specific guidelines for land use on slopes must consider:

- Open space is encouraged as the most compatible land use on slopes in excess of 15%. The steeper the slope, the more the requirement for open space.

- Hilltops shall be avoided as building sites for urban development as the natural horizon line is interrupted and structures are highly visible. Buildings, located below hillcrests, are more sheltered from typhoon force winds, less visible from distant viewpoints, and less prone to cause erosion problems (see Fig.16).

- When necessary to locate on sloping terrain, roads and other infrastructure shall be planned to follow the contours of the site. Structural and infrastructural development, if straight up and down slopes, requires more grading, expense, maintenance, and increases the potential for erosion.

- If necessary on sloping terrain, land grading should be done during the dry season and during the shortest feasible time span to reduce the risk of sedimentation runoff during periods of heavy rainfall.

- Where urban development must occur on slopes, natural vegetation should be saved wherever possible and unsurfaced, graded areas should be replanted with a vegetative cover.

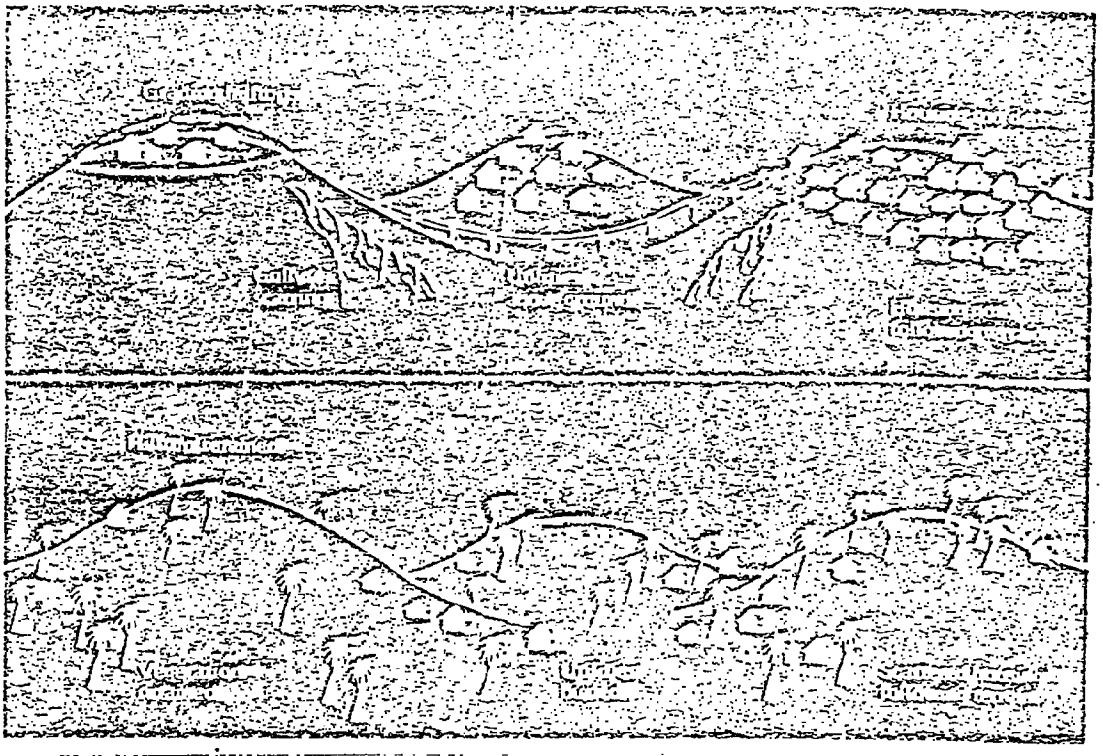
- Proposed development on slopes shall include plans for the safe disposal of increased water runoff caused by roofs, pavement, and land grading. This involves mechanisms such as temporary sediment basins, silt screens, ditches, and dikes during construction. Once construction has been completed, altered soil and surface conditions may require permanent inlets and storm drains to convey the increased runoff to an adequate storm water drainage system.

Figure 16

DESTRUCTIVE AND COMPATIBLE DEVELOPMENT ON SLOPING TERRAIN

Destructive development

Compatible development



Source: Performance Controls for Sensitive Lands: A Practical Guide for Local Administrators, A.S.P.O., July, 1975, p. 71.

- Where an area hazard study denotes unstable soils, where potential landslides may occur, land use within the hazard area shall be restricted to low-population density activities unless structural means of landslide protection are implemented.

- Generally, slopes are rocky or do not possess the fertile alluvial soils of basin lands and costs of transporting irrigation water to upland terrain is considerable; however, if field farming is considered feasible on steep terrain, mechanisms of erosion control such as contour planning, terracing, ground cover crops, or natural vegetative zones should be employed to minimize potential erosion problems.

- Reforestation efforts shall be encouraged as a responsible mechanism of erosion control for the repair and enhancement of natural or man-made eroded areas.

- Lack of fire control on larger grassy areas in Southern Guam destroys as much as 40% of the visible areas during periods of drought. Most fires are caused by illegal trash burning, camp fires, or illegal use of fire to flush game or clear terrain. Strict adherence to fire control regulations enforced by DPS Fire Department and Burning Permits required by GEPA shall be enforced.

Seismic Fault Zones (See Map No. 7)

Synopsis. During eras of the island's geologic development, different blocks of land have uplifted and subsided. The six blocks are divided by fault lines or geologic structural subdivision zones. In case of seismic or earthquake activity, the most potentially hazardous areas are along these zones. Major geologic activity occurs over such a long expanse of time, though, that the potential hazard along fault lines slight. The land is stable enough for most land uses. The six major blocks have been mapped and described in the Military Geology of Guam, published in 1959 as a joint effort of the U.S. Army Corps of Engineers and the U.S. Geological Survey. Further geologic and seismological studies are needed before a more precise determination of the extent of the hazards associated with fault lines is known and more precise guidelines can be established.

Performance Guideline. The basic guideline for this APC is that high-rise structures with a high-population density use (hospitals, apartments, condominiums, office buildings) shall not be constructed on a defined fault zone.

Map No. 7
being completed

Group (D). Freshwater Resources (See Map No. 8 and 9)

Synopsis. The underground aquifer systems of Northern Guam provide the bulk of the island's freshwater supply. A layer of freshwater floats upon saltwater and forms a basal lens. The lens is replenished by rainfall percolation through the limestone of the northern plateau. There are three main aquifer areas--Dededo-Yigo, Barrigada, and Chalan Pago-Ordot in Central Guam. In the area over the two northernmost aquifers, numerous sinkholes cause rapid injection of water into the lens system. These areas are particularly critical in terms of pollution of underground supplies as even partial filtration is not in effect. Where urban development surfaces the land over aquifer recharge areas, ponding basins are sometimes needed to assist in rainwater recharge of the underground lens.

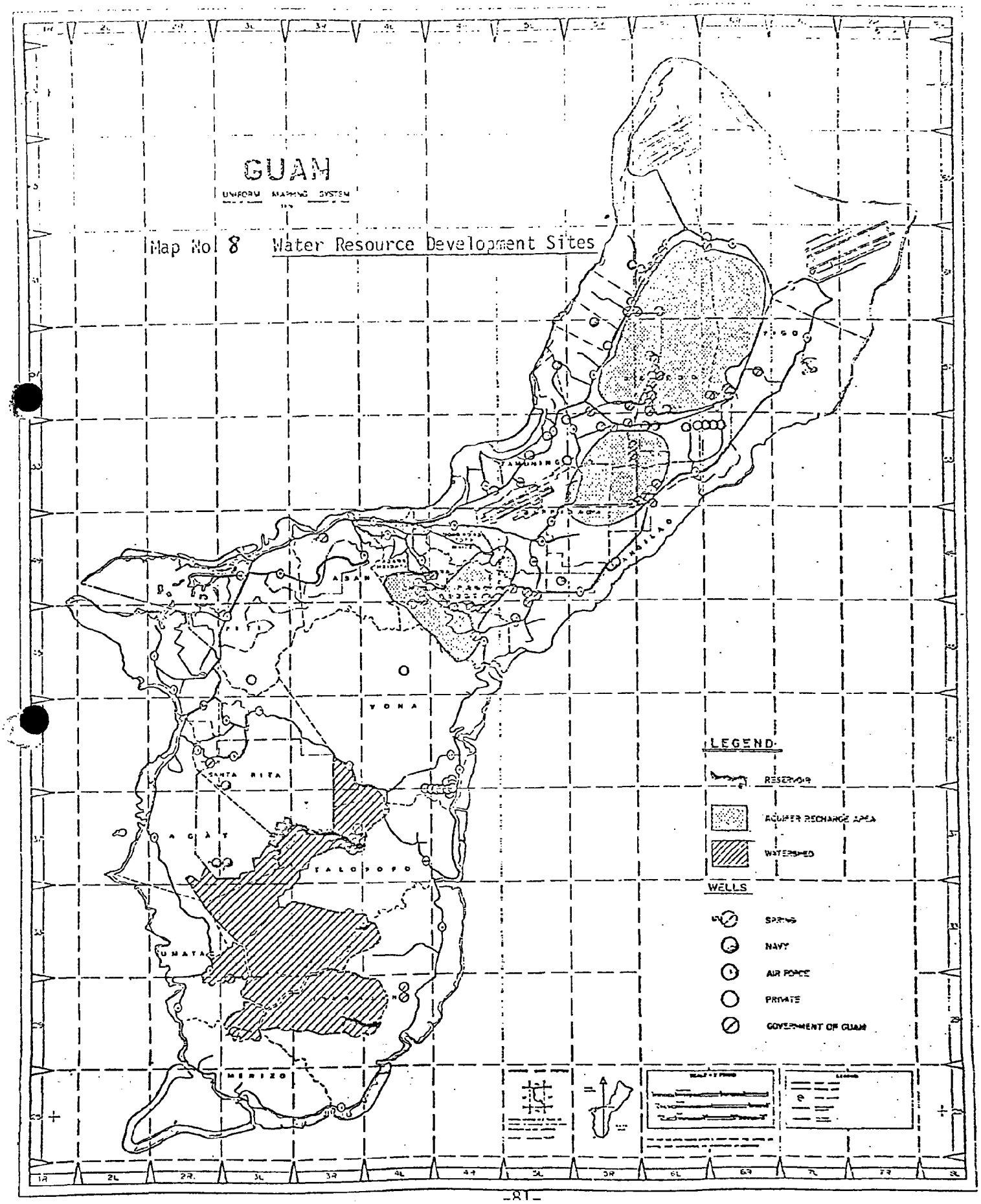
Forthcoming research may indicate that the three aquifer areas are interrelated.

In the Central Guam aquifer area, where southern volcanic uplands meet the northern limestone plateau, the topography is intersected by low-lying basins that appear as grassy fields that are flooded during periods of rainfall in the wet season. These natural low-lying basins, like the northern sinkholes, assist in aquifer recharge and are depicted on more detailed maps in the Community Design Element.

Performance guidelines for land use over aquifer systems may ease as ongoing research of the nature of groundwater resources further defines the extent of supplies and the capacity to absorb pollutants. Currently, the most comprehensive study, Groundwater Resources of Guam: Occurence and Development, by John F. Mink, has been published by the University of Guam Water Resources Research Center as their Technical Report No. 1.

In the southern half of the island, rainfall does not penetrate the volcanic rock as rapidly as limestone and surface water gathers in the form of rivers, streams and wetlands. Surface drainage from watershed areas can be directed into reservoirs such as the existing Fena Reservoir.

Because water resources are vital for activities such as human consumption, maintenance of wildlife habitats, agricultural use and industrial needs, they deserve special performance guidelines Water is a basic human need. The adverse effects of insensitive use can deprive the island of this fragile, finite and valuable resource.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 8 Water Resource Development Sites
AGANA
ASAN
YONA
SANTA RITA
AGAT
TALOFOFO
UMATAC
MERIZO
LEGEND
RESERVOIR
AQUIFER RECHARGE AREA
WATERSHED
WELLS
SPRING
NAVY
AIR FORCE
PRIVATE
GOVERNMENT OF GUAM

Presently, PUAG, GEPA, USGS and Navy PWC all cooperate in the management of water resources. The U.S. Army Corps of Engineers constructs reservoirs and defines watershed areas. Proposed watersheds and reservoirs are depicted on Community Design Maps as conservation uses. GEPA is the primary agency involved in the enforcement of water quality performance standards and erosion control standards which are directly related to water quality. Within GEPA, the 208 Program or Areawide Wastewater Treatment Management Plan has the objective making all of Guam's water swimable and fishable by 1985.

Performance Guidelines. A general performance guideline for water resource use is that all existing and all proposed water-related development shall adhere to the Water Quality and Erosion and Sedimentation Control Standards established and enforced by the Guam Enviromental Protection Agency and all agencies and private developers shall support the objective of eliminating all point source and non-point sources of adverse pollution. Specific performance guidelines are listed below.

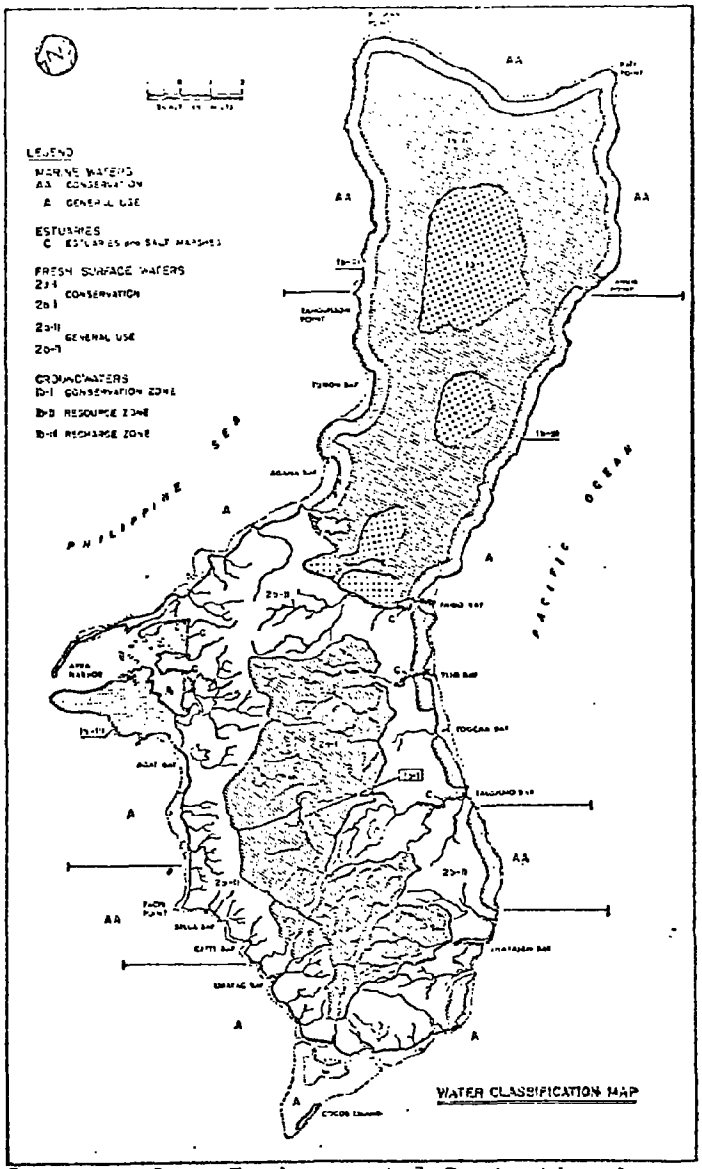
- All agencies and owners of residential and commercial buildings or sewage treatment facilities shall obtain required permits from GEPA and Public Works for septic tank installation or sewer connection with plans showing that construction or connection will not adversely affect water quality;

- All agencies, individuals and corporations wishing to drill or operate water wells shall obtain a Well Drilling License, Well Drilling Permit, and Well Operating Permit from GEPA to protect groundwater from contamination or overpumpage by unskilled personnel or improper construction and equipment;

- Anyone, including GovGuam, selling, distributing or importing pesticides shall obtain a required Pesticides Dealer's License and Registration of Pesticides to ensure competancy of all persons dealing in pesticides and that knowledge of imported pesticides products is monitored by EPA;

- Anyone, including GovGuam, intending to apply or use restricted pesticides shall obtain a Restricted Pesticides Applicator Certification, as required by GEPA, to ensure safe usage of pesticides which are classified as restricted;

Map No. 9 Water Classification Map



Source: Guam Environmental Protection Agency

- All government agencies, individuals and corporations planning to develop or maintain a dump on private or public property shall obtain Authorization for Solid Waste Disposal from GEPA to ensure health, sanitation, land-use compatibility and prevention of solid waste leachates from contaminating freshwater resources;

- Anyone, including government agencies, intending to clear or grade land shall obtain a required permit from Public Works and clearance from GEPA to ensure adequate provisions have been made for erosion and sedimentation control;

- Open space and enviromentally sensitive recreational or agricultural uses shall be encouraged in aquifer recharge and watershed areas. Urban-type uses are discouraged in such areas unless a thorough EIA determines that such development will not adversely affect water quality or quantity;

- Open space shall be maintained in sinkholes and natural low-lying basins. (Open space is defined as essentially undeveloped natural areas, strategically located where most needed to exclude intensifying urbanization patterns.) In areas where development is already present in low-lying basins and sinkholes, such development shall be permitted as a non-conforming use so long as it conforms to GEPA Water Quality Standards;

- Field farming, hydroponics and aquaculture, as agricultural uses, shall be monitored and planned such that nutrient discharges into surface waters or through seepage into groundwater supplies shall not produce adverse effects on water quality;

- Livestock slaughterhouses and industrial land uses (involving petroleum and chemicals) shall be discouraged as uses over aquifer recharge areas;

- Within proposed areas of intensive residential development within primary aquifer recharge areas, the surface drainage shall not be significantly altered; and ponding basins shall be required to ensure that surface development does not adversely affect rainwater recharge of groundwater supplies.

Group (E). Unique Terrestrial Ecosystems (See Map No. 10)

Terrestrial Pristine Ecological Communities

Synopsis. These are the most untouched representatives of the specific habitats known as the limestone forest, ravine forest, savannah, coastal strand, and wetlands. Though, each of these areas has its own performance standards, the most scientifically valuable representative requires a more strict control of permissible uses in order that it be preserved for the study of its unique ecology. Ecology is the relationship between the plants, animals, and natural features of an area. Being the least developed, they are usually the most aesthetically pleasing or beautiful examples of the different natural communities. Pristine ecological areas often contain the highest incidence of endangered and threatened species of plants and animals. These are species that are in immediate danger of extinction or would reduce to a critically low number as adverse land uses were permitted to operate.

Wildlife Refuges

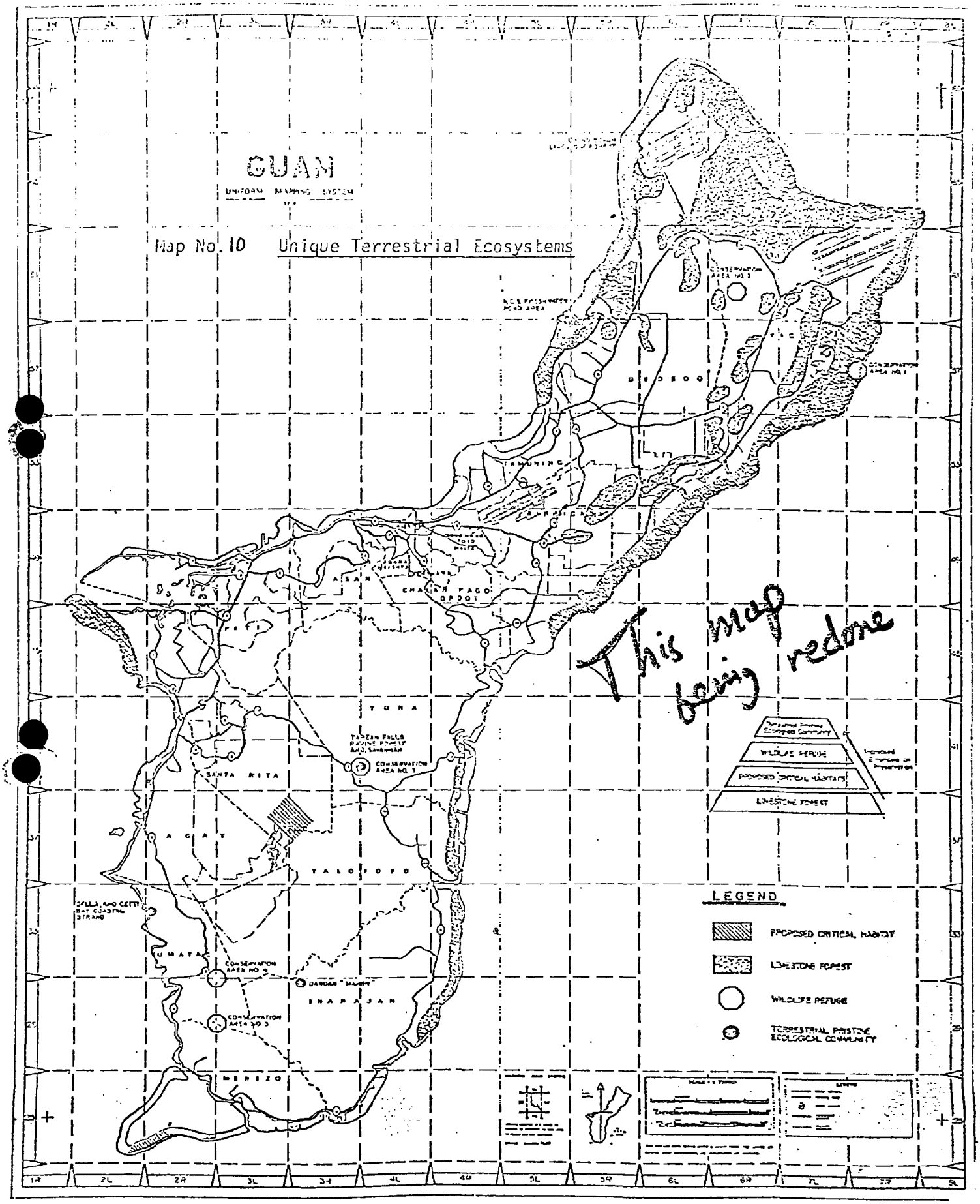
Synopsis. Pristine ecological communities, delineated through ongoing research, often overlap with other larger, unique wildlife habitats. As pristine areas are more specific in location, the larger Government of Guam Conservation Areas are maintained for the preservation of large tracts of wilderness land. They are precisely delineated in the Community Design Element as wildlife refuges.

Proposed Critical Habitats

Synopsis. Even more expansive are critical habitats for most resident birds. The majority of bird species on Guam are threatened or endangered and the Division of Wildlife and Aquatic Resources has delineated critical habitats for possible consideration by Federal Fish and Wildlife regulations. Critical habitats are the natural areas where particular species find the requirements for survival and protection from predators. The largest areas include much of the limestone forest around the northern coastal cliffLines. The Fena Reservoir area, Orote Peninsula, and Cocos Island are additional critical habitats. For example, Orote Island is the only nesting site on Guam for the brown booby and the ironwood trees on Cocos Island provide the nesting site for white fairy terns.

Limestone Forest

Synopsis. The limestone forests of Guam are so named because they grow in minimal soil upon the northern limestone plateau, Orote Peninsula, and areas of the southeast coastline. They are a finite resource as land development has cleared many forested areas. Unlike mainland forests, reforestration is not possible because introduced "invader" species of vegetation prohibits the re-establishment of native flora. Limestone


GUAM
Map No. 10 Unique Terrestrial Ecosystems
This map being redone
LEGEND
PROPOSED CRITICAL HABITAT
LIMESTONE FOREST
WILDLIFE REFUGE
TERRESTRIAL PRISTINE ECOLOGICAL COMMUNITY
ASAN
AGAT
SANTA RITA
TALOFOFO
YONA
UMATAC
INARAJAN
MERIZO

forests are characterized by large trees that provide a shaded canopy over understory shrubs, herbs, and lianas. Numerous epiphytic ferns, mosses and orchids cover the rocks and larger trees. Due to periodic typhoons, the limestone forest never reaches a climax stage of maximum growth potential. The importance of forested areas is multiple when weighing the public benefits of preservation and developmental needs. They provide a wildlife habitat for many unique and endangered species of plants and animals. They also provide an area for collection of medicinal plants and edible animal life such as the popular coconut crab. As an aesthetic resource, they are value for hiking, nature observation and scientific investigation. Of less visibility, but not of less importance, much of the limestone forest lies over areas of the lens system as surface runoff is negligible and natural areas inhibit the infiltration of pollutants that are associated with urban development.

Performance Guidelines. The performance guidelines for the above described types of unique terrestrial ecosystems are kept at a general level because the degree of preservation is different depending on the nature of an individual area and many areas overlap.

- As unique, fragile, and valuable wildlife habitats, these are generally reserved for limited recreational or scientific uses. Urban, rural (medium-high density) uses will not be encouraged.

- Medium-high density and agricultural uses, adjacent to these areas, must be sensitivly planned to avoid spillover impacts. It is recommended that an open-space buffer zone be maintained adjacent to pristine ecological communities.

- Infrastructure development within pristine communities and wildlife refuges shall be limited to minimal access roads, up to but not entering, the area. Transmission lines, lighting, signs (other than trail identification markers), and any off-road vehicular traffic (jeeps, cars, trucks, motorcycles) shall be prohibited within pristine communities and wildlife refuges.

- Disposal of solid waste (dumping and littering) within all unique terrestrial ecosystems shall be prohibited. Planned placement of trash receptacles along hiking trails is encouraged. While solid waste disposal is regulated on an islandwide basis, it is especially critical in these areas

- Discharge of pollutants into all water resources shall be prohibited in all unique terrestrial ecosystems.

- Plant, animal, or rock collection shall be prohibited in pristine ecological communities and wildlife refuge habitats, except for scientific or educational purposes.

- Collection of plants for medicinal, food, or other purposes is permitted as a cultural activity within areas of the limestone forest and proposed critical habitats that are not protected as government-owned wildlife refuges.

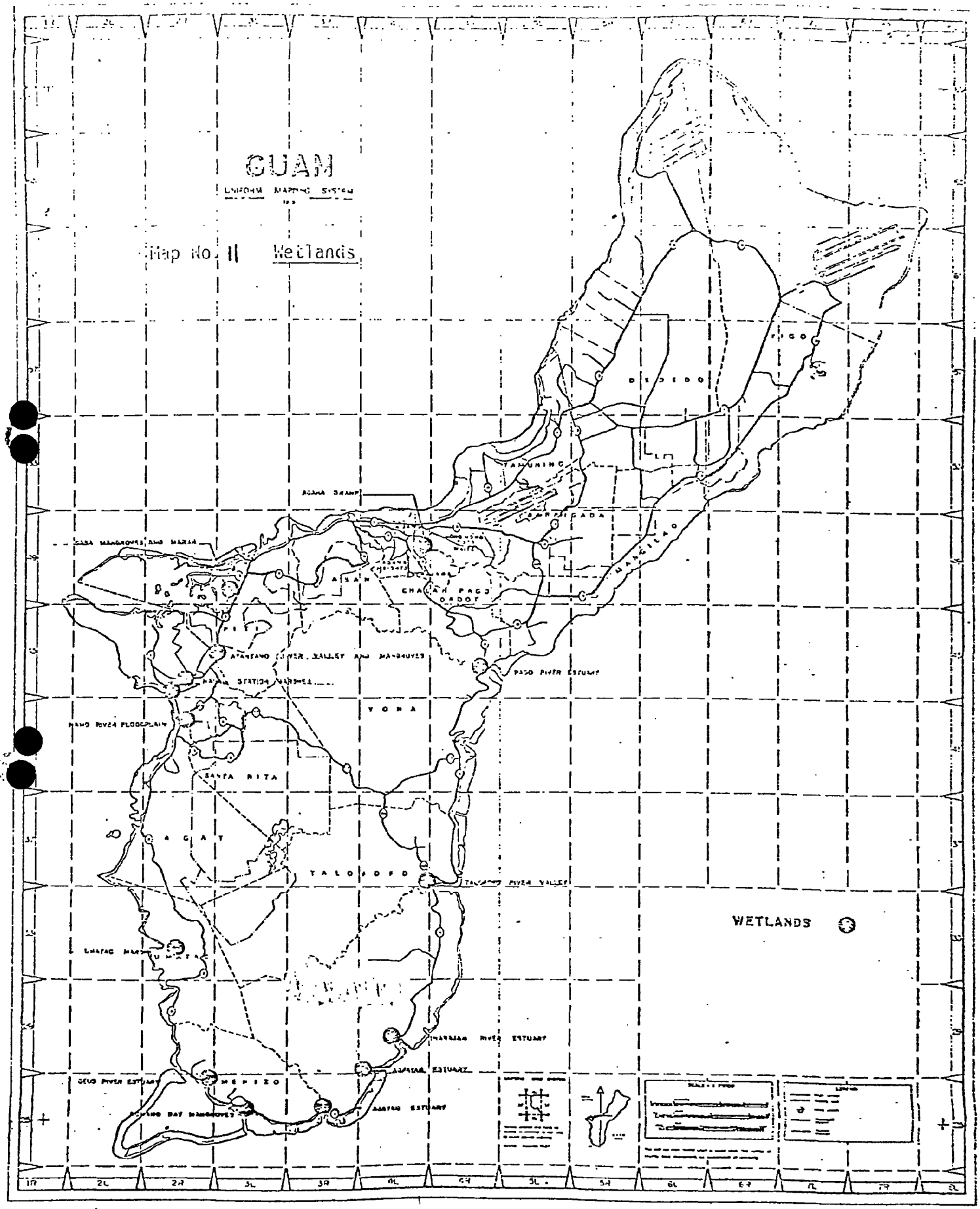
- Hunting within critical habitat areas and the limestone forest shall adhere to regulations established and enforced by the Division of Aquatic and Wildlife Resources and shall not be permitted within pristine ecological communities or wildlife refuges.

- Hiking trails, steps, and benches, etc, if required shall be planned and maintained to discourage the proliferation of excessive trails and off-trail hiking within pristine ecological communities and wildlife refuges.

- Reforestation and related restoration activities are encouraged in erosion-scarred or other damaged areas of natural terrain that are within unique terrestrial ecosystems.

Wetlands (See Map No. II and Fig.17)

Synopsis. Wetlands are unique components of the island ecosystem. They are the swamps, marshes, mangroves, and river valleys. These are areas that are constantly inundated with water and provide a wildlife habitat for aquatic species of plants and animals. Many wetlands also act as a source of freshwater supply or assist in recharging the aquifer. They primarily provide a nursery ground for many juvenile species of animals until the organism reaches a stage of growth when it can venture into another ecological niche . Wetlands are one of the most biologically productive areas on the island. They provide aesthetic scenery and are valuable locations for scientific research or sensitive aquaculture development. In areas at the coast, there is a transition from freshwater to saltwater wetlands with zonations of vegetation delineating the changes in salinity. A diversity of plant life is found in these areas, many of which assist in maintaining the balance of the habitat, supply nutrients to the water, and have ethno-botanical value as food, medicine, or material culture. Wetland areas are often in floodplain areas and absorb excess overflow from rivers during periods of excessive rainfall. The mangrove fringe, represented in only two major locations on Guam, is not only an ecological habitat, but also functional as a shoreline stabilization mechanism which prevents erosion during periods of stormwave inundation. Mangroves are particularly resistant to typhoon force winds. Numerous small reed marshes exist in inland savannah areas where surface drainage is slowed by a level area of topography. Savannah marshes are mostly found in the Dandan, Sigua and Umatac areas. Some unique salt marshes can also be seen at Sumay on federal lands. These small savannah and salt marshes can be identified by on-site field inspection and development should follow the performance guidelines for all wetlands.


GUAM
Map No. II Wetlands
WETLANDS

Suggested Performance Guidelines.

- The acreage of a wetland shall not be reduced by filling it at the edges or dumping material over submerged grass beds and the flow of water shall not be altered, by blocking or channelizing rivers or tidal flow, unless it is proven by the developer that such activity is necessary for the management of hazard areas or economic well-being of the people of Guam and no alternative measures are available.

- The water quality in wetlands shall not be lowered by the introduction of adverse pollution, nor should the bottom be covered with harmful sediments.

- The nutrient supply within wetland habitats shall not be altered by removing large amounts of productive plant life.

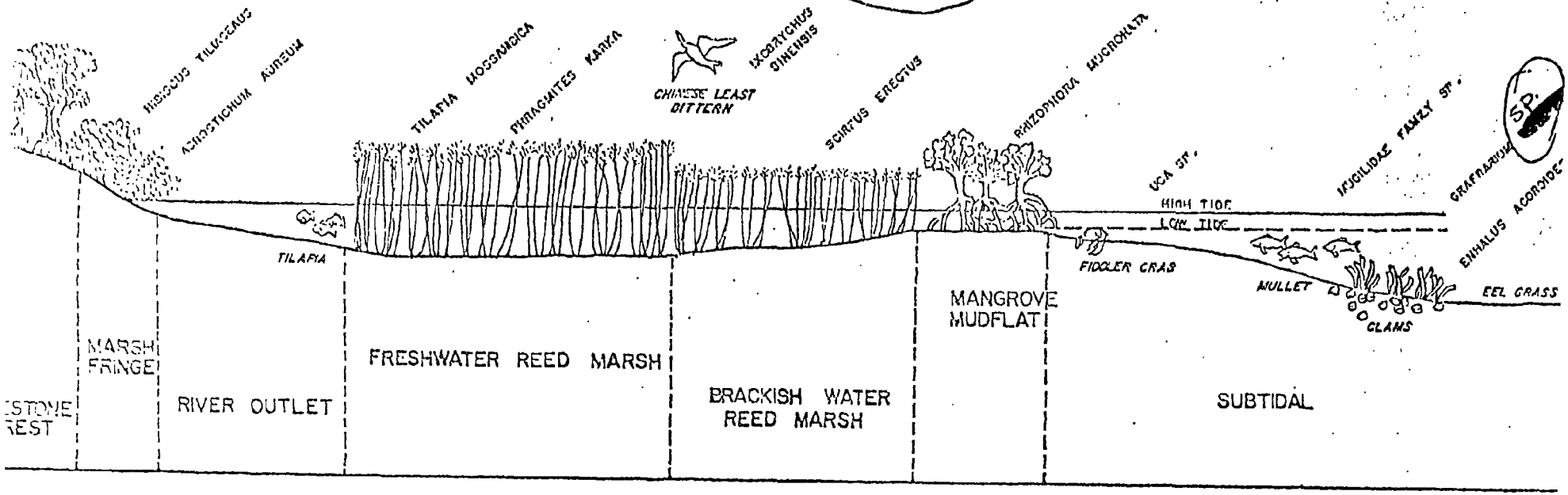
- The removal of endangered and threatened plants and animals shall be restricted. Particularly, mangroves, fringing the shoreline shall not be cleared to enhance visual access as they assist in shoreline stabilization and are only represented in two main locations on Guam. They are essential as nursery grounds for juvenile aquatic species of animals.

- Proposed development, adjacent to wetlands, shall adhere to GEPA water and erosion control standards and be compatible with the nature of the wetland habitat.

- Proposed recreational or cultural developments within wetland areas shall be permitted, after thorough planning for economic feasibility, complete funding and environmental assessment prove that such development will enhance the wetland habitat and benefit the people of Guam rather than cause irrepa damage to the finite amount of wetland habitat which is represented on Guam.

- Aquaculture developments in wetland areas shall be permitted only with an approved EIA, adherance to applicable GEPA standards, Division of Aquatic and Wildlife Resources regulations, approval of the U.S. Army Corps of Engineers (federal jurisdiction over defined wetlands), and responsible planning to ensure that the development will not cause irrepairable damage to the ecological complexity of the wetland area.

Figure 17 CROSS-SECTION OF THE SASA [illegible] WETLAND



Group (F). Unique Marine Ecological Communities

Coral Reefs (See Map No. 12)

Synopsis. Coral reefs are geological formations created by living marine organisms and include the living ecological communities on the surface of the reefs. Two deep lagoons surrounded by coral barrier reefs occur in Guam: Apra Harbor and Cocos Lagoon. Elsewhere, fringing coral reefs border over one half of Guam's present shoreline, forming wide reef flats of shallow water, separating the shore from the deeper ocean. At times of lowest tides, these shallow reef flat areas may be exposed to a great extent, but depressed areas within the reefs and the outer margins of the reefs are always submerged, allowing for the growth of corals and associated organisms.

Coral reefs provide protection of the shoreline, especially beaches, from storm waves and erosion. Reefs provide additional protection from the potential damage of tidal waves or tsunamis. They also provide recreational areas for swimming, boating, waterskiing, snorkeling, diving and numerous kinds of fishing. The rich diversity of corals, fishes and other reefs organisms on Guam make the coral reefs an outstanding location for scientific research. Reefs are biologically highly productive and economically important as a source of fish, corals and shellfish; and an outstanding tourist attraction.

Living corals of several hundred species are the basic resources determining values of coral reef areas. The total ecological community and physical features are largely maintained in direct relation to the maintenance of living corals. These require constant submergence in salt water, 70-80 degree temperatures, sunlight, water circulation (oxygen) and a solid substrate. Natural variations in these and other physical parameters result in distinct zonations and a wide variety of reef communities.

Performance Guidelines.

- Marinas, harbors, other shipping facilities, mariculture developments, power plants, etc. are to be encouraged at sites naturally suitable, where dredging and environmental alterations can be reduced to a minimum.

- Areas of living corals shall not be filled or dredged nor shall they be damaged by siltation or sedimentation from adjacent developments, unless it is proven by the developer that no alternative is possible and the resultant benefits exceed the environmental, social, recreational, and other costs in a document such as environmental impact assessment.

- The dredging or filling of other submerged lands besides those containing living corals should be kept to a minimum and allowed only if the development is water-dependent and there are no feasible alternatives.

- Developments that may alter currents and sediment transport shall provide current studies of the area throughout tidal cycles and all seasons and predict change caused by the development prior to approval of the project. Any major change in longshore currents should be avoided and if shoreline erosion is expected the development should not be approved.

- No dredging spoil material shall be placed in water areas that are not part of a permanent filling project.

- Turbidity and siltation control mechanisms such as silt screens and weirs shall be used to protect water quality in areas adjacent to dredging.

- Sewage outfalls, communication cables, pipelines, and similar structures which meet across reef flats shall be buried in trenches which are refilled and concreted to restore the original reef flat contours.

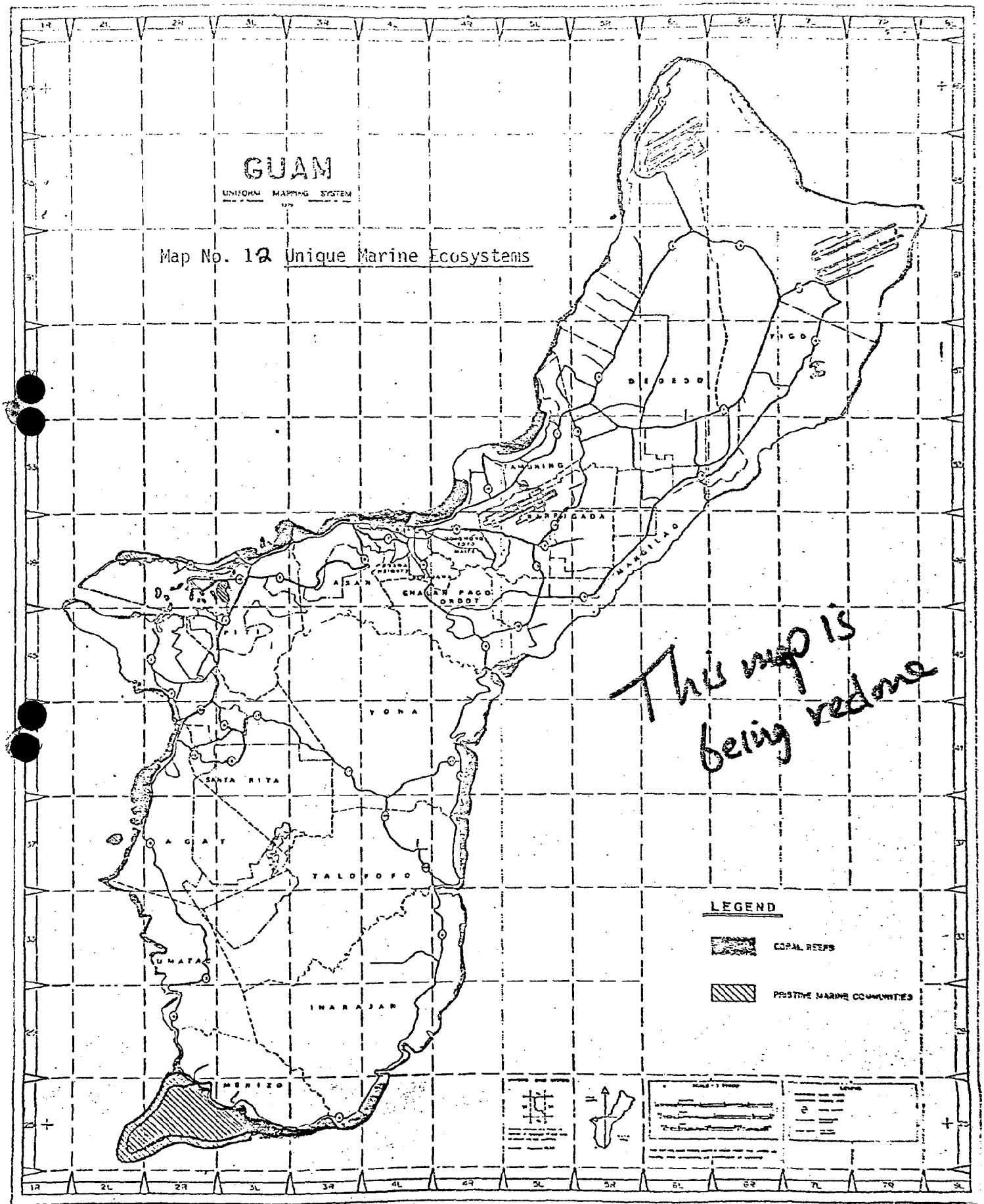
- Solid waste disposal and sanitary land fills shall not occur on reefs.

- Coral cover that has been damaged in areas adjacent to dredging, filling, and other changes in the marine environment should be reestablished by transplanting developed coral colonies to the area if a sufficient parent stock is available and if water turbidity and other conditions, as well as transportation mortality does not prevent transplantation.

- All land development, especially adjacent to living coral areas, shall be designed with stringent runoff controls to contain and filter excessive sediments and polluted discharges capable of degrading or destroying nearby marine resources.

- Change of ambient natural conditions, including turbidity, salinity, temperature, dissolved solids, suspended matter, dissolved oxygen, nutrients, currents, etc. shall not be allowed in the water immediately around living corals.

- Legal effluent outfalls and pollution systems shall not have live coral areas within mixing zones. Outfall sites shall be in deep, offshore areas.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 12 Unique Marine Ecosystems
This map is being redone
LEGEND
CORAL REEFS
PRISTINE MARINE COMMUNITIES
YIGO
DEDEDO
AMUNING
AGANA
ASAN
PITI
YONA
SANTA RITA
AGAT
TALOFOFO
UMATAC
INARAJAN
MERIZO

- Addition of pesticides, petroleum product bleach and other toxic substances shall not be allowed in anywaters surrounding living coral.
- Removal of coral is not allowed except under permit and supervision of the Aquatic and Wildlife Resources Division of the Government of Guam.
- Proposed developments adjacent to living coral areas shall be compatible with the nature of the coral habitats.
- Traditional and existing legal uses of the coral reef may continue, if not conflicting with any of the above performance guidelines. New uses must receive a submerged Land-Use permit and approval of the Land Use Commission.

Marine Pristine Ecological Communities (See Map No. 12)

Synopsis. Marine Pristine Ecological Communities include a typical representative of each of the major marine ecological community on Guam, including: estuaries, fringing reefs, barrier reefs, patch reefs, barrier reef channels, fringing reef channels, mangrove swamps, seagrass beds, cut benches and submarine cliffs. Each of the selected representative areas has retained its natural character or successfully re-established it after disturbance. This natural character includes biotic, and to a lesser extent abiotic, components of scientific, educational and aesthetic value. Of specific interest are the preservation of the natural ecological stability through diversity and the protection of critical habitats for rare, uncommon, threatened or endangered species. Although many of these areas are included in the coral reef category of APCs, these most valuable areas require a stricter control of permissible uses which will be governed by particular performance standards that can be developed after a study by the University of Guam's Marine Laboratory is completed in October, 1977.

Preliminary Performance Guidelines.

- The performance guidelines for coral reefs shall apply to pristine marine ecological communities.
- Coral harvesting permits shall not be given for harvesting in these areas.
- Permissible dredging and filling and developments shall not occur near these areas.
- Recreational use may be restricted as needed to protect these areas and their resources.

Group (G) Unique Geological Formations

Karst Topography

Synopsis. Karst topography consists of areas where limestone solution of uplifted reef coral is so extensive that large holes, crevices, and craggy geologic configurations are at a surface level. Human habitation of these areas is a safety hazard and the ground base is too unstable for most types of development. Topsoil is negligible. These are areas that, by geologic nature, are only fit for conservation and scientific investigation. They generally exist in two geographic areas and in two basic configurations. Eroded areas exist in the southern half of the island between the Alutom and Umatac volcanic formations. These two volcanic formations arose at different time periods and the reef formation, between, was uplifted. Karst topography exists in this dissected area and has developed as a result of continuous drainage of surface water from volcanic regions into the lower limestone-surfaced valley. The calcium carbonate in the limestone is carried away in solution and the most insoluble material is left. Most rainwater quickly disappears, but where surface drainage enters a Karst area, the stream may flow underground and emerge at the surface further downstream. Trace areas of Karst topography also exist on the summit of the Alutom formation, but most is found in the areas known as the southern interior basin. In the northern limestone plateau, karst topography is in the form of deep, round sinkholes that are sometimes found singly or in clusters. They are not as massive or localized as in the southern areas. Sinkholes are generally protected by open-space conservation use for the protection of water resources. The majority of both forms of Karst topography is located on federally-owned lands. Since the major area of Karst topography is adjacent to highly restricted ammo bunkers in the Fena Reservoir area, it is naturally protected from adverse development. It would only become a high priority concern if this land was ever opened for public use or development. Further study is needed to define the extent and geologic nature of Karst regions before precise performance guidelines can be recommended. Presently, federal properties, open-space, and water quality guidelines are sufficient for the management of most of this unique geologic ecosystem.

Caves and Waterfalls

Synopsis. In addition to the highly unique Karst areas, other geologic formations deserve management attention for the scientific study and recreational enjoyment of their aesthetic character. Within areas of raised limestone, numerous caves have formed. Natural caves are subterranean hollow spaces, in relatively horizontal configuration, formed when water seepage dissolves limestone. Their size may range from the small cliff-side shelters that are numerous in some northern precontact village sites to larger coastal caves with stalactite formations.

Larger caves are primarily important for geologic study of the composition, structure and history of the earth. Basically, performance guidelines managing sloping terrain should be adequate for the protection of caves. In addition, rock souvenirs should not be taken from cave areas and areas should be kept free of litter and fires associated with picnicking and overnight camping.

The Department of Parks and Recreation has listed 14 major waterfall areas of high scenic and recreational importance. Waterfalls are locations where steep topography causes surface drainage of a major river to vertically cascade to a lower river course. Waterfalls impede navigation, however, they greatly enhance scenic vistas and offer a potential power source. Performance guidelines for slide and erosion control as well as water quality standards should sufficiently protect waterfall areas. Below listed are the major waterfalls on Guam.

1. Talofofo Falls
2. Sigua Falls
3. Upper Sigua Falls
4. Inarajan Falls
5. Malojloj Falls
6. Tarzan Falls
7. Fintasa River Falls
8. Sella River Falls
9. Laelae River Falls
10. Imong River Falls
11. Agaga River Falls
12. Cetti River Falls
13. Cotal Falls
14. Cannon Falls

Group (H). Cultural and Recreation Areas

Overview

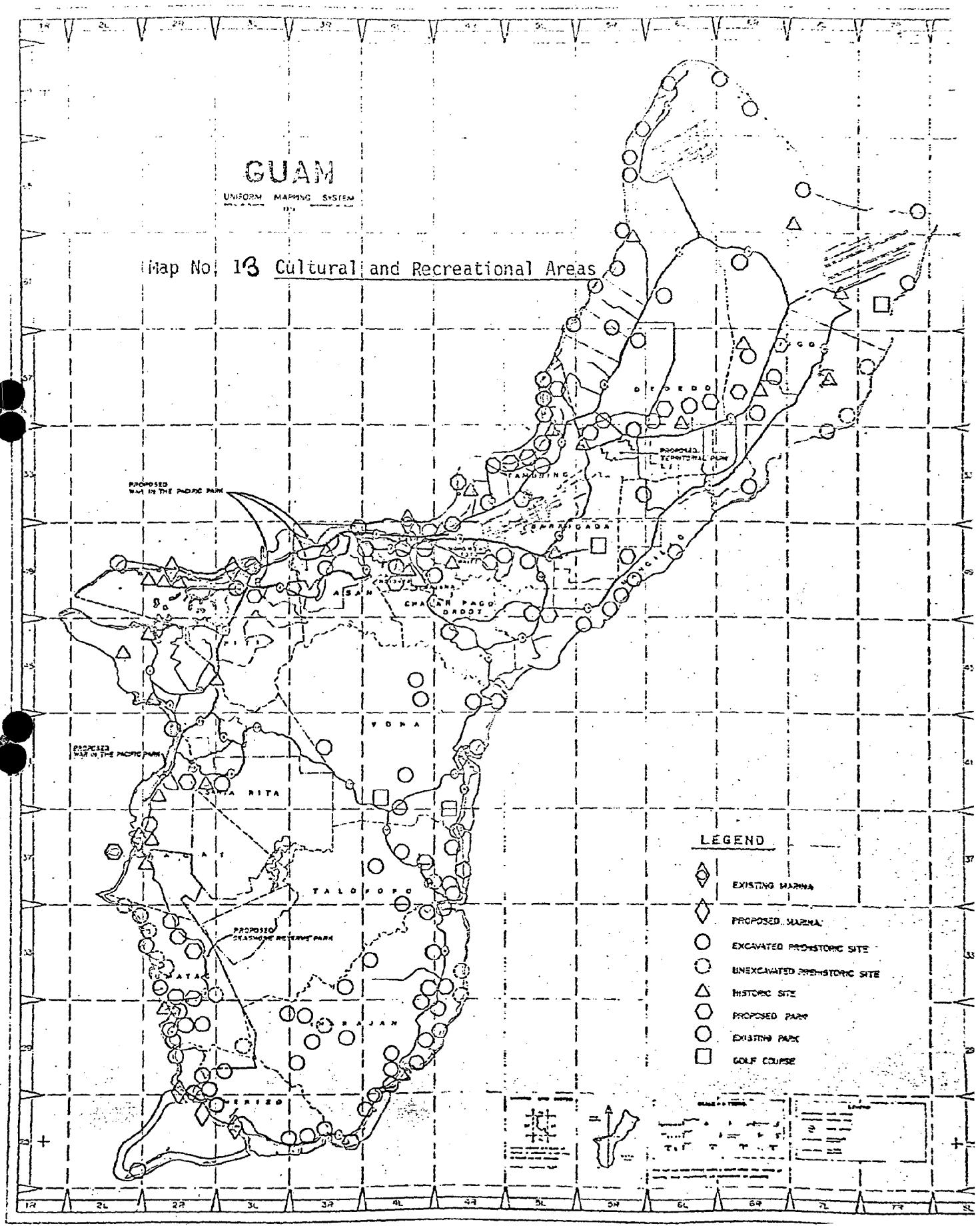
The Department of Parks and Recreation has the overall responsibility for design, construction, maintenance, operation and coordination of activities within all public and village recreation areas. In addition, historic and prehistoric sites, and scenic vistas fall under the planning and enforcement powers of the Department of Parks and Recreation. The Bureau of Planning has included these areas of APCs simply to reinforce the continued expansion and maintenance of these facilities and to emphasize the importance of keeping such areas free from development pressures. Additional performance standards are not foreseen as being developed by the Land-Use Element or subsequent documents. Rather, the approach will be one of support of existing standards, rules and regulations developed by the Department of Parks and Recreation, and the continuance of inter-agency cooperation for the success of recreational endeavors.

Parks and Village Recreation Areas (See Map 14; Table 6)

Synopsis. Recreation, active or passive, is an extremely important part of the lives of Guam's population. The island is fortunate to have a dynamic recreation program, supported by an active Department of Parks and Recreation. If the recreation program is to continue providing an increasing population with adequate parks, facilities and activites for various types of recreation, existing and potential areas must be free from development pressures which would negatively affect these activities.

Performance Guidelines. Use of park areas should follow the Parks and Recreation Rules and Regulations, being developed by the Department of Parks and Recreation. Existing rules of areas under the jurisdiction of the Department of Parks and Recreation include:

- Motor vehicles shall be parked only in designated areas; no vehicles shall be allowed on trails, beaches, or other areas within park boundaries.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 13 Cultural and Recreational Areas
PROPOSED WAR IN THE PACIFIC PARK
PROPOSED WAR IN THE PACIFIC PARK
PROPOSED SEASHORE RESERVE PARK
PROPOSED TERRITORIAL PARK
ASAN
AGAT
SANTA RITA
YONA
TALOFOFO
MERIZO
DEDEDO
TAMUNING
HAGATNA
CHALAN PAGO
OROOT
INARAJAN
LEGEND
EXISTING MARINA
PROPOSED MARINA
EXCAVATED PREHISTORIC SITE
UNEXCAVATED PREHISTORIC SITE
HISTORIC SITE
PROPOSED PARK
EXISTING PARK
GOLF COURSE

	Football Field	Softball/Baseball Field	Handball Courts	Basketball/Volleyball Court	Tennis Courts	Restrooms	Drinking Water	Children Play Apparatus	Pavilion/Shelter
1. Paseo de Susana, Agana		○		○	○	○	○	○	○
2. Agana Heights Recreation Area		○		○		○	○	○	○
3. Agat Recreation Area				○		○	○		
4. Asan Recreation Area				○			○		
5. Maina Recreation Area				○					
6. Barrigada Community Park				○	○	○	○		○
7. Chalan Pago Recreation Park		○					○		
8. Dededo Recreation Area		○		○			○	○	
9. Liguan Terraces Recreation Areas				○	○		○	○	○
10. Inarajan Recreation Area		○		○		○			
11. Mangilao Playground		○		○		○	○		
12. Merizo Recreation Area		○					○		
13. Mongmong Recreation Area		○		○		○	○		
14. Toto Recreation Area		○		○		○	○		
15. Piti Community Ballfield		○		○				○	
16. Santa Rita Recreation Area		○	○	○		○	○		○
17. Talofofo Recreation Area		○		○			○		
18. Tamuning Community Park	○	○		○		○	○	○	
19. Tumon Recreation Area		○							
20. Umatac Recreation Areas		○		○		○	○		○
21. Yigo Recreation Area		○		○		○	○		
22. Yona Recreation Areas		○		○		○	○	○	

Table 6 Village Recreation Areas (Number Keyed to Map No. 14)

Source: Guide to Guam's Public Park and Recreation Areas, Department of Parks and Recreation, 1977.

- Litter shall be placed in proper receptacles and dumping of household trash is prohibited.

- All pets must be on a leash.

- Degradation or defacing of trees, flowers, plants, or the removal of sand is prohibited.

Additional consideration should be given to impacts of surrounding activities upon recreation areas and vice versa:

- Adjacent commercial or other intensive uses, existing or proposed, shall not restrict access to parks or recreation areas by such things as storage yards, extension of parking spaces outside of designated parking areas, placement of waste receptacles, or any similar activity.

- Parking for recreation areas shall be sufficient, so as not to create a spillover impact which may impede traffic flow or create safety hazards on roads or impede parking for neighboring establishments, dwellings or other establishments unless permission has been granted by the property owners, or Office of Highway Safety, DPW.

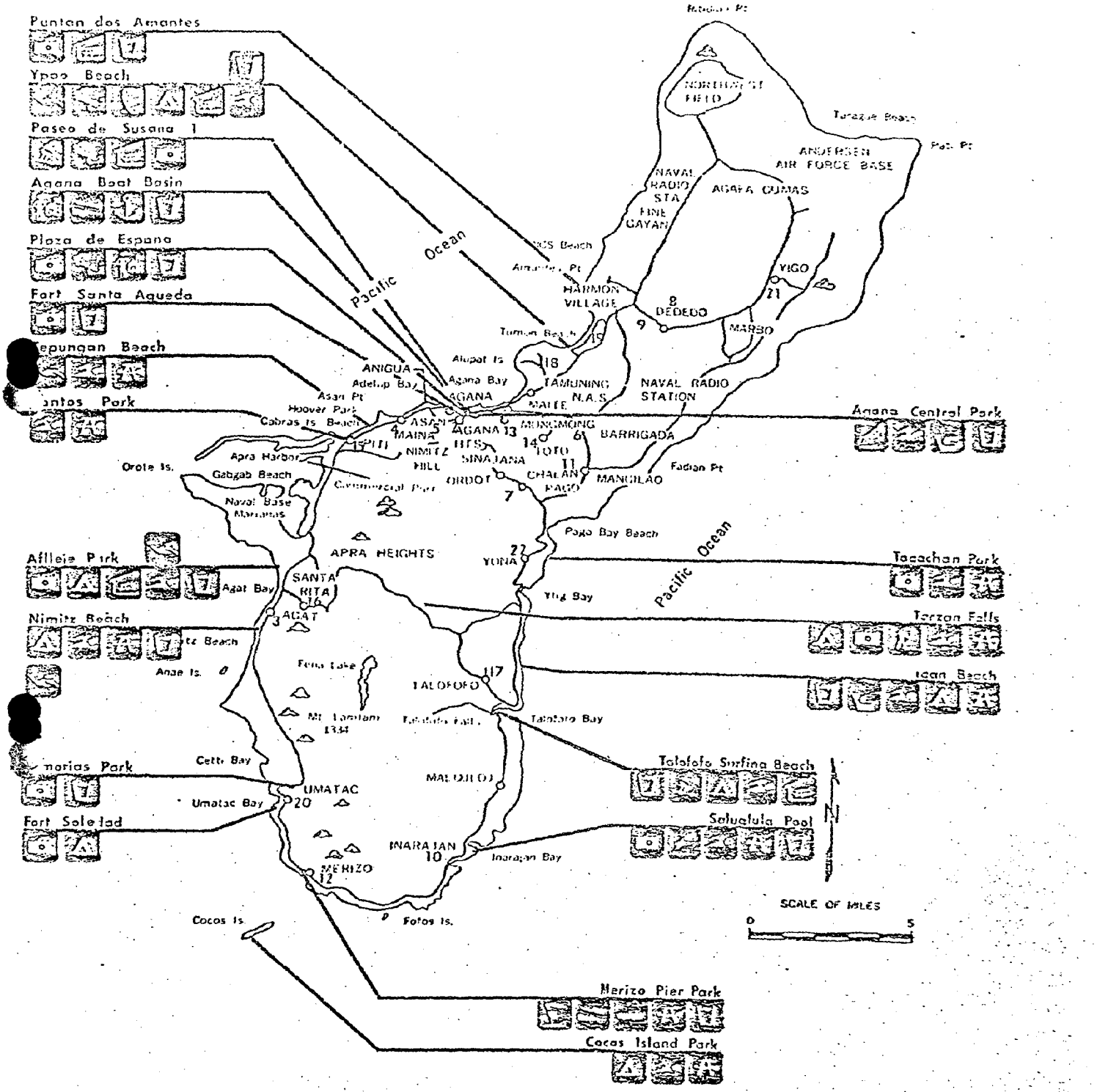
- Proposed development shall not interfere with the operation, access, nor encroach upon the land areas designated for public recreation.

Historic and Prehistoric Sites (See Map No. 13)

Synopsis. There are many areas on Guam where past human activity has left structures and artifacts that are highly valued as links with a rich cultural heritage. These are areas of particular concern because of their archaeological significance, aesthetic value and fragile nature. Unplanned development can destroy these areas or limit their use as areas for observation, recreation and educational experience.

The three elements of historic preservation are historic sites, archaeological sites and architectural sites.

Map No. 14 [redacted] Park Areas



Source: Department of Parks and Recreation

KEY

- Viewing Area
- Surfing
- Water Skiing
- Diving
- Scuba Diving
- Playground
- Hiking Trail
- Information
- Telephone
- Camping
- Launching Ramp
- Boating
- Picnic Shelter
- Picnic Area
- Showers
- Marina
- Drinking Water

Included in historical sites are precontact village areas that are characterized by a prevalence of artifacts and associated features such as latte stones, rock shelters and mortar stones.

Since much of the island's present lifestyle has been influenced by a Spanish heritage, buildings that have survived this colonial era are valuable historic sites. Also, of historic significance are World War II relics that provide a fascinating retrospect, for both residents and visitors, into the past time of conflict. Presently, many residents value the traditional architecture of southern villages. Inarajan village, in particular, represents the remaining concentration of a traditional architectural style and is proposed as a historic architectural district with plans for preservation and improvement of damaged structures.

Public Law 12-126 declares that it is the public policy and in the public interest to engage in a comprehensive program of historic preservation. Detailed description of historical resources, proposed historical park plans and preservation guidelines are outlined in the Guam Historic Preservation Plan and the Inarajan Village Historic Architectural Plan, Department of Parks and Recreation.

Performance Guidelines. Specific guidelines are outlined in the above mentioned documents. Basic guidelines for prehistoric sites involve:

- Notification shall be given to the Department of Parks and Recreation of intention to clear, construct, alter or improve a site that is suspected as having historical value.

- Development of a site listed in the [redacted] Guam Register of Historic Places shall not begin until three months' notice has been given to the Department of Parks and Recreation.

- Notification shall be given to the Department of Parks and Recreation of intention to develop previously

uncleared land for agriculture so a survey team can record a description of its features and make a surface collection of artifacts.

- Individuals or groups shall not collect prehistoric artifacts, especially by digging indiscriminate holes on or near prehistoric sites (latte stones, village sites, caves, or rock shelters.)

Scenic Vistas

Synopsis. Aesthetics or beauty is seen in different things by different people, however, the cultural learning process causes most people to generally agree on the scenic value of different vistas. The maintenance of visual access or a clear view of different geographic areas is important so that the overall beauty of Guam is preserved. Visually pleasing views enhance the quality of life for the resident and promote tourism as a valuable facet of the island's economy. Scenic vistas include unrestricted overlooks and ground level views of both developed and undeveloped areas of the island.

Performance Guidelines. Compliance with performance guidelines for other areas of particular concern will naturally protect natural scenic vistas, as areas such as slopes in excess of 15%, limestone forests, wetlands, and pristine communities are often components of a scenic vista. In scenic areas of urban development such as resort areas and subdivisions, building codes and zoning regulations can effectively protect and enhance scenic quality. Water quality and erosion control standards also directly affect scenic quality. General guidelines, which must also be considered, are listed below.

- Structural and infrastructural development in natural scenic areas shall be planned to compliment existing features or form a natural continuum so that aesthetic quality is enhanced rather than degraded. Fences, transmission lines, towers

or other forms of tall infrastructure shall be planned as not to obstruct visual access of natural scenic vistas.

- Particular concern shall be given to sensitive siting of structures within the Seashore Reserve which can potentially interrupt the homogeniety of views from either the shore or more distant overlooks from which the skyline can be interrupted by improper siting of structures such as tall, flat-topped buildings.

- Public access to scenic overlooks and shoreline areas shall be, wherever feasible, kept unrestricted.

- Within areas of industrial development, location of facilities shall consider siting and design of structures which have architectural (structural, graphic, color) interest.

- Within industrial areas, where unsightly storage of scrap materials or equipment is necessary, landscape and structural screening shall be employed as mechanisms to enhance area aesthetics.

- The amount of litter, due to abandoned cars, beverage containers and other solid waste is nearly twice that reported in other parts of the United States. Dumping into authorized sanitary landfills only shall be strictly enforced by GEPA in conjunction with the litter laws enforced by DPS.

- Abandoned, dilapidated housing and other structures represent both a health hazard and disrupts aesthetic quality and shall be removed pursuant to the requirements of the Department of Public Health and Social Services.

- Anchoring of boats shelling, fishing with spears, nets, lines, may have to be controlled, if needed, to retain the natural character of these areas.

Group I. Other Areas of Proposed Development

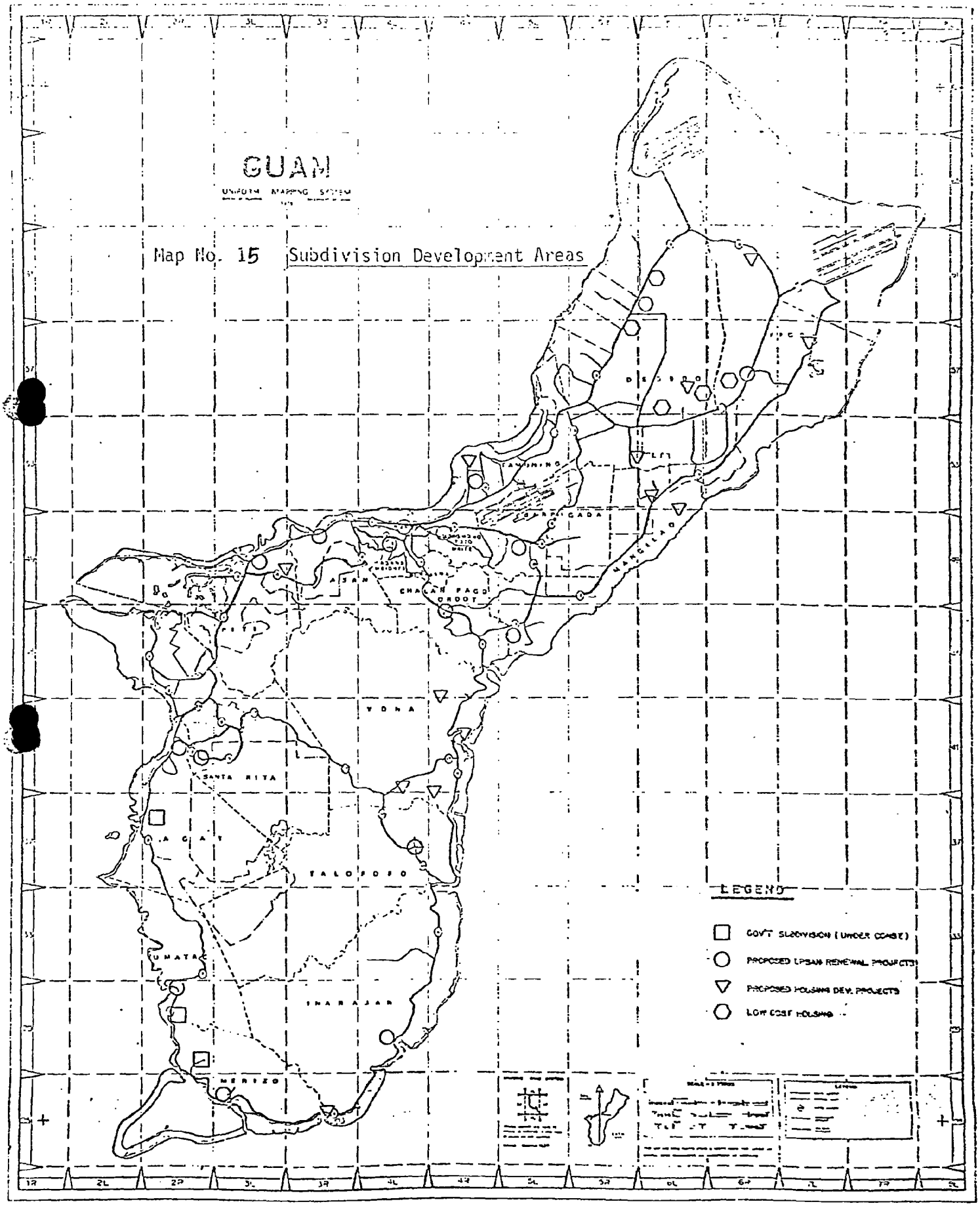
Subdivision Development Areas (See Map No. 15)

Synopsis. Human settlement and developmental needs are an inevitable aspect of island life. For social and economic purposes, urban development has historically consolidated at major trade centers. Because of terrain restrictions, relatively flat land adjacent to the coast has been the primary location for development of a wide range of urban developmental needs. With post-war reconstruction and the building boom there has been a notable trend toward subdivision of land further inland, adjacent to existing villages and in new locations.

With an increasing population desiring to utilize coastal resources for recreation and tourist industry development, coupled with the man-land ratio inefficiency and adverse ecological impacts associated with random urban sprawl, it has been necessary that increased planning for subdivision development provide the responsible mechanisms for change.

Urban renewal of existing communities, not only seeks to eliminate substandard housing, but produces an urban design that makes better use of land space. Urban renewal is projected for almost every major village proper area on Guam except Yona and Sinajana which have already been transformed by planned urban development. In addition to urban renewal, low-cost housing tracts and government subdivisions are other GovGuam mechanisms with the objective of providing housing and land space for the emerging generations. GovGuam is currently completing the Pigua, Pagachao and Umatac subdivisions and initiating construction of the GHURA 500 low-cost housing tracts in Dededo and Yigo.

Private developers have greatly supplemented the trend towards subdivision development. Existing, insular neighborhood-type areas such as Liguan Terrace and Barrigada Heights are rapidly affecting the traditional appearance, lifestyle and land-use patterns that have characterized urban residential areas in the past. Projected subdivision development and expansion are currently proposed for Ypapao Estates, Baza Gardens and Sasajyan. Undoubtedly, as cyclical demands for housing occur, even more subdivision expansion and planning will occur between the present and the year 2000. The Subdivision Development Review Committee, an advisory commission, [redacted] reviews subdivision plans for responsible development. At this stage, various agency guidelines are enforced.


GUAM
UNIFORM MAPPING SYSTEM
Map No. 15 Subdivision Development Areas
AGANA
AGANA HEIGHTS
ASAN
CHALAN PAGO ORDOT
MANGILAO
YONA
SANTA RITA
AGAT
TALOFOFO
MERIZO
INARAJAN
LEGEND
GOV'T SUBDIVISION (UNDER CONST.)
PROPOSED URBAN RENEWAL PROJECTS
PROPOSED HOUSING DEV. PROJECTS
LOW COST HOUSING

Single-family dwelling subdivision design may precede the planned design of land for other uses as evidenced by the Radio Barrigada agricultural subdivision. The 80-acre Radio Barrigada site is leased federal land and contains garden plots available for 1-year renewable leases. Guidelines for agricultural subdivisions are managed by the Departments of Land Management and Agriculture. Pesticide use and water quality is monitored by GEPA. The degree of success in the Radio Barrigada project will indicate the feasibility of future development of agricultural subdivisions.

Whether urban or agricultural, planned subdivision development assists in the provision for developmental needs while ensuring that unnecessary expansion into other less developable areas of particular concern is prevented and that subdivision land-use is compatible with the adjacent environment.

Unplanned Urban Form. The protection of scenic and natural resources is partially accomplished through the designation of a Seashore Reserve and development of performance guidelines for APCs. However, a large portion of the Seashore Reserve is already urbanized and the majority of communities lie in coastal areas of high scenic quality. The majority of the population lives in these communities which need corrective actions for environmental protection and innovative approaches to community design and development.

The most striking characteristic of the urban pattern on the land poor island of Guam has been the adoption of a random pattern of land utilization and building typology which as resulted in the misuse of land and an urban form unsuited for the whole of society.

Particularly evident is the lack of neighborhood design, since all design efforts are limited to the scale of single buildings. No improvement for the protection of scenic or aesthetic resources in an urban setting can be undertaken unless urban development is conceived within the framework of responsible community design.

Urban Design. The urban design tools which allow for the protection of natural resources and a responsible human environment within developed areas, suited to a wide range of resident's needs include:

- block design or cluster housing instead of random single building design. This requires that the buildings in a given area be planned in a coordinated scheme, and the discouragement of individual building typologies.

- Greater variety of building height in high-density districts.
- Neighborhood density and neighborhood open space ratios.
- Neighborhood view corridors.
- Separation of traffic flow (bicycle, pedestrian, cars) at the neighborhood scale.
- Multiple land-use and integration of activities at the neighborhood scale.
- View corridors from densely built areas towards the ocean, shoreline, or sloping terrain.
- Integration of neighborhood parks with an urban network of green space, pedestrian and bicycle lanes.

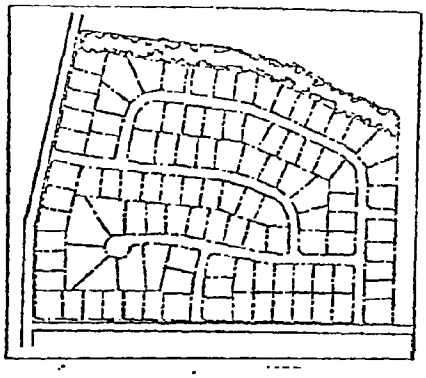
Planned urban form is based on human scale, community design and neighborhood organization. It provides for greater access to and protection of natural resources, greater energy saving and responsible, aesthetic and efficient development to meet human needs.

Cluster Housing as an Alternative to Random Urban Sprawl.

Where possible, low-density residential development should be clustered to retain as much open-space as possible. Cluster housing gives an area an aesthetic residential appearance as compared with the symmetrical arrangement of houses in rows and at right angles, where people tend to feel that they occupy one equal place in a rigid pattern of conformity. Even more socially, economically and aesthetically inefficient is random urban sprawl. Traditionally, urban development has randomly consumed vast amounts of land space, leaving little open space for recreation or ecology. This problem can be greatly alleviated with planned cluster housing. People living in the increasing number of subdivisions can only benefit from more carefully planned subdivision development that is both in the developer's and the public's interest. (See Figure18).

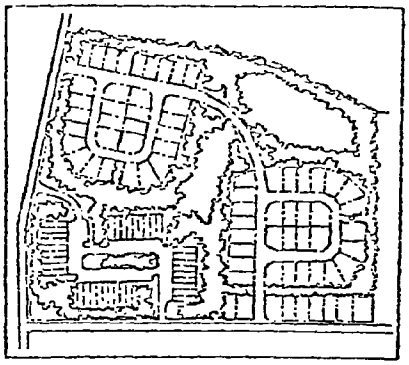
Figure 18

CONVENTIONAL SUBDIVISION



Number of lots: 108
Open space: 10%
Linear feet of streets: 5,400
Linear feet of sewer lines: 5,400

CLUSTER DEVELOPMENT



Number of lots: 108
Open space: 50%
Linear feet of streets: 4,900
Linear feet of sewer lines: 3,900

Source: How Will America Grow?: A Citizen Guide to Land-Use Planning, Citizens' Advisory Committee on Environmental Quality, Wash., D.C., April, 1976, p. 15.

C. Revised Zoning

Section A has presented the districting of Guam's land areas into four major districts. Because this concept does not exactly coincide with the regulation of zoning as presently defined by the Government Code, revisions have been incorporated into the law through proposed legislation. Proposed bills 233 and 234 are discussed in Chapter VI following.

While appearing quite complex, the actual application of the districting concept and the revision of present zoning code is quite simple and should not present any particular difficulties to commissions and Government of Guam agencies. (See Fig.19)

1. The zoning system presently in force (Residential R1 & R2, Commercial CO, Resort-Hotel H, Industrial M1 & M2) will only be applied within designated urban districts as shown on the Land-Use Districting Map. As the vast majority of existing and proposed development is expected to occur within the area designated as Urban, most individuals will not be affected. Zoning administration (process, procedure, premitted uses, etc.) will essentially remain in its present organizational framework.

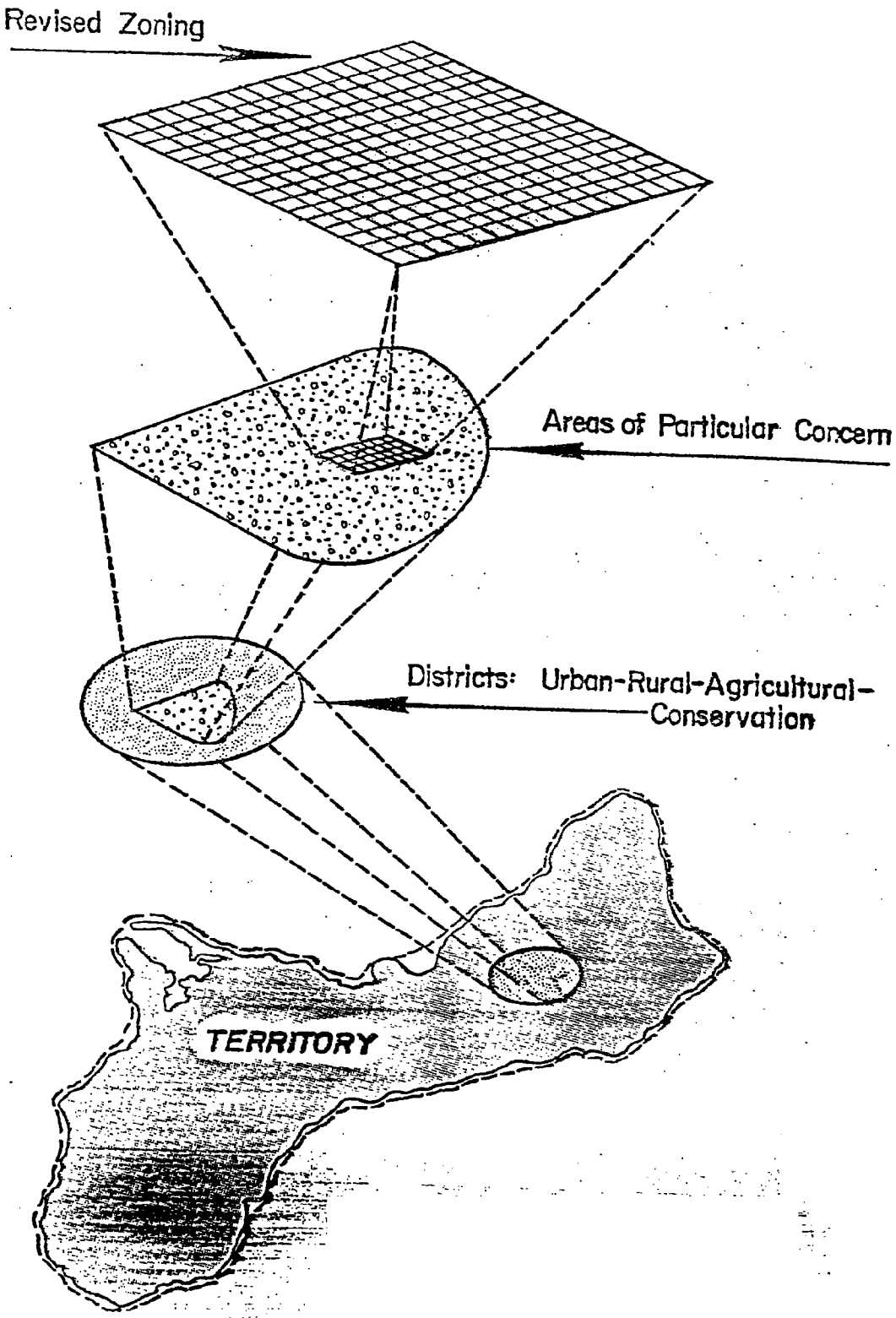
   Within the Urban District, changes have been recommended which substantially differ from existing zoning practice. A Resort-Hotel Zone has been delineated which suggests that specific types of development of a commercial nature, which would be complimentary to the concept of a resort-hotel area, be encouraged. Also, certain development within the urban residential (R1 or R2) zones would allowed to occur on lots of 2500-5000 sq. ft. Such development must meet an "average lot size" requirement, as well as constitue a Planned Unit Development (PUD).

2. Within the remaining three districts (Rural, Agricultural, Conservation), development will be permitted according to performance standards applicable to each district. The Land-Use Commission will make decisions on the permissibility of such development based on these performance standards, as well as consideration of various other standards applicable to APCs and the Seashore Reserve, as well as other guidelines. Specific agency guidelines address such things as infrastructure requirements, building codes, recreational space, erosion and sedimentation, air and water quality, and development in "all waters" (COE, 404 Program).

3. While the Land-Use Commission would exercise its powers directly over zoning within Urban districts and all development within the Rural, Agricultural, and Conservation districts, the Central Planning Council (CPC) will be responsible for the designation of districts and any proposed changes to district boundaries. After a district boundary change has been permitted by the CPC, the Land-Use Commission will assume responsibility for the application of rules, regulations and other applicable standards. However, if a type of development is proposed, for a Rural, Agricultural or Conservation district which is contrary to the performance standards defining allowable development within that district, the developer must submit a formal request to the CPC for a district amendment. Also, if it appears that the Land-Use Commission has permitted a use of lands in the Rural, Agricultural or Conservation districts which appears contrary to the performance standards established for those districts the decision can be reviewed by the CPC and the developer could be required to file for a district amendment. After a district amendment has been permitted by the CPC, the Land-Use Commission would assume responsibility for the regulation of the development. The functions of the Subdivision Development Review Committee SDRC) and the Department of Land Management, serving as staff for the Land-Use Commission, remain essentially unchanged.

4. The Agriculture Zone as it appears in the present code has been eliminated. In its place, an Agriculture District has been established, as described in Section A. Section B, Group (A) further discusses agricultural support areas as an APC.

Figure 19 The Three-Tiered System of Land-Use Planning



VI. REGULATORY MECHANISMS

A. Enforcement of Land-Use Related Law

Public Laws 12-200 and 13-89 resulted in separation of major land-use planning functions from those of land-use regulation, administration, and surveying. Under these laws, the Bureau of Planning assumed the responsibility for land-use planning, while the Department of Land Management, as the staff agency for the Territorial Planning Commission, retained its land-use regulatory authority.

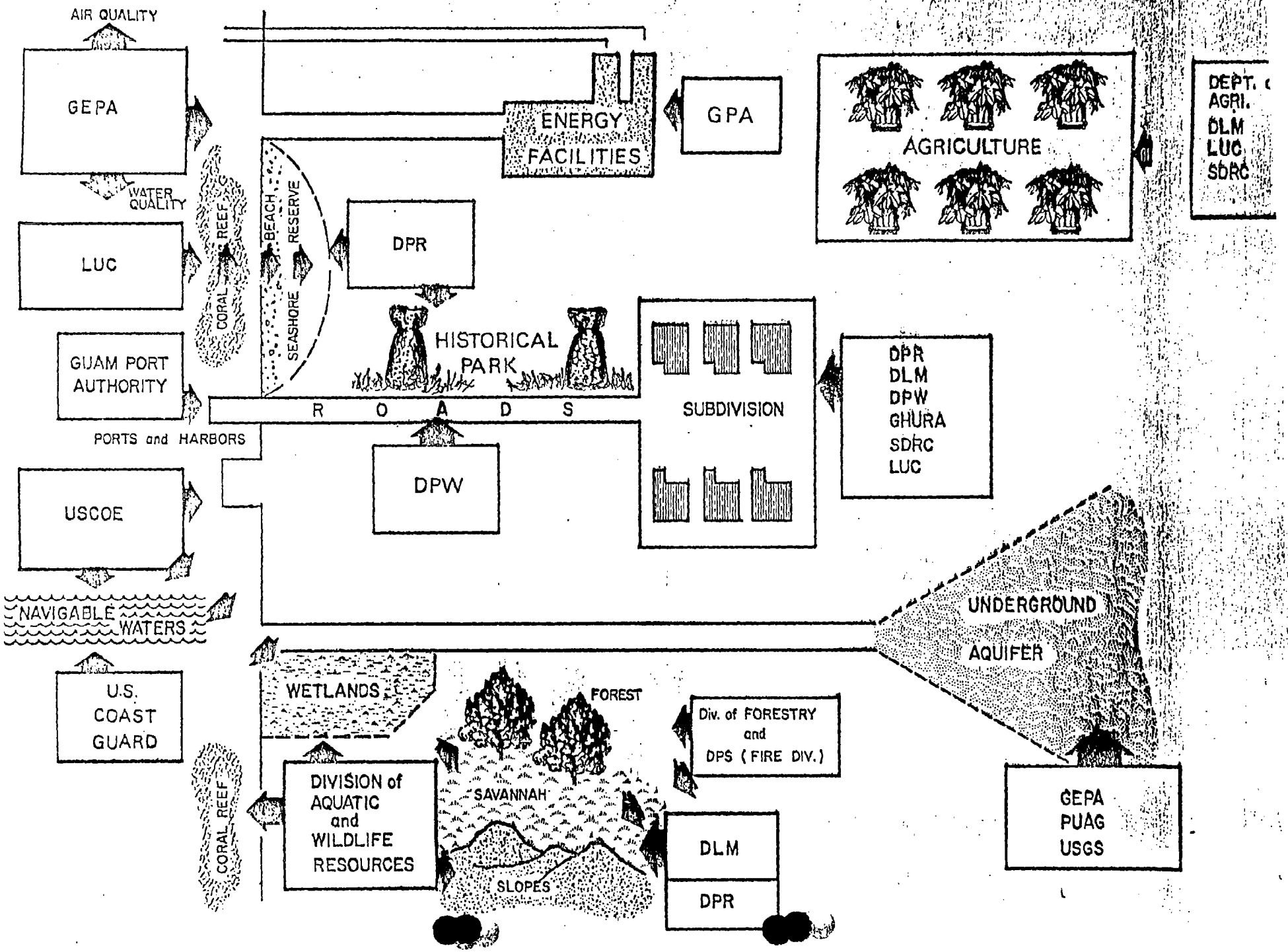
Legislation submitted to the 14th Guam Legislature by the Bureau of Planning, in the form of Bill Nos. 233 and 234, further attempts to clarify and distinguish between land-use planning policy and its implemetation, regulation, and enforcement. Very simply, this legislation directs the Territorial Planning Commission (renamed, more appropriately, the Land-Use Commission), through use of the Department of Land Management staff, to regulate development through the zoning law in urban districts and development standards in the remaining districts and areas of particular concern, pursuant to broader Central Planning Council policy guidelines. In addition, the Land-Use Commission's authority to review proposed development is expanded to include all development. Currently, the Commission primarily reviews only proposals requiring zone changes or variances, subdivisions, or planned unit developments.

The expansion of the Land-Use Commission's authority, which increases the Department of Land Management's regulatory and enforcement responsibilities, is proposed not unmindful of existing enforcement-related problems. However, new legislation cannot be looked upon as a panacea for all the government's regulatory problems. Improved coordination, communication, and management amongst the several agencies involved in land-use regulation can, and must occur irrespective of legislative action.

Some confusion is currently generated by Section 1745D of the Zoning Law which states that the Building Official, located within the Department of Public Works, shall have the power and duty to enforce the provisions of the zoning laws. This section should not be read to imply that the Building Official, alone, must determine, before issuance of a building permit, whether the proposed use is consistent with all applicable laws. Questions as to the development's compatability with zoning laws, water quality standards, public utility regulations, proposed land-use plans, and licensing provisions must be directed to other governmental agencies with jurisdiction and expertise in these respective areas.

While statutory provisions and case laws provide ample authority upon which to challenge the validity of permits or licenses issued in violation of governing laws, very few improperly issued permits are ever questioned. Business licenses are granted for the practice of prohibited commercial activities in residential areas without knowledge of the Department of Land Management. Suspect sewage disposal systems are permitted without having been cleared through the Guam Environmental Protection Agency. Subdivisions are approved without thorough review of their drainage facilities by the Department of Public Works. Tolerance

Figure 20 Land and Water Areas and Regulatory Agencies and Commissions



of these and other such laissez faire practices must not continue whatever the reasons for such breakdowns in the enforcement and regulatory mechanisms (insufficient funds, poor management, untrained staff, unclear procedures, or poor coordination). They must be identified and resolved before severe environmental or economic consequences are sustained. The previously mentioned proposed legislation requires the Building Official to specifically consult with appropriate agencies before issuance of permits and licenses. It also requires the Land-Use Commission to assure that proposed development not occur in violation of the Building Code or overall land-use planning policies as adopted by the Council. Such measures should aid in clarifying the duties of the respective agencies and regulatory bodies. Further refinement of these responsibilities can occur through development of necessary rules, regulations, and administrative procedures.

The Land-Use Commission, if it is to effectively regulate development, must maintain cognizance of all applicable land-use related planning programs, rules, regulations, relevant cases, developing legal doctrines, and governmental policies. Otherwise, efforts expended by various planning, regulatory, and administrative agencies may be undermined through imprudent approval of proposed zone changes and variances, ill-planned subdivisions and planned unit developments, or failure to require necessary permits or revoke those issued improperly. As development pressures grow amidst a finite amount of developable lands, Commission decisions and Council policies become of greater consequence to the community. A potential increase in legal challenges to such regulation could be somewhat discouraged by the provision of legal counsel to these bodies by the Attorney General's office prior to their final decision making.

With the passage of the Bureau's proposed legislation, the adoption of this Land-Use Plan and the completion of a scheduled environmental management study, the effectiveness of the Territory's Land-Use regulatory system should immeasurably increase.

B. Bills 233 and 234

1. Overview. The previous section discussed the enforcement aspects of land-use control and Section C, Chapter V briefly addressed the subject of changes within the existing code which are recommended by the districting approach. Following is a more in-depth discussion of these proposed bills. At the time when Bills 233 and 234 become law, this portion of the Land-Use Plan will be amended to reflect that these mechanisms would no longer be "proposed," but in effect.

2. General Discussion. Bills 233 and 234 have been prepared in response to P.L. 12-200's requirements for establishment of generalized areas of use within urban, rural, agriculture, and conservation contexts through creative legislation. Basically, Bill 233 established a system of classification of the Territory's land into the above mentioned categories. Bill 234 amends the current Zoning Law to comply with the objectives of the Comprehensive Development Plan and the districting system proposed under Bill 233. Both bills contain additional provisions which amend related sections of the code dealing

with land use, but have less important effect on the overall land-use planning process. Through adoption of these steps toward achieving a truly effective system of land-use control and planning as envisioned in P.L. 12-200.

3. Bill 233, Objectives:

- The establishment of a system for designating areas within urban, rural, agricultural and conservation contexts as required under P.L. 12-200.
- A procedure for development of necessary performance standards to regulate uses within these district classifications.
- A means to designate certain areas of particular concern which, because of their unique recreation, economic or resource value require special consideration.
- Amendment of the Chamorro Land Trust Commission Act to reflect the new districting system.

The districting system proposed under Bill 233, modeled after Hawaii's highly successful legislation, has been reviewed and endorsed by federal representatives of the CZM Program, under whose program the legislation was developed locally. It is important to note that this legislation merely established the system for designation and regulation of uses within this districting concept and does not establish actual zoning or district boundaries.

4. Bill 233: Purpose, Code Changes and Sectional Analysis

a. Purposes: To implement a more effective and practical system of land use classification.

b. Change in the Law: Adds a new Chapter IV to, and amends portions of Chapters I, III, V-A, and VI of, Title XIV; amends and repeals portions of Chapter VII of Title XIII; repeals Public Law 12-96 and sections 9 and 10 of Public Law 12-69.

c. Sectional Analysis

Section 1: 13300. Findings and declarations of purpose. Outlines need to establish effective system for determining best use of territory's land resources.

13301. Definitions.

13302. Land-Use Guidance Policy. Allows the Bureau of Planning and Central Planning Council to periodically revise land-use policies.

13303. Land-Use- Districts. Establishes and defines the four major land-use districts: urban, rural, agriculture, and conservation, into which all land shall be divided.

13304. Adoption of District Boundaries. Provides that the Bureau prepare, the CPC adopt following public hearings, and the Governor approve the proposed land-use district boundaries.

13305. Amendments to District Boundaries. Permits the Council to amend district boundaries.

13306. Amendments to Urban Districts. Sets out factors to be considered in amending district boundary to urban classification.

13307. Amendments to Rural Districts. Permits amendments to rural district if consistent with relevant land-use policies.

13308. Amendments to Agriculture Districts. Permits amendment to agriculture district if land is being used for, or has potential for, agricultural use.

13309. Amendments to Conservation Districts. Permits amendment to conservation district upon findings of need to conserve certain natural resources of minimize developmental impact.

13310. Hearings on amendments to land-use district boundaries. Sets out procedure for Council review of proposed boundary amendments.

13311. Adoption of Development Standards. Provides that the Bureau prepare and the Council adopt standards for development of specified uses within the land-use districts.

13312. Compliance with Development Standards. Requir building permits to be issued in compliance with applicable standards as adopted by the Council, establishes priorities for applying standards, requires Land-Use Commission to assures all development complies with standard and policies adopted by Council, permits Commission to review all proposed development for such compliance and permits Commission to create necessary rules and regulations.

13313. Use Classifications. Permits the Bureau to prepare, the Council to adopt, and the Governor to approve use classifications and accompaying standards for such uses, within rural, agriculture, and conservation districts

13314. Areas of Particular Concern (APC). Permits the Council to designate areas of land that are of particular concern because of their unique character; i.e., of high resource, recreation, economic, or development value.

13315. Designation of areas of particular concern. Permits the Bureau to recommend, and the Council to adopt following public hearings, areas of particular concern as delineated on adequate maps.

13316. Amendment and recession of areas of particular concern. Permits the Council to amend or rescind its designations of areas of particular concern upon findings following public hearings.

13317. Powers of the Council within areas of particular concern. Permits the Council to adopt standards and require preparation of detailed site plans for development within such areas.

13318. Property tax assessment. Provides transfer a land-use district designation to Department of Revenue and Taxation for assessment purposes.

13319. Enforcement and penalties.

13320. Effective date. Provides that standards for development adopted by Council become effective only upon final approval of standards for all districts.

13321. Severability.

Section 2: Permits the Central Planning Council to designate, and the Department of Agriculture to promulgate rules and regulations for, agricultural preserve areas.

Section 2: Provides that a division head within the Department of Land Management serve as Administrative Director of the Chamorro Land Trust Commission; that leases respect the purchase preferences for certain subdivisions as outlined in prior legislation; and that certain lands under lease, areas of particular concern, certain conservation areas, and areas not so designated for inclusion in the Comprehensive Development Plan not be designated as available lands.

Section 4: Requires the Department of Land Management to inventory, rather than classify, all government real property.

Sections
5 and 6. Rename the Territorial Planning Commission the Land-Use Commission.

Section 7. Transfer duties of preparing Seashore Reserve Plan to the Bureau of Planning and replaces the Seashore Protection Commission with the Land-Use Commission.

Section 8. Amends Code to recognize establishment of conservation districts.

Sections
9 and 10. Deletes Code sections and laws in conflict with this legislation.

5. Bill 234, Objective

Bill 234, though lengthy simply amends the current zoning law to reflect the institution of the districting system in Bill 233 and changes in the island's land uses since its initial enactment in 1952. Included in the bill are new lot size, yard and area standards to reflect the increasing trend toward multiple-family and subdivision development. The Zoning Law, as amended, would govern uses within urban districted areas, while development within the remaining districts would be covered under subsequently adopted performance standards.

6. Bill 234: Purpose, Code Changes and Sectional Analysis

a. Purposes: To update and revise the current Zoning Law to comply with the land use districting system proposed in Bill No. 233.

b. Changes in the Law: Amends Chapter I through IX and XII through XIV of title XVIII of the Government Code of Guam.

c. Sectional Analysis

Section 1: Defines purpose of the Zoning Law, Title XVIII.

Section 2: Comprehensive list of terms and definitions.

Section 3. Requires title to be applied and administered within framework of Comprehensive Development Plan.

Section 4. Establishes six zones, R1, R2, H, CO, M1 and M2 within Urban districted areas and provides that any changes or amendments to zoning maps become effective only upon approval by Land-Use Commission and the Governor.

Section 5.	Provides that all past legislatively approved zoning maps or changes remain in effect until changed in accordance with procedures established under the Zoning Law.
Section 6.	Provides that uses within any zone be subject to all applicable legislations established the Commission, Council, Legislature or other local or federal agency. Permits the Department of Land Management to require submission of comprehensive statements on various impacts of proposed development prior to issuance of building permits. Provides for conditional uses and increased setback lins within adjoining residential-industrial zones.
Section 7.	Establishes new list of permitted and conditional uses for R1 (One and Two Family Residential) Zone.
Section 8.	Establishes new list of permitted and conditional uses for R2 (Multiple Family Residential) Zone.
Section 9.	Establishes new list of permitted and conditional uses for H (Resort-Hotel) zone.
Section 10.	Establishes list of permitted and conditional uses for CO (Commercial) Zone.
Section 11.	Establishes list of permitted and conditional uses for M1 (Light Industrial) Zone.
Section 12.	Establishes list of permitted and conditional uses for M2 (Heavy Industrial) Zone.
Section 13.	Establishes height regulations for each of the six zones.
Section 14.	Establishes minimum yard and area regulations.
Section 15.	Provides for transfer of development rights.
Section 16.	Allows for establishment of lots down to 2,500 square feet in size within cluster developments of six or more units upon compliance with certain requirements.
Section 17.	Establishes regulations for location of accessory uses and buildings.
Section 18.	Establishes parking area regulations for commercially-zoned areas.

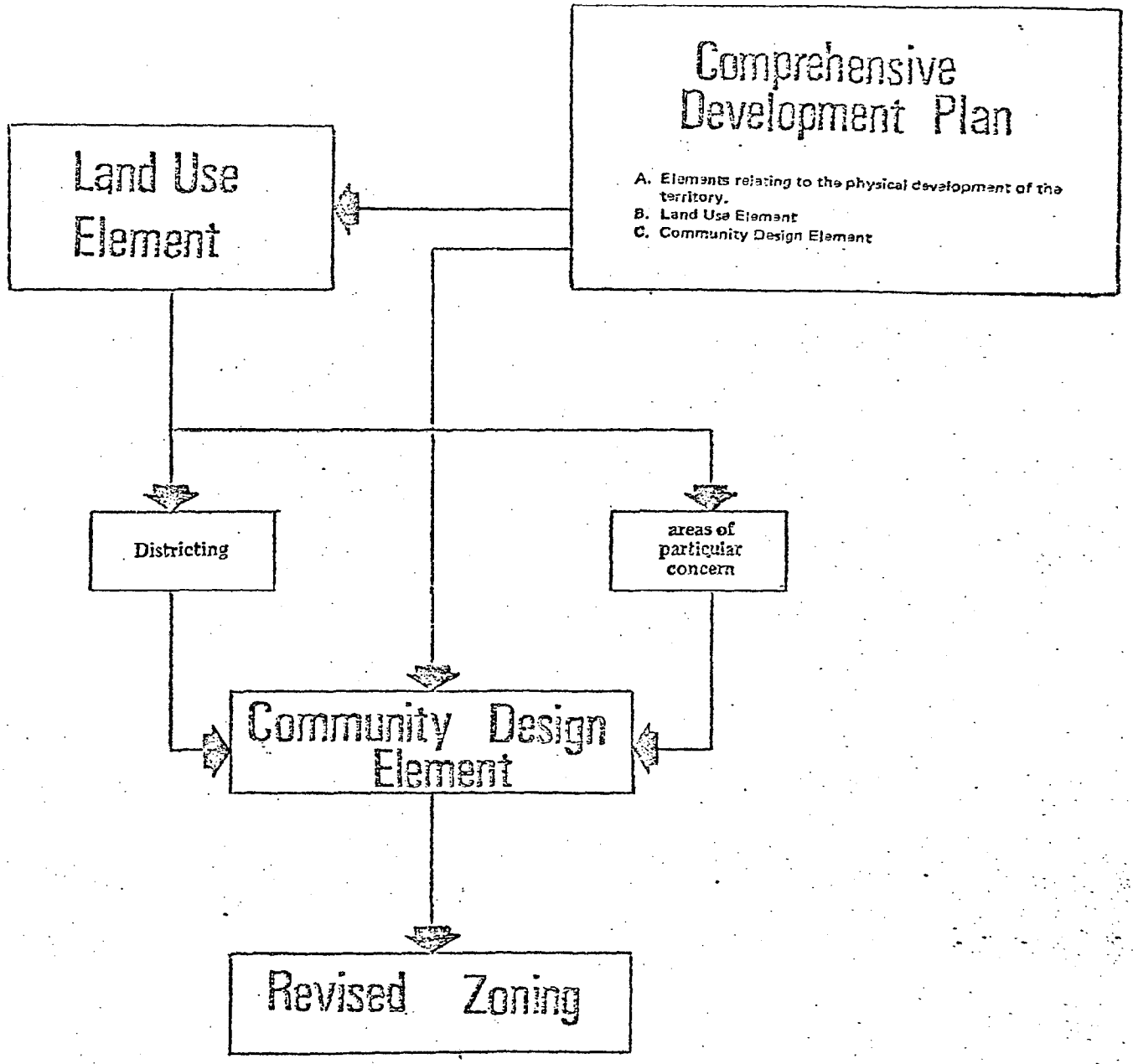
Section 19.	Provides that non-conforming use provisions also apply to establishment and amendment of use classifications and districts.
Section 20.	Eliminates requirement that the zoning maps or amendments thereto be submitted to the Legislature.
Section 21.	Amends sign regulations to reflect changes in zone designations.
Section 22.	Amends section dealing with variances to reflect creation of a Comprehensive Development Plan rather than a Master Plan.
Section 23.	Amends Section 17501 (K) to reflect new minimum lot sizes within rural ddistricts.
Section 24.	Eliminates requirement of submission of agricultural impact statement for certain zone changes.
Section 25.	Amends bill rezoning Tumon Bay to reflect proper maps delineating the rezoned area.
Section 26.	Provides that Sections One through Twenty-four take effect upon final approval of all district standards and that Section Twenty-five take effect upon enactment.

VII. FURTHER REFINEMENTS AND RECOMMENDATIONS

Overview. The Land-Use Element in itself does not constitute a working system for land-use control, it simply establishes the basis by which a more effective system can be implemented. A continuing effort must be made at all levels to ensure that this element of the larger Comprehensive Development Plan serves its objective of guiding the type, timing and intensity of growth in the next 25 years. "Further refinements" is a discussion of the logical pattern of action needed to achieve the objective of an effective mechanism for land-use controls, including:

A. Community Design
B. Large Scale Lot Line Mapping
C. Revision of Zoning Maps
D. Mapping of Government of Guam Lands
E. Coordination and Enforcement Agencies
F. Revised Seashore Protection Act and Seashore Reserve Plan

Figure 21 The Relationship Between the Land-Use and Community Design Elements of the Comprehensive Development Plan



A. Community Design

The Community Design Element compliments the Land-Use Element because both elements address the complexities of land-use patterns on Guam. The Land-Use Element generally describes the four main districts and outlines performance guidelines for APCs. Community design plans primarily bring different land uses, within an area of human settlement, into a composite plan on which future zoning patterns should be based. As communities, these are areas where residents have a strong identification within a specific geographic location. Community goals and cultural ties to the land are more specifically emphasized in community design plans. The land uses depicted on design maps are more specific in nature. They are a breakdown of the four main districts.

For example, conservation districted land is classified into nine specific uses in the Community Design Element:

1. Open Space. Essentially, open spaces are undeveloped, visually attractive natural areas, strategically located where most needed to exclude intensifying urbanization patterns. These are areas of natural terrain where nature observation and preservation of scenic beauty is emphasized. Preservation of open space enhances the quality of life for both the resident and the economically important tourist industry. Urban, rural and agricultural uses are discouraged in these areas, particularly in relatively untouched areas of the Seashore Reserve and on slopes in excess of 15%. Within the Seashore Reserve, open space promotes visual and public access as well as wildlife preservation and shoreline continuity. Open space on slopes assist in erosion control, visual aesthetics and wildlife preservation. Also of particular importance is the maintenance of open space over aquifer recharge areas to protect the quality and quantity of groundwater resources.

2. Low-Density. Within these areas, existing residential density and other uses pose an increasing threat to the visual, economic and ecological resources that characterize the areas. Additional large lot structures will be examined on a site by site basis. Of particular importance are areas within the Seashore Reserve where public and visual access are important for recreation and becoming increasingly restricted by unplanned development. In specific cases, relocation of residences to urban areas is recommended. Low-density conservation uses also act as a buffer around less-developed open space in certain areas.

3. Historical Sites. Within these areas, preservation of historical features is emphasized. They include architectural features, where residential development follows area guidelines. They also include areas containing precontact latte and village locations. Within precontact sites, land use is restricted to recreational site observation, wildlife preservation and professional archaeological investigation. Also included within this designation are park areas containing Spanish architecture and World War II relics.

4. Parks. These are major land areas delineated for recreational use and development that are sensitive to the resources within the area. Hiking, camping, picknicking, swimming and nature observation are the typical uses within these areas.

5. Recreation. These are small land areas set aside for recreational activites related to sports and relaxation. They include ballfields and urban parks that are centralized within urban areas. They rely upon infrastructure and central location for convenience. They are also important within commercial areas and subdivisions as an aesthetic provision of open-space within an area of extensive development. Particularly, the youth within urban areas need recreational land.

6. Wetlands. These are areas of aquatic plant and animal life. They include swamps, marshes and river estuaries that are constantly inundated with water. Due to their fragile nature, they are delineated for scientific and nature observation study of a wildlife habitat, their unique aesthetic appeal and flood control management.

7. Lowland Basins and Sinkholes. Lowland basins are low grassy areas intersecting the slopes that characterize the para-basal lens area and topography of Central Guam. In these areas, the northern limestone plateau and the southern volcanic uplands meet. These low areas act as drainage basins for aquifer recharge. Because they are periodically flooded and protect water quantity and quality, they are kept untouched and surrounded by open-space when possible. Sinkholes, though structurally different, also function to assist aquifer recharge and are kept as open-space. They are areas where solution has created a major opening in the surface of the limestone plateau such that rain water rapidly filters into the lens system.

8. Watersheds. These are areas in the southern volcanic uplands and ravine valleys that have been outlined as regions where uninterrupted or unpolluted surface drainage is important for surface aquifer recharge. Development that would adversely affect water quality or quantity is discouraged.

9. Wildlife Reserves. These are wildlife conservation areas that have been set aside by the government for intensive protection of plants and animals. Resource use, beyond nature observation is prohibited within these areas. They are usually the most untouched ecological habitats and given priority level protection because of their aesthetic appearance and the presence of endangered and threatened species of plant and animal life.

Both the Land-Use and Community Design Elements do not establish performance guidelines for Conservation districts or use classifications. The Land-Use Element defines and delineates the districts and the Community Design Element depicts compatible land-uses. However, as depicted in Figure 21, the APC concept has heavily influenced the designation of many use classifications. Therefore, performance guidelines for APCs can serve as a guide for development within communities as well as in the APC itself. Performance guidelines for districts will be developed at a later date. Within 90 days after passage of Bills 233 and 234, development standards and permissible uses for districts will be submitted to the Central Planning Council.

B. Large Scale Lot Line Mapping

It is imperative that individual lots are placed on the large scale (1"=400') ortho maps. The Bureau of Planning will endeavor to coordinate this effort with the Department of Land Management, and other agencies with mapping interests in the near future.

C. Revision of Zoning Maps

A standard zoning map, reflecting both the Land-Use Element and Community Design Element, must be prepared and put into effect by land-use related administrative and enforcement agencies. The present, rather random, administration of these maps must cease. The Department of Land Management will continue to have the responsibility for maintaining the official zoning maps. Each change as it occurs must be placed on the official zoning maps. Further, a procedure for notifying agencies which should have an up-to-date zoning map must be instituted. In addition, procedures for eventual changes in zoning designations must be developed.

There are certain areas, particularly in the commercial and industrial category, which are located in areas not suitable for the type of activity allowed. Any "downzoning" which takes place must avoid the "taking issue" (cases in which the owner could claim that the government is arbitrarily and capriciously preventing the highest and best use of the land.) This can be avoided through such mechanisms as land trading or amortization of capital investment in an existing land use after a certain period of time, but after that he could be reasonably required to discontinue the use without payment of compensation. (Courts have generally been sympathetic to this approach according to recent findings of the American Law Institute.) For example, an auto wrecking yard was given two years to complete business in Kansas (Spurgeon v. Board of Commissioners, 181 Kans. 1008,317 P.2d, 798, 1957) while a junkyard in New Hampshire was given one year (McKinney v. Riley, 105 N.H. 249, 197 A.2d, 218, 1964.)

The present zoning code must soon be amended to include various mechanisms for the elimination of particularly offensive uses. Nationally, there is a growing recognition that unrestrained private use of land is not identical with the public good. As population density increases, so must controls over marginally legal uses of land, such that abuses by developers operating outside the law can be quickly identified and halted. The basis for such action, particularly that of eliminating existing uses must be based on the existence of definite plan. The Community Design Element, as discussed in Section A preceding, is planned to meet this need.

D. Mapping of Government of Guam Land

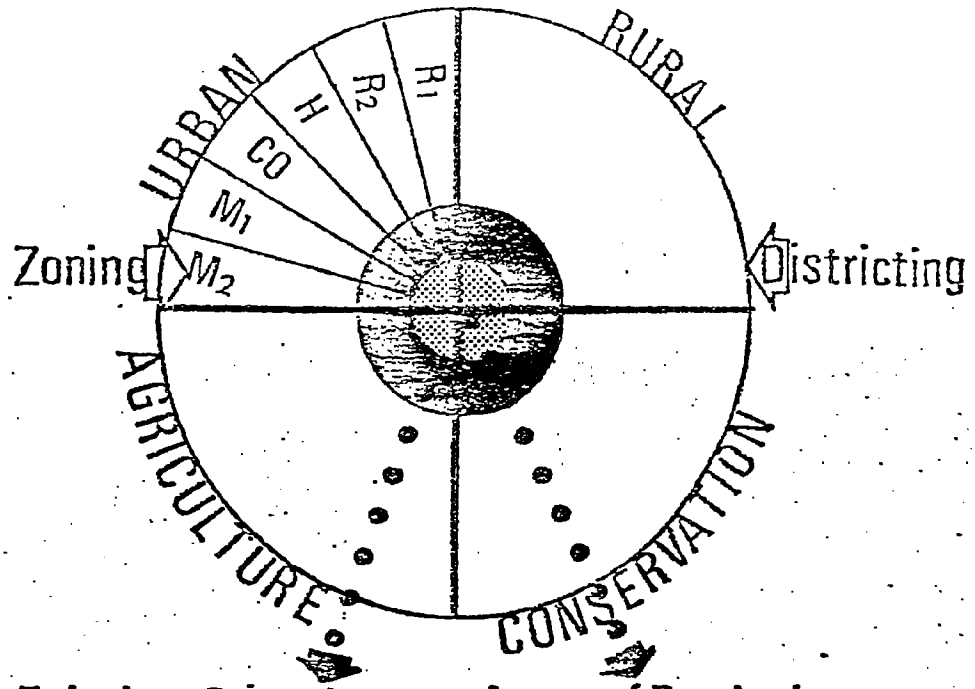
The annual reports prepared by the Territorial Auditor consistently state that land areas owned by the Government of Guam are the people's major asset. Yet, after more than 25 years of self-government, much of this land is still unsurveyed and being lost to encroaching private development. If this situation continues, the Government of Guam will continue to lose valuable and usable land. A major effort must be made to complete the surveying and mapping of these lands.

E. Coordination and Enforcement Agencies

One of the major problems experienced under present permitting processes is an apparent lack of coordination and cooperation among enforcement agencies. This has been partly the result of a lack of understanding of agency responsibility. To alleviate this problem, GEPA's 208 Program has contracted consultants to provide an in-depth analysis of regulatory agency permit procedures in an Environmental Management Study. Recommendations will seek to eliminate overlaps, fill in management gaps and increase overall enforcement capability and efficiency by clearly defining agency responsibilities. Agency directors and administrators must implement this forthcoming analysis by directing sections within their respective agencies to follow defined responsibilities. Of particular importance is the Department of Public Works' Building Permit process in conjunction with the Department of Land Management and GEPA's enforcement responsibilities. Present practice indicates that many DPW Building Permits are issued which should have had prior approval of GEPA and DLM.

The proposed Land-Use Commission (LUC), comprised of the present Territorial Planning Commission (TPC) and the Seashore Protection Commission (SPC), will have expanded powers under proposed legislation (Bill 233). The Department of Land Management will still serve as staff for the proposed LUC. The proposed LUC and present TPC and SPC are required to follow guidelines for public hearings as defined in the Administrative Adjudication Act, Title XXV, Government Code. Consistent and strict adherence to these procedures is vital to ensure that maximum public participation is gained. Procedures involve proper notification and recording of public hearings. All plans and land-use controls are implemented in the public interest and public hearings provide the vital link between residents and enforcement agencies. Breakdowns in this process only damage the public's right to responsible development and the credibility of regulatory agencies and commissions as effective mechanisms for control of land and water use.

Figure 22 A Conceptual Model of the Land-Use Control System



Existing Controls

Air Quality Standards (GEPA)
Erosion Control Standards (GEPA)
Blasting Permit (GEPA)
Open Burning Permit (GEPA)
Clearance for Grading and Clearing (GEPA, DPW)
Authorization for Solid Waste Disposal (GEPA)
Well Drilling and Operating Licenses and Permits (GEPA)
Sewage Disposal and Connection Permits (GEPA, DPW)
Water Quality Standards (GEPA)
Pesticides Certification, License and Registration (GEPA)
Building Permits (DPW)
Land Lease (DLM)
Agricultural Lease (DLM, Dept. of Agric.)
Zoning Regulations (DLM, LUC, SDRC)
Subdivision Review (DLM, SDRC)
Seashore Protection Permit (LUC)
Wetland Fill Permit (COE)
Construction in Navigable Waters (COE)
Coral Collection Permit (Div. of Aquatic and Wildlife Res.)
Hunting and Fishing Regulations (Div. of Aquatic and W.R.)
Archaeological Investigation (Dept. of Parks and Rec.)
Fire Control Regulations (DPS, Fire Dept.)
Public Health Standards (Public Health and Social Services)

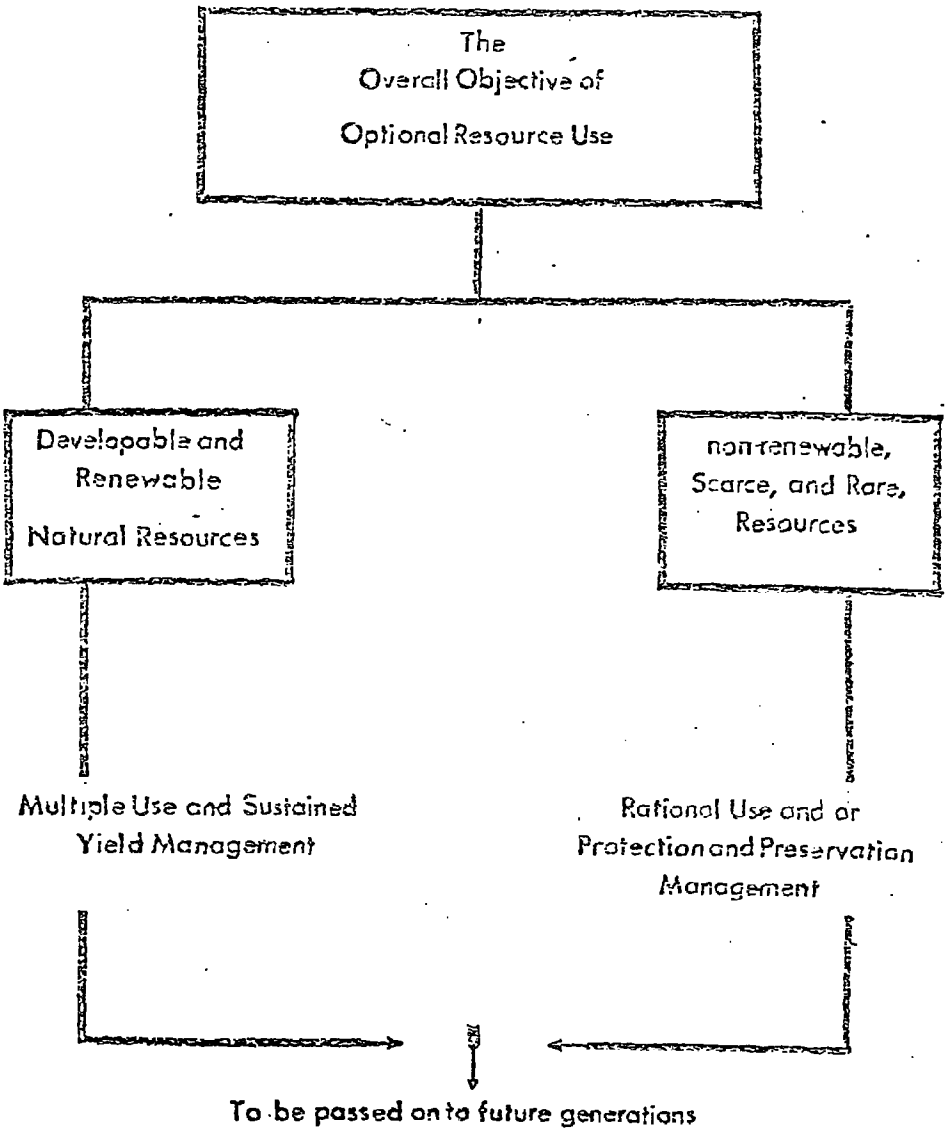
Areas of Particular Concern

Mineral Extraction
Industrial and Commercial Support
Agricultural Support
Resorts
Marinas and Boat Service Facilities
Educational Institutions
Sewage Disposals Sites
Public Parks and Beaches
Surfing Sites
Airport Crash and Sound Zones
Floodplains
Slide and Erosion Zones
Freshwater Resources
Terrestrial Pristine Ecological Communities
Wildlife Refuges
Proposed Critical Habitats
Limestone Forests
Wetlands
Karst Topography — Caves and Waterfalls
Marine Pristine Ecological Communities
Coral Reefs
Historic and Prehistoric Sites
Village Recreation Areas
Park Areas
Scenic Vistas
Subdivision Development Areas

F. Revised Seashore Protection Act and Seashore Reserve Plan

Public Law 12-108, the Seashore Protection Act, mandated the preparation of a Seashore Reserve Plan and instituted an interim permit system for any development taking place within 100 meters of the shoreline. A subsequent amendment (Rider to Public Law 13-154) decreased the distance to a mere 10 meters. The Coastal Management Section of the Bureau of Planning will prepare, in the near future, the Seashore Reserve Plan which will essentially redefine the boundaries of the Seashore Reserve area according to a more logical approach such as major geographic terrain features, as well as manmade features such as roads. Also, wording will be clarified within the bill to include, in their entirety, all of the offshore islands of Guam itself. The Seashore Reserve Plan will consist of the community design land-use designations falling within the redefined boundaries of the Seashore Reserve.

Figure 23 The Logical Approach of a Balanced Resource Use



APPENDIX NO. 1 COMMUNITY POPULATION PROJECTIONS FOR THE YEAR 2000

	Uniform Grid Reference	Estimated No. of Existing Dwelling Units	Estimation of Existing Population	Population Projection Year 2000	Location	Municipality
1. Asan - Piti Community	3E-49	200	1,000	2,000	Asan Village	Asan
	3C-49	157	785	1,400	Piti Village	Piti
	3B-48	50	250	275	Piti Kaiser	Piti
	3D-48	127	75	150	Nimitz Hill	Piti
	3C-48	112	460	560	Nimitz Hill Estates	Piti
	3C-48	0	0	260	Nimitz Towers	Piti
	TOTALS	646	2,570	4,645		
2. Agat-Santa Rita Community	3B-42	94	470	1,000	Apra Hts. North	Santa Rita
	3A-41	84	420	850	Apra Hts. South	Santa Rita
	2F-41	210	840	1,050	Hyundai Santa Rita	Santa Rita
	2F-40	294	1,470	2,150	Santa Rita	Santa Rita
	2E-40	219	1,095	2,650	Old Agat	Agat
	2E-39	443	2,215	4,500	Agat Village Proper	Agat
	2D-39	51	255	350	Agat South	Agat
	2D-38	72	360	500	Agat South to Pagachao	Agat
	2D-38	0	0	1,000	Pagachao	Agat
	2D-37	61	305	450	Taleyfac	Agat
	TOTALS	1,528	7,430	14,500		

		Uniform Grid Reference	Estimated No. of Existing Dwelling Units	Estimation of Existing Population	Population Projection Year 2000	Location	Municipality
Umatac Community	3.	2E-31	20	100	350	Salagna	Umatac
		2E-30	120	600	900	Umatac Village	Umatac
		2E-29	0	0	350	Machanage-As-Paile	Umatac
		TOTALS	140	700	1,600		
Merizo Community	4.	2E-28	26	130	280	Bile Bay	Merizo
		2F-27	183	915	1,500	Merizo Village & Pigua	Merizo
		3A-25	118	590	800	Sagualao	Merizo
		TOTALS	327	1,635	2,580		
Inarajan (Malojloj) Community	586.	4A-26	39	195	365	Agfayan Bay	Inarajan
		4B-27	104	520	600	Inarajan Village	Inarajan
		4C-28	90	450	800	Ghagamin-Lao	Inarajan
		4D-32	125	625	1,000	Malojloj	Inarajan
		TOTALS	358	1,790	2,765		

	Uniform Grid Reference	Estimated No. of Existing Dwelling Units	Estimation of Existing Population	Population Projection Year 2000	Location	Municipality
7. Talofofo Community	4C-36	324	1,620	1,975	Talofofo	Talofofo
	4D-37	107	535	700	Ipan	Talofofo
	4B-39	145	573	1,000	Windward Hills	Yona
	4B-39	150	750	1,400	Baza Gardens	Yona
	4B-38	42		200	Casa De Sirena	Yona
	4C-39	50	250	500	Sabana Maleyuc	Yona
	4E-41	16	80	100	Togcha	Yona
	TOTALS	834	3,808	5,875		
8. Yona Community	4E-41	0	0	100	Ylig Bay	Yona
	4E-41	87	435	800	As-Misen	Yona
	4E-42	298	1,500	2,820	Yona	Yona
	4E-43	46	230	500	North Yona	Yona
	4D-42	56	280	1,040	Pulantat	Yona
	Totals	487	2,445	5,260		
9. Central Guam Community	5A-45	336	1,572	5,000	Mangilao West	Chalan Pago-Ordot-Mangilao
	5B-45	576	1,392	4,080	Mangilao	Mangilao
	5B-48	955	4,691	10,000	Barrigada Village	Barrigada-Mangilao
	4E-49	1,401	5,644	8,000	Mongmong-Toto-Maite	Mongmong-Toto-Maite
	4C-50	166	639	2,550	Agana	Agana
	4A-49	88	440	700	Maina	Asan
	4B-48	905	4,525	8,000	Agana Hts.-Sinajana	Agana Hts.-Sinajana
	4A-48	90	450	750	Afami	Sinajana
	4D-46	446	2,212	4,000	Ordot-Chalan Pago	Chalan Pago-Ordot
	4F-47	85	425	600	Mai-Mai	Chalan Pago-Ordot-Mangilao
	TOTALS	5,048	21,[redacted]	43,680	[redacted]	

		Uniform Grid Reference	Estimated No. of Existing Dwelling Units	Estimation of Existing Population	Population Projection Year 2000	Location	Municipality
10. Tamuning Community		5C-54	537	1,491	4,000	Tumon Village	Tamuning
		5B-53	625	1,559	5,000	Tumon	Tamuning
		4E-52	2,853	8,799	18,500	Tamuning Village	Tamuning
	TOTALS		4,015	11,849	27,500		
11. Dededo Community		5E-53	406	1,811	3,000	Gugagon	Dededo
		5D-53	1,155	5,775	8,000	Liguan Terrace	Dededo
		5E-55	141	705	750	North Liguan Terrace	Dededo
		5E-56	0	0	5.000	Dededo West	Dededo
		5F-54	473	2,365	2,600	Dededo Village	Dededo
		5F-55	280	1,400	1,500	Wettengel	Dededo
		6B-55	1,034	5,170	5,200	Kaiser Dededo	Dededo
		6B-55	0	0	500	GHURA 500 site 1	Dededo
		6B-55	87	435	800	Ypa-Pao	Dededo
		6B-55	94	376	2,400	Ypa-Pao Estates	Dededo
		6C-56	0	0	500	GHURA 500 Site 5	Dededo
		6B-57	253	1,265	1,500	Yseng-song	Dededo
		5F-56	100	500	500	GHURA 500 Site 2	Dededo
		6A-59	337	1,685	3,000	South Areas	Dededo
		6A-60	0	0	500	GHURA 500 Site 3	Dededo
		6C-60	78	390	500	Yseng-song North	Dededo
	TOTALS		4,438	21,877	36,250		

	Uniform Grid Reference	Estimated No. of Existing Dwelling Units	Estimation of Exisitng Population	Population Projection Year 2000	Location	Municipality
12. Yigo Community	6E-56	695	3,361	9,000	Yigo Village	Yigo
	6D-56	0	0	500	GHURA 500 Site 6	Yigo
	6E-55	200	336	600	Perez Acres	Yigo
	7A-55	35	175	500	Mt. Santa Rosa	Yigo
	6F-58	253	1,265	1,500	Yseng-song West	Yigo
	6F-59	78	390	500	Chaguian	Yigo
	6D-62	102	520	1,000	Agafo-Gumas	Yigo
	TOTALS	1,363	6,097	13,600		
13. Pagat Community	5D-52	54	270	540	Barrigada Hill	Barrigada
	5D-52	256	800	1,050	Barrigada Hts.	Barrigada
	5F-52	326	815	1,244	Latte Hts.	Mangilao
	6B-50	0	0	5,000	Sasajyan	Mangilao
	5F-49	125	625	1,500	Pagat Village	Mangilao
	TOTALS	761	2,510	9,334		
GRAND TOTALS		19,945	84,701	167,589		

Appendix No. 2 POWER PRODUCTION FACILITIES, 1977

NAME	LOCATION	NAME PLATE CAPACITY (MW)	ON LINE YEAR	LIFE EXPECTANCY YEARS	OFF LINE YEAR	ENVIRONMENTAL PROBLEMS (RATING)
Cabras Steam Plant	Cabras Island Drawing No. 1001-5					
#1		66	1974	30	2004	1(c) 2(b) 3(a) 4(c
#2		66	1975	30	2005	1(c) 2(b) 3(a) 4(c
Piti Steam Power Plant	Piti Navfac drawing 7.900.500					
1		22	1964	30	1994	1(c) 2(a) 3(a) 4(c
2		22	1964	30	1994	1(c) 2(a) 3(a) 4(c
3		11.5	1951	30	1981	1(c) 2(a) 3(a) 4(c
4		11.5	1951	30	1981	1(c) 2(a) 3(a) 4(c
5		11.5	1955	30	Out of Service Accidental Damage	
Tanguisson Steam Power Plant	Tanguisson Drawing No. 1102205					
#1		26.5	1971	30	2001	1(a) 2(b) 3(a) 4(b
#2		26.5	1972	30	2002	1(a) 2(b) 3(a) 4(b
Tamuning Diesel Power Plant	Tamuning Hospital Rd. and Marine Drive behind GITC					
1		2.5	1970	20	1990	2(c) 3(a) 4(c)
2		2.5	1970	20	1990	2(c) 3(a) 4(c)
3		2.5**	1970	20	1990	2(c) 3(a) 4(c)
4		2.5**	1970	20	1990	2(c) 3(a) 4(c)
Dededo Diesel Plant	Mogfog (Dededo)					
1		2.05	1972	20	1992	2(b) 3(c) 4(c)
2		2.05	1972	20	1992	2(b) 3(c) 4(c)
3		2.05	1972	20	1992	2(b) 3(c) 4(c)
4		2.05	1972	20	1992	2(b) 3(c) 4(c)
Power Barge Inductance	Floating (Apra Harbor)	~~28~~ 30***	1973	30	1973	1(c) 2(a) 3(a) 4(b
(Steam)	(Has ended alloted life, but still in use for emergency and standby)					

* Environmental Problems

1. Cooling Water Discharge
2. Air Emissions (Sulfur Problem)
3. Locational Problems (Negative Effects on Surrounding Use)
4. Aesthetic Problems

Rating:

(a) High
(b) Medium
(c) Low

** To be relocated to Cabras for start-up generation

*** To be overhauled (under study)

Appendix No. 3 Surfing Sites on Guam*

Municipality Location	Popular Place Name	Comments
Mangilao	Underground Cave	Private property, body surfing
Mangilao	Marbo Caves	Small swell
Yigo	Castro's Beach	Private property, surfing inside the reef, very large swell
Dededo	Double Reef	Very good rights and lefts, popular location
Dededo	Dugan's Reef	
Tamuning	NCS Beach	Small swell
Tamuning	Gun Beach	Small swell
Tamuning	Rick's Reef	North swell, frequently ridden
Agana	Agana Boat Basin	Northwest, most popular all-year-around, lefts and rights
Asan	Left-overs	Channel, small swell
Asan	Coral Reef	Large west swell
Piti	Magoos	Large north and west swell
Piti	Magundos	Lefts and rights, best surf on Guam, any swell, very popular
Piti	Spanish Rock	Huge swell
Piti	Disneyland	Huge swell
Agat	Gabgab Reef	Huge swell
Agat	Rizal	Largest ridable waves on Guam (10-20 feet)
Agat	Cemeteries	Large west swell

*Data provided by the Guam Surfing Association

Municipality Location	Popular Place Name	Comments
Agat	Meetings	Rights, large swell
Agat	Rosey's Island	Popular lefts
Agat	Corner Pocket	
Umatac	Point Perfection	
Umatac	Umatac Bay	Very popular west swell
Merizo	Rock-bottom	
Merizo	Merizo	Lefts and rights, very popular, good on north-west, west and south swell
Merizo	Beachside Cocos	Small swell
Merizo	Mistoe's	Very good on east or south swell
Inarajan	Inarajan Bay	Large east or south swell
Talofofo	Talofofo Bay	Large east swell, beginners only
Talofofo	Number Nine	Small east swell
Yona	Ylig	Good on the east swell
Mangilao	Marine Lab-Gold Spot	Body surfing, small waves

Appendix No. 4 The Uniform Mapping System

In 1974 an intensive investigation and evaluation of the grid system and mapping system on Guam was begun. Due to the inadequacies of existing maps and dissatisfaction with such maps, various agencies began their own individual grid and mapping system. A policy such as this would have led to more confusion and duplication of mapping efforts. To avoid further problems, the Bureau of Planning consulted all the major map users in the Government of Guam and, with the help of their input, developed and proposed one uniform system for all to use.

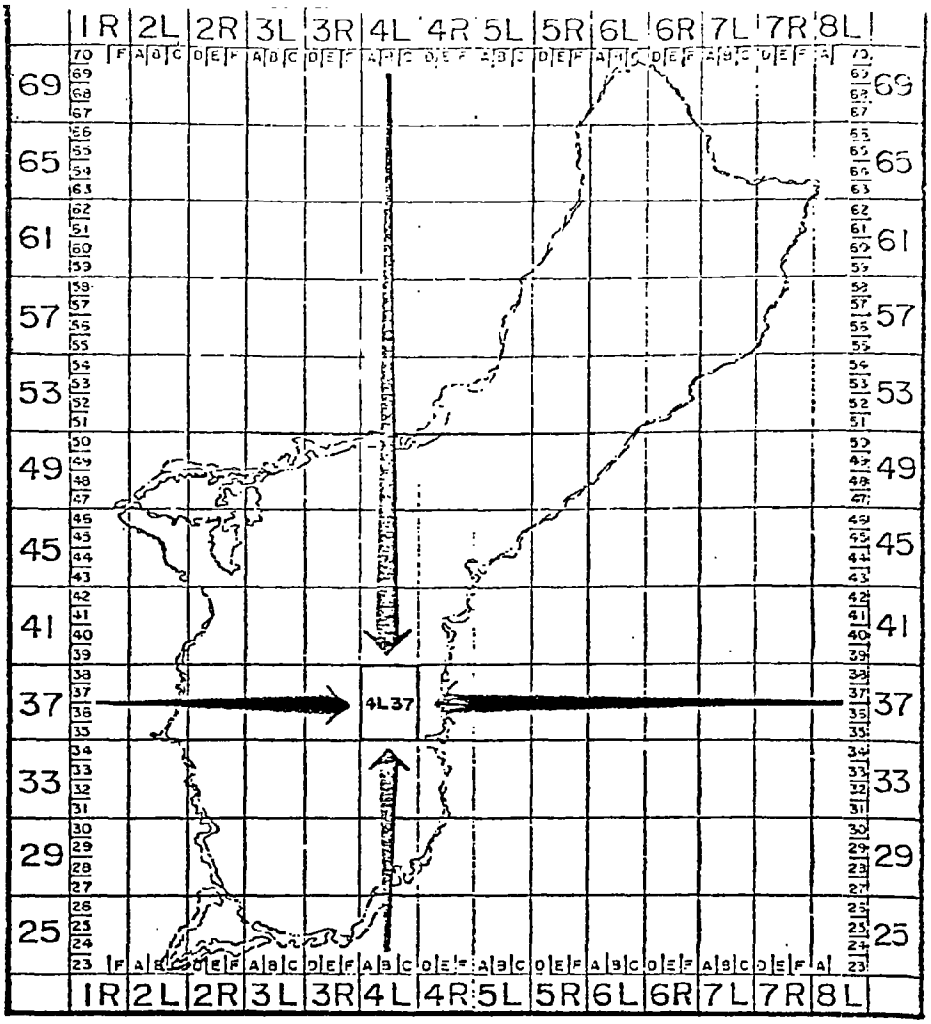
The only foundation for a grid and mapping system is the survey data of an area. For Guam, the survey data was established in 1913 which was ideal for grid identification and a map base. This coordinate system, which has negligible distortion for the island of Guam, is the legal basis for all surveying on the island. There have been technical difficulties due to poor survey procedures and war damage, but its basic concepts are as good as the most modern system anywhere in the world.

The Guam coordinate system has always been defined in metric units with direct conversion to foot system units often super-imposed. Since there is currently a growing, irreversible trend toward use of the metric system, this quality of the Guam Coordinate system is most fortunate. In early 1976, Public Law 13-473 was signed by the Governor which provides for a commission on the Metric System and requires that dual dimensioning begin by February, 1977. Considering these factors, the basis grid for Guam is based on the metric system.

By Executive Order No. 75-16 the Uniform Grid System was established for Guam. In essence, the Uniform Grid System updates the Guam Geodetic Triangulation Net technical procedures common to surveyors, into a more convenient and usable form for planners, engineers, and non-technical map users. The Guam Geodetic Triangulation Net, as noted in the Executive Order, is the technical base for the Uniform Grid System. On the other hand, the Land Square System, as developed in 1913, was good for the state-of-the-art of 1913. The running numbering of squares, the quadrant numbering sections, and the row numbering of units was copied from the American Sectional System common at the time. Such a system is not readily adaptable to computerization but rather dependent on using individual's working knowledge and memory. Therefore, the simple basis concept of Cartesian coordinates is used in the Uniform Grid System. This provides for divisions in units of ten and is fully described in the specifications provided for the system in Executive Order No. 75-37.

Evolving naturally from the Uniform Grid System was the Uniform Mapping System, and this was effected by Executive Order No. 75-37. The Uniform Mapping System provides guidelines so that all mapping on Guam fits into a systematic pattern based on the Uniform Grid System. This means that, in the case of a series of maps being designed for area coverage of a project, and where regular squares or rectangles constitute each map sheet, then the lines of the Uniform Grid System shall regulate the individu sheet match lines.

Some map series, which are standard, give total island coverage, with some sheets provided to show larger scales. This is regulated to be consistent for all users. Where only limited project areas are to be mapped the flexibility of the grid allows the use of any grid line, providing it has an even metric value and not a foot system value. In mapping irregular-shaped areas, no grid lines are used for the sheet lines; but the metric grid lines must be shown to allow integration with other maps of the system. Survey maps, engineering site maps, and strip maps are also flexible, with the only requirement that metric grid lines be superimposed and properly labeled.



EXPLANATION OF LOCATION SYSTEM

THE ISLAND OF GUAM IS DIVIDED INTO SQUARE "GRIDS" EACH 1000 METERS BY 1000 METERS. GENERAL LOCATION OF ANY FEATURE IS DEFINED BY THE GRID IN WHICH THE FEATURE IS LOCATED. LOCATION OF A GRID IS DEFINED BY THE "COLUMN" AND "ROW" IT IS IN.

COLUMNS ARE DEFINED BY A NUMBER-LETTER COMBINATION. THERE ARE EIGHT COLUMNS (1 THRU 8) EACH DIVIDED INTO SIX (A THRU F) 1000 METER COLUMNS. FOR MAPPING PURPOSES, COLUMNS A,B, & C ARE COMBINED TO FORM A "LEFT" HALF. (EXAMPLE 4L) AND COLUMNS D,E, & F FORM A "RIGHT" HALF (EXAMPLE 4R). THE NUMBER-LETTER COMBINATION IS A CODE SYSTEM RELATED DIRECTLY TO THE GUAM GEODETIC TRIANGULATION NET METRIC COORDINATE SYSTEM.

ROWS ARE DEFINED BY TWO NUMBERS (23 THRU 70) DEFINING THE 1000 METER INCREMENTS OF THE GUAM GEODETIC TRIANGULATION NET METRIC COORDINATE SYSTEM. FOR MAPPING PURPOSES, FOUR 1000 METER ROWS ARE COMBINED AND IDENTIFIED BY THE COORDINATE NUMBER OF THE MIDPOINT. FOUR ROWS SUCH AS 35, 36, 37, & 38 ARE INCLUDED IN MAPPING ROW 37 (EXAMPLE 37).

TO DEFINE THE LOCATION OF A MAP WHICH COVERS THREE COLUMNS (4A, 4B, & 4C) AND FOUR ROWS (35, 36, 37, & 38) THE MAP LOCATION IS 4L37. TOTAL ISLAND COVERAGE IS PROVIDED ON 70 SUCH MAPS WHICH INCLUDES 4 SMALL "INSET" AREAS. THESE MAPS ARE NUMBERED 1 THRU 70.

Appendix No. 5

A Summary Chart of Major Government of Guam Laws Related to Land Use

There are many different laws and GovGuam agencies and commissions involved in planning and regulation of land use. The chart is a summary by kind of land (coastline, subdivision, agricultural preserve, etc.), of the laws that have been passed and the agencies and commissions that have been authorized to act regarding the use of land on Guam. Each row of the chart refers to a particular kind of land. The columns contain the relevant sections of law and GovGuam bodies involved in the planning and regulation of the land.

GEOGRAPHIC AREA	GOVERNMENT BODY WITH OVERALL RESPONSIBILITY / RESPONSIBILITIES	ENABLING LEGISLATION (OVERALL PROPOSES, GOALS, RESPONSIBILITIES)	PROGRAMS / PLANNING GUIDES (GOVERNMENT BODY RESPONSIBLE FOR DEVELOPMENT)
erritory of uam (all ands and aters)	Government of Guam / Organic Act Section 28 (a)(b) Section 29 (a)(b)	Title I, Chapter II, Section 102 (Government of Guam Code)	
ederal Lands	Federal Government / Organic Act Section 28 (c)	Title I, Chapter II Section 101 (Government of Guam Code)	
ovGuam Real roperty	Department of Land Management / Section 13003	Title XIV, Chapter I Section 13002 (Government of Guam Code)	Classification / (Section 13005 Department of Land Management)
ovGuam Real roperty for gency Use	Governor / Section 13004	Title XIV, Chapter I Section 13004 (Government of Guam Code)	
ovGuam land vailable for ale or lease xcept agricultural nd	Governor / Section 13505.1	Title XIV Chapter VI (Government of Guam Code)	Inventory / (Department of Land Management, Section 13505.1)
overnment nd except griculture	Governor / Organic Act Section 6	Title XIV Chapter VII (Government of Guam Code)	
overnment nd suitable r agriculture	Governor / Organic Act Section 6	Title XIV Chapter VII (Government of Guam Code)	Selection / (Department of Land Management, Section 13700)
vGuam avail- le lands/ ction 13503	Chamorro Land Trust Commission	PL 12-226 Chamorro Land Trust	
overnment nd for sub- vision	Governor	Title XIV, Chapter XI (Government of Guam Code)	Subdivision Plan (Department of Land Management, Section 13952)

GOVERNMENT BODY RESPONSIBLE FOR IMPLEMENTATION	MECHANISMS FOR IMPLEMENTATION	NOTES AND COMMENTS
		Sections of Organic Act cited transfer title and control of property to GovGuam. Title I, Chapter II, Section 102 of the Code establishes the boundaries of jurisdiction of GovGuam.
		Federal lands consist of: 1) Military and submerged lands. 2) Others. Responsibilities, besides Organic Act, are in the agreement.
Executive Order Section 13007	Rules and Regulations Section 18007	
		This section is to be expanded, if necessary, since some PL's designate specific lands for specific agencies (e.g., Cabras Island).
Land Transfer Board Section 13500	Rules Section 13502	This Chapter has been repealed by PL 12-226 but the law is not implemented since there is no Commission yet. PL 12-226 excludes those lands already under the implementation of these chapters, but upon reversal to Government of Guam the same become Chamorro land
Department of Land Management	Land Use Permits	This chapter also repealed by PL 12-226
Department of Agri. Section 13701	Leasing Process Section 13702-13711	Chapter also repealed by 12-226
Chamorro Land Trust Commission Section 13504	Leasing and Licensing Section 13506	This law is inoperative since there is no Commission formed yet.
Governor Section 13956.1	Contract Section 13956.1	There are PL's which designate certain subdivision projects.

GEOGRAPHIC AREA	WITH OVERALL RESPONSIBILITY RESPONSIBILITIES	LEGISLATION (OVERALL PURPOSES, GOALS, RESPONSIBILITIES)	PLANNING GUIDES (GOVERNMENT BODY RESPONSIBLE FOR GOVERNMENT)
erritorial ark System - Natural Preserve - Conservation Reserve - Territorial Parks - Territorial Rec Facility - Historical & Prehistoric Objects and Sites - Community Parks - Community Rec. Facility ection 26007-26009	Department of Parks and Recreation Section 26001	PL 12-209 Parks and Recreation	Guam Territorial Park System Inventory (Dept. of Parks & Rec) Section 26007
GovGuam and private lands except for federal lands		Title XVIII	
All subdivided land	TPC Section 18003	Title XIX	Master Plan Section 18001.1 (TPC)
Agriculture Preserve - Agricultural use - Recreational use - Wildlife habitat - Open space - Submerged land	Department of Agriculture	PL 12-225 Agriculture Preserves (Guam Land Conservation Act)	Establishment of Preserves (Dept. of Agriculture)

RESPONSIBLE FOR IMPLEMENTATION	REGULATIONS FOR IMPLEMENTATIONS	NOTES AND COMMENTS
Division of Parks Section 26011 Village Commissioners Section 26010	Rules and Regulations Section 26003(a)	The Commission for the Department of Parks and Recreation is established to appoint, remove and advice the DTR. Executive Order 75-26 forms a conservation area in the Dededo watershed area and gives it to DLM.
Enforcement DPW Section 17450	Building Permits Section 17452 Use License Section 17453	The responsible entity needs clarification--may be the Governor or TPC? Also not clear is the role of the Master Plan—it may be the Program Development Guide--but M. P. comes in the subdivision law.
TPC Section 18003	Procedure Chapter II Title XIX Requirements Section 18005	The SDRC (E.O. 75-2) makes recommendations to the TPC. Rules and Regulations adopted by TPC--April 18, 1974. Suit brought Superior Court Civil Case #334-74. Temp. restraining order resulted vacated July 5, 1974.
Department of Agriculture	Contracts Article III Adopted Rules Section 12505 Eminent Domain or other acquisition Article V	The mapped area must be established by the Department of Agriculture as Agriculture Preserve. (Section 12504)

GEOGRAPHIC AREA	WITH OVERALL RESPONSIBILITY / RESPONSIBILITIES	LEGISLATION (OVERALL PURPOSES, GOALS, RESPONSIBILITIES)	PLANNING GUIDES (GOVERNMENT BODY RESPONSIBLE FOR DEVELOPMENT)
Planned Development District	Territorial Planning Commission	Title XVIII, Chapter XIII Section 17605	
Seashore Reserve Section 13412(c)	Seashore Protection Commission Section 13413 E. O. 75-24	PL 12-108	(Guam Seashore Reserve Plan) Section 13416(c)
Ocean Shore Territory Recreational Area	Territory of Guam Section 13459	PL 12-19	Department of Land Management Section 13453(2)
Historic Sites and Objects	Department of Parks and Recreation	PL 12-126	Comprehensive Program Section 13985.2 (Parks & Recreation)
Slum and blight areas and disaster areas	GHURA Section 13903	Title XIV Chapter X Section 13903(19) (GovGuam Code)	Section 13903(18) (GHURA)

GOVERNMENT BODY RESPONSIBLE FOR IMPLEMENTATION	MECHANISMS FOR IMPLEMENTATION	NOTES AND COMMENTS
TPC	Same as for a zone change	Also called Planned Unit Development (PUD)
Seashore Protection Commission	Interim Permits Section 13417	
		Ocean shores may now be under SPC operation (PL 12-108) and Territory Rec. Area under Parks and Rec. (PL 12-209)
Department of Parks and Recreation Section 13985.3	Operation of Properties Section 13985.7 Guam Register of Historic Places Section 13985.19	1. Dept. of Parks and, Rec may have received the responsibilities from Land Management via PL 12-209 2. The role of the Guam Institute of Spanish/ Chamorro Culture (Part IV) is not clear in this phase of the study. Part III refers to underwater historic properties but is not clear as to whether or not the submerged lands are considered as such.
GHURA Section 13903	Rules and Regulations Section 13903(5)	

GEOGRAPHIC AREA	GOVERNMENT BODY WITH OVERALL RESPONSIBILITY / RESPONSIBILITIES	ENABLING LEGISLATION (OVERALL PURPOSES, GOALS, RESPONSIBILITIES)	PROGRAMS / PLANNING GUIDES (GOVERNMENT BODY RESPONSIBLE FOR DEVELOPMENT)
Territory of Guam (Building Law)	Governor Organic Act Section 6	Title XXXII Building Law	
Territory of Guam (environmental matters)	Guam Environmental Protection Agency Section 57001-57002	PL 11-191	Comprehensive Program Implementation of: Title LXI Chapter II Chapter III Chapter IV Chapter V Chapter VI Chapter VIII (GEPA)
		PL 12-191	
Territory of Guam (Water Conservation)	GEPA PL 11-191	PL 9-131 Water Resources Conservation Act	Comprehensive Program PL 11-191 (GEPA)

RESPONSIBLE FOR IMPLEMENTATION	FOR IMPLEMENTATION	NOTES AND COMMENTS
Department of Public Works Section 31007	Section 31014 Rules and Reg. Section 31019 Permits Building Section 31040 Inspection Section 31055 Appeals Chapter V Classification of Occupancy and Requirements Occupancy Permits Section 31034	The Uniform Building Code is incorporated into the Rules and Regulations of the Department of Public Works.
GEPA	Rules and Regulations Section 57005	
		This public law renumbers certain titles and secetions of the Cov Guam Code pertaining to GEPA and similar other numbering.
GEPA	Well drilling License Well drilling Permits Well Operating Permits Inspection Meters Seedlings of Wells Penalties Injunctions	

GEOGRAPHIC AREA	GOVERNMENT BODY WITH OVERALL RESPONSIBILITY / RESPONSIBILITIES	ENABLING LEGISLATION (OVERALL PURPOSES, GOALS, RESPONSIBILITIES)	PROGRAMS / PLANNING GUIDES (GOVERNMENT BODY RESPONSIBLE FOR DEVELOPMENT)
Territory of Guam (Water Pollution)	GEPA / PL 11-191	PL 9-76 Water Pollution Control	Comprehensive Plan Section 57041 (GEPA)
Territory of Guam (Toilet Facilities and Sewerage Disposal)	GEPA / PL 11-191	PL 3-109 Toilet Facilities and Sewage Disposal	Comprehensive Plan PL 11-191 (GEPA)
Territory of Guam (Solid Waste)	GEPA / PL 11-191	PL 12-191 Solid Waste	Comprehensive Plan PL 11-191 (GEPA)
Territory of Guam (Emission Control)	GEPA / PL 11-191	PL 10-74	Comprehensive Plan PL 11-191 (GEPA)

GOVERNMENT BODY RESPONSIBLE FOR IMPLEMENTATION	MECHANISMS FOR IMPLEMENTATION	NOTES AND COMMENTS
GEPA PL 11-191	Section 57043 Study and Investigate Section 57045 Sewage Disposal System Permits Section 57047 Classification and Standards Section 57048 Enforcement Section 57049 Emergency Procedures Section 57050 Penalties	
GEPA PUAG	Approval requirement, Section 57064 Public Sewer Connection and Installation	Section 57084 states that PUAG has the power, duty and responsibility for the operation, administration and enforcement of this Chapter (IV) but PL 11-191 gives GEPA the responsibility of implementing this law.
GEPA Section 57172	Traffic Court citation Section 57170	
GEPA Section 57103	Section 57104 Monitor Section 57105 Permits Section 57106 Inspection Testing Sampling Section 57107 Rules & Reg on Emmission Control Section 57108 Enforcement Section 57109 Emergency Procedures Section 57110 Variances Section 57111 Hearings & Judicial Review Section 57113 Penalties Section 57115 Motor Ve-	PL 11-191 also known as "Air Pollution Act"

Appendix No. 6 A Summary of the Reports Completed by the Bureau of Planning, 1976-77, for Use as Background Data

Analysis of Results, CZM Land-Use Opinion Survey

An analysis of the results obtained from a survey questionaire distributed to 931 residents. Attitudes concern seashore development, recreational facilities, property ownership and citizen participation. (CZM)

Aquaculture and Its Potential Environmental Impact on Guam's Coastal Waters

An analysis of the potential for various kinds of aquaculture development on Guam with discussion of developable species, environmental impacts and necessary water quality controls. Areas for potential aquaculture development are mapped. (CZM)

Atlas of the Reefs and Beaches of Guam

An investigation of the coast and shallow reefs of Guam, including locations and geologic descriptions of reef platforms, rocky shorelines, and locations, extent, slope and composition of beaches. This study completely maps the shoreline and shallow reefs of Guam. (CZM)

An Ecological Survey of Pristine Terrestrial Communities on Guam

Provides area descriptions, species lists and maps of terrestrial areas that are essential for the protection of endangered and threatened species or are unique or relatively untouched representatives of characteristic Guam terrestrial ecological communities. (CZM)

An Economic Survey of Guam's Business Community

An analysis of the results obtained from a survey questionaire distributed to small businesses on Guam. Statistical data, discussion and recommendations address physical and human infrastructure, government and private activities, economic situation, social conditions and community environment, investment opportunities, large ans small business comparison and ethnic group comparison.

The Extent of Coral Shell and Algal Harvesting in Guam Waters

A discussion of living marine resources, other than fish, which are being harvested from shallow offshore areas of Guam. Includes extensive lists of exploited species, location maps, existing legislation, and recommendations for resource development and preservation requirements. (CZM)

Future Power Production and Transmission Alternative Plans, Guam USA

A description of existing private, federal and GovGuam facilities for the production of power; including power plants, fuel lines, fuel tanks, transmission lines, etc. Future expansion needs and locations are discussed and mapped. (CZM)

Guam Coastal Planning Bibliography

A bibliography of most written research materials concerning Guam, arranged according to subject matter ina numbered code system. Includes authors, number of pages, dates, cross

Guam: The United States Developing Territory

A discussion and illustrative reportof Typhoon Pamela damages. Outlines programs for post-typhoon upgrage and restoration, government operations, rehabilitation and economic development, community development and conclusions.

Guam's Visitor Industry: An Economic Assessment

A compilation of statistical data obtained from a survey questionaire distributed to tourists, with 1,300 respondents providing the data base. Data addresses expectations, ratings of recreational and entertainment facilities, expenditures, length of stay, visitor profiles and preferred attractions.

Guam Inventory of Planning Information

An inventory of plans, reports, surveys and data bases about Guam, produced from 1970 to 1976. Includes a short description of each published source. Entries are arranged by subject areas in three volumes with appendices.

A Guide to the Changes in Laws Relative to Land and Water Use, 1969-76

A presentation of changes in Guam's code of laws relative to land and water use during this time period. (CZM)

Growth Policy for Guam

A discussion of the factors relating to the development of Guam's economy. General policies discuss environment, culture and lifestyles, agriculture and light industry.

Housing Element, Residential Development Policy Report

An extensive discussion of housing on Guam for inclusion in the CDP. Chapters address problems, current housing stock, Guam's households today and tomorrow, residential development opportunities and constraints, policy alternatives and recommendations.

An Inventory of Present and Projected Coastal Land and Water Uses on Guam

An identification of Guam's existing coastal water uses, such as recreational, waste disposal and others. Includes extensive maps and tables of existing and proposed seashore activities by categories and projects, with appendix maps. (CZM)

Mechanisms for Land-Use Control on Guam

A compilation of data pertaining to regulatory land-use controls on Guam with discussion and flowcharts of permitting procedures for such activities as zoning variances, building permits, subdivisions and PUDs, COE permits, agricultural leases; with actual permit forms and guidelines included in the report. (CZM)

Overall Economic Development Plan

A discussion of development proposals for the federal Economic Development Authority. Programs which are vital to Guam's economy include those for agriculture, tourism, Commercial Port, Guam International Air Terminal and water resources. A summary of EDA related, specific projects follows and exhaustive discussion of the various componentsof Guam's economy. Major chapters address population, labor force and the economic potentials and constraints affecting the various sectors of the economy.

Population Projections

A brief report containing methodology, tables and graphs of population projections for Guam to the Year 2000. Three different projections are compared to give a reasonable estimate of population growth.

Street Atlas of Guam

The first official reference map of all streets on the island, including location of major public-use facilities. This document was published as a guide for government agencies and made available for sale to the public sector by the printing agency and private enterprise.

A Summary of Major Federal Land Holdings in the Territory of Guam

An analysis and listing of locations, areasand uses of federal lands on Guam with appendices and a key map. (CZM)

Appendix No. 7. Forthcoming Studies Being Developed by the Bureau of Planning, to be Completed Prior to December, 1977.

Beach Access Study

Will describe access to all beaches of Guam, delineate problem areas and identify properties owned by private interests, GovGuam and the Federal Government. (CZM)

Economic Development Plan

Following the Growth Policy and the OEDP as major economic reports, this element of the CDP will further address economic growth potentials for the territory. The emphasis will be on utilization of economic and statistical methodology to more accurately assess trends and outline a five-year plan for economic growth, as previous plans were exhaustive studies of the current economic situation.

Interim Disaster Preparedness Plan

A discussion of inter-agency response procedures and mechanisms for disaster preparedness in relation to hazard analysis studies for such potential disasters as typhoons, floods and earthquakes.

Inventory of Pristine Marine Ecological Communities

Will describe and map those marine areas that are essential for the protection of endangered and threatened species or are untouched representatives of characteristic Guam marine ecological communities. (CZM)

Phase II, Reef Study

Will provide area sedimentation studies, transects of sensitive and control areas; and discuss larval development of marine species in coastal wetland areas. (CZM)

Seashore Reserve Plan

Will provide mapping of the land uses and physical features characteristic of portions of the Seashore Reserve as delineated in the Community Design Element of the CDP. (CZM)

Social Element

Will discuss and analyze the dimensions and problems affecting health services and facilties, changing lifestyle and language, the educational system, drug abuse; and provide conclusions and recommendations for agency coordination, program emphasis and public action. This plan will provide an element of the CDP.

Sources and Projections of the Availability of Minerals for Engineering Construction in Guam

Will analyze the best sources of aggregates, fine sand and basalt for construction and pavement on Guam. (CZM)

Supplement to the Guam Coastal Planning Bibliography, 1977

Will add entries, produced in1976 and 1977, to the 1976 bibliography. (CZM)

Appendix No. 8 Forthcoming Studies, Related to Land and Water Resources, Being Prepared by Other Agencies (Tentative Titles)

GEPA 208 Studies

Environmental Management Study

Consultants have been contracted to provide an in-depth analysis of regulatory agency permitting procedures. Recommendations well seek to eliminate overlaps, fill in management gaps and increase overall enforcement capability and efficiency by clearly defining agency responsibilities.

Study of Non-Point Problems

This 208 Program study will provide an analysis of strategies needed to solve non-point pollution problems.

UOG Marine Laboratory Technical Reports

Biological Studies of the Coconut Crab (Birgus latro)

Will discuss the food habits, habitat, growth rate, and reproductive cycles of coconut crabs.

Guam-Micronesia Marine Bibliography

Will provide a list of sources relative to marine research in Guam and the Trust Territory.

Ecological Studies for Guam, Coastal Zone Planning and Management

A Sea Grant report of Tumon Bay, this study will provide a survey of submarine contours and physical and biological features of the area. The data will be important in relation to the feasibility of dredging Tumon Bay for resort purposes.

A Study of the Effects of Thermal Effluent on the Coral Reef at Cabras and Piti Power Plants

Will take data contained in previous reports, as well as recently collected data and provide a final compilation and analysis of the effects of thermal discharge into waters adjacent to the Piti and Cabras units.

A Study of the Effects of Thermal Effluent on the Coral Reef at Tanguisson

Will supplement previous studies which specifically outline the extent of coral kill zones caused by thermal discharge or dispersal of heated water onto adjacent coral reef from the power plant facility.

Studies on the Deepwater Shrimp (Heterocarpus ensifer)

Will provide an explanation of trapping methods, habitats (salinity, depths, etc.), localities and abundance of this marine species.

WRRC Technical Reports

Effects of Infiltration of Urban Runoff on Ground and Coastal Waters in Limestone Regions of Northern Guam

Will characterize the quality of urban runoff and changes in the quality of infilatrated runoff under laboratory, and if feasible, pilot field conditions.

Evaluation of the Impact of a Domestic Effluent Discharge on on Guam Coastal Waters

This study, prepared in conjunction with the Marine Laborator will characterize effluent, receiving water quality and analyze the impact on the biota.

Guam Basal Groundwater Monitoring Well System: Construction and Development

Will provide an illustrated report containing new information which will serve as a guideline for the monitoring of future well projects on Guam.

A Model of a Portion of the Public Utility Agency of Guam (PUAG) Water Distribution System

Will measure the flow parameters in a selected portion of the PUAG water distribution system. By determining the relationship between these quantities, it will be possible to locate areas of leakage and to aid in planning for future expansion of the system and development of new sources.

A Preliminary Study of the Dynamics of Guam's Northern Aquifer

Will estimate the dynamics of natural recharge and outflow, the thickness of the transition zone, the effects of well depth and pumping rate on the transition zone, and the maximum sustainable yield of the basal lens.

Preliminary Survey of Guam Groundwater Ages Utilizing Tritium

Will determine the relative ages of groundwater from different environments.

Quality of Percolate Below the Root Zone of Selected Guam Agricultural Crops

Will determine the type and amount of agricultural chemicals being used or allowable for use and characterize percolate quality in terms of chemicals being used.

Role of the Blue Green Alga (Nostoc muscorum) as a Possible Nitrate Source to the Groundwaters of Guam

Will provide additional information concerning the quality of Guam's groundwater by investigating to what extent, if any, Nostoc muscorum contributes to the concentration of nitrate in underground supplies.

Sociocultural Determinants of Fresh Water Uses in Guam

Will provide information concerning traditional Chamorro fresh water use customs which is intended as an aid in the solution of present and future water-related problems.

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