

CHAPTER 6 – POPULATION AND LAND USE FORECAST

6.1 Introduction

An in depth population and land use forecast for the island of Guam was completed to provide relevant input to other portions of the WRMP, including data for developing the water, wastewater, and costing models.

The focus of this chapter is on three major elements: (1) task approach, (2) relationship to Guam's existing land use plans, and (3) key assumptions.

6.1.1 Approach

The approach to attaining population and land use projections for Guam required systematic study and analysis of existing conditions, probable future conditions, and potential scenarios of future population distribution. The methodology involved:

- Use of official U.S. Census Bureau population projections, as they provided the most reasonable forecast, based on historic trends analysis;
- Analysis of existing land use, zoning data, and proposed projects to help discern future land use development patterns; and
- Preparation of an allocation model using the aforementioned elements to estimate future population distribution.

The following data and analyses served as the basis for the population and land use projections:

- Official U.S. Census Total Population Projections – Provides a reasonable forecast based on historic population growth trends prepared and recognized by the federal government.
- Existing Economic and Land Use Conditions – Provides an overview of the current economy, existing land uses, and zoning.
 - Economy – Provides a general discussion of the local economy.
 - Existing Land Uses – Documents existing land uses and zoning information.
- Anticipated Future Economic and Land Use Conditions – Outlines a future scenario for Guam, based on a breakdown of planning factors that affect future land uses.
 - Economy – Projects future economic and population characteristics.
 - Transportation Analysis Zones – Entails the use of traffic projections to estimate population distribution in urban areas.
 - Development Proposals – Includes development proposals from the public, private, and military sectors to estimate future growth.
 - Aquifer Protection and Government Land Lease Program – Assumes future low-density development in much of northern Guam due to

aquifer-sensitive areas and long-term (99 years) government land leases to residents of Chamorro ancestry.

- Future Population Distribution – Incorporates selected U.S. Census official population projections and local planning factors that affect how land may be used. An allocation model is used to adjust and distribute future population in census block groups. Population distribution for Years 2005 to 2020 is based on known potential development projects and possible development time-frame scenarios. For Years 2050 and 2100, growth rates are assumed to be consistent with historic population growth trends, but development projects that far in the future are unknown.

6.1.2 Relationship to Existing Land Use Master Plans

Though it contained useful historic data, the planning information in the 1967 Territory of Guam Master Plan was outdated. At best, it set the stage for policy and decision-making pertaining to land use on Guam. Of particular significance was the creation of the Territorial Land Use Commission (TLUC) and its regulatory mandates. The report indicates that its land use projections were intended to accommodate a population of 108,400 by 1985. Efforts to update the 1967 plan include the 1978 Guam Comprehensive Development Plan and the 1997 Y Tano Ta Land Use Plan, which was adopted by law but subsequently repealed.

The population and land use forecast effort covered in this chapter does not attempt to create a comprehensive island-wide land use master plan, nor does it include an island-wide public opinion survey of desirable community development scenarios. Rather, it concentrates on planning factors necessary to meet short-term and long-term water demand and wastewater disposal requirements in support of GWA's WRMP. Consequently, the planning tools used in this chapter focus on the following: (1) development patterns based on existing land use information and zoning designations; (2) transportation analysis zone information; (3) proposed developments; and, (4) aquifer protection and long-term lease of government lands.

It should be noted that the lack of an updated land use master plan places constraints on developing a unified and consistent growth management scenario.

6.1.3 Key Assumptions

Key assumptions of this report included the following:

- Tourism and military activities will continue to be the major economic drivers on Guam well into the future. This assumption is based on decades of historical experience related to Guam's strategic location for defense purposes and on its tropical island appeal to vacationers from Asian countries.
- Guam's political alliance with the United States will continue and will not differ radically from its current status as an Unincorporated Territory (with the continuation of U.S. immigration control).
- The land use forecast was based on existing land use patterns, available zoning data, and future development project proposals from the private, public, and military sectors. It is assumed that these factors will help determine future land use activities.

- The land use forecast assumes that, for the most part, the island’s water supply (both aquifer and surface water systems) will remain adequate in terms of quantity and quality for the forecast period.

6.2 Existing Conditions

Existing population, and land use conditions on Guam are discussed in this section.

6.2.1 Population

As stated above, Guam’s economic growth relies on tourism and military activities, and these industries will remain the prime economic forces well into the future. Immediately after World War II, the population increased significantly – from 22,290 in 1940 to 59,498 in 1950, a 167 percent increase. Since the 1960s, civilian and military population has experienced an average growth rate of 22 percent at the end of each decade (Table 6-1).

Economic activity in hotel and resort development was prevalent during the late 1980s and early 1990s while military construction activities were ongoing. More recently, population growth and economic activity appear to have slowed down, owing to such factors as the 9/11 attacks in 2001, Typhoon Pongsona in December 2002, the outbreak of SARS disease in 2003, the Asian financial crisis, and the ongoing war in Iraq. Such events have also affected monthly tourist visits to Guam by as much as 50-60 percent. The Guam Visitors Bureau (GVB) has embarked on a plan to increase visitor arrivals to Guam by marketing to potential South Korean tourists. This effort has paid off well as Korean tourists accounted for 12.1 percent of the total visitor count in 2002. The GVB is considering tourists from China as another market. However, recent political events (e.g. detection of a Chinese submarine circling Guam in October 2004) and the heightened security following 9/11 have temporarily thwarted this effort.

General visitor arrival figures for tourism are listed in Table 6-2.

Table 6-1 – Population History

Year 1960	Year 1970	Year 1980	Year 1990	Year 2000
67,044	84,996	105,979	133,152	154,805
13% change (1950)	27% change	25% change	26% change	16% change

Source: U.S. Census Bureau, Department of Commerce.

Table 6-2 – Visitor Arrivals

Year – Number of Visitors				
1985 – 377,941	1989 – 668,827	1993 – 784,018	1997 – 1,381,513	2001 – 1,159,895
1986 – 407,061	1990 – 780,404	1994 – 1,086,720	1998 – 1,137,026	2002 – 1,058,704
1987 – 483,956	1991 – 737,260	1995 – 1,361,830	1999 – 1,161,803	2003 – 909,506
1988 – 585,799	1992 – 876,742	1996 – 1,362,600	2000 – 1,288,002	2004 – 1,156,863*

Source: Guam Visitors Bureau. *Unofficial figures by GVB.

Increases in the number of hotel rooms and golf courses are a testament to the strategy of providing resort destinations in anticipation of increased visitor arrivals. This attitude is prevalent in Guam politics since tourism became a vital part of the island’s economy.

Facilities to accommodate the visitor industry are listed in Table 6-3.

Table 6-3 – General Tourist Accommodations

Sector	Year 1983	Year 1997	Year 2003
Hotel Rooms	2,125 rooms	5,940 rooms	9,220 rooms
Golf Courses	54 holes	180 holes	252 holes

Source: Guam Visitors Bureau.

6.2.2 Land Use

Based on analysis of aerial photography, zoning data, and available planning information, land use on Guam since 1966 (particularly residential, commercial, and industrial use) has increased dramatically during this 37-year period.

Generalized land uses are summarized on Table 6-4.

Table 6-4 – Generalized Land Use

Land Use	1967 Master Plan (acres)		1997 Y Tano Ta Plan (acres)	2004 (acres) ¹	
Roads	1,600	1.18%	---	1,954 ¹	1.44%
Residential	2,001	1.48%	---	11,077	8.16%
Commercial	309	0.23%	---	1,053	0.78%
Industrial	181	0.13%	---	2,480	1.83%
Public/Semi-Public	1,161	0.86%	---	7,006 ³	5.16%
Non-Urban/Agriculture	81,115	59.78%	---	38,800 ³	28.60%
Military/Federal	45,716	33.70%	43,408	40,137 ⁴	29.58%
Conservation	3,594	2.65%	19,526	19,526 ⁵	14.39%
Parks	---		13,646	13,646 ⁵	10.06%
TOTAL	135,677 ac. (100%)			135,679 ac. (100%)	

¹ Discrepancy in acreage is noted as follows: (1) 1967 Master Plan and current inventory from various planning documents – 135,680 acres; (2) GIS island polygon – 133,404 acres.

² Fixed Assets Report, Department of Public Works.

³ Guam Public Land Use Plan, Bureau of Planning. Territory of Guam Master Plan, Dept of Land Management.

³ Territory of Guam Master Plan and Guam Public Land Use Plan.

⁵ Y Tano Ta Land Use Plan, W.B. Flores/Strategic Planning Group.

As a reference point, existing land uses can be used to mark areas where new development activities may occur. Zoning, on the other hand, dictates how land is used within a given location. Figures 6-1, Generalized Land Uses and 6-2, Zoning, show generalized land use and zoning information. It should be noted that the zoning map of Guam has not been updated. Therefore, re-zones and Conditional Use Permit approvals by the Territorial Land Use Commission/Territorial Seashore Protection Commission (TLUC/TSPC) are not depicted.

Figure 6-1 – Generalized Land Uses

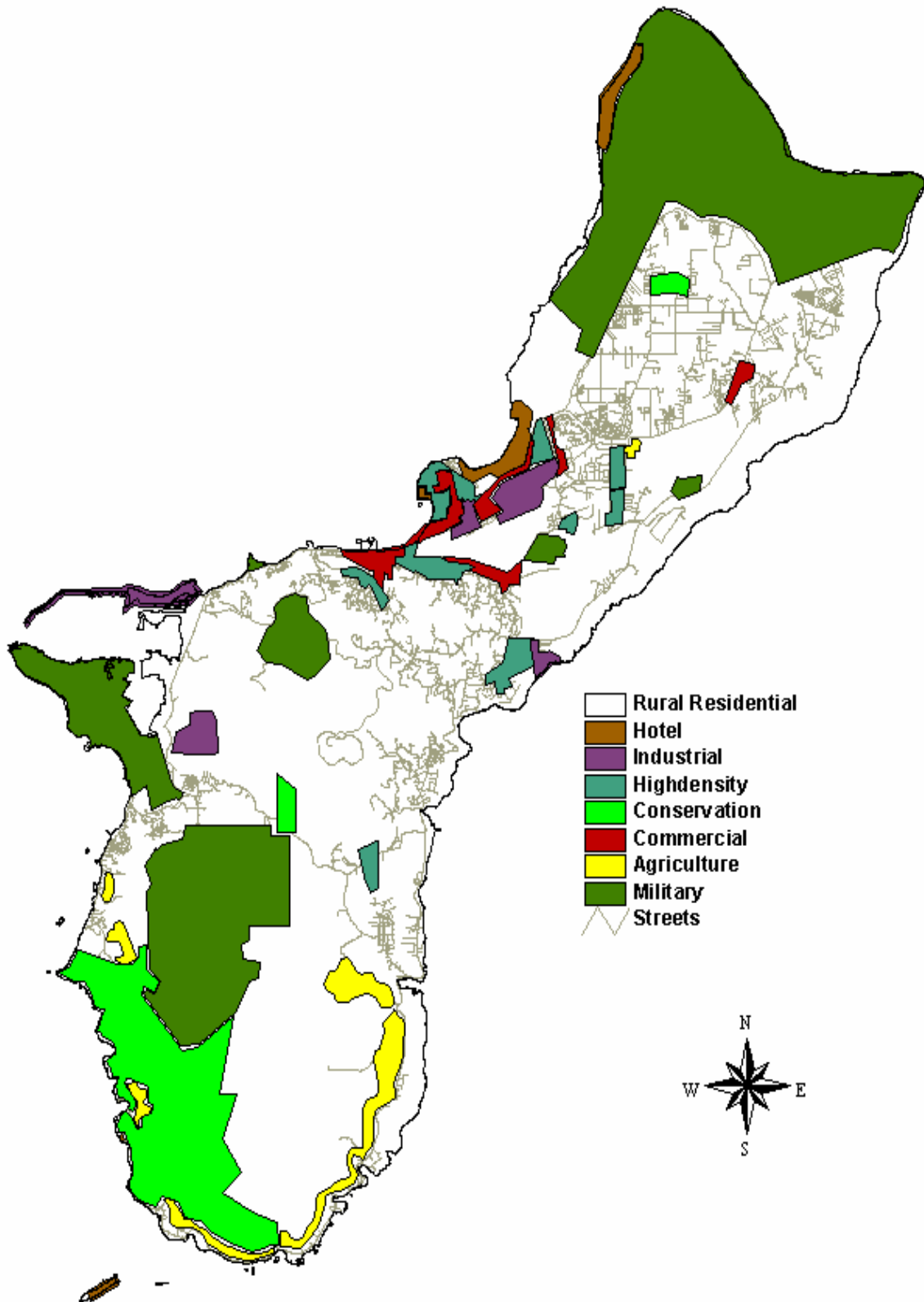
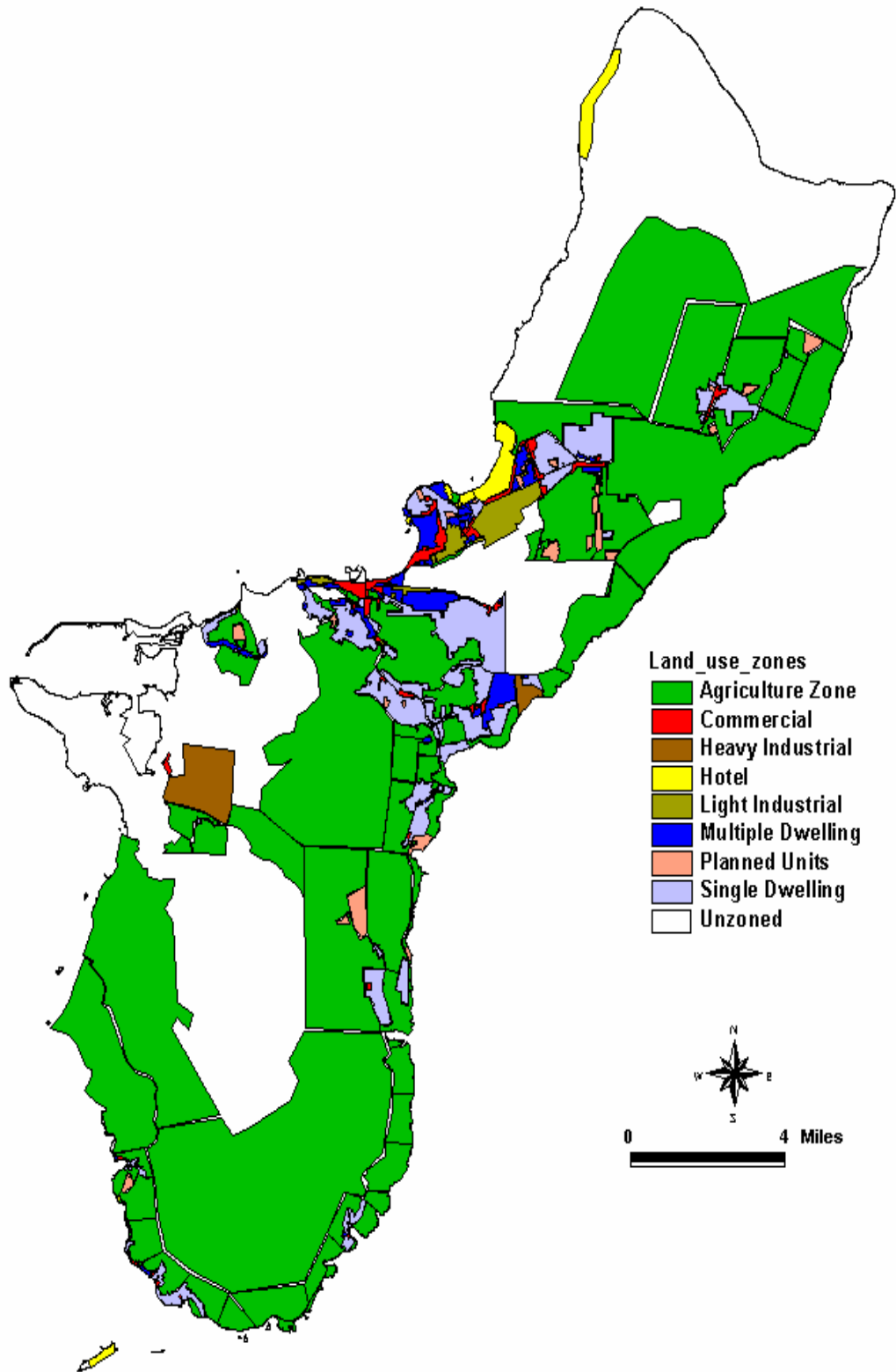


Figure 6-2 – Zoning



High-density and commercial development is concentrated primarily along the Tumon coastline and extends inward toward Tamuning and Dededo. The majority of Guam’s population resides in northern Guam (Tamuning, Dededo, and Yigo), while about 30 percent lives in central Guam (Agana Heights, Sinajana, Mongmong-Toto-Maite, Ordot-Chalan Pago, Barrigada, and Mangilao). In contrast, population in the south remains small due to rough terrain constraints and infrastructure availability.

6.3 Future Population

According to a recent report prepared by the Bank of Hawaii, “Guam’s economy faces greater uncertainty than at any other time over the past ten years” (Guam Economic Report issued by the Bank of Hawaii, East-West Center, 2003). The author suggests steps that Guam can take to improve its economy, including defining what public good the government can provide, improving higher education, and appealing to the Department of Defense for increased military spending on Guam. In response, the local government has begun to act on these suggestions, as indicated in the following examples:

- Privatization of the Guam Telephone Authority has been implemented.
- Similar privatization efforts are currently under way at GWA.
- The United States Navy is repositioning three fast-attack submarines to its Naval Station on Guam.
- The U.S. Air Force announced that plans are under consideration for new military initiatives and associated facilities at Andersen Air Force Base.
- The Guam Government has made legislative efforts to market Guam as a regional headquarters for American corporations doing business in the Asia-Pacific region.
- The GVB is extending its outreach by targeting Chinese visitors.

Thus, there appears to be some room for Guam’s economy to rebound from the various economic, political, and health-related setbacks of recent years. Given the potential for a reasonable economic recovery and with guarded optimism, given the uncertainties associated with any planning process, Guam’s population is anticipated to grow modestly from 179,658 in Year 2010 to 257,232 by Year 2100. (See Exhibit 6A, Population Projection for projection details.)

Table 6-5 presents several population projection scenarios for Guam.

Table 6-5 – Population Projection Scenarios

Year	Population	Lower	Constant	Medium	High
2000	154,805	154,805	154,805	154,805	154,805
2005	166,769	157,141	165,632	171,757	176,004
2010	179,658	159,512	182,583	190,565	200,105
2015	190,699	161,919	201,391	211,432	227,507
2020	202,419	164,363	222,259	234,585	258,662
2050	221,451	179,817	299,544	437,595	558,667
2100	257,232	216,942	545,860	1,236,970	2,016,142

6.3.1 Census History

The population growth pattern on Guam has been one of consistent and steady growth. Since 1793, when the population of Guam was recorded at 3,584 by the Spanish government, population has grown in every census except one. This remarkable statistical pattern has continued for 21 consecutive time periods with only one exception. The exception occurred in the period from 1849 to 1871, when the population declined by 21% (a slight decline also occurred earlier, between the censuses of 1710 and 1793.)

6.3.2 Population Projections Summary

Guam's population is projected to continue to grow, based on historical and U.S. Census Bureau population growth projections. However, growth rates are projected to slow in the future. The growth rates released by the U.S. Census Bureau for Guam have been used as the basis for the most likely population growth scenario for Guam.

As part of this projection process, regression analysis was performed to model the population growth trends. The trend since 1950, a period of economic activity perhaps more relevant to the future than other earlier periods, showed the growth trend to be linear, which means continued population growth in terms of the same number of persons each year but with declining population growth rates. As this analysis is highly consistent with the official U.S. population estimates, this statistical corroboration provided evidence that this was a reasonable approach. In addition to the linear regression, a regression equation was used to test the assumption that population might grow by a constant percentage each year, or as an exponential rather than a linear pattern. There is some evidence over particular time periods that this might also be a reasonable approach. Over a few decades the population would be very significantly higher and for longer time periods such as 50 to 100 years, the predicted population using such a growth function would be radically higher. The trend over the longer term of a century or more indicates a leveling off of the growth rate and provides evidence that the linear trend similar to the official U.S. projections may be more reasonable than an exponential growth scenario.

Population projections and confidence intervals produced in this analysis are included in Exhibit 6A to provide measures of variability inherent in any projection process. The population at various time periods will be expected to vary somewhat from the forecasts. While the overall projections of the U.S. Census Bureau are used for the basis of the total and area projections, it should be noted that while this is thought to be a more plausible growth scenario, other growth patterns are not impossible both in the short and long run and yield very different results.

In addition to the growth rates used in the report and tables as a starting point for the projections, reasonable alternatives are shown on Table 6-5. The low growth alternative shows the projected population at a 0.3 percent annual growth. This is the growth rate used in the forecast for the years between 2020 and 2100. It represents very slow growth of a mature economy or one constrained by resources. The second option represents the official U.S. Census Bureau's growth projections. These are percentage growth rates declining over time from 1.5 percent for 2000 – 2010, growth of 1.2 percent from 2010 – 2020 and .03 percent from 2020 – 2100. The third option is constant growth in the number of persons, or a little over 2,000 persons added every year for all of the future periods, this is a numerical growth rate similar to that of the last decade. A medium percentage growth rate of 1.2 percent per year and a high percentage growth rate of 2.6 percent per year are also shown.

The medium percentage growth rate is more consistent with the growth in the last decade and with some longer-term averages in the historical record. The growth from 1960 – 1990 was very close to that rate so such high growth rates are possible.

The U.S. Census growth rate chosen for the starting point for the population projections in this report and the low 0.3 percent growth rate are viewed as minimum planning levels of population growth that can very reasonably be expected. Lower growth or even population losses could conceivably occur due to disease, natural or economic disasters, however absent that, the long term trends for Guam and worldwide generally show population growth. Population setbacks, which might occur in the short term, may be offset over the longer term by continuing growth. The high growth rate of 2.6 percent has occurred for several decades and plans must recognize that such growth over a period of decades can and has occurred. It is less likely however that such high growth rates will be sustained over periods of 50 to 100 years into the future.

In the ninety-nine year period from 1901 to 2000, the population grew from 9,676 to 154,805. The resulting population in 2000 was nearly sixteen times that of 1901. If the population continued to grow at such a rate, or sixteen times the population in 2000, it would reach over 2.4 million persons by 2100. The differences in the possible growth rates should argue for planning flexibility into capital and infrastructure plans. While the differences in populations differ moderately in the short-term periods of five to ten years, they vary radically over twenty, fifty or one hundred year horizons. While the U.S. Census growth rates or the constant growth rates seem most reasonable, it will be necessary to keep an eye on the growth rates to keep planning efforts on track.

6.3.3 Methodology

The population projection methodology used for this project involved a variety of techniques and procedures. The initial approach focused on the overall population of Guam and the growth trends for the last two centuries, with greater emphasis on trends in the most recent decades. These trends are affected by births, deaths and immigration. The U.S. Census Bureau, International Population Division, prepares population estimates and projections for various political and geographic entities, including Guam. Those projections incorporate various demographic trends and include information on births and deaths, and they are prepared in coordination with the respective governments. The Census Bureau's population projection growth rates for the island of Guam as a whole were used as a starting reference in the process. The next step was to review the historical trends and determine what the growth patterns have been in order to develop insights about what they might be in the future.

6.3.4 Geographic Detail of Projections

The population projections are comprehensive, covering all geographic areas of Guam. The adjusted population distribution projections for Guam are provided for each Census at the Block Group level in Exhibit 6B.

6.3.5 Projection Periods

The time periods for the projections use year 2000 as the base with projections for all of these levels of aggregation for 2005, 2010, 2015, 2020, 2050 and 2100.

6.4 Future Land Use

Current land use and zoning designations were analyzed to yield land use patterns. This process makes it possible to determine the relative mix of uses and locations where new development could conceivably occur. Zoning will continue to yield land uses in a consistent pattern. For this to occur, however, spot zoning must be kept to a minimum.

Based on land use and zoning data, future development patterns on Guam will be contiguous in nature. This assumption follows the concentric model (invasion/succession concept) in urban spatial organization theory. Developable and re-developable lands will expand given current trends. Therefore, it is likely that high-density projects will continue in Tumon, Tamuning, and Dededo.

Village meetings conducted by GWA from August 18, 2004 to October 21, 2004, yielded little information regarding desirable future land uses. Community input focused primarily on the ability of existing infrastructure to accommodate current and future development, as well as the need to protect the island's water source.

In contrast, a GVB survey of resident attitudes regarding development provides substantial insights about economic development issues. Resident views were systematically documented in the *Survey on Tourism Attitudes of Guam Residents* (STAR) conducted by professional research firms under contract to GVB in October 1993, 1997 and 2000. Because the surveys were conducted by professionals using large samples, the findings are viewed as statistically reliable. Residents' perceptions of the visitor industry reported in the 1993 report are discussed in the following text.

In general, Guam residents view tourism as having a positive effect on the family. Nearly 45% believe it definitely has a good effect on their family, 31.6% think it has brought both detrimental and beneficial effects, and less than 5 percent feel that it has had an adverse impact on their family. Reasons for the positive perceptions about the visitor industry centered mainly on tourism as being:

- A source of employment and income for the family
- A boost to the island's economy and standard of living
- Revenue for the local government
- An enhancement to the social, cultural, and recreational life, and
- A captive market for businesses on the island.

On the other hand, effects of tourism that were considered negative were increases in:

- The cost of living
- Prices of commodities
- Value of land
- Population rate, and
- Crime rate.

The 1997 survey contained similar sentiments favoring tourism but expressed similar concerns as well. According to the summary findings, "Respondents were generally very positive towards the visitor industry. They were satisfied with the current level of tourism on Guam and, for the most part, were in favor of continuing the expansion of the tourism industry." By 1997, the economy had undergone very rapid development, so that there were new concerns about the pace of development and infrastructure deficiencies, as well as increased population and migration to Guam. The 1997

survey contained questions and obtained responses about development specifics with the findings summarized in the following items:

- Only 28% agreed with the statement that “Casino Gambling should be allowed on Guam.”
- 65% agreed that “Government funds should be used to build public attractions like aquariums and zoological gardens.”
- More than half of the respondents (54%) thought that the land currently under the administration of the Chamorro Land Trust Commission should be used for activities to improve tourism on Guam.
- Respondents believed that Tumon was overdeveloped and that development there should be stopped. 62% agreed with the statement that “We should stop building hotels on Tumon Bay.”
- Respondents were generally opposed to developing Hagatna Bay to be like Tumon Bay (54%), but residents did believe that development of Hagatna Bay should continue.
- Nearly half of respondents (49%) did not favor having hotels and condominiums built in their villages, while one-third favored the idea. More than half (57%) would favor a restriction on large-scale development in their villages, but 25% would favor them.
- Respondents were nearly two to one against the promotion of further development of golf courses. 60% of respondents were against the promotion of golf course development, while 35% were in favor of the continued promotion of golf course development.

By the time of the 2000 survey, the rapid pace of economic growth seen in the late 1980s and early 1990s had slowed. The opinions expressed in the survey of 2000 reflected changes due to the less vibrant economy.

In the 2000 survey, there was a sharp increase in the view that there could be more visitors coming to Guam. There had been a gradual decrease in the proportion of residents who felt that too many outsiders were immigrating to the island. This figure fell from 51% in 1993, to 46% in 1997, to 33% in 2000. But this attitude did not extend to selling land, as 60% of Guam’s residents believed that selling local land to foreign investors should be prohibited. Residents also favored a moratorium on building hotels in Tumon, and the creation of special tourism zones to limit development. Residents were not in favor of a moratorium on development in Hagatna Bay, though they did not wish it to be developed to the same extent as Tumon. They were also not interested in developing more golf courses.

Interestingly, other questions provided information that would indicate a greater geographic diversity of tourism development and activities. Residents of Guam do not agree with confining visitor facilities to Tumon Bay. One result of focus group sessions was that the perception that limited and managed expansion of the industry into the villages would be welcomed by local residents. In fact, only 14% agreed with the statement that “Visitors should be confined to Tumon Bay and kept away from the rest of the island.”

Resident attitudes, therefore, may be insightful in the planning and forecasting of future development patterns. The residents’ desires, as articulated in these surveys, are generally consistent with the population, hotel, and employment growth patterns projected in this report. Resident attitudes will undoubtedly have a significant influence in shaping future development. However,

individual and property rights of landowners, as well as the economic and geographic characteristics of various properties, may permit types or amounts of development or development in areas that are not entirely supported by popular opinion.

Future land use on Guam is not anticipated to vary significantly from current patterns, at least not in the next 10 to 20 years. The first population wave is expected to occupy existing vacant residential units and new single-family residential units. High-density uses will continue to come in the form of hotel, condominium, and apartment complexes. Hotel development will grow at a steady pace and will remain confined, for the most part, in Tumon and adjacent areas where infrastructure is intact. Sporadic development consisting of high-density units (such as those proposed at Dededo-Urunao, Yona-Manengong, Yigo-Marbo, Agat-Nomura, and Barrigada-PacEcon Hotel) is anticipated to take place gradually, as the economy continues to embrace tourism and military activities increase at a modest pace. Original landowners of former military properties, who are gearing toward high-density or commercial development, are likely to seek long-term financing for their projects. Commercial uses will also grow steadily. Industrial activities will occur primarily within the airport property. Essentially, most future development or redevelopment will likely be in the same location, or near, existing development. The basis for this assumption is Guam's limited land mass and availability of infrastructure.

Most high-intensity development will occur in central and northern Guam. In contrast, southern Guam is likely to retain its slower-paced, traditional environment. This assumption is based on physical development constraints, such as terrain, wetlands, and water springs, as well as available infrastructure.

As the economy matures, Year 2050 may see the beginnings of a build-out scenario. By Year 2100, build-out will likely be reached due to Guam's limited landmass. This scenario assumes that the aquifer's sustainable yield and the surface water systems in the south can accommodate the projected population of Years 2050 and 2100 (i.e., 221,451 and 257,232, respectively) without overstressing the island's overall water supply.

6.4.1 Methodology

Future land uses were determined by acquiring project proposals approved by the TLUC through Notices of Action. It was verified that these proposed projects have not yet been constructed by reviewing documents and the building permit database at the Department of Public Works (DPW), Building Permits Division. Project names and associated lot descriptions were crosschecked with the database on building permit issuance. Those projects identified as not yet built remain as planned proposals that can be viewed as indicators of where future projects may occur based on proximity to developed areas and other physical land characteristics. Projects were reviewed and categorized by the project development forecast time frames, based on infrastructure availability, access to the sites, and communications with government land use officials. The time frame for actual completion of these projects is, of course, subject to revision. Some may be completed sooner than scheduled, some later, and some cancelled altogether, and new projects may be added. A periodic review to update the status of projected developments is therefore essential.

6.4.2 Private Development Proposals

Private development proposals refer to potential developments on private lands. This category anticipates high-density types of development that cater primarily to the tourism

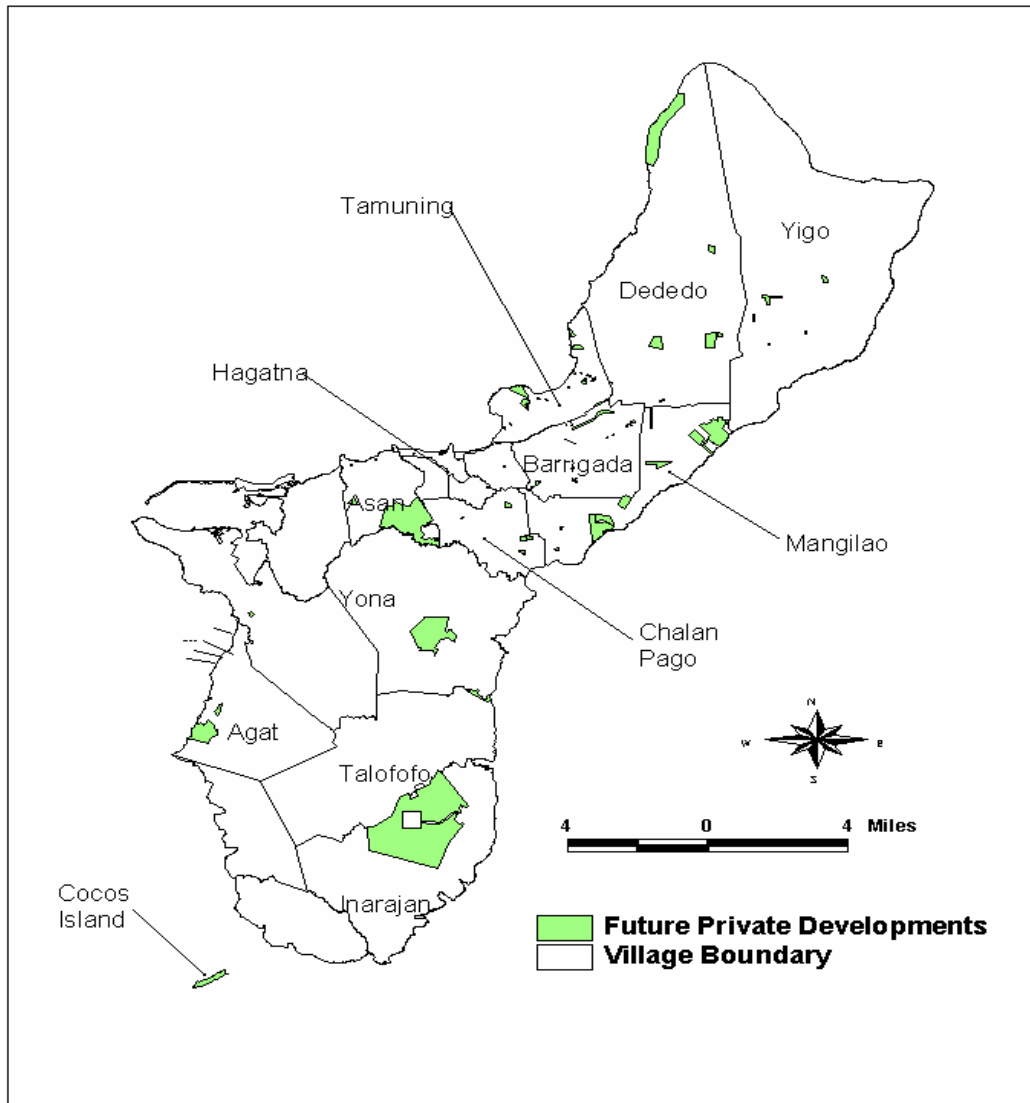
industry. Hotels and condominiums fit this description. There is also the potential for high-density development by landowners who have acquired large parcels but currently do not have the immediate funds necessary to finance their projects. These proposals are anticipated to materialize over a longer time frame.

Proposed for low-density facilities and not as robust as hotel resorts, eco-tourism is also a foreseeable development trend. In this case, development will manifest itself in “thatched roof” units geared towards sociocultural themes. Low-density dwelling units may also take place through land subdivision and associated housing projects. Such development may provide a variety of cultural interest projects but are not likely to present substantial infrastructure demands.

Figure 6-3, Future Private Sector Development, identifies the location of potential development sites of projects that have been approved by TLUC/TSPC, but have not yet been issued building permits by the DPW.

A notable area in terms of potential economic development is the site of the now defunct Tiyan economic development zone government project. This area is proximate to near the Antonio B. Won Pat International Airport and could conceivably be developed through private land ownership (many of the properties have since been returned to original landowners). Conceptually, this area has the potential to contain a free trade zone, commercial and light industrial park facilities (e.g., airport support, shopping, banking, restaurants, and fitness clubs).

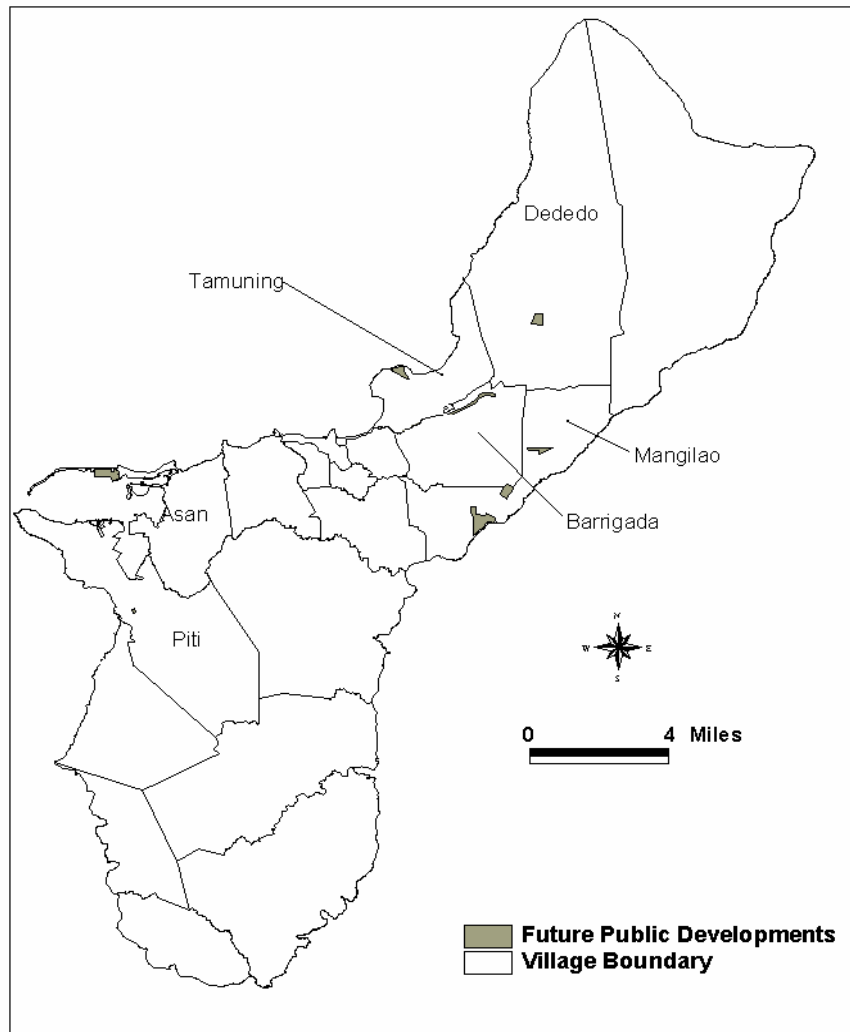
Figure 6-3 – Future Private Sector Development



6.4.3 Public Development Proposals

Public development proposals refer to potential development of government-owned property (i.e., Government of Guam). To date, the major development proposals include the landfill sites, the old hospital site, airport expansion, port facility expansion, and several public schools. Figure 6-4, Future Public Sector Development, shows the location of these potential development sites.

Figure 6-4 – Future Public Sector Development



6.4.4 Military Development Proposals

Existing military facilities on Guam consist primarily of Air Force and Navy bases. Because of its strategic geographic location, Guam is placed in high regard with respect to deployment of military-related activities concurrent with world events.

Air Force officials have stated that additional housing units are envisioned to support planned initiatives within the Andersen Air Force Base boundary. It is anticipated that ancillary development may spill over into the Yigo commercial and residential areas.

Navy officials have reported to local print media that they anticipate an increase in the number of attack submarines to be home-ported on Guam. Nine attack submarines are being considered at the time of this writing. This translates to approximately 1,000 sailors and their families that will require housing accommodations. It is assumed, at this point, that housing needs will be provided on base.

6.4.5 Traffic Analysis Zones

The Guam Highway Master Plan, prepared by the DPW in 1992, anticipates that the number of daily vehicle trips will increase by 132% in the 1990-2010 period, which is consistent with its population and employment forecasts. The difference in growth rates is attributed to the trend toward smaller average households, which tend to produce more trips than larger households.

Table 6-6 summarizes daily vehicle trips and population.

Table 6-6 – Daily Vehicle Trips and Population

Factor	1990	1995	2010	% Increase 1990-2010
Population	133,152	158,677	237,288	78
Daily Vehicle Trips	434,466	535,143	1,008,917	132

Source: Guam Highway Master Plan, 1992, Dept. of Public Works

The analysis also anticipates that, based on population and daily vehicle trips, the village of Tamuning will play a dominant role as the island’s employment center, as indicated in Table 6-7. DPW is currently updating the Highway Master Plan.

Vehicular trip origins are compared in Table 6-7 for years 1990 and 2010.

Table 6-7 – Comparison of 1990 and 2010 Vehicle Trip Origins

Sector	Daily Vehicle Trip Origins			% Increase 1990-2010
	1990	1995	2010	
Yigo, Dededo	86,316	175,484	194,024	125
Tamuning	141,329	202,231	375,604	166
Agana, Agana Hgts, Asan, M-T-M, Sinajana	72,457	76,875	160,539	122
Barrigada, Mangilao, Chalan Pago-Ordot	66,667	36,912	132,682	99
Yona	9,215	5,862	34,127	270
Agat, Piti, Santa Rita	46,171	29,710	84,328	83
Inarajan, Merizo, Talofoto, Umatac	12,311	8,069	27,613	124
TOTAL	434,466	535,143	1,008,917	132

Source: Guam Highway Master Plan, 1992, DPW

6.4.6 Aquifer Protection

Because the groundwater source in northern Guam is considered the principal water supply for the island, the GEPA asserted a policy that residential development on lots of 9,600 square feet or less, depending on the zoning standard, should be connected to the nearest sewer line. If unsewered, the minimum lot area should be 19,200 square feet. Many rural areas in northern Guam are not sewerred. Numerous single-family residential units are

located in rural areas, so septic tanks and leaching fields are the primary means of sewage disposal. Consequently, local environmental officials suspect that high concentrations of nitrate may be making their way to the aquifer.

The EPA, under the terms of the Safe Drinking Water Act, formally determined and identified the northern aquifer as the sole and principal groundwater system on Guam. The determination further states that if the ground waters were contaminated, a significant hazard to public health would exist (Federal Register, Volume 43, No. 81).

By virtue of the aquifer's role as a primary water source, any development over it will be dictated, to a large extent, by the need to protect the water source. Thus, GEPA has set policy direction on development standards for areas that are serviced by wastewater disposal facilities and for those areas that are not. Thus, future development in rural northern Guam will likely be limited to single-family residential units. Considerable emphasis will be placed on homeowners to connect to available sewer lines. Clearly, GEPA considers aquifer protection a high-priority project.

6.4.7 Year 2005 Land Uses

Based on research and meetings with government officials, construction activities are anticipated to begin within a four-year time frame (i.e., up to Year 2009) for the projects listed in Table 6-8, Year 2005 Potential Developments. The population forecast for Year 2005 is 166,769, an increase of approximately 11,964 people from Year 2000. The vacant residential units (8,908) and proposed subdivisions (251 units) can accommodate this first population wave.

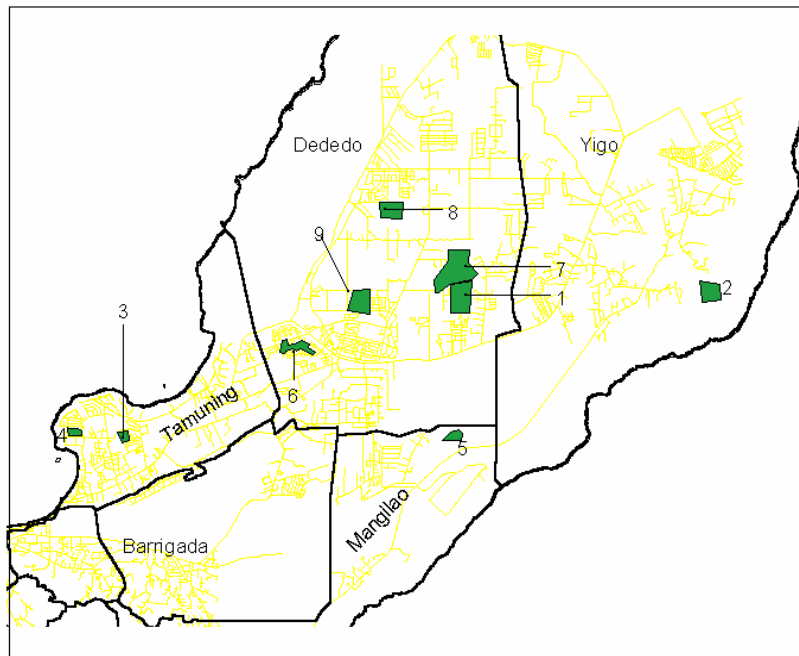
Development proposals anticipated to commence in 2005, or shortly thereafter, are listed in Table 6-8 and depicted on Figure 6-5, Year 2005 Potential Developments.

Table 6-8 – Year 2005 Potential Developments

Project	Map ID	Location	Lot Description	Units
Paradise Estates	1	Dededo	T276-REM	98 (Phase I)
Gil-Breeze Subdivision	2	Yigo	T94002	89
Royal Gardens	3	Tamuning	T1314B16L45	36
Oka Point Subdivision	4	Tamuning	T10B2NewLR1	28
Adacao Elem. School	5	Mangilao	5402-R5New-R5	550 students
Liguan Terrace Elem.	6	Dededo	T100, Parcel 1A	550 students
Batulo High School	7	Dededo	L10122-R18	1,200 students
Astumbo Middle School	8	Dededo	L10125-11-2	700 students
Wettengel High School	9	Dededo	L10125-11-2	1,200 students
TOTAL				251 Units

Residential unit vacancy data was obtained from the Census 2000 database to provide a glimpse of the number of vacancies throughout the island. Table 6-9, Census 2000 - Housing Unit Vacancies, illustrates the breakdown of these vacancies is by census tract. As assumed, the first population wave occurring in Year 2005 and beyond is anticipated to fill these existing vacant units, as well as the new single-family residential units.

Figure 6-5 – Year 2005 Potential Developments



 Y2005
 Village Boundary

0  3 Miles

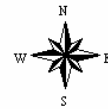


Table 6-9 – Census 2000 - Housing Unit Vacancies

Census Tract	Location	Total Units	Occupied Units	Vacant Units
9501	Yigo	831	695	136
9502	Yigo	553	487	66
9503	Dededo	871	473	398
9504	Dededo	2432	2055	377
9505	Yigo	1822	1558	264
9506	Yigo	2283	1894	389
9507	Dededo	2204	1896	308
9508	Dededo	2130	1838	292
9509	Dededo	1790	1523	267
9510	Dededo	736	606	130
9511	Dededo	1956	1625	331
9512	Dededo	0	0	0
9513	Mangilao	5	4	1
9514	Mangilao	1448	1295	153
9515	Mangilao	7	6	1
9516	Barrigada	0	0	0
9517	Barrigada	649	581	68
9518	Barrigada	5	5	0
9519	Tamuning	3373	2403	970
9520	Tamuning	736	567	169
9521	Tamuning	728	486	242
9522	Tamuning	1465	1167	298
9523	Tamuning	1101	873	228
9524	Tamuning	705	457	248
9525	Mongmong Toto Maite	0	0	0
9526	Mongmong Toto Maite	592	504	88
9527	Barrigada	1289	1167	122
9528	Mangilao	1	1	0
9529	Mangilao	1298	1054	244
9530	Mangilao	1167	830	337
9531	Chalan Pago Ordot	1920	1573	347
9532	Sinajana	857	742	115
9533	Mongmong Toto Maite	1510	1129	381
9534	Hagatna/Tamuning	395	268	127
9535	Agana Heights	67	63	4
9536	Agana Heights	1126	995	131
9537	Asan	596	538	58
9538	Asan	64	14	50
9539	Yona	1093	950	143
9540	Yona	652	536	116
9541	Santa Rita	0	0	0
9542	Santa Rita	1138	1029	109
9543	Piti	547	448	99
9544	Piti	29	26	3
9545	Santa Rita	1160	597	563
9546	Santa Rita	219	154	65
9547	Agat	760	643	117
9548	Agat	739	655	84
9549	Agat	0	0	0
9550	Talofoto	0	0	0
9551	Talofoto	849	738	111
9552	Inarajan	701	644	57
9553	Merizo	535	471	64
9554	Umatac	179	162	17
9555	Yigo	0	0	0
9556	Barrigada	346	344	20
TOTALS		47659	38769	8908

Source: U.S. Census Bureau.

6.4.8 Year 2010 Land Uses

The second population wave (12,899 people) is likely to continue filling vacant units and occupy new residential units in the same manner as the first population wave in Year 2005. Residential development, together with military housing units, will accommodate the housing needs of this population wave.

Development proposals anticipated to begin in 2010, or thereafter, are illustrated in Figures 6-6 and 6-7 and listed in Table 6-10, Year 2010 Potential Developments.

Figure 6-6 – Year 2010 Potential Developments (Central)

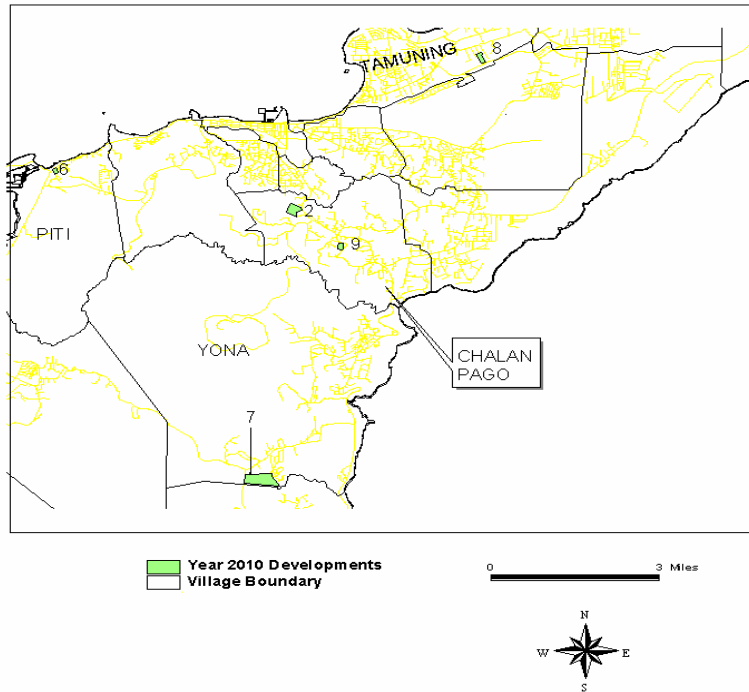


Figure 6-7 – Year 2010 Potential Developments (North)

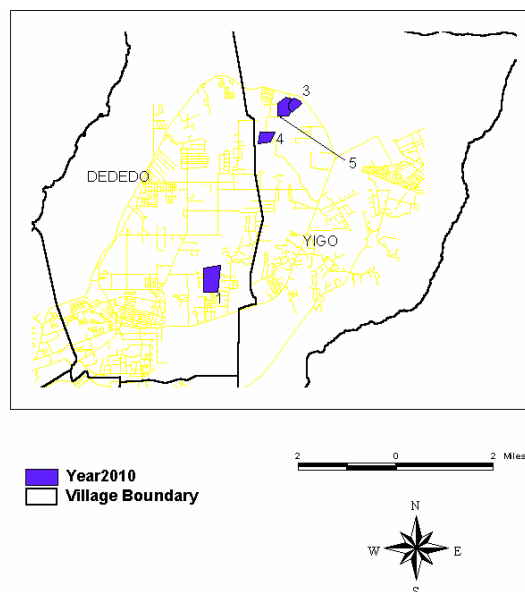


Table 6-10 – Year 2010 Potential Developments

Project	Map ID	Location	Lot Description	Units
Paradise Estates	1	Dededo	T276-REM	98 (Phase II)
Chalan Pago Subdivision	2	Chalan Pago	T19212	40
Yigo Subdivision	3	Yigo	T63003	38
Gil Baza Subdivision	4	Yigo	T63004	79
Yigo Subdivision	5	Yigo	T6301	79
Piti Elem. School	6	Piti	L113-REM	550 students
DanDan Landfill Site	--	Inarajan	---	---
Navy Housing	--	U.S. Navy	---	1,000
Air Force Housing	--	U.S. Air Force	---	---
Laguina Farms	7	Yona	L154-9	120
Sabana Plaza Condo	8	Tamuning	L5166-3-10	48
Southern Cross Subdivision	9	Chalan Pago	L3347-R1-R9	35
TOTAL				1,537 Units

6.4.9 Year 2015 and 2020

By this time, it is likely that residential unit vacancies will be minimal. New development for the third and fourth population waves will commence. This growth, consisting of up to 20,000 new residents for Years 2015 and 2020, will be accommodated by proposed developments, as listed in Table 6-10 and shown on Figure 6-8 through Figure 6-21 on the following pages. Though these developments represent extreme growth (a total of 18,000 housing units), not all are expected to be constructed. Should its developers choose, the particularly large projects such as DanDan Estates, Lonfit New Town, and Manengon Hills may not materialize due to their proximity to proposed landfill sites and inadequate infrastructure. The Urnao development may not materialize due to its remote location, archaeological historic significance, and infrastructure shortfalls. Nevertheless, these development projects signify the magnitude of future development potential on Guam and the realization of potential economic benefits.

The Guam International Airport Authority has begun construction activities on various airport-related projects. However, full realization of a potential economic zone through private development may extend beyond Year 2020. Because of improved airport facilities and the attraction of commercial activities, more residents are likely to travel in and out of Tiyan.

Out of the 18,000 units anticipated in Year 2015, some of the smaller development projects (including hotel rooms) might not be built in Year 2015. Some projects will spill over into Year 2020, which is appropriate, in order to allow the infrastructure to “catch up.” Thus, housing accommodation for Years 2015 and 2020 are essentially merged.

6.4.10 Year 2050 and 2100

By these time periods, it is assumed that Guam’s potential to accommodate increased population may depend on the capabilities of the water supply and distribution systems. By Year 2100, the population is forecast to reach up to 257,232 residents (i.e., an increase of 35,781 new residents from Year 2050).

Developable lands for these time periods were identified through a process of elimination. Using aerial photography and overlaying it with existing and future uses, it appears that

developable lands may be confined primarily to northern Guam and to a few areas in the south, as indicated in Figure 6-22. This slow growth development scenario for southern Guam is attributed to rugged terrain, the presence of several springs, and numerous wetland areas. The lands designated in Dededo and Barrigada are mostly former military lands (e.g., Harmon Cliffline). The lands designated in Yigo are privately owned for the most part, but some are government-owned. The lands in Urunao and Jinapsan are privately owned but are anticipated to grow slowly. Access to Jinapsan may open to the general public, but development activity will be limited according to the Air Force's mission at that time. The future treatment of these lands, as well as the government lands leased to residents of Chamorro ancestry for up to a period of 99 years, are sketchy. Many original landowners (i.e., landowners whose lands were returned to them by the Government of Guam subsequent to the federal excess lands disposition process) lack the financing to develop their lands. At the same time, it is difficult to develop the government-leased lands due to the terms of the 99-year lease agreement.

Developments anticipated in 2015 and 2020 are listed in Table 6-11.

Table 6-11 – Year 2015 & 2020 Potential Developments

Project	Map ID	Location	Lot Description	Units
Machanao Woods Subdivision	1	Dededo	10100-5	144
Tai-Pan Corp	2	Yigo	7028-R5-NEW	16
Santa Lourdes Subdivision	3	Yigo	7128-2 & 7128-3R	102
Water Park	4	Tamuning	10113-R3	
Ypaopao Phase III	5	Dededo	T276-REM	79
Guam Yamanoi Condo	6	Tamuning	5089-1-3R	102
Dai Sucho Condo	7	Tamuning	5076-R4-4	12
Franklin Leong Subdivision	8	Yigo	7032-4-R2	15
Terry Wilson Subdivision	9	Yigo	10111-10-1	44
Hotel (Peter Wang)	10	Tamuning	5075-Part-3	
Hotel (Nakashima)	11	Tamuning	5075-REM1-1	
Sky City Marianas Hotel	12	Tamuning	5089-13-1	160
Hotel	13	Tamuning	5076-1-6NEW	
Ravinder Dewan Subdivision	14	Yigo	T10417	17
Yury Enterprise Condo	15	Mongmong-Toto	1133-R1	18
Kojimaya Condo	16	Tamuning	2146-1-10	12
Cheng Yen Hotel	17	Tamuning	5142-1-4NEW	212
Ishwar Hemlani Hotel	18	Merizo	247-R1	34
Sang Ung Yu Condo	19	Agana	B14	20
Oceanview Garden Subdivision	20	Tamuning	2152-F-RNEW-1	13
Casa Dos Amantes Hotel	21	Tamuning	5144-1NEW	48
Agana Bay Condo	22	Tamuning	2125-2-R1	80
Bayview Resort Hotel	23	Tamuning	5028-4NEW	222
Toyo Real Estate Condo	24	Tamuning	5114#5-R1-NEW	21
Oceanview Garden Homes	25	Tamuning	T1314B16	42
UDL, Inc. Condo	26	Tamuning	5160-6-3	36
ParaOceana Condo	27	Tamuning	5022-5NEW-1	28
Del Rosario Subdivision	28	Yigo	T911L3-R16	14
Lucky Dragon Subdivision	29	Tamuning	5076-1-4	17
As-Yigu Estate Subdivision	30	Yigo	7028-5-1NEW	17
PDG Village	32	Dededo	10053-5-R1NEW	66

Table 6-11 – Year 2015 & 2020 Potential Developments (continued)

Project	Map ID	Location	Lot Description	Units
Petlas Condo	33	Mangilao	2314-2	25
Paicon Condo	34	Barrigada	T219-B2-L5-R1	21
Barrigada Terrace	35	Barrigada	T1841-L1028	30
Willson Subdivision	36	Dededo	T10310	44
I Lisong Housing	37	Barrigada	T1417	96
Manengon Hills	38	Yona	T2511	2350
Zion Town	39	Barrigada	T1428	16
Manibusan Condo	40	Barrigada	2176-3-15NEW	12
Fuji Development Housing	41	Barrigada	T9-BD-L2-2,	23
Visat-Mar Condo,	42	Asan	289-2New	12
Keiyo II Condo	43	Dededo	T1424-4-R1	21
Keiyo Condo	44	Dededo	T1424-4-1	13
Agana Marina Hotel	45	Agana	Agana Boat Basin	440
Agat Hilltop Gardens	46	Agat	195-1-3NEW	420
S&R Hotel	47	Agat	310-1	18
Corps of SDA Hotel	48	Agat	453-3NEW-2	273
Lonfit New Town	49	Asan	450	6046
Okso Taguac Condo	50	Asan	A-6	240
Oshima Apts	51	Asan	429-6REM	54
CAS Int'l Hotel	52	Barrigada	5211-2-2-3	78
Kanada Palms Condo	53	Barrigada	2352-R6	39
Pacific Econ Hotel	54	Barrigada	5351-4-5	518
Palm View Townhouses	55	Barrigada	T9BC-L1	26
Valuant Townhouses	56	Barrigada	2358-1	65
Golden Palm Condo	57	Chalan Pago	3268-4	30
Pago Bay Hills Condo	58	Chalan Pago	3436-R1	68
Conga Terrace Condo	59	Chalan Pago	3405	135
Sabanán Magas Condo	60	Chalan Pago	3461	58
Micronesia Condo	61	Chalan Pago	19.28A-R3	154
Dandan Estates Development	62	Inarajan	B-REM-2	920
Fadian Hotel	63	Mangilao	T157-NEW	1436
Marbo Cave Resort	64	Mangilao	T1531	1800
Sanchez Apts	65	Mangilao	P19.75.9	120
Kurason Guahan Hotel	66	Talofoto	91-1A	150
Faifai Beach Resort	67	Tamuning	10116-R1	400
Cocos Island Resort	68	Merizo	Cocos Island	118
Urunao Hotels	69	Dededo	Urunao	500 -1000
New GCC Campus	70	Mangilao	5433 & 5434	
Old Hospital Site	72	Tamuning	5173-1-R2NEW	
Ukudo High School	73	Dededo	10120-16	
Luayao High School	74	Mangilao	5401N-R4	
TOTAL				18,000 Units

Figure 6-8 – Year 2015 & 2020 Potential Developments (Dededo/Yigo)

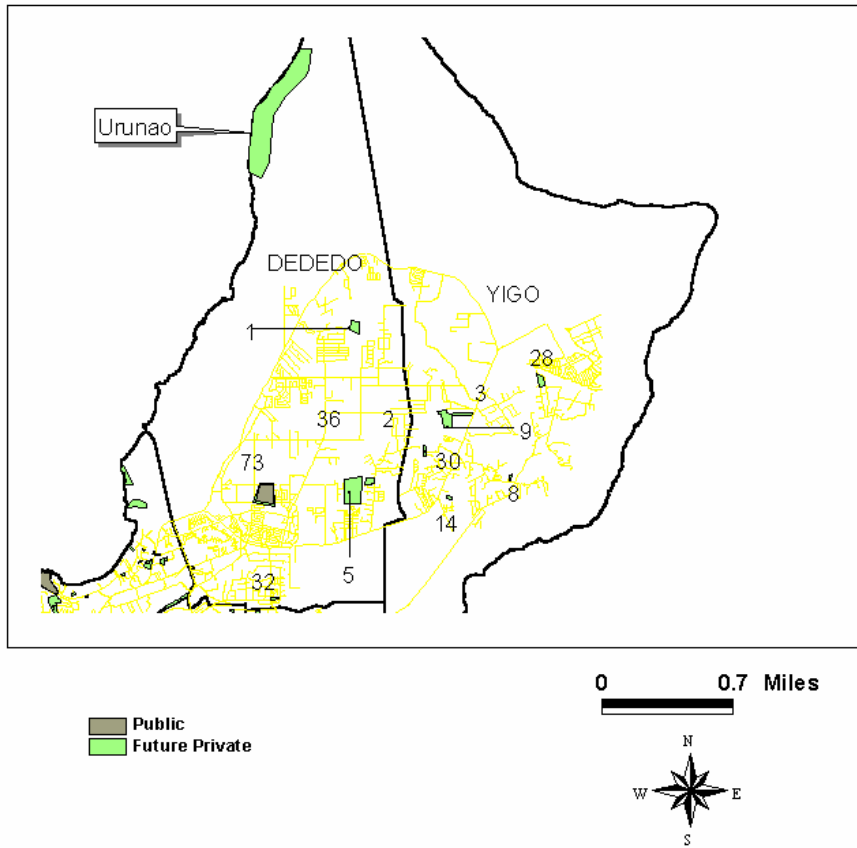


Figure 6-9 – Year 2015 & 2020 Potential Developments (Barrigada)

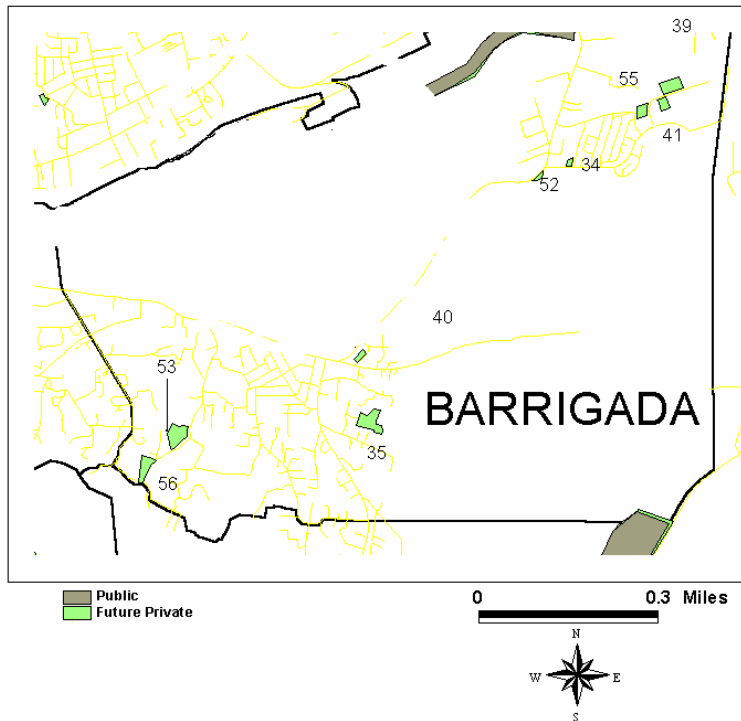


Figure 6-10 – Year 2015 & 2020 Potential Developments (Tamuning)

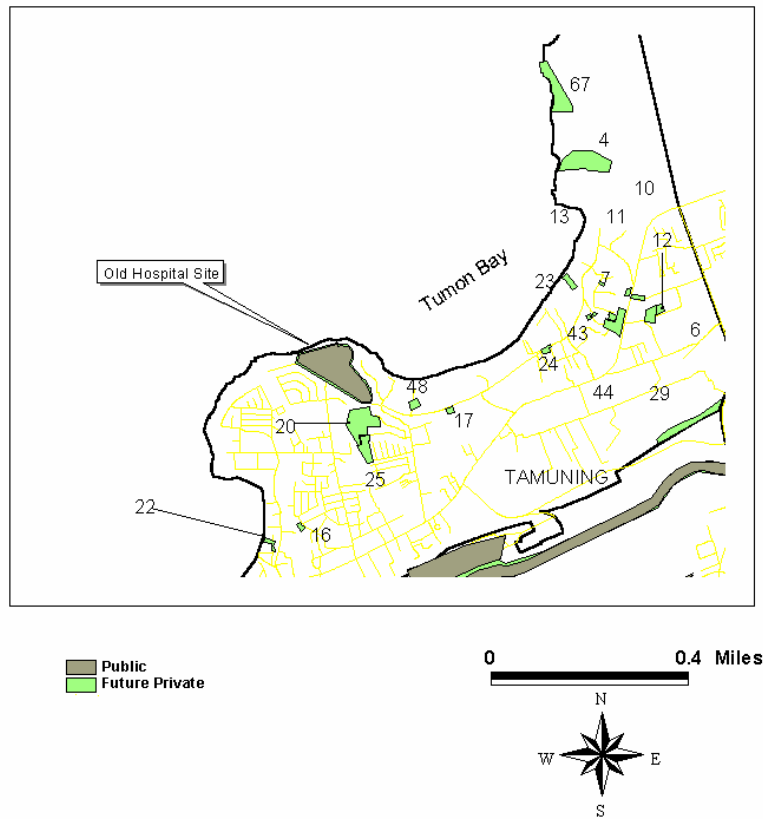


Figure 6-11 – Year 2015 & 2020 Potential Developments (Mangilao south)

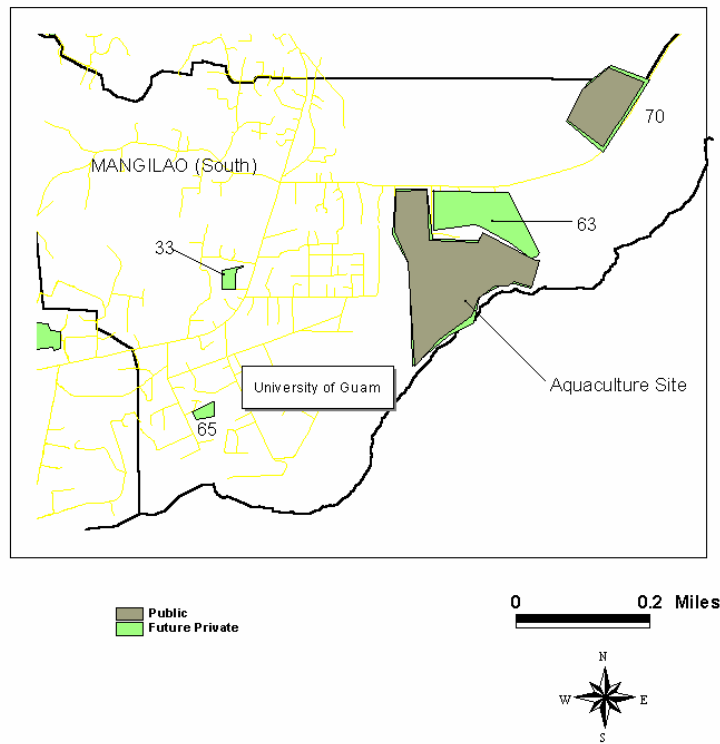


Figure 6-12 – Year 2015 & 2020 Potential Developments (Agana & MTM)

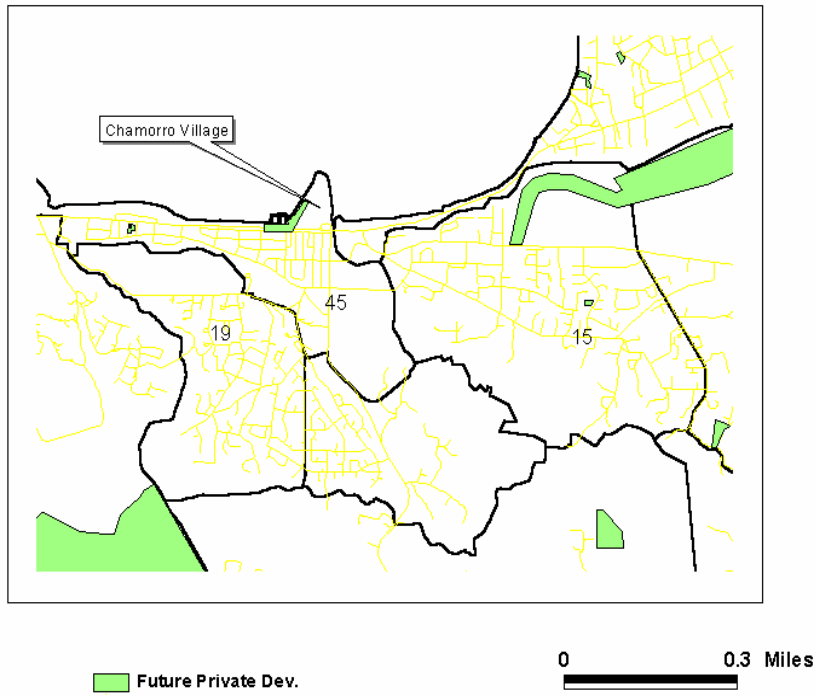


Figure 6-13 – Year 2015 & 2020 Potential Developments (Agat)

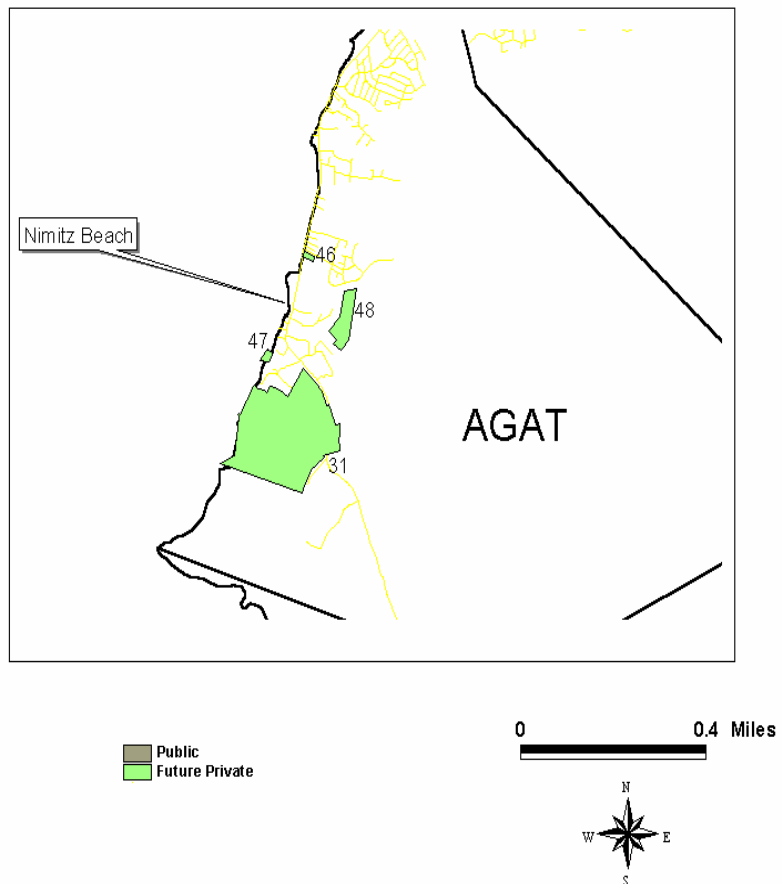


Figure 6-14 – Year 2015 & 2020 Potential Developments (Asan)

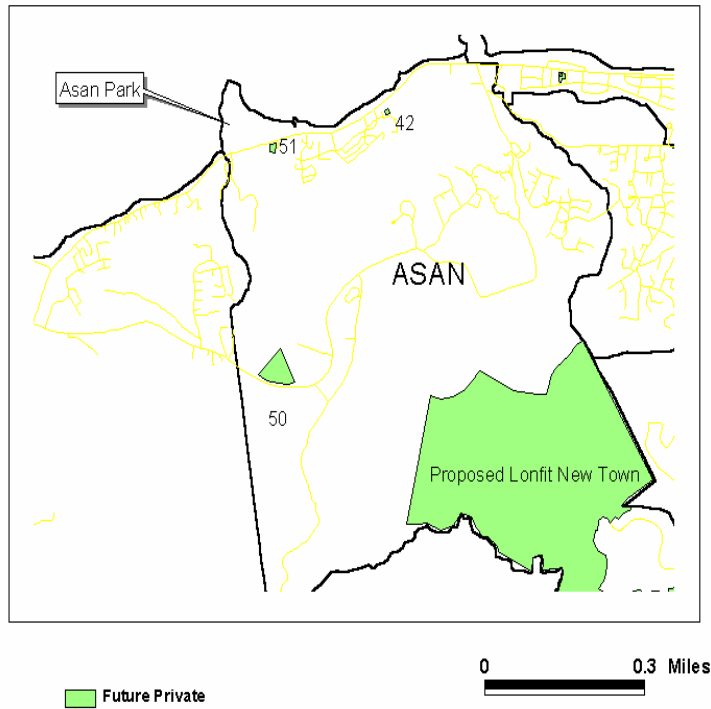


Figure 6-15 – Year 2015 & 2020 Potential Developments (Chalan Pago)

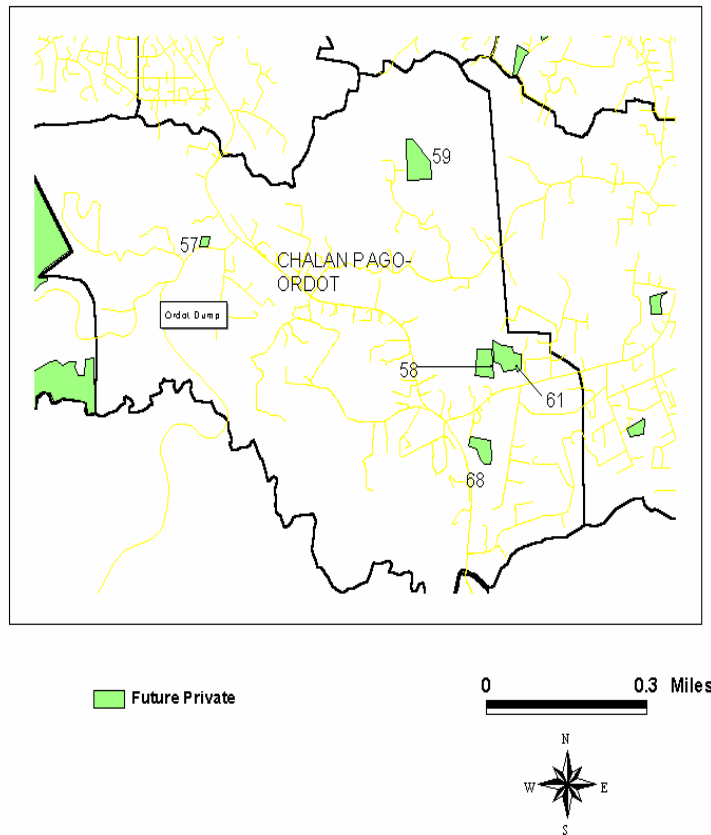


Figure 6-16 – Year 2015 & 2020 Potential Developments (Inarajan)

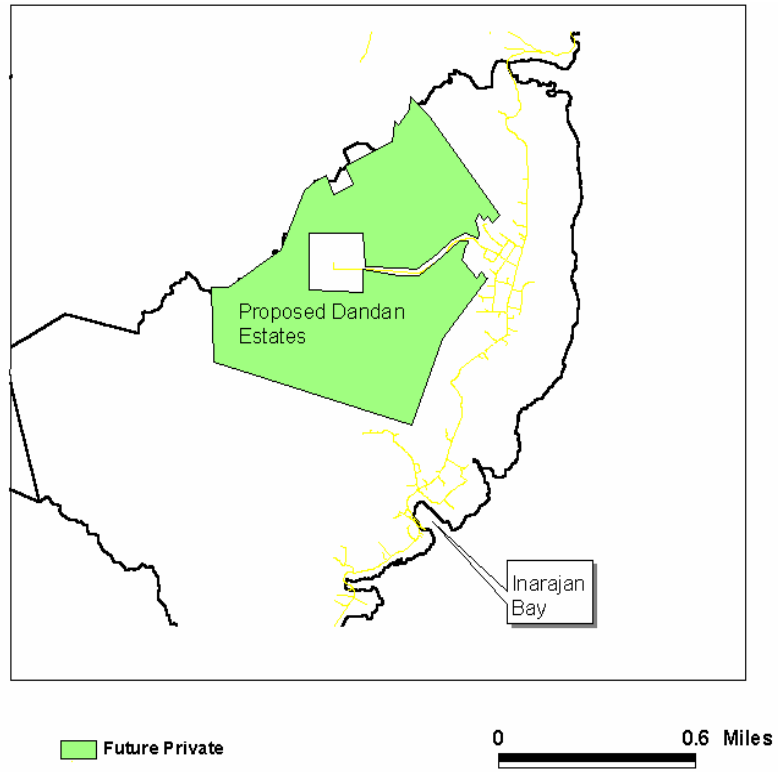


Figure 6-17 – Year 2015 & 2020 Potential Developments (Merizo)

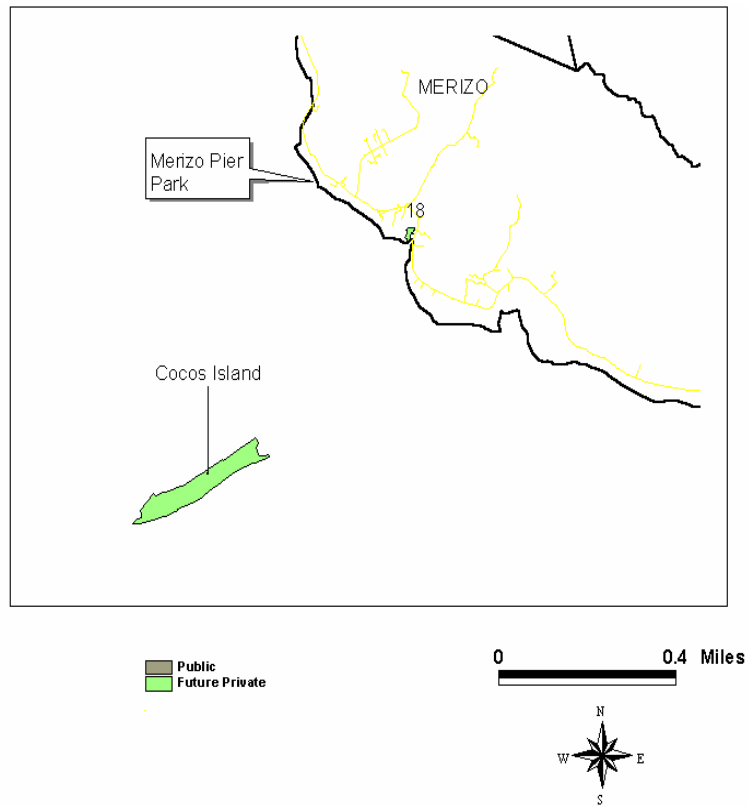


Figure 6-18 – Year 2015 & 2020 Potential Developments (Mangilao north)

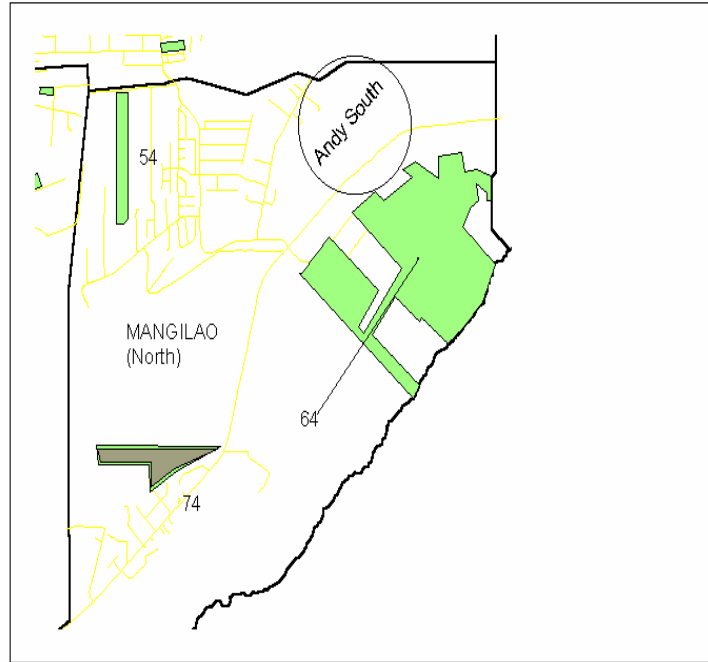


Figure 6-19 – Year 2015 & 2020 Potential Developments (Piti)

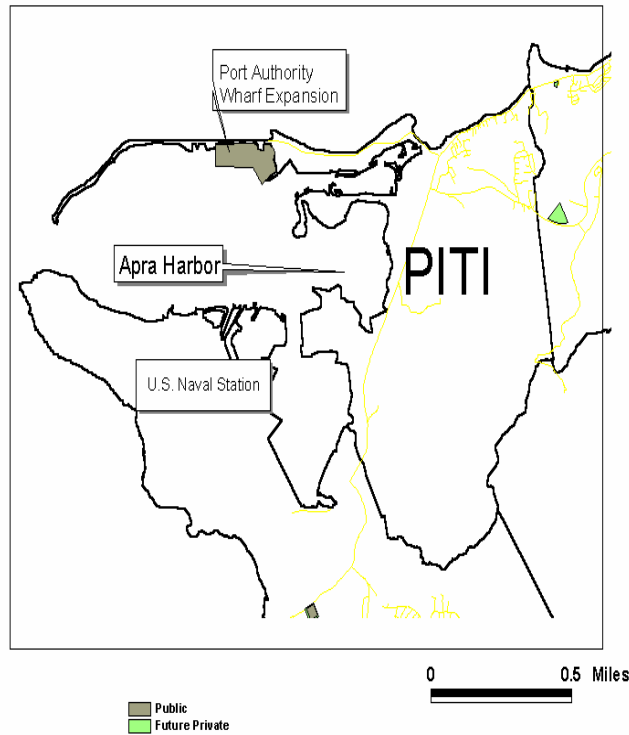
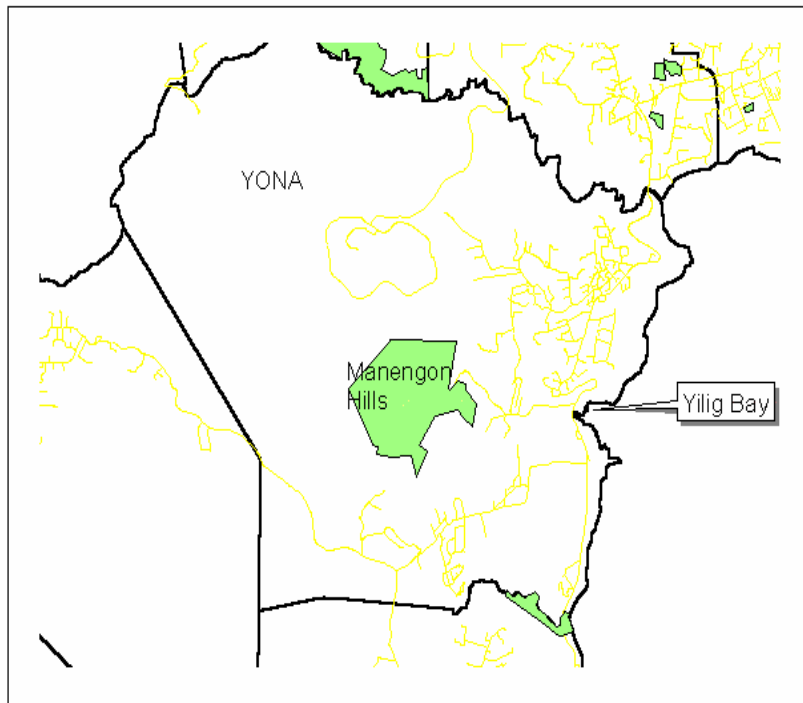


Figure 6-20 – Year 2015 & 2020 Potential Developments (Yona)

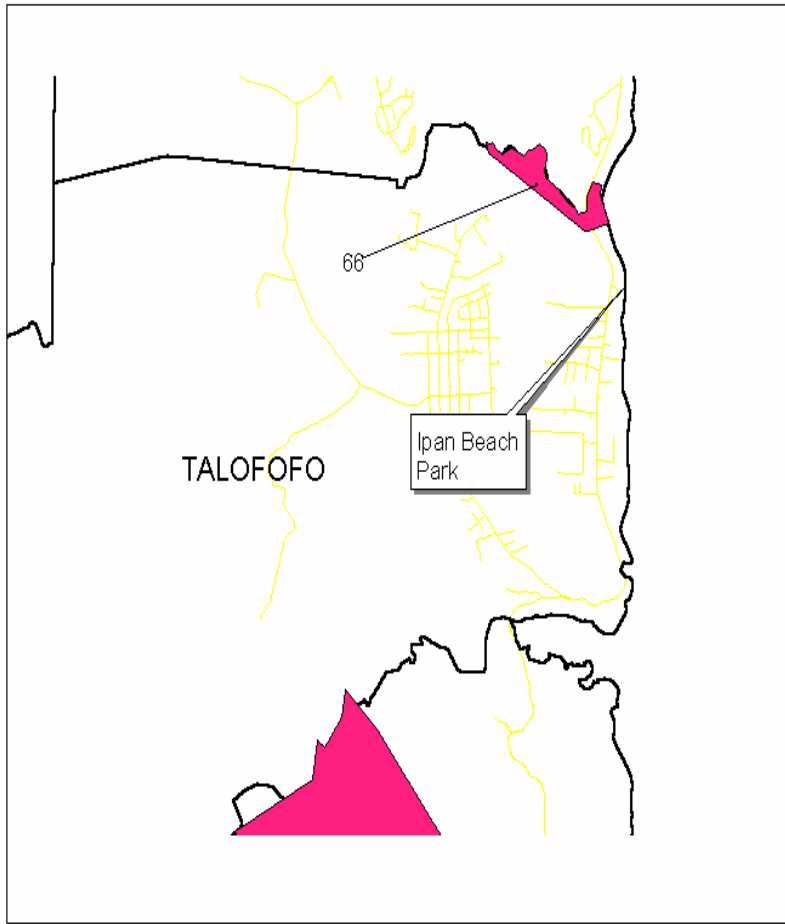


 Future Private

0 0.6 Miles



Figure 6-21 – Year 2015 & 2020 Potential Developments (Talofofo)



Year 2015/2020 Developments

0.8 0 0.8 Miles

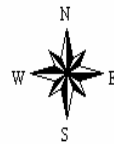
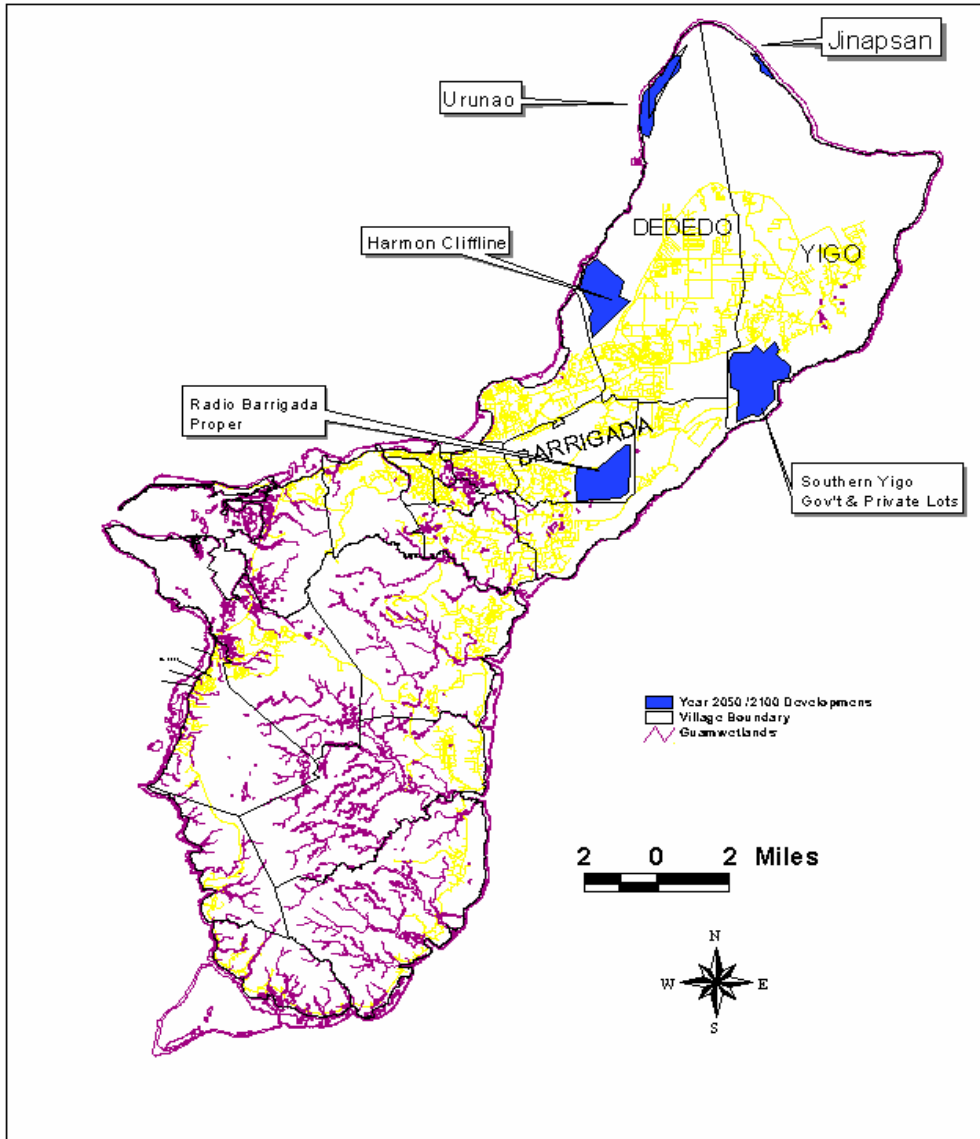


Figure 6-22 – Year 2050 & 2100 Potential Developable Lands



6.5 Future Population Distribution

This section covers the geographic distribution of growth anticipated to occur for years 2005, 2010, 2015, 2020, 2050 and 2100. The distribution area detail is by the census tract block group system, chosen for its suitability in providing area specific data. The population distribution data are essentially an adjustment of the block group projection based on zoning and future proposed development projects in the private, public, and military sectors.

Resident population was extracted from 2000 Census of Population. Hotel population was compiled from a variety of sources, including GVB data, telephone listings, on-line research, and on-site visits to the various hotel properties. Private sector employment data by village was obtained from the 2002 Economic Census, while federal and Government of Guam employment data were added to create employment estimates by village. Large establishments were geo-coded based on their actual geographic locations. The remaining establishments in the villages were allocated based on commercial and industrial zoning designations. Population growth capacity was developed based on zoning standards (Title 21 GCA) and the actual densities of areas that are fully developed.

6.6 Findings

Because Guam has a relatively low population density, there is room for growth in most areas without reaching the population capacity provided in the population growth in Exhibit 6B, Population Growth Table. Hotel employment capacity is not seen as a constraint for growth during the forecast period except for Tumon. It appears that by Year 2020 growth will occur in areas other than Tumon. Comments provided by various Government of Guam agencies downplayed the importance of Tiyan as an economic development zone due to return of excess lands to original landowners. Military sector officials provided personnel data but lacked site-specific housing facilities information. Year 2010 military projections can be incorporated into the water modeling hydraulic analysis once site-specific housing locations are identified (see Exhibit 6C, Population Projection).

6.7 Recommendations

It is highly recommended that this report be updated periodically to reflect population and land use changes as they occur; and ensure consistency with the goals and objectives of the Guam land use master plan as it is updated.

Exhibit 6A – Population Projection

Demographic Indicators: 2000 and 2025

	2000	2025
Births per 1,000 population.....	24	15
Deaths per 1,000 population.....	4	6
Rate of natural increase (percent).....	2.0	0.9
Annual rate of growth (percent).....	2.0	0.9
Life expectancy at birth (years).....	76.9	81.4
Infant deaths per 1,000 live births.....	6	5
Total fertility rate (per woman).....	3.1	2.1

Midyear Population Estimates and Average Annual Period Growth Rates:

Growth						Timeline:major population events.
Year	Population	Year	Population	Period	Rate	
1950	59,900	1995	144,190	1950-1960	1.1	1.1
1960	66,900	1996	145,324	1960-1970	2.6	2.6
1970	86,470	1997	146,799	1970-1980	2.1	2.1
1980	106,869	1998	149,724	1980-1990	2.3	2.3
1990	134,125	1999	152,590	1990-2000	1.5	1.5 1.92
2000	155,324	2010	180,692	2000-2010	1.5	1.5
2001	158,330	2020	203,216	2010-2020	1.2	1.2
2002	161,057	2030	222,166	2020-2030	0.9	0.9
2003	163,593	2040	235,135	2030-2040	0.6	0.6
2004	166,090	2050	242,692	2040-2050	0.3	0.3 0.9

Midyear Population, by Age and Sex: 2000 and 2025

AGE	-----2000-----			-----2025-----		
	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE
TOTAL	155,324	79,423	75,901	213,329	107,552	105,777
0-4	16,863	8,848	8,015	16,191	8,325	7,866
5-9	16,127	8,300	7,827	16,194	8,327	7,867
10-14	14,360	7,268	7,092	16,148	8,298	7,850
15-19	12,453	6,303	6,150	15,982	8,206	7,776
20-24	11,951	6,100	5,851	16,468	8,434	8,034
25-29	12,790	6,502	6,288	16,655	8,685	7,970
30-34	12,895	6,734	6,161	15,866	8,091	7,775
35-39	12,767	6,687	6,080	14,047	7,024	7,023
40-44	10,502	5,411	5,091	12,108	6,034	6,074
45-49	9,072	4,628	4,444	11,540	5,801	5,739
50-54	7,609	3,861	3,748	12,175	6,077	6,098
55-59	5,041	2,571	2,470	11,992	6,124	5,868
60-64	4,576	2,218	2,358	11,411	5,784	5,627
65-69	3,426	1,634	1,792	8,867	4,348	4,519
70-74	2,476	1,290	1,186	6,979	3,301	3,678
75-79	1,421	700	721	5,073	2,287	2,786
80+	995	368	627	5,633	2,406	3,227

Source: U.S. Census Bureau, International Data Base, March 2004 version.

Exhibit 6A – Population Projection (continued)

Regression analysis

0.978 r²
0.989 r
6322.851 std. error of estimate
6 observations
1 predictor
variable
Y dependent variable

variables	coefficients	std. error	t (df=4)	p-value	confidence interval	
					95% lower	95% upper
intercept	a = - 3,843,853.85 71					
X1	b = 1,997.6971	151.1450	13.22	.0002	1,578.0504	2,417.3439

ANOVA
table

Source	SS	df	MS	F	p-value
Regression	6,983,889,280.5 143	1	6,983,889,280.5 143	174.69	.0002
Residual	159,913,757.485 7	4	39,978,439.3714		
Total	7,143,803,038.0 000	5			

	Y'	Residual
1	51,655.571	8,244.4286
2	71,632.543	-4,732.5429
3	91,609.514	-5,139.5143
4	111,586.486	-4,717.4857
5	131,563.457	2,561.5429
6	151,540.429	3,783.5714

Predicted values	Predicted	95% Confidence Interval		95% Prediction Interval	
		lower	upper	lower	upper
1,950.00	Y				
2,010.00	171,517	155,175	187,860	147,533	195,502
2,020.00	191,494	171,296	211,693	164,733	218,255
2,030.00	211,471	187,304	235,639	181,601	241,342
2,040.00	231,448	203,245	259,651	198,228	264,669
2,050.00	251,425	219,146	283,704	214,681	288,169
2,060.00	271,402	235,019	307,785	231,006	311,799
2,070.00	291,379	250,874	331,885	247,233	335,525
2,080.00	311,356	266,714	355,998	263,387	359,326
2,090.00	331,333	282,545	380,122	279,482	383,184
3,000.00	2,149,238	1,719,040	2,579,435	1,718,6	2,579,793
				82	
3,010.00	2,169,215	1,734,821	2,603,608	1,734,4	2,603,963
				66	

Exhibit 6A – Population Projection (continued)

Regression analysis

0.992 r²
 0.996 r
 1.921 std. error of estimate
 6 observations
 1 predictor
 variable
 Y dependent variable

variables	coefficients	std. error	t (df=4)	p-value	confidence interval	
					95% lower	95% upper
intercept	a = 1,411.4035					
X1	b = 49.13793641	2.26634440	21.68	2.68E-05	42.84554257	55.43033025

ANOVA
 table

Source	SS	df	MS	F	p-value
Regression	1,735.2349	1	1,735.2349	470.09	2.68E-05
Residual	14.7651	4	3.6913		
Total	1,750.0000	5			

	Y'	Residual
1	1,951.942	-1.9420
2	1,957.373	2.6272
3	1,969.982	0.0184
4	1,980.389	-0.3893
5	1,991.552	-1.5519
6	1,998.762	1.2376

Predicted values Predicted	Y	95% Confidence Interval		95% Prediction Interval	
		lower	upper	lower	upper
11.0004317 8					

Regression analysis

0.992 r²
 0.996 r
 1.921 std. error of estimate
 6 observations
 1 predictor
 variable
 Y dependent variable

variables	coefficients	std. error	t (df=4)	p-value	confidence interval	
					95% lower	95% upper
intercept	a = 1,411.4035					
X1	b = 49.13793641	2.26634440	21.68	2.68E-05	42.84554257	55.43033025

ANOVA
 table

Source	SS	df	MS	F	p-value
Regression	1,735.2349	1	1,735.2349	470.09	2.68E-05
Residual	14.7651	4	3.6913		
Total	1,750.0000	5			

Exhibit 6A – Population Projection (continued)

	<u>Y'</u>	<u>Residual</u>
1	1,951.942	-1.9420
2	1,957.373	2.6272
3	1,969.982	0.0184
4	1,980.389	-0.3893
5	1,991.552	-1.5519
6	1,998.762	1.2376

<i>Predicted values</i>					
	<i>Predicted</i>	<i>95% Confidence Interval</i>		<i>95% Prediction Interval</i>	
	Y	<i>lower</i>	<i>upper</i>	<i>lower</i>	<i>upper</i>
11.0004317					
8					

Regression analysis

0.992 r²
0.996 r
0.039 std. error of estimate
6 observations
1 predictor
variable
Y dependent variable

<i>variables</i>	<i>coefficients</i>	<i>std. error</i>	<i>t</i>	<i>p-value</i>	<i>confidence interval</i>	
					<i>95% lower</i>	<i>95% upper</i>
intercept	a = -28.3842					
X1	b = 0.0202	0.0009	21.68	2.68E-05	0.0176	0.0228

ANOVA table

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>
Regression	0.7126	1	0.7126	470.09	2.68E-05
Residual	0.0061	4	0.0015		
Total	0.7187	5			

	<u>Y'</u>	<u>Residual</u>
1	10.965	0.0352
2	11.167	-0.0560
3	11.369	-0.0012
4	11.571	0.0088
5	11.772	0.0342
6	11.974	-0.0209

<i>Predicted values</i>						
	<i>Predicted</i>	<i>95% Confidence Interval</i>		<i>95% Prediction Interval</i>		
	Y	<i>lower</i>	<i>upper</i>	<i>lower</i>	<i>upper</i>	
1,950.00						
2,010.00	12.1760	12.0753	12.2766	12.0283	12.3236	194,065.9429
2,020.00	12.3777	12.2534	12.5021	12.2130	12.5425	237,457.7516
2,030.00	12.5795	12.4307	12.7284	12.3956	12.7635	290,551.6698
2,040.00	12.7813	12.6077	12.9550	12.5768	12.9859	355,517.0227
2,050.00	12.9831	12.7844	13.1819	12.7569	13.2094	435,008.1811
2,060.00	13.1849	12.9609	13.4089	12.9362	13.4337	532,273.0153
2,070.00	13.3867	13.1373	13.6361	13.1149	13.6585	651,285.5966
2,080.00	13.5885	13.3136	13.8634	13.2931	13.8839	796,908.5718
2,090.00	13.7903	13.4899	14.0907	13.4710	14.1096	975,091.8415
3,000.00	32.1533	29.5043	34.8024	29.5021	34.8046	92,048,083,836,674.200
3,010.00	32.3551	29.6803	35.0300	29.6781	35.0322	112,629,401,605,358.00

Vol I Chapter 6
Population & Land Use Forecast

Exhibit 6A – Population Projection (continued)

Regression analysis

0.992 r^2
 0.996 r
 0.039 std. error of estimate
 6 observations
 1 predictor
 1 variable
 Y dependent variable

variables	coefficients	std. error	t (df=4)	p-value	confidence interval	
					95% lower	95% upper
intercept	a = -28.3842					
X1	b = 0.0202	0.0009	21.68	2.68E-05	0.0176	0.0228

ANOVA
 table

Source	SS	df	MS	F	p-value
Regression	0.7126	1	0.7126	470.09	2.68E-05
Residual	0.0061	4	0.0015		
Total	0.7187	5			

	Y'	Residual
1	10.965	0.0352
2	11.167	-0.0560
3	11.369	-0.0012
4	11.571	0.0088
5	11.772	0.0342
6	11.974	-0.0209

1,950.00	Predicted values					
	Predicted Y	95% Confidence Interval		95% Prediction Interval		
		lower	upper	lower	upper	
2,010.00	12.1760	12.0753	12.2766	12.0283	12.3236	
2,020.00	12.3777	12.2534	12.5021	12.2130	12.5425	
2,030.00	12.5795	12.4307	12.7284	12.3956	12.7635	
2,040.00	12.7813	12.6077	12.9550	12.5768	12.9859	
2,050.00	12.9831	12.7844	13.1819	12.7569	13.2094	
2,060.00	13.1849	12.9609	13.4089	12.9362	13.4337	
2,070.00	13.3867	13.1373	13.6361	13.1149	13.6585	
2,080.00	13.5885	13.3136	13.8634	13.2931	13.8839	
2,090.00	13.7903	13.4899	14.0907	13.4710	14.1096	
3,000.00	32.1533	29.5043	34.8024	29.5021	34.8046	
3,010.00	32.3551	29.6803	35.0300	29.6781	35.0322	

Exhibit 6A – Population Projection (continued)

Regression analysis

0.992 r²
0.996 r
0.039 std. error of estimate
6 observations
1 predictor
variable
Y dependent variable

variables	coefficients	std. error	t (df=4)	p-value	confidence interval	
					95% lower	95% upper
intercept	a = -28.3842					
X1	b = 0.0202	0.0009	21.68	2.68E-05	0.0176	0.0228

ANOVA
table

Source	SS	df	MS	F	p-value
Regression	0.7126	1	0.7126	470.09	2.68E-05
Residual	0.0061	4	0.0015		
Total	0.7187	5			

1,950.00	Predicted values		95% Confidence Interval		95% Prediction Interval			
	Predicted	Y	lower	upper	lower	upper		
2,010.00	12.1760		12.0753	12.2766	12.0283	12.3236	194,066	175,487
2,020.00	12.3777		12.2534	12.5021	12.2130	12.5425	237,458	209,687
2,030.00	12.5795		12.4307	12.7284	12.3956	12.7635	290,552	250,376
2,040.00	12.7813		12.6077	12.9550	12.5768	12.9859	355,517	298,840
2,050.00	12.9831		12.7844	13.1819	12.7569	13.2094	435,008	356,595
2,060.00	13.1849		12.9609	13.4089	12.9362	13.4337	532,273	425,439
2,070.00	13.3867		13.1373	13.6361	13.1149	13.6585	651,286	507,516
2,080.00	13.5885		13.3136	13.8634	13.2931	13.8839	796,909	605,375
2,090.00	13.7903		13.4899	14.0907	13.4710	14.1096	975,092	722,058
3,000.00	32.1533		29.5043	34.8024	29.5021	34.8046	92,048,083,836,674	6,509,637,564,379
3,010.00	32.3551		29.6803	35.0300	29.6781	35.0322	112,629,401,605,358	7,761,987,762,540

Exhibit 6B – Population Growth Table

DOD Facility	Tract	Location	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL Growth	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP
Andersen	950100	Yigo	1	558	277	50%	601	732	771	1314	1382	1511	0	0	0	0	0	0	0	1.27	0	19,275	38550	0
Andersen	950100	Yigo	2	361	345	96%	389	419	445	972	1016	1100	1,086	1,170	1,260	1,338	1,420	1,554	1,805	1.27	0	2,785	3639	0
Andersen	950100	Yigo	3	696	189	27%	750	808	857	1434	1520	1,681	0	0	0	0	0	0	0	1.27	0	7,931	9451	0
Andersen	950100	Yigo	4	624	145	23%	672	724	769	816	893	1,037	0	0	0	0	0	0	0	1.27	0	1,036	1091	0
Andersen	950100	Yigo	5	627	167	27%	627	627	627	627	627	627	82	88	95	101	107	117	136	1.27	0	304	608	0
Andersen	950200	Yigo	1	78	16	21%	84	91	96	102	112	130	0	0	0	0	0	0	0	1.27	0	595	1190	0
Andersen	950200	Yigo	2	336	102	30%	362	390	414	439	481	558	0	0	0	0	0	0	0	1.27	0	32,081	64162	0
Andersen	950200	Yigo	3	488	122	25%	526	566	601	638	698	811	0	0	0	0	0	0	0	1.27	0	3,000	4139	0
Andersen	950200	Yigo	4	710	207	29%	710	710	710	710	710	710	0	0	0	0	0	0	0	1.27	0	477	955	0
Andy South	951200	Dededo	1	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	10,067	10884	0
Andy South	951300	Mangilao	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	220	440	0
Andy South	951300	Mangilao	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	1,204	1688	0
Andy South	955500	Yigo	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	6,958	7296	0
Andy South	955500	Yigo	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	1,504	3008	0
Army Natn'l	951600	Barrigada	1	0	0	0	0	0	0	0	0	0	66	71	77	81	86	94	110	1.27	0	8,030	15711	0
Army Natn'l	951600	Barrigada	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	1,724	3447	0
Naval Magazine	954100	Santa Rita	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	21,496	42992	0
Naval Magazine	954900	Santa Rita	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	22,535	30780	0
Naval Magazine	955000	Talofofo	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	8,940	13461	0
Naval Station	954500	Santa Rita	1	199	99	0	214	231	245	260	285	331	1,954	2,105	2,268	2,407	2,555	2,795	3,247	1.27	0	5,087	10174	0
Naval Station	954500	Santa Rita	2	881	308	0	949	1,022	1,085	1,152	1,260	1,464	0	0	0	0	0	0	0	1.27	0	5,358	10716	0
Naval Station	954500	Santa Rita	3	1,356	391	0	2,361	1,574	1,670	1,773	1,940	2,253	0	0	0	0	0	0	0	1.27	297	2,916	5833	600
Naval Station	954500	Santa Rita	4	331	331	0	357	384	408	433	474	550	522	562	606	643	683	747	867	1.27	0	2,753	5506	0
NCTAMS	950300	Dededo	1	10	10	100%	11	12	12	13	14	17	0	0	0	0	0	0	0	1.27	0	16,932	33864	0
NCTAMS	950300	Dededo	2	0	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	2,827	31589	0
NCTAMS	950300	Dededo	3	213	58	27%	229	247	262	279	305	354	0	0	0	0	0	0	0	1.27	0	4,655	9309	0
NCTAMS	950300	Dededo	4	247	176	71%	266	287	304	323	353	410	0	0	0	0	0	0	0	1.27	0	6,477	12953	0
NCTAMS	950300	Dededo	5	7	0	0%	8	8	9	9	10	12	0	0	0	0	0	0	0	1.27	0	4,410	8820	0
NCTAMS	950300	Dededo	6	513	92	18%	553	595	632	671	734	852	0	0	0	0	0	0	0	1.27	0	3,002	6004	0
NCTAMS	950300	Dededo	7	588	117	20%	588	588	588	588	588	588	0	0	0	0	0	0	0	1.27	0	221	442	1280
NCTAMS	950300	Dededo	8	128	19	15%	138	149	158	167	183	213	0	0	0	0	0	0	0	1.27	0	422	843	0
NCTAMS	950300	Dededo	9	53	0	0%	57	62	65	69	76	88	0	0	0	0	0	0	0	1.27	0	7,470	12389	0
Nimitz Hill Annex	953800	Asan	1	44	9	0	47	51	54	58	63	73	323	348	375	398	422	462	537	1.27	0	4,471	8032	0
TOTALS				9048	3180	35%	10499	10277	10782	12847	13724	15370	4033	4344.714	4680.604	4968.089	5273.342	5769.322	6701.598	41.93787	297	217160.2	409965.4	1880
	950400	Dededo	1	4,180			4,503	4,851	5,149	5,466	6,556	7,522	0	0	0	0	0	0	0	1.27	0	16,155	16649	0
	950400	Dededo	2	963			1,037	1,118	1,186	1,259	1,378	1,600	81	87	94	100	106	116	135	1.27	146	1,282	1413	300
	950400	Dededo	3	1,993			1,993	1,993	1,993	1,993	1,993	1,993	0	0	0	0	0	0	0	1.27	0	1,165	1300	0
	950400	Dededo	4	1,944			2,094	2,256	2,395	2,542	2,781	3,230	0	0	0	0	0	0	0	1.27	0	2,122	2304	0
	950500	Yigo	1	1,006			1,084	1,168	1,239	1,315	1,439	1,672	0	0	0	0	0	0	0	1.27	0	4,245	4630	0
	950500	Yigo	2	873			940	1,797	1,859	1,926	2,033	2,235	0	0	0	0	0	0	0	1.27	0	12,065	13761	0
	950500	Yigo	3	1,263			1,361	1,466	1,556	1,651	2,215	2,507	0	0	0	0	0	0	0	1.27	0	6,788	7177	0
	950500	Yigo	4	2,717			2,927	3,153	3,347	3,553	3,887	4,515	243	262	283	300	318	348	405	1.27	0	4,801	5051	0
	950500	Yigo	5	1,126			1,213	1,307	1,387	1,472	1,611	1,871	217	234	252	267	284	310	361	1.27	0	1,217	1324	0
	950600	Yigo	1	1,183			1,274	1,729	1,813	1,903	2,048	2,322	0	0	0	0	0	0	0	1.27	0	33,798	33545	0
	950600	Yigo	2	2,092			2,254	2,428	2,577	2,735	2,993	3,476	0	0	0	0	0	0	0	1.27	0	8,878	9976	0
	950600	Yigo	3	437			538	571	625	679	726	726	0	0	0	0	0	0	0	1.27	0	1,652	3063	0
	950600	Yigo	4	1,468			1,581	1,704	1,808	1,920	2,100	2,439	202	217	234	249	264	289	335	1.27	0	5,014	6112	0
	950600	Yigo	5	2,227			2,399	2,585	2,743	2,912	3,186	3,700	352	379	408	433	460	503	584	1.27	0	5,412	5845	0
	950600	Yigo	6	604			651	701	744	790	864	1,004	27	29	31	33	35	39	45	1.27	0	3,742	3743	0
	950700	Dededo	1	2,113			2,276	2,452	2,603	2,763	3,023	3,511	0	0	0	0	0	0	0	1.27	0	15,094	16698	0
	950700	Dededo	2	943			1,016	1,094	1,162	1,233	1,349	1,567	0	0	0	0	0	0	0	1.27	0	4,321	4682	0
	950700	Dededo	3	546			546	546	546	546	546	546	0	0	0	0	0	0	0	1.27	0	215	240	0
	950700	Dededo	4	1,429			1,539	2,442	2,544	2,653	2,828	3,159	0	0	0	0	0	0	0	1.27	0	2,045	2169	0
	950700	Dededo	5	655			706	760	807	856	937	1,088	0	0	0	0	0	0	0	1.27	0	4,557	4775	0
	950700	Dededo	6	567			567	567	567	567	567	567	0	0	0	0	0	0	0	1.27	0	349	389	0
	950700	Dededo	7	479			479	479	479	479	479	479	0	0	0	0	0	0	0	1.27	0	477	295	0
	950700	Dededo	8	1,022			1,022	1,022	1,022	1,022	1,022	1,022	92	99	107	113	120	132	153	1.27	0	210	420	0
	950700	Dededo	9	861			861	861	861	861	861	861	0	0	0	0	0	0	0	1.27	0	631	422	0
	950800	Dededo	1	2,007			2,162	2,329	2,472	2,624	2,871	3,335	0	0	0	0	0	0	0	1.27	0	6,530	7100	0

DOD Facility	Tract	Location	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL Growth	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP
	950800	Dededo	2	1,256			1,353	1,458	1,547	1,642	1,797	2,087	0	0	0	0	0	0	0	1.27	0	1,398	1576	0
	950800	Dededo	3	1,139			1,227	1,322	1,403	1,489	1,629	1,893	0	0	0	0	0	0	0	1.27	0	7,218	8136	0
	950800	Dededo	4	1,414			1,523	1,641	1,742	1,849	2,023	2,350	0	0	0	0	0	0	0	1.27	0	2,800	2281	0
	950800	Dededo	5	1,179			1,270	1,368	1,452	1,542	1,687	1,959	0	0	0	0	0	0	0	1.27	0	2,201	1831	0
	950800	Dededo	6	647			697	751	797	846	926	1,075	0	0	0	0	0	0	0	1.27	0	999	658	0
	950800	Dededo	7	654			705	759	806	855	936	1,087	125	135	145	154	163	179	208	1.27	0	2,302	1303	0
	950900	Dededo	1	880			880	880	880	880	880	880	1,777	1,914	2,062	2,189	2,323	2,542	2,952	1.27	0	654	2688	0
	950900	Dededo	2	721			721	721	721	721	721	721	0	0	0	0	0	0	0	1.27	0	628	357	0
	950900	Dededo	3	839			839	839	839	839	839	839	41	44	47	50	53	58	68	1.27	0	753	591	0
	950900	Dededo	4	1,391			1,591	1,391	1,391	1,391	1,391	1,391	0	0	0	0	0	0	0	1.27	0	1,284	738	0
	950900	Dededo	5	2,507			2,701	2,909	3,088	3,278	3,586	4,166	613	660	711	755	801	877	1,018	1.27	135	3,781	3137	270
	951000	Dededo	1	666			666	666	666	666	666	666	0	0	0	0	0	0	0	1.27	0	657	385	0
	951000	Dededo	1	492			492	492	492	492	492	492	0	0	0	0	0	0	0	1.27	0	411	251	0
	951000	Dededo	3	414			446	480	510	541	592	688	116	125	135	143	152	166	193	1.27	0	437	275	0
	951000	Dededo	4	463			463	463	463	463	463	463	41	44	47	50	53	58	68	1.27	0	373	311	0
	951000	Dededo	5	564			608	655	695	737	807	937	714	769	829	879	934	1,021	1,186	1.27	0	1,015	1005	0
	951100	Dededo	1	2,978			3,208	3,456	3,668	3,894	4,260	4,948	694	748	806	855	908	993	1,154	1.27	0	5,578	5261	0
	951100	Dededo	2	2,484			2,676	2,883	3,060	3,248	3,553	4,128	2,287	2,464	2,655	2,818	2,991	3,272	3,801	1.27	0	7,398	10415	0
	951100	Dededo	3	831			895	964	1,024	1,087	1,189	1,381	0	0	0	0	0	0	0	1.27	0	1,449	1509	0
	951300	Mangilao	3	15	0	0	16	17	18	20	21	25	0	0	0	0	0	0	0	1.27	0	962	1153	0
	951400	Mangilao	1	1,832			1,974	2,126	2,257	2,395	2,621	3,044	0	0	0	0	0	0	0	1.27	0	4,175	3869	0
	951400	Mangilao	2	1,201			1,294	1,394	1,479	1,570	1,718	1,996	0	0	0	0	0	0	0	1.27	0	2,586	1031	0
	951400	Mangilao	3	914			985	1,061	1,126	1,195	1,307	1,519	0	0	0	0	0	0	0	1.27	0	5,092	3943	0
	951400	Mangilao	4	1,516			1,633	1,759	1,868	1,982	2,169	2,519	0	0	0	0	0	0	0	1.27	0	18,131	19052	0
	951500	Mangilao	1	29			31	34	36	38	41	48	0	0	0	0	0	0	0	1.27	0	2,779	5559	0
	951700	Barrigada	1	1,114			1,200	1,293	1,372	1,457	1,594	1,851	0	0	0	0	0	0	0	1.27	0	4,484	4698	0
	951700	Barrigada	2	590			636	685	727	771	844	980	0	0	0	0	0	0	0	1.27	0	1,633	505	0
	951700	Barrigada	3	515			555	598	634	673	737	856	0	0	0	0	0	0	0	1.27	0	2,446	1762	0
	951800	Barrigada	1	12			13	14	15	16	17	20	1,936	2,085	2,246	2,384	2,531	2,769	3,216	1.27	0	7,488	23601	0
	951800	Barrigada	2	7			8	8	9	9	10	12	184	198	214	227	241	263	306	1.27	0	283	566	0
	951800	Barrigada	3	0			0	0	0	0	0	0	337	363	391	415	441	482	560	1.27	0	264	528	0
	951900	Tamuning	1	68			73	79	84	89	97	113	294	317	341	362	384	421	489	1.27	1890	3,239	4618	300
	951900	Tamuning	2	375			404	435	462	490	536	623	6,825	7,353	7,921	8,408	8,925	9,764	11,342	1.27	10985	2,402	23564	16000
	951900	Tamuning	3	792			792	792	792	792	792	792	1,868	2,013	2,168	2,302	2,443	2,673	3,105	1.27	515	683	9281	1000
	951900	Tamuning	4	1,920			2,068	2,228	2,365	2,511	2,895	3,338	585	630	679	721	765	837	972	1.27	290	3,261	2776	600
	951900	Tamuning	5	878			946	1,019	1,082	1,148	1,256	1,459	741	798	860	912	968	1,059	1,231	1.27	0	2,249	1768	0
	951900	Tamuning	6	1,086			1,145	1,086	1,086	1,086	1,086	1,086	104	112	121	128	136	149	173	1.27	0	1,009	1163	0
	951900	Tamuning	7	1,236			1,236	1,236	1,236	1,236	1,236	1,236	8,431	9,082	9,784	10,385	11,024	12,060	14,009	1.27	290	998	44757	600
	951900	Tamuning	8	280			280	280	280	280	280	280	142	153	165	175	186	203	236	1.27	0	94	1193	0
	951900	Tamuning	9	544			544	544	544	544	544	544	936	1,008	1,086	1,153	1,223	1,338	1,555	1.27	1215	435	5494	2500
	952000	Tamuning	1	852			918	989	1,050	1,114	1,219	1,416	1,381	1,487	1,602	1,701	1,805	1,975	2,294	1.27	0	4,617	4000	0
	952000	Tamuning	2	479			516	556	590	626	685	796	0	0	0	0	0	0	0	1.27	0	1,397	704	0
	952000	Tamuning	3	450			485	634	666	700	756	860	9	10	11	12	12	14	16	1.27	0	620	416	0
	952100	Tamuning	1	435			469	505	536	569	622	723	222	240	258	274	291	318	370	1.27	927	790	634	1800
	952100	Tamuning	2	267			288	310	329	349	382	444	47	51	55	58	62	68	79	1.27	0	840	605	0
	952100	Tamuning	3	354			381	411	436	463	526	608	352	380	409	434	461	504	585	1.27	310	1,103	2336	600
	952200	Tamuning	1	894			894	894	894	894	894	894	140	150	162	172	183	200	232	1.27	45	592	1254	100
	952200	Tamuning	2	1,087			1,171	1,262	1,339	1,421	1,555	1,806	376	405	436	463	492	538	625	1.27	1276	1,633	616	2500
	952200	Tamuning	3	829			829	829	829	829	829	829	0	0	0	0	0	0	0	1.27	0	774	218	0
	952200	Tamuning	4	1,075			1,158	1,248	1,324	1,406	1,538	1,786	1,349	1,454	1,566	1,662	1,764	1,930	2,242	1.27	0	1,893	5515	0
	952300	Tamuning	1	874			942	1,014	1,077	1,143	1,250	1,452	412	444	478	507	539	589	685	1.27	365	4,615	3274	840
	952300	Tamuning	2	1,235			1,330	1,577	1,665	1,759	1,911	2,196	276	298	321	340	361	395	459	1.27	146	3,842	2309	300
	952300	Tamuning	3	586			586	586	586	586	586	586	958	1,032	1,112	1,180	1,253	1,370	1,592	1.27	108	486	6272	200
	952400	Tamuning	1	899			968	1,043	1,107	1,176	1,286	1,494	1,422	1,532	1,650	1,752	1,859	2,034	2,363	1.27	90	941	9302	180
	952400	Tamuning	2	517			557	600	637	676	740	859	737	794	855	907	963	1,054	1,224	1.27	194	1,223	6020	400
	952500	Mongmong	1	0			0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	868	1737	0
	952600	Mongmong	1	459			494	533	565	600	657	763	0	0	0	0	0	0	0	1.27	0	975	269	0
	952600	Mongmong	2	478			515	555	589	625	684	794	443	477	514	546	579	634	736	1.27	68	1,579	1694	140
	952600	Mongmong	3	1,107			1,193	1,285	1,364	1,447	1,584	1,839	58	62	67	71	76	83	96	1.27	0	4,661	2723	0
	952700	Barrigada	1	421			421	421	421	421	421	421	62	67	72	77	81	89	103	1.27	0	297	1239	0
	952700	Barrigada	2	597			643	693	735	781	854	992	53	57	61	65	69	75	87	1.27	0	805	1326	0
	952700	Barrigada	3	1,211			1,305	1,405	1,492	1,583	1,732	2,012	0	0	0	0	0	0	0	1.27				

DOD Facility	Tract	Location	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL Growth	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP
	953100	Ordot	1	208			224	241	256	272	298	346	0	0	0	0	0	0	0	1.27	0	4,183	4315	0
	953100	Ordot	2	1,951			2,102	2,264	2,403	2,551	2,791	3,242	12	13	14	15	16	17	20	1.27	0	4,444	4588	0
	953100	Ordot	3	1,098			1,183	1,434	1,513	1,596	1,731	1,984	245	264	284	302	320	351	407	1.27	0	12,293	11421	0
	953100	Ordot	4	545			587	964	1003	1045	1045	1238	104	112	120	128	135	148	172	1.27	0	2,917	2998	0
	953100	Ordot	5	185			199	215	228	242	265	307	30	33	35	37	40	44	51	1.27	0	8,691	7636	0
	953100	Ordot	6	962			1,036	1,116	1,185	1,258	1,376	1,599	0	0	0	0	0	0	0	1.27	0	4,240	3820	0
	953100	Ordot	7	974			1,049	1,130	1,200	1,274	2,009	2,234	43	46	50	53	56	61	71	1.27	0	4,741	4276	0
	953200	Sinajana	1	752			810	873	926	983	1,076	1,250	74	80	86	92	97	106	124	1.27	0	3,391	4228	0
	953200	Sinajana	2	286			308	332	352	374	409	475	99	107	115	122	130	142	165	1.27	0	1,181	628	0
	953200	Sinajana	3	774			834	898	953	1,012	1,107	1,286	0	0	0	0	0	0	0	1.27	0	1,225	600	0
	953200	Sinajana	4	1,041			1,121	1,208	1,282	1,361	1,489	1,730	47	51	55	58	62	68	79	1.27	0	1,237	1310	0
	953300	Mongmong	1	494			532	573	609	646	707	821	53	57	62	65	69	76	88	1.27	176	1,815	850	300
	953300	Mongmong	2	969			1,044	1,125	1,194	1,267	1,386	1,610	107	115	124	132	140	153	178	1.27	0	2,085	2320	0
	953300	Mongmong	3	945			1,018	1,097	1,164	1,236	1,352	1,570	57	61	66	70	74	81	94	1.27	0	4,182	3850	0
	953300	Mongmong	4	779			839	904	960	1,019	1,114	1,294	153	165	178	189	200	219	255	1.27	0	2,492	2508	0
	953300	Mongmong	5	614			661	713	756	803	878	1,020	47	50	54	57	61	67	78	1.27	0	1,084	873	0
	953400	Agana/Tamu	1	572			616	664	705	748	818	950	2,785	3,000	3,232	3,431	3,641	3,984	4,628	1.27	180	2,109	14907	360
	953400	Agana/Tamu	2	528			569	613	650	690	755	877	6,094	6,565	7,073	7,507	7,968	8,718	10,126	1.27	0	1,921	5536	0
	953500	Agana Heights	1	208			224	241	256	272	298	346	0	0	0	0	0	0	0	1.27	0	1,049	1359	0
	953600	Agana Heights	1	840			905	975	1,035	1,098	1,202	1,396	102	110	118	126	133	146	169	1.27	0	1,875	1466	0
	953600	Agana Heights	2	688			741	798	848	900	984	1,143	32	34	37	39	42	46	53	1.27	0	1,739	1178	0
	953600	Agana Heights	3	847			912	983	1,043	1,108	1,212	1,407	0	0	0	0	0	0	0	1.27	0	2,619	1889	0
	953600	Agana Heights	4	600			646	696	739	785	858	997	8	9	9	10	11	11	13	1.27	0	883	611	0
	953600	Agana Heights	5	757			816	879	933	990	1,083	1,258	0	0	0	0	0	0	0	1.27	0	1,305	850	0
	953700	Asan	1	950			1,023	1,103	1,170	1,242	1,359	1,579	154	166	179	190	201	220	256	1.27	0	5,383	5862	0
	953700	Asan	2	1,002			1,079	1,163	1,234	1,310	1,433	1,665	0	0	0	0	0	0	0	1.27	0	2,269	4538	0
	953700	Asan	3	94			101	109	1556	1563	1574	6191	0	0	0	0	0	0	0	1.27	0	13,669	18148	0
	953900	Yona	1	1,060			1,142	1,230	1,306	1,386	1,516	1,761	72	78	84	89	94	103	120	1.27	0	5,241	4682	0
	953900	Yona	2	552			595	641	680	722	790	917	320	344	371	394	418	457	531	1.27	0	64,290	78155	0
	953900	Yona	3	944			1,017	1,096	1,163	1,234	1,350	1,569	0	0	0	0	0	0	0	1.27	0	4,379	4708	0
	953900	Yona	4	1,138			1,226	1,321	1,402	1,488	1,628	1,891	23	25	27	29	30	33	39	1.27	0	1,255	1190	0
	953900	Yona	5	681			734	790	839	890	974	1,132	23	25	27	29	30	33	39	1.27	0	9,672	6444	0
	954000	Yona	1	119			128	138	147	156	170	198	0	0	0	0	0	0	0	1.27	0	8,149	8818	0
	954000	Yona	2	780			840	905	961	1,020	1,116	1,296	0	0	0	0	0	0	0	1.27	0	20,576	20723	0
	954000	Yona	3	4			4	5	5	5	6	7	0	0	0	0	0	0	0	1.27	0	3,377	5643	0
	954000	Yona	4	59			64	68	73	77	84	98	0	0	0	0	0	0	0	1.27	0	162	323	0
	954000	Yona	5	1,147			1,236	1,811	1,893	1,980	2,121	2,386	0	0	0	0	0	0	0	1.27	0	6,771	2671	0
	954200	Santa Rita	1	1,296			1,396	1,504	1,596	1,695	1,854	2,154	0	0	0	0	0	0	0	1.27	0	9,472	48633	0
	954200	Santa Rita	2	1,652			1,780	1,917	2,035	2,160	2,363	2,745	171	184	198	211	224	245	284	1.27	0	2,404	7947	0
	954200	Santa Rita	3	614			661	713	756	803	878	1,020	0	0	0	0	0	0	0	1.27	0	1,450	935	0
	954200	Santa Rita	4	591			637	686	728	773	845	982	0	0	0	0	0	0	0	1.27	0	1,968	1842	0
	954300	Piti	1	822			886	954	1,013	1,075	1,176	1,366	0	0	0	0	0	0	0	1.27	0	6,683	4347	0
	954300	Piti	2	222			239	258	273	290	318	369	0	0	0	0	0	0	0	1.27	0	1,193	1007	0
	954300	Piti	3	484			521	562	596	633	692	804	82	88	95	101	107	117	136	1.27	0	1,827	1515	0
	954400	Piti	1	72			78	84	89	94	103	120	411	443	477	506	537	588	683	1.27	0	12,249	23137	0
	954400	Piti	2	66			71	77	81	86	94	110	620	668	719	764	811	887	1,030	1.27	0	2,282	91264	0
	954600	Santa Rita	1	193			208	224	238	252	276	321	0	0	0	0	0	0	0	1.27	0	1,266	1431	0
	954600	Santa Rita	2	140			151	162	172	183	200	233	0	0	0	0	0	0	0	1.27	0	647	773	0
	954600	Santa Rita	3	247			266	287	304	323	353	410	14	15	16	17	18	20	23	1.27	0	1,675	3350	0
	954700	Agat	1	415			447	482	511	543	594	690	197	213	229	243	258	282	328	1.27	0	1,660	2005	0
	954700	Agat	2	803			865	932	989	1,050	1,149	1,334	163	176	189	201	213	234	271	1.27	0	2,521	2078	0
	954700	Agat	3	704			758	817	867	921	1,007	1,170	193	208	225	238	253	277	321	1.27	0	1,595	1440	0
	954700	Agat	4	770			830	894	949	1,007	1,101	1,279	30	33	35	37	40	43	50	1.27	0	798	727	0
	954800	Agat	1	1,711			1,843	1,986	2,108	2,237	2,448	2,843	0	0	0	0	0	0	0	1.27	0	3,723	4167	0
	954800	Agat	2	1,253			1,350	1,454	1,544	1,638	1,792	2,082	46	49	53	56	60	65	76	1.27	0	33,665	27915	0
	955100	Talofofo	1	845			910	981	1,041	1,105	1,209	1,404	51	55	59	63	67	73	85	1.27	0	8,334	7403	0
	955100	Talofofo	2	967			1,042	1,122	1,191	1,264	1,383	1,607	15	16	18	19	20	22	25	1.27	0	2,155	2075	0
	955100	Talofofo	3	667			719	774	822	872	954	1,108	0	0	0	0	0	0	0	1.27	0	6,958	7435	0
	955100	Talofofo	4	706			761	819	870	923	1,010	1,173	91	98	105	112	119	130	151	1.27	0	2,536	2073	0
	955100	Talofofo	5	30			32	35	37	39	43	50	0	0	0	0	0	0	0	1.27	0	58,140	80390	0
	955200	Inarajan	1	487			525	565	600	637	697	809	0	0	0	0	0	0	0	1.27	0	13,616	14992	0
	955200	Inarajan	2	1,879			2,024	2,181	2,315	2,457	2,688	3,122	22	24	26	27	29	31	37	1.27	90	86,334	91217	300
	955200	Inarajan	3	467			503	542	575	611	668	776	11	12	13	13	14	15	18	1.27	0	6,349	6473</	

Exhibit 6C – Population and Land Use Projection Correspondence



GUAM WATERWORKS AUTHORITY
Good Water Always
578 N. Marine Corps Drive, Tamuning, GU 96913-4111
Phone: (671) 647-2603 Fax: (671) 646-2335

September 27, 2005

MEMORANDUM

TO: Commander, U.S. Air Force

FROM: General Manager, Guam Waterworks Authority

SUBJECT: Guam Waterworks Authority Water Resources Master Plan – Population and Land Use Projection Report

Gentlemen:

We appreciate your review and comments provided on the subject report. Stated below in italics is our response to your input on the subject report. Note that our consultants have incorporated your comments where appropriate.

Statement changes have been requested concerning Air Force activities on pages 9, 19, and 21. The changes have been made as requested. The Department of Land Management provided Figures 1 and 2 presented in the report. They were prepared in the mid to late 1980's and are the best available zoning and land use maps.

We look forward to working with you as we progress in preparing a Water Resources Master Plan that addresses water demand and wastewater treatment needs for Guam as outlined in the stipulated order from the U.S. Environmental Agency. Note that the subject report satisfies only one component of the much larger and complex Water Resources Master Plan.

Si Yu'os Ma'ase.

David Craddick.

Exhibit 6C – Population and Land Use Projection Correspondence (continued)



GUAM WATERWORKS AUTHORITY
Good Water Always
578 N. Marine Corps Drive, Tamuning, GU 96913-4111
Phone: (671) 647-2603 Fax: (671) 646-2335

September 27, 2005

MEMORANDUM

TO: Director, Bureau of Statistics & Planning
FROM: General Manager, Guam Waterworks Authority
SUBJECT: Guam Waterworks Authority Water Resources Master Plan (WRMP) –
Population and Land Use Projection Report

Gentlemen:

We appreciate your review and comments provided on the subject report. Stated below in italics is our response to your input on the subject report. Note that our consultants have incorporated your comments where appropriate.

The carrying capacity of Guam's water supply is evaluated and discussed in the WRMP's Water Budget Report. Population projection scenarios were provided in the initial population projection report. The limiting factors for population block group is based on the average number of people per unit and the number of units within block groups which can be accommodated within existing zoning regulations.

The projections on military lands were prepared similarly to those on other areas. The employment projections assume a constant proportion of the population participating in the labor force with some adjustments in the geographic distribution areas consistent with development trends. Full header titles are included as footnotes in the report. A breakout of the Department of Defense block groups is provided in the report. There is merit regarding the comments on the limitations of long-term projection periods. Projections for the various time periods included were required to anticipate a visionary view of the future. While longer term projections are necessarily more speculative, they may be insightful for long term capital infrastructure scenarios. Tourists are included in the hotel population.

We look forward to working with you as we progress in preparing a Water Resources Master Plan that addresses water demand and wastewater treatment needs for Guam as outlined in the stipulated order from the U.S. Environmental Agency. Note that the subject report satisfies only one component of the much larger and complex Water Resources Master Plan.

Si Yu'os Ma'ase.

David Craddick.

Exhibit 6C – Population and Land Use Projection Correspondence (continued)



GUAM WATERWORKS AUTHORITY

Good Water Always

578 N. Marine Corps Drive, Tamuning, GU 96913-4111

Phone: (671) 647-2603 Fax: (671) 646-2335

September 27, 2005

MEMORANDUM

TO: Director, Guam Economic Development & Commerce Authority

FROM: General Manager, Guam Waterworks Authority

SUBJECT: Guam Waterworks Authority Water Resources Master Plan (WRMP) – Population and Land Use Projection Report

Gentlemen:

We appreciate your review and comments provided on the subject report. Stated below in italics is our response to your input on the subject report. Note that our consultants have incorporated your comments where appropriate.

On General Comments:

We have contacted the agency responsible for the Highway Master Plan Update and they indicated that the plan update remains in draft form and is not yet available. The previous Highway Master Plan projections were not utilized due to outdated data and the fact that it was released prior to the availability of 2000 census data. A breakout of the Department of Defense block groups is provided in the report. The carrying capacity of Guam's water supply is evaluated and discussed in the WRMP's Water Budget Report.

On Specific Comments

Changes recommended for specific line items have been incorporated where necessary.

We look forward to working with you as we progress in preparing a Water Resources Master Plan that addresses water demand and wastewater treatment needs for Guam as outlined in the stipulated order from the U.S. Environmental Agency. Note that the subject report satisfies only one component of the much larger and complex Water Resources Master Plan.

Si Yu'os Ma'ase.

David Craddick.

Exhibit 6C – Population and Land Use Projection Correspondence (continued)



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Phone: (671) 647-2603 Fax: (671) 646-2335

September 27, 2005

MEMORANDUM

TO: Director, Guam International Airport Authority

FROM: General Manager, Guam Waterworks Authority

SUBJECT: Guam Waterworks Authority Water Resources Master Plan – Population and Land Use Projection Report

Gentlemen:

We appreciate your review and comments provided on the subject report. Stated below in italics is our response to your input on the subject report. Note that our consultants have incorporated your comments where appropriate.

Comments shared have been noted and corrected as appropriate in the report. Development activities suitable for the airport proper are likely to occur regardless of ownership, based on highest and best use.

We look forward to working with you as we progress in preparing a Water Resources Master Plan that addresses water demand and wastewater treatment needs for Guam as outlined in the stipulated order from the U.S. Environmental Agency. Note that the subject report satisfies only one component of the much larger and complex Water Resources Master Plan.

Si Yu'os Ma'ase.

David Craddick.

Exhibit 6C – Population and Land Use Projection Correspondence (continued)



GUAM WATERWORKS AUTHORITY

Good Water Always

578 N. Marine Corps Drive, Tamuning, GU 96913-4111

Phone: (671) 647-2603 Fax: (671) 646-2335

January 16, 2006

MEMORANDUM

TO: Admiral, U.S. Navy

FROM: General Manager, Guam Waterworks Authority

SUBJECT: Guam Waterworks Authority Water Resources Master Plan – Population and Land Use Projection Report

Gentlemen:

In finalizing our report on Population and Land Use Projection, stated below in italics is our response to your input on the subject report. Our consultants have incorporated your comments where appropriate.

The personnel loading data projected for 2010 will be incorporated into the water hydraulics model once actual location of housing facilities is determined. The inability of future civilian development projects to access military water sources could constrain development in the short term. However, in the longer term, alternative water sources and distribution could be developed.

Your comments are greatly appreciated. We look forward to working with you as we continue to address the stipulated order from the U.S. Environmental Agency to prepare a Water Resources Master Plan that addresses water demand and wastewater treatment for Guam. Note that the subject report satisfies only one component of the much larger and complex Water Resources Master Plan.

Si Yu'os Ma'ase.

David Craddick,
General Manager.