

CHAPTER 6 – POPULATION & LAND USE FORECAST

6.1 Introduction

As an integral part of the GWA WRMP a population and land use forecast was initiated to provide input to other pertinent portions of the Plan. Results from this task will provide data for water, wastewater and costing models. The focus of this chapter will be on three major elements: (1) approach, (2) relationship to Guam’s existing land use plans, and (3) key assumptions.

6.1.1 Approach

The approach for attaining population and land use projections for Guam entails a systematic study and analysis of existing conditions, probable future conditions, and potential distribution scenario of future population. The methodology involves: 1) Use of official U.S. Census Bureau population projections, as it provides the most reasonable forecast, based on historic trends analysis; 2) Analysis of existing land uses, zoning data, and proposed projects to arrive at future land use development patterns; and 3) Preparation of an allocation model using the aforementioned factors to yield future population distribution.

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

- 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 & Land Use Conditions – Provides an overview of the economy, existing land uses, and zoning.
 - Economy – A general discussion on economic conditions.
 - Existing Land Uses - Involves existing land uses and zoning information.
- Anticipated Future Land Use Conditions – Entails a future scenario of Guam and a breakdown of planning factors that affect future land uses.
 - Economy – Provides a general discussion on the economy and population.
 - Transportation Analysis Zones – Entails the use of traffic projections for population distribution in urban areas.
 - Development Proposals – Involves development proposals from the public, private, and military sectors.
 - Aquifer Protection and Government Land Lease Program – Presumes low-density development in much of northern Guam due to aquifer sensitive areas and long-term government land leases to residents of Chamorro ancestry (99 years).
- Future Population Distribution – Incorporates selected U.S. Census official population projections and local planning factors above that affect how land might be used. Utilizes an allocation model 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. Years 2050 and 2100 assumes growth rates consistent with historic population linear growth trends. Here, future development projects are unknown.

6.1.2 Relationship to Existing Land Use Master Plans

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

This report does not attempt to create a comprehensive island-wide land use master plan. That activity would entail re-examination of existing land use policies and land use guidance tools such as the 1967 Master Plan, Community Development Plan, Zoning standards, or the Land Use Regulatory process. 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. Thus, planning tools utilized in this projection report focus on the following: a) development patterns based on existing land use information and zoning designations; b) transportation analysis zone information; c) proposed developments; and, d) aquifer protection and government land long-term lease considerations.

Throughout the report, it should be noted that Guam's economy is likely to be driven by the tourism and military industries well into the future. However, the lack of an updated master plan places constraints for a unified and consistent growth management scenario.

6.1.3 Key Assumptions

Key assumptions of this report include:

- Tourism and military activities will continue to be the major economic drivers on Guam. The population projections contained in this report are based on the economic assumption that the two key economic drivers of the economy, tourism and defense activities will continue to be the key forces in the economy. This assumption is based on decades of historical experience based on Guam's strategic geographic location for defense purposes and its alluring tropical island characteristics geographically positioned for vacations from most Asian origins.
- The population projections are also based on the political assumption of continued political alliance with the United States not radically different from the 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.

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

6.2 Existing Conditions

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

6.2.1 Population

Paramount in Guam’s economic growth is tourism and military activities. Given Guam’s geo-political status, it is likely that these industries will remain as the prime economic forces well into the future. Economic activity was prevalent in hotel and resort development during the late 1980’s and early 1990’s while military activities continued to see construction activities through the years. Historically, immediately after WWII, the population increased significantly from 22,290 in 1940 to 59,498 in 1950, a 167% increase. Civilian and military population experienced an average growth rate of 22% at the end of each decade since the 1960’s (see Table 6-1). Population growth and economic activity appears to have slowed down owing to factors such as Typhoon Pongsona in December 2002, the Asian financial crisis, the 9/11 attacks, the Iraq war, and the SARS disease outbreak. 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 inviting Korean tourists. This ploy paid off well as Korean tourists comprised 12.1 percent of total visitors in 2002. The GVB is considering the Chinese tourists as another market; however, recent political events (i.e. a Chinese submarine was detected circling Guam in October, 2004) and the heightened security following 9/11 have temporarily thwarted this effort. General visitor arrival figures for tourism are shown on 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.

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The increases in hotel rooms and golf courses are a testament to providing resort destinations in anticipation of increased visitor arrivals. Such is the attitude of Guam politics since tourism became a vital part of Guam’s economy.

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

Table 6-3 – General Tourist Accommodations

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

Source: Guam Visitors Bureau.

6.2.2 Land Use

Using aerial photography, zoning data, and available planning information, land uses on Guam (since 1966); particularly residential, commercial, and industrial uses, have increased dramatically within a 37-year duration.

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) ⁵
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 ² 5.16%
Non-Urban/Agriculture	81,115 59.78%	---	38,800 ² 28.60%
Military/Federal	45,716 33.70%	43,408	40,137 ³ 29.58%
Conservation	3,594 2.65%	19,526	19,526 ⁴ 14.39%
Parks	---	13,646	13,646 ⁴ 10.06%
TOTAL	135,677 ac. (100%)		135,679 ac. (100%)

¹Fixed Assets Report, Department of Public Works.

²Guam Public Land Use Plan, Bureau of Planning. Territory of Guam Master Plan, Dept of Land Management.

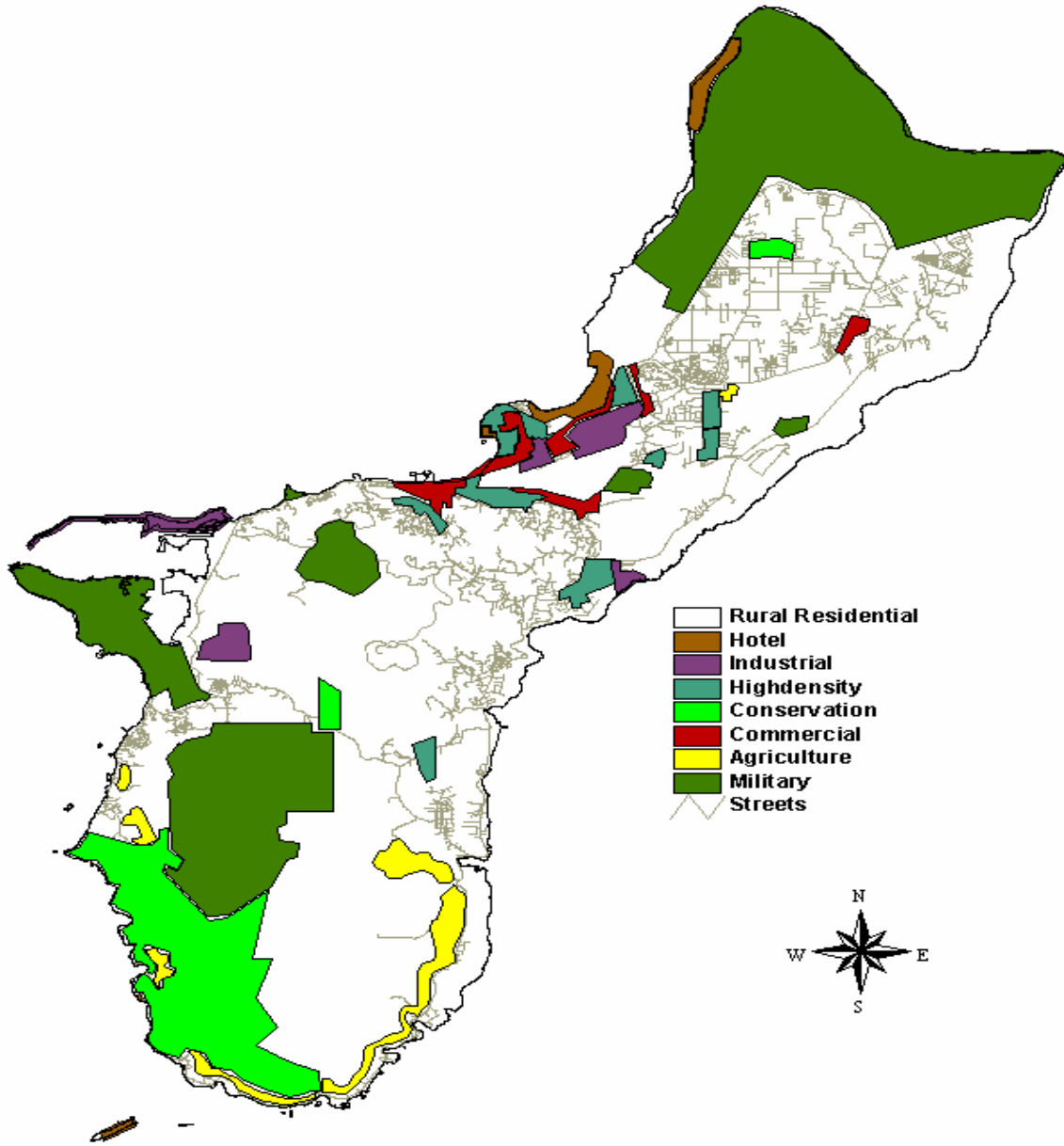
³Territory of Guam Master Plan and Guam Public Land Use Plan.

⁴Y Tano Ta Land Use Plan, W.B. Flores/Strategic Planning Group.

⁵Discrepancy in acreage is noted as follows: (1) 1967 Master Plan and current inventory from various planning documents – 135,680 ac. (2) GIS island polygon – 133,404 ac.

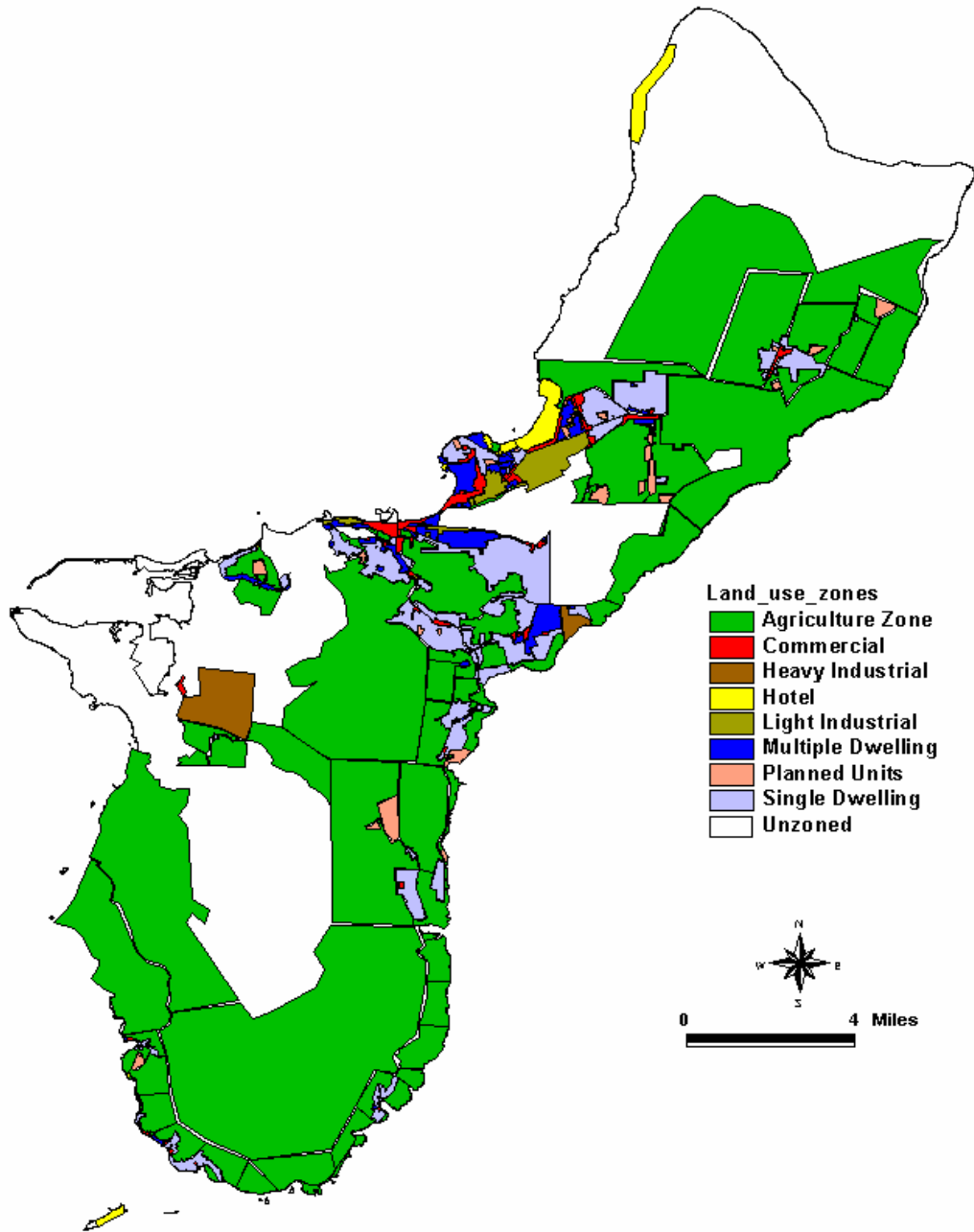
As a reference point, existing land uses can be used to mark areas where new development activities may occur, while zoning, on the other hand, dictates how land is used within a given location. Figures 6-1 and 6-2 show generalized land use and zoning information. It should be noted that the zoning map of Guam has not been updated; hence, 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



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Figure 6-2 – Zoning



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

6.3 Future Population

According to an economic report prepared by the Bank of Hawaii in October 2003, "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 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. Already, the local government has begun to take the necessary measures towards these suggestions.

- Privatization has taken place with the Guam Telephone Authority.
- Privatization efforts are currently being made regarding the Guam Waterworks Authority.
- The Navy's repositioning of three fast-attack submarines to Naval Station.
- The Air Force's announcement of plans under consideration for new military initiatives and related facilities at Andersen Air Force Base.
- The Government of Guam's legislative effort to market Guam as a regional headquarters for American corporations doing business in the Asia-Pacific region.
- The Guam Visitors Bureau's effort in inviting Chinese visitors to further broaden its visitor groups.
- In its 2001 exit survey of visitors, the Guam Visitors Bureau found that the majority of visitors (Japanese, Taiwanese, and Korean) would re-visit Guam, but would like to see "theme parks" and "archaeological site" attractions.

Thus, there appears to be some room for Guam's economy to rebound from the effects of Typhoon Pongsona, the Asian financial crisis, the 9/11 attacks, the Iraq war, and the SARS disease outbreak.

Given the potential for a reasonable economic recovery, and with guarded optimism due to uncertainties in 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 for projection details.

Table 6-5 offers 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 Historical Summary

The population growth pattern on Guam has been one of consistent and steady growth. In each and every census with only one exception since 1793 when the population of Guam was recorded at 3,584 by the Spanish government, the population of Guam has grown. This remarkable statistical pattern of consistent population growth from one census to the next beginning in 1793 has continued for twenty-one consecutive time periods with only one exception, the period from 1849 to 1871, when the population declined by twenty-one percent. Prior to that, between the Censuses conducted in 1710 and 1793 the population also experienced a slight decline. The U.S. Census Bureau has conducted population censuses on Guam at regular intervals every ten years since 1920 as part of the U.S. decennial census activities. In 1901 and 1910 the naval governor took the censuses. Prior to 1901 there were eleven Censuses taken by the Spanish government as somewhat irregular intervals but with no interval exceeding twenty-two years.

6.3.2 Population Projections Summary

The population of Guam is projected to continue to grow based on historical experience that is supported by U.S. Census Bureau population growth projections. The population is expected to continue to grow, although, growth rates are projected to slow in the future. The growth rates released by the U.S. Census Bureau for Guam are 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 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 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 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 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

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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 US 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 .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 US 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 US Census growth rate chosen for the starting point for the population projections in this report and the Low .03 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 US 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 looked at 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

are prepared in coordination with the respective governments. As such, the Census Bureau's population projection growth rates for the island of Guam as a whole are 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 to develop insights on what they might be in the future.

6.3.4 Geographic Detail of Projection

The population projections are comprehensive, covering all geographic areas of Guam. The adjusted population distribution projections for Guam at the Block Group level of disaggregation are discussed in section 6.3.2.

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. In this process it is possible to determine the relative mix of uses and where new development could conceivably occur. Because of its Euclidian nature, 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.

Notes from village meetings conducted by the Guam Waterworks Authority from August 18, 2004 to October 21, 2004, yielded little information with respect to desirable future land uses. Community input focused primarily on the ability of existing infrastructure to accommodate existing and future development, as well as the need to protect the island's water source.

However, a GVB survey on resident attitude regarding development provides substantial insights about economic development issues. These resident views were systematically documented in the Survey on tourism attitudes of Guam Residents (STAR) conducted under contract with the GVB in October 1993, 1997, and 2000. These surveys were conducted using large samples by professional research firms so that the findings are viewed as being statistically reliable.

Resident's perceptions of the Visitor Industry in the 1993 report were that:

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

- Employment and income for the family;
- Boost to the island's economy and standard of living;
- Revenue for the local government;
- Enhancement to the social, cultural and recreational life, and
- Captive market for businesses on the island.

On the other hand, things cited as adverse effects of tourism on the island are increases in:

- The Cost of living;
- Prices of commodities;
- Value of land;
- Population rate; and
- Crime rate

The 1997 survey contained similar sentiments generally favoring tourism with similar concerns. 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 been experiencing a very rapid pace of 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”
- Sixty-five percent agreed that “Government funds should be used to build public attractions like aquariums and zoological gardens”.
- More than half of the respondents (54%) felt 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 Tumon was over developed and development in Tumon should be stopped. In response to the statement that “We should stop building hotels on Tumon Bay” 62% agreed.
- Respondents were generally opposed to the development of Agana Bay to be like Tumon Bay (54%) Residents did believe that development of Agana 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 gold courses. Sixty percent 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 survey in 2000, the rapid pace of economic growth seen in the late 1980’s and early nineties had slowed. The opinions expressed in the survey of 2000 reflected changes due to the less vibrant economy.

There was a sharp increase in the sentiment that there could be more visitors coming to Guam. There has been a gradual decrease in the proportion of residents who feel that too many outsiders are immigrating to the island. This figure has fallen from 51% in 1993 to 46% in 1997 to 33%. But this attitude does not extend to selling land, as 60% of Guam’s

residents now feel that selling local land to foreign investors should be prohibited. Residents also favor a moratorium on building of hotels in Tumon, and the creation of special tourism zones to limit development. Residents are not in favor of a moratorium on development in Hagatna Bay, though they do not wish it to be developed to the extent that Tumon is. They are also not interested in promoting the development of more golf courses.

Interestingly, other questions provide 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 the focus group sessions was that the perception that limited and managed expansion of the industry into the villages would be welcomed by local residents. 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 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 the development landscape. However, individual and property rights of land owners as well as the economic and geographic characteristics of various properties may permit types or amounts of development or development in areas that is 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 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 at a modest pace. Original landowners of former military properties, who are gearing towards 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 proper. Essentially, most future development/re-development will likely be in the same location, or proximate to, existing development. This assumption is premised on 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, non-abrasive 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. It is anticipated that by year 2100, build-out will be reached due to Guam’s limited landmass. This build-out scenario assumes that the aquifer’s sustainable yield and the surface water systems in the south can accommodate the projected population of Year 2050 and 2100 (i.e. 221,451 and 257,232, respectively) without over-stressing the island’s overall water supply.

6.4.1 Methodology

Future land uses were determined by acquiring project proposals approved by the Territorial Land Use Commission through Notices of Action. It was verified that these proposals 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 description were crosschecked with the database on building permit issuance. Based on DPW records, these projects have not been built and therefore remain as planned proposals which 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 variation, as some may occur sooner, later, or cancelled altogether and new projects added. A periodic review is therefore desirable to update the status of projected developments.

6.4.2 Private Development Proposals

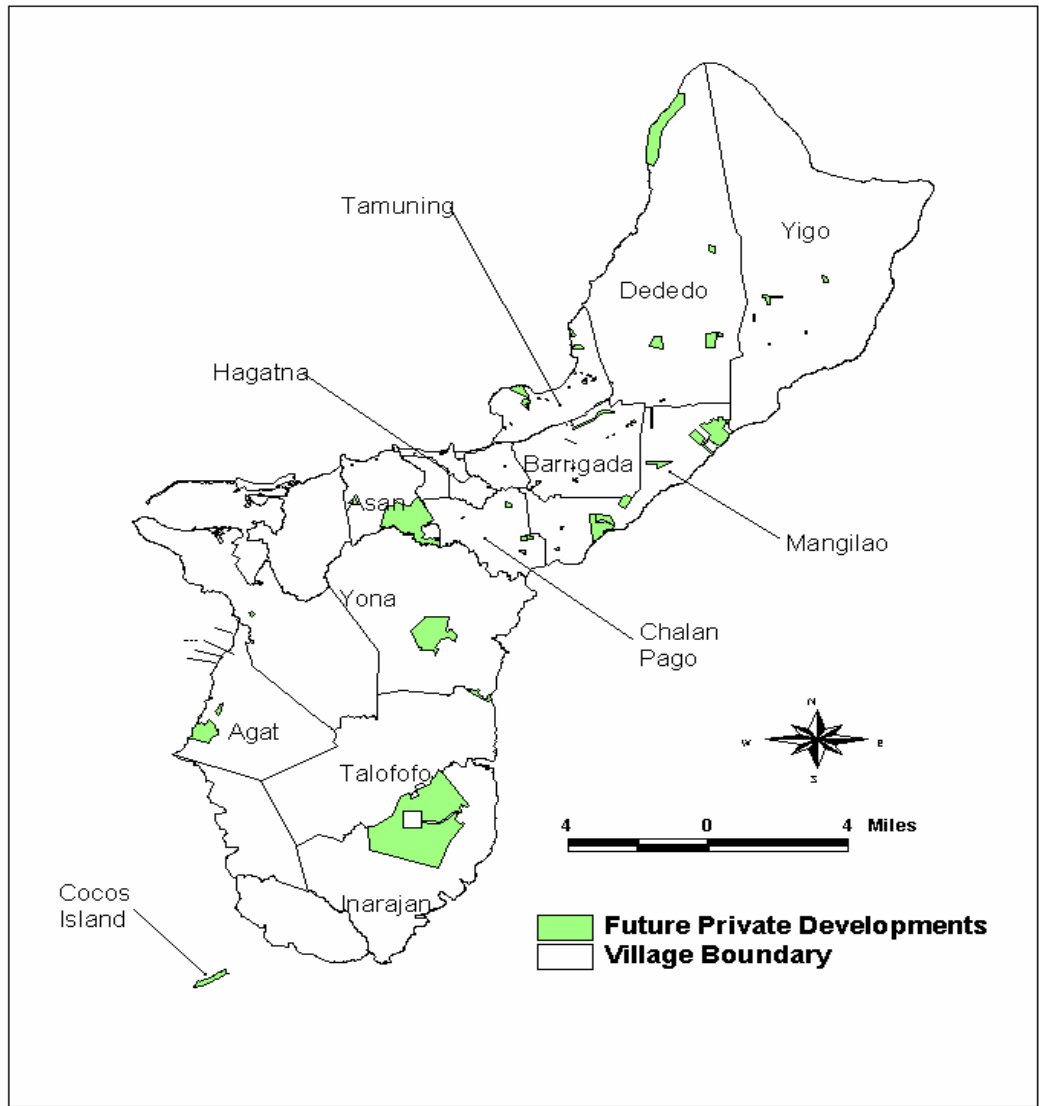
Private development proposals refer to potential development of private lands. This category anticipates high-density types of development that cater primarily to the tourism industry. Hotels and condos fit this description. There is also the potential for high-density development by landowners who have 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 socio-cultural themes. Low-density dwelling units may also take place through land subdivision and associated housing projects. These may provide a variety of cultural interest projects but may not pose substantial infrastructure demands.

Figure 6-3 illustrates potential development sites of projects approved by the Territorial Land Use Commission/Territorial Seashore Protection Commission (TLUC/TSPC), but have not yet been issued building permits by the Department of Public Works.

Notable in terms of potential economic development is the now defunct Tiyan economic development zone government project. This area is proximate to the Antonio B. Won Pat International Airport and could conceivably be developed through private land ownership (as 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 (airport support, shopping banking, restaurants, and fitness clubs, etc.).

Figure 6-3 – Future Private Sector Development



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6.4.3 Public Development Proposals

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

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.

Communication with Air Force officials has yielded information that additional housing units are conceptualized to support planned initiatives within the Andersen Air Force Base proper. 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 of attack submarines to be home-ported on Guam. A total of 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 Highway Master Plan, prepared by the Department of Public Works in 1992, anticipates that the number of daily vehicle trips will increase by 132 percent in the 1990-2010 period, consistent with its population and employment forecast. This difference in growth rates is attributed to the trend of smaller average household size, which produces more trips than larger households.

Table 6-6 is a summary of daily vehicle trips, population and employment trends.

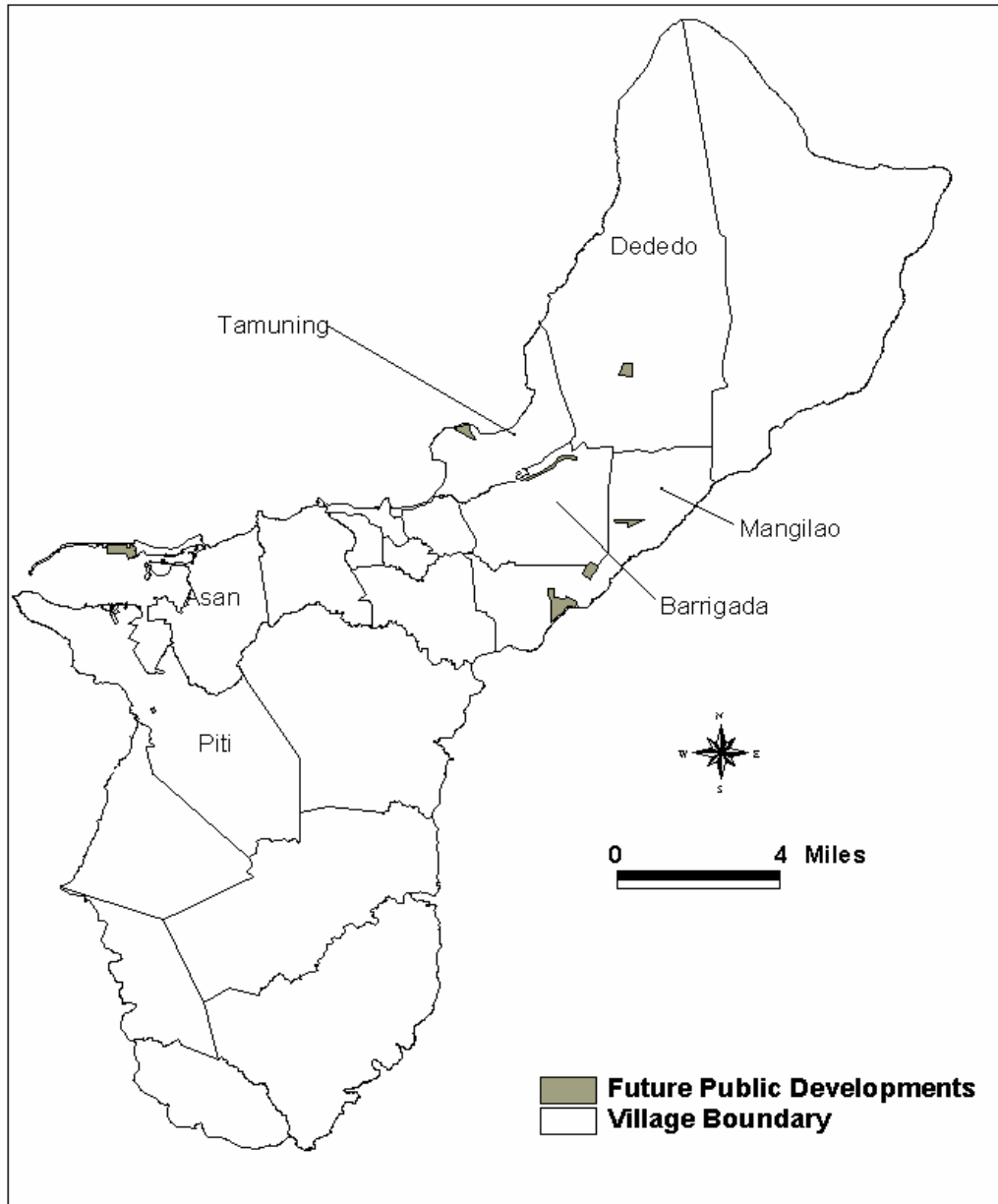
Table 6-6 – Daily Vehicle Trips, Population, and Employment Summary

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, employment, and daily vehicle trips, the village of Tamuning will play a dominant role as the island’s employment center, see Table 6-7. The Department of Public Works indicated however, that the Highway Master Plan is currently being updated.

Figure 6-4 – Future Public Sector Development



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Vehicular trip origins are compared in the table below 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, Talofofo, Umatac	12,311	8,069	27,613	124
TOTAL	434,466	535,143	1,008,917	132

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

6.4.6 Aquifer Protection

In recognition of the groundwater source in northern Guam as the principal water supply for the island, the Guam Environmental Protection Agency (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. Because of this, local environmental officials suspect that high concentrations of nitrate may be making its way to the aquifer.

The US Environmental Protection Agency, under 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 its role as a primary water source, development over the aquifer will be dictated, to a large extent, over 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. Heavy emphasis will be placed on homeowners to connect to available sewer lines. Needless to say, aquifer protection is considered a high priority project by the GEPA.

6.4.7 Year 2005 Land Uses

Based on research and meetings with government officials, construction activities are anticipated to commence within a four-year time frame (i.e. up to Year 2009) for the projects shown on Table 6-8 on the following page. The population forecasted for Year 2005 is 166,769. This is 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.

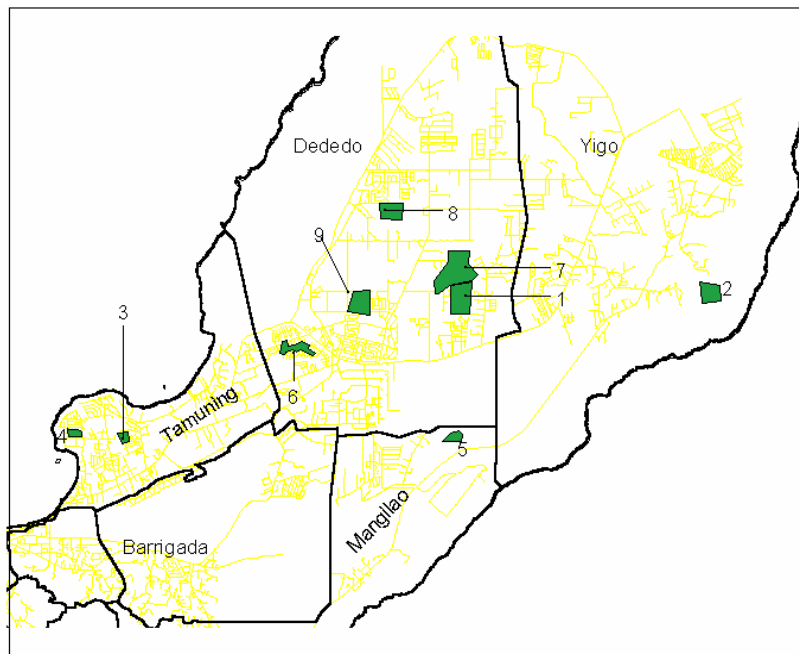
Development proposals anticipated to commence in 2005, or shortly thereafter, are listed on Table 6-8 and depicted on Figure 6-5.

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 Sub'd	2	Yigo	T94002	89
Royal Gardens	3	Tamuning	T1314B16L45	36
Oka Point Sub'd	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	8	Dededo	L10125-11-2	700 students
Wettengel High	9	Dededo	L10125-11-2	1,200 students
			TOTAL	251 Units

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

Figure 6-5 – Year 2005 Potential Developments



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Table 6-9 – Census 2000 - Housing Unit Vacancies

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

Source: U.S. Census Bureau.

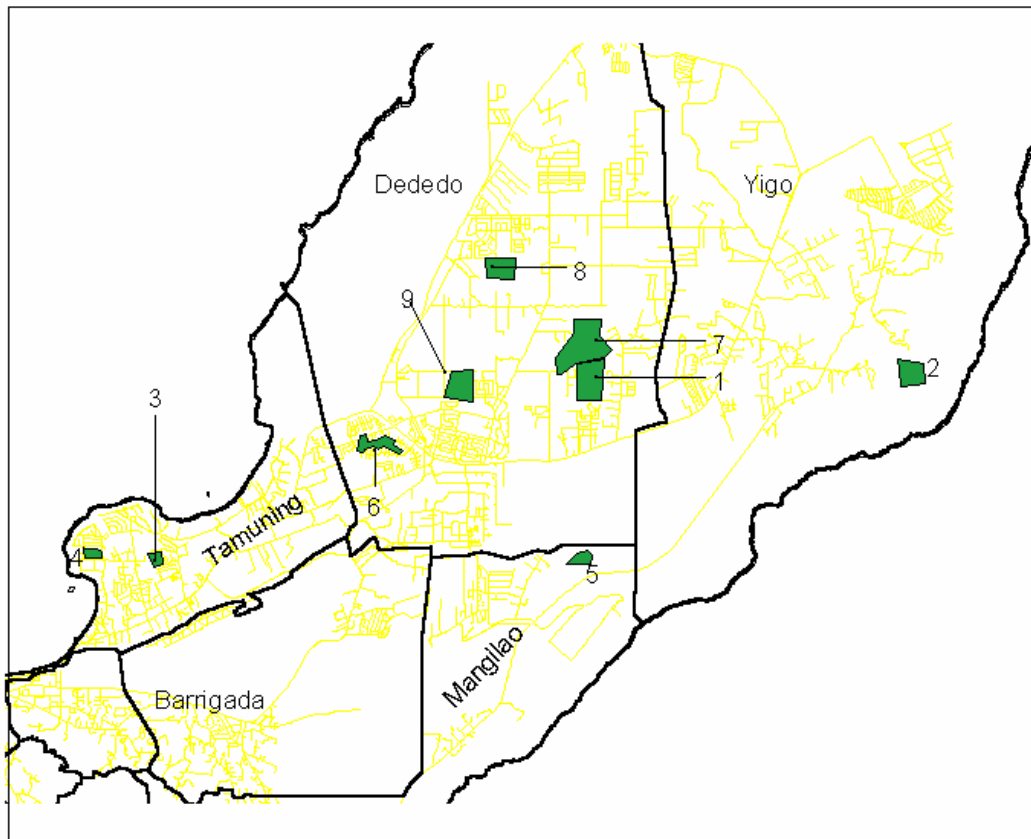
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6.4.8 Year 2010 Land Uses

This 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, coupled with military housing units, will accommodate the housing needs of this population wave.

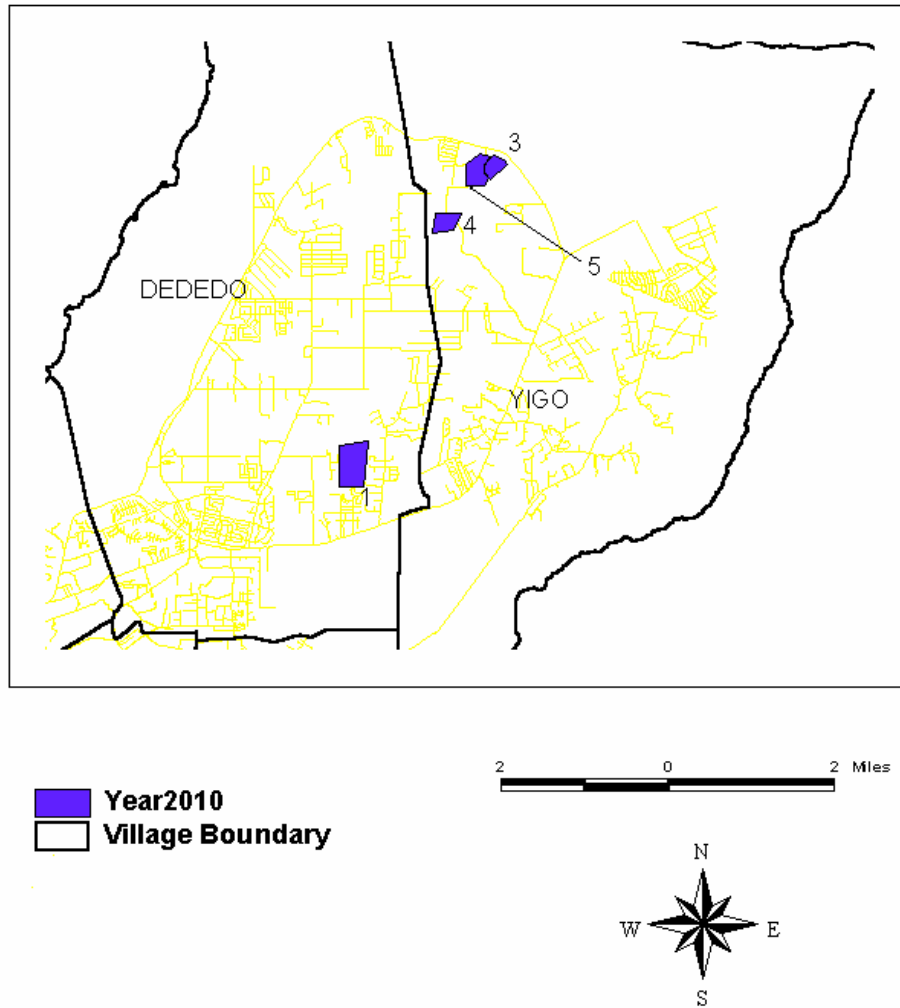
Development proposals anticipated to commence in 2010, or thereafter, are shown below. Figures 6-6 and 6-7 illustrate these proposals.

Figure 6-6 – Year 2010 Potential Developments



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



6.4.9 Year 2015 and 2020

By this time, it is likely that most of the residential unit vacancies will be minimal. New development for this third and fourth population wave will commence. This population wave, consisting of up to some 20,000 new residents for Years 2015 and 2020, will be accommodated by proposed developments shown on Table 6-10 and on Figure 6-8 – Figure 6-21 on the following pages. Though extreme (these projects add up to 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 infrastructure woes. Urunao development may not materialize due to its remote location, archaeological historic significance, and also to infrastructure shortfalls. Nevertheless, these development projects signify the magnitude of future development potential on Guam and the realization of potential economic benefits.

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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 Sub'd	2	Chalan Pago	T19212	40
Yigo Sub'd	3	Yigo	T63003	38
Gil Baza Sub'd	4	Yigo	T63004	79
Yigo Sub'd	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 Sub'd	9	Chalan Pago	L3347-R1-R9	35
			TOTAL	1,537Units

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

In addition, some of the other smaller development projects of the 18,000 units anticipated in Year 2015 (which include hotel rooms) might not all be built in Year 2015. Some will spill over into Year 2020; appropriately so, 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 will depend upon the capabilities of the water supply system and distribution system. The population for Year 2100 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 in a few areas in the south. See Figure 6-22 on the following pages. This 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 and some are also 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 with limited development activity based upon the Air Force’s mission at that time period. The future treatment of these aforementioned 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

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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 on Table 6-11.

Table 6-11 – Year 2015 & 2020 Potential Developments

Project	Map ID	Location	Lot Description	Units
Machanao Woods Sub'd	1	Dededo	10100-5	144
Tai-Pan Corp	2	Yigo	7028-R5-NEW	16
Santa Lourdes Sub'd	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 Sub'd,	8	Yigo	7032-4-R2	15
Terry Wilson Sub'd	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 Sub'd	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 Sub'd	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 Sub'd	28	Yigo	T911L3-R16	14
Lucky Dragon Sub'd	29	Tamuning	5076-1-4	17
As-Yigu Estate Sub'd	30	Yigo	7028-5-1NEW	17
Nomura Resort Hotel	31	Agat	311	314
PDG Village	32	Dededo	10053-5-R1NEW	66
Pettas Condo	33	Mangilao	2314-2	25
Paicicon Condo	34	Barrigada	T219-B2-L5-R1	21
Barrigada Terrace	35	Barrigada	T1841-L1028	30

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Population & Land Use Forecast

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

Project	Map ID	Location	Lot Description	Units
Willson Sub'd	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
Sabanan 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

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

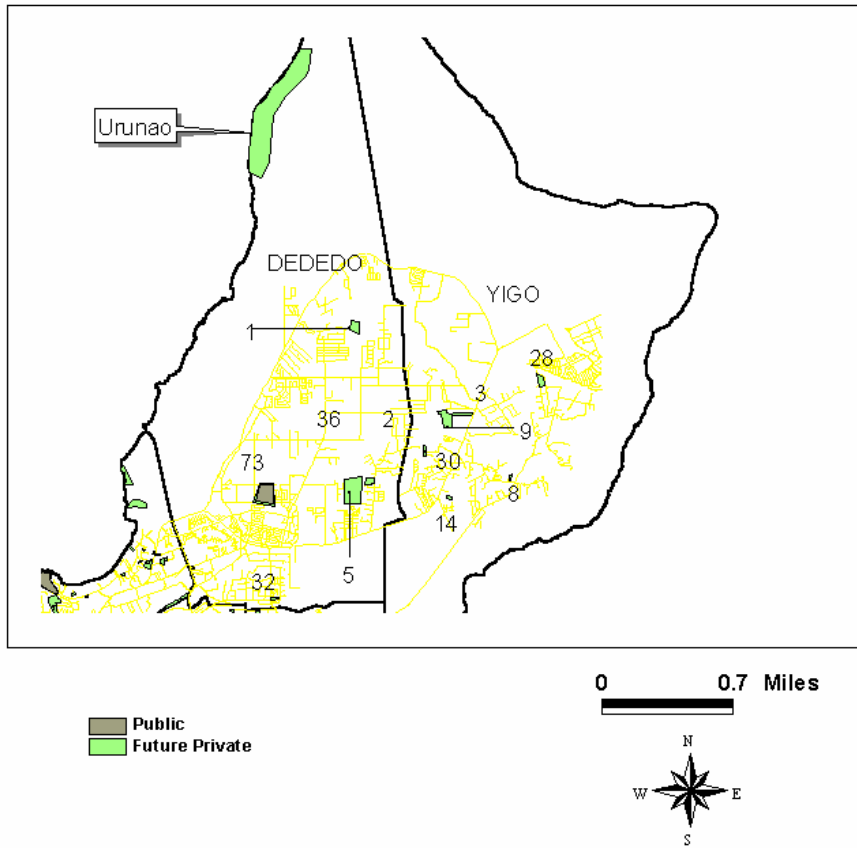
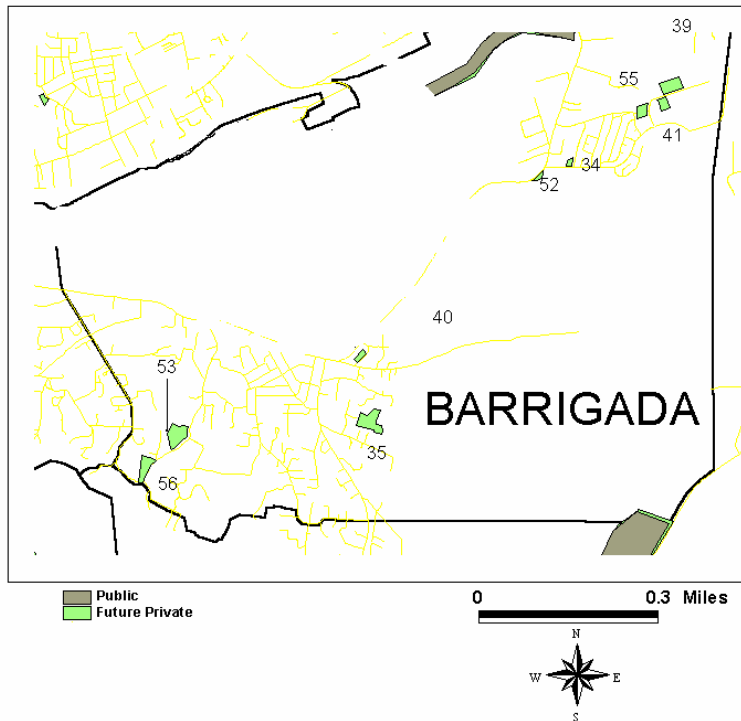


Figure 6-9 – Year 2015 & 2020 Potential Developments (Barrigada)



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

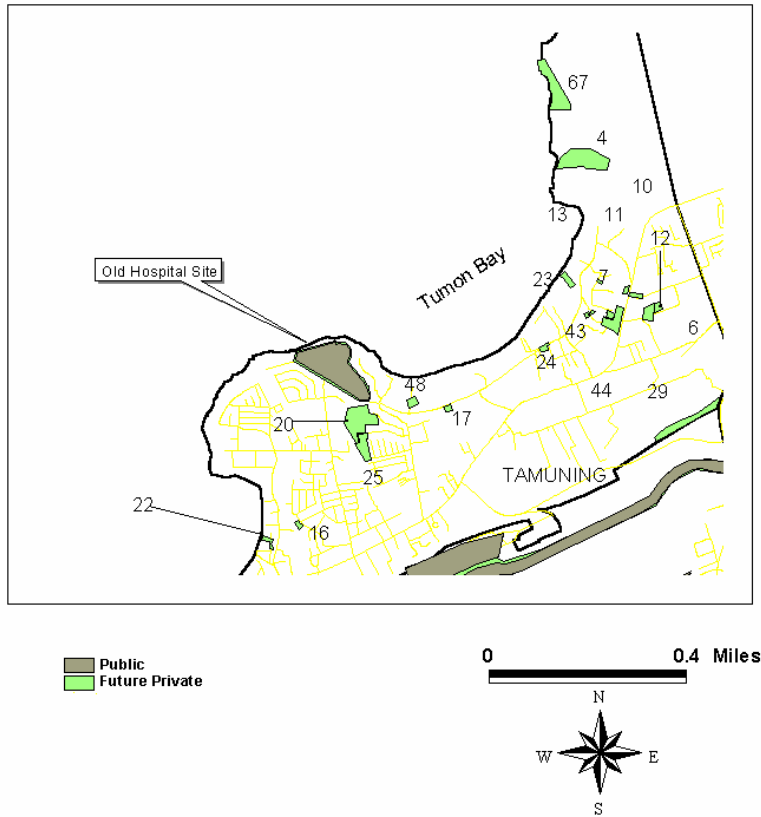
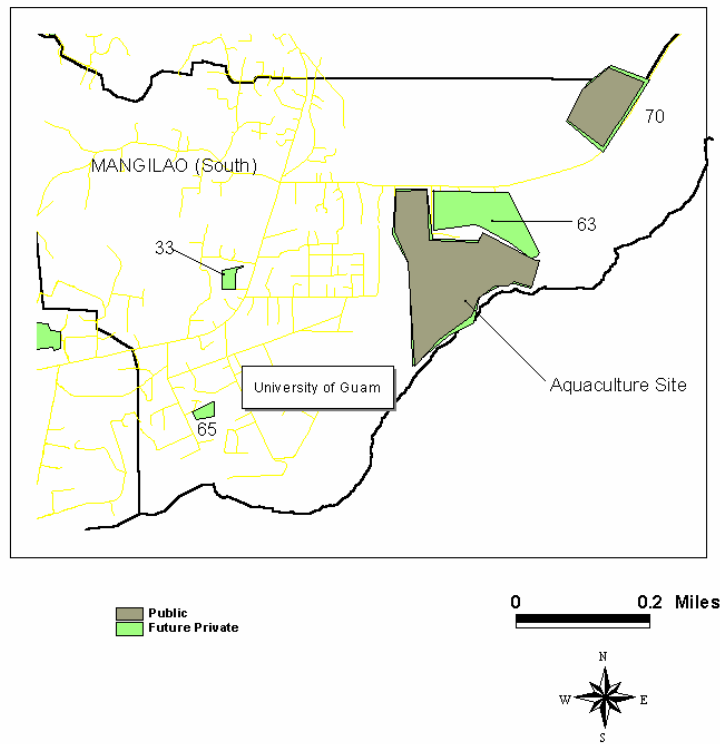


Figure 6-11 – Year 2015 & 2020 Potential Developments (Mangilao south)



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

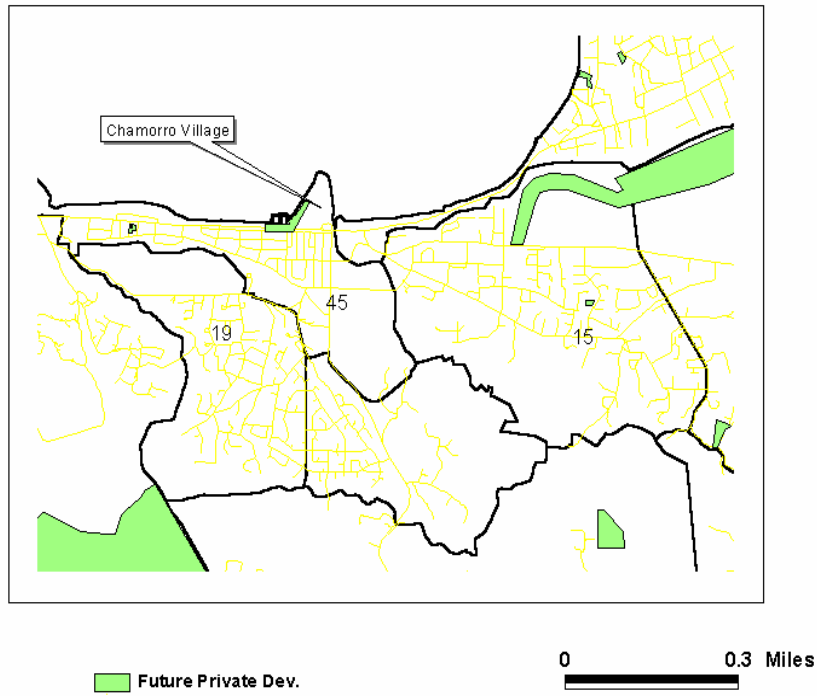
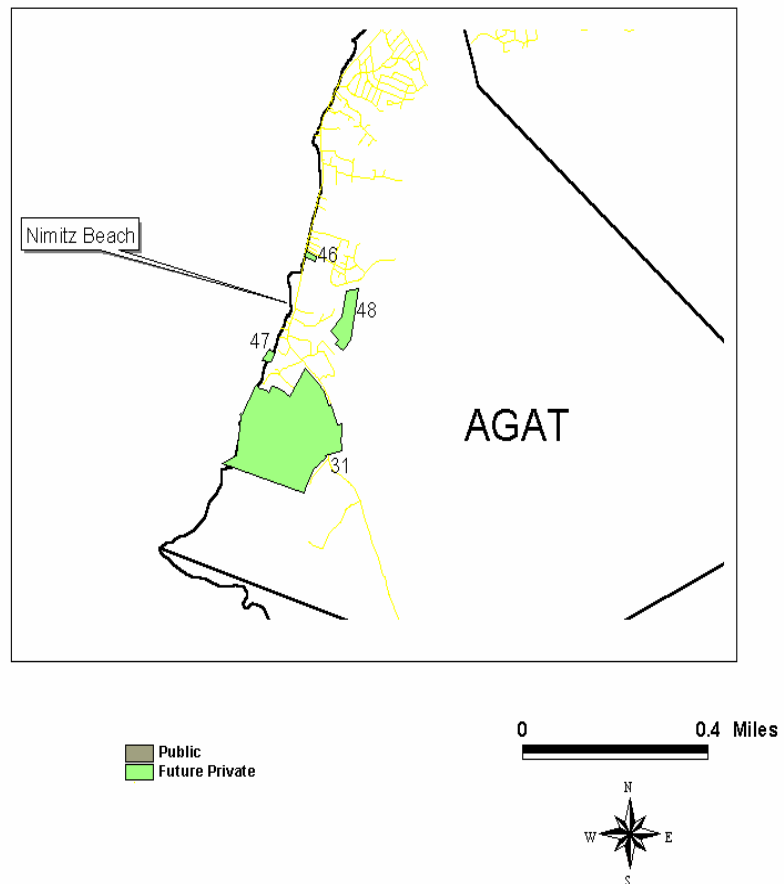


Figure 6-13 – Year 2015 & 2020 Potential Developments (Agat)



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

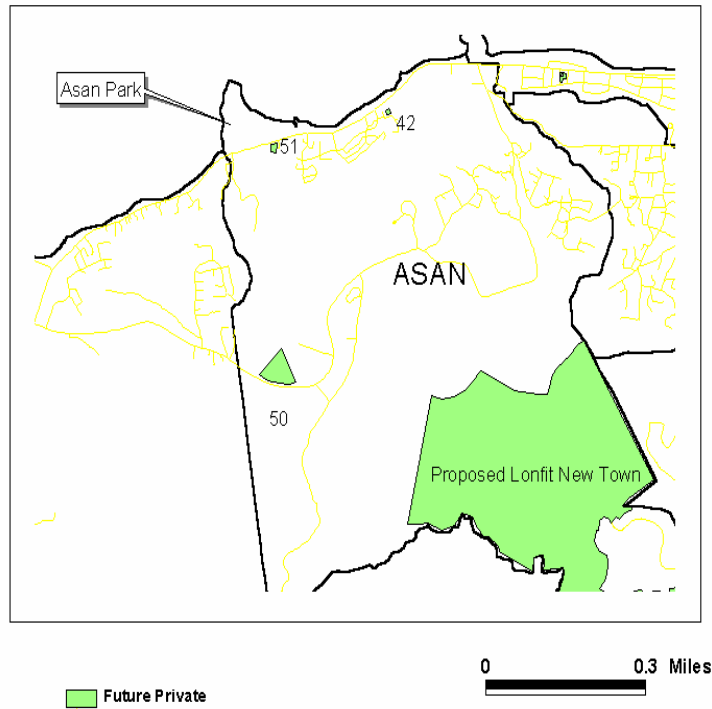


Figure 6-15 – Year 2015 & 2020 Potential Developments (Chalan Pago)

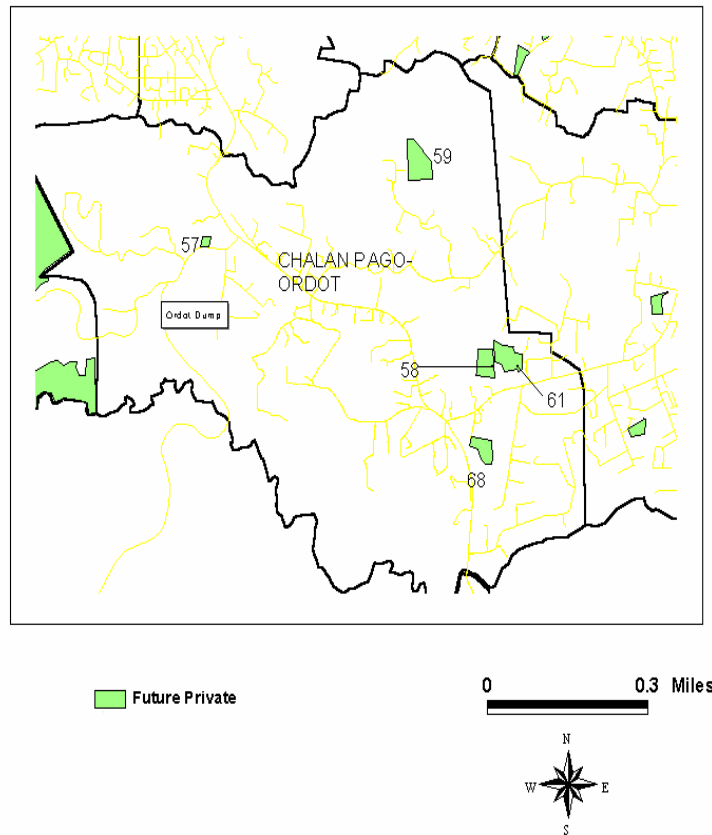


Figure 6-16 – Year 2015 & 2020 Potential Developments (Inarajan)

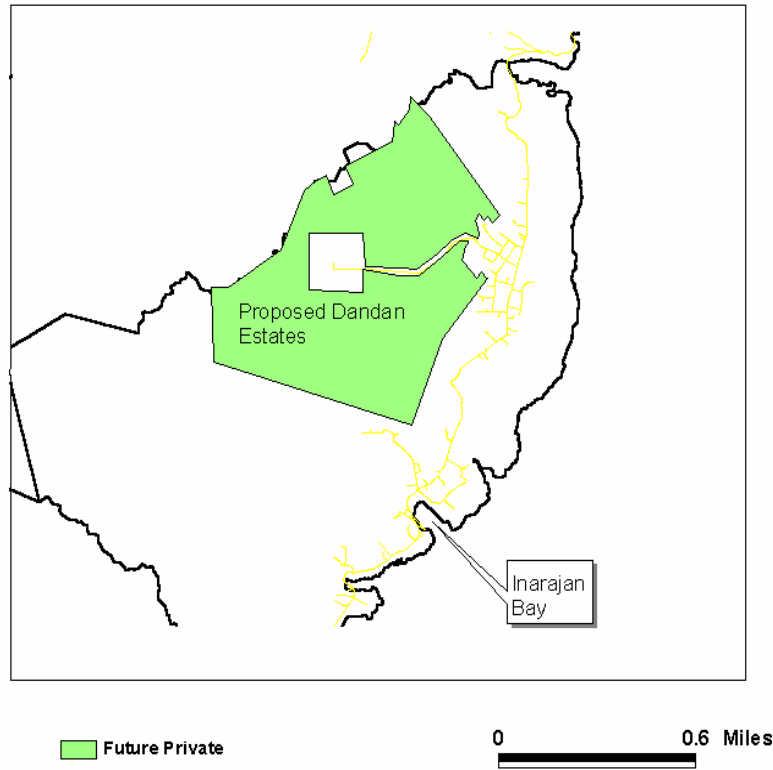
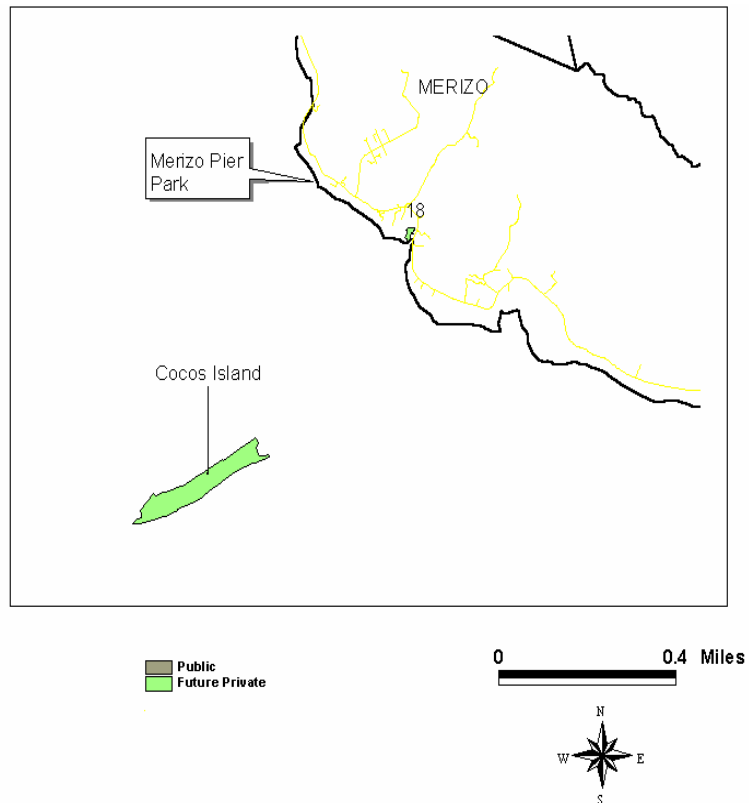


Figure 6-17 – Year 2015 & 2020 Potential Developments (Merizo)



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

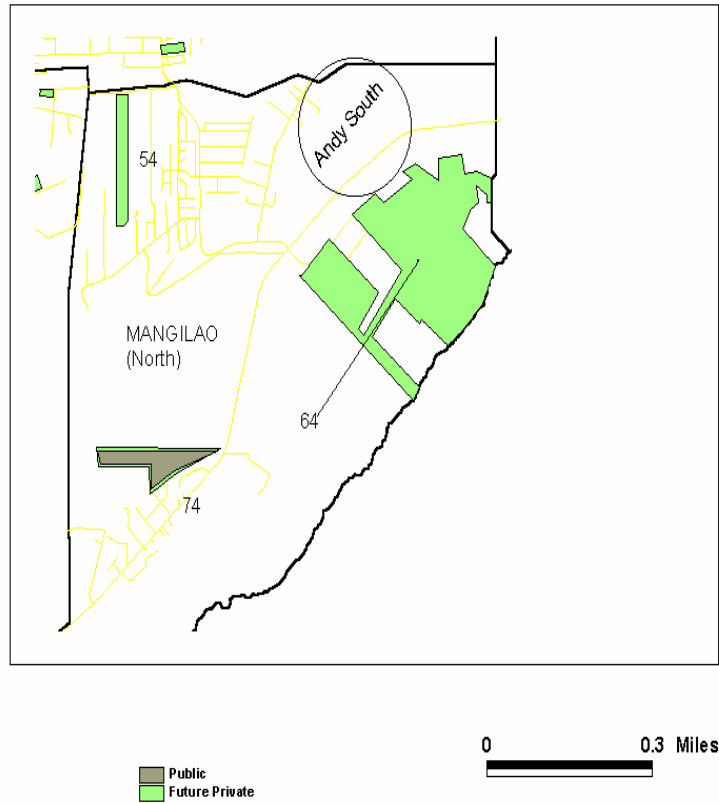
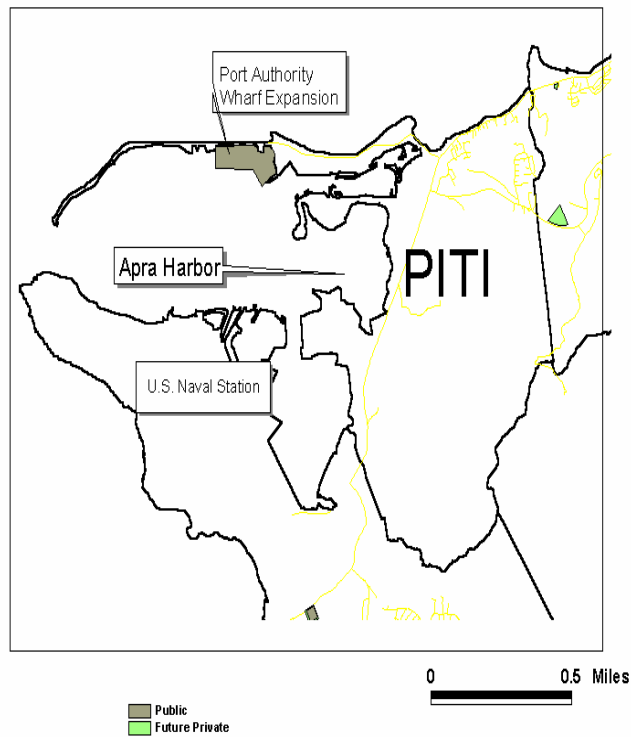
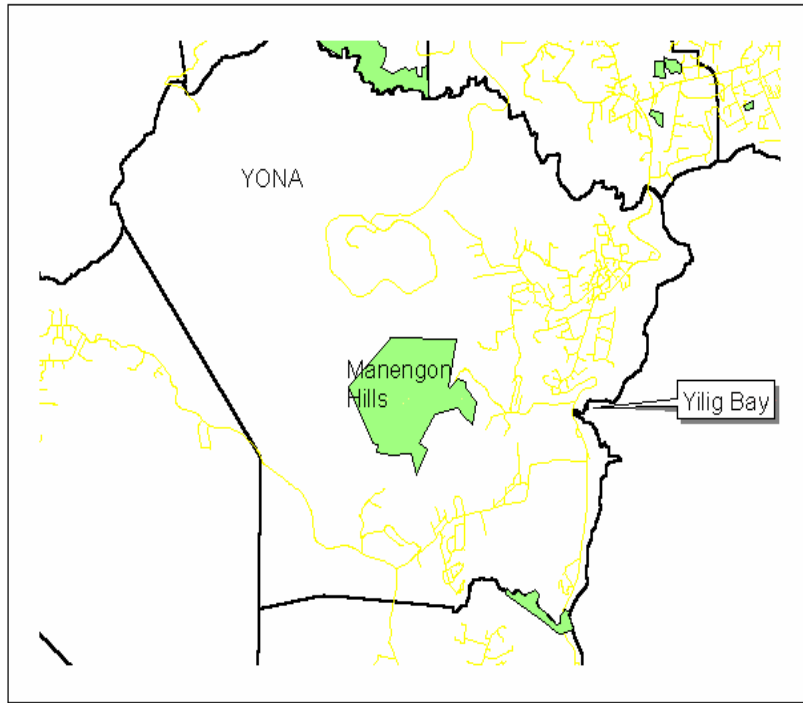


Figure 6-19 – Year 2015 & 2020 Potential Developments (Piti)



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

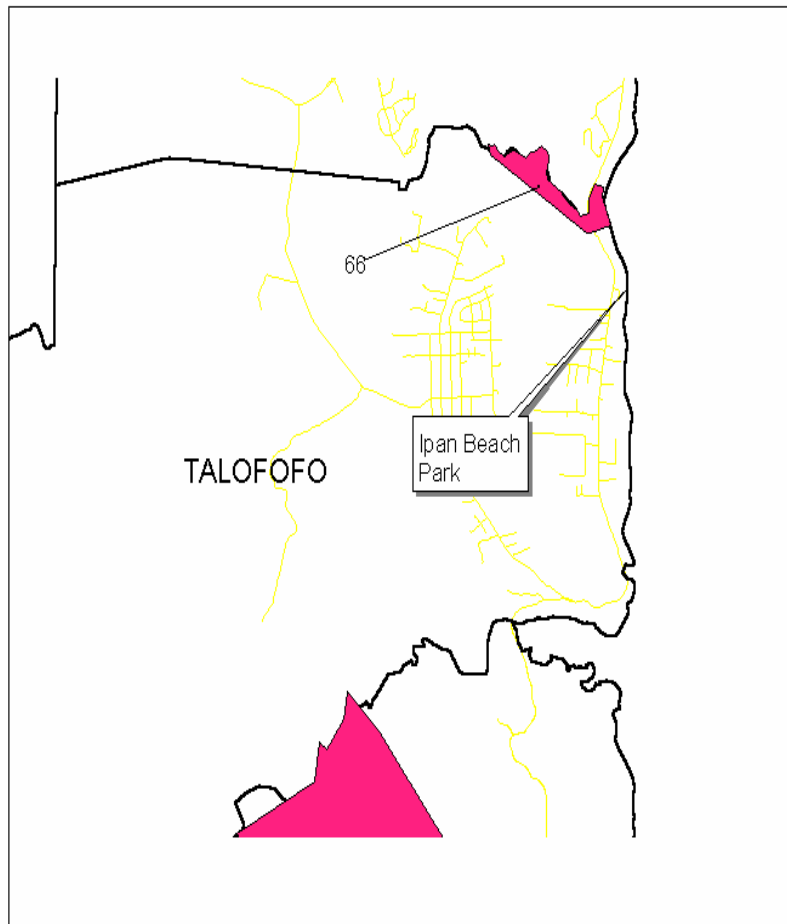



0 0.6 Miles

 Future Private



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



 Year 2015/2020 Developments

0.8 0 0.8 Miles


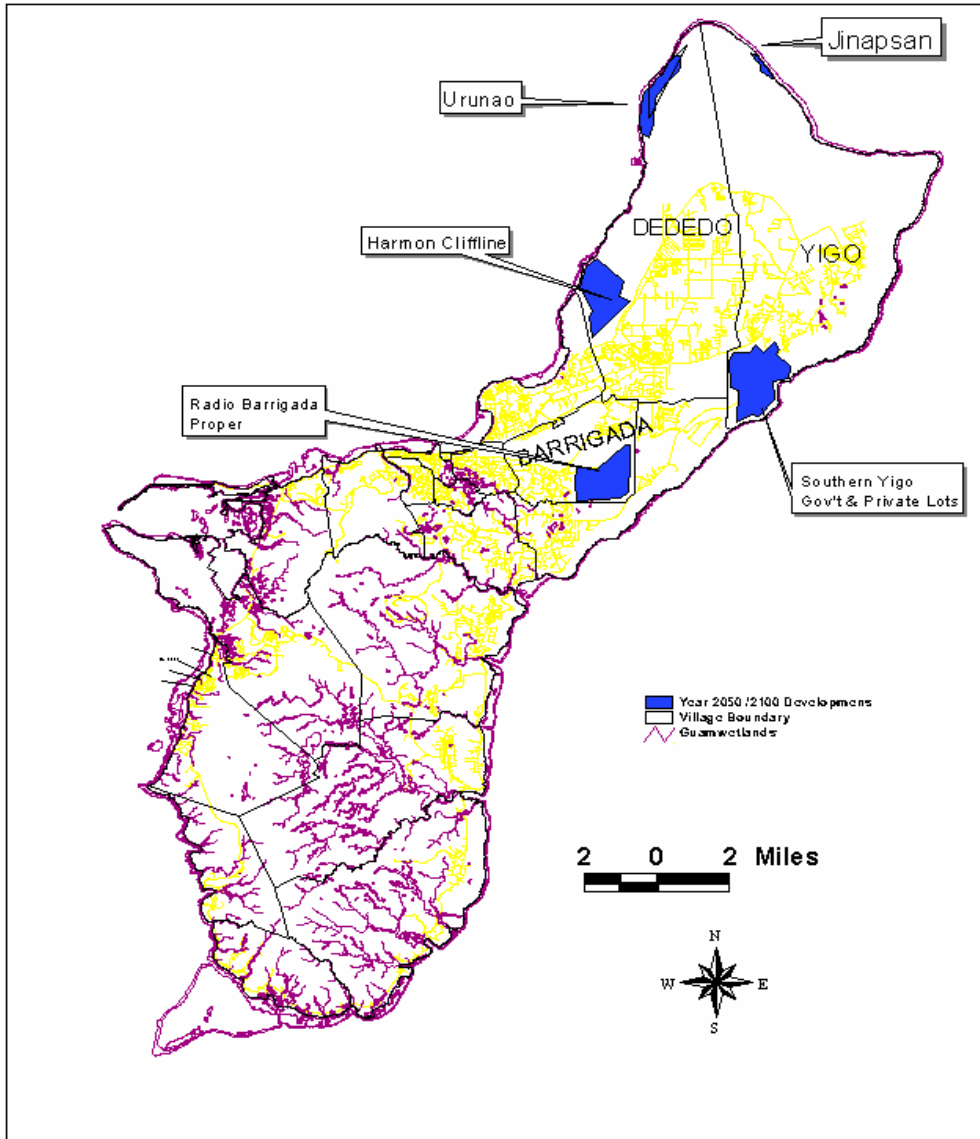


Figure 6-22 – Year 2050 & 2100 Potential Developable Lands



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6.5 Future Population Distribution

This section covers the geographic distribution of where growth is 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 is essentially an adjustment of the block group projection based on zoning and future proposed development projects in the private, public, and military sectors.

6.5.1 Methodology

Resident population was extracted from 2000 Census of Population while hotel population was compiled from a variety of sources including GVB data, phone listings, on-line research, and on-site visits of 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 was added to create employment estimates by village. Large establishments were geo-coded based on 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 actual densities of areas that are fully developed.

6.5.2 Findings

Because Guam has a relatively low population density, there's room for growth in most areas without reaching the population capacity provided in the population growth table (see Exhibit 6B). Hotel employment capacity is not seen as a constraint for growth during the forecast period except for Tumon. As such, it appears that by year 2020, growth is anticipated to occur in areas other than Tumon. Comments provided by various Government of Guam agencies, downplayed Tiyan as an economic development zone due to return of excess lands to original landowners. Military sector officials provided personnel loading 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.

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

	-----2000-----			-----2025-----		
AGE	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.

Vol I Chapter 6
Population & Land Use Forecast

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	1,718,682	2,579,793
3,010.00	2,169,215	1,734,821	2,603,608	1,734,466	2,603,963

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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			

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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

<u>Predicted values</u>					
	<u>Predicted</u>	<u>95% Confidence Interval</u>		<u>95% Prediction Interval</u>	
	Y	<u>lower</u>	<u>upper</u>	<u>lower</u>	<u>upper</u>
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

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

ANOVA table

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p-value</u>
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

<u>Predicted values</u>						
	<u>Predicted</u>	<u>95% Confidence Interval</u>		<u>95% Prediction Interval</u>		
	Y	<u>lower</u>	<u>upper</u>	<u>lower</u>	<u>upper</u>	
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

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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

Predicted values	Predicted	95% Confidence Interval		95% Prediction Interval	
		lower	upper	lower	upper
1,950.00	Y				
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

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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	p-value	confidence interval	
					(df=4)	95% lower
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	

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Exhibit 6B – Population Growth Table

DOD Facility	Tract	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP	
Andersen	950100	1	558	277	50%	601	732	771	1314	1382	1511	0	0	0	0	0	0	0	0	1.27	0	19,275	38550	0
Andersen	950100	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	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	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	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	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	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	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	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	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	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	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	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	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 Nat'l	951600	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 Nat'l	951600	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	954100	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	954900	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	955000	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	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	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	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	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	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	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	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	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	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	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	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	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	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	953800	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	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	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	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	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	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	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	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	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	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	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	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	3	437			471	507	538	571	625	726	0	0	0	0	0	0	0	1.27	0	1,652	3063	0	
	950600	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	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	6	604			651	701	744	790	864	1,004	27	29	31	33	35	39	45	1.27	0	3,742	3743	0	
	950700	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	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	3	546			546	546	546	546	546	546	0	0	0	0	0	0	0	1.27	0	215	240	0	
	950700	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	5	655			706	760	807	856	937	1,088	0	0	0	0	0	0	0	1.27	0	4,557	4775	0	
	950700	6	567			567	567	567	567	567	567	0	0	0	0	0	0	0	1.27	0	349	389	0	
	950700	7	479			479	479	479	479	479	479	0	0	0	0	0	0	0	1.27	0	477	295	0	

"This is a draft report and is not intended to be a final representation of the work done or recommendations made by Brown and Caldwell. It should not be relied upon; consult the final report."

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Population & Land Use Forecast**

DOD Facility	Tract	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL wth	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP
	950700	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	9	861			861	861	861	861	861	861	0	0	0	0	0	0	0	1.27	0	631	422	0
	950800	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
	950800	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	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	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	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	6	647			697	751	797	846	926	1,075	0	0	0	0	0	0	0	1.27	0	999	658	0
	950800	7	654			705	759	806	855	936	1,087	125	135	145	154	163	179	208	1.27	0	2,302	1303	0
	950900	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	2	721			721	721	721	721	721	721	0	0	0	0	0	0	0	1.27	0	628	357	0
	950900	3	839			839	839	839	839	839	839	41	44	47	50	53	58	68	1.27	0	753	591	0
	950900	4	1,391			1,391	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	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	1	666			666	666	666	666	666	666	0	0	0	0	0	0	0	1.27	0	657	385	0
	951000	1	492			492	492	492	492	492	492	0	0	0	0	0	0	0	1.27	0	411	251	0
	951000	3	414			446	480	510	541	592	688	116	125	135	143	152	166	193	1.27	0	437	275	0
	951000	4	463			463	463	463	463	463	463	41	44	47	50	53	58	68	1.27	0	373	311	0
	951000	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	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	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	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	3	15	0	0	16	17	18	20	21	25	0	0	0	0	0	0	0	1.27	0	962	1153	0
	951400	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	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	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	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	1	29			31	34	36	38	41	48	0	0	0	0	0	0	0	1.27	0	2,779	5559	0
	951700	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	2	590			636	685	727	771	844	980	0	0	0	0	0	0	0	1.27	0	1,633	505	0
	951700	3	515			555	598	634	673	737	856	0	0	0	0	0	0	0	1.27	0	2,446	1762	0
	951800	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	2	7			8	8	9	9	10	12	184	198	214	227	241	263	306	1.27	0	283	566	0
	951800	3	0			0	0	0	0	0	0	337	363	391	415	441	482	560	1.27	0	264	528	0
	951900	1	68			73	79	84	89	97	113	294	317	341	362	384	421	489	1.27	1890	3,239	4618	300
	951900	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	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	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	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	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	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	8	280			280	280	280	280	280	280	142	153	165	175	186	203	236	1.27	0	94	1193	0
	951900	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	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	2	479			516	556	590	626	685	796	0	0	0	0	0	0	0	1.27	0	1,397	704	0
	952000	3	450			485	634	666	700	756	860	9	10	11	12	14	16	16	1.27	0	620	416	0
	952100	1	435			469	505	536	569	622	723	222	240	258	274	291	318	370	1.27	927	790	634	1800
	952100	2	267			288	310	329	349	382	444	47	51	55	58	62	68	79	1.27	0	840	605	0
	952100	3	354			381	411	436	463	508	562	352	380	409	434	461	504	585	1.27	310	1,103	2336	600
	952200	1	894			894	894	894	894	894	894	140	150	162	172	183	200	232	1.27	45	592	1254	100
	952200	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	3	829			829	829	829	829	829	829	0	0	0	0	0	0	0	1.27	0	774	218	0
	952200	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	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	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	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	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	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	1	0			0	0	0	0	0	0	0	0	0	0	0	0	0	1.27	0	868	1737	0
	952600	1	459			494	533	565	600	657	763	0	0	0	0	0	0	0	1.27	0	975	269	0
	952600	2	478			515	555	589	625	684	794	443	477	514	546	579	634	736	1.27	68	1,579	1694	140
	952600	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	1	421			421	421	421	421	421	421	62	67	72	77	81	89	103	1.27	0	297	1239	0
	952700	2	597			643	693	735	781	854	992	53	57	61	65	69	75	87	1.27	0	805	1326	0
	952700	3	1,211			1,305	1,																

DOD Facility	Tract	Group	RES2000	Armed Forces	%Armed Forces	RES2001	RES2010	RES2015	RES2020	RES2050	RES2100	EMP2000	EMP2005	EMP2010	EMP2015	EMP2020	EMP2050	EMP2100	RES/EMP/ HOTEL vth	HOTEL POP2	RESCAP	EMPCAP	HOTEL CAP
	953100	1	208			224	241	256	272	298	346	0	0	0	0	0	0	0	1.27	0	4,183	4315	0
	953100	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	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	4	545			587	964	1003	1045	1045	1238	104	112	120	128	135	148	172	1.27	0	2,917	2998	0
	953100	5	185			199	215	228	242	265	307	30	33	35	38	40	44	51	1.27	0	8,691	7636	0
	953100	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	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	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	2	286			308	332	352	374	409	475	99	107	115	122	130	142	165	1.27	0	1,181	628	0
	953200	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	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	1	494			532	573	609	646	707	821	53	57	62	65	69	76	88	1.27	176	1,815	850	300
	953300	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	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	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	5	614			661	713	756	803	878	1,020	47	50	54	57	61	67	78	1.27	0	1,084	873	0
	953400	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	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	1	208			224	241	256	272	298	346	0	0	0	0	0	0	0	1.27	0	1,049	1359	0
	953600	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	2	688			741	798	848	900	984	1,143	32	34	37	39	42	46	53	1.27	0	1,739	1178	0
	953600	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	4	600			646	696	739	785	858	997	8	9	9	10	10	11	13	1.27	0	883	611	0
	953600	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	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	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	3	94			101	109	1556	1563	1574	1691	0	0	0	0	0	0	0	1.27	0	13,669	18148	0
	953900	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	2	552			595	641	680	722	790	917	320	344	371	394	418	457	531	1.27	0	64,290	78155	0
	953900	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	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	5	681			734	790	839	890	974	1,132	23	25	27	29	30	33	39	1.27	0	9,672	6444	0
	954000	1	119			128	138	147	156	170	198	0	0	0	0	0	0	0	1.27	0	8,149	8818	0
	954000	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	3	4			4	5	5	5	6	7	0	0	0	0	0	0	0	1.27	0	3,377	5643	0
	954000	4	59			64	68	73	77	84	98	0	0	0	0	0	0	0	1.27	0	162	323	0
	954000	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	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	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	3	614			661	713	756	803	878	1,020	0	0	0	0	0	0	0	1.27	0	1,450	935	0
	954200	4	591			637	686	728	773	845	982	0	0	0	0	0	0	0	1.27	0	1,968	1842	0
	954300	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	2	222			239	258	273	290	318	369	0	0	0	0	0	0	0	1.27	0	1,193	1007	0
	954300	3	484			521	562	596	633	692	804	82	88	95	101	107	117	136	1.27	0	1,827	1515	0
	954400	1	72			78	84	89	94	103	120	411	443	477	506	537	588	683	1.27	0	12,249	23137	0
	954400	2	66			71	77	81	86	94	110	620	668	719	764	811	887	1,030	1.27	0	2,282	91264	0
	954600	1	193			208	224	238	252	276	321	0	0	0	0	0	0	0	1.27	0	1,266	1431	0
	954600	2	140			151	162	172	183	200	233	0	0	0	0	0	0	0	1.27	0	647	773	0
	954600	3	247			266	287	304	323	353	410	14	15	16	17	18	20	23	1.27	0	1,675	3350	0
	954700	1	415			447	482	511	543	594	690	197	213	229	243	258	282	328	1.27	0	1,660	2005	0
	954700	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	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	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	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	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	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	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	3	667			719	774	822	872	954	1,108	0	0	0	0	0	0	0	1.27	0	6,958	7435	0
	955100	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	5	30			32	35	37	39	43	50	0	0	0	0	0	0	0	1.27	0	58,140	80390	0
	955200	1	487			525	565	600	637	697	809	0	0	0	0	0	0	0	1.27	0	13,616	14992	0
	955200	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	3	467			503	542	575	611	668	776	11	12	13	13	14	15	18	1.27	0	6,349	6473	0
	955200	4	219			236	254	270	286	313	364	128	138	149	158	168	183	213	1.27	0	7,768	7926	0
	955300	1	1,155			1,244	1,340	1,423	1,510	1,652	1,919	5	6	6	6	7	7	9	1.27	0	27,925	28865	0
	955300	2	1,008			1,086	1,170	1,242	1,31														

Exhibit 6C – Population Projection



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 Projection (continued)



GUAM WATERWORKS AUTHORITY
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578 N. Marine Corps Drive, Tamuning, GU 96913-4111
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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 Projection (continued)



GUAM WATERWORKS AUTHORITY

Good Water Always

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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 Projection (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 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 Projection (continued)



GUAM WATERWORKS AUTHORITY

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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.