
CHAPTER II

Planning Area Profile for Hazard Mitigation Analysis

A U.S. Territory since 1900, American Samoa is located in the central South Pacific Ocean, 2,300 miles south-southwest of Hawaii and 1,600 miles east-northeast of New Zealand. American Samoa has a total land area of approximately 76 square miles and consists of a group of five volcanic islands and two atolls (Rose Atoll and Swains Island). The five volcanic islands, Tutuila, Aunu'u, Ofu, Olosega, and Ta'u, are the major inhabited islands. Tutuila is the largest island and the center of government. Ofu, Olosega, and Ta'u, collectively are referred to as the Manu'a Islands. Figure 1 Base Map of American Samoa depicts all of the islands of American Samoa.

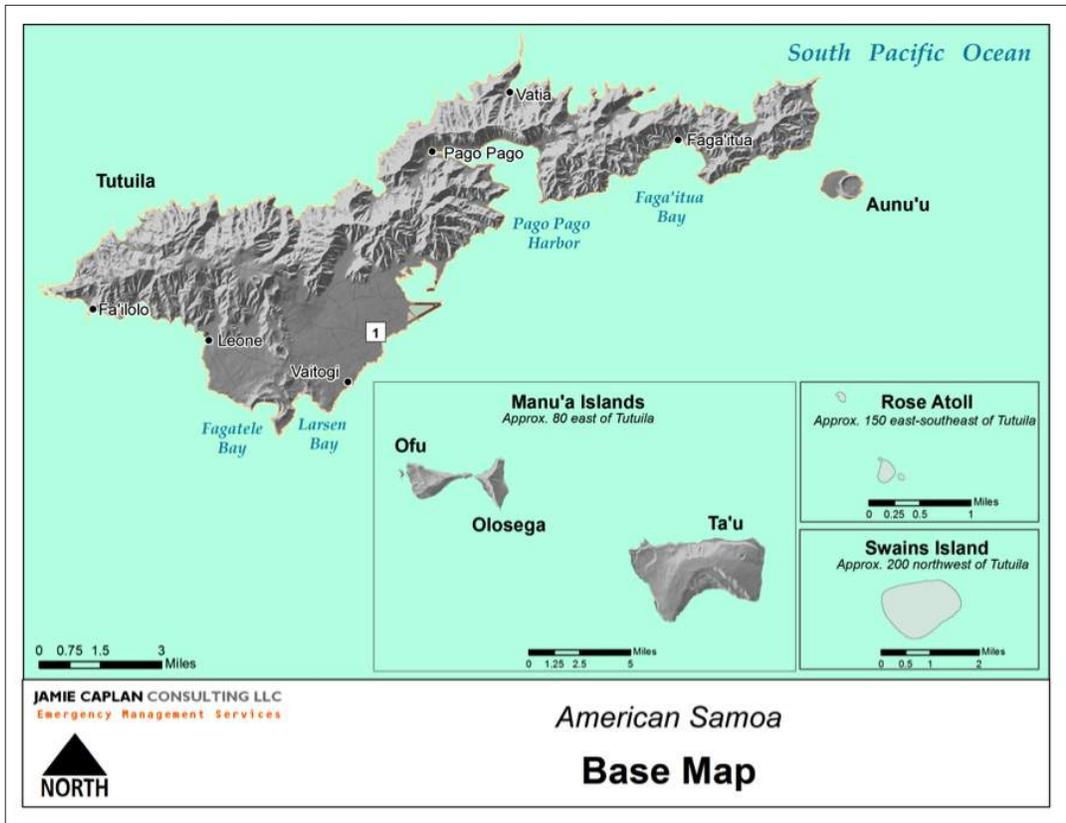


Figure 1. Base Map of American Samoa. The five volcanic islands, Tutuila, Aunu'u, Ofu, Olosega, and Ta'u, are the inhabited islands.

At 53 square miles, Tutuila is the largest and oldest of the islands, and is the center of government and business. It is a long, narrow island lying SW-NE, is just over 20 miles in length, and ranges from 1 to 2 miles wide in the eastern half, and from 2 to 5 miles wide in the western half. Home to 95 percent of the territory's 55,000 residents, Tutuila is the historic capitol (Pago Pago), the seat of American Samoa's legislature and judiciary (Fagatogo), as well as the office of the Governor. Tutuila is often divided into 3 regions: the eastern district, the western district and Manu'a district. There are nine counties and 65 villages on Tutuila. Figure 2 Village and County Base Map for Tutuila and Aunu'u Islands below shows these counties and village boundaries.

It is recognized that American Samoa traditionally refers to areas of the islands as villages and districts (East District, West District, and Manu'a District), as opposed to county geographies. However, the best available data for mapping and analysis boundaries was U.S. 2010 Census data, so the county geography was utilized. It is also recognized that the 2010 Census data did not include FoFo County, which is included as part of Lealatu County in this version of the plan (including the Village of Leone). Future revisions of this plan should move towards aligning the traditional American Samoan areas of reference with the best available data.

Figure 2. Village and County Base Map for Tutuila and Aunu'u Islands

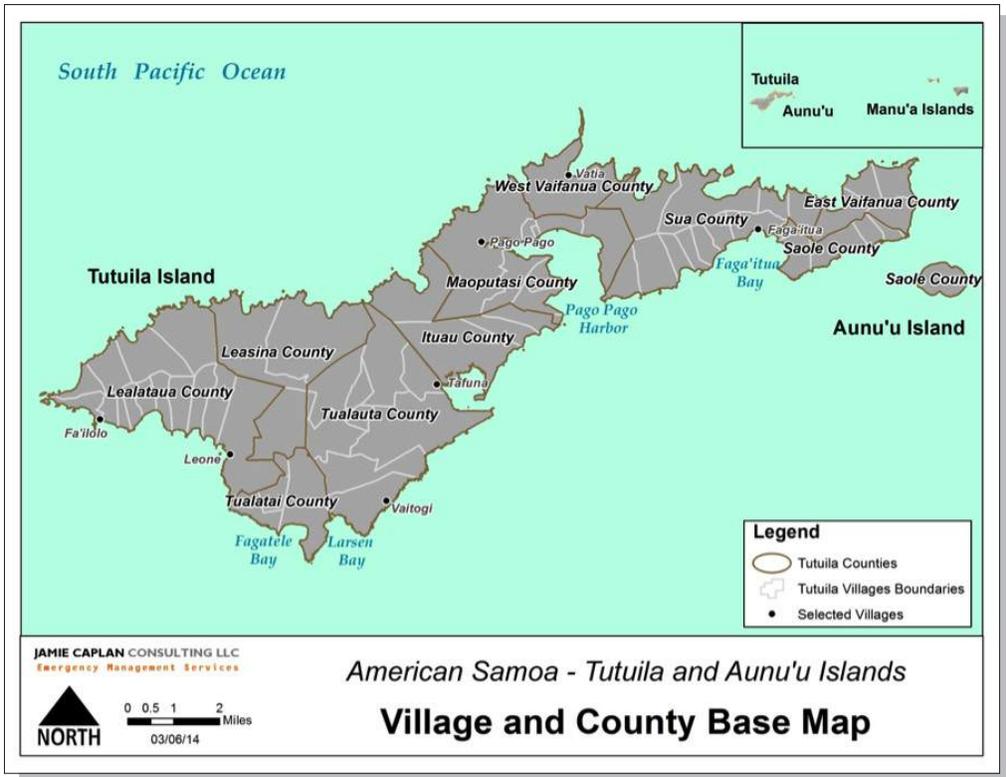
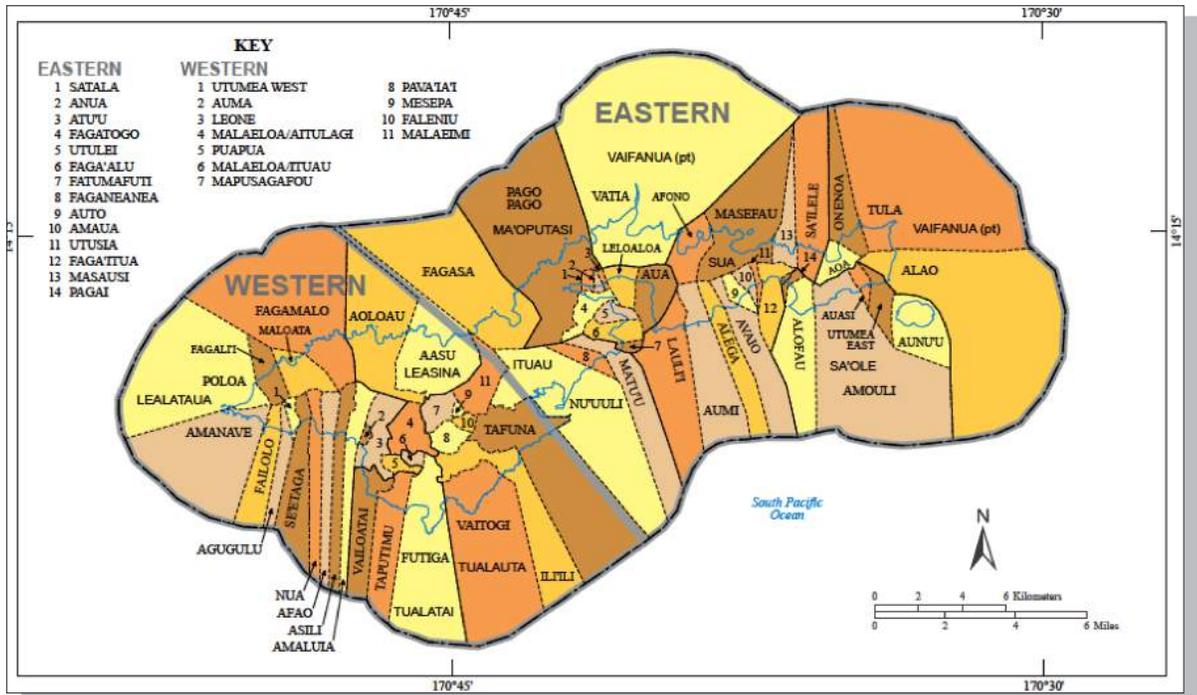


Figure 3 Western and Eastern Districts of Tutuila¹



The tiny island of Aunu'u, approximately 375 acres in size (.59 square miles), lies 1 mile off the southeastern coast of Tutuila. According to the 2010 census fewer than 450 people live on the island. Aunu'u Island is included in Saole County that also has villages on Tutuila Island. Given the close proximity, there are regular commuter boats to and from the island.

¹ 2010 Census American Samoa Demographic Profile Summary File (2010). U.S. Census Bureau. p. 255.

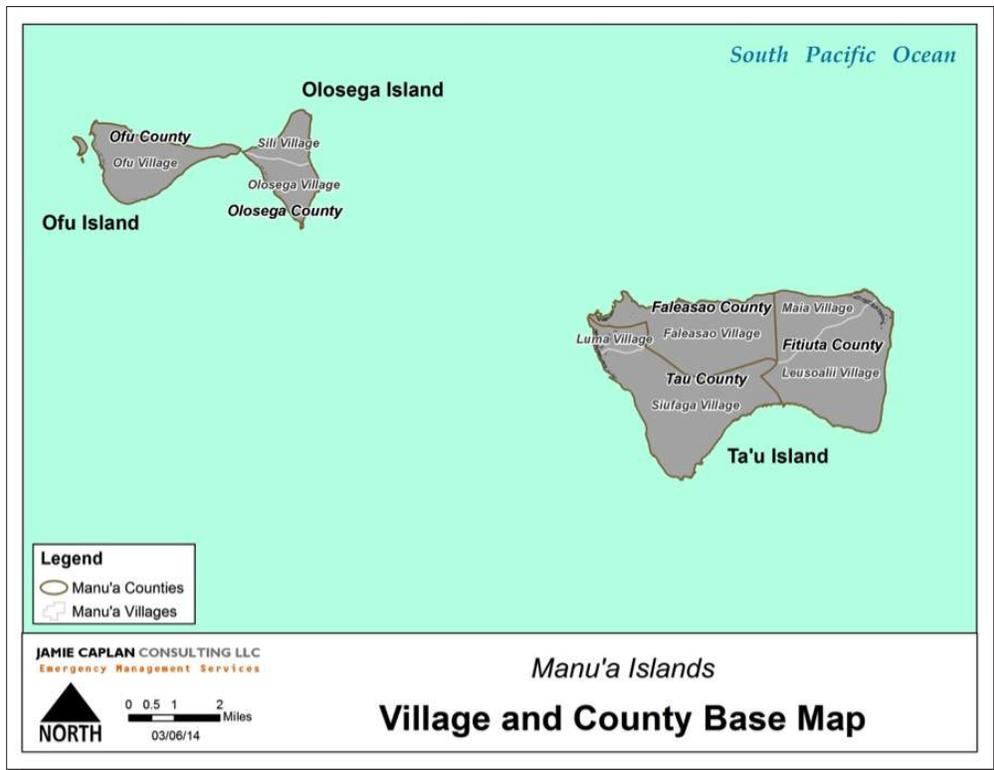


Figure 4. Village and County Base Map for Manu'a Islands

The three islands of Ofu, Olosega and Ta'u, collectively referred to as the Manu'a islands, lie 70 miles east of Tutuila with a population of about 1,100. Ta'u is the largest of the three islands at 6.5-mile square miles followed by Ofu (2.8 square miles) and Olosega (2.0 square miles). Access is made by boat or plane. Figure 4 Village and County Base Map for Manu'a Islands depicts the counties in the Manu'a islands.

Swains Island, with a population of approximately 17 lies 240 miles north of Tutuila, and the uninhabited Rose Atoll is a National Wildlife Sanctuary 180 miles to the east.

The Manu'a Islands can be considered an underserved community. The current government is making a big effort to build up the Manu'a Islands via the current American Samoa's Comprehensive Economic Development Strategy. Below is a news summary of these economic efforts, with footnoted reference:

Revival Planned for American Samoa's Manu'a Islands ²

Updated at 4:46 pm on 15 August 2012

A review of American Samoa's Comprehensive Economic Development Strategy will include recommendations on possible business ventures for Manu'a, not only to create jobs but attract Manuans back to the islands.

Businessman Lewis Wolman is contracted with economist Malcolm McPhee to update the Strategy. Mr. Wolman says tourism, fishing, agriculture and the broadband link, called BLAST, all hold promise of greater economic activity in Manu'a.

“None of those will happen overnight but between transportation, fisheries, agriculture, the internet connection from the BLAST project and of course tourism, I believe that the conditions

² Revival planned for American Samoa's Manu'a Islands (2012). Radio New Zealand. Retrieved August 8, 2014 from <http://www.radionz.co.nz/international/pacific-news/206584/revival-planned-for-american-samoa-s-manu-a-islands>

will be good that everybody pulls together there is a brighter future for Manu'a than we have seen in the last 20 years." Stated by, American Samoa businessman, Lewis Wolman.

"Rose Atoll, known to Samoans as Muliāva, is approximately 150 miles (240 km) east-southeast of Tutuila Island's Pago Pago Harbor. It is the easternmost Samoan island, the southernmost point of the United States, the only atoll in the Samoan archipelago, and one of the smallest atolls in the world.

The Muliāva sanctuary area encompasses 13,507.8 square miles (34,985.04 square km) of marine waters of the Rose Atoll Marine National Monument and waters surrounding the Vailulu'u Seamount, the only hydrothermally active seamount within the EEZ. The inner sanctuary boundary is adjacent to the seaward boundary of the Rose Atoll National Wildlife Refuge. Hence, the sanctuary does not include the land or lagoon waters that make up the refuge.

The atoll is home to 270 species of reef fish as well unique plant life and bird life only found on this atoll. Access to Rose Atoll is only for scientific and research purposes and permission must be sought from the US Fish & Wildlife Service."³

Demographic and its Impact on Risk

According to the 2010 U.S. Census, the total population in American Samoa was 55,519 persons including 52,928 persons on Tutuila and 1,143 in Manu'a (176 persons on Ofu, 177 persons on Olosega, and 790 persons on Ta'u).⁴ Table 1, Population Distributions for Villages, is shown below. In Tutuila, the population is heavily concentrated in the Tafuna Plain, in the Western District, since this is the largest area of flat or gently sloping terrain. The village with the highest population is Tafuna at nearly 8,000 persons. Nu'uuli is the second largest village (approximately 4,000 persons) and Pago Pago is the third largest village (approximately 3,600 persons). The village with the lowest reported population is Maloata (approximately 8 persons), which is located on the northwestern side of Tutuila. In Manu'a, the eight villages range in population from five to 183, with an average of 143. The most populated village is Luma, on the island of Tau. Figure 5 2010 U.S. Census Village Population below shows the population distribution across American Samoa.

County (District)	Villages within	Approx. Size (sq. mi.)	2010 Population
TUTUILA ISLAND			
East Vaifanua (East District)	Alao Aoa Onenoa Tula Utumea East	2.31	1,953
Ituau (East District)	Faganeanea Fagasa Matuu Nuuuli	5.52	5,335

³ National Marine Sanctuary of American Samoa. (2014). American Samoa Government Department of Commerce. Retrieved August 8, 2014, from <http://doc.as.gov/resource-management/nmsas/>

⁴ Note: remaining population, 1,448 reside on outlying islands.

Table 1. Population Distribution for Villages

County (District)	Villages within	Approx. Size (sq. mi.)	2010 Population
Lealataua (West District)	Afao Agugulu Amaluia Amanave Asili Fagalii Fagamalo Failolo Leone Maloata Nua Poloa Seetaga Utumea West	9.22	3,884
Leasina (West District)	Aasu Aoloau Malaeloa Aitulagi	6.51	1,807
Maoputasi (East District)	Anua Atuu Aua Fagaalu Fagatogo Leloaloa Pago Pago Utulei	6.65	9,889
Saole (East District)	Alofau Amouli Auasi Aunu'u Island Pagai Utumea East	2.27	2,281
Sua (East District)	Afono Alega Amaua Aumi Auto Avaio Fagaitua Laulii Masausi Masefau Saillele	3.00	3,223

County (District)	Villages within	Approx. Size (sq. mi.)	2010 Population
Tualatai (West District)	Futiga Malaeloa Ituau Taputimu Vailoatai	2.53	3,561
Tualata (West District)	Falenui Iiili Malaemi Mapusagafou Mesepa Nuuuli Pavaiai Tafuna Vaitogi	9.25	20,290
West Vaifanua (East District)	Vatia	9.25	640
AUNU'U ISLAND			
Saole (East District) ⁵	Aunu'u	0.59	436
MANU'A ISLAND			
Ta'u Island			
Faleasao (Manu'a District)	Faleasao	4.59	162
Fitiuta (Manu'a District)	Leusoalii Maia	6.73	270
Ta'u (Manu'a District)	Luma Siufaga	188.56	176
Ofu Island			
Ofu (Manu'a District)	Ofu	2.84	176
Olosega Island			
Olosega (Manu'a District)	Olosega Sili	2.03	177
Rose Atoll ⁶		0.08	0
Swains Island ⁷		0.58	17

Until the 2010 Census, the Territory's population had been increasing each decade with double-digit percent change growth (Table 2 Population Change 1970-2010). The population growth in American Samoa has been attributed to a combination of high fertility rates and immigration.⁸ The 2010 U.S. Census shows the population declined slightly from 2000 to 2010. (Figure 6 American Samoa - 2010 Census Results and Figure 7 American Samoa - 2010 Census Results % Change show specific changes and highlights from 2000 to 2010.) The population

⁵ Size and population totals included in Saole County estimate for Tutuila above.

⁶ No population so not included in the risk assessment or future parts of plan

⁷ Ibid.

⁸ Section 309 Assessment and Strategy for the American Samoa Coastal Management Program. (2011). American Samoa Coastal Management Program. Retrieved August 8, 2014 from <http://coastalmanagement.noaa.gov/mystate/docs/as3092011.pdf>

more than doubled between 1970 and 2000 from approximately 25,000 persons to over 55,000 persons. In addition, it is suspected that persons live undocumented on the island and thus are not reported in the U.S. Census estimates. This increased population and density is impacting its environment and resources.

“The population density (average number of persons per square kilometer) in 2010 was 331. This number could be a lot higher given the ruggedness and steep mountainous landscaping of the islands. People move to other places because of economic reasons, availability of land resources, and socio-political stability. The Manu’a Island residents continued to relocate to the main island of Tutuila looking for better economic opportunities or attending schools. Tutuila’s population shifted from the Eastern District to the Western District in the past decades. In the 2010 Census, there were 31,329 people living in the Western District while 23,030 people live in the Eastern District.”⁹

Year	American Samoa Population	Population Change from the previous decade	Percent Change (growth/decline)
1970	25,065	--	--
1980	30,538	+5,473	22%
1990	45,043	+14,505	47%
2000	55,885	+10,842	24%
2010	55,419	-366	-1%

Table 2 Population Change 1970-2010

Tutuila has experienced much of the Territory’s population growth. The population density on Tutuila has reached an alarming 1.6 people per acre (or 1,047 persons per square mile). Nearly 90% of the Territory’s population resides on this island, primarily on the Tafuna Plain and around Pago Pago Harbor. High population densities in those areas have impacted many aspects of life, including significantly straining the existing infrastructure (roads, water supply, wastewater, etc.), causing increased waste streams, surface runoff increases, leading to chronic flooding along roads and properties and increasing vulnerability to natural hazards. This last point was highlighted during the September 2009 tsunami, which caused 34 deaths and destroyed nearly 250 homes and another 2,750 dwellings.”¹⁰ The increased population near the ocean certainly contributed to the catastrophic nature of this event.

Demographic trends reflect the growing population through a substantial young population and young median age. The 2010 Demographic Profile for American Samoa indicates that the median age is 22.4 and the highest population is those under five years of age (11.9 percent).¹¹ Those aged 0 to 19 make up 46.3 percent of the population, indicating a strong and growing youth population. Just 5.6 percent of the population is aged 62 or older emphasizing the population boom in recent decades. Average household size is 5.6 persons. Median household income (2009 dollars) was \$23,892.

Regarding education, 11.2 percent of the population is enrolled in college and most, 47.9 percent, are in elementary school. Eighty-two percent of the population is a high school graduate or higher. Just 3.9 percent of the population speaks English only at home. Samoan is the primary language spoken at home (88.6 percent). Table 3 Summarizes the demographic data from the 2010 Census for the people of American Samoa.

⁹ American Samoa Statistical Yearbook 2012. (2012). Department of Commerce Statistic Division. Retrieved August 8, 2014 from <http://www.doc.as/wp-content/uploads/2011/06/2012-Statistical-Yearbook-1.pdf>

¹⁰ Section 309 Assessment and Strategy for the American Samoa Coastal Management Program. (2011). American Samoa Coastal Management Program. Retrieved August 8, 2014 from <http://coastalmanagement.noaa.gov/mystate/docs/as3092011.pdf>

¹¹ The 2010 Demographic Profile for American Samoa. (2010). U.S. Census Bureau. Retrieved August 8, 2014 from <http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t#non>

Table 3. Summary of Demographic Category, 2010 data

Demographic Category, 2010 Data		Demographic Value
1	Median Age	22.4
2	Population under 5 years old	11.9%
3	Population under 19 years old	46.3%
4	Population older than 62 years old	5.6%
5	Average household size	5.6 persons
6	Median household income	\$23,892
7	College enrollment	11.2
8	Elementary school enrollment	47.0
9	Graduated from High School	82%
10	English speakers at home	3.9%
11	Samoan speakers at home	88.6

There are 18,300 individuals in the civilian labor forces (over 16 years of age, employed or seeking work; not in armed forces). Of these, 16,616 are employed and 1,684 (9 percent) are unemployed.

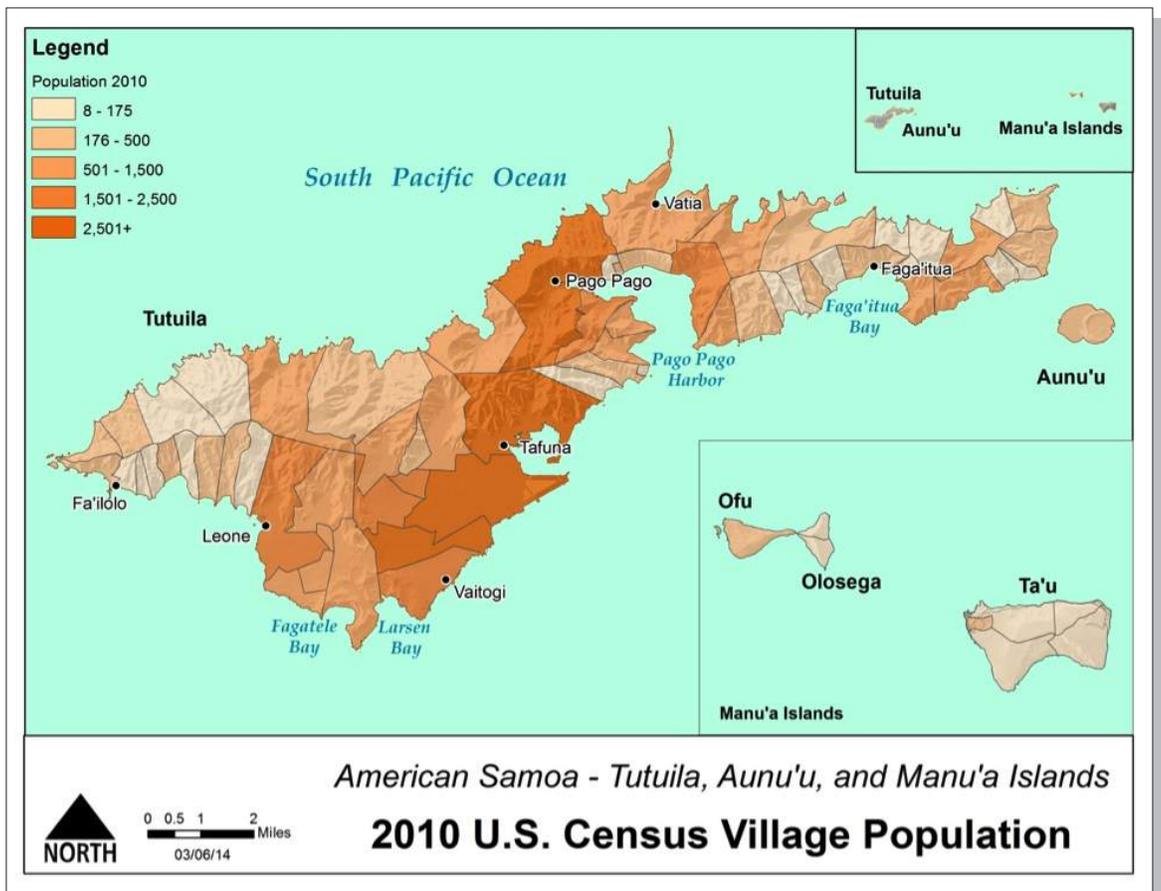


Figure 5. 2010 U.S. Census Village Population

AMERICAN SAMOA - 2010 Census Results

Total Population by County

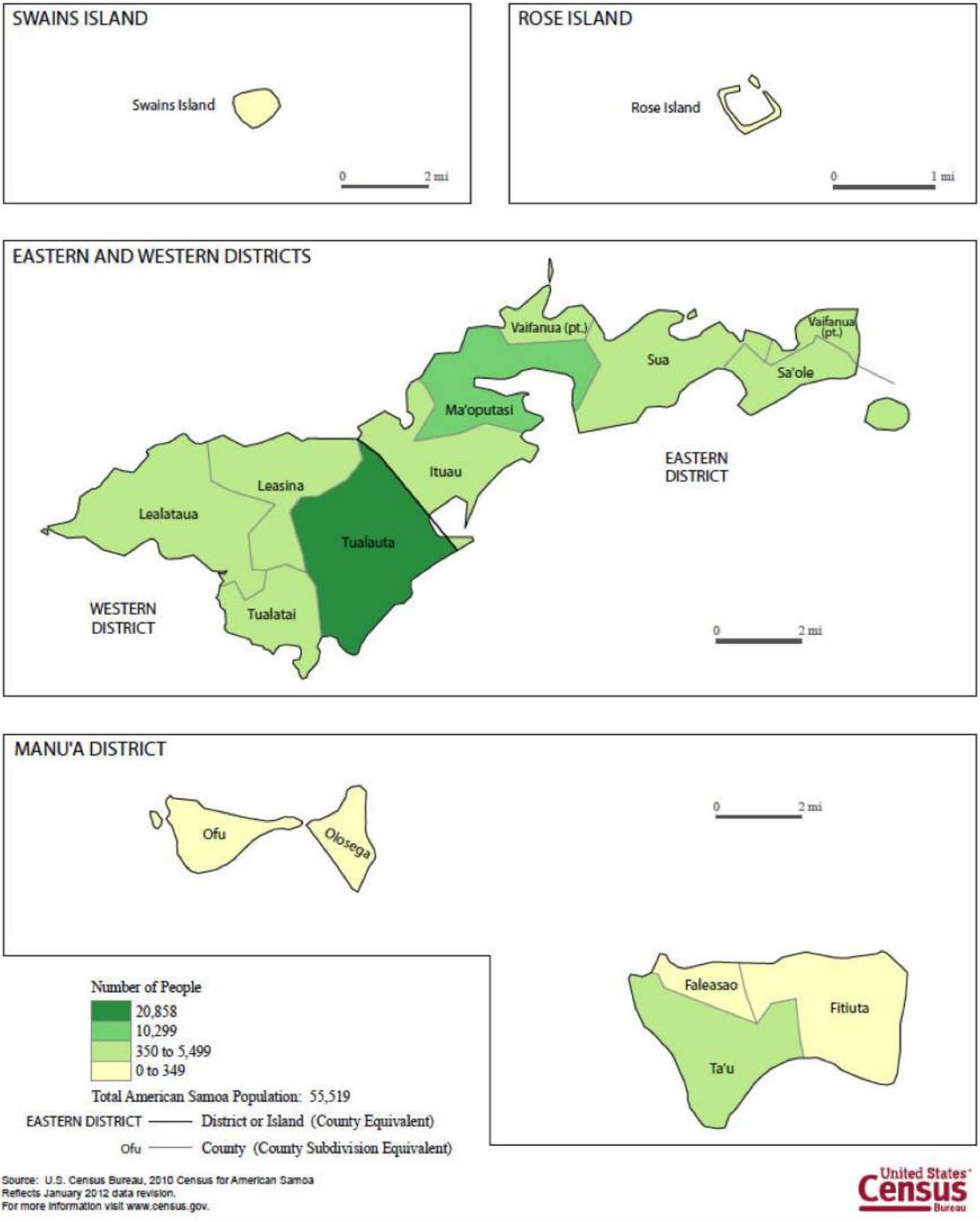
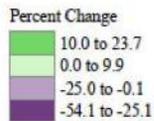
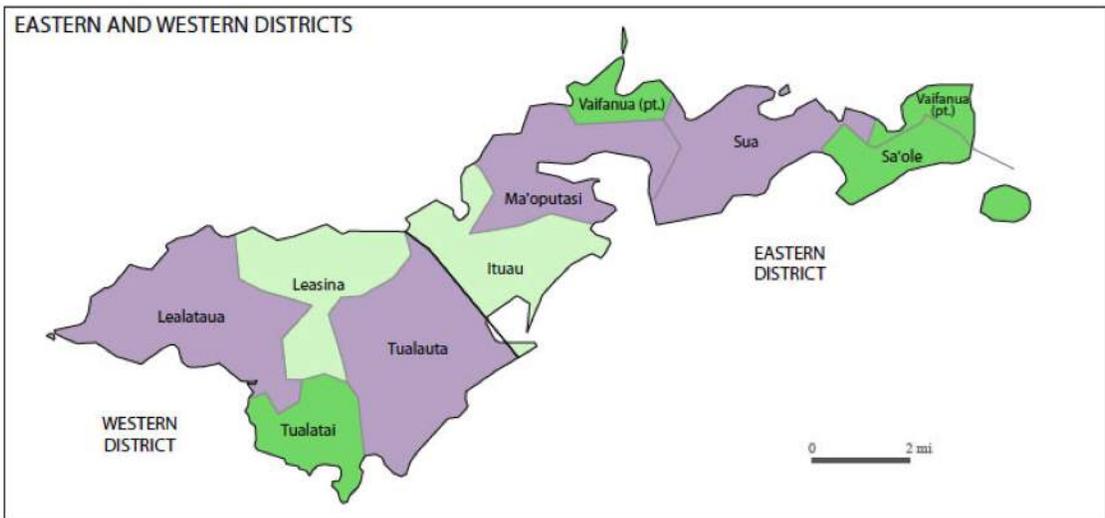
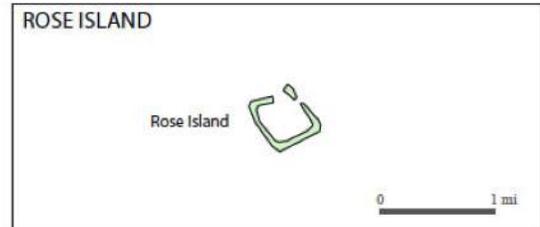
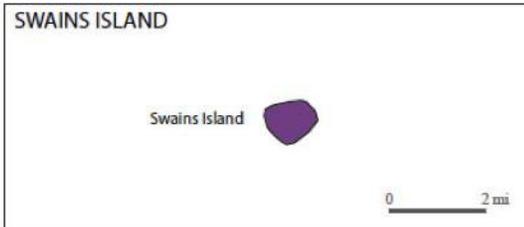


Figure 6. American Samoa - 2010 Census Results¹²

12 2010 Census Island Areas: American Samoa (2010). U.S. Census 2010. Retrieved August 8, 2014 from <http://www.census.gov/2010census/news/press-kits/island-areas/island-areas.html>

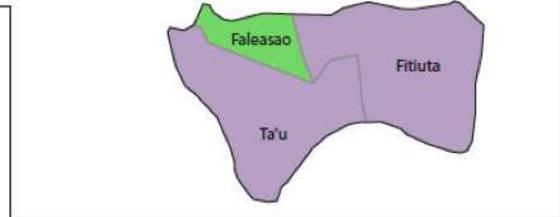
AMERICAN SAMOA - 2010 Census Results

Percent Change in Population by County: 2000 to 2010



Percent Change for American Samoa: -3.1%

EASTERN DISTRICT — District or Island (County Equivalent)
 Ofu — County (County Subdivision Equivalent)



Source: U.S. Census Bureau, Census 2000 for American Samoa and the 2010 Census for American Samoa
 Reflects January 2012 data revision.
 For more information visit www.census.gov.



Figure 7. American Samoa - 2010 Census Results % Change¹³

13 2010 Census Island Areas: American Samoa (2010). U.S. Census 2010. Retrieved August 8, 2014 from <http://www.census.gov/2010census/news/press-kits/island-areas/island-areas.html>

Building Permits and Growth

Land ownership is unique in American Samoa. According to American Samoa Department of Commerce (ASDOC), there are five categories of ownership: freehold, government-owned, church-owned, individually owned, or communal/native owned. Communal land ownership is the traditional land tenure system and under the direct authority of the Samoan chiefs known as “matais.” Within this system, traditional land cannot be purchased or sold and the current reigning chief from within the family unit has final say over the disposition of a family’s holdings. This system ensures the passage of assets to future generations and serves to preserve the Samoan culture and the Samoan land value system.¹⁴

The table below shows how land ownership is divided by ownership type among 7,875 acres. This information comes from the ASDOC 2012 Statistical Yearbook.¹⁵ It should be noted that there are about 48,767 acres of land but nearly two-thirds of that land is unbuildable due to steep slope. However, some of the undevelopable land is registered annually (including 12 new acres in 2012).

		Land Ownership Type					
Acres/Year		Freehold	Government	Church	Individual	Communal	Total
	2012	1,072	1,651	1,030	2,027	2,095	7,875
	2011	1,072	1,651	1,030	2,016	2,094	7,873
	2010	1,072	1,651	1,030	2,015	2,093	7,862
	2009	1,018	1,651	1,028	2,006	2,091	7,794
	2008	1,018	1,651	1,018	1,971	2,088	7,746
	2007	1,018	1,651	1,013	1,962	2,061	7,705
	2006	1,018	1,651	1,013	1,955	2,056	7,693
	2005	1,018	1,651	1,013	1,942	2,046	7,670
	2004	1,019	1,651	1,005	1,935	2,039	7,649
	2003	1,019	1,651	1,004	1,903	2,034	7,611
2002	1,014	1,651	1,003	1,899	1,991	7,558	

Table 4. Acreage Aggregated by Ownership Type

Information from the Statistical Yearbook indicates that of 9,688 structures on-island built between pre-1939 and March 2010, a majority of structures (5,121) were built between 1990 and 2008. An additional 2,117 structures were built between 1980 and 1989. Of the total structures built, a majority of buildings were built in Tualauta County (3,063 new structures) and Ma’oputasi County (1,160 new structures). However, these statistics likely do not account for the rebuilding that occurred in 2009-2010 due to the devastating tsunami in September 2009.

To address potential rebuilding from the tsunami, the statistical Yearbook also lists “number of building permits issued” (Table 5 Building Permits Issued (2002-2012), including those for new structures, between 2002 and 2012. Note the spike in 2010 is likely due to tsunami repairs and rebuilding. A spike is also evident in 2003 and 2004. There were federal disaster declarations in each of these years – flooding and landslides in 2003 and Tropical Cyclone Heta in 2004. Unfortunately, information about where these structures were built was not provided. This information was researched but not available.

¹⁴ American Samoa Government (2003). Retrieved August 8, 2014 from <http://www.asg.gov.com/islandinfo.htm>.

¹⁵ American Samoa Statistical Yearbook 2012. (2012). Department of Commerce Statistic Division. Retrieved August 8, 2014 from <http://www.doc.as/wp-content/uploads/2011/06/2012-Statistical-Yearbook-1.pdf>

Table 5. Building Permits Issued (2002-2012)

Building Permits Issued (2002-2012)			
	New Structure Permits	Other Permits (repairs etc.)	Total Permits Issued
2002	126	470	596
2003	139	812	951
2004	238	1,098	1,336
2005	183	625	808
2006	158	534	692
2007	118	460	578
2008	111	540	651
2009	133	705	838
2010	243	798	1,041
2011	132	579	711
2012	135	557	692

With the exception of hurricane construction, approximately 200 residential homes are built annually. Villages continue to grow in size and limited agricultural land is fast being converted to residential lands to accommodate such expansion. As population increases, greater numbers of people become potentially at risk from natural hazards. Assessing risk becomes a significant factor in planning and policy making for future development and hazard mitigation.

Specific information on potential areas for new growth was researched but no information was available. As the most suitable land is developed, pressure moves to develop on steeper, unstable slopes or in floodplains. As new development is likely to face some risk of future hazards due to lack of buildable area, more focus on hazard mitigation must be placed on strengthening the Permit Notification and Review System (PNRS) to quickly and accurately identify vulnerable land development requests and scenarios. For the Tualauta County and other population centers, flood control is an important mitigation solution, while landslide identification, mapping, education and control of building in landslide-prone areas in a preferred mitigation solution.

Economy: Limited Economic Base

Economic activity in American Samoa is strongly linked to the United States mainland, with which American Samoa conducts the great bulk of its trade. Similar to many south pacific economies, fish-related industry is a major portion of the economy. Tuna fishing and canning plants are the backbone of the private sector, with canned tuna being the primary export. Transfers from the United States government add substantially to American Samoa's economic wellbeing. Attempts by the government to develop a larger and broader economy are constrained by American Samoa's remote location, its limited transportation, and limited land that is not prone to flooding, landslide, and tsunami hazards.

The Fiscal year is 1 October - 30 September, and the US dollar is the local currency. For the 2012 year (latest available), the Territory recorded a "trade surplus of \$151.3 million. Imports include government purchases,

value of fish brought in for processing for the canneries, and value of commercial merchandise brought in for resale. Trade data is still considered incomplete because of the absence of the Post Exchange (PX) data from the import series. The value of exports is made up primarily of canned tuna and by-products.”¹⁶ This is an increase from 2010 and 2011 but still down from years prior to that, likely a result in recession impacts. Table 6 Balance of Trade – 2007-2012.

Exports (\$)				Imports	Trade Balance
Annually	Domestic	Re-exports	Total	Imports CIF	Surplus (+) / Deficit (-)
2012	418,047,313	2,876,129	420,923,442	269,614,159	151,309,283
2011	278,288,152	2,825,627	281,113,779	207,387,800	73,725,979
2010	315,570,103	3,342,454	318,912,557	239,163,212	79,749,345
2009	491,239,242	2,748,124	493,987,366	311,374,752	182,612,614
2008	592,466,782	3,101,098	595,567,880	331,623,182	263,944,698
2007	463,120,592	2,940,532	466,061,124	232,201,560	233,859,564

Table 6. Balance of Trade - 2007-2012¹⁷

In 2012, \$269.6 million dollars in imports were reported, an increase from the previous fiscal year. The top three principal imports (by percentage) include live animals (38%), vehicles, aircraft and associated transport equipment (18%), and prepared foods including spirits, beverages and tobacco (8%). Canned tuna, by far, leads the export market, accounting for \$415 million out of \$420 million in total exports. Exports totaled \$446 million (2004) and are largely canned tuna (93%) and fresh produce.

American Samoa’s annual Gross Domestic Product (GDP) was \$648 million in 2011 and \$725 million in 2012. GDP last peaked at \$725 million in 2009 and has been in decline until 2012, likely a result of the recession.

The American Samoa Balance of Trade in fiscal year 2012 recorded a surplus of \$151.3 million. Imports include government purchases, value of fish brought in for processing for the canneries, and value of commercial merchandise brought in for resale. Trade data is still considered incomplete because of the absence of the Post Exchange (PX) data from the import series. The value of exports is made up primarily of canned tuna and by-products.

“Imports brought in through Customs Regulations for commercial use and resale are valued at \$269.6 million, which is an increase from FY2011 reported value. The United States continued to be American Samoa’s leading trade partner, followed by Fiji, New Zealand, Korea and Taiwan.”¹⁸

The American Samoa Statistical Yearbook, 2012 notes that major improvements are needed at the Customs Office for the collection of trade statistics, especially in regards to the right Country of Origin and the correct value of imported goods. Any and all goods crossing American Samoa border should be accounted for regardless of purpose or user.



Figure 8. Charlie the Tuna, Mascot for Starkist, displayed outside the Tuna Cannery

¹⁶ American Samoa Statistical Yearbook 2012. (2012). Department of Commerce Statistic Division. Retrieved August 8, 2014 from <http://www.doc.as/wp-content/uploads/2011/06/2012-Statistical-Yearbook-1.pdf>

¹⁷ Ibid., p.187.

¹⁸ Ibid., p.187.

Valuation of goods (FOB and CIF) must be applied. Automation and standard commodity classification of all goods should be adopted. Differentiation between intermediate goods and final consumption goods need major improvements.”¹⁹

Since the last update of this plan in 2010, the Section 309 Assessment and Strategy for the American Samoa Coastal Management Program February 2011 notes the following relevant economic situation transpired in American Samoa, “Economic activity in American Samoa for the past two decades has been based primarily on two major components, U.S. federal government expenditures and the tuna canneries, and to a lesser extent, retail and commercial sectors. Total employment in American Samoa in 2008 was estimated at 16,990, with the government providing 6,035 jobs and the canneries providing 4,861. Two tuna canneries were previously operating in Pago Pago Harbor; however, due to changes in minimum wage laws requiring incremental annual wage increases to eventually meet U.S. wage levels, one of the two canneries closed its doors in September 2009 and the other is expected to reduce its operations by approximately two-thirds during the fall of 2010. Over 2,000 jobs were lost with the first cannery closure, and an additional 600 to 800 jobs may be cut in the downsizing of the second cannery.

The economic impacts of the decrease in cannery activities will be widespread throughout the territory, requiring short-term assistance to help support unemployed workers and vulnerable families, as well as a long-term action plan to help rebuild economic activity in the territory. In anticipation of the decline in cannery activities, the American Samoa Government (ASG) has begun considering possible alternative sources of economic activity including light manufacturing, internet-based businesses including information and communications, tourism, agriculture, and aquaculture. In early October 2010, Tri Marine announced that it was planning on reopening the Chicken of the Sea cannery under its own operations. While this is a positive step in maintaining economic opportunities in American Samoa, the time frame for such a reopening has not yet been disclosed.”²⁰

Geography and Related Flood and Landslide Impacts

Emerging from the ocean floor two to three miles below the ocean’s surface, American Samoa formed as a result of volcanic activity over a hot spot in the Pacific Plate. Tectonic uplifts and volcanic activity during the early formation period of the islands have led to steep inclines and sharp cliffs being the dominant geographical features of the main islands. Peak elevations reach 3,100 feet on Ta’u Island (Lata Mountain), and 2,142 feet on Tutuila Island (Matafao Peak). Only 34 percent or 16,695 acres of the land in American Samoa has a slope of 30 percent or less. Deep valleys radiating from the summit of each distinct volcanic cone provide natural drainage. Streams discharging at the heads of small embayment’s have developed small coastal plains. This topography causes flooding and landslide hazards. Tutuila’s natural deep-water harbor has given the islands their strategic value during the past two centuries. Narrow sand and coral rubble beaches rim approximately 25 percent of the coastline wherever fringing reefs exist. Such reefs are primarily on the calmer south shore of the islands and on average extend out to sea 200 feet. Exposed to severe marine erosion, the north shore coasts of the islands are primarily steep volcanic cliffs.

19 American Samoa Statistical Yearbook 2012. (2012). Department of Commerce Statistic Division. Retrieved August 8, 2014 from <http://www.doc.as/wp-content/uploads/2011/06/2012-Statistical-Yearbook-1.pdf>

20 Section 309 Assessment and Strategy for the American Samoa Coastal Management Program. (2011). American Samoa Coastal Management Program. Retrieved August 8, 2014 from <http://coastalmanagement.noaa.gov/mystate/docs/as3092011.pdf>

The rugged terrain and salty environment make for limited suitable development and additional factors to consider with building materials. As noted above, the terrain includes very steep slopes and floodplain areas in flatter places. As population pressures increase, building in less suitable areas, such as on steep slopes, excavated landslide areas, and near floodplains is becoming more common. However, development in higher risk areas has resulted in past landslides (2003) and puts population at risk. In addition to building location, the marine environment creates a need for suitable building materials. Proximity to the reef and salt spray exposure creates a highly corrosive marine environment, which has caused the construction industry to seriously reevaluate building materials. For instance, the expected useful life of standard metal guardrails is reduced by 50 percent as a result of the salt air.²¹ Corrosion-resistant materials are encouraged such as concrete, plastics and stainless steel. The appropriate material will depend on the item being constructed and determined by professional guidance.



Figure 9. Image of Mountains and Pago Harbor

Climate

Located within the Tropic of Capricorn and 14 degrees south of the equator, American Samoa has a maritime climate with copious rainfall and warm humid days and nights. Temperatures in the islands range between 73 and 93 degrees Fahrenheit and relative humidity ranges between 73 and 84 percent throughout the year. As a result, vegetation is moderately dense, with many coconut, banana, and other tropical fruit trees, grasses, and low-growing brush. Depending on topography, precipitation ranges from 125 inches in some areas, to approximately 250 inches in others. The village of Pago Pago, including a major international port, less than 4 miles north of the airport and open to the prevailing wind, receives nearly 200 inches of rain per year. The crest of the mountain range receives well above 250 inches. In recent years, the airport weather station has recorded at least trace amounts of rain about 300 days per year, with nearly 175 days receiving rainfall of 0.10 inch or more.

The drier months are June through September (southern winter) and the wettest, December through March (southern summer). However, the seasonal rainfall may vary widely in individual years, and heavy showers and long rainy periods can occur in any month. Thunderstorms are less frequent than might be expected, considering the moisture and instability of the tropical air mass that usually overlies the Samoa Islands. Flooding rains are common, and although some of these are associated with hurricanes and tropical storms, they can occur at other times as well.

²¹ American Samoa Government (2003). Retrieved August 8, 2014 from <http://www.asg-gov.com/islandinfo.htm>.

June, July and August are the coolest months and January, February, and March, are the warmest. Afternoon temperatures reach the upper-80s (F°) in summer, and mid 80s (F°) in the winter, while nighttime temperatures fall to the mid-70s (F°) in summer, and low-70s (F°) in winter. The highest recorded temperatures at the airport were in the low-90s (F°), and the lowest near 60 (F°).

Easterly trade winds prevail throughout the year, and tend to be easterly December through March, but are predominantly from the ESE and SE during the rest of the year. The trade winds are less prevalent in summer than in winter, often interrupted by the proximity of small tropical storms, bands of converging winds, or one of the low pressure systems higher in the atmosphere, all of which help make summer the rainy season.

At other times, the absence of the trade winds is marked by periods of light and variable westerly to northerly winds and by land and sea breezes. Although strong at times, these winds are often quite light, and may reflect the nighttime drainage of cooled air from the mountains west and north of the airport.

Water, Electricity and Petroleum

“American Samoa does not produce or refine petroleum. Petroleum products are imported in tankers, which unload at a terminal and tank farm adjacent to the main harbor at Pago Pago. The territory imports distillates, mainly low-sulfur diesel fuel, high-sulfur marine fuel, jet fuel, and motor gasoline. Except for a period following the 2009 tsunami, American Samoans typically consume about one-tenth more petroleum per capita than the U.S. average.”²²

The territory lacks conventional energy resources and depends on imported petroleum products to meet most energy needs. High petroleum product prices are a major concern for the islands’ economy, which typically has been more than twice as energy-intensive as that of the United States, though per capita energy consumption runs about one-half of the U.S. average. Energy consumption dropped sharply after 2009, when an earthquake and tsunami devastated the island just as one of two canneries was closing, throwing one in five island employees out of work. Since then, the economy and energy consumption have been slowly recovering.²³

“There are two principal importers (suppliers) of petroleum products: 1) Pacific Energy Marketing, the marketing arm of PE that manages the terminal, also acts as a fuel wholesaler and retailer; and 2) the American Samoa Power Authority (ASPA) which imports the diesel fuel it consumes in its electricity generators and which also sells fuel to companies such as Clipper and Sunrise. These two companies, as well as PE, in turn sell fuels to gasoline stations or other purchasers (i.e. private contractors). There are 11 retail gasoline stations on Tutuila. Most have 5,000-gallon tanks while the largest gasoline station on the island in Utulei has 50,000 gallons of gasoline storage capacity.”²⁴

22 American Samoa: Territory Profile and Energy Estimates. (2013). Retrieved August 8, 2014 from <http://www.eia.gov/state/analysis.cfm?sid=AQ>

23 Ibid.

24 Energy Assurance Plan. (2014) American Samoa Power Authority. Retrieved August 8, 2014 from <http://www.aspower.com/aspaweb/Downloads/ASREC/DRAFT%20Energy%20Assurance%20Plan.pdf>

American Samoa Power Authority (ASPA)

“Nearly all of American Samoa’s electricity is supplied by generators consuming No. 2 diesel fuel. The American Samoa Power Authority (ASPA), a government corporation, owns and operates two generating plants and the electric grid on Tutuila and two other small generating plants and grids serving the Manu’a group. Total generating capacity is about 40 megawatts, most of it from the Tafuna and Satala plants on Tutuila. ASPA also provides drinking water and wastewater treatment. Pumping, treating, distributing, and collecting water consume a significant share of ASPA’s electricity generation. In September 2009, an earthquake and tsunami destroyed the Satala generating plant.”²⁵ That halved the electricity-generating capacity on Tutuila. Generators burning ultra-low-sulfur diesel replaced those destroyed in 2009, which had used high-sulfur diesel fuel. This temporary generating capacity still continues today without a second power plant since the September 2009 tsunami.



Figure 10. ASPA Generators

“The residential sector is the largest electricity consumer, using nearly one-third of all power. It is closely followed by the commercial sector. The government consumes nearly one-fifth of electricity generated on the islands. Per capita consumption is only about one-fourth of U.S. per capita consumption. Electricity cost varies with a fuel surcharge linked to world oil prices. In early 2012, that surcharge brought the average electricity price in American Samoa to about five times the average U.S. price.”²⁶

Utulei Tank Farm

The Utulei Tank Farm is located in Pago Pago Harbor along the main road in the village of Utulei. Due to the location of the Tank Farm it is vulnerable to storm surge, sea level rise and tsunami flood waters. The current operator, BP Southwest Pacific Ltd. stores oil & operates the tank farm terminal. This facility started to store oil in 1941 and has been upgraded several times. Currently, the oldest tanks were installed in the 1980’s. The facility is primarily engaged in the wholesale distribution of petroleum products from bulk liquid storage terminals.

²⁵ American Samoa: Territory Profile and Energy Estimates. (2013). Retrieved August 8, 2014 from <http://www.eia.gov/state/analysis.cfm?sid=AQ>

²⁶ Ibid.

The main office and primary storage are located in the village of Utulei, on the west side of Pago Pago Harbor. It is owned by the American Samoa Government and operated by BP South West Pacific Limited. The fuel dock is located south of the Commercial Container pier, adjacent to the Rainmaker Hotel, on the west rim of Pago Pago Harbor. The Airport Tank Farm Satellite is located on the west end of the Pago Pago International Airport parking lot.



Figure 11. Utulei Tank Farm

The petroleum storage area at the Utulei Tank Farm contains 10 above ground storage tanks with a total storage capacity of 29,512 barrels. The Airport Tank Farm contains 6 horizontal bullet tanks with a total storage capacity of 3,048 barrels. All of the tanks are contained within dike (secondary containment) areas. The Utulei Tank Farm was further protected using Hazard Mitigation Grant Program funds as one of the Territory's first projects in the early 1990s. The wall built around the Tank Farm in 2001 was designed to contain an oil spill and to withstand

135 mph winds and an 8.4 magnitude earthquake, however it is not designed to withstand the outer force from a major tsunami, storm surge or sea level rise event.²⁷ The fuel dock is connected to the storage area by three petroleum pipelines.

American Samoa Renewable Energy Committee (ASREC)

The American Samoa Renewable Energy Committee (ASREC) established by executive order, adopted a charter outlining the purpose, mission, organization, staffing, directive, and duration. Succinctly, ASREC must develop a long-term strategic energy plan that creates a sustainable energy future for American Samoa with input from various sectors and stakeholders.²⁸

ASREC's Mission is to "enhance the well-being of our citizenry, ensure energy and economic security through energy independence and diversification, and improve environmental quality. Educate all stakeholders on the importance of our vision by embracing conservation, energy efficiency and alternative energy. The ASREC is a forum for considering options and offering guidance related to the achievement of its energy goals through policy, projects and programs."²⁹

²⁷ Energy Assurance Plan. (2014) American Samoa Power Authority. Retrieved August 8, 2014 from <http://www.aspower.com/aspaweb/Downloads/ASREC/DRAFT%20Energy%20Assurance%20Plan.pdf>

²⁸ American Samoa Renewable Energy Committee. (2014). Retrieved August 8, 2014 from <http://www.asrec.net>

²⁹ Ibid.

“With American Samoa’s high cost of electricity and geographic isolation, the government has established a Renewable Energy Committee to work with federal experts to bring sustainable renewable energy to the islands. Potential renewable energy resources include solar, wind, and biomass. In 2008, American Samoa adopted a net metering law that allows owners of small solar or wind facilities installed primarily for the consumer’s use to receive credit for excess power sent to the grid. More than 20 government and commercial customers use net metering and account for more than 0.5 megawatt of total load.

American Samoa’s renewable energy program includes a 1.75-megawatt solar photovoltaic (PV) array near the Tafuna power station, 24 smaller arrays on rooftops of government buildings, and solar hot water heating for Tutuila’s LBJ Tropical Medical Center. Assistance for residential weatherization is also being offered. Because it is near the equator, American Samoa has substantial potential to expand both solar hot water heating and solar PV applications.

No commercial-scale wind turbines have been installed in American Samoa, but ASPA has set up measuring stations around the islands to assess wind speeds. Earlier measurements indicated limited wind resources around the main island of Tutuila but more potential in the Manu’a islands. Challenges for wind energy include typhoons, social acceptance, and grid stability. To ensure reliability on its small island grids, ASPA is limiting renewable power to 20% of peak demand capacity. American Samoa’s communal land ownership structure also makes long-term leasing for larger scale projects a potential hurdle for development.

ASPA is using organic Rankine cycle technology to generate additional electricity from waste heat emitted by diesel generators at its Tafuna plant. Preliminary studies indicate potential for generating electricity with municipal solid waste on Tutuila and for displacing petroleum-based diesel fuel with biodiesel, although the mountainous terrain limits land available for raising biodiesel feedstocks.”³⁰

See Appendix K for two articles related to solar installations.

³⁰ American Samoa: Territory Profile and Energy Estimates. (2013). Retrieved August 8, 2014 from <http://www.eia.gov/state/analysis.cfm?sid=AQ>