

Oahu Transportation Summary Report

Prepared for James Campbell National
Wildlife Refuge

July 2012



Central Federal Lands Highway Division
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Prepared for James Campbell National Wildlife Refuge

Final Report
July 2012

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Executive Summary

This document was developed to assist refuge managers, staff, and relevant stakeholders in making informed decisions that may affect transportation to, from, in and around the James Campbell National Wildlife Refuge (JCNWR). The document presents baseline transportation conditions for the Island of Oahu and area specifically near JCNWR.

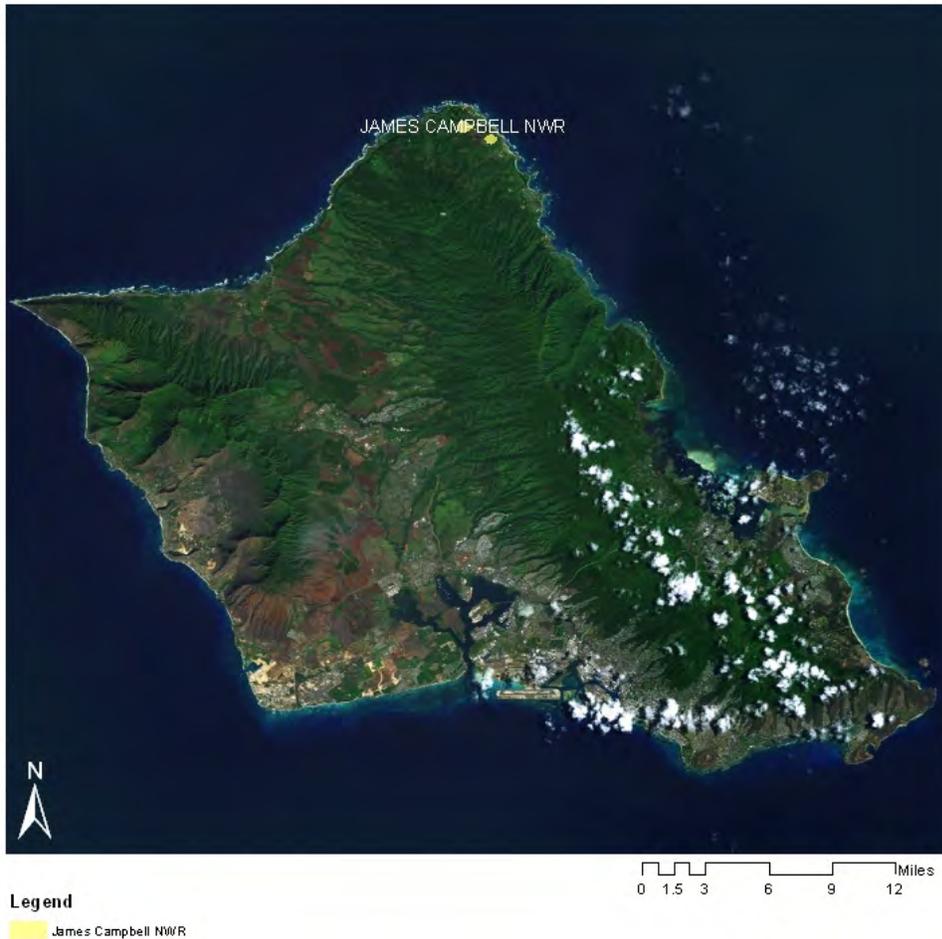
At the time of this report, JCNWR had published its *Draft Comprehensive Conservation Plan and Environmental Assessment*.¹ Within the plan are three distinct alternatives for the future development of the refuge. For the purposes of this report, where transportation/visitation impacts are involved, staff estimated a range of visitation and impacts based on the preferred alternative, alternative 3, which includes full restoration and management of refuge expansion lands. Currently, the U.S. Fish and Wildlife Service (USFWS) is in agreement with the James Campbell Company to purchase land to expand the refuge, it is assumed this acquisition will continue to take place, with the final purchase anticipated in 2012, or soon after



This report was prepared with assistance from the Oahu Metropolitan Transportation Organization (OahuMPO), Hawaii Department of Transportation (HDOT), the City and County of Honolulu, U.S. Fish and Wildlife Service, Atkins Global, and the Polynesian Cultural Center. These organizations are not responsible for the content of the report, but did supply valuable assistance in data acquisition. This summary report is a dynamic document that contains continuously changing information. It represents the best information available at the time of its writing.

¹ USFWS. 2011. *James Campbell National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment*. <http://www.fws.gov/pacific/planning/main/docs/HI-PI/James%20Campbell%20Pearl%20Harbor%20CCP/James%20Campbell%20NWR%20DCCPEA.pdf>

Figure 1 – James Campbell NWR Location



Summary of Findings

Hawaii and the Island of Oahu’s population and employment will continue to grow into the future. Oahu is projected to grow in population by 22% from 2007 to 2035; jobs will increase by 25%. Hawaii and Oahu have aggressive land use regulations that limit where development occurs. A large amount of new employment growth will occur in the southwestern part of the island and on the North Shore. Population growth will be spread throughout the island.

Most of Oahu’s congestion occurs in and around Honolulu. However, local congestion occurs almost daily along Hwy 83 (Kamehameha Highway) on the North Shore of Oahu. Oahu has a well-developed transit (bus) system, has planned bike connectivity improvements throughout the island, and is preparing for heavy rail additions to its transportation network.

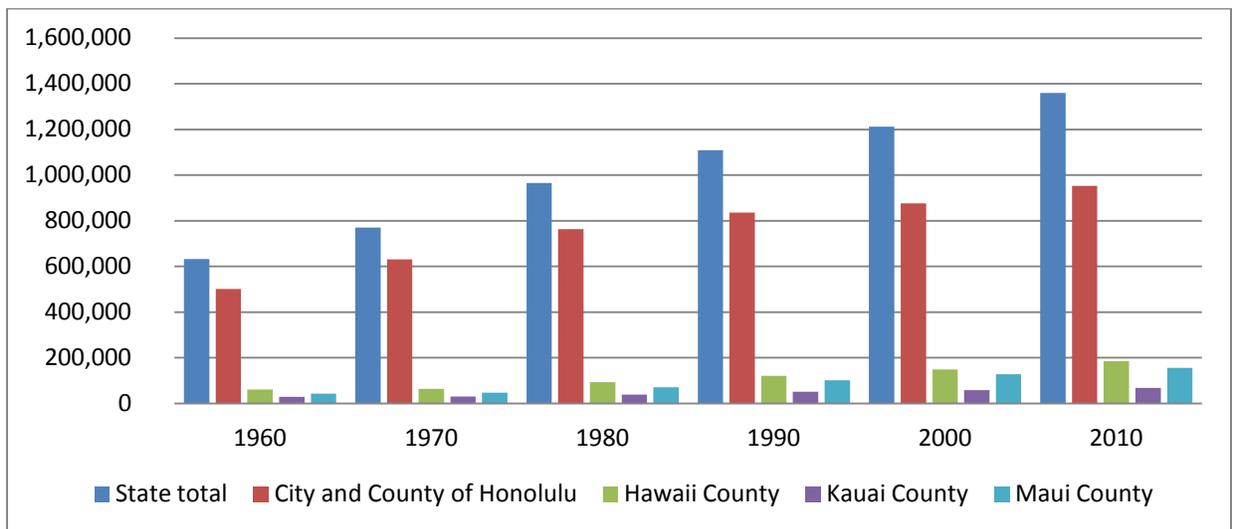
Tourism has declined since 2008, but is expected to remain constant, or grow into the future. With increased development in the Turtle Bay area proposed, growth could have a real impact on the transportation system, natural resources, and visitation to the JCNWR.

Chapter 1 - Population, Employment and Land Use

Population and land use have a large impact on development patterns. Where people live, work, and play greatly impacts the transportation system. The following represents a summary of population trends and current land use in Oahu, and specifically, in areas close to the JCNWR.

As of the 2010 US Census, Oahu had 953,207 residents and 311,047 households. There are approximately 556,900 employees with seventy-one percent of the island's jobs and forty-six percent of the island population located in the Primary Urban Center in Honolulu.²

Figure 2 – Population Change (1960 – 2010)

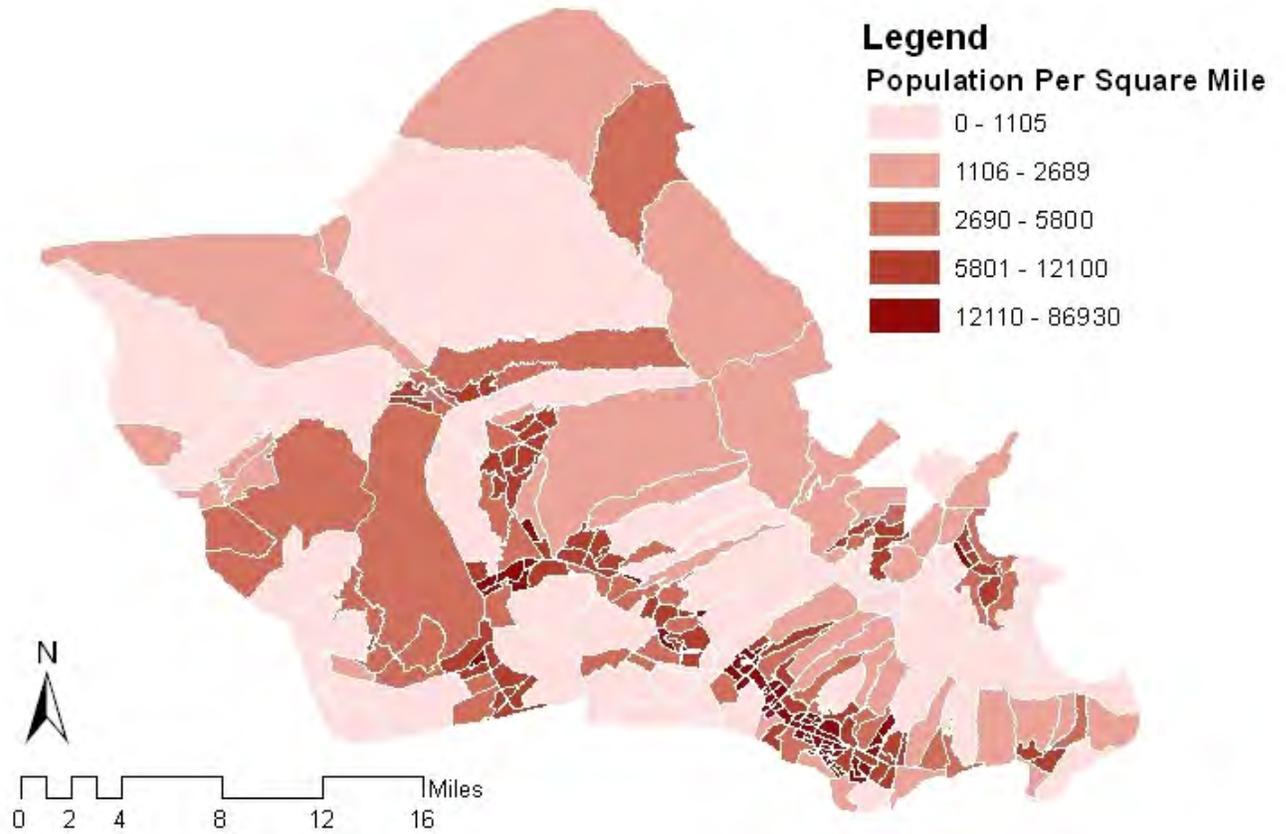


² Oahu MPO. 2011 *2035 Transportation Plan*.

http://www.oahumpo.org/ortp_docs/ortp_2035_docs/11.1.2AdoptedPlan20110411.pdf

³ State of Hawaii. 2010. *State of Hawaii Data Book*. <http://hawaii.gov/dbedt/info/economic/databook/2010-individual/>

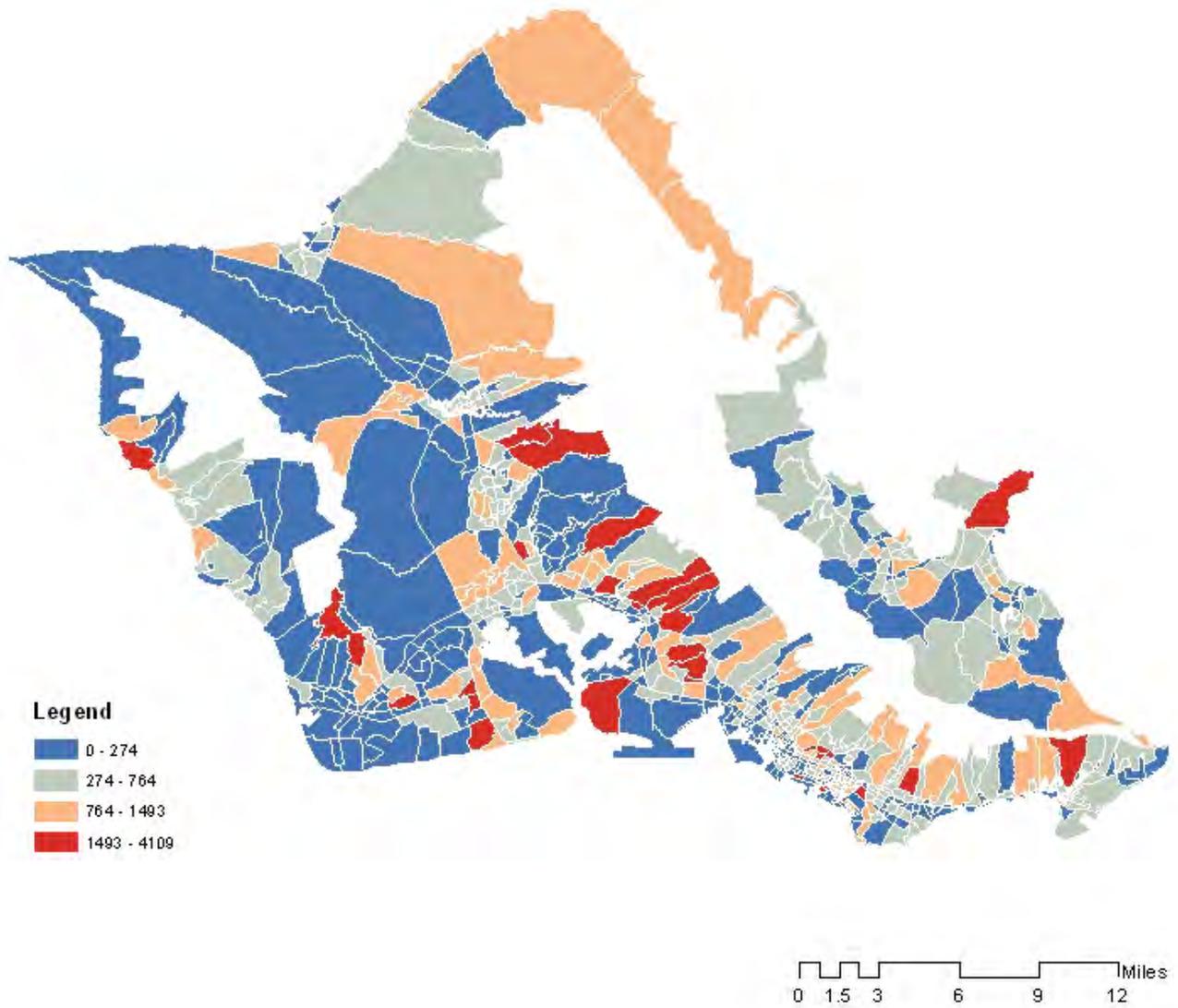
Figure 3 – Oahu Population Density (2010)



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⁴ US Census, 2011. 2010 US Census. <http://factfinder2.census.gov/>

Figure 4 – Oahu Housing Units (2007)



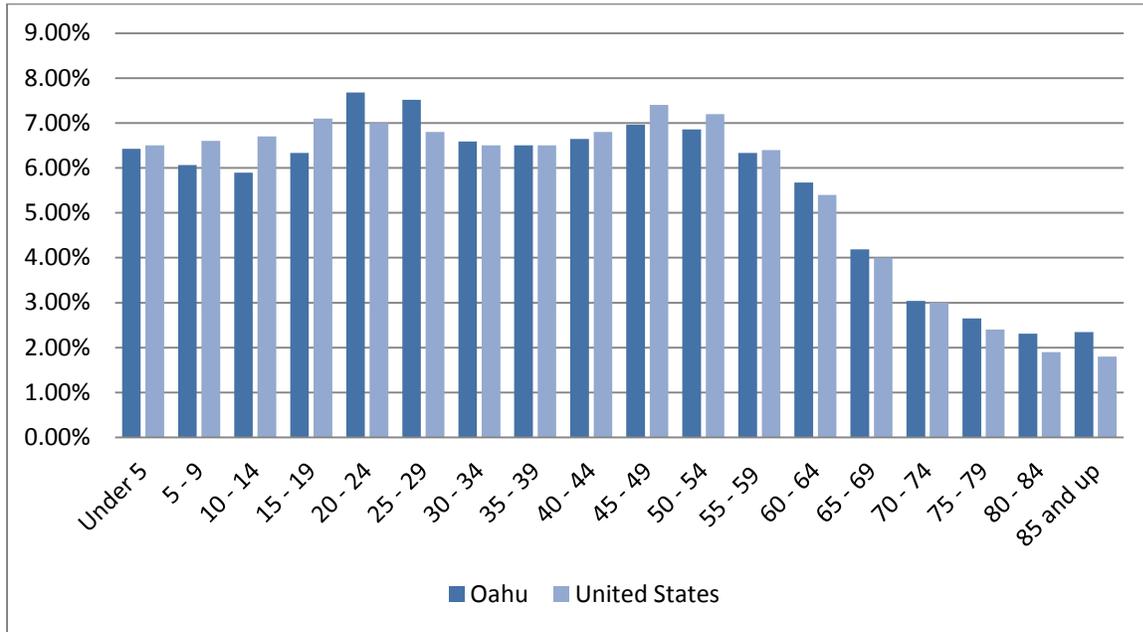
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⁵ Oahu MPO. 2011. 2007 Housing Units by TAZ.

Changing Demographics

In general, people are living longer, which places additional pressure on social services, transit resources, and housing throughout the United States. This pattern is consistent for Hawaii and Oahu, in addition to having a large population over 60, Oahu has a high population of individuals aged 20 – 34.

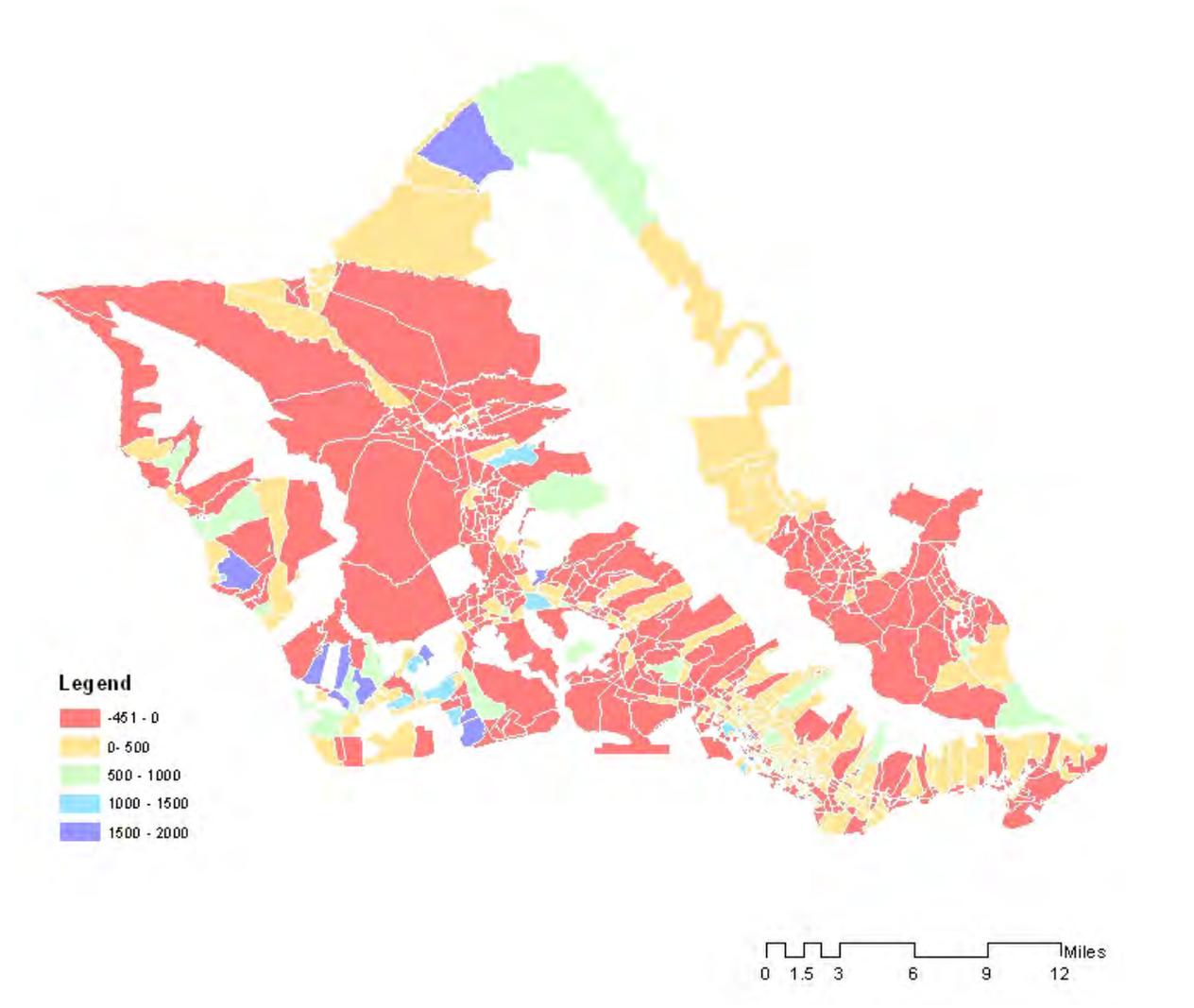
Figure 5 – Population by Age Range



⁶ State of Hawaii. 2010. *State of Hawaii Data Book*. <http://hawaii.gov/dbedt/info/economic/databook/2010-individual/>

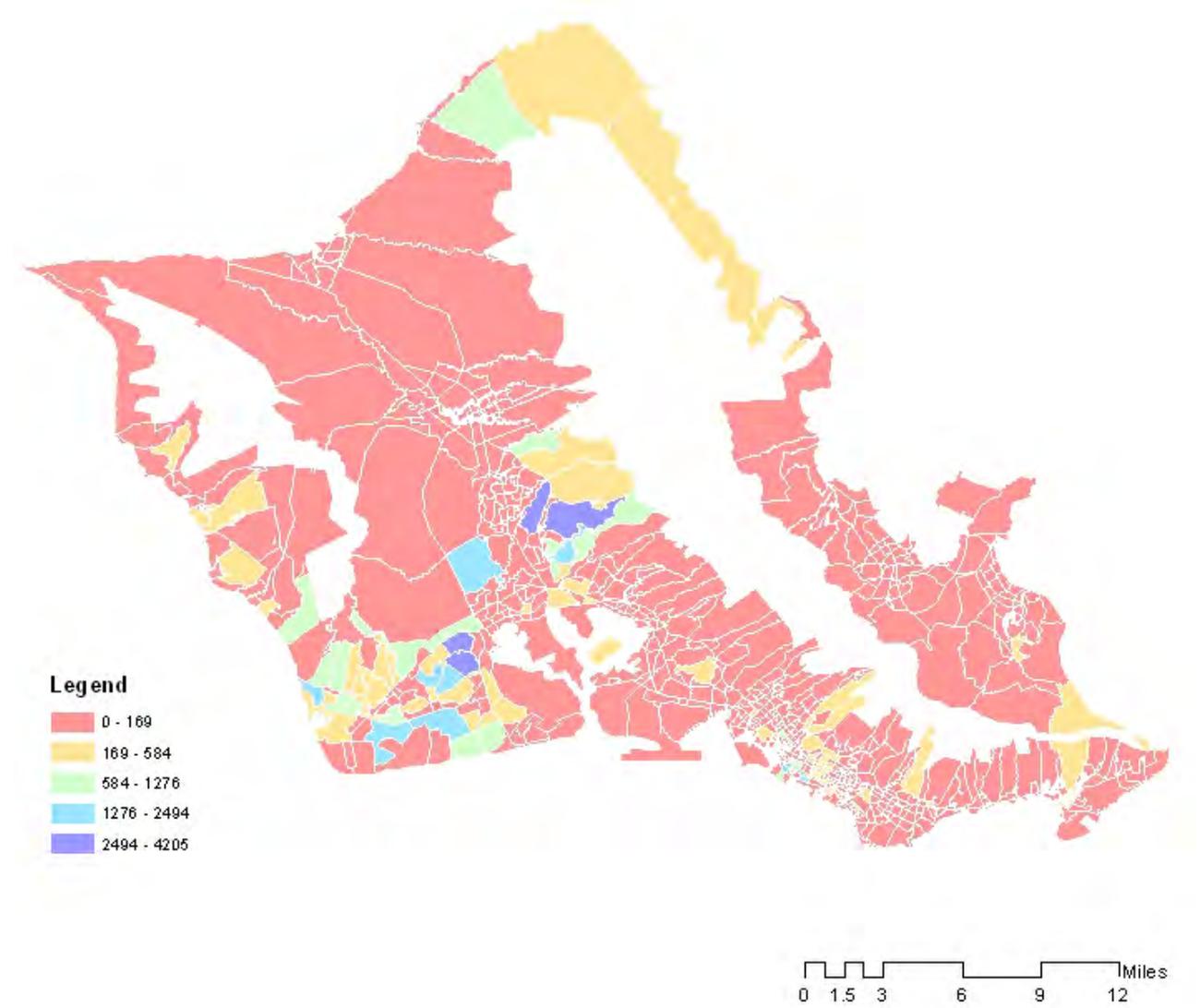
The OahuMPO estimates that population will grow by 22% from 2007 to 2035; this will add over 200,000 people to the island of Oahu. The MPO analyzes population and employment characteristics by geographic units known as Traffic Analysis Zones (TAZ), which TAZs will experience growth and decline in both population as well as housing units is indicated in the figures below. Note that some areas of the island are projected to lose population. Population growth is fairly scattered with larger increases forecasted for the southwestern part of the island.

Figure 6 – Forecasted Population Change (2007 - 2035)



Housing unit growth follows population growth somewhat, but is less scattered. New housing units will be built where allowable under State and City/County land use regulations and where land is available.

Figure 7 – Housing Unit Change (2007 - 2035)



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⁷ Oahu MPO. 2011. 2007 - 2035 Housing Units and Population Numbers by TAZ.

Underserved Populations

Presidential Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Presidential Executive Order 13166, *Improving Access to Services for Persons with Limited English Proficiency*, requires federal agencies to improve access to federally conducted and assisted programs and activities for persons who, as a result of national origin, are limited in their English proficiency. Both Executive Orders are based on Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color, sex, or national origin by government agencies that receive federal funding. The number of U.S. residents for whom English is a second language is increasing, and minority and low-income populations frequently have limited English proficiency and/or literacy.

In addition to Environmental Justice regulations, through the America’s Great Outdoors initiative (AGO), launched by President Obama, there is a national effort to link Americans to the outdoors. This includes an emphasis on providing access and engagement to underserved communities.

What defines an underserved community? To address local needs and circumstances defined by JCNWR, working with local communities, the thresholds used to define underserved communities vary greatly for every planning unit. The analysis below is for illustrative purposes only. Underserved analysis must be vetted through the appropriate stakeholders to be appropriate and meaningful. To illustrate how this type of analysis can be done, a threshold of “average” was used. However, simply having a population that is above/below average may not be significant, telling, or equated with being “under-served”. This analysis is relative to the place, people, and circumstances that limit access to individuals.

Table 1 - Underserved Population Statistics

	United States	Hawaii	Oahu
Non-White Population	25.5%	73.1%	77 %
Hispanic Population	15.1%	8.6%	7.9%
Median Household Income	\$ 51,425	\$64,661	\$67,066
Individuals below poverty level	13.5%	9.4%	8.9%
Speak a language other than English at home	19.6 %	24.4%	26.7%
Without Access to Car	Not Available	9 %	10.1%

8

⁸ US Census. 2005 – 2009 American Community Survey 5-Year Estimates. <http://factfinder.census.gov>

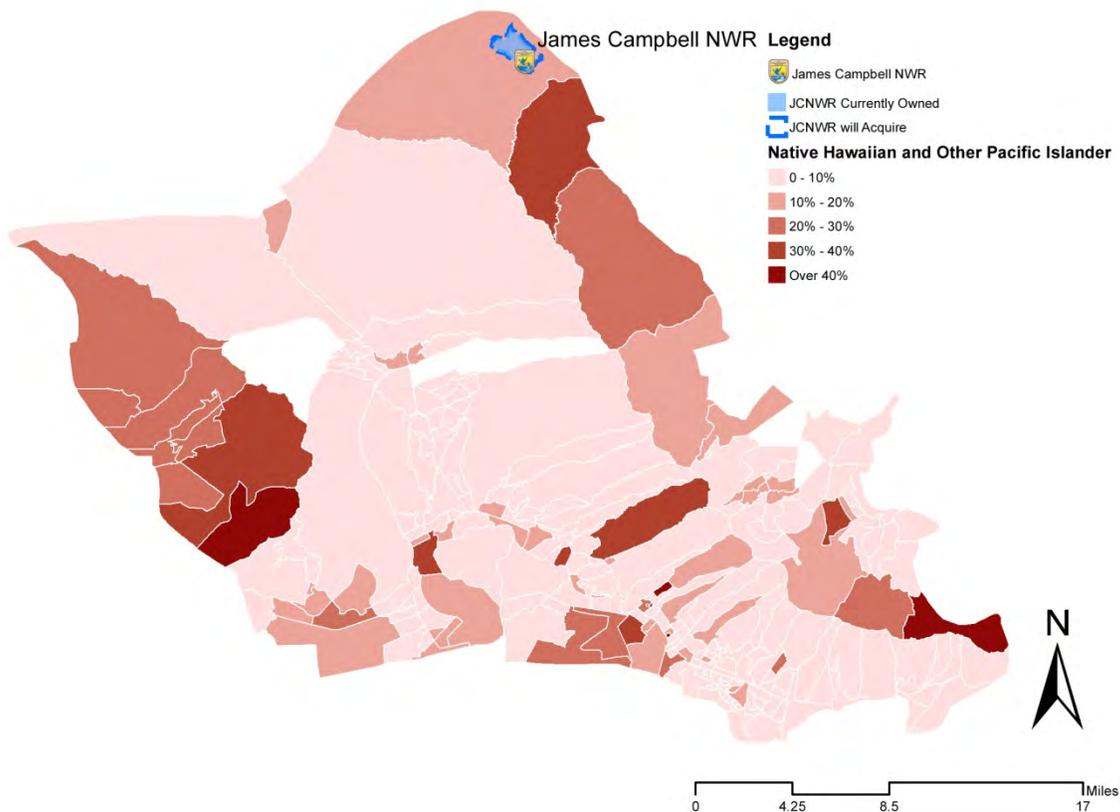
Summary of Underserved Variables (See Appendix A for more Detail)



⁹ US Census. 2005 – 2009 American Community Survey 5-Year Estimates. <http://factfinder.census.gov>

Around the James Campbell Wildlife Refuge, underserved populations of significance include low-income, non-English speakers, and Hispanic populations, when simply looking at populations that are above the island average. As previously indicated, this is one way of performing under-served analysis. Identifying underserved populations is important for many reasons, but from a transportation perspective, knowing what populations are underserved can help the refuge plan for the needs of those populations when trying to facilitate transportation to and engagement at the refuge. Large underserved populations can affect many levels of refuge planning, such as the language used in way-finding signs, or in educational materials, for example. JCNWR planning staff asked CFL staff to provide (for illustrative purposes) an example underserved analysis – identifying areas with higher than average residents of Native Hawaiian and other Pacific Islander race. This includes Native Hawaiian, Guamanian or Chamorro, Samoan, and other Pacific Islander. In Hawaii, 9.6% of the population identifies with this race¹⁰. There is a higher than average population of Native Hawaiians and other Pacific Islanders in the areas near JCNWR. In the Census tract in which JCNWR is located, 15% of residents identify themselves as Native Hawaiian and other Pacific Islander; in the tract southeast of that tract, 32% of the population identify this way.

Figure 8 – Example of Underserved Population Analysis (US. Census Tract Level)

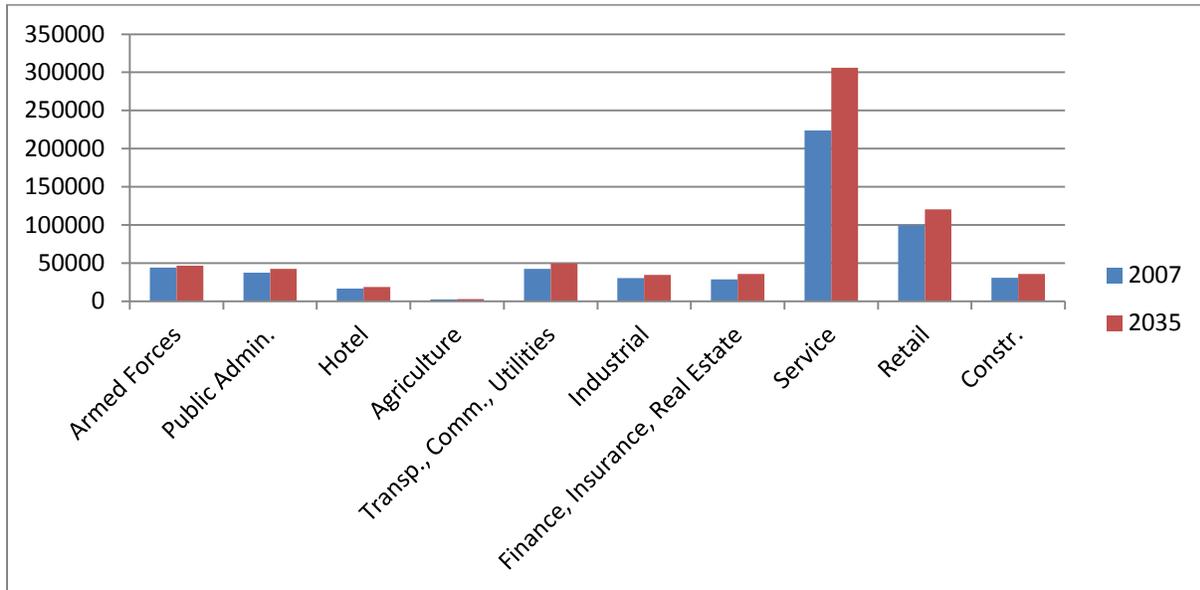


¹⁰ US Census. 2010. 5 Year American community Survey Demographic and Housing Estimates.

Employment

OahuMPO estimates that in 2007, there were 556,871 jobs on the island of Oahu, by 2035, there will be 693,338 jobs, which is an increase of 25% (higher than the estimated population increase). The figure below shows which sectors employ people in Oahu, and which sectors are expected to grow. The service industry, the largest employer, is expected to grow by around 37%.

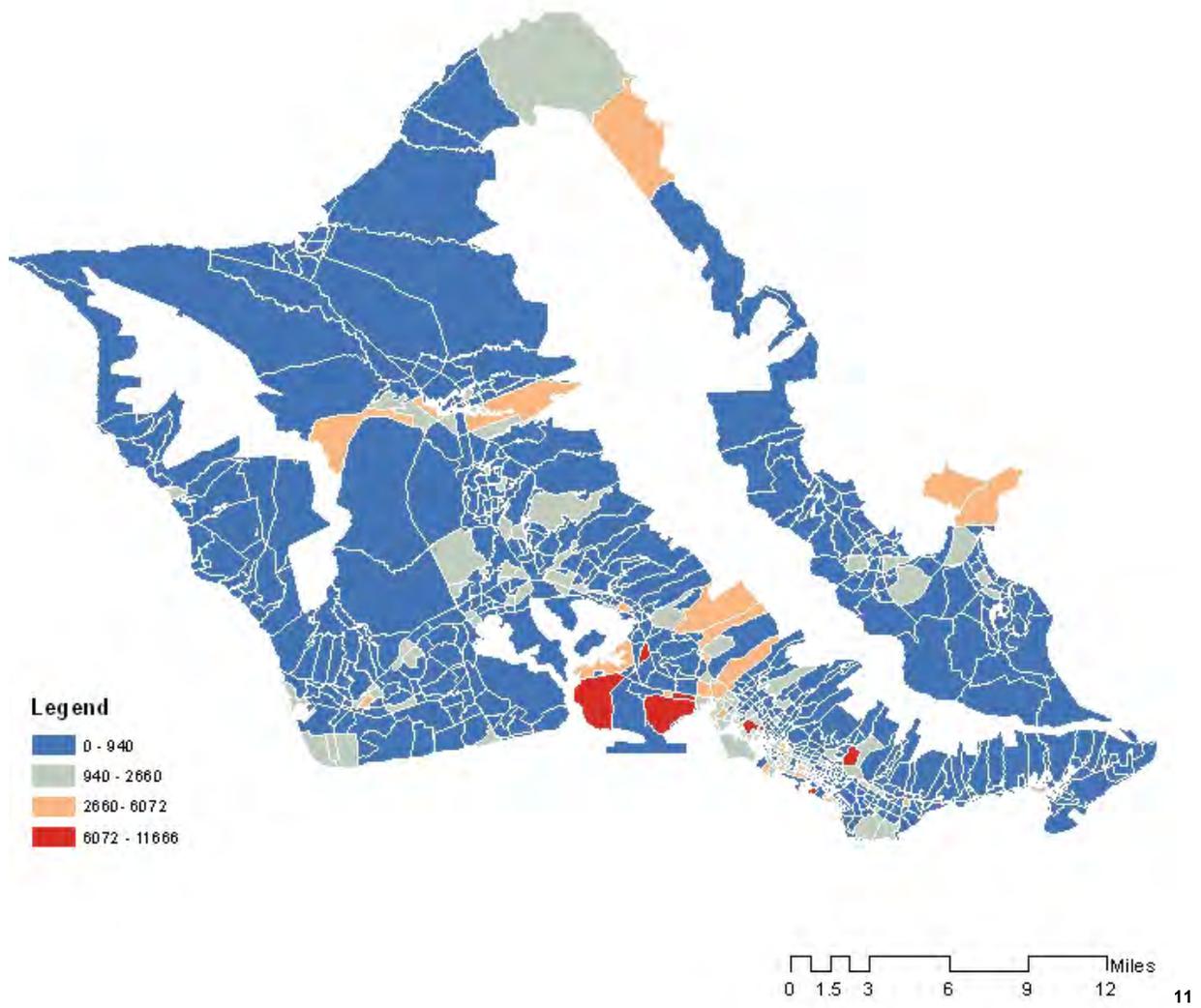
Figure 9 – Employment by Sector



There are currently more jobs located in and around Pearl Harbor, although jobs are fairly consistently scattered around the coastal areas. Job growth will likely occur throughout the island, with greater intensity on the north shore and on the southwestern shore, as indicated in Figure 10.

It is important to distinguish between employment and jobs. The figures below indicate where jobs are located and where they are forecast to grow. Job location greatly impacts transportation resources. Employment generally refers to the percent of the population that is employed. Job location is what planners use for transportation planning purposes.

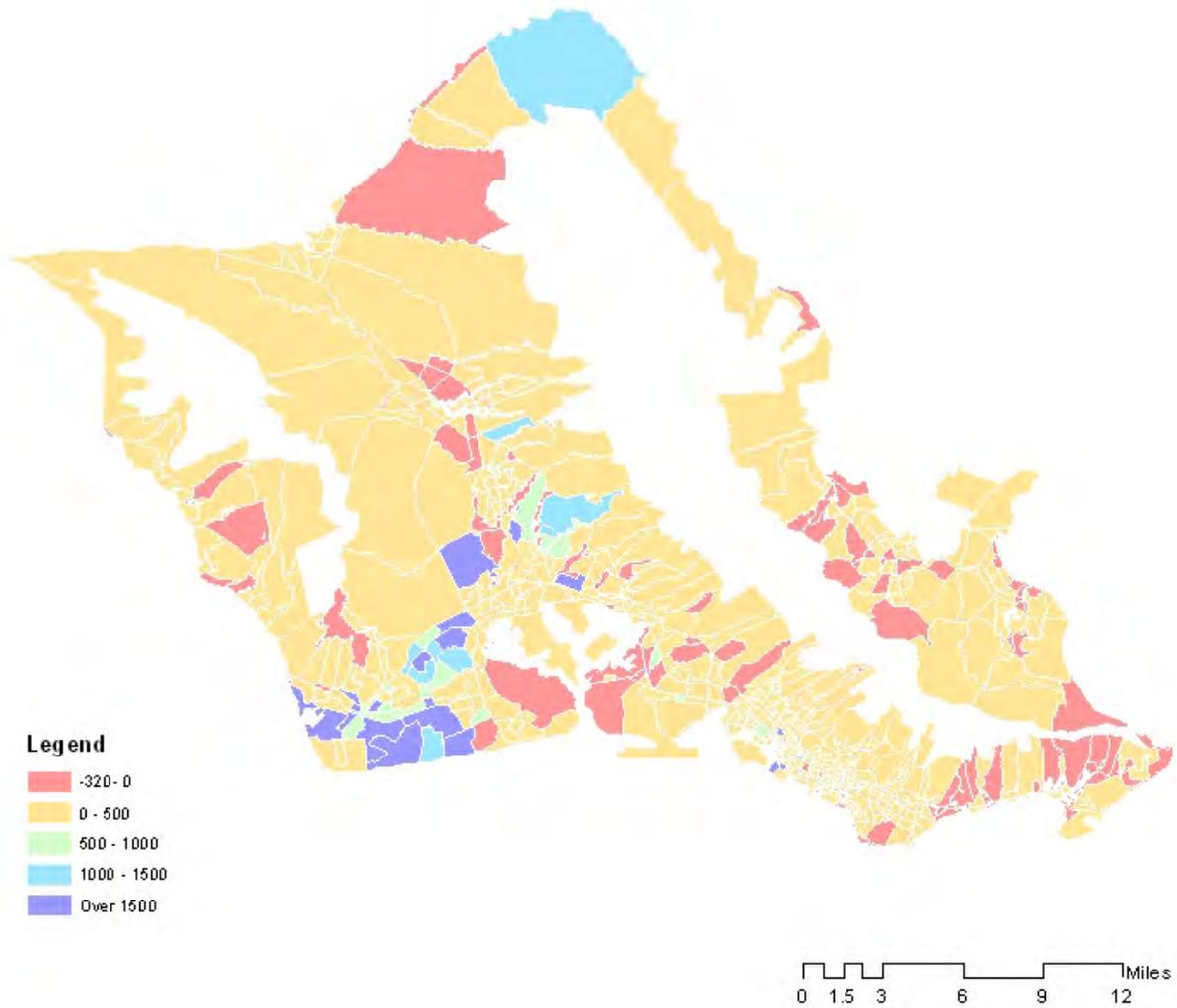
Figure 10 – Number of Jobs by Traffic Analysis Zone (2007)



¹¹ Oahu MPO. Regional Transportation Demand Model Output. 2007 Baseline.

The OahuMPO estimated that jobs will increase in some areas and decrease in others. They evaluated a number of factors when estimating where jobs will be located. Job location changes are indicated below.

Figure 11 – Location of Job Growth/Decline (2007 – 2035, TAZ Level, Number of Jobs)

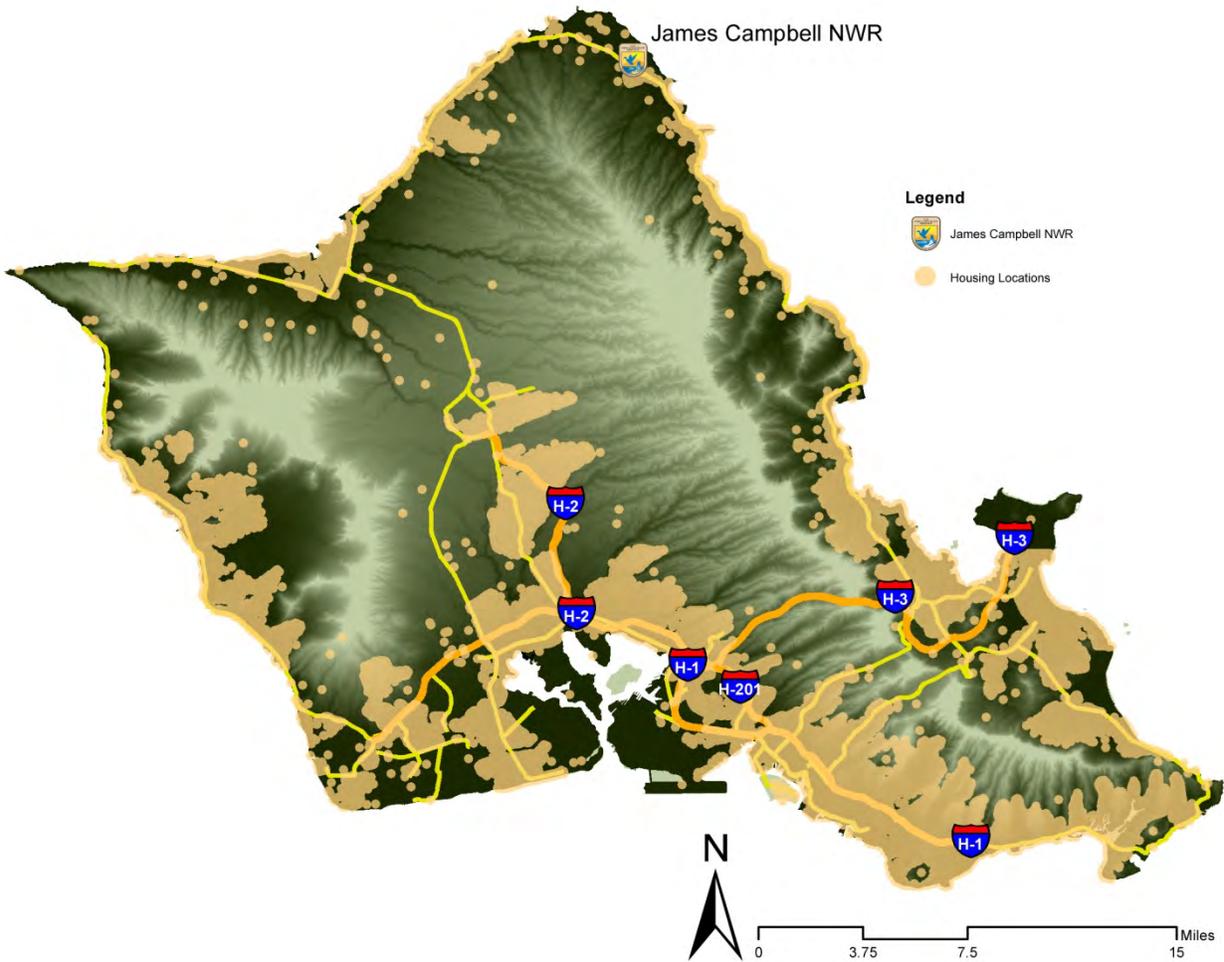


Land Use

Land use helps define development patterns and subsequent transportation needs. While the area adjacent to the JCNWR is not heavily populated, there is some development, and there will continue to be growth in the area. That growth, along with JCNWR expansion will have an impact on the transportation system and the area in general.

The map below shows housing address densities across the island of Oahu.

Figure 12 – Housing Locations



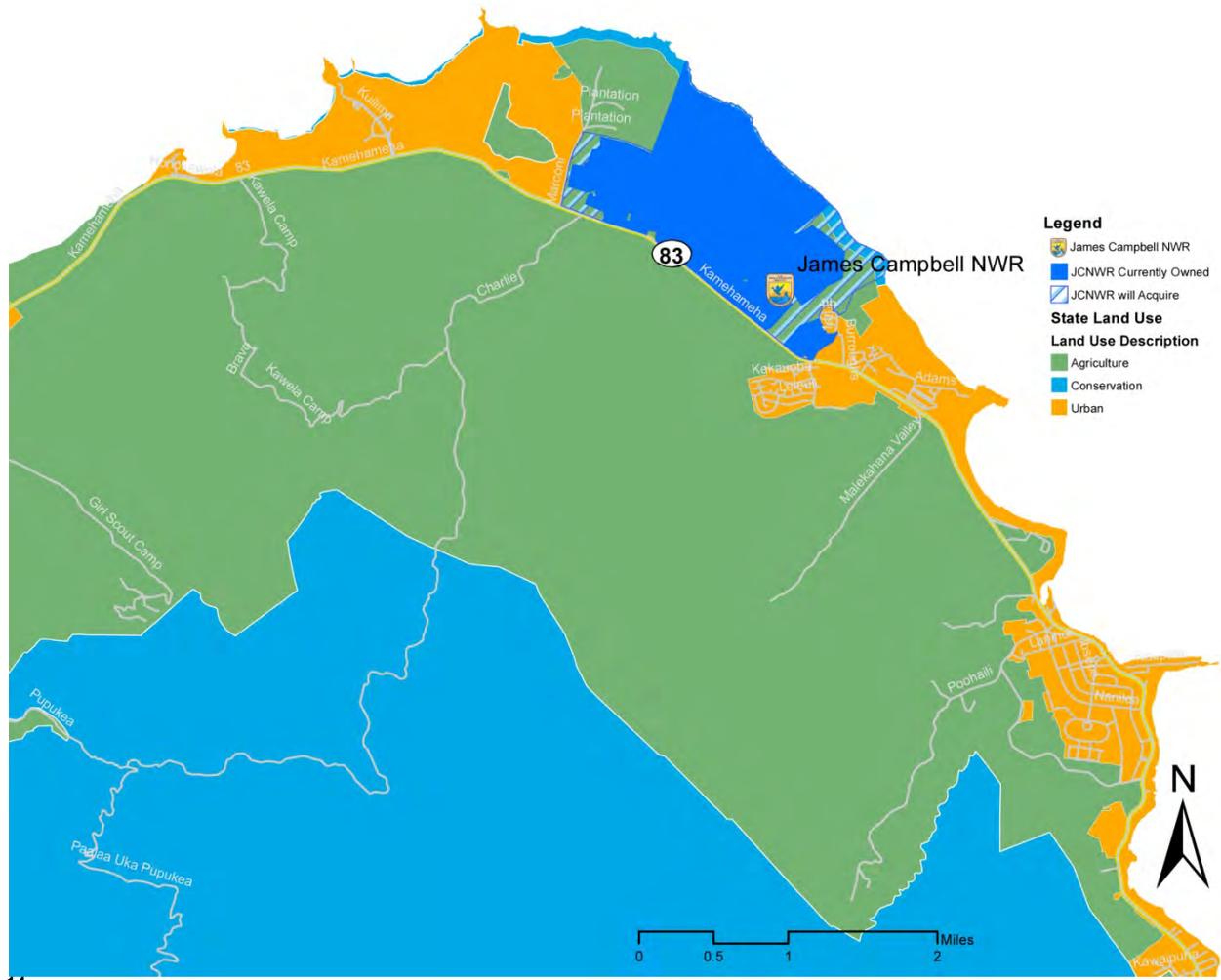
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In 1961, the State of Hawaii adopted a state-wide zoning law and established the Land Use Commission. The commission is responsible for preserving and protecting Hawaii's lands and encouraging those uses

¹² Honolulu. 2011. Honolulu Land Information System. <http://gis.hicentral.com/>

to which lands are best suited.¹³ Classification includes: urban, rural, agricultural, and conservation. Any boundary changes must be made by petition to the State Land Use Commission if the parcel is over 15 acres, parcels below 15 acres can be reclassified by the county. The statewide classifications for areas adjacent to JCNWR is displayed below.

Figure 13 – State Land Use Classification near JCNWR



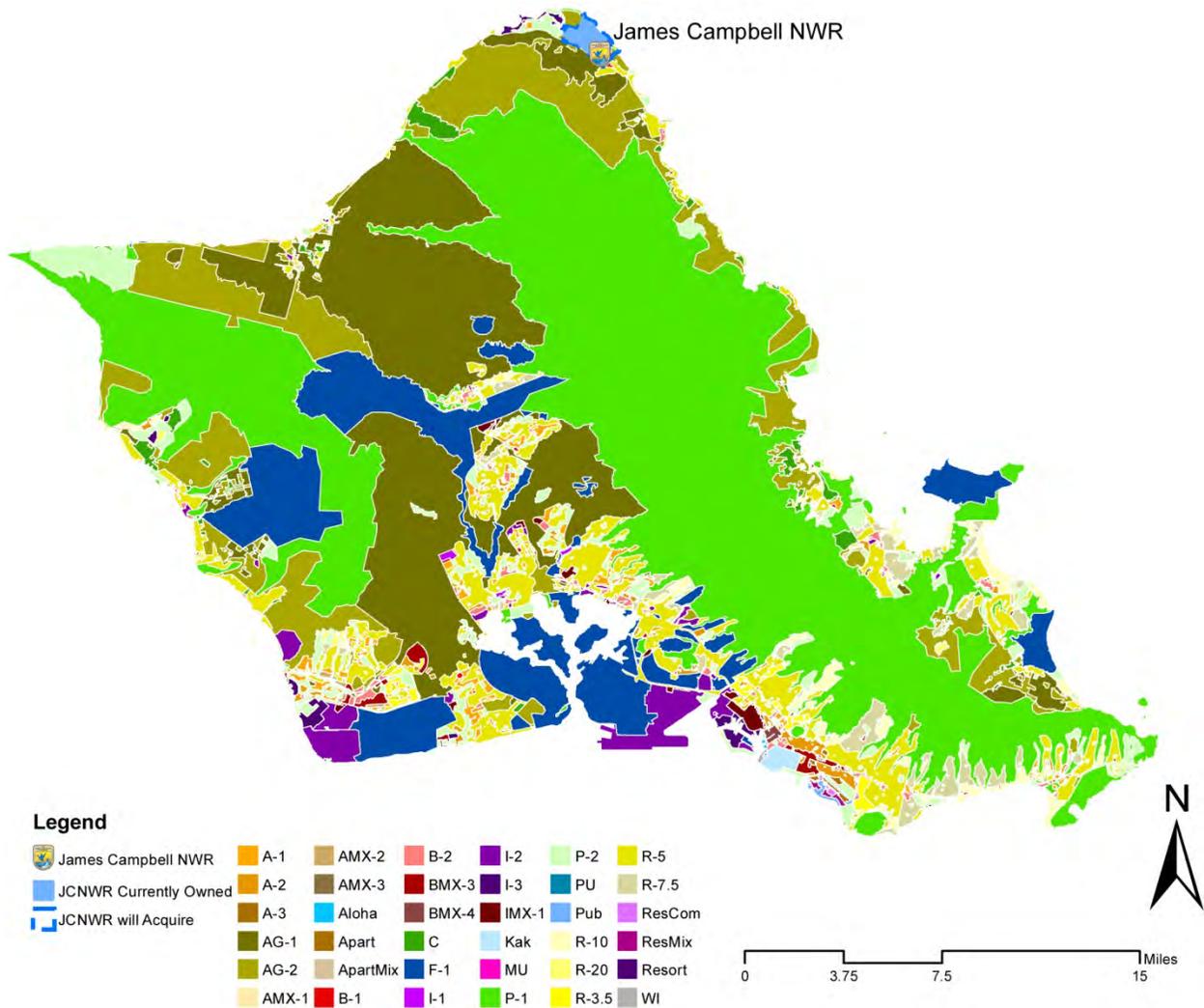
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Honolulu City/County maintains its own land use zoning in addition to the statewide land use classification, which is indicated below. It provides more finite delineations of use and specific rules and regulations.

¹³ Hawaii. 2011. Land Use Commission. <http://luc.state.hi.us/about.htm#PURPOSE%20OF%20THE%20LAW>

¹⁴ Honolulu. 2011. Honolulu Land Information System. <http://gis.hicentral.com/>

Figure 14 – Honolulu Land Use Map



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For a complete list of Honolulu’s land use codes, check out their website.¹⁶ See the table below for brief descriptions.

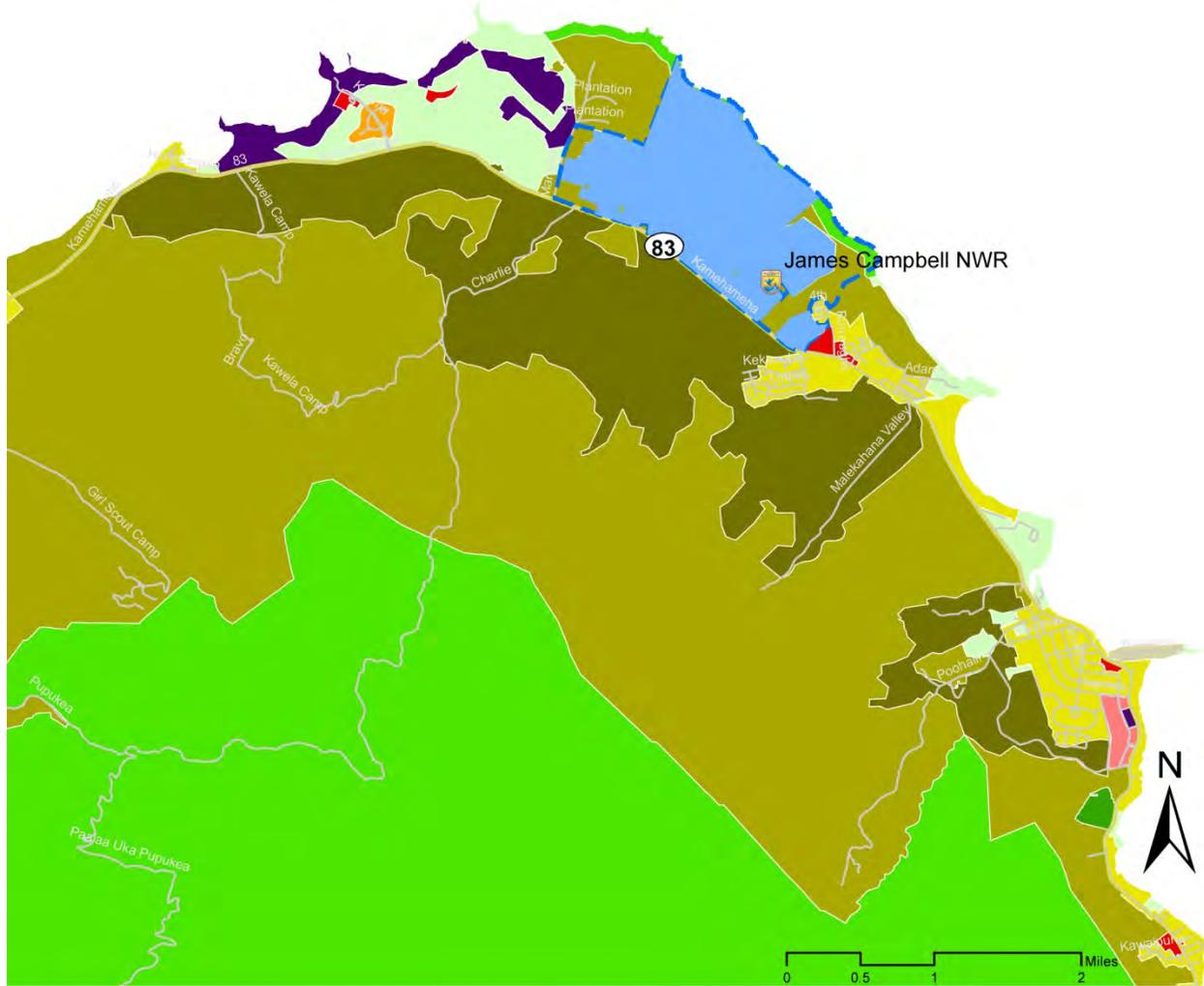
¹⁵ Honolulu. 2011. Honolulu Land Information System. <http://gis.hicentral.com/>. Accessed 08/2011.

¹⁶ Honolulu. 2011. Land Use Ordinance. <http://www1.honolulu.gov/council/ocs/roh/21990.pdf>

Table 2 – Zoning Class Descriptions

Zoning Class	Description
A-1	Apartment, low-density
A-2	Apartment, medium-density
A-3	Apartment, high-density
AG-1	Agricultural, restricted
AG-2	Agricultural, general
AMX-1	Apartment mixed use, low-density
AMX-2	Apartment mixed Use, medium-density
AMX-3	Apartment mixed use, high-density
Aloha	Aloha Tower Project
Apart	Apartment precinct (Waikiki Special District)
ApartMix	Apartment mixed use (Waikiki Special District)
B-1	Business, neighborhood
B-2	Business, community
BMX-3	Business mixed use, community
BMX-4	business mixed use, central
C	Country
F-1	Preservation, Military and Federal
I-1	Industrial, limited
I-2	Industrial, intensive
I-3	Industrial, waterfront
IMX-1	Industrial-commercial mixed use
Kak	Kakaako Community Development District
MU	Mixed use (Kakaako Special Design District)
P-1	Preservation, Restricted
P-2	Preservation, General
PU	Public use precinct (Kakaako Speical Design District)
Pub	Public precinct (Waikiki Special District)
R-10	Residential
R-20	Residential
R-3.5	Residential
R-5	Residential
R-7.5	Residential
ResCom	Resort commercial
ResMix	Resort mixed use (Waikiki Special District)
Resort	Resort
WI	Waterfront Industrial (Kakaako Special Design District)

Figure 15 – Oahu Land Use Near JCNWR



Legend

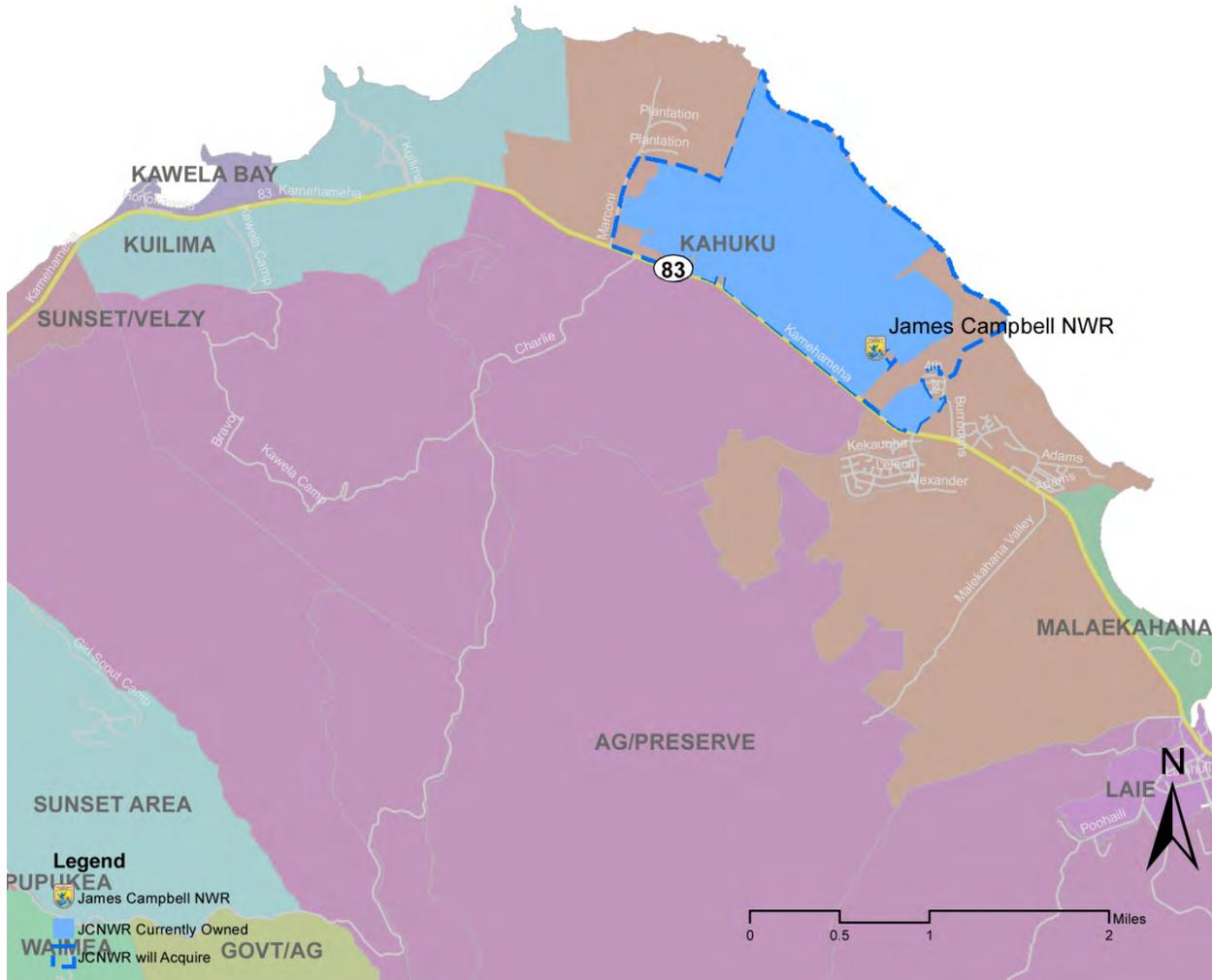
James Campbell NWR	A-1	AMX-2	B-2	I-2	P-2	R-5
JCNWR Currently Owned	A-2	AMX-3	BMX-3	I-3	PU	R-7.5
JCNWR will Acquire	A-3	Aloha	BMX-4	IMX-1	Pub	ResCom
	AG-1	Apart	C	Kak	R-10	ResMix
	AG-2	ApartMix	F-1	MU	R-20	Resort
	AMX-1	B-1	I-1	P-1	R-3.5	WI

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¹⁷ City of Honolulu. Land Use Shapefile. Accessed 08/2011.

JCNWR is located in the Kahuku Neighborhood (shown below). There are a number of smaller communities located within the neighborhood boundaries.

Figure 16 – Oahu Neighborhoods near JCNWR



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Land use in the Ko’olau Loa area (of which JCNWR is a part) is distinctly different that other more populous areas of the island. As indicated in the land use map, there is a large amount of agricultural, open space, and protected resource areas. In addition to traditional land use planning, Honolulu has created a Sustainable Communities Plan for the Ko’olau Loa area that guides development and land use. That document helps articulate how the area will remain “uncrowded and rural” with limited growth with each of the small communities in the area (Kahuku, La’ie and Hau’ula maintaining its own small-scale commercial and economic base).¹⁹

¹⁸ Honolulu. 2011. Honolulu Land Information System. <http://gis.hicentral.com/>

¹⁹ Honolulu. 1999. *Ko’olau Loa Sustainable Communities Plan*. http://www1.honolulu.gov/council/ocs/roh/24_plandocs_koolauloa.pdf

Figure 17 – Kahuku Community View 1



Figure 18 – Kahuku Community View 2

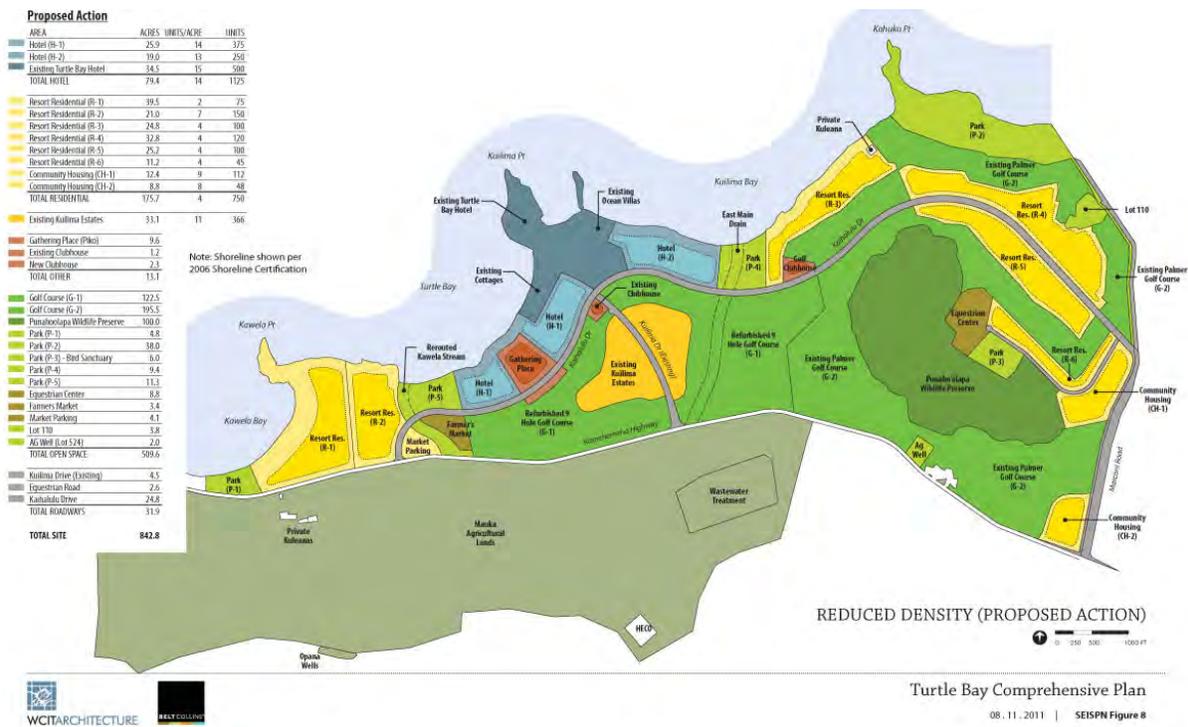


The closest community to JCNWR is Kahuku. It is a Census Designated Place (CDP) with an estimate population just over 2,600 and 622 housing units.²⁰ This community is primarily residential with the typical amenities found in a small town including schools, churches, a library, stores, and a medical facility. Expansion of JCNWR and the Turtle Bay Resort will have an impact on Kahuku. The community has and could expand pedestrian/bicycle connections to the refuge along Kamehameha Highway.

Turtle Bay Resort Development

Turtle Bay Resorts is in the process of preparing a master plan for the community and a Supplemental Environmental Impact Statement (SEIS). The Draft SEIS is targeted to be available in early 2013. The resort area currently has 500 hotel units and 368 condominium units. The proposed development plan will add 525 new hotel units and 225 new resort residences. The development will be adjacent to JCNWR. One of the major access roads to the development, Marconi Road, adjacent to JCNWR, has the potential to provide access to any new facilities that are constructed by JCNWR along the road. The resort has been looking at additional development since 1985.

Figure 19 - Turtle Bay Comprehensive Plan



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The development plan for the resort community states the following regarding transportation access to the community.

²⁰ US Census. 2010 US Census. <http://factfinder2.census.gov>

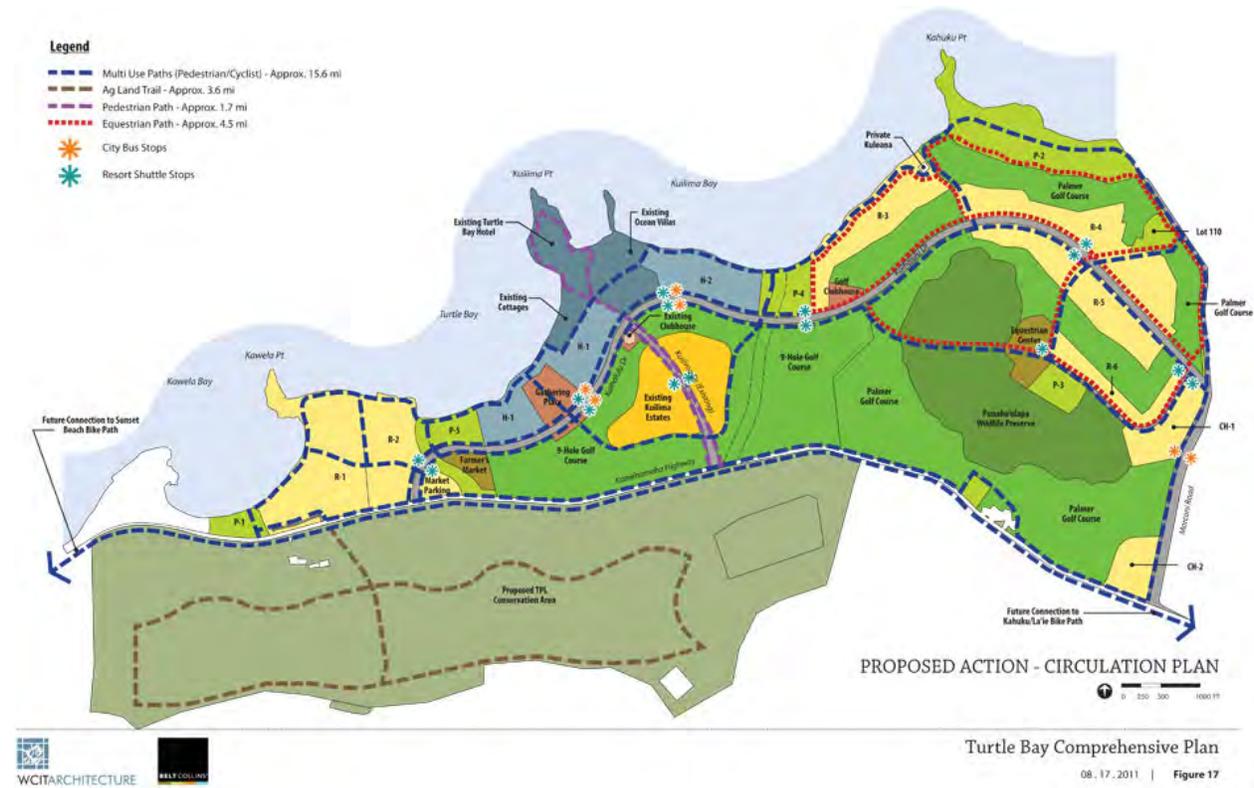
²¹ Turtle Bay Resort SEIS. 2011. *Master Plan*. <http://turtlebayseis.com/the-plan/resort-plan/>

To improve vehicular access to Turtle Bay resort, two new intersections at Kamehameha Highway are proposed to supplement the existing entrance at Kuilima Drive. A new internal road will link the new Marconi Road intersection at the far eastern end of the resort in an east-west direction to a new resort entrance east of Kawela Bay. Kuilima Drive intersection will also be upgraded to improve traffic flows.

An extensive network of pedestrian walkways and rustic bridle paths will enable resort guests, visitors, and local residents to walk, bike, and ride horses throughout much of the resort's open space and shoreline area. Nine separate public shoreline access ways, each with public parking stalls, will improve access to the resort's four-plus mile coastline. Alternative transportation methods will be encouraged and facilitated with signage and a commitment to bike rentals. We look forward to the day when regional trails extend from Hale'iwa to Lā'ie and beyond.²²

The transportation plan below indicates where the proposed transportation enhancements will take place. This plan is still under development, but has the potential to greatly affect the JCNWR, with the USFWS monitoring the planning and development process.

Figure 20 – Turtle Bay Transportation Plan



From a transportation perspective, the greatest impact will likely be many-fold including:

²² Turtle Bay Resort SEIS. 2011. *Transportation Plan*. <http://turtlebayseis.com/the-plan/pedestrian-vehicular-transportation-plan/>

- Increased traffic along Kamehameha Highway;
- Enhancements to Marconi Road/Kamehameha Highway intersection;
- Increased pedestrian and bike traffic on Marconi Road potentially on trails in/around the refuge;
- Increased animal-vehicular conflicts in/around the refuge (particularly on Marconi Road, which is adjacent to the refuge);
- Equestrian related impacts (proposed equestrian facilities run along Marconi Road);
- New pathways for pedestrian/bicycle access; and
- New transit stops on Marconi Road near proposed JCNWR Visitor Center site.

The Turtle Bay Resort will make enhancements to Marconi Road, it is anticipated that improvements will match the access at the current resort entrance road, Kuilima Drive, which is shown below in Figures 21 and 22.

Figure 21 – Turtle Bay Resort Access to Kamehameha Highway



Figure 22 – Entrance Lane into Turtle Bay Resort

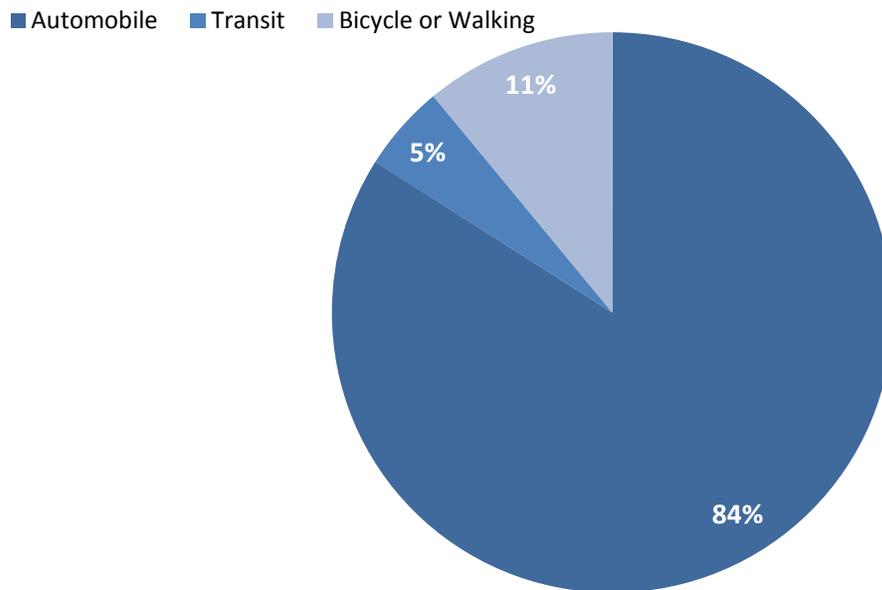


Chapter 2 - Transportation Infrastructure

Transportation infrastructure includes roadway, freight, air, water, transit, bike and pedestrian modes. This section first addresses island-wide transportation and then looks specifically at areas in and around the JCNWR.

Most residents travel by personal automobile with a modest amount of transit and non-motorized transportation usage.

Figure 23 – Percentage of Trips by Mode (Oahu)



Roadway Infrastructure

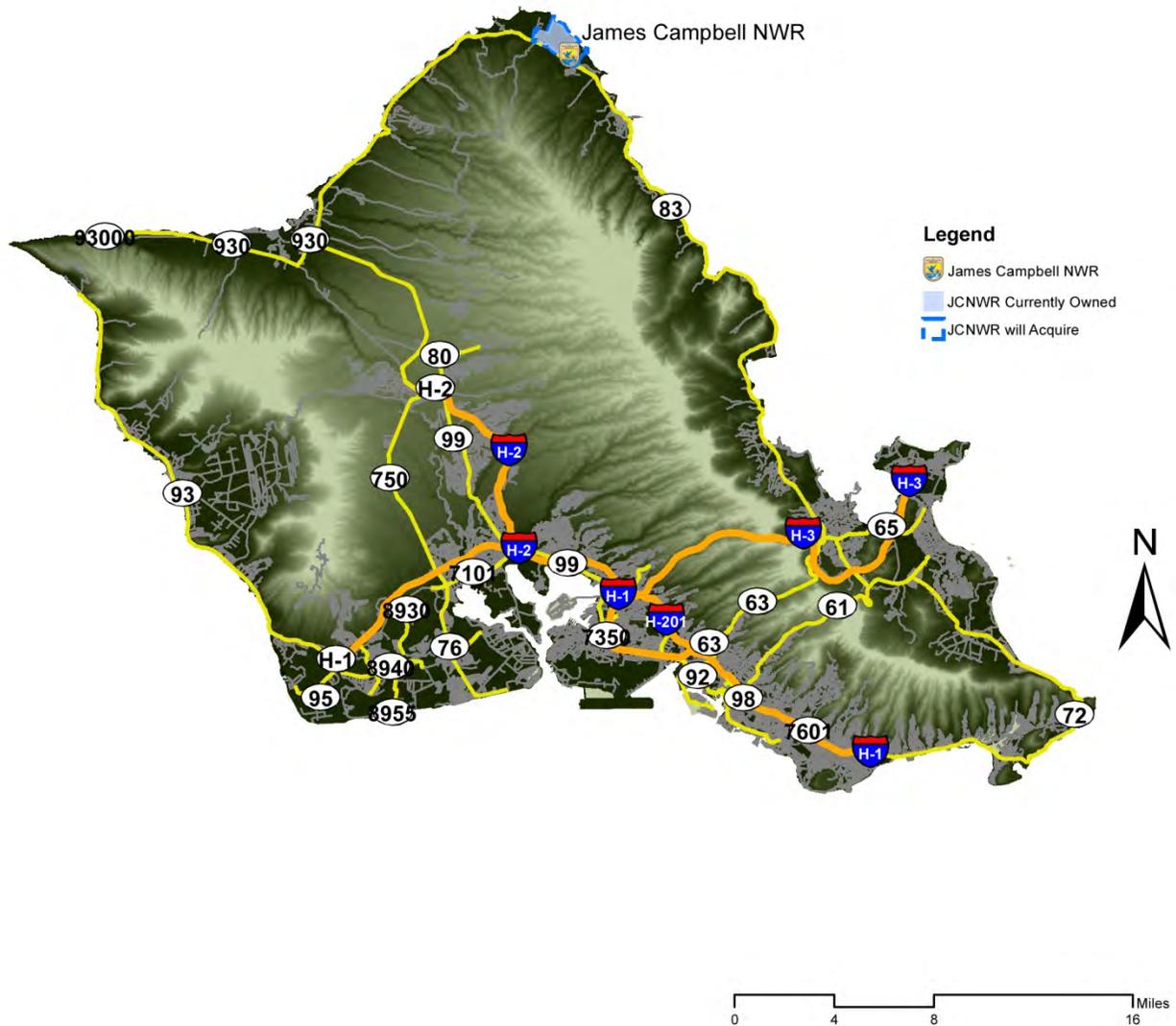
Oahu has a large network of roadways throughout the island. Near JCNWR, state highway, Kamehameha Highway, provides access to the entire island.

Table 3 – Oahu Transportation | Fast Facts²³

Miles of Interstate	54.9
Miles of State Highways	280.4
Miles of City and County roads	1,308.4
Number of automobiles and trucks	695,400
Number of bus routes	100
Number of buses	540
Number of park-and-ride facilities	5
Miles of bikeways	98

²³ Oahu MPO. 2011. *Regional Transportation Plan 2035*. <http://www.oahumpo.org/programs/ortp.html>

Figure 24 – Oahu Roadway Network



The island of Oahu has an extensive network of highways and roads. Most of the traffic and congestion are in and around Honolulu. However, the North Shore has a moderate amount of traffic, particularly during winter's high surf season. Highway 83, Kamehameha Highway, which borders the JCNWR is the only through road that serves the North Shore. Almost daily, Highway 83 experiences local congestion as many tourists and other island visitors converge on the North Shore for day trips. This is indicated below with Hawaii Department of Transportation (HDOT) traffic count numbers and hot spot analysis done by Atkins.

²⁴ Oahu MPO. 2011 2035 Transportation Plan. http://www.oahumpo.org/ortp_docs/ortp_2035_docs/11.1.2AdoptedPlan20110411.pdf

Figure 25 – HDOT Traffic Count Locations near JCNWR



Use the map above to locate the count station of interest. Traffic count numbers are listed below. Counts are higher at the 3rd count station, this is likely due to the proximity to Kahuku.

Table 4 – HDOT Traffic Counts for AM/PM Peak

Count Station	AM Peak Direction 1	AM Peak Direction 2	PM Peak Direction 1	PM Peak Direction 2
1	260	195	326	355
2	216	187	350	283
3	436	403	524	428

Note that a.m. Peak is from 7:15 - 8:15 a.m., p.m. Peak is from 3:00 – 4:00 p.m.²⁵

²⁵ HDOT. 2009. Traffic Station Maps. http://hwyppgis.dot.hawaii.gov/infostructure/index_files/Page326.htm Accessed 11/2011.

The highest volumes of traffic for these counters are all in the afternoon – and not associated with a.m. or p.m. commute traffic. This is a departure from most traffic patterns on the island. The table below shows the peak travel periods for each traffic count station.²⁶

Figure 26 – Real Peak Travel Period from HDOT Traffic Counts

Count Station	Time	Peak Direction 1	Peak Direction 2	Total	K Factor (% of ADT)
1	2:00 – 3:00 p.m.	336	341	677	9.28
2	2:15 – 3:15 p.m.	332	356	688	9.95
3	2:00 – 3:00 p.m.	548	497	1045	9.57

As noted in the above table, and by observations along Kamehameha Highway, the busiest travel periods around JCNWR are during mid-day. Many users of the roadway at this time are likely visiting the area for recreational purposes. They may be unfamiliar with the area, are more likely to pull off the road and take photographs, and stop frequently. This presents additional way-finding and safety concerns for visitors and staff at JCNWR. The photo below shows a segment of roadway where patrons of a local restaurant have pulled off the side of the highway, the cars at right will have to back into oncoming traffic; vehicles at left will exit directly into traffic. Sight distance is reduced along large segments of the highway due to this informal parking along the roadway. The speed limit is 45 mph along this segment.

Figure 27 – Kamehameha Highway looking west near JCNWR



²⁶ HDOT. 2009. Traffic Station Maps. http://hwygis.dot.hawaii.gov/infostructure/index_files/Page326.htm
 Accessed 11/2011.

Atkins, a consulting group, performed hot spot analysis on three segments of road on and around Kamehameha Highway. Segments are identified below with their estimated Average Annual Daily Traffic (AADT). There are a number of residences located southeast of the refuge in Kahuku, which affect the adjacent roadway segment's high AADT.

Figure 28 – Traffic Analysis near JCNWR



27

The OahuMPO estimates trips in key locations, known as screenlines. There are no screenline locations in the immediate vicinity of the refuge, however, there are two locations relatively close. The estimates below are for 2035, based on a 2007 base year, forecasted with the MPO's travel demand model.²⁸

²⁷ Atkins. 2011. Hot Spot Analysis Data (in shapefile format).

Table 5 – Screenline Data near JCNWR (2035 forecast)

Screenline Name	SOV	HOV 2+	Transit	Total	Difference from 2007	% Difference
Waimea	10,000	10,100	1,400	21,500	5,200	32%
Hauula	12,900	9,300	2,400	24,600	5,200	27%

Trips in and around JCNWR are estimated to increase dramatically into the future, this will place additional strain on transportation facilities.

Travel Demand Modeling

Metropolitan Planning Organizations (MPO) are required to maintain a transportation model with uses baseline trends to predict transportation patterns into the future. This generally includes travel amounts, travel speeds, mode choice (car, bike, transit), freight transport, among other variables the MPO may want to model for planning purposes. OahuMPO has developed a four-step travel demand model for planning purposes. Some important outputs from this model that are helpful for JCNWR planning are detailed below.

The following model output applies to Link 3319, which is adjacent to the refuge, modeled for 2035 using a 2005 baseline. The length of the link in study is 3.97 miles. The link has a maximum capacity of 1400 vehicles/hour/lane with the free flow travel speed (highest speeds of travel) around 45 mph. There is one lane of traffic in each direction, classified as an arterial. During peak traffic, the average travel speed is modeled to be 37 mph, it is 45 mph during the off-peak.

Table 6 – Travel Time and Speed (2035)

	Driving	MPH	Transit	MPH	Walking	MPH
Peak Time	6.44 min	37	9.18 min	26	79.45 min	3
Off Peak Time	5.3 min	45	8.77 min	27	79.45 min	3

During peak, the volume/capacity ratio for traffic traveling west to east is 0.53 with an average speed of 39 mph (1476 vehicles/2800 capacity), and from east to west is 0.14 with an average speed of 44 mph (371/2800 capacity), this indicates that that the link/area of highway is modeled to operate below capacity, however, within the peak, there may be particular times in which there is still congestion due to heavy use. The modeled total daily flow is 12,515 vehicles (6324 west – east; 6190 east – west). Per the OahuMPO, this modeling was done with anticipation of development at Turtle Bay.

While the modeling and traffic counts do not currently show severe congestion issues, after a site visit to JCNWR, planning staff noted significant traffic, slow speeds, and at times platoon build-ups when near attractions (ex: highly used beach) along Kamehameha Highway. The figure below shows some of that congestion (along Kamehameha Highway) around 1 p.m. on a Friday afternoon. Most modeling is done for commuting peak. The highest congestion occurs during mid-day when many visitors to the island are traveling from the Honolulu area and converging on the North Shore for day trips.

²⁸ Oahu MPO. 2035 Regional Transportation Plan.

Figure 29 – Traffic Southbound on Kamehameha Highway near North Shore



Freight and Rail

Freight mobility is important to Oahu, with ocean and air transportation importing the majority of food, building materials, manufactured goods, and energy products. Freight travel patterns on Oahu are focused around the two commercial harbors on the island, Honolulu Harbor and Kalaheo Barbers Point Harbor, and Honolulu International Airport. Goods are transported out to all areas via the connecting highways. Oahu does not have dedicated freight routes.²⁹ The primary routes used for moving freight include Nimitz Highway, Interstate H-1, and Ala Moana Boulevard, these roadways are also used by transit and the general public. As such, freight movers experience the same delays as individuals in automobiles and on transit.

There are 38.7 miles of rail facility on the island of Oahu, although all most of the rail is not in operation. Those that are in operation are exclusively used by the Hawaiian Railway Society.³⁰ There is no AMTRAK service or other operational heavy rail infrastructure on the island.

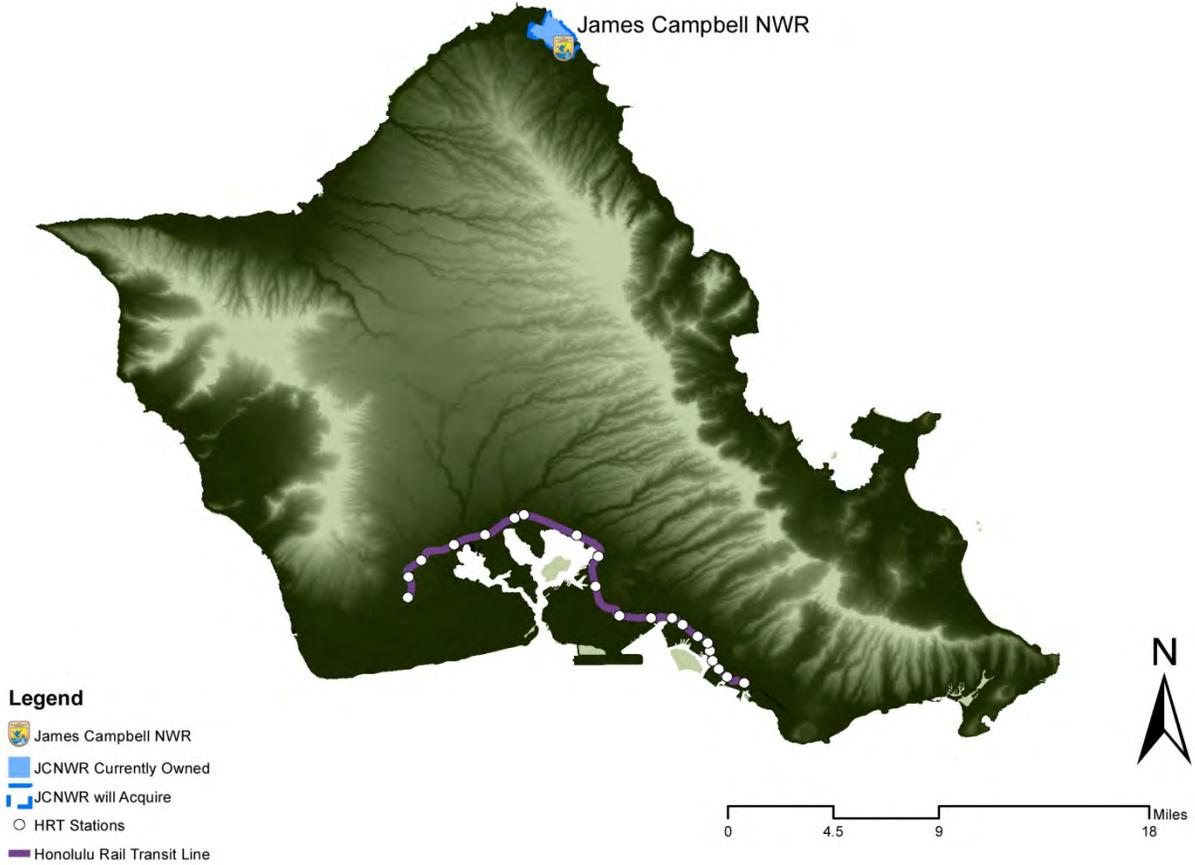
Although there is not currently commuter/heavy or light rail infrastructure on the island, the City/County through the Honolulu Rail Transit Authority (HART) has begun planning, design, and right of way acquisition for a heavy rail in and around Honolulu. This will not have a significant impact on JCNWR

²⁹ Oahu MPO. 2035 Regional Transportation Plan.

³⁰ Bureau of Transportation Statistics. 2011. Rail Road Network (shapefile)

due to the location of the proposed facilities, but it will impact how and when people travel on the island.

Figure 30 – Honolulu Rail Transit (Proposed)



31

There are four intermodal facilities on the island of Oahu, all in Pearl Harbor. All four are air – truck facilities. These facilities include: Emery Forwarding, Aloha Airlines, Honolulu International Airport, and Hawaiian Airlines.

Water Transportation

There are a number of intermodal freight facilities on Oahu, all of which connect air and water freight movement to land. There is no freight rail in Hawaii.

- The Honolulu Harbor has a plethora of distribution gates along Ala Moana Blvd/ Nimitz Highway and Sand Island Access Road to serve intermodal freight purveyors including Matson, Horizon, and Young Brothers.

³¹ Honolulu Rail Transit Project. Shapefiles. Received 2/16/2011

- The Honolulu International Airport also has a number of distribution points along the airport boundaries served by Lagoon Drive and Aolele Street to the east and Elliott Street to the west. Intermodal freight includes Aloha, United, and Delta Air Cargo, and UPS and FedEx.
- The Kaleloa/ Barbers Point Harbor, on the leeward coast south shore, is accessed by Malakole Street. Heavy construction materials enter Hawaii through this port and the Campbell Industrial Park.

In 2010, the harbor accommodated \$3.3 billion US in imports and \$200 million US in exports. Both harbors are managed by the State of Hawaii.³²

There are a number of cruise operators that serve Oahu, some start in Honolulu, while others travel to Hawaii, with ports of call in Honolulu. In 2005, Honolulu Harbor accommodated over 500,000 cruise ship passengers. This number dropped significantly to 225,616 by 2010. Often, these ships offer excursions on the island including helicopter tours, shuttle bus tours, island cruises in addition to other options.

Figure 31 – Cruise Ship Arrival and Passenger Count

Subject	2006	2007	2008	2009	2010
Number of ships, arrivals	29	33	31	23	23
Number of tours	216	252	141	111	116
Number of passengers	426,194	513,840	268,550	221,138	225,616
Out of state visitors	415,967	503,020	266,534	217,283	223,693
Arrived by air	315,955	372,021	157,059	120,677	122,454
Arrived by ship	100,012	130,999	109,475	96,606	101,239
Hawaii residents	10,227	10,820	2,016	3,855	1,923 ³³

Air Transportation

There are three publicly accessible airports on Oahu, and nine heliports. Airports include:

- Honolulu International (South Shore - HNL) with 24 hour operations;
- Dillingham (North Shore - HDH) is VFR daylight operation for general aviation and is shared with the US Army for their training purposes; and
- Kaleloa (Leeward - JRF) provides general aviation and is shared jointly with the USCG SAR operations.

Active military air facilities include: JB Hickam-Pearl Harbor (shares facilities with HNL), and Wheeler Army Airfield at Schofield Barracks, MCAF Kaneohe at Marine Corps Base Hawaii, and NALF on Ford Island in Pearl Harbor.

Ninety percent (90%) of Oahu’s air arrivals are through HNL. Honolulu International Airport (HNL), it is operated by the Hawaii Department of Transportation and covers 4,520 acres. It has four active runways and services over 20 million visitors each year. It is served by twenty seven international and domestic carriers, three interisland airlines, and four commuter airlines. It is estimated that during a typically day, Less than 1% of travelers using Hawaii’s airports are traveling through to another location.

³² World Port Source. 2011. Port Detail. www.worldportsource.com

³³ Hawaii State Department of Business, Economic Development and Tourism. *Cruise Ship Arrival and Passenger Count: 2006 to 2010*.

there are 10,000 people in the airport (employees and passengers), serving an average of 50,000 passengers each day.

Figure 32 – Oahu Air Facility

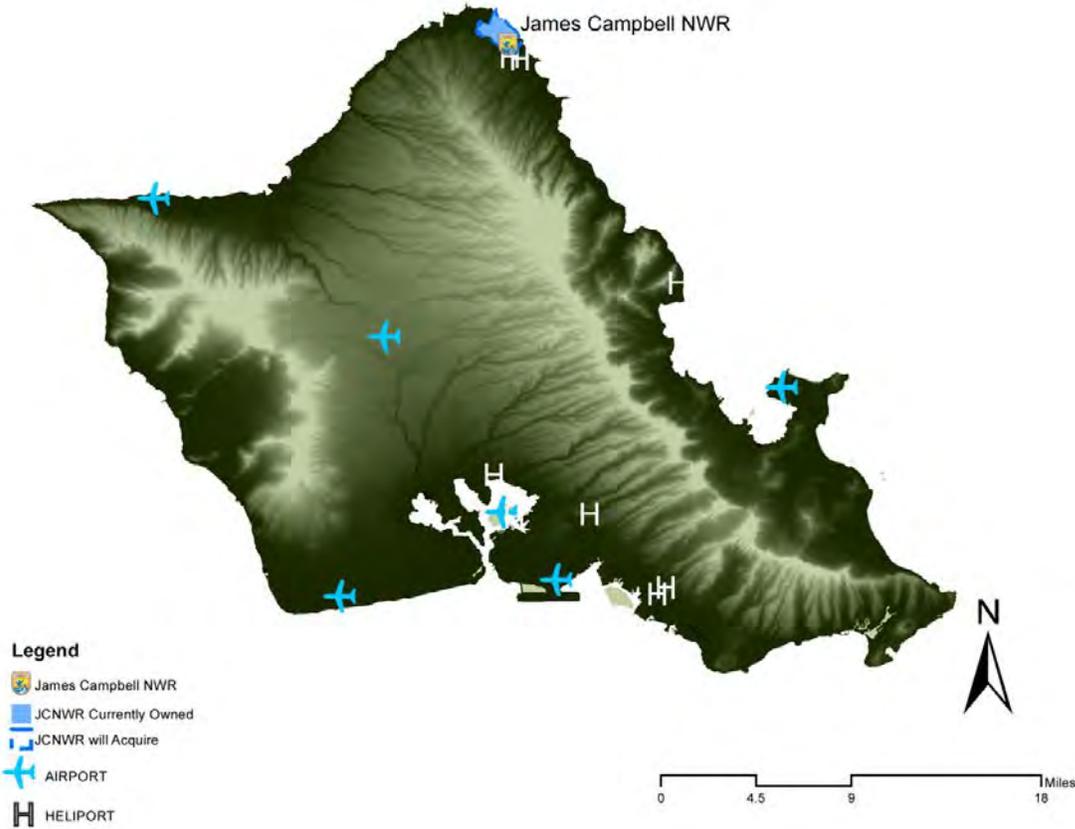
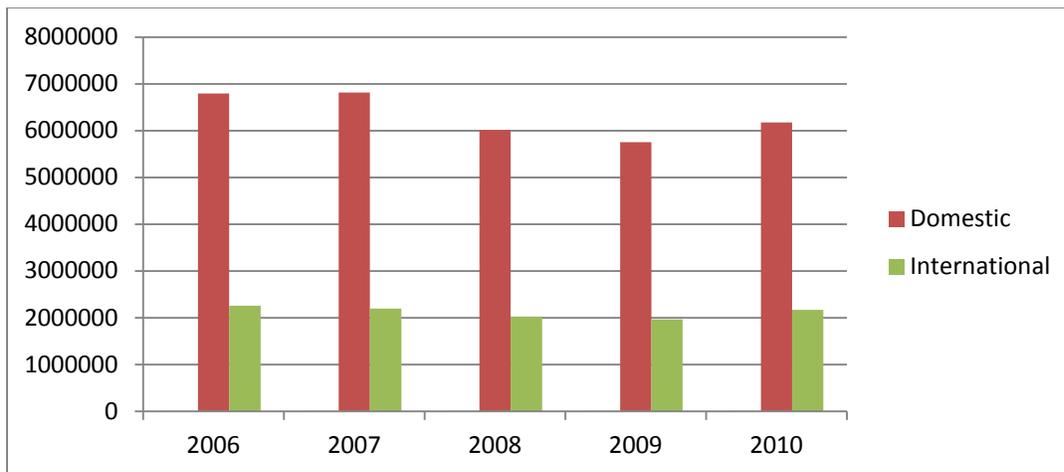


Figure 33 – Honolulu Airport Passengers Arriving, by Point of Origin



³⁴ Hawaii 2010. State Department of Business, Economic Development and Tourism, Tourism Research.

Transit, Tour and Shuttle Service

There are four transit routes with service in and/or around the refuge, all of which are Express routes. These routes have frequent headways (time in between service). Transit is marketed as TheBus on the island. The system operates as a hub-and-spoke system with seven transit centers. There are also five park-and-ride locations that access the transit system. Para-transit and TheHandi-Van are available throughout the island. Formal and informal ride share and van-pool services are available, primarily directed at commuters.

Transit trips are forecasted to increase by more than 49% by 2035, this is mostly due to the implementation of to fixed guideway (light rail) transit between Kapolei and Ala Moana Center. Honolulu Transit is in the process of planning, constructing, and operating the new rail line. This 20 mile system will service Honolulu and connect with transit providing multi-modal access at its 21 stations. The rail line is expected to be fully operational by 2024.³⁵

In addition to transit service, the City previously operated ferry service known as TheBoat. Ferry service was designed to connect transit riders to other parts of the island. The OahuMPO's Regional Transportation Plan 2035 and Transportation Improvement Program (TIP) listed a project, funded at \$7.5 million to:

Continue ferry demonstration project operations and plan, design, and construct facilities for a ferry operation which will serve as an extension of the bus service and provide West Oahu residents with another transportation option to downtown Honolulu. The project will include, but not be limited to, parking lots, passenger terminals, and improved docking facilities.

Inter-island "super ferry" service was in service although it is no longer in operation. The MPO does not include inter-island ferry operations in its planning documents and there is not interest in re-instating the service.

A number of shuttle services and tour operators serve the island by transporting visitors to/from attractions, the airport, as well as hotels and resorts. Commercial tour operators offer a variety of tours throughout the islands. Relative to the JCNWR, several tour operators offer bus tours to the Polynesian Cultural Center, located 6 miles southeast of the refuge along Kamehameha Highway. There are number of shuttle and tour services available from Waikiki to/from the Polynesian Cultural Center. Currently, around 275,000 visitors travel via tour bus (42% of its visitors) to the Center³⁶. Some Center visitors choose accommodations in Turtle Bay Resort, due to its close proximity, which is adjacent to JCNWR.

Transit In/Around JCNWR

The figures below indicate where transit routes are within ¼ mile of the refuge both currently and with proposed expansion. Transit ridership research indicates that most riders are willing to walk ¼ mile to access a transit stop. There are presently 12 transit stops within ¼ mile of the refuge.

³⁵ Honolulu Transit. 2011. *Facts and Figures*. www.honolulustransit.org/rail-system-guide/facts-and-figures.aspx

³⁶ Walker, Alan. 2011. *Email Correspondence – Visitation Information*. (PCC Sales and Marketing)

Figure 34 – Transit Stop near Marconi Road



The current master plan for the Turtle Bay resort includes a transit stop off of Marconi Road near the preferred site for the JCNWR visitor center complex, this would help provide safer transit access to visitors and no longer require crossing Kamehameha Highway to access a stop.

Figure 36 – Bus Traveling East on Kamehameha Highway near Eastern Refuge Boundary



Transit service near the refuge maintains a regular schedule and provides access to Honolulu as well as other attractions, population, and employment centers. A table below indicates relative frequency of headways (time in between buses) as well as time from the Turtle Bay area to Ala Moana. Transit times vary greatly throughout the day and Honolulu Transit should be consulted for the most up-to-date schedules. Preliminary review of the OahuMPOs Regional Transportation Plan did not indicate service level changes to transit in the Turtle Bay area.

Figure 37 – JCNWR Transit Connectivity

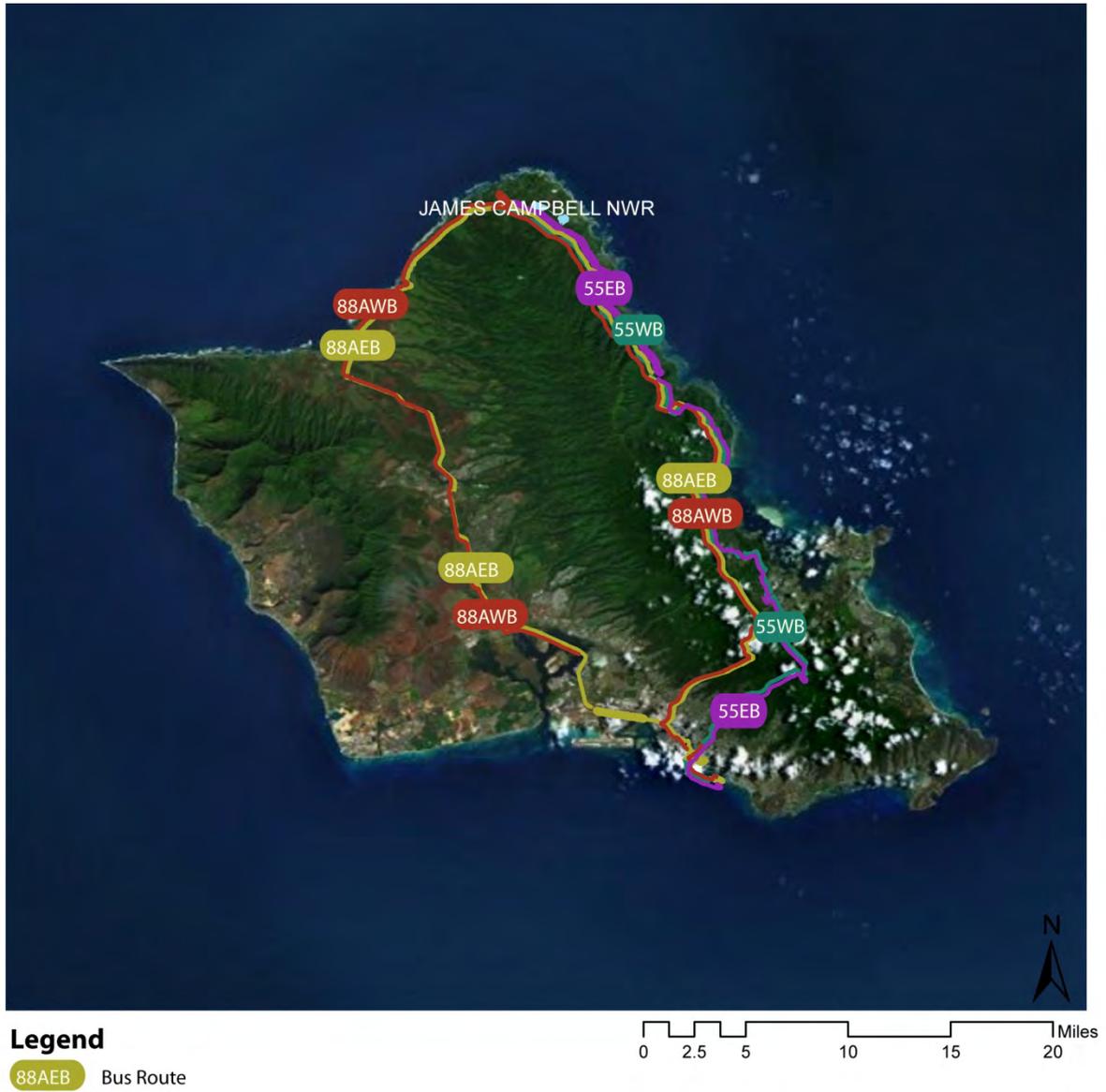


Table 7 – Nearby Transit Routes

Route	Route Name	Route Description	Frequency	Transit Time from Turtle Bay to Ala Moana Center (Kona St) at 12:00 p.m.
55 East Bound	Kaneohe Circle Isle	Via Pali Hwy/Kam Hwy to Kaneohe/North Shore/Wahiawa/Mililani/Honolulu	Every Half Hour	2:12
55 West Bound	Kaneohe Circle Isle	Via H-1/H-2 to Mililani/Wahiawa/North Shore/Kaneohe/Honolulu	Every Half Hour	1:50
88A East Bound	North Shore Express	Via Pali Hwy/Kam Hwy to Kaneohe/North Shore/Wahiawa/Milalani/Honolulu	Every Half Hour	2:12
88A West Bound	North Shore Express	Via H-1/H-2 to Mililani/Wahiawa/North Shore/Kaneohe/Honolulu	Every Half Hour	1:50

³⁷ Note: Schedules subject to change and vary on holidays and weekends. Travel time varies greatly (from 1:30 to over 2 hours, depending on time of day)

Transit service expansion and enhancements are noted in planning documents for the OahuMPO. However, specific corridors, enhancements, and service changes are not noted.

³⁷ City and County of Honolulu. "The Bus". www.thebus.org. Accessed 11/2011

Bicycling and Walking

Access for bicyclists and pedestrians in and around the refuge is an important consideration. There are a number of trails and sidewalks near the refuge. With enhanced connectivity, design and infrastructure improvements, walking and biking may be a viable transportation option to the refuge. The current refuge Comprehensive Conservation Plan (CCP) identifies the development of biking trails as a potential visitor enhancement project. A subsequent Visitor Services Plan for the refuge will be developed over the next few years. This plan will identify and evaluate specific alternatives for potential biking and walking trails on the refuge.

AARP published a report for Hawaii with detailed analysis and recommendations to help improve pedestrian safety and walkability on the islands. *Walk Audit Report: Making Pedestrian Safety and Walkability A Top Priority* was published in 2006³⁸. This report included an audit of key areas on the islands, while there was not an audit done near JCNWR, the findings can apply to improvements needed in and around the refuge to provide better pedestrian access and safety. JCNWR may consider a safety study, or a Road Safety Audit to evaluate the multi-modal safety and access to and around the refuge. Road Safety Audits include involvement from stakeholders in need identification and evaluation to make transportation facilities safer for all users.

The network of bicycle facilities on the Island of Oahu includes the following:

Signed Shared Road:	30.1 Miles
Bike Lane	33.6 Miles
Shared Use Path	34.3 Miles
All Facilities	98 Miles³⁹

There are three primary facility types that comprise the bikeway infrastructure on the island. The three facility types fall into the following categories as defined by the *Bike Plan Hawaii, A State of Hawaii Master Plan* (2003).

Shared Roadway. A shared roadway refers to any street or highway that is open to both bicycle and motor vehicle travel. All roadways on Oahu are shared roadways, except for the interstates and roadways where bicycles are specifically prohibited. Shared roadways may have signs designating their status as a preferred bike route.

Bike Lane. A bike lane refers to a section of the roadway that has been designated by striping, signing, and/or pavement markings for the preferential or exclusive use by bicyclists. It delineates the ROW assigned to bicyclists and motorists in part to provide for more predictable movements by each type of user.

Shared-Use Path. Shared-use path refers to a pathway that is physically separated from motorized vehicular traffic by an open space or a barrier, and is either within the highway ROW or has an independent ROW. Shared-use paths may also be used by other non-motorized vehicle users.

³⁸ AARP Hawaii, 2006. *Walk Audit Report: Making Pedestrian Safety and Walkability a Top Priority*. <http://hawaii.gov/health/healthy-lifestyles/injury-prevention/PDF/aarpsurv5.pdf>

³⁹ HDOT. 2003. *Bike Plan Hawaii, A State of Hawaii Master Plan*. <http://hawaii.gov/dot/highways/Bike/Bike%20Plan/pdf/appendixc.pdf>

Existing bike infrastructure within relative close proximity, identified by HDOT includes the Ke Ala Pupukea Bike Path from Waialea Beach Park, before Waimea Bay and the multi-use trail near Kahuku.

Figure 38 – Trail along Kamehameha Highway near Kahuku



The above photo is of the multi-use trail near Kahuku. This trail was part of the Envision Laie planning effort. The 1.2-mile-long and 9-foot-wide project stretches from Laie to Kahuku. “Envision Lā’ie represents a diverse group of residents and stakeholders of Laie, Kahuku, Hauula, and Ko’olau Loa who are working together to study Lā’ie and plan for its future possibilities.”⁴⁰ The planning effort has identified several transportation related goals including: “pedestrian and bike path network and recreational opportunities” and, “connect communities with a restored Cane Haul road”.

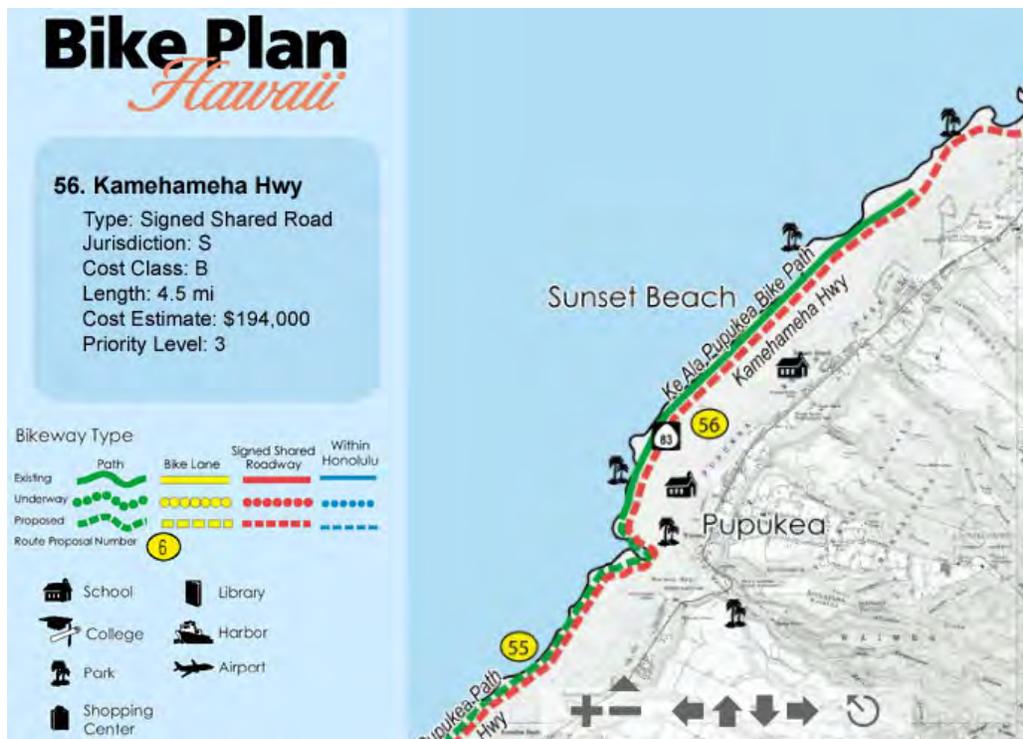
There are two proposed bicycle improvements that will provide enhanced access near the refuge. They are included in the *Bike Plan Hawaii, A State of Hawaii Master Plan* (2003). These improvements include segments of signed shared road along Kamehameha Highway. One improvement is from Waimea Bay to Waialea Beach Park, the facility is owned by the state, 4.5 miles in length, at a cost of \$194,000. The second proposed project is from Waialea Beach Park to Crouching Lion, 17.1 miles, at an estimated cost of \$4.8 million. Both projects have a priority level of III (on a scale of I to III).

⁴⁰ Envision Laie. About Us. <http://envisionlaie.com/> Accessed 04/2012.

Figure 39 – Island Bicycle Facilities (current, proposed, and under construction)



Figure 40 – Island Bicycle Facilities (current, proposed, and under construction)



Chapter 3 - James Campbell and Transportation

James Campbell NWR is adjacent to Kamehameha Highway (Route 83); Kamehameha Highway provides major access to both the surrounding area and the rest of the island. With the acquisition of new lands, a large amount of new transportation infrastructure has been acquired since the last road inventory. Much of this roadway is in poor condition and of native surface.

Figure 41 – Access road on JCNWR (Nudist Camp Road)



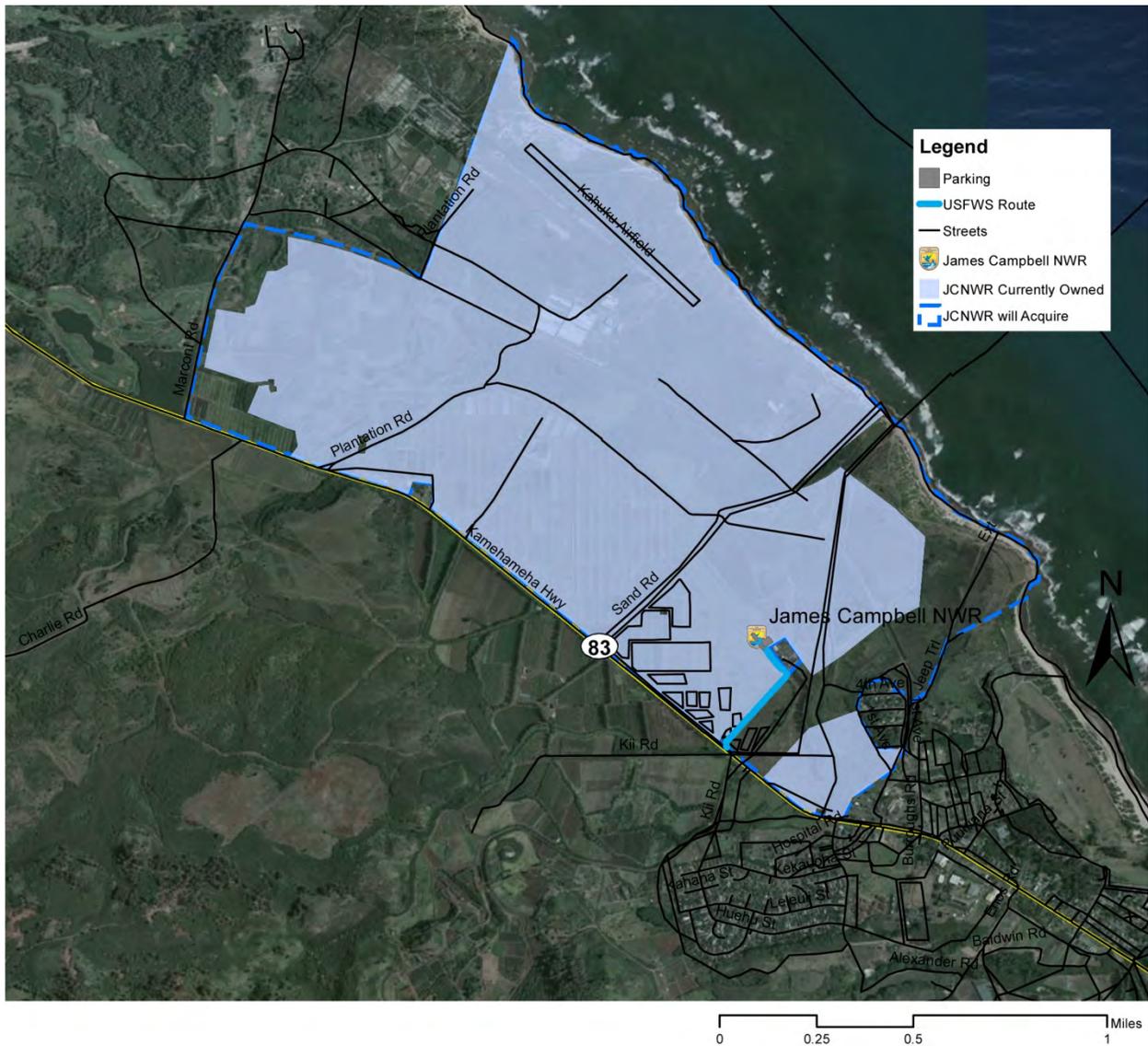
Only the entrance road is recorded by the refuge Road Inventory Program (RIP). As stated in the CCP, the refuge hopes to expand access to the refuge through the development and maintenance of trails, boardwalks and observation sites. Due to recent and ongoing land acquisition, the RIP needs to be updated.

Table 8 – Refuge Road Program Summary⁴¹

Refuge Road	Total
Paved Route Miles	0.24
Unpaved Route Miles	0.10
Total Miles	0.34

⁴¹ Refuge Road Inventory Program (RIP), Cycle 4

Figure 42 – JCNWR Transportation Access



As noted in the map above, there is a large amount of transportation infrastructure that could be utilized by visitors or staff on the refuge, but currently is not being maintained. *Note: Due to the undeveloped nature of the transportation network, some of the roadways indicated above are inaccurate. Many of the lines shown as streets are actually ditches (roadway network source: NAVTEQ, 2011).*

Table 9 – Refuge Route Length Summary by Surface Type

Surface Type	Mileage	Percentage
Asphalt	0.24	71%
Concrete	0.00	0%
Gravel	0.00	0%
Native	0.10	29%

As of the last RIP report, there was 18,219 square feet of gravel parking. The refuge also contains the remnants of the Kahuku Army Airfield which is an old World War II era asphalt runway. There are no plans to bring this airfield back into use. Also, 50 CFR 27.34 prohibits aircraft from operating over national wildlife refuges at altitudes that result in harassment of wildlife and specifically prohibits unauthorized landings or take-offs. Located on newly acquired refuge land the old runway could actually provide habitat for many types of birds including nesting seabirds.

Figure 43 – Kahuku Airfield



The refuge will explore the development of an auto-tour route on the refuge. Currently, land is still being acquired to complete the network needed for an auto tour route. Given the sensitive environment of the refuge, it is uncertain whether an auto tour route will impact wildlife.

The roadway surface on the transportation network on the refuge is mixed, but generally in poor conditions.

New Visitor Center and Access

JCNWR proposes to build a visitor center and educational facility on the southwestern corner of its boundary, where Marconi Road intersects Kamehameha Highway. Under current plans for additional development on Turtle Bay Resort, the existing Marconi Road would undergo major widening and improvements. The access would likely be similar to what is at Turtle Bay Resort (see Figure 22). Improvements would be all along Marconi Road including roadway widening, curb, gutter, and the addition of trails. The improved Marconi Road would be dedicated to the City/County of Honolulu.

Figure 44 – Marconi Road facing Kamehameha Highway



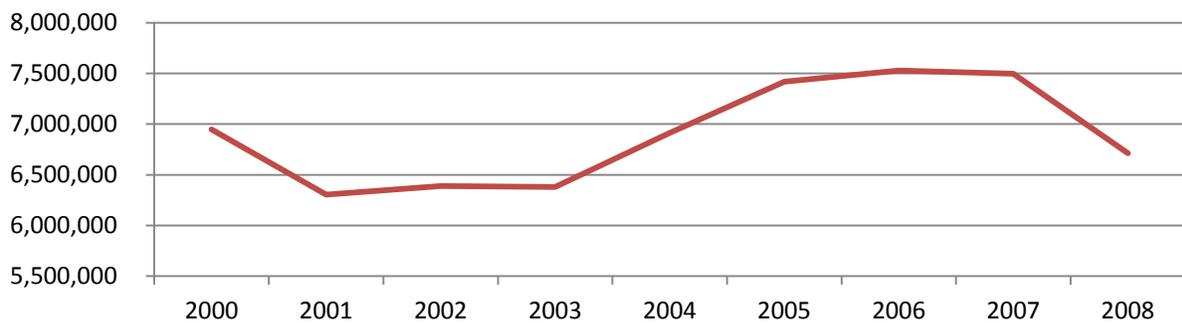
Chapter 4 - Visitation and Transportation Impacts

Tourism greatly impacts Hawaii in countless ways, including the transportation network. This chapter focuses first on Hawaii tourism and then provides detail on tourism in and around JCNWR.

Hawaii

Hawaii had over 6.9 million visitors in 2010. On average, Hawaii has around 175,000 visitors present every day, of those, 76% are domestic visitors and 23% are international. Oahu averaged over 87,000 visitors per day in 2010, roughly 49% of the daily visitors to Hawaii.⁴² Economically, tourism contributes over \$9.6 billion in gross domestic product to Hawaii.⁴³ Visitor numbers have declined since 2006.⁴⁴

Figure 45 – Hawaii Visitor Arrivals (2000 - 2008)



Visitor units are located throughout the island, areas with higher numbers of units are indicated below.

⁴² Hawaii 2010. State Department of Business, Economic Development and Tourism, Tourism Research. *Contribution to the State's Economy by Statewide Visitor Industry and by Waikiki.*

⁴⁴ Hawaii 2010. State Department of Business, Economic Development and Tourism, Tourism Research. *Visitor Arrivals and Average Daily Visitor Census.*

Figure 46 – Visitor Accommodations (Ex: hotel units)

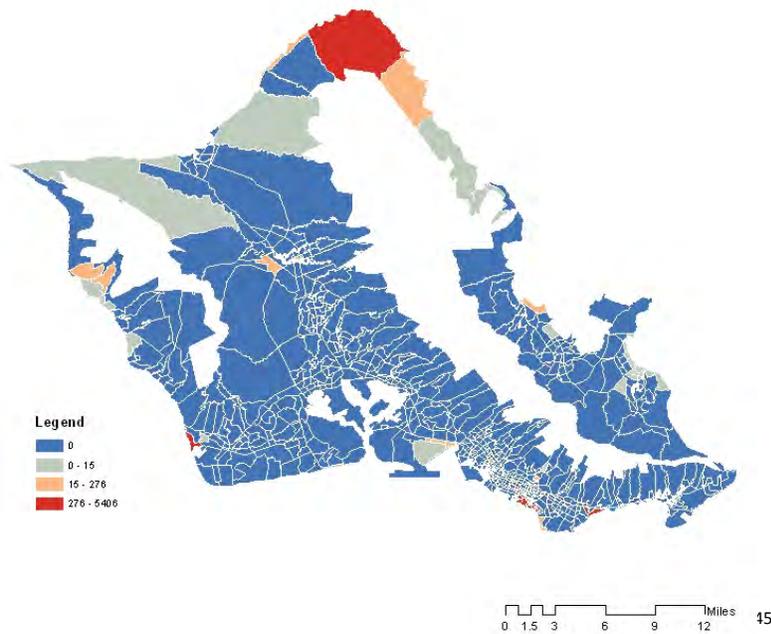
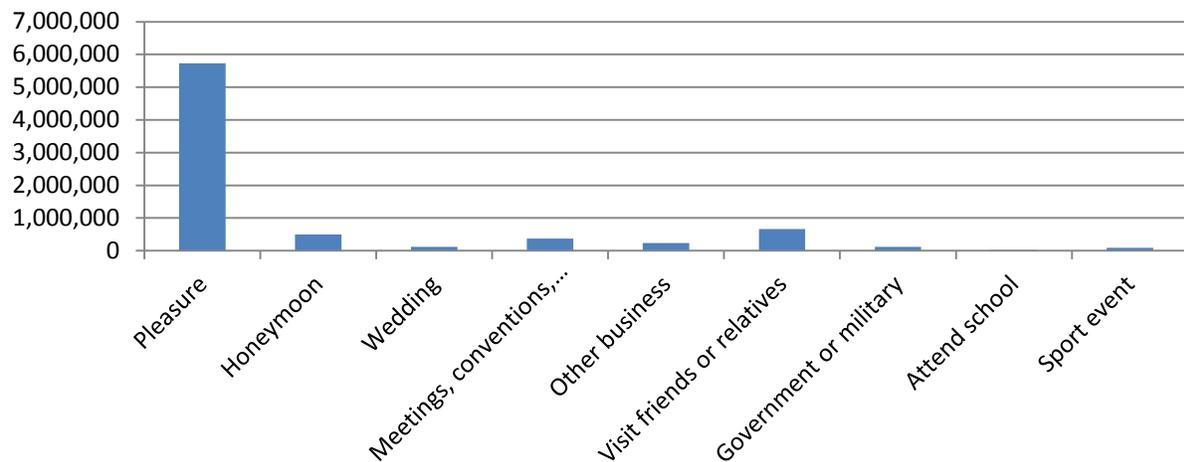


Figure 47 – Purpose of Visit to Hawaii (2010)



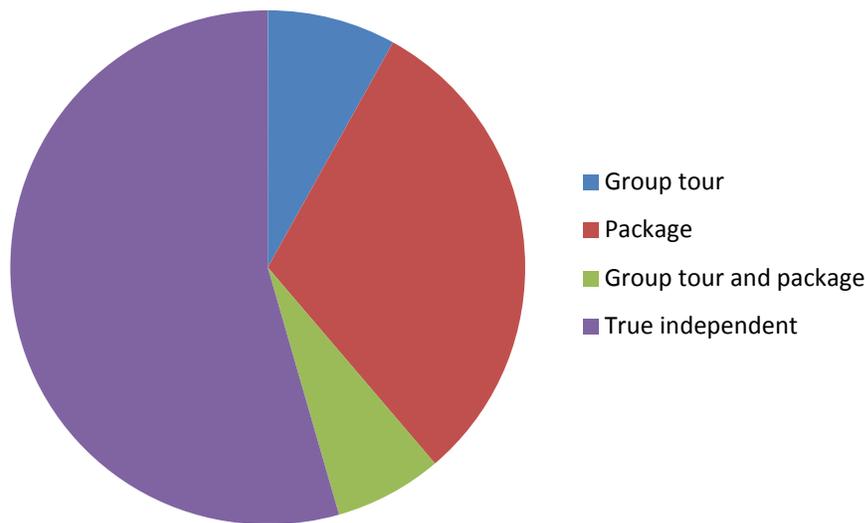
46

Most visitors travel independently (eg: renting a vehicle trip planning by the individual), but a moderate amount of visitors choose tours and packages when traveling to Hawaii.

⁴⁵ Oahu MPO. 2011. TAZ Level Forecast (2007)

⁴⁶ Hawaii 2010. State Department of Business, Economic Development and Tourism, Tourism Research. *Trip Characteristics of Visitors, by Point of Origin.*

Figure 48 – Travel Method to Hawaii (2010)



Approximately two-thirds of Oahu’s domestic visitors stay on Oahu only. The remaining visitors travel to the other islands. Visitors to Oahu stayed an average of seven (7) days on the island, and ten (10) days in the state.⁴⁷

According to research done in 2004, 51% of Oahu’s visitors travel to the “North Shore” which includes JCNWR.⁴⁸ This indicates that a large number of tourists are in the area of the refuge, and could be potential visitors.

James Campbell National Wildlife Refuge

JCNWR had 1,110 visitors in 2010 and 1,640 in 2011. The refuge expects that with the new expansion of the refuge boundary and the addition of visitor and educational facilities, visitation will rise dramatically.

⁴⁷ Hospitality Advisors LLC. 2010. *Visitor Industry Analysis, City and County of Honolulu General Plan Update*.

⁴⁸ Hawaii Visitors and Convention Bureau. 2004. *Tourism Industry Update*.

<http://www.hvcb.org/media/documents/TIU04-28.pdf>

Figure 49 – JCNWR Refuge Entrance Sign



JCNWR had 1,110 visitors in 2010 and 1,640 in 2011.

Table 10 – 2010 Visitation Summary

	Total Number of Visitors	Visitors to Visitor Center or Contact Center	Foot Trail/Pedestrian Visits
James Campbell NWR	1,110	0	365
Oahu Forest NWR	0	0	0
Pearl Harbor NWR	2,540	0	0

Visitation to JCNWR is currently very limited due to the small size of the refuge, limited facilities, and sensitive and seasonal nature of managing for endangered species. Public entry is prohibited between February and September for endangered species in the Ki,,i unit of the refuge. From October through February visitors are allowed access by participating in scheduled tours. General public tours are led by volunteer docents or knowledgeable birders on Thursdays and Saturdays by reservation only. Tours average 12 people per tour while school based tours have slightly over 30 individuals per tour.

The JCNWR does not have a visitor center or an auto tour route. However, the preferred alternative described in the CCP will include the following enhancements for visitors and staff:

- New headquarters/visitor center/employee facility,
- Maintenance shop,
- Bunkhouse (restoration of house on Parcel 4), and

- Greenhouse.⁴⁹

Under the proposed expansion, the refuge estimates annual visitation at the following:

- 6,000 student visitors each year
- 5,000 visitors annually along the coastline, and
- Up to 210,000 with the construction and staffing of the visitor center.

The refuge plans to construct new refuge facilities apart from the current location of the complex maintenance facility. The current complex facilities are undersized and exposed to harsh marine coastal winds (tradewinds). Preliminary discussions with refuge and regional staff have stated that the new facilities may be sited near Marconi Road and Kamehameha Highway, as previously noted in this report.

Figure 50 – Proposed New Visitor Center Location



The refuge plans to create a Visitor Services Plan (VSP) within five years of adopting its CCP. This will help define the future visitor services that will be available on the refuge. Educational and interpretive trails/boardwalks may be included in the VSP as well as way-finding for traversing the refuge, this may include:

⁴⁹ USFWS. James Campbell National Wildlife Refuge Draft Comprehensive Conservation Plan and Environmental Assessment. <http://www.fws.gov/pacific/planning/main/docs/HI-PI/James%20Campbell%20Pearl%20Harbor%20CCP/James%20Campbell%20NWR%20DCCPEA.pdf>

- Interpretive boardwalk(s)
- Observation tower(s)
- Kiosks
- Spur trails for photographers
- Beach access
- Roadside pull-offs
- Visitor contact station(s)

With the recent additions to the refuge, public access to most parts of the refuge is still to be determined. The refuge includes approximately two miles of rare, undeveloped, native coastline. The refuge is considering the provision of visitor and neighborhood access via trails/paths, but it has not yet made a determination on access. The existing roadway network does not provide safe or feasible public access to the coastline. Due to the highly sensitive and valuable nature of natural resources along the coastline, any public access will have to be carefully considered and controlled.

Figure 51 – Coastline at JCNWR



Figure 52 – Administrative Access Road to Coastline

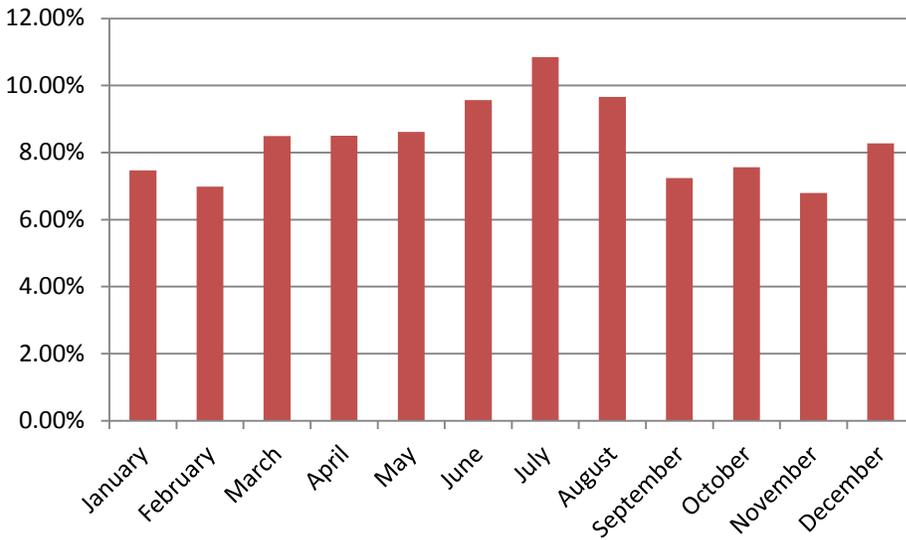


Additional analysis is needed to forecast the number of visitors, timing, and travel mode for JCNWR. The neighboring Polynesian Cultural Center (PCC) has around 650,000 visitors annually, with a large number (roughly 42%) coming via tour bus.⁵⁰ A similar type of visitation to JCNWR would impact parking, facility use, resource impacts (due to a large density of visitors at one time), and staffing requirements. Further analysis and forecasting is needed regarding visitation patterns and subsequent refuge needs.

The busiest months for the PCC are June through August, although visitation is fairly consistent year-long. This seasonal variation would likely be similar for JCNWR.

⁵⁰ Walker, Alan. 2011. *Email Correspondence – Visitation Information*. (PCC Sales and Marketing)

Figure 53 – Polynesian Cultural Center Visitation (2009 - 2011 Average)



There are many international visitors to Oahu and many do not speak English. Therefore, transportation signage, infrastructure design, and overall wayfinding must take cultural barriers into consideration. Acknowledging the diverse needs of visitors will be important to JCNWR.

Figure 54 – Sign at WWII Valor in the Pacific National Monument



Chapter 5 - Access, Signage, Geometric Design and Parking

Access Regulations

Hawaii DOT does not have specific regulations regarding highway access, acceleration lanes, or turn lanes. Typically, access changes are handled case-by-case, with the exception of driveway regulations (although, these only apply to residential and commercial development). Access is reviewed when construction permits are issued. Depending on the scale of development HDOT will require a traffic study. Although this too is determined on a case-by-case basis.⁵¹

Figure 55 - Kamehameha Highway looking West near JCNWR



Signage

There are currently no directional signs for the refuge on Kamehameha Highway, only when you drive down the administrative road and arrive to a locked gate is there refuge signage. Even if access is not extended, providing signage along Kamehameha Highway could be useful to groups coming into the refuge.

Hawaii allows along its highways only “directional and other official signs and notices, which signs and notices shall include, but not be limited to, signs and notices pertaining to natural wonders, scenic and historic attractions as authorized or required by law” or “signs, displays, and devices advertising

⁵¹ HDOT. Phone Consult. B. Tyao. 11/2011.

activities conducted on the property on which they are located. JCNWR has one sign noting the entrance, as indicated below. More are allowable.

Table 11 – Allowable Roadway Signage

Intersection	Number of Signs
0 – 2 Miles	0
2 – 5 Miles	6
More than 5 Miles	Average of 1 sign per mile

No two signs may be permitted within any mile distance measured from any point, and no two signs shall be less than 1,000 feet apart.

Directional sign messages are limited to identifying the attraction or activity and directional information useful to the traveler in locating the attraction such as mileage, route numbers, or exit numbers. Descriptive words or phrases and pictorial or photographic representation of the activity or its environs are prohibited. Signs must receive written approval from HDOT before being erected.

The refuge is not currently planning kiosks or pull-outs for the refuge along Kamehameha Highway, but if informational kiosks were to be installed, approval and coordination with HDOT is required. The Visitor Services Plan, to be completed over the next few years for the refuge will consider and identify potential pullouts along Kamehameha Highway.

Geometric Design

Design practices that are not broken out in HDOT’s administrative rules, are to conform to the ANSI standard and AASHTO guidelines. For complete information on design guidelines, HDOT should be consulted. Some guidance is included in HDOT’s Administrative Rules Chapter 19-127.1 Design, Construction, and Maintenance of Public Streets and Highways.

Parking Facilities

Parking facilities, the amount of spaces needed, type of spaces, and the parking facility layout will depend on visitation, type of vehicles, duration of visit, peak demand and site characteristics. A detailed parking study should be performed in conjunction with new facility planning on JCNWR. Honolulu’s land use code includes rules and regulations for parking facilities.

Chapter 6 - Safety

Safety is an important consideration in transportation planning. Comprehensive safety planning looks not only at incident statistics, but also proactively addresses known risks. There are a number of tools to evaluate safety in around James Campbell, these include: Road Safety Audit (RSA), comprehensive safety study, or project specific safety evaluations.

In HDOT's Hawaii Strategic Highway Safety Plan, the State identifies key areas where safety improvements are needed. The strategies are categorized as legislative, education, enforcement, engineering, and data needs.⁵²

HDOT incident data from 2004 – 2008 is displayed below for the transportation network in and around JCNWR. While there are a number of incidents that have occurred, they are not in close proximity to the current entrance or Marconi Road, which could serve as the gateway to new, expanded facilities.

There are a total of 30,999 incidents recorded from 2004 – 2008 on Oahu. Of those, at least 45 occurred within 10 miles of the refuge. There are three areas in which incidents are clustered on the map, which is indicated below. Most accidents involved only one car, three involved motorcycles, six involved bicycles and vehicles, and five involved pedestrians. No individuals were killed. 25 incidents resulted in injury.⁵³

Table 12 – Number of Vehicles Involved in Incidents near JCNWR (within 10 miles)

Number of Cars Involved	Number of Incidents
0	4
1	25
2	11
3	5

While HDOT did provide incident data, there was some important geographic referencing information that was missing for some records, so the incident statistics are approximate.

There does not appear to be a higher than average number of incidents occurring in and around the refuge. The closest cluster of incidents southeast of the refuge, of the 7 incidents within 2 miles, 2 of those involved bicyclists.

Table 13 – Estimated Incidents near JCNWR (2004 - 2008)

Intersection	Incidents
0 – 2 Miles	7
2 – 5 Miles	18
5 – 10 Miles	20

⁵² Hawaii Department of Transportation. Hawaii Strategic Highway Safety Plan 2007 thru 2012. <http://hawaii.gov/health/healthy-lifestyles/injury-prevention/PDF/safetyplan07.pdf>. Accessed 04/2012

⁵³ Hawaii Department of Transportation. 2012. Incident Data. Received 02/2012.

Figure 58 – Incidents Near JCNWR (2004 - 2008)



⁵⁴ Note: Data was geographically referenced to nearest intersection, incidents may have occurred in different locations.

Chapter 7 - Climate Change

The USFWS created a *Climate Change Strategic Plan* to help guide the Service in responding to climate change. Adaptation, mitigation, and engagement are the key responses from the Service in dealing with climate change.

Some of the key vulnerabilities for Hawaii due to climate change include:

- Availability of freshwater
- Exposure to coastal hazards including sea level inundation, and
- Negative impacts of climate change to coastal and marine ecosystems.⁵⁵

The timing and extent of climate change is uncertain, although it is clear that some amount of adaptation will be required. From a transportation planning perspective, sea level rise will have the largest (assumed) impact on transportation infrastructure and service.

How much sea level will rise and its impact is uncertain. It is assumed that the most vulnerable areas are those that are currently identified by FEMA through its flood insurance mapping program. Figure 59 below indicates where flood zones are located. Low-lying coastal areas will be periodically or permanently inundated by seawater, the Intergovernmental Panel on Climate Change's Fourth Assessment estimates a sea level rise between .6 and 2.0 ft by 2100, although additional estimates place the range between 2.6 and 6.6 ft.⁵⁶

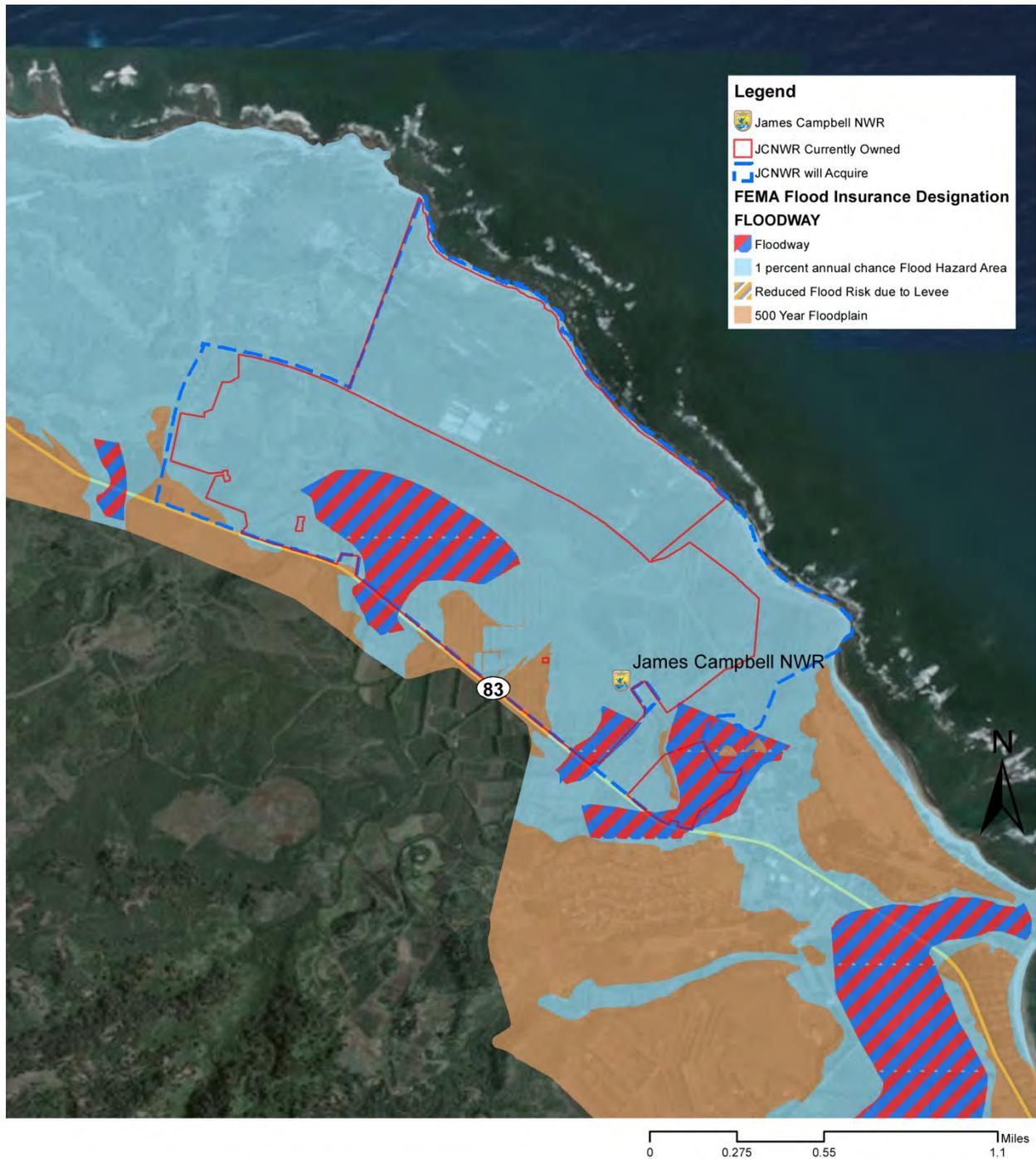
Much of JCNWR is in the 100-year floodplain, and portions are within the general floodway identified by FEMA. This puts much of the refuge and surrounding area at risk for flooding. A large portion of the entrance road is located in the floodway and all of it is located within the 100-year floodplain. Floodways are defined as areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated amount, for example, this could include the channel of a river.

The preferred location for the new visitor center is in the 500 year floodplain and one of the few places within the refuge boundary that is not in the 100 year floodplain or in the floodway.

⁵⁵ University of Hawaii. 2009. *A Framework for Climate Change Adaptation in Hawaii*.

⁵⁶ USFWS. 2011. *Climate Change in the Pacific Islands*. <http://www.fws.gov/pacific/Climatechange/changeipi.html>

Figure 59 – FEMA Flood Insurance Zones near JCNWR



From a transportation perspective not only is infrastructure flooding an issue, additionally, weather patterns including severity of storms, hurricanes, wind events, tsunamis, temperature changes, and the amount of precipitation will affect transportation resources. This includes increased wildfire risk, soil composition/moisture degradation, vegetation, erosion, infrastructure life-cycle reduction, submersion

of transportation infrastructure (roadway, harbor, bike-way, transit stops, etc) and additional stress on storm water resources.

Adaptation measures may include, but are not limited to: pavement composition (porous), riparian buffers, siting of facilities outside of flood-prone areas. Given the tremendous amount of uncertainty surrounding climate change, planning for adaptation is extremely difficult.

Next Steps

This report was developed to help shed some light to the transportation issues that will surround the expansion of JCNWR. Further analysis is needed in areas as the land acquisition and development plans move forward. This includes environmental, land use, transportation, and design review. All of the information used in this report is available to refuge managers and planners for use in additional planning and study.



There are a number of planning and engineering tools available to help guide the development JCNWR's transportation network. These include, but are not limited to:

- Visitor Services Plan
- Refuge Road Inventory Program
- Access and Mobility Planning
- Site and Master Planning
- Traffic Study

Appendix A

Underserved Population

Summary of Underserved Variables

Figure 60 - Non-White Population | Oahu

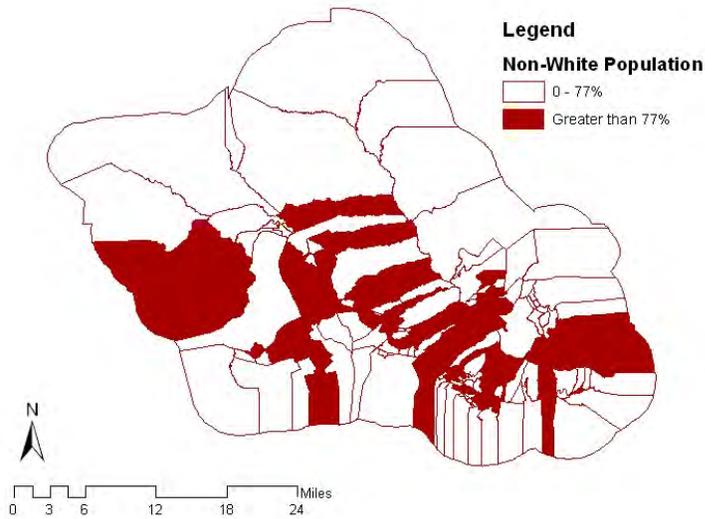
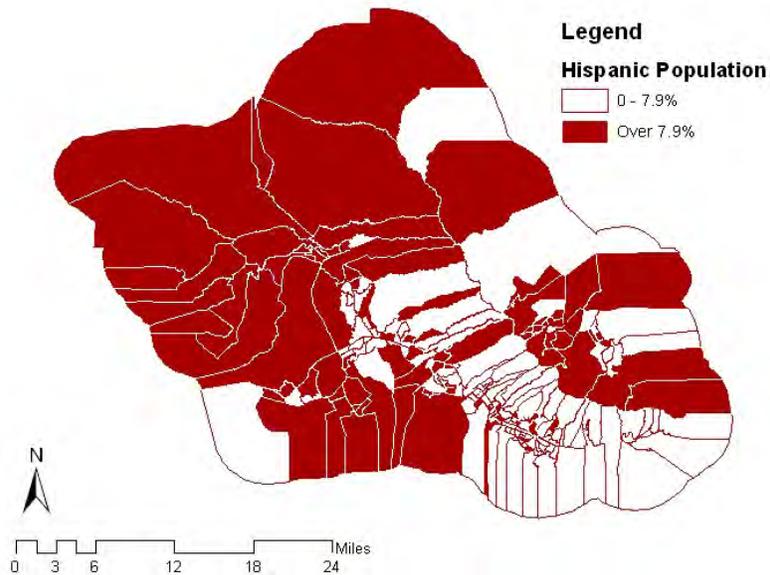
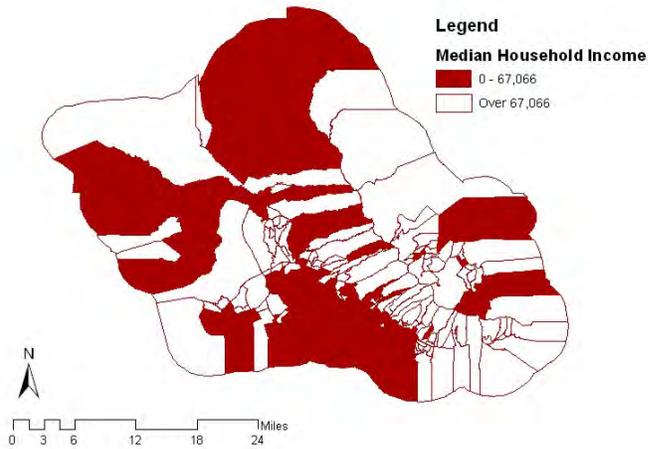


Figure 61 - Hispanic Population | Oahu



The median household income in Hawaii (in 2010 dollars) is \$68,622.

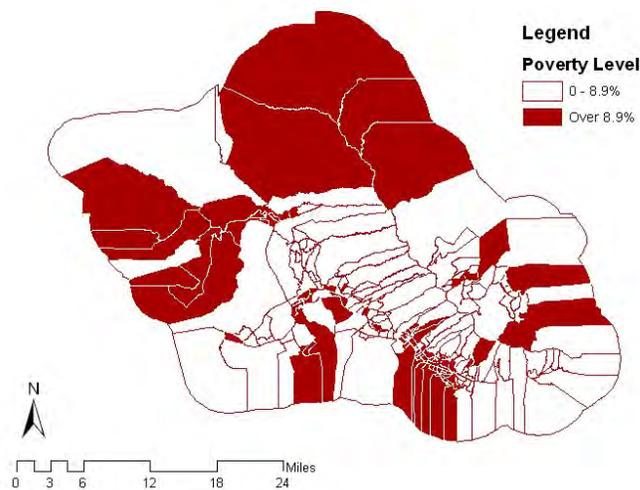
Figure 62 - Median Household Income | Oahu



58

The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine how is in poverty.⁵⁹ The average poverty rate at the tract level for Hawaii is 9.5%.

Figure 63 - Poverty | Oahu

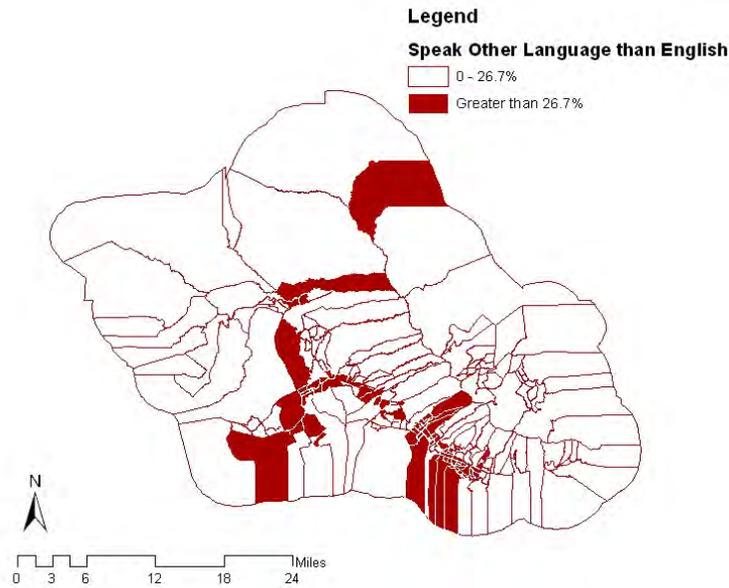


75% of Hawaiians speak English as their only language, 25% of Hawaiians speak at least one other language.

⁵⁸ US Census. 2005 – 2009 American Community Survey 5-Year Estimates. <http://factfinder.census.gov>

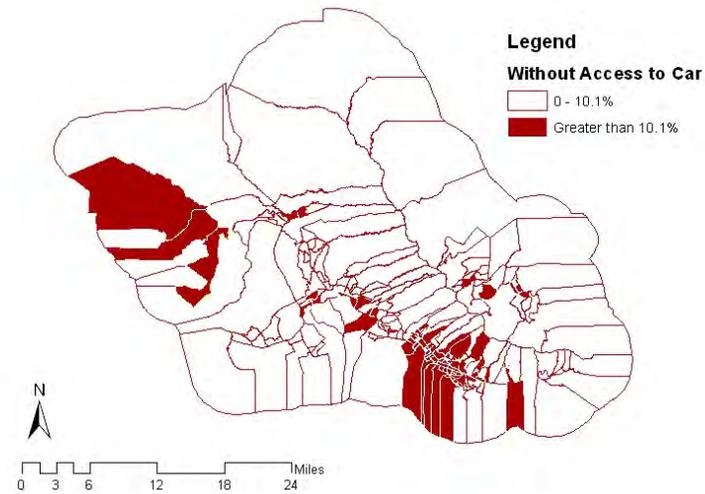
⁵⁹ US Census. 2011. *How the Census Bureau Measures Poverty*. <http://www.census.gov/hhes/www/poverty/about/overview/measure.html>

Figure 64 - Language Spoken at Home | Oahu



On average, 9% of Hawaiians do not have access to a vehicle.

Figure 65 - Without Access to Vehicle



Around the James Campbell Wildlife Refuge, underserved populations of significance include low-income, non-English speakers, low-income, and Hispanic populations.