Archaeological Report

ARCHAEOLOGICAL REPORT FOR THE OAHU COMMERCIAL HARBORS 2020 MASTER PLAN - IMMEDIATE PHASE ENVIRONMENTAL IMPACT STATEMENT

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ABSTRACT

At the request of Wil Chee-Planning, Inc., Pacific Legacy, Inc., conducted archaeological investigations for the Oahu Commercial Harbors 2020 Master Plan - Immediate Phase Environmental Impact Statement. The purpose of the project was to determine the presence/absence of any potentially significant cultural resources that may be present within the project area.

A document and literature search and an archaeological surface survey were conducted, and concluded that no significant cultural deposits are present within the project area. The entire project area is situated on recently created land, formed by numerous dredging and filling operations. The probability of uncovering any subsurface *in situ* cultural remains within the project area is extremely remote and improbable.

The proposed improvements to the project area will result in the demolition of 17 structures. These structures are associated with the shipping industry and range from warehouses and cargo sheds to office space and restrooms. Of the 17 structures, ten are older than 50 years (Pier 18 shed, Pier 19 shed, Pier 22 Warehouse's #6 and #8, Pier 24 shed, Pier 25 shed, Pier 26 shed, Pier 27 and 28 shed, Pier 29 shed, and Pier 32 shed) and are potentially eligible for inclusion to the National Register of Historic Places (NRHP). However, a majority of these structures have undergone various improvements over the years and are generally in poor condition. Records detailing their construction and structural improvements are presented, and they have been photographed and recorded. As a result, none of the structures are recommended for NRHP inclusion and no further work is recommended.

The dredging activities planned for Piers 16 and 24 would not impact any cultural remains. No intact cultural resources are present within the harbor itself. Likewise for the area along Lagoon Drive where the proposed Lay Berths' are planned. The area is filled land and no archaeological deposits have been documented. With the exception of a recently constructed building no other structures are present. No further work is recommended.

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1.0 INTRODUCTION

At the request of Wil Chee-Planning, Inc., Pacific Legacy, Inc., conducted archaeological investigations for the O'ahu Commercial Harbor 2020 Master Plan - Immediate Phase Environmental Impact Statement. Specifically, the investigations consisted of archival research (archaeological reports, historic maps, documentary texts, and land court documents), and archaeological surveys. The purposes of this project are to determine the presence/absence of any potentially significant cultural resources within the area of Honolulu Harbor and determine whether any of these resources may be impacted by the proposed harbor improvements.

Honolulu Harbor and its surrounding area is rich in history and culture. The harbor has served as the main point of entry for goods and people arriving from around the world since the early post contact period (after 1778) until today. Although people may now arrive in Hawai'i by other means, Honolulu Harbor and its ocean-going vessels still serve to supply Hawai'i with 98.6% of its imported goods and products (Oahu Commercial Harbors 1997).

1.1 SCOPE OF WORK

The following scope of work (SOW) guided our investigations and provided a framework for the field investigations. The following work tasks were undertaken:

1) conduct an archaeological background and literature search, summarizing the history and land use of the Honolulu Harbor area,

2) conduct limited archaeological field investigations of the subject property(s),

3) evaluate structures scheduled for demolition based upon National Register of Historic Places (NRHP) criteria, and

4) prepare a clear and concise report for inclusion in the Environmental Impact Statement.

The structures discussed in this report were evaluated based upon the National Historic Preservation Act of 1966 (as amended). Any structures meeting the criteria may be determined eligible for inclusion to the National Register of Historic Places (NRHP).

1.2 PROJECT LOCATION

The project area is located in the Kona District of the island of O'ahu, in downtown Honolulu (Figure 1).

The project area, from Pier 2 to Pier 15, is within the State Historic Downtown and Chinatown Districts. The area of the proposed development is itself broken into three areas. The first area (Piers 2 through 29) is bounded to the north by Nimitz Highway, to the south by Honolulu Harbor proper, to the east by Fort Armstrong, and to the west by Chevron and Shell Oil Co. Property.

The second area (Pier 32) is bounded by the Hawaiian Cement property to the north, Chevron and Shell to the east, and the Harbor to the south and west. The last area (Lagoon Drive) is located adjacent to the Honolulu International Airport and is bounded by the airport to the north and west, various car dealerships to the east and Ke'ehi Lagoon to the south. The entire project area extends through the *ahupua`a* of: Pauoa, Nu'uanu, Kapalama, Kalihi, Kahauiki, and Moanalua. The following table (Table 1) provides the Tax Map Key (TMK) designations for various portions of the project.

TABLE 1. TAX MAP KEY LISTINGS FOR THE PROJECT AREA.

Project Location	Tax Map Key Numbers
Pier 2	2-1-15: 29, 30
Piers 12 through 16	2-1-01: 42, 45, 56
Piers 18 through 23	1-5-39: 18, 21, 22, 26, 28, 29, 30, 34, 35, 40, 48, 59, 60, 61
Piers 24 through 29	1-5-38: 7, 8, 9, 15, 16, 18, 19, 20, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40, 42, 43, 44, 45, 48, 49, 50, 51, 52, 53
Pier 32	1-5-36: 9
Lagoon Drive	1-1-76: 01 1-1-72: 27, 28, 30, 33, 36, 39, 42, 45, 49, 51 1-1-70: 1, 3, 4, 5, 6, 7, 33, 42

1.3 ENVIRONMENT

Geologically, Honolulu Harbor was created by the continual flow of freshwater flowing from Nu'uanu Valley into the ocean. The freshwater restricted the growth of coral forming a basin, the start of the harbor. Also forming were channels that cut through the coral reef. In this area sand eventually began to accumulate, forming what would later become Sand Island (Oahu Commercial Harbors 1997).

Elevation at the Harbor's area is between sea level and approximately five feet above mean sea level (amsl). Rainfall within the project area is approximately 10 inches per year with the driest months being June through August (Armstrong 1983). Temperature in the area ranges from 60 degrees to 89 degrees with the warmest temperatures occurring from July to August (Armstrong 1983). Vegetation within the area is primarily located along roadways, Pier 2, and Lagoon Drive, and was observed to consist mainly of ornamental shower trees (*Cassia spp.*), coconut trees (*cocos nucifera*), wedelia ground cover (*wedelia trilobata*), *koa haole* (*Leucaena glauca*), and various grasses and weeds (Neal 1965).

Foote et al. (1972) describes soils within the project area as being entirely fill land (Figures 2 and 3). Fill land consists of "areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse and slurry from sugar mills" (Foote et al. 1972:31). This type of land is commonly used for urban development, housing, airports, and industrial uses.

An analysis of historic maps and sequences of aerial photographs by Eric Komori at the SHPD has resulted in the map presented in Figure 4. This map shows the configuration of the previous shoreline at ca. AD 1900. This figure clearly shows that most of the project area is on recently created land. The only exception is a small area near pier 40 (see Section 4.3 for further information about this portion of the project area).

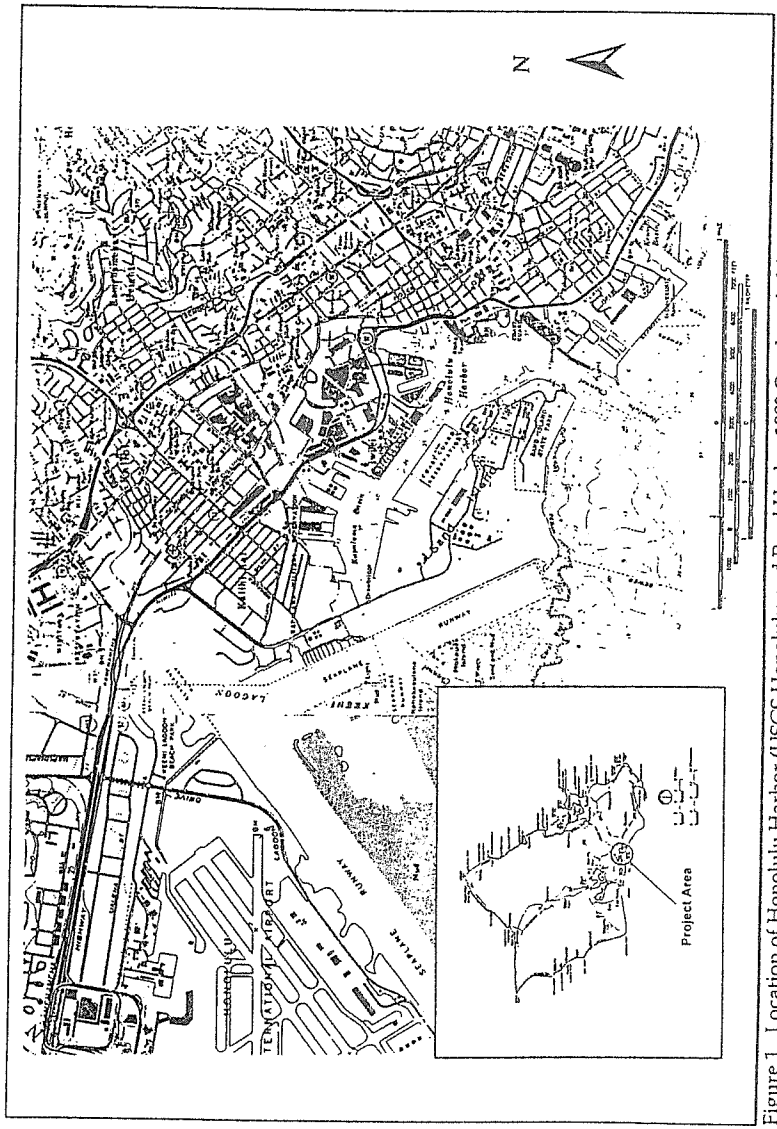

Figure 1. Location of Honolulu Harbor (USGS Honolulu and Pearl Harbor 1983 Quadrangle Maps)

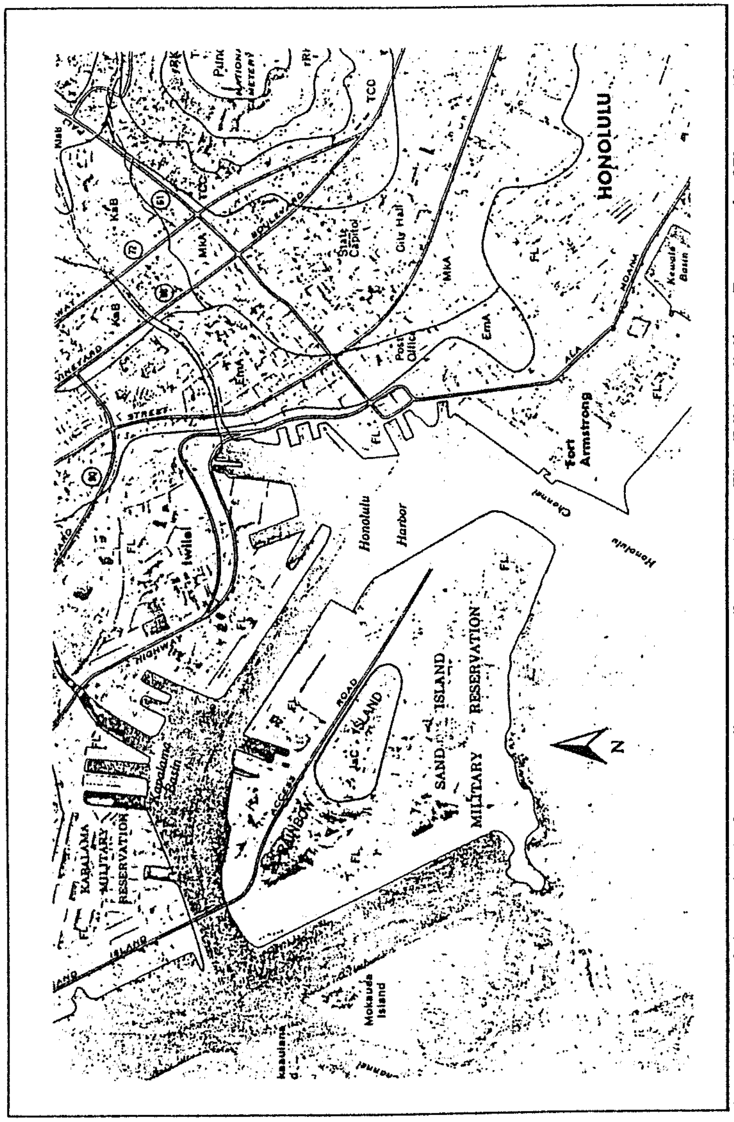

Figure 2. Map of Honolulu Harbor area illustrating soil types (note: FL = Fill Land) (from Foote et al. 1972: map 62).

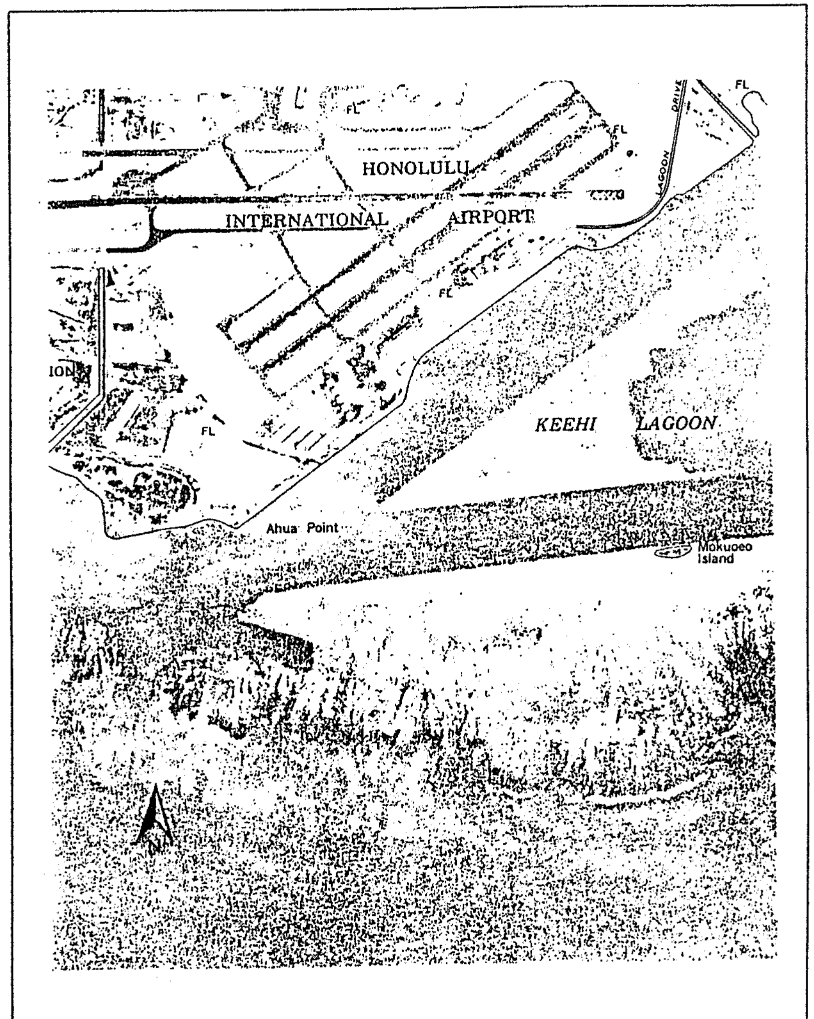

Figure 3. Map illustrating soil types along Lagoon Drive (note: FL = Fill Land) (from Foote et al. 1972: map 55).

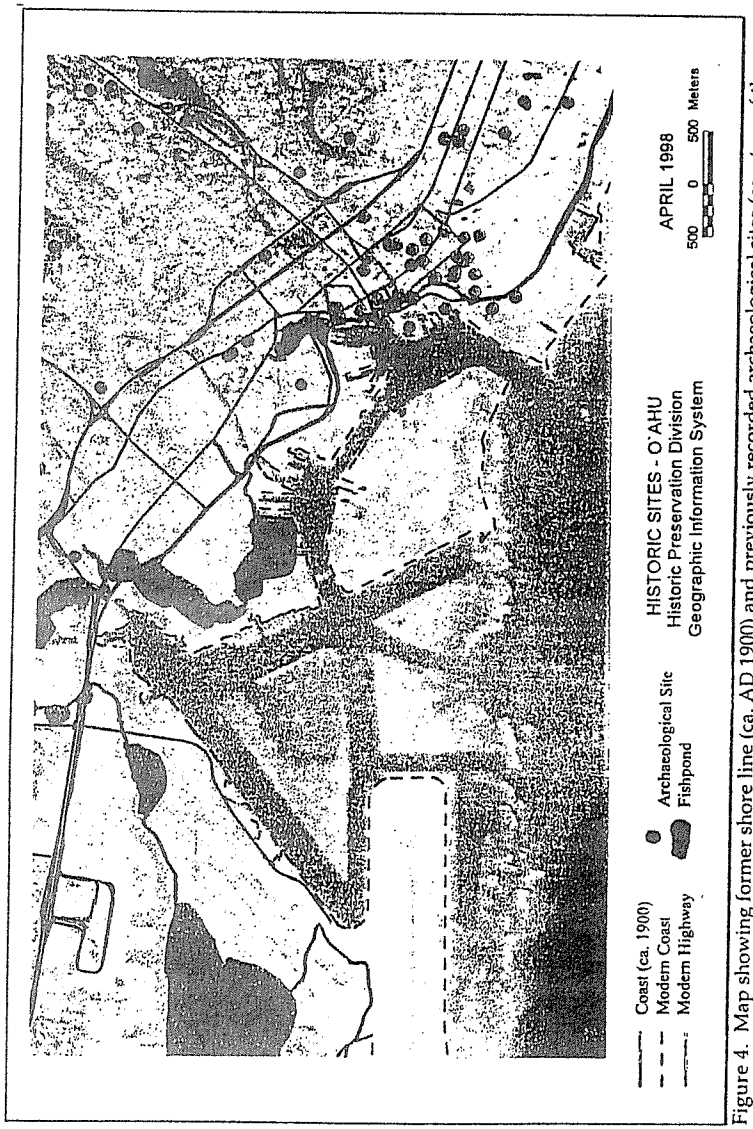

Figure 4. Map showing former shore line (ca. AD 1900) and previously recorded archaeological sites (courtesy of the State Historic Preservation Division, April 1998).

2.0 METHODOLOGY

Personnel for the project was Paul Cleghorn, Ph. D., who served as Principal Investigator and main point of contact and James McIntosh, B.A. who conducted the historical background and literature search.

Archival research consisting of background and literature searches was conducted at the State Historic Preservation Division's library, the State of Hawai'i Main Library, the Department of Land and Natural Resources Survey Office, Bureau of Conveyances, State of Hawai'i Archives, Hawaiian Historical Society, and the State Department of Transportation, Harbors Division offices.

Reports detailing previous archaeological studies both within and adjacent to the current project area were reviewed. Landownership, as illustrated by Land Commission Awards and Executive Orders, was researched. Other historical sources were reviewed in order to provide a brief summary of the history and land use of the general area.

Two field visits were conducted (October 1 and 9, 1998) to examine the the project area for any surface archaeological sites that may have been present. Since the entire project area is situated on filled land, none were anticipated. Structures proposed for demolition were investigated, recorded (35 mm-black and white film), and evaluated for potential NRHP consideration.

3.0 HISTORIC BACKGROUND

Included below is a brief and general history of Honolulu Harbor and the Downtown District as they relate to each other. Honolulu Harbor and its surrounding area has served as both the reason for and the benefactor of Oahu's growth. The business district of Honolulu continued to grow with the influx of vessels entering Hawai'i. The deep water harbor that was initially recognized by early explorers was a major reason Hawai'i was chosen as a rest stop for fur traders, whalers, and merchants from all nations. Over time, the harbor has grown from a one slip dock to over fifty piers that control nearly all the goods and products moving in and out of Hawai'i.

3.1 DOCUMENT AND LITERATURE SEARCH

Honolulu Harbor has often been translated to mean "fair haven" or "protected bay." Pukui and Elbert (1973:74) translate Honolulu as literally meaning: "sheltered harbor."

Honolulu Harbor and its surrounding area has had several other names. The area from the harbor inland to Hotel Street and between Alakea and Nu'uanu Streets was referred to as Kou, "said to be named for the executive officer (*ilāmuku*) of Chief Kakuhihewa of O'ahu" (Pukui et al. 1976:117-118). The area was a favorite "rendevous for *kōnane* (checkers)," (Pukui and Elbert 1973:154). This name was used until the 1800's.

The harbor entrance was called Mamala. It is named for "the shark woman that lived near the entrance of Honolulu Harbor" (Pukui et al. 1976: 144).

There is some confusion as to when the first westerner actually entered Honolulu Harbor. Captain William Brown of the *Butterworth* has often been credited as the first westerner to enter the harbor in November of 1794 (Krauss 1987). Although he is the first westerner to discover and map the harbor, he was not the first to enter it. That honor is afforded to the schooner *Jackall* (tender to the *Butterworth*), who first entered Honolulu Harbor on January 1, 1795 (Damon, 1857: 22).

The growth of Honolulu Harbor can be attributed to several periods in Hawaiian history. The sandalwood or *'iliahi* (*Santalum ellipticum*) trade that dominated activities in Hawai'i during the 1790's started the shipping industry. Prior to the discovery of sandalwood in Hawaii, ships would layover to replenish supplies for their journey between the Pacific Northwest and China. With the discovery of sandalwood, ships came from as far away as Boston to take part in the trade.

The trade of sandalwood would prove to be a boom to Hawaii and the recently born United States. At the height of the trade (1810 to 1820) ships came to Hawai'i carrying

furs from the Pacific Northwest. After adding Hawaiian sandalwood to their holds, they proceeded to China (Wagner 1996: 65). The sandalwood was favored by the Chinese for use as incense and small furniture. In exchange, the ships brought back silk, tea, spices and money.

Kamehemeha I administered great control over sandalwood harvesting and trading. Since much of the trees were on royal land, he had no problem enforcing his authority. However, after his death in 1819, his heirs found it difficult to maintain control. They bought western goods at inflated prices and paid for them with unharvested sandalwood. Soon the harvesting took a toll on the population of Hawai'i. People began to neglect their *lo'i* (taro fields) resulting in a small famine (Wagner 1996: 68).

Sandalwood harvesting is credited for much of the deforestation on Hawai'i and O'ahu (Cuddihy and Stone 1990: 38-39). Demand for sandalwood was so great that even today small groves are difficult to find (Neal 1965:326).

During the 1820's as the sandalwood trade began to slow more and more whaling vessels began to appear at Honolulu Harbor. The port became a rest stop for the ships to refit and replenish supplies during their long journey. Some of these ships stayed out at sea for four years (Daws 1974). About this time, the harbor began to feel the squeeze from the great numbers of whaling ships, "some reports claim 100 ships anchored in the harbor at one time" (Smith and Rosendahl 1990: Appendix).

In 1816, Governor Alexander Baranov of the Russian-American Co., began construction on a blockhouse that would serve as a trading post near the entrance of the harbor (Judd 1975 in Smith and Rosendahl 1990:11). Kalanimoku, who was sent to investigate by King Kamehameha I scared off the Russians.

Soon after, Kalanimoku and his men began construction of a fort which would protect the harbor. The walls of the fort were constructed of coral blocks that were obtained from the nearby reef. Soil and rubble served to fill in the rest of the walls. The entrance of the fort faced, what is today Fort Street, and was secured by a heavy wooded gate. It measured 340 feet long and 300 feet wide, its walls were 12 feet high and 20 feet thick at the base.

An interesting element regarding the fort was discovered. A drawing on file at the State Archives (Located in Volume 1, 1778-1816 Catalogue books, Neg. #17,723) by Louis Choris, a painter on the ship *Rurick*, captained by Otto Von Kotzebue, which arrived in Hawaii in 1816, shows a view of the Port of Honolulu. In the foreground are nine *hale* (houses) next to the fort and in the harbor are eight ships and six canoes. But what makes this drawing so interesting is that the fort is already completed (in the same year that construction supposedly started), and flying upside down in the fort is the Hawaiian flag. In modern times, when a nation's flag is flying upside down, it is a

symbol of a nation in distress. Whether the flag was actually that way or Choris mistakenly depicted it that way is not known. But it is an interesting point none-the-less.

Around 1857, the walls of the fort were torn down and used as fill for the expanding waterfront. "Between 1857 and 1870, twenty-two acres of reef and tideland between Fort and Alakea Streets were filled in from harbor dredging to form the 'Esplanade' " (Oahu Commercial Harbors 1997: IV-4).

In March of 1857, an article appeared in The Friend, a local newspaper devoted to maritime life. This excerpt provides a glimpse of what the waterfront was like at this time. It is clear that the intent of the article was to lobby support for the growth and improvements of the harbor and its facilities.

> The Harbor is a deep basin in the coral reef...The bottom is deep, stiff mud-the best of holding ground. Vessels at anchor in the harbor are perfectly secure at all times of the year...About one-third of the basin or harbor proper, at the north end is filled with mud-a deposit from the Nuuanu Valley stream. This can be converted at pleasure into a harbor for ships by dredging...There are five good wharves, at which vessels of 1500 tons can discharge or take on cargo. These wharves furnish about six hundred feet wharfage front... This wharf is so easy of access, that any sailing directions for it are almost superfluous.
>
> The population of Honolulu is somewhat fluctuating; during the fall and winter season it is as high as 10,000 to 12,000, caused by the influx of seamen and also natives from the other islands of the group. At other seasons of the year it may be as low as 7,000 to 8,000. There are four ship chandlery stores, about twenty importing houses, and from fifty to sixty retail stores, twelve hotels, nine or ten physicians, and five printing offices.
>
> Before closing our remarks on the harbor of Honolulu, perhaps we ought to allude to its wants. A LIGHT-HOUSE [sic] ought to be erected forthwith at the entrance of the harbor. The necessities of our commerce demand this improvement. The fearful disasters and losses near the mouth of the harbor for the past few years, and all for the want of one, call loudly for such a safeguard.
>
> But a much more felt is a marine railway for repairing ship. We are surprised that no attempt to construct a railway has ever been carried out here...the arrival of a large number of vessels, one-fifth of which come into this port for repairs. The present mode of repairing vessels is very expensive, while the repairing of the hull of large steamers at this port is almost impracticable at present...it would be a fortune to any person or company who undertook it with practical knowledge of the subject (Damon 1857).

During the American Civil War, the northern half of the United States was cut off from

sugar normally supplied by the southern states. Hawaii's sugar became a valuable commodity to the north (Daws 1974: 174). Sugar prices soared and Hawai'i experienced a rapid increase in sugar production. Ships carrying sugar exports increased, which led to various improvements to Honolulu Harbor.

With the increasing need for wharfage and evolution of larger ships Honolulu Harbor continued its growth. Dredging around the harbor proceeded while the dredged material was deposited around the shoreline of Honolulu and Kapalama, increasing waterfront acreage.

3.2 LAND COMMISSION AWARDS

Three Land Commission Awards (LCA) were awarded in the current project area. Information regarding each is detailed in Table 2.

Under the Hawaii Revised Statutes, §171-11, the governor is permitted to set aside public lands for public use or purposes. The lands can be set aside to any department of the State, City and County or to the United States. This is done by the signing of the Executive Order (EO). The control of land around the harbor was set aside to the Department of Transportation, Harbors Division (DOT Harbors) by the signing of five EO's listed in Table 3. Under the EO, DOT Harbors has full legal juristiction to the land and can enforce laws and administrative rules of action on the property.

TABLE 2. LAND COMMISSION AWARDS IN THE PROJECT AREA.

Parcel Area	LCA Number	Awardee	Year	Royal Patent Number
Pier 2	1328	Kahaukomo	1853	7350
Pier 1-16	7713:49	V. Kamamalu	1852	7834
	11225	Kekualoa	1854	1879 1/2

TABLE 3. LAND TRANSFERRED BY EXECUTIVE ORDERS IN THE PROJECT AREA.

Parcel Area	Executive Order	Year	Purpose
Pier 2	1081	August 24, 1944	harbor related
	2278	May 24, 1966	container yard; harbor support
Pier 1-16	3542	April 20, 1992	harbor and wharfage operations
Piers 18-29	2903	April 29, 1978	maritime and maritime related use
Lagoon Drive	3202	June 8, 1983	airport and harbor related uses

4.0 PREVIOUS ARCHAEOLOGY

A review of available literature from the State Historic Preservation Division (SHPD), indicated that no archaeological projects have been undertaken and no archaeological sites have been recorded within the project area. In fact, only one traditional site (Pakaka Heiau) was known to exist in the immediate area. Likewise, Sterling and Summers' (1978) compendium of archaeological studies did not identify any sites within the vicinity. Much of the archaeological studies that have taken place in downtown Honolulu have focused on Hawaiian sites from the transitional period of post-contact to the historic times. Two significant Historic sites are recorded within the immediate area of Honolulu Harbor. They are the Aloha Tower Complex and the Falls of Clyde.

4.1 TRADITIONAL SITES

The only traditional site previously located in the area was Pakaka Heiau. The *heiau* (temple) was known to exist behind the fort at the base of what is today Fort Street (McAllister 1933:81). McAllister makes mention of Pakaka but it was destroyed prior to his time.

Westervelt writes that Pakaka Heiau:

> . . .was standing on the western side of the foot of Fort Street long after the fort was built for which the street was named. It was just below the fort. Pakaka was owned by Kinau. It was. . . built before the time of Kakuhihewa. In this temple the school of the priests of Oahu had its headquarters for centuries. The walls of the temple were adorned all around with heads of men offered in sacrifice. (Westervelt 1915:8).

Kamakau writes:

> Pakaka was an ancient temple, a Waihau pookena. It was built by Kamaunuihalakaipo the chief. Kuhooneenuu was the god.
>
> Iolena and popoulu bananas hung in front of the female idols of the paehumu, and maoli bananas in front of the male idols at the altar (lele) inside the paehumu, which was of lama.
>
> At the back of the male images is the anuu, 24 feet high, 18 feet wide, covered with oloa, standing on North side of the house, and also the opu its height and width similar to anuu, but this was laid with kapa aeokahaloa, resembling the Maeloa kapa. The small lama branches at top are like hair standing on end. The

opu stands on the south side of the house facing the images and the anuu, the space between the altar and the opu is well paved. In the middle of the space is... the house. The house is covered with dry...leaves (and made like the Hale o keawe) and is called Hale o Lono, made of lama wood, here the young chiefs stay. Two other houses called Hale Hui and Hale o Kaili were also enclosed. The former was for the collective gods, the other was for Kaili. Two lama posts were crossed at the entrance gate, before entering which one must divest himself of his clothing.

Hale ai puupuu (Mua house?) Was where the chief and others were in which was the fireplace (umu) (Kamakau in McAllister 1933: 81).

4.2 HISTORIC SITES

The Aloha Tower Complex was constructed between 1921 and 1926 (Records on file at the State Historic Preservation Division). The land that the tower sits on was filled with timber and coral blocks from the old Honolulu Fort. Construction of the tower itself was begun in 1924 by C.W. Winstedt and the National Construction Co. (Smith and Rosendahl 1990:19). Closed to the public during WWII, Aloha Tower was reopened in 1947. It is designated as State Site 50-80-14-9929, and is listed on the NRHP.

The Falls of Clyde, presently located at Pier 7, is the only four-masted, fully-rigged iron hulled ship left in the world. The vessel was constructed in great Britain in 1878 by Russell and Company (Records on file at the State Historic Preservation Division). It was built for general trade between Great Britain and India. The ship was first sold to American owners in 1893. Restored and re-opened to the public in 1968, The Falls of Clyde is listed on the NRHP.

4.3 PREVIOUS STUDIES

Beginning in 1991, the Bishop Museum's Department of Anthropology-Applied Research Group conducted an archaeological inventory survey (Hurst and Allen 1992) and later, data recovery (Lebo 1997) for the Harbor Court redevelopment project located at the intersection of Queen Street and Nimitz Highway, *mauka* of Honolulu Harbor. The excavation uncovered a total of 53 features (18 during the inventory survey and 35 during data recovery) in the project area. Features included a mixture of both prehistoric Native Hawaiian features and historic Euro-American features. A majority of the features were associated with the commercial use of the property (wall remnants, metal piping, trash pit, concrete flooring) during the early and late historic period.

In 1992, James Landrum, also from the Applied Research Group, Bishop Museum, conducted emergency data recovery procedures at the River-Nimitz Redevelopment project. During the course of the project "seven features with varying cultural and temporal origins" (Landrum 1992:i) were identified. The significance of this site may

not necessarily be the findings but more importantly the context in which they were found. The project area was located within a wet-site environment (a shallow marsh-like environment) that preserved the remains of a pre-historic period, traditional Hawaiian burial, with probable associated mortuary artifacts (braided cordage, and matted *pandanus* fibers).

Also in 1992, International Archaeological Research Institute, Inc., conducted archaeological monitoring, inventory survey, and data recovery for the Marin Tower property, (Site 50-80-14-4494), in downtown Honolulu (Goodwin et al. 1996). An initial survey by the Applied Research Group (Hurst and Cleghorn 1990) concluded that the area would likely have significant archaeological resources. This presumption would prove to be correct. Indeed, the excavations at the Marin Tower property (named for Don Francisco de Paula Marin, whose family occupied the property from 1810 to ca. 1850) uncovered a plethora of data that is unmatched in historic Hawaiian archaeology. Goodwin was able to trace the land use at the property through seven major periods, from a pre-contact, limited human occupation to the current revitalization of the subject property. Ten "research blocks" were formed to aid in the organization during the data recovery phase. Blocks I and II were known to contain human remains thus they received the highest priority. A total of nine individuals within six distinct features were recovered in Block I. "There are three adult females aged 35 or older; two adult males under 50 years of age; a teenager, one young child, and two infants" (Goodwin et al. 1996: 85). These individuals were interred in coffins constructed with iron nails. All were of Hawaiian descent, that were likely buried after 1778. Artifacts recovered during excavations included: Chinese porcelain, various stoneware, whole and broken glass bottles, copper, bone and wood buttons, iron nails, figurines, charcoal chunks and flecking, basalt flakes, a basalt adze, *`ili`ili* paving, volcanic glass and chert fragments, coral chunks and blocks, and midden including: marine shell, turtle, numerous birds and fish, dog, pig, and cattle faunal.

Between 1992 to 1995, Archaeological Consultants of Hawaii, conducted an archaeological inventory survey (Kennedy et al. 1993) and data recovery for the Kekaulike Revitalization Project in the Historic Chinatown District of Honolulu (Riley et al. 1995). Two sites were identified during the inventory survey. A total 55 features were identified data recovery. Radiocarbon dates from these dated initial use of the area "between ca. A.D. 1386 and 1700, and continued into the nineteenth century" (Riley et al. 1995: 4). Excavations relocated a historic fishpond (Site 50-80-14-4587) that existed to ca. 1852. The pond once contained a single *mākāhā* and *'auwai* (Riley et al. 1995:42). Features identified during data recovery include: a possible Hawaiian stone platform, postholes, and metal pipes. Numerous historic artifacts were recovered along with traditional Hawaiian artifacts. The traditional artifacts included six basalt adzes, numerous adze blanks, a traditional ring poi pounder, a possible stirrup poi pounder (previously only found on Kaua'i), two metal fishhooks, six cowry shell lures (*Cyprea sp.*), four stone octopus lure sinkers, six *'ulu maika*, and various faunal remains (bird,

cat, rat, and dog).

In 1993, Paul H. Rosendahl Inc., conducted an archaeological inventory survey at the Nuuanu Court Project site located on the corner of Nu'uanu Avenue and Nimitz Highway (Dunn and Rosendahl 1993). Test excavations uncovered a single cultural layer that extended throughout the project area. The cultural layer was designated as site "50-80-14-2456, a large cultural deposit initially identified at the Ka'ahumanu Parking Structure Redevelopment/Harbor Court Project site" [PHRI report pending] (Dunn and Rosendahl 1993: ii). This layer was reported to be from the late prehistoric to early historic period of Hawaiian history. Identified within the layer were marine shell, non-human bone, charcoal, cut non-human bone, basalt flakes, along with several features such as postholes, pipe trenches and basin-shaped pits.

In 1994, International Archaeological Research Institute, Inc., conducted an archaeological inventory survey for the Kekaulike Diamond Head block in downtown Honolulu (Goodwin 1997). A total of 105 subsurface features were identified during the excavation of 21 test trenches, these included a disturbed human burial, fire pits, glass and concrete casings, etc. Goodwin (1997) determined that significant archaeological resources were present at Kekaulike with the deposits likely ranging from the Pre-Contact Period (before 1778) to the Early Chinatown Period (1850-1900). The site was assessed to be significant under both National Register of Historic Places and State of Hawaii critera.

In 1997, James Moore of Archaeological Consultants of the Pacific, Inc., performed emergency recovery procedures on an inadvertent find of human remains near Pier 40 (Moore 1997). The remains were discovered during the excavation of a utility trench and consisted of both disturbed and *in situ* human remains. The burial was, "placed in a small crevice between ridges of coral bedrock" (Moore 1997: 1). Among the remains recovered were fragile pieces of the cranium, mandible, and teeth. Information regarding the remains is limited since only a letter report has been submitted to SHPD. However, State Archaeologist, Elaine Jourdane who conducted a field visit to the site, believes that the remains are of a person who died at that spot (while possibly fishing) and was not necessarily buried there (personal communication with James McIntosh, 10/15/98).

5.0 RESULTS

No traditional Hawaiian archaeological sites were found during the course of the current investigations. This result is not surprising given the geomorphological nature of the project area. The project area consists of recently created fill land and is extensively urbanized. The project area is an active commercial harbor, with buildings, structures, and facilities associated with maritime transportation of goods and materials.

The State Department of Transportation, Harbors Division informed us that 17 structures in the project area are being considered for demolition and replacement. A listing of these 17 structures with information on their use, date of construction, improvements, and condition is presented in Table 4. Descriptions and plan view maps of these structures, compiled by the State Department of Transportation, Harbors Division, are presented in Appendix A. Photographs of these structures, taken during the current project are presented in Appendix B.

The 17 structures that are slated for demolition and replacement are primarily metal structures with some use of hollow tile and concrete in their construction. The oldest structures are two warehouses on Pier 22 that are 70 years old, and the newest structures are the Pier 19 office and comfort station that were constructed in 1955.

Of the 17 structures slated for demolition, three are less than 50 years old (Pier 2 Shed, Pier 19 Office and Pier 19 Comfort Station). Ten were constructed over 50 years ago (Pier 18, Shed 19 Shed, Pier 22 Warehouses 6 and 8, Pier 24 Shed, Pier 25 Shed, Pier 26 Shed, Pier 27 and 28 Shed, Pier 29 Shed and Pier 32 Shed). The four remaining structures (Pier 21 Machine Shop, Pier 21 Carpenter Shop, Pier 23 shed and Pier 24 hi-lift maintenance shop) have unknown dates of construction.

Of the ten structures that are over 50 years old, only three structures have had no renovations or improvements (Pier 18 Shed, Pier 25 Shed, and Pier 29 Shed). The Sheds on Piers 18 and 29 are in poor condition and appear unsafe.

The following are summary descriptions of the 17 structures slated for demolition, organized by their pier locations (Figure 5):

Pier 2:
The Pier 2 Shed is the only structure east of Aloha Tower scheduled for demolition. It was built in 1953 and has been extensively modified.

TABLE 4. EVALUATION OF STRUCTURES SCHEDULED FOR DEMOLITION.

Building Location	Building Use	Date of Construction	Renovations/ Improvements	Structural Condition
Pier 2	shed	1953	extensive	good
Pier 18	shed	1947	roof/siding	fair
Pier 19	shed	1924	extensive	fair
Pier 19	office	1955	various	fair
Pier 19	comfort station	1955	unknown	fair
Pier 21	machine shop	unknown	unknown	fair
Pier 21	carpenter shop	unknown	unknown	fair
Pier 22	warehouse #6	1928	steel frame extended	poor
Pier 22	warehouse #8	1928	replaced roof	poor
Pier 23	shed	unknown	unknown	fair
Pier 24	shed	1936	shed extended; twice	poor
Pier 24	hi-lift maintenance shop	unknown	unknown	poor
Pier 25	shed	1923	none	poor
Pier 26	shed	1923	roofing	poor
Pier 27 and 28	shed	1938	shed reduced on Ewa end	poor
Pier 29	shed	1942	none	poor
Pier 32	shed	1938	unknown	fair

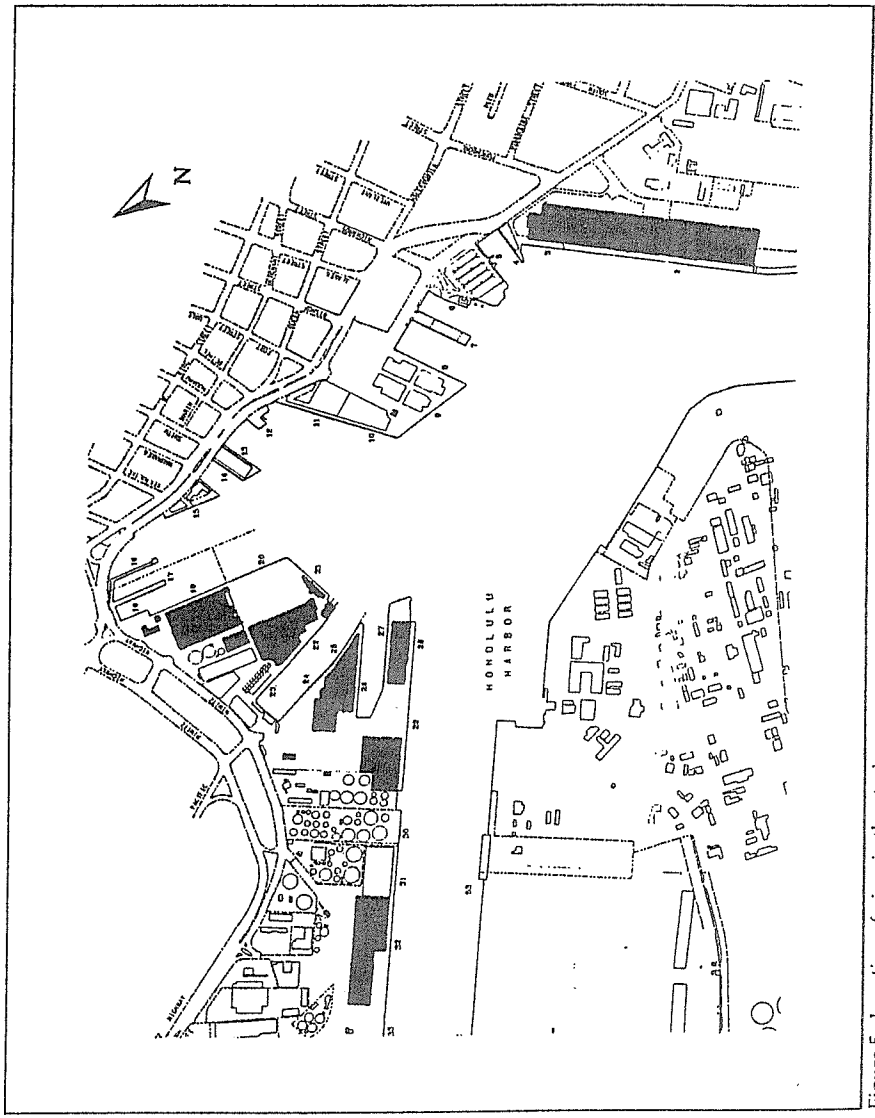

Figure 5. Location of piers in the study area.

Piers 18-29:
Between Piers 18 and 29, 15 structures are proposed for demolition. Two of these (Pier 19 Office and Pier 19 Comfort Station) were constructed after 1948. Four of the structures (Pier 21 Machine Shop, Pier 21 Carpenter Shop, Pier 23 Shed and Pier 24 Hi-Lift Maintenance Shop) have unknown dates of construction.

Nine structures were constructed prior to 1948 (Pier 18 Shed, Pier 19 Shed, Pier 22 Warehouses 6 and 8, Pier 24 Shed, Pier 25 Shed, Pier 26 Shed, Pier 27 and 28 Shed, Pier 29 Shed) and are thus over 50 years old. Of these, seven have had various improvements and modification done over the years (Pier 18 Shed, Pier 19 Shed, Pier 22 Warehouses 6 and 8, Pier 24 Shed, Pier 26 Shed, Pier 27 and 28 Shed) which have altered their construction and appearance.

Only two structures have had no renovations or improvements and thus retain their original integrity (Pier 25 Shed, and Pier 29 Shed). However, these structures are in extremely poor condition.

Pier 32:
The Pier 32 Shed is connected to the Pier 31 Shed forming a single continuous structure fronting Piers 31 and 32. The Pier 32 Shed was built in 1938, but has undergone several improvements to its main structure and doors.

6.0 HISTORIC SIGNIFICANCE ASSESSMENTS

The National Historic Preservation Act of 1966 (as amended) authorizes the Secretary of Interior to expand and maintain a National Register of Historic Places (NRHP) that contains a listing of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets criteria for evaluation defined at 36 CFR §60.4:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history.

None of the structures in the project area appear to be significant based on the above criteria.

While the Pier 2 shed is located within the Downtown District, which is listed on the NRHP, we do not think that this structure is a contributing property. The Pier 2 shed was built within the last 50 years and has undergone extensive renovations so that its original integrity is compromised.

An argument could be possibly constructed that some of the structures to be affected are significant for their informational content (Criterion d). However, the data that have been recorded and presented in this report (see especially Appendices A and B) adequately document these structures and there appear to be no further potentially significant information remaining. Hence even if one were to argue that these structures were significant for their informational content, sufficient information has been recorded, during the course of the current investigations.

7.0 DISCUSSION AND RECOMMENDATIONS

The current project has consisted of archival research and surface archaeological survey of the area in Honolulu Harbor and its environs. It has been shown that Honolulu Harbor has had a long and rich history. It was important during the period of sandalwood trade and later during the whaling period. By the mid-1800s the Harbor and the adjacent community of Honolulu was a bustling area of commerce. Honolulu and its Harbor continue to be the commercial center for the State of Hawai'i.

The historic structures that are planned to be demolished have been recorded and documented. They have been shown to be not significant and can be demolished without any further study.

Archival research has shown that most of the shoreline surrounding Honolulu Harbor is composed of recently created land. This land was created by depositing fill materials such as dredge material, excavation material from upland areas, garbage, etc. This geomorphological situation resulted in predicting that no traditional Hawaiian sites would be found in the project area. The surface survey substantiated this prediction. No surface traditional Hawaiian archaeological sites were found or are present in the project area.

It is interesting, however, that previous archaeological investigations conducted in the vicinity of Pier 40 recovered apparently *in situ* human remains (Moore 1997). A closer examination of the reconstructed shoreline map (Figure 4) shows that traditional fishponds existed immediately to the west of Pier 40. It seems highly likely that the reconstructed plotting of the fishponds is slightly erroneous and that the fishponds may have actually extended as far east as Pier 40 or even to the mouth of Kapalama Stream. Although Pier 40 is outside of the current project area, it is relevant within the overall scheme of Honolulu Harbor. Therefore, it is recommended that if future developments or improvements are proposed for the area west of Pier 39, that archaeological testing be conducted in an attempt to identify the extent of the fishponds or other cultural deposits.

Within the rest of the project area, no cultural remains should be present. If any are identified, however, they would have likely been brought in with the fill and are not *in situ*. It has been shown that the original coastline around the turn of the century was located farther inland along the Airport and Harbor areas. Thus, any cultural remains that were once present along the coast, will be situated inland of Nimitz Highway, rather than along the current Harbor edge.

Dredging activities are not anticipated for any of the 2020 Master Plan Immediate Phase projects. However, routine maintenance dredging activities involving the removal of accumulated sediment and dead coral may be undertaken in the areas of Piers 16 and 24. These dredging activities would not impact any cultural resources, as no intact cultural remains should be present within the harbor itself. No further archaeological investigations are recommended in these areas.

The area along Lagoon Drive where the proposed Lay Berths' will be constructed is entirely filled land (see Figures 3-5). No archaeological remains have been identified in the area and it is doubtful that any subsurface deposits are present. The harbor itself, the lagoon portion, has been previously dredged. A recently constructed structure (a commercial sea plane operation) is present in the middle of Lagoon Drive, on the water. No other structures are present and no further work is recommended.

In conclusion, the proposed Immediate Phase projects will have no impact on cultural resources, and no further archaeological work is recommended.

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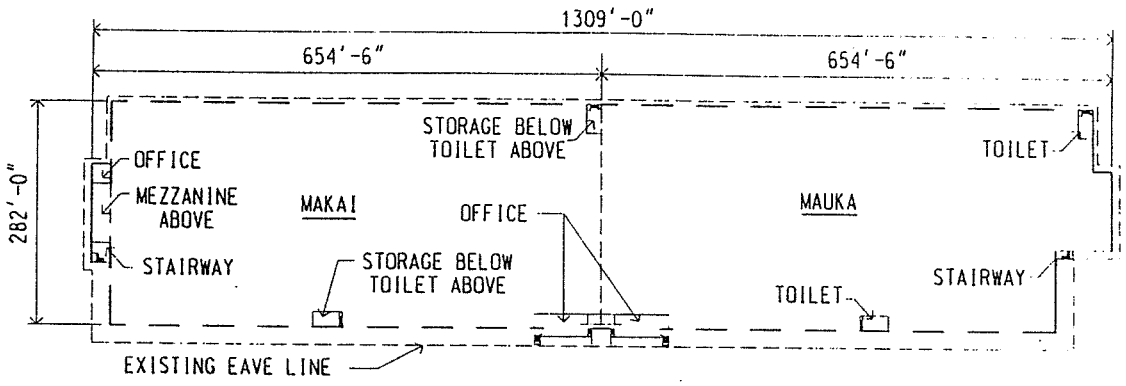
APPENDIX A

DESCRIPTIONS AND MAPS OF HARBOR STRUCTURES



PLAN VIEW

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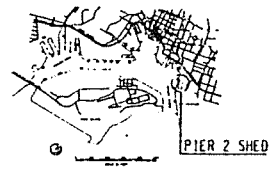


LOCATION MAP

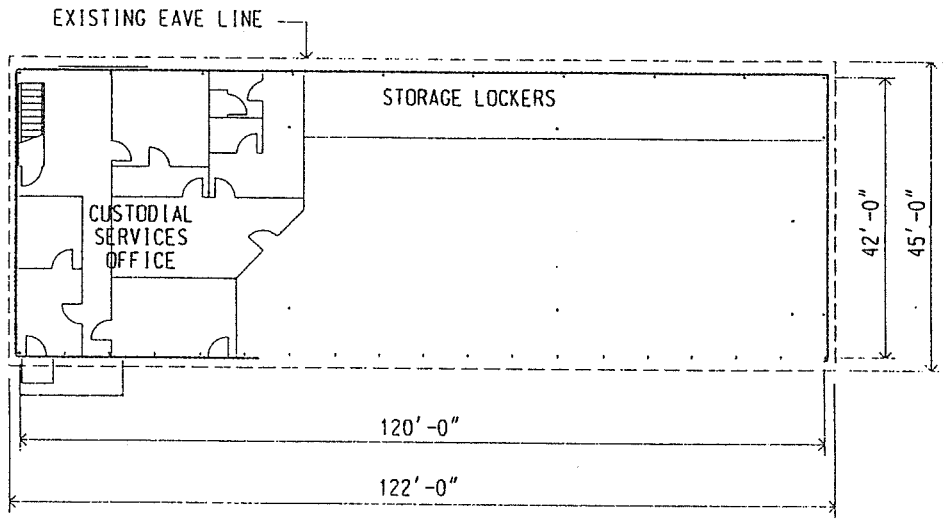
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HARBORS DIVISION MAINTENANCE SECTION	PIER 2 SHED HONOLULU HARBOR, OAHU, HAWAII	FIGURE O-2

HONOLULU HARBOR - PIER 2 SHED

Location or Address:	Honolulu Harbor, Honolulu, Hawaii
Date of original construction:	1953
H.C. Job No. of original construction:	821
Original floor area (sq. ft.):	184,569
Approximate floor area size (sq. ft.):	654.5' x 282'
No. of floors:	1, plus mezzanine
Date of major renovation and description:	Extended 654.5' x 282'
New floor area (sq. ft.):	369,138
Roof area (sq. ft.):	369,138
Approximate roof area size (sq. ft.):	1309' x 282'
Present use of building:	Office, storage area
Type of construction:	
Asbestos survey:	Survey-no
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 2 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
INTERIOR	1606	05/30/86	$215,920.00	Makai half
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



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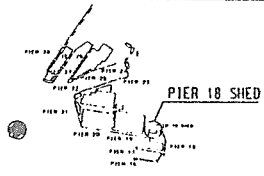


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 18 SHED
HONOLULU HARBOR, OAHU, HAWAII

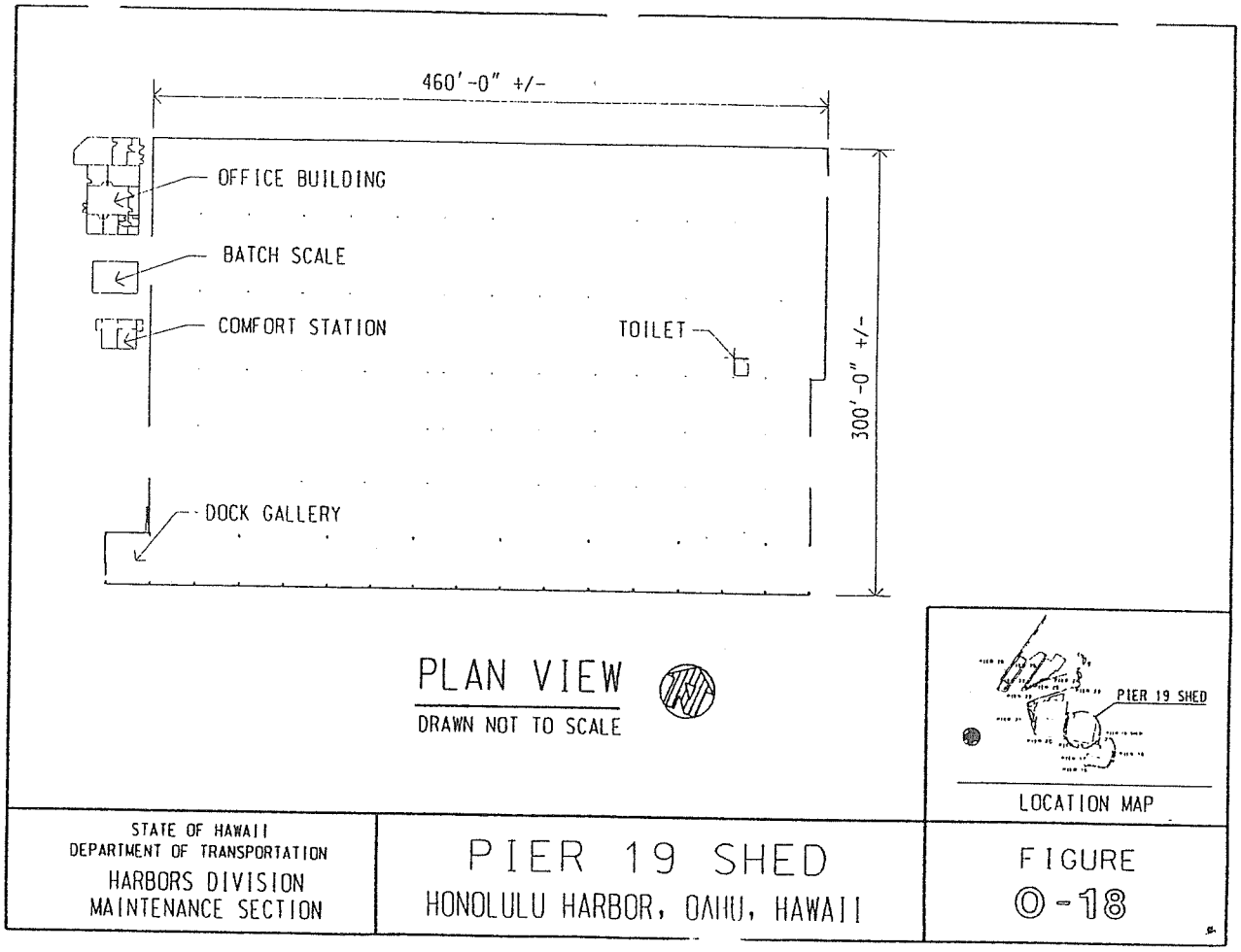
FIGURE
O-17

HONOLULU HARBOR - PIER 18 SHED

Location or Address:	Pier 18, Honolulu, Hawaii
Date of original construction:	1947
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	5,040/5,200
Approximate floor area size (sq. ft.):	120' x 42'
No. of floors:	1
Date of major renovation and description:	None
New floor area (sq. ft.):	
Roof area (sq. ft.):	5,490
Approximate roof area size (sq. ft.):	122' x 45'
Present use of building:	Commercial fishing support area. Harbors Division Oil & Water Office
Type of construction:	Steel frame, corrugated metal siding, corrugated aluminum roofing, A C floor Office area: wood structure
Asbestos survey:	Survey-yes, 4/96, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 18 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
REPLACE ROOFING & SIDING	1889	10/27/95	$83,282	
SIDING:				
ELECTRICAL:				
ELECTRICAL REPAIRS	1099	?		PO#54885 Replacing feeder cable w/new conductors
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				

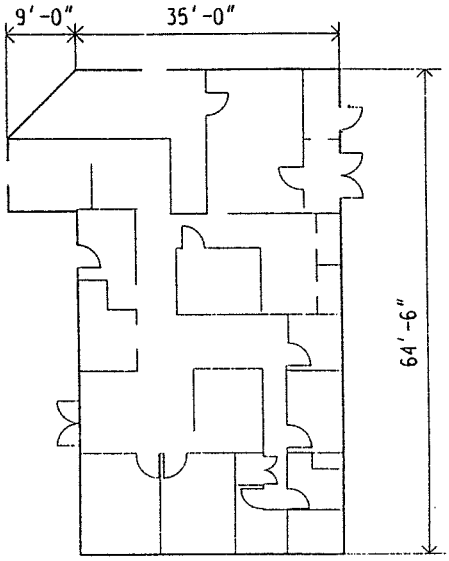


HONOLULU HARBOR - PIER 19 SHED

Location or Address:	Pier 19, Honolulu, Hawaii
Date of original construction:	1924
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	Unknown
Approximate floor area size (sq. ft.):	460' x 300'
No. of floors:	1
Date of major renovation and description:	1954, 1956, 1960 - Extent of work unknown 1982 - Roof truss replaced at half of shed; Various reroofing
New floor area (sq. ft.):	122,820 (not including easement area - 267' x 460')
Roof area (sq. ft.):	138,000
Approximate roof area size (sq. ft.):	460' x 300'
Present use of building:	Cargo handling
Type of construction:	Steel frame, corrugated metal siding & roof, A.C. floor. CMU comfort station in shed
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 19 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
REPAINT EXTERIOR	1565	07/25/84	$11,000	PO#60701112
ROOFING:				
REPAIR ROOF & GUTTERS	1740	05/29/91	$453,483	Replacing existing roof & gutter systems; replacement of existing wooden trusses & purlins; painting existing steel purlins & framing members; furnishing & installing a new sheet metal roofing; sheet metal gutters, leader boxes, downspouts, & gutter screens
	1378	?		
REPAIR GUTTERS	1714	02/28/90	$21,871	Removing & disposing of sections of existing sheet metal gutters & downspout leaders
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				
REPAIRS TO INTERIOR FRAMING	1337	05/26/78	$30,000	Repair damaged portion of beams, truss members & braces, & bottom lateral bracings
WOODEN TRUSS REPAIRS	1310	02/23/77	$2,833	PO#627601



PLAN VIEW

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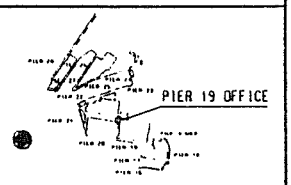


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 19 OFFICE
HONOLULU HARBOR, OAHU, HAWAII

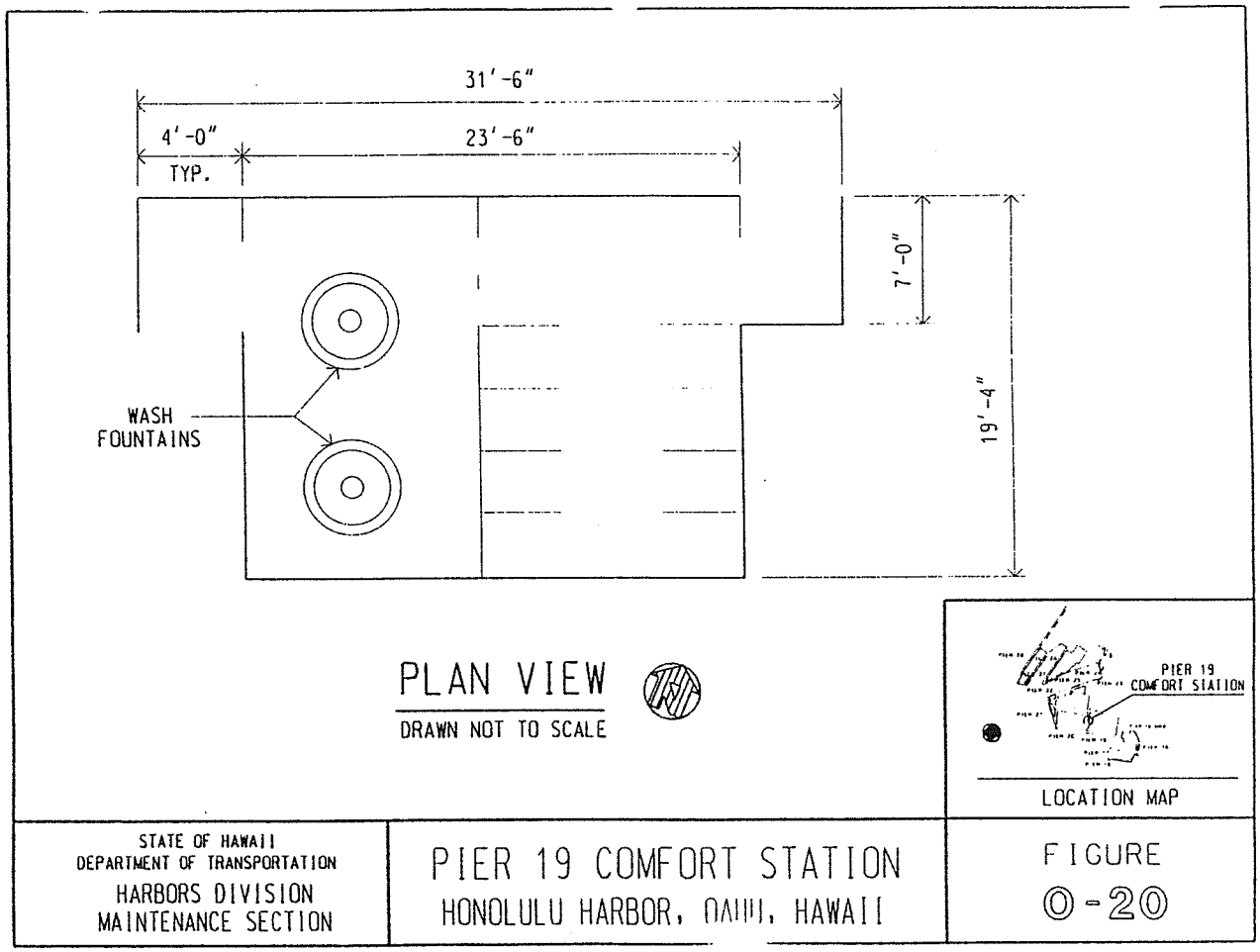
FIGURE
O-19

HONOLULU HARBOR - PIER 19 OFFICE

Location or Address:	Pier 19, Honolulu, Hawaii
Date of original construction:	1955
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	2,258
Approximate floor area size (sq. ft.):	64.5' x 35'
No. of floors:	1
Date of major renovation and description:	Unknown. Various interior modifications.
New floor area (sq. ft.):	2,258
Roof area (sq. ft.):	2,258
Approximate roof area size (sq. ft.):	64.5' x 35'
Present use of building:	Food concession, barge company office
Type of construction:	CMU walls, steel roof trusses, corrugated metal roofing, concrete floor
Asbestos survey:	Survey-yes, 4/96, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 19 OFFICE

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				

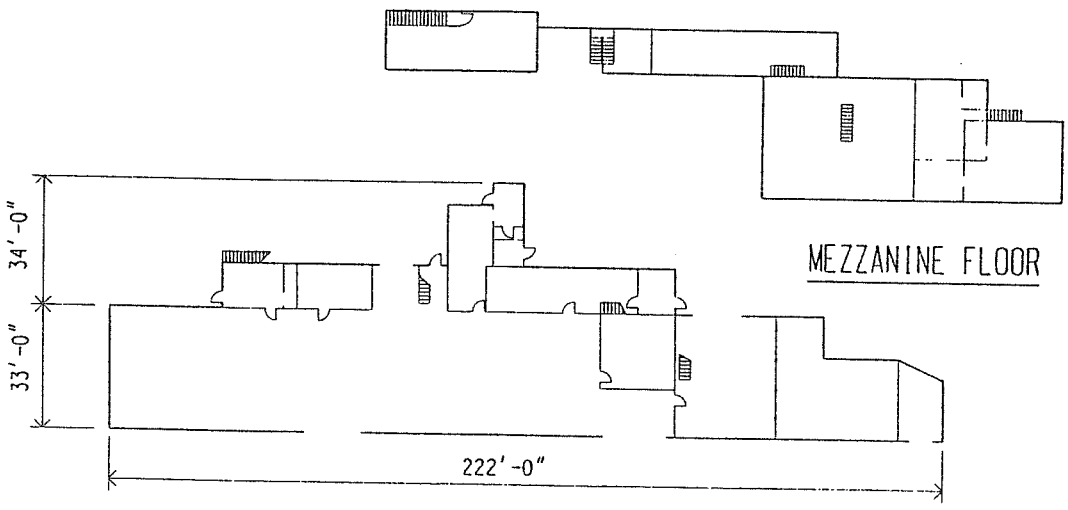


HONOLULU HARBOR - PIER 19 COMFORT STATION

Location or Address:	Pier 19, Honolulu, Hawaii
Date of original construction:	1955
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	453
Approximate floor area size (sq. ft.):	23.5' x 19.3'
No. of floors:	1
Date of major renovation and description:	Unknown
New floor area (sq. ft.):	
Roof area (sq. ft.):	453
Approximate roof area size (sq. ft.):	23.5' x 19.3'
Present use of building:	Bathroom
Type of construction:	CMU wall, steel roof truss, corrugated metal roof, concrete floor
Asbestos survey:	Survey-yes, 6/93, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, negative

HONOLULU HARBOR - PIER 19 COMFORT STATION

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



GROUND FLOOR

PLAN VIEW

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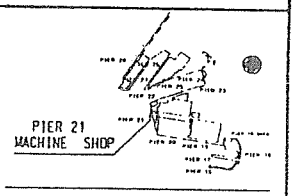


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 21 MACHINE SHOP
HONOLULU HARBOR, OAHU, HAWAII

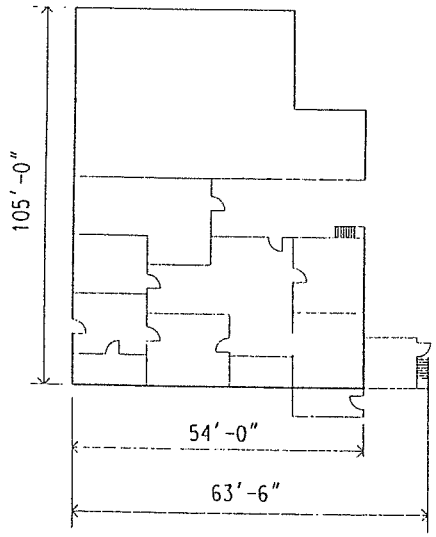
FIGURE
O-21

HONOLULU HARBOR - PIER 21 MACHINE SHOP

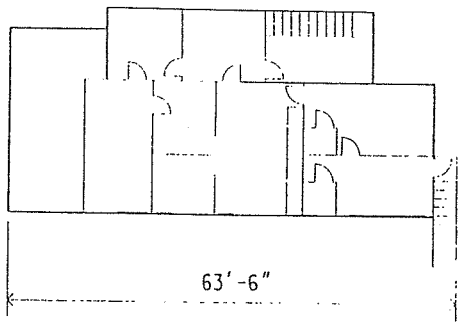
Location or Address:	Pier 21, Honolulu, Hawaii
Date of original construction:	
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	Unknown
Approximate floor area size (sq. ft.):	222' x varies
No. of floors:	2, including mezzanine
Date of major renovation and description:	Unknown. None after 1967
New floor area (sq. ft.):	8,964 1st floor. 4,160 mezzanine
Roof area (sq. ft.):	8,964
Approximate roof area size (sq. ft.):	222' x varies
Present use of building:	1st flr.: tug repair; mezzanine: cafeteria & office
Type of construction:	Steel frame, corrugated metal siding & roof, A.C. ground floor. Corr. Transite siding on mezzanine
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-yes, 10/87
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 21 MACHINE SHOP

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



GROUND FLOOR



MEZZANINE FLOOR

PLAN VIEW

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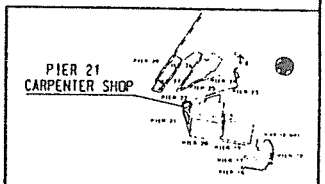


LOCATION MAP

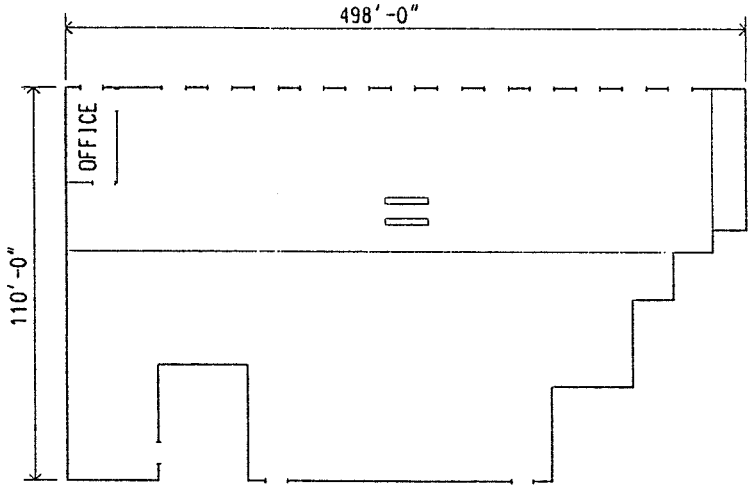
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HARBORS DIVISION MAINTENANCE SECTION	PIER 21 CARPENTER SHOP HONOLULU HARBOR, OAHU, HAWAII	FIGURE O-22

HONOLULU HARBOR - PIER 21 CARPENTER SHOP

Location or Address:	Honolulu Harbor, Honolulu, Hawaii
Date of original construction:	
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	5,670
Approximate floor area size (sq. ft.):	105' x 54'
No. of floors:	1, plus mezzanine
Date of major renovation and description:	
New floor area (sq. ft.):	
Roof area (sq. ft.):	4,942
Approximate roof area size (sq. ft.):	105' x 54'
Present use of building:	Offices, storage and work area
Type of construction:	Corrugated sheetmetal siding & roofing, concrete floor, wooden trusses
Asbestos survey:	Survey-yes, 8/87, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 21 CARPENTER SHOP

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



PLAN VIEW

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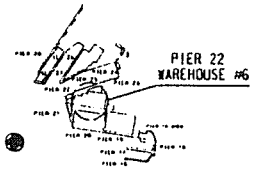


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 22 WAREHOUSE #6
HONOLULU HARBOR, OAHU, HAWAII

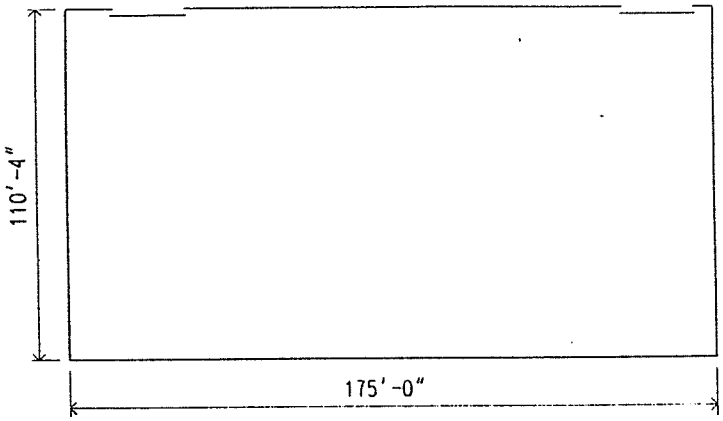
FIGURE
O-23

HONOLULU HARBOR - PIER 22 WAREHOUSE #6

Location or Address:	Pier 20, Honolulu, Hawaii
Date of original construction:	1928
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	54,780
Approximate floor area size (sq. ft.):	498' x 110'
No. of floors:	1
Date of major renovation and description:	1953 - Added 3 bays of steel framed shed, 49,955 sq. ft.. Small metal shed added at makai end of shed 1958 - Added trapezoidal shaped steel frame extension to shed, on Ewa side, 27, 280 sq. ft..
New floor area (sq. ft.):	132,089/54,853
Roof area (sq. ft.):	54,780
Approximate roof area (sq. ft.):	498' x 110'
Present use of building:	Cargo storage and warehouse
Type of construction:	1928 section: concrete columns, CMU walls, steel roof, A.C. floor. 1953 section: steel frame, corrugated steel siding & roof, A.C. floor. 1958 section: same as 1953. Extensive trailer office complex in shed addition
Asbestos survey:	Survey-yes, 4/96, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 22 WAREHOUSE #6

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
REPAINT EXTERIOR	1777	11/05/91	$18,585	
	1494	08/24/82	$14,995.00	PO#612115
ROOFING:				
REPLACEMENT OF GUTTERS	1487	07/21/83	$37,237.42	
	1359	12/05/79	$30,092.03	
GUTTER REPAIRS	1312	02/10/77	$2,747.00	PO#627531
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
PAINTING & INSPECTING FIRE SPRINKLER SYSTEM	1211	02/20/76	$7,995	New side
REPLACING FIRE SPRINKLER SYSTEM	1178	06/30/75	$6,000	Old side
REPAIRING FIRE SPRINKLER SYSTEM	1177	06/30/75	$46,000	New side
OTHERS:				



PLAN VIEW

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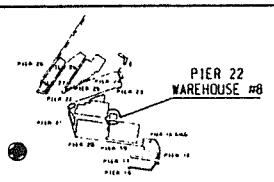


LOCATION MAP

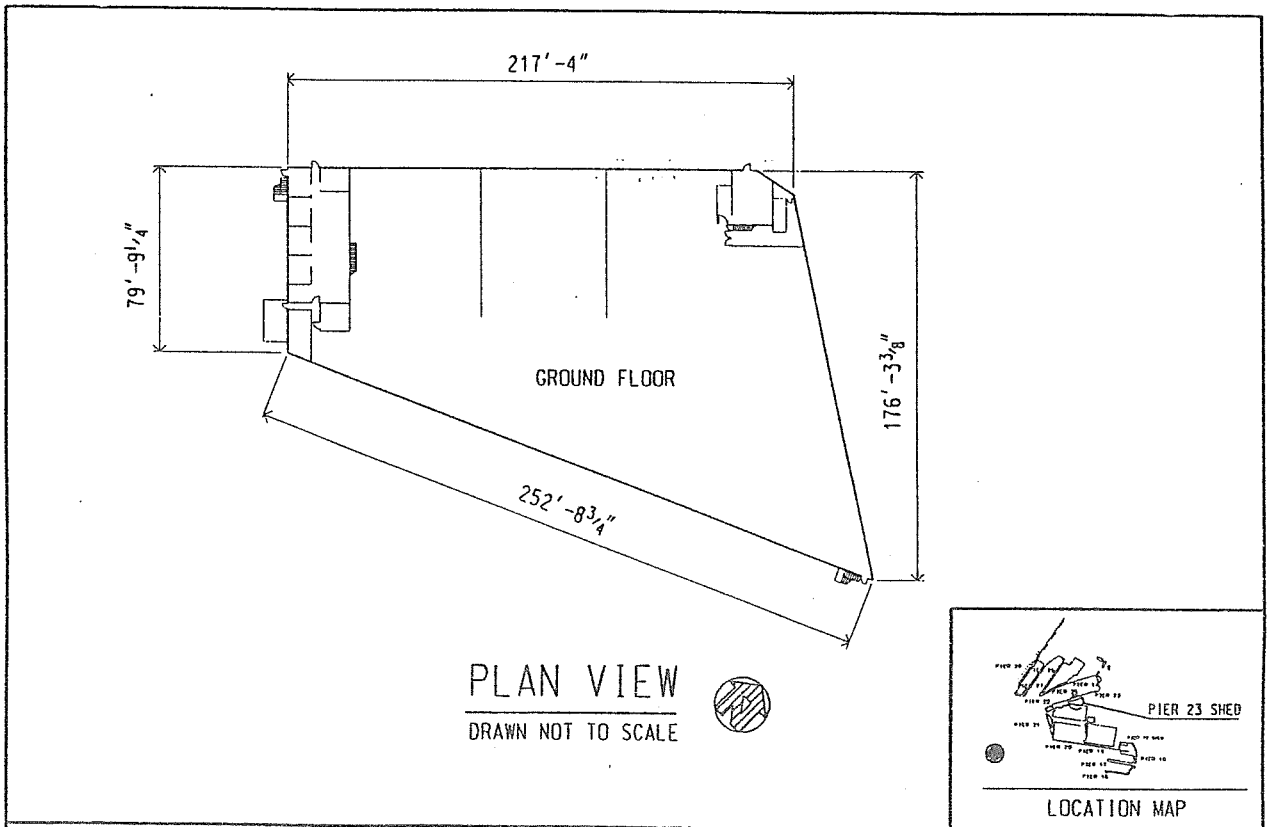
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HARBORS DIVISION MAINTENANCE SECTION	PIER 22 WAREHOUSE #8 HONOLULU HARBOR, OAHU, HAWAII	FIGURE O-24

HONOLULU HARBOR - PIER 22 WAREHOUSE #8

Location or Address:	Pier 19, Honolulu, Hawaii
Date of original construction:	1928
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	19,308
Approximate floor area size (sq. ft.):	110.3' x 175'
No. of floors:	1
Date of major renovation and description:	Unknown before 1967 1986 - replaced roofing
New floor area (sq. ft.):	19,308
Roof area (sq. ft.):	19,308
Approximate roof area size (sq. ft.):	175' x 110.3'
Present use of building:	Cargo storage
Type of construction:	Steel frame, corrugated metal siding & roof, A.C. floor
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 22 WAREHOUSE #8

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
REPAIR ROOF	1625	02/26/87	$177,194.43	Remove & dispose existing corrugated sheet metal roofing; modifying existing roof trusses; installing new pre-finished corrugated steel roofing
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
REPAIRING FIRE SPRINKLER SYSTEM	1154	12/28/73	$3,317	PO#601908
OTHERS:				
REPAIRS	1504	01/17/84	$75,567.09	Gutter replacement, repair laps & eaves; coating entire roof w/asphalt base aluminum coating; painting interior structural steel surfaces; removing & replacing 1150 sq. ft. of damaged siding; repair 2 pairs of exterior sheet metal siding doors



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 23 SHED
HONOLULU HARBOR, OAHU, HAWAII

FIGURE
O-25

HONOLULU HARBOR - PIER 23 SHED

Location or Address:	Honolulu Harbor, Honolulu, Hawaii
Date of original construction:	
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	
Approximate floor area size (sq. ft.):	217' x varies
No. of floors:	1, plus mezzanine
Date of major renovation and description:	
New floor area (sq. ft.):	32,578
Roof area (sq. ft.):	32,578
Approximate roof area size (sq. ft.):	217' x varies
Present use of building:	Offices, storage area
Type of construction:	A.C. floor, A.C. over reinforced concrete roof, concrete footings
Asbestos survey:	Survey-yes, 6/93, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 23 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
EXTERIOR	1844	12/06/93	$29,796.00	Exterior surfaces of walls, parapets, stairs, piping, conduits, canopy, trim, ramp, and stanchions.
ROOFING:				
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				

PLAN VIEW

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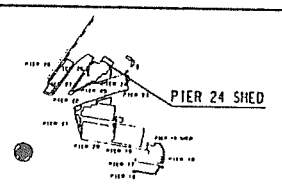

LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 24 SHED
HONOLULU HARBOR, OAHU, HAWAII

FIGURE
O-27

HONOLULU HARBOR - PIER 24 SHED

Location or Address:	Pier 24, Honolulu, Hawaii
Date of original construction:	1936
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	38,000
Approximate floor area size (sq. ft.):	183.75' x 520'
No. of floors:	1
Date of major renovation and description:	1939 - Shed addition, 49, 363 sq. ft. 1953 - Shed addition, 28,240 sq. ft.
New floor area (sq. ft.):	115,603/75,760
Roof area (sq. ft.):	75,760
Approximate roof area size (sq. ft.):	
Present use of building:	Barge and container maintenance
Type of construction:	Reinforced concrete columns & beams, corrugated metal siding, wooden roof with built up roofing, A.C. floor
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 24 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
REPLACE ROOFING	1607	11/26/91	$721,412.80	Replaced on Pier Sheds 24-26
GUTTER REPAIRS	1536	04/19/84	$54,338	
REPAIRS	1446	09/15/80	$15,655.64	Repaired with Pier Shed 25 Repaired damaged part of roof
REPLACEMENT OF GUTTERS AND DOWNSPOUTS	1112	12/23/71	$2,979	PO#54214
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				

PLAN VIEW

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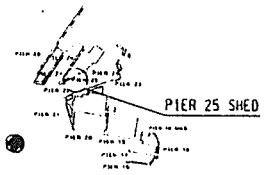

LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 25 SHED
HONOLULU HARBOR, OAHU, HAWAII

FIGURE
O-31

HONOLULU HARBOR - PIER 25 SHED

Location or Address:	Pier 25, Honolulu, Hawaii
Date of original construction:	1923
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	18,560
Approximate floor area size (sq. ft.):	
No. of floors:	1
Date of major renovation and description:	None
New floor area (sq. ft.):	
Roof area (sq. ft.):	18,560
Approximate roof area size (sq. ft.):	
Present use of building:	Barge and container maintenance
Type of construction:	Reinforced concrete columns & beams, corrugated metal siding, wooden roof with built up roofing, A.C. floor
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 25 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
REPLACE ROOFING	1607	11/26/91	$721,412.80	Replaced on Pier Sheds 24-26
	1446	09/15/80	$15,655.64	Repaired damaged portion of roof along with Pier Shed 24
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRES SPRINKLER:				
OTHERS:				

PLAN VIEW

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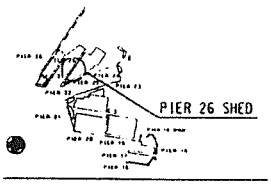


LOCATION MAP

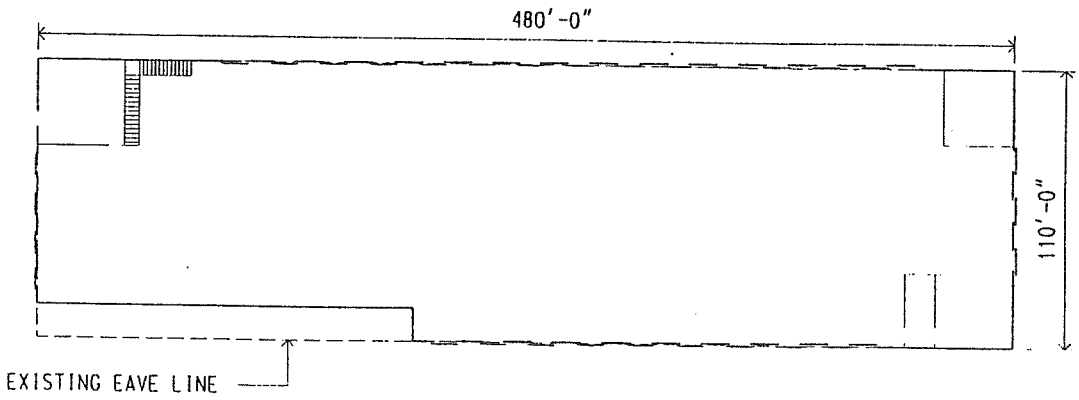
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HARBORS DIVISION MAINTENANCE SECTION	PIER 26 SHED HONOLULU HARBOR, OAHU, HAWAII	FIGURE O-32

HONOLULU HARBOR - PIER 26 SHED

Location or Address:	Pier 26, Honolulu, Hawaii
Date of original construction:	1923
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	35,000
Approximate floor area size (sq. ft.):	608' x varies
No. of floors:	1
Date of major renovation and description:	None. Various roofing
New floor area (sq. ft.):	
Roof area (sq. ft.):	35,000
Approximate roof area size (sq. ft.):	608' x varies
Present use of building:	Interisland cargo handling
Type of construction:	Reinforced concrete columns & beams, corrugated metal siding, wooden roof with built up roofing, A.C. floor
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR -PIER 26 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
REPAINT INTERIOR	1775	01/29/92	$169,370	
ROOFING:				
COAT SHED ROOF	1572	11/21/84		
REPLACE ROOFING	1607	11/26/91	$721,412.80	Replaced on Pier Sheds 24-26
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				
DRAINAGE SYSTEM	1697	11/09/88	$36,634.60	



PLAN VIEW

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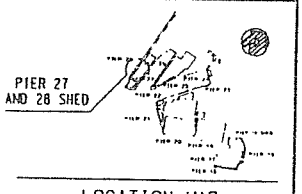


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 27 & 28 SHED
HONOLULU HARBOR, OAHU, HAWAII

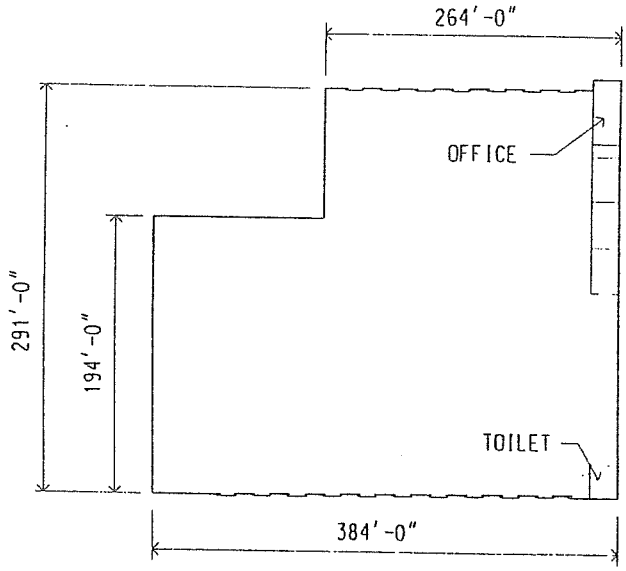
FIGURE
O-33

HONOLULU HARBOR - PIER 27 & 28 SHED

Location or Address:	Pier 27-28, Honolulu, Hawaii
Date of original construction:	1938
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	64,320
Approximate floor area size (sq. ft.):	480' x 110'
No. of floors:	1
Date of major renovation and description:	Date unknown - reduced width of shed at Ewa end
New floor area (sq. ft.):	61,609
Roof area (sq. ft.):	61,609
Approximate roof area size (sq. ft.):	480' x 110'
Present use of building:	Interisland cargo handling
Type of construction:	Steel frame, corrugated steel roofing, some corrugated steel siding, A.C. floor
Asbestos survey done:	Survey-yes, 6/93, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 27 & 28 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
REPAIR ROOF DRAINS	1871	09/08/95	$38,328	
ROOF REPAIRS	1564	10/26/84		Treat corrugated sheet metal roofing, eave, & monitor siding surfaces & sheet metal gutter surfaces w/ phosphoric acid metal treatment; repair all end laps & corroded sections of corrugated sheet metal roofing along mauka eave line, repair holes, coat w/asphalt base aluminum coating; Replace 24 wire flass window panes & recaulk windows along truss lines 2, 4, 6, 8, 10, 12, 14, 16, 18, & 20
REPLACE DRAIN SYSTEM	1415	11/19/81	$44,116	
SIDING:				
ELECTRICAL:				
REPLACE LIGHTING SYSTEM	1616	10/17/86	$73,000	
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



PLAN VIEW

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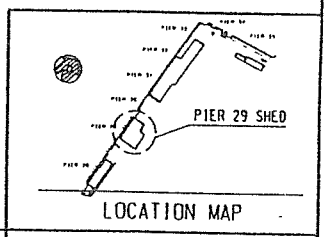


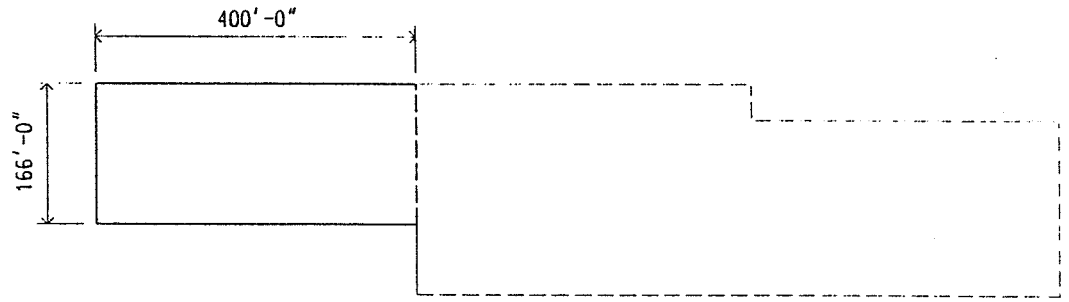
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HARBORS DIVISION MAINTENANCE SECTION	PIER 29 SHED HONOLULU HARBOR, OAHU, HAWAII	FIGURE O-34

HONOLULU HARBOR - PIER 29 SHED

Location or Address:	Pier 29, Honolulu, Hawaii
Date of original construction:	1942
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	103,000
Approximate floor area size (sq. ft.):	384' x 291'
No. of floors:	1
Date of major renovation and description:	None
New floor area (sq. ft.):	
Roof area (sq. ft.):	103,000
Approximate roof area size (sq. ft.):	384' x 291'
Present use of building:	Interisland cargo handling
Type of construction:	Steel frame, corrugated steel roofing & siding, A.C. floor. Office area: wood construction
Asbestos survey:	Survey-yes, 6/93, positive
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 29 SHED

COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
ROOF REPLACEMENT	1562	06/05/85	$159,917	Replace whole roof w/ corrugated steel roof panels
REROOFING PORTION	1478	05/05/83	$169,151.73	Remove existing damaged corrugated sheet metal roof panels & installing new corrugated sheet metal roofing & fasteners (roofs sloping mauka)
ROOF REPAIRS	1356	11/19/81	$29,958.80	Remove existing damaged corrugated sheet metal roof panels & install new corrugated sheet metal roofing & fasteners; patching corrugated metal roofing
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
FIRE SPRINKLER:				
OTHERS:				



PLAN VIEW

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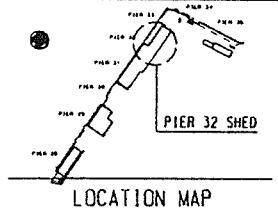


LOCATION MAP

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
MAINTENANCE SECTION

PIER 32 SHED
HONOLULU HARBOR, OAHU, HAWAII

FIGURE
O-37

HONOLULU HARBOR - PIER 32 SHED

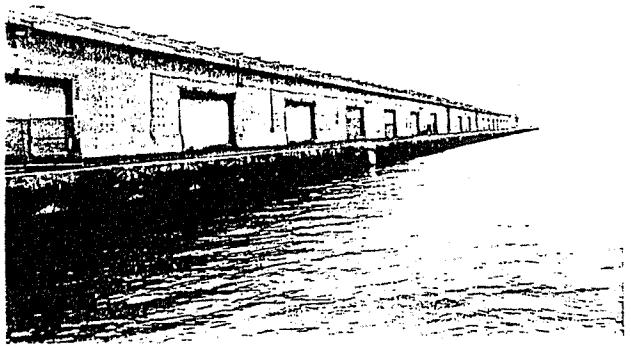
Location or Address:	Honolulu Harbor, Honolulu, Hawaii
Date of original construction:	1938
H.C. Job No. of original construction:	1421
Original floor area (sq. ft.):	66,400
Approximate floor area size (sq. ft.):	400' x 166'
No. of floors:	1
Date of major renovation and description:	
New floor area (sq. ft.):	
Roof area (sq ft.):	66,400
Approximate roof area size (sq. ft.):	400' x 166'
Present use of building:	Cargo area
Type of construction:	Steel trusses, support columns, joists, metal siding
Asbestos survey:	Survey-yes, 4/96, negative
Asbestos abatement:	Abatement-no
Lead paint survey:	Survey-yes, 4/96, positive

HONOLULU HARBOR - PIER 32 SHED

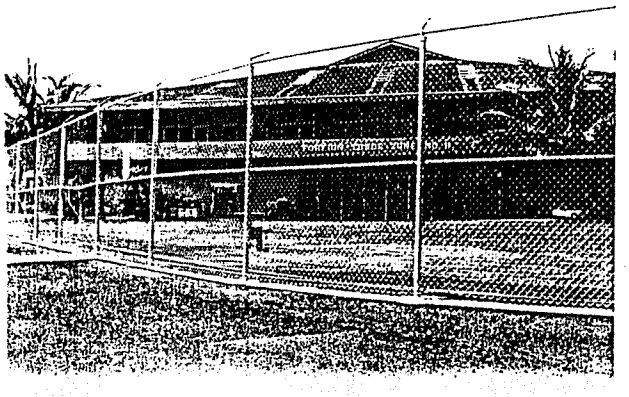
COMPLETED PROJECTS:	H.C. NO.	COMPL DATE	COST	REMARKS
PAINTING:				
ROOFING:				
GUTTER REPAIRS	1597	01/17/86	$88,568	Piers 31A-32 Shed
REPLACE GUTTERS & CANOPY	1581	06/21/85	$110,326	Piers 31-32 Shed
SIDING:				
ELECTRICAL:				
ROLL-UP DOORS:				
REPAIR ROLL-UP DOORS	1831	01/28/94	$70,290.06	Piers 31-32 Shed Doors H, I, V
FIRE SPRINKLER:				
REPLACING SPRINKLER HEADS	1210	02/16/76	$33,947	Piers 31A-33 Shed
OTHERS:				

APPENDIX B

BUILDING PHOTOS

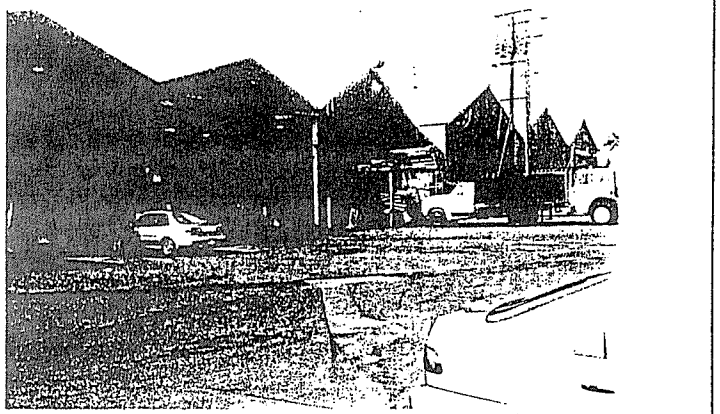


Pier 2 Shed. View to south.

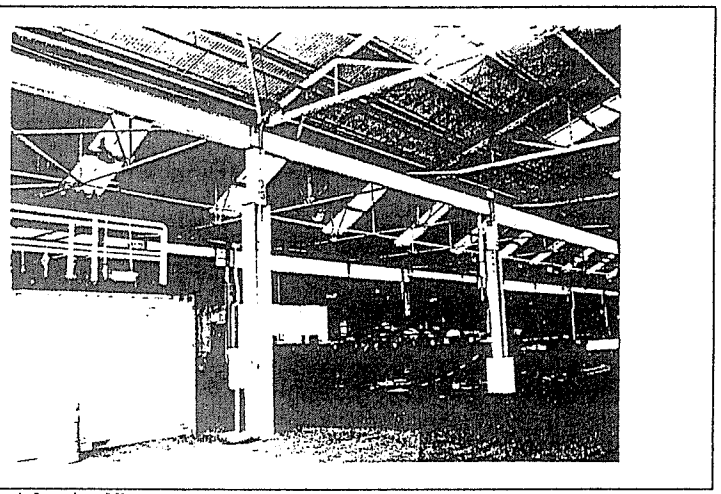


Pier 2 Shed. Office space at north end of shed.

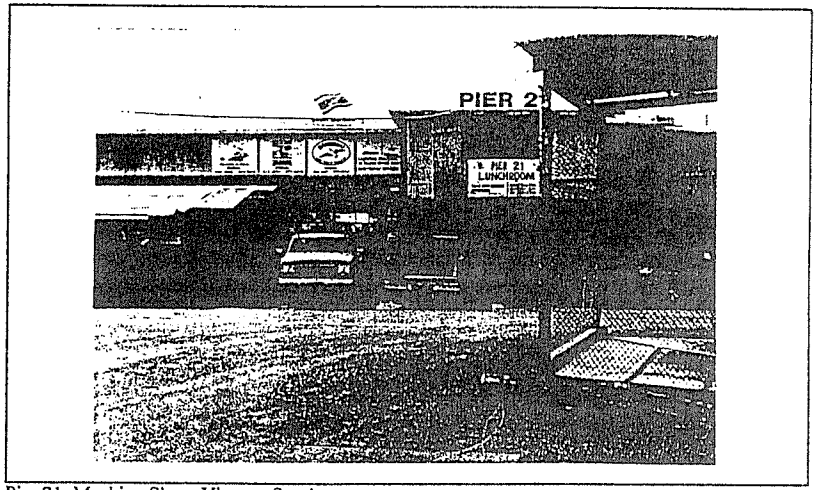
O'ahu Commercial Harbors
Archaeological Investigations
March 1999



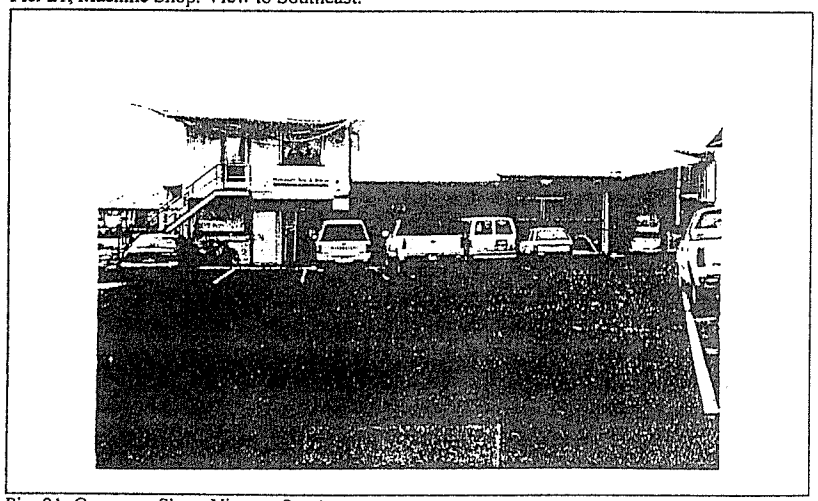
Pier 19 Shed. View to Southwest.



Pier 19 Shed, Interior. View to west.



Pier 21, Machine Shop. View to Southeast.



Pier 21, Carpenter Shop. View to Southwest.

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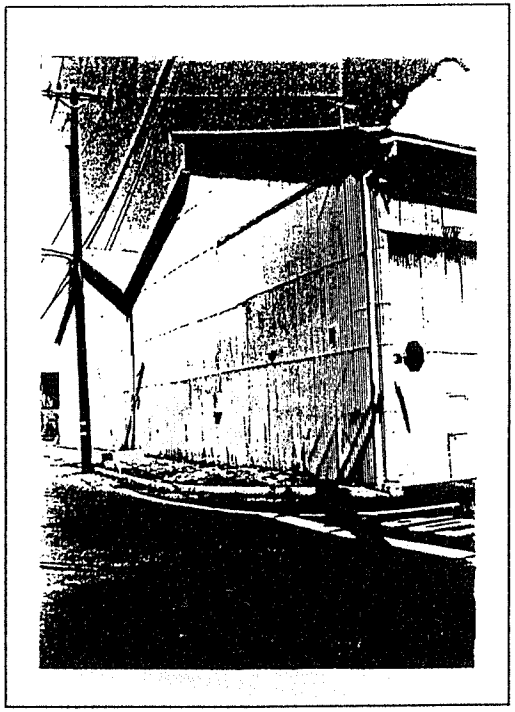
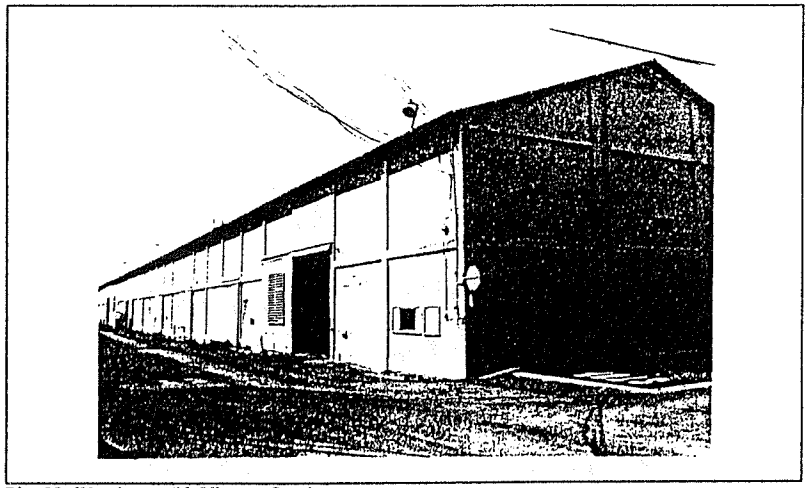
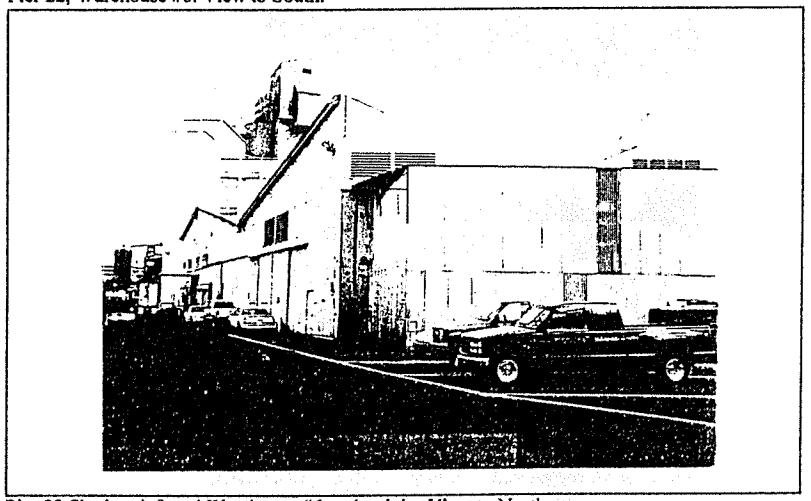


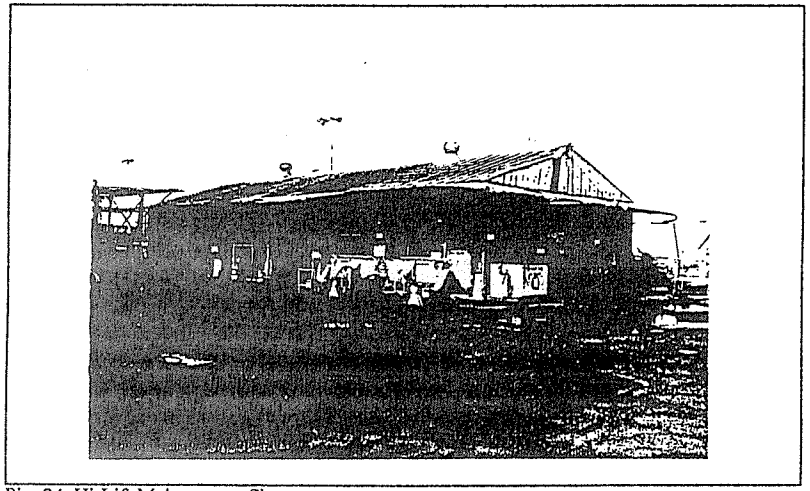
Pier 22, Warehouse #8. View to Northwest.



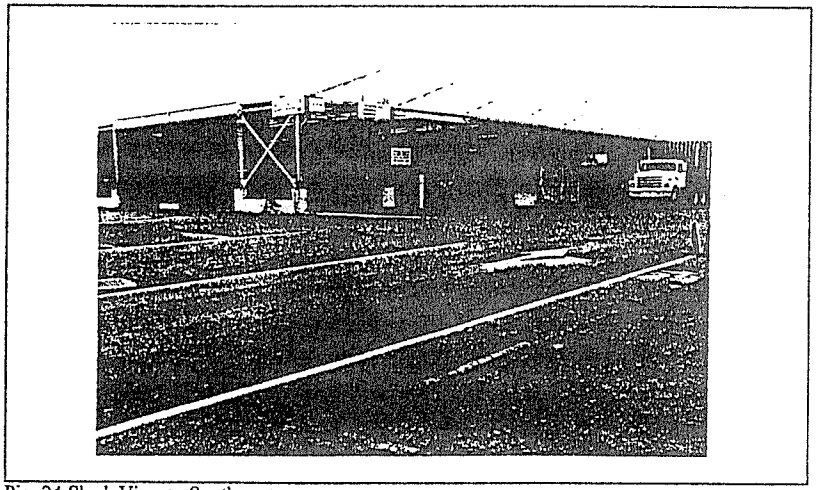
Pier 22, Warehouse #6. View to South.



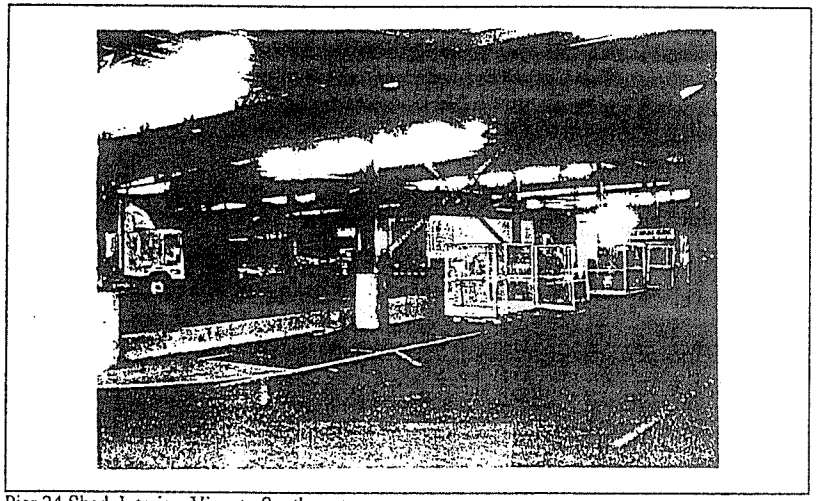
Pier 23 Shed on left and Warehouse #6 to the right. View to North.



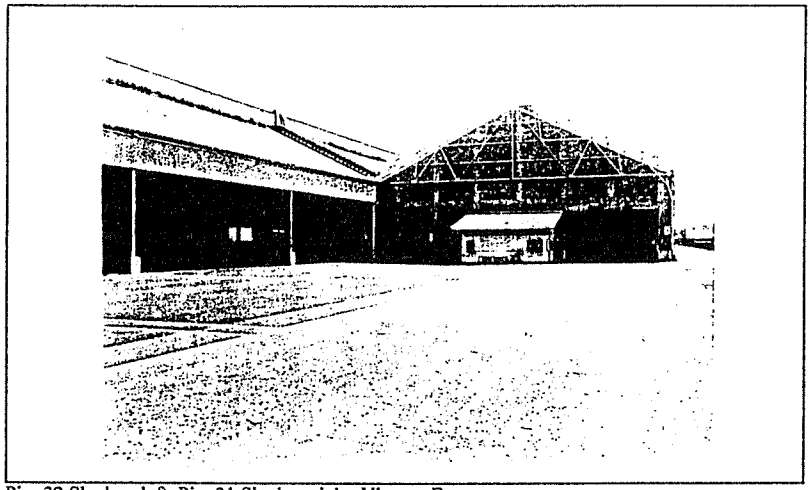
Pier 24, Hi-Lift Maintenance Shop.



Pier 24 Shed. View to Southwest.

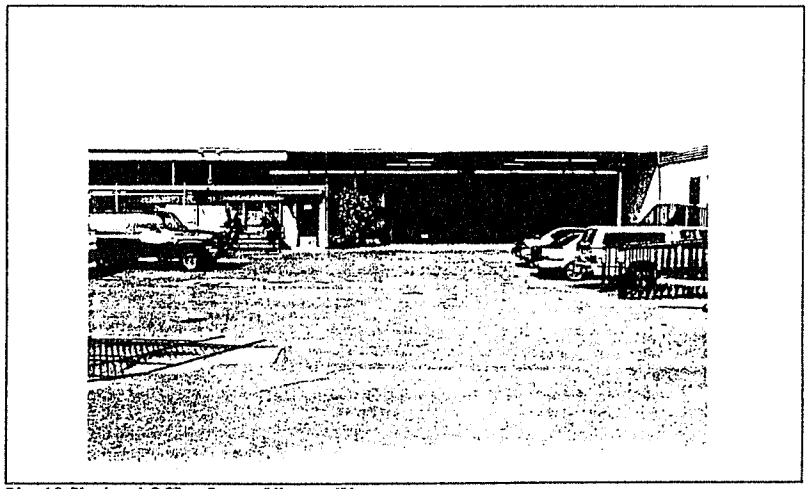


Pier 24 Shed, Interior. View to Southwest.

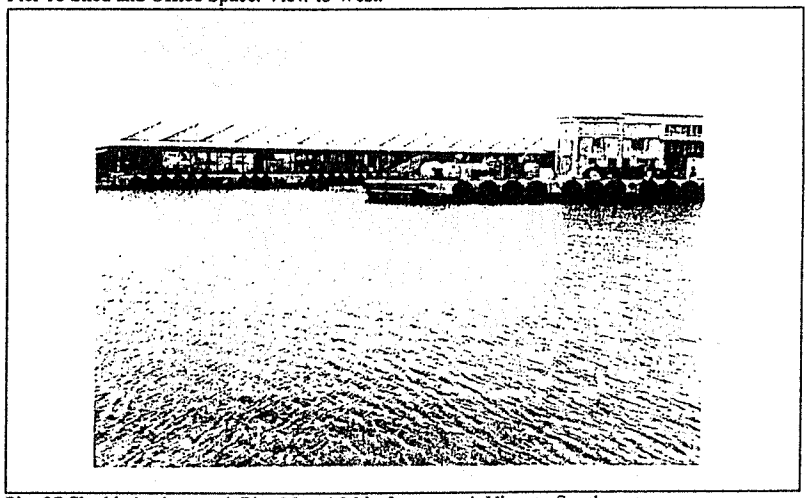


Pier 32 Shed on-left, Pier 31 Shed on right. View to East.

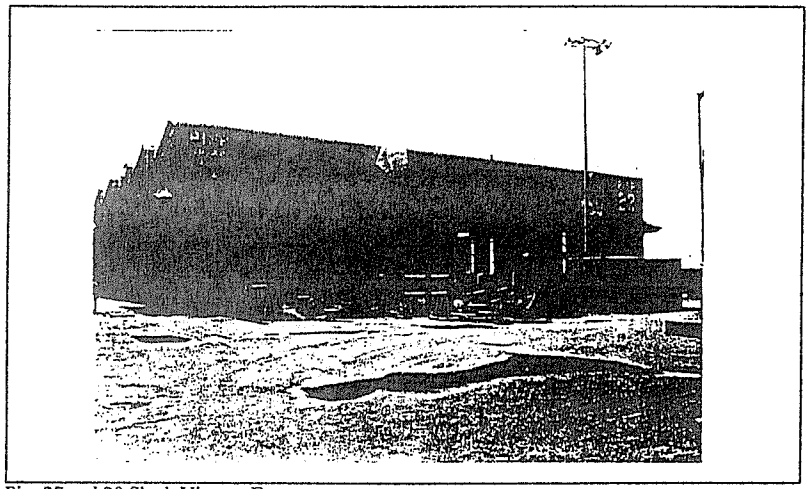
Pier 32 Shed on right. View to South.



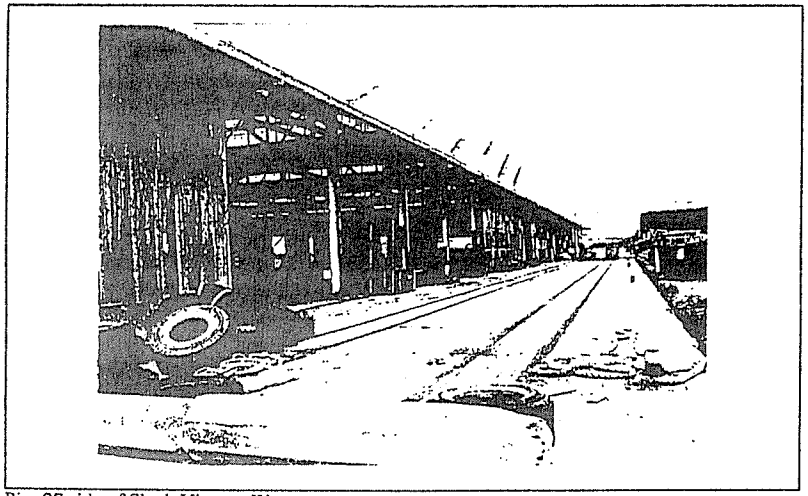
Pier 18 Shed and Office Space. View to West.



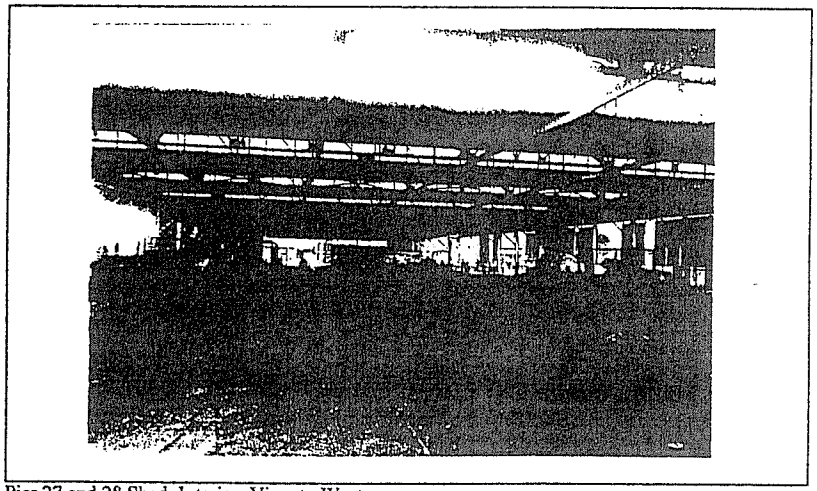
Pier 27 Shed in background, Pier 25 and 26 in foreground. View to Southwest.



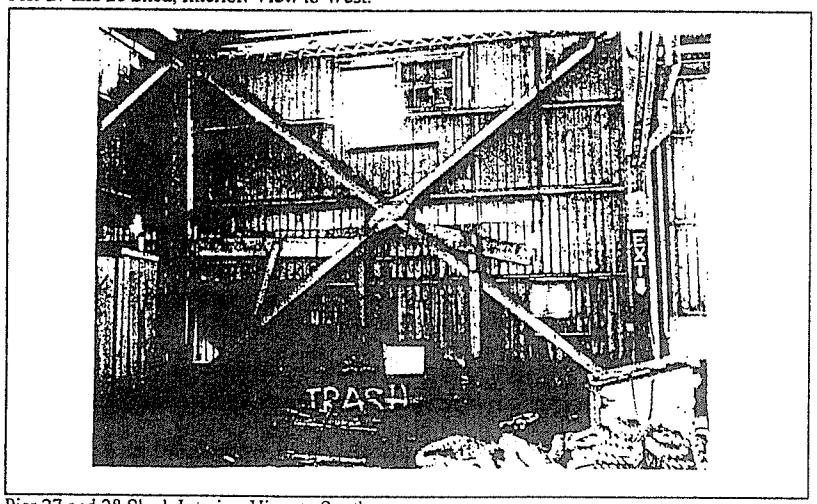
Pier 27 and 28 Shed. View to East.



Pier 27 side of Shed. View to West.



Pier 27 and 28 Shed, Interior. View to West.



Pier 27 and 28 Shed, Interior. View to South.

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March 1999

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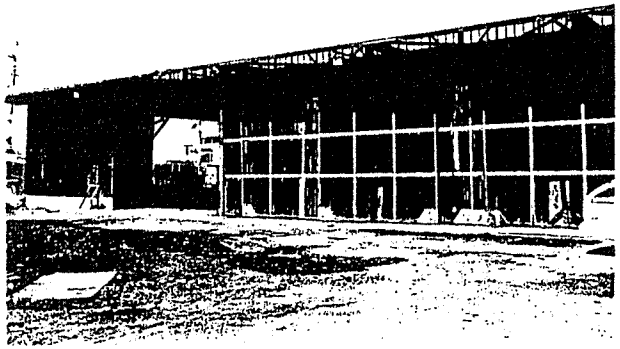
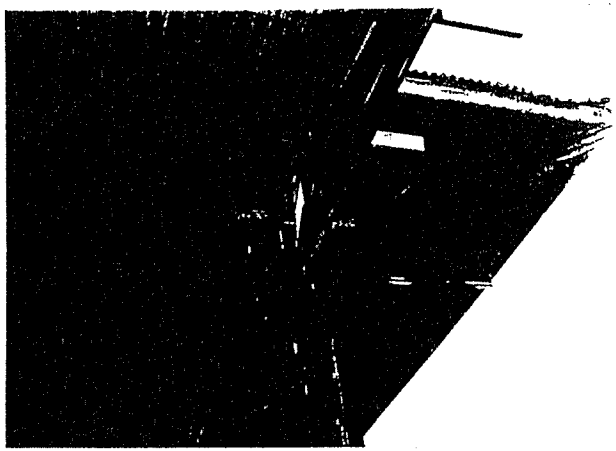


Pier 27 and 28 Shed, East end. View to Southwest.



Close-up view of Pier 27 and 28 Shed roof supports.

Pier 29 Shed. View to West.

Lagoon Drive/Keehi Lagoon. Approximate location for proposed Lay Berths'. View to North.

O'ahu Commercial Harbors
Archaeological Investigations
March 1999

Pacific Legacy Incorporated

Letter from State Historic Preservation Office
(Dated July 23, 1999)

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JANET E. KAWELO

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES
ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

July 23, 1999

Richard Stook
Environmental Planner
Wil Chee Planning, Inc.
HMSA Center
1400 Rycroft Street, Suite #928
Honolulu, Hawaii 96814

LOG NO: 23824
DOC NO: 9907co12
Architecture

Dear Mr. Stook:

SUBJECT: **Archaeological Report for the**
Oahu Commercial Harbors 2020 Master Plan
Immediate Phase Environmental Impact Statement
TMK various parcels on 2-1-15, 2-1-01, 1-5-39, 38 & 36, 1-17
Honolulu, Oahu

Thank you for the letter dated May 14, 1999, regarding the Archaeological Report for Oahu Commercial Harbors 2020 Master Plan. The following includes our comments on the report.

The project location and area should be clarified, Figure 1 should indicate the boundary of the project location. Clarify that the structures identified are the only structures over 50 years old and there are no structures over 50 years old in the Lagoon Drive project area. Plan view drawings of Pier 24, 25, & 26 are missing. Plan view of Pier 32 could include Pier 31, if plan is clearly labeled. We request that original black & white photographs be submitted to our office for archival purposes.

We believe that Pier 2 & 3, is good example of 1950's industrial architecture. Although the structure is not 50 years old, we believe that it should be photographically documented, prior to demolition. We believe that this would be prudent, as the structures are nearing 50 years of age and if reuse in the redevelopment is not considered.

With the above comments incorporated, we concur with the determination that the demolition of the identified structures, and the project will have no impact on cultural resources. There remains the possibility that historic sites, including human burials, will be discovered during routine construction activities. Should this be the case, all work in the vicinity must stop and the Historic Preservation Division must be contacted at 692-8015.

Thank you for the opportunity to comment. Should you have any comments please contact Carol Ogata at 692-8032.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

CO:jk

TRAFFIC IMPACT ANALYSIS REPORT

OAHU COMMERCIAL HARBORS 2020 MASTER PLAN IMMEDIATE PHASE

IN HONOLULU, OAHU, HAWAII

Prepared For

WIL CHEE PLANNING, INC.

Honolulu, Hawai'i

Phillip Rowell and Associates
47-273 'D' Hui Iwa Street
Kaneohe, Hawai'i 96744
Tel: 808-239-8206 Fax: 808-239-4175
Email: prowell@aloha.net

May 2, 1999

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Executive Summary

Phillip Rowell and Associates has been retained by Wil Chee Planning, Inc. to perform a traffic impact analysis for the immediate phase of the Honolulu Harbor 2020 Master Plan[1]. The immediate phase includes improvements and modifications at Piers 2, Piers 12 through 16, Piers 24 through 29 and Keehi Lagoon, which are described in this chapter.

There are four projects which are summarized in Table ES-1.

Table ES-1 Summary of Proposed Development(1)

Location	Proposed Uses
Pier 2	New cruise ship terminal serving both interisland and foreign/domestic cruise ships.
Piers 12 - 16	Commercial fishing facilities.
Piers 24 - 29	Excursion cruise boat docking facilities including scuba, snorkeling, parasailing and dinner cruises. Uses will be comparable to existing operations at Kewalo Basin.
Keehi Lagoon	Lay Berths

Notes:
(1) Oahu Commercial Harbors 2020 Master Plan (May 1997) and discussion with HDOT-Harbors staff.

[1] State of Hawaii Department of Transportation Harbors Division, Oahu *Commercial Harbors 2020 Master Plan*, May 1997

Trip Generation Analysis of Proposed Projects

The total trips generated by the proposed projects is summarized in Table ES-2. Only the excursion activities proposed for Piers 24 through 29 will coincide with the PM peak commuter period. Cruise ship operations proposed for Pier 2 will operate with scheduled arrivals and departures to occur during outside the AM and PM peak commute periods. The impacts of a large cruise ship arrival and an interisland cruise ship arrival occurring concurrently during the PM weekday afternoon peak hour traffic represent the worst-case and thus was the scenario analyzed.

Table ES-2 Trip Generation Summary

	Weekday PM Peak[1]			Saturday Peak[1]		
Location and Project	In	Out	Total	In	Out	Total
Pier 2 Cruise Ship Terminal	268	276	544	288	276	544
Piers 12 - 24 Fishing Boat Berths		Minimal			Minimal	
Piers 24 - 29 Excursion Vessel Berths	160	130	290	160	130	290
Keehi Lagoon Lay Berths	35	35	70	35	35	70
Totals	463	441	904	463	441	904

Notes:
(1) Peak hour refers to the greater peak hour of the adjacent street or the generator.

Project Related Traffic Impacts

The impact of project related traffic is estimated by comparing the LOS analysis of cumulative plus project to cumulative (without project conditions) The methodology and assumptions used for this analysis are as follows:

1. The LOS analysis was performed for "worst-case" conditions, which is defined as the peak hourly traffic volume generated by the project (peak hour of the generator) superimposed on the peak commute period of the adjacent street network. This represents a "worst-case" condition since the peak hours can be slightly different in a real case condition.

2. The LOS analysis was performed using the operations method described in the 1998 Edition of the *Highway Capacity Manual*.

3. The LOS analysis was performed for weekday afternoon and Saturday morning "worse-case" traffic conditions for cumulative and cumulative plus project conditions.

4. For 2003 cumulative (without project) conditions, Ilalo Street will be in place. It was determined during the analysis of future background conditions that the shared westbound left turn and through lane at South Street and Punchbowl Street would not function because of the heavy eastbound through traffic. Westbound left turns are currently not allowed at these intersection because of width and sight distance restrictions and should not be allowed in the future. Future traffic assignments were adjusted to prohibit left turns consistent with existing conditions.

5. The section of Ilalo Street adjacent to Pier 2 was assumed to be constructed concurrently with the new passenger cruise ship terminal. Part of the construction of this roadway improvement is the demolition of Channel Street and the traffic signal at the intersection of Channel Street and Ala

Moana Boulevard.

The results of the level-of-service analysis are tabulated in Table ES-3 and ES-4.

Table ES-3 Results of Level-of-Service Analysis - 2003 Weekday PM Peak Hour [1]

	Cumulative			Cumulative Plus Project				
				Weekday PM			Changes	
Intersection and Movement	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay
Ala Moana Bl. at South Street	0.924	17.2	C	0.938	17.8	C	0.014	0.6
Eastbound Left	0.976	73.1	F	0.950	67.1	F	-0.026	-6.0
Eastbound Thru & Right	0.797	6.4	B	0.814	6.8	B	0.017	0.4
Westbound Thru & Right	0.915	18.4	C	0.942	20.4	C	0.027	2.0
Northbound Left & Thru	0.764	44.0	E	0.764	44.0	E	0.000	0.0
Northbound Right	0.111	30.1	D	0.111	30.1	D	0.000	0.0
Southbound Left & Thru	0.913	71.6	F	0.913	71.6	F	0.000	0.0
Southbound Right	0.818	45.9	E	0.818	45.9	E	0.000	0.0
Ala Moana Bl. at Channel St.	0.758	8.6	B	Demolished				
Eastbound Thru & Right	0.877	10.6	B					
Westbound Left	0.126	37.9	D					
Westbound Thru	0.769	5.0	A					
Northbound Left	0.367	32.2	D					
Northbound Right	0.423	32.9	D					
Ala Moana Bl. at Punchbowl St.	0.869	28.7	D	0.926	32.2	D	0.057	3.5
Eastbound Thru	0.962	22.5	C	0.983	27.0	D	0.021	4.5
Eastbound Right	0.167	7.5	B	0.349	3.1	A	0.182	-4.4
Westbound Thru	1.011	31.4	D	1.020	35.0	D	0.009	3.6
Northbound Left	0.304	32.2	D	0.600	41.1	E	0.296	8.9
Northbound Left & Right	0.214	31.7	D	0.483	40.1	E	0.269	8.4
Southbound Left	0.636	37.2	D	0.636	43.2	E	0.000	6.0
Southbound Thru & Left	0.714	39.8	D	0.714	45.9	E	0.000	6.1
Southbound Right	0.904	49.4	E	0.904	55.7	E	0.000	6.3
Nimitz Hwy (EB) at Pacific St.	0.706	8.0	B	0.679	10.3	B	-0.027	2.3
Eastbound Right, Thru & Left	0.655	4.9	A	0.786	9.0	B	0.131	4.1
Northbound Thru	0.381	24.0	C	0.095	18.3	C	-0.286	-5.7
Northbound Right	0.117	22.4	C	0.305	19.6	C	0.188	-2.8
Southbound Left	0.896	51.8	E	0.425	20.7	C	-0.471	-31.1
Southbound Thru	0.059	22.2	C	0.290	19.5	C	0.231	-2.7
Nimitz Hwy (WB) at Pacific St.	0.789	10.2	B	0.837	13.4	B	0.048	3.2
Westbound Left, Thru & Right	0.752	5.9	B	0.910	12.2	B	0.158	6.3
Northbound Left	0.762	39.8	D	0.408	20.7	C	-0.354	-19.1
Northbound Thru	0.923	47.0	E	0.665	24.1	C	-0.258	-22.9
Southbound Thru	0.392	24.1	C	0.278	19.4	C	-0.114	-4.7

NOTES:
6. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
7. V/C denotes ratio of volume to capacity. See Appendices B for calculations.
8. Delay is in seconds per vehicle.
9. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay. See Table 4 for definitions.

Table ES-4 Results of Level-of-Service Analysis - 2003 Saturday Peak Hour[1]

Intersection and Movement	Cumulative			Cumulative Plus Project				
				Saturday Peak			Changes	
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay
Ala Moana Bl. at South Street	0.405	7.8	B	0.414	7.9	B	0.009	0.1
Eastbound Left	0.251	33.0	D	0.251	33.0	D	0	0.0
Eastbound Thru & Right	0.435	3.3	A	0.467	3.4	A	0.032	0.1
Westbound Thru & Right	0.507	9.8	B	0.535	10.1	B	0.028	0.3
Northbound Left & Thru	0.176	30.5	D	0.176	30.5	D	0	0.0
Northbound Right	0.049	29.7	D	0.049	29.7	D	0	0.0
Southbound Left & Thru	0.186	30.5	D	0.186	30.5	D	0	0.0
Southbound Right	0.091	30.0	D	0.091	30.0	D	0	0.0
Ala Moana Bl. at Channel St.	0.373	3.9	A	Demolished				
Eastbound Thru & Right	0.469	4.9	A					
Westbound Left	0.073	37.7	D					
Westbound Thru	0.396	2.5	A					
Northbound Left	0.025	30.2	D					
Northbound Right	0.016	30.1	D					
Ala Moana Bl. at Punchbowl St.	0.417	14.3	B	0.539	15.6	C	0.122	1.3
Eastbound Thru	0.536	12.1	B	0.555	12.3	B	0.019	0.2
Eastbound Right	0.055	2.4	A	0.258	2.9	A	0.203	0.5
Westbound Thru	0.552	12.2	B	0.582	12.6	B	0.03	0.4
Northbound Left	0.124	29.6	D	0.583	33.4	D	0.459	3.8
Northbound Left & Right	0.185	30.0	D	0.588	34.6	D	0.403	4.6
Southbound Left	0.238	30.3	D	0.359	31.3	D	0.121	1.0
Southbound Thru & Left	0.228	30.3	D	0.330	31.0	D	0.102	0.7
Southbound Right	0.144	29.8	D	0.120	29.6	D	-0.024	-0.2
Nimitz Hwy (EB) at Pacific St.	Not Analyzed			Not Analyzed				
Eastbound Right, Thru & Left								
Northbound Thru								
Northbound Right								
Southbound Left								
Southbound Thru								
Nimitz Hwy (WB) at Pacific St.	Not Analyzed			Not Analyzed				
Westbound Left, Thru & Right								
Northbound Left								
Northbound Thru								
Southbound Thru								

NOTES
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. See Appendices B for calculations.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay. See Table 4 for definitions.

The results of the LOS analysis of cumulative plus project conditions versus cumulative without project conditions indicate that:

1. The proposed projects will have minimal impacts on traffic operations at the adjacent intersections during the weekday PM peak commute period (worst-case conditions) and no significant impacts on Saturday conditions. The proposed projects will not have significant impacts on the adjacent intersections that warrant mitigation.

2. Traffic generated by the projects studied in this report is localized in nature and will not have a significant regional impact warranting implementation of mitigation measures.

3. Interisland cruise ship operations should continue to operate on the current schedule, which is to have arrivals and departures scheduled during Saturday morning and evenings, respectively.

4. A shuttle bus operation between Pier 2 and adjacent shopping areas should be considered for a period of several hours before the departure of a large cruise ship to reduce the pedestrian activity and associated impacts on traffic flow at the adjacent intersections. A schedule of one bus every 10 to 15 minutes would have a minimal impact of traffic operations but would enhance pedestrian safety. This operation would best be provided by the cruise operator.

Construction Impacts

Traffic impacts of construction activities are short term. The following guidelines should be followed:

1. Construction activities should be located off-street unless not practical. Such an area would be construction at Pier 12 through 16 where there is not off-street area for staging immediately adjacent to the site.

2. Lane closures should be coordinated with Hawaii Department of Transportation and City and County of Honolulu Department of Transportation Services.

1. INTRODUCTION

Phillip Rowell and Associates has been retained by Wil Chee Planning, Inc. to perform a traffic impact analysis for the immediate phase of the Honolulu Harbor 2020 Master Plan[2]. The immediate phase includes improvements and modifications at Piers 2, Piers 12 through 16, Piers 24 through 29 and Keehi Lagoon, which are described in this chapter.

The following report has been prepared to describe the traffic characteristics and of the proposed project and likely impacts to the adjacent roadway network. This introductory chapter discusses the location of the project, the proposed development, and the study methodology.

Project Location and Description

The location of the proposed projects are shown on Figure 1. There are four projects which are summarized in Table 1.

[2] State of Hawaii Department of Transportation Harbors Division, Oahu *Commercial Harbors 2020 Master Plan*, May 1997

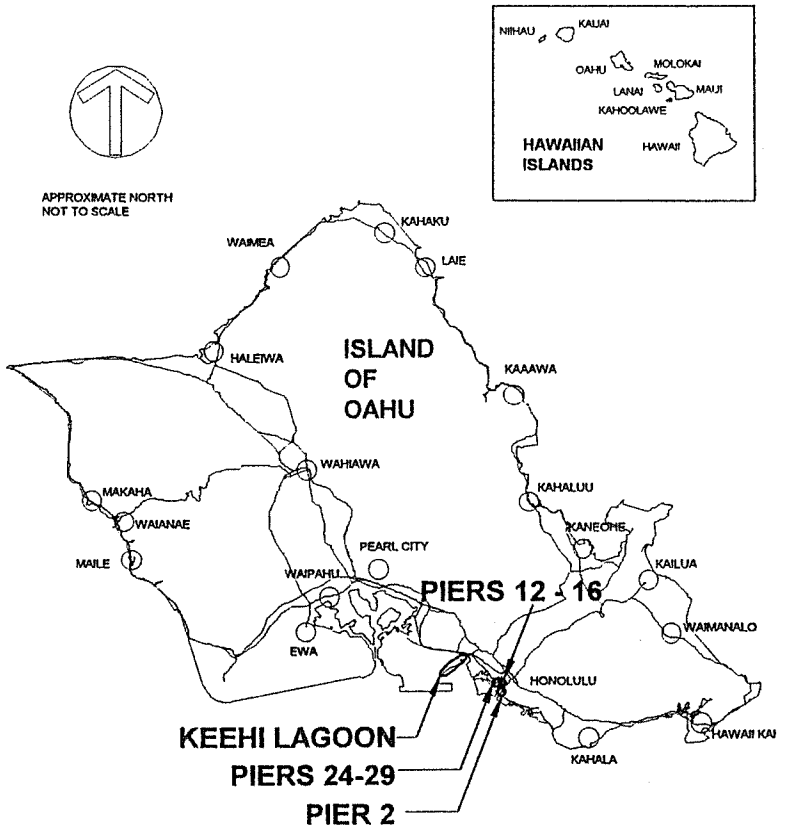


Figure 1
PROJECT LOCATION MAP

Table 1 **Summary of Proposed Development**(3)

Location	Proposed Uses
Pier 2	New cruise ship terminal serving both interisland and foreign/domestic cruise ships.
Piers 12 - 16	Commercial fishing and lay berthing facilities.
Piers 24 - 29	Excursion cruise boat docking facilities including scuba, snorkeling, parasailing and dinner cruises. Uses will be comparable to existing operations at Kewalo Basin.
Keehi Lagoon	Lay Berths

Notes:
(3) Oahu Commercial Harbors 2020 Master Plan (May 1997) and discussion with HDOT-Harbors staff.

Purpose and Objectives

The purpose of the proposed traffic impact study is:

1. To determine the traffic related impacts of the Oahu Commercial Harbors 2020 Master Plan,
2. To identify improvements to the adjacent roadway network to accommodate increased traffic generated by the project at an acceptable level-of-service, and
3. To identify potential measures to mitigate the project's adverse traffic impacts.

Study Methodology and Order of Presentation

In order to conduct this traffic study, a number of tasks were performed. These tasks are discussed in the following paragraphs.

1. Define Projects and Scope of Work

The first task performed was to define the various projects to be analyzed relative to location and type of proposed uses. A preliminary trip generation analysis was performed to estimate the order of magnitude of the trips generated by the various projects in order to establish the intersections that would be impacted and the time periods that should be analyzed to estimate the traffic impacts. The preliminary trip generation analysis was submitted to the Highways Division of the Department of Transportation (HDOT-Highways) to establish the criteria for the analysis, study area, intersections and the time periods (weekday, Saturday, peak hours) to be analyzed.

2. Analyze Existing Traffic Conditions

Existing traffic volumes at the study intersections were determined from traffic counts performed during July and August, 1997. Intersection configurations and traffic control information were also collected in the field at the time of the traffic counts. Other data collected included bus stop locations, bus routes, speed limits and traffic signal phasing.

The methodology for signalized and unsignalized intersections described in the 1994 *Highway Capacity Manual* (HCM) [3] was used to determine the level-of-service (LOS) at the study intersections. Existing traffic conditions, the LOS concept and the results of the LOS analysis for existing conditions is presented in Chapter 2.

3. Estimate and Analyze Cumulative Traffic Projections

Cumulative traffic conditions are defined as future background traffic conditions without the proposed project. The year 2003 was established as the design year. In general, the process involved the expansion of existing traffic volumes by the appropriate growth factor plus the addition of traffic generated by potential development adjacent to the project sites. Traffic studies for related projects were obtained and the relevant traffic data extracted where possible. A description of the process and relevant projects used to estimate 2003 cumulative traffic volumes is presented in Chapter 3.

4. Estimate Project-Related Traffic Characteristics

The next step in the traffic analysis was to estimate the peak-hour traffic that would be generated by the proposed development. The typical method is to use standard trip generation rates provided by the Institute of Transportation Engineers. However, there are no data for the types of facilities proposed nor would trip generation rates from a standard reference reflect the unique traffic characteristics in Honolulu. Therefore, it was decided that a series of traffic generation studies specific to the proposed uses would be performed. These surveys resulted in traffic generation rates that were applied to the proposed projects. The results of these surveys and the calculation of project related traffic is presented in Chapter 4. Detailed discussion of the traffic generation surveys is presented in the appendices.

[3] *Highway Capacity Manual*, Institute of Transportation Engineers, Washington, D.C., 1998

These trips were distributed based on the available approach and departure routes. The project-related traffic was then superimposed on 2003 cumulative traffic volumes at the subject intersections. The HCM methodology was used again to conduct a LOS analysis for cumulative plus project conditions. The results of this analysis were compared to 2003 cumulative conditions to determine the impacts of this project. The 2003 cumulative plus project traffic projections are presented in Chapter 4.

5. *Analysis of Project-Related Traffic Impacts*

The project-related traffic impacts were determined by comparing 2003 cumulative plus project to 2003 cumulative LOS calculations. The analysis of the project-related impacts and the conclusions of the analyses are presented in Chapter 5.

A flow chart of the above tasks is shown as Figure 2.

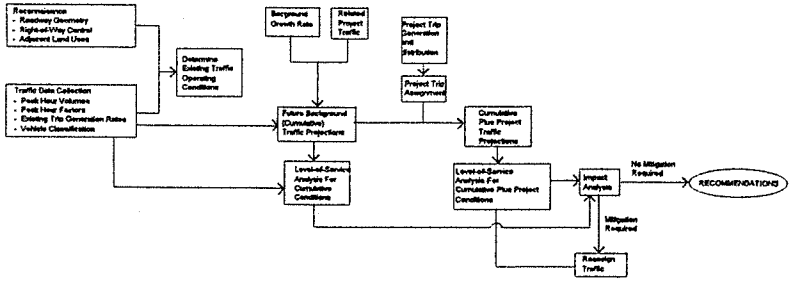


Figure 2

WORK PROGRAM FLOW CHART

Study Area and Study Intersections

Improvements associated with the Master Plan are located between Keehi Lagoon on the west and Kewalo and Pier 2 on the east. At the outset of the traffic study, it was decided that input from Hawaii Department of Transportation (HDOT) would be desirable to define the study area. However, before any input could be solicited, it was necessary to perform a preliminary trip generation analysis of the proposed projects to establish the magnitude of the potential traffic impacts.

The results on these meetings and discussion were:

1. The intersections along Ala Moana Boulevard between South Street and Punchbowl Street would be analyzed for the weekday afternoon peak commute period (between 4 PM and 6 PM) to establish the worst-case conditions and during the peak Saturday morning commute period (between 7 AM and 9 AM) because this is the time period that interisland cruise ship arrive at the current cruise ship terminal.

2. The entrance to Piers 24 through 26 would be analyzed for the weekday afternoon peak commute period (4 PM to 6 PM) because this would represent the worst-case condition and the traffic generation characteristics for the proposed excursion vessel operations are the same for weekdays and weekends.

3. Traffic generation surveys would be performed for the existing cruise ship and excursion vessel operations to rates for the new facilities.

2. ANALYSIS OF EXISTING CONDITIONS

This chapter presents the existing traffic conditions on the roadways adjacent to the proposed projects. The level-of-service concept (LOS) and the results of the LOS analysis for existing conditions is also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a subsequent chapter.

Description of Existing Streets and Intersection Controls

The intersections analyzed and existing lane configurations are shown on Figures 3 and 4. These intersections were selected based on a preliminary trip generation analysis to determine the magnitude and location of trips generated by the proposed improvements. Photographs of the roadways adjacent to the shopping center are presented as Appendix A.

Ala Moana Boulevard. Ala Moana Boulevard is an east-west major arterial linking downtown Honolulu with Waikiki. The section studied in this project is between Punchbowl Street and South Street. This section has three lanes in each direction and left turn storage lanes at South Street and Channel Street. The posted speed limit along Ala Moana Boulevard is 35 miles per hour (both directions). The eastbound average daily traffic (ADT) is 40,100 vpd (vehicles per day) and the westbound ADT is 38,000 vpd.

South Street. South Street is a four-lane, north-south arterial between Ala Moana Boulevard and King Street. The intersection of South Street at Ala Moana Boulevard is signalized with a leading left turn phase for eastbound to northbound left turns. The northbound and southbound ADT's are 4,340 vpd and 3,790 vpd, respectively.

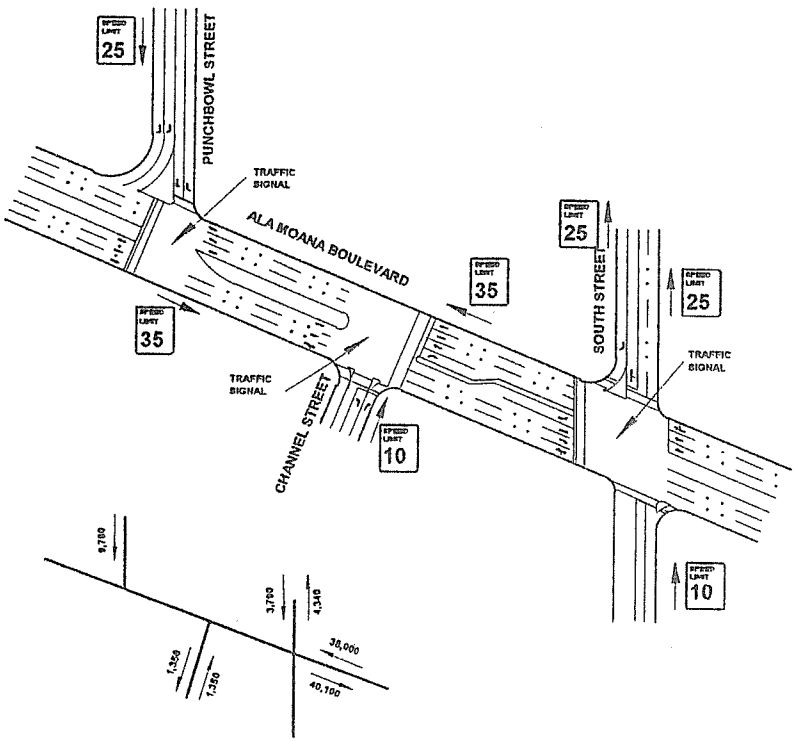
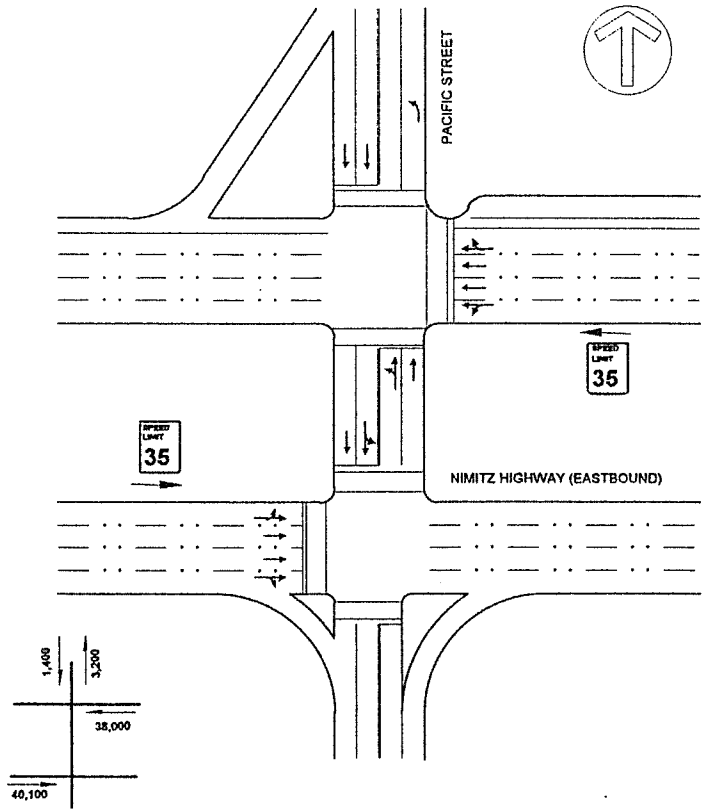


Figure 3

EXISTING ROADWAY CONDITIONS - PIER 2 AREA



AVERAGE DAILY TRAFFIC
(IN VEHICLES PER DAY)

Figure 4

EXISTING ROADWAY CONDITIONS ENTRANCE TO PIERS 24 THROUGH 26

Channel Street. Channel Street is a short roadway south of Ala Moana Boulevard providing access to the Foreign Trade Zone at Piers 1 and 2. The roadway has two lanes in each direction. The ADT is 1,350 vpd in each direction. The intersection of Channel Street at Ala Moana Boulevard is signalized.

Punchbowl Street. Punchbowl Street is a southbound arterial between Beretania Street to the north and Ala Moana Boulevard to the south. The southbound approach to Ala Moana Boulevard has two left-turn lanes and two right-turn lanes. The ADT is approximately 9,780 vpd. The Punchbowl Street/Ala Moana Boulevard is signalized.

Nimitz Highway. Nimitz Highway is an east-west arterial linking Honolulu with Honolulu International Airport. The section under study includes the approaches to Pacific Street which provide access to Piers 24 through 26. The posted speed limit is 35 mph in both directions. The eastbound ADT is 40,100 vpd and the westbound ADT is 38,000 vpd.

Pacific Street. Pacific Street is a north-south two-lane roadway intersecting Nimitz Highway in the vicinity of Piers 24 through 26. The ADT is approximately 3,200 vpd northbound and 1,400 vpd southbound. There were no speed limit signs posted. The speed limit was assumed to be 25 mph for the following calculations. The intersection with Nimitz Highway is signalized.

Traffic characteristics of these roadways are summarized in Table 2.

Table 2 Traffic Characteristics of Study Roadways

Roadway & Direction		Posted Speed	Average Daily Traffic
Ala Moana Boulevard			
	Eastbound	35 mph	40,100[1]
	Westbound	35 mph	38,000[1]
South Street			
	Northbound	25 mph	4,340[3]
	Southbound	25 mph	3,790[3]
Channel Street			
	Northbound	10 mph	1,350[3]
	Southbound	10 mph	1,350[3]
Punchbowl Street			
	Southbound	25 mph	9,780[3]
Nimitz Highway			
	Eastbound	35 mph	40,100[2]
	Westbound	35 mph	38,000[2]
Pacific Street (North of Nimitz Highway)[4]			
	Northbound	25 mph	3,200[3]
	Southbound	25 mph	1,400[3]

NOTES:
(1) Hawaii Department of Transportation. Date of Survey: Monday, December 11, 1995.
(2) Hawaii Department of Transportation. Date of Survey: July 31, 1997.
(3) Estimated from traffic counts.
(4) Counts were performed prior relocation of Young Brothers' operation from Piers 24-26 to Piers 39-40.

Existing Peak Hour Traffic Volumes

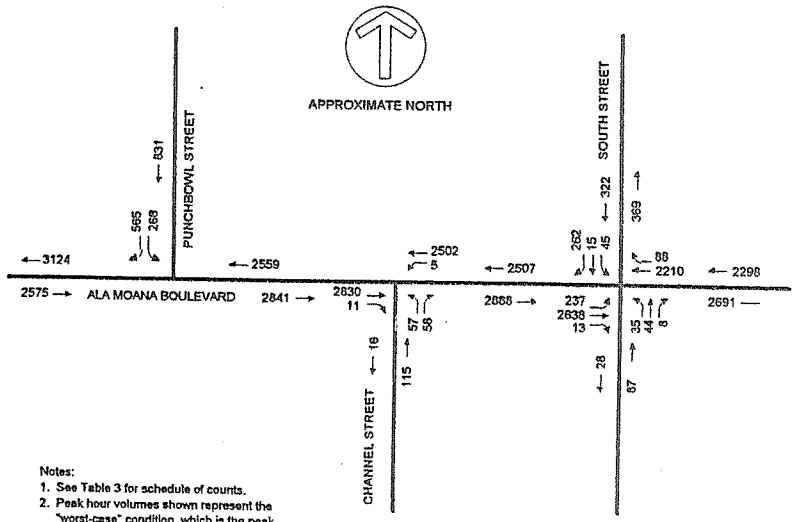
Traffic counts for this project were performed in July and August 1998. The schedule for the traffic counts is shown in Table 3. Traffic counts were performed during the weekday afternoon to include the AM and PM peak commute period of the street intersections, which would be the "worst-case" condition.

Table 3 Traffic Count Schedule

Intersection	Weekday	Weekend
Ala Moana Bl. at South St.	Monday, October 19, 1998	Saturday, October 17, 1998
Ala Moana Bl. at Channel St.	Monday, October 19, 1998	Saturday, November 14, 1998
Ala Moana Bl. at Punchbowl St.	Monday, October 19, 1998	Saturday. September 26, 1998
Nimitz Hwy. at Pacific St. North	Friday, July 24, 1998	Not Counted
Nimitz Hwy at Pacific St. South	Thursday, July 23, 1998	Not Counted

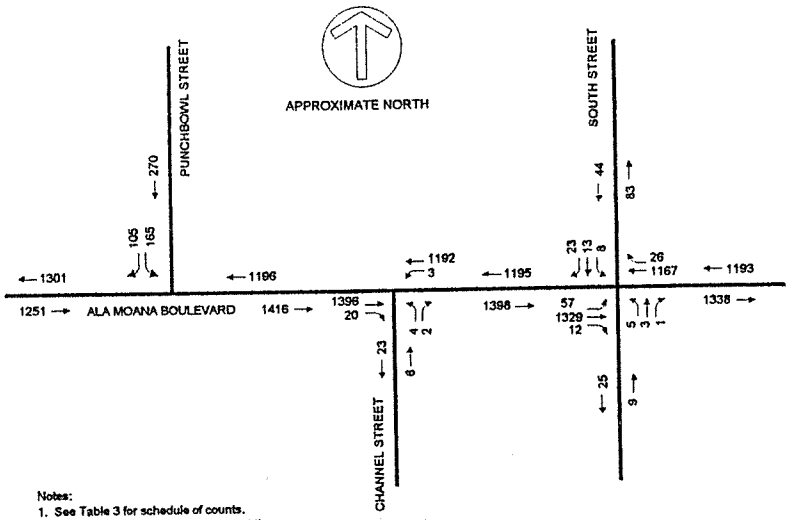
Notes:
(1) Weekday counts were conducted from 6 AM to 9 AM and 3 PM to 6 PM. Saturday counts were conducted from 7 AM to 9 AM.

The peak hour traffic volumes at the study intersections serving the project are shown in Figures 5, 6 and 7 for Pier 2 and Piers 24 through 26, respectively. The volumes shown are the peak hourly volumes of each traffic movement at the study intersections and represent the peak hourly volumes along the adjacent streets. The sum of these movements will be slightly higher than the conditions in the field. This will result in a "worst-case" scenario since it represents a condition in which the peak conditions of all traffic movements occur simultaneously.



Notes:
1. See Table 3 for schedule of counts.
2. Peak hour volumes shown represent the "worst-case" condition, which is the peak hourly volume of each movement at the study intersections.

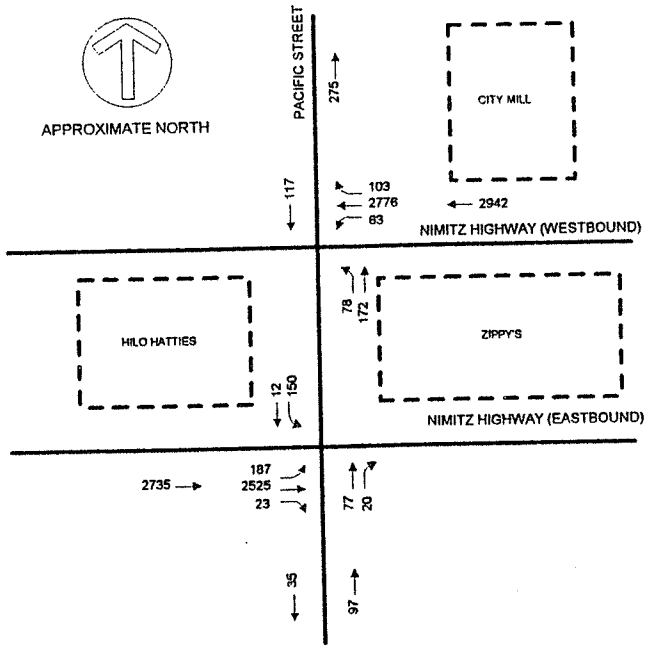
Figure 5
EXISTING PM PEAK HOUR TRAFFIC VOLUMES AT PIER 2



Notes:
1. See Table 3 for schedule of counts.
2. Peak hour volumes shown represent the "worst-case" condition, which is the peak hourly volume of each movement at the study intersections.

Figure 6

EXISTING SATURDAY PEAK HOUR TRAFFIC VOLUMES AT PIER 2



Notes:
1. See Table 3 for schedule of counts.
2. Peak hour volumes shown represent the "worst-case" condition, which is the peak hourly volume of each movement at the study intersections.

Figure 7

EXISTING PM PEAK HOUR TRAFFIC VOLUMES AT PIERS 24 THROUGH 26

Level-of-Service Concept

Signalized Intersections

The planning method described in the *1994 Highway Capacity Manual* (HCM) was used to analyze the operating efficiency of the signalized intersections adjacent to the study site. This method involves the calculation of a volume-to-capacity (V/C) ratio which is related to a level-of-service. A maximum intersection capacity based on the number of phases was used for the V/C calculations.

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 4. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. Level-of-service D is typically considered acceptable for peak hour conditions in urban areas.

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Table 4 Level-of-Service Definitions for Signalized Intersections[1]

Level of Service	Interpretation	Volume-to-Capacity Ratio[2]	Stopped Delay (Seconds)
A, B	Uncongested operations; all vehicles clear in a single cycle.	0.000-0.700	<15.0
C	Light congestion; occasional backups on critical approaches	0.701-0.800	15.1-25.0
D	Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed.	0.801-0.900	25.1-40.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.	0.901-1.000	40.1-60.0
F	Total breakdown with stop-and-go operation	>1.001	>60.0

Notes:
(1) Source: *Highway Capacity Manual*, 1994.
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity.

Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for level-of-service at an unsignalized intersection is therefore based on delay of each turning movement. Table 5 summarizes the definitions for level-of-service and the corresponding delay. A subsequent calculation to determine an overall LOS was made, and these results are presented in tables to summarize traffic conditions using parameters similar to those used for signalized intersections.

Table 5 Level-of-Service Definitions for Unsignalized Intersections[1]

Level-of-Service	Expected Delay to Minor Street Traffic	Delay (Seconds)
A	Little or no delay	>5
B	Short traffic delays	5.1 to 10.0
C	Average traffic delays	10.1 to 20.0
D	Long traffic delays	20.1 to 30.0
E	Very long traffic delays	30.1 to 45.0
F	See note (2) below	>45.1

Notes:
(1) Source: *Highway Capacity Manual*, 1994.
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

Level-of-Service Analysis of Existing Conditions

The results of the Level-of-Service analysis for the signalized intersections are shown in Table 6. The calculations are presented in Attachment B.

Table 6 Results of Level-of-Service Analysis for Existing Conditions

Intersection and Movement	PM Peak Hour			Saturday Peak Hour		
	V/C[1]	Delay	LOS[2]	V/C	Delay	LOS
Ala Moana Bl. at South Street	0.893	19.3	C	0.361	7.8	B
Eastbound Left	1.093	115.9	F	0.324	34.5	D
Eastbound Thru & Right	0.739	6.1	B	0.382	3.5	A
Westbound Thru & Right	0.790	13.9	B	0.421	9.1	B
Northbound Left & Thru	0.379	31.1	D	0.054	28.7	D
Northbound Right	0.051	28.7	D	0.013	28.5	D
Southbound Left & Thru	0.454	32.1	D	0.169	29.4	D
Southbound Right	1.080	101.7	F	0.196	29.6	D
Ala Moana Bl. at Channel St.	0.710	7.4	B	0.344	3.8	A
Eastbound Thru & Right	0.816	8.8	B	0.434	4.7	A
Westbound Left	0.126	37.9	D	0.042	37.7	D
Westbound Thru	0.669	3.9	A	0.319	2.3	A
Northbound Left	0.360	32.2	D	0.029	30.2	D
Northbound Right	0.419	32.8	D	0.016	30.1	D
Ala Moana Bl. at Punchbowl St.	0.346	6.8	B	0.346	6.8	B
Eastbound Thru	0.378	4.5	A	0.378	4.5	A
Westbound Thru	0.362	4.4	A	0.362	4.4	A
Southbound Left	0.242	26.4	D	0.242	26.4	D
Southbound Right	0.212	26.1	D	0.212	26.1	D
Nimitz Highway (Eastbound) at Pacific St.[3]	0.655	7.2	B	NOT ANALYZED		
Westbound Right, Thru & Left	0.611	4.6	A			
Northbound Thru	0.362	23.9	C			
Northbound Right	0.114	22.4	C			
Southbound Left	0.816	40.6	E			
Southbound Thru	0.054	22.1	C			
Nimitz Highway (Westbound) at Pacific St.[3]	0.726	9.8	B	NOT ANALYZED		
Westbound Left, Thru & Right	0.672	5.0	A			
Northbound Left	0.691	33.8	D			
Northbound Thru	0.923	47.0	E			
Southbound Thru	0.373	24.0	C			

NOTES:
(1) V/C denotes ratio of volume to capacity. See Appendices B for calculations.
(2) LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay
(3) Conditions shown represent LOS before relocation of Young Brothers' operations from Piers 24-26 to Piers 39-40.

3. PROJECTED CUMULATIVE TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2003 cumulative traffic conditions. Cumulative traffic conditions are defined as the traffic conditions resulting from background growth and related projects, not including the proposed project under study. Comparison of cumulative traffic conditions to cumulative plus project conditions defines the traffic impacts of the project.

Cumulative traffic projections are calculated by adding estimated traffic growth to existing traffic volumes. Traffic growth consists of two components. The first is ambient background growth that is a result of regional growth and cannot be attributed to a specific project. The second component is estimated traffic that will be generated by other development projects in the vicinity of the proposed project. Each of these components are discussed separately.

Background Growth Rate

The background growth rate in the study area was estimated from traffic projection provided in the *Traffic Analysis for Kakaako Makai Area Plan* prepared by Kaku Associates in 1998 for the Hawaii Community Development Authority (HCDA) Makai Area Plan. The study provided 2020 traffic projections generated from developments adjacent to the study area. The study estimated that the regional background growth rate would be 1% per year through 2020. However, the growth rate was reduced to 0.5% to account for the traffic generated by the Kakaako Area Master Plan.

For the current study, the 1% background growth rate was used for areas other than Kakaako. For the area adjacent to Pier 2, the growth rate of 0.5% per year was used to be consistent with the Kakaako Makai traffic study. The traffic generated by the Kakaako Master Plan was considered a related project to be consistent with the projections provided in the *Kakaako Makai Area Plan*. This is discussed further in the following section.

Related Projects

There are two categories of related projects. The first is development projects, including projects associated with the Oahu Commercial Harbors 2020 Master Plan. Where possible, the traffic studies for these projects were obtained and the project related traffic data was extracted for the traffic study. Most these studies did not contain any information relative to Saturday traffic conditions. Any data not provided by the project's traffic study had to be calculated for the Harbors traffic study to be complete. For those projects which did not have a traffic study, the necessary information required to generate, distribute and assign project related traffic was extracted from the traffic study and the necessary calculation performed.

The second category of related projects is roadway improvement projects. As with redevelopment projects, traffic studies were obtained when possible. For the others, the assumptions used to adjust traffic projects are discussed.

The roadway improvement projects were the Ilalo Street improvements, which includes a connection to Punchbowl Street on the west and to Ward Avenue on the east.

The related projects are listed in Table 7. This list was compiled during development of the scope for the Oahu Commercial Harbors 2020 Master Plan EIS and, therefore, had to be addressed in this traffic study. Shown are the projects and the source of the required traffic data. In addition to the data shown in the table, assumptions had to be made in order to estimate the traffic generated by the related project. The specific assumptions for each of the related projects is discussed in the following paragraphs.

Table 7 Related Projects

Number	Project	Source of Background Traffic Data
1	Honolulu International Airport Expansion	Traffic generated by the project included in background growth rate
2	Honolulu Trolley System	Additional information needed from City and County.
3	Kuhio Beach Improvement	Traffic generated by the project included in background growth rate
4	Waipio Peninsula Recreation Park	Traffic generated by the project included in background growth rate
5	Barbers Point Deep Water Expansion and Related Improvements [a]	Traffic generated by the project included in background growth rate
6	Mother Waldron Park Master Plan Revision	Traffic generated by the project included in background growth rate
7	A'ala Park Renovation and Expansion	Traffic generated by the project included in background growth rate
8	Sand Island Development	Traffic generated by the project included in background growth rate
9	Aloha Tower	Traffic projections taken from project's traffic study.
10	Kakaako Community Development Plan	Traffic projections taken from project's traffic study.
11	Kakaako Makai Area Plan (includes Ilalo Street extensions)	Traffic projections taken from project's traffic study.
12	Bank of Hawaii Annex Tower	Traffic projections taken from project's traffic study.
13	General Cargo Yard at Piers 19-20 [a]	Traffic estimated, distributed and assigned.
14	Piers 31-34 Neobulk Cargo [a]	Traffic estimated, distributed and assigned.
15	Excursion Vessel Accommodations at Piers 5-7 [a]	Traffic estimated, distributed and assigned.
16	Domestic Fishing Village at Piers 36-38 [a]	Traffic estimated, distributed and assigned.
17	Inter-Island Cargo Yard at Piers 39-40 [a]	Traffic estimated, distributed and assigned.
18	Maritime Office Building at Piers 10-11 [a]	Traffic estimated, distributed and assigned.
19	Bike Plan Hawaii	Will not have any impact on traffic projections but is considered in developing and analyzing intersection geometry.

Notes:
(a) Projects exempt from EIS process but will be identified in the EIS.
(b) Projects whose EA's/EIS's will be incorporated by reference.

Related Projects

1. *Honolulu International Airport Expansion.* Additional traffic along Nimitz Highway and Ala Moana Boulevard as result of the expansion of the Honolulu International Airport (HIA) was considered part of the regional growth factors. This would be consistent with the Kakaako Master Plan and the Kakaako Makai Area Plan traffic studies.

2. *Honolulu Trolley System.* This project is still under development. At this stage, the routing and scheduling for the system has not been developed so that the potential impacts can be established. However, since the purpose of such a project is to increase the use of public transportation, any impact of the project would be to reduce the number of private automobiles within the study. Since the information available is so limited, no consideration at this time would be a conservative approach.

3. *Kuhio Beach Improvement.* Additional traffic from this project was considered part of the regional growth rate.

4. *Waipio Peninsula Recreation Park.* Considered part of the regional growth.

5. *Barber's Point Deep Water Expansion and Related Improvements.* The traffic study for this project was obtained and reviewed. The estimated traffic generated was calculated from the graphics in the report since no trip generation calculations were provided. The morning and afternoon peak hour traffic volumes generated were estimated to be 530 and 230 vehicles per hour, respectively. Since this is a relatively small amount of traffic and Barber's Point is 20 miles from the study areas, traffic would dissipate over the roadway system such that any resulting traffic would be minimal. Therefore, any traffic generated by this project was considered part of the regional growth.

6. *Mother Waldron Park Master Plan Revision.* No traffic impacts at the study intersections are anticipated. Any traffic increases would be part of regional growth.

7. *A'ala Park Renovation and Expansion.* No traffic impacts are anticipated at the study intersections.

8. *Sand Island Development.* No traffic study was available nor was a description of the proposed project from which to estimate future traffic. Therefore, any traffic increases at the study intersections as a result of this project was considered part of the regional growth. This would be consistent with the assumptions in the *Kakaako Makai Area Plan Traffic Study.*

9. *Aloha Tower.* The traffic studies for the overall Aloha Tower project and the Waterfront portion of the project were obtained. Since, the Waterfront portion is completed and occupied, traffic from this project would be included in the existing traffic counts. There is no timetable for development of the remaining phases of the Aloha Tower project, so it is reasonable to assume that there will not be any additional development of Aloha Tower before the 2003 design year for the Harbors Master Plan traffic study. In conclusion, it was assumed that no additional traffic would be generated through the study intersections within the study period.

10. *Kakaako Community Development Plan.* Traffic generated by this project was calculated from data provided in the *Kakaako Makai Area Traffic Study.* Since the design year was 2020, traffic from this project was prorated from 1998 to 2020 to estimate 2003 conditions.

11. *Kakaako Makai Area Plan.* The traffic from this project was obtained from the *Kakaako Makai Area Traffic Study* and prorated as with the Kakaako Community Development Plan. An important aspect of this study was the recommendation to link Ilalo Street with Punchbowl Street and Ward Avenue.

12. *Bank of Hawaii Annex Tower.* This project is a proposed office building along the north side of Nimitz Highway between Nuuanu Avenue and Smith Street and will generate traffic along Nimitz Highway and Ala Moana Boulevard. Traffic projections generated by this project were obtained from the *Traffic Impact Analysis Report for the Bank of Hawaii Annex Tower.*

13. *General Cargo Yard at Piers 19 through 20.* Traffic generated by this project was estimated from standard trip generation rates provided by the Institute of Transportation Engineers, distributed and assigned to the study intersections.

14. *Piers 31-34 Neobulk Cargo Facility.* Traffic from this project was also generated, distributed and assigned as with the previous project.

15. *Excursion Vessel Accommodations at Piers 5-7.* Traffic generated by this project was estimated using trip generation rates for excursion vessel activities determined from studies performed as part of the Harbors Traffic Study. These surveys are discussed in the following chapter since the studies were performed to determine trip generation rates for part of the proposed study.

16. *Domestic Fishing Village at Piers 36 through 18.* This project will generate minimal traffic during the peak commuter hours (7 AM to 9 AM and 4 PM to 6 PM). Therefore, any peak commute period traffic generated by this project was considered part of the regional growth.

17. *Inter-island Cargo Yard at Piers 39 through 40.* Traffic projections were estimated using standard ITE rates. The trips were then distributed and assigned to the study intersections.

18. *Maritime Office Building at Piers 10 & 11.* Traffic generated by an office building was estimated using ITE trip generation rates, distributed and assigned to the study intersections. The calculations were based on an office building of 271,580 square feet. This is the area used for an office building in the Aloha Tower traffic study.

19. *Bike Plan Hawaii.* This project will have no impact on traffic volumes at the study intersections. However, the recommendations were considered the evaluation of the intersection geometry. This means that any recommendations would provide sufficient width for bike lanes and crosswalks. Traffic signal phasing would provide phasing for bicycle as well as pedestrian crossings.

2003 Cumulative Traffic Projections

Traffic projections for 2003 cumulative (without project) conditions were calculated by expanding existing traffic volumes by the appropriate growth rate and adding the peak hour traffic from the related project. This procedure assumes that the peak hour of each related project coincides with the peak commuter period of the adjacent street network. In reality, there may be a slight difference in the peak hour for each component. The assumption that all peak hours coincide results in conservative peak hourly volume estimates, representing the "worst-case" scenario.

The HCDA advised that work would commence on the Ilalo Street improvements described in the *Traffic Analysis for Kakaako Makai Area Plan* in the Spring of 1999. Therefore, traffic projections for cumulative conditions reflect the improvements recommended in the *Kakaako Makai Area Plan Traffic Study.* The

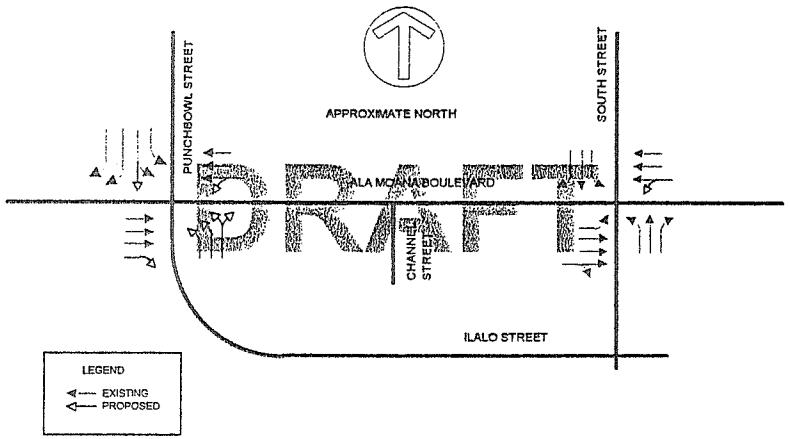


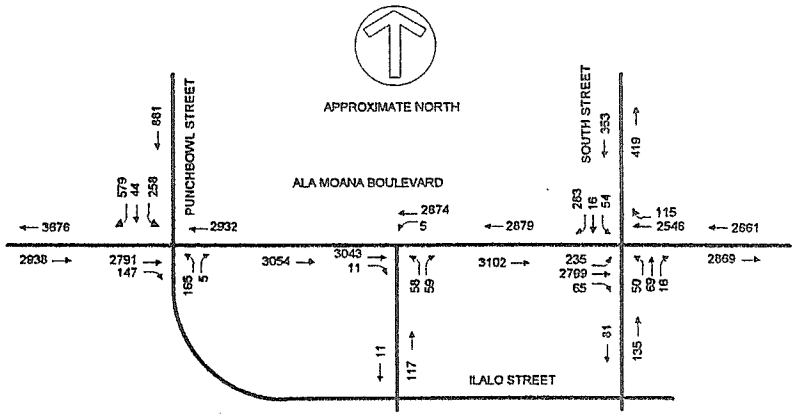
Figure 8

LANE CONFIGURATIONS FOR PUNCHBOWL STREET-ILALO STREET CONNECTOR

applicable improvements include a connection between Punchbowl Street and Ilalo Street (referred to as the Punchbowl Street/Ilalo Street Connector), installation of westbound to southbound left turns at South Street and Punchbowl Street, and provision for southbound through traffic at the intersection of Punchbowl Street at Ala Moana Boulevard. These street improvements are shown in Figure 8.

The resulting 2003 cumulative peak hour traffic projections are shown in Figures 9, 10 and 11. The volumes shown represent the 2003 cumulative peak hourly traffic volumes at the study intersections and is the sum of the peak commute period traffic of the street and the peak hour of each related project.

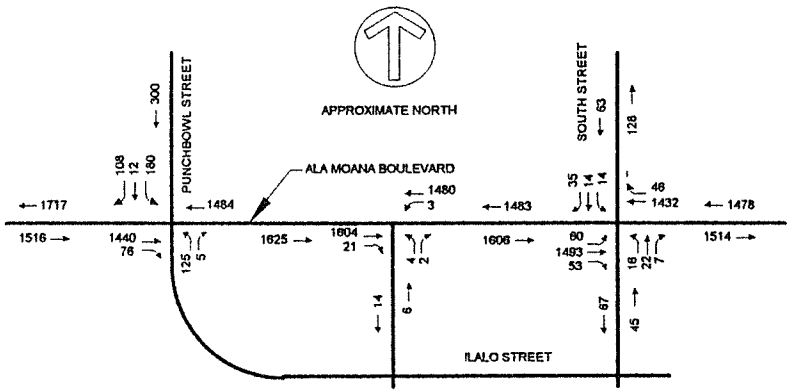
The analysis of cumulative peak hour conditions determined that the westbound to southbound left turns would create a "de facto" left turn lane because of the heavy opposing traffic volumes, resulting in only two westbound through lanes at these intersections. The calculated V/C ratios were greater than 2.0 and delays could not be calculated. In conclusion, in order to calculate delays and LOS's, the left turns had to be removed. This is reflected in the volumes shown.



EXISTING ROADWAY NETWORK
WITH ILALO STREET/PUNCHBOWL STREET CONNECTOR

Figure 9

CUMULATIVE PM PEAK HOUR TRAFFIC VOLUMES AT PIER 2



EXISTING ROADWAY NETWORK
WITH ILALO STREET/PUNCHBOWL STREET CONNECTOR

Figure 10

CUMULATIVE SATURDAY PEAK HOUR TRAFFIC VOLUMES AT PIER 2

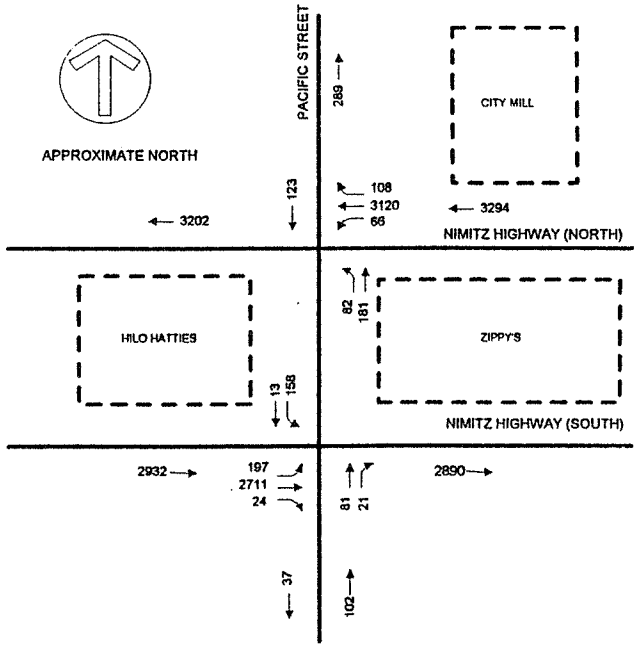


Figure 11

CUMULATIVE WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES AT PIERS 24 THROUGH 26

4. PROJECT-RELATED TRAFFIC CONDITIONS

This chapter discusses the methodology used to identify the traffic-related impacts of the proposed project. Generally, the process involves the determination of weekday peak-hour trips that would be generated by the proposed project, distribution and assignment of these trips on the approach and departure routes, and finally, determination of the levels-of-service at affected intersections and driveways subsequent to implementation of the project. The proposed project under study consists of four separate projects with different trip generation characteristics. Further, none of the proposed uses have established trip generation rates of equations in the standard references. Therefore, the methodology used to estimate the trip generation characteristics and the results of the trip generation analysis of each of the proposed uses is described separately.

Pier 2

The development proposed for Pier 2 consists of constructing a new terminal to be used by interisland, foreign, and domestic cruise ships. No standard trip generation rates or equations were identified through a review of trip generation literature. Also, it is well known that the activities occurring in the harbor area are unique. Therefore, it was determined that a trip generation study specific to the Honolulu Harbor would be the most reliable approach to estimate future trips generated by the proposed project.

Separate trip generation analyses were performed for interisland and domestic/foreign cruise ships. Each is discussed separately.

Interisland Cruises

The characteristics of the interisland cruise ship were determined from interviews with and data provided by the operators. The characteristics that impact traffic generation are:

1. The capacity of an interisland cruise ship is 850 passengers and the cruises are typically full, that is 100% occupancy.

2. Approximately 30% of the passengers are part of an organized tour group that provides transportation between the cruise ship terminal and Waikiki. The remaining passengers are referred to as Free Independent Travelers (FIT's).

3. The average number of employees per cruise is 335.

4. All interisland cruises are currently scheduled to arrive on Saturday morning and depart on Saturday evening. Therefore, interisland cruise ship operations have no impacts on weekday peak hour traffic conditions along the adjacent streets. Based on discussions with HDOT-Harbors, future interisland cruises will have the same schedule.

A survey of the traffic generated by an interisland cruise ship operation was performed on Saturday, September 5, 1998. The purpose of the survey was to determine the amount of vehicular traffic (including service vehicles) generated by the arrival of an interisland cruise ship and relate the number of vehicular trips to the number of passengers on the cruise ship. It was determined during the surveys that a cruise ship arrival would have much greater traffic impacts than a cruise ship departure because passengers arrive throughout the afternoon whereas passenger departures are concentrated within a short period after arrival of the cruise ship. The survey methodology and results are presented in Appendix C. The survey results are summarized in Table 8.

Table 8 Results of Interisland Cruise Ship Traffic Survey[1]

Direction	Trips per Hour[2]	Trips per 100 Passengers[3]
Inbound	78	9.18
Outbound	51	6.00
Total	129	15.18

NOTES:
(1) Survey was performed on Saturday, September 5, 1998. See Appendix E for details of survey methodology.
(2) Trips shown are the peak hourly volume of each class of vehicle serving the cruise ship. See Appendix C.
(3) Trip rate shown is based on 850 passengers which assumes the cruise ship was 100% occupied as indicated by the cruise ship operator.

Foreign Cruises

A survey of the traffic associated with the arrival and departure of a foreign cruise ship was performed to establish trip generation rates as with the interisland cruise ship operations. The survey methodology and calculations are presented in Appendix D. The survey determined that the peak hourly volume of traffic generated by the cruise ship operations occurs during the cruise ship arrival, during which there are 20.75 vehicular trips per 100 passengers, 9.50 inbound plus 11.25 outbound. This is the peak hourly volume rate of traffic associated with the cruise ship and may or may not be concurrent with the peak hour of the adjacent street.

The number of trips generated by foreign cruises were calculated using a similar methodology as for interisland cruises. Calculations were performed for an average and maximum sized cruise vessels. These data were determined for cruise ships that are scheduled for arrivals at Honolulu Harbor. Table 9 is a listing of ships currently scheduled for Honolulu along with the passenger capacity and number of crew for each ship. The average sized cruise ship has a capacity for 1,000 passengers with an average sized crew of 460. The largest cruise ship operating to and from Honolulu Harbor has a capacity of 2,000 passengers with a crew of 800. The traffic generated by average and maximum sized cruise ships is estimated in Table 10.

Table 9 Foreign Cruise Ships Using Honolulu Harbor

Operator	Vessel	Capacity[1] (Passengers)	Crew[1]
Norton Lill Hawaii	Crystal Harmony	960	545
	Crystal Symphony	960	545
	Asuka	400	270
	Delphin	460	260
Trans Marine	Crown Princess	1,600	700
	Island Princess	700	300
	Sky Princess	1,200	600
	Regal Princess	1,600	700
	Arcadia	1,600	600
	Oriana	1,700	700
Waldron Steamship	Silver Cloud	296	185
	Norwegian Star	850	380
	Norwegian Dynasty	800	300
	Norwegian Wind	1,800	700
	Rotterdam	1,400	644
	Legend of the Seas	1,804	732
	Silver Wind	296	185
	Statendam	1,264	588
	Arkona	480	243
	Jubilee	1,488	670
	Rhapsody of the Seas	2,000	765
	Vision of the Seas	1,800	730
Lavino Shipping	Paul Gaugin	320	250
	Deutschland	620	250
	Astor	650	250
	Vistafjord	750	400
	Queen Elizabeth II	1,200	800
	Maxim Gorky	650	350
	Royal Viking Sun	750	450
	Pacific Venus	720	180
	Albatross	Not Available	
Average Vessel Size		1,000	460
Maximum Vessel Size		2,000	800

Notes:
(1) Data shown was provided by the individual operators.

Table 10 Trip Generation Calculations for Foreign Cruise Ships

	Trips per 100 Passengers[1]	Trips Generated By Cruise Ship for: 1,000 Passengers	2,000 passengers
Cruise Ship Arrival			
Inbound	9.5	95	190
Outbound	11.25	113	225
Total	20.75	208	415
Cruise Ship Departure			
Inbound	3.38	34	68
Outbound	3.25	33	65
Total	6.63	67	133

Note:
(1) See Appendix D for calculations.

Conclusions

The trip generation analysis of interisland and foreign cruise operations results in the following conclusions:

1. The typical interisland cruise ship arrival will generate approximately 129 trips vehicular trips during the peak hour following arrival of the cruise ship. This peak hourly volume may or may not coincide with the peak hour of the adjacent street.

2. A foreign cruise ship with a capacity of 2,000 passengers will generate 415 vehicular trips during the peak hour after arrival of the ship.

3. The traffic generated by cruise ship operations was estimated for three scenarios to establish the worst-case condition. The calculations are shown in Table 11. As shown, the worst-case occurs when a larger cruise ship and an interisland cruise ship arrive concurrently. In this scenario, there would be a total of 544 trips generated, 268 inbound and 276 outbound.

Table 11 Trip Generation for Cruise Ship Arrival Scenarios

No.	Scenario	Inbound	Outbound	Total
1	1 Large Foreign Cruise Ship	190	225	415
2	2 Interisland Cruise Ships	156	102	258
3	1 Large Foreign Cruise Ship Plus 1 Interisland Cruise Ship	268	276	544

4. The transportation and parking facilities should be designed to accommodate approximately 900 vehicles. Since it is not often that two cruise ships would arrive simultaneously, planning to accommodate the arrival of a single large cruise ship would provide capacity to accommodate other scenarios with a margin of safety.

5. There would be little or no traffic generated by the cruise ship arrivals and departures during weekday peak commute periods. However, the adjacent intersections should be analyzed to determine impacts during the peak period of the generator even though this period will not be the peak hour of the adjacent street.

Piers 12 through 16

Piers 12 through 18 will be reconstructed to accommodate additional commercial fishing and temporary berthing facilities. Fishing boat activities at the current facility and at Kewalo Basin indicate that fishing boats depart well before the traffic peak hour begins and return to the harbor during the mid-afternoon. Thus, these operations will not generate any peak hour traffic and therefore will not impact peak hour traffic conditions along Nimitz Highway.

Piers 24 through 29

The assumptions used to calculate the trips generated by an excursion vessel terminal at Piers 24 through 29 are :

1. The new facility will replace the existing Young Brothers operation, which has been relocated to Piers 39-40.

2. The three piers will provide 1600 linear feet for docking.

3. Based of data provided by HDOT-Harbors, the average length required to accommodate an excursion boat is 200 feet. This means that the new facility will accommodate 8 boats.

4. The excursion vehicles will operate from 9 AM to 4 PM with dinner cruises departing after 5 PM. Thus, each boat will make 8 excursion operations and one dinner cruise per day for a total of 9 two way operations per day per boat, or 18 operations per day per boat.

The number of landside vehicular trips is based on counts performed at Kewalo Basin. The total number of vehicles entering Kewalo Basin was counted and compared to the number of boat operations, both

scheduled and actual. During this survey, the vehicles were classified so that the number of buses and shuttle buses could be estimated. The survey concluded that during the afternoon peak hour, there are 1.11 inbound vehicle trips and 0.90 outbound vehicle trips per daily boat operation. The survey data is presented in Appendix E. Therefore, the peak hour trips generated by the proposed development at Piers 24 through 29 is estimated as follows:

8 boats x 18 operations/day/boat x 1.11 trips per operation = 160 Inbound vehicle trips

8 boats x 18 operations/day/boat x 0.90 trips per operation = 130 Outbound vehicle trips

Keehi Lagoon

Keehi Lagoon is to be developed to provide approximately 13 lay berths. Lay berths are defined as berthing facilities to accommodate boats waiting for repairs or scheduled departures. Discussions with HDOT-Harbors indicated that traffic generated by the lay berths should be calculated using the following assumptions:

1. The average crew size will be between 6 and 8 persons. Seven was used for the calculations.
2. The maximum number of berths that could be occupied within one hour is 10.
3. Vehicles or taxicabs would be used to shuttle sailors to local destinations, including HIA. The average number of persons per vehicle would be 2.0.

Using these assumptions, the estimated number of vehicles that would be generated is 35 round trips (35 inbound and 35 outbound. All of this traffic would use Lagoon Drive.

Summary

The total trips generated by the proposed projects is summarized in Table 12. Only the excursion activities proposed for Piers 24 through 29 could impact traffic during the afternoon peak commuter period. Cruise ship operations proposed for Pier 2 will operate with scheduled arrivals and departures to occur outside the peak commuter periods. The impacts of a large cruise ship arrival and an interisland cruise ship arrival occurring concurrently represent the worst-case and thus was the scenario analyzed.

Table 12 Trip Generation Summary

	Weekday PM Peak(1)			Saturday Peak(1)		
Location and Project	In	Out	Total	In	Out	Total
Pier 2 Cruise Ship Terminal	268	276	544	268	276	544
Piers 12 - 24 Fishing Boat Berths		Minimal			Minimal	
Piers 24 - 26 Excursion Vessel Berths	160	130	290	160	130	290
Keehi Lagoon Lay Berths	35	35	70	35	35	70
Totals	463	441	904	463	441	904

Notes:
(1) Peak hour refers to the greater peak hour of the commuter period or the generator.

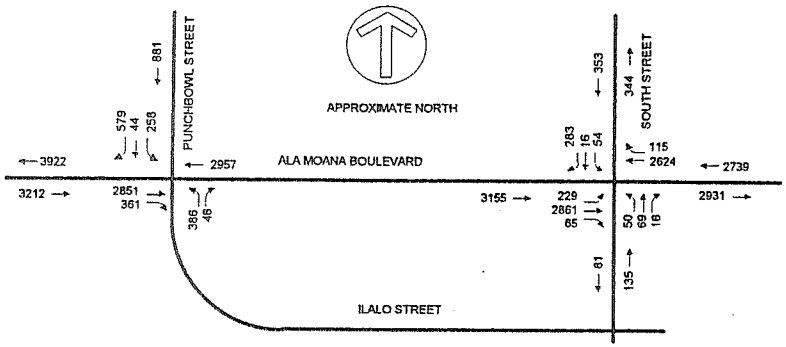
Trip Distribution and Assignment

The project-related trips were distributed along the anticipated approach routes to the project site. This information was obtained from previously conducted traffic studies in the area, which have been generally accepted by the reviewing agencies, traffic surveys and familiarity with cruise ship and excursion vessel operations. All these studies confirmed that traffic generated by the cruise ship operations would primarily shuttle passengers between the cruise ship terminal and HIA. Traffic generated by the excursion vessel operations would shuttle passengers between the excursion vessel berths and Waikiki since it primarily serves tourists.

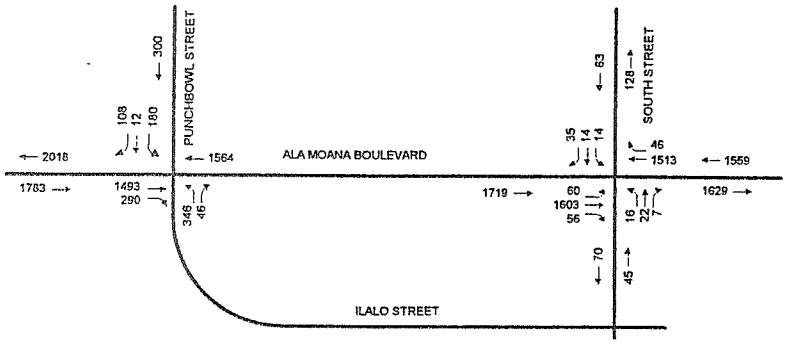
Using the trip generation and trip distribution previously discussed, project-related traffic was assigned to the various traffic movements at the intersections studied.

2003 Cumulative Plus Project Peak Hour Traffic Volumes

Future traffic volumes with the proposed projects were determined by superimposing the project-generated traffic on the 2003 cumulative traffic volumes presented in Chapter 3. The resulting "worst-case" peak hour traffic volumes for 2003 cumulative plus project are shown on Figures 12 and 13.



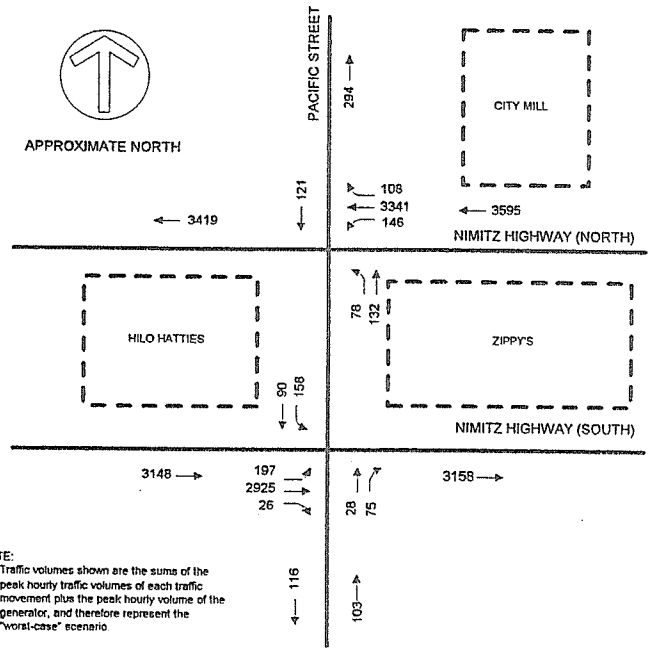
WEEKDAY PM PEAK HOUR



SATURDAY PEAK HOUR

NOTE
1 Traffic volumes shown are the sums of the peak hourly traffic volumes of each traffic movement plus the peak hourly volume of the generator, and therefore represent the "worst-case" scenario.

Figure 12
CUMULATIVE PLUS PROJECT PEAK HOUR TRAFFIC VOLUMES AT PIER 2



NOTE:
1. Traffic volumes shown are the sums of the peak hourly traffic volumes of each traffic movement plus the peak hourly volume of the generator, and therefore represent the "worst-case" scenario.

Figure 13
CUMULATIVE PLUS PROJECT PM PEAK HOUR TRAFFIC VOLUMES AT PIERS 24 THROUGH 26

5. CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to present the results of the level-of-service analysis, which identifies the project-related impacts. Each of the various scenarios is discussed separately. In addition, any mitigation measures necessary and feasible are identified and other access, egress and circulation issues are discussed.

Definition of Significant Traffic Impacts

Criteria for determining if a project has a significant traffic impact for which mitigation measures must be investigated have been established based on traffic impact study guidelines used in other traffic studies. Generally, the criteria are as follows: if the level-of-service (LOS) without the project is E or F and the volume/capacity (V/C) ratio changes less than 0.020, the project's traffic impacts are considered insignificant. However, if the V/C ratio change is greater than 0.020, then mitigation measures which will reduce the V/C ratio change to less than 0.020 must be identified. If the LOS with the project is D or better, then no mitigation measures need to be identified.

Project Related Traffic Impacts and Mitigation Measures

The impact of project related traffic is estimated by comparing the LOS analysis of cumulative plus project to cumulative (without project conditions) The methodology and assumptions used for this analysis are as follows:

1. The LOS analysis was performed for "worst-case" conditions, which is defined as the peak hourly traffic volume generated by the project (peak hour of the generator) superimposed on the peak hourly traffic volume during the peak commuter period of the adjacent street network. This represents a "worst-case" condition since the peak hours may not coincide in a real case condition.

2. The LOS analysis was performed using the operations method described in the 1998 Edition of the *Highway Capacity Manual.*

3. The LOS analysis was performed for weekday afternoon and Saturday morning "worse-case" traffic conditions for cumulative and cumulative plus project conditions.

4. For 2003 cumulative (without project) conditions, Ilalo Street will be in place. It was determined during the analysis of future background conditions that the shared westbound left turn and through lane at South Street and Punchbowl Street would not function because of the heavy eastbound through traffic. Westbound left turns are currently not allowed at these intersection because of width and sight distance restrictions and should not be allowed in the future. Future traffic assignments were adjusted to prohibit left turns consistent with existing conditions.

5. The section of Ilalo Street adjacent to Pier 2 was assumed to be constructed concurrently with the new passenger cruise ship terminal. Part of the construction of this roadway improvement is the demolition of Channel Street and the traffic signal at the intersection of Channel Street and Ala Moana Boulevard.

The results of the level-of-service analysis are tabulated in Table 12 and 13 and summarized for the study intersections as follows:

Ala Moana Boulevard at South Street

The analysis concluded that overall the intersection will operate at LOS C during the afternoon. However, the eastbound left will operate at LOS F without and with the project. The V/C ratio and the delay is actually less with the project than without the project because traffic associated with the foreign trade zone has been diverted. Thus, the proposed project will improve this condition slightly.

The northbound left and through movements and all the southbound approach movements will operated at LOS E or F without the project. These movements are not impacted by the proposed project

For Saturday conditions, the impacts are insignificant

Ala Moana Boulevard at Channel Street

This intersection will operate at LOS D during cumulative (without project) conditions. The intersection will be demolished during the construction of the final section of Ilalo Street and therefore was not analyzed for cumulative plus project conditions.

Table 13 Results of Level-of-Service Analysis - 2003 Weekday PM Peak Hour [1]

Intersection and Movement	Cumulative			Cumulative Plus Project				
				Weekday PM			Changes	
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay
Ala Moana Bl. at South Street	0.924	17.2	C	0.938	17.8	C	0.014	0.6
Eastbound Left	0.976	73.1	F	0.950	67.1	F	-0.026	-6.0
Eastbound Thru & Right	0.797	6.4	B	0.814	6.8	B	0.017	0.4
Westbound Thru & Right	0.915	18.4	C	0.942	20.4	C	0.027	2.0
Northbound Left & Thru	0.764	44.0	E	0.764	44.0	E	0.000	0.0
Northbound Right	0.111	30.1	D	0.111	30.1	D	0.000	0.0
Southbound Left & Thru	0.913	71.6	F	0.913	71.6	F	0.000	0.0
Southbound Right	0.818	45.9	E	0.818	45.9	E	0.000	0.0
Ala Moana Bl. at Channel St.	0.758	8.6	B	Demolished				
Eastbound Thru & Right	0.677	10.6	B					
Westbound Left	0.126	37.9	D					
Westbound Thru	0.769	5.0	A					
Northbound Left	0.367	32.2	D					
Northbound Right	0.423	32.9	D					
Ala Moana Bl. at Punchbowl St.	0.869	28.7	D	0.926	32.2	D	0.057	3.5
Eastbound Thru	0.962	22.5	C	0.983	27.0	D	0.021	4.5
Eastbound Right	0.167	7.5	B	0.349	3.1	A	0.182	-4.4
Westbound Thru	1.011	31.4	D	1.020	35.0	D	0.009	3.6
Northbound Left	0.304	32.2	D	0.600	41.1	E	0.296	8.9
Northbound Left & Right	0.214	31.7	D	0.483	40.1	E	0.269	8.4
Southbound Left	0.636	37.2	D	0.636	43.2	E	0.000	6.0
Southbound Thru & Left	0.714	39.8	D	0.714	45.9	E	0.000	6.1
Southbound Right	0.904	49.4	E	0.904	55.7	E	0.000	6.3
Nimitz Hwy (EB) at Pacific St.	0.706	8.0	B	0.679	10.3	B	-0.027	2.3
Eastbound Right, Thru & Left	0.655	4.9	A	0.786	9.0	B	0.131	4.1
Northbound Thru	0.381	24.0	C	0.095	18.3	C	-0.286	-5.7
Northbound Right	0.117	22.4	C	0.305	19.6	C	0.188	-2.8
Southbound Left	0.896	51.8	E	0.425	20.7	C	-0.471	-31.1
Southbound Thru	0.059	22.2	C	0.290	19.5	C	0.231	-2.7
Nimitz Hwy (WB) at Pacific St.	0.789	10.2	B	0.837	13.4	B	0.048	3.2
Westbound Left, Thru & Right	0.752	5.9	B	0.910	12.2	B	0.158	6.3
Northbound Left	0.762	39.8	D	0.408	20.7	C	-0.354	-19.1
Northbound Thru	0.923	47.0	E	0.665	24.1	C	-0.258	-22.9
Southbound Thru	0.392	24.1	C	0.278	19.4	C	-0.114	-4.7

NOTES:
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. See Appendices B for calculations.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay. See Table 4 for definitions.

Table 13 Results of Level-of-Service Analysis - 2003 Saturday Peak Hour[1]

Intersection and Movement	Cumulative			Cumulative Plus Project				
				Saturday Peak			Changes	
	V/C[2]	Delay[3]	LOS[4]	V/C	Delay	LOS	V/C	Delay
Ala Moana Bl. at South Street	0.405	7.8	B	0.414	7.9	B	0.009	0.1
Eastbound Left	0.251	33.0	D	0.251	33.0	D	0	0.0
Eastbound Thru & Right	0.435	3.3	A	0.467	3.4	A	0.032	0.1
Westbound Thru & Right	0.507	9.8	B	0.535	10.1	B	0.028	0.3
Northbound Left & Thru	0.176	30.5	D	0.176	30.5	D	0	0.0
Northbound Right	0.049	29.7	D	0.049	29.7	D	0	0.0
Southbound Left & Thru	0.186	30.5	D	0.186	30.5	D	0	0.0
Southbound Right	0.091	30.0	D	0.091	30.0	D	0	0.0
Ala Moana Bl. at Channel St.	0.373	3.9	A	Demolished				
Eastbound Thru & Right	0.469	4.9	A					
Westbound Left	0.073	37.7	D					
Westbound Thru	0.396	2.5	A					
Northbound Left	0.025	30.2	D					
Northbound Right	0.016	30.1	D					
Ala Moana Bl. at Punchbowl St.	0.417	14.3	B	0.539	15.6	C	0.122	1.3
Eastbound Thru	0.536	12.1	B	0.555	12.3	B	0.019	0.2
Eastbound Right	0.055	2.4	A	0.258	2.9	A	0.203	0.5
Westbound Thru	0.552	12.2	B	0.582	12.6	B	0.03	0.4
Northbound Left	0.124	29.6	D	0.583	33.4	D	0.459	3.8
Northbound Left & Right	0.185	30.0	D	0.588	34.6	D	0.403	4.6
Southbound Left	0.238	30.3	D	0.359	31.3	D	0.121	1.0
Southbound Thru & Left	0.228	30.3	D	0.330	31.0	D	0.102	0.7
Southbound Right	0.144	29.8	D	0.120	29.6	D	-0.024	-0.2
Nimitz Hwy (EB) at Pacific St.	Not Analyzed			Not Analyzed				
Eastbound Right, Thru & Left								
Northbound Thru								
Northbound Right								
Southbound Left								
Southbound Thru								
Nimitz Hwy (WB) at Pacific St.	Not Analyzed			Not Analyzed				
Westbound Left, Thru & Right								
Northbound Left								
Northbound Thru								
Southbound Thru								

NOTES
1. Peak hour conditions analyzed are "worst-case" conditions, which is the sum of the peak hour of the adjacent street plus the peak hour of the generator.
2. V/C denotes ratio of volume to capacity. See Appendices B for calculations.
3. Delay is in seconds per vehicle.
4. LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. LOS is based on delay. See Table 4 for definitions.

Ala Moana Boulevard at Punchbowl

Overall the intersection will operate at LOS D during afternoon condition without or with the project. Several movements will operate at LOS E based on delay because of the traffic signal timing and the relatively low volume of traffic compared to the other movements at the intersection. However, the V/C ratios are low, indicating a LOS of D or better. No improvements are recommended since the V/C ratio is low.

The intersection will operate at LOS D or better during Saturday conditions.

Nimitz Highway At Pacific Street

This intersection will operate at LOS C or better during afternoon conditions with the project. This is an improvement versus conditions without the project.

Conclusions

The results of the LOS analysis of cumulative plus project conditions versus cumulative without project conditions indicate that:

1. The proposed projects will have minimal impacts on traffic operations at the adjacent intersections during the weekday afternoon commuter period (worst-case conditions) and no significant impacts on Saturday conditions. The proposed projects will not have a significant impact of the adjacent intersections requiring mitigation.

2. Traffic generated by the projects studied in this report is localized and will not have a significant regional impact requiring implementation of mitigation measures.

3. Interisland cruise ship operations should continue to operate on the current schedule, which is to have arrivals and departures scheduled during Saturday morning and evenings, respectively.

4. A shuttle bus operation between Pier 2 and adjacent shopping areas should be considered for a period of several hours before the departure of a large cruise ship to reduce the pedestrian activity and associated impacts on traffic flow at the adjacent intersections. A schedule of one bus every 10 to 15 minutes would have a minimal impact of traffic operations but would enhance pedestrian safety. This operation would best be provided by the cruise operator.

Construction Impacts

Traffic impacts of construction activities are short term. The following guidelines should be followed:

1. Construction activities should be located off-street unless not practical. Such an area would be construction at Pier 12 through 16 where there is not off-street area for staging immediately adjacent to the site.

2. Lane closures should be coordinated with Hawaii Department of Transportation and City and County of Honolulu Department of Transportation Services.

6. GLOSSARY OF TERMS

At the outset of this project, there was concerned relative to the precise definition of "peak hour" traffic. Therefore, the following definitions of the peak hour terms used in the preceding study is provided:

1. *Peak Hour of the Intersection* - The peak hour of the intersections analyzed in this report is the peak hourly volume of each individual traffic movement at the intersection. The sum of each peak is higher than the peak of the sum of each movement because rarely does the peak of each movement occur concurrently.

2. *Peak Commuter Period* - This peak hour refers to the peak hourly volume that typically occurs during the morning or afternoon peak commute period. The morning peak commute period is typically between 7 AM and 9 AM; the afternoon peak is typically between 3:30 PM and 6:00 PM.

3. *Peak Hour of Generator* - The peak hour of the generator refers to the peak hourly volume of traffic generator and may, may not, coincide with the peak hour of the adjacent street. For instance, the peak hour of an office building will coincide with the peak hour of the adjacent street because the traffic stream is largely commuters. A school, on the other hand, will have a mid afternoon peak at the end of the school day, but does not generate enough traffic to create volume as high as those that occur during the peak commute period.

4. *Worst-Case Peak Hour Traffic Volume* - The worst-case peak hour traffic volume is calculated for the cumulative plus project condition and assumes that the peak hour of the generator of a project coincides with the peak hour of the adjacent street. This volume is the is the sum of the peak hourly traffic volume of each movement at the adjacent intersections during the AM, PM or Saturday commuter periods and the peak hourly volume of the proposed project or generator.

APPENDIX A

PHOTOGRAPHS OF STUDY INTERSECTIONS

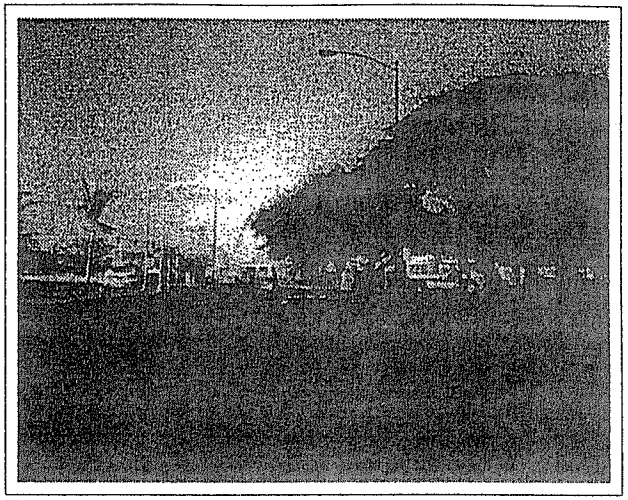


Figure A-1 Looking south along South Street toward intersection with Ala Moana Boulevard.

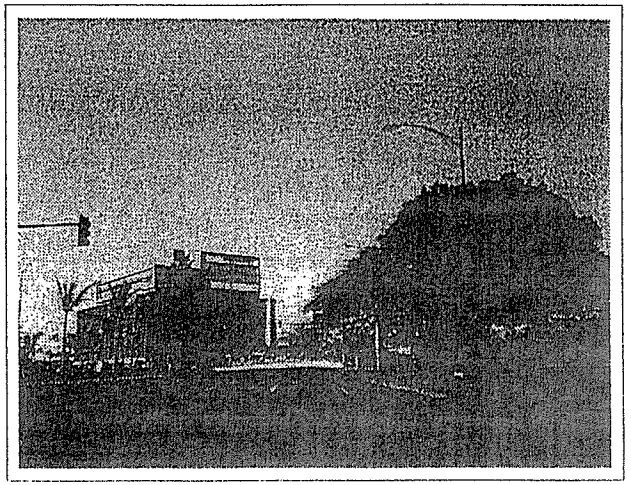


Figure A-2 Looking east along Ala Moana Boulevard toward intersection with South Street.

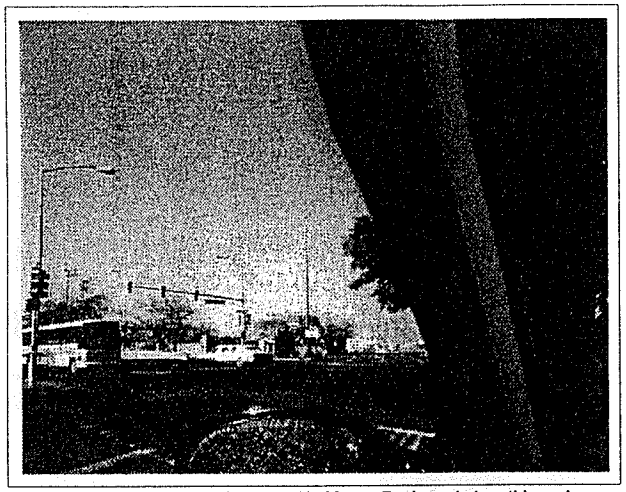


Figure A-3 Looking south across Ala Moana Boulevard at northbound approach of South Street at Ala Moana Boulevard.

Figure A-4 Looking north along South Street toward intersection with Ala Moana Boulevard.

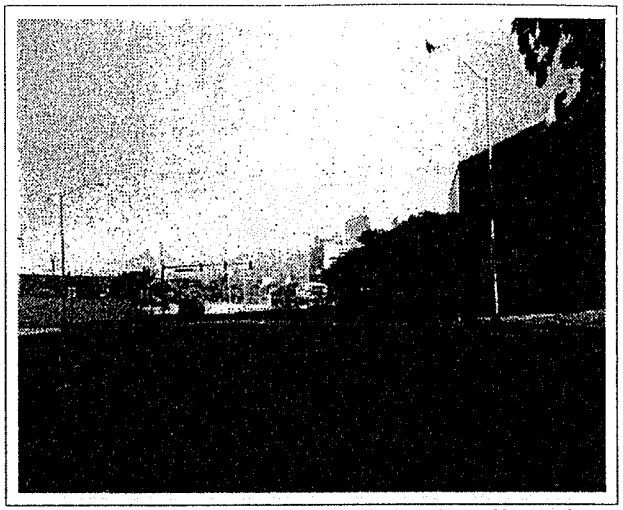


Figure A-5 Looking west along Ala Moana Boulevard toward intersection with Channel Street.

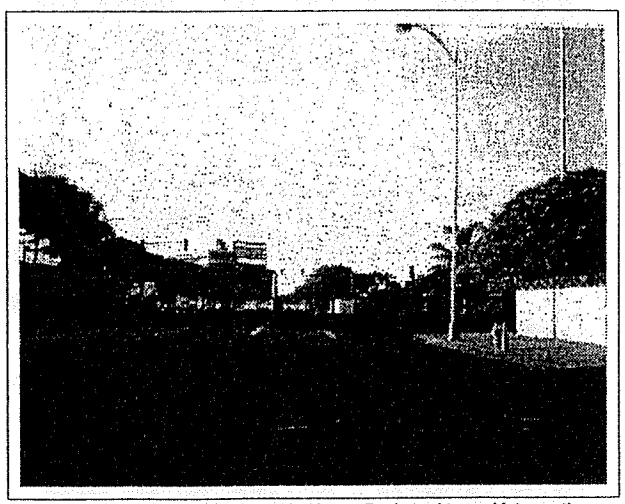


Figure A-6 Looking east along Ala Moana Boulevard toward intersection with Channel Street.

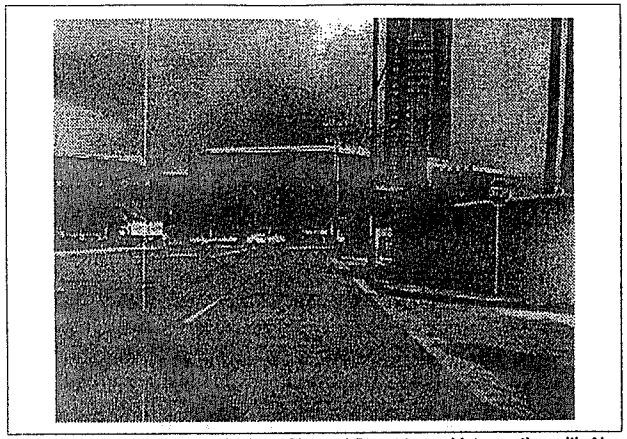


Figure A-7 Looking north along Channel Street toward intersection with Ala Moana Boulevard.

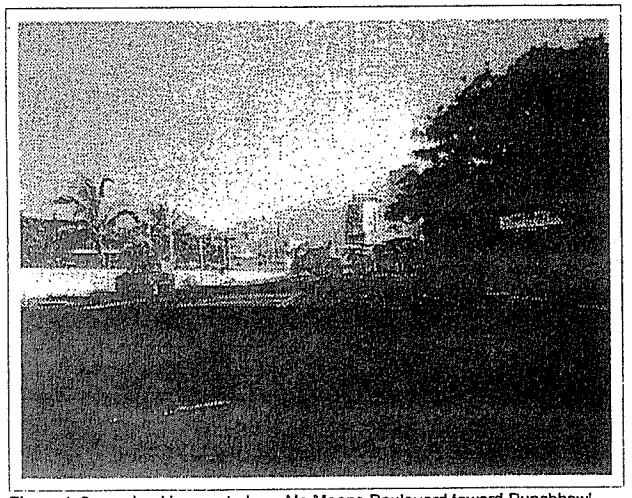


Figure A-8 Looking west along Ala Moana Boulevard toward Punchbowl Street.

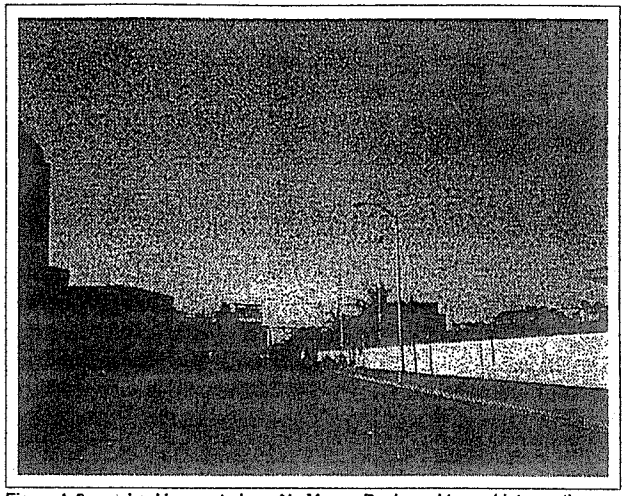


Figure A-9 Looking east along Ala Moana Boulevard toward intersection with Punchbowl Street.

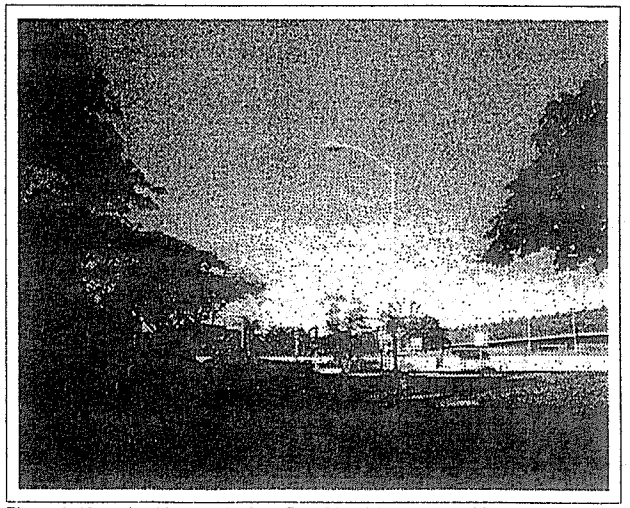


Figure A-10 Looking south along Punchbowl Street toward intersection with Ala Moana Boulevard.

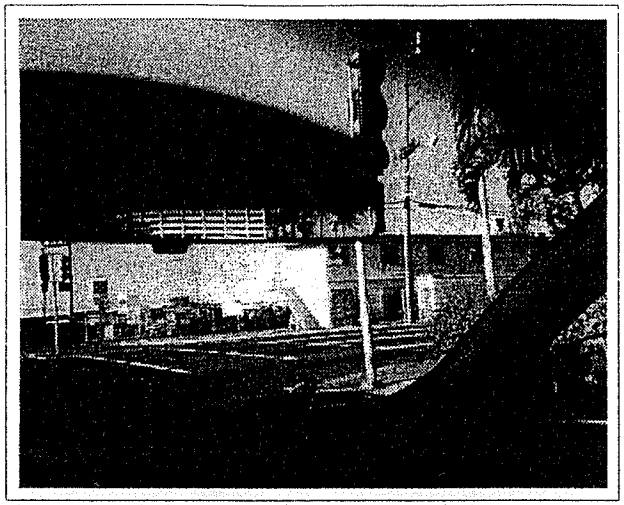


Figure A-11 Looking at eastbound approach on Nimitz Highway at Pacific Street.

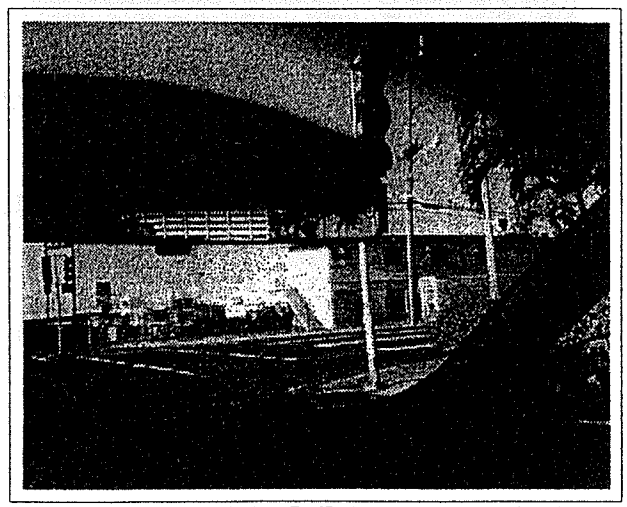


Figure A-12 Looking south along Pacific Street toward intersection with esatbound Nimitz Highway.

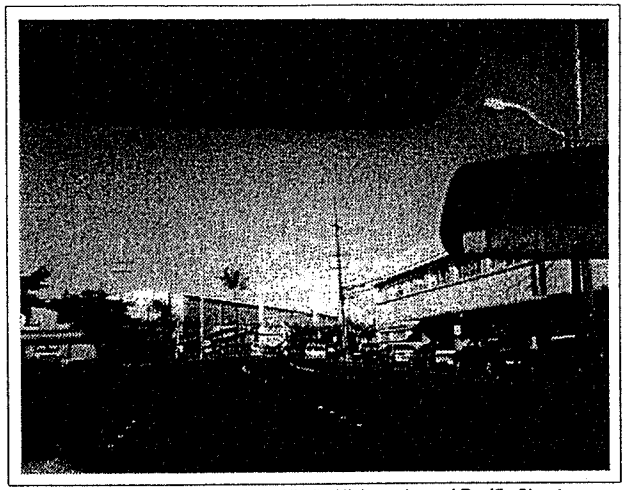


Figure A-13 Looking west along Nimitz Highway toward Pacific Street.

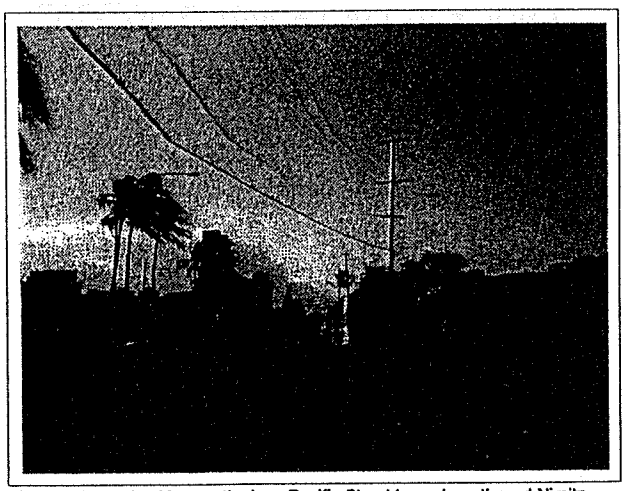


Figure A-14 Looking south along Pacific Street toward westbound Nimitz Highway.

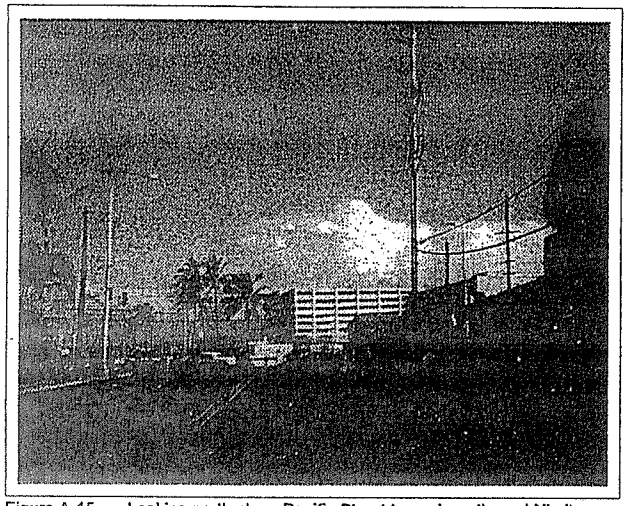


Figure A-15 Looking north along Pacific Street toward westbound Nimitz Highway.

APPENDIX B

LEVEL-OF-SERVICE CALCULATIONS

Table B-1 Index of Level-of-Service Calculations

No	N-S Street	E-W Street	Condition	Roadway	Time	File Name	Fig	Page No.
1	South St.	Ala Moana Blvd.	Existing	Existing	PM	1PMEX	5	2
			Existing	Existing	Sat	1SATEX	6	3
			Cumulative	w/ Ilalo St. Ext.	PM	1PMCUMB	9	4
			Cumulative	w/ Ilalo St. Ext	Sat	1SACUMB	10	5
			With Project	w/ Ilalo St. Ext.	PM	1PMPLANE	14	6
			With Project	w/ Ilalo St. Ext	Sat	1SAPLANF	14	7
2	Channel St.	Ala Moana Blvd.	Existing	Existing	PM	2PMEX	5	8
			Existing	Existing	Sat	2SATEX	6	9
			Cumulative	w/ Ilalo St. Ext.	PM	2PMCUMB	9	10
			Cumulative	w/ Ilalo St. Ext	Sat	2SACUMB	10	11
			With Project	w/ Ilalo St. Ext.	PM	NOT ANALYZED		
			With Project	w/ Ilalo St. Ext.	Sat	NOT ANALYZED		
3	Punchbowl St.	Ala Moana Blvd.	Existing	Existing	PM	3PMEX	5	12
			Existing	Existing	Sat	3SATEX	6	13
			Cumulative	w/ Ilalo St. Ext.	PM	3PMCUMB	9	14
			Cumulative	w/ Ilalo St. Ext	Sat	3SACUMB	10	15
			With Project	w/ Ilalo St. Ext.	PM	3PMPLANE	14	16
			With Project	w/ Ilalo St. Ext.	Sat	3SAPLANF	14	17
4	Pacific St.	Nimitz Highway (EB)	Existing	Existing	PM	4PMEX	7	18
			Cumulative	Existing	PM	4PMCUM	11	19
			With Project	Existing	PM	4PMPROJ	25	20
5	Pacific St.	Nimitz Highway (WB)	Existing	Existing	PM	5PMEX	7	21
			Cumulative	Existing	PM	5PMCUM	11	22
			With Project	Existing	PM	5PMPROJ	15	23


```
HCM: SIGNALIZED INTERSECTION SUMMARY   Version 2.4g       03-01-1999
                    Phillip Rowell And Associates
================================================================================
Streets: (E-W) Ala Moana Bl.              (N-S) South St.
Analyst: PJR                              File Name: 1PMEX.HC9
Area Type: Other                          11-13-98
Comment: Existing Weekday PM Conditions
================================================================================
           |   Eastbound  |  Westbound   |  Northbound  |  Southbound
           | L    T    R | L    T    R | L    T    R | L    T    R
           |---- ---- ----|---- ---- ----|---- ---- ----|---- ---- ----
No. Lanes  | 1    3  < 0 | 0    3  < 0 | 0  > 1    1  | 0  > 1    1
Volumes    | 237 2638   13|     2210   88| 35   44    8| 45   15  262
Lane W (ft)|12.0 12.0     |     12.0     |     12.0 12.0|     12.0 12.0
RTOR Vols  |           0  |           0  |           0  |           0
Lost Time  |3.00 3.00 3.00|     3.00 3.00|3.00 3.00 3.00|3.00 3.00 3.00
--------------------------------------------------------------------------------
                              Signal Operations
Phase Combination 1     2     3     4 |          5     6     7     8
EB  Left          *                   |NB  Left    *
    Thru          *     *             |    Thru    *
    Right         *     *             |    Right   *
    Peds          *     *             |    Peds
WB  Left                              |SB  Left    *
    Thru                *             |    Thru    *
    Right               *             |    Right   *
    Peds                *             |    Peds    *
NB  Right                             |EB  Right
SB  Right                             |WB  Right
Green          21.0A 82.0A            |Green     26.0A
Yellow/AR       0.0   3.0             |Yellow/AR 3.0
Cycle Length: 135 secs  Phase combination order: #1 #2 #5
--------------------------------------------------------------------------------
                        Intersection Performance Summary
     Lane  Group:   Adj Sat     v/c     g/C                      Approach:
     Mvmts    Cap     Flow     Ratio   Ratio    Delay   LOS     Delay   LOS
     -----  ----  -------     -----   -----    -----   ---     -----   ---
EB   L       241    1805     1.093   0.133    115.9    F      14.6     B
     TR     4258    5581     0.739   0.763      6.1    B
WB   TR     3374    5555     0.790   0.607     13.9    B      13.9     B
NB   LT      295    1533     0.379   0.193     31.1    D      30.8     D
     R       311    1615     0.051   0.193     28.7    D
SB   LT      236    1223     0.454   0.193     32.1    D      84.9     F
     R       311    1615     1.080   0.193    101.7    F
              Intersection Delay =  19.3 sec/veh Intersection LOS = C
Lost Time/Cycle, L =   9.0 sec   Critical v/c(x)    = 0.893
--------------------------------------------------------------------------------
```

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) South St.
Analyst: PJR File Name: 1SATEX.HC9
Area Type: Other 11-13-98
Comment: Existing Saturday Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	< 0	0	3	< 0	0	> 1	1	0	> 1	1
Volumes	57	1329	12		1167	26	5	3	1	8	13	23
Lane W (ft)	12.0	12.0			12.0			12.0	12.0		12.0	12.0
RTOR Vols			0			0			0			0
Lost Time	3.00	3.00	3.00		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*	*			Thru	*			
Right	*	*			Right	*			
Peds	*	*			Peds				
WB Left					SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds		*			Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	21.0A	82.0A			Green	26.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 135 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	241	1805	0.324	0.133	34.5	D	4.9	A
	TR	4250	5571	0.382	0.763	3.5	A		
WB	TR	3383	5570	0.421	0.607	9.1	B	9.1	B
NB	LT	335	1742	0.054	0.193	28.7	D	28.7	D
	R	311	1615	0.013	0.193	28.5	D		
SB	LT	349	1812	0.169	0.193	29.4	D	29.5	D
	R	311	1615	0.196	0.193	29.6	D		

Intersection Delay = 7.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.361

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) South St.
Analyst: PJR File Name: 1PMCUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	< 0	0	3	< 0	0	> 1	1	0	> 1	1
Volumes	235	2799	65		2546	115	50	69	16	54	16	283
Lane W (ft)	12.0	12.0			12.0			12.0	12.0		12.0	12.0
RTOR Vols			0			0			0			100
Lost Time	3.00	3.00	3.00		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*	*			Thru	*			
Right	*	*			Right	*			
Peds	*	*			Peds				
WB Left					SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds		*			Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	23.0A	82.0A			Green	24.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 135 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	267	1805	0.976	0.148	73.1	F	11.1	B
	TR	4321	5556	0.797	0.778	6.4	B		
WB	TR	3372	5551	0.915	0.607	18.4	C	18.4	C
NB	LT	220	1237	0.764	0.178	44.0	E	41.7	E
	R	287	1615	0.111	0.178	30.1	D		
SB	LT	136	764	0.913	0.178	71.6	F	54.8	E
	R	287	1615	0.818	0.178	45.9	E		

Intersection Delay = 17.2 sec/veh Intersection LOS = C

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.924

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) South St.
Analyst: PJR File Name: 1SACUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Saturday, With Ilalo Street Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	< 0	0	3	< 0	0	> 1	1	0	> 1	1
Volumes	60	1493	53		1432	46	16	22	7	14	14	35
Lane W (ft)	12.0	12.0			12.0			12.0	12.0		12.0	12.0
RTOR Vols			0			0			0			15
Lost Time	3.00	3.00	3.00		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*	*			Thru	*			
Right	*	*			Right	*			
Peds	*	*			Peds				
WB Left					SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds		*			Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	23.0A	82.0A			Green	24.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 135 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	267	1805	0.251	0.148	33.0	D	4.3	A
	TR	4309	5540	0.435	0.778	3.3	A		
WB	TR	3378	5561	0.507	0.607	9.8	B	9.8	B
NB	LT	308	1730	0.176	0.178	30.5	D	30.3	D
	R	287	1615	0.049	0.178	29.7	D		
SB	LT	312	1758	0.186	0.178	30.5	D	30.3	D
	R	287	1615	0.091	0.178	30.0	D		

Intersection Delay = 7.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.405

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-02-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) South St.
Analyst: PJR File Name: 1PMPLANE.HC9
Area Type: Other 11-13-98
Comment: Cumulative Plus Project PM Weekday, w/ Ilalo St. Ext

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	< 0	0	3	< 0	0	> 1	1	0	> 1	1
Volumes	229	2861	65		2624	115	50	69	16	54	16	283
PHF or PK15	0.90	0.93	0.54		0.95	0.92	0.73	0.69	0.50	0.66	0.38	0.78
Lane W (ft)	12.0	12.0			12.0			12.0	12.0		12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	0	2	2		2	0	0	0	0	0	0	0
Parking	N	N		N	N		N	N		N	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3			3			3	3		3	3
RTOR Vols			0			0			0			100
Lost Time	3.00	3.00	3.00		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*	*			Thru	*			
Right	*	*			Right	*			
Peds	*	*			Peds				
WB Left					SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds		*			Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	23.0A	82.0A			Green	24.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 135 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	267	1805	0.950	0.148	67.0	F	10.8	B
	TR	4322	5557	0.814	0.778	6.8	B		
WB	TR	3372	5552	0.942	0.607	20.4	C	20.4	C
NB	LT	220	1237	0.764	0.178	44.0	E	41.7	E
	R	287	1615	0.111	0.178	30.1	D		
SB	LT	136	764	0.913	0.178	71.6	F	54.8	E
	R	287	1615	0.818	0.178	45.9	E		

Intersection Delay = 17.8 sec/veh Intersection LOS = C
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.938

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-02-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) South St.
Analyst: PJR File Name: 1SAPLANF.HC9
Area Type: Other 11-13-98
Comment: Cumulative Plus Project Saturday, w/ Ilalo St. Ext

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3 < 0		0	3 < 0		0 > 1		1	0 > 1		1
Volumes	60	1603	56		1513	46	16	22	7	14	14	35
PHF or PK15	0.90	0.93	0.54		0.95	0.92	0.73	0.69	0.50	0.66	0.38	0.78
Lane W (ft)	12.0	12.0			12.0			12.0	12.0		12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	0	2	2		2	0	0	0	0	0	0	0
Parking	N	N		N	N		N	N		N	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3			3			3	3		3	3
RTOR Vols			0			0			0			15
Lost Time	3.00	3.00	3.00		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*	*			Thru	*			
Right	*	*			Right	*			
Peds	*	*			Peds				
WB Left					SB Left	*			
Thru		*			Thru	*			
Right		*			Right	*			
Peds		*			Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	23.0A	82.0A			Green	24.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 135 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	267	1805	0.251	0.148	33.0	D	4.4	A
	TR	4310	5541	0.467	0.778	3.4	A		
WB	TR	3379	5563	0.535	0.607	10.1	B	10.1	B
NB	LT	308	1730	0.176	0.178	30.5	D	30.3	D
	R	287	1615	0.049	0.178	29.7	D		
SB	LT	313	1758	0.186	0.178	30.5	D	30.3	D
	R	287	1615	0.091	0.178	30.0	D		

Intersection Delay = 7.9 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.414

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Channel St.
Analyst: PJR File Name: 2PMEX.HC9
Area Type: Other 11-13-98
Comment: Existing Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3 < 0		1	3	0	1	0	1	0	0	0
Volumes		2830	11		5	2502		57	58			
Lane W (ft)		12.0			12.0	12.0		12.0	12.0			
RTOR Vols			0			0			0			
Lost Time		3.00	3.00	3.00	3.00		3.00		3.00			

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	*			
Thru		*			Thru				
Right		*			Right	*			
Peds		*			Peds	*			
WB Left	*				SB Left				
Thru	*	*			Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	10.0A	94.0A			Green	20.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 130 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	TR	4038	5584	0.816	0.723	8.8	B	8.8	B
WB	L	95	1770	0.126	0.054	37.9	D	4.0	A
	T	4470	5588	0.669	0.800	3.9	A		
NB	L	278	1805	0.360	0.154	32.2	D	32.5	D
	R	248	1615	0.419	0.154	32.8	D		

Intersection Delay = 7.4 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.710

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Channel St.
Analyst: PJR File Name: 2SATEX.HC9
Area Type: Other 11-13-98
Comment: Existing Saturday Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	< 0	1	3	0	1	0	1	0	0	0
Volumes		1396	20	3	1192		4		2			
Lane W (ft)		12.0		12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			
Lost Time		3.00	3.00	3.00	3.00		3.00		3.00			

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left	*			
Thru		*				Thru				
Right		*				Right	*			
Peds		*				Peds	*			
WB Left	*				SB	Left				
Thru	*	*				Thru				
Right						Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	10.0A	94.0A			Green		20.0A			
Yellow/AR	0.0	3.0			Yellow/AR		3.0			

Cycle Length: 130 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	TR	4027	5569	0.434	0.723	4.7	A	4.7	A
WB	L	95	1770	0.042	0.054	37.7	D	2.4	A
	T	4470	5588	0.319	0.800	2.3	A		
NB	L	278	1805	0.029	0.154	30.2	D	30.2	D
	R	248	1615	0.016	0.154	30.1	D		

Intersection Delay = 3.8 sec/veh Intersection LOS = A
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.344

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Channel St.
Analyst: PJR File Name: 2PMCUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Weekday PM, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	< 0	1	3	0	1	0	1	0	0	0
Volumes		3043	11	5	2874		58		59			
Lane W (ft)		12.0		12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			
Lost Time		3.00	3.00	3.00	3.00		3.00		3.00			

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left	*			
Thru		*				Thru				
Right		*				Right	*			
Peds		*				Peds	*			
WB Left	*				SB	Left				
Thru	*	*				Thru				
Right						Right				
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	10.0A	94.0A			Green		20.0A			
Yellow/AR	0.0	3.0			Yellow/AR		3.0			

Cycle Length: 130 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	TR	4038	5584	0.877	0.723	10.6	B	10.6	B
WB	L	95	1770	0.126	0.054	37.9	D	5.1	B
	T	4471	5588	0.769	0.800	5.0	A		
NB	L	278	1805	0.367	0.154	32.2	D	32.6	D
	R	248	1615	0.423	0.154	32.9	D		

Intersection Delay = 8.6 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.758

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Channel St.
Analyst: PJR File Name: 2SACUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Saturday, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	< 0	1	3	0	1	0	1	0	0	0
Volumes		1604	21		3 1480		4		2			
Lane W (ft)		12.0		12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			
Lost Time		3.00	3.00	3.00	3.00		3.00		3.00			

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	*			
Thru		*			Thru				
Right		*			Right	*			
Peds		*			Peds	*			
WB Left	*				SB Left				
Thru	*	*			Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	10.0A	94.0A			Green	20.0A			
Yellow/AR	0.0	3.0			Yellow/AR	3.0			

Cycle Length: 130 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	TR	4030	5574	0.469	0.723	4.9	A	4.9	A
WB	L	95	1770	0.073	0.054	37.7	D	2.6	A
	T	4471	5588	0.396	0.800	2.5	A		
NB	L	278	1805	0.025	0.154	30.2	D	30.2	D
	R	248	1615	0.016	0.154	30.1	D		

Intersection Delay = 3.9 sec/veh Intersection LOS = A
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.373

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3PMEX.HC9
Area Type: Other 11-13-98
Comment: Existing Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	0	0	3	0	0	0	0	2	0	2
Volumes		2575			2559					565		266
Lane W (ft)		12.0			12.0					12.0		12.0
RTOR Vols			0			0						0
Lost Time		3.00			3.00					3.00		3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left				
Thru	*				Thru				
Right					Right				
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru				
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	94.0A				Green	30.0A			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 130 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	4041	5588	0.746	0.723	7.5	B	7.5	B
WB	T	4041	5588	0.741	0.723	7.5	B	7.5	B
SB	L	833	3610	0.777	0.231	33.5	D	31.7	D
	R	745	3230	0.448	0.231	28.0	D		

Intersection Delay = 10.9 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.753

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3SATEX.HC9
Area Type: Other 11-13-98
Comment: Existing Saturday Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	0	0	3	0	0	0	0	2	0	2
Volumes		1251			1196					165		105
Lane W (ft)		12.0			12.0					12.0		12.0
RTOR Vols			0			0						0
Lost Time		3.00			3.00					3.00		3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left				
Thru	*				Thru				
Right					Right				
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru				
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	94.0A				Green	30.0A			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 130 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	4041	5588	0.378	0.723	4.5	A	4.5	A
WB	T	4041	5588	0.362	0.723	4.4	A	4.4	A
SB	L	833	3610	0.242	0.231	26.4	D	26.3	D
	R	745	3230	0.212	0.231	26.1	D		

Intersection Delay = 6.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.346

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3PMCUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Weekday PM, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	1	0	3	0	2 > 0		< 0	1 > 1		2
Volumes		2791	147		2932		165		5	258	44	579
PHF or PK15		0.94	0.54		0.94		0.73		0.50	0.90	0.38	0.90
Lane W (ft)		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
Grade		0			0			0			0	
% Heavy Veh		2	2		2		0		0	0	0	0
Parking	N		N	N		N	N		N	N		
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type		3	3		3		3	3		3	3	3
RTOR Vols			60			0			0			200
Lost Time		3.00	3.00		3.00		3.00		3.00	3.00	3.00	3.00
Prop. Share							23			35		50
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left		*		
Thru	*				Thru				
Right	*				Right		*		
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru	*			
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right				
SB Right					WB Right				
Green	82.0A				Green	22.0A	22.0A		
Yellow/AR	3.0				Yellow/AR	3.0	3.0		

Cycle Length: 135 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3394	5588	0.962	0.607	22.5	C	21.8	C
	R	962	1583	0.167	0.607	7.5	B		
WB	T	3394	5588	1.011	0.607	31.4	D	31.4	D
NB	L	588	3610	0.304	0.163	32.2	D	32.1	D
	LR	290	1779	0.214	0.163	31.7	D		
SB	L	294	1805	0.636	0.163	37.2	D	44.4	E
	LT	303	1857	0.714	0.163	39.8	D		
	R	526	3230	0.904	0.163	49.4	E		

Intersection Delay = 28.7 sec/veh Intersection LOS = D
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.869

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3SACUMB.HC9
Area Type: Other 11-13-98
Comment: Cumulative Saturday, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	1	0	3	0	3 > 0		< 0	2 > 1		2
Volumes		1440	76		1484		125		5	180	12	108
Lane W (ft)		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vols			40			0			0			40
Lost Time		3.00	3.00		3.00		3.00		3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left		*		
Thru	*				Thru				
Right	*				Right		*		
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru	*			
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right		*		
SB Right					WB Right				
Green	76.0A				Green	25.0A	25.0P		
Yellow/AR	3.0				Yellow/AR	3.0	3.0		

Cycle Length: 135 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3146	5588	0.536	0.563	12.1	B	11.7	B
	R	1220	1583	0.055	0.770	2.4	A		
WB	T	3146	5588	0.552	0.563	12.2	B	12.2	B
NB	L	1003	5415	0.124	0.185	29.6	D	29.8	D
	LR	329	1778	0.185	0.185	30.0	D		
SB	L	669	3610	0.238	0.185	30.3	D	30.2	D
	LT	342	1846	0.228	0.185	30.3	D		
	R	598	3230	0.144	0.185	29.8	D		

Intersection Delay = 14.3 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.417

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-02-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3PMPLANE.HC9
Area Type: Other 11-13-98
Comment: Cumulative Plus Project Weekday PM, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	1	0	3	0	2 > 0		< 0	1 > 1		2
Volumes		2851	361		2957		386		46	258	44	579
PHF or PK15		0.94	0.54		0.94		0.90		0.90	0.90	0.38	0.90
Lane W (ft)		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
Grade		0			0			0			0	
% Heavy Veh		2	2		2		0		0	0	0	0
Parking	N		N	N		N	N		N	N		N
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type		4	4		4		3	3		3	3	3
RTOR Vols			125			0			0			200
Lost Time		3.00	3.00		3.00		3.00		3.00	3.00	3.00	3.00
Prop. Share							20			35		50
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left		*		
Thru	*				Thru				
Right	*				Right		*		
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru	*			
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right		*		
SB Right					WB Right				
Green	82.0A				Green	22.0A	22.0P		
Yellow/AR	3.0				Yellow/AR	3.0	3.0		

Cycle Length: 135 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3394	5588	0.983	0.607	27.0	D	24.2	C
	R	1255	1583	0.349	0.793	3.1	A		
WB	T	3394	5588	1.020	0.607	35.0	D	35.0	D
NB	L	588	3610	0.600	0.163	41.1	E	40.8	E
	LR	283	1739	0.483	0.163	40.1	E		
SB	L	294	1805	0.636	0.163	43.2	E	50.6	E
	LT	303	1857	0.714	0.163	45.9	E		
	R	526	3230	0.904	0.163	55.7	E		

Intersection Delay = 32.2 sec/veh Intersection LOS = D
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.926

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-02-1999
Phillip Rowell And Associates

Streets: (E-W) Ala Moana Bl. (N-S) Punchbowl Street
Analyst: PJR File Name: 3SAPLANF.HC9
Area Type: Other 11-13-98
Comment: Cumulative Plus Project Saturday, With Ilalo St. Extension

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	3	1	0	3	0	2 > 0 < 0			1 > 1		2
Volumes		1493	290		1564		346		46	180	12	108
PHF or PK15		0.94	0.54		0.94		0.73		0.50	0.90	0.38	0.90
Lane W (ft)		12.0	12.0		12.0		12.0	12.0		12.0	12.0	12.0
Grade		0			0			0			0	
% Heavy Veh		2	2		2		0		0	0	0	0
Parking	N		N	N		N	N		N	N		
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N) N			(Y/N) N			(Y/N) N			(Y/N) N		
Arr Type		3	3		3		3	3		3	3	3
RTOR Vols			120				0		0			50
Lost Time		3.00	3.00		3.00		3.00		3.00	3.00	3.00	3.00
Prop. Share							20			40		30
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left		*		
Thru	*				Thru				
Right	*				Right		*		
Peds					Peds				
WB Left					SB Left	*			
Thru	*				Thru	*			
Right					Right	*			
Peds	*				Peds	*			
NB Right					EB Right		*		
SB Right					WB Right				
Green	76.0A				Green	25.0A	25.0A		
Yellow/AR	3.0				Yellow/AR	3.0	3.0		

Cycle Length: 135 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3146	5588	0.555	0.563	12.3	B	10.9	B
	R	1220	1583	0.258	0.770	2.9	A		
WB	T	3146	5588	0.582	0.563	12.6	B	12.6	B
NB	L	669	3610	0.583	0.185	33.4	D	33.8	D
	LR	318	1716	0.588	0.185	34.6	D		
SB	L	334	1805	0.359	0.185	31.3	D	30.8	D
	LT	340	1834	0.330	0.185	31.0	D		
	R	598	3230	0.120	0.185	29.6	D		

Intersection Delay = 15.6 sec/veh Intersection LOS = C
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.539

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Eastbound (N-S) Pacific Street
Analyst: PJR File Name: 4PMEX.HC9
Area Type: Other 11-18-98
Comment: Existing Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0 > 4 < 0			0	0	0	0	1	1	1	1	0
Volumes	187	2525	23					77	20	150	12	
Lane W (ft)		12.0						12.0	12.0	12.0	12.0	
RTOR Vols			0						0			0
Lost Time	3.00	3.00	3.00					3.00	3.00	3.00	3.00	

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left				
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
WB Left					SB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	66.0P				Green	18.0P			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	LTR	5431	7406	0.611	0.733	4.6	A	4.6	A
NB	T	373	1863	0.362	0.200	23.9	C	23.6	C
	R	317	1583	0.114	0.200	22.4	C		
SB	L	211	1054	0.816	0.200	40.6	E	38.7	D
	T	373	1863	0.054	0.200	22.1	C		

Intersection Delay = 7.2 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.655

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Eastbound (N-S) Pacific Street
Analyst: PJR File Name: 4PMCUM.HC9
Area Type: Other 11-18-98
Comment: Cumulative Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 4	< 0	0	0	0	0	1	1	1	1	0
Volumes	197	2711	24					81	21	158	13	
PHF or PK15	0.83	0.92	0.48					0.57	0.56	0.87	0.60	
Lane W (ft)		12.0						12.0	12.0	12.0	12.0	
Grade		0						0			0	
% Heavy Veh	2	2	2					2	2	2	2	
Parking	N		N				N		N	N		N
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type		3						3	3	3	3	
RTOR Vols			0						0			0
Lost Time	3.00	3.00	3.00					3.00	3.00	3.00	3.00	
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left				
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
WB Left					SB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	66.0P				Green	18.0P			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	LTR	5432	7407	0.655	0.733	4.9	A	4.9	A
NB	T	373	1863	0.381	0.200	24.0	C	23.7	C
	R	317	1583	0.117	0.200	22.4	C		
SB	L	203	1016	0.896	0.200	51.8	E	48.6	E
	T	373	1863	0.059	0.200	22.2	C		

Intersection Delay = 8.0 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.706

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Eastbound (N-S) Pacific Street
Analyst: PJR File Name: 4PMPROJ.HC9
Area Type: Other 11-18-98
Comment: Cumulative Plus Project Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 4	< 0	0	0	0	0	1	1	1	1	0
Volumes	197	2925	26					28	75	158	90	
PHF or PK15	0.83	0.92	0.48					0.57	0.56	0.87	0.60	
Lane W (ft)		12.0						12.0	12.0	12.0	12.0	
Grade		0						0			0	
% Heavy Veh	2	2	2					2	2	2	2	
Parking	N		N				N		N	N		N
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type		3						3	3	3	3	
RTOR Vols			0						0			0
Lost Time	3.00	3.00	3.00					3.00	3.00	3.00	3.00	
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left				
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
WB Left					SB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	59.0P				Green	25.0P			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	LTR	4857	7408	0.786	0.656	9.0	B	9.0	B
NB	T	517	1863	0.095	0.278	18.3	C	19.3	C
	R	440	1583	0.305	0.278	19.6	C		
SB	L	428	1540	0.425	0.278	20.7	C	20.1	C
	T	517	1863	0.290	0.278	19.5	C		

Intersection Delay = 10.3 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.679

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Westbound (N-S) Pacific Street
Analyst: PJR File Name: 5PMEX.HC9
Area Type: Other 11-18-98
Comment: Existing Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0 > 4 < 0			1	1	0	0	1	0
Volumes				63	2776	103	78	172			117	
Lane W (ft)					12.0		12.0	12.0			12.0	
RTOR Vols					0				0			0
Lost Time				3.00	3.00	3.00	3.00	3.00			3.00	

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
WB Left		*			SB Left				
Thru		*			Thru	*			
Right		*			Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green		66.0P			Green	18.0P			
Yellow/AR		3.0			Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LTR	5427	7400	0.672	0.733	5.0	A	5.0	A
NB	L	151	753	0.691	0.200	33.8	D	43.9	E
	T	373	1863	0.923	0.200	47.0	E		
SB	T	373	1863	0.373	0.200	24.0	C	24.0	C

Intersection Delay = 9.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.726

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Westbound (N-S) Pacific Street
Analyst: PJR File Name: 5PMCUM.HC9
Area Type: Other 11-18-98
Comment: Cumulative Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0 > 4 < 0			1	1	0	0	1	0
Volumes				66	3120	108	82	181			123	
PHF or PK15				0.93	0.89	0.80	0.75	86			0.84	
Lane W (ft)					12.0		12.0	12.0			12.0	
Grade					0			0			0	
% Heavy Veh				2	2	2	2	2			2	
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds						0			0			0
Ped Button				(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type					3		3	3			3	
RTOR Vols						0			0			0
Lost Time				3.00	3.00	3.00	3.00	3.00			3.00	
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
WB Left		*			SB Left				
Thru		*			Thru	*			
Right		*			Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green		66.0P			Green	18.0P			
Yellow/AR		3.0			Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LTR	5429	7403	0.752	0.733	5.9	B	5.9	B
NB	L	143	715	0.762	0.200	39.8	D	45.3	E
	T	373	1863	0.923	0.200	47.0	E		
SB	T	373	1863	0.392	0.200	24.1	C	24.1	C

Intersection Delay = 10.2 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.789

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 03-01-1999
Phillip Rowell And Associates

Streets: (E-W) Nimitz Westbound (N-S) Pacific Street
Analyst: PJR File Name: 5PMPROJ.HC9
Area Type: Other 11-18-98
Comment: Cumulative Plus Project Weekday PM Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 4	< 0	1	1	0	0	1	0
Volumes				146	3341	108	78	132			121	
PHF or PK15				0.93	0.89	0.80	0.75	86			0.84	
Lane W (ft)					12.0		12.0	12.0			12.0	
Grade					0			0			0	
% Heavy Veh				2	2	2	2	2			2	
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			0			0			0			0
Ped Button				(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type					3		3	3			3	
RTOR Vols						25			0			0
Lost Time				3.00	3.00	3.00	3.00	3.00			3.00	
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4		5	6	7	8
EB Left					NB Left	*			
Thru					Thru	*			
Right					Right				
Peds					Peds				
WB Left	*				SB Left				
Thru	*				Thru	*			
Right	*				Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	59.0P				Green	25.0P			
Yellow/AR	3.0				Yellow/AR	3.0			

Cycle Length: 90 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LTR	4856	7408	0.910	0.656	12.2	B	12.2	B
NB	L	255	918	0.408	0.278	20.7	C	23.3	C
	T	517	1863	0.665	0.278	24.1	C		
SB	T	517	1863	0.278	0.278	19.4	C	19.4	C

Intersection Delay = 13.4 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.837

APPENDIX C

INTERISLAND CRUISE SHIP TRAFFIC SURVEY

Appendix C

Interisland Cruise Ship Traffic Survey

A. Purpose and Objective

The primary objective of the traffic survey was to determine the amount of traffic generated by the operation of interisland cruise ships. This information will be used to estimate future traffic resulting from relocation and/or expansion of interisland cruise ship operations at Honolulu Harbor.

Additionally, vehicles were categorized so that estimates of the types of vehicles serving cruise ship operations and the length of time that vehicles dwell at the pier was determined.

B. Methodology

1. The counts were performed from 6:30 AM to 9:00 AM on Saturday, September 5, 1998. This time period was selected because vehicles start arriving at approximately 6:30 AM, which is the same time that the interisland cruise ship arrives and approximately one hour before the first passengers disembark from the cruise ship. These parameter were determined from field observations for the previous two weekends.

2. The number of vehicles arriving and departing the arrival area was recorded by category in 15-minute intervals. The vehicle categories recorded were private automobiles, trucks, taxis and buses. The busses were the full-sized vehicles with a capacity of approximately 40 persons.

3. The arrival and departure times of the buses were recorded for use in estimating the average dwell time at the arrival curbside.

C. Traffic Data

The results of the traffic survey is shown in Table C-1. The peak hourly volume is the sum of the peak hourly volume of each vehicle category. The sum of the peak for each category will be larger than the actual peak hourly volume counted since it is assumed that the peak of each category may occur concurrently. The sum of the peak inbound vehicles for all categories is 78 vehicles. The peak for the outbound volume is 51 vehicles per hour. The factor will be used to estimate future vehicular traffic generation.

D. Conclusions

1. A typical cruise ship arrival will generate 78 inbound and 51 outbound trips during the peak arrival and departure hours.

2. The number of trucks and passenger cars does not appear to be related to the number of cruise ship passengers. The majority of passenger depart the terminal area via taxis and full size buses. The remainder of the traffic is related to servicing the cruise ship, meeter and greeter services, and baggage services. Cruise ship staff appear to depart the area well after the passengers have left the area.

Table C-1 Interisland Cruise Ship Traffic Survey[1]

15-Minute Volumes

	Inbound				Outbound			
Time	Autos	Trucks	Taxis	Buses	Autos	Trucks	Taxis	Buses
6:30 to 6:45	13	1	1	0	1	2	0	0
6:45 to 7:00	15	2	1	0	4	1	0	0
7:00 to 7:30	6	6	0	1	4	1	0	0
7:15 to 7:30	7	1	1	0	4	1	1	0
7:30 to 7:45	11	2	1	3	5	0	3	2
7:45 to 8:00	7	4	7	1	5	2	6	0
8:00 to 8:15	9	1	3	1	6	0	3	2
8:15 to 8:30	6	2	3	1	4	4	3	0
8:30 to 8:45	5	1	5	0	6	1	6	1
8:45 to 9:00	6	2	7	3	4	1	6	2
Peak Hourly Volumes of Each Count								
Hourly Volume	41	13	18	6	21	7	18	5
Total[2]	78				51			

Notes:
(1) Survey was performed Saturday, September 5, 1998, from 6:30 AM to 9:00 AM.
(2) Volume shown is the total of the peak hourly volumes of each category of vehicle.

APPENDIX D

FOREIGN CRUISE SHIP TRAFFIC SURVEY

Foreign Cruise Ship Traffic Survey

A. Purpose and Objective

The primary objective of the traffic survey was to determine the amount of traffic generated by the arrival and departure foreign cruise ships. This information will be used to estimate future traffic resulting from construction of a new cruise ship terminal at Pier 2.

Additionally, vehicles were categorized so that estimates of the types of vehicles serving cruise ship operations and the length of time that vehicles dwell at the pier was determined.

B. Methodology

1. The counts were performed from 6:15 AM to 10:45 AM and from 4:30 PM to 7:00 PM on Friday, November 30, 1998. This morning survey period was selected since the cruise ship was scheduled to arrive at 6:30 AM. Passengers do not start arriving in the terminal area until 30 to 45 minutes later. The survey was terminated when no more passengers were in the terminal area. The afternoon survey period was selected because the cruise ship departure was scheduled for 8:00 PM. The survey was terminated at 7:00 because the terminal was closed to additional passengers.

2. The number of vehicles arriving and departing the arrival area was recorded by category in 15-minute intervals. The vehicle categories recorded were private automobiles, trucks, taxis and buses. The busses were the full-sized vehicles with a capacity of approximately 40 persons.

3. The arrival and departure times of the buses were recorded for use in estimating the average dwell time at the arrival curbside.

C. Survey Results and Conclusions

The results of the traffic survey is shown in Tables D-1 and D-2. The conclusions

1. Peak hour traffic conditions occur during the arrival of the cruise ship . During the arrival, there are 166 one-way trips whereas during the departure there were only 53 one-way trips. See table F-3.

2. During the cruise ship arrival, there were 9.50 inbound and 11.25 outbound trips per 100 passengers, assuming that the cruise ship was 100% occupied.

3. To assess worse-case conditions, the arrival of a cruise ship during afternoon peak hour traffic conditions (between 4 PM and PM on a weekday) should be examined.

Table D-1 Foreign Cruise Ship Arrival Traffic Survey

15-Minute Counts

Time Period Begins At:	Inbound							Outbound						
	Autos				Taxis	Trucks	Buses	Autos				Taxis	Trucks	Buses
	Pier 10	Irwin Park	Pier 11	Total				Pier 10	Irwin Park	Pier 11	Total			
6:15 AM	3	2	0	5	1	1	0	0	0	0	0	0	0	0
6:30 AM	10	0	0	10	1	5	0	3	0	0	3	0	1	0
6:45 AM	10	2	2	14	0	1	0	1	0	2	3	0	3	0
7:00 AM	2	0	2	4	1	0	0	0	0	2	2	0	0	0
7:15 AM	4	2	1	7	0	0	1	0	24	2	26	0	0	1
7:30 AM	1	0	0	1	1	3	2	0	7	0	7	1	0	0
7:45 AM	4	0	1	5	0	3	1	5	0	1	6	0	1	0
8:00 AM	4	0	2	6	0	1	0	0	0	2	2	0	0	0
8:15 AM	1	0	0	1	0	0	0	3	0	0	3	0	0	0
8:30 AM	1	0	0	1	3	4	0	2	0	0	2	8	4	1
8:45 AM	0	0	1	1	6	1	3	4	0	1	5	2	0	0
9:00 AM	4	0	0	4	0	0	1	5	0	0	5	0	1	2
9:15 AM	2	0	0	2	1	1	3	4	0	0	4	0	2	2
9:30 AM	0	0	0	0	1	0	2	0	0	0	0	1	1	2
9:45 AM	2	0	5	7	11	0	0	5	0	5	10	12	1	1
10:00 AM	0	0	3	3	2	3	0	0	0	3	3	5	5	1
10:15 AM	0	0	0	0	7	2	1	1	0	0	1	3	2	1
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Totals	48	6	17	71	35	25	14	33	31	18	82	31	22	12
Peak Hourly Volume of Each Count														
	26	4	8	38	21	8	9	15	31	8	54	20	9	7
Totals				76							90			

NOTES:
(1) Survey was performed on Friday, November 30, 1998 from 6:15 AM tp 10:45 AM. The cruise ship arriving was the Norwegian Dynasty, which has a capacity of 800 passengers and 300 crew members.

Table D-2 Foreign Cruise Ship Departure Traffic Survey

15-Minute Counts

Time Period Begins At:	Inbound							Outbound						
	Autos				Taxis	Trucks	Buses	Autos				Taxis	Trucks	Buses
	Pier 10	Irwin Park	Pier 11	Total				Pier 10	Irwin Park	Pier 11	Total			
4:30 PM	0	0	1	1	3	0	1	1	0	1	2	1	1	1
4:45 PM	5	0	0	5	4	1	1	6	0	0	6	5	1	1
5:00 PM	4	0	2	6	1	0	0	0	0	0	0	2	0	0
5:15 PM	0	0	0	0	0	1	0	0	0	2	2	0	0	0
5:30 PM	0	0	0	0	4	1	1	0	0	0	0	4	0	1
5:45 PM	0	0	1	1	4	0	0	0	0	0	0	4	0	0
6:00 PM	0	0	0	0	0	1	0	0	0	1	1	0	1	0
6:15 PM	0	0	3	3	0	0	0	0	0	2	2	0	0	0
6:30 PM	0	0	0	0	1	0	1	0	0	1	1	1	0	1
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Totals	9	0	7	16	17	4	4	7	0	7	14	17	4	4
Peak Hourly Volume of Each Count														
	9	0	4	13	9	3	2	7	0	4	11	11	2	2
Totals				27							26			

NOTES:
(1) Survey was performed on Friday, November 30, 1998 from 6:15 AM tp 10:45 AM. The cruise ship arriving was the Norwegian Dynasty, which has a capacity of 800 passengers and 300 crew members.
(2) Irwin Park was open for public parking for Aloha Tower Marketplace. It was unlikely that any vehicles parked in Irwin Park were associated with the cruise ship departure because no pedestrian movements between the park and Pier 11 were observed.

Table D-3 Calculation of Trip Generation Rates[1]

Passenger Ship Capacity	800 Passenger											
Vehicle Classification and Parking Location	Cruise Ship Arrival						Cruise Ship Departure					
	Inbound		Outbound		Total		Inbound		Outbound		Total	
	Trips	Rate	Trips	Rate	Trips	Rate	Trips	Rate	Trips	Rate	Trips	Rate
Autos at Pier 10 Garage	26	3.25	15	1.88	41	5.13	9	1.13	7	0.88	16	2.00
Autos at Irwin Park	4	0.50	31	3.88	35	4.38	0	0.00	0	0.00	0	0.00
Autos at Pier 11 Curb	8	1.00	8	1.00	16	2.00	4	0.50	4	0.50	8	1.00
Total Autos	38	4.75	54	6.75	92	11.50	13	1.63	11	1.38	24	3.00
Trucks at Pier 10 Garage	8	1.00	9	1.13	17	2.13	3	0.38	2	0.25	5	0.63
Taxis	21	2.63	20	2.50	41	5.13	9	1.13	11	1.38	20	2.50
Buses	9	1.13	7	0.88	16	2.00	2	0.25	2	0.25	4	0.50
Total Vehicles	76	9.50	90	11.25	166	20.75	27	3.38	26	3.25	53	6.63

NOTES:
(1) Trip generation rate is calculated as trips per 100 passengers.

APPENDIX E

KEWALO BASIN EXCURSION VESSEL TRAFFIC SURVEY

Appendix E

Kewalo Basin Excursion Vehicle and Traffic Survey

A. Purpose and Objective

The purpose of the traffic survey was to determine the amount of traffic generated by the operation of excursion boats. This information will be used to estimate future traffic resulting from relocation and/or expansion of excursion cruise boat operations at Honolulu Harbor.

B. Methodology

The objective of the survey was accomplished by counting the number of excursion boats and the amount of vehicular traffic entering and exiting the excursion parking areas and then calculating the number of peak hour inbound and outbound trips during the afternoon peak hour. The vehicular counts were conducted on July 21 and 22, 1998 between 4 and 6 PM. The excursion cruise ships were counted from 6 AM to 6 PM on July 28, 1998.

Vehicular counts were tabulated in 15 minute increments and the types of vehicles were noted. The excursion cruise ships were tabulated in one-hour increments and the types of excursion ship was also noted. The categories of excursion ships recorded were:

Submarine tour,
Fishing boat,
Excursion,
Dinner cruise, and
Other

C. Survey Results

The hourly excursion vehicle volumes are shown in Table E-1. The peak hour for excursion vehicle activity is between 2 and 3 PM during which 12 boats enter and 7 boats exit. The total daily operations are 65 inbound and 56 outbound, for a total of 131 one-way boat operations.

The inbound and outbound vehicular volumes are shown in Table E-2 and E-3, respectively. The peak inbound hour is between 4 and 5 PM during which 102 vehicles enter the parking areas. The ratio of peak hour inbound vehicle trips to daily one-way boat operations is 102/131 = 0.779.

The peak hour for outbound traffic is between 4:15 PM and 5:15 PM. During the peak outbound hour, there are 89 outbound vehicles. The ratio of outbound vehicle trips to daily one-way boat operations is 89/131 = 0.679.

For the trip generation analysis, the peak hour of the generator is assumed to coincide with the peak hour of the street and the inbound and outbound peak hour coincide. Therefore, the total peak hour trips generated is estimated to be 1.458 trips per one-way boat trip (the sum of inbound and outbound boat movements). The directional split is 53.4% inbound and 46.6% outbound.

Table E-1 Kewalo Basin Boat Movement Counts

Time		Sub Tour		Fishing		Excursion		Dinner		Other		Total		
From	To	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	Total
6 AM	7 AM	0	0	1	9	0	0	0	0	0	0	1	9	10
7 AM	8 AM	0	0	0	2	0	3	0	0	0	0	0	5	5
8 AM	9 AM	0	1	0	0	1	4	0	0	0	0	1	5	6
9 AM	10 AM	2	2	0	1	0	2	0	0	2	3	4	8	12
10 AM	11 AM	2	2	0	0	3	1	0	0	3	2	8	5	13
11 AM	NOON	2	2	1	0	3	3	0	0	3	2	9	7	16
NOON	1 PM	1	1	0	0	2	3	0	0	0	0	3	4	7
1 PM	2 PM	3	1	0	1	2	2	0	0	2	2	7	6	13
2 PM	3 PM	2	2	2	0	5	1	0	0	3	4	12	7	19
3 PM	4 PM	1	1	2	0	0	0	0	0	4	2	7	3	10
4 PM	5 PM	1	1	4	0	1	0	0	0	1	1	7	2	9
5 PM	6 PM	0	0	1	0	0	0	0	5	0	0	1	5	6
AFTER 6 PM		0	0	0	0	0	0	5	0	0	0	5	0	5
TOTALS		14	13	11	13	17	19	5	5	18	16	65	66	131