DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

RICK BLANGIARDI
MAYOR

WESLEY T. YOKOYAMA, P.E.
DIRECTOR

MICHAEL O'KEEFE
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

November 26, 2021

IN REPLY REFER TO:
WEC.C 21-1797

Ms. Mary Alice Evans, Director
Environmental Review Program
Office of Planning and Sustainable Development
Department of Business, Economic Development and Tourism
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Evans:

SUBJECT: Draft Environmental Assessment and Anticipated Finding of No Significant Impact, Sand Island Wastewater Treatment Plant Bioconversion Facility Upgrades, Tax Map Keys: (1) 1-5-041; and (1) 1-5-041: 022 portion

With this letter, the City and County of Honolulu Department of Environmental Services, Division of Wastewater Engineering and Construction hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the proposed Sand Island Wastewater Treatment Plant Bioconversion Facility Upgrades project on the island of Oahu for publication in the next available edition of The Environmental Notice.

In addition to this letter, the Environmental Review Program's online Publication Form has been completed and submitted with one electronic copy of the DEA-AFONSI as an Adobe Acrobat PDF file.

Should you have any questions, please contact Daniel Brieck from our Division of Wastewater Engineering and Construction at (808) 768-8810 or via email at dbrieck@honolulu.gov.

Sincerely,

Wesley T. Yokoyama, P.E.
Director

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Wednesday, December 8, 2021 9:55:23 AM

Action Name

Sand Island Wastewater Treatment Plant (SIWWTP) Bioconversion Facility Upgrades

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds
- (3) Propose any use within a shoreline area
- (9)(A) Propose any wastewater treatment unit, except an individual wastewater system or a wastewater treatment unit serving fewer than fifty single-family dwellings or the equivalent

Judicial district

Honolulu, Oʻahu

Tax Map Key(s) (TMK(s))

(1) 1-5-041: 005; and (1) 1-5-041: 022 portion

Action type

Agency

Other required permits and approvals

FAA Form 7460-1; Covered Source Air Permit; NPDES NOI Forms C, F, & G; HRS, Chapter 6E Review, SMA Major; Zoning Height Waiver; & Various other construction and building permit applications and construction plan review and approvals. See also Section 1.6

Proposing/determining agency

Department of Environmental Services (ENV), City and County of Honolulu

Agency contact name

Wesley Yokoyama

Agency contact email (for info about the action)

dbrieck@honolulu.gov

Email address or URL for receiving comments

briant@rmtowill.com

Agency contact phone

(808) 768-3486

Agency address

1000 Uluohia Street
Suite 308
Kapolei, Hawaii 96707

United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

R. M. Towill Corporation

Consultant contact name

Brian Takeda

Consultant contact email

briant@rmtowill.com

Consultant contact phone

(808) 842-1133

Consultant address

2024 North King Street
Suite 200
Honolulu, Hawaii 96819
United States
Map It

Action summary

The Department of Environmental Services (ENV) proposes the Sand Island Wastewater Treatment Plant (SIWWTP) Bioconversion Facility Upgrades project to provide additional solids stream treatment capacity for the phased buildout process to upgrade the SIWWTP to meet secondary treatment effluent standards for the facility's wastewater flow. The project will address the requirements of a 2010 Consent Decree to meet secondary treatment effluent standards by 2035. Phase 1 will provide secondary treatment for a portion of the projected 2055 planning flows by 2026, and Phase 2 will provide secondary treatment of the annual average design flow by 2035. The action will upgrade the capacity of the solids stream process and facilities. Phased facilities will include digesters, sludge storage tanks and a control building with associated infrastructure. Future digesters would be installed during Phase 2 of the project.

Reasons supporting determination

The proposed project is not anticipated to have a significant adverse environmental impact based on the preliminary evaluation of the significance criteria in HAR §11-200.1-13. This Draft EA identifies and considers the "significance" of potential environmental effects, including the sum of effects on the quality of the environment including cumulative long-term effects. See DEA Section 6, Significance Criteria and Anticipated Determination.

Attached documents (signed agency letter & EA/EIS)

- Signed-DEA-AFONSI-for-SIWWTP-Bioconversion.pdf
- Appendix-B-2019-TIAR.pdf
- Appendix-A-Preassmt-Compiled-Letters-Double-Page.pdf
- SIWWTP-Bioconversion-Facility-Final-DEA.pdf

Action location map

- SIWWTP-Project-Location.zip

Authorized individual

Brian Takeda, PM, Agent for Applicant

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Draft Environmental Assessment

Prepared in Accordance with Hawai‘i Revised Statutes,
Chapter 343, and Hawai‘i Administrative Rules, Title 11, Chapter 200.1

Sand Island Wastewater Treatment Plant Bioconversion Facility Upgrades

Honolulu, Island of O‘ahu, Hawai‘i

December 2021

Prepared For:
City and County of Honolulu
Department of Environmental Services
1000 Ulu‘ōhi‘a Street, Suite 308
Kapolei, Hawai‘i 96707

Prepared By:
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai‘i 96819-3494

Draft Environmental Assessment

Sand Island Wastewater Treatment Plant Bioconversion Facility Upgrades

Honolulu, Island of Oʻahu, Hawaiʻi

December 2021

Prepared For:
City and County of Honolulu
Department of Environmental Services
1000 Uluʻōhiʻa Street, Suite 308
Kapolei, Hawaiʻi 96707

Prepared By:
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaiʻi 96819-3494

Project No. 1-23650-01P

Table of Contents

List of Figures

List of Tables

List of Appendices

LIST OF ACRONYMS

ADA	American Disability Act
AMSL	Above Mean Sea Level
BMP	Best Management Practice
BWS	Board of Water Supply
CAB	Clean Air Branch, Department of Health
CCH	City and County of Honolulu
CEPT	Chemically Enhanced Primary Treatment
CFR	Code of Federal Regulations
CH_4	Methane
CHP	Combined Heat and Power
CIA	Cultural Impact Assessment
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSH	Cultural Surveys Hawai‘i, Inc.
CSP	Covered Source Permit
CWA	Clean Water Act
CWB	Clean Water Branch, Department of Health
CWRM	Commission on Water Resources Management, State of Hawai‘i
CZM	Coastal Zone Management
DAAF	Design Annual Average Flow
dBA	A-weighted decibels
DBEDT	Department of Business, Economic Development and Tourism, State of Hawaii
DCAB	Disability and Communication Access Board
DEM	Department of Emergency Management, CCH
DFM	Department of Facilities Maintenance, CCH
DIG	Anaerobic Digester
DLNR	Department of Land and Natural Resources, State of Hawai‘i
DMMF	Design Maximum Month Flow
DOH	Department of Health, State of Hawai‘i
DOT	Department of Transportation, State of Hawai‘i
DOFAW	Division of Forestry and Wildlife, Department of Land and Natural Resources
DPP	Department of Planning and Permitting, City and County of Honolulu
DTS	Department of Transportation Services, City and County of Honolulu
EAL	Environmental Action Level
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENV	Department of Environmental Services, City and County of Honolulu
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPS	Effluent Pump Station

ESA	Endangered Species Act
ESD	Egg-Shaped Digester
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FL	Mixed Fill Land
GHG	Greenhouse Gas
GMSS	Grit, Maintenance, Septage and Site
GP	General Plan
GT	Gravity Thickeners
H_2S	Hydrogen Sulfide
HAR	Hawai‘i Administrative Rules
HECO	Hawaiian Electric Company
HFD	Honolulu Fire Department
HPD	Honolulu Police Department
HRHP	Hawai‘i Register of Historic Places
HRS	Hawai‘i Revised Statutes
IBC	International Building Code
JaC	Jaucus Sand
JD	Jurisdictional Determination
kV	Kilovolts
lf	Linear Feet
LOS	Level of Service
LUO	Land Use Ordinance, Revised Ordinance of Honolulu, Chapter 21
MBR	Membrane Bioreactor
MBTA	Migratory Bird Treaty Act
MG	Million gallons
mgd	Million Gallons per Day
MLS	Makai Lift Station
MMPA	Marine Mammal Protection Act
mph	Miles Per Hour
msl	Mean Sea Level
N_2O	Nitrous Oxide
NHO	Native Hawaiian Organizations
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSP	Non-Covered Source Permit
NWI	National Wetlands Inventory
O_3	Ozone

O&M	Operation & Maintenance
OCS	Odor Control System
OHV	Off-Highway Vehicles
OPS	Operations Building
OTS	Oahu Transit Services
PCB	Polychlorinated Biphenyls
PCs	Primary Clarifiers
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of 2.5 microns or less
ppb	Parts Per Billion
ppm	Parts Per Million
PUC	Primary Urban Center
PUCDP	Primary Urban Center Development Plan
PV	Photovoltaic
RAS	Returned Activated Sludge
RFPS	Return Flow Pump Station
RLS	Reconnaissance Level Survey
ROH	Revised Ordinances of Honolulu
ROW	Right-of-Way
sf	Square Foot
SFAS	Step-Feed Activated Sludge
SHPD	State Historic Preservation Division, Department of Land and Natural Resources
SISB	Sand Island Sewer Basin
SISRA	Sand Island State Recreation Area
SIWWTP	Sand Island Wastewater Treatment Plant
SLR-XA	Sea Level Rise – Exposure Area
SLUC	State Land Use Commission
SMA	Special Management Area
SMGMA	Soil Management Area
SO_2	Sulfur Dioxide
SRT	Solid Retention Time
SST	Sludge Storage Tanks
SWQB	Storm Water Quality Branch, Department of Facilities Maintenance
TAZ	Traffic Analysis zones
T/d	Dry Tons per Day
THP	Thermal Hydrolysis Process
TIAR	Traffic Impact Assessment Report
TMK	Tax Map Key
TOD	Transit-oriented Development
TS	Total Dry Solids
TSS	Total Suspended Solids
UFC	Uniform Fire Code
µg/m3	Micrograms Per Cubic Meter
USACE	U.S. Army Corps of Engineers

USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	Ultraviolet
VAR	Vector Attraction Reduction
VFA	Volatile Fatty Acids
WAS	Waste Activated Sludge
WSST	Wet Sludge Storage Tank
WWPS	Wastewater Pump Station
WWTP	Wastewater Treatment Plant

PROJECT SUMMARY

Project Name:	Sand Island Wastewater Treatment Plant Bioconversion Facility Upgrades
Proposing Agency:	City and County of Honolulu Department of Environmental Services 1000 Uluohia Street, Suite 308 Kapolei, Hawai‘i 96707 Wesley T. Yokoyama, P.E., Director Phone: (808) 768-3486
Agent:	R.M. Towill Corporation 2024 North King Street, Suite 200 Honolulu, Hawai‘i 96819 Brian Takeda, Planning Project Manager Phone: (808) 842-1133
Project Location:	Honolulu, Island of O‘ahu
Tax Map Key:	(1) 1-5-041: 005 and (1) 1-5-041: 022 por.
Land Area:	63.949 acres
Landowner:	Owned by State of Hawai‘i and use granted to City and County of Honolulu by Governor’s Executive Order No. 3939 issued in 2002 and Executive Order No. 4498 issued in 2016
Existing Use:	Sand Island Wastewater Treatment Plant
State Land Use District:	Urban
City and County of Honolulu Plan Designation:	Primary Urban Center Development Plan
County Zoning District:	I-3 Waterfront Industrial; P-2 General Preservation
Special Management Area:	Within Special Management Area
Flood Zone:	X (Outside the 0.2-percent-annual-chance floodplain);
Chapter 343, HRS Trigger:	1. Propose the use of state or county lands or the use of state or county funds 2. Propose any use within a shoreline area 3. Propose any wastewater treatment unit, except an individual wastewater system or a wastewater

	treatment unit serving fewer than fifty single-family dwellings or the equivalent.
Permits Required:	See Section 1.6

1.0 PROJECT DESCRIPTION

1.1 Background and Overview

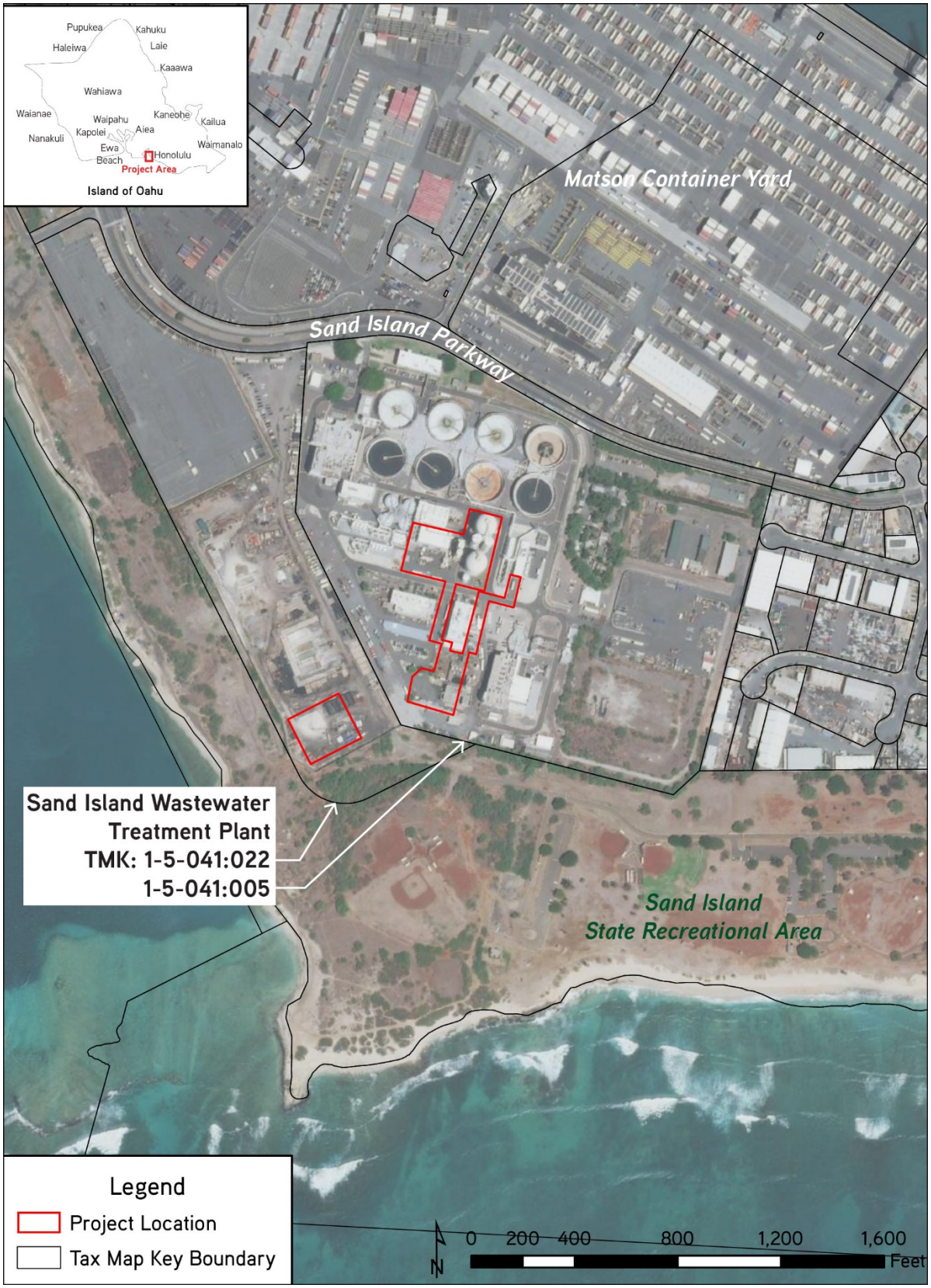
The City and County of Honolulu (CCH), Department of Environmental Services (ENV) ("Applicant") proposes to undertake the Sand Island Wastewater Treatment Plant (SIWWTP) Bioconversion Facility Upgrades ("Project"), to provide additional solids stream treatment capacity for the phased buildout process to upgrade the SIWWTP to meet secondary treatment effluent standards for the facility's wastewater flow. The existing SIWWTP is located on approximately 64 acres of land identified as Tax Map Key (TMK) (1) 1-5-041: 005 ("Parcel 5") and (1) 1-5-041: 022 ("Parcel 22"), which are owned by the State of Hawai'i and granted to CCH for SIWWTP use by Governor's Executive Orders (EOs) No. 3939 issued in 2002, and No. 4498 issued in 2016. The SIWWTP facility is owned by CCH, ENV. The proposed project will be constructed within Parcel 5, and staging and stockpiling will occur in Parcel 22 (see Figure 1).

In 2010, CCH, State of Hawai'i, Department of Health (DOH), and the U.S. Environmental Protection Agency (EPA) entered into the 2010 Consent Decree Civil No. 94-00765DAE-KSC ("2010 Consent Decree"), which requires CCH to upgrade the Wastewater Treatment Plants (WWTPs) to provide secondary treatment in accordance with Clean Water Act of 1972 (CWA) requirements. The 2010 Consent Decree requires CCH to complete construction of the SIWWTP secondary treatment facilities by the compliance milestones established within. As listed in the 2010 Consent Decree, "VII. Compliance Requirements: Wastewater Treatment Plants", the compliance milestones are as follows:

31. Sand Island Wastewater Treatment Plant. No later than 30 Days after the Effective Date of the 2010 Consent Decree, CCH shall withdraw any pending appeals of EPA's denial of its application for a permit pursuant to section 301(h) of the CWA for the SIWWTP. Unless the schedule is extended pursuant to Paragraph 3l.d., CCH shall Complete Construction of facilities necessary to comply with secondary treatment standards of the Act, as defined by 40 C.F.R. Part 133, for wastewater discharges from the SIWWTP by the compliance milestone of December 31, 2035, in accordance with the schedule set forth in subparagraphs a.-c.

> *a. As an interim compliance milestone, by January 1, 2019, CCH shall execute a design contract and issue a notice to proceed with the design of treatment process facilities needed to comply with secondary treatment standards for wastewater discharges from the SIWWTP. The scope of the design contract may reflect phasing of necessary upgrades to the SIWWTP, and may not include the detailed designs of all process facilities necessary to comply with secondary treatment standards.*
>
> *b. By January 1, 2022, CCH shall execute a construction contract and issue a notice to proceed with construction of facilities that are part of its design to upgrade the SIWWTP, in relation to compliance with secondary treatment standards. The scope of the construction contract may reflect phasing of necessary upgrades to the Sand Island*

Figure 1: Project Location



WWTRP, and may not include all process facilities necessary to comply with secondary treatment standards.

c. If the notice to proceed required by subparagraph b. did not authorize construction of all secondary treatment process facilities necessary to comply with secondary treatment standards for wastewater discharges from the SIWWTP, as an interim compliance milestone, by January 1, 2030, CCH shall execute a construction contract (or contracts) and issue a notice (or notices) to proceed with construction of all secondary treatment process facilities necessary to comply with secondary treatment standards for wastewater discharges from the SIWWTP.

d. No earlier than January 1, 2024, and no later than December 31, 2025, CCH may submit to the Parties a report with a proposal to extend the Deadline to Complete Construction of facilities necessary to comply with Secondary treatment standards of the Act, as defined by 40 C.F.R. Part 133, for Wastewater discharges from the SIWWTP. The proposal shall, in no event, seek to extend this compliance milestone to a date later than December 31, 2038. The report submitted pursuant to this subparagraph shall, at a minimum, contain the following elements:

i. CCH's proposed schedule to Complete Construction of secondary treatment facilities, including any proposed modifications to the schedule in subparagraphs a.-c. above.

ii. An analysis of the technical, logistical, and financial impacts of constructing secondary treatment facilities at Sand Island under: (1) the 2035 schedule set forth in Paragraph 31 and subparagraphs a.-c. above; and (2) CCH's proposed schedule.

iii. A comparison of the impacts to CCH of the two construction schedules. In this report, CCH shall present detailed information on the costs it has incurred and anticipates it will incur in complying with the 2010 Consent Decree and operating and maintaining its Wastewater Collection System and Wastewater Treatment Plants, including but not necessarily limited to:

- *CCH's actual expenditures on its Wastewater Collection System from Year One through Year Ten.*
- *CCH's actual expenditures on its Wastewater Collection System following Year Ten. If any of these costs were incurred to complete work required by Section VI (Compliance Requirements: Wastewater Collection System) of the Decree, these costs shall be specifically itemized.*
- *CCH may include projected capital improvements to the Wastewater Collection System in this analysis, and shall indicate whether the costs are: (1) included in its Capital Improvements Plan; and (2) likely to be incurred.*
- *CCH's projected budget for operation and maintenance of its Wastewater Collection System through Termination of the 2010 Consent*

Decree, along with the basis for the projections and supporting information.

• The most complete information available on the costs of construction of secondary treatment facilities at the Honouliuli WWTP.

• CCH's estimate of the projected construction costs of secondary treatment facilities at the SIWWTP based on CCH's planning and design for all secondary treatment alternatives considered for the WWTP.

• CCH's actual expenditures in operating and maintaining its Wastewater Treatment Plants and sludge facilities through the end of the fiscal year prior to submittal of the report and CCH's estimate of changes to these operation and maintenance costs once secondary treatment operation commences at Sand Island.

• Actual and projected expenditures as a result of additional or more stringent legislative or regulatory mandates regarding air quality, water quality and treatment standards applicable to CCH's Wastewater Collection System and Wastewater Treatment Plants.

iv. A discussion of the rate structure that CCH has implemented to finance the Wastewater Collection System and Wastewater Treatment Plant improvements it has constructed pursuant to the 2010 Consent Decree. This shall include a discussion of how CCH adjusted sewer rates to finance existing and expected costs during the implementation of the work required by the 2010 Consent Decree, along with EPA and / or industry guidelines regarding affordability, and sewer fees in jurisdictions of comparable size and population.

v. A comparison of the rate structure that CCH projects would be appropriate to finance completion of construction of secondary treatment facilities at Sand Island by December 31, 2035, with the compliance deadline proposed by CCH. Specifically, CCH shall present its rational for why requiring compliance by an earlier deadline than that proposed by CCH would result in undue financial hardship, which may include consideration of factors such as the cost of regulatory and statutory mandates, and other financial and socio-economic indicators relevant to evaluating the financial capability of CCH and its ratepayers.

vi. If CCH uses any models as part of its analysis in the report, CCH shall provide the Parties access to those models as well as all inputs to the models, and an explanation of the models' operation.

vii. Nothing set forth in subparagraph d. above shall limit the information or contentions that CCH may include in its report, or that any of the Parties may present to the Court, in support of its position.

e. After receiving CCH's report, the Parties shall meet and confer to discuss the report and shall use their best efforts to negotiate a schedule for construction of secondary

treatment facilities at Sand Island. Any such schedule shall include a compliance milestone to Complete Construction of secondary treatment facilities at Sand Island by no later than December 31, 2038, and adjustments to interim compliance milestones in this Paragraph consistent with achieving this compliance milestone.

f. If the Governments and CCH reach an agreement regarding the construction schedule for secondary treatment facilities at the SIWWTP, they shall submit the schedule to the Court for approval as a major modification pursuant to Section XIX (Modification) of the 2010 Consent Decree.

g. If the Governments and CCH cannot reach agreement regarding the construction schedule for secondary treatment facilities, they shall submit a joint motion to the Court requesting judicial resolution of the dispute. The joint motion shall contain a written statement of: (1) CCH's position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and the requested construction schedule, as presented to the Governments pursuant to subparagraph d.; and (2) the Governments' response to CCH's position, including a proposed construction schedule. Within 15 Days after the joint motions is filed, Intervenors may file a statement of position proposing a construction schedule that includes, at a minimum, the elements set forth in subparagraph e. above.

h. CCH shall bear the burden of demonstrating by a preponderance of the evidence that CCH's position should prevail over the Governments' position. Should the Court determined that the schedule proposed by the Governments is either technically infeasible or would result in undue financial hardship, the Court shall adopt the schedule proposed by CCH; provided that the schedule selected by the Court shall not require completion of construction of secondary treatment facilities at Sand Island any earlier than December 31, 2035, or later than December 31, 2038.

In 2019, a Final Environmental Impact Statement (FEIS) was prepared for the SIWWTP Facility Plan to assess the impacts of two (2) potential secondary treatment alternatives to be provided at the SIWWTP; the step-feed activated sludge (SFAS) process alternative and the membrane bioreactor process (MBR) alternative. Based on the capital and maintenance cost, as well as the existing site constraints at the SIWWTP, the CCH selected the MBR as the preferred secondary treatment alternative. This project will evaluate the impacts of the Solids Waste Stream Process Facilities identified in Section 3.2.6 of the FEIS.

1.2 Project Purpose and Need

Per the 2010 Consent Decree, the SIWWTP will need to meet secondary treatment effluent standards for the wastewater flow by the year 2035, in accordance with CWA requirements. Phase 1 will provide secondary treatment for a portion of the projected 2055 planning flows for the SIWWTP (20 annual average daily (AAD)) anticipated in the year of 2026, and Phase 2 will provide secondary treatment of the annual average design flow of the SIWWTP (85 AAD) by year 2035 to satisfy the 2010 Consent Decree requirements. Phase 1 of the upgrades to SIWWTP to secondary treatment include the installation of the membrane bioreactor facility

(MBR), secondary treatment thickener building, and upgrades to the solid handling facilities. Figures 2 and 3 illustrate 1) the overall process flow diagram of SIWWTP with Phase 1 of the secondary treatment upgrades, and 2) the solids stream process flow with the Phase 1 upgrades.

Figure 2: SIWWTP Process Flow Diagram with Phase 1 Secondary Treatment

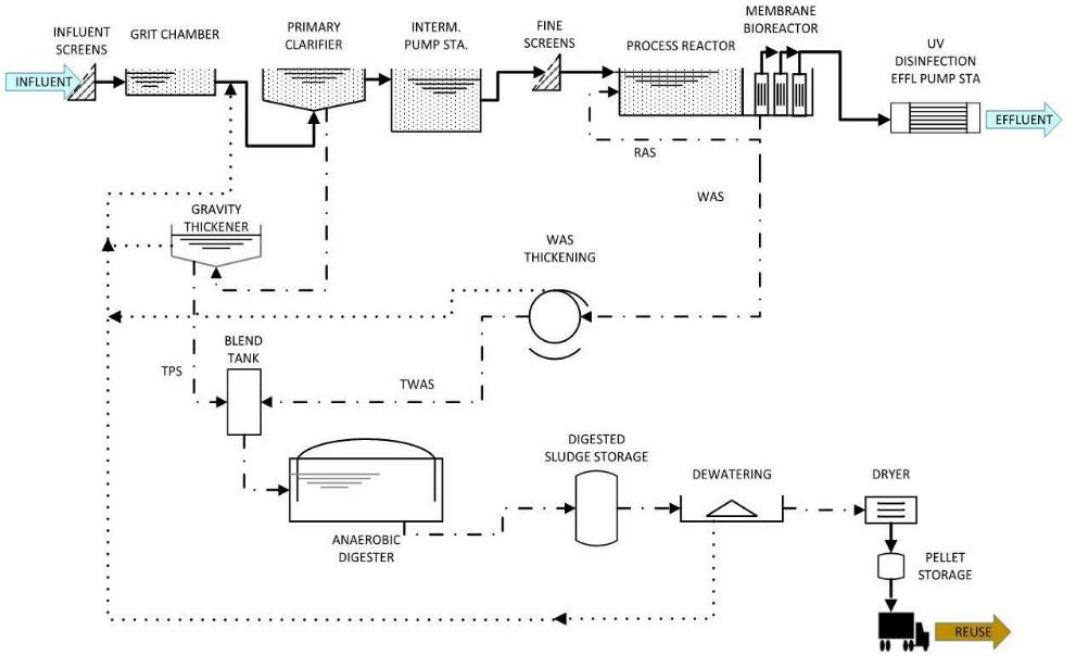
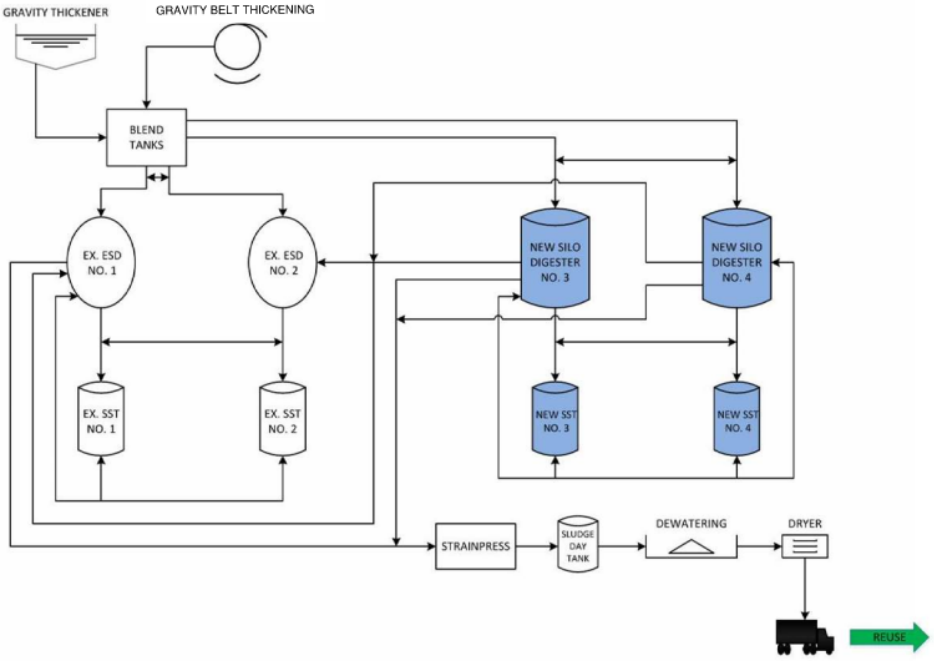


Figure 3: SIWWTP Bioconversion Facility Solids Process Flow Diagram Upgrades



1.3 Basis for Environmental Assessment

The proposed action involves the demolition and relocation of existing structures for the construction of new facilities that will upgrade the capacity of the solids stream process and facilities. The site plan from the 2019 FEIS for the SIWWTP Facility Plan is shown in Figure 4; the new construction included in the proposed action is shown in yellow as the "Solid Stream Facilities Constructed During Phase 1", and the demolition included in the proposed action is shown as "Future Facilities and Staging Area." The construction of new facilities will include the installation of digesters, sludge storage tanks and a control building with associated infrastructure to accommodate the SIWWTP's projected future loads through the year 2035. Building 10 identified as the Old Effluent Pump Station and Chlorination Building (currently abandoned in place) will be demolished to provide space for the new facilities, and the proposed future digesters to be installed during Phase 2 of the SIWWTP upgrades to accommodate the projected future loads of year 2055.

The proposed action includes the following demolition and relocation of existing structures:

- Demolition of Building 10 (Old Effluent Pump Station and Chlorination Building), and removal of abandoned 72-inch (in) and 84-in outfall pipe.
- Relocation of the water tank at the Effluent Screening Facility; removal and disposal of effluent screening and stockpiled equipment.
- Removal of the emergency generator, pump, engine parts, Healy-Ruff enclosures, and stockpiled tile material.
- Relocation of effluent water reuse pumps; installation of one new pump, two new self-cleaning strainers, and appurtenant structures.
- Relocation of the ChemFeed system, tanks, and all appurtenant structures.
- Relocation of electrical equipment, seal water tank and filter unit.
- Demolition and disposal of a fuel tank, effluent retention tank, and supports.

The proposed action includes the following new construction (see Section 1.5 for details):

- Installation of two new 2.35 million gallons (MG) anaerobic digesters to accommodate the 2035 solids loading.
- Installation of a new boiler and heating system inside of the existing Solids Handling Building to provide heat to the existing and new digesters. The building will be modified to accommodate the new boilers.
- Installation of two new 0.537 MG sludge storage tanks to provide additional storage capacity.
- Installation of a new Combined Heat and Power (CHP) system to beneficially reuse biogas to produce heat for the new and existing anaerobic digestion facilities and generate electricity for plantwide use.
- Installation of a new gas line and meter to serve as an alternative fuel source for the CHP system, digesters, boilers, dryers and other various processes at the facility.
- Installation of a digester control building containing an electrical room and process mechanical room, with a utility tunnel.

- Site work and utilities to accommodate the aforementioned facilities and the preparation of the site for future digesters to be installed during Phase 2.
- Installation of new aboveground gas, hot water and sludge piping along a pipe bridge that connects the new digester process area to the existing. Construction of 8-foot-high retaining walls along the north, south and east edges of the Bioconversion Facility.
- Installation of a new waste gas burner, relocation of the existing waste gas burner and associated appurtenances to accommodate 2035 gas production.

A Draft Environmental Assessment (Draft EA) is being prepared for this project in accordance with Hawai'i Revised Statutes (HRS) Chapter 343, and Hawai'i Administrative Rules (HAR) Title 11, Chapter 200.1 as the project involves the following actions identified in HRS Chapter 343, Section 5:

(1) Propose the use of state or county lands or the use of state or county funds;
(3) Propose any use within a shoreline area; and
(9)(A) Propose any wastewater treatment unit, except an individual wastewater system or a wastewater treatment unit serving fewer than fifty single-family dwellings or the equivalent.

1.4 Existing Facilities

The SIWWTP facility is owned by CCH, ENV. CCH operates the preliminary treatment, primary treatment, UV disinfection, effluent pumping, primary sludge thickening facility, and all other facilities not operated by Synagro. Synagro WWT, Inc. ("Synagro") is contracted by CCH to operate the sludge processing, including the digester feed and digestion, strain press, dewatering, Class A thermal drying system, and solids return flow lift pump station (RFLS).

The SIWWTP treats all of the wastewater flows generated in the Sand Island Sewer Basin (SISB) service area, which extends from Niu Valley in the east, to Salt Lake/Āliamanu in the west. The SIWWTP is the largest wastewater treatment plant (WWTP) on O'ahu, while the SISB is the largest in Hawai'i, serving a population of approximately 700,000. The SISB serves approximately 44 percent residential, 48 percent commercial, and 8 percent hotel occupants. Wastewater is routed to the SIWWTP via 16 CCH-owned wastewater pump stations (WWPS), one (1) military-owned WWPS at Fort Shafter and a network of gravity sewer lines and force mains. The SIWWTP has a design average daily flow rate of 90 mgd and peak wet weather hydraulic capacity of 271 mgd. Phase 1 and 2 of the SIWWTP secondary treatment facility improvements will be designed and developed based on improved design flow data and modeling to accommodate a design annual average flow (DAAF) of 85 mgd and design maximum monthly flow (DMMF) of 92 mgd. The current design data for the existing SIWWTP enhanced primary treatment facility is shown in Table 1. A site plan of the existing SIWWTP is shown in Figure 5.

Table 1: SIWWTP Current Enhanced Primary Treatment Design Data

Flows	Million Gallons per Day (mgd)
Design Average Flow	90 mgd
Intraday Elevated Flow	113 mgd
Design Peak Wet Weather Flow	271 mgd

1.4.1 Existing Treatment Processes

The existing SIWWTP treats incoming wastewater through chemically enhanced primary treatment (CEPT) and ultraviolet (UV) disinfection before being discharged via a deep ocean outfall. Solids are thickened, anaerobically digested, dewatered and thermally dried producing a pelletized product that can be used as a fertilizer, or as a source of fuel. The existing process flow diagram of the SIWWTP is shown in Figure 6.

Existing Liquid Waste Stream Processes

The following is a description of the existing major liquid stream facilities and processes:

- **Headworks:** This facility was placed in operation in 2005 and replaced the original Screenings Building. An influent receiving area receives flows from the Ala Moana WWPS, Hart Street WWPS, Sand Island Parkway WWPS, and the Fort Shafter WWPS. The headworks facility consists of band screens with rectangular openings and associated screening washers and compactors for screenings removal; six Parshall flumes for flow measurement; and four aerated grit chambers for grit removal. Screenings and grit are conveyed and discharged into a dump truck for disposal at the Waimānalo Gulch landfill. Recently, the screens were upgraded to smaller opening screens; this upgrade will improve rags removal and solids capture.
- **Primary Clarifiers (PCs):** PCs provide for the separation of solids from liquid waste (effluent), and facilitation of the primary odor control treatment system.
- **Inorganic Chemical Feed Building (ICFB):** The ICFB allows the injection of chemicals used for CEPT. Currently iron chloride (ferric chloride [FeC13]) is being utilized for advanced primary treatment and odor control. Polymer is also being used for flocculation.
- **Ultraviolet (UV) Disinfection Facility:** The UV disinfection facility consists of three effluent screens, six UV disinfection channels and an effluent WWPS. Five of the six UV disinfection channels are currently populated with UV lamps. The UV system has room for expansion from the current six UV disinfection channels to ten. Four channels are used under normal operations. The EPS is used to provide additional pumping head to discharge the treated primary effluent through the 84-in diameter ocean outfall pipeline.

Figure 4: SIWWTP Facility Plan for Secondary Treatment Upgrades (from the 2019 FEIS)

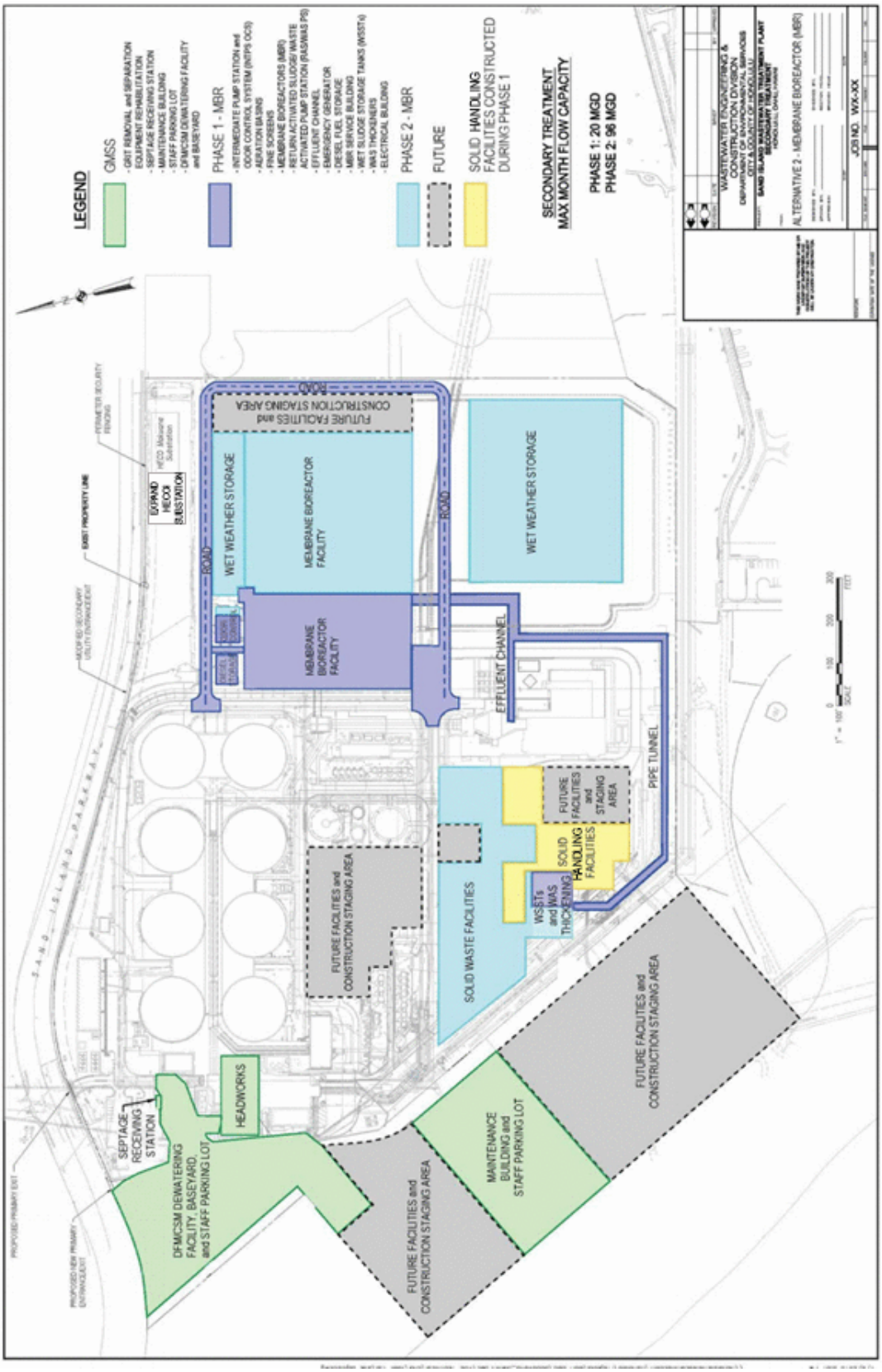
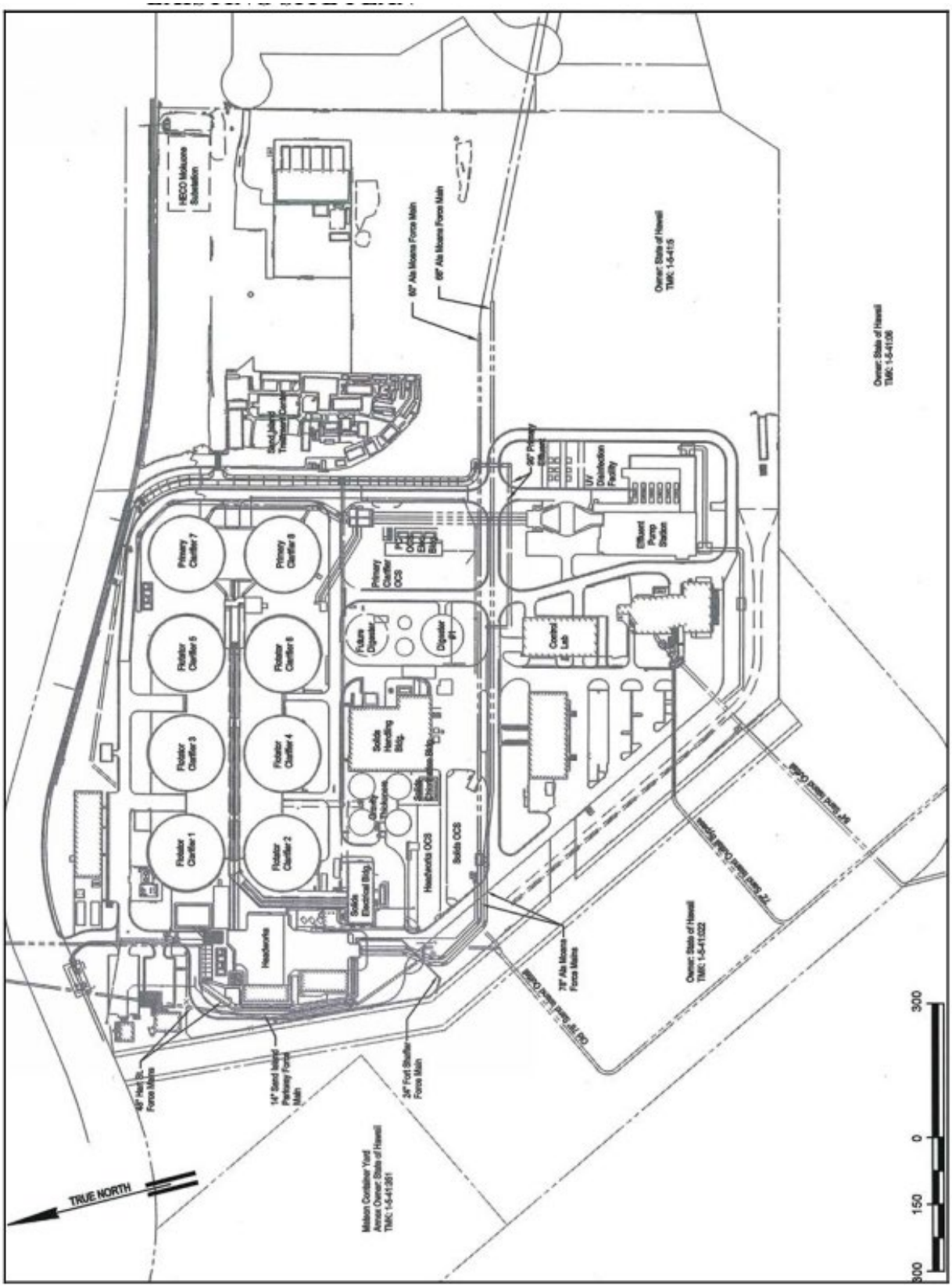


Figure 5: SIWWTP Existing Site Plan



- **Ocean Outfall:** Effluent is discharged through an 84-inch diameter ocean outfall extending nearly 2 miles offshore to a depth of over 220 feet, see Figure 7. The total length of the outfall is approximately 14,000 linear feet (lf). The wastewater is diffused through the final stretch of the outfall pipe, which is approximately 3,400 lf.
- **Odor Control System (OCS):** Foul air emissions for the SIWWTP operations are governed by Non-covered Source Permit (NSP) No. 0216-05-N, Application for Renewal No. 0216-13. NSP coverage includes operations from the initial stages of WWTP processing including the headworks, clarifiers, gravity thickeners, and WSSTs. Currently, there are three main OCSs operating at the SIWWTP (see Table 2). Odor and emission controls have resulted in improved ambient air quality, which will continue to produce positive long-term effects on air quality surrounding the treatment plant.

ENV recently completed a project to install an additional OCS system consisting of covers, ducting, fans, scrubber system and exhaust stacks to treat foul air generated by the UV Disinfection and EPS facility in 2020 (see Table 3). Based on the total annual emission, the EPS/UV Odor Control System does not require an air permit in accordance with Hawaii Administrative Rules (HAR), Chapter 11-60.1, Air Pollution Control.

Existing Solid Waste Stream Processes

The following is a description of the existing major solid stream facilities and processes:

- **Gravity Thickeners (GT):** Primary sludge from the floater clarifiers and PCs is pumped to the three of the four GTs where ferric chloride is added to control odors and assist in thickening.
- **Wet Sludge Storage Tanks (WSSTs):** Thickened sludge from the GTs and primary scum from the clarifiers are pumped to one of the four existing WSSTs. The WSSTs were originally designed to serve as sludge equalization tanks for the original solids handling processes, which formerly included a thermal conditioning system, centrifuges and sludge incinerators. These systems have been replaced with the sludge dewatering drying and pelletizing system now in operation.
- **Anaerobic Digester:** The anaerobic digester involves a continuous feed process from the WSSTs into two existing Egg-Shaped Digesters (ESDs). This is in compliance with 40 CFR Part 503 for the production of Class B biosolids. The anaerobic digesters reduce solids and produce energy in the form of methane (CH_4). The CH_4 or biogas is used as a fuel source for the sludge heat drying system and boiler to heat the anaerobic digesters. A biogas holding storage tank, hydrogen sulfide (H_2S) scrubber, two waste gas burners, and associated auxiliary equipment (e.g., piping, valves, and condensate trap) and controls are a part of the anaerobic digestion process. After completion of the digestion process, the liquid digested biosolids are pumped to the sludge dewatering drying and pelletizing system.
- **Sludge Dewatering Drying and Pelletizing System:** The system consists of digesters, centrifuges and final drying and pelletizing apparatus. This is in accordance with 40 CFR Part 503 Class A Heat Dried Biosolids regulations. The resulting pelletized sludge is

Figure 6: SIWWTP Existing Process Flow Diagram

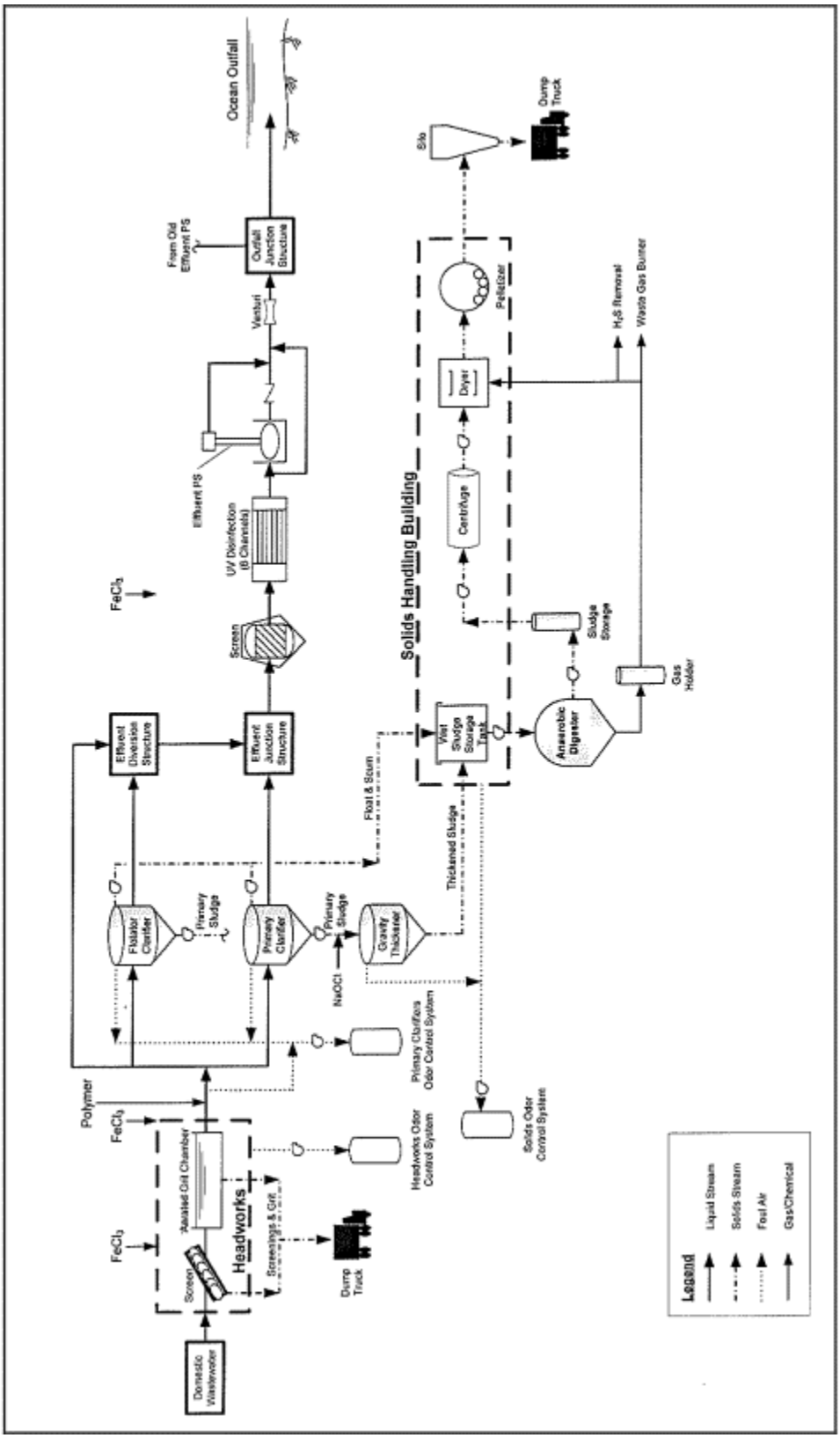


Figure 7: SIWWTP Ocean Outfall

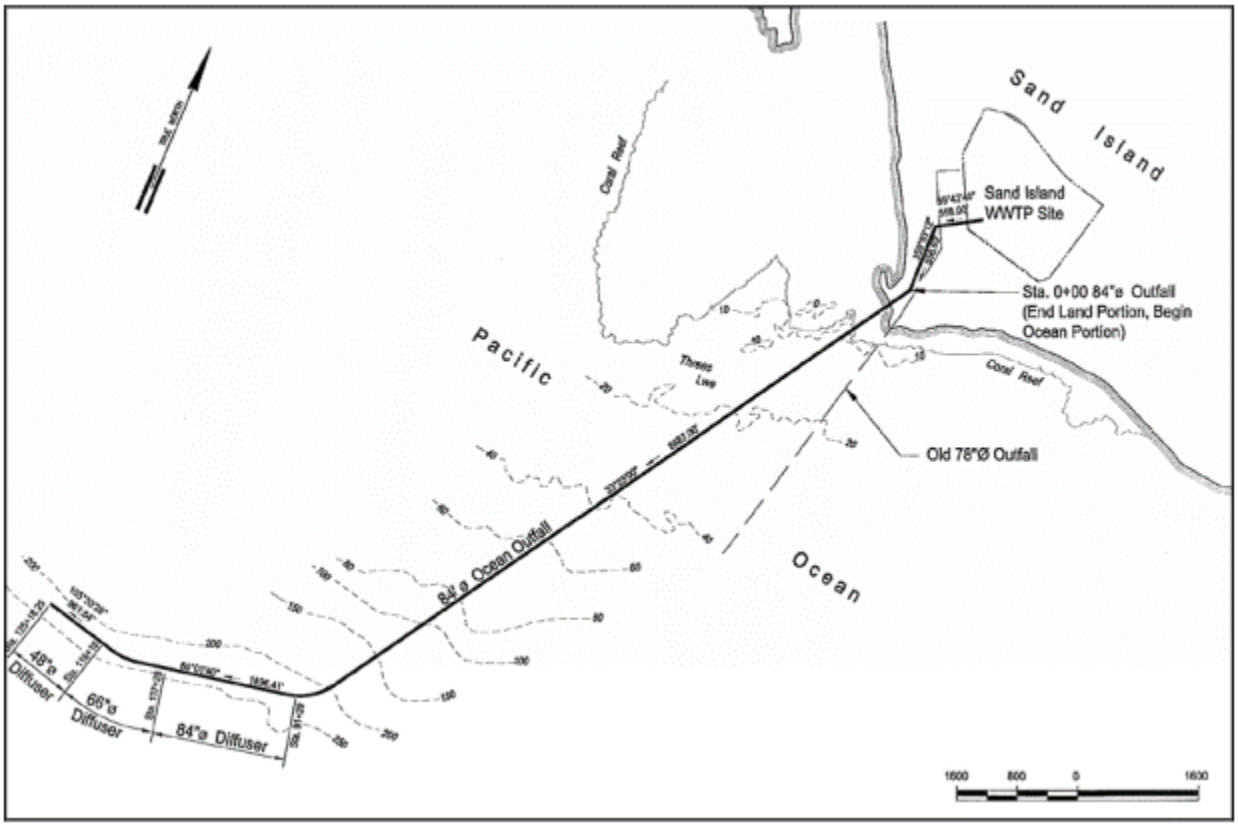


Table 2: Existing Odor Control Systems

Odor Control System (OCS) Name	Design System Airflow (cubic feet per minute [cfm])	Installation Completed	First Stage	Second Stage	Process Air Treated
Headworks	40,000	April 2012	2 + 1 Fans 20,000 cfm	2 + 1 Fans 20,000 cfm	Influent Receiving Area Screening Channels Aerated Grit Chambers Screening Hoppers Grit Hopper Truck Bay Area
			3 + 1 BTFs[1] 10,000 cfm each	2 + 1 GAC[2] filters 20,000 cfm each	

Primary Clarifiers (PCs)	50,000	August 2011	3 + 1 Fans 16,700 cfm each	3 + 1 Fans 16,700 cfm each	PCs 1-6 Launders PCs 7 & 8 Launders Influent Channels Effluent Channels
			4 + 1 BTFs[1] 10,000 cfm each	3 + 1 GAC[2] filters 16,700 cfm each	
Solids	30,000	December 2011	2 + 1 Fans 15,000 cfm each	2 + 1 Fans 15,000 cfm each	Gravity Thickeners WSSTs[3] RFPS[4] Sludge Division Box MLS[5]
			3 + 1 BTFs[1] 7,500 cfm each	2 + 1 GAC[2] filters 15,000 cfm each	

Source: ENV, 2018
Notes: [1] Bio-Trickling Filter (BTF)
[2] Granular Activated Carbon (GAC)
[3] Wet Sludge Storage Tank (WSSTs)
[4] Return Flow Pump Station (RFPS)
[5] Makai Lift Station (MLS)

Table 3: New Odor Control Systems

Odor Control System (OCS) Name	**Design System Airflow** (cubic feet per minute [cfm])	**Installation Completed**	**First Stage**	**Second Stage**	**Process Air Treated**
UV Disinfection and Effluent Pump Station	18,000	September 2020	1 + 1 Fans 18,000 cfm each	None	UV Screen Influent UV Screen Effluent UV Disinfection Channels Effluent Channel EPS Wet Well Scum Collection Pit

available for use as fertilizer . The anaerobic digester operations, and sludge dewatering, drying and pelletizing system are owned by the CCH and operated by Synagro under an Operation and Maintenance (O&M) contract. The pellets produced at this facility are beneficially reused as fertilizer for land applications at agricultural farms. Residual materials not suitable for marketing is disposed of at the Waimānalo Gulch landfill and/or H-POWER. The majority of the pellet material is being non-commercially used for fertilizer.

1.4.2 Utility Services

Electrical Power

The SIWWTP receives electrical services from Hawaiian Electric Company (HECO). Electrical power to the SIWWTP facilities is provided by an 11.5 kilovolts (kV) distribution system within the SIWWTP. Separate circuits from separate HECO substations (Sand Island Substation and Mokuone Substation) are provided for increased electrical service reliability to the plant.

Sand Island is served by two 46 kV HECO transmission lines, Iwilei 1 and 2. These two 46 kV circuits are run overhead along two diverse routes and on different poles to a location at the Honolulu (west) side of Sand Island Parkway bridge. The two 46 kV overhead lines riser down on separate poles as they then transition to submarine type cables and cross the channel on the mauka side of the bridge. The submarine cables land on Sand Island at locations between the bridge and the end of Pier 51. The two 46 kV lines then continue underground to HECO Sand Island Substation located near the Sand Island (east) end of the bridge and adjacent to the channel. The Sand Island Substation steps the 46 kV transmission voltages down to 11.5 kV for distribution on Sand Island, including within SIWWTP. The two 11.5 kV distribution feeders from the Sand Island Substation are designated as Sand Island 1 and 2. These two feeders are generally run overhead on joint use utility poles along Sand Island Parkway.

The two 46 kV lines have recently been extended from the Sand Island Substation to the Mokuone Substation to support the increasing loads at the SIWWTP. The two 46 kV lines run overhead out of the Sand Island Substation on common poles for a short distance. Then the 46 kV circuits split off as two separate overhead pole lines on opposite sides of the Sand Island Parkway to Mokuone Substation, except for a section fronting the SIWWTP where the Iwilei 2 circuit is run underground. Mokuone Substation steps the 46 kV transmission voltages down to 11.5 kV for distribution on Sand Island. The two 11.5 kV distribution feeders from the Mokuone

Substation are designated as Mokuone 1 and 2. In the event of a utility power outage, a system of backup generators located throughout the plant will automatically start and provide power to essential equipment.

Water

Potable Water

Water is provided to the SIWWTP for potable water and water for fire protection through a 12-inch water main which is connected to a CCH Board of Water Supply (BWS) 16-inch water main located along Sand Island Parkway. Potable water use at the SIWWTP includes sanitary fixtures

(e.g. sinks, toilets, showers, eyewash stations and water fountains), fire protection, landscape irrigations, wet well cleaning and odor control system and maintenance purposes.

Re-use Water

The SIWWTP also provides primary effluent process water to Synagro for "moisture conditioning" of the dryer exhaust that is returned to the front of the dryer.

1.5 Proposed Facilities and Site Work

The following new facilities are proposed to be constructed to upgrade the capacity of the solids stream process and facilities:

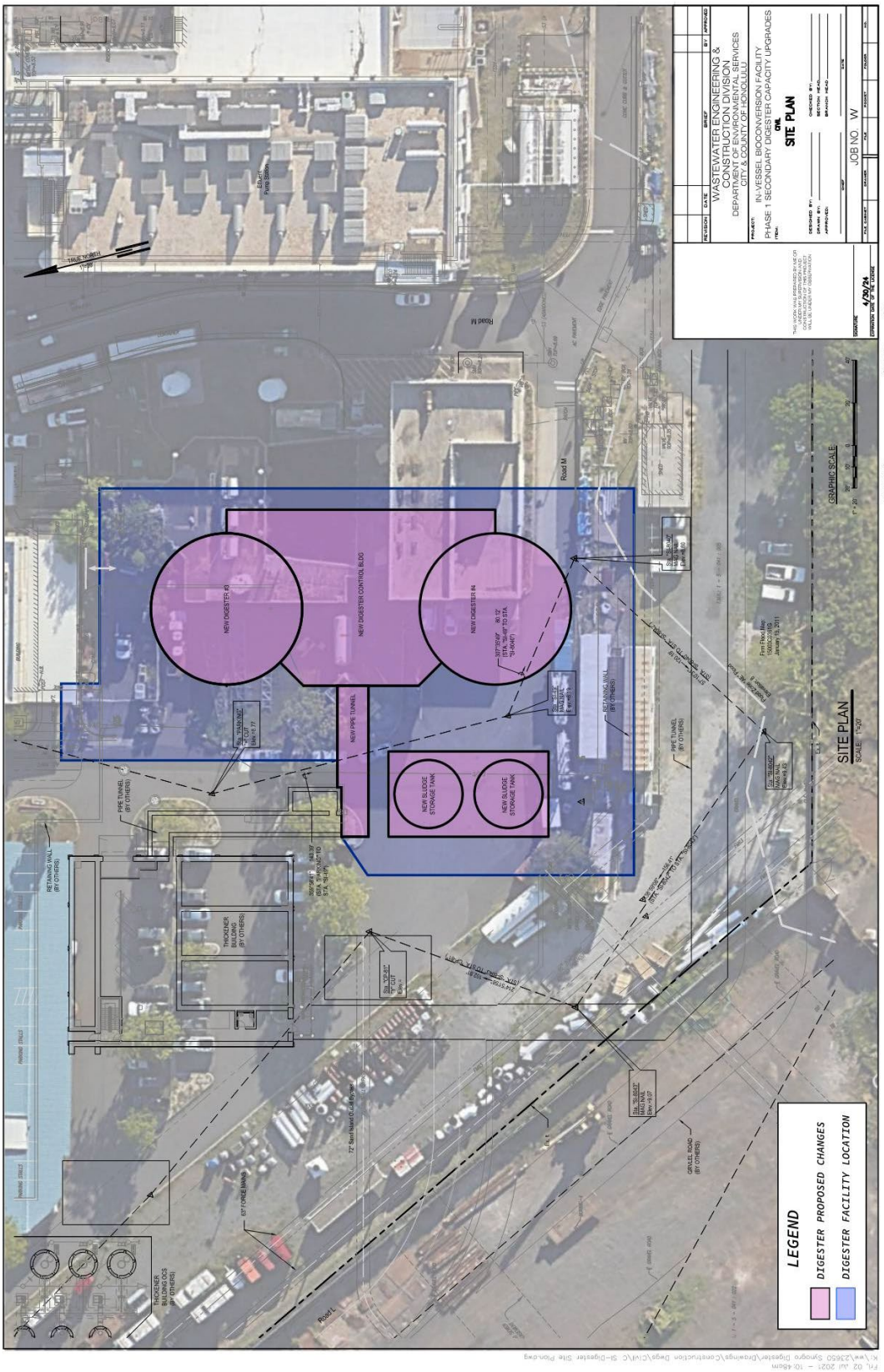
- **Anaerobic Digesters (DIGs):** Two (2) new 2.35 MG, approximately 71-foot diameter, 123-foot tall, concrete, cylinder DIGs, are proposed to support the two existing ESD to accommodate the projected 2035 solids loading. Solid streams will be sent from the WSST facilities to the DIGs. The DIGs will be conventional mesophilic digesters, which will starve the solid streams of oxygen through a heat-induced process for approximately 30 days, which will convert the solid sludge into Volatile Fatty Acids (VFAs) and eventually into CH_4 and carbon dioxide (CO_2).
- **Sludge Storage Tanks (SSTs):** Two (2) 0.537 MG SSTs will store digested sludge, a by-product of the secondary treatment of effluent. These SSTs will provide additional storage capacity to support the two existing SSTs.
- **Digester Control Building:** The Control Building will be located between the two DIGs. A utility tunnel will be provided to connect the Control Building with the new Thickener Building. This building will house an electrical room and process mechanical room.
- **Gas Treatment Facilities:** The Gas Treatment Facilities will handle all the biogas produced, prioritize biogas usage in the dryer, and will maximize biogas used to feed the Combined Heat and Power (CHP) system.

The project will also include the construction of 8-foot-high retaining walls along the north, south and east edges of the Bioconversion Facility. A conceptual site plan is shown in Figure 8. Site work will be required to accommodate the new facilities, as well as prepare the site for future digesters to be installed during Phase 2.

The following facilities will also be constructed to support the operation of the digesters. These facilities would be constructed within the SIWWTP, but outside of the area bounded by the new 8-foot-high retaining walls.

- **New CHP System:** A new CHP system will be installed to beneficially reuse biogas to produce heat for the new and existing anaerobic digestion facilities and generate electricity for plantwide use. As noted above, this system will be located within the SIWWTP to support the operation of the digesters. The final location is to be determined as it is presently in design.

Figure 8: Conceptual Site Plan



- **New Gas Line and Meter**. Natural gas may be provided to the project site to serve as an alternative fuel source for the CHP system, digesters, boilers, dryers and other various processes at the facility, which would otherwise run on electricity, biogas, or diesel fuel. The location of the new gas line and meter would be based on the final location selected for the CHP system and digester gas treatment system. This system would also be located entirely within the SIWWTP.

The following structures will be demolished or removed to accommodate the new facilities:

- Demolition of Building 10 (Old Effluent Pump Station and Chlorination Building), and removal of abandoned 72-in and 84-in outfall pipe.
- Relocation of the water tank at the Effluent Screening Facility; removal and disposal of effluent screening and stockpiled equipment.
- Removal of the emergency generator, pump, engine parts, Healy-Ruff enclosures, and stockpiled tile material.
- Relocation of effluent water reuse pumps; installation of one new pump, two new self-cleaning strainers, and appurtenant structures.
- Relocation of the ChemFeed system, tanks, and all appurtenant structures.
- Relocation of electrical equipment, seal water tank and filter unit.
- Demolition and disposal of a fuel tank, effluent retention tank, and supports.

1.5.1 Basis of Design

The purpose of this project is to provide additional solids stream treatment capacity for the phased buildout process to upgrade the SIWWTP to meet secondary treatment effluent standards for the facility's wastewater flow, in compliance with the 2010 Consent Decree. The project is not designed for the purposes of stimulating population growth and development within urban Honolulu or the SISB, but is instead based on the projected future needs and growth in the SIWWTP service basin that will be driven by Transit-oriented Development (TOD) and other private developments.

CCH, Department of Planning and Permitting, Planning Research Branch (DPP-PRB), prepares value-added demographic information for the island of O'ahu that is based on the U.S. Census. DPP-PRB projects population growth up to 30 years into the future, with current projections to the year 2035. Population projections are compartmentalized for Development Plan areas, Sustainable Communities Plan areas, and Traffic Analysis zones (TAZ) within TOD plan areas. For this project, population projections are based on existing TAZ data for the SISB and was used as the basis for the generation of wastewater flows to the SIWWTP. The design influent flowrates at average and maximum month conditions in the year 2035 and 2055 are summarized in Table 4.

Table 4: SIWWTP Design Influent Flows

Year	Annual Average (mgd)	Maximum Month (mgd)
2035	85	92
2055	89	96

Reference: TM 1.8 Solids Evaluation (AECOM)

The basis of design for the bioconversion facility will only consider primary sludge loadings to the year 2035 and waste activated loadings for Phase 1 of secondary treatment. A future project will evaluate if additional upgrades are required when future phases and secondary treatment is completed.

Rising wastewater flows and adding partial secondary treatment to SIWWTP is estimated to result in a large increase in sludge production. The 2035 annual average and maximum month mass loads from the Phase 1 MBR secondary treatment modeling included in a report prepared by AECOM is presented in Table 5. The modeling assumed that the existing CEPT system would remain in operation throughout Phase 1 secondary treatment since it is required to meet effluent permit requirements. The sludge concentrations and volatile solids content listed are based on the outputs from the process modeling that was presented in the report.

Table 5: Phase 1 Loading Requirements with CEPT - MBR

Parameter	MBR	
	2035	
	Annual Average	Maximum Month
Primary Sludge (PS)		
PS Mass Loading dry tons per day (dtpd)	58.3	63.2
PS Volatile Content (% VS/TS)	83%	83%
PS Solids Content (mg/L)	3,900	3,900
PS Volumetric Loading (mgd)	3.6	3.9
Waste Activated Sludge (WAS)		
WAS Mass Loading (dtpd)	6.2	6.9

WAS Volatile Content (% VS/TS)	74%	75%
WAS Solids Content (mg/L)	6,400	6,400
WAS Volumetric Loading (mgd)	0.2	0.3
Total Sludge Production		
Total Sludge Production (dtpd)	64.5	70.1
Total Volatile Content (% VS/TS)	82.4%	82.6%
Total Solids Content (mg/L)	4,000	4,000
Total Volume (mgd)	3.9	4.2

Reference: TM 1.8 Solids Evaluation (AECOM)

The annual average and maximum month mass loads for future design years are presented in Table 6. Modeling presented in the AECOM report assumed additional membrane bioreactors would be added for secondary treatment, and that CEPT would not be in operation during future phases. Loading requirements in the report were used as the basis for the 2055 mass and energy balance. It should be noted that additional planning, design and construction will be needed to upgrade the capacity and/or renew major equipment in the bioconversion facility to handle future loading conditions.

Table 6: Future Design Years Loading Requirements with MBR

Parameter	MBR	
	2055	
	Annual Average	Maximum Month
Primary Sludge (PS)		
PS Mass Loading (dtpd)	50.1	51.7
PS Volatile Content (% VS/TS)	83%	84%
PS Solids Content (mg/L)	3,500	3,200
PS Volumetric Loading (mgd)	3.4	3.9

Waste Activated Sludge (WAS) (90 mgd)		
WAS Mass Loading (dtpd)	26.7	28.0
WAS Volatile Content (% VS/TS)	76%	76%
WAS Solids Content (mg/L)	6,900	6,700
WAS Volumetric Loading (mgd)	0.9	1.0
Total Sludge Production		
Total Sludge Production (dtpd)	76.8	79.7
Total Volatile Content (% VS/TS)	80.5%	80.9%
Total Solids Content (mg/L)	4,300	3,900
Total Volume (mgd)	4.3	4.9

Reference: TM 1.8 Solids Evaluation (AECOM)

Anaerobic Digesters Process Description

Anaerobic digestion is a biological process where organic matter is capable of stabilizing into Class B biosolids in the absence of oxygen, while biodegradable organic matter is converted to water and biogas. The EPA has three classes of biosolids, Class A EQ, Class A and Class B. These classifications are based on standards for the concentrations of pathogens and metals present, and odors and vector attraction reduction. Different levels of solids processing are required for each class. An additional set of requirements referred to as Processes to Further Reduce Pathogens (PFRPs) must also be satisfied. PFRPs include composting, heat drying, heat treatment, thermophilic aerobic digestion, thermophilic anaerobic digestion operated in the batch mode, beta ray irradiation, gamma ray irradiation, and pasteurization. Heat treatment includes the emerging thermal hydrolysis process (THP) operating in the batch mode. The SIWWTP currently uses a heat drying process and produces an EPA Class A biosolids product.

At the SIWWTP, the digestion process has significantly reduced the overall quantity of pathogens and volatile solids to control vector attraction in the sludge, and decreased the total volume of solids that downstream processes need to dewater and thermally dry to Class A biosolids. Class A biosolids have pathogen levels which are essentially at non-detectable levels to control vector attraction, and may be used on gardens, parks and golf courses. Additionally, the produced biogas which contains methane and carbon dioxide is reused as an energy source for the thermal dryer. Biogas may be used by the CHP system to produce electricity and heat.

Solids retention time (SRT) is the prime parameter in the sizing of anaerobic digestors. Conventional mesophilic anaerobic digesters are typically operated at SRT of 15 to 25 days and at temperatures ranging from 95 to 102°F. Blended feed solids concentrations are typically in

the range of 4 to 6%, and volatile solids reduction varies between 40% to 60%. The applicable design flows and design criteria for sizing of the digesters is presented in Table 7.

Table 7: Anaerobic Digestion System Design Criteria

Parameter	Value
Applicable Design Flows and Loads	
Phase 1 Design Flow Condition	Max. Month Flow and Load
Phase 2 Design Flow Condition	Max. Month Flow and Load
Operating Criteria	
Combined Sludge Feed Concentration	4 – 6%
Solids Retention Time (SRT)	15 – 20 days
City Standard SRT	>20 days
Temperature Range	95 – 102°F
Volatile Solids Loading Rate (VSLR)	0.12 – 0.18 lb/cf/d
City Standard VSLR	<0.12 lb/cf/d
Volatile Solids Reduction (VSR)	40 – 60%

Digester tank shape will influence the operating characteristics of the anaerobic digestion along with the overall operation and maintenance. Two concrete silo type digesters are proposed for this project because of the following advantages:

- Reduced potential foam and scum accumulation
- Ability to manage grit accumulation
- Reduced footprint
- Efficient mixing

The operational parameters for the silo shape anaerobic digesters and digester tank dimensions are outlined in Table 8.

Table 8: New Anaerobic Digester Tank Dimensions

Parameters	Value
Number of Digesters	2
Inside Diameter (ft)	70’ – 10”
Side Water Depth (ft)	70’ – 10”
Design Operating Level Elevation (ft)	110.625’
Cone Depth (ft)	31’ – 3.5”
Tank Top Wall Elevation (ft) including cover/piping	130.00’
Tank Wall Elevation, MSL (ft)	114.96’
Tank Top Wall Height (ft)	98.96’
Bottom Floor Slope (degrees)	Minimum 38°
Design Gas Pressure at Cover	20 inches W.C.

Sludge Storage Tanks Process Description

Digested sludge from the egg-shaped digesters is drained to the sludge storage tanks prior to being transferred to the dewatering and drying operations. The digested sludge storage provides a buffer between the digestion, dewatering and drying operations. This buffer is important since the dewatering and drying systems currently operates only 3 to 4 days per week.

Digested sludge from the existing digesters is drained to their respective sludge storage tanks either by pumping or via a 10-inch diameter pipe at the bottom of the digester, by the resulting pressure head between the digester and sludge storage tank. The system can be operated in an overflow that transfers directly to the sludge storage tanks.

SIWWTP currently has two 537,400-gallon storage tanks that are each 30-ft in diameter and 108-ft tall. Each existing tank currently provides 4 to 5 days of storage capacity, allowing the dewatering and drying to operate only 3 to 4 days per week. A summary of the digested sludge storage requirements is provided in Table 9. The hydraulic residence time (HRT) required for each new sludge storage tank is assumed to be the same as the existing to allow for operational flexibility for the dewatering and dryer facilities.

Table 9: Sludge Storage Tank Design Criteria

Parameters	2035 (Phase 1)	2035 (First Day of Phase 2 Operations)
Sludge loading (dtpd)	30	47
Total Solids (%)	2.8%	3.1%
HRT (days)	4	4

Under 2035 conditions and with Phase 1 secondary treatment completed, the existing sludge storage tanks would be able to provide a total of 4 days of storage. Two additional storage tanks similar in volume will be added along with the two new digesters in this project. With one additional new storage tank there would be approximately 6.2 days of storage capacity. In 2035 (on the first day of Phase 2 operations), the sludge storage capacity available with three sludge storage tanks will be 4.5 days; with four tanks there will be 6 days of storage. Although the dewatering and drying processes are expected to increase their hours of operation to handle increased solids loading, sludge storage tanks would allow for additional storage capacity in the event of an emergency or maintenance shutdown of the dryer. The design parameters for the new sludge storage tanks are outlined in Table 10.

Table 10: New Sludge Storage Tank

Parameters	Value
Inside Diameter (ft)	30’
Tank Wall Elevation (ft) including cover/piping	130.00’
Tank Wall Elevation, MSL (ft)	115.13’
Tank Wall Height (ft)	99.13’
Design Operating Level (ft)	110.63’
Volume (each tank)	0.537 MG

Gas Treatment Facilities and Combined Heat and Power (CHP) System Process Description

The gas treatment facilities will be designed to safely handle all the biogas produced and prioritize biogas usage for the dryers and hot water boiler. The back-up fuel to the thermal dryer and hot water boiler is costly, so prioritizing biogas for use by the dryers over the CHP

system is the best approach. Untreated biogas will be burned in the flare if CHP and thermal drying operations cannot utilize the full biogas production.

Biogas generated in anaerobic digesters is a mixed gas composed primarily of methane and carbon dioxide, with trace amounts of other gases such as hydrogen sulfide, nitrogen, water vapor, and siloxanes. The CHP requires the biogas to be treated for each of these constituents before it can be utilized in the engines.

SIWWTP has an existing gas conditioning system used to treat biogas prior to use in the thermal dryer. This system pressurizes the biogas and reduce moisture and hydrogen-sulfide concentration. The additional vessel(s) would be able to treat the biogas required to run the dryer, boiler, and CHP systems simultaneously. The CHP system requires an additional treatment process to reduce the concentration of siloxanes in the digester gas. Downstream of the installed gas treatment system, a new tee will be installed, and the additional siloxane treatment system will be installed on the new gas line in route for the CHP system.

The design quantities of biogas are shown in Table 11, which include the projected biogas production from the existing anaerobic digestion system at the SIWWTP. The existing thermal drying system will take precedence over the CHP system for biogas usage. Furthermore, the thermal drying system operates intermittently, several days a week at 24-hour operations. The table includes the estimated number of days per week the dryer will be operating and what the resulting quantity of biogas for the CHP will be when the dryer is on and off.

Table 11: Estimated Biogas Production Based on Thermal Dryer Operation

Scenario	Biogas Production (SCFD)	Dryer Operation (days/week)	Available Biogas and Power Production – Dryer ON		Available Biogas and Power Production – Dryer OFF	
			Available Biogas (SCFD)	Estimated Power Production (kW)	Available Biogas (SCFD)	Estimated Power Production (kW)
Current	459,300	2.5	1,500	5	459,300	1,310
2025	826,500	5.2	368,600	1,050	826,500	2,360
2035	1,032,600	6.4	574,800	1,640	1,032,600	2,950

*Assumptions:

LHV = 585 Btu/scf
Power Conversion Efficiency = 40%
2035 Maximum Month Loading

The CHP system will use treated biogas to create electricity to offset onsite power demand. The system will also create heat to be used by the hydronic heating system to heat the anaerobic digester heat exchangers. The CHP system is not intended to operate as back-up power to the treatment facility.

Natural gas may be provided to the project site to serve as an alternative fuel source for the CHP system, digesters, boilers, dryers and other various processes, which would otherwise run-on biogas or diesel fuel. The location of the new gas line and meter would be based on the final location selected for the CHP system.

1.6 Approvals and Permits

1.6.1 Federal

- U.S. Department of Transportation, Federal Aviation Administration
    - Notice of Proposed Construction or Alteration, Form 7460-1
- U.S. Environmental Protection Agency
    - Application for the risk-based disposal approval for PCB cleanup (if necessary)

1.6.2 State of Hawai‘i

- Department of Health
    - Notification of Demolition and Renovation
    - Community Noise Permit or Community Noise Variance (if nighttime work is proposed)
    - Construction Plan Review and Approval
    - Covered Source Air Permit
    - CWA Section 402, National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) or Individual Permit for Discharges to State Waters:
        - NOI C – Construction Storm Water
        - NOI F – Discharge of Hydrotesting Effluent
        - NOI G – Discharge of Construction Dewatering
    - Prepare Construction Environmental Hazard Management Plan
    - Disability and Communication Access Board (DCAB) Facility Access Plan Review
- Department of Land and Natural Resources
    - State Historic Preservation Division, Hawai‘i Revised Statutes, Chapter 6E Review
- Department of Transportation, Highways Division
    - Permit to Discharge into State Highway Drainage System (if discharging to Sand Island Access Road inlets)

1.6.3 City and County of Honolulu

- Department of Planning and Permitting
    - Special Management Area Permit (Major)
    - Construction Plan Review and Approval

  - Building and Construction Permits
  - Zoning Height Waiver
- Department of Transportation Services
  - Construction Plan Review and Approval

2.0 AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

2.1 Climate and Climate Change

The project site is located on Sand Island within an industrialized sector of urban Honolulu, on the south shore of O'ahu. The average annual temperature recorded in 2020 at the nearby Daniel K. Inouye International Airport was 78.9-degrees Fahrenheit, while the average annual precipitation was 13.65-in. Average annual wind speed recorded in 2020 was 10.30-miles per hour (mph).

The University of Hawai'i, Coastal Geology Group (CGG) in collaboration with Tetra Tech, Inc., modeled the potential future exposure of the State to multiple coastal hazards as a result of sea level rise. Three chronic flooding hazards were modeled: passive flooding, annual high wave flooding, and coastal erosion. The footprints of these hazards were combined to create the sea level rise exposure area (SLR-XA), which shows the projected extent of chronic flooding due to sea level rise. Four sea level rise scenarios were modeled: 0.5-foot, 1.1-feet, 2.0-feet and 3.2-feet. Figure 9 shows the project site's relation to 3.2-ft of SLR-XA, which is predicted to be reached by the year 2100.

As part of the 2019 FEIS for the SIWWTP Facility Plan, a Greenhouse Gas Emissions Estimate Study (GHG Study) was prepared by McGovern McDonald Engineers (MME). The study assessed emissions for three greenhouse gases (GHGs): carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). At the SIWWTP, CO_2 is produced during the treatment process from the sludge digesters, from digester gas combustion, the activated sludge process and through purchased electricity. CH_4 is produced during the anaerobic degradation and digester gas combustion. N_2O is produced during digester gas combustions and the nitrification/denitrification process. For the purposes of the report, the total emissions for each of these gases were calculated separately but reported as "carbon dioxide-equivalents" or CO_{2e}, so that the emission of non-CO_2 gases could be reported on a common basis.

The study assessed anthropogenic emissions, as they are considered to be outside of the natural carbon cycle, as opposed to "biogenic" emissions, or those that are part of the natural carbon cycle; e.g., CO_2 produced as a result of combusting digester gas are considered biogenic because they originated from biologic sources. Emissions for both the existing and future "baseline" conditions with primary treatment only were estimated. The total anthropogenic CO_{2e} emissions for the existing baseline condition were estimated at 34,003 metric tons per year. The total CO_{2e} emissions for the future baseline condition without secondary treatment were estimated at 48,061 metric tons per year.

As part of this Draft EA, MME produced greenhouse gas estimates for the proposed upgrades to the solids treatment process. Four scenarios were evaluated: the existing primary conditions and flow, the expanded primary and future flow, Phase 1 Upgrades with 2035 flows without

CHP, and Phase 1 Upgrades with 2035 flows with CHP. The following results shown in Figures 10 and 11 are based on preliminary assumptions.

Potential Impacts and Mitigation Measures

In anticipation of sea level rise, the proposed project considered a high groundwater level of 9-feet above mean sea level (amsl) to use in the foundation design of the new structures. The proposed digester facility will have a finish grade elevation of approximately 16-feet, which is about 8-feet above the existing ground elevation. The elevation was established by the installation of the Phase 1 MBR facilities to accommodate for flood conditions and sea level rise, which projected sea level rise of 6-feet plus storm surge of 8-feet, plus 2-feet of freeboard.

The higher floor elevation will help the facility be more resilient to coastal inundation and flooding due to storm surges, sea level rise and tsunamis. Deep foundation systems will be considered in the design to resist impacts from high buoyancy forces.

The GHG Study was conducted to evaluate the effects on climate change and sea level rise by estimating the potential levels of GHGs that would result from the SIWWTP secondary treatment facilities. The study found that the secondary treatment facilities are not anticipated to result in an adverse direct effect on the climate of Hawai‘i.

The addition of the secondary treatment process results in an approximately 30,000 metric tons per year increase in CO_2 emissions over expansion of the existing process. The highest source of indirect emissions from the SIWWTP is from purchased electricity. Although secondary treatment requires a large amount of electricity, it provides a higher quality effluent, and therefore slightly reduces the power required by the UV disinfection system. In addition, according to MME’s estimates the installation of the CHP system shows a significant reduction in greenhouse gas emissions as the system would offset onsite power demand and produce heat for a hydronic heating system to heat the anaerobic digester heat exchanges.

Figure 9: SLR-XA 3.2-ft Scenario

Figure 10:Summary of Annual Anthropogenic CO_{2e} Emissions by Emission Source

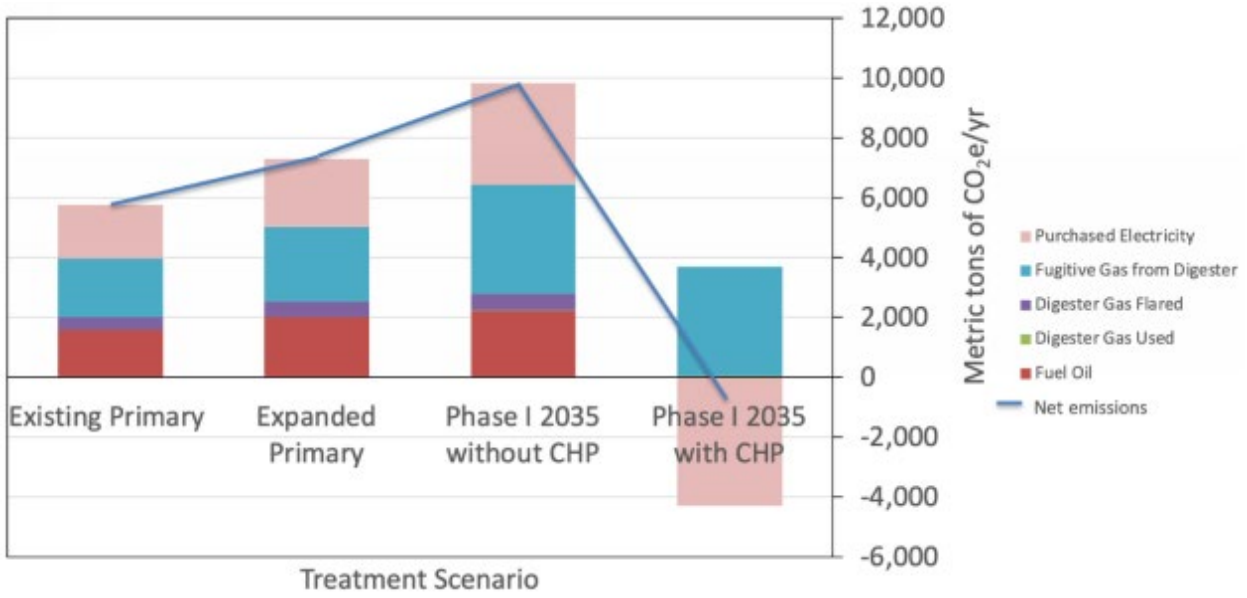


Figure 11: Summary of Preliminary Anthropogenic CO_{2e} Emissions

SCENARIO	Flow Rate (MGD)	Anthropogenic CO_2e (metric tons/yr)	CO_2e kg/MG WW treated	% Above Baseline
BASELINE - Existing Primary Conditions and Flow	**67**	5,751	235	-
BASELINE FUTURE FLOW - Expanded Primary and Future Flow	**85**	7,290	235	27%
PHASE 1 2035 FLOWS– Expanded Primary and 20 MGD Secondary Flow without Combined Heat and Power	**85/20**	9,828	317	71%
PHASE 1 2035 FLOWS w/CHP– Expanded Primary and 20 MGD Secondary Flow with Combined Heat and Power	**85/20**	-603	-19	-110%

2.2 Geology, Topography and Soils

The SIWWTP site is relatively flat with little topographic variation. The site elevations range between 4 to 9-feet amsl. Sand Island is an approximately 520-acre man-made island created from material dredged during the construction of Honolulu Harbor in the 1940s. The dredged material was placed on a shallow reef flat composed of limestone reef material that includes hard reef rock, coral cobbles, and sand.

The SIWWTP is underlain by Jaucas sand (JaC) and mixed Fill land (FL), as classified by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). The project

site consists of only mixed Fill land, which consists of material dredged from the ocean or hauled from nearby areas, garbage, and material from other sources (see Figure 12). This land type is used for urban development including airports, housing areas and industrial facilities.

In 2021, AECOM prepared an application for Toxic Substances Control Act Polychlorinated Biphenyls Risk-Based Disposal Approval for the secondary treatment facilities designed by AECOM, to be constructed at the SIWWTP. The application documented the history of the SIWWTP property and previous soil investigations and site remediation efforts. According to the application, the SIWWTP property was previously operated as a mix of vehicle salvage yards and scrapping operations from 1989 to 1992 in the southeast portion of the site. During previous construction projects at the facility, polychlorinated biphenyls (PCB) were detected in concentrations that exceeded regulatory levels set forth in the Toxic Substances Control Act (TSCA) 40 Code of Federal Regulations (CFR) 761.61. Remediation of the project sites were completed in 2003. In 2004 and 2005, additional soil data was collected at the SIWWTP during site and soils investigations. The results from the investigations indicated the widespread presence of PCBs at low concentrations. In 2008, the DOH, Hazard Evaluation and Emergency Response (HEER) office approved the Long-Term Maintenance Plan for the Soil Management at the SIWWTP, which detailed the design of a remedial design soil stockpile (RDSS) at the SIWWTP. The RDSS serves as a repository of soils with concentrations less than 25 parts per million (ppm) of PCBs, which is below the DOH Tier 1 environmental action levels (EALs) for commercial/industrial land use.

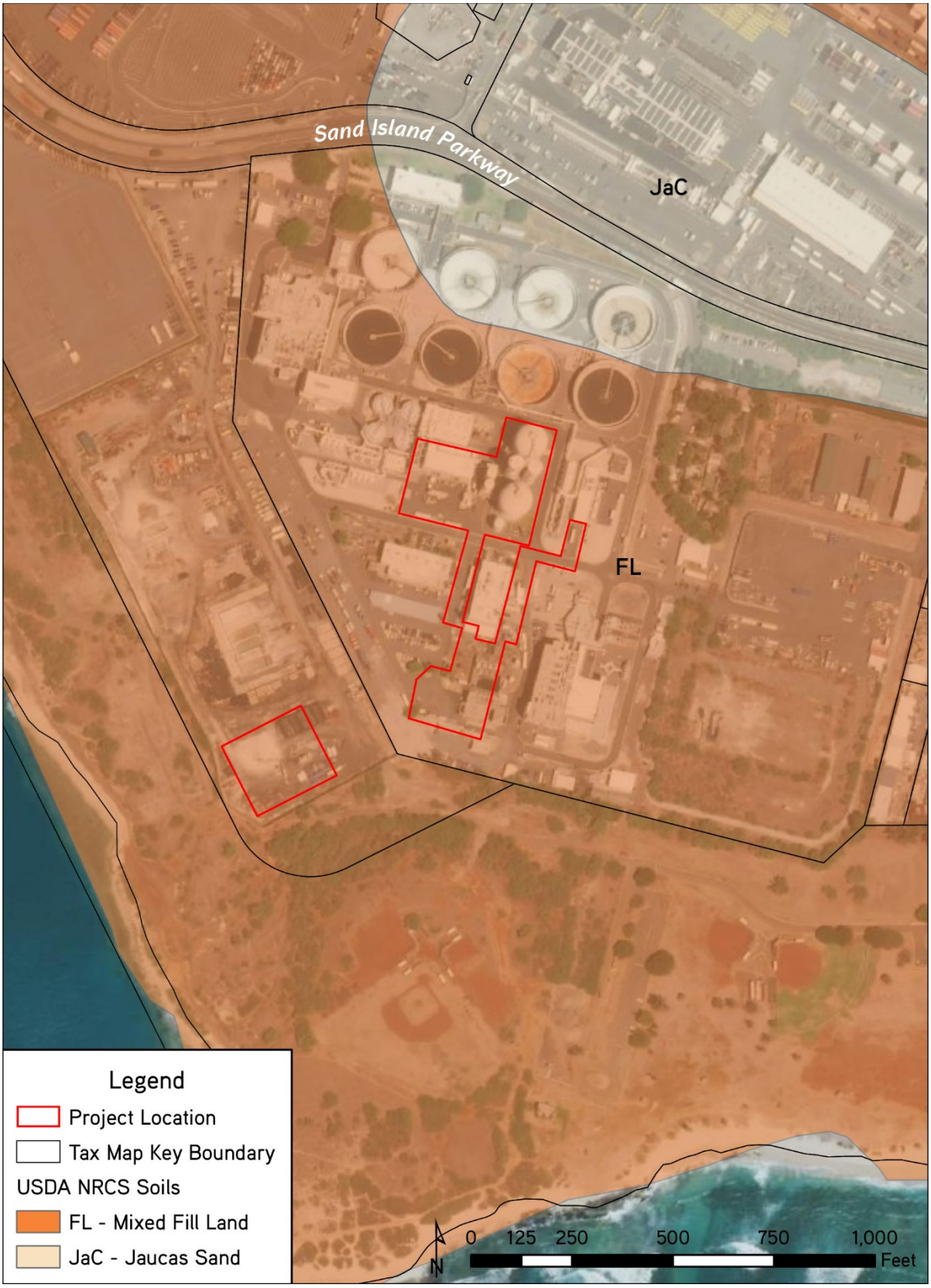
Potential Impacts and Mitigation Measures

The proposed project will not have a significant adverse effect on geology, topography and/or soils, as the proposed upgrades will not result in reduced stability of surface features or underground utilities; the alteration of topographic conditions that adversely effects views or drainage patterns; and/or the excavation or disturbance of hazardous contaminants that compromise public health and safety.

Construction Related

Based on recent soil sampling results from 2021, PCBs were detected in only one of the twelve samples collected from within the proposed construction footprint at a concentration of 0.35 ppm, which is an order of magnitude below the DOH Tier 1 EALs for commercial/industrial land use. Currently, the CCH is in discussion with the EPA and DOH. If required, the he proposed project will comply with the requirements set forth in 40 CFR 761.61 for the excavation, disposal and/or use of soils at the SIWWTP. An application for the risk-based disposal approval of PCB contaminated soil may need to be prepared and submitted to the EPA for review and approval.

Figure 12: Soils



Post-Construction/Operations

The proposed digester facility will have a finish grade elevation of approximately 16-feet, which is about 8-feet above the existing ground elevation. The project site will be graded to direct runoff away from onsite structures. The finished surfaces will be sloped between 1 to 2-percent for surface drainage. Along the east and west edges of the facility, 2:1 slopes will be used to tie the finish grade elevation to the existing ground elevation. Along the north and south edges of the facility, 8-foot-high retaining walls will be installed in lieu of 2:1 slopes. Access to the facility will be via a ramp that will have an approximate 10-percent slope.

2.3 Ground, Surface and Marine Waters

2.3.1 Ground Waters

The project site is located within the Honolulu Aquifer Sector of the Southern Oʻahu Groundwater Area. The Honolulu Sector Aquifer is one of six major groundwater areas defined by the State Commission on Water Resource Management (CWRM) based on geologic and hydrologic differences. It is comprised of five aquifer subsystems: Palolo System, Nuʻuanu System, Kalihi System, Moanalua System, and Waiʻalae System. Sand Island is located at the makai end of the Kalihi and Nuʻuanu subsystems.

Groundwater depths are expected to be encountered approximately 3 to 5-feet below the surface elevation. Groundwater flows within the potential areas of excavation will vary depending on the porosity of the different soil types and geological conditions encountered.

2.3.2 Surface Waters

As part of the 2019 FEIS for the SIWWTP Facility Plan, AECOS, Inc. prepared a final report on the "Jurisdictional Delineation of Waters of the U.S. at Sand Island Waste Water Treatment Plant." Existing surface waters within the SIWWTP property include a 1,500-foot long, man-made drainage ditch ("SI drainage ditch") near the Sand Island Parkway. The SI drainage ditch extends eastward from near the Primary Clarifier Nos. 7 and 8, approximately 700-feet to the edge of the treatment plant property, then northward for approximately 120-feet to a 6-foot by 8-foot box culvert that passes under the Sand Island Parkway and Matson cargo container yard and discharges to Honolulu Harbor.

According to the U.S. Fish and Wildlife Service (USFWS), National Wetlands Inventory (NWI) dataset, three man-made freshwater ponds (PUBHx, PUBFx) and a segment of the SI drainage ditch (R5UBFx) are within the vicinity of the project site. On July 27, 2018, AECOS scientists conducted a survey to verify the presence and condition of the aquatic features in support of the 2019 FEIS for the SIWWTP Facility Plan. It was determined that the three man-made freshwater ponds did not qualify as wetlands, as none of the ponds displayed the indicators of a wetland, including hydric soil, wetland hydrology, and hydrophytic vegetation. However, the SI drainage ditch was determined to be tidally influenced and likely to be under federal jurisdiction, thus a Jurisdictional Determination (JD) request was sent to the U.S. Army Corps of Engineers (USACE), Honolulu District, Regulatory Branch. In a letter from USACE dated

September 23, 2019, it was determined that although the property contains waters of the U.S, the proposed SIWWTP Facility Plan project "would not involve an activity subject to the regulatory jurisdiction of USACE", and therefore a Department of the Army (DA) permit is not required.

2.3.3 Marine Waters

Marine waters surrounding the project site include the Honolulu Harbor on the north and east, Keehi Lagoon to the west, and Mamala Bay and open coastal waters to the south. Honolulu Harbor, Keehi Lagoon and Mamala Bay are all classified as "Class A" embayment or marine waters and are all on the CWA 303(d) impaired waters list ("303(d) list"), as referenced in the "2016 State of Hawai'i Water Quality Monitoring and Assessment Report".

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to have a significant adverse effect on ground, surface and/or marine waters, as the proposed improvements do not involve the installation of an injection well or detention/infiltration basin, and/or the release of toxic chemicals.

Construction Related

During geotechnical borings, groundwater was encountered at depths ranging from 5 to 8-feet below the existing ground surface, which corresponds to groundwater levels about 1 to 2.4-feet above msl. Based on the groundwater levels encountered and the permeable nature of the sandy/gravelly soils anticipated within the proposed excavations, dewatering will be required during planned excavations for the project. Since the excavation will involve the discharge of groundwater, a National Pollutant Discharge Elimination System (NPDES) permit for construction dewatering will be obtained from the DOH, Clean Water Branch (CWB). To mitigate potential effects, deep excavation will use construction methods to shore and seal excavated work areas in a manner that will minimize the potential for ground water infiltration and depression of the natural groundwater table. Groundwater control requirements will be specified in the construction documents.

Post-Construction/Operations

Overall, the proposed project is not anticipated to result in indirect or cumulative effects on ground, surface and/or marine waters. Upon completion of construction, and during operation, the proposed project will contribute to the positive environmental effect of the SIWWTP upgrades to secondary treatment, as the secondary treatment system will improve the quality of secondary effluent that is discharged in offshore marine waters.

2.4 Flora and Fauna

As part of the 2019 FEIS for the SIWWTP Facility Plan, AECOS, Inc. prepared "Environmental Surveys for the Sand Island Waste Water Treatment Plant Improvement Project", which identified terrestrial and aquatic biological flora and fauna at the SIWWTP and surrounding areas within the Honolulu Harbor. The proposed project site was included in the surveys.

Flora

Terrestrial Flora

In April 2018, AECOS conducted a pedestrian survey of the SIWWTP to identify terrestrial flora. The SIWWTP site is a heavily disturbed industrial site, thus the flora found consisted mostly of naturalized non-native grasses and forbs, with scattered shrubs and trees. A total of 143 species were identified, of which 11 species are native. None of the native flora identified are of special concern as they are widespread around the State, and none are protected or proposed for protection under State or Federal statutes. None of the identified tree species are listed in CCH's Exceptional Trees Program.

Marine Flora

A marine survey was conducted by AECOS in the nearshore waters of the former Ke'ehi Lagoon Seaplane Runway, which is south of the SIWWTP. In addition, quantitative point-intercept benthic surveys on three transects were performed near the SI drainage ditch discharge point in Honolulu Harbor by Pier 53. The seafloor near the seaplane runway consisted of fine sand, sand mounds, a limestone shelf, boulders and patchy seagrass beds (*Halophila decipiens).* Near the discharge point by Pier 53, the seafloor consisted of silt-coated concrete boulders and rubble. No marine flora species of concern were identified during the surveys.

Fauna

Terrestrial Fauna

Terrestrial surveys and visual observations of tracks, scat, and other signs of mammalian presence were conducted and recorded by AECOS biologists. The feral house cat *(Felis catus)* and small Asian mongoose *(Herpestes auropunctatus)* were observed during the surveys; these species are considered alien to Hawai'i. No terrestrial fauna species of concern were identified during the surveys.

Avifauna

On April 24 and 25, 2018, AECOS conducted 10-minute avian surveys at 8 point-count stations in the SIWWTP. In addition, a 30-minute water bird count and a visual bird nest-search were performed near potential endangered water bird habitats.

During the survey a total of 236 individual birds of 18 species representing 11 families were identified. Four bird species are native to Hawai'i; the White Tern *(Gygis alba)* or manu o kū; Black-crowned Night-Heron *(Nycticorax nycticorax)* or 'auku'u; Ruddy Turnstone *(Arenaria interpres)* or 'akekeke; and the Wandering Tattler *(Tringa incanca)* or 'ūlili. The White Tern is listed as threatened under the State of Hawai'i Endangered Species statute, HRS 195D, but is not federally-listed under the Endangered Species Act of 1973 (ESA). No water bird species or nests were observed, however SIWWTP staff revealed that the Hawaiian Stilt *(Himantopus mexicanus knudseni)* or ae'o, occurs at the SIWWTP clarifiers on occasion, as standing wastewater at the plant serves as an alternative habitat for Hawaiian shorebird and water bird species. The Hawaiian Stilt is listed as endangered under both HRS 195D and the ESA. Eight species that are listed under the Migratory Bird Treaty Act (MBTA) were observed, including the

aforementioned four native bird species, as well as four introduced species. Although they were not observed during the surveys, other MBTA-listed species such as the Hawaiian Stilt, Hawaiian Coot *(Fulica alai)* or ʻalae keʻo keʻo, and Pacific Golden Plover *(Pluvialis fulva)* or kolea may occur at the SIWWTP. The Hawaiian Coot is also listed as endangered under both HRS 195D and the ESA.

Marine Fauna

During the marine survey conducted near the Ke'ehi Lagoon Seaplane Runway, AECOS observed rock-boring urchins *(Echinometra mathaei),* sponges *(Phorbas sp., Spirastrella vagabunda, Biemna fistulosa, Dysidea* cf. *avara,* and *Iotrochota protea)*, blue soft coral *(Sarcothelia edmondsoni),* ringed sap-sucking slug *(Plakobranchus ocellatus),* and medusa spaghetti worm *(Loimia medusa),* one black-lipped pear oyster *(Pinctada margaritifera)* and one green sea turtle *(Chelonia mydas).* Approximately 10 taxa of corals were observed *(Pocillopora amicornis, Poc. meandrina, Porites compressa, Porites lobata, Cyphastrea ocellina, Leptastrea bewickensis, L. purpurea, Pavona varians, Montipora capitata, and M. patula)* growing on the limestone shelf and boulders in shallow water. A total of 48 fish taxa was observed, of which 13 are species endemic to Hawaiʻi. Common observed fish species included surgeonfishes, including the brown tang *(Acanthurus nigrofuscus),* orangeband surgeonfish *(A. olivaceus),* yellow tang *(Zebrasoma flavescens)* and palenose unicornfish *(Naso brevirostris)*; damselfish: sergeants *(Abudefduf abdominalis and A. sordidus)*; and bullethead parrotfish *(Chlorurus spillurus)*.

During the marine survey near the discharge point in Honolulu Harbor by Pier 53, AECOS biologists observed a total of 236 coral colonies representing at least 5 coral taxa *(Leptastrea sp., M. capitata, Montipora sp., Poc. damicornis and Porites spp.)*. Additionally, sponges *(Hyrtios sp., Mycale sp., and Dysidea sp.)* tunicates *(Herdmania momus, Phallusia nigra, Ascidea sydneiensis)* brown purse shells *(Isognomonperna),* hydroids *(including Pennaria disticha),* several species of bryozoans *(Schizoporella errata, Reteporellina denticulata, Crisina radians, Bugula dentata),* nudibranchs *(Chromodoris albopustulosa, Thoruna kahuna, Tambja morosa, Ceratosoma tenue, Jarunna funebris. Hypselodoris infurata, Goniobranchs decorus),* and bivalves, including black-lipped pear oyster *(Pinctada margaritifera),* Hawaiian oyster *(Dendostrea sandvichensis),* and purse shells *(Isognomon californicum and I. perna)* were observed.

The endangered Hawaiian monk seal *(Monachus schauinslandi)* may occur in the waters of Kalihi Channel in the general vicinity off Sand Island. The Hawaiian monk seal was listed as an endangered species pursuant to the ESA on November 23, 1976 (41 FR 51612) and remains listed as endangered. In that same year, the Hawaiian monk seal was designated as "depleted" under the Marine Mammal Protection Act (MMPA). Critical habitat for Hawaiian monk seals has been designated (NOAA-NMFS, 2015) and includes the seafloor and marine environment to 10-meters (m) above the seafloor from the 200-m depth contour, through the shoreline and extending onto the land 5-m inland from the shoreline between identified boundary points. These terrestrial boundary points define preferred pupping areas and significant haul-out areas (NOAA-NMFS, 2015). The shoreline of Sand Island has not been designated as terrestrial critical habitat for the Hawaiian monk seal. Marine critical habitat off the southwest shore of Sand Island starts at the waterline and extends from there out to the 200-m depth contour, including

the seafloor and marine habitat 10-m in height. Honolulu Harbor (and all State commercial and small boat harbors) is excluded from critical habitat designation for the Hawaiian monk seal (NOAA-NMFS, 2015).

The Essential Fish Habitat (EFH) Regulatory Guidelines (NOAA, 2002) describe provisions to identify and protect habitats of federally managed marine and anadromous fish species. Congress defines EFHs as "those waters and substrate necessary to fish(es) for spawning, breeding, feeding, or growth to maturity" (MSFCMA, 1996; NOAA, 2002). The waters off the project area in Kalihi Channel and Honolulu Harbor are designated as EFHs for coral reef ecosystem, bottom fish, pelagic and crustacean Management Unit Species. Of the thousands of species that are federally managed under the coral reef Fishery Management Plan (FMP), at least 48 are known to occur in waters in the vicinity of Kalihi Channel (AECOS, 2019) and 68 species were identified in Honolulu Harbor (AECOS, 2019).

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to have any adverse effects on terrestrial flora and fauna and marine flora and fauna, as the project will not result in a substantial decline of federally listed species and their habitats, or substantial interference with daily or seasonal movements of seabirds or migratory avifauna.

Construction Related

Terrestrial Flora

No protected botanical resources or those proposed for protection under State or Federal statutes were observed in the project area. In addition, no trees listed in the CCH Exceptional Trees Program were found to be within the project area.

Marina Flora and Fauna

The proposed project will occur at least 1,000-feet inland from the nearest shoreline. No adverse effects are anticipated on the nearshore areas off Sand Island, or on the designated EFHs of Kalihi Channel and Honolulu Harbor. Coral reef communities and robust reef fish assemblages are found in Honolulu Harbor and Ke'ehi Lagoon and have persisted despite the construction and use of the harbor, and the presence of the discharge drain in the vicinity. It is assumed that the effects of turbidity and sedimentation from runoff will be limited and not detrimental to the survival of coral reef and fish communities within Honolulu Harbor. Any additions to the volume of runoff carried by the existing drainage system as a result of the increase in impermeable surfaces from the project would have no significant adverse effect on EFH.

Terrestrial Fauna

No terrestrial fauna species of concern were found within the project area. The Hawaiian Hoary Bat (*Lasiurus cinereus semotus)* is a Federal and State listed endangered species and the only endemic terrestrial mammal species in Hawai'i. While a survey for the Hawaiian Hoary Bat was not completed for the 2019 SIWWTP Facility Plan FEIS, it was assumed that there is a very low likelihood of encountering this species near the project site. However, to avoid any possible

adverse effects, woody vegetation taller than 15-ft will not be cleared during the Hawaiian Hoary Bat pupping season (June 1 to September 15).

Avifauna

Construction activities are expected to result in no adverse effect on any endangered, threatened, or otherwise protected animal species, as none are known to be present at the site. However, construction activities may potentially have minimal adverse effects on the following seabirds and State and Federally listed water birds: the threatened Newell's shearwater *(Puffinus auricularis newelli),* endangered Hawaiian petrel *(Pterodroma sandwichensis),* endangered band-rumped storm-petrel *(Oceanodroma castro),* Hawaiian duck *(Anas wyvilliana),* Hawaiian stilt, Hawaiian moorhen *(Gallinula chloropus sanvicensi*s), and the Hawaiian coot. Construction period activities may also affect the White Tern, as species protected under the MTBA, which is known to exist within vicinity of the project area. No adverse effect on critical habitats is expected from construction activities.

The following mitigation measures for seabirds and water birds will be incorporated during construction:

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height, and only use when necessary.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period (September 15 to December 15).
- If the final construction plans will increase the risk for predatory-take of endangered bird species, a predator control program may be required per review by USFWS and/or DLNR.

Construction activities may impact the White Tern if a nest-site is disturbed. Proposed Best Management Practices (BMPs) include:

- If a White Tern egg or chick is discovered during construction activities, USFWS and DLNR should be notified immediately. Work should be halted at the nest site until the chick fledges, which may take up to 75 days.
- If nighttime construction activity or equipment maintenance is proposed during the construction phases, all associated lights should be shielded, and when large flood or work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly downward at the ground.

Post-Construction/Operations

Terrestrial Flora

No adverse effects are expected post-construction or during the operations of the proposed facilities.

Marine Flora and Fauna

No adverse effects are expected post-construction or during the operations of the proposed facilities. Operations of the proposed facilities as part of the SIWWTP upgrades to secondary treatment are likely to result in positive impacts to marine fauna, as the secondary treatment system will improve the quality of secondary effluent that is discharged in offshore marine waters.

Terrestrial Fauna

To minimize adverse effects to the Hawaiian Hoary Bat, the use of barbed wire at the project site will be avoided, as bat mortalities have been documented as a result of becoming ensnared by barbed wire during flight.

Avifauna

Post-construction effects from the project are unlikely to adversely affect the White Tern species, as similar habitat is readily available in the adjacent Sand Island State Recreational Area (SISRA) and elsewhere in Honolulu. Potential effects to seabirds include increased risk that birds will be downed after becoming disoriented by lights associated with the project, either during construction or as a result of new or upgraded facility lighting. To mitigate any potential effects, any exterior lighting and lamp posts installed as part of the project will be cut-off luminaries and will be shielded to mitigate potential light pollution and lessen possible seabird strikes.

2.5 Air Quality

2.5.1 Ambient Air

The DOH, Clean Air Branch (CAB), Air Surveillance and Analysis Section, collects measurements of ambient level pollutants in the air through a statewide monitoring network. The DOH, CAB maintains an ambient air quality monitoring stations near the project site, which is the Sand Island Station (SI Sta.) near the entrance to the SISRA. The SI Sta. monitors for ozone (O_3) and fine particulate matter ($PM_{2.5}$). A snapshot reading from the SI Sta. from the past month (June 14th, 2021 – July 14th, 2021) shows O_3 did not exceed levels of 0.0030 ppm, and $PM_{2.5}$ did not exceed levels of 5.1 micrograms per cubic meter of air ($\mu g/m^3$). All levels within the past month fall within the U.S. Environmental Protection Agency (EPA) National Ambient Air Quality Standards.

2.5.2 Odor

Hydrogen sulfide (H_2S) is the most commonly identified odor compound from municipal wastewater systems. It is generated in the collection system as well as at other facilities where the detention time is long and there is no natural or supplemental aeration. Current regulatory requirements in the CCH wastewater system generally focus on H_2S gas removal. H_2S gas is generated in the collection system and is known to be present at the SIWWTP facilities. The State standard for odor emissions, found in HAR §11-59, Ambient Air Quality Standards, Section 11-59-4(i), states, “In the ambient air, the average concentration of H_2S measured by a

reference method shall not exceed 35 µg/m3 of air (25 ppb) in any 1-hour period." These standards apply at the fence line of above-ground facilities.

As expected, odor is sometimes noticeable around the SIWWTP facilities; however, not at levels that cause a public nuisance. To prevent excessive odors and protect air quality, odor control system (OCS) facilities are installed at the existing SIWWTP facilities where necessary.

Foul air emissions for the SIWWTP operations are governed by Non-Covered Source Permit (NSP) No. 0216-05-N, Application for Renewal No. 0216-13. NSP coverage includes operations from the initial stages of WWTP processing including the headworks, clarifiers, gravity thickeners, and WWSTs. Prior to NSP No. 0216-05-N expiring on August 12, 2014, ENV submitted a re-application which was accepted by the DOH, CAB. Limits on operational hours and emission opacity are included in the permit. Therefore, until a new NSP is issued by DOH, CAB, the old NSP is administratively extended allowing operations of the SIWWTP to continue.

Foul air emissions for Synagro operations at the SIWWTP, including solids stream process, operations of the anaerobic digester, gas holder, sludge storage, centrifuge, and a thermal dryer, are governed under a separate Covered Source Permit (CSP), No. 0216-06-C, which is administered by DOH, CAB. The proposed project is expected to require modifications to the CSP and potentially the NSP.

Currently there are four main OCS operating at the SIWWTP. Odor and emission controls have resulted in improved ambient air quality, which will continue to produce positive long-term effects on air quality surrounding the treatment plant. Headworks improvements were installed in April 2012 shortly after the installation of PCs and solids improvements in August and December 2011, respectively. ENV has also recently completed the installation of a new OCS at the UV/EPS facility.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to have a significant adverse effect on air quality, as the proposed improvements and construction related emissions will meet State air quality standards.

Construction Related

Construction related activities will result in the generation of dust and exhaust from construction vehicles and equipment. Possible sources of dust from construction related activities include earthwork, grading, excavation, concrete work, stockpiling, and transport of building materials and construction spoils and debris.

The following mitigation measures will be followed to ensure that degradation of air quality will not result from construction activities. To prevent the release of fugitive dust from construction sites, measures will be undertaken by the operator in accordance with HAR, Chapter 11-60.1-33, *Fugitive Dust.* The standard mitigations measures will include, but not be limited to, the following:

- Phasing of construction activities to minimize concurrent dust generating activities in the vicinity where feasible.

- Applying water during ground disturbing activities or movement of vehicles that generate excessive levels of dust capable of migrating off construction sites, in quantities sufficient to dampen soils without causing runoff.
- Installing dust screens around active work areas.
- Stabilizing disturbed ground areas with grass, mulch, or hydro-mulch.
- Applying water to or cover open bodied trucks hauling dust generating materials to and from the project with a tarpaulin as necessary to prevent the escape of fugitive dust.
- Cleaning paved roadways adjacent to the project site entrances daily or as needed to remove dirt, mud, or rock tracked from the site.

The following measures will also be undertaken to mitigate exhaust emissions, in compliance with HAR, Chapter 60-1, *Air Pollution Control.* Standard mitigation measures include, but are not limited to, the following:

- Properly maintaining internal combustion engines used in vehicles, generators, and equipment.
- Limiting the amount of engine idle time of construction vehicles and equipment when not in use.
- Locating diesel engines and generators away from public use areas.
- Replacing diesel or gasoline powered equipment with electric powered equipment where possible.

Post-Construction/Operations

Increased levels of H2S containing odor compound from the proposed expanded SIWWTP would be a potential post-construction effect. As expected, odor is sometimes noticeable around the SIWWTP facilities; however not at levels that cause a public nuisance.

Foul air emissions for the SIWWTP operations are currently governed by NSP No. 0216-05-N, Application for Renewal No. 0216-13. NSP coverage includes operations from the initial stages of WWTP processing including the headworks, clarifiers, gravity thickeners, and WSSTs. Four electric/diesel engine effluent pumps are covered by the same NSP governing the foul air systems. Limits on operational hours and emission opacity are included in the permit. The permit requires weekly monitoring to ensure that maximum permitted levels of off-property H2S gas are not exceeded. Foul air emissions from solids stream process, including operations of the anaerobic digester, gas holder, sludge storage, centrifuge, dryer, and the pelletizer, are governed under a separate CSP, No. 0216-06-C. The proposed project is expected to require modifications to the CSP and potentially the NSP.

2.6 Noise

Noise is regulated by the DOH, Indoor and Radiological Health Branch, in accordance with HAR §11-46, *Community Noise Control.* Per HAR §11-46-3, maximum permissible sound levels are specified by classifications of land use (zoning districts); “Class A” zoning districts include all areas equivalent to lands zoned as residential, conservation, preservation, public space, open space, or similar types of zoning districts; “Class B” zoning districts include all areas equivalent

to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar types of zoning districts; and "Class C" zoning districts include all areas equivalent to lands zoned as agriculture, country, industrial, or similar types of zoning districts. The project site is zoned as I-3 Waterfront Industrial District, thus it is within the Class C zoning district. The maximum permissible sound levels for Class C zoning districts is 70 dBA during the day, and 70 dBA during the night.

The current operations at the SIWWTP are in compliance with the State's community noise standards within the Class C zoning district. Class A zoning districts and uses in the vicinity of the project area primarily include parks and recreational areas, such as the SISRA, Kakaako Waterfront Park and Keehi Lagoon Park. Noise generated at these recreational areas come from watercraft, automobiles, vehicle and boat horns, and trucks, as well as natural elements such as the wind and waves. Class B zoning districts and uses in the vicinity of the project area primarily include business and commercial activities along Sand Island Parkway. Noise generated from these uses include vehicular traffic along Sand Island Parkway and naturally occurring noise from wind. Class C zoning districts and uses in the vicinity of the project area primarily include maritime and non-maritime industrial operations on Sand Island, where the noise sources come from motor vehicle traffic, industrial activities, shipping activities and dock operations, and overflights of commercial aircraft.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect to existing noise conditions, as the proposed upgrades will not involve construction-related or permanent increase in noise levels that fail to meet State community noise control regulations.

Construction Related

Increased noise will be generated from construction activities and the related mobilization of equipment. Construction generated noise will temporarily affect sound levels and therefore may have an impact on the neighboring SISRA and park goers. These effects are unavoidable but will be temporary. Most of the surrounding businesses are industrial, therefore construction noise should not have an impact on their activities or services.

Pursuant to HAR Chapter 11-46, all construction activities must comply with all community noise controls. The DOH Community Noise Rule specifies that industrial areas may not exceed the "maximum permissible" noise level of 70 dBA during both day and night. In cases where construction sound level exceeds or is expected to exceed to DOH's "maximum permissible" noise levels, the contractor will obtain a Noise Permit from the DOH to operate vehicles, construction equipment, and power tools that emit noise levels in excess of "maximum permissible" levels. In addition, the contractor will obtain a Noise Variance from DOH in the case that nighttime construction work is proposed.

To mitigate short-term construction related noise, project contractors will be required to comply with the provisions of HAR, Chapter 11-46 *Community Noise Control*. Construction activities will be subject to the following limitations listed under HAR §11-46-7(j):

(1) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels for the hours before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday;
(2) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels for the hours before 9:00 a.m. and after 6:00 p.m. on Saturday; and
(3) No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays.

Construction equipment, on-site vehicles and/or devices with a motor or exhaust system will also be appropriately muffled and maintained to reduce backfires. All generators will be housed in baffle boxes (a sound-resistant box placed over or around a generator), be equipped with an attached muffler, or use other noise-abatement methods in accordance with industry standards.

Post-Construction/Operations

The proposed project is not expected to have indirect or cumulative effects on the existing noise conditions.

2.7 Visual and Scenic Resources

The foremost visual resource near the project site is the interface between the ocean and the land, which includes an active shoreline and waterfront within a continuous urban corridor backed by the steep peaks and valleys of the Koʻolau Mountain Range. The project site falls within the areas described in the following policies from the CCH DPP's Primary Urban Center Development Plan (PUC-DP):

Section 3.1.2

- *"Preserve views of the Koʻolau and Waiʻanae Mountain Ranges, Punchbowl, Diamond Head, Pearl Harbor and other natural landmarks. Maintain important view corridors within and across urban Honolulu and keep Downtown as the most prominent feature of the urban skyline. Views along the Pearl Harbor shoreline and the Pearl Harbor Historic Trail toward the mountains, shoreline, significant landmarks, and adjacent communities should be created and maximized wherever possible and appropriate."*

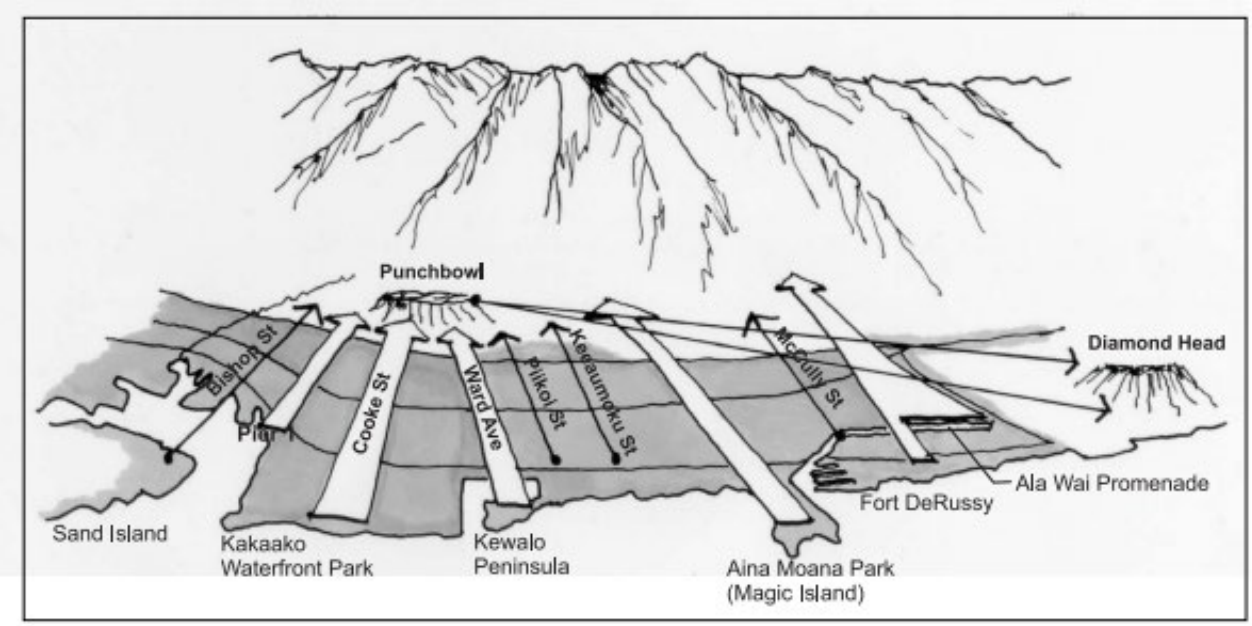
Section 3.1.3.3

- *"Apart from Downtown and other central Honolulu locations, promote mid-rise or low-rise scale for new buildings."*
- *"Preserve and enhance significant mauka or makai view corridors along major collector streets indicated in Figure 3.1 through a combination of zoning controls and streetscape improvements."*

The SIWWTP includes several prominent structures, including clarifier tanks, a gas tank (approximately 40-feet tall), an incinerator building (approximately 80-feet tall), and the anaerobic digester towers (approximately 108-ft tall). The proposed project will include SSTs

and anaerobic digester tanks that will have an elevation of 130-ft (see Tables 8 and 10).These facilities are and will be visible from the ocean, Ke'ehi Lagoon, various vantage points within urban Honolulu, immediate surrounding properties, and from areas with elevations exceeding 100-feet above sea level, including Punchbowl, Diamond Head, and high-rise buildings along Ala Moana Boulevard and Nimitz Highway. The SIWWTP is located within an industrial harbor area containing many other large commercial/industrial buildings, fuel tanks, and tall cranes used for container shipping operations. Within the larger view plane, the SIWWTP blends in with the surrounding built urban environment and is obscured by the surrounding buildings. In addition, the SIWWTP facilities are subordinate to the much taller cargo facility loading cranes (approximately 250-ft in height) and are consistent in appearance with other industrial facilities on Sand Island.

Figure 13: Mauka View Corridors



Source: City and County of Honolulu, Department of Planning and Permitting, Primary Urban Center Development Plan 2004

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect to any visual or scenic resources, as the proposed improvements will not result in a substantial and permanent alteration of the visual character of the project area or region, an existing recognized view plane or obstruction of a landmark feature, or lighting characteristics.

Construction Related

Visual and scenic resources will not be significantly impacted by construction activities due to the relatively remote location of Sand Island and the industrial harbor setting. Construction activities will be visibly apparent from areas surrounding active work sites, and in some locations will occupy scenic views from the Nimitz Highway and Ala Moana Boulevard corridors. Construction related effects to visual and scenic resources may result from general work

activities, heavy equipment and vehicle operations, nighttime lighting, and the presence of dust screens (12 to 16-ft tall) around some work areas. The construction related effects are temporary and will end upon completion of project activities. The following measures will be employed to mitigate construction-related effects on visual and scenic resources:

- Schedule and phase construction activities to minimize the project duration.
- Schedule material and equipment delivery and refuse removal during non-peak use periods on public roadways and within areas of high public use.
- Install dust fences with a minimum height of 12-ft to screen active construction areas, staging and stockpile areas from view.
- Where nighttime lighting is used, shield and angle light fixtures to minimize glare and prevent direct light reaching areas outside of the construction site. Use minimum lighting required to ensure a safe and secure work environment.

Post-Construction/Operations

The post-construction views will be generally restored to pre-construction characteristics, as the proposed facilities will be within range of the existing facilities at the SIWWTP. The new SSTs and anaerobic digester tanks will have an elevation of 130-ft; the existing anaerobic digester tanks are 108-ft tall.

2.8 Natural Hazards

2.8.1 Tsunami

The CCH, in conjunction with County Public Safety Officials, produced the Tsunami Evacuation Zone map for Oʻahu, which is based on the historical tsunami impacts on the State and island of Oʻahu over the past 100 years. The Extreme Tsunami Evacuation Zone illustrates the areas of impact from an extreme tsunami event, which was created based on inundation models by University of Hawaiʻi researchers. The project site is located within the "tsunami evacuation zone".

The ENV has "Tsunami Emergency Procedures" as stated in Directive No. O-22, dated October 28, 2011. This Directive establishes procedures for the continued operation of the SIWWTP before, during and after a tsunami event, and for the safe evacuation and temporary relocation of personnel and equipment from facilities located within the tsunami evacuation zone.

2.8.2 Seismic Hazard

The island of Oʻahu does not have any active volcanoes and thus is not subject to significant earthquakes or seismic hazards. Earthquakes on Oʻahu are generally related to tectonic activity on the seafloor (Fletcher, et. al., 2002). A majority of seismic hazards that occur within the State occurs on the Big Island; 95-percent of Big Island's earthquakes are caused by volcanism.

2.8.3 Flood Hazard

The Federal Emergency Management Agency (FEMA) produces Flood Insurance Rate Maps (FIRM) that identify flood hazard areas and associated base flood elevations (BFE), which is the computed elevation to which floodwater is anticipated to rise during the base flood. The project site is located within flood zone "X", which corresponds to areas outside the 0.2-percent annual chance floodplain (see Figure 14).

2.8.4 Hurricane and High Winds

Hurricanes in the State occur seasonally, typically during the summer to early winter months (June to November). Actual hurricane strikes on the islands are relatively rare in the modern record, and near-misses that generate large swells and moderately high winds are more common. The most recent hurricane to threaten Hawai'i was Hurricane Lane in 2018, which passed within 350 miles of the Big Island.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect regarding natural hazards, as the upgrades do not involve the creation of facilities that are susceptible to or exacerbate property damage, increase risk to the public's health and safety during a natural hazard event, raise flood elevations, or fail to meet current flood district or seismic design standards.

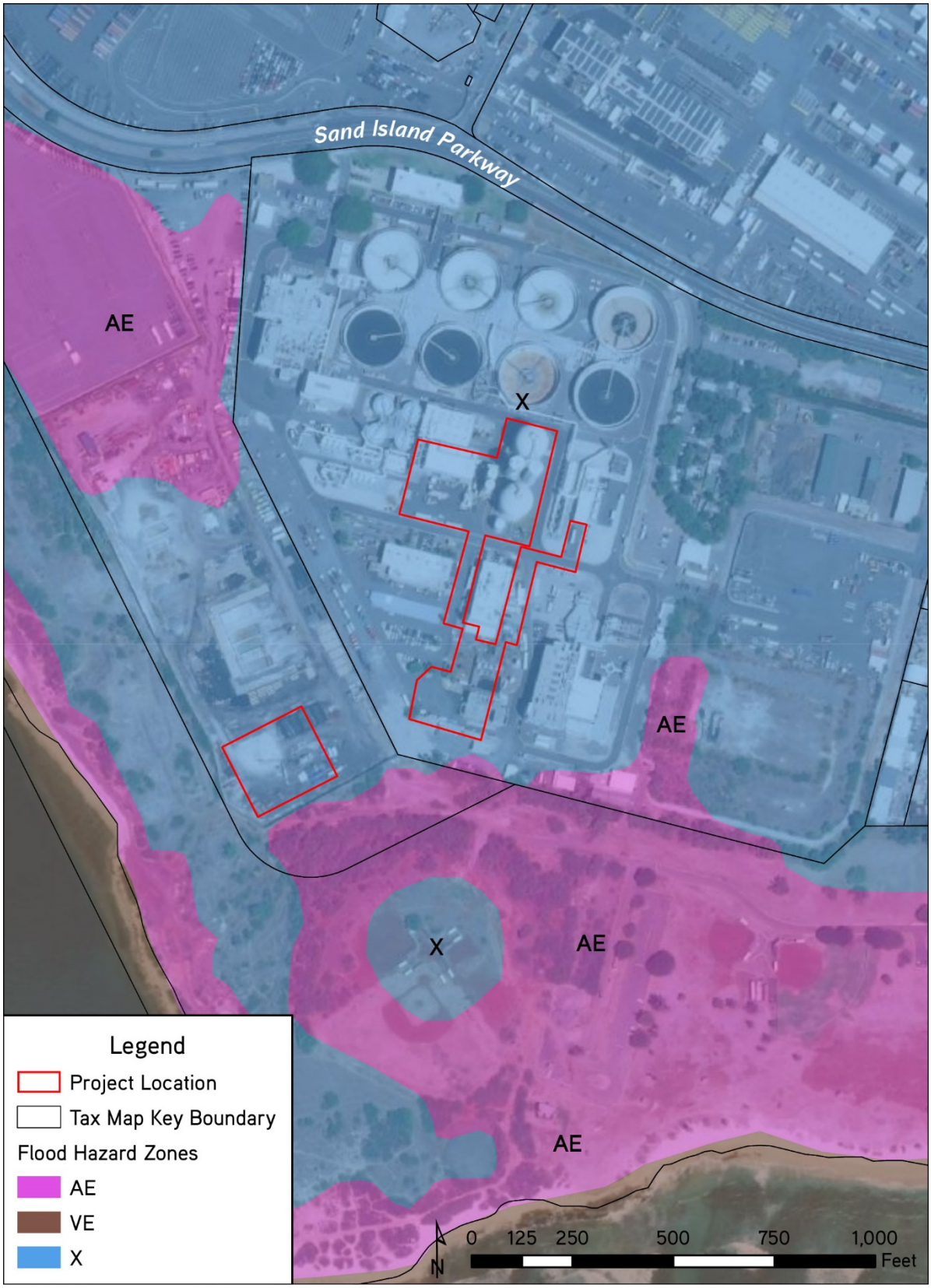
Construction Related

The SIWWTP is located near the coast and is within the "tsunami evacuation zone", where evacuation is required for any tsunami warning. In the case of a tsunami warning event, the SIWWTP staff and construction crews will follow the "Tsunami Emergency Procedures" in accordance with ENV, Division of Wastewater Treatment and Disposal's Directive No. O-22, dated October 28, 2011.

In the case of an earthquake, flood, or hurricane event, the construction crew will begin securing the site as follows:

- Construction activities will cease;
- Equipment, materials, machinery, and portable toilets will be secured and/or removed;
- Construction debris will be cleaned up;
- Jobsite signage, dust screens, silt screens, and other temporary installations will be removed;
- Jobsite utilities such as electricity, water and gas will be turned off;
- All Federal, State and CCH requirements will be implemented to ensure the safety of the SIWWTP staff, construction crews, and community members near the project area.

Figure 14: Flood Hazard Zones



Post-Construction/Operations

Once the proposed project is constructed, it will continue to be at risk from the threat of natural hazards such as tsunamis, earthquakes, flooding, and hurricanes. However, it is not at any increased risk of damage from these hazards in comparison to the surrounding environment.

All new above-ground facilities will be designed in compliance with Revised Ordinances of Honolulu (ROH) Section 16-11, to resist flood depths, pressures, velocities, and impact and uplift forces associated with floodwaters due to tsunamis. The design will also include consideration for imposed groundwater, flood and tsunami loading in accordance with the American Society of Civil Engineers (ASCE) *Minimum Design Loads for Buildings and Other Structures 2016* (ASCE 7-16), Chapter 6.

To safeguard against seismic hazards, the facilities will be designed in accordance with standards for Risk Category III of the International Building Code (IBC) 2012, and standards for Site Classification D in accordance with ASCE 7-10 and American Concrete Institute (ACI) Seismic Design of Liquid-Containing Concrete Structures and Commentary (ACI 350.3-06).

To minimize the potential for adverse effects from flooding, the proposed facilities will be constructed in accordance with CCH flood hazard area ordinance and rules relating to storm drainage standards and water quality. In addition, the finished elevation will be built at 16-feet above msl to account for coastal inundation and flooding due to sea level rise, storm surges and tsunami.

2.9 Wastewater System

Wastewater from the plant bathrooms, kitchen and lab building are sent to the plant sewer system. The plant sewer system conveys to the Makai Lift Station (MLS). The MLS conveys this wastewater to the head of the plant upstream of the Influent Flow Meters and is measured as raw wastewater. The MLS has two 6-inch submersible pumps each with a design flow of 625 gallons per minute (gpm). Process wastewater "return flow" that is generated on-site is returned to the treatment stream, downstream of the Influent Flow Meters. The return flow system consists of the RFPS and the Return Lift Station for the SHB.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing wastewater system, as the proposed improvements will not result in a substantial increase in generation of wastewater on the project site or the surrounding wastewater collection system.

Construction Related

It is anticipated that there will be no adverse effects to the facility's on-site wastewater collection and return flow system during construction activities. During construction, the contractor will provide portable toilets for use by the construction workers. Wastewater from the portable toilets will be collected and discharged in the SIWWTP via a sewer manhole designated for septage receiving. ENV will require the contractor to adhere to strict BMPs to

minimize and control the generation of construction related wastewater and pollutants that could be discharged in storm water runoff.

Post-Construction/Operations

Wastewater from the existing Building 10 Old Effluent Pump Station and Chlorination building restroom and laboratory are currently sent to the plant sewer system. As part of the project, the existing sewer system will be cut and plugged so that Building 10 may be demolished. There are no proposed restrooms in the new digester control building.

The proposed project is not expected to significantly increase return flows to the existing lift station. Sources of additional return flows will include, but are not limited to, condensate water, washdown water, increased centrate return flows, and increased dryer return flows.

2.10 Traffic and Circulation

Vehicular Traffic

The majority of the automobile traffic near the project site is generated by surrounding activities, including the transportation of shipping containers to and from Honolulu Harbor cargo terminals on Sand Island, the U.S. Coast Guard Station Honolulu, the SISRA and a number of small businesses and industries located in the Sand Island Industrial Park. The following is a brief description of the existing roadways in the vicinity of the project:

- **Sand Island Parkway Road** is generally an east-west, two-way, four-lane, divided roadway from its connection with Sand Island Access Road at the Lt. John R. Slattery Bridge to the SISRA. In the vicinity of the project, the roadway has a posted speed limit of 25 mph. Primary access to SIWWTP is via Sand Island Parkway.
- **Makepono Street** is generally a north-south, two-way, two-lane, undivided roadway with intersection on Sand Island Parkway that serves the Sand Island Industrial Park. The roadway begins to the north just past its intersection with Sand Island Parkway and terminates south of its intersection with Mikole Street. Makepono Street provides access to several industrial businesses from Sand Island Parkway and provides access via Hoʻokela Place to a utility entrance on the east side of SIWWTP. The roadway has a posted speed limit of 25 mph.
- **Hoʻokela Place** is generally an east-west, two-way, two-lane, undivided roadway. The roadway begins to the east at its intersection with Makepono Street and terminates approximately 650 ft to the west at a dead end. The SIWWTP gated back-up access is located at the terminus of Hoʻokela Place along with accesses to Honolulu Recovery Systems and Martin Transportation Services. The roadway has a posted speed limit of 25 mph (ATA, 2019).

Currently, access to the SIWWTP is provided via a primary driveway, secondary driveway and a construction/utility access on Sand Island Parkway. The existing primary entrance/exit to the SIWWTP is via a driveway located on Sand Island Parkway approximately 0.5 mile southeast from the Kalihi Channel Bridge. The existing secondary entrance/exit to the SIWWTP is via a driveway on Sand Island Parkway, approximately 925 ft east of the primary driveway. The

existing construction/utility access is an entrance / exit to SIWWTP, located on Sand Island Parkway, approximately 230 ft west of the primary driveway.

As part of the 2019 FEIS for the SIWWTP Facility Plan, a Traffic Impact Analysis Report (TIAR) was prepared by Austin, Tsutsumi & Associates, Inc. (ATA) in May 2019 (see Appendix B). The TIAR assessed existing traffic conditions at key intersections near the project site, traffic projections for Year 2035 with and without the Facility Plan project, while taking into account the traffic generated by other known, future developments in the project vicinity. The following is a brief description of the existing traffic conditions listed in the TIAR:

- Eight intersections were studied on July 12, 2018. Based on the traffic count data collection, it was determined that the morning (a.m.) peak hour of traffic occurs between 6:00 a.m. to 7:00 a.m. and the afternoon (p.m.) peak hour of traffic occurs between 3:00 p.m. to 4:00 p.m.
- Traffic volumes during the morning peak hour were observed to be higher along Sand Island Parkway in the eastbound direction with approximately 74 percent of traffic entering Sand Island. Traffic volumes during the afternoon peak hour were observed to be higher along Sand Island Parkway in the westbound direction with 63 percent exiting Sand Island.
- Traffic was observed to generally operate smoothly in the project area; most of the intersections operated at a level of service (LOS) 8 of A-D. Minor Street and left-turn movements at the non-signalized study intersections were observed to experience some delays but adequate gaps in through traffic were generally available to complete movements.
- During the morning peak hour of traffic, the signalized 'Sand Island Parkway / Pasha Container Terminal Access' intersection, going northbound left-turn operated at LOS E. Queues were occasionally observed to form in the southbound direction at this intersection; however, these queues were observed to clear within a single cycle (ATA, 2019).

Public Transportation

O'ahu Transit Services (OTS) operates TheBus, which currently operates a fleet of 542 buses that services the island of O'ahu. Currently TheBus does not operate any routes to Sand Island. The closest bus stop to the project site is located approximately one mile away on Sand Island Access Road; only the Route 10 – Kalihi to Alewa Heights services this stop.

Bicycle and Pedestrian Accessibility

Near the project site, bicycle lanes are provided along both sides of Sand Island Parkway. However, there is a gap in the bicycle lane on the mauka side of the roadway between the Matson Container Yard Access to the Ke'ehi Boat Harbor Access. On the makai side of the roadway, the bicycle lane becomes a shared two-way bicycle and pedestrian path from the Pasha Container Yard Access to the Ke'ehi Boat Harbor Access. The bicycle lanes along Sand Island Parkway are not always usable due to vehicles that use the lane as parking. Bicyclists in the project area were observed to use both the sidewalks and bicycle lanes to travel along Sand Island Parkway (ATA, 2019).

Sidewalks are provided along both sides of Sand Island Parkway for pedestrian use. There is a gap in the sidewalk on the mauka side of the roadway from near the Pasha Container Yard Access to the Keʻehi Boat Harbor Access. However, crosswalks are provided at both locations to provide connectivity to the makai side sidewalk. Pedestrian activity in the project area was generally low due largely to the surrounding industrial land use; most pedestrians were observed engaging in recreational activities such as running and bicycling (ATA, 2019).

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing traffic and circulation network, as the proposed improvements will not involve a substantial alteration or degradation of the existing roadway network that would cause further traffic delays, or a substantial increase in traffic that would decrease the LOS of the existing roadway network.

Construction Related

Construction related traffic will be temporarily noticeable but will not result in significant alterations in traffic volume on Sand Island Access Road. The contractor will be required to keep all construction vehicles in proper operating condition and ensure that material loads are properly secured to prevent dust, debris, leakage, or other adverse conditions from affecting public roadways. The project proposes to access the construction site via a gated entrance on Hookela Place, which may result in increased construction traffic on Hookela Place, Makepono Street and Sand Island Parkway. TheBus would likely not be affected as the nearest bus stop is located approximately 1-mile away from the SIWWTP. A Traffic Control Plan will be prepared and submitted to CCH, Department of Transportation Services (DTS) for review and approval prior to the start of construction activities. Mitigation measures may include:

- Construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.
- Construction schedules should be coordinated with other nearby properties that have planned improvements to ensure minimal effects on local streets.
- The area Neighborhood Board, as well as the area residents, businesses, emergency personnel (fire, ambulance and police), OTS (TheBus), etc., should be kept informed of the details of the proposed project and the effects that the project may have on the adjoining local street area network.
- Flagmen and/or traffic controls will be used to maintain accessibility for businesses and residents who may use the surrounding area roads.
- Should any proposed construction activities require the temporary closure of a traffic lane, a street usage permit from the CCH, Department of Transportation Services (DTS) will be obtained by the contractor.
- A permit from the State, Department of Transportation (HDOT) is required for the transport of oversized and/or overweight materials and equipment on State highway facilities.

- The contractor will be required to keep all construction vehicles in proper operating condition and ensure that material loads are properly secured to prevent dust, debris, leakage, or other adverse conditions from affecting public roadways. No other mitigation measures are required or recommended.

Post-Construction/Operations

The site layout for the proposed project is designed to accommodate access for a single-unit truck, which includes emergency vehicles. Vehicular access will be provided to all structures onsite and will connect to the other Phase 1 facilities. A two-way ramp at the northeast corner of the site will connect to Road M, which will provide access to and from the other facilities.

Based on the TIAR prepared for the 2019 FEIS for the SIWWTP Facility Plan, it was estimated that the full buildout of SIWWTP process facilities and secondary treatment system would generate a total of 104 new net external trips during the morning peak hour of traffic and 82 new net external trips during the afternoon peak hour of traffic. It was also estimated that by year 2035, traffic operations in the project area will remain similar to current conditions, however the northbound approach at Sand Island Parkway/Makepono Street intersection is expected to operate with longer delays by less than five (5) seconds during both morning and afternoon peak hours of traffic. By year 2035, it is estimated that the truck traffic will increase by two trucks per week to transport additional solids from SIWWTP to H-Power or the landfill. However, these trips were assumed to occur during off-peak hours. The trips generated by this proposed project alone would be minimal in comparison to the full buildout of the SIWWTP secondary treatment system, and thus it is not anticipated to have an impact on internal vehicle circulation and external roadway impacts.

2.11 Potable Water System

CCH, BWS constructs, operates and maintains O‘ahu’s municipal potable water system, which comprises of an interconnected distribution network of reservoirs, wells, shafts, water tunnels, booster and pumping stations and water mains. The BWS pumps approximately 145 mgd of water through 2,100 miles of pipe, 386 source and booster pumps, 212 water sources (wells, tunnels, and shafts), and 171 water storage reservoirs. The BWS also provides approximately 10 mgd of non-potable water for irrigation and industrial uses through a water recycling facility and several separate brackish sources. O‘ahu’s potable water supply comes from naturally filtered aquifers underground.

BWS operations are guided by multiple plans, including the Water Master Plan (WMP), Watershed Management Plans (WMGPs) and Water Conservation Plan (WCP). The WMP (2016) evaluates the entire BWS water system, quantifies future demands and source options, and identifies improvements to meet future needs 30 years out. The SIWWTP is located within the PUC WMP area. The BWS is currently preparing the WMGP for this area. The PUC WMGP will investigate existing water demand and supply, anticipate future water demands and identify supply options (BWS, 2016).

Potable water is provided to the SIWWTP through an existing 12-inch water main, which is connected to a BWS 16-inch water main located along Sand Island Parkway. Potable water use at the SIWWTP includes sanitary fixtures (e.g. sinks, toilets, showers, eyewash stations and water fountains), fire protection, landscape irrigation, wet well cleaning and odor control system and maintenance purposes.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the potable water system, as the proposed upgrades do not involve the creation of point-source pollution that leads to permanent damage to the watershed, surface waters or aquifers that replenish O'ahu's potable water supply, a substantial alteration to the existing potable water system, or substantial consumption of potable water.

Construction Related

Construction related activities that will require use of water include dust control, vehicle wash down, concrete mixing, general housekeeping activities, and pipe pressure testing. The existing water system has sufficient capacity to accommodate the temporary demands from these activities, as they will not require a substantial consumption of potable water.

Post-Construction/Operations

Potable water within the treatment plant is generally used for sinks, toilets, showers, eyewash stations and fire protection. The proposed solids process areas may also require potable water; the potable water demands and fixture counts will be determined as the project design progresses.

2.12 Drainage System

The CCH, Department of Facility Maintenance, Storm Water Quality Branch (SWQB), is responsible for maintaining the drainage system on O'ahu and aims to increase the water quality that enters the CCH's drainage system, natural waterways and Pacific Ocean, pursuant to HAR, Chapter 3, *Rules Relating to Water Quality,* Chapter 11-55, *Water Pollution Control* and ROH, Chapter 14, Article 12, *Drainage, Flood and Pollution Control*.

Rainfall and storm water runoff at the SIWWTP percolates into landscaped areas, evaporates, sheet flows offsite and/or is directed to the existing storm drainage system, which consists of catch basins and underground piping, then discharges into an existing SI drainage ditch and eventually enters the Honolulu Harbor near the southeastern edge of Matson's pier 53. The SI drainage ditch is approximately 5 feet deep with steep sides. The SI drainage ditch begins approximately 125 feet east of the existing Primary Clarifier No. 7 and 8, extends eastward approximately 650 feet to the edge of the treatment plant property, then northward for approximately 120 feet to a 6-foot by 8-foot box culvert that passes under the Sand Island Parkway and nearby Matson cargo container yard located north of the SIWWTP.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to have a significant adverse effect on existing drainage patterns or systems. All of the stormwater runoff will be retained and treated on-site through planned improvements to the SIWWTP's drainage system. There will be no net increase in drainage leaving the Project site, thus no impacts to neighboring properties' drainage systems are anticipated.

Construction Related

Dewatering of excavations will be necessary where the existing groundwater level is above the bottom of the proposed excavation. Since the excavation will involve the discharge of groundwater, a National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI), Form G - Discharge of Construction Dewatering will be obtained from the DOH, Clean Water Branch (CWB). To mitigate potential effects, deep excavation will use construction methods to shore and seal excavated work areas in a manner that will minimize the potential for ground water infiltration and areal depression of the natural groundwater table. Groundwater control requirements will be specified in the construction documents.

Other NPDES NOIs or individual permits that may be required during construction include NOI Form C – Construction Storm Water and NOI Form F – Discharge of Hydrotesting Effluent. Effluent from hydrotesting may be contained on-site or in tanker trucks and processed on-site at the SIWWTP.

Post-Construction/Operations

For the proposed project, onsite runoff will be managed in accordance with the CCH, DPP Storm Drainage Standards dated August 2017. The project will use a 10-year, 1-hour storm event to calculate peak flow runoff rates. If needed, the project will include onsite drainage systems such as swales, inlets and pipes, which will be design in accordance with the Storm Drainage Standards.

Runoff onsite will sheet flow from the west toward the east. An infiltration trench located along the western boundary will provide subsurface storage for onsite runoff generated from the peak storm event. The storage will accommodate the increase in runoff onsite compared to the existing conditions. The site will be graded to sheet flow a majority of the surface runoff generated onsite toward the infiltration trench. Runoff from larger storm events will be designed to overflow into the existing facility's stormwater system following existing drainage patterns. If needed, an onsite storm drain system will be installed consisting of drain inlets and underground piping. Drain inlets will be installed at low points to collect runoff; runoff collected will then be conveyed via underground pipes to the nearest existing storm drain connection.

Stormwater treatment will be provided by an infiltration trench used for runoff storage, located along the western site boundary. The required treatment volume will be determined in accordance with DPP's Rules Relating to Water Quality (CCH Administrative Rules, Title 20, DPP, Chapter 3).

2.13 Solid Waste Disposal

The CCH ENV, Refuse Division is the municipal agency responsible for the collection, transport and disposal of O'ahu's solid waste. Solid waste services include drop-off facilities, curbside collection, and recycling. The majority of residential and commercial solid waste is disposed of at H-POWER, the CCH's waste-to-energy plant, located at Campbell Industrial Park, or at one of two landfills: Waimānalo Gulch Sanitary Landfill or the PVT Landfill, both located on the Wai'anae Coast. The PVT Landfill is privately owned and operated by the PVT Land Company and accepts recyclable materials and non-combustible construction and demolition materials from contractors on a pre-arranged basis.

In 2019, approximately 2,200 dry tons of pelletized biosolids were beneficially reused as fertilizer. Approximately 310 dry tons biosolids consisted of digested waste cake and rejected pellet product and was directed to the Waimānalo Gulch Landfill. By 2035, the annual average biosolids production is projected to increase up to 31.8 dry tons per day (T/d).

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing solid waste disposal system, as the proposed improvements will not lead to a substantial increase in the generation of solid waste during and/or post-construction, a delay or disruption in the collection of solid waste for the surrounding community, or the creation of a new landfill.

Construction Related

Construction activities will result in the generation of construction and demolition debris, which will be disposed of at the PVT landfill in accordance with CCH and DOH regulations and provisions of the PVT facility license. Excess soils resulting from excavation activities will be disposed by storage at the SIWWTP RDSS.

Post-Construction/Operations

Current annual average biosolids production at the SIWWTP is approximately 12.1 dry T/d; this is the amount of treated biosolids material that leaves the facility. Of this amount, approximately 10 T/d of pelletized biosolids is beneficially reused for land application (fertilizer). The remaining biosolids, consisting of digested waste cake and rejected pellet product, is directed to the Waimānalo Gulch Landfill. By 2035, annual average biosolids production is projected to increase to approximately 19.9 T/d. With the continued beneficial re-use of additional pelletized biosolid for land application, the current practice of solid waste handling will continue with manageable adjustments over time.

2.14 Electrical Power and Communications

HECO provides electrical service to Sand Island via two 46 kV transmission lines: Iwilei 1 and 2. The Sand Island Substation steps the 46 kV transmission voltages down to 11.5 kV for distribution on Sand Island; the 11.5 kV distribution feeders are designated as Sand Island 1 and 2. The two 46 kV lines extend from the HECO Sand Island Substation to the Mokuone Substation to support loads at the SIWWTP; the Mokuone Substation steps the 46 kV

transmission voltages down to 11.5 kV for distribution, and the distribution feeders are designated as Mokuone 1 and 2.

Electrical power distribution systems at the SIWWTP consist of a combination of underground HECO-owned and CCH-owned 11.5 kV, 3-phase systems serviced by the Mokuone 1, and Sand Island 1 and 2 feeder lines. In the event of a utility power outage, a system of backup generators located throughout the SIWWTP automatically starts and provides power to the pumps and essential equipment.

The existing electrical distribution system is "decentralized" resulting in multiple HECO electric meters and multiple standby power generators that increase the complexity of electrical load and demand management at the SIWWTP. Most of the existing electrical power supply load centers are adequate for the existing treatment systems but are not sufficient to service the planned secondary treatment and related solids handling improvements and most of the existing electrical rooms are not located near the planned improvements. There is presently excess biogas available for CCH to further develop as a renewable fuel supply in the future. Currently, only 15 percent to 25 percent of the available biogas is beneficially used as fuel for the existing thermal drying system.

Cable communication facilities are provided to the SIWWTP by Spectrum, and telecommunications services are provided by Hawaiian Telcom, Inc. The systems provide communication services within and outside of the project area for residential, commercial, military, and government entities.

Potential Impacts and Mitigation Measures

The project was originally proposed to be connected to the same electrical system that the existing Synagro facility is connected to. However, the existing Synagro facility is connected to the original City owned 11.5 kV system. This system consists of old medium voltage cables that are protected by old switchgear that were provided in the late 1970s. At over 40 years old, the cables and switchgear are near their end of life. Therefore, the project will be connected to the more reliable PCS OCS electrical system that was installed in 2008. Per HECO meter readings from the SIWWTP HECO Bill for Service Period 12/24/20 to 01/25/21 and load calculations, the PCS OCS electrical system has sufficient capacity to accommodate the new facilities.

The proposed project includes the installation of a CHP system, which will use biogas generated in anaerobic digesters to convert to electricity and heat generation. The electricity will be used for facilities onsite, while the heat will be used for a hydronic heating system to heat the anaerobic digester heat exchangers. Because back-up fuel for the thermal dryers is costly, biogas will be first used for the thermal dryers before being used to feed the CHP system. It is estimated that in Phase 2 and full buildout of the secondary treatment system, the available biogas would be able to produce up to 4.7 MW of electricity.

The new facilities' telecommunications system will be connected to the existing telecommunications system in the existing Synagro facility. The proposed facilities will not result in a significant increase in communication system demand.

2.15 Fire, Police and Medical Services

The CCH, Honolulu Fire Department (HFD) provides fire protection services on Oʻahu, and responds to emergencies including, but not limited to, fires, emergency medical calls, hazardous materials incidents, motor vehicle accidents, natural disasters, and technical rescues. The nearest HFD fire station to the project area is the Kalihi Kai Fire Station, which is approximately 2.4 miles away.

The CCH, Honolulu Police Department (HPD) has eight patrol districts on the island; the project site is within District 5, Sector 3, which serves Kalihi Kai, Pālama and Sand Island. The nearest police station to the project site is located at 1865 Kamehameha IV Road, which is approximately 4 miles away from the SIWWTP.

The CCH, Honolulu Emergency Services Department (HESD), Emergency Medical Services Division (EMS), provides emergency medical services on Oʻahu. The project site is located within the HESD-EMS' District 2, "East Oʻahu". The nearest medical center to the project site is Kuakini Medical Center, which is approximately 4.5 miles from the SIWWTP.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing fire, police and medical services, as the proposed improvements will not result in a significant increase in demand or lead to an obstruction or reduction of these services for the project site and the surrounding community.

Construction Related

During construction, it is anticipated that there may be an increase in phone calls to the police concerning construction related traffic and noise. Construction activities could potentially increase the demand on police and medical services should worker safety emergency situations arise. Emergency vehicle access to the project site will be maintained for the duration of construction. An increase in firefighting services is not anticipated to result from construction activities. Coordination with HPD during construction will be necessary to mitigate traffic congestions and ensure public safety.

Post-Construction/Operations

The proposed project is not expected to result in significant increases in demands on police, fire or medical services. All facility improvements will be designed and constructed in compliance with the Honolulu Fire Code (ROH Chapter 20), National Fire Protection Association (NFPA, 2012), and relevant provisions of the Uniform Fire Code (UFC), 2006 Edition, including requirements for emergency vehicle/fire apparatus access for the purposes of emergency response, and water supply and distribution for fire protection. The proposed digester control building will be located not more than 150-feet from an approved fire department access road, and the access road shall extend to within 50-feet of at least one exterior door that will provide access to the interior of the building. ENV will ensure that the proposed facilities and buildings will be provided with approved water supply and flow required for fire protection, and that on-site fire hydrants and mains capable of supplying the required fire flow shall be provided

whenever a portion of a facility or building is more than 150-feet from an approved fire apparatus access road. The civil construction drawings will be submitted to the HFD for review and approval upon completion.

2.16 Park and Recreational Resources

The nearest park and recreational resource to the project site is the SISRA, which is an approximately 141-acre urban, coastal recreational area that is located along the southern boundary of the SIWWTP. The SISRA is managed by the DLNR, Division of State Parks, and provides facilities such as campsites, picnic pavilions, picnic tables, multi-use paths, baseball and softball diamonds, open lawn recreational areas, exercise and play apparatus, and comfort stations. It also provides a wide stretch of sandy beach, over a 0.5 mile long. The Sand Island Off-Highway Vehicle (OHV) riding area is located at the west end of the SISR and contains tracks and trails for motorized OHV's and non-motorized bike motocross.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing parks and recreational resources, as the proposed improvements will not involve a long-term loss of access to, or use of, recreational park space or shoreline areas, a substantial or permanent change to a park or natural recreational area, or a substantial conflict with recreational uses in the long-term.

Construction Related

Park and recreational resources near the project site include the SISRA and the Sand Island OHV riding area. During construction, the SISRA and OHV riding area may be temporarily impacted by construction noise, dust, lighting and traffic. Traffic congestion and potential temporary detours could affect public access to the Sand Island OHV and SISRA, however a Traffic Control Plan will be submitted to the CCH, DTS for review and approval to ensure that access is maintained during construction. Minor impacts to the existing noise, air quality and lighting conditions at the Sand Island OHV and SISRA may occur as a result of the construction activities. These impacts and mitigation measures are discussed in Sections 2.5, 2.6 and 2.7.

Post-Construction/Operations

The proposed project will not create a loss of access to nearby park and recreational resources, permanently change the physical or aesthetic character or nearby park and recreational resources or conflict with the uses of nearby park and recreational resources.

2.17 Socio-Economic Conditions

The SIWWTP service area consists of metropolitan Honolulu from Moanalua-Āliamanu to Niu Valley-Paiko Peninsula and includes the U.S. Army facilities at Fort Shafter and Tripler Army Medical Center. The SIWWTP serves a combined urban resident and visitor population of approximately 700,000, as the service area contains the central business district, Waikīkī, and other tourist attractions and industrial areas at Sand Island, Kakaako, and Māpunapuna. This

service area also contains Honolulu Harbor and the Daniel K. Inouye International Airport, which have relatively small work forces and total revenues, but together facilitate nearly all of the commercial activity in the State.

As part of the 2019 FEIS for the SIWWTP Facility Plan, an Economic Impact Assessment (EIA) was prepared by SMS to assess the potential social issues and concerns of the project on the surrounding community, as well as estimate the economic effects on employment, employment income, and contribution to the local tax base. The EIA distinguished the surrounding community as the primary study area (PSA), which contains Census Tracts 39, 40, 52, 57, and 59; the secondary study area (SSA) that are the regions inland of the PSA and contain Census Tracts 38, 41, 42, 51-56, 58, and 60; and the tertiary area, which contains the entire County of Honolulu for baseline comparisons.

According to the EIA, the population in the PSA increased by 28 percent from 2010 to 2016; a total of 10,834 people lived in the PSA. In comparison, the total population for the County of Honolulu grew by 5.3 percent during the same period. The total population in the County of Honolulu is expected to increase by 11 percent between 2015 and 2040; this is estimated to lead to an increase of 1,213 residents in the PSA. In the County of Honolulu there was an increase of 8,170 housing units between 2010 and 2016, while the PSA saw a decrease of 205 units during the same period.

In addition to the assessment, SMS conducted 35 in-person interviews with stakeholders to assess their perceptions of the project as well as their concerns about their communities. The stakeholders consisted of business owners, institution leaders and community board members within the study area who were lifetime and/or long-time residents of Hawai‘i and/or highly involved in the community. The consensus of the interviewees was that upgrades to the SIWWTP facilities are necessary, and work should begin as soon as possible. Concerns that were raised about the SIWWTP Facility Plan projected included its potential to cause traffic congestion during construction, the cost of the secondary treatment facilities, odor from the SIWWTP, impacts on the views from the Aloha Tower Marketplace, and the potential for a tsunami or other natural disaster to cause the sewage tanks at SIWWTP to break and contaminate Honolulu Harbor essential cargo operations. One interviewee expressed concern about sea level rise and the potential impacts on the SIWWTP.

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in a significant adverse effect on the existing socio-economic conditions, as the proposed improvements will not result in a substantial decrease in employment, earnings and/or tax revenue during and/or post-construction and will not result in a substantial population or demographic change in the surrounding community.

Construction Related

From the 35 interviews conducted for the EIA prepared by SMS, the primary construction-related concern raised by the interviewees is the traffic congestion during construction. It was suggested in the EIA that construction should take place during non-peak travel times to minimize traffic congestion.

Construction expenditures associated with the proposed project will have a direct beneficial impact on the local construction industry, and construction activities will benefit the local economy indirectly through the creation of temporary jobs and construction-related procurement of materials, equipment and services.

Post-Construction/Operations

The concerns raised by the interviewees included the cost of the secondary treatment facilities, odor from the SIWWTP, effects to views from the Aloha Tower Marketplace, the potential for a tsunami or other natural disaster to cause the sewage tanks at SIWWTP to break and contaminate the Honolulu Harbor, and the effects of sea level rise. The effects and mitigation measures addressing these concerns are discussed in sections 2.5, 2.7 and 2.8.

The proposed project is part of the first phase to provide secondary treatment at the SIWWTP, which will provide for an efficient and effective secondary treatment process of wastewater services for the PUC communities on O‘ahu. By meeting the requirements of the 2010 Consent Decree, the project would help to ensure that the ENV is able to maintain a critical public utility that is vital to the health and welfare of the resident and visitor population on O‘ahu.

2.18 Archaeological, Historic and Cultural Resources

2.18.1 Archaeological and Historic Resources

As part of the 2019 FEIS for the SIWWTP Facility Plan, an Archaeological Inventory Survey (AIS) was prepared by Cultural Surveys Hawai‘i, Inc. (CSH) for the project. The AIS was conducted to identify, document, and assess historic properties within the project area. Since no significant historic properties were identified within the project area during the investigation, CSH did not conduct further surveys and/or research and no additional reports were produced.

Sand Island was originally an island names Kamokuakulikuli (Mauliola), and was a fraction of the size of what it is today. In 1872, it became known as the “Quarantine Island” as it was used as a quarantine station during the smallpox epidemic. In 1941 after the attack on Pearl Harbor, all Japanese, Italian, and German suspected “enemy agents” in Hawai‘i were moved to Quarantine Island. Throughout 1905 to 1953, dredged material from Honolulu Harbor and other fill land from the spoils of Keehi Lagoon’s seaplane channel were place within and around the island into the present configuration of Sand Island. Previous archaeological studies within the area indicate that the project area has been impacted by a series of significant mechanized developments, and it is assumed that very little of the land and waterscape of the pre-1900s remains.

On January 26, 2018, CSH archaeologists conducted a 100% pedestrian survey of the open, unbuilt spaces of the SIWWTP. A survey that focused on an “Italian Chapel” was conducted on March 5, 2019. During the pedestrian survey in 2018, four remnant features associated with the development of Sand Island were discovered in the northeast corner of the SIWWTP. During the field check of the “Italian Chapel”, it was observed to be an in situ standing building from the World War II-era, although no archaeological remnants of World War II infrastructure was found. Further evaluation of the “Italian Chapel” building by an architectural historian was

recommended by CSH, thus in March 2019, Mason Architects performed a Reconnaissance Level Survey (RLS) of the chapel and a dormitory building documented to be over 50 years of age. The Italian Chapel was deemed eligible for the HRHP, as it is a significant component of the World War II Italian prisoners of war camp on Sand Island, and because it is the original building of the Half Way House organization, which was one of the first efforts on O'ahu to rehabilitate alcoholics in a campus setting.

In a letter dated January 6, 2021, the State Historic Preservation Division (SHPD) determined that the four remnant features associated with the development of Sand Island (assigned SIHP # 50-80-14-8848) were determined to be significant under HAR §13-275-6 Criterion d as it has yielded or is likely to yield information important for research on history or prehistory, and retains diminished integrity of location, design, materials, and workmanship. In addition, the former "Italian Chapel" was assigned SIHP # 50-80-14-8849 and was determined to be significant under HAR §13-275-6 Criterion a, as it was associated with events that have made an important contribution to the broad patterns of our history, and it retains sufficient integrity of location, design, materials, and workmanship. Based on the findings and assessments, the SHPD concurred with ENV's "Effect, with proposed mitigation commitments" effect determination. SHPD concurred that Site 8848 had been sufficiently documented, and that no further archaeological work was required for this site. In addition, SHPD concurred with the proposed mitigation commitment of historical data recovery in the form of a two-part historic context study for the planned demolition of Site 8849. The architectural report titled "Thematic Historic Context Study: Post Chapel and Half-Way House, Sand Island, O'ahu, HI" was prepared by Mason Architects in September 2020 and was accepted by SHPD, as noted in the letter.

2.18.2 Cultural Resources

As part of the 2019 FEIS for the SIWWTP Facility Plan, a Cultural Impact Assessment (CIA) was conducted by CSH in October 2019. The CIA examined the cultural and historical resources, including reviewing Land Commission documents, historic maps, previous research reports, and archaeological work around the SIWWTP, to provide information to assess the project's potential effects on cultural beliefs, practices, and resources. In addition, CSH attempted to contact 61 Native Hawaiian Organizations (NHO), agencies, and community members during April through October 2018. Of the 61, only six participants responded, of which two were formally interviewed. Through research and community consultation, CSH concluded that there was no likelihood of encountering historic properties related to traditional habitation at the SIWWTP. The CIA included the following recommendations:

- *Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease and the SHPD will be notified pursuant to HAR §13-280-3. In the event that iwi kūpuna are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a*

burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.

- *In the event that iwi kūpuna and/or cultural finds are encountered during construction, project proponents should consult with cultural and lineal descendants of the area to develop a reinterment plan and cultural preservation plan for proper cultural protocol, curation, and long-term maintenance (CSH, 2019b).*

Potential Impacts and Mitigation Measures

The proposed project is not anticipated to result in adverse effects to existing historic resources as the proposed improvements will not disturb archaeological or resources and/or cultural remains or burials. The historic features documented in the AIS were not found to be within the project site. In addition, the proposed project will not result in a significant adverse effect on cultural resources, as the proposed improvements will not result in loss of access to the shoreline or areas customarily used by native Hawaiians or others for resource gathering or traditional cultural practices, a degradation of plants, animals, and other resources customarily used by native Hawaiians for subsistence or traditional cultural practices, or a disturbance to traditional sacred sites or traditional cultural objects.

Construction Related

The historic features documented in the AIS were not found to be within the project site. During construction, the contractor and personnel involved in construction and facility operations will be informed of the possibility of inadvertent cultural finds, including human remains. If any potential historic properties are identified during construction activities, all activities will cease and SHPD will be notified pursuant to HAR §13-280-3. If iwi kūpuna (ancestral remains) are identified, all earth moving activities in the area will stop, the area will be cordoned off, and SHPD and HPD will be notified pursuant to HAR §13-300-40. In addition, if there is an inadvertent discovery of iwi kūpuna and/or cultural finds during construction, a burial treatment plan will be completed, in compliance with HAR §13-300 and HRS §6E-43.

Post-Construction/Operations

There will be no adverse effects to historic or cultural resources once the proposed project is constructed and/or during the process and non-process operations at SIWWTP.

2.19 Cumulative and Secondary Impacts

The proposed project is part of a phased buildout process to upgrade the SIWWTP to a secondary treatment system. The project is required to upgrade the capacity of the solids stream process to handle the additional load from the secondary treatment system. This project, along with the other planned improvements to upgrade the SIWWTP to provide secondary treatment, is anticipated to be beneficial to the environment and to the community. The proposed facilities and the secondary treatment system will be able to remove more contaminants from the wastewater stream, resulting in a higher quality effluent that gets released through the ocean outfall. In addition, the proposed project and secondary treatment

system is required to meet the requirements set by the EPA under the CWA, in accordance with the 2010 Consent Decree.

The proposed project is not anticipated to produce adverse secondary impacts. The project is not designed for the purpose of stimulating population growth and development within the PUC and the service area, rather, it is designed to address anticipated future needs and projected growth within the PUC. The proposed project will upgrade the capacity of the solids stream process to handle the additional load projected for Phase 1 of the secondary treatment system, which is being designed to handle anticipated wastewater flows from the SISB through 2035.

3.0 RELATIONSHIP TO LAND USE PLANS AND POLICIES

3.1 Federal

3.1.1 Federal Aviation Administration

The Federal Aviation Administration (FAA) administers standards and criteria to ensure safe, efficient use and preservation of the navigable airspace surrounding airports. Any construction or alteration to a structure that is more than 200-ft above ground level, or "exceeds an imaginary surface extending outward and upward" at a slope of "50 to 1 for a horizontal distance of 10,000-ft from the nearest point of the nearest runway" of an airport, requires the filing and submittal of FAA Form 7460-1 Notice of Proposed Construction or Alteration. The proposed project site is located approximately 9,200-ft east of the Daniel K. Inouye International Airport runway. The preliminary basis of design for the proposed project indicates that the new sludge storage tanks and new anaerobic digester tanks will have elevations of 115.13-ft; thus, the ENV will file FAA Form 7460-1 for FAA review and determination.

3.2 State of Hawai'i

3.2.1 Hawai'i State Plan

The Hawai'i State Plan was set forth by the Hawai'i State Planning Act, which was signed into law in 1978 and codified under HRS Chapter 226. The plan is a long-range comprehensive plan that identifies goals, objectives, policies, and priorities for the state. The plan is divided into three parts, in which the first part identifies the overall theme, goals, objectives, and policies of the state. The listing below identifies the objectives and policies that are met by the proposed project.

HRS Chapter 226 Hawai'i State Planning Act **Part I. Overall Theme, Goals, Objectives and Policies**	**Applicability to Project**
§226-5 Objective and policies for population	Not applicable
§226-6 Objectives and policies for the economy--in general	Not applicable
§226-7 Objectives and policies for the economy-- agriculture	Not applicable
§226-8 Objective and policies for the economy--visitor industry	Not applicable
§226-9 Objective and policies for the economy--federal expenditures	Not applicable
§226-10 Objective and policies for the economy--potential growth and innovative activities	Not applicable
§226-10.5 Objectives and policies for the economy--information industry	Not applicable
§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources	Not applicable
§226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources	Not applicable
§226-13 Objectives and policies for the physical environment--land, air, and water quality	**Applicable**

HRS Chapter 226 Hawai'i State Planning Act	**Applicability to Project**
Part I. Overall Theme, Goals, Objectives and Policies	
§226-14 Objective and policies for facility systems--in general	**Applicable**
§226-15 Objectives and policies for facility systems--solid and liquid wastes	**Applicable**
§226-16 Objective and policies for facility systems--water	**Applicable**
§226-17 Objectives and policies for facility systems--transportation	Not applicable
§226-18 Objectives and policies for facility systems--energy	Not applicable
§226-18.5 Objectives and policies for facility systems--telecommunications	Not applicable
§226-19 Objectives and policies for socio-cultural advancement--housing	Not applicable
§226-20 Objectives and policies for socio-cultural advancement--health	**Applicable**
§226-21 Objective and policies for socio-cultural advancement--education	Not applicable
§226-22 Objective and policies for socio-cultural advancement--social services	Not applicable
§226-23 Objective and policies for socio-cultural advancement--leisure	Not applicable
§226-24 Objective and policies for socio-cultural advancement--individual rights and personal well-being	Not applicable
§226-25 Objective and policies for socio-cultural advancement--culture	Not applicable
§226-26 Objective and policies for socio-cultural advancement--public safety	Not applicable
§226-27 Objective and policies for socio-cultural advancement--government	Not applicable
Part III. Priority Guidelines	
§226-102 Overall Direction	**Applicable**
§226-103 Economic priority guidelines	Not applicable
§226-104 Population growth and land resources priority guidelines	Not applicable
§226-105 Crime and criminal justice	Not applicable
§226-106 Affordable housing	Not applicable
§226-107 Quality education	Not applicable
§226-108 Sustainability	**Applicable**
§226-109 Climate change adaptation priority guidelines	**Applicable**

Below is an analysis of the project's compliance and consistency with the applicable themes, goals, objectives, policies, and priority guidelines of the Hawai'i State Plan.

§226-13 Objectives and policies for the physical environment--land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

- *(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.*
- *(2) Greater public awareness and appreciation of Hawaii's environmental resources.*

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

- *(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.*
- *(2) Promote the proper management of Hawaii's land and water resources.*
- *(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.*

(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.
(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.
(7) Encourage urban developments in close proximity to existing services and facilities.
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.

Discussion: The proposed project is consistent with the objectives and policies for the physical environment regarding land, air and water quality, as the project will enable the CCH to maintain basic sanitation standards relating to wastewater collection and treatment in O'ahu's PUC's wastewater service areas, as well as comply with the 2010 Consent Decree. In addition, the project is part of the SIWWTP's upgrade to secondary treatment, which at full buildout will increase the quality of treated effluent that is discharged from the SIWWTP through the deep ocean outfall.

§226-14 Objective and policies for facility systems--in general.

(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.
(b) To achieve the general facility systems objective, it shall be the policy of this State to:

(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

Discussion: The proposed project is consistent with the objectives and policies for facility systems, as the project will provide flexibility, reliability and redundancy in the wastewater treatment process. The project will assist the SIWWTP in meeting current and future loads, which are projected based on anticipated future needs and growth of TOD and other private developments within the PUC area.

§226-15 Objectives and policies for facility systems--solid and liquid wastes.

(a) Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:

(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.

(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.

(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

(1) Encourage the adequate development of sewerage facilities that complement planned growth.
(2) Promote reuse and recycling to reduce solid and liquid wastes and employ a conservation ethic.
(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.

Discussion: The proposed project is consistent with the objectives and policies for solid and liquid wastes facility systems, as the project will meet the current and future loads of the SIWWTP service basin, which is based on the projections for TOD and other future developments within the PUC area. In addition, through the solids stream process the proposed anaerobic digesters will produce biogas, which will then be treated to be used for the CHP system to provide electricity.

§226-16 Objective and policies for facility systems--water.

(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.

(b) To achieve the facility systems water objective, it shall be the policy of this State to:

(1) Coordinate development of land use activities with existing and potential water supply.
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.
(5) Support water supply services to areas experiencing critical water problems.
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.

Discussion: The proposed project is consistent with the objectives and policies for water facility systems, as the project will encourage the productive use of wastewater discharges by supporting the SIWWTP's upgrades to secondary treatment. As previously mentioned, through the proposed upgrades to the solids stream process, the anaerobic digesters will be able to produce biogas from the biodegradable organic matter, and the biogas will be used for the CHP system to produce electricity to be used on-site at the SIWWTP.

§226-20 Objectives and policies for socio-cultural advancement--health.

(a) Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:

(1) Fulfillment of basic individual health needs of the general public
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.
(3) Elimination of health disparities by identifying and addressing social determinants of health.

(b) To achieve the health objectives, it shall be the policy of this State to:

(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.
(4) Foster an awareness of the need for personal health maintenance and preventive health care through education and other measures.
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.
(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.

Discussion: The proposed project is consistent with the objectives and policies for socio-cultural advancement in regards to health, as the project will support the SIWWTP's upgrade to secondary treatment, which at full buildout will increase the quality of treated effluent that is discharged from the SIWWTP through the deep ocean outfall and have a positive effect on the surrounding coastal waters and marine life. In addition, at full buildout, the SIWWTP secondary treatment will be able to handle the current and future loads of the projected wastewater flow to maintain sanitary and environmentally healthful conditions of the State's communities.

§226-102 Overall direction. The State shall strive to improve the quality of life for Hawaii's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population

growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation.

Discussion: The proposed project is consistent with the overall direction of the priority guidelines, as the project is part of the upgrades to the SIWWTP's system to serve the current and future population of the State. The proposed upgrades also address sustainability and climate change adaptation through the production and use of biogas, and the facility's design layout to accommodate future sea level rise.

§226-102 Sustainability. Priority guidelines and principles to promote sustainability shall include:

(1) Encouraging balanced economic, social, community, and environmental priorities;
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;
(3) Promoting a diversified and dynamic economy;
(4) Encouraging respect for the host culture;
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations;
(6) Considering the principles of the ahupua'a system; and
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.

Discussion: The proposed project is consistent with the priority guidelines and principles to promote sustainability within the State, as the project proposes the use of biodegradable organic matter from the wastewater stream to produce biogas, which will be converted to electricity to be used within the facility.

§226-109 Climate change adaptation priority guidelines. Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall:

(1) Ensure that Hawaii's people are educated, informed, and aware of the impacts climate change may have on their communities;
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;
(3) Invest in continued monitoring and research of Hawaii's climate and the impacts of climate change on the State;
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;

(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;
(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options;
(8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities;
(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and
(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.

Discussion: The proposed project is consistent with the priority guidelines and principles for climate change adaptation, as the project has been designed to address the projected sea level rise for the area. As discussed in Section 2.1, the project considered a high groundwater level of 9-ft above msl to use in the foundation design of the new structures. The finished grade elevation of the project site will be 16-ft. The higher elevation will help the facility be more resilient to coastal inundation and flooding due to storm surges, sea level rise and tsunamis.

3.2.2 State Land Use Classification

The Hawai‘i State Land Use Law, HRS Chapter 205, *State Land Use Commission (SLUC)*, was adopted in 1961. The purpose of the law is to establish a framework of land use management and regulation in which all lands in the State are classified into one of four state land use districts: Urban, Rural, Agricultural or Conservation.

The proposed project is located in the State Land Use Urban District. Land uses within the Urban District are regulated by ordinances or regulations set forth by each county, which for the CCH is the ROH, Chapter 21, Land Use Ordinance (LUO). See Section 3.3.2 for discussion of the LUO. No action from the SLUC is required to implement the proposed project.

3.2.3 State-level Implementation of Clean Water Act, Clean Air Act and Safe Drinking Water Act

The DOH, Environmental Management Division (EMD) is responsible for implementing and maintaining statewide programs for controlling air and water pollution, for assuring safe drinking water, and for the proper management of solid and hazardous waste. The EMD also regulates wastewater.

Control of water pollution is regulated under HAR Chapter 11-55. Control of discharges of wastewater, including storm water runoff into ground, surface or marine waters are enforced by the DOH, Clean Water Branch (CWB). The CWA Section 402, NPDES permits required for the project includes the following:

- NOI C – Construction Storm Water;
- NOI F – Discharges of Hydrotesting Effluent; and
- NOI G – Discharge of Construction Dewatering

Control of air pollution is regulated under HAR Chapter 11-60.1, Air Pollution Control. Requirements include, but are not limited to the following:

- *The planning of project construction phasing should focus on: minimizing the amount of dust-generating materials and activities; centralizing material transfer points and on-site vehicular traffic routes; and, locating potentially dusty equipment in areas of least impact.*
- *An adequate water source at the site should be provided prior to start-up of construction activities.*
- *The project site should be landscaped with rapid covering of bare areas, including slopes, starting from the initial grading phase.*
- *Dust should be controlled from shoulders, project entrances, and access roads.*
- *Adequate dust control measures should be provided on weekends, after hours, and prior to daily start-up of construction activities.*

Vehicle and construction equipment exhausts will also be a source of air pollution. Mitigation of potential adverse impacts associated with the use of construction equipment, fuel tanks and vehicle exhausts will be handled through adherence to HAR, Chapter 11-60.1 and applicable federal and county regulations. All machinery and vehicles will be required to be in proper working order with appropriate use of mufflers.

ENV will consider preparing a dust control management plan which identifies, mitigates, and controls all activities that may generate airborne, visible fugitive dust, as well as consider establishing buffer zones to mitigate the effects of dust on near to existing residences, business, public areas, and major thoroughfares. The management plan will also consider providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities, as well as for visible fugitive dust from debris being hauled away from the project site.

Other provisions to maintain compliance with HAR, Chapter 11-60.1, are addressed in NSP No. 0216-05-N Application for Renewal No. 0216-13, described in Section 7.1.2.

Discharges of treated wastewater effluent from the SIWWTP are regulated under the NPDES Permit HI 0020117. As required, all discharges must comply with state law.

3.2.4 State-level Regulation of Noise and Vibration

HRS, Chapter 342F Noise Pollution and HAR, Chapter 11-46 Community Noise Control provides provisions for the prevention, control and abatement of noise pollution in the State from excessive noise sources. Per HRS, Chapter 342F-4.5, the proposed project will be required to apply for a Community Noise Permit since it will have a total cost exceeding $250,000. However, if construction activities will occur before 7AM and after 6PM, from Monday to Fridays, or before 9AM and after 6PM on Saturdays, and/or at any time on Sundays, then the

project will be required to apply for a Community Noise Variance. The applicable permit or variance will be applied for when the construction schedule is determined.

3.2.5 Coastal Zone Management Act

The State Coastal Zone Management (CZM) Program, as formalized in HRS Chapter 205A, establishes objectives and policies to "provide for the effective management, beneficial use, protection, and development of the coastal zone." The following is an assessment of the project's compliance and consistency with respect to the objectives and policies of the CZM.

1) Recreational Resources Objective: Provide coastal recreational opportunities accessible to the public.

> *a) Improve coordination and funding of coastal recreational planning and management; and*
>
> *b) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
>
> > *i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
> >
> > *ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
> >
> > *iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
> >
> > *iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
> >
> > *v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*
> >
> > *vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
> >
> > *vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
> >
> > *viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.*

Discussion: The SISRA is located along the southern edge of the project site and features developed park areas and an OHV recreation which are managed by the DLNR. Access to the adjacent SISRA may be adversely affected during period of construction activities due to construction detours and congestion caused by the presence of heavy, slow-moving construction equipment and material delivery at or near the Sand Island Access Road located to the north of the project site. A traffic management plan will be prepared to ensure that public access will be safely maintained during the construction period.

2) Historic Resources Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

a) Identify and analyze significant archaeological resources

b) Maximize information retention through preservation of remains and artifacts or salvage operations; and

c) Support state goals for protection, restoration, interpretation, and display of historic resources

Discussion: As discussed in Section 2.19, an AIS was conducted for the 2019 FEIS for the SIWWTP Facility Plan, which included the project site. None of the findings from the survey are within the proposed project site, and it is anticipated that no historic properties will be affected by the project.

3) Scenic and Open Space Resources Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

a) Identify valued scenic resources in the coastal zone management area;

b) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

c) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

d) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion: The facility improvements will match the industrial character of the existing SIWWTP and surrounding built environment, and thus will not significantly alter the existing scenic views or open space resources. The proposed project will not permanently alter public access to the SISRA or nearby shoreline open space resources.

4) Coastal Ecosystems Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

a) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

b) Improve the technical basis for natural resource management;

c) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

d) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

e) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: The proposed project will not significantly impact coastal ecosystems. During construction, BMPs will be employed to prevent potential pollutant discharges into storm water runoff. These measures will be in place and functional before project activities begin, and will be maintained throughout the construction period.

5) Economic Uses Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

a) Concentrate coastal dependent development in appropriate areas;

b) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

c) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

i) Use of presently designated locations is not feasible;

ii) Adverse environmental effects are minimized; and

iii) The development is important to the State's economy.

Discussion: The proposed project will provide needed improvement of existing facilities and infrastructure systems within the SIWWTP. The construction expenditures will have an overall short term beneficial impact on the local construction industry that will benefit the community indirectly through the creation of jobs.

6) Coastal Hazards Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

a) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

b) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

c) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

d) Prevent coastal flooding from inland projects.

Discussion: As previously mentioned, natural hazards such as hurricanes, flooding and tsunamis are unavoidable for all coastal areas. The proposed project will be designed to minimize the potential for adverse effects from natural hazards, as discussed in Section 2.9.

7) Managing Development Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

a) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

b) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

c) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion: The proposed project conforms to all State regulations. A list of permits that may be required is provided in Section 1.6. While the proposed project site is within the coastal zone, no coastal resources will be adversely affected.

8) Public Participation Objective: Stimulate public awareness, education, and participation in coastal management.

a) Promote public involvement in coastal zone management processes;

b) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

c) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: The provision for public participation will be provided through the environmental review process as required in HRS, Chapter 343. Public comments will be received during the comment period associated with the filing of the Draft EA. In addition, all permits that may be required for the project will be subject to governmental agency and public review as required under law.

9) Beach Protection Objective: Protect beaches for public use and recreation.

a) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

b) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

c) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: The proposed project will not affect any beaches, as the project site is located over 1,000-ft inland of the shoreline.

10) Marine Resources Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

a) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

b) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

c) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

d) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

e) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The proposed project does not involve the use or development of marine and coastal resources.

3.2.6 State Historic Preservation

The State Historic Preservation Program, codified by HRS Chapter 6E, is administered by the DLNR SHPD. The program and DLNR SHPD work to provide leadership in preserving, restoring, and maintaining historic and cultural property. Per HRS §6E-08, prior to the commencement of any State agency project that may affect historic property, the agency shall allow the SHPD an opportunity for review of the effect of the proposed project on historic properties, aviation artifacts, or burial sites, especially those listed on the HRHP.

As discussed in Section 2.19, an AIS was prepared for the SIWWTP during the 2019 FEIS for the SIWWTP Facility Plan, which covered the proposed project site. The findings documented in the AIS were not found to be within the proposed project site. The project will be reviewed by SHPD in accordance with HRS Chapter 6E. The AIS will be provided as supporting documentation for this review.

3.3 City and County of Honolulu

3.3.1 City and County of Honolulu – General Plan

The General Plan for the City and County of Honolulu was originally adopted in 1977 and was most recently amended in 2002. A revised version is currently in review by the City Council. The General Plan is a statement of the long-range physical, social, cultural, economic, environmental, and design objectives for the welfare and prosperity of the people of O'ahu. It is intended to guide land use and development decisions, and to influence actions in eleven areas of concern, including population; economy; natural environment and resource stewardship; housing and communities; transportation and utilities; energy; physical development and urban design; public safety and community resilience; health and education; culture and recreation; and government operations and fiscal management. The following is a discussion regarding the project's consistency with the most relevant section and subsequent objectives and policies of the revised General Plan, Section V, *Transportation and Utilities* and Section VII, *Physical Development and Urban Design* (CCH GP).

V. Transportation and Utilities

> ***Objective B:*** *To provide an adequate supply of water and environmentally sound systems of waste disposal for O'ahu's existing population and for future generations.*
>
> *Policy 6:* *Provide safe, reliable, efficient, and environmentally sound waste-collection and waste-disposal services that consider the impacts of climate change during the siting and construction of new facilities.*
>
> *Policy 7:* *Pursue programs to expand recycling and resource recovery from O'ahu's solid-waste and wastewater streams.*
>
> ***Objective C:*** *To ensure reliable, cost-effective and responsive service for all utilities.*
>
> *Policy 3:* *Facilitate the timely and orderly expansion of utility systems.*
>
> ***Objective D:*** *To maintain transportation and utility systems which support O'ahu as a desirable place to live and visit.*
>
> *Policy 2:* *Evaluate the social, cultural, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.*
>
> *Policy 5:* *Evaluate impacts of sea level rise on existing public infrastructure, especially sewage treatment plants, roads, and other public and private utilities located along or near O'ahu's coastal areas.*

Discussion: The project is consistent with the objectives and policies of Section V of the General Plan, as the project is concerned with improving the safety, efficiency and environmental sensitivity of wastewater collection and treatment services. The proposed project is part of the Phase 1 upgrades to the SIWWTP to secondary treatment, which will allow the facility to be compliant with the 2010 Consent Decree. Implementation of the wastewater facility improvements would enhance efficiency of the systems and the secondary treatment to

provide safe waste collection and disposal. The proposed anaerobic digesters will also expand the recycling and resource recovery from wastewater streams, as it will convert biodegradable organic matter to biogas, which will be used to produce electricity for the facility. As previously discussed, the proposed facility will be constructed with a finished grade elevation of 16-ft to mitigate the impacts of sea level rise and natural hazards such as tsunamis and flooding.

VII. Physical Development and Urban Design

> ***Objective A:*** *To coordinate changes in the physical environment of O'ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.*
>
> *Policy 1: Plan for the construction of new public facilities and utilities in the various parts of the Island according to the following order of priority: first, in the primary urban center; second, in the secondary urban center at Kapolei; and third, in the urban- fringe and rural areas.*
>
> *Policy 2: Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities.*

Discussion: The proposed project is consistent with Policy 1, as the project will be constructed in the PUC, within the existing SIWWTP.

3.3.2 Land Use Ordinance

The City and County of Honolulu Land Use Ordinance (LUO) regulates land use in accordance with adopted land use policies, which includes the General Plan and Sustainable Communities Plans. The provisions are also referred to as the "zoning ordinance." The project site is located on land in the I-3 Industrial Waterfront zone.

According to ROH Table 21-3, the existing and proposed SIWWTP facilities and buildings are permitted as "public uses and structures" in all zoning districts. The development standards for the I-3 Industrial Waterfront zone are set forth in ROH §21-3.130 and summarized below in Table 12.

Table 12: I-3 Industrial Waterfront Development Standards

Development Standard		I-3 Industrial Waterfront
Minimum lot area (square feet)		7,500
Minimum lot width and depth (feet)		60
Yards (feet):	**Front**	0
	Side and rear	0[1]

Maximum building area (percent of zoning lot)	80 However, the building area may be increased to include all of the buildable area of the zoning lot provided all structures beyond the designated 80 percent building area shall: a. Provide a minimum clear interior height of 18 feet; b. Contain no interior walls, except for those between a permitted use and a special accessory office; and c. Provide a minimum distance of 40 feet between interior columns and other structural features
Maximum density (FAR)	2.5
Maximum height (feet)	60 feet
Height setbacks	Per Sec. 21-3.140-1(c)

[1]Where the side or rear property line of a zoning lot adjoins the side or rear yard of a zoning lot in a residential, apartment, apartment mixed use or resort district, there shall be a side or rear yard which conforms to the side or rear yard requirements for dwelling use of the adjoining district. In the I-3 district only, this yard shall be not less than 15 feet. In addition, see Section 21-4.70-1 for landscaping and buffering requirements.

The proposed project will include new facilities that exceed the maximum height allowed per the I-3 Development Standards, thus a zoning waiver will be required to bring the facilities into conformance with the LUO.

3.3.3 Primary Urban Center Development Plan

The Primary Urban Center Development Plan (PUCDP) is one of eight community-oriented plans that is intended to guide public policy, investment, and decision-making in response to the specific conditions and community values of each region. The most recent version of the PUCDP was adopted in June 2004, however the plan is currently being updated. The PUCDP area is described as the "cultural, governmental and economic center of both Oʻahu and the State," and encompasses the coastal plain that extends along Oʻahu's southern shore from Waiʻalae-Kāhala in the east, to Pearl City in the west. The following is a discussion regarding the project's compliance and consistency with the most relevant policies of Section 4.2 in the PUCDP.

4.2 Wastewater System

4.2.2 Policies

- *Implement wastewater collection system improvements to provide adequate service and sound facilities to existing neighborhoods and timely increases in system capacity to areas planned to undergo improvement or change in use.*
- *Implement adequate and timely upgrades/expansion of wastewater treatment facilities to meet the growth demands of the PUC.*

Discussion: The project is consistent with the policies listed in Section 4.2 of the PUCDP, as the purpose of the project is to assist the SIWWTP in complying with the 2010 Consent Decree to provide adequate service to the SISB by accommodating projected wastewater flows through 2055, based on existing State and CCH DPs, zoning allowances and population projections.

3.3.4 Special Management Area

The CCH has designated the shoreline and certain inland areas of O‘ahu as being within the Special Management Area (SMA). The SMA areas are designated sensitive environments that are protected in accordance with the State’s CZM policies, as set forth in ROH Chapter 25. The project site is located within the SMA (see Figure 15). The project will require a SMA Major Permit as the project qualifies as a development under ROH §25-1.3 and has a valuation in excess of $500,000.

Figure 15: Special Management Area

4.0 OTHER CONSIDERATIONS

4.1 Irretrievable and Irreversible Commitments of Resources

Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effects that the use of those resources have on future generations. Irretrievable resource commitments involve the loss in value of an affected resource (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site). The proposed project would constitute an irreversible or irretrievable commitment of non-renewable or depletable resources for the materials, time, money, and energy expended during activities implementing the project and for the land area used.

In the short-term, construction activities would require the consumption of fossil fuel and energy, as construction requires equipment that would use fuel, either gasoline or diesel, to operate. Irreversible and irretrievable commitments to resources would be unavoidable but would be minor and temporary.

Construction activities would require the manufacturing and use of materials. Following construction, unused materials would be reused or recycled whenever possible. Materials that cannot be recycled at the end of the project lifetime would become an irreversible and irretrievable commitment of resources. However, no supplies are considered scarce and thus would not limit other unrelated construction activities in the region. The packaging of construction materials that cannot be reused or recycled, as well as other waste generated during construction activities, would result in an irreversible and irretrievable allocation of landfill or other solid waste disposal capacity.

It is anticipated that the project would have both beneficial and adverse effects on non-residential development and employment in the area. The proposed project would create demand for construction materials and services, and hence direct and indirect (mostly construction- and industrial-related) employment in the project area.

In the long term, the facility may require fossil fuels to generate energy for heating, cooling and ventilation. However, upgrades would be constructed with modern equipment that incorporates greater efficiencies than those achieved at the existing facilities. In addition, the installation of the CHP system will use biogas produced by the anaerobic digesters to generate electricity and heat for the facilities on site. Therefore, although irreversible and irretrievable commitments of resources are unavoidable (i.e., using oil for energy production), these effects are anticipated to be insignificant, particularly when balanced against the project benefits.

5.0 ALTERNATIVE TO THE PROPOSED ACTION

The no action alternative would involve no effort to provide upgrades to the solid streams system at the SIWWTP. Under this alternative, environmental effects resulting from development activities would be averted and project costs would be spared. However, the no action alternative would result in failure of the CCH to meet the 2010 Consent Decree. The proposed project is essential to the existing wastewater treatment system and the proposed MBR facilities being installed in Phase 1 to be able to handle the existing and future loads for the SIWWTP's secondary treatment system. For this reason, this alternative is eliminated from further consideration.

In addition, other site alternatives were not considered for the project, as the current proposed location is the most ideal and cost-efficient alternative. The new anaerobic digesters and sludge storage tanks will need to be located next to the existing digesters to streamline the solids processing. Locating the proposed new anaerobic digesters and sludge storage tanks in a different location away from the existing digesters would be costly, as additional facilities and/or utilities would need to be installed to transfer the sludge to separate locations for processing, and to then transfer the sludge to the dewatering and drying facilities.

6.0 SIGNIFICANCE CRITERIA AND ANTICIPATED DETERMINATION

6.1 Anticipated Determination

The SIWWTP Bioconversion Facility Upgrades project is not anticipated to have a significant impact based on the criteria set forth in HAR §11-200.1-13. The objective of this Draft EA is to identify and consider the "significance" of potential environmental effects, which includes the sum of effects on the quality of the environment along with cumulative long-term effects.

As set forth in HAR §11-200.1-13, a prescribed set of 13 Significance Criteria is used to determine the project's impact on the environment. The project's relationship to each criterion is discussed in this section.

6.2 Significance Criteria Findings

To determine whether a proposed action may have a significant effect on the environment under HAR §11-200.1, the Proposing Agency needs to consider every phase of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The Proposing Agency's review and evaluation of the proposed action's effect on the environment would result in a determination whether: 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding of No Significant Impact (FONSI).

1. ***Irrevocably commit a natural, cultural, or historic resource;***
   The proposed project will take place within developed areas where effects on natural resources, including flora and fauna, water, and soils, are anticipated to be minimal.

   As discussed in Section 2.18, an Archaeological Assessment was prepared for the 2019 FEIS for the SIWWTP Facility Plan, which included the project site. The findings from the assessment are not within the proposed project area. The proposed improvements will occur in conditions of fill land and in areas that were previously disturbed, thus encountering cultural or historic resources is not anticipated.

2. ***Curtail the range of beneficial uses of the environment;***
   The proposed project will be developed within the SIWWTP facility on land previously developed. While the project would curtail other uses for the SIWWTP facility on its site, it will not expand outside of the facility site and/or detract from the surrounding environment or other uses in the area. The proposed project will enable to CCH to maintain basic sanitation standards relating to wastewater collection and treatment in O'ahu's PUC's

wastewater service areas and will result in adequate sewage facilities to support both current and future growth within the area.

3. Conflict with the State's environmental policies or long-term environmental goals established by law;

The proposed project does not conflict with the State's long-term environmental policies or goals. This Draft EA is being prepared to address the proposed upgrades for the bioconversion facility at the SIWWTP, which will support the facility's upgrades to a secondary treatment system. As part of the Draft EA, an evaluation and analysis of the project's conformance to the State's long-term environmental policies and goals has been undertaken in a manner consistent with HRS Chapter 344, State Environmental Policy. The project is required to meet the demands of Honolulu's existing and future population for reliable wastewater treatment to ensure public health and welfare, and to ensure CCH compliance with the 2010 Consent Decree.

4. Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State;

The proposed project will not have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State, as the project will benefit the community within the SIWWTP service area and the larger population of O'ahu by protecting health and safety through the environmentally responsible management and treatment of wastewater. The proposed upgrades will ensure that the municipal wastewater treatment system will continue to provide reliable service and meet future service demands.

5. Have a substantial adverse effect on public health;

The proposed project will not have a substantial adverse effect on public health. The project will have long-term beneficial effects on public health, as the planned upgrades will ensure the SIWWTP will continue to provide reliable wastewater treatment for the existing and future demands of the service area. Short-term effects to noise, air, water quality, and traffic that could result from construction activities will be limited to the construction phase and will be mitigated through BMPs and adherence to regulatory requirements as described in sections 2.5, 2.6 and 2.10.

6. Involve adverse secondary impacts, such as population changes or effects on public facilities;

The proposed project will not result in substantial secondary or cumulative impacts to the natural or built environment, or to the social and economic community. The proposed facilities have been designed to accommodate projected population growth within the PUC area based on existing State and CCH plans and zoning constraints.

7. Involve a substantial degradation of environmental quality;

The proposed project will not involve substantial degradation of environmental quality. All project activities will be conducted in compliance with Federal, State, and CCH rules and regulations governing environmental quality and public health.

8. Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions;

The SIWWTP wastewater treatment system is an essential public facility. ENV is currently undertaking improvements to the SIWWTP to provide secondary treatment of wastewater to meet the 2010 Consent Decree and to provide safe and efficient handling of municipal wastewater. The cumulative effects of the proposed upgrades are addressed in Section 2.19. The facilities will not result in a cumulatively substantial adverse effect upon the environment.

9. Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat;

The proposed project will not have a substantial adverse effect on rare, threatened, or endangered species or its habitat. The project site is located on highly urbanized and developed land, which is not known to provide habitat for rare, threatened or endangered plant or animal species. In addition, the project area does not contain any land designated as Critical Habitat. Mitigation measures are proposed in Section 2.4 to minimize the effect of construction activities on avifauna.

10. Have a substantial adverse effect on air or water quality or ambient noise levels;

The proposed project will not have a substantial adverse effect on air or water quality or ambient noise levels. The proposed project is being undertaken in accordance with CWA and Clean Air Act requirements to ensure the long-term protection of O‘ahu’s water and air resources, and public health and safety. Mitigation measures and BMPs will be employed during construction activities to mitigate temporary air, noise and water pollution. Runoff from construction areas will be regulated under NPDES permit conditions. Construction related exhaust emissions and dust generation will be mitigated by requiring that construction activities comply with HAR Chapter 11-59 and 60 – *Air Pollution Control*. Construction related effects to air quality will be temporary and will cease when construction is completed.

11. Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

The proposed project will be constructed near the coastline of Sand Island. Areas along the coastline, including the SIWWTP, are susceptible to inundation from flooding and tsunamis. As required, facility improvements will be developed in compliance with ROH, Section 21-9.10-1 through 21-9.10-14, relating to development within the flood hazard districts.

The design of the proposed improvements will be in accordance with all applicable IBC seismic design standards and CCH standards pertaining to seismic safety. To minimize impacts from sea level rise, the proposed facilities will be built at a floor elevation of 16-ft above msl.

12. Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies; or

The proposed project will not have a substantial adverse effect on scenic vistas and viewplanes identified in State or County plans or studies. The project will be located in a highly industrialized area and the proposed facilities will be similar in appearance and character to the existing setting. During construction activities, work crews operating equipment and machinery will be visible. Mitigation measures to screen construction activities from view and minimize nighttime lighting are proposed.

13. Require substantial energy consumption or emit substantial greenhouse gases.

The secondary treatment facilities will result in approximately 30,000 metric tons per year increase in CO_2 emissions over expansion of the existing process. The proposed facilities will require substantial electricity, biogas and/or diesel consumption for the solids treatment process, in addition to relatively nominal energy consumption for required facility controls, lighting, and office machinery. Although the proposed facilities and the secondary treatment system requires a large amount of energy, it provides a higher quality effluent, and therefore slightly reduces the power required by the UV disinfection system. In addition, the project proposes the use of a CHP system to offset onsite power demand and produce heat for a hydronic heating system to heat the anaerobic digester heat exchanges. The biogas produced by the anaerobic digesters will be used to fuel the CHP, dryer, digesters, boilers, and other various processes of the proposed facilities.

7.0 AGENCIES AND PARTIES CONSULTED

Distribution	Pre-Assessment Consultation Recipient	Pre-Assessment Comments Received
FEDERAL AGENCIES		
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office	X	
U.S. Department of Agriculture, Natural Resources Conservation Service	X	
U.S. Environmental Protection Agency, Region 9, Pacific Islands Office	X	
U.S. Army Corps of Engineers, Honolulu District, Regulatory Office	X	X
U.S. Department of Transportation, Federal Aviation Administration	X	
National Oceanic and Atmospheric Administration National Marine Fisheries Service, Pacific Islands Regional Office	X	
STATE OF HAWAIʻI AGENCIES		
State of Hawaiʻi, Office of Planning and Sustainable Development	X	X
State of Hawaii, Department of Accounting and General Services	X	
State of Hawaiʻi, DBEDT, Office of Planning and Sustainable Development	X	X
State of Hawaiʻi, DBEDT, Hawaiʻi Housing Finance & Development Corporation	X	
State of Hawaii, Department of Hawaiian Home Lands	X	X

State of Hawai'i, Department of Land and Natural Resources, State Historic Preservation Division	**X**	
State of Hawai'i, Department of Land and Natural Resources, Engineering Division	**X**	**X**
State of Hawai'i, Department of Land and Natural Resources, Land Division	**X**	**X**
State of Hawai'i, Department of Land and Natural Resources, Commission on Water Resource Management	**X**	**X**
State of Hawai'i, Department of Land and Natural Resources, Division of Aquatic Resources	**X**	**X**
State of Hawai'i, Department of Land and Natural Resources, Division of Boating and Ocean Recreation	**X**	
State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife	**X**	**X**
State of Hawai'i, Department of Land and Natural Resources, Division of State Parks	**X**	
State of Hawai'i, Department of Land and Natural Resources, Office of Conservation and Coastal Lands	**X**	**X**
State of Hawai'i, Department of Health, Office of Environmental Quality Control	**X**	
State of Hawai'i, Department of Health, Clean Air Branch	**X**	
State of Hawai'i, Department of Health, Clean Water Branch	**X**	
State of Hawai'i, Department of Health, Wastewater Branch	**X**	
State of Hawaii, Department of Health, Environmental Health Administration	**X**	

State of Hawaii, Department of Health, Indoor and Radiological Health Branch	**X**	**X**
State of Hawaii, Department of Health, Solid and Hazardous Waste Branch	**X**	
State of Hawaii, Department of Health, Disability and Communication Access Board	**X**	**X**
State of Hawai‘i, Department of Transportation, Highways Division	**X**	**X**
State of Hawai‘i, Department of Transportation, Airports Division	**X**	**X**
State of Hawai‘i, Department of Transportation, Harbors Division	**X**	**X**
Hawaii State Library, Hawaii Documents Center	**X**	
State of Hawaii, Legislative Reference Bureau	**X**	
Office of Hawaiian Affairs	**X**	
University of Hawaii, Environmental Center	**X**	
University of Hawaii, Sea Grant College Program	**X**	
University of Hawaii, Water Resources Research Center	**X**	
CITY AND COUNTY OF HONOLULU		
Board of Water Supply	**X**	
City and County of Honolulu, Department of Planning and Permitting, Land Use Permits Division	**X**	
City and County of Honolulu, Department of Planning and Permitting	**X**	**X**
City and County of Honolulu, Department of Parks and Recreation	**X**	**X**

City and County of Honolulu, Department of Design and Construction	**X**	**X**
City and County of Honolulu, Department of Transportation Services	**X**	
City and County of Honolulu, Department of Facility Maintenance	**X**	**X**
City and County of Honolulu, Department of Emergency Management	**X**	**X**
City and County of Honolulu, Emergency Services Department	**X**	
City and County of Honolulu, Fire Department	**X**	**X**
City and County of Honolulu, Police Department	**X**	**X**
Downtown-Chinatown Neighborhood Board No. 13	**X**	
Kalihi Pālama Neighborhood Board No. 15	**X**	
Kalihi Valley Neighborhood Board No. 16	**X**	
Āliamanu-Salt Lake Neighborhood Board No. 18	**X**	
ELECTED OFFICIALS		
Office of the Governor, Honorable Governor David Ige	**X**	
Office of the Mayor, Honorable Mayor Rick Blangiardi	**X**	
United States House of Representatives, Hawai‘i First Congressional District	**X**	
United States House of Representatives, Hawai‘i Second Congressional District	**X**	
United States Senate, Senator Mazie Hirono	**X**	
United States Senate, Senator Brian Schatz	**X**	
State House of Representatives, House District 26	**X**	

State House of Representatives, House District 28	**X**	
Senate District 13, Senator Karl Rhoads	**X**	
Senate District 15, Senator Glenn Wakai	**X**	
Honolulu City Council, Council District 1	**X**	
Honolulu City Council, Council District 2	**X**	
Honolulu City Council, Council District 3	**X**	
Honolulu City Council, Council District 4	**X**	
Honolulu City Council, Council District 5	**X**	
Honolulu City Council, Council District 6	**X**	
Honolulu City Council, Council District 7	**X**	
Honolulu City Council, Council District 8	**X**	
Honolulu City Council, Council District 9	**X**	
Honolulu City Council, Public Safety and Welfare Committee	**X**	
Honolulu City Council, Zoning, Planning and Housing Committee	**X**	
OTHER AGENCIES		
Chinatown Merchants Association	**X**	
Sand Island Business Association	**X**	
Kalihi Business Association	**X**	
Mr. Roy Abe, State of Hawaii, Environmental Council	**X**	
Matson	**X**	
Pasha Hawai‘i	**X**	
Sierra Club of Hawai‘i	**X**	

Hawaiian Electric Company	**X**	
Hawaiian Telcom	**X**	

7.1 Summary of Pre-Consultation Comments Received

The table below provides a summary of the comments received during the pre-consultation period, along with the associated responses and referenced sections in the Draft EA. A copy of the comment letters received are provided in Appendix A.

No.	Commentor	Date of Letter	Comments	Response	Draft EA Reference Sections
1	State of Hawai'i, Department of Transportation, Harbors Division Dean Watase, Senior Planner/Project Manager	Email dated June 23, 2021	About a year ago, DOT- H was approached by CCH about the Wastewater Plant Project. Specifically, they asked about a 30 ft wide access lane through the Sand Island Annex Yard to drive in their equipment and supplies. As far as I can tell, this project will not require this type of access? Can you please confirm this.	The ENV confirms that a prior access request is not needed for this project.	
2	City and County of Honolulu, Department of Emergency Management Marie Jacinto-Kawabata for Hirokazu Toiya, Director	Email dated June 24, 2021	No comment	The ENV confirms the Department of Emergency Management has no pre-consultation comments to offer.	
3	State of Hawai'i, Department of Health, Indoor and Radiological Health Branch	June 28, 2021	Project activities shall comply with the following Administrative Rules of the Department of Health: • Chapter 11-41 Lead-based Paint Activities • Chapter 11-46 Community Noise Control	The ENV acknowledges and will comply with HAR regulations concerning Chapters 11-41, Lead-based Paint Activities; 11-46, Community Noise Control; and 11-501, Asbestos Requirements.	Section 1.6.2 and 2.6

	Daryn Yamada, Acting Program Manager		• Chapter 11-501 Asbestos Requirements		
4	State of Hawai'i, Department of Transportation, Airports Division Ross Higashi, Deputy Director	June 28, 2021	1. The proposed project is approximately 0.14 miles from the property boundary of the Daniel K. Inouye International Airport (HNL). All projects within 5 miles from Hawai'i State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. 2. The proposed project is approximately 8,750 ft from the end of the Runway 8R at HNL. Federal Aviation Administration (FAA) regulation requires the submittal of FAA Form 7460-1 Notice of Proposed Construction or alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 ft of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 ft. Construction equipment and staging area heights, including heights of temporary construction cranes, shall be included in the submittal. 3. Due to the proximity to the airport, the City and County of Honolulu should be aware of	1. The ENV acknowledges this comment. The TAM will be consulted for guidance with development and activities requiring further review and permits. 2. This comment is acknowledged. A FAA Form 7460-1 Notice of Construction or alteration pursuant to CFR, Title 14. Part 77.9 will be filed as required to ensure compliance with height safety regulations. 3. This comment is acknowledged. We appreciate this advisement concerning the operating requirements of the HNL over or near the project location. 4. This comment is acknowledged. The proposed project is not anticipated to constitute a wildlife attractant or hazard near the HNL due to its location within an active operating part of the Sand Island Wastewater Treatment Plant.	Sections 1.6.1 and 3.1.1

			potential noise from aircraft operations. There is also a potential for fumes, smoke, vibrations, odors, etc. resulting from occasional aircraft flight operations over or near the project location. These impacts may increase or decrease over time and depending on airport operations. 4. Standing water has the potential to become a wildlife hazard. The HDOT-A recommends that the developer incorporate measures to minimize hazardous wildlife attractants in compliance with FAA Advisory Circular (AC) 150/5200-33C Hazardous Wildlife Attractants On or Near Airports. If the project results in a wildlife attractant, these effects shall be immediately mitigated by the owner upon notification by the HDOT-A and/or FAA.		
5	State of Hawai'i, Department of Land and Natural Resources, State Historic Preservation Division Alan S. Downer, Administrator		The State of Hawai'i Historic Preservation Division is in the process of moving to an online submission system. The Hawai'i Cultural Resource Information System (HICRIS) will be the only way for SHPD to accept and process submittals. We are not accepting submissions currently, while we migrate the data from our existing systems to HICRIS. The transition period is from November 28 to December 16, 2020.	The ENV acknowledges this comment and advisement concerning HICRIS. Any submittals for review by the SHPD shall be submitted via HICRIS.	

6	City and County of Honolulu, Department of Parks and Recreation Laura Thielen, Director	June 30, 2021	The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the department you may remove us as a consulted party to the balance of the EIS process.	The ENV acknowledges the Department of Parks and Recreation (DPR) has no comment and further that the proposed project will have no impact on any program or facility of the DPR. As requested the DPR will be removed as a consulting party for this project.	
7	City and County of Honolulu, Department of Facility Maintenance Roger Babcock, Jr., Ph.D, P.E., Director and Chief Engineer	July 1, 2021	It is understood that the proposed Wastewater Treatment Plant Project will affect the Department of Facility Maintenance, Division of Road Maintenance (DRM) existing Street Sweeping Yard and Litter Container Service Operations and as part of the project a Temporary Street Sweeping and Litter Container Servicing Baseyard will be constructed within the Sand Island Wastewater Treatment Plant Facility at TMK: (1) 1-5-041:005.	ENV acknowledges this comment. We intend to coordinate the requirements of the DRM through consultation with Mr. Lan Yoneda, DRM at (808) 768-3600. The major construction of this project will occur at the location of an existing structure within the Sand Island Wastewater Treatment Plant. Accordingly, we anticipate the impact to DFM would be very minimal.	
8	City and County of Honolulu, Honolulu Fire Department Jason Samala, Assistant Chief	July 2, 2021	1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is not located not more than 150 ft (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. A fire department access road shall extend to within 50 ft (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building.	1. The ENV acknowledges this comment and intends to comply with fire safety design requirements for building and facility construction, including the provision of fire department access roads. 2. This comment is acknowledged. The provision of an appropriate water supply including fire hydrants and mains shall be provided to all facilities and building associated with the proposed project, as required by the	Section 2.15

			2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 ft (45,720 millimeters) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the Authority Having Jurisdiction. 3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. 4. Submit civil drawings to the HFD for review and approval.	National Fire Protection Association (NFPA), 2012 Edition. Civil drawings will be submitted to HFD for review and approval. 3. This comment is acknowledged. Unobstructed width and vertical clearance of a fire apparatus access road shall be provided meeting City and County of Honolulu requirements, per the NFPA, 2012 Edition. 4. This comment is acknowledged. Civil drawings and construction documents as required by the HFD shall be submitted for review and approval.	
9	State of Hawai'i, Disability and Communication Access Board Kirby Shaw, Executive Director	July 6, 2021	Because this project is a City and County program being constructed on State land, it is covered by §103-50, HRS. Construction of the Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades Project is required to comply with the Department of Justice's (DOJ) 2010 ADA Standards for Accessible Design (2010 Standards). If this project is receiving federal funds, it will also have	The ENV confirms that all employee and public spaces will be designed in compliance with the 2010 ADA Standards for Accessible Design. The project plans will be submitted to DCAB for formal review. The project will not be receiving any federal funding.	

			to comply with the requirements under Section 504 of the Rehabilitation Act, but this is not included in the DCAB review process. Projects with construction documents that are covered by §103-50, HRS are required to be submitted to DCAB for a formal document review. DCAB's review for this proposed project will include employee and public spaces. Beyond DCAB's review process, program access obligations must be met under the ADA Title II provisions. This obligation may require additional means to provide access, especially where full compliance with the 2010 Standards cannot be achieved.		
10	City and County of Honolulu, Police Department Darren Chun, Assistant Chief of Police	July 7, 2021	The Honolulu Police Department (HPD) recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project. The HPD also recommends that adequate notification be made to the public and businesses in the area in the event of road closures. Any impacts to pedestrian and/or vehicular traffic, particularly the main corridor of Sand Island Parkway, may lead to complaints.	The ENV acknowledges HPD's recommendation. Sections 2.4-Flora/Fauna, 2.5-Air Quality, 2.6-Noise, and 2.7-Visual/Scenic Resources lists the measures that will be adhered to during construction to mitigate construction-related impacts to the surrounding environment. In addition, a Traffic Control Plan will be prepared and submitted to DTS for review and approval prior to the commencement of construction activities.	Sections 2.4, 2.5, 2.6, 2.7, and 2.10
11	State of Hawai'i, Department of Land and Natural Resources,	July 8, 2021	• We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of	The ENV confirms that all of the stormwater runoff will be retained and treated on-site through planned	Section 2.12

	Commission on Water Resource Management Kaleo Manuel, Deputy Director		the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED Certification. • We recommend the use of alternative water sources, wherever practicable.	improvements to the SIWWTP's drainage system. There will be no net increase in drainage leaving the Project site, thus no impacts to neighboring properties' drainage systems are anticipated.	
12	City and County of Honolulu, Department of Design and Construction Alex Kozlov, Director	July 14, 2021	Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments to offer at this time.	The ENV acknowledges that the Department of Design and Construction has no pre-consultation comments to offer.	
13	State of Hawai'i, Department of Hawaiian Home Lands William Aila Jr., Chairman	July 14, 2021	After reviewing the project description for the planned upgrades to the bioconversion facility at the Sand Island Wastewater Treatment Plant (SIWWTP), we note that this facility will provide service to DHHL's homestead communities and commercial properties on O'ahu. The DHHL currently has about 8,154 acres of land on O'ahu and anticipates adding to our land inventory. The Department's O'ahu Island Plan (OIP) notes that unconstrainted lands will be used to fulfill our top priority, which is for homestead development for native Hawaiian beneficiaries. Therefore, we would appreciate a description of the SIWWP service area and how this project will take into consideration DHHL's long-	The ENV acknowledges this comment. As stated in Section 1.4, the SIWWTP treats all of the wastewater flows generated in the Sand Island Sewer Basin (SISB) service area, which extends from Niu Valley in the east, to Salt Lake/Āliamanu in the west. The project will meet the current and future loads of the SIWWTP service basin, which is based on the projections for TOD and other future developments within the PUC area; this area includes DHHL land in the ahupua'a of Honolulu, Moanalua, Kapālama, and Waikīkī as noted in the OIP.	Section 1.4

			term future development as noted in the OIP.		
14	State of Hawai'i, Department of Transportation, Highways Division and Harbors Division Jade Butay, Director	July 15, 2021	<u>Highways Division:</u> HDOT previously reviewed the SIWWTP Facility Plan Draft EIS which included a Traffic Impact Analysis Report (TIAR) and provided comments to ENV in letter HWY-PS 2.0583 dated July 29, 2019. The HDOT-HWY's has the following comments for the Draft EA: 1. The TIAR provided in the SIWWTP Facility Plan EIS shall be included with this project's Draft EA. 2. Should unexpected traffic issues arise that can be attributed to the SIWWTP employee and operations traffic, ENV shall mitigate those issues to Sand Island Parkway at its expense and to the satisfaction of the HDOT. <u>Harbors Division:</u> 1. HDOT-H requests the Draft EA consider the potential impacts to the transportation of cargo and related shipping operations in the area. The Sand Island Container Terminal, located to the north of the project site, is used by two major container cargo operators: Matson Navigation and Pasha Hawaii. In addition, the Sand Island Annex is located to the west of the project and is adjacent to the project area. Sand Island Parkway is the primary thoroughfare for	<u>Highways Division:</u> 1. The ENV acknowledges this comment and confirms the TIAR has been included in the Draft EA. 2. The ENV acknowledges this request and confirms that any traffic issues that may arise will be mitigated in consultation with, and to the satisfaction of, HDOT. <u>Harbors Division:</u> 1. The ENV acknowledges this request and will consider the potential impacts to the related shipping operations in the area. 2. The ENV acknowledges this recommendation and will consult with Matson Navigation and Pasha Hawai'i to identify any potential impacts the project may have on their operations.	Appendix B

			approximately 5,500 cargo trucks each week. 2. HDOT- H recommends consulting with both Matson Navigation and Pasha Hawaii to identify potential impacts to their operations.		
15	State of Hawai'i, Office of Planning & Sustainable Development Mary Alice Evans, Director	July 16, 2021	1. Pursuant to Hawai'i Revised Standards (HRS) § 205A-4, in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project is being proposed by a government agency, the Draft EA should include analysis on the project's consistency with the objectives and supporting policies of the Hawaii CZM Program, HRS § 205A-2, as amended, in the subject Draft EA. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343. 2. We note that the review material transmitted to us indicates that the Draft EA is being prepared in accordance with HRS Chapter 343, and Hawai'i Administrative Rules (HAR) Title 11, Chapter 200.1. Therefore, the Draft EA should list all federal permits required for the proposed action, so that our office can determine any impacts on plans and policies that fall under our jurisdiction.	1. This comment is acknowledged. An analysis on the project's consistency with the objectives and supporting policies of the Hawai'i CZM program is included in Section 3.2.5. 2. This comment is acknowledged. A list of the required permits and approvals needed for this project is included in Section 1.6.1. Per the letter received from USACE (Comment 13) a Department of the Army Section 404 permit is not required for this project. 3. This comment is acknowledged. A map of the project location in relation to the SMA boundary is included in Section 3.3.4. The project will require a SMA Major Permit as the project qualifies as a development under ROH §25-1.3 and has a valuation in excess of $500,000. 4. This comment is acknowledged. A map of the project location in relation to the SLR-XA 3.2-ft scenario is included in Section 2.1. This section also includes a description of how the project was	Sections 1.6.1, 2.1, 2.3, 3.2.5, 3.3.4

			For example, the need for Federal permits, such as a Department of the Army Section 404 or U.S. EPA Section 405 could result in this project being subject to CZMA federal consistency. If it is determined that the proposed facility improvements require federal permits, please have a representative of ENV contact our office on the policies and procedures governing CZMA federal consistency reviews. 3. The subject Draft EA can serve as the primary supporting document for any required SMA use permit application. OP suggests that the Draft EA specifically discuss compliance with the requirements of SMA use, by consulting with the Department of Planning and Permitting (DPP), CCH. Furthermore, the EA should provide a regional location map of the subject property on O'ahu, with the project site proximity and relation to the CCH designated SMA boundary. 4. SLR increases the risk of flooding, storm surges, and coastal erosion. To assess any potential impacts of sea level rise on the vulnerability of the SIWWTP to threats such as coastal inundation, storm surges, or coastal erosion, we suggest the Draft EA refer to the findings of the Hawai'i	designed to address the anticipated impacts of sea level rise. 5. This comment is acknowledged. Section 2.3 includes an analysis of impacts and mitigation measures to the nearby ground, surface, and marine waters.	

			Sea Level Rise Vulnerability and Adaptation Report 2017, accepted by the Hawai'i Climate Change Mitigation and Adaptation Commission. The Draft EA should provide a map of 3.2-foot sea level rise exposure area in relation to the project area, and consider site-specific mitigation measures if necessary, to respond to the potential impacts of 3.2-foot sea level rise on the proposed development. 5. Pursuant to HAR § 11-200.1-18(d)(7) – identification and analysis of impacts and alternatives considered; to ensure that offshore marine resources along the southshore of O'ahu remain protected, the negative effects of stormwater inundation and sediment loading surrounding the proposed project site should be evaluated. Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, potential vulnerability of water resources, the shoreline, and examining any increase of permeable surfaces in the area. Developing mitigation measures for the protection for surface water resources and the coastal ecosystem		

			should take this into account, pursuant to HAR § 11-200.1-18(d)(8).		
16	State of Hawai'i, Department of Land and Natural Resources, Engineering Division Carty Chang, Chief Engineer	July 16, 2021	The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards. The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project.	The ENV acknowledges this comment. Per FEMA's Flood Insurance Rate Map, the project site is within Zone X, which is described as areas outside of the 0.2% annual chance flood plain and is not designated as a Special Flood Hazard Area.	Section 2.8.3
17	City and County of Honolulu, Department of Planning and Permitting Dean Uchida, Director	July 19, 2021	1. Please explain the relationship between the proposed Project and the overall SIWWTP Upgrades Project, including the Final Environmental Impact Statement published in 2019. 2. The DEA should discuss how the proposed development complies with the development standards in the Land Use Ordinance (Chapter 21, Revised Ordinances of Honolulu (ROH)) and identify any elements of the Project that may require a Zoning Waiver.	1. This comment is acknowledged. The relationship between the proposed project and the overall SIWWTP Upgrades Project from the 2019 FEIS is described in Section 1.1. 2. This comment is acknowledged. Section 3.3.2 identifies the elements of the proposed project that will require a Zoning Waiver. 3. This comment is acknowledged. The project will require a	Sections 1.1, 2.1, 2.8, 2.8.3, 3.3.2, and 3.3.4

			3. The DEA should provide sufficient information to determine whether the overall Project or portions of it will be considered development for the purposes of Chapter 25, ROH, the Special Management Area (SMA) Ordinance. Any "development" will require an SMA permit. 4. The DEA should describe the Project's compliance with the City's Flood Hazard Areas Ordinance (Chapter 21A, ROH). 5. Proposed development activities within the SMA must be evaluated not only for potential impacts to sensitive SMA resources, but also for current and future susceptibility to coastal hazards such as the following: • SLR – Potential impacts relating to SLR at the subject property • Storm Surge – Potential impacts and hurricane storm surge inundation levels at the subject property during Category 1 through 4 hurricane events. • Potential cumulative impacts of coastal hazards and property inundation should SLR exacerbate existing flooding, coastal erosion, wave-action, or other coastal hazards that may occur at the subject property. The DEA should also explore project alternatives, site design features, project design features, Best	SMA Major Permit as the project qualifies as a development under ROH §25-1.3 and has a valuation in excess of $500,000, as discussed in Section 3.3.4. 4. ENV acknowledges this comment and confirms that the proposed project is within Zone X as identified in FEMA's FIRM and is not determined to be a special flood hazard area, as noted in Section 3.3.4. 5. This comment is acknowledged. A map of the project location in relation to the SLR-XA 3.2-ft scenario is included in Section 2.1. This section also includes a description of how the project was designed to address the anticipated impacts of sea level rise and coastal hazards. Section 2.8 includes a description of how the project was designed to address the anticipated impacts of natural hazards.	

			Management Practices, and appropriate mitigation measures to reduce potential impacts related to coastal hazards to the extent possible.		
18	Department of the Army, U.S. Army Corps of Engineers, Honolulu District Vera Koskelo, Regulatory Project Manager	August 30, 2021	Based on our review of the information you provided and the enclosed approved jurisdictional determination (AJD) form, dated August 24, 2021, the area identified as the Corps Area of Review (AOR) consists entirely of uplands and does not contain wetlands or other waters of the U.S.. Therefore, a DA permit under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899 is not required for activities occurring within the AOR. While a DA permit is not required for your proposed project, you are responsible for obtaining all other applicable Federal, State, or local authorizations required by law.	ENV concurs with this determination.	

8.0 REFERENCES

AECOM. "Toxic Substances Control Act Polychlorinated Biphenyls Risk-Based Disposal Approval Application." Prepared for the City and County of Honolulu, Department of Environmental Services. April 2021.

AECOS, Inc. "Final Environmental Surveys for the Sand Island Waste Water Treatment Plant Improvement Project at Sand Island, Honolulu, Oʻahu." 22 February 2018.

Austin, Tsutsumi & Associates, Inc. "Final Traffic Impact Analysis Report." 23 May 2019.

Cultural Surveys Hawaiʻi, Inc. "Draft Archaeological Assessment for the Sand Island Wastewater Treatment Plant Facility Plan EIS Project, Honolulu Ahupuaa, Honolulu District, Oʻahu TMKs: [1] 1-5-041:005 and 022 and Sand Island Parkway (por.)." May 2019.

Cultural Surveys Hawaiʻi, Inc. "Final Cultural Impact Assessment for the Sand Island Wastewater Treatment Plant Facility Plan Project, Honolulu Ahupuaa, Honolulu District, Oʻahu TMKs: [1] 1-5-041:005 and 022 (por.)." October 2019.

Department of Planning and Permitting, City and County of Honolulu. "Primary Urban Center Development Plan." June 2004.

Federal Emergency Management Agency. "Flood Hazard Areas for the State of Hawaiʻi." *State of Hawaiʻi, Office of Planning and Sustainable Development,* 18 March 2021, https://files.hawaii.gov/dbedt/op/gis/data/s_fld_haz_ar_state.html. Accessed 01 July 2021.

Fletcher III, Charles, et al. "Atlas of Natural Hazards in the Hawaiian Coastal Zone." Prepared in cooperation with University of Hawaiʻi, State of Hawaiʻi Office of Planning, and National Oceanic and Atmospheric Administration. 09 January 2002, https://pubs.usgs.gov/imap/i2761/i2761.pdf/. Accessed on 21 June 2021.

McGovern McDonald Engineers. "Final Greenhouse Gas Emissions Estimate." 04 November 2019.

R.M. Towill Corporation. "Final Environmental Impact Statement, Sand Island Wastewater Treatment Plant Facility Plan, Honolulu, Oʻahu, Hawaiʻi." Prepared for the City and County of Honolulu, Department of Environmental Services. December 2019.

R.M. Towill Corporation and Synagro. "Sand Island WWTP Bioconversion Facility Capacity Upgrades Oʻahu, Hawaiʻi." Prepared for the City and County of Honolulu, Department of Environmental Services. July 2021.

SMS Research. "Draft Sand Island Wastewater Treatment Plant Social Impact Assessment." March 2019.

Tetra Tech, Inc., et al. "SLR Exposure Area 3.2ft." *State of Hawaiʻi, Office of Planning and Sustainable Development,* 21 December 2017, https://files.hawaii.gov/dbedt/op/gis/data/slr_exposure_area_3_pt_2_ft.html. Accessed 01 July 2021.

U.S. Department of Agriculture, Natural Resources Conservation Service. "Soil Survey Geographic (SSURGO) database for Island of Oʻahu, Hawaiʻi." 16 September 2019, https://websoilsurvey.sc.egov.usda.gov/. Accessed on 16 June 2021.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration. "2020 Local Climatological Data Annual Summary With Comparative Data Honolulu, Hawaiʻi (PHNL)." https://www.ncei.noaa.gov/pub/orders/IPS/IPS-5AF23638-93F5-4632-8CB0-9E50C604211A.pdf. Accessed 01 July 2021.

Appendix A:
Pre-Assessment Consultation Letters and Responses for

Draft Environmental Assessment
Sand Island Wastewater Treatment Plant
Bioconversion Facility Upgrades
Honolulu, Island of Oʻahu, Hawaiʻi

December 2021

City and County of Honolulu
Department of Environmental Services
1000 Uluʻōhiʻa Street, Suite 308
Kapolei, Hawaiʻi 96707

From: Brian Takeda
To: Watase, Dean
Cc: Tiow Ping Wong; Jaime Nishikawa
Subject: HDOT Harbors Preassmt SIWWTP Digester EA 062521
Date: Friday, June 25, 2021 9:09:00 AM
Importance: High

Hi Dean,

The City responded that the prior access request is not needed for the Synagro digester project. However, the additional construction access to the SI WWTP would benefit the City and its construction program within the Plant. The City is continuing to consider alternative access options and is currently in discussions with the State DLNR regarding preliminary engineering for a temporary access road option across State Parks property. The City apologizes for the poor communication and respectfully requests HDOT-Harbors' continued patience and participation in future access option discussions.

We hope this answers your question. If you require anything further let us know.

Thank you,

Brian Takeda
Planning Project Manager
mailto:BrianT@rmtowill.com

R. M. Towill Corporation
2024 North King Street Suite 200
Honolulu, Hawaii 96819
voice: 808 842 1133 fax: 808 842 1937 web: www.rmtowill.com

From: Brian Takeda
Sent: Wednesday, June 23, 2021 3:41 PM
To: Watase, Dean <dean.watase@hawaii.gov>
Subject: RE: Early Consultation for the Sand Island Treatment Plant Draft EA
Importance: High

Hi Dean,

We've forwarded your question to the SIWWTP PM for this project to request a response. We'll forward this upon our receipt.

Thanks,

Brian Takeda
Planning Project Manager
mailto:BrianT@rmtowill.com

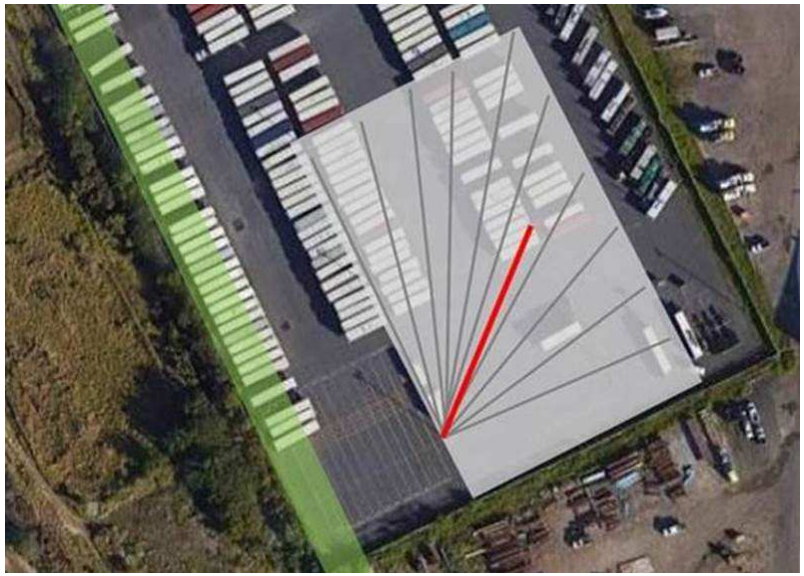
R. M. Towill Corporation
2024 North King Street Suite 200
Honolulu, Hawaii 96819
voice: 808 842 1133 fax: 808 842 1937 web: www.rmtowill.com

From: Watase, Dean <dean.watase@hawaii.gov>
Sent: Wednesday, June 23, 2021 3:15 PM
To: Brian Takeda <BrianT@rmtowill.com>
Subject: Early Consultation for the Sand Island Treatment Plant Draft EA

CAUTION: External Email

Brian,

We received the consultation letter and I had a question. About a year ago, DOT-H was approached by CCH and/or their contractor about the Wastewater Plant Project. Specifically, they asked about a 30 feet wide access lane through the Sand Island Annex Yard to drive in their equipment and supplies – see green color below. We haven't heard from them since. As far as I can tell, this project will not require this type of access? Can you please confirm this.



Dean Watase
Senior Planner / Project Manager
Department of Transportation, Harbors Division Planning
79 South Nimitz Highway
Honolulu, HI 96813
(808) 587.1883

CONFIDENTIAL NOTICE: This communication and any attachments may contain confidential information for the sole use of the intended recipient. Any unauthorized use, disclosure, viewing, copying, alteration, dissemination, or reliance on this message is strictly prohibited. If you receive this message in error, or you are not the authorized recipient, please notify the sender immediately by replying to the message, delete this message immediately and all copies from your e-mail system and destroy printed copies.

This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Brian Takeda

From: Jacinto-Kawabata, Marie <m.jacinto-kawaba@honolulu.gov>
Sent: Thursday, June 24, 2021 12:03 PM
To: Brian Takeda
Subject: Draft Environmental Assessment (DEA) - Sand Island Wastewater Treatment Plant

CAUTION: External Email

Aloha Mr. Takeda,

Director Toiya has no comments on the DEA for the Sand Island Wastewater Treatment Plant.

Mahalo,

Marie Jacinto-Kawabata
Clerk
Department of Emergency Management
City & County of Honolulu
808-723-8960

This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

DAVID Y. IGE
GOVERNOR OF HAWAII

ELIZABETH A. CHAR, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

June 28, 2021

Mr. Brian Takeda
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, HI 96819

Dear Mr. Takeda:

Thank you for your submittal requesting comments to the Pre-Assessment Consultation for Draft Environmental Assessment for the Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades (Tax Map Key: (1) 1-5-041: 005.

Project activities shall comply with the following Administrative Rules of the Department of Health:

- Chapter 11-41 Lead-based Paint Activities
- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements

Should you have any questions, please contact me at (808) 586-4700.

Sincerely,

Daryn A. Yamada
Acting Program Manager
Indoor and Radiological Health Branch

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

IN REPLY REFER TO:
AIR-EP
21.0062

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION
400 RODGERS BOULEVARD, SUITE 700
HONOLULU, HAWAII 96819-1880

June 28, 2021

Mr. Brian Takeda
Planning Project Manager
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Takeda:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades
Tax Map Key: (1) 1-5-041:005

The State of Hawaii, Department of Transportation, Airports Division (HDOT-A), has reviewed the pre-assessment consultation for the subject project and has the following comments:

1. The proposed project is approximately 0.14 miles from the property boundary of the Daniel K. Inouye International Airport (HNL). All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

2. The proposed project is approximately 8,750 feet from the end of the Runway 8R at HNL. Federal Aviation Administration (FAA) regulation requires the submittal of FAA Form 7460-1 Notice of Proposed Construction or alteration pursuant to the Code of Federal Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. Construction equipment and staging area heights, including heights of temporary construction cranes, shall be included in the submittal. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

Adobe Sign Transaction Number: CBJCHBCAABAApEK4Q_H5jdsP-pK5DpAwldGX0bTKDgDU

3. Due to the proximity to the airport, the City and County of Honolulu should be aware of potential noise from aircraft operations. There is also a potential for fumes, smoke, vibrations, odors, etc., resulting from occasional aircraft flight operations over or near the project location. These impacts may increase or decrease over time and depending on airport operations.

4. Standing water has the potential to become a wildlife hazard. The HDOT-A recommends that the developer incorporates measures to minimize hazardous wildlife attractants in compliance with FAA Advisory Circular (AC) 150/5200-33C Hazardous Wildlife Attractants On Or Near Airports. If the project results in a wildlife attractant, these effects shall be immediately mitigated by the owner upon notification by the HDOT-A and/or FAA.

If you have any questions, please contact Mr. Herman Tuiolosega, Head Planner, at 838-8810 or by email to herman.tuiolosega@hawaii.gov.

Sincerely,

ROSS M. HIGASHI
Deputy Director – Airports

c: Mr. Neil M. Takekawa, Acting Airport Manager, Oahu District
Mr. Gordon K. Wong, Federal Aviation Administration

Adobe Sign Transaction Number: CBJCHBCAABAApEK4Q_H5jdsP-pK5DpAwldGX0bTKDgDU

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU
1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

LAURA H. THIELEN
DIRECTOR

KEHAULANI PU'U
DEPUTY DIRECTOR

June 30, 2021

Mr. Brian Takeda
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Takeda:

SUBJECT: Pre-Assessment Consultation for the Draft Environmental Assessment
Sand Island Wastewater Treatment Plant
Bioconversion Facility Capacity Upgrades
Tax Map Key: (1) 1-5-041:005

Thank you for the opportunity to review and comment at Pre-Consultation stage of the Draft Environmental Assessment for the subject Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity upgrades.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the department you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

Laura H. Thielen
Director

LHT:jr
(855055)

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ROGER BABCOCK, JR., Ph. D., P.E.
DIRECTOR AND CHIEF ENGINEER

DAWN S. SZEWCZYK, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 21-406

July 1, 2021

R.M. Towill Corporation
Mr. Brian Takeda, Planning Project Manager
2024 N. King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Takeda:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment, Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades
TMK: (1) 1-5-041:005

Thank you for the opportunity to review and comment on the subject project.

Our comments are as follows:

- It is understood that the proposed Wastewater Treatment Plant Project will affect the Department of Facility Maintenance, Division of Road Maintenance (DRM) existing Street Sweeping Yard and Litter Container Service Operations and as part of the project a Temporary Street Sweeping and Litter Container Servicing Baseyard will be constructed within the Sand Island Wastewater Treatment Plant Facility at TMK: (1) 1-5-041:005.

If you have any questions, please call Mr. Lan Yoneda of the Division of Road Maintenance at 768-3600.

Sincerely,

Roger Babcock, Jr., Ph. D., P.E.
Director and Chief Engineer

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

RICK BLANGIARDI
MAYOR

LIONEL CAMARA JR.
ACTING FIRE CHIEF

SHELDON K. HAO
ACTING DEPUTY FIRE CHIEF

July 2, 2021

Mr. Brian Takeda
Planning Project Manager
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3470

Dear Mr. Takeda:

Subject: Preassessment Consultation
Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades
Tax Map Keys: 1-5-041: 005

In response to your letter dated June 17, 2021, regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45,720 millimeters) from

a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the Authority Having Jurisdiction. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Reid Yoshida of our Fire Prevention Bureau at 723-7151 or ryoshida@honolulu.gov.

Sincerely,

JASON SAMALA
Assistant Chief

JS/TC:bh

DISABILITY AND COMMUNICATION ACCESS BOARD

1010 Richards Street, Room 118 • Honolulu, Hawaii 96813
Ph. (808) 586-8121 • Fax (808) 586-8129

July 6, 2021

Mr. Brian Takeda
Planning Project Manager
R.M. Towill Corporation
2024 North King Street
Suite 200
Honolulu, HI 96819-34370

Regarding: Pre-Assessment Consultation for Draft Environmental Assessment for Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades

Dear Mr. Takeda:

The Disability and Communication Access Board (DCAB) would like to thank you for the opportunity to review and comment on the forthcoming Draft Environmental Assessment for the Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades Project. The purpose of DCAB's review is to ensure that this project will take into account accessibility design requirements for persons with disabilities.

Because this project is a City and County program being constructed on State land, it is covered by §103-50, Hawaii Revised Statutes (HRS). Construction of the Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades Project is required to comply with the Department of Justice's (DOJ) 2010 ADA Standards for Accessible Design (2010 Standards) http://www.ada.gov/2010ADAstandards_index.htm. To be consistent with the DOJ's standard, DCAB adopted the 2004 Americans with Disabilities Act Accessibility Guidelines (ADAAG) as of January 1, 2011 and passed interpretive opinions consistent with the 2010 ADA Standards. All new Interpretive Opinions can be viewed or downloaded at http://health.hawaii.gov/dcab/facility-access/interpretive-opinions/.

If this project is receiving federal funds, it will also have to comply with the requirements under Section 504 of the Rehabilitation Act, but this is not included in the DCAB review process. If you have any questions regarding your obligations under Section 504 of the Rehabilitation Act, you should contact the federal agency that is providing federal funds for your project.

Projects with construction documents that are covered by §103-50, HRS, are required to be submitted to DCAB for a formal document review. DCAB's review for this proposed project will include employee and public spaces.

Beyond DCAB's review process, program access obligations must be met under the ADA Title II provisions. This obligation may require additional means to provide access, especially where full compliance with the 2010 Standards cannot be achieved.

The above reflects DCAB's staff review and comments concerning the forthcoming Draft Environmental Assessment for the Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades Project.

Should you have any further questions, please feel free to contact Duane Buote, Facility Access Coordinator at (808) 586-8121.

Sincerely,

KIRBY L. SHAW
Executive Director

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

RICK BLANGIARDI
MAYOR

RADE K. VANIC
INTERIM CHIEF

OUR REFERENCE EO-DK

July 7, 2021

SENT VIA EMAIL

Mr. Brian Takeda
BrianT@rmtowill.com

Dear Mr. Takeda:

This is in response to your letter of June 17, 2021, requesting input on the Pre-Assessment Consultation, Draft Environmental Assessment, for the proposed upgrades to the bioconversion facility located at the Sand Island Wastewater Treatment Plant.

The Honolulu Police Department (HPD) recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project. The HPD also recommends that adequate notification be made to the public and businesses in the area in the event of road closures. Any impacts to pedestrian and/or vehicular traffic, particularly the main corridor of Sand Island Parkway, may lead to complaints.

If there are any questions, please call Acting Major Robert Towne of District 5 (Kalihi) at 723-8202.

Thank you for the opportunity to review this project.

Sincerely,

DARREN CHUN
Assistant Chief of Police
Support Services Bureau

Serving and Protecting With Aloha

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

MICHAEL G. BUCK
ELIZABETH A. CHAR, M.D.
NEIL J. HANNAHS
AURORA KAGAWA-VIVIANI, PH.D.
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

July 8, 2021

REF: RFD.4708.3

TO: Mr. Brian Takeda, Planning Project Manager
R.M. Towill Corporation

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades

FILE NO.: RFD.4708.3
TMK NO.: (1) 1-5-041:005, (1) 1-5-041:022

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

- [ ] 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.
- [ ] 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- [ ] 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.
- [ ] 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.
- [X] 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/
- [X] 6. We recommend the use of alternative water sources, wherever practicable.
- [ ] 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.
- [ ] 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- [ ] 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- [ ] 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- [ ] 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [ ] 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- [ ] 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

- [ ] OTHER:

If you have any questions, please contact Nel Fujii of the Commission staff at 587-0216.

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

July 14, 2021

In reply refer to:
PO-21-179

Sent by electronic mail: BrianT@rmtowill.com

R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai'i 96819
Attention: Brian Takeda

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades
TMK: (1) 1-5-041:005, O'ahu, Hawai'i

Dear Mr. Takeda,

The Department of Hawaiian Home Lands (DHHL) acknowledges receiving the request for comments, concerns or regulatory requirements on the above-cited project. After reviewing the project description for the planned upgrades to the bioconversion facility at the Sand Island Wastewater Treatment Plant (SIWWTP), we note that this facility will provide service to DHHL's homestead communities and commercial properties on O'ahu.

The DHHL currently has about 8,154 acres of land on O'ahu and anticipates adding to our land inventory. The Department's O'ahu Island Plan (OIP) notes that unconstrained lands will be used to fulfill our top priority, which is for homestead development for native Hawaiian beneficiaries. Therefore, we would appreciate a description of the SIWWP service area and how this project will take into consideration DHHL's long-term future development as noted in the OIP. This report is available on Department's website: https://dhhl.hawaii.gov/po/

Mahalo for the opportunity to provide comments. If you have any questions, please call Pearlyn Fukuba, at (808) 620-9279 or contact via email at pearlyn.l.fukuba@hawaii.gov.

Aloha,

William J. Ailā Jr., Chairman
Hawaiian Homes Commission

c: DHHL Land Development Division
DHHL Land Management Division

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ALEX KOZLOV, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

July 14, 2021

Mr. Brian Takeda
Planning Project Manager
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3470

Dear Mr. Takeda:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Sand Island Wastewater Treatment Plant
Bioconversion Facility Capacity Upgrades
TMK: (1) 1-5-041:005

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments to offer at this time.

Should you have any further questions, please contact me at 768-8480.

Sincerely,

Alex Kozlov, P.E.
Director

AK:krn (855066)

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
LYNN A.S. ARAKI-REGAN
DEREK J. CHOW
ROSS M. HIGASHI
EDWIN H. SNIFFEN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0593
STP 8.3215

July 15, 2021

VIA USPS WITH COPY VIA EMAIL: BrianT@rmtowill.com

Mr. Brian Takeda
Planning Project Manager
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Takeda:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment (EA)
Sand Island Wastewater Treatment Plant (SIWWTP) Bioconversion Facility
Capacity Upgrades
Honolulu, Oahu, Hawaii
Tax Map Key: (1) 1-5-041:005

Thank you for your letter dated June 17, 2021 requesting comments on the subject project. The State of Hawaii Department of Transportation (HDOT) has reviewed the provided information and understands the City and County of Honolulu, Department of Environmental Services (ENV) is proposing to provide additional solids stream treatment capacity for the first of two phases to upgrade the SIWWTP to full secondary treatment of the facility's entire wastewater flow, as identified in the 2019 Final Environmental Impact Statement (EIS) for the SIWWTP Facility Plan. The SIWWTP is accessed from Sand Island Parkway

The HDOT Airports Division previously provided comments for the subject request in letter AIR-EP 21.0062 dated June 28, 2021 (attached). HDOT now wishes to provide additional comments from our Harbors and Highways Divisions.

Highways Division (HDOT-HWY)

HDOT previously reviewed the SIWWTP Facility Plan Draft EIS which included a Traffic Impact Analysis Report (TIAR) and provided comments to ENV in letter HWY-PS 2.0583 dated July 29, 2019. The HDOT-HWY's has the following comments for the Draft EA:

1. The TIAR provided in the SIWWTP Facility Plan EIS shall be included with this project's Draft EA.

2. Should unexpected traffic issues arise that can be attributed to the SIWWTP employee and operations traffic, ENV shall mitigate those issues to Sand Island Parkway at its expense and to the satisfaction of the HDOT.

Harbors Division (HDOT-H)

1. HDOT-H requests the Draft EA consider the potential impacts to the transportation of cargo and related shipping operations in the area. The Sand Island Container Terminal, located to the north of the project site, is used by two major container cargo operators: Matson Navigation and Pasha Hawaii. In addition, the Sand Island Annex is located to the west of the project and is adjacent to the project area. Sand Island Parkway is the primary thoroughfare for approximately 5,500 cargo trucks each week.

2. HDOT- H recommends consulting with both Matson Navigation and Pasha Hawaii to identify potential impacts to their operations.

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

Attachment

STATE OF HAWAII
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

DAVID Y. IGE
GOVERNOR

Mary Alice Evans
DIRECTOR

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS 202107141719HE

July 16, 2021

Mr. Brian Takeda
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Pre-Assessment Consultation for Draft Environmental Assessment
Sand Island Wastewater Treatment Plant Bioconversion Facility Capacity Upgrades; TMK: (1) 1-5-041:005

Thank you for the opportunity to provide comments on the pre-consultation request for the preparation of a Draft Environmental Assessment (Draft EA) for the Sand Island Wastewater Treatment Plant Bioconversion Capacity Upgrades project. The pre-consultation review material was transmitted to our office via letter dated June 17, 2021.

According to the request, it is our understanding that the City and County of Honolulu (CCH), Department of Environmental Services (ENV) proposes upgrades to the bioconversion facility at the Sand Island Wastewater Treatment Plant (SIWWTP), Honolulu, O'ahu. The proposed action will aide in additional solids stream treatment capacity for the first phase of a two-phase process to upgrade the SIWWTP to full secondary treatment of the facility's entire wastewater flow per the 2010 Consent Decree Civil No. 94-00765DAE-KSC between the State of Hawai'i, Department of Health and the U.S. Environmental Protection Agency (EPA).

Phase 1 of the upgrades to SIWWTP will allow the facility to meet full secondary treatment. These modifications include the installation of the membrane bioreactor facility with the addition of a secondary treatment thickener building, upgrades to the solid handling, as well as solids stream process flow improvements.

The Office of Planning & Sustainable Development (OPSD) has reviewed the transmitted material and has the following comments to offer:

1. Hawai'i Coastal Zone Management (CZM) Program
The CZM area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1).

Pursuant to Hawai'i Revised Standards (HRS) § 205A-4, in implementing the objectives of

the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project is being proposed by a government agency, the Draft EA should include analysis on the project's consistency with the objectives and supporting policies of the Hawaii CZM Program, HRS § 205A-2, as amended, in the subject Draft EA. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343.

2. Coastal Zone Management Act (CZMA) - Federal Consistency
We note that the review material transmitted to us indicates that the Draft EA is being prepared in accordance with HRS Chapter 343, and Hawai'i Administrative Rules (HAR) Title 11, Chapter 200.1. Therefore, the Draft EA should list all federal permits required for the proposed action, so that our office can determine any impacts on plans and policies that fall under our jurisdiction.

For example, the need for Federal permits, such as a Department of the Army Section 404 or U.S. EPA Section 405 could result in this project being subject to CZMA federal consistency. If it is determined that the proposed facility improvements require federal permits, please have a representative of ENV contact our office on the policies and procedures governing CZMA federal consistency reviews.

3. Special Management Area
The subject Draft EA can serve as the primary supporting document for any required SMA use permit application. OP suggests that the Draft EA specifically discuss compliance with the requirements of SMA use, by consulting with the Department of Planning and Permitting (DPP), CCH.

Furthermore, the EA should provide a regional location map of the subject property on O'ahu, with the project site proximity and relation to the CCH designated SMA boundary.

4. Climate Change / Sea Level Rise (SLR)
SLR increases the risk of flooding, storm surges, and coastal erosion. To assess any potential impacts of sea level rise on the vulnerability of the SIWWTP to threats such as coastal inundation, storm surges, or coastal erosion, we suggest the Draft EA refer to the findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report 2017, accepted by the Hawai'i Climate Change Mitigation and Adaptation Commission.

The Report, and Hawai'i Sea Level Rise Viewer at https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/ particularly identifies a 3.2-foot sea level rise exposure area across the main Hawaiian Islands, including O'ahu, which may occur in the mid to latter half of the 21st century. The Draft EA should provide a map of 3.2-foot sea level rise exposure area in relation to the project area, and consider site-specific

mitigation measures if necessary, to respond to the potential impacts of 3.2-foot sea level rise on the proposed development.

5. Stormwater Runoff, Erosion, and Water Resources
Pursuant to HAR § 11-200.1-18(d)(7) – identification and analysis of impacts and alternatives considered; to ensure that offshore marine resources along the southshore of O'ahu remain protected, the negative effects of stormwater inundation and sediment loading surrounding the proposed project site should be evaluated.

Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, potential vulnerability of water resources, the shoreline, and examining any increase of permeable surfaces in the area. Developing mitigation measures for the protection for surface water resources and the coastal ecosystem should take this into account, pursuant to HAR § 11-200.1-18(d)(8).

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 16, 2021

LD 0689

Brian Takeda, Planning Project Manager
R.M. Towill Corporation
2024 North King Street, Suite 200 *Via email: BrianT@rmtowill.com*
Honolulu, HI 96819-3470

Dear Mr. Takeda:

SUBJECT: **Pre-Assessment Consultation for Draft Environmental Assessment**
Sand Island Wastewater Treatment Plant
Bioconversion Facility Capacity Upgrades
Honolulu, Island of Oahu, Hawaii; TMK: (1) 1-5-041:005

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to various DLNR divisions, as indicated on the attached, for their review and comment.

Attached are comments received from our Division of Engineering. Should you have any questions, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Attachments

Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 21, 2021

LD 0689

MEMORANDUM

FROM:

~~TO:~~ **DLNR Agencies:**
X Div. of Aquatic Resources *(via email: kendall.l.tucker@hawaii.gov)*
__ Div. of Boating & Ocean Recreation
X Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
X Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
__ Div. of State Parks
X Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
X Office of Conservation & Coastal Lands *(via email: sharleen.k.kuba@hawaii.gov)*
X Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*

TO:

~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Pre-Consultation for Draft Environmental Assessment for Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades**
LOCATION: Honolulu, Island of Oahu, Hawaii; TMK: (1) 1-5-041:005
APPLICANT: **RM Towill Corporation on behalf of City and County of Honolulu, Department of Environmental Services**

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **July 15, 2021** to the Land Division at DLNR.Land@hawaii.gov, and copied to barbara.j.lee@hawaii.gov.

If no response is received by the above due date, we will assume your agency has no comments at this time. If you have any questions, please contact Barbara Lee at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are attached.

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Jul 9, 2021

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Consultation for Draft Environmental Assessment for Sand Island Wastewater Treatment Plant, Bioconversion Facility Capacity Upgrades
Location: Honolulu, Island of Oahu, Hawaii
TMK(s): (1) 1-5-041:005
Applicant: RM Towill Corporation on behalf of City and County of Honolulu, Department of Environmental Services

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Jul 9, 2021

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

File

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

July 19, 2021 2021/ELOG-1231(CK)

Mr. Brian Takeda
Planning Project Manager
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii, 96813

Dear Mr. Takeda:

SUBJECT: Pre-Draft Environment Assessment Comments
Bioconversion Facility Upgrades Project (Project)
Sand Island Wastewater Treatment Plant (SIWWTP)
1240 Sand Island Parkway - Sand Island
Tax Map Key 1-5-041: 005

This is in response to your letter, received on June 21, 2021, requesting comments on the scope and content to be addressed in a Draft Environmental Assessment (DEA), as required under Chapter 343, Hawaii Revised Statutes (HRS), for proposed upgrades to the existing bioconversion facility at the SIWWTP to provide full secondary treatment of wastewater. The Department of Planning and Permitting has the following comments on the proposal:

1. Please explain the relationship between the proposed Project and the overall SIWWTP Upgrades Project, including the Final Environmental Impact Statement published in 2019.

2. The DEA should discuss how the proposed development complies with the development standards in the Land Use Ordinance (Chapter 21, Revised Ordinances of Honolulu (ROH) and identify any elements of the Project that may require a Zoning Waiver.

3. The DEA should provide sufficient information to determine whether the overall Project or portions of it will be considered development for the purposes of Chapter 25, ROH, the Special Management Area (SMA) Ordinance. Any "development" will require an SMA permit.

4. The DEA should describe the Project's compliance with the City's Flood Hazard Areas Ordinance (Chapter 21A, ROH).

5. Mayor's Directive 18-2, issued on July 16, 2018, requires all City departments and agencies to use the Hawaii *Sea Level Rise (SLR) Vulnerability and Adaptation Report*, the *SLR Guidance* and the *Climate Change Brief* in planning decisions. As a result, proposed development activities within the SMA must be evaluated not only for potential impacts to sensitive SMA resources, but also for current and future susceptibility to coastal hazards such as the following:

   - SLR - Potential impacts relating to SLR at the subject property, based on review of the State's Sea Level Rise Exposure Area (SLR-XA) Mapping Tool, of 6.0 feet of SLR by the later decades of this century as a planning benchmark for public infrastructure and critical facilities.

   - Storm Surge - Potential impacts and hurricane storm surge inundation levels at the subject property during Category 1 through 4 hurricane events, based on review of the National Oceanic and Atmospheric Administration's (NOAA) National Hurricane Storm Surge Hazard Maps.

   - Potential cumulative impacts of coastal hazards and property inundation should SLR exacerbate existing flooding, coastal erosion, wave-action, or other coastal hazards that may occur at the subject property.

   The DEA should also explore project alternatives, site design features, project design features, Best Management Practices, and appropriate mitigation measures to reduce potential impacts related to coastal hazards to the extent possible. Relevant sources of information are available online at the following links:

   - *Mayor's Directive No. 18-2 (2018)* regarding climate change and sea level rise:
     www.honolulu.gov/rep/site/dpptod/climate_docs/MAYORS_DIRECTIVE_18-2.pdf

   - *Sea Level Rise Vulnerability and Adaptation Report*:
     http://climate.hawaii.gov/wp-content/uploads/2019/02/SLR-Report_Dec2017-with-updated-disclaimer.pdf

   - State *SLR Exposure Area (SLR-XA) Mapping Tool*:
     www.pacioos.hawaii.edu/shoreline/slr-hawaii/

- *Guidance for Using the SLR-XA*:
  https://climate.hawaii.gov/wp-content/uploads/2020/12/Guidance-for-Using-the-Sea-Level-Rise-Exposure-Area.pdf

- Climate Change Commission - *Climate Change Brief* and *SLR Guidance*:
  https://resilientoahu.org/climate-change-commission

- Honolulu Office of Climate Change, Sustainability and Resiliency - *Climate Ready Oahu Web Explorer*:
  www.resilientoahu.org/water

- NOAA *Storm Surge Mapping Tool*:
  https://www.nhc.noaa.gov/nationalsurge/

Thank you for the opportunity to comment on this proposal. Should you have any questions, please contact Christi Keller, of our staff, at (808) 768-8087, or c.keller@honolulu.gov.

Very truly yours,

For: Dean Uchida
Director

cc: City and County of Honolulu, Department of Environmental Services

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

August 30, 2021

SUBJECT: Approved Jurisdictional Determination and Determination of No Permit Required for Sand Island Waste Water Treatment Plant (SIWWTP), Expand and Upgrade, Oahu, HI, Department of the Army File No. POH-2019-00066

City and County of Honolulu
Department of Environmental Services
Attn: Mr. Wesley Yokoyama
Kapolei Civic Center
1000 Uluohia Street
Kapolei, Hawaii 96707

Dear Mr. Yokoyama:

The Honolulu District, U.S. Army Corps of Engineers (Corps), Regulatory Office has received your request for clarification whether a Department of the Army (DA) permit is required to convert an existing paved portion of the Sand Island Waste Water Treatment Plant to a Synagro Digester and related infrastructure at 21.304464, -157.882311, on TMK: (1) 1-5-041:005 and a portion of TMK: (1) 1-5-041:022, on the south side of the existing Sand Island Waste Water Treatment Plant facility, in Honolulu, Island of Oahu, Hawaii. Your request has been assigned DA file number POH-2019-00066. Please reference this number in all future correspondence with our office relating to this action.

Based on our review of the information you provided and the enclosed approved jurisdictional determination (AJD) form (Enclosure 1), dated August 24, 2021, the area identified as the Corps Area of Review (AOR) (Enclosure 2) consists entirely of uplands and does not contain wetlands or other waters of the U.S. Therefore, a DA permit under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899 is not required for activities occurring within the AOR. While a DA permit is not required for your proposed project, you are responsible for obtaining all other applicable Federal, state, or local authorizations required by law.

If you object to this determination, you may request an administrative appeal under 33 CFR Part 331. We have enclosed a Notification of Appeal Process and Request for Appeal (NAP/RFA) form (Enclosure 3).

Thank you for your cooperation with the Honolulu District Regulatory Program. If you have any questions related to this determination, please contact me at 808-835-4310 or via e-mail at Vera.B.Koskelo@usace.army.mil.

You are encouraged to provide comments on your experience with the Honolulu District Regulatory Office by accessing our web-based customer survey form at https://regulatory.ops.usace.army.mil/customer-service-survey/. For additional information about our Regulatory Program, please visit our web site at http://www.poh.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,

Vera B. Koskelo
Regulatory Project Manager

Enclosures

Electronic Cc:
Mr. Brian Takeda, R.M. Towill Corporation

Appendix B

TRAFFIC IMPACT ANALYSIS REPORT SAND ISLAND WASTEWATER TREATMENT PLANT

Honolulu, Oahu, Hawaii

FINAL DRAFT

May 23, 2019

Prepared for:
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031
Telephone: (808) 533-3646
Facsimile: (808) 526-1267
E-mail: atahnl@atahawaii.com
Honolulu • Wailuku • Hilo, Hawaii

TRAFFIC IMPACT ANALYSIS REPORT
SAND ISLAND WASTEWATER TREATMENT PLANT

Honolulu, Oahu, Hawaii

FINAL DRAFT

Prepared for

R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Prepared by
Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
Honolulu • Wailuku • Hilo, Hawaii

May 23, 2019

TABLE OF CONTENTS

TABLE OF CONTENTS
Cont'd

TABLE OF CONTENTS
Cont'd

TABLES

FIGURES

TABLE OF CONTENTS
Cont'd

APPENDICES

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

TERRANCE S. ARASHIRO, P.E.
ADRIENNE W.L.H. WONG, P.E., LEED AP
DEANNA M.R. HAYASHI, P.E.
PAUL K. ARITA, P.E.
ERIK S. KANESHIRO, L.P.L.S., LEED AP
MATT K. NAKAMOTO, P.E.
GARRETT K. TOKUOKA, P.E.

FINAL DRAFT

TRAFFIC IMPACT ANALYSIS REPORT

SAND ISLAND WASTEWATER TREATMENT PLANT FACILITY PLAN

Honolulu, Oahu, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed Sand Island Wastewater Treatment Plant (SIWWTP) Facility Plan in Honolulu, Oahu, Hawaii (hereinafter referred to as the "Project"). This Traffic Impact Analysis Report (TIAR) is being prepared for inclusion in an Environmental Impact Study (EIS).

1.1 Location

The existing SIWWTP is located in Honolulu on Sand Island on approximately 63.949 acres of land identified by Tax Map Key (1) 1-5-041:005 and 022. The Project site is bound by Sand Island Parkway to the north and Sand Island State Recreation Area to the south. In addition to the SIWWTP, Sand Island serves a large number of industrial businesses along with the Matson and Pasha offices and container Yards, the U.S. Coast Guard and the state recreational area. See Figure 1.1 for the Project location.

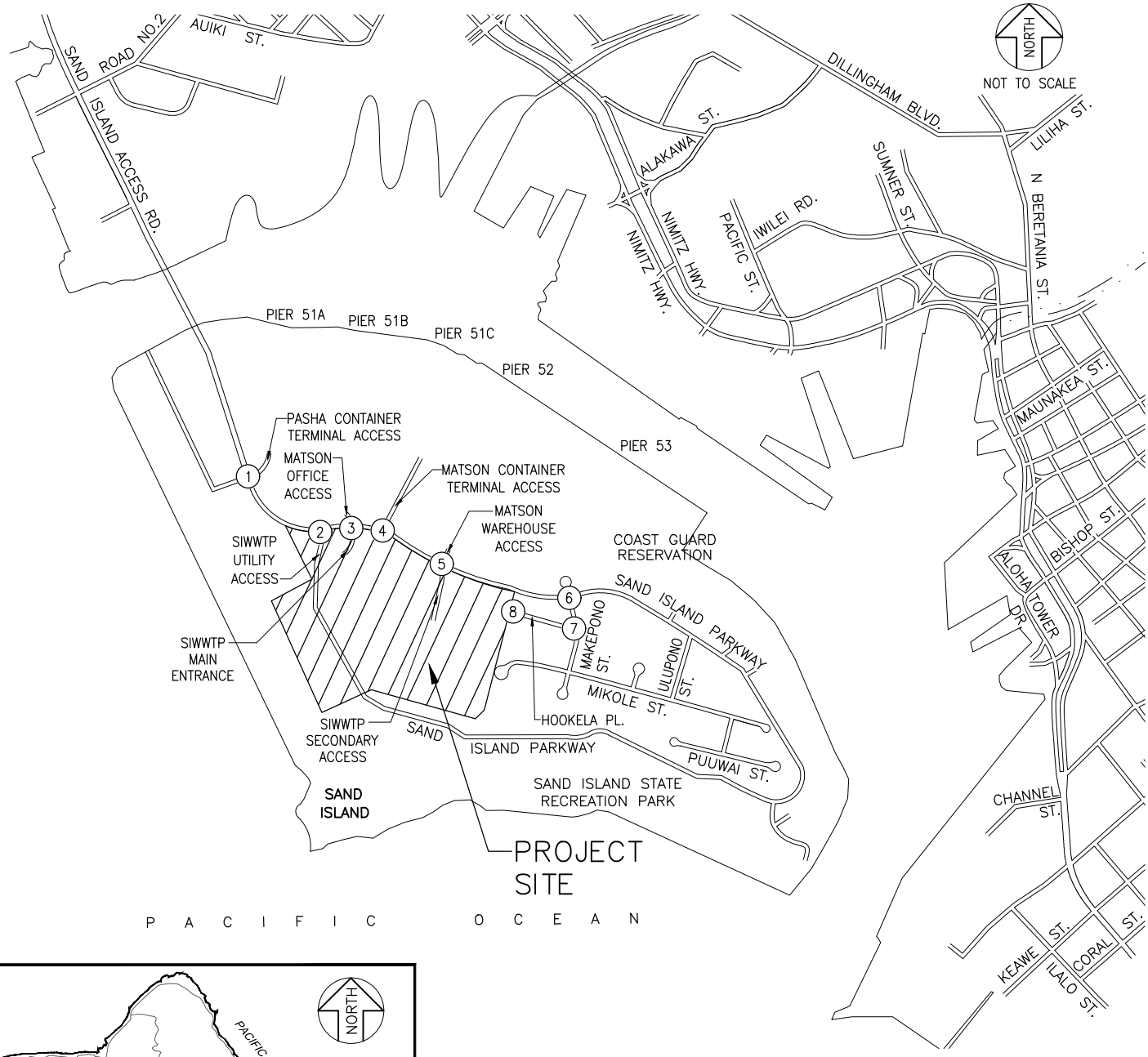
1.2 Project Description

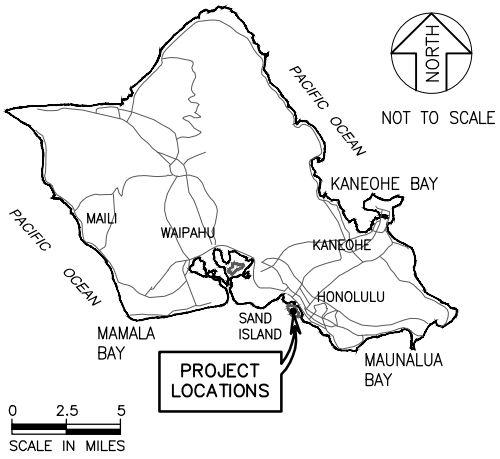
The Project proposes to expand the existing SIWWTP in order to upgrade the SIWWTP to provide secondary treatment. Upgrades to the SIWWTP will include new secondary treatment facilities for processing both liquid and solid waste streams and additional non-process facilities. Two conceptual site plans are being evaluated for the updated facility plan. The site plans utilize either a Step-Feed Activated Sludge (SFAS) process with rectangular clarifiers or a Membrane Bioreactor (MBR) process for secondary treatment. Currently, access to the SIWWTP is provided via a main driveway, secondary driveway and construction/utility access along Sand Island Parkway. A final gated back-up entrance is located at the end of Hookela Place. With either of the preliminary site plans, all accesses will remain. However, conversion of the construction/utility access to a main access providing entrance only is proposed.

Construction completion of the secondary treatment facilities is currently projected to occur in 2035. Although current planning efforts for the SIWWTP are to accommodate projected wastewater flows through 2055, this TIAR evaluates traffic conditions for the construction completion of the secondary treatment facilities only. The year 2035 was selected to best

represent the projected completion of the secondary treatment facilities at the time of this report. As a conservative measure, Project impacts were based off the projected 2055 wastewater flows to accommodate the full potential trips generated by the SIWWTP.

See Figures 1.2 and 1.3 for the proposed Project site plans.





ISLAND OF OAHU
LOCATION MAP

STUDY INTERSECTIONS

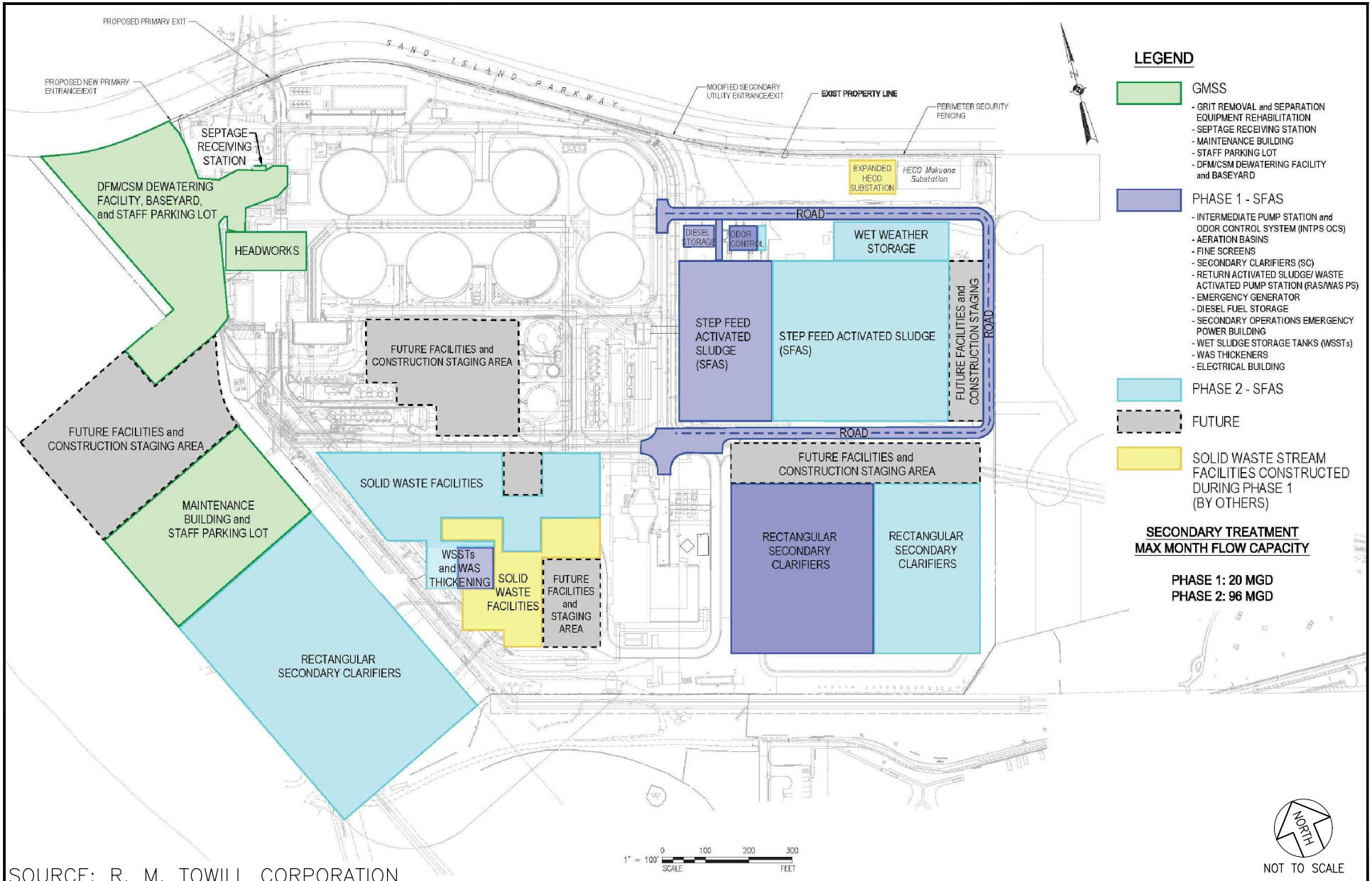
1. SAND ISLAND PKWY. & PASHA CONTAINER TERMINAL ACCESS
2. SAND ISLAND PKWY. & SIWWTP UTILITY ACCESS
3. SAND ISLAND PKWY. & SIWWTP MAIN ENTRANCE & MATSON OFFICE ACCESS
4. SAND ISLAND PKWY. & MATSON CONTAINER TERMINAL ACCESS
5. SAND ISLAND PKWY. & SIWWTP SECONDARY ACCESS & MATSON WAREHOUSE ACCESS
6. SAND ISLAND PKWY. & MAKEPONO ST.
7. MAKEPONO ST. & HOOKELA PL.
8. HOOKELA PL. & SIWWTP BACK-UP ACCESS

SAND ISLAND WWTP FACILITY PLAN
TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

LOCATION MAP

FIGURE
1.1



SOURCE: R. M. TOWILL CORPORATION

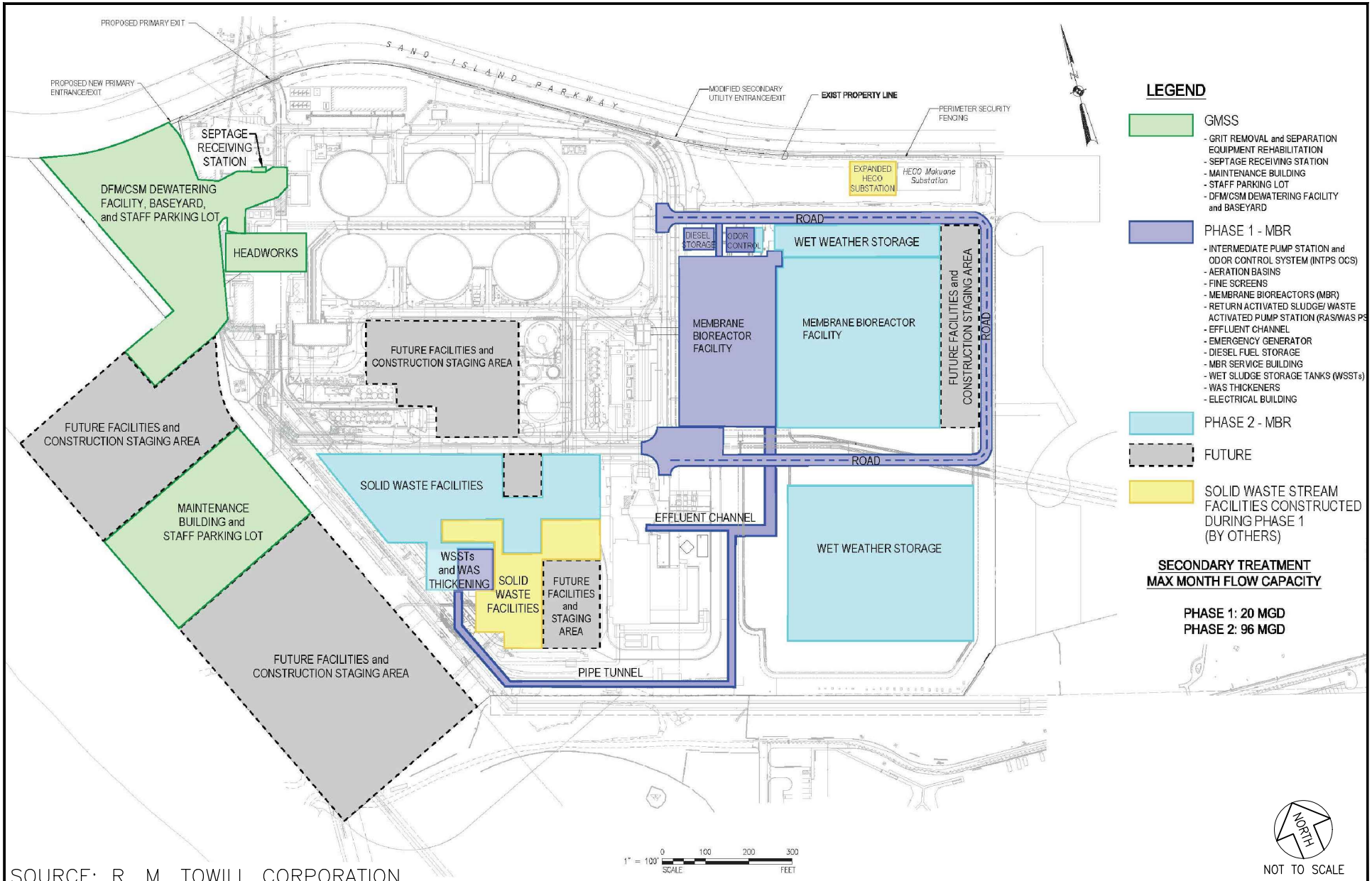
SAND ISLAND WWTP
FACILITY PLAN

TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

SITE PLAN - STEP-FEED ACTIVATED SLUDGE PROCESS

FIGURE
1.2



SOURCE: R. M. TOWILL CORPORATION

SAND ISLAND WWTP
FACILITY PLAN

TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

SITE PLAN - MEMBRANE BIOREACTOR PROCESS

FIGURE
1.3

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Base Year 2035 (without the Project) including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for Future Year 2035 (with the Project), which includes Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for Base Year as well as Future Year roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by known developments in the region or the Project.

2.2 Intersection Analysis

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, dated 2016, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

3. EXISTING CONDITIONS

3.1 Roadway System

The following are brief descriptions of the existing roadways in the vicinity of the Project.

Sand Island Parkway – is generally an east-west, two-way, four-lane, divided roadway from its connection with Sand Island Access Road at the Lt. John R. Slattery Bridge to near the Matson Container Yard Access. East of the Matson Container Yard Access, Sand Island Parkway is generally a two-way, two-lane, undivided roadway until its terminus at the Sand Island State Recreation Area. In the vicinity of the Project, the roadway has a posted speed limit of 25 miles per hour (mph).

Makepono Street – is generally a north-south, two-way, two-lane, undivided roadway. The roadway begins to the north just past its intersection with Sand Island Parkway and terminates south of its intersection with Mikole Street. Makepono Street provides access to several industrial businesses from Sand Island Parkway. The roadway has a posted speed limit of 25 mph.

Hookela Place – is generally an east-west, two-way, two-lane, undivided roadway. The roadway begins to the east at its intersection with Makepono Street and terminates approximately 650 feet to the west at a dead end. The SIWWTP gated back-up access is located at the terminus of Hookela Place along with accesses to Honolulu Recovery Systems and Martin Transportation Services. The roadway has a posted speed limit of 25 mph.

3.2 Sustainable Transportation

3.2.1 Complete Streets

While transportation planning has traditionally focused on automobile travel, recent "Complete Streets" policies also recognize the numerous benefits of encouraging the use of alternative modes of transportation. "Complete Streets" policies encourage the provision of equitable, accessible and safe transportation for all modes.

Hawaii State Senate Bill 718 (2009) required that the Hawaii Department of Transportation (HDOT) and the County transportation departments:

"…adopt a complete streets policy that seeks to reasonably accommodate convenient access and mobility for all users of the public highways within their respective jurisdictions…"

3.2.2 Pedestrian Accessibility

In the vicinity of the Project, sidewalks are provided along both sides of Sand Island Parkway. There is a gap in the sidewalk on the Mauka side of the roadway from near the Pasha Container Yard Access to the Keehi Boat Harbor Access. However, crosswalks are provided at both locations to provide connectivity to the Makai side sidewalk. The gap in the sidewalk is likely to accommodate the truck weigh station. Along the same stretch of roadway, the Makai side sidewalk is shared with two-way bicycle traffic and is barrier separated from the vehicular traffic.

Pedestrian activity in the Project area was generally low due to the largely industrial land use on Sand Island. The majority of sidewalk users observed during data collection were performing recreational activities such as running and bicycling. Several pedestrians during the AM peak

hour were also observed to originate from the SIWWTP Secondary Access and pick up trash along both sides of Sand Island Parkway up to the Pasha Container Yard Access.

See Figure 3.1 for the existing pedestrian facilities in the Project vicinity.

3.2.3 Bicycle Accessibility

In the vicinity of the Project, bicycle lanes are provided along both sides of Sand Island Parkway. However, there is a gap in the bicycle lane on the Mauka side of the roadway between the Matson Container Yard Access to the Keehi Boat Harbor Access. On the Makai side of the roadway, the bicycle lane becomes a shared two-way bicycle and pedestrian path from the Pasha Container Yard Access to the Keehi Boat Harbor Access as mentioned above.

Although there are bicycle lanes along Sand Island Parkway, the lanes are not always usable due to vehicles that use the lane as parking. This was mainly observed to occur further east of the SIWWTP closer to the Sand Island State Recreation Area. However, heavy vehicles were observed to queue in the westbound bike lane at the Matson Container Yard Access prior to 6:00 AM as they waited for the terminal to open.

Bicyclists in the Project area were observed to use both the sidewalks and bicycle lanes to travel along Sand Island Parkway.

See Figure 3.1 for the existing bicycle facilities in the Project vicinity.

3.2.4 Public Transit

Oahu Transit Services (OTS) operates TheBus, which currently operates a fleet of 542 buses servicing the most populated areas of the island. TheBus is the primary form of public transit on Oahu. The cost of service is $2.75 for each one-way ride, $5.50 for a one-day pass, $70 for a monthly pass and $770 for an annual pass[1].

TheBus does not serve any routes to Sand Island. The closest bus stop to the Project is located just over a mile away along Sand Island Access Road. This bus stop services a single route, Route 10 – Kalihi to Alewa Heights.

3.3 Existing Traffic Volumes

The hourly turning movement data utilized in this report were collected on July 12, 2018. Based on the proximity to the proposed Project site, the following intersections were studied in the existing conditions scenario.

- [1] Sand Island Parkway/Pasha Container Terminal Access (signalized)
- [2] Sand Island Parkway/SIWWTP Utility Access (unsignalized)
- [3] Sand Island Parkway/SIWWTP Main Entrance/Matson Office Access (unsignalized)
- [4] Sand Island Parkway/Matson Container Terminal Access (unsignalized)

[1] Based on 2018 data from www.thebus.org.

- [5] Sand Island Parkway/SIWWTP Secondary Access/Matson Warehouse Access (unsignalized)
- [6] Sand Island Parkway/Makepono Street (unsignalized)
- [7] Makepono Street/Hookela Place (unsignalized)
- [8] Hookela Place/SIWWTP Back-Up Access (unsignalized)

Based on the count data, it was determined that the AM peak hour of traffic occurs between 6:00 AM and 7:00 AM and the PM peak hour of traffic occurs between 3:00 PM and 4:00 PM. The turning movement count data is included in Appendix A.

3.4 Existing Traffic Conditions Observations and Analysis

The observations and analysis described below are based on prevailing observations during the time at which the data was collected. Hereinafter, observations that are expressed as ongoing and current shall represent the conditions that prevailed at the time at which the data was collected.

3.4.1 Existing Intersection Analysis

During the AM peak hour of traffic, volumes along Sand Island Parkway were observed to be higher in the eastbound direction with approximately 74% of traffic along the roadway entering Sand Island. Volumes along Sand Island Parkway during the PM peak hour were observed to be higher in the westbound direction with 63% exiting Sand Island. Directional distributions along Sand Island Parkway were observed to correspond to commuter traffic heading to and from the SIWWTP, Pasha, Matson, the Coast Guard and various industrial businesses in the area.

Prior to the AM peak hour, heavy vehicles were observed to queue along Sand Island Parkway while waiting for the Matson and Pasha Container Terminals to open at 6:00 AM. Vehicles waiting to enter the Pasha Container Terminal were observed to queue in the southbound left-turn lane that provides exclusive access to the site. These heavy vehicles were observed to spill out of the left-turn lane and into the leftmost southbound through lane. Vehicles waiting to enter the Matson Container Terminal were observed to queue in the westbound bicycle lane at the terminal access.

Traffic was observed to generally operate smoothly in the Project area. Queues along Sand Island Parkway were occasionally observed to form in the southbound direction at the signalized Pasha Container Terminal Access. However, these queues were observed to clear within a single cycle. Minor street and left-turn movements at the unsignalized study intersections were observed to experience some delays but adequate gaps in through traffic were generally available to complete movements.

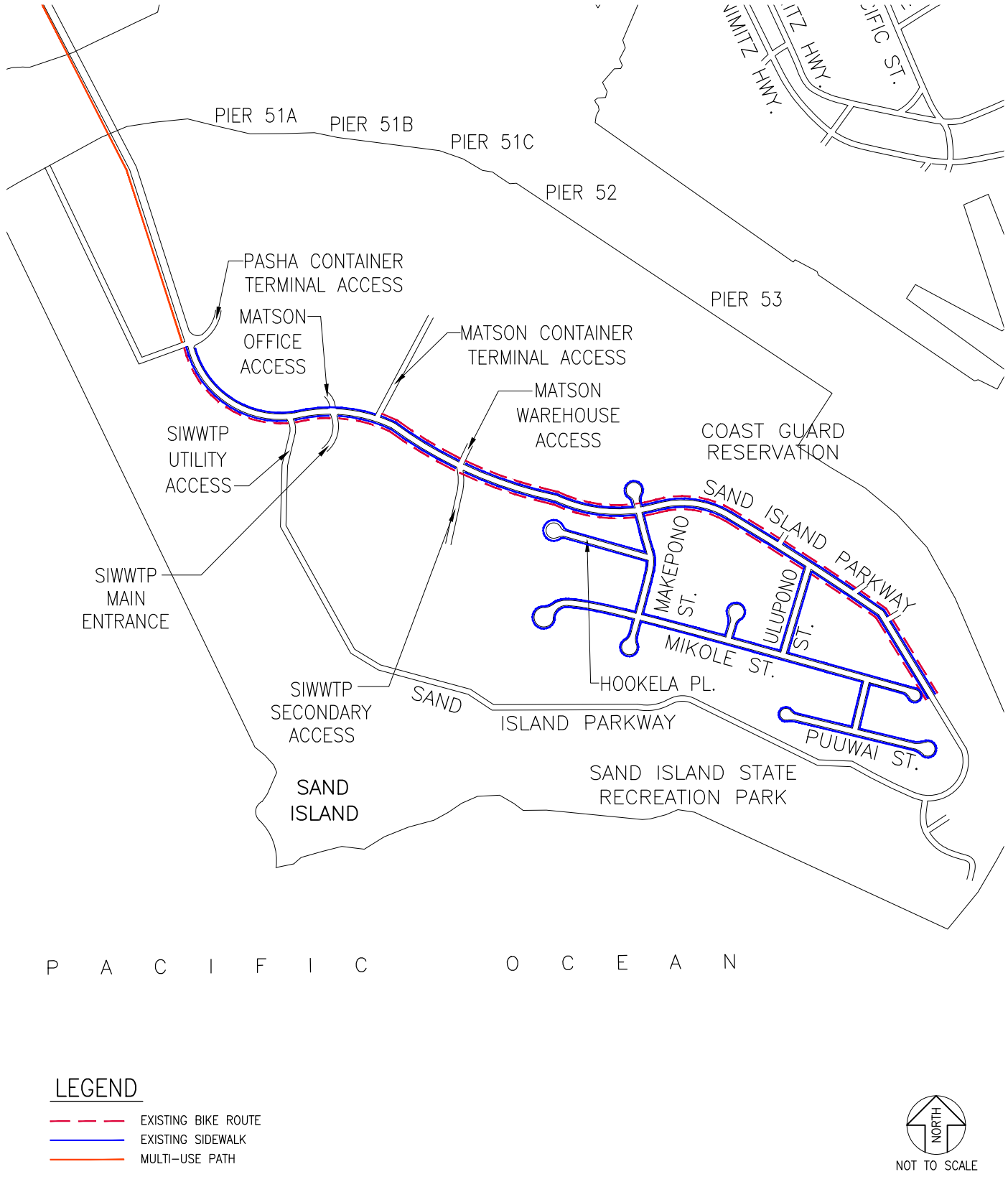
The following intersections operated with movements at LOS E/F during that AM and/or PM peak hours of traffic.

[1] Sand Island Parkway/Pasha Container Terminal Access

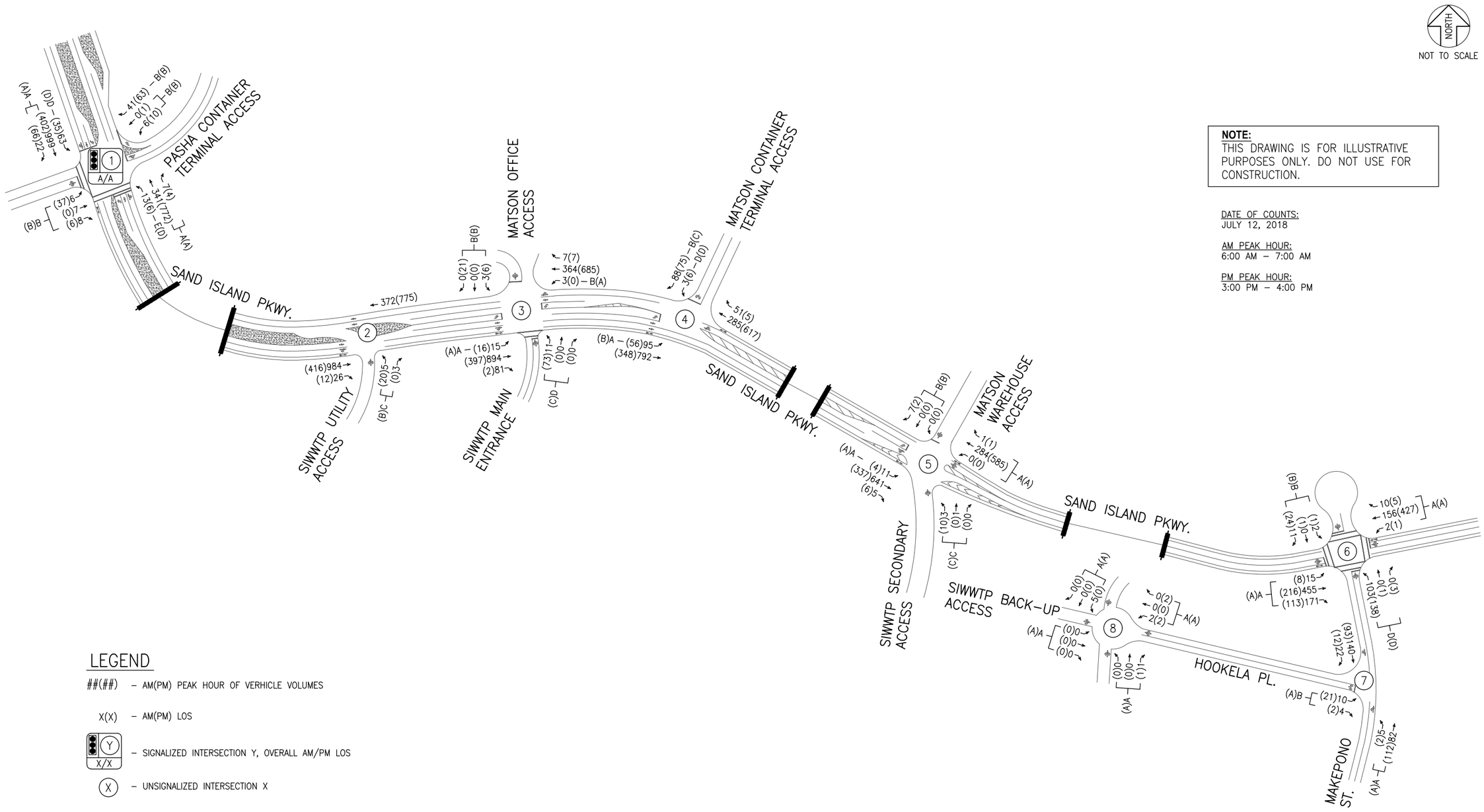
During the AM peak hour of traffic, the northbound left-turn operated at LOS E. Delay to this movement was the result of the low movement volume (13 vehicles) and long green times allotted to the through movements along Sand Island Parkway. It should be noted that heavy

vehicles were observed to queue in the southbound left-turn lane prior to 6:00 AM as mentioned above. This queue was observed to take approximately three cycles to clear once the terminal opened. No additional problems were observed in the remainder of the peak hour.

Figure 3.2 illustrates the existing lane configurations, volumes and LOS for the study intersection movements. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C



SAND ISLAND WWTP FACILITY PLAN TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII **EXISTING PEDESTRIAN + BICYCLE ACCESSIBILITY**	FIGURE **3.1**



NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

DATE OF COUNTS:
JULY 12, 2018

AM PEAK HOUR:
6:00 AM – 7:00 AM

PM PEAK HOUR:
3:00 PM – 4:00 PM

LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

X(X) – AM(PM) LOS

(Y) / X/X – SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS

(X) – UNSIGNALIZED INTERSECTION X

SAND ISLAND WWTP FACILITY PLAN
TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

EXISTING LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

FIGURE
3.2

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing 2018 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Sand Island Pkwy & Pasha Container Yard Access [1]						
NB LT	55.9	0.72	E	42.2	0.52	D
NB TH/RT	4.8	0.26	A	6.1	0.53	A
EB LT/TH/RT	15.8	0.08	B	13.3	0.13	B
WB LT/TH	15.3	0.03	B	12.6	0.04	B
WB RT	15.4	0.03	B	12.7	0.04	B
SB LT	38.5	0.86	D	48.9	0.86	D
SB TH/RT	5.4	0.59	A	4.6	0.33	A
OVERALL	7.2	-	A	7.2	-	A
2: SIWWTP Utility Access & Sand Island Pkwy						
NB LT/RT	20.8	0.04	C	12.8	0.05	B
OVERALL	0.1	-	-	0.2	-	-
3: SIWWTP Main Entrance/Matson Office Access & Sand Island Pkwy						
NB LT/TH/RT	26.0	0.07	D	15.4	0.19	C
EB LT	8.1	0.01	A	9.3	0.02	A
WB LT	14.9	0.01	B	0.0	0.00	A
SB LT/TH/RT	13.8	0.01	B	12.4	0.06	B
OVERALL	0.3	-	-	1.3	-	-
4: Sand Island Pkwy & Matson Container Terminal Access						
EB LT	9.3	0.11	A	11.3	0.10	B
SB LT	27.4	0.02	D	25.9	0.04	D
SB RT	13.0	0.18	B	18.4	0.23	C
OVERALL	1.6	-	-	2.0	-	-
5: SIWWTP Secondary Access/Matson Warehouse Access & Sand Island Pkwy						
NB LT/TH/RT	22.7	0.02	C	22.5	0.05	C
EB LT	8.1	0.01	A	8.8	0.01	A
WB LT/TH/RT	0.0	0.00	A	0.0	0.00	A
SB LT/TH/RT	10.2	0.01	B	12.5	0.01	B
OVERALL	0.2	-	-	0.3	-	-
6: Makepono St & Sand Island Pkwy						
NB LT/TH/RT	31.1	0.45	D	31.6	0.54	D
EB LT/TH/RT	8.0	0.01	A	8.5	0.01	A
WB LT/TH/RT	8.9	0.00	A	8.7	0.00	A
SB LT/TH/RT	12.2	0.03	B	12.0	0.05	B
OVERALL	3.8	-	-	5.2	-	-
7: Makepono St & Hookela Pl						
NB LT	8.3	0.01	A	8.0	0.00	A
EB LT/RT	10.4	0.02	B	9.9	0.03	A
OVERALL	0.7	-	-	1.0	-	-
8: SIWWTP Back-Up Access/Hookela Pl						
NB LT/TH/RT	6.3	0.00	A	6.3	0.00	A
EB LT/TH/RT	6.9	0.00	A	6.9	0.00	A
WB LT/TH/RT	8.8	0.00	A	7.4	0.01	A
SB LT/TH/RT	8.6	0.01	A	6.9	0.00	A
OVERALL	8.4	-	A	7.2	-	A

1. Intersection analyzed using HCM 2010 methodology due to HCM 6th Edition significantly reducing saturation flow for high heavy vehicle percentages to levels not observed in the field.

4. BASE YEAR 2035

Base Year 2035 was selected to reflect the full buildout of the Project. The Base Year 2035 scenario represents the traffic conditions within the study area without the Project. Base Year traffic projections were formulated by applying a defacto growth rate to the existing 2018 traffic count volumes and adding trips generated by known future developments in the vicinity of the Project.

4.1 Defacto Growth Rate

Based on the 2017 State of Hawaii Data Book published by the Hawaii Department of Business, Economic Development and Tourism (DBEDT), cargo tonnage at the Port of Honolulu has increased on average at an annual rate of 1.5%. It was assumed that all shipping operations in the Project vicinity would continue to grow at this rate for a total growth of approximately 28% by 2035. However, the Pasha Container Terminal will be relocated to the new Kapalama Container Terminal as discussed in Section 4.2 below. The Matson Container Terminal will expand into the space vacated by Pasha, and therefore, it was assumed that existing Pasha operations would conservatively account for projected growth in Matson operations, and no additional growth to shipping operations traffic was applied.

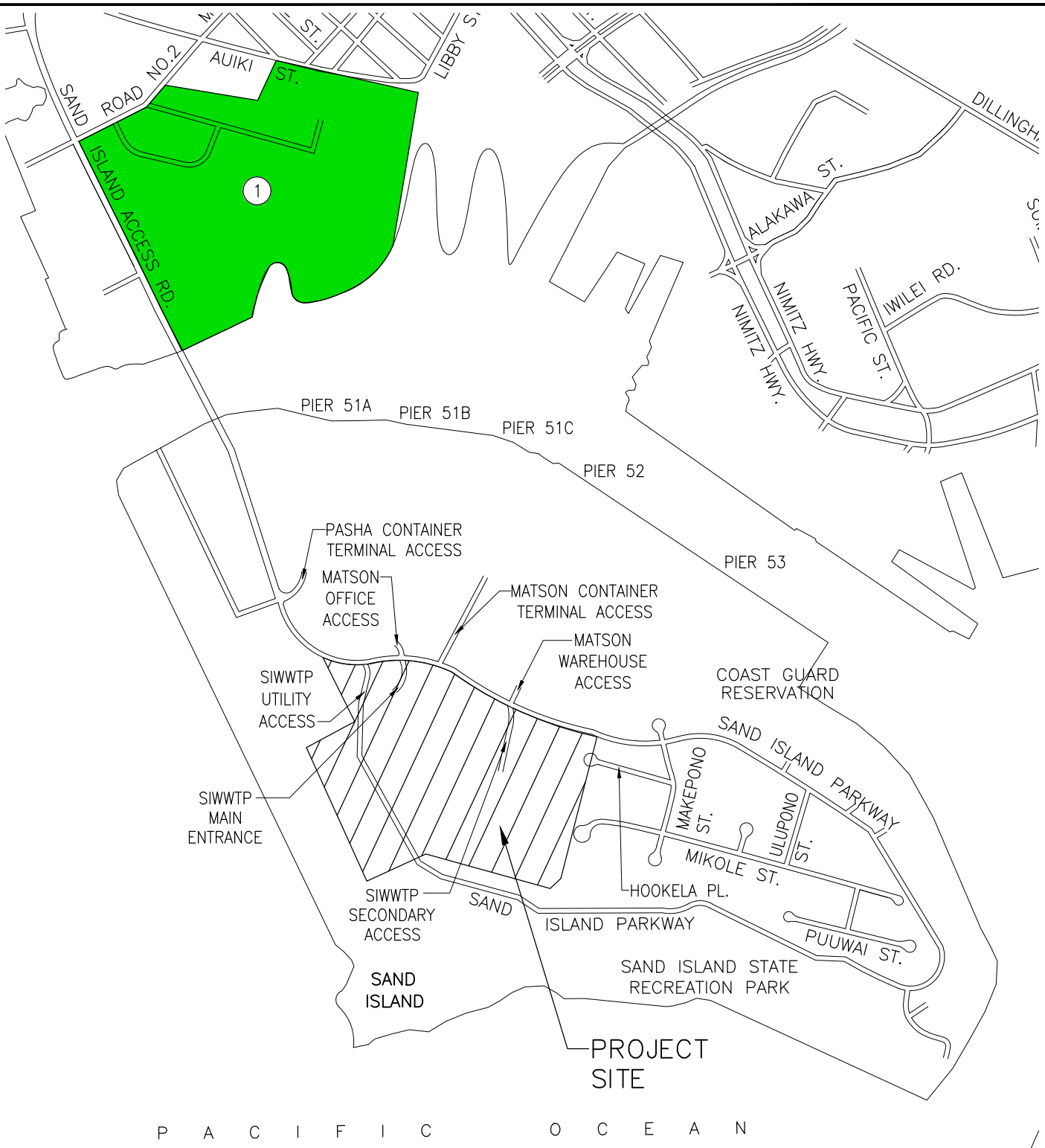
The Oahu Regional Transportation Plan 2035 (ORTP) was prepared in 2011 and serves as the basis for future traffic projections of future conditions throughout this TIAR. The ORTP uses existing data from 2007 as its baseline before assigning land uses and socioeconomic data to Traffic Analysis Zones (TAZ's) to generate and assign traffic across the roadway network.

The ORTP Model takes into account island wide projects and distributes the generated trips throughout the roadway network. It should be noted, however, that the economic environment and housing demand would be the main driver for pace of development to occur. Based on the ORTP Model, an annual growth rate of 0.5% along Sand Island Parkway was derived from the 2007 and 2035 traffic projections and was applied linearly to existing 2018 traffic volumes to determine Base Year conditions.

4.2 Traffic Forecasts for Known Developments

By Year 2035, traffic in the Project area is expected to experience minimal growth due to the limited area for further development on Sand Island. The known developments that are projected to be complete by Year 2035 are illustrated in Figure 4.1 and listed below based on the best information available:

1. Kapalama Container Terminal – This project is located east of Sand Island Access Road just north of the Lt. John R. Slattery Bridge. The project proposes to relocate the existing Pasha Container Terminal to this new location. Once Pasha has relocated, Matson will expand into the old Pasha site. Construction of the Kapalama Container Terminal began in early 2018 and completion is targeted for 2022. However, the new container terminal is not expected to operate at full capacity until 2039. Because Matson is anticipated to expand into the existing Pasha site, no reductions to traffic at the Sand Island Parkway/Pasha Container Terminal Access intersection were applied.



BACKGROUND DEVELOPMENTS

(1) KAPALAMA CONTAINER TERMINAL

NORTH

NOT TO SCALE

SAND ISLAND WWTP FACILITY PLAN
TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

BACKGROUND DEVELOPMENTS

FIGURE
4.1

4.3 Base Year 2035 Analysis

It is anticipated that by Base Year 2035, traffic will remain similar to existing conditions due to minimal ambient traffic growth expected in the region. Background development in the Project area is anticipated to be low as available space for further development on Sand Island is limited.

4.3.1 Base Year 2035 Intersection Analysis

The following intersections are expected to operate with movements at LOS E/F during that AM and/or PM peak hours of traffic.

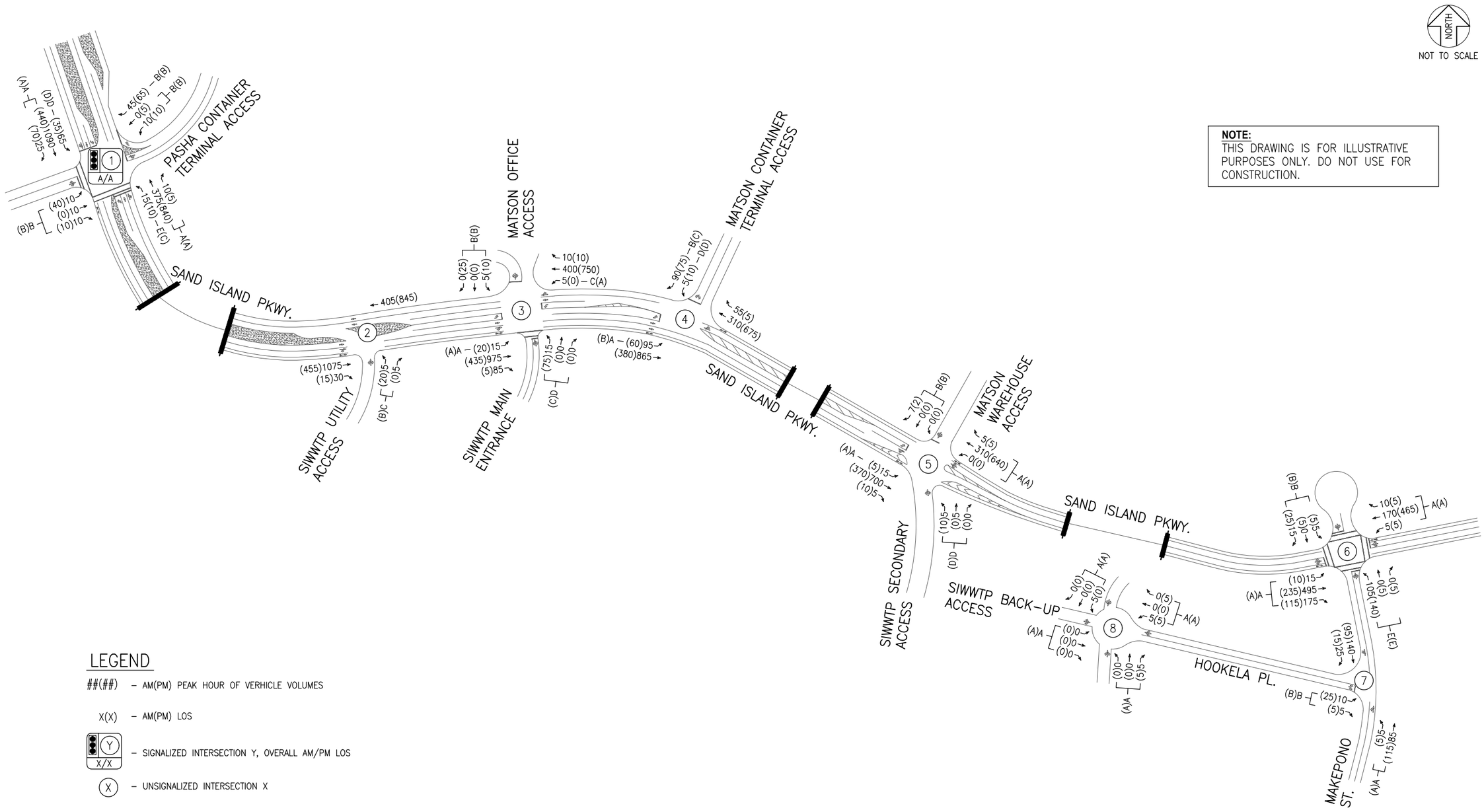
[1] Sand Island Parkway/Pasha Container Terminal Access

The northbound left-turn is expected to continue operating at LOS E during the AM peak hour of traffic. As in existing conditions, long delays to this movement are expected to be the result of the low northbound left-turn volumes and the long green time allotted to the through movements along Sand Island Parkway.

[6] Sand Island Parkway/Makepono Street

With the proposed growth along Sand Island Parkway, the northbound approach is expected to operate at LOS E during both the AM and PM peak hours of traffic due to the high left-turn volumes. Although the northbound left-turn movement is anticipated to experience longer delays by Base Year 2035, adequate gaps in through traffic along Sand Island Parkway are expected for vehicles to complete turning movements.

Figure 4.2 illustrates the Base Year 2035 forecast traffic volumes and LOS for the study intersection movements. Table 4.1 summarizes the Base Year 2035 LOS at the study intersections compared to existing conditions. LOS worksheets are provided in Appendix C.



SAND ISLAND WWTP FACILITY PLAN
TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE 4.2

BASE YEAR 2035 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

TABLE 4.1: LOS SUMMARY TABLE
EXISTING CONDITIONS AND BASE YEAR 2035

Intersection	Existing 2018 Conditions						Base Year 2035					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Sand Island Pkwy & Pasha Container Yard Access [1]												
NB LT	55.9	0.72	E	42.2	0.52	D	55.8	0.73	E	34.7	0.53	C
NB TH/RT	4.8	0.26	A	6.1	0.53	A	4.9	0.28	A	6.3	0.56	A
EB LT/TH/RT	15.8	0.08	B	13.3	0.13	B	17.1	0.11	B	14.2	0.14	B
WB LT/TH	15.3	0.03	B	12.6	0.04	B	16.8	0.05	B	13.4	0.06	B
WB RT	15.4	0.03	B	12.7	0.04	B	16.6	0.01	B	13.5	0.06	B
SB LT	38.5	0.86	D	48.9	0.86	D	45.6	0.90	D	51.4	0.87	D
SB TH/RT	5.4	0.59	A	4.6	0.33	A	5.6	0.61	A	4.7	0.34	A
OVERALL	7.2	-	A	7.2	-	A	7.7	-	A	7.3	-	A
2: SIWWTP Utility Access & Sand Island Pkwy												
NB LT/RT	20.8	0.04	C	12.8	0.05	B	21.4	0.05	C	13.4	0.05	B
OVERALL	0.1	-	-	0.2	-	-	0.2	-	-	0.2	-	-
3: SIWWTP Main Entrance/Matson Office Access & Sand Island Pkwy												
NB LT/TH/RT	26.0	0.07	D	15.4	0.19	C	30.0	0.10	D	16.7	0.21	C
EB LT	8.1	0.01	A	9.3	0.02	A	8.2	0.01	A	9.6	0.03	A
WB LT	14.9	0.01	B	0.0	0.00	A	16.1	0.02	C	0.0	0.00	A
SB LT/TH/RT	13.8	0.01	B	12.4	0.06	B	14.6	0.01	B	13.5	0.08	B
OVERALL	0.3	-	-	1.3	-	-	0.5	-	-	1.4	-	-
4: Sand Island Pkwy & Matson Container Terminal Access												
EB LT	9.3	0.11	A	11.3	0.10	B	9.5	0.11	A	11.8	0.11	B
SB LT	27.4	0.02	D	25.9	0.04	D	30.6	0.04	D	30.3	0.07	D
SB RT	13.0	0.18	B	18.4	0.23	C	13.5	0.19	B	20.1	0.26	C
OVERALL	1.6	-	-	2.0	-	-	1.6	-	-	2.1	-	-
5: SIWWTP Secondary Access/Matson Warehouse Access & Sand Island Pkwy												
NB LT/TH/RT	22.7	0.02	C	22.5	0.05	C	25.9	0.06	D	26.0	0.06	D
EB LT	8.1	0.01	A	8.8	0.01	A	8.2	0.01	A	9.0	0.01	A
WB LT/TH/RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT/TH/RT	10.2	0.01	B	12.5	0.01	B	10.4	0.02	B	13.2	0.01	B
OVERALL	0.2	-	-	0.3	-	-	0.5	-	-	0.3	-	-
6: Makepono St & Sand Island Pkwy												
NB LT/TH/RT	31.1	0.45	D	31.6	0.54	D	38.3	0.52	E	43.6	0.66	E
EB LT/TH/RT	8.0	0.01	A	8.5	0.01	A	8.0	0.01	A	8.7	0.01	A
WB LT/TH/RT	8.9	0.00	A	8.7	0.00	A	9.1	0.01	A	8.8	0.01	A
SB LT/TH/RT	12.2	0.03	B	12.0	0.05	B	14.3	0.05	B	14.4	0.09	B
OVERALL	3.8	-	-	5.2	-	-	4.5	-	-	7.0	-	-
7: Makepono St & Hookela Pl												
NB LT	8.3	0.01	A	8.0	0.00	A	8.3	0.01	A	8.0	0.00	A
EB LT/RT	10.4	0.02	B	9.9	0.03	A	10.4	0.02	B	10.0	0.04	B
OVERALL	0.7	-	-	1.0	-	-	0.7	-	-	1.3	-	-
8: SIWWTP Back-Up Access/Hookela Pl												
NB LT/TH/RT	6.3	0.00	A	6.3	0.00	A	6.3	0.01	A	6.3	0.01	A
EB LT/TH/RT	6.9	0.00	A	6.9	0.00	A	6.9	0.00	A	6.9	0.00	A
WB LT/TH/RT	8.8	0.00	A	7.4	0.01	A	8.9	0.01	A	7.4	0.01	A
SB LT/TH/RT	8.6	0.01	A	6.9	0.00	A	8.6	0.01	A	6.9	0.00	A
OVERALL	8.4	-	A	7.2	-	A	7.9	-	A	7.0	-	A

1. Intersection analyzed using HCM 2010 methodology due to HCM 6th Edition significantly reducing saturation flow for high heavy vehicle percentages to levels not observed in the field.

5. FUTURE YEAR 2035

5.1 Background

The Project proposes to expand the existing SIWWTP in order to upgrade the SIWWTP to provide secondary treatment. Upgrades to the SIWWTP will include new secondary treatment facilities for processing both liquid and solid waste streams and additional non-process facilities. Two conceptual site plans are being evaluated for the updated facility plan. The site plans utilize either a Step-Feed Activated Sludge (SFAS) process with rectangular clarifiers or a Membrane Bioreactor (MBR) process for secondary treatment. Currently, access to the SIWWTP is provided via a main driveway, secondary driveway and construction/utility access along Sand Island Parkway. A final gated back-up entrance is located at the end of Hookela Place. With either of the preliminary site plans, all accesses will remain. However, conversion of the construction/utility access to a main access providing entrance only is proposed.

5.2 Travel Demand Estimations

5.2.1 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms and associations. This publication, titled Trip Generation Manual, 10th Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables. Based on the specific wastewater treatment plant land use of the Project, generic ITE trip generation rates were not used in favor of rates derived from existing vehicle trips to and from SIWWTP.

With the proposed Project, the number of employees at the SIWWTP non-process facilities is expected to increase. Increases are expected for maintenance, administration and operations personnel. Projected personnel levels will be the same for both of the conceptual site plans under consideration. As noted previously, although Future Year 2035 is being evaluated in this TIAR as the projected completion year of the secondary treatment facilities, wastewater flows at the SIWWTP have been projected through 2055. As a conservative measure, the personnel required for the projected 2055 flows were used to represent the full potential impacts of the Project. Table 5.1 shows the existing and projected personnel numbers at the SIWWTP.

Table 5.1: SIWWTP Personnel

Function/Space	Existing	Future
Maintenance Facility Staffing	56	110
Process Lab	1	1
Administration	4	6
Operations (Weekday, Day Shift [1])	10	31
Total	71	148

1. Only weekday day shift operations personnel are included here as evening and night shift personnel are not anticipated to significantly contribute to traffic during the AM and PM peak hours of traffic.

Based on the above personnel levels, non-process facility employees are expected to increase by 77 with the Project. Note that the existing and projected personnel levels consider employees

during day shifts only. Although evening and night shift employees may enter or exit the Project site during the AM and PM peak hours of traffic, they were not considered in order to conservatively predict trip generation rates for the Project. Trip generation rates resulting from the increase in personnel were derived based on the existing number of day shift personnel and the observed trips in and out of SIWWTP during the AM and PM peak hours.

In addition, based on the Island-Wide Sludge Management Plan prepared by AECOM, dated August 2013, truck traffic is expected to increase by approximately two trucks per week under Future Year 2035 conditions to transport additional solids from SIWWTP to H-Power or the landfill. However, these trips were assumed to occur during off-peak hours and, as such, were not included within the peak hour analysis. Tables 5.2 and 5.3 show the projected peak hour trip generation rates and volumes for the Project.

5.2.2 Trip Distribution and Assignment

Trips generated by the Project were assigned throughout the study region generally based upon existing travel patterns. Trip distribution at the Project accesses was adjusted based on the understanding that the westernmost access will be the main entrance for non-process facility employees. The traffic generated by the Project was added to the forecast Base Year 2035 traffic volumes to constitute the traffic volumes for Future Year 2035 traffic conditions. Trip distribution of new and existing trips at the SIWWTP is expected to be the same for both the SFAS process and MBR process site plans. Figure 5.1 illustrates the Project-generated trip distribution which includes the redistribution of existing trips among the Project accesses.

Table 5.2: Trip Generation Rates

Land Use	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Wastewater Treatment Plant (WWTP)	Employees	1.34	88%	1.06	3%

Table 5.3: Project-Generated Trips

Land Use	Independent Variable	AM Peak Hour			PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
WWTP Employees	77 New Employees	92	12	104	2	80	82

5.3 Future Year 2035 Analysis

At completion, the Project is projected to generate a total of 104(82) new net external trips during the AM(PM) peak hour of traffic. Traffic projections for Future Year 2035 are expected to be the same for both the SFAS process and MBR process site plans. The anticipated traffic growth due to the Project is expected along major roadways in the study area.

5.3.1 Future Year 2035 Intersection Analysis

By Future Year 2035 with the Project, traffic operations in the study area are anticipated to remain similar to Base Year 2035. Delay to study intersection movements is generally expected to increase by less than five seconds.

Based on the Manual on Uniform Traffic Control Devices (MUTCD) Warrant 2, Four-Hour Vehicular Volume, traffic signals are not anticipated to warrant at the Sand Island Parkway/SIWWTP Main Entrance intersection or the Sand Island Parkway/SIWWTP Secondary Access intersection by Future Year 2035 with Project volumes. Signal warrants are included in Appendix D. Although the left-turn volumes from the SIWWTP Main Entrance onto Sand Island Parkway is expected to increase significantly during the PM peak hour of traffic, the existing left-turn acceleration lane is anticipated to minimize delay to the northbound approach. Volumes at the SIWWTP Secondary Access are expected to remain low with the majority of exiting trips utilizing the main access.

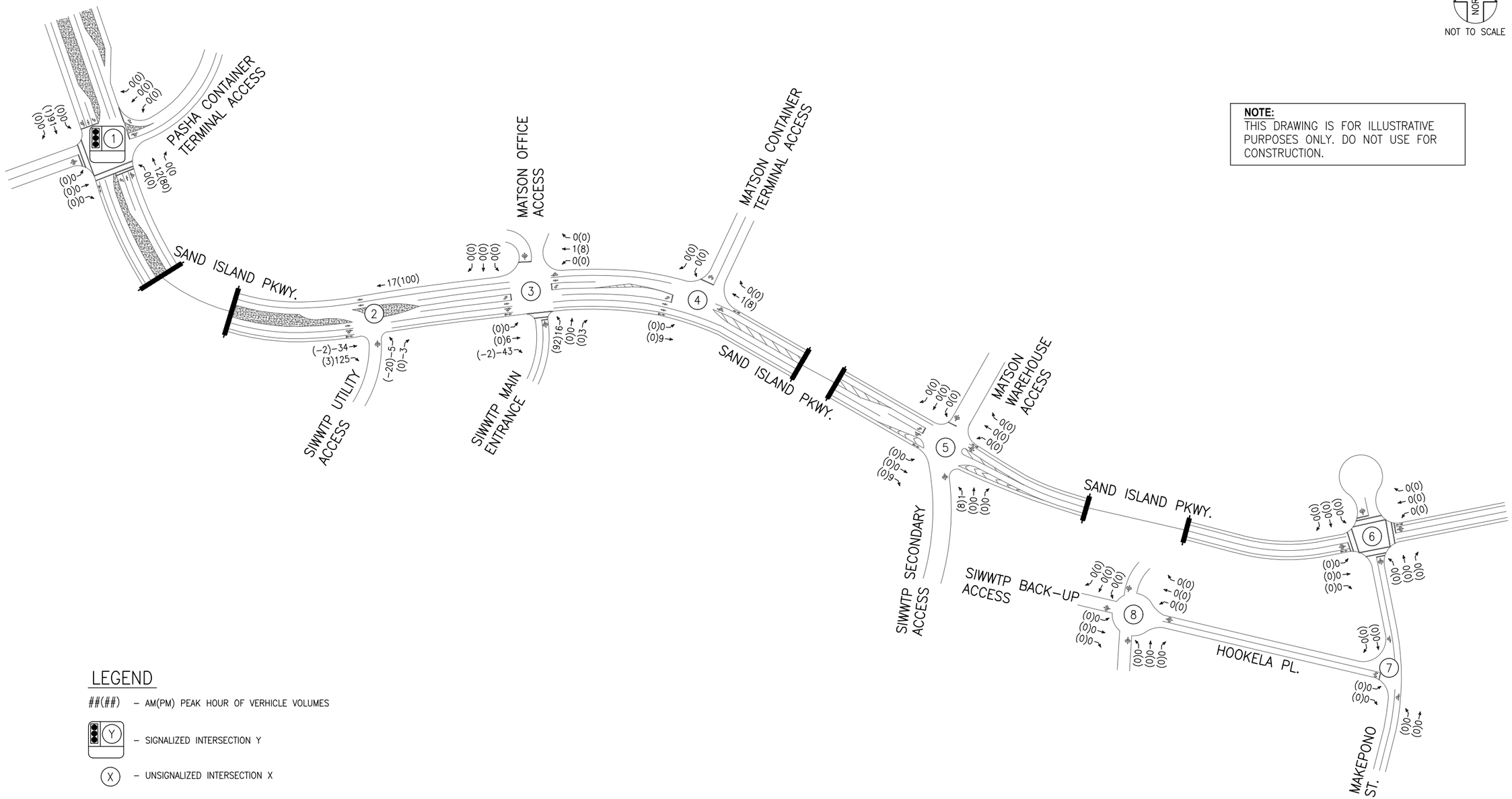
It should be noted that traffic generated by the Project is anticipated to travel through the Nimitz Highway/Sand Island Access Road intersection. Based on available data, the Project is expected to contribute approximately 2% of traffic to the intersection. Due to the minimal traffic increase at the intersection due to the Project, the Nimitz Highway/Sand Island Access Road intersection was not evaluated in this report. Although the Project will contribute to turning movement volumes at the intersection, it should be noted that the intersection already operates with dual left-turn lanes on the westbound approach and triple left-turn lanes on the northbound approach.

Figure 5.2 illustrates Future Year 2035 forecast traffic volumes and LOS for the study intersection movements. Table 5.4 summarizes the Future Year 2035 LOS at the study intersections compared to Base Year 2035 conditions. LOS worksheets are provided in Appendix C.

NORTH

NOT TO SCALE

NOTE:
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.



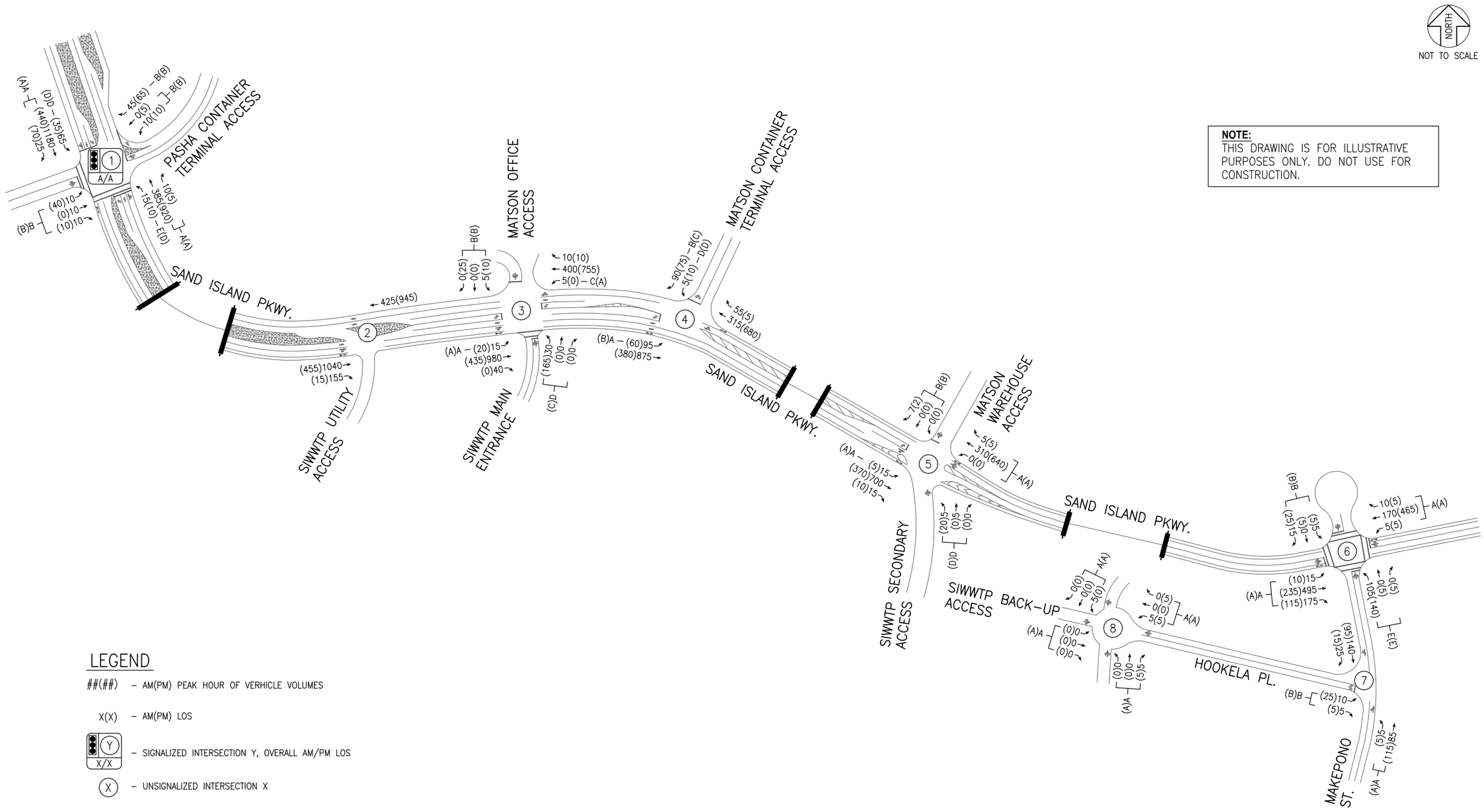
LEGEND

##(##) – AM(PM) PEAK HOUR OF VERHICLE VOLUMES

(Y) – SIGNALIZED INTERSECTION Y

(X) – UNSIGNALIZED INTERSECTION X

SAND ISLAND WWTP FACILITY PLAN TIAR	AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS, SURVEYORS • HONOLULU, HAWAII **PROJECT-GENERATED TRAFFIC**	FIGURE 5.1



SAND ISLAND WWTP FACILITY PLAN
TIAR

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE 5.2

FUTURE YEAR 2035 LANE CONFIGURATION, VOLUMES AND MOVEMENT LOS

TABLE 5.4: LOS SUMMARY TABLE
BASE YEAR 2035 AND FUTURE YEAR 2035

Intersection	Base Year 2035						Future Year 2035					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Sand Island Pkwy & Pasha Container Yard Access [1]												
NB LT	55.8	0.73	E	34.7	0.53	C	58.3	0.74	E	35.9	0.53	D
NB TH/RT	4.9	0.28	A	6.3	0.56	A	4.7	0.27	A	6.2	0.58	A
EB LT/TH/RT	17.1	0.11	B	14.2	0.14	B	18.6	0.11	B	15.2	0.15	B
WB LT/TH	16.8	0.05	B	13.4	0.06	B	18.3	0.05	B	14.4	0.06	B
WB RT	16.6	0.01	B	13.5	0.06	B	18.1	0.01	B	14.4	0.05	B
SB LT	45.6	0.90	D	51.4	0.87	D	52.0	0.93	D	54.2	0.88	D
SB TH/RT	5.6	0.61	A	4.7	0.34	A	5.7	0.64	A	4.5	0.33	A
OVERALL	7.7	-	A	7.3	-	A	7.9	-	A	7.3	-	A
2: SIWWTP Utility Access & Sand Island Pkwy												
NB LT/RT	21.4	0.05	C	13.4	0.05	B	-	-	-	-	-	-
OVERALL	0.2	-	-	0.2	-	-	0.0	-	-	0.0	-	-
3: SIWWTP Main Entrance/Matson Office Access & Sand Island Pkwy												
NB LT/TH/RT	30.0	0.10	D	16.7	0.21	C	30.1	0.21	D	21.9	0.46	C
EB LT	8.2	0.01	A	9.6	0.03	A	8.2	0.01	A	9.6	0.03	A
WB LT	16.1	0.02	C	0.0	0.00	A	15.5	0.02	C	0.0	0.00	A
SB LT/TH/RT	14.6	0.01	B	13.5	0.08	B	14.7	0.01	B	13.6	0.08	B
OVERALL	0.5	-	-	1.4	-	-	0.9	-	-	3.0	-	-
4: Sand Island Pkwy & Matson Container Terminal Access												
EB LT	9.5	0.11	A	11.8	0.11	B	9.5	0.11	A	11.8	0.11	B
SB LT	30.6	0.04	D	30.3	0.07	D	31.0	0.04	D	30.5	0.07	D
SB RT	13.5	0.19	B	20.1	0.26	C	13.6	0.19	B	20.3	0.26	C
OVERALL	1.6	-	-	2.1	-	-	1.6	-	-	2.1	-	-
5: SIWWTP Secondary Access/Matson Warehouse Access & Sand Island Pkwy												
NB LT/TH/RT	25.9	0.06	D	26.0	0.06	D	26.2	0.06	D	27.4	0.12	D
EB LT	8.2	0.01	A	9.0	0.01	A	8.2	0.01	A	9.0	0.01	A
WB LT/TH/RT	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A
SB LT/TH/RT	10.4	0.02	B	13.2	0.01	B	10.4	0.02	B	13.2	0.01	B
OVERALL	0.5	-	-	0.3	-	-	0.5	-	-	0.6	-	-
6: Makepono St & Sand Island Pkwy												
NB LT/TH/RT	38.3	0.52	E	43.6	0.66	E	38.3	0.52	E	43.6	0.66	E
EB LT/TH/RT	8.0	0.01	A	8.7	0.01	A	8.0	0.01	A	8.7	0.01	A
WB LT/TH/RT	9.1	0.01	A	8.8	0.01	A	9.1	0.01	A	8.8	0.01	A
SB LT/TH/RT	14.3	0.05	B	14.4	0.09	B	14.3	0.05	B	14.4	0.09	B
OVERALL	4.5	-	-	7.0	-	-	4.5	-	-	7.0	-	-
7: Makepono St & Hookela Pl												
NB LT	8.3	0.01	A	8.0	0.00	A	8.3	0.01	A	8.0	0.00	A
EB LT/RT	10.4	0.02	B	10.0	0.04	B	10.4	0.02	B	10.0	0.04	B
OVERALL	0.7	-	-	1.3	-	-	0.7	-	-	1.3	-	-
8: SIWWTP Back-Up Access/Hookela Pl												
NB LT/TH/RT	6.3	0.01	A	6.3	0.01	A	6.3	0.01	A	6.3	0.01	A
EB LT/TH/RT	6.9	0.00	A	6.9	0.00	A	6.9	0.00	A	6.9	0.00	A
WB LT/TH/RT	8.9	0.01	A	7.4	0.01	A	8.9	0.01	A	7.4	0.01	A
SB LT/TH/RT	8.6	0.01	A	6.9	0.00	A	8.6	0.01	A	6.9	0.00	A
OVERALL	7.9	-	A	7.0	-	A	7.9	-	A	7.0	-	A

1. Intersection analyzed using HCM 2010 methodology due to HCM 6th Edition significantly reducing saturation flow for high heavy vehicle percentages to levels not observed in the field.

6. CONCLUSIONS

The Project proposes to expand the existing SIWWTP in order to upgrade the SIWWTP to provide secondary treatment. Upgrades to the SIWWTP will include new secondary treatment facilities for processing both liquid and solid waste streams and additional non-process facilities. Two conceptual site plans are being evaluated for the updated facility plan. The site plans utilize either a Step-Feed Activated Sludge (SFAS) process with rectangular clarifiers or a Membrane Bioreactor (MBR) process for secondary treatment. Currently, access to the SIWWTP is provided via a main driveway, secondary driveway and construction/utility access along Sand Island Parkway. A final gated back-up entrance is located at the end of Hookela Place. With either of the preliminary site plans, all accesses will remain. However, conversion of the construction/utility access to a main access providing entrance only is proposed.

At full buildout, the Project is projected to generate a total of 104(82) new net external trips during the AM(PM) peak hour of traffic.

6.1 Existing Conditions

During the AM peak hour of traffic, volumes along Sand Island Parkway were observed to be higher in the eastbound direction with approximately 74% of traffic along the roadway entering Sand Island. Volumes along Sand Island Parkway during the PM peak hour were observed to be higher in the westbound direction with 63% exiting Sand Island. Directional distributions along Sand Island Parkway were observed to correspond to commuter traffic heading to and from the SIWWTP, Pasha, Matson, the Coast Guard and various industrial businesses in the area.

Prior to the AM peak hour, heavy vehicles were observed to queue along Sand Island Parkway while waiting for the Matson and Pasha Container Terminals to open at 6:00 AM. Vehicles waiting to enter the Pasha Container Terminal were observed to queue in the southbound left-turn lane that provides exclusive access to the site. These heavy vehicles were observed to spill out of the left-turn lane and into the leftmost southbound through lane. Vehicles waiting to enter the Matson Container Terminal were observed to queue in the westbound bicycle lane at the terminal access.

Traffic was observed to generally operate smoothly in the Project area. Queues along Sand Island Parkway were occasionally observed to form in the southbound direction at the signalized Pasha Container Terminal Access. However, these queues were observed to clear within a single cycle. Minor street and left-turn movements at the unsignalized study intersections were observed to experience some delays but adequate gaps in through traffic were generally available to complete movements.

6.2 Base Year 2035

It is anticipated that by Base Year 2035, traffic will remain similar to existing conditions due to minimal ambient traffic growth expected in the region. Background development in the Project area is anticipated to be low as available space for further development on Sand Island is limited.

The northbound approach at the Sand Island Parkway/Makepono Street intersection is expected to operate with longer delays at LOS E during both the AM and PM peak hours of

traffic. However, adequate gaps in through traffic along Sand Island Parkway are expected for vehicles to complete turning movements.

6.3 Future Year 2035

At completion, the Project is projected to generate a total of 104(82) new net external trips during the AM(PM) peak hour of traffic. Traffic from the Project is expected to generate growth along major roadways in the study area.

By Future Year 2035 with the Project, traffic operations in the study area are anticipated to remain similar to Base Year 2035. Delay to study intersection movements are generally expected to increase by less than five (seconds).

Based on the MUTCD Warrant 2, Four-Hour Vehicular Volume, traffic signals are not anticipated to warrant at the Sand Island Parkway/SIWWTP Main Entrance intersection or the Sand Island Parkway/SIWWTP Secondary Access intersection by Future Year 2035 with Project volumes. Although the left-turn volumes from the SIWWTP Main Entrance onto Sand Island Parkway is expected to increase significantly during the PM peak hour of traffic, the existing left-turn acceleration lane is anticipated to minimize delay to the northbound approach. Volumes at the SIWWTP Secondary Access are expected to remain low with the majority of exiting trips utilizing the main access.

7. REFERENCES

1. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
2. Institute of Transportation Engineers, Trip Generation, 10th Edition, 2017.
3. Transportation Research Board, Highway Capacity Manual, 6th Edition, 2016.

Y:\2018\18-046\Report\Submitted\190220 Draft TIAR\190226 Sand Island WWTP DRAFT TIAR.docx

A P P E N D I C E S

APPENDIX A

TRAFFIC COUNT DATA

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Sand Island Pkwy - Horizon Line Dwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

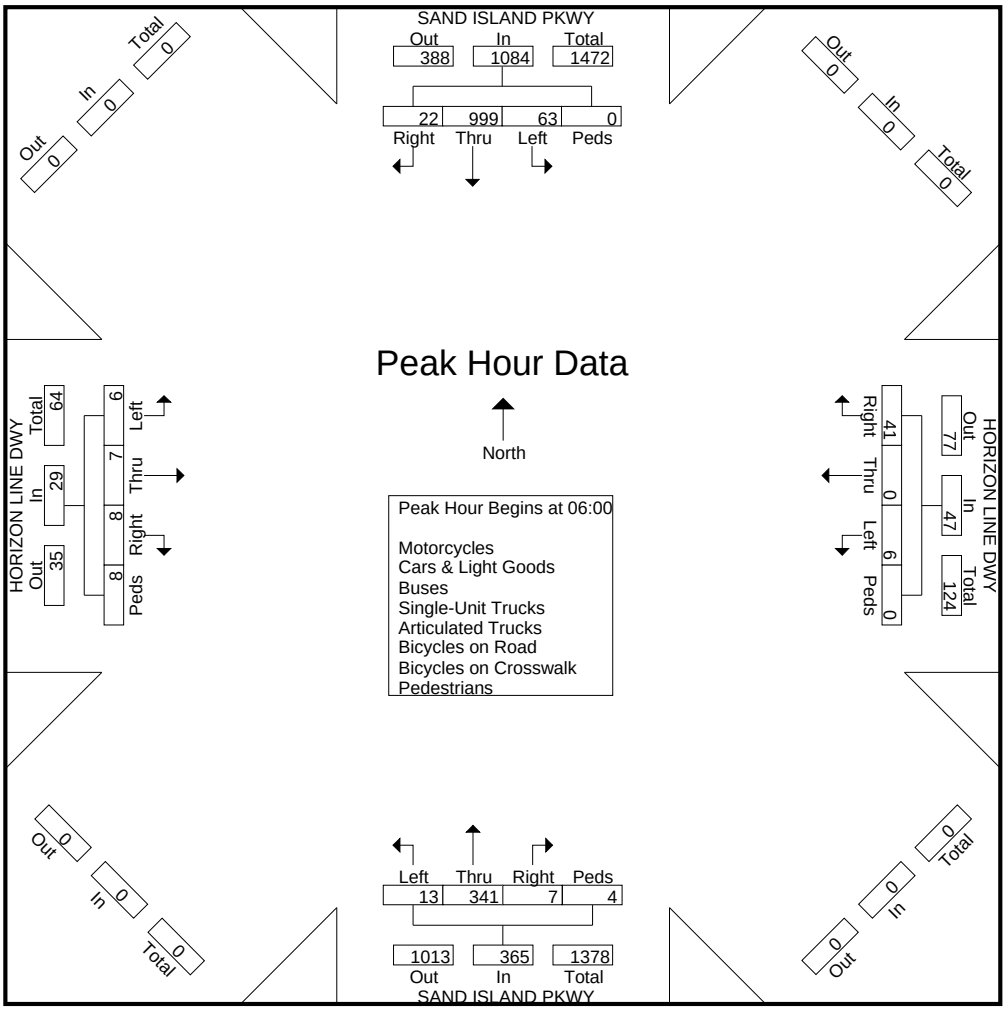
	SAND ISLAND PKWY SOUTHBOUND				HORIZON LINE DWY WESTBOUND				SAND ISLAND PKWY NORTHBOUND				HORIZON LINE DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	11	162	11	0	1	0	3	0	0	22	0	0	3	2	1	5	221
05:45	12	175	8	0	0	0	1	0	0	106	0	0	2	1	0	4	309
Total	23	337	19	0	1	0	4	0	0	128	0	0	5	3	1	9	530
06:00	26	254	5	0	1	0	6	0	0	76	2	0	1	7	2	4	384
06:15	10	270	4	0	3	0	15	0	2	82	1	0	1	0	1	4	393
06:30	18	276	6	0	1	0	12	0	4	95	0	0	2	0	2	0	416
06:45	9	199	7	0	1	0	8	0	7	88	4	4	2	0	3	0	332
Total	63	999	22	0	6	0	41	0	13	341	7	4	6	7	8	8	1525
07:00	7	133	5	0	0	0	10	0	3	103	0	0	8	0	3	0	272
07:15	12	122	1	0	1	0	18	0	0	102	3	0	6	0	0	0	265
Grand Total	105	1591	47	0	8	0	73	0	16	674	10	4	25	10	12	17	2592
Apprch %	6	91.3	2.7	0	9.9	0	90.1	0	2.3	95.7	1.4	0.6	39.1	15.6	18.8	26.6	
Total %	4.1	61.4	1.8	0	0.3	0	2.8	0	0.6	26	0.4	0.2	1	0.4	0.5	0.7	
Motorcycles	1	20	0	0	0	0	0	0	0	2	0	0	0	0	0	0	23
% Motorcycles	1	1.3	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0.9
Cars & Light Goods	42	1389	39	0	0	0	21	0	5	455	0	0	18	3	7	0	1979
% Cars & Light Goods	40	87.3	83	0	0	0	28.8	0	31.2	67.5	0	0	72	30	58.3	0	76.4
Buses	0	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5
% Buses	0	0.2	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0.2
Single-Unit Trucks	37	104	8	0	5	0	7	0	7	108	7	0	2	7	2	0	294
% Single-Unit Trucks	35.2	6.5	17	0	62.5	0	9.6	0	43.8	16	70	0	8	70	16.7	0	11.3
Articulated Trucks	25	70	0	0	3	0	45	0	4	107	3	0	5	0	3	0	265
% Articulated Trucks	23.8	4.4	0	0	37.5	0	61.6	0	25	15.9	30	0	20	0	25	0	10.2
Bicycles on Road	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
% Bicycles on Road	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76.5	0.5
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	8
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	23.5	0.3

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Sand Island Pkwy - Horizon Line Dwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	SAND ISLAND PKWY SOUTHBOUND					HORIZON LINE DWY WESTBOUND					SAND ISLAND PKWY NORTHBOUND					HORIZON LINE DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	**26**	254	5	0	285	1	0	6	0	7	0	76	2	0	78	1	**7**	2	**4**	**14**	384
06:15	10	270	4	0	284	**3**	0	**15**	0	**18**	2	82	1	0	85	1	0	1	4	6	393
06:30	18	**276**	6	0	**300**	1	0	12	0	13	4	**95**	0	0	99	**2**	0	2	0	4	**416**
06:45	9	199	**7**	0	215	1	0	8	0	9	**7**	88	**4**	**4**	**103**	2	0	**3**	0	5	332
Total Volume	63	999	22	0	1084	6	0	41	0	47	13	341	7	4	365	6	7	8	8	29	1525
% App. Total	5.8	92.2	2	0		12.8	0	87.2	0		3.6	93.4	1.9	1.1		20.7	24.1	27.6	27.6		
PHF	.606	.905	.786	.000	.903	.500	.000	.683	.000	.653	.464	.897	.438	.250	.886	.750	.250	.667	.500	.518	.916



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Construction Access - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

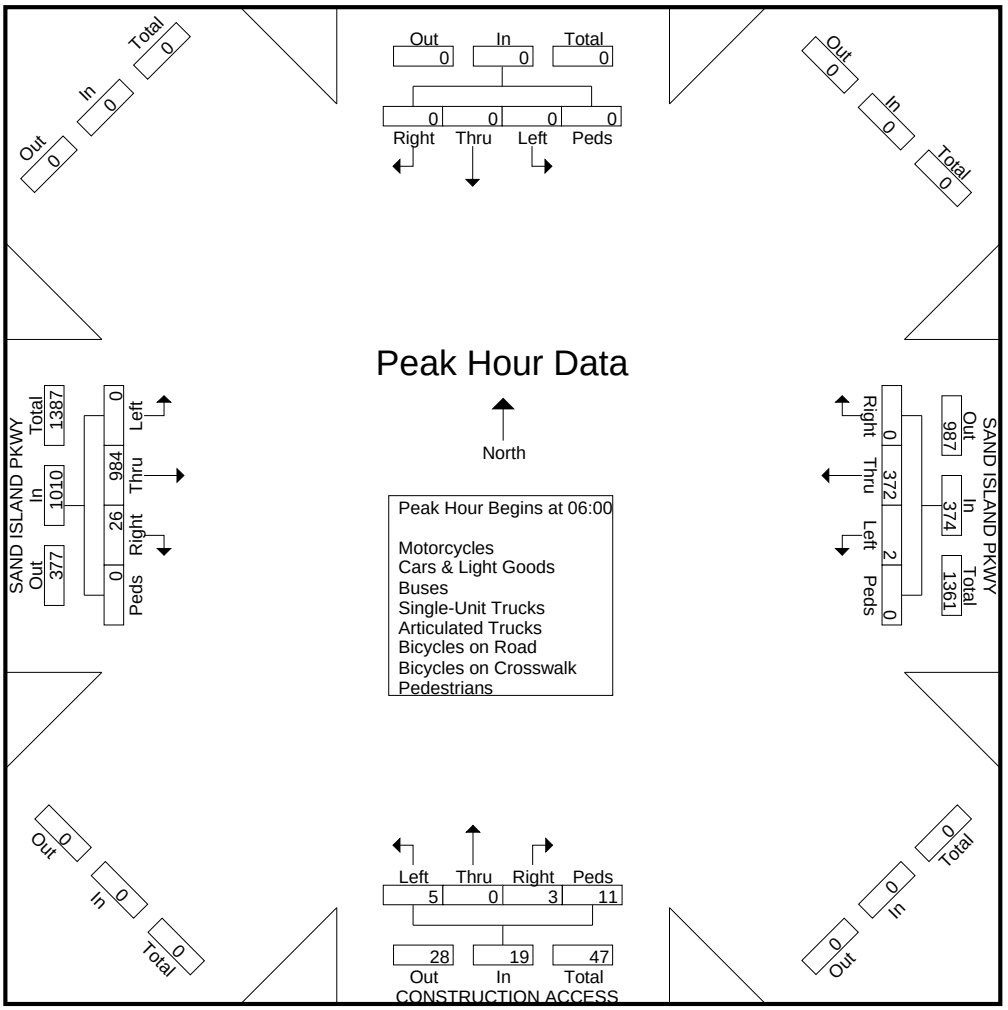
	SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				CONSTRUCTION ACCESS NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	0	0	0	0	0	23	0	0	0	0	0	4	0	163	1	0	191
05:45	0	0	0	0	0	114	0	0	0	0	1	5	0	175	2	0	297
Total	0	0	0	0	0	137	0	0	0	0	1	9	0	338	3	0	488
06:00	0	0	0	0	1	74	0	0	1	0	0	3	0	243	5	0	327
06:15	0	0	0	0	0	91	0	0	2	0	1	3	0	267	6	0	370
06:30	0	0	0	0	1	101	0	0	1	0	0	5	0	268	7	0	383
06:45	0	0	0	0	0	106	0	0	1	0	2	0	0	206	8	0	323
Total	0	0	0	0	2	372	0	0	5	0	3	11	0	984	26	0	1403
07:00	0	0	0	0	0	100	0	0	6	0	0	1	0	132	1	0	240
07:15	0	0	0	0	0	99	0	0	11	0	0	0	0	122	2	0	234
Grand Total	0	0	0	0	2	708	0	0	22	0	4	21	0	1576	32	0	2365
Apprch %	0	0	0	0	0.3	99.7	0	0	46.8	0	8.5	44.7	0	98	2	0	
Total %	0	0	0	0	0.1	29.9	0	0	0.9	0	0.2	0.9	0	66.6	1.4	0	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	19	0	0	21
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	1.2	0	0	0.9
Cars & Light Goods	0	0	0	0	2	465	0	0	11	0	4	0	0	1362	29	0	1873
% Cars & Light Goods	0	0	0	0	100	65.7	0	0	50	0	100	0	0	86.4	90.6	0	79.2
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	6
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.3
Single-Unit Trucks	0	0	0	0	0	121	0	0	10	0	0	0	0	112	3	0	246
% Single-Unit Trucks	0	0	0	0	0	17.1	0	0	45.5	0	0	0	0	7.1	9.4	0	10.4
Articulated Trucks	0	0	0	0	0	116	0	0	1	0	0	0	0	75	0	0	192
% Articulated Trucks	0	0	0	0	0	16.4	0	0	4.5	0	0	0	0	4.8	0	0	8.1
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	5	0	0	6
% Bicycles on Road	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.3	0	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	12
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	57.1	0	0	0	0	0.5
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	42.9	0	0	0	0	0.4

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Construction Access - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					CONSTRUCTION ACCESS NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	0	0	0	0	0	**1**	74	0	0	75	1	0	0	3	4	0	243	5	0	248	327
06:15	0	0	0	0	0	0	91	0	0	91	**2**	0	1	3	**6**	0	267	6	0	273	370
06:30	0	0	0	0	0	1	101	0	0	102	1	0	0	**5**	6	0	**268**	7	0	**275**	**383**
06:45	0	0	0	0	0	0	**106**	0	0	**106**	1	0	**2**	0	3	0	206	**8**	0	214	323
Total Volume	0	0	0	0	0	2	372	0	0	374	5	0	3	11	19	0	984	26	0	1010	1403
% App. Total	0	0	0	0		0.5	99.5	0	0		26.3	0	15.8	57.9		0	97.4	2.6	0		
PHF	.000	.000	.000	.000	.000	.500	.877	.000	.000	.882	.625	.000	.375	.550	.792	.000	.918	.813	.000	.918	.916



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Main Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

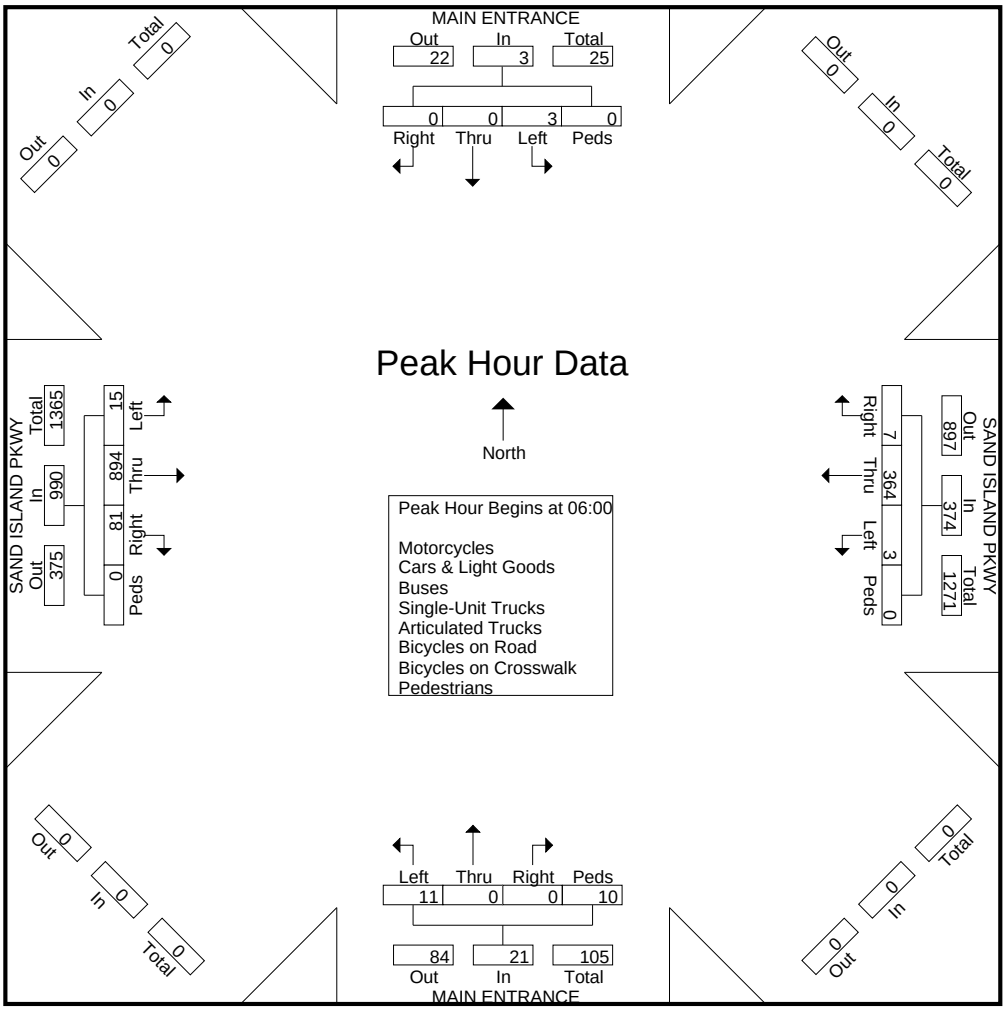
	MAIN ENTRANCE SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				MAIN ENTRANCE NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	1	0	0	0	0	24	0	0	0	0	0	4	3	147	13	0	192
05:45	1	0	1	0	1	112	1	0	1	0	0	5	8	155	10	0	295
Total	2	0	1	0	1	136	1	0	1	0	0	9	11	302	23	0	487
06:00	1	0	0	0	1	74	1	0	2	0	0	3	2	225	17	0	326
06:15	0	0	0	0	1	89	1	0	1	0	0	2	4	241	23	0	362
06:30	1	0	0	0	1	98	2	0	4	0	0	5	5	237	27	0	380
06:45	1	0	0	0	0	103	3	0	4	0	0	0	4	191	14	0	320
Total	3	0	0	0	3	364	7	0	11	0	0	10	15	894	81	0	1388
07:00	1	0	1	4	0	94	1	0	3	0	1	0	5	121	6	0	237
07:15	1	0	2	0	2	92	1	0	7	0	1	0	6	111	5	0	228
Grand Total	7	0	4	4	6	686	10	0	22	0	2	19	37	1428	115	0	2340
Apprch %	46.7	0	26.7	26.7	0.9	97.7	1.4	0	51.2	0	4.7	44.2	2.3	90.4	7.3	0	
Total %	0.3	0	0.2	0.2	0.3	29.3	0.4	0	0.9	0	0.1	0.8	1.6	61	4.9	0	
Motorcycles	0	0	0	0	0	2	0	0	0	0	0	0	0	19	0	0	21
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	0	1.3	0	0	0.9
Cars & Light Goods	7	0	4	0	2	450	10	0	16	0	2	0	37	1219	112	0	1859
% Cars & Light Goods	100	0	100	0	33.3	65.6	100	0	72.7	0	100	0	100	85.4	97.4	0	79.4
Buses	0	0	0	0	1	2	0	0	1	0	0	0	0	3	0	0	7
% Buses	0	0	0	0	16.7	0.3	0	0	4.5	0	0	0	0	0.2	0	0	0.3
Single-Unit Trucks	0	0	0	0	3	116	0	0	4	0	0	0	0	107	2	0	232
% Single-Unit Trucks	0	0	0	0	50	16.9	0	0	18.2	0	0	0	0	7.5	1.7	0	9.9
Articulated Trucks	0	0	0	0	0	116	0	0	1	0	0	0	0	75	0	0	192
% Articulated Trucks	0	0	0	0	0	16.9	0	0	4.5	0	0	0	0	5.3	0	0	8.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	6
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0.9	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	10
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	52.6	0	0	0	0	0.4
Pedestrians	0	0	0	4	0	0	0	0	0	0	0	9	0	0	0	0	13
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	47.4	0	0	0	0	0.6

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Main Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAIN ENTRANCE SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					MAIN ENTRANCE NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	**1**	0	0	0	**1**	**1**	74	1	0	76	2	0	0	3	5	2	225	17	0	244	326
06:15	0	0	0	0	0	1	89	1	0	91	1	0	0	2	3	4	**241**	23	0	268	362
06:30	1	0	0	0	1	1	98	2	0	101	**4**	0	0	**5**	**9**	**5**	237	**27**	0	**269**	**380**
06:45	1	0	0	0	1	0	**103**	**3**	0	**106**	4	0	0	0	4	4	191	14	0	209	320
Total Volume	3	0	0	0	3	3	364	7	0	374	11	0	0	10	21	15	894	81	0	990	1388
% App. Total	100	0	0	0		0.8	97.3	1.9	0		52.4	0	0	47.6		1.5	90.3	8.2	0		
PHF	.750	.000	.000	.000	.750	.750	.883	.583	.000	.882	.688	.000	.000	.500	.583	.750	.927	.750	.000	.920	.913



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Matson Offices Dwy - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

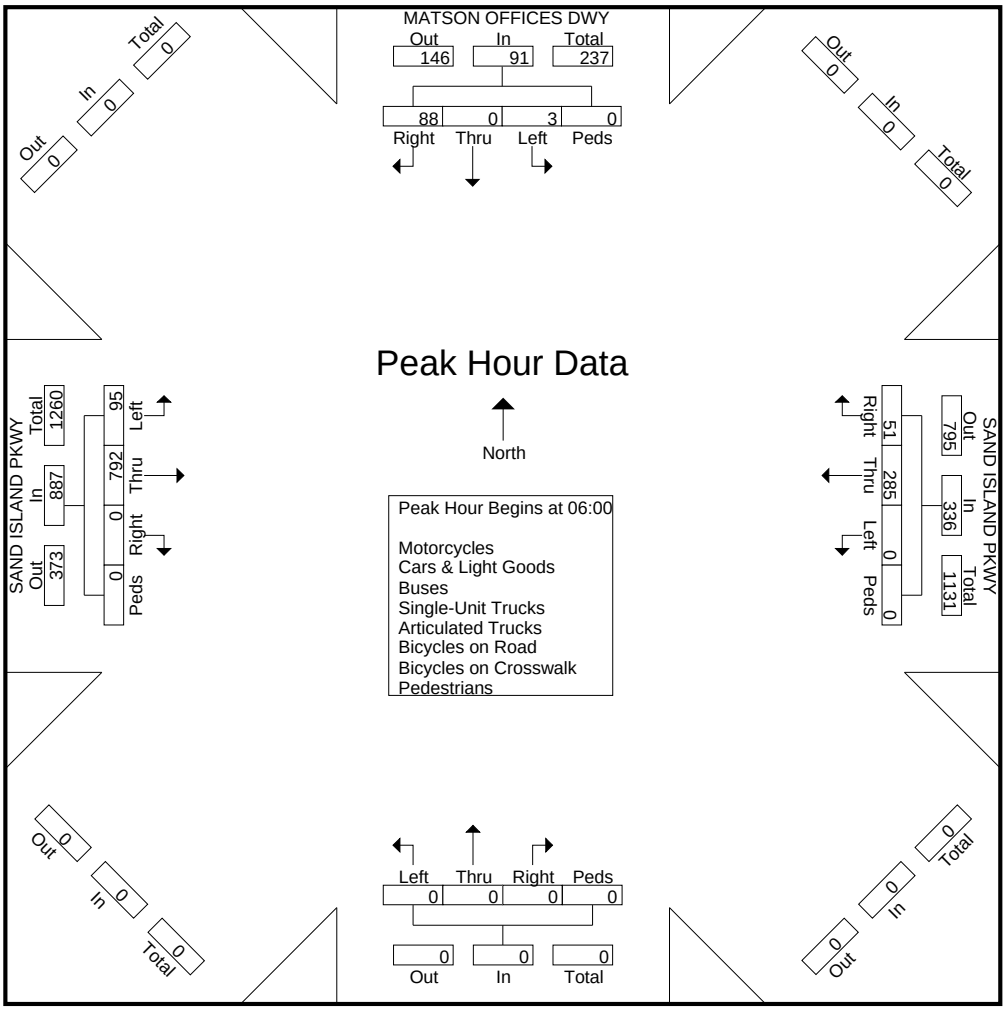
	MATSON OFFICES DWY SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	1	0	0	0	0	23	2	0	0	0	0	0	14	133	0	0	173
05:45	4	0	13	0	0	102	0	0	0	0	0	0	16	141	0	0	276
Total	5	0	13	0	0	125	2	0	0	0	0	0	30	274	0	0	449
06:00	0	0	10	0	0	64	44	0	0	0	0	0	14	205	0	0	337
06:15	0	0	27	0	0	66	2	0	0	0	0	0	29	209	0	0	333
06:30	1	0	26	0	0	76	3	0	0	0	0	0	24	219	0	0	349
06:45	2	0	25	0	0	79	2	0	0	0	0	0	28	159	0	0	295
Total	3	0	88	0	0	285	51	0	0	0	0	0	95	792	0	0	1314
07:00	2	0	18	4	0	76	3	0	0	0	0	0	23	104	0	0	230
07:15	2	0	20	0	0	77	1	0	0	0	0	0	16	97	0	0	213
Grand Total	12	0	139	4	0	563	57	0	0	0	0	0	164	1267	0	0	2206
Apprch %	7.7	0	89.7	2.6	0	90.8	9.2	0	0	0	0	0	11.5	88.5	0	0	
Total %	0.5	0	6.3	0.2	0	25.5	2.6	0	0	0	0	0	7.4	57.4	0	0	
Motorcycles	0	0	1	0	0	1	0	0	0	0	0	0	0	17	0	0	19
% Motorcycles	0	0	0.7	0	0	0.2	0	0	0	0	0	0	0	1.3	0	0	0.9
Cars & Light Goods	4	0	35	0	0	429	7	0	0	0	0	0	81	1142	0	0	1698
% Cars & Light Goods	33.3	0	25.2	0	0	76.2	12.3	0	0	0	0	0	49.4	90.1	0	0	77
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	4
% Buses	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0.2
Single-Unit Trucks	3	0	15	0	0	100	35	0	0	0	0	0	38	65	0	0	256
% Single-Unit Trucks	25	0	10.8	0	0	17.8	61.4	0	0	0	0	0	23.2	5.1	0	0	11.6
Articulated Trucks	5	0	88	0	0	31	15	0	0	0	0	0	45	33	0	0	217
% Articulated Trucks	41.7	0	63.3	0	0	5.5	26.3	0	0	0	0	0	27.4	2.6	0	0	9.8
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.4
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0.2

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Matson Offices Dwy - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MATSON OFFICES DWY SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	0	0	10	0	10	0	64	**44**	0	**108**	0	0	0	0	0	14	205	0	0	219	337
06:15	0	0	**27**	0	**27**	0	66	2	0	68	0	0	0	0	0	**29**	209	0	0	238	333
06:30	1	0	26	0	27	0	76	3	0	79	0	0	0	0	0	24	**219**	0	0	**243**	**349**
06:45	**2**	0	25	0	27	0	**79**	2	0	81	0	0	0	0	0	28	159	0	0	187	295
Total Volume	3	0	88	0	91	0	285	51	0	336	0	0	0	0	0	95	792	0	0	887	1314
% App. Total	3.3	0	96.7	0		0	84.8	15.2	0		0	0	0	0		10.7	89.3	0	0		
PHF	.375	.000	.815	.000	.843	.000	.902	.290	.000	.778	.000	.000	.000	.000	.000	.819	.904	.000	.000	.913	.941



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

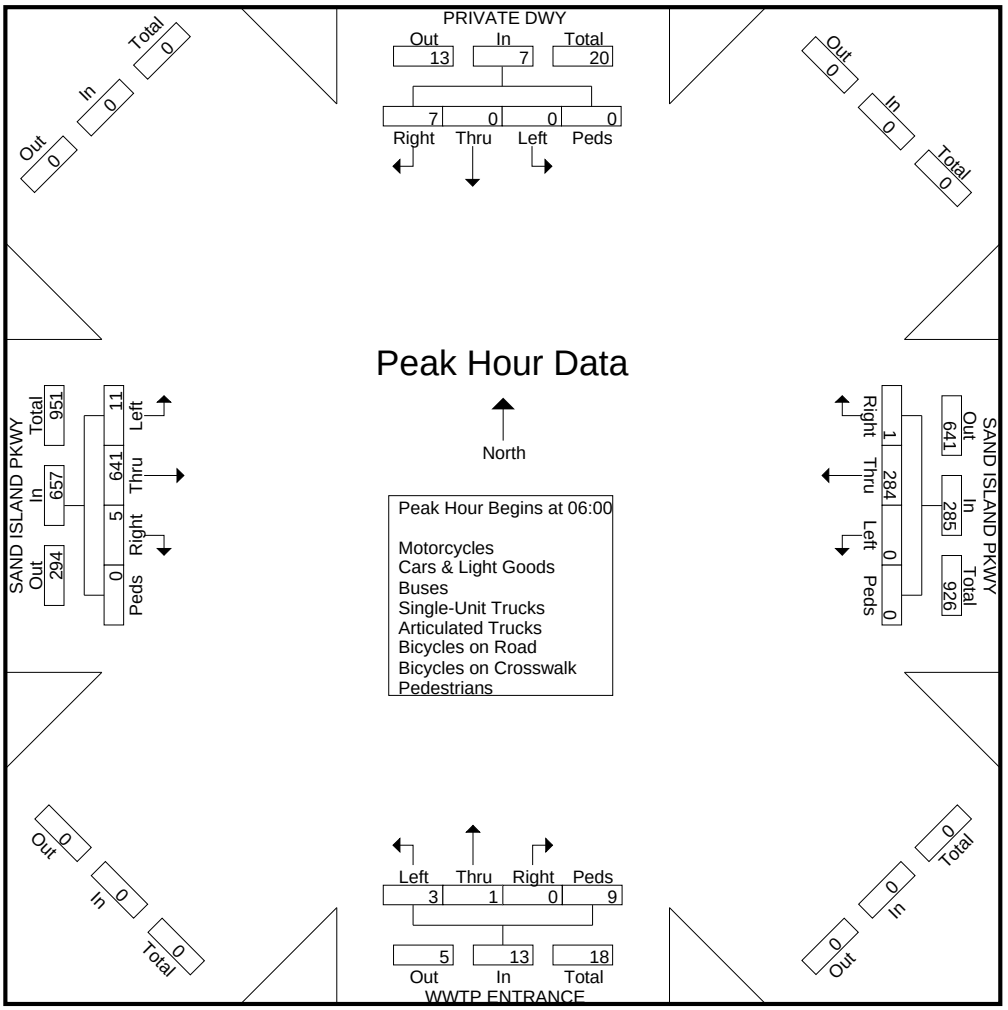
	PRIVATE DWY SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				WWTP ENTRANCE NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	0	0	0	0	0	25	0	0	0	0	0	4	1	112	0	0	142
05:45	0	0	0	0	0	57	0	0	0	0	0	4	0	123	1	0	185
Total	0	0	0	0	0	82	0	0	0	0	0	8	1	235	1	0	327
06:00	0	0	4	0	0	79	0	0	1	0	0	1	2	168	1	0	256
06:15	0	0	1	0	0	61	0	0	0	1	0	4	0	180	2	0	249
06:30	0	0	1	0	0	68	1	0	1	0	0	4	4	160	2	0	241
06:45	0	0	1	0	0	76	0	0	1	0	0	0	5	133	0	0	216
Total	0	0	7	0	0	284	1	0	3	1	0	9	11	641	5	0	962
07:00	0	0	1	0	0	72	1	0	0	0	0	0	1	105	0	0	180
07:15	0	0	0	0	0	78	0	0	0	0	1	0	0	95	1	0	175
Grand Total	0	0	8	0	0	516	2	0	3	1	1	17	13	1076	7	0	1644
Apprch %	0	0	100	0	0	99.6	0.4	0	13.6	4.5	4.5	77.3	1.2	98.2	0.6	0	
Total %	0	0	0.5	0	0	31.4	0.1	0	0.2	0.1	0.1	1	0.8	65.5	0.4	0	
Motorcycles	0	0	0	0	0	1	0	0	0	0	0	0	0	12	0	0	13
% Motorcycles	0	0	0	0	0	0.2	0	0	0	0	0	0	0	1.1	0	0	0.8
Cars & Light Goods	0	0	7	0	0	342	2	0	3	1	1	0	11	971	5	0	1343
% Cars & Light Goods	0	0	87.5	0	0	66.3	100	0	100	100	100	0	84.6	90.2	71.4	0	81.7
Buses	0	0	0	0	0	5	0	0	0	0	0	0	0	2	0	0	7
% Buses	0	0	0	0	0	1	0	0	0	0	0	0	0	0.2	0	0	0.4
Single-Unit Trucks	0	0	1	0	0	124	0	0	0	0	0	0	1	58	1	0	185
% Single-Unit Trucks	0	0	12.5	0	0	24	0	0	0	0	0	0	7.7	5.4	14.3	0	11.3
Articulated Trucks	0	0	0	0	0	44	0	0	0	0	0	0	1	31	0	0	76
% Articulated Trucks	0	0	0	0	0	8.5	0	0	0	0	0	0	7.7	2.9	0	0	4.6
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	14.3	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	8
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	47.1	0	0	0	0	0.5
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	52.9	0	0	0	0	0.5

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	PRIVATE DWY SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					WWTP ENTRANCE NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	0	0	**4**	0	**4**	0	**79**	0	0	**79**	**1**	0	0	1	2	2	168	1	0	171	**256**
06:15	0	0	1	0	1	0	61	0	0	61	0	**1**	0	**4**	**5**	0	**180**	**2**	0	**182**	249
06:30	0	0	1	0	1	0	68	**1**	0	69	1	0	0	4	5	4	160	2	0	166	241
06:45	0	0	1	0	1	0	76	0	0	76	1	0	0	0	1	**5**	133	0	0	138	216
Total Volume	0	0	7	0	7	0	284	1	0	285	3	1	0	9	13	11	641	5	0	657	962
% App. Total	0	0	100	0		0	99.6	0.4	0		23.1	7.7	0	69.2		1.7	97.6	0.8	0		
PHF	.000	.000	.438	.000	.438	.000	.899	.250	.000	.902	.750	.250	.000	.563	.650	.550	.890	.625	.000	.902	.939



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

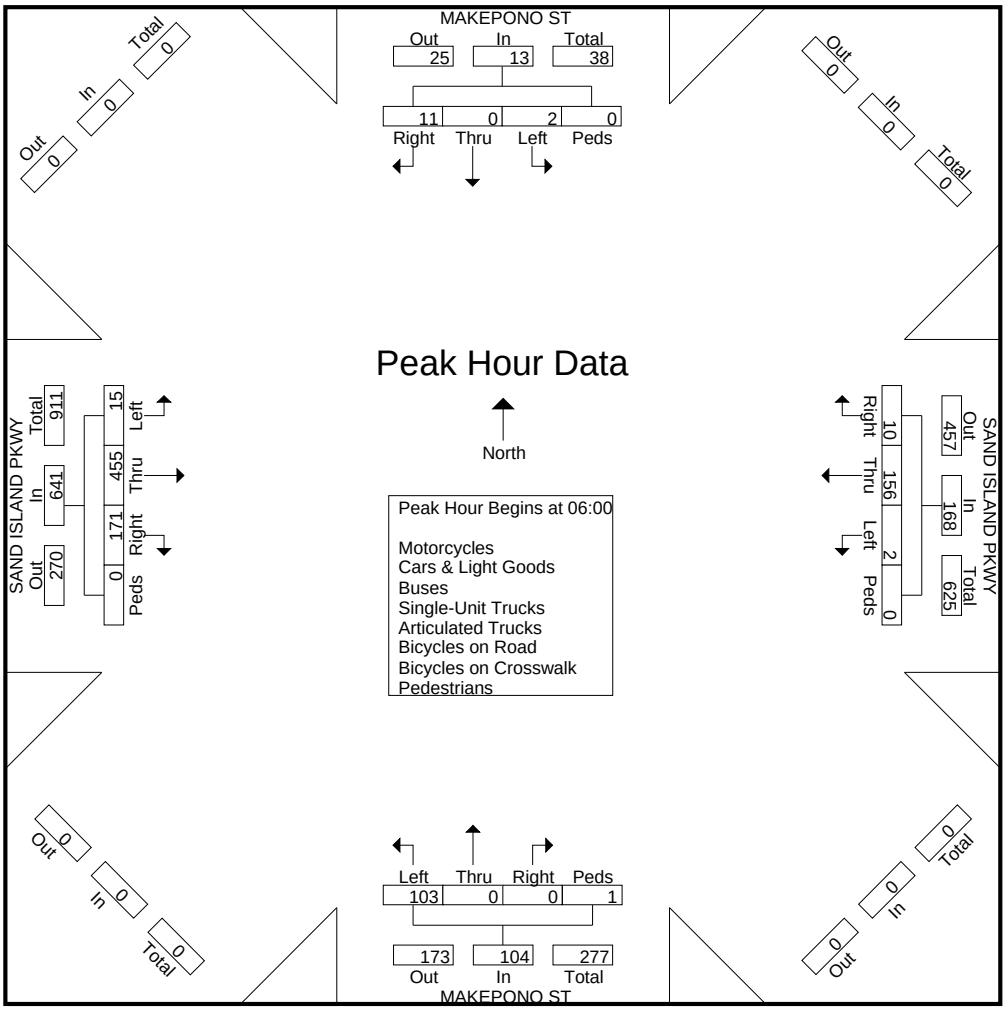
	MAKEPONO ST SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				MAKEPONO ST NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	0	0	4	0	0	12	1	0	7	0	2	1	7	51	48	1	134
05:45	0	0	7	0	0	38	2	0	20	0	1	0	6	72	45	2	193
Total	0	0	11	0	0	50	3	0	27	0	3	1	13	123	93	3	327
06:00	0	0	4	0	0	41	0	0	14	0	0	1	6	123	39	0	228
06:15	2	0	2	0	1	32	6	0	31	0	0	0	4	124	54	0	256
06:30	0	0	3	0	1	33	2	0	30	0	0	0	4	116	45	0	234
06:45	0	0	2	0	0	50	2	0	28	0	0	0	1	92	33	0	208
Total	2	0	11	0	2	156	10	0	103	0	0	1	15	455	171	0	926
07:00	0	0	5	0	1	39	2	0	28	0	1	9	7	65	40	0	197
07:15	0	0	3	0	0	64	2	0	14	0	1	0	4	54	34	0	176
Grand Total	2	0	30	0	3	309	17	0	172	0	5	11	39	697	338	3	1626
Apprch %	6.2	0	93.8	0	0.9	93.9	5.2	0	91.5	0	2.7	5.9	3.6	64.7	31.4	0.3	
Total %	0.1	0	1.8	0	0.2	19	1	0	10.6	0	0.3	0.7	2.4	42.9	20.8	0.2	
Motorcycles	0	0	0	0	0	1	0	0	0	0	0	0	1	10	7	0	19
% Motorcycles	0	0	0	0	0	0.3	0	0	0	0	0	0	2.6	1.4	2.1	0	1.2
Cars & Light Goods	0	0	5	0	3	246	3	0	97	0	5	0	23	658	283	0	1323
% Cars & Light Goods	0	0	16.7	0	100	79.6	17.6	0	56.4	0	100	0	59	94.4	83.7	0	81.4
Buses	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2	0	6
% Buses	0	0	0	0	0	0.6	0	0	1.2	0	0	0	0	0	0.6	0	0.4
Single-Unit Trucks	2	0	16	0	0	49	12	0	59	0	0	0	8	14	32	0	192
% Single-Unit Trucks	100	0	53.3	0	0	15.9	70.6	0	34.3	0	0	0	20.5	2	9.5	0	11.8
Articulated Trucks	0	0	9	0	0	11	2	0	14	0	0	0	6	8	13	0	63
% Articulated Trucks	0	0	30	0	0	3.6	11.8	0	8.1	0	0	0	15.4	1.1	3.8	0	3.9
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	1	7	1	0	9
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	2.6	1	0.3	0	0.6
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	3	14
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	0.9

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAKEPONO ST SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					MAKEPONO ST NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 05:30 to 07:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	0	0	**4**	0	**4**	0	41	0	0	41	14	0	0	**1**	15	**6**	123	39	0	168	228
06:15	**2**	0	2	0	4	**1**	32	**6**	0	39	**31**	0	0	0	**31**	4	**124**	**54**	0	**182**	**256**
06:30	0	0	3	0	3	1	33	2	0	36	30	0	0	0	30	4	116	45	0	165	234
06:45	0	0	2	0	2	0	**50**	2	0	**52**	28	0	0	0	28	1	92	33	0	126	208
Total Volume	2	0	11	0	13	2	156	10	0	168	103	0	0	1	104	15	455	171	0	641	926
% App. Total	15.4	0	84.6	0		1.2	92.9	6	0		99	0	0	1		2.3	71	26.7	0		
PHF	.250	.000	.688	.000	.813	.500	.780	.417	.000	.808	.831	.000	.000	.250	.839	.625	.917	.792	.000	.880	.904



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Hookela Pl
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

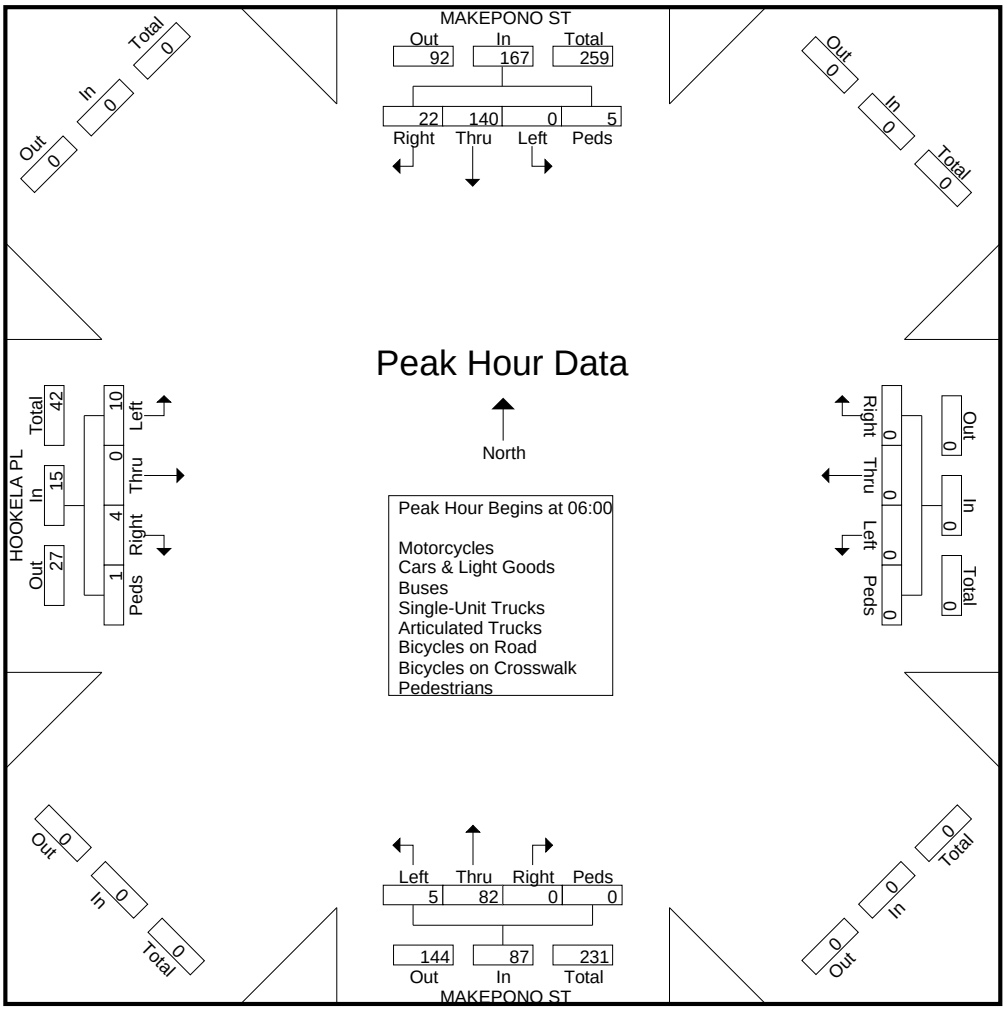
	MAKEPONO ST SOUTHBOUND				WESTBOUND				MAKEPONO ST NORTHBOUND				HOOKELA PL EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	0	39	6	0	0	0	0	0	0	5	0	0	4	0	0	1	55
05:45	0	38	7	0	0	0	0	0	0	10	0	0	4	0	0	0	59
Total	0	77	13	0	0	0	0	0	0	15	0	0	8	0	0	1	114
06:00	0	33	5	3	0	0	0	0	0	9	0	0	3	0	1	0	54
06:15	0	41	9	0	0	0	0	0	1	26	0	0	3	0	0	0	80
06:30	0	41	4	2	0	0	0	0	2	25	0	0	1	0	1	1	77
06:45	0	25	4	0	0	0	0	0	2	22	0	0	3	0	2	0	58
Total	0	140	22	5	0	0	0	0	5	82	0	0	10	0	4	1	269
07:00	0	30	6	0	0	0	0	0	0	19	0	0	8	0	1	0	64
07:15	0	29	4	0	0	0	0	0	3	12	0	0	3	0	0	0	51
Grand Total	0	276	45	5	0	0	0	0	8	128	0	0	29	0	5	2	498
Apprch %	0	84.7	13.8	1.5	0	0	0	0	5.9	94.1	0	0	80.6	0	13.9	5.6	
Total %	0	55.4	9	1	0	0	0	0	1.6	25.7	0	0	5.8	0	1	0.4	
Motorcycles	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
% Motorcycles	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2
Cars & Light Goods	0	227	42	0	0	0	0	0	3	84	0	0	17	0	3	0	376
% Cars & Light Goods	0	82.2	93.3	0	0	0	0	0	37.5	65.6	0	0	58.6	0	60	0	75.5
Buses	0	2	1	0	0	0	0	0	0	2	0	0	0	0	0	0	5
% Buses	0	0.7	2.2	0	0	0	0	0	0	1.6	0	0	0	0	0	0	1
Single-Unit Trucks	0	28	1	0	0	0	0	0	5	35	0	0	9	0	2	0	80
% Single-Unit Trucks	0	10.1	2.2	0	0	0	0	0	62.5	27.3	0	0	31	0	40	0	16.1
Articulated Trucks	0	12	1	0	0	0	0	0	0	7	0	0	3	0	0	0	23
% Articulated Trucks	0	4.3	2.2	0	0	0	0	0	0	5.5	0	0	10.3	0	0	0	4.6
Bicycles on Road	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	2	7
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100	1.4

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Hookela Pl
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAKEPONO ST SOUTHBOUND					WESTBOUND					MAKEPONO ST NORTHBOUND					HOOKELA PL EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 06:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	0	33	5	**3**	41	0	0	0	0	0	0	9	0	0	9	**3**	0	1	0	4	54
06:15	0	**41**	**9**	0	**50**	0	0	0	0	0	1	**26**	0	0	**27**	3	0	0	0	3	**80**
06:30	0	41	4	2	47	0	0	0	0	0	**2**	25	0	0	27	1	0	1	**1**	3	77
06:45	0	25	4	0	29	0	0	0	0	0	2	22	0	0	24	3	0	**2**	0	**5**	58
Total Volume	0	140	22	5	167	0	0	0	0	0	5	82	0	0	87	10	0	4	1	15	269
% App. Total	0	83.8	13.2	3		0	0	0	0		5.7	94.3	0	0		66.7	0	26.7	6.7		
PHF	.000	.854	.611	.417	.835	.000	.000	.000	.000	.000	.625	.788	.000	.000	.806	.833	.000	.500	.250	.750	.841



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Private Dwy - Back Entrance
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

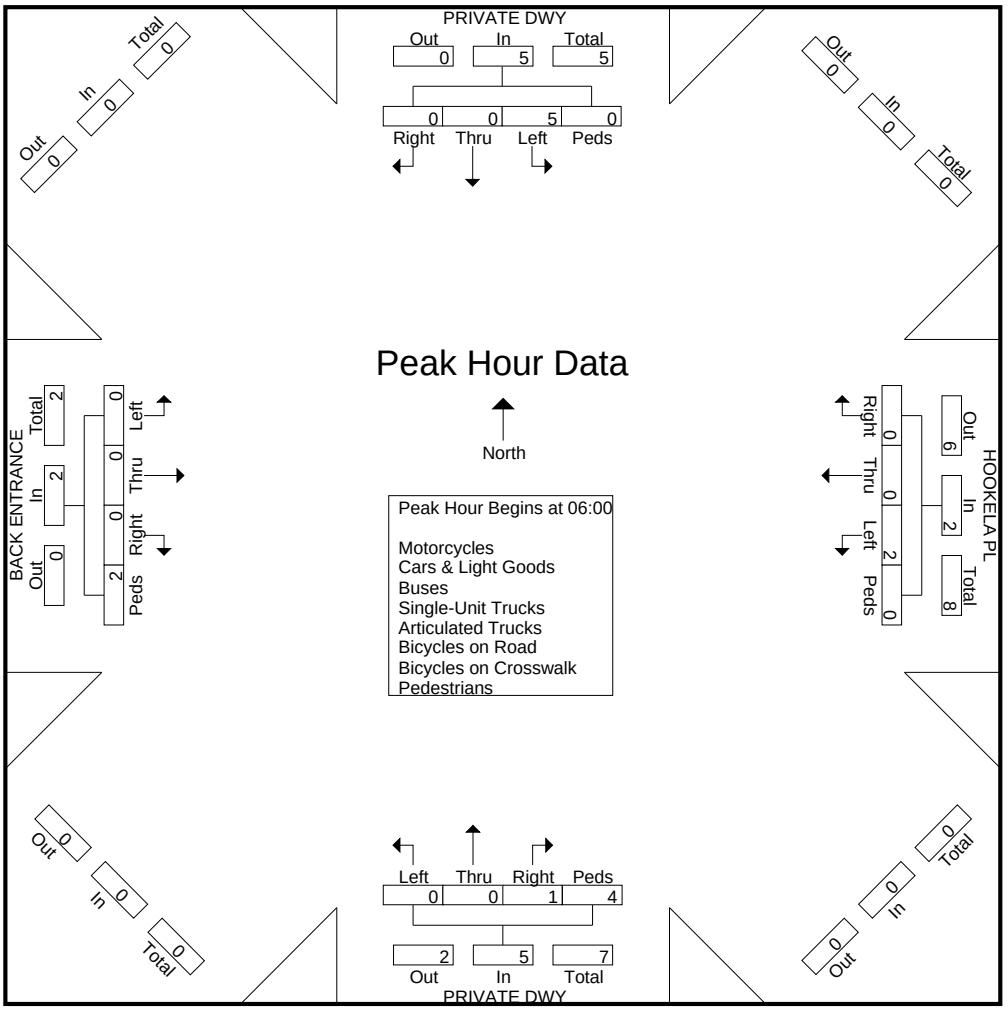
	PRIVATE DWY SOUTHBOUND				HOOKELA PL WESTBOUND				PRIVATE DWY NORTHBOUND				BACK ENTRANCE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
05:30	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	4
05:45	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	3
Total	2	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	7
06:00	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
06:15	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
06:45	1	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	4
Total	5	0	0	0	2	0	0	0	0	0	1	4	0	0	0	2	14
07:00	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
07:15	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	3
Grand Total	7	0	0	0	3	0	4	2	0	0	3	4	0	0	0	2	25
Apprch %	100	0	0	0	33.3	0	44.4	22.2	0	0	42.9	57.1	0	0	0	100	
Total %	28	0	0	0	12	0	16	8	0	0	12	16	0	0	0	8	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
% Cars & Light Goods	14.3	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	8
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	3	0	0	0	3	0	2	0	0	0	3	0	0	0	0	0	11
% Single-Unit Trucks	42.9	0	0	0	100	0	50	0	0	0	100	0	0	0	0	0	44
Articulated Trucks	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
% Articulated Trucks	42.9	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	16
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	2	8
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	100	32

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Private Dwy - Back Entrance
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	PRIVATE DWY SOUTHBOUND					HOOKELA PL WESTBOUND					PRIVATE DWY NORTHBOUND					BACK ENTRANCE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 06:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:00																					
06:00	**4**	0	0	0	**4**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**	**4**	0	0	0	0	0	4
06:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**	**2**	2
06:45	1	0	0	0	1	**2**	0	0	0	**2**	0	0	**1**	0	1	0	0	0	0	0	4
Total Volume	5	0	0	0	5	2	0	0	0	2	0	0	1	4	5	0	0	0	2	2	14
% App. Total	100	0	0	0		100	0	0	0		0	0	20	80		0	0	0	100		
PHF	.313	.000	.000	.000	.313	.250	.000	.000	.000	.250	.000	.000	.250	.250	.313	.000	.000	.000	.250	.250	.875



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Sand Island Pkwy - Horizon Line Dwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

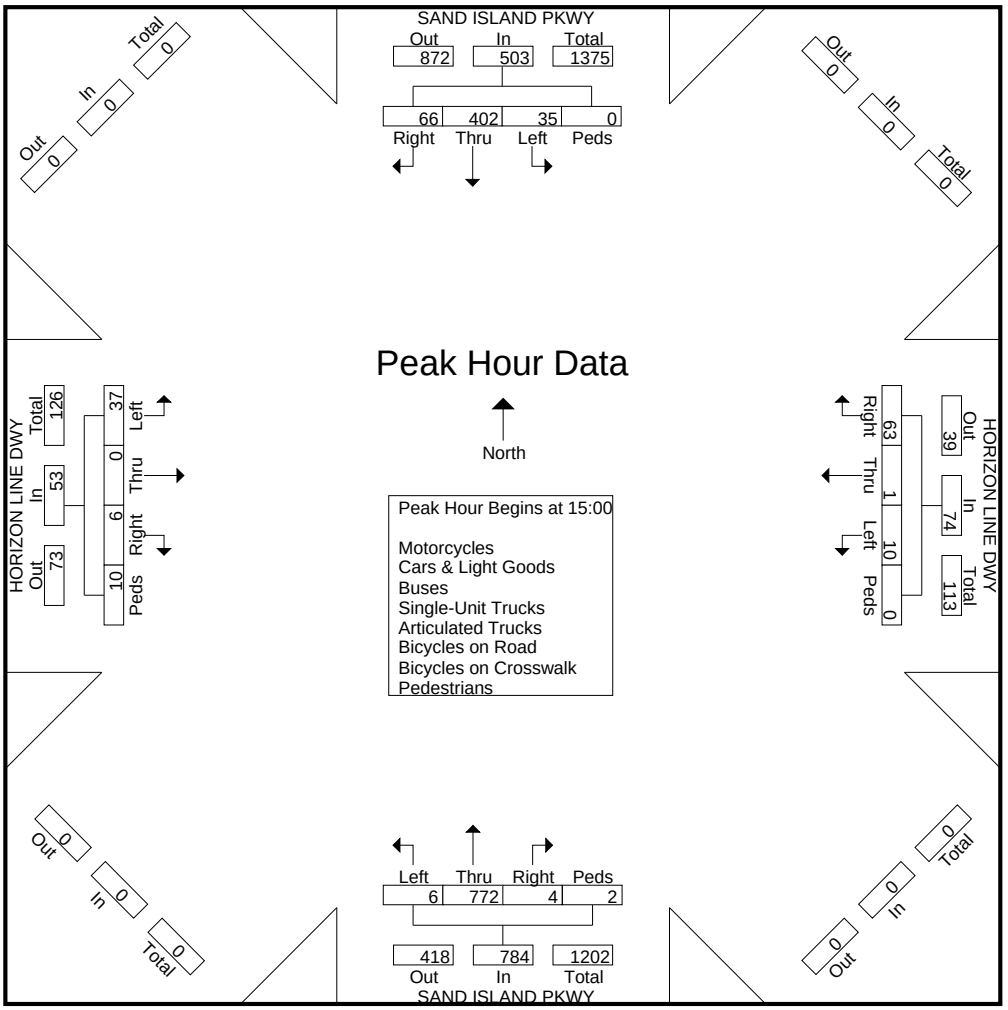
	SAND ISLAND PKWY SOUTHBOUND				HORIZON LINE DWY WESTBOUND				SAND ISLAND PKWY NORTHBOUND				HORIZON LINE DWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	13	90	6	0	1	1	14	0	3	149	4	1	15	0	3	3	303
14:45	7	95	9	0	0	0	17	0	3	153	1	0	7	0	2	2	296
Total	20	185	15	0	1	1	31	0	6	302	5	1	22	0	5	5	599
15:00	14	114	9	0	2	0	18	0	1	191	2	0	8	0	1	3	363
15:15	7	96	18	0	2	0	18	0	1	166	0	1	6	0	2	1	318
15:30	7	110	15	0	3	1	9	0	2	222	0	1	10	0	2	4	386
15:45	7	82	24	0	3	0	18	0	2	193	2	0	13	0	1	2	347
Total	35	402	66	0	10	1	63	0	6	772	4	2	37	0	6	10	1414
16:00	3	87	22	0	0	1	14	0	2	172	2	0	13	0	1	2	319
16:15	8	67	35	0	3	0	7	0	1	148	0	0	3	1	4	5	282
Grand Total	66	741	138	0	14	3	115	0	15	1394	11	3	75	1	16	22	2614
Apprch %	7	78.4	14.6	0	10.6	2.3	87.1	0	1.1	98	0.8	0.2	65.8	0.9	14	19.3	
Total %	2.5	28.3	5.3	0	0.5	0.1	4.4	0	0.6	53.3	0.4	0.1	2.9	0	0.6	0.8	
Motorcycles	0	7	0	0	0	0	0	0	0	10	0	0	2	0	0	0	19
% Motorcycles	0	0.9	0	0	0	0	0	0	0	0.7	0	0	2.7	0	0	0	0.7
Cars & Light Goods	9	574	137	0	4	1	28	0	11	1263	5	0	64	1	14	0	2111
% Cars & Light Goods	13.6	77.5	99.3	0	28.6	33.3	24.3	0	73.3	90.6	45.5	0	85.3	100	87.5	0	80.8
Buses	0	4	1	0	0	0	0	0	0	2	0	0	2	0	0	0	9
% Buses	0	0.5	0.7	0	0	0	0	0	0	0.1	0	0	2.7	0	0	0	0.3
Single-Unit Trucks	3	99	0	0	8	2	39	0	3	58	6	0	0	0	2	0	220
% Single-Unit Trucks	4.5	13.4	0	0	57.1	66.7	33.9	0	20	4.2	54.5	0	0	0	12.5	0	8.4
Articulated Trucks	54	57	0	0	2	0	48	0	1	60	0	0	7	0	0	0	229
% Articulated Trucks	81.8	7.7	0	0	14.3	0	41.7	0	6.7	4.3	0	0	9.3	0	0	0	8.8
Bicycles on Road	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	10	11
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	33.3	0	0	0	45.5	0.4
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	12	14
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	66.7	0	0	0	54.5	0.5

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Sand Island Pkwy - Horizon Line Dwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	SAND ISLAND PKWY SOUTHBOUND					HORIZON LINE DWY WESTBOUND					SAND ISLAND PKWY NORTHBOUND					HORIZON LINE DWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	**14**	**114**	9	0	**137**	2	0	**18**	0	20	1	191	**2**	0	194	8	0	1	3	12	363
15:15	7	96	18	0	121	2	0	18	0	20	1	166	0	**1**	168	6	0	**2**	1	9	318
15:30	7	110	15	0	132	**3**	**1**	9	0	13	**2**	**222**	0	1	**225**	10	0	2	**4**	**16**	**386**
15:45	7	82	**24**	0	113	3	0	18	0	**21**	2	193	2	0	197	**13**	0	1	2	16	347
Total Volume	35	402	66	0	503	10	1	63	0	74	6	772	4	2	784	37	0	6	10	53	1414
% App. Total	7	79.9	13.1	0		13.5	1.4	85.1	0		0.8	98.5	0.5	0.3		69.8	0	11.3	18.9		
PHF	.625	.882	.688	.000	.918	.833	.250	.875	.000	.881	.750	.869	.500	.500	.871	.712	.000	.750	.625	.828	.916



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Construction Access - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

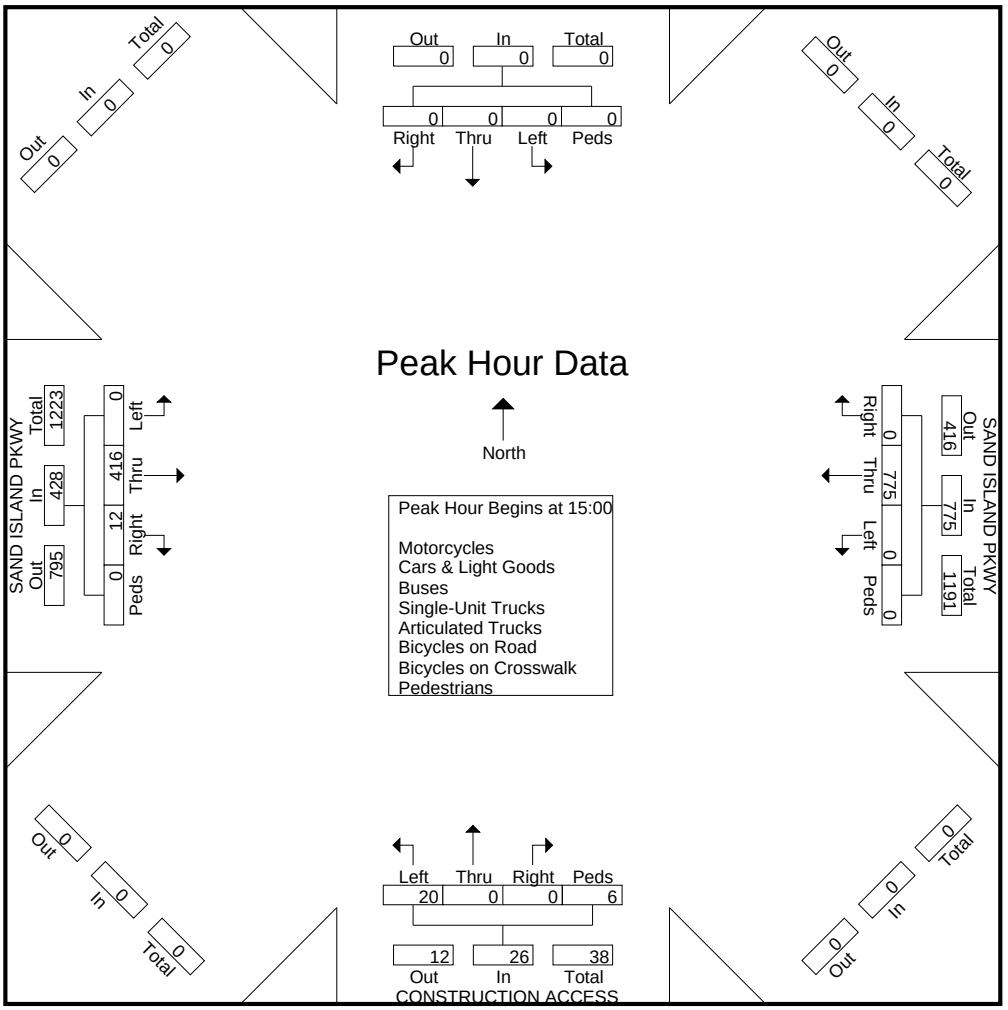
	SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				CONSTRUCTION ACCESS NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	0	0	0	0	0	159	0	0	0	0	0	1	0	95	0	0	255
14:45	0	0	0	0	0	164	0	0	1	0	0	2	0	89	2	0	258
Total	0	0	0	0	0	323	0	0	1	0	0	3	0	184	2	0	513
15:00	0	0	0	0	0	201	0	0	0	0	0	2	0	117	5	0	325
15:15	0	0	0	0	0	164	0	0	4	0	0	0	0	102	2	0	272
15:30	0	0	0	0	0	218	0	0	9	0	0	3	0	108	3	0	341
15:45	0	0	0	0	0	192	0	0	7	0	0	1	0	89	2	0	291
Total	0	0	0	0	0	775	0	0	20	0	0	6	0	416	12	0	1229
16:00	0	0	0	0	0	171	0	0	4	0	1	2	0	90	1	0	269
16:15	0	0	0	0	0	151	0	0	1	0	0	4	0	76	0	0	232
Grand Total	0	0	0	0	0	1420	0	0	26	0	1	15	0	766	15	0	2243
Apprch %	0	0	0	0	0	100	0	0	61.9	0	2.4	35.7	0	98.1	1.9	0	
Total %	0	0	0	0	0	63.3	0	0	1.2	0	0	0.7	0	34.2	0.7	0	
Motorcycles	0	0	0	0	0	12	0	0	0	0	0	0	0	7	0	0	19
% Motorcycles	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0.9	0	0	0.8
Cars & Light Goods	0	0	0	0	0	1271	0	0	26	0	1	0	0	595	6	0	1899
% Cars & Light Goods	0	0	0	0	0	89.5	0	0	100	0	100	0	0	77.7	40	0	84.7
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	6
% Buses	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.5	0	0	0.3
Single-Unit Trucks	0	0	0	0	0	66	0	0	0	0	0	0	0	100	9	0	175
% Single-Unit Trucks	0	0	0	0	0	4.6	0	0	0	0	0	0	0	13.1	60	0	7.8
Articulated Trucks	0	0	0	0	0	61	0	0	0	0	0	0	0	60	0	0	121
% Articulated Trucks	0	0	0	0	0	4.3	0	0	0	0	0	0	0	7.8	0	0	5.4
Bicycles on Road	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	8
% Bicycles on Road	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.4
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0.3
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	0.4

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Construction Access - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					CONSTRUCTION ACCESS NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	0	0	0	0	0	0	201	0	0	201	0	0	0	2	2	0	**117**	**5**	0	**122**	325
15:15	0	0	0	0	0	0	164	0	0	164	4	0	0	0	4	0	102	2	0	104	272
15:30	0	0	0	0	0	0	**218**	0	0	**218**	**9**	0	0	**3**	**12**	0	108	3	0	111	**341**
15:45	0	0	0	0	0	0	192	0	0	192	7	0	0	1	8	0	89	2	0	91	291
Total Volume	0	0	0	0	0	0	775	0	0	775	20	0	0	6	26	0	416	12	0	428	1229
% App. Total	0	0	0	0		0	100	0	0		76.9	0	0	23.1		0	97.2	2.8	0		
PHF	.000	.000	.000	.000	.000	.000	.889	.000	.000	.889	.556	.000	.000	.500	.542	.000	.889	.600	.000	.877	.901



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Main Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

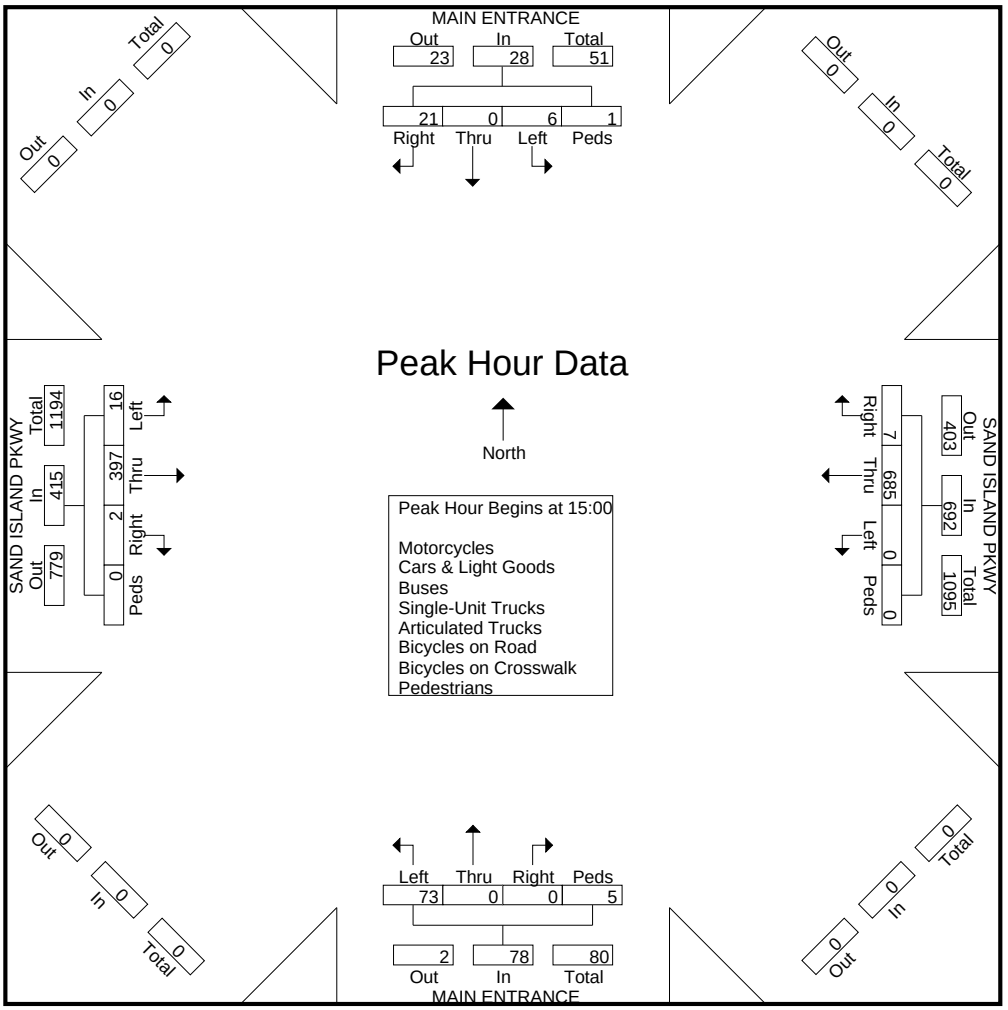
	MAIN ENTRANCE SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				MAIN ENTRANCE NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	2	0	6	0	0	145	6	0	13	0	0	1	3	95	1	0	272
14:45	3	0	6	1	0	141	3	0	12	1	0	2	0	88	0	0	257
Total	5	0	12	1	0	286	9	0	25	1	0	3	3	183	1	0	529
15:00	1	0	4	1	0	162	2	0	36	0	0	1	7	112	1	0	327
15:15	2	0	6	0	0	147	3	0	11	0	0	0	5	97	0	0	271
15:30	1	0	5	0	0	206	1	0	10	0	0	3	1	104	0	0	331
15:45	2	0	6	0	0	170	1	0	16	0	0	1	3	84	1	0	284
Total	6	0	21	1	0	685	7	0	73	0	0	5	16	397	2	0	1213
16:00	3	0	13	0	0	155	2	0	6	0	0	2	0	90	1	0	272
16:15	1	0	6	0	0	144	0	0	1	0	0	4	0	73	2	0	231
Grand Total	15	0	52	2	0	1270	18	0	105	1	0	14	19	743	6	0	2245
Apprch %	21.7	0	75.4	2.9	0	98.6	1.4	0	87.5	0.8	0	11.7	2.5	96.7	0.8	0	
Total %	0.7	0	2.3	0.1	0	56.6	0.8	0	4.7	0	0	0.6	0.8	33.1	0.3	0	
Motorcycles	0	0	0	0	0	14	0	0	0	0	0	0	0	7	0	0	21
% Motorcycles	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0.9	0	0	0.9
Cars & Light Goods	15	0	50	0	0	1125	17	0	102	1	0	0	19	575	4	0	1908
% Cars & Light Goods	100	0	96.2	0	0	88.6	94.4	0	97.1	100	0	0	100	77.4	66.7	0	85
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	6
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.5	0	0	0.3
Single-Unit Trucks	0	0	2	0	0	63	1	0	2	0	0	0	0	99	2	0	169
% Single-Unit Trucks	0	0	3.8	0	0	5	5.6	0	1.9	0	0	0	0	13.3	33.3	0	7.5
Articulated Trucks	0	0	0	0	0	60	0	0	0	0	0	0	0	58	0	0	118
% Articulated Trucks	0	0	0	0	0	4.7	0	0	0	0	0	0	0	7.8	0	0	5.3
Bicycles on Road	0	0	0	0	0	6	0	0	1	0	0	0	0	0	0	0	7
% Bicycles on Road	0	0	0	0	0	0.5	0	0	1	0	0	0	0	0	0	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	35.7	0	0	0	0	0.2
Pedestrians	0	0	0	2	0	0	0	0	0	0	0	9	0	0	0	0	11
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	64.3	0	0	0	0	0.5

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Main Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAIN ENTRANCE SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					MAIN ENTRANCE NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	1	0	4	**1**	6	0	162	2	0	164	**36**	0	0	1	**37**	**7**	**112**	**1**	0	**120**	327
15:15	**2**	0	**6**	0	**8**	0	147	**3**	0	150	11	0	0	0	11	5	97	0	0	102	271
15:30	1	0	5	0	6	0	**206**	1	0	**207**	10	0	0	**3**	13	1	104	0	0	105	**331**
15:45	2	0	6	0	8	0	170	1	0	171	16	0	0	1	17	3	84	1	0	88	284
Total Volume	6	0	21	1	28	0	685	7	0	692	73	0	0	5	78	16	397	2	0	415	1213
% App. Total	21.4	0	75	3.6		0	99	1	0		93.6	0	0	6.4		3.9	95.7	0.5	0		
PHF	.750	.000	.875	.250	.875	.000	.831	.583	.000	.836	.507	.000	.000	.417	.527	.571	.886	.500	.000	.865	.916



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Matson Offices Dwy - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

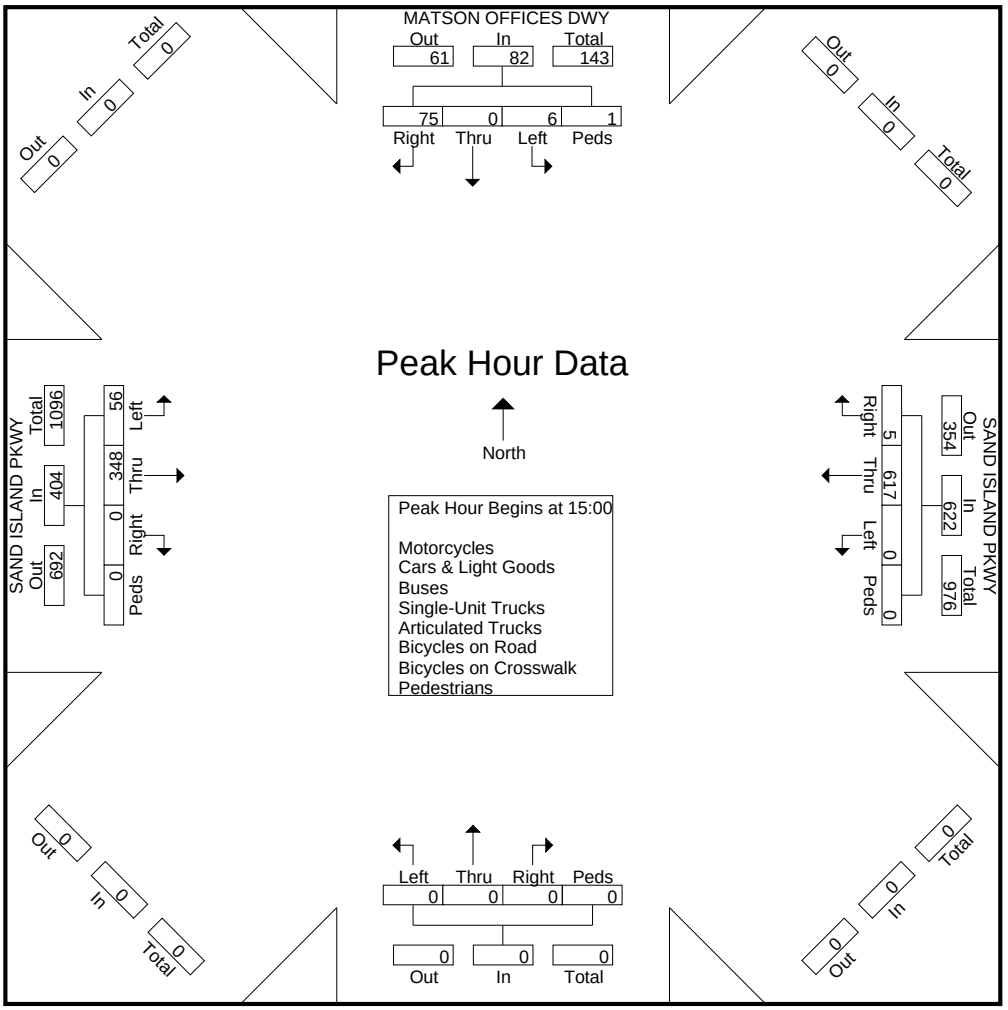
	MATSON OFFICES DWY SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	1	0	29	0	0	125	0	0	0	0	0	0	16	80	0	0	251
14:45	2	0	27	0	0	118	1	0	0	0	0	0	11	81	0	0	240
Total	3	0	56	0	0	243	1	0	0	0	0	0	27	161	0	0	491
15:00	1	0	21	1	0	145	3	0	0	0	0	0	16	95	0	0	282
15:15	3	0	20	0	0	128	1	0	0	0	0	0	15	85	0	0	252
15:30	1	0	18	0	0	189	1	0	0	0	0	0	11	95	0	0	315
15:45	1	0	16	0	0	155	0	0	0	0	0	0	14	73	0	0	259
Total	6	0	75	1	0	617	5	0	0	0	0	0	56	348	0	0	1108
16:00	2	0	21	1	0	137	1	0	0	0	0	0	10	81	0	0	253
16:15	5	0	9	0	0	133	7	0	0	0	0	0	9	68	0	0	231
Grand Total	16	0	161	2	0	1130	14	0	0	0	0	0	102	658	0	0	2083
Apprch %	8.9	0	89.9	1.1	0	98.8	1.2	0	0	0	0	0	13.4	86.6	0	0	
Total %	0.8	0	7.7	0.1	0	54.2	0.7	0	0	0	0	0	4.9	31.6	0	0	
Motorcycles	0	0	1	0	0	14	0	0	0	0	0	0	0	7	0	0	22
% Motorcycles	0	0	0.6	0	0	1.2	0	0	0	0	0	0	0	1.1	0	0	1.1
Cars & Light Goods	8	0	69	0	0	1079	11	0	0	0	0	0	37	550	0	0	1754
% Cars & Light Goods	50	0	42.9	0	0	95.5	78.6	0	0	0	0	0	36.3	83.6	0	0	84.2
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	4	0	0	6
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.6	0	0	0.3
Single-Unit Trucks	2	0	34	0	0	29	2	0	0	0	0	0	27	75	0	0	169
% Single-Unit Trucks	12.5	0	21.1	0	0	2.6	14.3	0	0	0	0	0	26.5	11.4	0	0	8.1
Articulated Trucks	6	0	57	0	0	3	1	0	0	0	0	0	38	22	0	0	127
% Articulated Trucks	37.5	0	35.4	0	0	0.3	7.1	0	0	0	0	0	37.3	3.3	0	0	6.1
Bicycles on Road	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0.1

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Matson Offices Dwy - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MATSON OFFICES DWY SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	1	0	**21**	**1**	**23**	0	145	**3**	0	148	0	0	0	0	0	**16**	**95**	0	0	**111**	282
15:15	**3**	0	20	0	23	0	128	1	0	129	0	0	0	0	0	15	85	0	0	100	252
15:30	1	0	18	0	19	0	**189**	1	0	**190**	0	0	0	0	0	11	95	0	0	106	**315**
15:45	1	0	16	0	17	0	155	0	0	155	0	0	0	0	0	14	73	0	0	87	259
Total Volume	6	0	75	1	82	0	617	5	0	622	0	0	0	0	0	56	348	0	0	404	1108
% App. Total	7.3	0	91.5	1.2		0	99.2	0.8	0		0	0	0	0		13.9	86.1	0	0		
PHF	.500	.000	.893	.250	.891	.000	.816	.417	.000	.818	.000	.000	.000	.000	.000	.875	.916	.000	.000	.910	.879



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

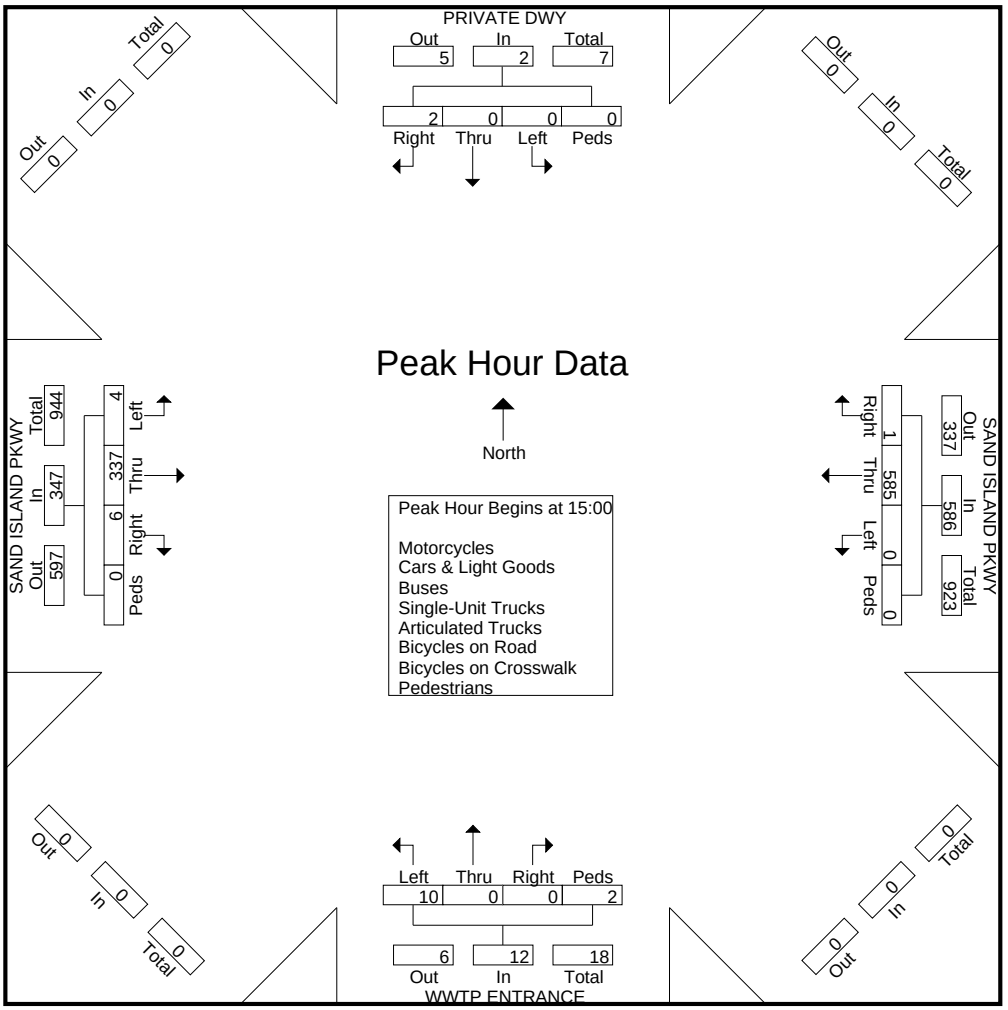
	PRIVATE DWY SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				WWTP ENTRANCE NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	0	0	0	0	0	108	0	0	1	0	0	1	0	70	1	0	181
14:45	0	0	0	0	0	114	0	0	1	0	0	1	2	82	2	0	202
Total	0	0	0	0	0	222	0	0	2	0	0	2	2	152	3	0	383
15:00	0	0	0	0	0	136	1	0	4	0	0	0	1	89	1	0	232
15:15	0	0	0	0	0	116	0	0	1	0	0	0	0	90	1	0	208
15:30	0	0	1	0	0	186	0	0	1	0	0	0	2	89	3	0	282
15:45	0	0	1	0	0	147	0	0	4	0	0	2	1	69	1	0	225
Total	0	0	2	0	0	585	1	0	10	0	0	2	4	337	6	0	947
16:00	0	0	2	0	0	125	1	0	6	0	0	1	1	77	0	0	213
16:15	0	0	4	0	0	114	0	0	2	0	0	4	0	66	0	0	190
Grand Total	0	0	8	0	0	1046	2	0	20	0	0	9	7	632	9	0	1733
Apprch %	0	0	100	0	0	99.8	0.2	0	69	0	0	31	1.1	97.5	1.4	0	
Total %	0	0	0.5	0	0	60.4	0.1	0	1.2	0	0	0.5	0.4	36.5	0.5	0	
Motorcycles	0	0	0	0	0	14	0	0	0	0	0	0	1	6	0	0	21
% Motorcycles	0	0	0	0	0	1.3	0	0	0	0	0	0	14.3	0.9	0	0	1.2
Cars & Light Goods	0	0	8	0	0	992	2	0	20	0	0	0	6	517	8	0	1553
% Cars & Light Goods	0	0	100	0	0	94.8	100	0	100	0	0	0	85.7	81.8	88.9	0	89.6
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	0	5
% Buses	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0.5	0	0	0.3
Single-Unit Trucks	0	0	0	0	0	32	0	0	0	0	0	0	0	78	0	0	110
% Single-Unit Trucks	0	0	0	0	0	3.1	0	0	0	0	0	0	0	12.3	0	0	6.3
Articulated Trucks	0	0	0	0	0	3	0	0	0	0	0	0	0	28	0	0	31
% Articulated Trucks	0	0	0	0	0	0.3	0	0	0	0	0	0	0	4.4	0	0	1.8
Bicycles on Road	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	4
% Bicycles on Road	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	11.1	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	11.1	0	0	0	0	0.1
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	8
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	88.9	0	0	0	0	0.5

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : WWTP Entrance - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	PRIVATE DWY SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					WWTP ENTRANCE NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	0	0	0	0	0	0	136	**1**	0	137	**4**	0	0	0	4	1	89	1	0	91	232
15:15	0	0	0	0	0	0	116	0	0	116	1	0	0	0	1	0	**90**	1	0	91	208
15:30	0	0	**1**	0	**1**	0	**186**	0	0	**186**	1	0	0	0	1	**2**	89	**3**	0	**94**	**282**
15:45	0	0	1	0	1	0	147	0	0	147	4	0	0	**2**	**6**	1	69	1	0	71	225
Total Volume	0	0	2	0	2	0	585	1	0	586	10	0	0	2	12	4	337	6	0	347	947
% App. Total	0	0	100	0		0	99.8	0.2	0		83.3	0	0	16.7		1.2	97.1	1.7	0		
PHF	.000	.000	.500	.000	.500	.000	.786	.250	.000	.788	.625	.000	.000	.250	.500	.500	.936	.500	.000	.923	.840



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

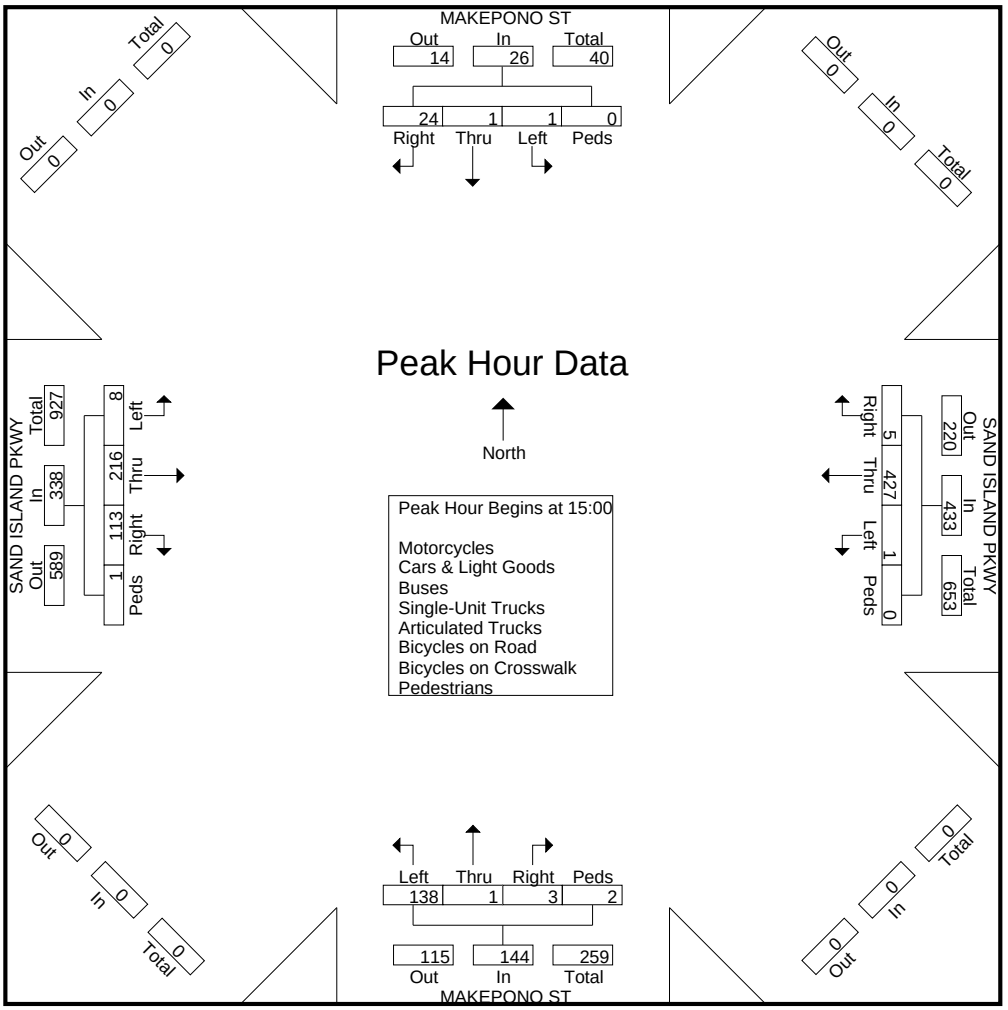
	MAKEPONO ST SOUTHBOUND				SAND ISLAND PKWY WESTBOUND				MAKEPONO ST NORTHBOUND				SAND ISLAND PKWY EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	0	0	3	1	0	79	0	0	30	0	1	0	1	45	28	0	188
14:45	0	0	3	1	1	72	1	0	36	0	0	0	0	48	33	0	195
Total	0	0	6	2	1	151	1	0	66	0	1	0	1	93	61	0	383
15:00	0	0	5	0	0	112	0	0	27	0	2	0	3	54	31	0	234
15:15	1	0	2	0	1	81	3	0	27	0	1	0	0	63	28	0	207
15:30	0	0	8	0	0	138	1	0	48	1	0	1	3	60	26	0	286
15:45	0	1	9	0	0	96	1	0	36	0	0	1	2	39	28	1	214
Total	1	1	24	0	1	427	5	0	138	1	3	2	8	216	113	1	941
16:00	0	0	5	0	0	75	0	0	42	0	0	1	3	44	29	0	199
16:15	0	0	5	0	0	73	0	0	38	0	1	3	1	42	23	0	186
Grand Total	1	1	40	2	2	726	6	0	284	1	5	6	13	395	226	1	1709
Apprch %	2.3	2.3	90.9	4.5	0.3	98.9	0.8	0	95.9	0.3	1.7	2	2	62.2	35.6	0.2	
Total %	0.1	0.1	2.3	0.1	0.1	42.5	0.4	0	16.6	0.1	0.3	0.4	0.8	23.1	13.2	0.1	
Motorcycles	0	0	0	0	0	9	0	0	4	0	0	0	0	6	0	0	19
% Motorcycles	0	0	0	0	0	1.2	0	0	1.4	0	0	0	0	1.5	0	0	1.1
Cars & Light Goods	1	1	37	0	1	691	2	0	265	0	4	0	11	345	153	0	1511
% Cars & Light Goods	100	100	92.5	0	50	95.2	33.3	0	93.3	0	80	0	84.6	87.3	67.7	0	88.4
Buses	0	0	0	0	0	1	0	0	1	0	0	0	0	1	2	0	5
% Buses	0	0	0	0	0	0.1	0	0	0.4	0	0	0	0	0.3	0.9	0	0.3
Single-Unit Trucks	0	0	3	0	1	16	4	0	12	1	1	0	1	33	53	0	125
% Single-Unit Trucks	0	0	7.5	0	50	2.2	66.7	0	4.2	100	20	0	7.7	8.4	23.5	0	7.3
Articulated Trucks	0	0	0	0	0	4	0	0	2	0	0	0	1	10	18	0	35
% Articulated Trucks	0	0	0	0	0	0.6	0	0	0.7	0	0	0	7.7	2.5	8	0	2
Bicycles on Road	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	5
% Bicycles on Road	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	0	0	0	0	6	0	0	0	1	9
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	100	0.5

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Sand Island Pkwy
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAKEPONO ST SOUTHBOUND					SAND ISLAND PKWY WESTBOUND					MAKEPONO ST NORTHBOUND					SAND ISLAND PKWY EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	0	0	5	0	5	0	112	0	0	112	27	0	**2**	0	29	**3**	54	**31**	0	88	234
15:15	**1**	0	2	0	3	**1**	81	**3**	0	85	27	0	1	0	28	0	**63**	28	0	**91**	207
15:30	0	0	8	0	8	0	**138**	1	0	**139**	**48**	**1**	0	**1**	**50**	3	60	26	0	89	**286**
15:45	0	**1**	**9**	0	**10**	0	96	1	0	97	36	0	0	1	37	2	39	28	**1**	70	214
Total Volume	1	1	24	0	26	1	427	5	0	433	138	1	3	2	144	8	216	113	1	338	941
% App. Total	3.8	3.8	92.3	0		0.2	98.6	1.2	0		95.8	0.7	2.1	1.4		2.4	63.9	33.4	0.3		
PHF	.250	.250	.667	.000	.650	.250	.774	.417	.000	.779	.719	.250	.375	.500	.720	.667	.857	.911	.250	.929	.823



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Hookela Pl
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

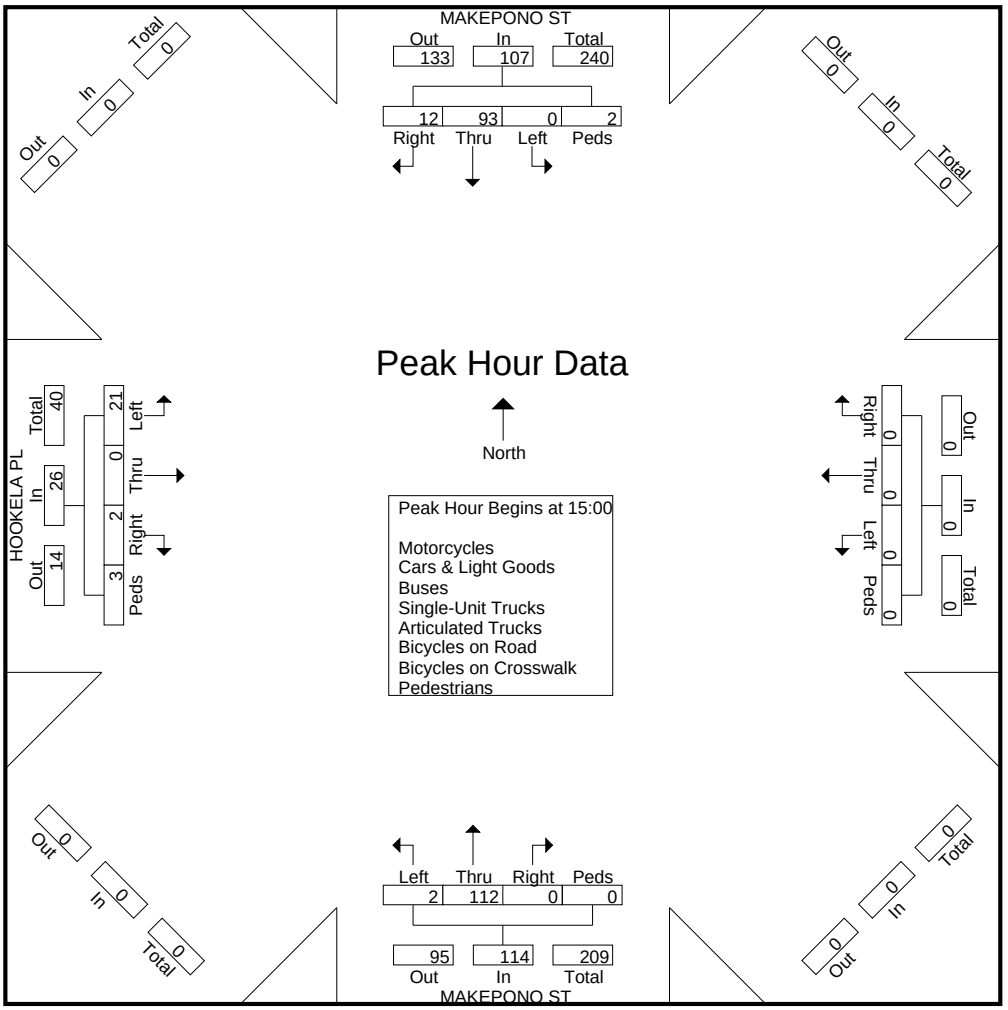
	MAKEPONO ST SOUTHBOUND				WESTBOUND				MAKEPONO ST NORTHBOUND				HOOKELA PL EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	0	22	4	0	0	0	0	0	0	21	0	0	6	0	1	0	54
14:45	0	27	4	0	0	0	0	0	0	27	0	0	5	0	0	0	63
Total	0	49	8	0	0	0	0	0	0	48	0	0	11	0	1	0	117
15:00	0	23	5	0	0	0	0	0	1	18	0	0	6	0	1	0	54
15:15	0	28	0	0	0	0	0	0	1	22	0	0	5	0	1	0	57
15:30	0	21	3	0	0	0	0	0	0	44	0	0	5	0	0	2	75
15:45	0	21	4	2	0	0	0	0	0	28	0	0	5	0	0	1	61
Total	0	93	12	2	0	0	0	0	2	112	0	0	21	0	2	3	247
16:00	0	22	5	1	0	0	0	0	0	39	0	0	5	0	0	0	72
16:15	0	20	2	0	0	0	0	0	0	26	0	0	10	0	1	0	59
Grand Total	0	184	27	3	0	0	0	0	2	225	0	0	47	0	4	3	495
Apprch %	0	86	12.6	1.4	0	0	0	0	0.9	99.1	0	0	87	0	7.4	5.6	
Total %	0	37.2	5.5	0.6	0	0	0	0	0.4	45.5	0	0	9.5	0	0.8	0.6	
Motorcycles	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4
% Motorcycles	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0.8
Cars & Light Goods	0	135	19	0	0	0	0	0	1	206	0	0	47	0	3	0	411
% Cars & Light Goods	0	73.4	70.4	0	0	0	0	0	50	91.6	0	0	100	0	75	0	83
Buses	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
% Buses	0	1.1	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.6
Single-Unit Trucks	0	40	5	0	0	0	0	0	1	13	0	0	0	0	1	0	60
% Single-Unit Trucks	0	21.7	18.5	0	0	0	0	0	50	5.8	0	0	0	0	25	0	12.1
Articulated Trucks	0	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	10
% Articulated Trucks	0	3.8	11.1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Bicycles on Road	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	6
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100	1.2

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Makepono St - Hookela Pl
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	MAKEPONO ST SOUTHBOUND					WESTBOUND					MAKEPONO ST NORTHBOUND					HOOKELA PL EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 15:00 to 15:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	0	23	**5**	0	**28**	0	0	0	0	0	**1**	18	0	0	19	**6**	0	**1**	0	**7**	54
15:15	0	**28**	0	0	28	0	0	0	0	0	1	22	0	0	23	5	0	1	0	6	57
15:30	0	21	3	0	24	0	0	0	0	0	0	**44**	0	0	**44**	5	0	0	**2**	7	**75**
15:45	0	21	4	**2**	27	0	0	0	0	0	0	28	0	0	28	5	0	0	1	6	61
Total Volume	0	93	12	2	107	0	0	0	0	0	2	112	0	0	114	21	0	2	3	26	247
% App. Total	0	86.9	11.2	1.9		0	0	0	0		1.8	98.2	0	0		80.8	0	7.7	11.5		
PHF	.000	.830	.600	.250	.955	.000	.000	.000	.000	.000	.500	.636	.000	.000	.648	.875	.000	.500	.375	.929	.823



Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Private Dwy - Back Entrance
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

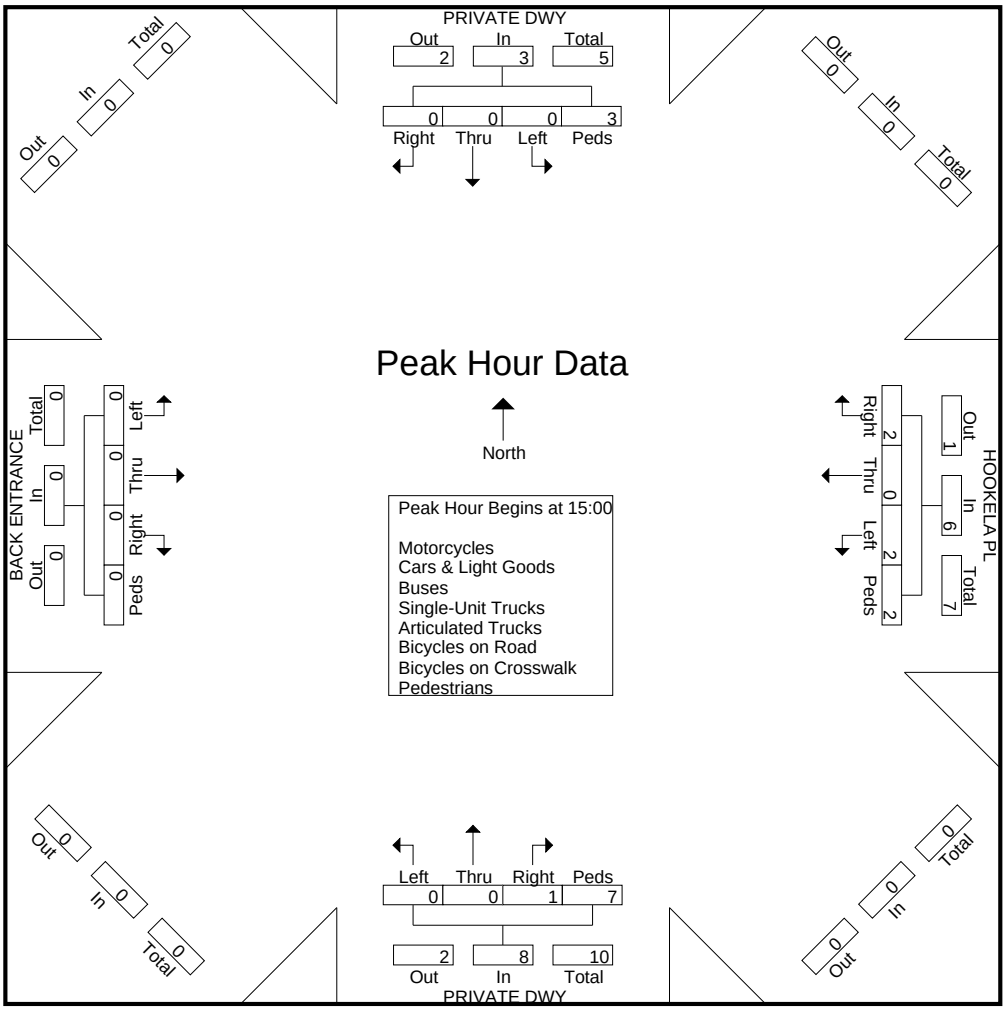
	PRIVATE DWY SOUTHBOUND				HOOKELA PL WESTBOUND				PRIVATE DWY NORTHBOUND				BACK ENTRANCE EASTBOUND				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
14:30	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
14:45	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	4
Total	0	0	0	0	2	0	1	0	0	0	3	0	0	0	0	0	6
15:00	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2
15:15	0	0	0	0	2	0	0	0	0	0	1	2	0	0	0	0	5
15:30	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	3
15:45	0	0	0	1	0	0	0	2	0	0	0	4	0	0	0	0	7
Total	0	0	0	3	2	0	2	2	0	0	1	7	0	0	0	0	17
16:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
16:15	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Grand Total	0	0	0	3	5	0	4	2	0	0	4	7	0	0	0	0	25
Apprch %	0	0	0	100	45.5	0	36.4	18.2	0	0	36.4	63.6	0	0	0	0	
Total %	0	0	0	12	20	0	16	8	0	0	16	28	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	0	0	0	3	0	1	0	0	0	3	0	0	0	0	0	7
% Cars & Light Goods	0	0	0	0	60	0	25	0	0	0	75	0	0	0	0	0	28
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	3
% Single-Unit Trucks	0	0	0	0	40	0	0	0	0	0	25	0	0	0	0	0	12
Articulated Trucks	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3
% Articulated Trucks	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	12
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	3	0	0	0	2	0	0	0	7	0	0	0	0	12
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	0	48

Austin Tsutsumi & Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: 533-3646 Fax: 526-1267

File Name : Private Dwy - Back Entrance
Site Code : 18-046 Sand Island WWTP
Start Date : 7/12/2018
Page No : 2

	PRIVATE DWY SOUTHBOUND					HOOKELA PL WESTBOUND					PRIVATE DWY NORTHBOUND					BACK ENTRANCE EASTBOUND					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 14:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:00																					
15:00	0	0	0	0	0	0	0	**1**	0	1	0	0	0	1	1	0	0	0	0	0	2
15:15	0	0	0	0	0	**2**	0	0	0	**2**	0	0	**1**	2	3	0	0	0	0	0	5
15:30	0	0	0	**2**	**2**	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
15:45	0	0	0	1	1	0	0	0	**2**	2	0	0	0	**4**	**4**	0	0	0	0	0	**7**
Total Volume	0	0	0	3	3	2	0	2	2	6	0	0	1	7	8	0	0	0	0	0	17
% App. Total	0	0	0	100		33.3	0	33.3	33.3		0	0	12.5	87.5		0	0	0	0		
PHF	.000	.000	.000	.375	.375	.250	.000	.500	.250	.750	.000	.000	.250	.438	.500	.000	.000	.000	.000	.000	.607



APPENDIX B

LEVEL OF SERVICE CRITERIA

APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th Edition)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th Edition)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	7	8	6	0	41	13	341	7	63	999	22
Future Volume (veh/h)	6	7	8	6	0	41	13	341	7	63	999	22
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	0.98		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1290	1900	1900	950	1105	1124	1424	1900	1195	1710	1900
Adj Flow Rate, veh/h	7	8	1	7	0	2	14	371	7	68	1086	23
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	70	70	70	0	0	72	69	32	32	59	11	11
Cap, veh/h	177	31	4	257	0	60	19	1411	27	79	1856	39
Arrive On Green	0.06	0.06	0.06	0.06	0.00	0.06	0.02	0.52	0.52	0.07	0.57	0.57
Sat Flow, veh/h	429	491	61	765	0	931	1071	2716	51	1138	3252	69
Grp Volume(v), veh/h	16	0	0	7	0	2	14	185	193	68	542	567
Grp Sat Flow(s),veh/h/ln	981	0	0	765	0	931	1071	1353	1415	1138	1624	1697
Q Serve(g_s), s	0.5	0.0	0.0	0.0	0.0	0.1	0.4	2.6	2.6	2.0	7.4	7.4
Cycle Q Clear(g_c), s	0.7	0.0	0.0	0.3	0.0	0.1	0.4	2.6	2.6	2.0	7.4	7.4
Prop In Lane	0.44		0.06	1.00		1.00	1.00		0.04	1.00		0.04
Lane Grp Cap(c), veh/h	213	0	0	257	0	60	19	703	735	79	927	969
V/C Ratio(X)	0.08	0.00	0.00	0.03	0.00	0.03	0.72	0.26	0.26	0.86	0.59	0.59
Avail Cap(c_a), veh/h	1136	0	0	842	0	835	495	1995	2086	1349	3569	3729
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.6	0.0	0.0	15.3	0.0	15.2	16.9	4.6	4.6	15.9	4.8	4.8
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.0	0.0	0.2	39.0	0.2	0.2	22.5	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	0.1	0.0	0.0	0.3	1.0	1.1	1.1	3.3	3.5
LnGrp Delay(d),s/veh	15.8	0.0	0.0	15.3	0.0	15.4	55.9	4.8	4.8	38.5	5.4	5.3
LnGrp LOS	B			B		B	E	A	A	D	A	A
Approach Vol, veh/h		16			9			392			1177	
Approach Delay, s/veh		15.8			15.3			6.6			7.3	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.4	22.0		6.2	4.6	23.7		6.2
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	41.0	51.0		31.0	16.0	76.0		31.0
Max Q Clear Time (g_c+I1), s	4.0	4.6		2.7	2.4	9.4		2.3
Green Ext Time (p_c), s	0.2	2.5		0.0	0.0	10.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	7.2
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	984	26	2	372	5	3
Future Vol, veh/h	984	26	2	372	5	3
Conflicting Peds, #/hr	0	11	11	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	12	9	0	34	50	0
Mvmt Flow	1070	28	2	404	5	3

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1109	0	1301	560
Stage 1	-	-	-	-	1095	-
Stage 2	-	-	-	-	206	-
Critical Hdwy	-	-	4.1	-	7.8	6.9
Critical Hdwy Stg 1	-	-	-	-	6.8	-
Critical Hdwy Stg 2	-	-	-	-	6.8	-
Follow-up Hdwy	-	-	2.2	-	4	3.3
Pot Cap-1 Maneuver	-	-	637	-	102	477
Stage 1	-	-	-	-	197	-
Stage 2	-	-	-	-	682	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	630	-	101	472
Mov Cap-2 Maneuver	-	-	-	-	182	-
Stage 1	-	-	-	-	194	-
Stage 2	-	-	-	-	682	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	20.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	236	-	-	630	-
HCM Lane V/C Ratio	0.037	-	-	0.003	-
HCM Control Delay (s)	20.8	-	-	10.7	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	894	81	3	364	7	11	0	0	3	0	0
Future Vol, veh/h	15	894	81	3	364	7	11	0	0	3	0	0
Conflicting Peds, #/hr	0	0	10	10	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	13	0	67	34	0	27	0	0	0	0	0
Mvmt Flow	16	972	88	3	396	8	12	0	0	3	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	404	0	0	1070	0	0	1262	1468	540	924	1508	202
Stage 1	-	-	-	-	-	-	1058	1058	-	406	406	-
Stage 2	-	-	-	-	-	-	204	410	-	518	1102	-
Critical Hdwy	4.1	-	-	5.44	-	-	8.04	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.87	-	-	3.77	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1166	-	-	370	-	-	103	129	491	227	122	811
Stage 1	-	-	-	-	-	-	200	304	-	598	601	-
Stage 2	-	-	-	-	-	-	712	599	-	514	290	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1166	-	-	366	-	-	100	125	486	223	118	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	183	267	-	412	254	-
Stage 1	-	-	-	-	-	-	195	297	-	590	596	-
Stage 2	-	-	-	-	-	-	706	594	-	507	283	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	26	13.8
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	183	1166	-	-	366	-	-	412
HCM Lane V/C Ratio	0.065	0.014	-	-	0.009	-	-	0.008
HCM Control Delay (s)	26	8.1	-	-	14.9	-	-	13.8
HCM Lane LOS	D	A	-	-	B	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	95	792	285	51	3	88
Future Vol, veh/h	95	792	285	51	3	88
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	51	8	22	88	67	74
Mvmt Flow	103	861	310	55	3	96

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	365	0	-	0	975	338
Stage 1	-	-	-	-	338	-
Stage 2	-	-	-	-	637	-
Critical Hdwy	4.865	-	-	-	7.605	7.31
Critical Hdwy Stg 1	-	-	-	-	6.405	-
Critical Hdwy Stg 2	-	-	-	-	6.805	-
Follow-up Hdwy	2.6845	-	-	-	4.1365	4.003
Pot Cap-1 Maneuver	935	-	-	-	184	543
Stage 1	-	-	-	-	576	-
Stage 2	-	-	-	-	368	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	935	-	-	-	164	543
Mov Cap-2 Maneuver	-	-	-	-	164	-
Stage 1	-	-	-	-	513	-
Stage 2	-	-	-	-	368	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	935	-	-	-	164	543
HCM Lane V/C Ratio	0.11	-	-	-	0.02	0.176
HCM Control Delay (s)	9.3	-	-	-	27.4	13
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1	0.6

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	641	5	0	284	1	3	1	0	0	0	7
Future Vol, veh/h	11	641	5	0	284	1	3	1	0	0	0	7
Conflicting Peds, #/hr	0	0	9	9	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	16	9	14	0	34	0	0	0	0	0	0	13
Mvmt Flow	12	697	5	0	309	1	3	1	0	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	310	0	0	711	0	0	1047	1043	709	1034	1045	310
Stage 1	-	-	-	-	-	-	733	733	-	310	310	-
Stage 2	-	-	-	-	-	-	314	310	-	724	735	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.33
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.344	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.417
Pot Cap-1 Maneuver	1175	-	-	898	-	-	208	231	438	212	231	705
Stage 1	-	-	-	-	-	-	415	429	-	705	663	-
Stage 2	-	-	-	-	-	-	701	663	-	420	428	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1175	-	-	890	-	-	202	227	434	210	227	705
Mov Cap-2 Maneuver	-	-	-	-	-	-	202	227	-	210	227	-
Stage 1	-	-	-	-	-	-	407	421	-	698	663	-
Stage 2	-	-	-	-	-	-	693	663	-	415	420	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	22.7	10.2
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	208	1175	-	-	890	-	-	705
HCM Lane V/C Ratio	0.021	0.01	-	-	-	-	-	0.011
HCM Control Delay (s)	22.7	8.1	-	-	0	-	-	10.2
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	15	455	171	2	156	10	103	0	0	2	0	11
Future Vol, veh/h	15	455	171	2	156	10	103	0	0	2	0	11
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	36	3	13	0	20	82	44	0	0	100	0	83
Mvmt Flow	16	495	186	2	170	11	112	0	0	2	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	181	0	0	682	0	0	807	806	589	800	894	176
Stage 1	-	-	-	-	-	-	621	621	-	180	180	-
Stage 2	-	-	-	-	-	-	186	185	-	620	714	-
Critical Hdwy	4.46	-	-	4.1	-	-	7.54	6.5	6.2	8.1	6.5	7.03
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.524	-	-	2.2	-	-	3.896	4	3.3	4.4	4	4.047
Pot Cap-1 Maneuver	1214	-	-	920	-	-	256	318	512	212	283	695
Stage 1	-	-	-	-	-	-	411	482	-	639	754	-
Stage 2	-	-	-	-	-	-	728	751	-	344	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1214	-	-	919	-	-	247	310	512	208	276	695
Mov Cap-2 Maneuver	-	-	-	-	-	-	247	310	-	208	276	-
Stage 1	-	-	-	-	-	-	402	471	-	625	752	-
Stage 2	-	-	-	-	-	-	714	749	-	336	428	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	31.1	12.2
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	247	1214	-	-	919	-	-	511
HCM Lane V/C Ratio	0.453	0.013	-	-	0.002	-	-	0.028
HCM Control Delay (s)	31.1	8	0	-	8.9	0	-	12.2
HCM Lane LOS	D	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	4	5	82	140	22
Future Vol, veh/h	10	4	5	82	140	22
Conflicting Peds, #/hr	5	0	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	41	40	63	34	15	6
Mvmt Flow	11	4	5	89	152	24

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	269	165	177	0	-	0
Stage 1	165	-	-	-	-	-
Stage 2	104	-	-	-	-	-
Critical Hdwy	6.81	6.6	4.73	-	-	-
Critical Hdwy Stg 1	5.81	-	-	-	-	-
Critical Hdwy Stg 2	5.81	-	-	-	-	-
Follow-up Hdwy	3.869	3.66	2.767	-	-	-
Pot Cap-1 Maneuver	644	790	1103	-	-	-
Stage 1	778	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	639	789	1102	-	-	-
Mov Cap-2 Maneuver	639	-	-	-	-	-
Stage 1	773	-	-	-	-	-
Stage 2	830	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1102	-	676	-	-
HCM Lane V/C Ratio	0.005	-	0.023	-	-
HCM Control Delay (s)	8.3	0	10.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	2	0	0	0	0	1	5	0	0
Future Vol, veh/h	0	0	0	2	0	0	0	0	1	5	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	100	0	75	0	0	100	86	0	0
Mvmt Flow	0	0	0	2	0	0	0	0	1	5	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	8.8	6.3	8.6
HCM LOS	-	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	100%	100%
Vol Thru, %	0%	100%	0%	0%
Vol Right, %	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	1	0	2	5
LT Vol	0	0	2	5
Through Vol	0	0	0	0
RT Vol	1	0	0	0
Lane Flow Rate	1	0	2	5
Geometry Grp	1	1	1	1
Degree of Util (X)	0.001	0	0.004	0.008
Departure Headway (Hd)	3.308	3.913	5.812	5.567
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1086	0	619	646
Service Time	1.314	1.921	3.818	3.571
HCM Lane V/C Ratio	0.001	0	0.003	0.008
HCM Control Delay	6.3	6.9	8.8	8.6
HCM Lane LOS	A	N	A	A
HCM 95th-tile Q	0	0	0	0

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	0	6	10	1	63	6	772	4	35	402	66
Future Volume (veh/h)	37	0	6	10	1	63	6	772	4	35	402	66
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1694	1900	1900	1113	1080	1496	1740	1900	1022	1596	1900
Adj Flow Rate, veh/h	40	0	2	11	1	3	7	839	4	38	437	63
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	67	67	76	27	9	9	86	22	22
Cap, veh/h	324	0	4	305	6	73	13	1573	7	44	1336	191
Arrive On Green	0.08	0.00	0.08	0.08	0.08	0.08	0.01	0.47	0.47	0.05	0.50	0.50
Sat Flow, veh/h	1056	0	53	883	81	914	1425	3373	16	973	2660	381
Grp Volume(v), veh/h	42	0	0	12	0	3	7	411	432	38	248	252
Grp Sat Flow(s),veh/h/ln	1108	0	0	963	0	914	1425	1653	1737	973	1516	1524
Q Serve(g_s), s	0.9	0.0	0.0	0.0	0.0	0.1	0.1	5.2	5.2	1.1	2.9	2.9
Cycle Q Clear(g_c), s	1.2	0.0	0.0	0.3	0.0	0.1	0.1	5.2	5.2	1.1	2.9	2.9
Prop In Lane	0.95		0.05	0.92		1.00	1.00		0.01	1.00		0.25
Lane Grp Cap(c), veh/h	328	0	0	312	0	73	13	771	810	44	761	766
V/C Ratio(X)	0.13	0.00	0.00	0.04	0.00	0.04	0.52	0.53	0.53	0.86	0.33	0.33
Avail Cap(c_a), veh/h	1575	0	0	1147	0	965	776	3152	3313	530	2892	2908
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.2	0.0	0.0	12.6	0.0	12.5	14.5	5.6	5.6	13.9	4.3	4.4
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.0	0.0	0.2	27.7	0.6	0.5	34.9	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.1	0.0	0.0	0.2	2.4	2.5	0.7	1.2	1.2
LnGrp Delay(d),s/veh	13.3	0.0	0.0	12.6	0.0	12.7	42.2	6.1	6.1	48.9	4.6	4.6
LnGrp LOS	B			B		B	D	A	A	D	A	A
Approach Vol, veh/h		42			15			850			538	
Approach Delay, s/veh		13.3			12.6			6.4			7.7	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.3	17.7		6.3	4.3	18.7		6.3
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	16.0	56.0		31.0	16.0	56.0		31.0
Max Q Clear Time (g_c+I1), s	3.1	7.2		3.2	2.1	4.9		2.3
Green Ext Time (p_c), s	0.0	6.5		0.2	0.0	3.5		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	7.2
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	416	12	0	775	20	0
Future Vol, veh/h	416	12	0	775	20	0
Conflicting Peds, #/hr	0	6	6	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	21	60	0	9	0	0
Mvmt Flow	452	13	0	842	22	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	886	239
Stage 1	-	-	-	-	465	-
Stage 2	-	-	-	-	421	-
Critical Hdwy	-	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	0	-	288	768
Stage 1	-	-	0	-	604	-
Stage 2	-	-	0	-	636	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	286	764
Mov Cap-2 Maneuver	-	-	-	-	481	-
Stage 1	-	-	-	-	600	-
Stage 2	-	-	-	-	636	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	481	-	-	-
HCM Lane V/C Ratio	0.045	-	-	-
HCM Control Delay (s)	12.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	397	2	0	685	7	73	0	0	6	0	21
Future Vol, veh/h	16	397	2	0	685	7	73	0	0	6	0	21
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	22	33	0	10	6	2	0	0	0	0	4
Mvmt Flow	17	432	2	0	745	8	79	0	0	7	0	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	754	0	0	439	0	0	845	1226	222	1000	1223	378
Stage 1	-	-	-	-	-	-	472	472	-	750	750	-
Stage 2	-	-	-	-	-	-	373	754	-	250	473	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.54	6.5	6.9	7.5	6.5	6.98
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.52	4	3.3	3.5	4	3.34
Pot Cap-1 Maneuver	865	-	-	1132	-	-	256	180	788	200	181	614
Stage 1	-	-	-	-	-	-	542	562	-	374	422	-
Stage 2	-	-	-	-	-	-	620	420	-	738	562	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	864	-	-	1127	-	-	242	175	784	197	176	613
Mov Cap-2 Maneuver	-	-	-	-	-	-	426	342	-	336	352	-
Stage 1	-	-	-	-	-	-	529	548	-	366	422	-
Stage 2	-	-	-	-	-	-	597	420	-	723	548	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	15.4	12.4
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	426	864	-	-	1127	-	-	518
HCM Lane V/C Ratio	0.186	0.02	-	-	-	-	-	0.057
HCM Control Delay (s)	15.4	9.3	-	-	0	-	-	12.4
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	56	348	617	5	6	75
Future Vol, veh/h	56	348	617	5	6	75
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	64	15	3	21	50	57
Mvmt Flow	61	378	671	5	7	82

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	677	0	-	0	986	675
Stage 1	-	-	-	-	675	-
Stage 2	-	-	-	-	311	-
Critical Hdwy	5.06	-	-	-	7.35	7.055
Critical Hdwy Stg 1	-	-	-	-	6.15	-
Critical Hdwy Stg 2	-	-	-	-	6.55	-
Follow-up Hdwy	2.808	-	-	-	3.975	3.8415
Pot Cap-1 Maneuver	637	-	-	-	199	350
Stage 1	-	-	-	-	406	-
Stage 2	-	-	-	-	608	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	636	-	-	-	179	350
Mov Cap-2 Maneuver	-	-	-	-	179	-
Stage 1	-	-	-	-	367	-
Stage 2	-	-	-	-	607	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	19
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	636	-	-	-	179	350
HCM Lane V/C Ratio	0.096	-	-	-	0.036	0.233
HCM Control Delay (s)	11.3	-	-	-	25.9	18.4
HCM Lane LOS	B	-	-	-	D	C
HCM 95th %tile Q(veh)	0.3	-	-	-	0.1	0.9

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	337	6	0	585	1	10	0	0	0	0	2
Future Vol, veh/h	4	337	6	0	585	1	10	0	0	0	0	2
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	17	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	4	366	7	0	636	1	11	0	0	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	637	0	0	375	0	0	1018	1017	372	1015	1020	637
Stage 1	-	-	-	-	-	-	380	380	-	637	637	-
Stage 2	-	-	-	-	-	-	638	637	-	378	383	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	956	-	-	1195	-	-	218	239	678	219	239	481
Stage 1	-	-	-	-	-	-	646	617	-	469	475	-
Stage 2	-	-	-	-	-	-	468	475	-	648	616	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	956	-	-	1193	-	-	216	238	677	218	238	481
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	238	-	218	238	-
Stage 1	-	-	-	-	-	-	642	613	-	467	475	-
Stage 2	-	-	-	-	-	-	466	475	-	645	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	22.5	12.5
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	216	956	-	-	1193	-	-	481
HCM Lane V/C Ratio	0.05	0.005	-	-	-	-	-	0.005
HCM Control Delay (s)	22.5	8.8	-	-	0	-	-	12.5
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	8	216	113	1	427	5	138	1	3	1	1	24
Future Vol, veh/h	8	216	113	1	427	5	138	1	3	1	1	24
Conflicting Peds, #/hr	0	0	2	2	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	15	11	32	50	3	67	5	100	20	0	0	8
Mvmt Flow	9	235	123	1	464	5	150	1	3	1	1	26

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	469	0	0	360	0	0	800	788	299	786	847	468
Stage 1	-	-	-	-	-	-	317	317	-	469	469	-
Stage 2	-	-	-	-	-	-	483	471	-	317	378	-
Critical Hdwy	4.25	-	-	4.6	-	-	7.15	7.5	6.4	7.1	6.5	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.335	-	-	2.65	-	-	3.545	4.9	3.48	3.5	4	3.372
Pot Cap-1 Maneuver	1028	-	-	976	-	-	300	232	700	312	301	583
Stage 1	-	-	-	-	-	-	688	510	-	579	564	-
Stage 2	-	-	-	-	-	-	559	425	-	698	619	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1028	-	-	974	-	-	282	229	699	307	297	582
Mov Cap-2 Maneuver	-	-	-	-	-	-	282	229	-	307	297	-
Stage 1	-	-	-	-	-	-	679	503	-	573	563	-
Stage 2	-	-	-	-	-	-	532	425	-	686	611	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	31.6	12
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	285	1028	-	-	974	-	-	543
HCM Lane V/C Ratio	0.542	0.008	-	-	0.001	-	-	0.052
HCM Control Delay (s)	31.6	8.5	0	-	8.7	0	-	12
HCM Lane LOS	D	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	3	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	21	2	2	112	93	12
Future Vol, veh/h	21	2	2	112	93	12
Conflicting Peds, #/hr	2	0	3	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	25	50	6	26	30
Mvmt Flow	23	2	2	122	101	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	239	111	117	0	-	0
Stage 1	111	-	-	-	-	-
Stage 2	128	-	-	-	-	-
Critical Hdwy	6.4	6.45	4.6	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.525	2.65	-	-	-
Pot Cap-1 Maneuver	754	883	1221	-	-	-
Stage 1	919	-	-	-	-	-
Stage 2	903	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	748	880	1218	-	-	-
Mov Cap-2 Maneuver	748	-	-	-	-	-
Stage 1	914	-	-	-	-	-
Stage 2	900	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1218	-	758	-	-
HCM Lane V/C Ratio	0.002	-	0.033	-	-
HCM Control Delay (s)	8	0	9.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	2	0	2	0	0	1	0	0	0
Future Vol, veh/h	0	0	0	2	0	2	0	0	1	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	40	0	75	0	0	25	0	0	0
Mvmt Flow	0	0	0	2	0	2	0	0	1	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	7.4	6.3	0
HCM LOS	-	A	A	-

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	50%	0%
Vol Thru, %	0%	100%	0%	100%
Vol Right, %	100%	0%	50%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	1	0	4	0
LT Vol	0	0	2	0
Through Vol	0	0	0	0
RT Vol	1	0	2	0
Lane Flow Rate	1	0	4	0
Geometry Grp	1	1	1	1
Degree of Util (X)	0.001	0	0.005	0
Departure Headway (Hd)	3.308	3.905	4.382	3.909
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1088	0	822	0
Service Time	1.31	1.906	2.382	1.911
HCM Lane V/C Ratio	0.001	0	0.005	0
HCM Control Delay	6.3	6.9	7.4	6.9
HCM Lane LOS	A	N	A	N
HCM 95th-tile Q	0	0	0	0

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2035 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	10	10	10	0	45	15	375	10	65	1090	25
Future Volume (veh/h)	10	10	10	10	0	45	15	375	10	65	1090	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	0.99		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1295	1900	1900	950	1105	1124	1420	1900	1195	1710	1900
Adj Flow Rate, veh/h	11	11	1	11	0	1	16	408	10	71	1185	26
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	70	70	70	0	0	72	69	32	32	59	11	11
Cap, veh/h	171	41	3	244	0	68	22	1467	36	79	1929	42
Arrive On Green	0.07	0.07	0.07	0.07	0.00	0.07	0.02	0.55	0.55	0.07	0.59	0.59
Sat Flow, veh/h	445	554	45	764	0	930	1071	2692	66	1138	3249	71
Grp Volume(v), veh/h	23	0	0	11	0	1	16	204	214	71	592	619
Grp Sat Flow(s),veh/h/ln	1045	0	0	764	0	930	1071	1349	1409	1138	1624	1697
Q Serve(g_s), s	0.5	0.0	0.0	0.0	0.0	0.0	0.6	3.1	3.1	2.4	8.9	9.0
Cycle Q Clear(g_c), s	0.9	0.0	0.0	0.4	0.0	0.0	0.6	3.1	3.1	2.4	8.9	9.0
Prop In Lane	0.48		0.04	1.00		1.00	1.00		0.05	1.00		0.04
Lane Grp Cap(c), veh/h	215	0	0	244	0	68	22	735	768	79	964	1007
V/C Ratio(X)	0.11	0.00	0.00	0.05	0.00	0.01	0.73	0.28	0.28	0.90	0.61	0.61
Avail Cap(c_a), veh/h	1027	0	0	759	0	751	446	1792	1871	1215	3215	3359
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	16.7	0.0	16.5	18.7	4.7	4.7	17.7	5.0	5.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.1	37.1	0.2	0.2	27.9	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	0.1	0.0	0.0	0.4	1.2	1.2	1.3	4.0	4.1
LnGrp Delay(d),s/veh	17.1	0.0	0.0	16.8	0.0	16.6	55.8	4.9	4.9	45.6	5.6	5.6
LnGrp LOS	B			B		B	E	A	A	D	A	A
Approach Vol, veh/h		23			12			434			1282	
Approach Delay, s/veh		17.1			16.8			6.8			7.8	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.7	24.9		6.8	4.8	26.8		6.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	41.0	51.0		31.0	16.0	76.0		31.0
Max Q Clear Time (g_c+I1), s	4.4	5.1		2.9	2.6	11.0		2.4
Green Ext Time (p_c), s	0.2	2.8		0.1	0.0	11.7		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	7.7
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1075	30	5	405	5	5
Future Vol, veh/h	1075	30	5	405	5	5
Conflicting Peds, #/hr	0	11	11	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	12	9	0	34	50	0
Mvmt Flow	1168	33	5	440	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1212	0	1426	612
Stage 1	-	-	-	-	1196	-
Stage 2	-	-	-	-	230	-
Critical Hdwy	-	-	4.1	-	7.8	6.9
Critical Hdwy Stg 1	-	-	-	-	6.8	-
Critical Hdwy Stg 2	-	-	-	-	6.8	-
Follow-up Hdwy	-	-	2.2	-	4	3.3
Pot Cap-1 Maneuver	-	-	583	-	82	441
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	661	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	577	-	80	436
Mov Cap-2 Maneuver	-	-	-	-	156	-
Stage 1	-	-	-	-	166	-
Stage 2	-	-	-	-	661	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	21.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	230	-	-	577	-
HCM Lane V/C Ratio	0.047	-	-	0.009	-
HCM Control Delay (s)	21.4	-	-	11.3	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	975	85	5	400	10	15	0	0	5	0	0
Future Vol, veh/h	15	975	85	5	400	10	15	0	0	5	0	0
Conflicting Peds, #/hr	0	0	10	10	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	13	0	67	34	0	27	0	0	0	0	0
Mvmt Flow	16	1060	92	5	435	11	16	0	0	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	446	0	0	1162	0	0	1376	1604	586	1013	1645	223
Stage 1	-	-	-	-	-	-	1148	1148	-	451	451	-
Stage 2	-	-	-	-	-	-	228	456	-	562	1194	-
Critical Hdwy	4.1	-	-	5.44	-	-	8.04	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.87	-	-	3.77	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1125	-	-	332	-	-	83	107	459	196	101	787
Stage 1	-	-	-	-	-	-	174	276	-	563	574	-
Stage 2	-	-	-	-	-	-	687	572	-	484	262	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1125	-	-	329	-	-	80	103	455	192	97	787
Mov Cap-2 Maneuver	-	-	-	-	-	-	160	241	-	381	227	-
Stage 1	-	-	-	-	-	-	170	269	-	555	565	-
Stage 2	-	-	-	-	-	-	677	563	-	477	256	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.2	30	14.6
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	160	1125	-	-	329	-	-	381
HCM Lane V/C Ratio	0.102	0.014	-	-	0.017	-	-	0.014
HCM Control Delay (s)	30	8.2	-	-	16.1	-	-	14.6
HCM Lane LOS	D	A	-	-	C	-	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	95	865	310	55	5	90
Future Vol, veh/h	95	865	310	55	5	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	51	8	22	88	67	74
Mvmt Flow	103	940	337	60	5	98

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	397	0	-	0	1043	367
Stage 1	-	-	-	-	367	-
Stage 2	-	-	-	-	676	-
Critical Hdwy	4.865	-	-	-	7.605	7.31
Critical Hdwy Stg 1	-	-	-	-	6.405	-
Critical Hdwy Stg 2	-	-	-	-	6.805	-
Follow-up Hdwy	2.6845	-	-	-	4.1365	4.003
Pot Cap-1 Maneuver	906	-	-	-	165	520
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	349	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	906	-	-	-	146	520
Mov Cap-2 Maneuver	-	-	-	-	146	-
Stage 1	-	-	-	-	492	-
Stage 2	-	-	-	-	349	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	14.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	906	-	-	-	146	520
HCM Lane V/C Ratio	0.114	-	-	-	0.037	0.188
HCM Control Delay (s)	9.5	-	-	-	30.6	13.5
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	700	5	0	310	5	5	5	0	0	0	10
Future Vol, veh/h	15	700	5	0	310	5	5	5	0	0	0	10
Conflicting Peds, #/hr	0	0	9	9	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	16	9	14	0	34	0	0	0	0	0	0	13
Mvmt Flow	16	761	5	0	337	5	5	5	0	0	0	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	342	0	0	775	0	0	1150	1147	773	1138	1147	340
Stage 1	-	-	-	-	-	-	805	805	-	340	340	-
Stage 2	-	-	-	-	-	-	345	342	-	798	807	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.33
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.344	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.417
Pot Cap-1 Maneuver	1143	-	-	850	-	-	177	201	402	180	201	678
Stage 1	-	-	-	-	-	-	379	398	-	679	643	-
Stage 2	-	-	-	-	-	-	675	642	-	382	397	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1143	-	-	843	-	-	171	196	399	174	196	678
Mov Cap-2 Maneuver	-	-	-	-	-	-	171	196	-	174	196	-
Stage 1	-	-	-	-	-	-	371	389	-	669	643	-
Stage 2	-	-	-	-	-	-	664	642	-	371	388	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	25.9	10.4
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	183	1143	-	-	843	-	-	678
HCM Lane V/C Ratio	0.059	0.014	-	-	-	-	-	0.016
HCM Control Delay (s)	25.9	8.2	-	-	0	-	-	10.4
HCM Lane LOS	D	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	495	175	5	170	10	105	0	0	5	0	15
Future Vol, veh/h	15	495	175	5	170	10	105	0	0	5	0	15
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	36	3	13	0	20	82	44	0	0	100	0	83
Mvmt Flow	16	538	190	5	185	11	114	0	0	5	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	196	0	0	729	0	0	875	872	634	866	962	191
Stage 1	-	-	-	-	-	-	666	666	-	201	201	-
Stage 2	-	-	-	-	-	-	209	206	-	665	761	-
Critical Hdwy	4.46	-	-	4.1	-	-	7.54	6.5	6.2	8.1	6.5	7.03
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.524	-	-	2.2	-	-	3.896	4	3.3	4.4	4	4.047
Pot Cap-1 Maneuver	1197	-	-	884	-	-	229	291	483	189	258	681
Stage 1	-	-	-	-	-	-	387	460	-	621	739	-
Stage 2	-	-	-	-	-	-	706	735	-	322	417	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1197	-	-	883	-	-	218	282	483	185	250	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	282	-	185	250	-
Stage 1	-	-	-	-	-	-	378	449	-	607	735	-
Stage 2	-	-	-	-	-	-	685	731	-	315	407	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	38.3	14.3
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	218	1197	-	-	883	-	-	408
HCM Lane V/C Ratio	0.524	0.014	-	-	0.006	-	-	0.053
HCM Control Delay (s)	38.3	8	0	-	9.1	0	-	14.3
HCM Lane LOS	E	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.7	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	5	5	85	140	25
Future Vol, veh/h	10	5	5	85	140	25
Conflicting Peds, #/hr	5	0	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	41	40	63	34	15	6
Mvmt Flow	11	5	5	92	152	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	274	167	180	0	-	0
Stage 1	167	-	-	-	-	-
Stage 2	107	-	-	-	-	-
Critical Hdwy	6.81	6.6	4.73	-	-	-
Critical Hdwy Stg 1	5.81	-	-	-	-	-
Critical Hdwy Stg 2	5.81	-	-	-	-	-
Follow-up Hdwy	3.869	3.66	2.767	-	-	-
Pot Cap-1 Maneuver	640	787	1100	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	636	786	1099	-	-	-
Mov Cap-2 Maneuver	636	-	-	-	-	-
Stage 1	771	-	-	-	-	-
Stage 2	828	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1099	-	679	-	-
HCM Lane V/C Ratio	0.005	-	0.024	-	-
HCM Control Delay (s)	8.3	0	10.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	5	0	0	0	0	5	5	0	0
Future Vol, veh/h	0	0	0	5	0	0	0	0	5	5	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	100	0	75	0	0	100	86	0	0
Mvmt Flow	0	0	0	5	0	0	0	0	5	5	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	8.9	6.3	8.6
HCM LOS	-	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	100%	100%
Vol Thru, %	0%	100%	0%	0%
Vol Right, %	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	0	5	5
LT Vol	0	0	5	5
Through Vol	0	0	0	0
RT Vol	5	0	0	0
Lane Flow Rate	5	0	5	5
Geometry Grp	1	1	1	1
Degree of Util (X)	0.005	0	0.009	0.008
Departure Headway (Hd)	3.314	3.924	5.82	5.576
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1083	0	618	645
Service Time	1.324	1.933	3.826	3.584
HCM Lane V/C Ratio	0.005	0	0.008	0.008
HCM Control Delay	6.3	6.9	8.9	8.6
HCM Lane LOS	A	N	A	A
HCM 95th-tile Q	0	0	0	0

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Base Year 2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	0	10	10	5	65	10	840	5	35	440	70
Future Volume (veh/h)	40	0	10	10	5	65	10	840	5	35	440	70
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1693	1900	1900	1119	1080	1496	1739	1900	1022	1595	1900
Adj Flow Rate, veh/h	43	0	1	11	5	5	11	913	5	38	478	67
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	67	67	76	27	9	9	86	22	22
Cap, veh/h	316	0	2	246	33	78	21	1643	9	44	1382	193
Arrive On Green	0.09	0.00	0.09	0.09	0.09	0.09	0.01	0.49	0.49	0.04	0.52	0.52
Sat Flow, veh/h	1043	0	24	616	392	914	1425	3370	18	973	2668	372
Grp Volume(v), veh/h	44	0	0	16	0	5	11	448	470	38	270	275
Grp Sat Flow(s),veh/h/ln	1067	0	0	1008	0	914	1425	1652	1736	973	1515	1525
Q Serve(g_s), s	1.0	0.0	0.0	0.0	0.0	0.2	0.2	6.0	6.0	1.2	3.3	3.3
Cycle Q Clear(g_c), s	1.5	0.0	0.0	0.4	0.0	0.2	0.2	6.0	6.0	1.2	3.3	3.3
Prop In Lane	0.98		0.02	0.69		1.00	1.00		0.01	1.00		0.24
Lane Grp Cap(c), veh/h	318	0	0	279	0	78	21	806	846	44	785	790
V/C Ratio(X)	0.14	0.00	0.00	0.06	0.00	0.06	0.53	0.56	0.56	0.87	0.34	0.35
Avail Cap(c_a), veh/h	1461	0	0	1104	0	903	726	2948	3097	496	2704	2721
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.0	0.0	0.0	13.3	0.0	13.2	15.4	5.7	5.7	14.9	4.4	4.4
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.3	19.4	0.6	0.6	36.5	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.1	0.0	0.0	0.2	2.7	2.9	0.8	1.4	1.4
LnGrp Delay(d),s/veh	14.2	0.0	0.0	13.4	0.0	13.5	34.7	6.3	6.2	51.4	4.7	4.7
LnGrp LOS	B			B		B	C	A	A	D	A	A
Approach Vol, veh/h		44			21			929			583	
Approach Delay, s/veh		14.2			13.4			6.6			7.7	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.4	19.3		6.7	4.5	20.3		6.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	16.0	56.0		31.0	16.0	56.0		31.0
Max Q Clear Time (g_c+I1), s	3.2	8.0		3.5	2.2	5.3		2.4
Green Ext Time (p_c), s	0.0	7.3		0.2	0.0	3.9		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	7.3
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	455	15	0	845	20	0
Future Vol, veh/h	455	15	0	845	20	0
Conflicting Peds, #/hr	0	6	6	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	21	60	0	9	0	0
Mvmt Flow	495	16	0	918	22	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	968	262
Stage 1	-	-	-	-	509	-
Stage 2	-	-	-	-	459	-
Critical Hdwy	-	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	0	-	255	743
Stage 1	-	-	0	-	574	-
Stage 2	-	-	0	-	609	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	253	739
Mov Cap-2 Maneuver	-	-	-	-	452	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	452	-	-	-
HCM Lane V/C Ratio	0.048	-	-	-
HCM Control Delay (s)	13.4	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	435	5	0	750	10	75	0	0	10	0	25
Future Vol, veh/h	20	435	5	0	750	10	75	0	0	10	0	25
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	22	33	0	10	6	2	0	0	0	0	4
Mvmt Flow	22	473	5	0	815	11	82	0	0	11	0	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	827	0	0	483	0	0	933	1352	244	1103	1349	414
Stage 1	-	-	-	-	-	-	525	525	-	822	822	-
Stage 2	-	-	-	-	-	-	408	827	-	281	527	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.54	6.5	6.9	7.5	6.5	6.98
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.52	4	3.3	3.5	4	3.34
Pot Cap-1 Maneuver	813	-	-	1090	-	-	221	151	763	168	152	582
Stage 1	-	-	-	-	-	-	504	533	-	339	391	-
Stage 2	-	-	-	-	-	-	591	389	-	708	532	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	812	-	-	1085	-	-	205	146	759	164	147	581
Mov Cap-2 Maneuver	-	-	-	-	-	-	388	310	-	302	323	-
Stage 1	-	-	-	-	-	-	488	516	-	330	391	-
Stage 2	-	-	-	-	-	-	563	389	-	689	515	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	16.7	13.5
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	388	812	-	-	1085	-	-	460
HCM Lane V/C Ratio	0.21	0.027	-	-	-	-	-	0.083
HCM Control Delay (s)	16.7	9.6	-	-	0	-	-	13.5
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	60	380	675	5	10	75
Future Vol, veh/h	60	380	675	5	10	75
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	64	15	3	21	50	57
Mvmt Flow	65	413	734	5	11	82

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	740	0	-	0	1075	738
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	337	-
Critical Hdwy	5.06	-	-	-	7.35	7.055
Critical Hdwy Stg 1	-	-	-	-	6.15	-
Critical Hdwy Stg 2	-	-	-	-	6.55	-
Follow-up Hdwy	2.808	-	-	-	3.975	3.8415
Pot Cap-1 Maneuver	596	-	-	-	172	319
Stage 1	-	-	-	-	375	-
Stage 2	-	-	-	-	587	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	595	-	-	-	153	319
Mov Cap-2 Maneuver	-	-	-	-	153	-
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	586	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	21.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	595	-	-	-	153	319
HCM Lane V/C Ratio	0.11	-	-	-	0.071	0.256
HCM Control Delay (s)	11.8	-	-	-	30.3	20.1
HCM Lane LOS	B	-	-	-	D	C
HCM 95th %tile Q(veh)	0.4	-	-	-	0.2	1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	370	10	0	640	5	10	0	0	0	0	5
Future Vol, veh/h	5	370	10	0	640	5	10	0	0	0	0	5
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	17	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	5	402	11	0	696	5	11	0	0	0	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	701	0	0	415	0	0	1121	1121	410	1117	1124	699
Stage 1	-	-	-	-	-	-	420	420	-	699	699	-
Stage 2	-	-	-	-	-	-	701	701	-	418	425	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	905	-	-	1155	-	-	185	208	646	186	207	443
Stage 1	-	-	-	-	-	-	615	593	-	434	445	-
Stage 2	-	-	-	-	-	-	433	444	-	616	590	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	905	-	-	1153	-	-	182	206	645	185	205	443
Mov Cap-2 Maneuver	-	-	-	-	-	-	182	206	-	185	205	-
Stage 1	-	-	-	-	-	-	611	588	-	431	445	-
Stage 2	-	-	-	-	-	-	428	444	-	613	585	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	26	13.2
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	182	905	-	-	1153	-	-	443
HCM Lane V/C Ratio	0.06	0.006	-	-	-	-	-	0.012
HCM Control Delay (s)	26	9	-	-	0	-	-	13.2
HCM Lane LOS	D	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	235	115	5	465	5	140	5	5	5	5	25
Future Vol, veh/h	10	235	115	5	465	5	140	5	5	5	5	25
Conflicting Peds, #/hr	0	0	2	2	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	15	11	32	50	3	67	5	100	20	0	0	8
Mvmt Flow	11	255	125	5	505	5	152	5	5	5	5	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	510	0	0	382	0	0	877	862	320	863	922	509
Stage 1	-	-	-	-	-	-	342	342	-	518	518	-
Stage 2	-	-	-	-	-	-	535	520	-	345	404	-
Critical Hdwy	4.25	-	-	4.6	-	-	7.15	7.5	6.4	7.1	6.5	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.335	-	-	2.65	-	-	3.545	4.9	3.48	3.5	4	3.372
Pot Cap-1 Maneuver	992	-	-	957	-	-	266	207	681	277	272	552
Stage 1	-	-	-	-	-	-	667	496	-	544	536	-
Stage 2	-	-	-	-	-	-	524	401	-	675	603	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	955	-	-	244	202	680	265	266	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	202	-	265	266	-
Stage 1	-	-	-	-	-	-	656	488	-	536	532	-
Stage 2	-	-	-	-	-	-	489	398	-	653	593	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	43.6	14.4
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	248	992	-	-	955	-	-	421
HCM Lane V/C Ratio	0.657	0.011	-	-	0.006	-	-	0.09
HCM Control Delay (s)	43.6	8.7	0	-	8.8	0	-	14.4
HCM Lane LOS	E	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	4.1	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	5	5	115	95	15
Future Vol, veh/h	25	5	5	115	95	15
Conflicting Peds, #/hr	2	0	3	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	25	50	6	26	30
Mvmt Flow	27	5	5	125	103	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	251	114	122	0	-	0
Stage 1	114	-	-	-	-	-
Stage 2	137	-	-	-	-	-
Critical Hdwy	6.4	6.45	4.6	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.525	2.65	-	-	-
Pot Cap-1 Maneuver	742	880	1215	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	895	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	735	877	1212	-	-	-
Mov Cap-2 Maneuver	735	-	-	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	892	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1212	-	755	-	-
HCM Lane V/C Ratio	0.004	-	0.043	-	-
HCM Control Delay (s)	8	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	5	0	5	0	0	5	0	0	0
Future Vol, veh/h	0	0	0	5	0	5	0	0	5	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	40	0	75	0	0	25	0	0	0
Mvmt Flow	0	0	0	5	0	5	0	0	5	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	7.4	6.3	0
HCM LOS	-	A	A	-

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	50%	0%
Vol Thru, %	0%	100%	0%	100%
Vol Right, %	100%	0%	50%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	0	10	0
LT Vol	0	0	5	0
Through Vol	0	0	0	0
RT Vol	5	0	5	0
Lane Flow Rate	5	0	11	0
Geometry Grp	1	1	1	1
Degree of Util (X)	0.005	0	0.013	0
Departure Headway (Hd)	3.32	3.918	4.39	3.924
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1083	0	820	0
Service Time	1.325	1.921	2.39	1.93
HCM Lane V/C Ratio	0.005	0	0.013	0
HCM Control Delay	6.3	6.9	7.4	6.9
HCM Lane LOS	A	N	A	N
HCM 95th-tile Q	0	0	0	0

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2035 AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	10	10	10	0	45	15	385	10	65	1180	25
Future Volume (veh/h)	10	10	10	10	0	45	15	385	10	65	1180	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.99	0.99		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1295	1900	1900	950	1105	1124	1421	1900	1195	1710	1900
Adj Flow Rate, veh/h	11	11	1	11	0	1	16	418	10	71	1283	26
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	70	70	70	0	0	72	69	32	32	59	11	11
Cap, veh/h	160	44	3	227	0	67	22	1543	37	76	2018	41
Arrive On Green	0.07	0.07	0.07	0.07	0.00	0.07	0.02	0.57	0.57	0.07	0.62	0.62
Sat Flow, veh/h	444	602	48	756	0	930	1071	2694	64	1138	3256	66
Grp Volume(v), veh/h	23	0	0	11	0	1	16	209	219	71	640	669
Grp Sat Flow(s),veh/h/ln	1094	0	0	756	0	930	1071	1350	1409	1138	1624	1698
Q Serve(g_s), s	0.4	0.0	0.0	0.0	0.0	0.0	0.6	3.3	3.3	2.6	10.3	10.3
Cycle Q Clear(g_c), s	0.9	0.0	0.0	0.5	0.0	0.0	0.6	3.3	3.3	2.6	10.3	10.3
Prop In Lane	0.48		0.04	1.00		1.00	1.00		0.05	1.00		0.04
Lane Grp Cap(c), veh/h	207	0	0	227	0	67	22	773	807	76	1006	1052
V/C Ratio(X)	0.11	0.00	0.00	0.05	0.00	0.01	0.74	0.27	0.27	0.93	0.64	0.64
Avail Cap(c_a), veh/h	949	0	0	698	0	691	411	1650	1723	1118	2959	3093
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	0.0	18.2	0.0	18.0	20.3	4.5	4.5	19.4	5.0	5.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.1	37.9	0.2	0.2	32.7	0.7	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.1	0.0	0.0	0.4	1.2	1.3	1.5	4.6	4.8
LnGrp Delay(d),s/veh	18.6	0.0	0.0	18.3	0.0	18.1	58.3	4.7	4.7	52.0	5.7	5.6
LnGrp LOS	B			B		B	E	A	A	D	A	A
Approach Vol, veh/h		23			12			444			1380	
Approach Delay, s/veh		18.6			18.2			6.6			8.0	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.8	27.9		7.0	4.8	29.9		7.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	41.0	51.0		31.0	16.0	76.0		31.0
Max Q Clear Time (g_c+I1), s	4.6	5.3		2.9	2.6	12.3		2.5
Green Ext Time (p_c), s	0.2	2.9		0.1	0.0	13.5		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	7.9
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1040	155	5	425	0	0
Future Vol, veh/h	1040	155	5	425	0	0
Conflicting Peds, #/hr	0	11	11	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	12	9	0	34	50	0
Mvmt Flow	1130	168	5	462	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1309	0	1466	660
Stage 1	-	-	-	-	1225	-
Stage 2	-	-	-	-	241	-
Critical Hdwy	-	-	4.1	-	7.8	6.9
Critical Hdwy Stg 1	-	-	-	-	6.8	-
Critical Hdwy Stg 2	-	-	-	-	6.8	-
Follow-up Hdwy	-	-	2.2	-	4	3.3
Pot Cap-1 Maneuver	-	-	535	-	76	410
Stage 1	-	-	-	-	163	-
Stage 2	-	-	-	-	651	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	529	-	74	406
Mov Cap-2 Maneuver	-	-	-	-	150	-
Stage 1	-	-	-	-	159	-
Stage 2	-	-	-	-	651	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	529	-
HCM Lane V/C Ratio	-	-	-	0.01	-
HCM Control Delay (s)	0	-	-	11.9	-
HCM Lane LOS	A	-	-	B	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	980	40	5	400	10	30	0	5	5	0	0
Future Vol, veh/h	15	980	40	5	400	10	30	0	5	5	0	0
Conflicting Peds, #/hr	0	0	10	10	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	13	0	67	34	0	27	0	0	0	0	0
Mvmt Flow	16	1065	43	5	435	11	33	0	5	5	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	446	0	0	1118	0	0	1357	1585	564	1016	1601	223
Stage 1	-	-	-	-	-	-	1129	1129	-	451	451	-
Stage 2	-	-	-	-	-	-	228	456	-	565	1150	-
Critical Hdwy	4.1	-	-	5.44	-	-	8.04	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.04	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.87	-	-	3.77	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1125	-	-	350	-	-	86	109	474	195	107	787
Stage 1	-	-	-	-	-	-	179	281	-	563	574	-
Stage 2	-	-	-	-	-	-	687	572	-	482	275	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1125	-	-	347	-	-	83	105	469	189	103	787
Mov Cap-2 Maneuver	-	-	-	-	-	-	164	245	-	377	237	-
Stage 1	-	-	-	-	-	-	175	274	-	555	566	-
Stage 2	-	-	-	-	-	-	677	564	-	470	268	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.2	30.1	14.7
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	181	1125	-	-	347	-	-	377
HCM Lane V/C Ratio	0.21	0.014	-	-	0.016	-	-	0.014
HCM Control Delay (s)	30.1	8.2	-	-	15.5	-	-	14.7
HCM Lane LOS	D	A	-	-	C	-	-	B
HCM 95th %tile Q(veh)	0.8	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	95	875	315	55	5	90
Future Vol, veh/h	95	875	315	55	5	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	51	8	22	88	67	74
Mvmt Flow	103	951	342	60	5	98

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	402	0	-	0	1054	372
Stage 1	-	-	-	-	372	-
Stage 2	-	-	-	-	682	-
Critical Hdwy	4.865	-	-	-	7.605	7.31
Critical Hdwy Stg 1	-	-	-	-	6.405	-
Critical Hdwy Stg 2	-	-	-	-	6.805	-
Follow-up Hdwy	2.6845	-	-	-	4.1365	4.003
Pot Cap-1 Maneuver	902	-	-	-	162	516
Stage 1	-	-	-	-	552	-
Stage 2	-	-	-	-	346	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	902	-	-	-	144	516
Mov Cap-2 Maneuver	-	-	-	-	144	-
Stage 1	-	-	-	-	489	-
Stage 2	-	-	-	-	346	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	14.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	902	-	-	-	144	516
HCM Lane V/C Ratio	0.114	-	-	-	0.038	0.19
HCM Control Delay (s)	9.5	-	-	-	31	13.6
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	700	15	0	310	5	5	5	0	0	0	10
Future Vol, veh/h	15	700	15	0	310	5	5	5	0	0	0	10
Conflicting Peds, #/hr	0	0	9	9	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	16	9	14	0	34	0	0	0	0	0	0	13
Mvmt Flow	16	761	16	0	337	5	5	5	0	0	0	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	342	0	0	786	0	0	1155	1152	778	1144	1158	340
Stage 1	-	-	-	-	-	-	810	810	-	340	340	-
Stage 2	-	-	-	-	-	-	345	342	-	804	818	-
Critical Hdwy	4.26	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.33
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.344	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.417
Pot Cap-1 Maneuver	1143	-	-	842	-	-	175	199	400	179	198	678
Stage 1	-	-	-	-	-	-	377	396	-	679	643	-
Stage 2	-	-	-	-	-	-	675	642	-	380	393	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1143	-	-	835	-	-	169	194	397	173	193	678
Mov Cap-2 Maneuver	-	-	-	-	-	-	169	194	-	173	193	-
Stage 1	-	-	-	-	-	-	369	387	-	669	643	-
Stage 2	-	-	-	-	-	-	664	642	-	369	384	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	26.2	10.4
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	181	1143	-	-	835	-	-	678
HCM Lane V/C Ratio	0.06	0.014	-	-	-	-	-	0.016
HCM Control Delay (s)	26.2	8.2	-	-	0	-	-	10.4
HCM Lane LOS	D	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	495	175	5	170	10	105	0	0	5	0	15
Future Vol, veh/h	15	495	175	5	170	10	105	0	0	5	0	15
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	36	3	13	0	20	82	44	0	0	100	0	83
Mvmt Flow	16	538	190	5	185	11	114	0	0	5	0	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	196	0	0	729	0	0	875	872	634	866	962	191
Stage 1	-	-	-	-	-	-	666	666	-	201	201	-
Stage 2	-	-	-	-	-	-	209	206	-	665	761	-
Critical Hdwy	4.46	-	-	4.1	-	-	7.54	6.5	6.2	8.1	6.5	7.03
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	7.1	5.5	-
Follow-up Hdwy	2.524	-	-	2.2	-	-	3.896	4	3.3	4.4	4	4.047
Pot Cap-1 Maneuver	1197	-	-	884	-	-	229	291	483	189	258	681
Stage 1	-	-	-	-	-	-	387	460	-	621	739	-
Stage 2	-	-	-	-	-	-	706	735	-	322	417	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1197	-	-	883	-	-	218	282	483	185	250	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	282	-	185	250	-
Stage 1	-	-	-	-	-	-	378	449	-	607	735	-
Stage 2	-	-	-	-	-	-	685	731	-	315	407	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.2	38.3	14.3
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	218	1197	-	-	883	-	-	408
HCM Lane V/C Ratio	0.524	0.014	-	-	0.006	-	-	0.053
HCM Control Delay (s)	38.3	8	0	-	9.1	0	-	14.3
HCM Lane LOS	E	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.7	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	5	5	85	140	25
Future Vol, veh/h	10	5	5	85	140	25
Conflicting Peds, #/hr	5	0	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	41	40	63	34	15	6
Mvmt Flow	11	5	5	92	152	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	274	167	180	0	-	0
Stage 1	167	-	-	-	-	-
Stage 2	107	-	-	-	-	-
Critical Hdwy	6.81	6.6	4.73	-	-	-
Critical Hdwy Stg 1	5.81	-	-	-	-	-
Critical Hdwy Stg 2	5.81	-	-	-	-	-
Follow-up Hdwy	3.869	3.66	2.767	-	-	-
Pot Cap-1 Maneuver	640	787	1100	-	-	-
Stage 1	776	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	636	786	1099	-	-	-
Mov Cap-2 Maneuver	636	-	-	-	-	-
Stage 1	771	-	-	-	-	-
Stage 2	828	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1099	-	679	-	-
HCM Lane V/C Ratio	0.005	-	0.024	-	-
HCM Control Delay (s)	8.3	0	10.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	5	0	0	0	0	5	5	0	0
Future Vol, veh/h	0	0	0	5	0	0	0	0	5	5	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	100	0	75	0	0	100	86	0	0
Mvmt Flow	0	0	0	5	0	0	0	0	5	5	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	8.9	6.3	8.6
HCM LOS	-	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	100%	100%
Vol Thru, %	0%	100%	0%	0%
Vol Right, %	100%	0%	0%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	0	5	5
LT Vol	0	0	5	5
Through Vol	0	0	0	0
RT Vol	5	0	0	0
Lane Flow Rate	5	0	5	5
Geometry Grp	1	1	1	1
Degree of Util (X)	0.005	0	0.009	0.008
Departure Headway (Hd)	3.314	3.924	5.82	5.576
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1083	0	618	645
Service Time	1.324	1.933	3.826	3.584
HCM Lane V/C Ratio	0.005	0	0.008	0.008
HCM Control Delay	6.3	6.9	8.9	8.6
HCM Lane LOS	A	N	A	A
HCM 95th-tile Q	0	0	0	0

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

- Future Year 2035 PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	0	10	10	5	65	10	920	5	35	440	70
Future Volume (veh/h)	40	0	10	10	5	65	10	920	5	35	440	70
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1693	1900	1900	1119	1080	1496	1739	1900	1022	1595	1900
Adj Flow Rate, veh/h	43	0	1	11	5	4	11	1000	5	38	478	68
Adj No. of Lanes	0	1	0	0	1	1	1	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	67	67	76	27	9	9	86	22	22
Cap, veh/h	299	0	2	231	34	76	21	1734	9	43	1449	205
Arrive On Green	0.08	0.00	0.08	0.08	0.08	0.08	0.01	0.51	0.51	0.04	0.54	0.54
Sat Flow, veh/h	1039	0	24	600	411	914	1425	3372	17	973	2663	377
Grp Volume(v), veh/h	44	0	0	16	0	4	11	490	515	38	271	275
Grp Sat Flow(s),veh/h/ln	1063	0	0	1011	0	914	1425	1652	1736	973	1515	1524
Q Serve(g_s), s	1.1	0.0	0.0	0.0	0.0	0.1	0.3	6.9	6.9	1.3	3.3	3.4
Cycle Q Clear(g_c), s	1.6	0.0	0.0	0.4	0.0	0.1	0.3	6.9	6.9	1.3	3.3	3.4
Prop In Lane	0.98		0.02	0.69		1.00	1.00		0.01	1.00		0.25
Lane Grp Cap(c), veh/h	301	0	0	265	0	76	21	850	893	43	824	829
V/C Ratio(X)	0.15	0.00	0.00	0.06	0.00	0.05	0.53	0.58	0.58	0.88	0.33	0.33
Avail Cap(c_a), veh/h	1369	0	0	1035	0	846	681	2763	2903	465	2533	2549
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.0	0.0	0.0	14.3	0.0	14.1	16.4	5.6	5.6	15.9	4.2	4.2
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.3	19.5	0.6	0.6	38.3	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.0	0.1	0.0	0.0	0.2	3.1	3.3	0.8	1.4	1.4
LnGrp Delay(d),s/veh	15.2	0.0	0.0	14.4	0.0	14.4	35.9	6.2	6.2	54.2	4.5	4.5
LnGrp LOS	B			B		B	D	A	A	D	A	A
Approach Vol, veh/h		44			20			1016			584	
Approach Delay, s/veh		15.2			14.4			6.5			7.7	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.5	21.2		6.8	4.5	22.2		6.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	16.0	56.0		31.0	16.0	56.0		31.0
Max Q Clear Time (g_c+I1), s	3.3	8.9		3.6	2.3	5.4		2.4
Green Ext Time (p_c), s	0.0	8.4		0.2	0.0	3.9		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	7.3
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	455	15	0	945	0	0
Future Vol, veh/h	455	15	0	945	0	0
Conflicting Peds, #/hr	0	6	6	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	21	60	0	9	0	0
Mvmt Flow	495	16	0	1027	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1023	262
Stage 1	-	-	-	-	509	-
Stage 2	-	-	-	-	514	-
Critical Hdwy	-	-	-	-	6.8	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	0	-	235	743
Stage 1	-	-	0	-	574	-
Stage 2	-	-	0	-	571	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	234	739
Mov Cap-2 Maneuver	-	-	-	-	435	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	571	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	0	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	435	0	0	755	10	165	0	0	10	0	25
Future Vol, veh/h	20	435	0	0	755	10	165	0	0	10	0	25
Conflicting Peds, #/hr	1	0	5	5	0	1	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	50	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	2	-	-	2	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	22	33	0	10	6	2	0	0	0	0	4
Mvmt Flow	22	473	0	0	821	11	179	0	0	11	0	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	833	0	0	478	0	0	933	1355	242	1109	1350	417
Stage 1	-	-	-	-	-	-	522	522	-	828	828	-
Stage 2	-	-	-	-	-	-	411	833	-	281	522	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.54	6.5	6.9	7.5	6.5	6.98
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.52	4	3.3	3.5	4	3.34
Pot Cap-1 Maneuver	809	-	-	1095	-	-	221	151	765	167	152	579
Stage 1	-	-	-	-	-	-	506	534	-	336	389	-
Stage 2	-	-	-	-	-	-	589	386	-	708	534	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	808	-	-	1090	-	-	205	146	761	163	147	578
Mov Cap-2 Maneuver	-	-	-	-	-	-	389	308	-	300	322	-
Stage 1	-	-	-	-	-	-	490	517	-	327	389	-
Stage 2	-	-	-	-	-	-	561	386	-	689	517	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0	21.9	13.6
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	389	808	-	-	1090	-	-	457
HCM Lane V/C Ratio	0.461	0.027	-	-	-	-	-	0.083
HCM Control Delay (s)	21.9	9.6	-	-	0	-	-	13.6
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2.4	0.1	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	60	380	680	5	10	75
Future Vol, veh/h	60	380	680	5	10	75
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Stop
Storage Length	0	-	-	-	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	64	15	3	21	50	57
Mvmt Flow	65	413	739	5	11	82

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	745	0	-	0	1080	743
Stage 1	-	-	-	-	743	-
Stage 2	-	-	-	-	337	-
Critical Hdwy	5.06	-	-	-	7.35	7.055
Critical Hdwy Stg 1	-	-	-	-	6.15	-
Critical Hdwy Stg 2	-	-	-	-	6.55	-
Follow-up Hdwy	2.808	-	-	-	3.975	3.8415
Pot Cap-1 Maneuver	593	-	-	-	171	316
Stage 1	-	-	-	-	373	-
Stage 2	-	-	-	-	587	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	592	-	-	-	152	316
Mov Cap-2 Maneuver	-	-	-	-	152	-
Stage 1	-	-	-	-	332	-
Stage 2	-	-	-	-	586	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	21.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	592	-	-	-	152	316
HCM Lane V/C Ratio	0.11	-	-	-	0.072	0.258
HCM Control Delay (s)	11.8	-	-	-	30.5	20.3
HCM Lane LOS	B	-	-	-	D	C
HCM 95th %tile Q(veh)	0.4	-	-	-	0.2	1

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	370	10	0	640	5	20	0	0	0	0	5
Future Vol, veh/h	5	370	10	0	640	5	20	0	0	0	0	5
Conflicting Peds, #/hr	0	0	2	2	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	17	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	5	402	11	0	696	5	22	0	0	0	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	701	0	0	415	0	0	1121	1121	410	1117	1124	699
Stage 1	-	-	-	-	-	-	420	420	-	699	699	-
Stage 2	-	-	-	-	-	-	701	701	-	418	425	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	905	-	-	1155	-	-	185	208	646	186	207	443
Stage 1	-	-	-	-	-	-	615	593	-	434	445	-
Stage 2	-	-	-	-	-	-	433	444	-	616	590	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	905	-	-	1153	-	-	182	206	645	185	205	443
Mov Cap-2 Maneuver	-	-	-	-	-	-	182	206	-	185	205	-
Stage 1	-	-	-	-	-	-	611	588	-	431	445	-
Stage 2	-	-	-	-	-	-	428	444	-	613	585	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	27.4	13.2
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	182	905	-	-	1153	-	-	443
HCM Lane V/C Ratio	0.119	0.006	-	-	-	-	-	0.012
HCM Control Delay (s)	27.4	9	-	-	0	-	-	13.2
HCM Lane LOS	D	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	235	115	5	465	5	140	5	5	5	5	25
Future Vol, veh/h	10	235	115	5	465	5	140	5	5	5	5	25
Conflicting Peds, #/hr	0	0	2	2	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	15	11	32	50	3	67	5	100	20	0	0	8
Mvmt Flow	11	255	125	5	505	5	152	5	5	5	5	27

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	510	0	0	382	0	0	877	862	320	863	922	509
Stage 1	-	-	-	-	-	-	342	342	-	518	518	-
Stage 2	-	-	-	-	-	-	535	520	-	345	404	-
Critical Hdwy	4.25	-	-	4.6	-	-	7.15	7.5	6.4	7.1	6.5	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	6.5	-	6.1	5.5	-
Follow-up Hdwy	2.335	-	-	2.65	-	-	3.545	4.9	3.48	3.5	4	3.372
Pot Cap-1 Maneuver	992	-	-	957	-	-	266	207	681	277	272	552
Stage 1	-	-	-	-	-	-	667	496	-	544	536	-
Stage 2	-	-	-	-	-	-	524	401	-	675	603	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	955	-	-	244	202	680	265	266	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	202	-	265	266	-
Stage 1	-	-	-	-	-	-	656	488	-	536	532	-
Stage 2	-	-	-	-	-	-	489	398	-	653	593	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	43.6	14.4
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	248	992	-	-	955	-	-	421
HCM Lane V/C Ratio	0.657	0.011	-	-	0.006	-	-	0.09
HCM Control Delay (s)	43.6	8.7	0	-	8.8	0	-	14.4
HCM Lane LOS	E	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	4.1	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	5	5	115	95	15
Future Vol, veh/h	25	5	5	115	95	15
Conflicting Peds, #/hr	2	0	3	0	0	3
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	25	50	6	26	30
Mvmt Flow	27	5	5	125	103	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	251	114	122	0	-	0
Stage 1	114	-	-	-	-	-
Stage 2	137	-	-	-	-	-
Critical Hdwy	6.4	6.45	4.6	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.525	2.65	-	-	-
Pot Cap-1 Maneuver	742	880	1215	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	895	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	735	877	1212	-	-	-
Mov Cap-2 Maneuver	735	-	-	-	-	-
Stage 1	910	-	-	-	-	-
Stage 2	892	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1212	-	755	-	-
HCM Lane V/C Ratio	0.004	-	0.043	-	-
HCM Control Delay (s)	8	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Intersection Delay, s/veh	7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	5	0	5	0	0	5	0	0	0
Future Vol, veh/h	0	0	0	5	0	5	0	0	5	0	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	40	0	75	0	0	25	0	0	0
Mvmt Flow	0	0	0	5	0	5	0	0	5	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

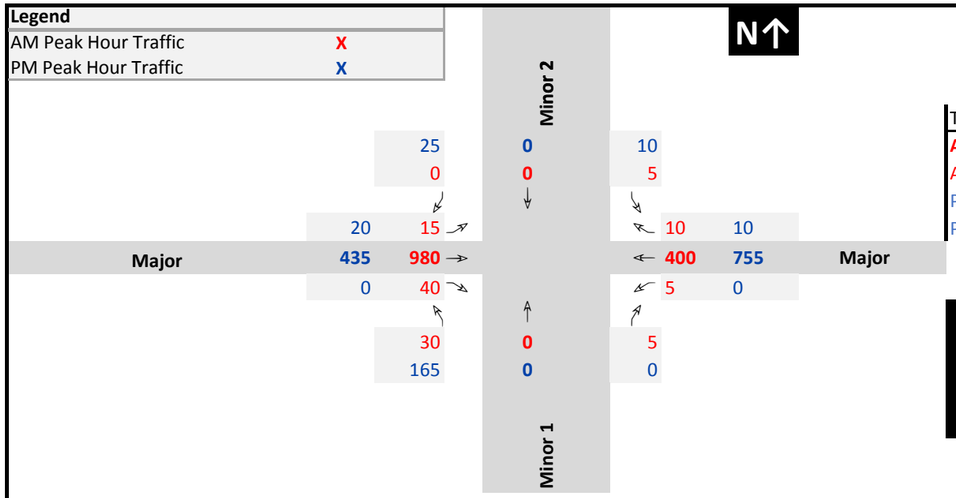
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	0	7.4	6.3	0
HCM LOS	-	A	A	-

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	0%	50%	0%
Vol Thru, %	0%	100%	0%	100%
Vol Right, %	100%	0%	50%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	0	10	0
LT Vol	0	0	5	0
Through Vol	0	0	0	0
RT Vol	5	0	5	0
Lane Flow Rate	5	0	11	0
Geometry Grp	1	1	1	1
Degree of Util (X)	0.005	0	0.013	0
Departure Headway (Hd)	3.32	3.918	4.39	3.924
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	1083	0	820	0
Service Time	1.325	1.921	2.39	1.93
HCM Lane V/C Ratio	0.005	0	0.013	0
HCM Control Delay	6.3	6.9	7.4	6.9
HCM Lane LOS	A	N	A	N
HCM 95th-tile Q	0	0	0	0

APPENDIX D

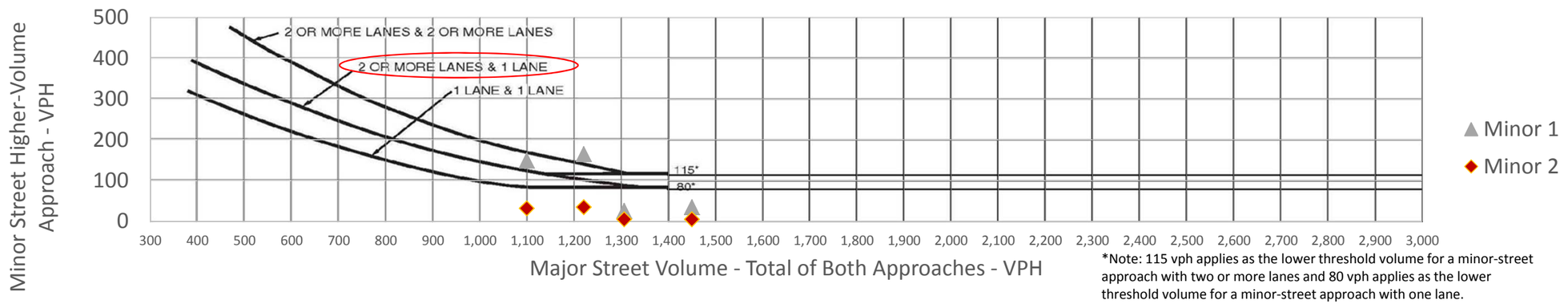
4-HOUR TRAFFIC SIGNAL WARRANTS

Legend	
AM Peak Hour Traffic	X
PM Peak Hour Traffic	X

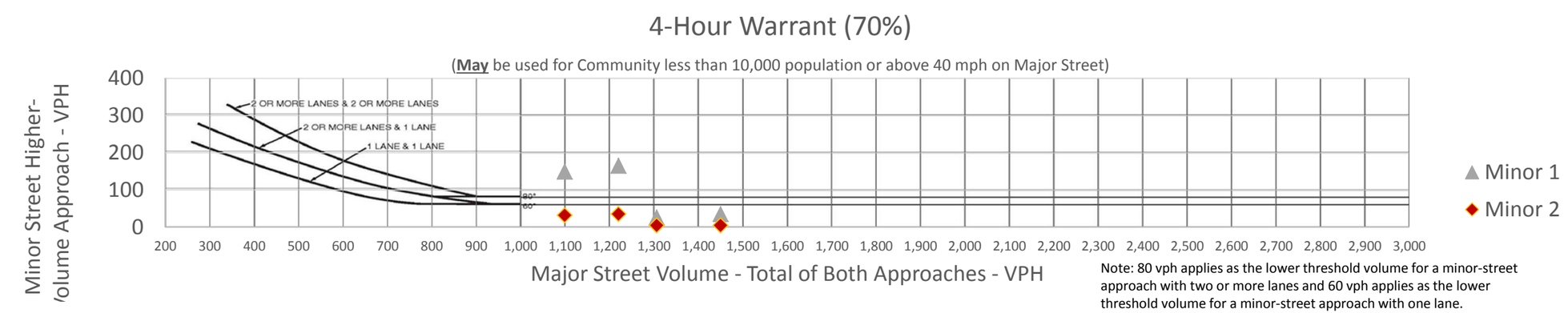


	Major						Minor 1			Minor 2			
					Lanes:	2		Lanes:	1		Lanes:	1	
								RT Reduction:	0%		RT Reduction:	0%	
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Factor
AM Peak	15	980	40	5	400	10	30	0	5	5	0	0	
AM Peak 2 (est.)	14	882	36	5	360	9	21	0	5	5	0	0	70%
PM Peak	20	435	0	0	755	10	165	0	0	10	0	25	
PM Peak 2 (est.)	18	392	0	0	680	9	149	0	0	9	0	23	90%

Major	Minor 1	Minor 2
1,450	35	5
1,306	26	5
1,220	165	35
1,099	149	32



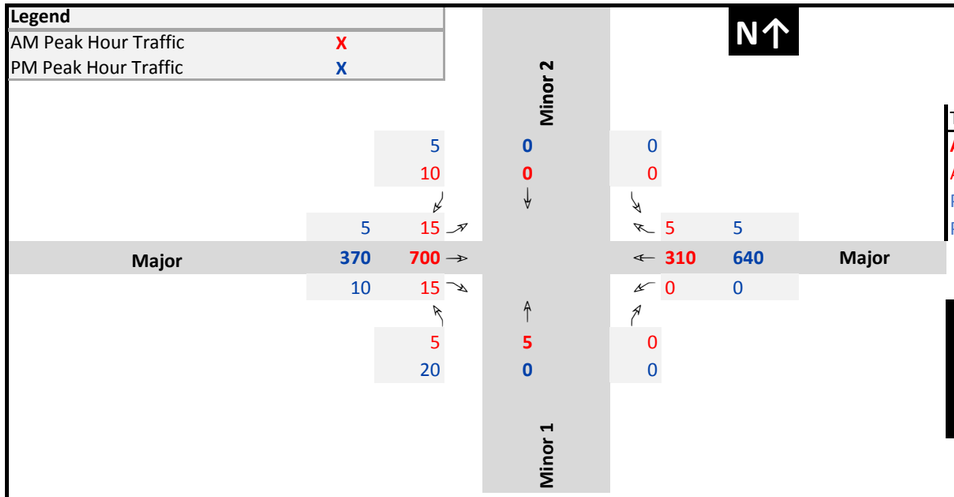
*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.



Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Sand Island Wastewater Treatment Plant Facility Plan TIAR	Austin, Tsutsumi, and Associates, Inc.	FIGURE
	Sand Island Parkway/SIWWTP Main Entrance 4-Hour Signal Warrant Approximation	D.1

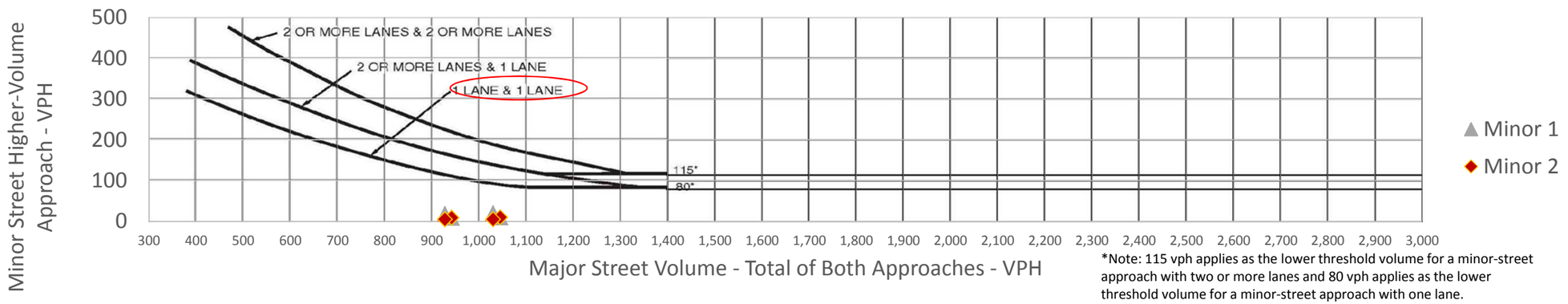
Legend	
AM Peak Hour Traffic	X
PM Peak Hour Traffic	X



	Major						Minor 1			Minor 2			
						Lanes:	1		Lanes:	1		Lanes:	1	
									RT Reduction:	0%		RT Reduction:	0%	
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Factor
AM Peak	15	700	15	0	310	5	5	5	0	0	0	10	
AM Peak 2 (est.)	14	630	14	0	279	5	4	5	0	0	0	9	70%
PM Peak	5	370	10	0	640	5	20	0	0	0	0	5	
PM Peak 2 (est.)	5	333	9	0	576	5	18	0	0	0	0	5	90%

Major	Minor 1	Minor 2
1,045	10	10
942	9	9
1,030	20	5
928	18	5

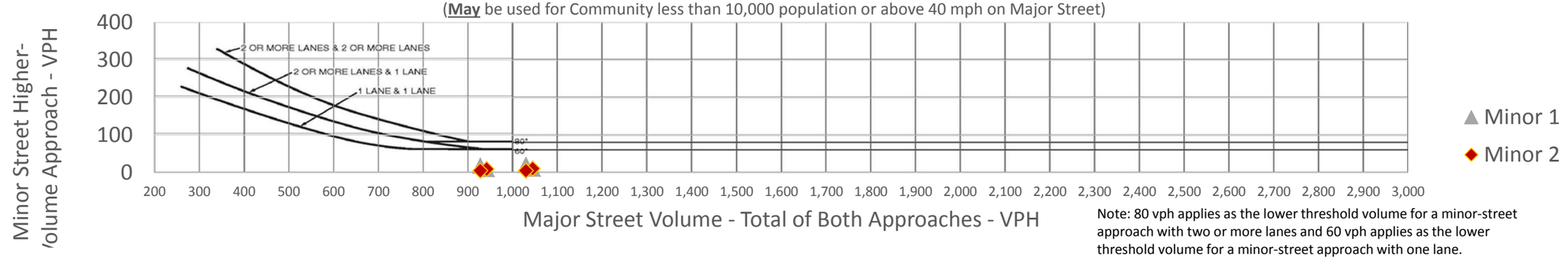
4-Hour Warrant (100%)



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

4-Hour Warrant (70%)

(**May** be used for Community less than 10,000 population or above 40 mph on Major Street)



Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Sand Island Wastewater Treatment Plant Facility Plan TIAR	Austin, Tsutsumi, and Associates, Inc.	FIGURE
	Sand Island Parkway/SIWWTP Secondary Access 4-Hour Signal Warrant Approximation	D.2