2 EXISTING FACILITIES

The Honouliuli WWTP was originally built in 1978 as a primary plant and became operational in 1984. The rated design capacity is 38 mgd with one unit on standby and 51 mgd with all units in service, according to the Honouliuli WWTP Facility-Wide Operations Manual (Fukunaga and Associates, Inc. and HDR Engineering, Inc. 2011) herein referred to as the O&M Manual. The WWTP provides primary treatment to all flow received. Approximately 13 mgd undergoes further secondary treatment. A portion of the secondary effluent is treated for water reuse at the CCH Board of Water Supply (BWS) HWRF. The solids stream has a rated design capacity of solids generated from 42 mgd of primary treatment and 26 mgd of secondary treatment according to the O&M Manual. The existing Honouliuli WWTP is shown on Figure 2-1.

This section describes the major components of the Honouliuli WWTP system including: collection system, liquid treatment system, effluent disposal system, solids handling system, odor control system, and electrical.

2.1 Collection System

The Honouliuli sewer basin is the second largest on Oahu, serving a population of over 300,000. It includes 17 CCH-operated wastewater pump stations excluding the Honouliuli Influent Pump Station (IPS). The Honouliuli WWTP provides primary treatment to all flow, and secondary treatment to a portion of the total flow received. Approximately half of the influent is further treated to secondary treatment.

The Honouliuli gravity collection system is mainly made up of approximately 83% vitrified clay pipes and approximately 9% reinforced concrete pipes. The most common pipe size in the sewer basin is 8-inch diameter pipes which make up approximately 65% of the total length of pipes. A summary of the gravity collection system pipe diameter and material are provided in Table 2-1 and Table 2-2.

2.2 Liquid Treatment System

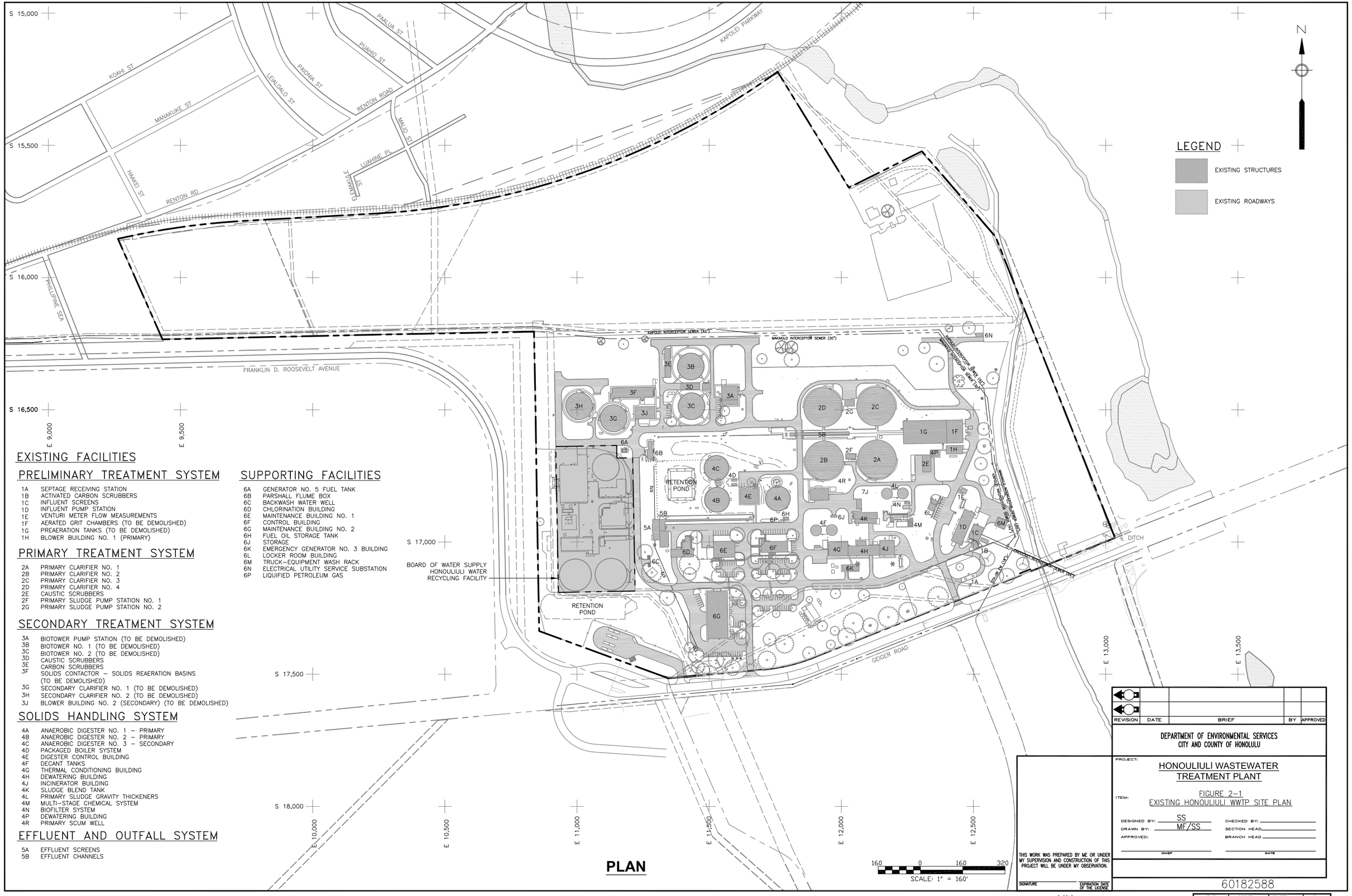
The existing system includes preliminary treatment, primary treatment, and secondary treatment.

2.2.1 Preliminary Treatment

Preliminary treatment is a physical process in which large items such as rags, sticks, grit, grease, and other items are removed from the wastewater. The primary treatment equipment includes the septage receiving station, influent screens, the IPS, influent flow measurements, preaeration tanks, aerated grit chambers, and Blower Building (No. 1).

2.2.1.1 Septage Receiving Station

The septage receiving station is located at the southeastern end of the WWTP (Figure 2-1) shows the existing WWTP site plan). Currently permitted private haulers and CCH ENV haulers discharge septage or liquid sludge at a manhole upstream of the influent screens. There is no odor control facility for the septage receiving station. There is no pump station at the septage receiving station as the septage or liquid sludge flows by gravity via a 12-inch sewer that connects to the 21-inch sewer from Kalaeloa prior to entering the influent junction box.



EXISTING FACILITIES

PRELIMINARY TREATMENT SYSTEM

- 1A SEPTAGE RECEIVING STATION
- 1B ACTIVATED CARBON SCRUBBERS
- 1C INFLUENT SCREENS
- 1D INFLUENT PUMP STATION
- 1E VENTURI METER FLOW MEASUREMENTS
- 1F AERATED GRIT CHAMBERS (TO BE DEMOLISHED)
- 1G PREAERATION TANKS (TO BE DEMOLISHED)
- 1H BLOWER BUILDING NO. 1 (PRIMARY)

PRIMARY TREATMENT SYSTEM

- 2A PRIMARY CLARIFIER NO. 1
- 2B PRIMARY CLARIFIER NO. 2
- 2C PRIMARY CLARIFIER NO. 3
- 2D PRIMARY CLARIFIER NO. 4
- 2E CAUSTIC SCRUBBERS
- 2F PRIMARY SLUDGE PUMP STATION NO. 1
- 2G PRIMARY SLUDGE PUMP STATION NO. 2

SECONDARY TREATMENT SYSTEM

- 3A BIOTOWER PUMP STATION (TO BE DEMOLISHED)
- 3B BIOTOWER NO. 1 (TO BE DEMOLISHED)
- 3C BIOTOWER NO. 2 (TO BE DEMOLISHED)
- 3D CAUSTIC SCRUBBERS
- 3E CARBON SCRUBBERS
- 3F SOLIDS CONTACTOR – SOLIDS REAERATION BASINS (TO BE DEMOLISHED)
- 3G SECONDARY CLARIFIER NO. 1 (TO BE DEMOLISHED)
- 3H SECONDARY CLARIFIER NO. 2 (TO BE DEMOLISHED)
- 3J BLOWER BUILDING NO. 2 (SECONDARY) (TO BE DEMOLISHED)

SOLIDS HANDLING SYSTEM

- 4A ANAEROBIC DIGESTER NO. 1 – PRIMARY
- 4B ANAEROBIC DIGESTER NO. 2 – PRIMARY
- 4C ANAEROBIC DIGESTER NO. 3 – SECONDARY
- 4D PACKAGED BOILER SYSTEM
- 4E DIGESTER CONTROL BUILDING
- 4F DECANT TANKS
- 4G THERMAL CONDITIONING BUILDING
- 4H DEWATERING BUILDING
- 4J INCINERATOR BUILDING
- 4K SLUDGE BLEND TANK
- 4L PRIMARY SLUDGE GRAVITY THICKENERS
- 4M MULTI–STAGE CHEMICAL SYSTEM
- 4N BIOFILTER SYSTEM
- 4P DEWATERING BUILDING
- 4R PRIMARY SCUM WELL

EFFLUENT AND OUTFALL SYSTEM

- 5A EFFLUENT SCREENS
- 5B EFFLUENT CHANNELS

SUPPORTING FACILITIES

- 6A GENERATOR NO. 5 FUEL TANK
- 6B PARSHALL FLUME BOX
- 6C BACKWASH WATER WELL
- 6D CHLORINATION BUILDING
- 6E MAINTENANCE BUILDING NO. 1
- 6F CONTROL BUILDING
- 6G MAINTENANCE BUILDING NO. 2
- 6H FUEL OIL STORAGE TANK
- 6J STORAGE
- 6K EMERGENCY GENERATOR NO. 3 BUILDING
- 6L LOCKER ROOM BUILDING
- 6M TRUCK–EQUIPMENT WASH RACK
- 6N ELECTRICAL UTILITY SERVICE SUBSTATION
- 6P LIQUIFIED PETROLEUM GAS

PLAN

160 0 160 320
SCALE: 1" = 160'

REVISION	DATE	BRIEF	BY	APPROVED

DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU

PROJECT:
HONOULIULI WASTEWATER TREATMENT PLANT

ITEM:
FIGURE 2–1
EXISTING HONOULIULI WWTP SITE PLAN

DESIGNED BY: SS
DRAWN BY: MF/SS
APPROVED:
CHECKED BY:
SECTION HEAD
BRANCH HEAD
CHIEF
DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION.

SIGNATURE
EXPIRATION DATE OF THE LICENSE

60182588

DRAWING 00 C–173

SHEET X OF XX

FILE	POCKET	FOLDER	NO.

Table 2-1. Summary of Gravity Sewers in the Honouliuli Sewer Basin

Diameter (in)	Number of Reaches	Total Length (ft)	% by Length
6	726	94,709	4
8	10,229	1,692,502	65
10	938	160,498	6
12	876	157,458	6
14	6	1,936	<1
15	620	115,543	4
16	8	14,965	1
18	338	67,387	3
20	7	11,727	<1
21	193	41,462	2
24	279	57,369	2
27	77	14,190	1
30	204	62,272	2
33	18	5,468	<1
36	135	42,645	2
42	88	41,421	2
48	11	12,931	<1
60	1	201	<1
84	26	12,290	<1
Total	14,782	2,606,687	100

Source: DPP 2010.

Table 2-2. Summary of Gravity Sewer Materials in the Honouliuli Sewer Basin

Pipe Material	Number of Reaches	Total Length (ft)	Average Age of Pipes (yr)	% by Length
ACP - Asbestos Cement Pipe	1	2,020	40	<1
CIP - Cast Iron Pipe	44	22,748	44	<1
DIP - Ductile Iron Pipe	54	68,004	29	3
HDPE - High Density Polyethylene	2	538	11	<1
PVC - Polyvinyl Chloride Pipe	631	115,165	15	4
RCP - Reinforced Concrete Pipe	1,000	228,776	33	9
TCP - Terra Cotta Pipe	28	3,402	56	<1
VCP - Vitrified Clay Pipe	12,934	2,150,820	32	83
UNK - Pipe Diameter <8-inch	88	15,210	41	1
Total	14,782	2,606,687	33	100

Source: DPP 2010.

2.2.1.2 Influent Screens

The wastewater from the Honouliuli sewer basin, along with septage from the septage receiving station, flows through the influent screens. Three mechanically cleaned bar screens are located upstream of the IPS wet well. The screens are located within reinforced concrete channels. Each screen is 5 ft wide with an operating water

depth ranging from 3 to 6 ft upstream of the screens. The openings for the bar screens are 0.75-inch to prevent large objects that may cause damage to downstream equipment from entering the WWTP. The screenings are mechanically removed, conveyed via a conveyor belt to a grinder and screenings washer/compactor, then discharged into a hopper. The compacted screenings hopper is then lifted by crane out of a below grade concrete pit that houses the screens, grinder, screenings compactor, and hopper. The compacted screenings are transported to a landfill for disposal.

2.2.1.3 Influent Pump Station

After the influent screens, wastewater is collected in a divided IPS wet well. The existing IPS consists of six extended shaft centrifugal pumps (four 20 mgd electric variable speed pumps and two 36 mgd electric and diesel [dual drive] variable speed pumps). These pumps are located in the basement of the IPS and are vertical non-clog centrifugal pumps with extended shafts connected to motors located at ground level. Each wet well compartment serves three pumps (two 20 mgd and one 36 mgd). The pumps convey the wastewater through two 42-inch diameter force mains. Each force main receives flow from three dedicated pumps: one 36 mgd electric and diesel variable speed pump (dual drive) and two 20 mgd electric variable speed pumps. In the event of a power outage, on-site standby power (located in a trailer adjacent to the IPS building) is able to operate two 20 mgd pumps (one for each force main). In addition, the two 36 mgd dual drive electric/diesel engine units can operate on their diesel engines during power outages. During normal conditions, two or three pumps are in service.

The influent flow is measured in the IPS force mains. There are two venturi flow meters (one on each force main) that measure the flow. The wastewater flows through the IPS force mains to the aerated grit chambers and preaeration tanks.

2.2.1.4 Grit Chambers and Preaeration Tanks

There are four aerated grit chambers and preaeration tanks. Each grit chamber and preaeration tank is 20 ft wide by 210 ft long. The grit chamber portion is 60 ft long and the preaeration tank portion is 150 ft long. The influent flow passes through a rectangular open channel that is 5 ft wide, then through a series of sluice gates into the aerated grit chambers, and then directly into the preaeration tanks. The effluent flow passes out of the preaeration tanks through a series of slide gates connected to a rectangular open channel that is 6 ft wide. The wastewater is then conveyed from the preaeration tanks to the primary clarifiers.

During normal conditions, three trains are in operation, with one train rotated out of service quarterly for maintenance or to be used as a standby train. The aerated grit chambers and preaeration tanks are designed for an average flow of 51 mgd and peak flow of 112 mgd.

2.2.2 Primary Treatment

Primary treatment is a physical process that removes suspended solids and organic material by physical settling. The primary treatment system consists of the primary clarifiers and two primary sludge pump stations.

2.2.2.1 Primary Clarifiers

The four primary clarifiers are each 145 ft in diameter with a minimum sidewater depth of 10 ft. Flow enters the tanks from a splitter box at the end of the rectangular open channels from the aerated grit chamber and preaeration tanks. Flow enters each tank via a 42-inch diameter influent pipe that is connected to the bottom of the splitter box. The pipe drops down below the bottom of the clarifier and is encased in a concrete jacket attached to the bottom of the clarifier floor. Each 42-inch pipe is connected to the clarifier center column. The clarifiers are provided with inboard effluent troughs outfitted with 3-inch v-notch weir plates to convey the effluent to the two primary effluent channels. Each rectangular primary effluent channel services two clarifiers and is 6 ft wide. During normal conditions, three clarifiers are in service and one unit is on standby.

2.2.3 Secondary Treatment

The secondary treatment system at the Honouliuli WWTP was completed in 1996. The Honouliuli WWTP secondary treatment process uses a biological fixed film trickling filter (TF) process to remove biodegradable organic matter and a suspended growth solids contact process for enhanced suspended solids removal. The trickling filter/solids contact (TF/SC) process provides secondary treatment for a constant wastewater flow of 13 mgd (approximately one-half of the current total flow to the Honouliuli WWTP). The secondary treatment system consists of a biotower pump station, biotowers, solids contacts/reaeration basins, secondary clarifiers, Blower Building No. 2, and Parshall flumes.

2.2.3.1 Trickling Filter Pump Station

A constant 13 mgd of primary effluent flows through two 5.5-ft wide screening channels to the TF pump station. In addition to primary effluent, the TF pump station receives recycle flow (TF effluent) from the recycle distribution box. The primary effluent and the TF recycle flows are conveyed by 36-inch diameter pipes into a mixing chamber and then flow into two wet wells, one on either side of the mixing chamber. The pump station, which sits above the mixing chamber and wet wells, has eight vertical turbine pumps. Four pumps (two 6.5 mgd and two 3.25 mgd constant speed vertical turbine pumps) are located over both wet wells. One of the large pumps for each TF is a standby unit (a total of two standby pumps are provided).The station pumps the mixture of primary effluent and TF recycle through two 36-inch pipes to the TFs. Each pipe is equipped with a 36-inch magnetic flow meter to measure the flow.

The biotower pump station conveys a constant flow of 13 mgd to each TF (6.5 mgd of primary effluent and 6.5 mgd of TF recycle flow). By design, the quantity of wastewater receiving secondary treatment is constant and the quantity of recycle flow is constant so adjustments to the gate positions are not required.

2.2.3.2 Trickling Filters

There are two TFs; each unit is 100 ft in diameter with a plastic media depth of 20 ft. The two TFs are designed to treat constant primary effluent flow of 13 mgd (6.5 mgd each). The TF secondary treatment process provides fixed film biological treatment to remove soluble organics in the wastewater thereby reducing soluble BOD_5. The TFs use plastic media to support the growth of bacteria (biofilm) that consume the organic pollutants in the primary effluent. The primary effluent and TF recycle are evenly distributed across the surface of the attached-growth media with a rotating assembly with four distribution arms called a rotary distributor. The hydraulic design of each rotary distributor is based on a constant flow of 13 mgd (6.5 mgd primary effluent and 6.5 mgd TF recycle). The TF pump station provides a constant wetting rate that promotes sloughing of the biofilm that attaches to the plastic media, and prevents organic overloading that would cause odors/septic conditions at the top of the TF towers. During normal conditions, both TFs are in service.

2.2.3.3 Solids Contact and Sludge Reaeration Basins

Settled sludge (return secondary sludge [RSS]) from the two secondary clarifiers is reaerated in four reaeration basins. Each basin is 8 ft wide by 24 ft long with a sidewater depth of 12 ft. The reaerated sludge is discharged into the mixing/distribution chamber where it is mixed with the TF effluent and is distributed equally into the SC basins. The mixture then flows into the solids contactor basins. Each basin is 8 ft wide by 105 ft long with a sidewater depth of 12 ft and volume of 75,000 gallons. The total SC volume is approximately 300,000 gallons. The four SC basins are designed to treat a constant flow of 13 mgd (3.25 mgd in each tank). The SC process is a biological treatment process designed to improve the settleability of the suspended solids through flocculation. Flow from the SC basins is conveyed to two secondary clarifiers. During normal operations, all four solids contact and sludge reaeration basins are in service.

2.2.3.4 Secondary Clarifiers

Effluent from the SC basins is conveyed by gravity to the secondary clarifiers. There are two secondary clarifiers designed to treat a constant flow of 13 mgd (6.5 mgd each). Each secondary clarifier is 100 ft in diameter with a sidewater depth of 16 ft. Flow enters each secondary clarifier via a 36-inch diameter influent pipe that is encased below the floor and connected to the clarifier center column. An inboard effluent trough, outfitted with 3-inch

v-notch weir plates, is provided in each clarifier. Flow exits each secondary clarifier via a 36-inch diameter pipe connected to a Parshall flume. During normal conditions, both secondary clarifiers are in operation.

2.3 Effluent Disposal System

The facilities that make up the effluent and outfall system include the effluent channel, effluent screens, effluent flow measurement, ocean outfall, and HWRF. Primary effluent, excess secondary effluent, and reverse osmosis brine are combined in the effluent channel and discharged to the ocean via the outfall. The Barbers Point Deep Ocean Outfall was constructed in 1979 and has a peak flow capacity of 112 mgd. The 84-inch diameter outfall extends approximately 8,760 ft into the ocean and discharges treated effluent approximately 200 ft below the surface through a 1,750-ft long diffuser pipe. The water reclamation processes associated with the HWRF include sand filtration, reverse osmosis, and ultraviolet (UV) disinfection.

2.4 Solids Handling System

The Honouliuli WWTP was recently upgraded under the *Honouliuli Wastewater Treatment Plant New Solids Handling Facility* project (GMP 2004), herein referred to as the *New Solids Handling Facility*. The existing Honouliuli WWTP solids unit processes include gravity thickeners, gravity belt thickeners (GBTs), blend tanks, anaerobic digesters, and centrifuge dewatering. The solids capacity is based on solids removed from 42 mgd of primary treatment and 26 mgd from secondary treatment.

Solids residues from the Honouliuli WWTP are either disposed of at the Waimanalo Gulch Landfill in Kahe Valley, Kapolei or disposed of at the H-Power Facility. Use of the landfill is being phased out. The solids loading to the Honouliuli WWTP is augmented by solids from the Wahiawa and Paalaa Kai WWTPs, which are trucked to the Honouliuli WWTP for further processing and disposal.

2.4.1 Primary Sludge Thickening

There were two gravity thickeners at the Honouliuli WWTP prior to the solids handling upgrades. After the heat treatment system and decant tanks were decommissioned in 2010, the two decant tanks were converted into gravity thickeners, giving the WWTP a total of four gravity thickeners. The sidewall heights of the converted decant tanks were extended to essentially match the existing gravity thickeners. Each gravity thickener is 40 ft in diameter with a side water depth of 10 ft for the original gravity thickeners and 9 ft 4 inches for the converted decant tanks. The thickened primary sludge is conveyed to the sludge blending tanks to be mixed with thickened secondary sludge. During normal operations, only primary sludge is pumped to the gravity thickeners and one gravity thickener is in operation.

2.4.2 Secondary Sludge Thickening

There are two GBTs to thicken secondary sludge from the TF/SC process. The GBTs use porous polyester belts that travel along a series of rollers. The sludge is conditioned with a cationic polymer and is distributed across the surface of the moving belt on the top of the unit. As the belt moves forward, the sludge passes through a series of polyester plows that enhance the drainage of water from the sludge solids. A significant amount of water is drained away from the sludge through the porous belt. The concentrated solids are dropped off the discharge end of the unit into a hopper or chute. During normal conditions, one GBT is in service.

2.4.3 Sludge Blend Tanks

The Honouliuli WWTP currently has four blending tanks. Each blending tank is 20 ft square, with a sidewater depth of 16.5 ft and an effective volume of approximately 49,000 gallons. Thickened sludge from both the gravity thickeners (primary sludge) and the GBTs (secondary sludge) is combined and mixed in the sludge blend tanks. Mixed sludge is then pumped to the anaerobic digesters. Odor is controlled by routing foul air to the Primary Sludge Odor Control System. During normal conditions, three sludge blend tanks are in service.

2.4.4 Anaerobic Digesters

The Honouliuli WWTP currently uses anaerobic digesters to stabilize solids produced by the primary and secondary treatment systems. There are three anaerobic digesters (two primary and one secondary) that receive a mixture of thickened primary and thickened waste secondary sludge (WSS) from the sludge blend tanks. The anaerobic digester process produces digested sludge and digester gas. Digested sludge is pumped to the dewatering centrifuges. A portion of the digester gas is used as fuel in the boiler to provide heat to the digesters. Excess digester gas is flared using the waste gas burner. During normal conditions, one primary and one secondary digester are in service.

2.4.5 Dewatering

The dewatering process at the Honouliuli WWTP is the final stage in the solids treatment process. Digested primary and secondary sludge is pumped from the anaerobic digesters to the three centrifuges located in the dewatering building. The centrifuges further dewater the sludge to 25 to 28% total solids (TS) concentration. Dewatered cake is trucked from the WWTP site to a landfill for disposal and centrate (liquid) is routed back to the WWTP headworks for liquid treatment.

2.5 Odor Control System

The Honouliuli WWTP has six separate odor control systems that collect and treat air emissions from the WWTP. The existing Honouliuli WWTP odor control systems are presently being evaluated under a separate CCH project entitled *Honouliuli Wastewater Basin Odor Control*. The odor control facilities at the WWTP include:

- *Preliminary Odor Control System.* Collects and treats foul air from the influent sewers, influent screens, and IPS wet well. This foul air is conveyed to two activated carbon scrubbers, which are run in parallel. The total capacity of the activated carbon scrubbers is 7,000 cubic feet per minute (cfm).
- *Primary Odor Control System.* Collects and treats foul air from the aerated grit chambers, preaeration tanks, and primary clarifier weirs. This system consists of two-stage treatment that includes two catalytic scrubbers that have been converted into caustic scrubbers, followed by five dual-bed activated carbon scrubbers. The total capacity of the system is 24,000 cfm.
- *Secondary Odor Control System.* Collects and treats foul air from the secondary treatment processes including the biotower pump station and TF/SC process. The Secondary Odor Control System consists of a two-stage treatment system that includes two catalytic scrubbers that have been converted into caustic scrubbers, followed by five dual-bed activated carbon scrubbers. The total capacity of the secondary odor control system is 25,000 cfm.
- *Primary Sludge Odor Control System.* Consists of a four-cell stone media biofilter system that collects and treats foul air from the gravity thickeners and sludge blend tanks. The total capacity of the Primary Sludge Odor Control System is 16,400 cfm.
- *Secondary Sludge Odor Control System.* Consists of an activated carbon system with two units that collect and treat foul air from the GBTs. The capacity of the Secondary Sludge Odor Control System is 3,000 cfm.
- *Solids Dewatering Odor Control System.* Consists of a multistage chemical unit that collects and treats foul air from the centrifuge dewatering building. The Solids Dewatering Odor Control System has a treatment capacity of 22,000 cfm.

2.6 Electrical

While there is limited existing electrical metering at the existing WWTP, the utility bills provide information on the overall electrical demand. Table 2-3 shows the maximum and minimum WWTP electrical demand for data collected from September 2008 to September 2011.

The measured maximum (peak) demand of 1,757 kilowatts (kW) was used as the representative peak demand for the existing WWTP operating with the existing flows.

Table 2-3. Facility Electrical Demand Data

Parameter	Electrical Demand (kW)	Reported Date
Maximum Measured Demand	1,757	Jan 26, 2011
Minimum Measured Demand	1,536	Dec 26, 2009

Legend: kW = kilowatt.
Source: Honouliuli Fac Plan Work Task 12 – Alternative Energy, Electrical Supply, and Distribution Strategy, Item 12.E Technical Memorandum (AECOM 2014a)

2.7 Summary

Table 2-4 summarizes the existing processes at the Honouliuli WWTP.

Table 2-4. Existing Honouliuli WWTP Process Units

Process Unit	No. of Units	Length (ft)	Width (ft)	Diameter (ft)	SWD (ft)	Surface Water Elev. at Avg Flow (ft MSL)	Surface Water Elev. at Peak Flow (ft MSL)	Volume Per Unit (gal)
Influent Screens	3	—	5	—	3 to 6	15.2 (1)	18.5 (1)	—
IPS	6	Extended-shaft centrifugal pumps, four 20-mgd, variable-speed electric, two 36-mgd electric and diesel driven: 92 ft x 11 ft wet well.						
Aerated Grit Chamber	4	60	20	—	13.76	43.2	45.2	123,510
Pre-aeration Tanks	4	150	20	—	14.5	43.2	45.2	325,380
Primary Clarifiers	4	—	—	145	9.96	42.6	42.7	1,230,230 (2)
Biotower Pump Station	8	Vertical turbine, constant-speed pumps (four for each biotower; two 6.5-mgd and two 3.25-mgd capacity pumps) (3)						
Biotowers (3)	2	—	—	100	20	49.3 (4)	49.3 (4)	—
Sludge Re-aeration Tanks (3)	4	24	8	—	12	46.5	46.5	17,230
Solids Contact Tank (3)	4	105	8	—	12	46.5	46.5	75,400
Secondary Clarifiers (3)	2	—	—	100	16	43.1	43.1	939,960 (2)
Effluent Screens	3	—	5.5	—	7.5	30.4 (5)	34.7 (5)	—
Barbers Point Deep Ocean Outfall: 8,760 ft into the ocean to a diffuser section; 1,750 ft in length, approximately 200 ft below surface								
Gravity Thickener	4	—	—	40	10	52.4	—	94,000
GBTs	2	—	6.5	—	—	—	—	—
Blend Tanks	4	20	20	—	16	62.8	—	47,870
Anaerobic Digesters	3	—	—	90	30	69.5	—	1,427,570
Centrifuges	3	Sludge feed rate = 150 gpm at 2% solids each, maximum solids loading = 1,800 lb/hr						

Legend: Avg. = average; Elev. = elevation; gal = gallon; gpm = gallons per minute, lb/hour = pounds per hour; MSL = mean sea level; SWD = side water depth.
Sources: GMP Hawaii, Inc. (2004); R. M. Towill (1997).
Notes:
(1) Upstream of Mechanical Screens
(2) Volume does not include the cone section of the tank.
(3) Secondary Treatment is a constant 13 mgd
(4) TF Underdrain Trough
(5) Upstream of Effluent Screens