Evaluation Report:
WaiHome LLC
Mata Solid Waste Interceptor

Under the provisions of NSF/ANSI Standards:
41: Non-Liquid Saturated Treatment Systems
245: Residential Wastewater Treatment Systems - Nitrogen Reduction

Conducted at University of Hawaiʻi at Mānoa, in partnership with the Department of Civil, Environmental and Construction Engineering and Water Resources Research Center

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1. PROCESS DESCRIPTION

The Mata™ solids interceptor utilizes a mechanically driven, physical separation and dewatering process to remove suspended and settleable organic solids from residential wastewater prior to downstream biological treatment or disposal. Unlike biological reactors that rely on microbial growth and aeration, Mata operates as a pre-treatment and primary solids management device, concentrating and removing fecal and fibrous solids at the point of entry to the treatment train.

By physically removing fecal solids, toilet paper fibers, and other particulate organic matter prior to biological treatment, Mata reduces **total suspended solids (TSS), particulate biochemical oxygen demand (BOD), and particulate nitrogen loading** to downstream treatment or disposal. This improves downstream process stability, oxygen utilization efficiency, and nitrogen-removal performance.

Because the Mata process is mechanical rather than biological, its performance does not depend on dissolved oxygen, microbial population stability, or temperature-sensitive biochemical reactions. Instead, solids capture efficiency is governed by screen geometry, rotational speed, and hydraulic loading. This allows the unit to maintain consistent separation performance across a wide range of flow rates, organic loadings, and operating conditions, including intermittent and shock loading typical of residential use.

The system is equipped with online monitoring and telemetry to track pump cycles, auger operation, and system status, supporting preventative maintenance and long-term performance verification during certification testing and field operation.

2. PERFORMANCE EVALUATION

2.1 Description of System Evaluated

The **Mata™ system** evaluated in this study has a rated capacity of five people per day. The unit was configured and operated in accordance with the manufacturer's specifications provided in Appendix A.

The system consists of a screened influent zone and a liquid collection zone within a single tank, along with a pair of separate solids collection and dehydration bins. Incoming wastewater enters the Mata unit and is directed toward a rotating perforated screen and auger assembly. As wastewater flows through the screen, liquid and dissolved constituents pass through the perforations, while particulate organic solids are retained on the screen surface.

Liquid effluent that passes through the screen accumulates in the lower portion of the tank. When the liquid level reaches a preset elevation, a float-activated control system energizes a sump pump, which transfers the clarified liquid to the downstream treatment or disposal system.

Simultaneously, the same float signal activates the auger drive, causing the auger to rotate and advance the retained solids along the screen.

As the auger turns, the captured solids are mechanically conveyed and compressed, allowing entrained liquid to drain back through the screen into the liquid compartment. The dewatered solids are discharged into a solids collection bin, where they are retained for passive drying and subsequent removal. When the liquid level drops below the float setpoint, both the sump pump and auger are de-energized.

The Mata unit operates in a flow-through configuration that maintains gravity passage of wastewater across the screen during both powered and unpowered conditions. This configuration prevents upstream surcharge while providing controlled liquid discharge and solids conveyance during normal operation.

An optional peracetic acid dosing pump may be configured in-line with the effluent to meet NSF/ANSI 41 liquid end-product bacteria limits. The Mata monitored in the controlled system tested was configured to apply a 250ppm PAA dose. As disinfection is unconventional in septic systems and systems monitored under NSF 245, the field tested units were not configured for PAA dosing.

2.2 Test Protocol

This section describes the methods used to evaluate the performance of the WaiHome Mata solids interceptor under a combined NSF/ANSI 41 and NSF/ANSI 245 equivalent testing program. Conventional treatment systems fall into one of two categories:

- a composting toilet evaluated with feces, urine, food waste, and water loading under the NSF/ANSI 41 standard; or
- a liquid-only treatment unit or ATU evaluated with dilute primary-treated wastewater loading under the NSF/ANSI 40/245 standards.

As a primary treatment alternative to the septic tank itself, not an ATU or composting toilet, it is only with a blended testing program that the Mata can be evaluated:

- NSF/ANSI 41 solid and liquid loading;
- NSF/ANSI 41 evaluation of solids end-products; and
- NSF/ANSI 245 evaluation of liquid end-products.

Performance testing and evaluation were conducted over a minimum six-month period and were not restricted to specific seasons. Both NSF/ANSI 41 and NSF/ANSI 245 require controlled loading tests, the methodology for which is provided here. Beyond the controlled system test, NSF 41 requires field testing of systems. The testing of two such systems has been included in this report.

Section 9 and 10 of NSF/ANSI Standard 41 protocol, "Mature systems ("field") performance testing and evaluation" and "New system ("controlled") performance testing and evaluation" are included in Appendix B. Section 8 of NSF/ANSI Standard 245 protocol, "Performance Testing and Evaluation", is included in Appendix C.

2.2.1 Controlled Test

As a Solids Interceptor, WaiHome's Mata is sized to handle a maximum instantaneous loading rate, not a maximum daily loading. Unlike conventional NSF/ANSI 245 testing, which utilizes municipal or septic tank effluent as influent, this blended evaluation employed real residential blackwater (kitchen and toilet) influent generated in accordance with NSF/ANSI 41 requirements.

For logistic purposes, the daily per capita loading rate was kept at one population equivalent. This is formally contemplated under the NSF/ANSI 41 standard - "The results obtained from performance testing and evaluation of one model may be indicative of other models, provided the other models are comparable in terms of design and function." Per NSF/ANSI 41, a population equivalent (p.e.) was defined as:

- 1.2 fecal events per person per day
- 4 urine events per person per day
- 200 g of food waste
- 15 gallons of water

Urine events were dosed as 350 mL volumes collected in a dedicated urine separation device and delivered to the system via automated pump. Water was dosed to the system using an automatic valve on a pressurized water line at a rate equivalent to typical residential use (toilet flushing plus kitchen wastewater). Fecal events and food waste were deposited directly into a pint flush toilet, documented, and flushed to the system.

The kitchen waste recipe was taken from Kuligowski et al. (2023) with the omission of flowers and paper. Expected urine volume of 1.4 L/day was taken from Rose et al. (2015).

Because influent composition was controlled generated rather than derived from a wastewater collection system, influent characteristics were estimated based on the mass and composition of applied materials.

Per NSF/ANSI 245, the loading schedule of the system was set at:

6 a.m. to 9 a.m. - 35 percent of daily loading
11 a.m. to 2 p.m. - 25 percent of daily loading
5 p.m. to 8 p.m. - 40 percent of daily loading

Water dosing was accomplished by opening an electrically actuated valve to feed water to the test system. Dosing was conducted once per hour during the required dosing intervals.

Per NSF/ANSI 41, after a start up period (at the manufacturer's discretion), the system loading began. After one month of design loading, the system was subjected to all applicable NSF/ANSI 41 and NSF/ANSI 245 stress loading conditions for a period of 2.5 months and then an additional 2.5 months of design loading (Figure 2.1). Detailed descriptions of the stress sequences are shown in Appendix B and C.

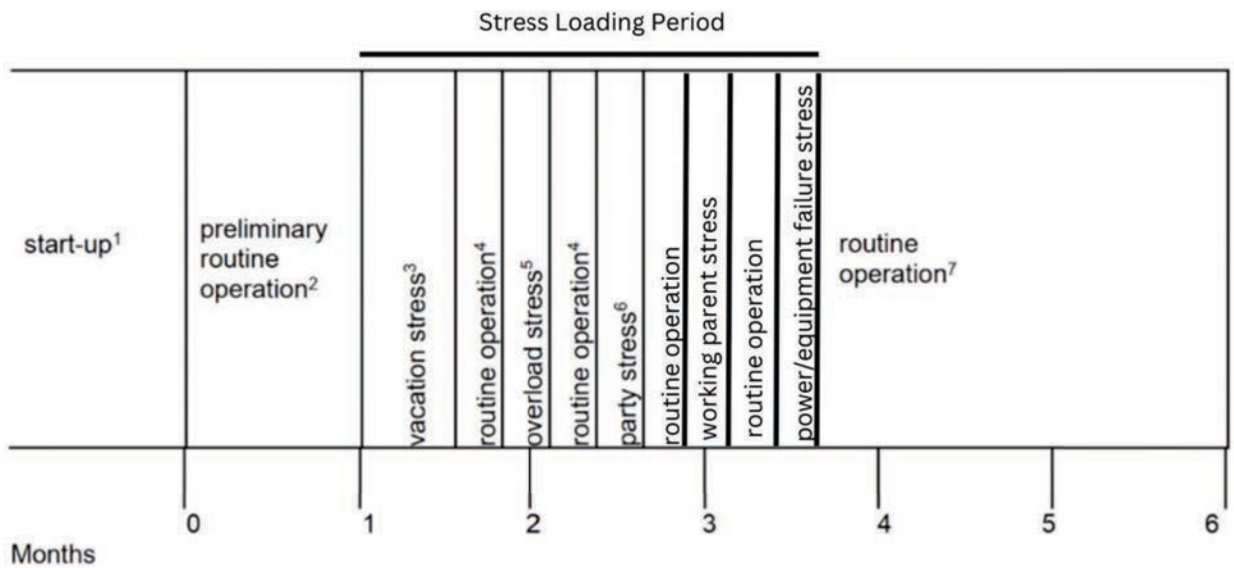

FIGURE 2.1: Stress loading patterns

Flow proportioned 24-hour composite effluent samples were collected three times per week. The effluent samples were analyzed for carbonaceous five-day biochemical oxygen demand (CBOD5), total suspended solids (TSS), alkalinity, Total Kjeldahl Nitrogen (TKN), ammonia-N and Nitrate/nitrate-N concentrations. On-site determinations of pH, temperature, ORP, and dissolved oxygen were made once per week through grab samples.

2.2.2 Field System Testing

Systems having end products characteristic of routine operation were subjected to a field test and performance evaluation. Liquid and solid end-products were grab-sampled once per week for testing. Site 1 was a 2 occupant home configured in a blackwater only treatment configuration with greywater diversion (Figure 2.2). Site 2 was a 1 occupant home configured in a mixed wastewater treatment configuration (Figure 2.3). Liquid end-product disinfection was installed at neither site.

FIGURE 2.2: Site 1 household with 1 bedroom with 2 occupants (left) and mata installed to receive kitchen and toilet blackwater (right).

FIGURE 2.3: Site 2 household with 1 bedroom with 1 occupant (left) and mata installed to receive mixed wastewater (right).

2.3 Test Chronology

The controlled system was installed under the direction of the manufacturer on June 10, 2025. Loading was initiated beginning June 11, 2025. Sampling for record was initiated on June 12, 2025. The stress test sequence was started on July 12, 2025. Testing was completed on December 12, 2025 (Table 2.1).

The Mata at Field Site 1 was installed and loading initiated under the direction of the manufacturer on May 21, 2025. Sampling for record was initiated on June 30, 2025. The Mata at Field Site 2 was installed and loading initiated under the direction of the manufacturer on October 16, 2025. Sampling for record was initiated on Nov 3, 2025.

TABLE 2.1. Controlled system operational phases

Operation Mode	Start Date	End Date	Duration (days)	Required (days)
Normal	Jun 11, 2025	Jul 11, 2025	30	30
Vacation	Jul 11, 2025	Jul 28, 2025	17	17
Normal	Jul 28, 2025	Aug 05, 2025	8	7
Overloading	Aug 05, 2025	Aug 10, 2025	5	5
Normal	Aug 10, 2025	Aug 16, 2025	6	7
Party	Aug 17, 2025	Aug 17, 2025	1	1
Normal	Aug 18, 2025	Aug 25, 2025	7	7
Working Parent	Aug 25, 2025	Sep 01, 2025	7	5
Normal	Sep 01, 2025	Sep 10, 2025	9	7
Power Outage	Sep 10, 2025	Sep 12, 2025	2	2
Normal	Sep 12, 2025	Dec 12, 2025	91	90
Overall	Jun 11, 2025	Dec 12, 2025	183	182

Dates correspond to NSF/ANSI testing protocol phases

2.4 Evaluation Criteria

Solid end products: Per NSF/ANSI 41, solid wastes shall meet the following requirements.

(1) solid end products shall not produce an objectionable odor immediately following removal from the system;

(2) moisture content shall not exceed 65% by weight; and

(3) shall not contain fecal coliform in excess of 200 MPN/g.

Odors: Per NSF/ANSI 41, gas emitted from the vent system shall be nonoffensive at ground level, and there shall be no offensive odors at the toilet seat at all times.

Liquid containment: Per NSF/ANSI 41, all devices shall provide for containment of liquid. The volume of the liquid end product that accumulates during the test shall not exceed the designed liquid storage capacity of the system. If the system is designed for liquid product discharge, the discharged volume shall not exceed the manufacturer’s designed discharge rate.

Liquid end products: NSF/ANSI 245 liquid testing was conducted, with effluent concentration criteria converted to mass removal efficiencies to adapt the testing for the primary treatment of highly concentrated raw residential sewage, per Section 2.2.

(1) BOD5: The average BOD of all effluent samples shall be less than 13% of the average BOD of all influent samples. This is based on an NSF 245 effluent requirement of 25mg/L using influent with 100-300 mg/L BOD.

(2) TSS: The average TSS of all effluent samples shall be less than 13% of the average TSS of all influent samples. This is based on an NSF 245 effluent requirement of 30mg/L using influent with 100-350 mg/L TSS.

(3) Total nitrogen: The average total nitrogen concentration of all effluent samples shall be less than 50% of the average total nitrogen concentration of all influent samples.

(4) pH: Individual effluent values remain between 6.0 and 9.0 SU.

3. ANALYTICAL RESULTS

3.1 Summary

Chemical analyses of samples collected during the evaluation were completed using the procedures in Standard Methods for the Examination of Water and Wastewater and USEPA methods. Summaries of the loading data generated during the evaluation are included in Appendix D. Results of the chemical analyses and onsite observations and measurements made during the evaluation are summarized in Tables 3.1 and 3.2. Data collected during stress loading and recovery is not included in the overall averages, as outlined in Section 8.4.3 of the NSF/ANSI 245 standard. For a complete summary of the results, please see Appendix E . For purposes of determining system performance, only samples collected during design loading periods, described in 8.2.2, were used in the calculations. The data collected during the stress sequences was not included in the calculations, but was included in the final report. Solids end product results are included in Appendix G.

Criteria for evaluating the analytical results from the testing are described in Section 8.4 of NSF/ANSI Standard 245. Section 8.4.1 of the Standard provides guidance addressing the impact of unusual testing conditions, including system upset, improper sampling, improper dosing, or influent characteristics outside the ranges specified in 8.2.1, an assessment shall be conducted to determine the extent to which these conditions adversely affected the performance of the system. Based on this assessment, specific data points may be excluded from the averages.

Early in the testing period several samples returned abnormally low BOD readings. These were taken to be the consequence of residual disinfectant in the effluent. Effluent samples with a BOD of less than 50 mg/L were discarded.

A single pH data point from Field Site 1 was discarded as it was greater than three standard deviations from the mean.

Beginning in the fourth month of the test, the water meter monitoring dosing to the system started returning variable results (Figure D.2). At this time, effluent TKN began to fluctuate significantly, indicating that urine dosing may have been similarly affected. Per the Standard, data days were excluded to account for the impacts of the out-of-range concentrations. For the calculation of TKN and TN summary statistics, days after September 12th were discarded.

Section 8.4.2 of the Standard addresses catastrophic site problems that may occur including, but not limited to, influent characteristics, malfunctions of test site apparatus and acts of God. If these problems jeopardize the validity of the performance testing, manufacturers shall be given the choice to perform maintenance and reinitiate start up of the test, or have the system brought back to pre-existing conditions with no routine maintenance within three weeks after the site problem has been identified and corrected. No such conditions were observed during this test.

TABLE 3.1 Summary of Controlled System Performance compared to the primary treatment performance of septic tanks (Nasr, 2013) and NSF secondary treatment performance standards.

	Parameter	NSF Equivalent Criteria	Septic Tank Performance	Result	Notes
Liquid End-Products	BOD (% Removal)	>87%	60%	87%	PASS
	TSS (% Removal)	>87%	60%	90%	PASS
	TN (% Removal)	>50%	0%	47%	FAIL
	pH	6-9	6-9	IQR 7.4-8.3a 4.5-6.1b	PASS without disinfection a - without disinfection b - with PAA disinfection
Liquid Containment				Zero Overflows Noted	PASS
Odors		None		None	PASS

TABLE 3.2 Summary of Analytical Results.

	N	Average	Std Dev	Min	Max	Median	IQR (25–75%)
Alkalinity (mg/L)							
Controlled System - Effluent	56	243.0	207.5	5.0	915.0	180.0	80 – 356.2
Field Site 1 - Effluent	18	675.6	277.1	40.0	1,075.0	720.0	507.5 – 861.2
Field Site 2 - Effluent	5	513.0	362.8	135.0	1,060.0	350.0	340 – 680
Ammonia-N (mg/L as N)							
Controlled System - Effluent	56	168.4	43.6	1.8	278.5	166.6	145.4 – 193.7
Field Site 1 - Effluent	19	202.9	78.1	22.5	333.3	197.5	169.2 – 258.7
Field Site 2 - Effluent	6	132.6	83.0	24.1	239.3	131.7	78.3 – 189.1
Biochemical Oxygen Demand (mg/L)							
Controlled System - Influent	13	1,677.4	262.1	1,126.8	2,131.2	1,684.1	1664.8 – 1738.5
Controlled System - Effluent	44	221.5	47.2	53.7	266.7	233.1	217.4 – 245.6
Field Site 1 - Effluent	20	222.0	26.0	153.0	255.3	229.4	210.6 – 239.6
Field Site 2 - Effluent	6	172.6	74.9	80.4	243.9	186.4	109.8 – 237
Dissolved Oxygen (mg/L)							
Controlled System - Effluent Grab	19	21.9	5.4	6.6	27.5	22.7	19.9 – 25.7
Nitrate/nitrite (mg/L as N)							
Controlled System - Effluent	56	1.2	1.3	0.0	6.9	0.7	0.5 – 1.5
Field Site 1 - Effluent	20	1.5	4.1	0.0	17.8	0.0	0 – 0.5
Field Site 2 - Effluent	6	16.1	10.0	0.0	26.0	17.0	11.6 – 24.4
pH							
Controlled System - Effluent	55	5.2	1.2	2.8	8.4	4.7	4.5 – 6.1
Field Site 1 - Effluent	16	8.1	0.4	7.2	8.8	8.0	7.9 – 8.3
Field Site 2 - Effluent	4	7.5	0.4	7.0	7.8	7.5	7.4 – 7.6
Controlled System - Effluent Grab	19	5.5	0.8	4.2	7.7	5.3	5 – 5.7
Total Kjeldahl Nitrogen (mg/L as N)							
Controlled System - Effluent	19	226.2	90.7	109.5	468.5	209.8	178.5 – 258.5
Field Site 1 - Effluent	20	337.0	128.8	123.3	579.4	329.4	239.6 – 415
Field Site 2 - Effluent	6	330.6	57.2	224.0	374.3	353.2	318.5 – 367
Total Nitrogen (mg/L as N)							
Controlled System - Influent	10	427.9	39.5	392.8	513.4	412.9	405 – 429
Controlled System - Effluent	19	227.4	90.7	110.0	470.0	210.0	180 – 260
Field Site 1 - Effluent	20	338.5	127.1	130.0	580.0	330.0	240 – 415
Field Site 2 - Effluent	6	346.7	55.0	250.0	400.0	360.0	330 – 382.5
Total Suspended Solids (mg/L)							
Controlled System - Influent	13	1,982.6	309.8	1,331.8	2,518.9	1,990.5	1967.7 – 2054.8
Controlled System - Effluent	56	198.0	134.2	29.0	715.4	179.3	103.4 – 250.3
Field Site 1 - Effluent	20	99.3	64.8	32.0	267.0	75.8	63.3 – 126.4
Field Site 2 - Effluent	6	81.6	63.6	2.0	153.0	84.3	32.2 – 134.5

3.2 Biochemical Oxygen Demand

The BOD of the influent was calculated based on the BOD of toilet paper, feces, food, and urine loaded to the system (Table D.1). The five-day biochemical oxygen demand (BOD5) analysis of the effluent was completed using the EPA Method 405.1. The results of the analyses completed on the samples collected during the testing are shown in Figure 3.1.

Controlled System Influent BOD5: The estimated influent BOD5 ranged from 1,125 to 2,128 mg/L during the evaluation, with an average concentration of 1,675 mg/L and a median concentration of 1,682 mg/L.

Controlled System Effluent BOD5: The effluent BOD5 concentrations ranged from 54 to 267 mg/L over the course of the evaluation, with an average concentration of 222 mg/L. The median effluent BOD5 concentration was 233 mg/L. Over the course of testing, the Mata reduced the influent BOD5 by an average of 87%.

Field Site 1 - Blackwater Effluent BOD5: The effluent BOD5 concentrations ranged from 153 to 255 mg/L over the course of the evaluation, with an average concentration of 222 mg/L. The median effluent concentration was 229 mg/L.

Field Site 2 - Mixed Wastewater Effluent BOD5 (Mata Site 2): The effluent BOD5 concentrations ranged from 80 to 244 mg/L over the course of the evaluation, with an average concentration of 173 mg/L. The median effluent concentration was 186 mg/L.

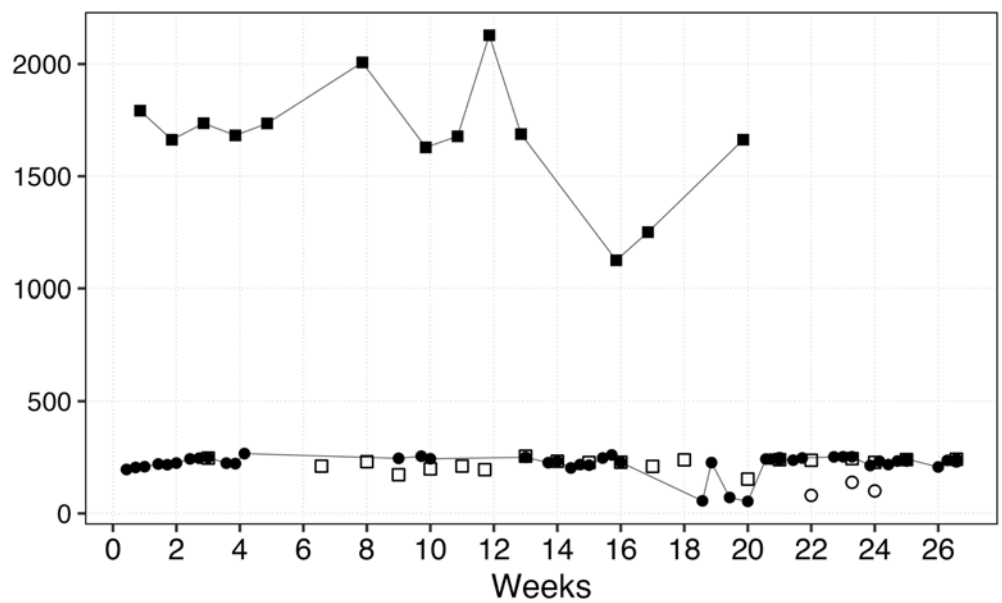

FIGURE 3.1: BOD5 (mg/L) concentrations across controlled and field systems. Filled square = Controlled System – Influent; filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.3 Total Suspended Solids

The TSS of the influent was calculated based on the mass and solid fraction of toilet paper, feces, and food loaded to the system (Table D.1). TSS analyses were completed using Method 209C of Standard Methods. The TSS results over the entire evaluation are shown in Figure 3.2.

Controlled System Influent TSS: The estimated influent TSS ranged from 1,330 to 2,515 mg/L during the evaluation, with an average concentration of 1,980 mg/L and a median concentration of 1,988 mg/L.

Controlled System Effluent TSS: The effluent TSS concentrations ranged from 29 to 715 mg/L over the course of the evaluation, with an average concentration of 198 mg/L. The median effluent TSS concentration was 179 mg/L. Over the course of testing, the Mata successfully reduced the influent TSS by an average of 90%.

Field Site 1 - Blackwater Effluent TSS: The effluent TSS concentrations ranged from 32 to 267 mg/L over the course of the evaluation, with an average concentration of 99 mg/L. The median effluent TSS concentration was 76 mg/L.

Field Site 2 - Mixed Wastewater Effluent TSS: The effluent TSS concentrations ranged from 2 to 153 mg/L over the course of the evaluation, with an average concentration of 82 mg/L. The median effluent TSS concentration was 84 mg/L.

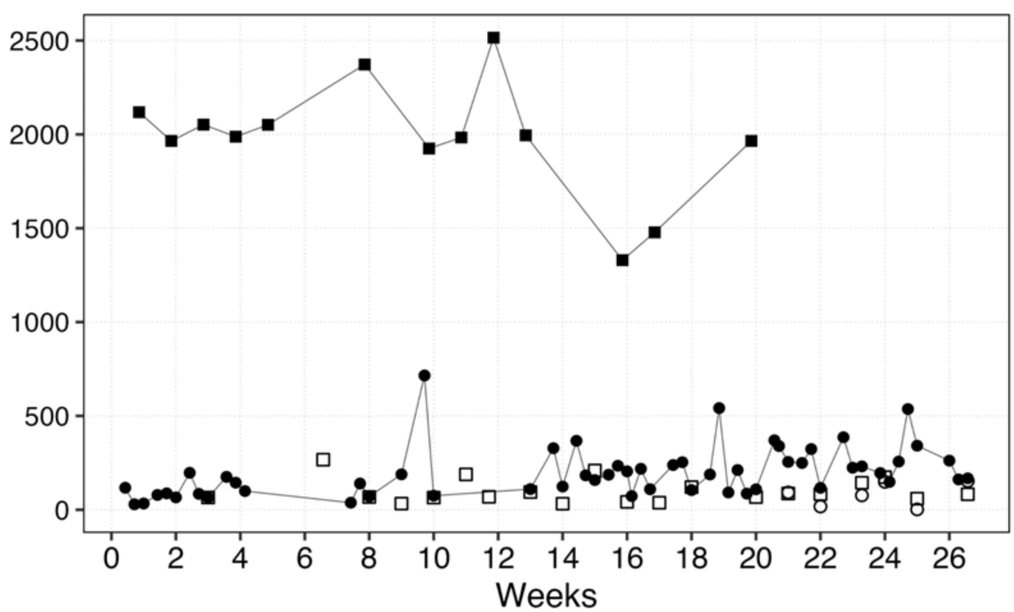

FIGURE 3.2: TSS (mg/L) concentrations across controlled and field systems. Filled square = Controlled System – Influent; filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.4 pH

The results of the analyses completed on the samples collected during the testing are shown in Figure 3.3. The pH data for the evaluation are shown in Appendix C.

Controlled System Effluent pH: Effluent pH values ranged from 2.8 to 8.4 over the course of the evaluation, with an average pH of 5.2. The median effluent pH was 4.7. PH in the controlled system was lower than normal due to the dosing of PAA disinfectant.

Field Site 1 - Blackwater Effluent pH: Effluent pH values ranged from 7.2 to 8.8 over the course of the evaluation, with an average pH of 8.1. The median effluent pH was 8.0.

Field Site 2 - Mixed Wastewater Effluent pH: Effluent pH values ranged from 7.0 to 7.8 over the course of the evaluation, with an average pH of 7.5. The median effluent pH was 7.5.

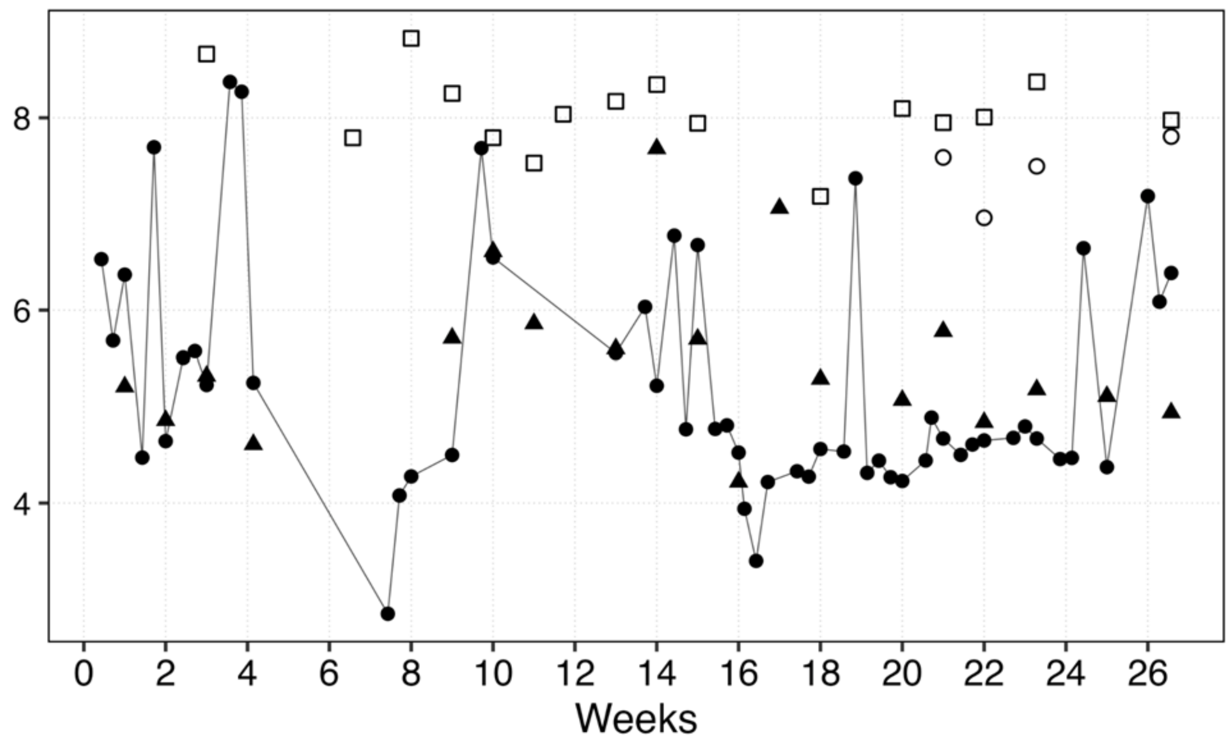

FIGURE 3.3: pH concentrations across controlled and field systems. Filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent; filled triangle = Controlled System – Effluent Grab..

3.5 Dissolved Oxygen

The dissolved oxygen (DO) concentration of the controlled system effluent was measured using Grab Samples in accordance with the Standard. The results of the analyses completed on the samples collected during the testing are shown in Figure 3.4.

Controlled System Dissolved Oxygen: Measured dissolved oxygen concentrations ranged from 6.6 to 27.5 mg/L over the course of the evaluation, with an average concentration of 21.9 mg/L. The median dissolved oxygen concentration was 22.7 mg/L. Dissolved oxygen in the controlled system was higher than normal wastewater due to the oxidizing effects of PAA disinfectant.

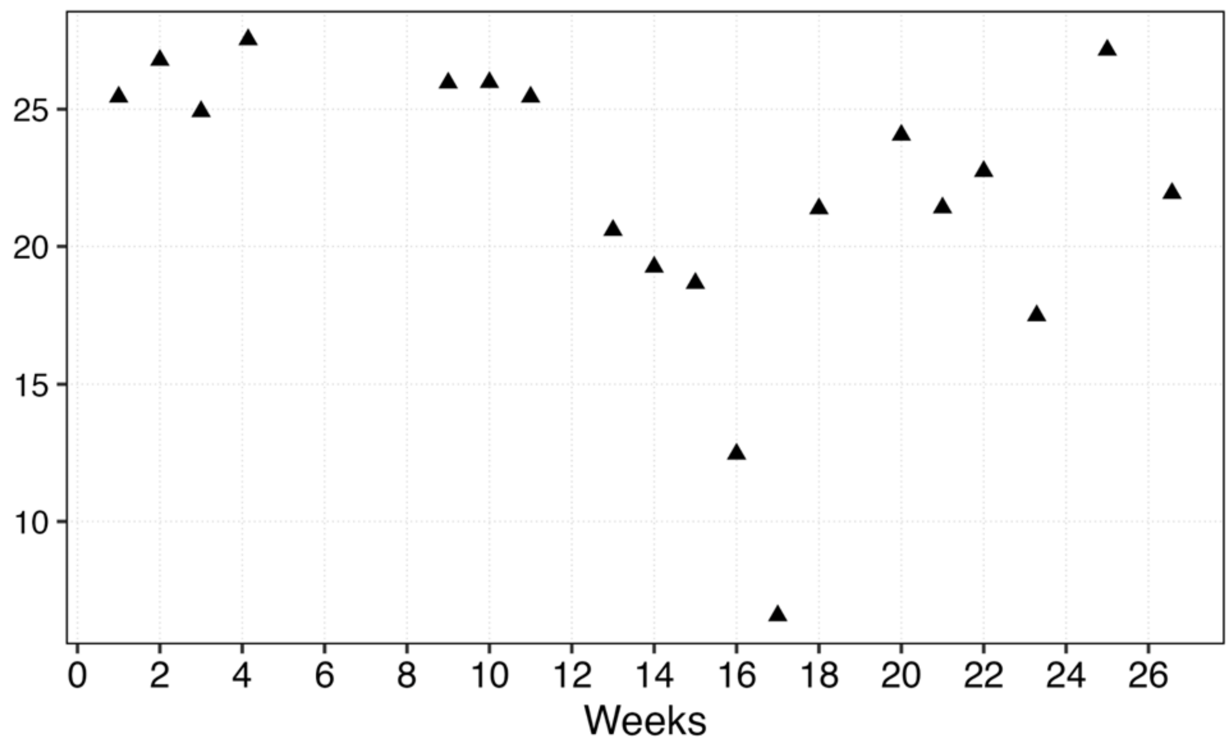

FIGURE 3.4: DO (mg/L) measurements through the duration of the test. Filled triangle = Controlled System – Effluent Grab.

3.6 Alkalinity

Alkalinity analyses were completed using Method 310.10 from EPA Methods. The alkalinity results over the entire evaluation are shown in Figure 3.5.

Controlled System Effluent Alkalinity: The effluent alkalinity concentrations ranged from 5 to 915 mg/L over the course of the evaluation, with an average concentration of 243 mg/L. The median effluent alkalinity concentration was 180 mg/L.

Field Site 1 - Blackwater Effluent Alkalinity: The effluent alkalinity concentrations ranged from 40 to 1,075 mg/L over the course of the evaluation, with an average concentration of 676 mg/L. The median effluent alkalinity concentration was 720 mg/L.

Field Site 2 - Mixed Wastewater Effluent Alkalinity: The effluent alkalinity concentrations ranged from 135 to 1,060 mg/L over the course of the evaluation, with an average concentration of 513 mg/L. The median effluent alkalinity concentration was 350 mg/L.

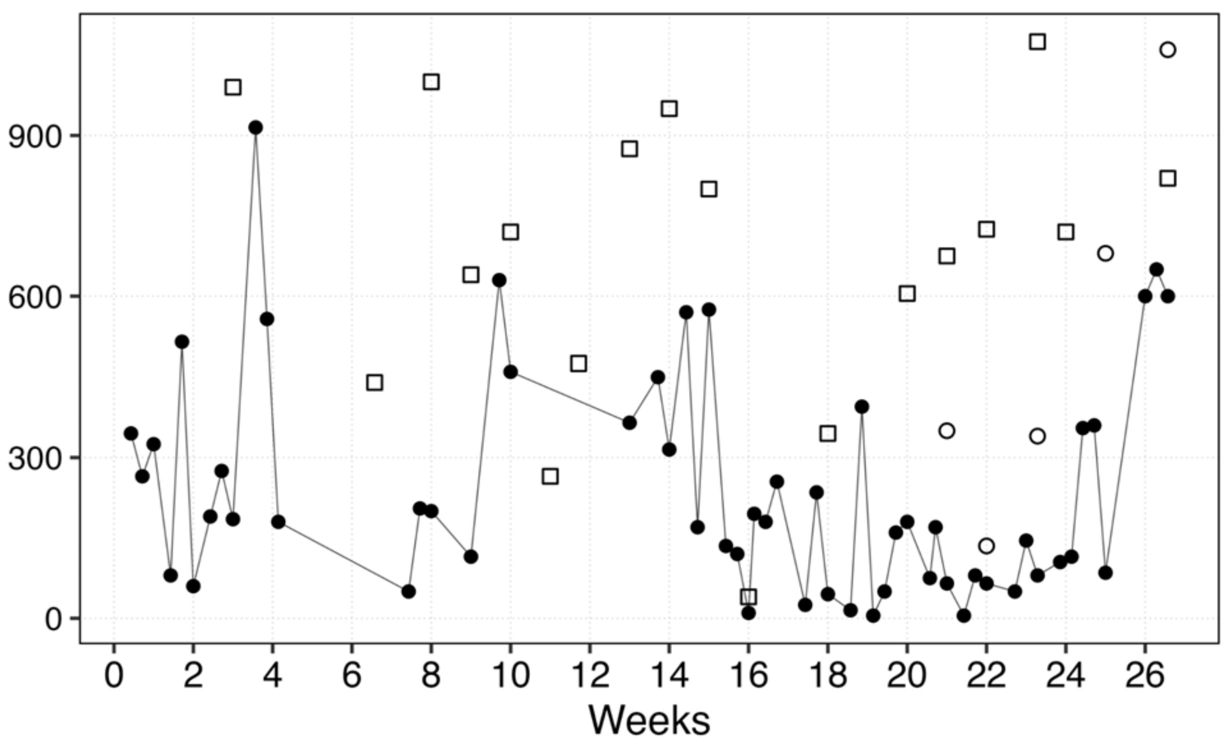

FIGURE 3.5: Alkalinity (mg/L) concentrations across controlled and field systems. Filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.7 Ammonia-N

Ammonia-N analyses were completed using Method 350.1 from EPA Methods. The Ammonia-N results over the entire evaluation are shown in Figure 3.6 and reported as mg/L as N.

Controlled System Effluent Ammonia-N: The effluent ammonia-N concentrations ranged from 1.8 to 278.5 mg/L over the course of the evaluation, with an average concentration of 168 mg/L. The median effluent ammonia-N concentration was 167 mg/L.

Field Site 1 - Blackwater Effluent Ammonia-N: The effluent ammonia-N concentrations ranged from 22.5 to 333.3 mg/L over the course of the evaluation, with an average concentration of 203 mg/L. The median effluent ammonia-N concentration was 198 mg/L.

Field Site 2 - Mixed Wastewater Effluent Ammonia-N: The effluent ammonia-N concentrations ranged from 24.1 to 239.3 mg/L over the course of the evaluation, with an average concentration of 133 mg/L. The median effluent ammonia-N concentration was 132 mg/L.

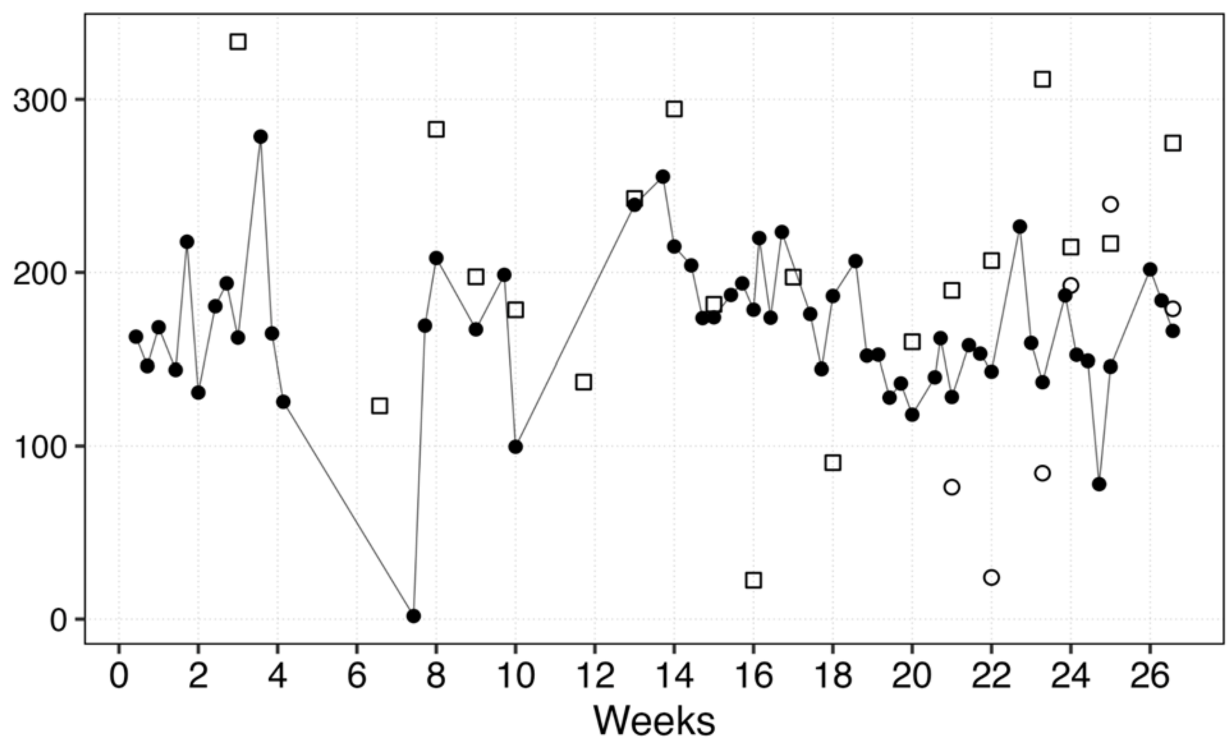

FIGURE 3.6: Ammonia-N (mg/L) concentrations across controlled and field systems. Filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.8 Nitrate/nitrite-N

Nitrate/nitrite-N analyses were completed using Method 353.2 from EPA Methods. The Nitrate/nitrite-N results over the entire evaluation are shown in Figure 3.7 and reported as mg/L as N.

Controlled System Effluent Nitrate/nitrite-N: The effluent Nitrate/nitrite-N concentration ranged from 0 to 6.9 mg/L during the evaluation, with an average concentration of 1.2 mg/L and a median concentration of 0.7 mg/L.

Field Site 1 - Blackwater Effluent Nitrate/nitrite-N: The effluent total nitrogen concentrations ranged from 0 to 17.8 mg/L over the course of the evaluation, with an average concentration of 1.5 mg/L. The median effluent total nitrogen concentration was 0 mg/L.

Field Site 2 - Mixed Wastewater Effluent Nitrate/nitrite-N: The effluent total nitrogen concentrations ranged from 0 to 26.0 mg/L over the course of the evaluation, with an average concentration of 16.1 mg/L. The median effluent total nitrogen concentration was 17 mg/L.

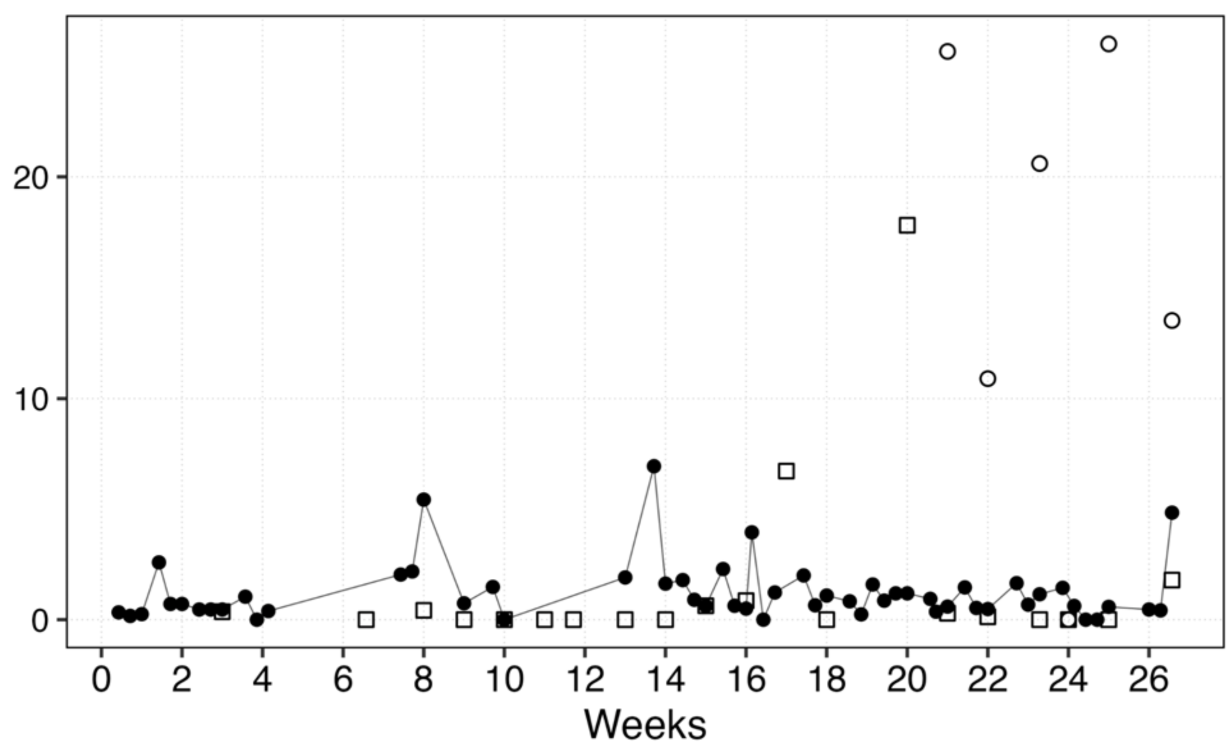

FIGURE 3.7: Nitrate/nitrite-N (mg/L) concentrations across controlled and field systems. Filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.9 Total Kjeldahl Nitrogen (TKN)

TKN analyses were completed using Method 351.2 from EPA Methods. The TKN results over the entire evaluation are shown in Figure 3.8 and reported as mg/L as N.

Controlled System Effluent TKN: The effluent TKN concentrations ranged from 109.5 to 468.5 mg/L over the course of the evaluation, with an average concentration of 226 mg/L. The median effluent TKN concentration was 210 mg/L.

Field Site 1 - Blackwater Effluent TKN: The effluent TKN concentrations ranged from 123.3 to 579.4 mg/L over the course of the evaluation, with an average concentration of 337 mg/L. The median effluent TKN concentration was 329 mg/L.

Field Site 2 - Mixed Wastewater Effluent TKN: The effluent TKN concentrations ranged from 224.0 to 374.3 mg/L over the course of the evaluation, with an average concentration of 331 mg/L. The median effluent TKN concentration was 353 mg/L.

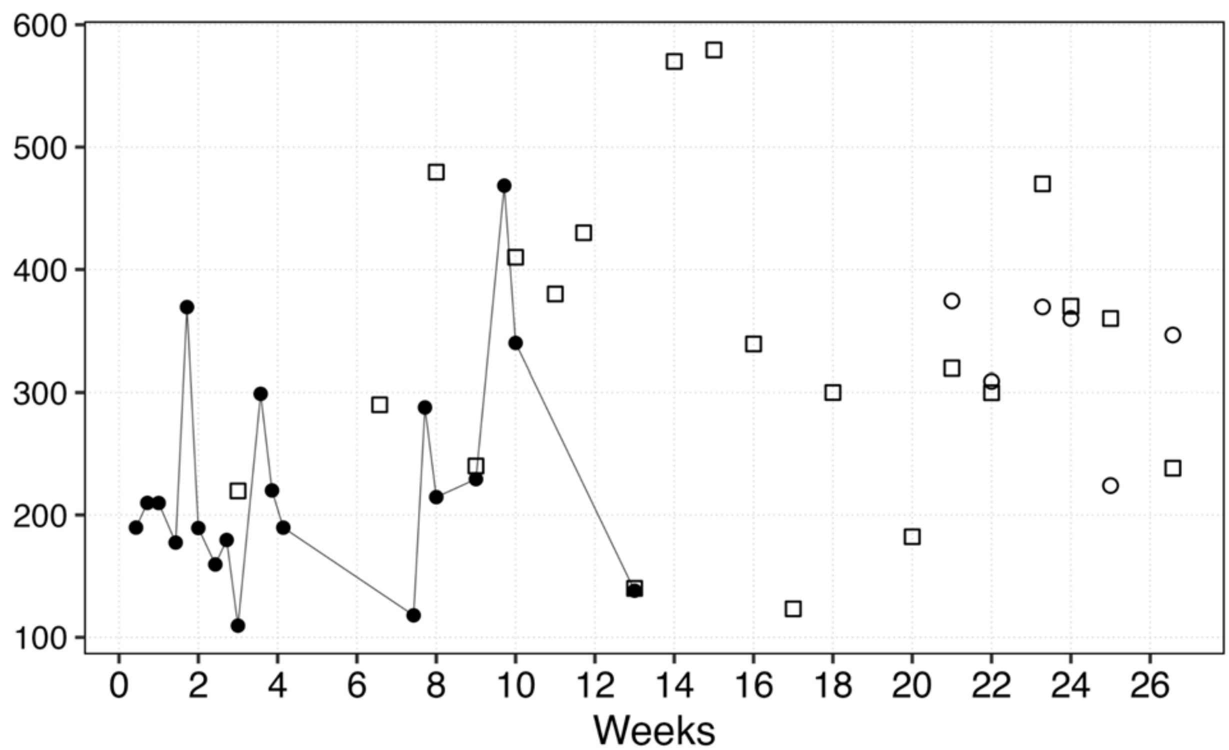

FIGURE 3.8: TKN (mg/L) concentrations across controlled and field systems. Filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

3.10 Total Nitrogen

Total Nitrogen (TN) is the sum of the total Kjeldahl nitrogen (TKN), nitrite (NO_2) and nitrate (NO_3) in a sample, and is expressed as mg/L as N. The TN results over the entire evaluation are shown in Figure 3.9 and reported as mg/L as N. The TN of the influent was calculated based on the mass and Nitrogen fraction of feces, food, and urine loaded to the system (Table D.1).

Controlled System Influent Total Nitrogen: The estimated influent total nitrogen ranged from 392 to 513 mg/L during the evaluation, with an average concentration of 427 mg/L and a median concentration of 412 mg/L.

Controlled System Effluent Total Nitrogen: The effluent total nitrogen concentrations ranged from 110 to 470 mg/L over the course of the evaluation, with an average concentration of 227 mg/L. The median effluent total nitrogen concentration was 210 mg/L.

The Mata successfully reduced the influent TN by 47%, nearly meeting the NSF/ANSI 245 target of 50%. This is in agreement with the observed TSS removal efficiency of 90% and estimated 46% Nitrogen solid fraction, which would predict a Nitrogen removal efficiency over 40%. Over the course of the evaluation the influent TN loading averaged 19.2 g/day. The Mata achieved an average reduction of 9.0 g/day.

Field Site 1 - Blackwater Effluent Total Nitrogen: The effluent total nitrogen concentrations ranged from 130 to 580 mg/L over the course of the evaluation, with an average concentration of 339 mg/L. The median effluent total nitrogen concentration was 330 mg/L.

Field Site 2 - Mixed Wastewater Effluent Total Nitrogen: The effluent total nitrogen concentrations ranged from 250 to 400 mg/L over the course of the evaluation, with an average concentration of 347 mg/L. The median effluent total nitrogen concentration was 360 mg/L.

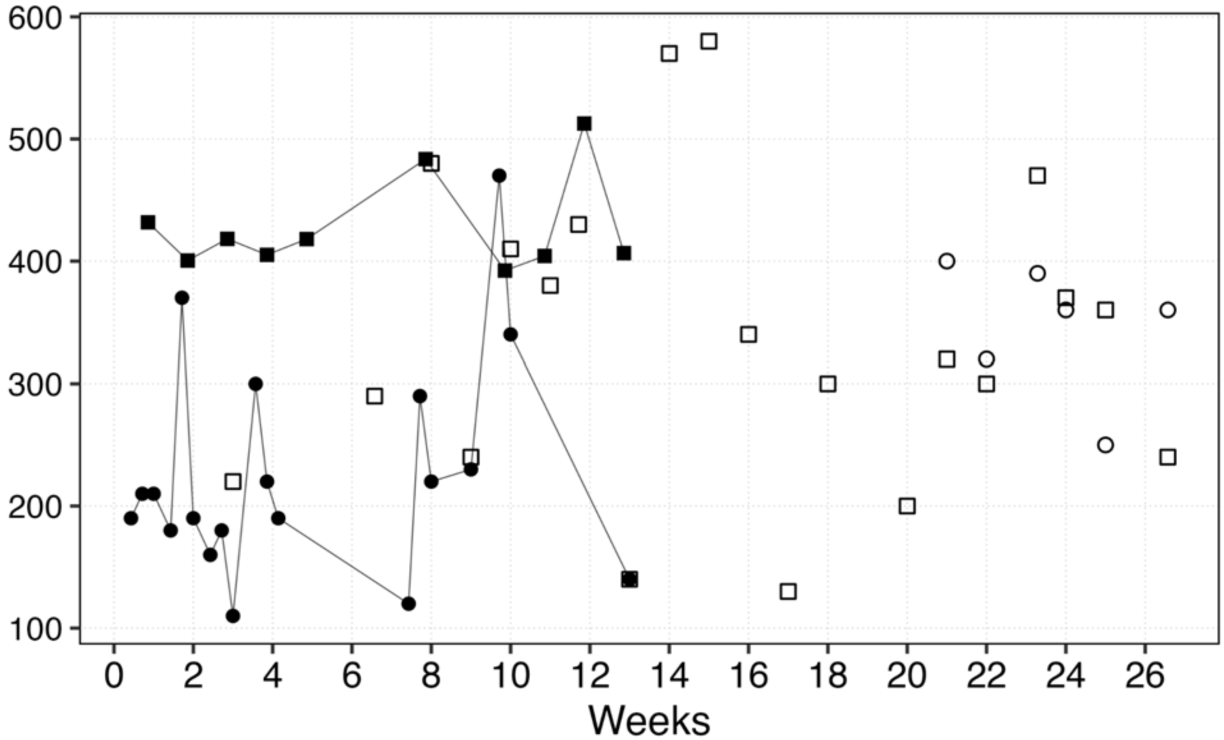

FIGURE 3.9: Calculated TN (mg/L) across controlled and field systems. Filled square = Controlled System – Influent; filled circle = Controlled System – Effluent; open square = Field Site 1 – Effluent; open circle = Field Site 2 – Effluent.

4. DISPOSAL RESULTS

4.1 Description of System Evaluated

The Sawa™ disposal system provides controlled and above-ground dispersal of treated residential effluent through low-pressure distribution and surface soil infiltration. The system functions as a low-profile leaching chamber that is inserted into the existing ground surface rather than being buried below grade, eliminating the need for excavation while still providing a defined soil interface for effluent dispersal protected from human interaction. With a nominal insertion depth of 6 inches, the Sawa creates roughly 12 inches of effective soil depth between the wastewater inside the chamber and the external environment. The perimeter of the chamber is sealed with bentonite clay to prevent wastewater short circuiting at the edges.

By eliminating excavation, the Sawa significantly reduces disposal costs on lots with shallow restrictive layers like groundwater and bedrock. It also preserves the existing soil matrix and avoids mechanical compaction that can significantly reduce infiltration capacity in conventional installations. The shallow, above-grade installation also removes the need for large excavation equipment such as backhoes, enabling deployment on small or constrained residential lots where heavy machinery access is limited.

The system is inherently easier to inspect, access, and maintain compared to deeply buried disposal infrastructure, and its low-profile form factor allows it to be discreetly integrated into residential environments, including placement beneath decks or other structures.

4.2 Installation

Sawa chambers were installed at Site 1 and covered with a deck (Figure 4.1). The Sawa's were fed by the Mata disposal pump and loaded with the treated toilet and kitchen blackwater for the household's two residents, estimated at a volume of 15 gallons per person per day or 30 gallons. The design percolation rate for the clayey soil was taken to be 0.4 gpd/ft2 for a total disposal area of 75 sqft.

FIGURE 4.1 Sawa installation process

4.3 Monitoring

A low-cost custom lysimeter system was designed using 2” PVC conduit, microfiber fabric, and silica powder. The silica power porosity was fine enough to prevent clay soil from migrating into the base of the lysimeter but coarse enough to capture any suspended solids that had passed through the clay. The lysimeter was inserted into a 2” lateral to a depth of 2 feet beneath the disposal system. A vacuum was pulled on the lysimeter for 30 minutes after each disposal event to capture any percolated fluid. Grab samples were collected once per week.

4.4 Results

Results of the chemical analyses and onsite observations and measurements made during the evaluation are summarized in Table 4.2. Table 4.1 summarizes the removal efficiency achieved by the soil matrix as well as the estimated overall removal efficiency achieved by the Mata and Sawa together. No odors or ponding outside of the Sawa were observed over the course of the 6-month testing period.

TABLE 4.1 Summary of Performance

	Parameter	Removal (Sawa Only)	Estimated Overall Removal (Mata + Sawa)	Effluent Concentration
Liquid End-Products	cBOD	85%	98%	25.7 mg/L
	TSS	71%	97%	28.4 mg/L
	TKN	95%	97%	15.9 mg/L
	TN	39%	68%	208.1 mg/L
	pH			7.3-8.5
Liquid Containment				Pass
Odors		None		Pass

TABLE 4.2: Summary of analytical results for treated wastewater applied to Sawa and water collected two feet below the infiltration surface after disposal events.

	N	Average	Std Dev	Min	Max	Median	IQR (25–75%)
Alkalinity (mg/L)							
Field Site 1 - Effluent	18	675.6	277.1	40.0	1,075.0	720.0	507.5 – 861.2
Field Site 1 - Sawa 24in Depth	11	208.6	35.3	175.0	280.0	195.0	182.5 – 230
BOD (mg/L)							
Field Site 1 - Effluent	20	222.0	26.0	153.0	255.3	229.4	210.6 – 239.6
Field Site 1 - Sawa 24in Depth	13	33.3	17.5	18.6	76.8	22.8	21.3 – 40.2
cBOD (mg/L)							
Field Site 1 - Effluent	20	210.7	39.4	81.3	255.3	223.9	205.1 – 236.8
Field Site 1 - Sawa 24in Depth	13	25.7	12.8	11.7	48.0	19.8	18 – 35.7
Conductivity							
Field Site 1 - Effluent	19	188.4	57.0	59.5	268.9	189.2	158.2 – 221.4
Field Site 1 - Sawa 24in Depth	14	146.0	80.4	83.0	367.7	119.9	95.6 – 154.9
N02 (mg/L as N)							
Field Site 1 - Effluent	20	0.0	0.1	0.0	0.4	0.0	0 – 0
Field Site 1 - Sawa 24in Depth	15	0.4	0.4	0.0	1.5	0.3	0.1 – 0.5
N03 (mg/L as N)							
Field Site 1 - Effluent	20	1.4	4.1	0.0	17.8	0.0	0 – 0.4
Field Site 1 - Sawa 24in Depth	15	204.2	130.0	6.2	339.1	231.5	78.8 – 326.5
NH4 (mg/L as N)							
Field Site 1 - Effluent	19	202.9	78.1	22.5	333.3	197.5	169.2 – 258.7
Field Site 1 - Sawa 24in Depth	15	8.6	4.0	0.9	14.5	9.6	6.2 – 12.1
Nitrate/nitrite-N (mg/L as N)							
Field Site 1 - Effluent	20	1.5	4.1	0.0	17.8	0.0	0 – 0.5
Field Site 1 - Sawa 24in Depth	15	204.5	130.1	6.2	339.4	232.0	79.1 – 326.9
ORP							
Field Site 1 - Effluent	19	−76.1	57.0	−119.4	122.9	−92.3	-112.8 – -55.7
Field Site 1 - Sawa 24in Depth	15	−59.4	22.8	−117.5	−28.4	−54.8	-70.6 – -46.8
pH							
Field Site 1 - Effluent	16	8.1	0.4	7.2	8.8	8.0	7.9 – 8.3
Field Site 1 - Sawa 24in Depth	10	7.7	0.4	7.3	8.5	7.6	7.4 – 8
TKN (mg/L as N)							
Field Site 1 - Effluent	20	337.0	128.8	123.3	579.4	329.4	239.6 – 415
Field Site 1 - Sawa 24in Depth	13	15.9	127.8	−199.4	212.7	3.8	-35.2 – 78.6

TN (mg/L as N)							
Field Site 1 - Effluent	20	338.5	127.1	130.0	580.0	330.0	240 – 415
Field Site 1 - Sawa 24in Depth	16	208.1	134.0	−10.0	420.0	205.0	122.5 – 312.5
TSS (mg/L)							
Field Site 1 - Effluent	20	99.3	64.8	32.0	267.0	75.8	63.3 – 126.4
Field Site 1 - Sawa 24in Depth	14	28.4	53.6	0.3	199.0	6.0	3.2 – 16.5

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APPENDIX A

SYSTEM SPECIFICATIONS

SYSTEM SPECIFICATIONS

WaiHome LLC

Mata™ Solid Waste Interceptor

System Capacity

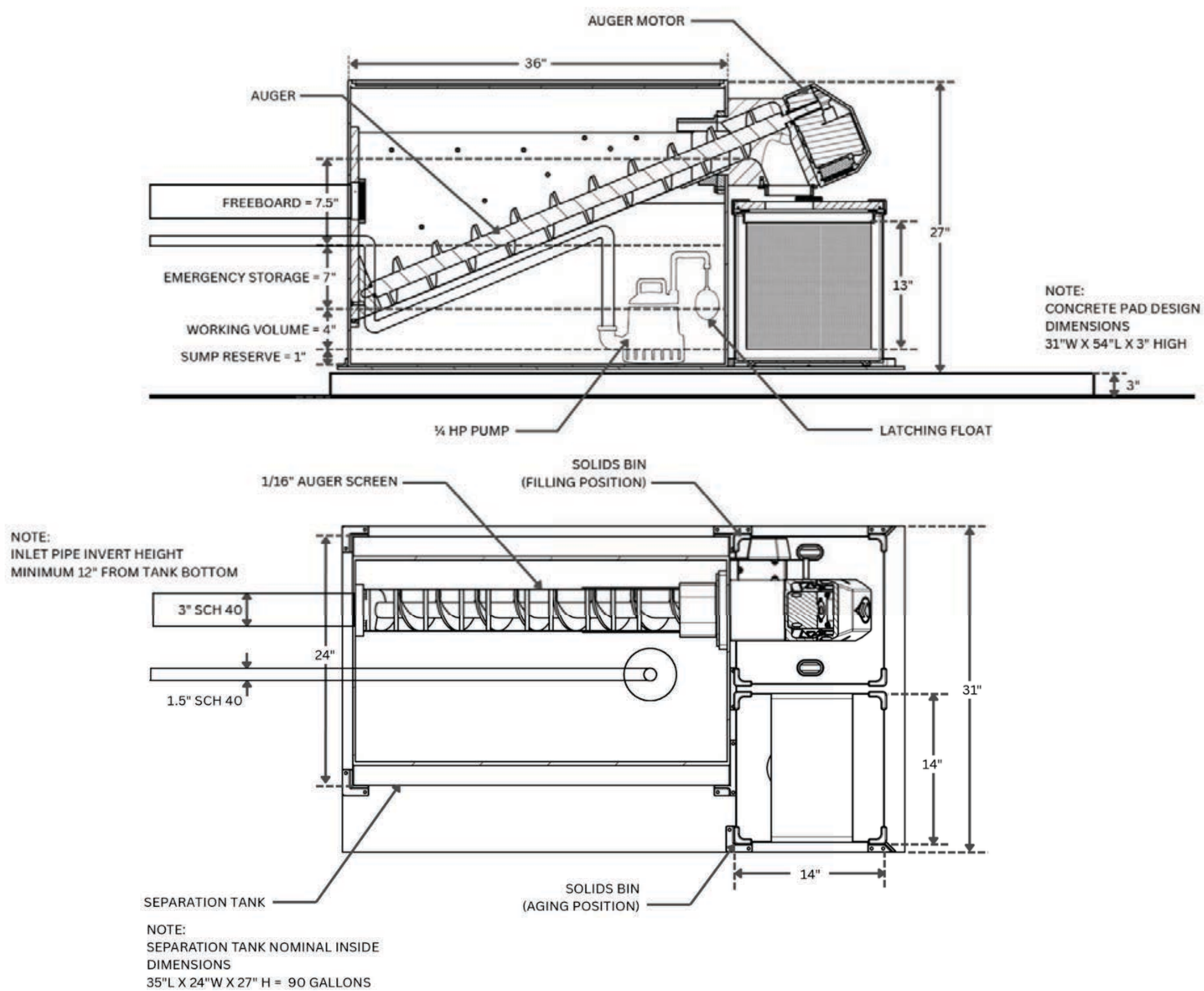
Design Loading	5 Adults - Residential Use
System Hydraulic Capacity	
Freeboard	20 gallons
Emergency Storage Volume	25 gallons
Working Volume	15 gallons
Sump Reserve	3.5 gallons
System Solids Capacity	
Filling Volume	5 gallons
Dehydrating Volume	5 gallons

Components

Dayton Submersible Pump	3YU69
Auger Motor	F55B150-24GL-30S/5GL150RC
Auger Motor Driver	BLD-510B
PLC Heater	110V/300W
Delta Blower Fan	BFB1024H
Orenco MVP Simplex Control Panel	MVP-SSF1 PTRO/DM

Filter Media Specifications

Material	stainless steel
Pore Size	1/16"



WAIHOME	WAIHOME SOLID WASTE INTERCEPTOR “MATA”			
	DWN BY: J ROBERTS	DATE: 01/30/2026	SCALE: NTS	

APPENDIX B

NSF STANDARD 41 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

10 Mature systems ("field") performance testing and evaluation

Systems having end products characteristic of routine operation shall be subjected to a field test and performance evaluation. A minimum of three systems currently in operation and representing the same model type shall be selected for testing.

10.1 System selection criteria

Systems selected for field testing and evaluation shall meet the following criteria:

— the loadings shall correspond to the loading capacity for which the nonliquid saturated treatment system is designed;

— installation and operational history of the systems shall comply with the manufacturer's instructions; and

— systems shall have been in operation for a period claimed by the manufacturer to be sufficient to produce end product(s) suitable for removal.

NOTE — It is suggested that the selection of mature systems include those from varying climatic conditions. The systems should be selected from areas with differing geographical conditions of temperature and humidity, where available.

10.2 Sample collection and analysis

Samples of end products shall be collected from the systems and analyzed in accordance with Sections 12 and 13, respectively.

10.3 Performance criteria

Systems shall meet the performance criteria contained in Section 14.

11 New system ("controlled") performance testing and evaluation

In addition to the performance testing and evaluation described in Section 10, one system shall be subjected to a controlled test for a total of at least 6 mo from the conclusion of start-up to collection of the end product(s). The test shall be conducted under the operating conditions that are characteristic of the intended installation conditions. The number of uses during a test shall be tallied on a cumulative counter and recorded. A complete profile of usage versus time shall be reported.

Some systems require longer than 6 mo to attain equilibrium or to accumulate a sufficient volume of end product to sample. Such systems shall be sampled and evaluated at the time specified by the manufacturer as the recommended time when the user should remove end product(s) for the first time. In these instances, when testing is to be longer than 6 mo, the system shall continue to be loaded in accordance with the applicable loading patterns specified in Section 11.1. These extended periods of loading shall be accomplished by repeating the applicable loading pattern.

In addition to loading the system according to the applicable loading patterns described in this section, systems designed to receive food wastes shall be loaded daily with a total of 200 g of food per person, per day. The system shall be loaded with an equal proportion (by weight) of the types of foods (in terms of vegetable matter, oil and grease, and meat / animal material) that the system is designed to receive.

Figure 1 provides an example of how systems shall be loaded with food.

If the system is designed to service a household of four people, then:

$$4 \text{ people} \times \frac{200 \text{ g food}}{(\text{person})\ (\text{day})} = \frac{800 \text{ g food}}{\text{day}}$$

Figure 1 Food Loading

11.1 Loading patterns

11.1.1 Residential systems

Residential systems are those systems that are intended for use in home settings, apartment complexes, and other settings that receive daily residential use.

A residential system shall be subjected to the loading that is representative of the 24-h excrement cycles of humans. A population equivalent (p.e.) shall be defined as 1.2 fecal events (f.e.) and 4 urine events (u.e.) per person per day. The system shall be loaded according to each of the eight loading patterns described in this section. These loading patterns shall be conducted sequentially in the order described. Figure 4 illustrates graphically how these loading patterns shall be conducted.

> NOTE 1 — For those loading patterns that are conducted for seven or more days, the actual loading for both feces and urine may vary by ± 10% on a weekly basis. For loading patterns that are conducted for < 7 d, the actual loading for both feces and urine may vary by ± 10% over the course of each loading pattern.
>
> NOTE 2 — Design rated capacity (DRC) is calculated by multiplying the manufacturer's population rating (the maximum number of people the system is designed to service in one 24-h period) by the p.e. for both urine and feces.

a) Start-up: The system shall be installed, started, loaded, and operated according to the manufacturer's instructions. The duration of the start-up period shall be specified by the manufacturer.

b) Preliminary routine operation: Following start-up, the system shall be loaded daily for 30 d at 100% of the DRC. See example calculations in Figure 2.

c) Vacation stress: A vacation stress shall be simulated by 17 consecutive days of nonuse.

d) Routine operation: The system shall be returned to routine operation by loading the system daily for 7 d at 100% of the DRC.

e) Overload stress: An overload stress shall be simulated by loading at 200% of DRC, applied over an 8-h period, during each 24 h/d for 5 d.

f) Routine operation: The system shall be returned to routine operation by loading the system daily for 7 d at 100% of the DRC.

g) Party stress: The party stress is a hydraulic overload stress in excess of the routine operation. This stress shall be simulated by loading urine at the rate of 500% of the DRC for one 8-h period. It is not necessary to load the system with feces during this stress. However, if feces loading does occur, it shall not exceed 100% of the DRC. Figure 3 demonstrates how the urine loading shall be conducted.

For routine operation, the system shall be returned to routine operation by loading the system daily at 100% of the DRC. This loading pattern shall continue for the duration of the 6-mo test period and shall not be < 3mo in duration.

The total number of f.e. and u.e. that are to be loaded weekly during the 30-d preliminary routine operation pattern is demonstrated below.

Manufacturer's population rating = 10 people

$$10 \text{ people} \times \frac{1.2 \text{ f.e.}}{(\text{person})\ (\text{day})} \times \frac{7 \text{ d}}{\text{week}} = \frac{84 \text{ f.e.}}{\text{week}}$$

where:

f.e. = fecal event

With the ± 10% allowable deviation, the total loading shall be between 76 and 92 f.e. per week.

$$10 \text{ people} \times \frac{4 \text{ u.e.}}{(\text{person})\ (\text{day})} \times \frac{7 \text{ d}}{\text{week}} = \frac{280 \text{ u.e.}}{\text{week}}$$

where:

u.e. = urine event

With the ± 10% allowable deviation, the total loading shall be between 252 and 308 u.e. per week.

Figure 2
Preliminary routine operation

Manufacturer's population rating = 10 people

$$\frac{10 \text{ people}}{8\text{-h party}} \times \frac{4 \text{ u.e.}}{(\text{person})\ (\text{day})} \times 500\% \times \frac{1}{3} \text{ d} = \frac{67 \text{ u.e.}}{8\text{-h party}}$$

where:

u.e. = urine event

These 67 u.e. are added to the 40 u.e. that the system would receive during normal daily usage (100% of the DRC) to yield a total loading of 107 u.e. With the ± 10% allowable deviation, the total loading shall be between 96 and 118 u.e..

Figure 3
Party stress

11.2 Schedule for performance testing and evaluation

Liquid containment and odor shall be evaluated weekly. Solid and liquid end products shall be collected when the user is first required to remove each of these end products from the system.

11.3 Sample collection and analysis

Samples of end products shall be collected from the system and analyzed in accordance with Sections 12 and 13, respectively.

11.4 Performance criteria

The system shall meet the performance criteria contained in Section 14.

12 Sample collection

12.1 All sample collection methods shall be in accordance with EPA-625/R-92/013, Appendix F, Section 1.2 and the modifications described in Sections 12.2 and 12.3.

12.2 End product samples shall be collected when the user is first required, according to the manufacturer's instructions, to remove end products from the system.

12.3 End products shall be sampled at the location specified by the manufacturer as the point for product removal and collected in sufficient volume to measure all of the parameters necessary for evaluation. The solid end product sampling shall consist of a minimum of five core samples of approximately equal weight or volume. The collection of core samples shall be evenly distributed and representative of the entire clean-out port. The five solid samples shall be thoroughly mixed together and placed in one container. If applicable, five samples of liquid product shall also be collected, mixed together, and placed in one sample container. Both the solid and liquid product samples shall be analyzed for the applicable parameters contained in Section 13. Samples shall be representative of end-product material. Sampling of non-end product material such as bulking agents or bedding materials shall be avoided.

13 Analyses of end products

The fecal coliform content of the collected solid and liquid end product samples shall be determined using EPA-625/R-92/013, Appendix F, Section 1.2.6

14 Performance criteria

Systems treating both solid and liquid wastes shall meet the requirements of Sections 14.1, 14.2, 14.3, and 14.4. Systems treating only solid waste shall meet the requirements of Sections 14.1, 14.2, and 14.3.

14.1 Liquid containment

All devices shall provide for containment of liquid. The volume of the liquid end product that accumulates during the test shall not exceed the designed liquid storage capacity of the system. If the system is designed for liquid product discharge, the discharged volume shall not exceed the manufacturer's designed discharge rate.

14.2 Odors

Gas emitted from the vent system shall be nonoffensive at ground level, and there shall be no offensive odors at the toilet seat at all times.

14.3 Solid end products

— solid end products shall not produce an objectionable odor immediately following removal from the system;

— moisture content of the solid end product shall not exceed 65% by weight; and

— solid end product shall not contain fecal coliform in excess of 200 MPN/g.

14.4 Liquid end products

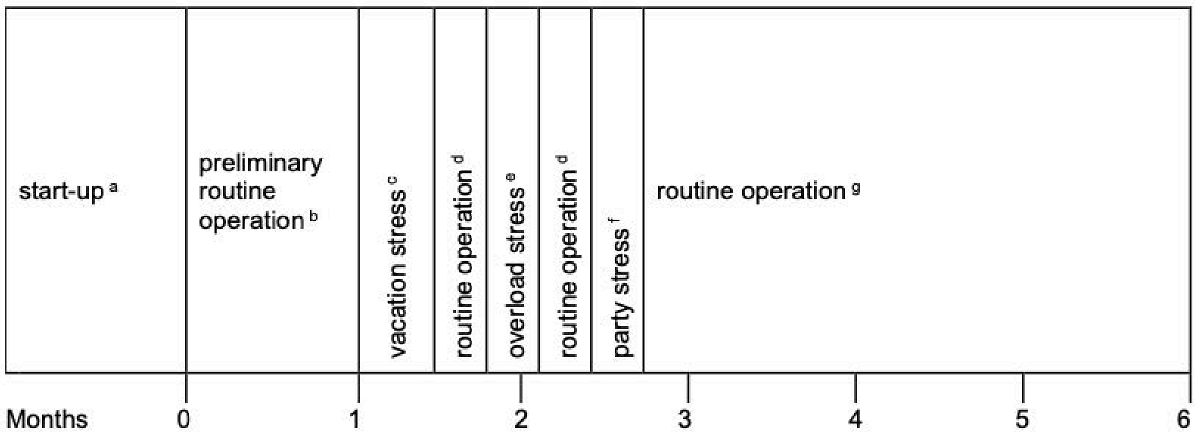
Liquid end products shall meet the following criteria:

— liquid end products shall not produce an objectionable odor immediately following removal from the system; and

— liquid end products shall not contain fecal coliform in excess of 200 MPN/100 mL.

Normative Annex 1

Graphical representations of loading patterns indicated in Section 11.1



a Duration determined by the manufacturer's instructions.
b At design rated capacity (DRC) for a duration of 30 d.
c Nonuse for a duration of 17 d.
d At DRC, for a duration of 7 d.
e At 200% of DRC for a duration of 5 d.
f At 500% of DRC for a duration of 8 h.
g At DRC for the remainder of the 6-mo period, but not < a 3-mo duration.

APPENDIX C

NSF STANDARD 245 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

8 Performance testing and evaluation

This section describes the methods used to evaluate the performance of residential wastewater treatment systems. Systems shall be designated as Class I or Class II. The performance classification shall be based upon the evaluation of effluent samples collected from the system over a six-month period.

8.1 Preparations for testing and evaluation

8.1.1 The system shall be assembled, installed, and filled in accordance with the manufacturer's instructions.

8.1.2 The manufacturer shall inspect the system for proper installation. If no defects are detected and the system is judged to be structurally sound, it shall be placed into operation in accordance with the manufacturer's start-up procedures. If the manufacturer does not provide a filling procedure, ⅔ of the system's capacity shall be filled with water and the remaining ⅓ shall be filled with residential wastewater.

8.1.3 The system shall undergo design loading (see 8.2.2.1) until testing and evaluations are initiated. Sample collection and analysis shall be initiated within 3 weeks of filling the system and, except as specified in 8.5.1.2, shall continue without interruption until the end of the evaluation period.

8.1.4 If conditions at the testing site preclude installation of the system at its normally prescribed depth, the manufacturer shall be permitted to cover the system with soil to achieve normal installation depth.

8.1.5 Performance testing and evaluation of systems shall not be restricted to specific seasons.

8.1.6 When possible, electrical or mechanical defects shall be repaired to prevent evaluation delays. All repairs made during the performance testing and evaluation shall be documented in the final report.

8.1.7 The system shall be operated in accordance with the manufacturer’s instructions. However, routine service and maintenance of the system shall not be permitted during the performance testing and evaluation period.

NOTE – The manufacturer may recommend or offer more frequent service and maintenance of the system but for the purpose of performance testing and evaluation, service and maintenance shall not be performed beyond what is specified in this Standard.

8.2 Testing and evaluation conditions, hydraulic loading, and schedules

8.2.1 Influent wastewater characteristics

The 30-d average BOD5 concentration of the wastewater delivered to the system shall be between 100 mg/L and 300 mg/L. The 30-d average TSS concentration of the wastewater delivered to the system shall be between 100 mg/L and 350 mg/L.

8.2.2 Hydraulic loading and schedules

The performance of the system shall be evaluated for 26 consecutive weeks. During the testing and evaluation period, the system shall be subjected to 16 weeks of design loading, followed by 7.5 weeks (52 days) of stress loading, and then an additional 2.5 weeks (18 days) of design loading.

8.2.2.1 Design loading

The system shall be dosed 7 days a week with a wastewater volume equivalent to the daily hydraulic capacity of the system. The following schedule shall be adhered to for dosing:

Time frame	% rated daily hydraulic capacity
6:00 a.m. to 9:00 a.m.	approximately 35
11:00 a.m. to 2:00 p.m.	approximately 25
5:00 p.m. to 8:00 p.m.	approximately 40

8.2.2.2 Stress loading

Stress loading is designed to evaluate a system's performance under four non-ideal conditions. Systems shall be subjected to each stress condition once during the 6-month testing and evaluation period, and each of the four stress conditions shall be separated by 7 days of design loading (see 8.2.2.1).

8.2.2.2.1 Wash-day stress

The wash day stress shall consist of 3 wash days in a 5-day period. Each wash day shall be separated by a 24-h period. During a wash-day, the system shall be loaded at times and capacities similar to those delivered during design loading (see 8.2.2.1), however during the first two dosing periods per day, the design loading shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.2.2.2 Working-parent stress

For 5 consecutive days, the system shall be subjected to a working-parent stress. During this stress, the system shall be dosed with 40% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. Between 5:00 p.m. and 8:00 p.m., the system shall be dosed with the remaining 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.3 Power/equipment failure stress

The system shall be dosed with 40% of its daily hydraulic capacity between 5:00 p.m. and 8:00 p.m. on the day the power/equipment failure stress is initiated. Power to the system shall then be turned off at 9:00 p.m. and dosing shall be discontinued for 48 hours. After 48 hours, power shall be restored and the system shall be dosed over a 3- h period with 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.4 Vacation stress

On the day that the vacation stress is initiated, the system shall be dosed at 35% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. and at 25% between 11:00 a.m. and 2:00 p.m. Dosing shall then be discontinued for 8 consecutive days (power shall continue to be supplied to the system). Between 5:00 p.m. and 8:00 p.m. of the ninth day, the system shall be dosed with 60% of its daily hydraulic capacity, which shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.3 Dosing volumes

The 30-d average volume of the wastewater delivered to the system shall be within 100% ± 10% of the system's rated hydraulic capacity.

NOTE – All dosing days, except those with dosing requirements less than the daily hydraulic capacity, shall be included in the 30-d average calculation.

8.2.4 Color, odor, foam, and oily film assessments

During the 6-month testing and evaluation, a total of 3 effluent samples shall be assessed for color, odor, foam, and oily film. The assessments shall be conducted on effluent composite samples selected randomly during the first phase of design loading (weeks 1 – 16), the period of stress loading (weeks 17 – 23.5), and the second phase of design loading (weeks 23.5 – 26).

8.3 Sample collection

8.3.1 General

8.3.1.1 A minimum of 96 data days shall be required during system performance testing and evaluation. No routine service or maintenance shall be performed on the system whether the time period to achieve the 96 data days falls within or exceeds 6 months.

8.3.1.2 All sample collection methods shall be in accordance with APHA's Standard Methods for the Examination of Water and Wastewater unless otherwise specified.

8.3.1.3 Influent wastewater samples shall be flow-proportional, 24-h composites obtained during periods of system dosing. Effluent samples shall be flow-proportional, 24-h composites obtained during periods of system discharge.

8.3.2 Design loading

During periods of design loading, daily composite effluent samples shall be collected and analyzed 5 days a week.

8.3.3 Stress loading

During stress loading, influent and effluent 24-h composite samples shall be collected on the day each stress condition is initiated. Twenty-four hours after the completion of washday, working-parent, and vacation stresses, influent and effluent 24-h composite samples shall be collected for 6 consecutive days. Forty-eight hours after the completion of the power/equipment failure stress, influent and effluent 24-h composite samples shall be collected for 5 consecutive days.

8.4 Analytical descriptions

8.4.1 pH, TSS, BOD5, and CBOD5

The pH, TSS, and BOD5 of the collected influent and the pH, TSS and CBOD5 of the collected effluent 24-h composite samples shall be determined with the appropriate methods in APHA's Standard Methods for the Examination of Water and Wastewater.

8.4.2 Color, odor, oily film, and foam

8.4.2.1 General

The effluent composite samples shall be diluted 1:1000 with distilled water. Three composite effluent samples shall be tested during the 6-month evaluation period.

8.4.2.2 Color

The apparent color of the diluted effluent samples shall be determined with the visual comparison method described in APHA's Standard Methods for the Examination of Water and Wastewater.

8.4.2.3 Odor

A panel consisting of at least 5 evaluators shall qualitatively rate 200 mL aliquots of the diluted effluent samples as offensive or non offensive when compared to odor-free water prepared in accordance with APHA's Standard Methods for the Examination of Water and Wastewater.

8.4.2.4 Oily film and foam

Diluted effluent sample aliquots shall be visually evaluated for the presence of an oily film or foaming.

8.5 Criteria

8.5.1 General

8.5.1.1 If conditions during the testing and evaluation period result in system upset, improper sampling, improper dosing, or influent characteristics outside of the ranges specified in 8.2.1, an assessment shall be conducted to determine the extent to which these conditions adversely affected the performance of the system. Based on this assessment, specific data points may be excluded from the 7-d and 30-d averages of effluent measurements. Rationale for all data exclusions shall be documented in the final report.

8.5.1.2 In the event that a catastrophic site problem not described in this Standard including, but not limited to, influent characteristics, malfunctions of test apparatus, and acts of God, jeopardizes the validity of the performance testing and evaluation, manufacturers shall be given the choice to: 1) Perform maintenance on the system, reinitiate system start-up procedures, and restart the performance testing and evaluation; or 2) With no routine maintenance performed, have the system brought back to pre-existing conditions and resume testing within 3 weeks after the site problem has been identified and corrected. Data collected during the system recovery period shall be excluded from 7-d and 30-d averages of effluent measurements. NOTE – Pre-existing conditions shall be defined as the point when the results of 3 consecutive data days are within 15% of the previous 30-d average(s).

8.5.1.3 A 7-d average discharge value shall consist of a minimum of 3 data days. If a calendar week contains less than 3 data days, sufficient data days may be transferred from the preceding calendar week to constitute a 7-d average discharge value. If there are not sufficient data days available in the preceding calendar week, the transfer of data days may take place from the following calendar week to constitute a 7-d average discharge value. No data day shall be included in more than one 7-d average discharge value.

8.5.1.4 A 30-d average discharge value shall consist of a minimum of 50% of the regularly scheduled sampling days per month. If a calendar month contains less than the required number of data days, sufficient data days may be transferred from the preceding calendar month to constitute a 30-d average discharge value. If there are not sufficient data days available in the preceding calendar month, the transfer of data days may take place from the following calendar month to constitute a 30-d average discharge value. No data day shall be included in more than one 30-d average discharge value.

8.5.1.5 During the stress loading sequence, consisting of wash-day, working-parent, power/equipment failure, and vacation stress loading periods, data shall be collected from a minimum of ⅔ of the total scheduled sampling days and from at least 2 of the scheduled sampling days during any single stress loading period.

APPENDIX D

LOADING DATA

TABLE D.1: Loading Summary

Component / Basis	Loading (g/day)	Calculation (if needed)	Source
BOD			
Toilet Paper	2.9	TSS x 1.18 thOD x .42 BOD/thOD	(Sravan, Kumar, & Mohan, 2016)
Feces	23.8		(Rose et al., 2015)
Food	44.7		Table D.3
Urine	8.4	6 g/L x 1.4 L	(Kuntke et al., 2013)
Overall	79.7		
TSS			
Toilet Paper	5.8	8 sheets/event x .6 g x 1.2 events	(YouGov, 2023)
Feces	29.0		(Rose et al., 2015)
Food	59.4		Table D.3
Overall	94.2		
TN			
Feces	1.8		(Rose et al., 2015)
Food	9.3		Table D.3
Urine	8.2		Table D.2
Total	19.2		

TABLE D.2: Urine Characteristics

	N	Average	Std Dev	Min	Max	Median	IQR (25–75%)
Ammonia-N (mg/L as N)							
Controlled System - Urine	19	3,844.7	1,046.9	2,724.1	7,226.8	3,658.2	3136.3 – 4216
Nitrate/nitrite (mg/L as N)							
Controlled System - Urine	20	3.6	6.3	0.0	22.2	0.0	0 – 3.8
Total Kjeldahl Nitrogen (mg/L as N)							
Controlled System - Urine	20	6,106.4	2,309.9	1,387.2	10,200.0	6,198.5	5273.4 – 7824
Total Nitrogen (mg/L as N)							
Controlled System - Urine	21	5,826.7	2,596.9	160.0	10,200.0	6,200.0	4600 – 7800

TABLE D.3: Kitchen Waste Characteristics

Ingredient	Loading (g/day)	Nitrogen Fraction	N Loading (g/day)	Moisture Fraction	TSS Loading (g/day)	BOD Basis / Fraction	BOD Loading (g/day)
Apple	11.11	2.3%	0.26	85.0%	1.67	0.58 g/g dry	0.97
Lemon	11.11	2.3%	0.26	85.0%	1.67	0.58 g/g dry	0.97
Roll	11.11	2.0%	0.22	40.0%	6.67	0.58 g/g dry	3.87
Butter	11.11	0.2%	0.02	17.0%	9.22	0.58 g/g dry	5.35
Sour Cream	11.11	0.5%	0.06	70.0%	3.33	400000 mg/L	4.44
Milk	11.11	0.5%	0.06	87.0%	1.44	100000 mg/L	1.11
Cottage Cheese	11.11	0.5%	0.06	80.0%	2.22	400000 mg/L	4.44
Yoghurt	11.11	0.5%	0.06	88.0%	1.33	400000 mg/L	4.44
Eggs	11.11	16.0%	1.78	75.0%	2.78	0.58 g/g dry	1.61
Meat with Bones	11.11	16.0%	1.78	60.0%	4.44	0.58 g/g dry	2.58
Sausage	11.11	16.0%	1.78	55.0%	5.00	0.58 g/g dry	2.90
Fish Meat	11.11	16.0%	1.78	55.0%	5.00	0.58 g/g dry	2.90
Potatoes	11.11	1.5%	0.17	72.0%	3.11	0.58 g/g dry	1.80
Banana	11.11	2.6%	0.29	76.0%	2.67	0.58 g/g dry	1.55
Tomato	11.11	0.2%	0.02	93.0%	0.78	0.58 g/g dry	0.45
Lettuce	11.11	4.0%	0.44	95.0%	0.56	0.58 g/g dry	0.32
Fruit Juice	11.11	0.2%	0.03	92.0%	0.89	100000 mg/L	1.11
Bun	11.11	2.0%	0.22	40.0%	6.67	0.58 g/g dry	3.87
Total	**200.00**	**NA**	**9.26**	**NA**	**59.44**	**NA**	**44.68**

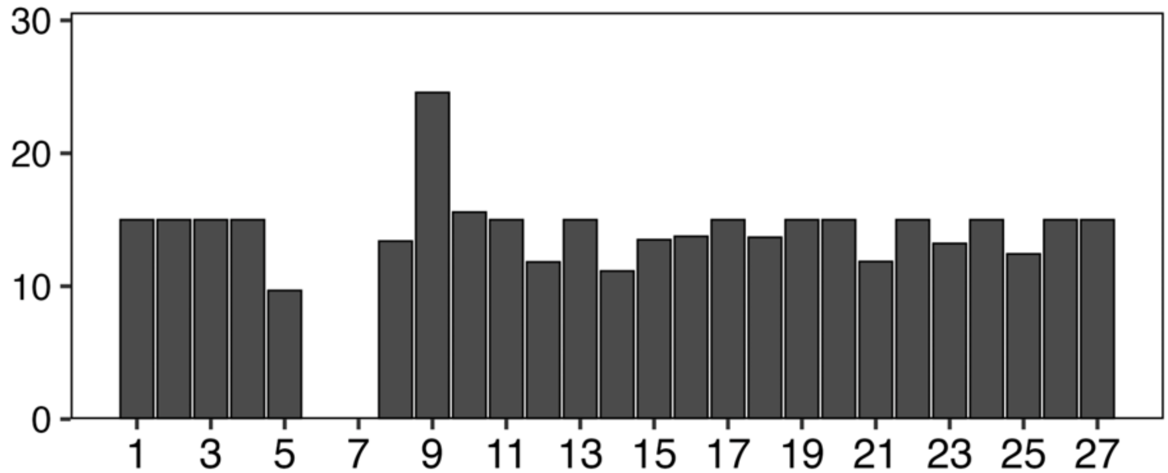


FIGURE D.1: GPD of scheduled water loading for the length of the test.

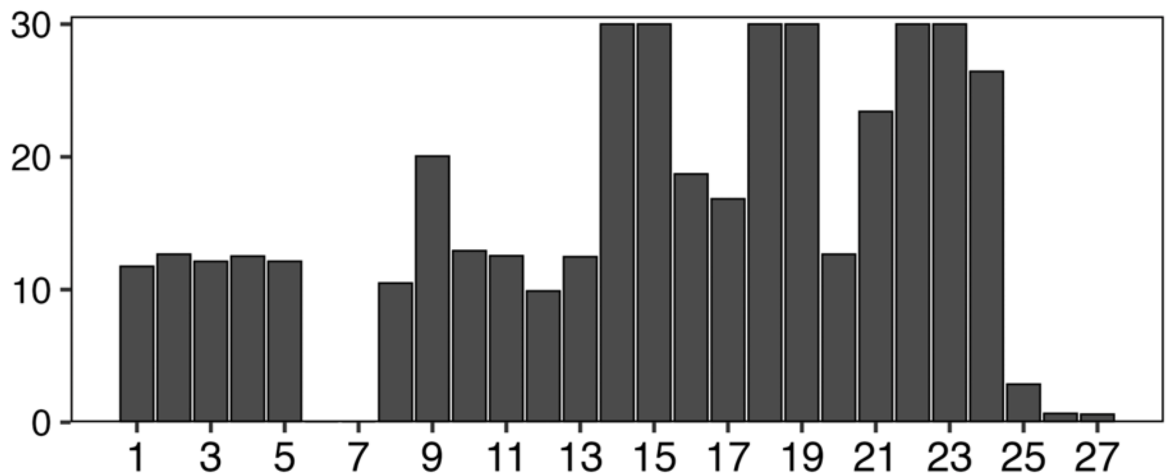


FIGURE D.2: GPD of measured water loading for the length of the test. Readings capped at 30 GPD.

TABLE D.4: Summary of recorded dosage events by testing phase.

Phase	days	food_events	fecal_events	urine_events	Food Events / Day	Fecal Events / Day	Urine Events / Day
Normal 1	31	31	33	121	1.00	1.06	3.90
Vacation	17	0	0	3	0.00	0.00	0.18
Normal 2	8	8	10	29	1.00	1.25	3.62
Overloading	5	11	12	18	2.20	2.40	3.60
Normal 3	7	6	9	28	0.86	1.29	4.00
Party	1	1	0	10	1.00	0.00	10.00
Normal 4	7	7	7	29	1.00	1.00	4.14
Working Parent	7	7	8	22	1.00	1.14	3.14
Normal 5	9	10	8	36	1.11	0.89	4.00
Power Outage	2	2	0	6	1.00	0.00	3.00
Normal 6	91	82	93	341	0.90	1.02	3.75

TABLE D.5: Fecal Event Log

datetime	value
2025–06–11 08:45:00	1
2025–06–11 09:29:00	2
2025–06–12 01:28:00	4
2025–06–12 10:40:00	3
2025–06–16 18:56:00	5
2025–06–16 20:22:00	6
2025–06–17 02:07:00	7
2025–06–18 00:12:00	8
2025–06–18 19:29:00	9
2025–06–19 02:43:00	10
2025–06–19 20:38:00	11
2025–06–20 00:10:00	12
2025–06–20 21:09:00	13
2025–06–21 01:00:00	14
2025–06–24 22:48:00	15
2025–06–25 20:19:00	16
2025–06–26 20:06:00	17
2025–06–30 18:46:00	18
2025–06–30 19:33:00	19
2025–07–01 19:25:00	20
2025–07–01 20:33:00	21
2025–07–02 00:55:00	22
2025–07–03 19:06:00	23
2025–07–03 23:40:00	24
2025–07–04 20:35:00	25
2025–07–04 23:38:00	26
2025–07–07 20:20:00	27
2025–07–08 00:01:00	28
2025–07–08 18:41:00	29
2025–07–09 00:02:00	30
2025–07–10 20:10:00	31
2025–07–11 03:11:00	32
2025–07–11 19:39:00	33
2025–07–28 20:05:00	1
2025–07–30 01:11:00	2
2025–07–31 19:08:00	3
2025–08–01 20:30:00	4
2025–08–01 23:30:00	5
2025–08–04 20:41:00	6
2025–08–04 23:25:00	7
2025–08–05 16:47:00	8
2025–08–05 16:54:00	9
2025–08–05 19:41:00	10
2025–08–06 00:13:00	1
2025–08–06 19:11:00	2
2025–08–06 20:58:00	3
2025–08–07 16:57:00	4
2025–08–07 20:22:00	5
2025–08–08 23:11:00	6
2025–08–09 00:22:00	7
2025–08–09 18:23:00	8
2025–08–09 19:00:00	9
2025–08–09 19:50:00	10
2025–08–10 02:45:00	11
2025–08–10 17:11:00	12
2025–08–11 20:00:00	1
2025–08–11 20:01:00	2
2025–08–11 20:48:00	3
2025–08–12 20:26:00	4
2025–08–13 17:21:00	5
2025–08–13 23:04:00	6
2025–08–14 02:01:00	7
2025–08–15 02:39:00	8
2025–08–15 21:06:00	9
2025–08–18 23:04:00	1
2025–08–19 23:31:00	2
2025–08–21 00:05:00	3
2025–08–21 23:25:00	4
2025–08–22 19:51:00	5
2025–08–24 03:44:00	6
2025–08–25 21:13:00	7
2025–08–26 04:01:00	1
2025–08–26 21:39:00	2
2025–08–27 17:57:00	3
2025–08–28 21:40:00	4
2025–08–29 21:03:00	5
2025–08–31 21:10:00	6
2025–08–31 21:23:00	7
2025–09–01 19:06:00	8
2025–09–02 20:16:00	1
2025–09–03 18:38:00	2
2025–09–08 17:56:00	3
2025–09–09 21:06:00	4
2025–09–10 21:35:00	5
2025–09–10 22:18:00	6
2025–09–11 03:06:00	7
2025–09–11 18:39:00	8
2025–09–15 23:25:00	1
2025–09–15 23:47:00	2
2025–09–16 19:33:00	3
2025–09–18 18:34:00	4
2025–09–18 22:05:00	5
2025–09–19 23:13:00	6
2025–09–19 23:32:00	7
2025–09–20 19:01:00	8
2025–09–21 18:55:00	9
2025–09–22 20:36:00	10
2025–09–23 01:02:00	11
2025–09–23 02:19:00	12
2025–09–23 20:16:00	13
2025–09–24 00:22:00	14
2025–09–26 03:27:00	15
2025–09–29 19:26:00	16
2025–10–01 23:14:00	17
2025–10–02 18:39:00	18
2025–10–03 19:16:00	19
2025–10–03 19:47:00	20
2025–10–06 18:38:00	21
2025–10–06 23:42:00	22
2025–10–09 01:08:00	23
2025–10–10 02:14:00	24
2025–10–13 18:39:00	25
2025–10–14 20:53:00	26
2025–10–15 18:24:00	27
2025–10–16 00:23:00	28
2025–10–17 03:19:00	29
2025–10–17 19:02:00	30
2025–10–17 20:28:00	31
2025–10–20 18:52:00	32
2025–10–21 20:26:00	33
2025–10–22 23:20:00	34
2025–10–22 23:21:00	35
2025–10–24 22:02:00	36
2025–10–25 20:39:00	37
2025–10–28 02:43:00	38
2025–10–28 22:58:00	39
2025–10–29 19:12:00	40
2025–10–30 18:52:00	41
2025–10–30 19:35:00	42
2025–10–30 20:59:00	43
2025–11–04 00:12:00	44
2025–11–04 23:38:00	45
2025–11–05 23:51:00	46
2025–11–06 21:30:00	47
2025–11–07 23:09:00	48
2025–11–10 18:42:00	49
2025–11–10 22:50:00	50
2025–11–12 16:01:00	51
2025–11–13 18:01:00	52
2025–11–15 02:00:00	53
2025–11–16 19:48:00	54
2025–11–17 03:39:00	55
2025–11–17 17:47:00	56
2025–11–18 18:36:00	57
2025–11–20 00:12:00	58
2025–11–21 20:15:00	59
2025–11–23 21:16:00	60
2025–11–24 19:42:00	61
2025–11–24 20:07:00	62
2025–11–24 20:50:00	63
2025–11–24 21:56:00	64
2025–11–25 19:09:00	65
2025–11–25 21:35:00	66
2025–11–26 03:35:00	67
2025–11–27 01:29:00	68
2025–11–27 20:00:00	69
2025–11–29 00:02:00	70
2025–12–01 02:24:00	71
2025–12–01 18:33:00	72
2025–12–01 19:28:00	73
2025–12–01 22:55:00	74
2025–12–02 01:17:00	75
2025–12–03 18:39:00	76
2025–12–03 20:59:00	77
2025–12–04 01:21:00	78
2025–12–04 23:04:00	79
2025–12–05 03:38:00	80
2025–12–05 17:58:00	81
2025–12–06 00:56:00	82
2025–12–06 19:47:00	83
2025–12–08 18:39:00	84
2025–12–08 20:10:00	85
2025–12–08 21:39:00	86
2025–12–09 18:07:00	87

datetime	value
2025−12−09 19:54:00	88
2025−12−10 19:47:00	89
2025−12−10 20:24:00	90
2025−12−11 19:05:00	91
2025−12−11 19:37:00	92
2025−12−11 22:26:00	93

TABLE D.6: Food Loading Log

datetime	value
2025−06−12 13:30:00	1
2025−06−13 17:45:00	2
2025−06−14 03:45:00	3
2025−06−14 22:26:00	4
2025−06−16 00:36:00	5
2025−06−17 03:31:00	6
2025−06−18 00:17:00	7
2025−06−18 19:53:00	8
2025−06−20 02:32:00	9
2025−06−21 03:12:00	10
2025−06−22 05:57:00	11
2025−06−22 19:18:00	12
2025−06−24 03:37:00	13
2025−06−25 03:33:00	14
2025−06−25 20:23:00	15
2025−06−27 03:14:00	16
2025−06−28 01:52:00	17
2025−06−29 23:32:00	18
2025−07−01 02:25:00	19
2025−07−01 02:26:00	20
2025−07−02 03:42:00	21
2025−07−02 17:38:00	22
2025−07−04 02:54:00	23
2025−07−04 20:37:00	24
2025−07−06 17:31:00	25
2025−07−07 05:03:00	26
2025−07−08 03:34:00	27
2025−07−09 03:56:00	28
2025−07−09 17:21:00	29
2025−07−10 20:13:00	30
2025−07−11 20:23:00	31
2025−07−29 03:32:00	1
2025−07−31 19:10:00	2
2025−08−01 03:42:00	3
2025−08−02 00:48:00	4
2025−08−02 18:29:00	5
2025−08−04 03:59:00	6
2025−08−04 22:20:00	7
2025−08−05 23:17:00	8
2025−08−05 23:24:00	1
2025−08−07 02:40:00	2
2025−08−07 02:41:00	3
2025−08−08 03:23:00	4
2025−08−08 03:25:00	5
2025−08−09 03:07:00	6
2025−08−09 03:09:00	7
2025−08−09 19:02:00	8
2025−08−10 01:23:00	9
2025−08−10 17:14:00	10
2025−08−10 23:57:00	11
2025−08−11 00:17:00	1
2025−08−12 03:54:00	2
2025−08−13 03:23:00	3
2025−08−14 03:25:00	4
2025−08−15 20:58:00	5
2025−08−16 05:10:00	6
2025−08−17 03:28:00	7
2025−08−18 07:37:00	1

datetime	value
2025−08−19 03:29:00	2
2025−08−20 02:54:00	3
2025−08−21 05:00:00	4
2025−08−21 23:26:00	5
2025−08−23 00:25:00	6
2025−08−23 23:41:00	7
2025−08−26 02:55:00	1
2025−08−26 02:56:00	2
2025−08−27 03:51:00	3
2025−08−29 02:01:00	4
2025−08−29 04:20:00	5
2025−08−30 01:30:00	6
2025−08−31 21:11:00	7
2025−09−02 01:53:00	1
2025−09−02 03:20:00	2
2025−09−03 04:54:00	3
2025−09−04 02:40:00	4
2025−09−06 01:49:00	5
2025−09−06 03:27:00	6
2025−09−08 17:49:00	7
2025−09−09 21:08:00	8
2025−09−10 00:55:00	9
2025−09−10 19:21:00	10
2025−09−11 03:15:00	1
2025−09−11 06:21:00	2
2025−09−13 21:54:00	1
2025−09−16 02:47:00	2
2025−09−17 02:54:00	3
2025−09−17 21:28:00	4
2025−09−19 03:16:00	5
2025−09−20 03:09:00	6
2025−09−20 19:04:00	7
2025−09−21 18:55:00	8
2025−09−23 03:06:00	9
2025−09−24 03:13:00	10
2025−09−25 03:20:00	11
2025−09−26 03:22:00	12
2025−09−27 02:44:00	13
2025−09−28 20:21:00	14
2025−09−30 03:15:00	15
2025−10−01 02:51:00	16
2025−10−01 18:44:00	17
2025−10−02 01:26:00	18
2025−10−03 03:21:00	19
2025−10−03 19:18:00	20
2025−10−06 06:08:00	21
2025−10−07 04:57:00	22
2025−10−08 03:10:00	23
2025−10−09 03:36:00	24
2025−10−10 03:59:00	25
2025−10−10 23:25:00	26
2025−10−11 01:50:00	27
2025−10−12 01:09:00	28
2025−10−13 07:03:00	29
2025−10−14 04:30:00	30
2025−10−15 03:23:00	31
2025−10−16 03:17:00	32
2025−10−17 03:21:00	33

datetime	value
2025−10−18 00:54:00	34
2025−10−21 03:17:00	35
2025−10−22 03:30:00	36
2025−10−29 04:46:00	37
2025−10−30 03:25:00	38
2025−10−31 03:45:00	39
2025−10−31 22:06:00	40
2025−11−01 03:06:00	41
2025−11−03 00:22:00	42
2025−11−04 03:24:00	43
2025−11−05 03:41:00	44
2025−11−06 03:09:00	45
2025−11−07 00:22:00	46
2025−11−07 20:56:00	47
2025−11−09 03:43:00	48
2025−11−09 21:22:00	49
2025−11−11 03:43:00	50
2025−11−12 03:14:00	51
2025−11−13 04:04:00	52
2025−11−13 20:41:00	53
2025−11−15 03:06:00	54
2025−11−15 20:06:00	55
2025−11−17 03:33:00	56
2025−11−18 00:08:00	57
2025−11−18 20:22:00	58
2025−11−19 19:36:00	59
2025−11−21 19:48:00	60
2025−11−22 02:06:00	61
2025−11−23 03:40:00	62
2025−11−23 20:40:00	63
2025−11−25 03:56:00	64
2025−11−26 03:35:00	65
2025−11−27 01:31:00	66
2025−11−27 20:03:00	67
2025−11−29 01:31:00	68
2025−12−01 02:25:00	69
2025−12−02 03:49:00	70
2025−12−02 03:49:00	71
2025−12−02 17:19:00	72
2025−12−04 04:10:00	73
2025−12−05 03:36:00	74
2025−12−06 04:12:00	75
2025−12−07 00:44:00	76
2025−12−08 18:38:00	77
2025−12−09 03:53:00	78
2025−12−10 03:55:00	79
2025−12−11 19:38:00	80
2025−12−12 03:31:00	81
2025−12−13 06:11:00	82

TABLE D.7: Urine Loading Log

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2025−11−12 02:15:59	350
2025−11−12 05:15:59	350
2025−11−12 17:16:01	350
2025−11−12 22:16:05	350
2025−11−13 02:16:06	350
2025−11−13 05:16:08	350
2025−11−13 22:16:01	350
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2025−11−14 05:16:05	350
2025−11−15 02:16:10	350
2025−11−15 05:16:03	350
2025−11−15 17:16:00	350
2025−11−15 22:16:00	350
2025−11−16 02:16:01	350
2025−11−16 05:16:03	350
2025−11−16 17:16:03	350
2025−11−16 22:15:57	350
2025−11−17 02:16:02	350
2025−11−17 05:16:01	350
2025−11−17 17:16:00	350
2025−11−17 22:16:06	350
2025−11−18 02:15:59	350
2025−11−18 05:16:04	350
2025−11−18 17:16:00	350
2025−11−18 22:16:00	350
2025−11−19 02:16:02	350
2025−11−19 05:16:04	350
2025−11−19 17:16:00	350
2025−11−19 22:16:03	350
2025−11−20 02:16:05	350
2025−11−20 05:15:58	350
2025−11−20 17:15:59	350
2025−11−20 22:15:58	350
2025−11−21 02:16:06	350
2025−11−21 05:16:01	350
2025−11−21 17:16:08	350
2025−11−21 22:16:03	350
2025−11−22 02:15:59	350
2025−11−22 05:15:59	350
2025−11−22 17:16:04	350
2025−11−22 22:16:01	350
2025−11−23 02:16:08	350
2025−11−23 05:17:51	350
2025−11−23 17:16:04	350
2025−11−23 22:15:59	350
2025−11−24 02:16:00	350
2025−11−24 05:16:07	350
2025−11−24 17:16:03	350
2025−11−24 22:16:01	350
2025−11−25 02:15:57	350

datetime	value
2025−11−25 05:16:05	350
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2025−11−25 22:16:01	350
2025−11−26 02:16:00	350
2025−11−26 05:16:00	350
2025−11−26 17:16:02	350
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2025−11−27 02:16:00	350
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2025−11−28 22:30:34	350
2025−11−29 02:15:59	350
2025−11−29 05:16:09	350
2025−11−29 17:16:03	350
2025−11−29 22:15:56	350
2025−11−30 02:16:00	350
2025−11−30 05:15:59	350
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2025−12−01 02:16:05	350
2025−12−01 05:16:03	350
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2025−12−01 22:16:05	350
2025−12−02 02:15:58	350
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2025−12−02 22:15:57	350
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2025−12−03 05:16:07	350
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2025−12−03 22:15:58	350
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2025−12−04 22:15:56	350
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2025−12−05 05:15:59	350
2025−12−05 17:16:06	350
2025−12−05 22:15:59	350
2025−12−06 02:16:03	350
2025−12−06 05:16:01	350
2025−12−06 17:16:09	350
2025−12−06 22:15:58	350
2025−12−07 02:16:02	350
2025−12−07 05:16:01	350
2025−12−07 17:16:06	350
2025−12−07 22:15:58	350
2025−12−08 02:16:02	350
2025−12−08 05:16:01	350
2025−12−08 17:16:08	350
2025−12−08 22:15:59	350
2025−12−09 02:16:03	350
2025−12−09 02:17:57	350
2025−12−09 05:16:09	350
2025−12−09 17:16:06	350
2025−12−09 22:15:58	350
2025−12−10 02:16:03	350
2025−12−10 05:16:02	350
2025−12−10 17:16:03	350

datetime	value
2025−12−10 22:16:06	350
2025−12−11 02:16:00	350
2025−12−11 05:15:58	350
2025−12−11 17:16:01	350
2025−12−11 22:16:06	350
2025−12−12 02:15:59	350
2025−12−12 05:16:08	350
2025−12−12 17:16:09	350
2025−12−12 22:15:59	350
2025−12−13 02:16:03	350
2025−12−13 05:16:01	350
2025−12−13 17:16:13	350
2025−12−13 22:16:00	350

APPENDIX E

ANALYTICAL RESULTS

TABLE E.1: Analytical Summary by Sample Source

	N	Average	Std Dev	Min	Max	Median	IQR (25–75%)
Alkalinity (mg/L)							
Controlled System - Effluent	56	243.0	207.5	5.0	915.0	180.0	80 – 356.2
Field Site 1 - Effluent	18	675.6	277.1	40.0	1,075.0	720.0	507.5 – 861.2
Field Site 2 - Effluent	5	513.0	362.8	135.0	1,060.0	350.0	340 – 680
BOD (mg/L)							
Controlled System - Influent	13	1,675.0	261.7	1,125.2	2,128.2	1,681.7	1662.4 – 1736
Controlled System - Effluent	44	221.5	47.2	53.7	266.7	233.1	217.4 – 245.6
Field Site 1 - Effluent	20	222.0	26.0	153.0	255.3	229.4	210.6 – 239.6
Field Site 2 - Effluent	6	172.6	74.9	80.4	243.9	186.4	109.8 – 237
Conductivity							
Controlled System - Effluent	56	188.6	36.8	53.7	259.1	192.8	171.1 – 206.4
Field Site 1 - Effluent	19	188.4	57.0	59.5	268.9	189.2	158.2 – 221.4
Field Site 2 - Effluent	6	221.2	128.7	52.8	373.6	199.3	145.3 – 331
Dissolved Oxygen (mg/L)							
Controlled System - Effluent Grab	19	21.9	5.4	6.6	27.5	22.7	19.9 – 25.7
N02 (mg/L as N)							
Controlled System - Effluent	56	0.1	0.5	0.0	3.3	0.0	0 – 0
Field Site 1 - Effluent	20	0.0	0.1	0.0	0.4	0.0	0 – 0
Field Site 2 - Effluent	6	0.0	0.1	0.0	0.2	0.0	0 – 0
N03 (mg/L as N)							
Controlled System - Effluent	56	1.1	1.1	0.0	5.6	0.7	0.5 – 1.5
Field Site 1 - Effluent	20	1.4	4.1	0.0	17.8	0.0	0 – 0.4
Field Site 2 - Effluent	6	16.1	10.0	0.0	26.0	16.9	11.6 – 24.3
NH4 (mg/L as N)							
Controlled System - Effluent	56	168.4	43.6	1.8	278.5	166.6	145.4 – 193.7
Field Site 1 - Effluent	19	202.9	78.1	22.5	333.3	197.5	169.2 – 258.7
Field Site 2 - Effluent	6	132.6	83.0	24.1	239.3	131.7	78.3 – 189.1
Nitrate/nitrite-N (mg/L as N)							
Controlled System - Effluent	56	1.2	1.3	0.0	6.9	0.7	0.5 – 1.5
Field Site 1 - Effluent	20	1.5	4.1	0.0	17.8	0.0	0 – 0.5
Field Site 2 - Effluent	6	16.1	10.0	0.0	26.0	17.0	11.6 – 24.4

ORP							
Controlled System - Effluent	56	80.8	67.8	−93.1	199.5	111.2	34.1 – 125.5
Field Site 1 - Effluent	19	−76.1	57.0	−119.4	122.9	−92.3	-112.8 – -55.7
Field Site 2 - Effluent	6	−61.9	19.5	−94.7	−36.1	−59.4	-67 – -54.2
Controlled System - Effluent Grab	19	481.6	104.8	187.9	568.4	525.6	488.4 – 535.5
pH							
Controlled System - Effluent	55	5.2	1.2	2.8	8.4	4.7	4.5 – 6.1
Field Site 1 - Effluent	16	8.1	0.4	7.2	8.8	8.0	7.9 – 8.3
Field Site 2 - Effluent	4	7.5	0.4	7.0	7.8	7.5	7.4 – 7.6
Controlled System - Effluent Grab	19	5.5	0.8	4.2	7.7	5.3	5 – 5.7
TKN (mg/L as N)							
Controlled System - Effluent	19	226.2	90.7	109.5	468.5	209.8	178.5 – 258.5
Field Site 1 - Effluent	20	337.0	128.8	123.3	579.4	329.4	239.6 – 415
Field Site 2 - Effluent	6	330.6	57.2	224.0	374.3	353.2	318.5 – 367
TN (mg/L as N)							
Controlled System - Influent	10	427.9	39.5	392.8	513.4	412.9	405 – 429
Controlled System - Effluent	19	227.4	90.7	110.0	470.0	210.0	180 – 260
Field Site 1 - Effluent	20	338.5	127.1	130.0	580.0	330.0	240 – 415
Field Site 2 - Effluent	6	346.7	55.0	250.0	400.0	360.0	330 – 382.5
TSS (mg/L)							
Controlled System - Influent	13	1,982.6	309.8	1,331.8	2,518.9	1,990.5	1967.7 – 2054.8
Controlled System - Effluent	56	198.0	134.2	29.0	715.4	179.3	103.4 – 250.3
Field Site 1 - Effluent	20	99.3	64.8	32.0	267.0	75.8	63.3 – 126.4
Field Site 2 - Effluent	6	81.6	63.6	2.0	153.0	84.3	32.2 – 134.5

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 9-Jun-25 Plant Code: Mata
Weeks Into Test: 1

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)					15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent				6.53		5.685	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent				195.9		204.9	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent				117.33		29	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 16-Jun-25 Plant Code: Mata
Weeks Into Test: 2

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	25.45						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	6.369			4.473		7.694	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	208.2			220.2		217.2	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	33.33			79		87.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 23-Jun-25 Plant Code: Mata
Weeks Into Test: 3

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	26.79						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.644			5.509		5.575	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	224.4			243		246	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	66			197		84.67	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 30-Jun-25 Plant Code: Mata
Weeks Into Test: 4

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	24.92						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	5.228				8.373		8.271
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	249				224.1		222
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	65				175.33		144.33
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 7-Jul-25 Plant Code: Mata
Weeks Into Test: 5

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	11.5	11.3	0	0
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent		27.54					
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent		5.25					
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent		266.7					
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent		99.67					
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 14-Jul-25 Plant Code: Mata
Weeks Into Test: 6

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		0	0	0	0	0	0	0
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.85	5.085	6.306				
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	259.8	259.8	244.8				
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	183.33	415.67	168.67				
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 21-Jul-25 Plant Code: Mata
Weeks Into Test: 7

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		0	0	0	0	0	0	0
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent							
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent							
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 28-Jul-25 Plant Code: Mata
Weeks Into Test: 8

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		3.8	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent				2.849		4.079	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent				12.9		8.1	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent				37.67		139.67	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 4-Aug-25 Plant Code: Mata
Weeks Into Test: 9

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	17.5	30	30	19.5	30	30
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.277			4.566		4.233	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	27.9			231		226.8	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	71			198.33		355	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 11-Aug-25 Plant Code: Mata
Weeks Into Test: 10

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		19	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	25.96						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.5					7.685	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	245.4					255	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	188.67					715.37	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 18-Aug-25 Plant Code: Mata
Weeks Into Test: 11

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	25.98						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	6.548						
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	243.6						
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	74.67						
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 25-Aug-25 Plant Code: Mata
Weeks Into Test: 12

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		13.8	15	15	15	15	9	0
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	25.45						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	5.787						
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	210					260.1	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	205.33					170	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 1-Sep-25 Plant Code: Mata
Weeks Into Test: 13

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent							
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent							
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 8-Sep-25 Plant Code: Mata
Weeks Into Test: 14

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	6	0	12	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	20.59						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	5.554					6.034	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	250.2					226.2	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	110					328	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 15-Sep-25 Plant Code: Mata
Weeks Into Test: 15

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	9.8	9.8	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	19.25						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	5.22			6.775		4.767	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	232.8			202.8		217.5	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	123.67			367.33		183.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 22-Sep-25 Plant Code: Mata
Weeks Into Test: 16

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	9.8	11.5	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	18.66						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	6.677			4.771		4.808	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	215.1			246.9		260.7	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	158.33			186.67		234.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 29-Sep-25 Plant Code: Mata
Weeks Into Test: 17

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	12.46						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.525	3.941		3.399		4.219	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	227.7	4.5		13.2		9.3	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	204.67	72.67		218.33		109.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 6-Oct-25 Plant Code: Mata
Weeks Into Test: 18

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	16.3	15	9.8	9.8	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	6.57						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	7.06			4.331		4.275	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent				23.1		12.6	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent				238.33		253.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 13-Oct-25 Plant Code: Mata
Weeks Into Test: 19

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	21.38						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.562				4.536		7.371
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	10.8				56.1		226.5
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	104.67				188		541.67
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 20-Oct-25 Plant Code: Mata
Weeks Into Test: 20

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent		4.314		4.441		4.269	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent		39.6		71.1		33.9	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent		92		211.67		86	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 27-Oct-25 Plant Code: Mata
Weeks Into Test: 21

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	13.3	15	15	15	6	3.8
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	24.06						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.23				4.443	4.889	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	53.7				242.4	242.4	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	109				370	339.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 3-Nov-25 Plant Code: Mata
Weeks Into Test: 22

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	21.41						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.671			4.501		4.609	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	243			237.3		246.9	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	255			249.33		323.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 10-Nov-25 Plant Code: Mata
Weeks Into Test: 23

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	11.5	6	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	22.74						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.651					4.678	
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	14.4					252	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	116.67					386.33	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 17-Nov-25 Plant Code: Mata
Weeks Into Test: 24

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent			17.48				
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.797		4.671				4.458
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	252.6		252.6				213.6
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	224		231				195.67
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 24-Nov-25 Plant Code: Mata
Weeks Into Test: 25

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	9.5	2.5	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent		4.47		6.644			
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent		232.8		217.8		233.4	
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent		148.33		256.67		536.67	
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 1-Dec-25 Plant Code: Mata
Weeks Into Test: 26

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15	15	15
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	27.16						
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	4.374						
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	242.7						
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	341.33						
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: 8-Dec-25 Plant Code: Mata
Weeks Into Test: 27

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)		15	15	15	15	15		
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent					21.94		
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent	7.186		6.087		6.386		
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent	207		236.4		241.5		
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent	261.67		161.67		167.33		
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

University of Hawaii - NSF Equivalent
Standard 41/245 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning 15-Dec-25 Plant Code: Mata
Weeks Into Test: 28

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Dosed Volume (gallons)								
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							
Temperature (C)	influent							
	aeration chamber							
	effluent							
pH	influent							
	aeration chamber							
	effluent							
Biochemical Oxygen Demand (mg/L)	influent (BOD5)							
	effluent							
Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
Volatile Suspended Solids (mg/L)	influent							
	aeration chamber							
	effluent							
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

APPENDIX F

ANALYTICAL RESULTS – NITROGEN ANALYSES

TABLE F.1: Raw effluent nitrogen analysis and calculated influent total nitrogen.

	Ammonia Nitrogen (mg/L as N)	Total Kjeldahl Nitrogen (mg/L as N)	Combined Nitrate–Nitrite (mg/L as N)	Total Alkalinity (mg/L as $CaCO_3$)	Total Nitrogen (mg/L as N)	
	Controlled System Effluent	Controlled System Effluent	Controlled System Effluent	Controlled System Effluent	Controlled System Influent	Controlled System Effluent
2025-06-12	162.8	189.7	0.3	345.0		190.0
2025-06-14	146.2	209.8	0.2	265.0		210.0
2025-06-15					431.7	
2025-06-16	168.3	209.8	0.2	325.0		210.0
2025-06-19	143.9	177.4	2.6	80.0		180.0
2025-06-21	217.7	369.3	0.7	515.0		370.0
2025-06-22					400.5	
2025-06-23	130.9	189.3	0.7	60.0		190.0
2025-06-26	180.5	159.5	0.5	190.0		160.0
2025-06-28	193.7	179.5	0.5	275.0		180.0
2025-06-29					418.2	
2025-06-30	162.3	109.5	0.5	185.0		110.0
2025-07-04	278.5	299.0	1.0	915.0		300.0
2025-07-06	164.7	220.0	0.0	557.5	405.1	220.0
2025-07-08	125.6	189.6	0.4	180.0		190.0
2025-07-13					418.0	
2025-07-14	130.5	179.6	0.4	145.0		180.0
2025-07-15	123.8	209.7	0.3	190.0		210.0
2025-07-16	73.7	109.8	0.2	150.0		110.0
2025-07-31	1.8	118.0	2.0	50.0		120.0
2025-08-02	169.2	287.8	2.2	205.0		290.0
2025-08-03					483.5	
2025-08-04	208.3	214.6	5.4	200.0		220.0
2025-08-07	173.8	277.2	2.8	145.0		280.0
2025-08-09	168.0	208.6	1.4	145.0		210.0
2025-08-11	167.1	229.3	0.7	115.0		230.0
2025-08-16	198.6	468.5	1.5	630.0		470.0
2025-08-17					392.3	
2025-08-18	99.6	340.0	0.0	460.0		340.0
2025-08-24					404.2	

2025-08-25		506.5	3.5	400.0		510.0
2025-08-30	249.0	548.3	1.7	310.0		550.0
2025-08-31					512.7	
2025-09-07					406.6	
2025-09-08	239.1	138.1	1.9	365.0		140.0
2025-09-13	255.3	613.1	6.9	450.0		620.0
2025-09-15	215.0	578.4	1.6	315.0		580.0
2025-09-18	204.1	488.2	1.8	570.0		490.0
2025-09-20	173.6	469.1	0.9	170.0		470.0
2025-09-22	174.1	479.4	0.6	575.0		480.0
2025-09-25	187.0	477.7	2.3	135.0		480.0
2025-09-27	193.7	469.4	0.6	120.0		470.0
2025-09-28					271.1	
2025-09-29	178.4	449.5	0.5	10.0		450.0
2025-09-30	219.9	256.1	4.0	195.0		260.0
2025-10-02	173.8	120.0	0.0	180.0		120.0
2025-10-04	223.3	138.8	1.2	255.0		140.0
2025-10-05					301.3	
2025-10-09	176.0	278.0	2.0	25.0		280.0
2025-10-11	144.4	219.3	0.7	235.0		220.0
2025-10-13	186.4	238.9	1.1	45.0		240.0
2025-10-17	206.6	629.2	0.8	15.0		630.0
2025-10-19	151.9	479.8	0.2	395.0		480.0
2025-10-21	152.5	768.4	1.6	5.0		770.0
2025-10-23	128.0	149.1	0.9	50.0		150.0
2025-10-25	136.2	158.8	1.2	160.0		160.0
2025-10-26					400.5	
2025-10-27	118.2	218.8	1.2	180.0		220.0
2025-10-31	139.7	309.1	0.9	75.0		310.0
2025-11-01	162.0	319.6	0.4	170.0		320.0
2025-11-03	128.4	309.4	0.6	65.0		310.0
2025-11-06	158.0	518.5	1.5	5.0		520.0
2025-11-08	153.1	439.5	0.5	80.0		440.0
2025-11-10	142.9	429.5	0.5	65.0		430.0
2025-11-15	226.5	448.4	1.6	50.0		450.0
2025-11-17	159.3	439.3	0.7	145.0		440.0

2025-11-19	136.9	388.9	1.1	80.0		390.0
2025-11-23	186.7	458.6	1.4	105.0		460.0
2025-11-25	152.4	349.4	0.6	115.0		350.0
2025-11-27	149.1	320.0	0.0	355.0		320.0
2025-11-29	78.0	280.0	0.0	360.0		280.0
2025-12-01	145.8	339.4	0.6	85.0		340.0
2025-12-08	201.8	349.5	0.5	600.0		350.0
2025-12-10	183.8	229.6	0.4	650.0		230.0
2025-12-12	166.2	265.2	4.8	600.0		270.0

APPENDIX G

SOLID PRODUCT TEST RESULTS

APPENDIX H

OWNER'S MANUAL

OWNERS MANUAL

WaiHome LLC - Mata Solid Waste Interceptor
All work must conform to local electrical, plumbing, and building codes.

TABLE OF CONTENTS

THANK YOU and congratulations on your new Mata Solids Interceptor! You have chosen a cutting-edge solution for responsible wastewater management. By mechanically separating solids at the source, your Mata provides a superior level of primary treatment that protects the environment and ensures the longevity of your household utility system.

At WaiHome, we believe you have the right to a **"hands-off"** experience. Your Mata system is equipped with smart sensors that communicate directly with our service team. This means you can enjoy the benefits of advanced waste treatment without the typical maintenance headaches.

Please take the time to read the information in this manual. Safe and proper operation of your Mata system will ensure a long product life.

With Aloha,

The WaiHome Team

Warning and Danger Labels

These labels are located on the control panel, motor box, Mata Lid, heating loop, and solid bins. **F**ollow the information on these labels to ensure your safety. If you have questions regarding safety, operation, or maintenance of Mata, contact WaiHome or your authorized service provider before taking action.

Dangers

Electrical equipment located in flooded areas presents an electrical hazard. Should the unit become flooded, call your WaiHome authorized service technician. Do not enter a flooded area. Entering a flooded area may result in electrical shock causing death or serious bodily injury. There are electrical cables located near this equipment. Contact your WaiHome authorized service technician before performing work around wiring. Failure to do so may result in electrical shock causing death or serious bodily injury.

Warnings

1. DO NOT attempt to service, modify, or repair Mata yourself. All servicing must be performed by WaiHome or an authorized technician.
2. DO NOT remove covers, access panels, or piping connections unless authorized. Unauthorized access may expose you to hazardous gases, wastewater, or electrical components.
3. DO NOT allow children to play on or around the Mata unit, vents, piping, or blower housing. Climbing or tampering may result in falls or serious injury.
4. Use caution when walking near the system.
5. The bottom of the heating loop may be hot.
6. Anyone who comes into contact with untreated or partially treated wastewater must:
    a. Remove contaminated clothing immediately
    b. Wash exposed skin thoroughly with soap and water
    c. Seek medical advice if illness is suspected
7. Site Protection and Loading
    a. The Mata solids interceptor may be damaged if heavy items are placed on or against the system enclosure or supporting surface.
    b. Do not place anything on or against the Mata unit.
    c. Maintain a clear buffer around Mata to prevent accidental impact, vibration, or structural damage to the unit and connected piping.
8. Ventilation and Airflow
    a. Proper airflow is essential to Mata's treatment performance.
    b. The area around the Mata unit's air intake, blower housing, and vents must remain clear at all times.
    c. DO NOT allow debris, vegetation, tools, snow, ice, or other objects to block vents or air pathways.
    d. When mowing or performing yard maintenance, direct clippings and debris away from the Mata unit and ventilation openings.

INTRODUCTION

Thank you for choosing the Mata, an advanced above-ground wastewater treatment system designed to improve sanitation performance while reducing environmental impact. The Mata is compatible with standard household plumbing fixtures and appliances, including toilets, sinks, showers, washing machines, and dishwashers.

The Mata is designed to operate reliably in challenging site conditions, including small lots, shallow soils, high groundwater tables, and areas where conventional septic or advanced treatment systems may be infeasible.

HOW MATA WORKS

Solid Interception

The Mata™ solids interceptor utilizes a mechanically driven, physical separation and dewatering process to remove suspended and settleable organic solids from residential wastewater prior to downstream biological treatment or disposal (Figure 1). Unlike biological reactors that rely on microbial growth and aeration, Mata operates as a pre-treatment and primary solids management device, concentrating and removing fecal and fibrous solids at the point of entry to the treatment train.

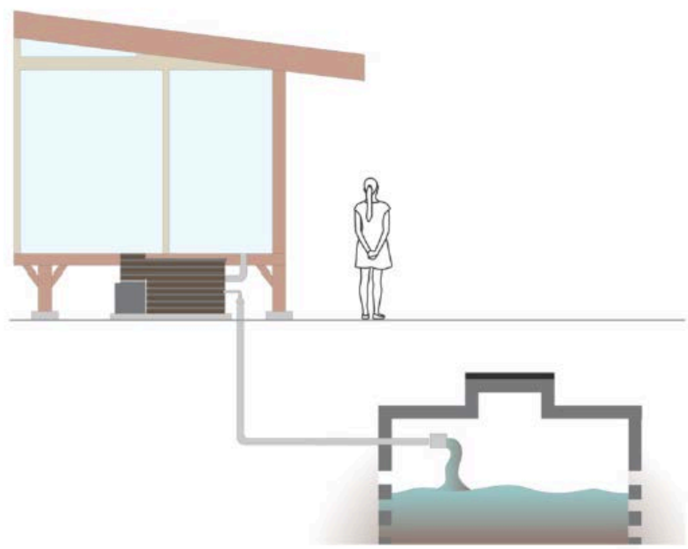

Figure 1: Mata Solid Waste Interceptor installed between a home and a seepage pit or cesspool.

By physically removing fecal solids, toilet paper fibers, and other particulate organic matter prior to biological treatment, Mata reduces total suspended solids (TSS), particulate biochemical oxygen demand (BOD), and particulate nitrogen loading to downstream treatment or disposal. This improves downstream process stability, oxygen utilization efficiency, and nitrogen-removal performance.

Because the Mata process is mechanical rather than biological, its performance does not depend on dissolved oxygen, microbial population stability, or temperature-sensitive biochemical reactions. Instead, solids capture efficiency is governed by screen geometry. This allows the unit to maintain consistent separation performance across a wide range of flow rates, organic loadings, and operating conditions, including intermittent and shock loading typical of residential use.

The Solids Separation tank consists of a screened influent zone and a liquid collection zone within a single tank. Incoming wastewater enters the Mata unit and is directed toward an auger screen assembly. As wastewater flows through the screen, liquid and dissolved constituents pass through the perforations, while particulate organic solids are retained on the screen surface (Figure 2).

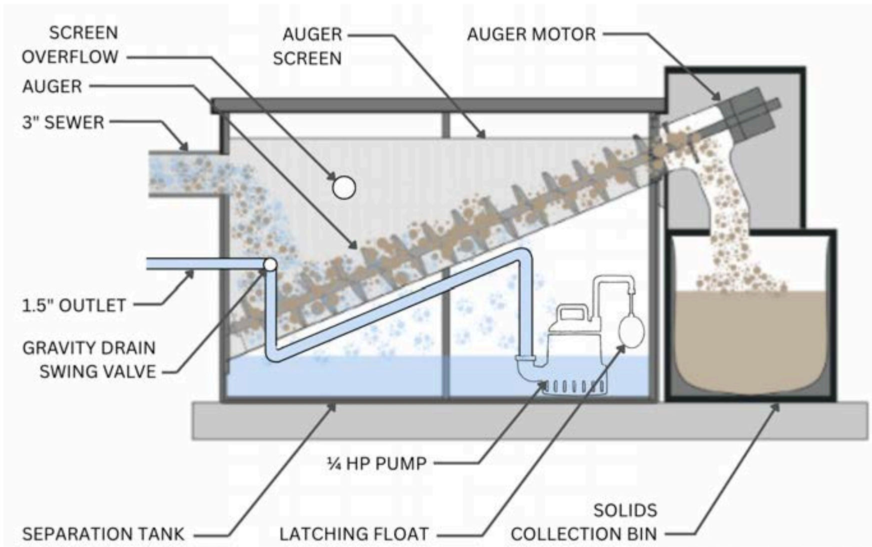

Figure 2: Mata Solid Waste Interceptor operation schematic.

Liquid effluent that passes through the screen accumulates in the lower portion of the tank. When the liquid level reaches a preset elevation, a float-activated control system energizes a flow-assist sump pump, which transfers the clarified liquid to the downstream treatment or disposal system. Simultaneously, the same float signal activates the auger drive, causing the auger to rotate and advance the retained solids along the screen. When the liquid level drops below the float setpoint, both the flow-assist sump pump and auger motor are de-energized.

Should a power outage or pump failure occur, the system is designed to operate by gravity like a standard gravity flow non-trap interceptor (Figure 3).

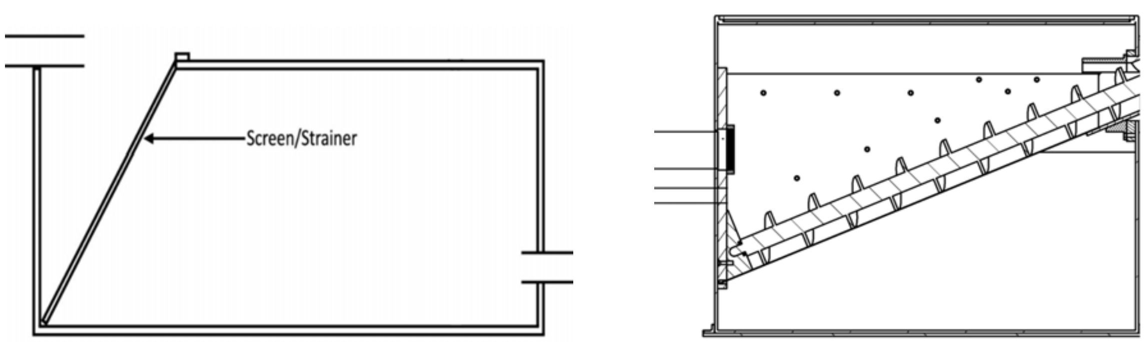

Figure 3: (left) IAPMO/ANSI Z1167 non-trap interceptor; (right) Mata solid waste interceptor without active components.

Solid Drying and Sterilization:

As the auger turns, the captured solids are mechanically conveyed and compressed, allowing entrained liquid to drain back through the screen into the liquid compartment. The dewatered solids are discharged into a solids collection bin, where they are retained for drying and subsequent removal.

The Mata comes complete with at least two solids collection bins to allow a full bin of solids to age while the other is filling. A heating and ventilation cap is mounted onto the top of the aging bin to support dehydration and sterilization. A typical heating cycle is 24 hours and is activated intermittently based on use. The heating process is designed to kill pathogens and bacteria by bringing the internal temperature of the solids above 50C for more than 12 hours, producing a biomaterial that is both dehydrated and in compliance with NSF 41 solids standards. The frequency with which bins are filled and swapped is roughly 4-12 weeks depending on occupancy of the household served. The control panel will notify maintenance personnel via cloud monitoring when it is time to swap the bins. The aged and now sterilized bin may then be emptied by an authorized service provider. Local auditory and visual alarms will engage if the solids bins are not swapped as required.

The Mata is kept at negative pressure by an outlet fan that draws air from the system and passes it through a refillable activated carbon filter prior to venting. The vent pipe should be directed away from trafficked areas to minimize the risk of odors. Should the user notice any odors, the activated carbon can be replaced with any commercially available 4mm diameter activated carbon pellets.

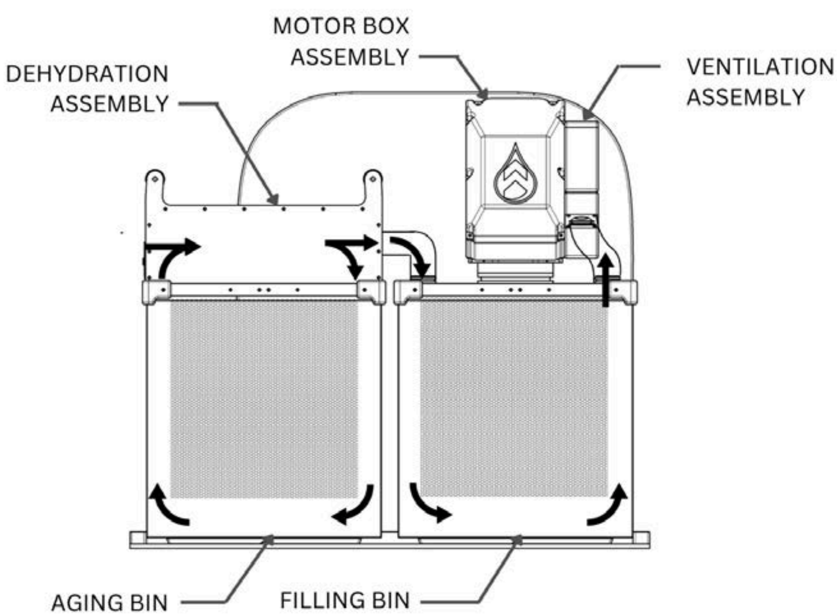

Figure 4: Airflow pathway through Mata's Dehydration Assembly, Solids Bins Assembly, and Ventilation Assembly.

Liquid Effluent Management:

The 1.5” pump-assisted drain leaving the Mata is connected to downstream treatment or disposal environments. Within the separation tank, small holes in this effluent pipe act as jets to disturb the bottom of the tank and sides of the screen to prevent the build up of any solids that have clogged or passed through the screen. Water leaving the tank is not disinfected and direct exposure should be avoided.

PRODUCT COMPONENTS

The Mata is composed of the 7 sub-assemblies and one final integration assembly as seen in the diagram below.

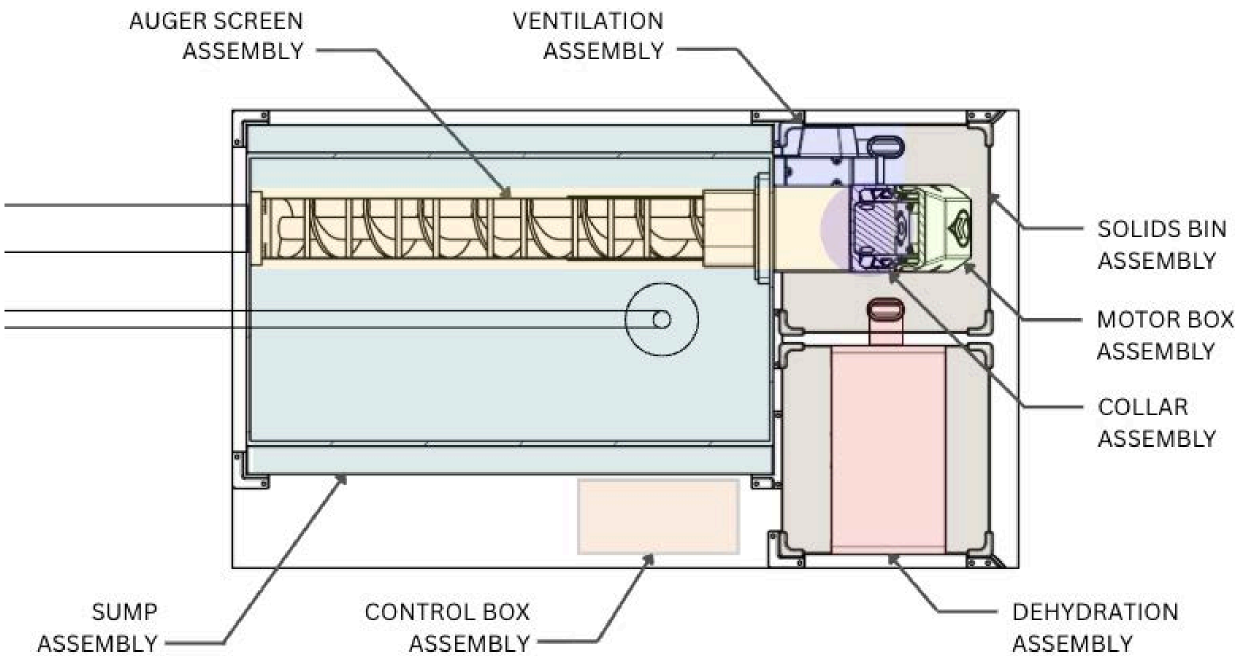

Figure 5: Mata Solid Waste Interceptor component assemblies.

Sump Assembly:

Consists of screened water collection and conveyance components. Key components include:

- 100 Gallon LLDPE Tank
- ¼ HP Submersible Sump Pump
- Vertical Latching Float
- 1.5” Swing Check Overflow Valve

Auger Screen Assembly:

Consists of the key auger screen components that separate the solids and convey them to the solids bins. Key components include:

- Poly-Cupped Stainless Steel 4” Auger
- Perforated 1/16” Hole Stainless Steel Screen
- Solids Diversion Fitting
- Emergency Float Switch

Motor Box Assembly:

Acts as an enclosure for the motor that rotates the auger, and junction box for the 24V wire connections. Key components include:

- 150W, 24V Gear Motor
- Gear Motor Driver
- Motor Box

Solids Bin Assembly (x2):

The Active Solids bin is defined as the bin temporarily located beneath the motor box assembly. This is where solids are collected, and the drying process begins. The Aging Solids Bin is located adjacent to the Active Solids Bin and is operatively connected to the Heating Loop Assembly. This is where solids are further dried, and the sterilization of pathogens occurs. Key components include:

- 14”x14”x14” Bin
- 14”x14” Lid with inlet and outlet vents, and solids port.
- 10”x10”x12” Stainless Steel Solids Basket
- 26”x22” Perforated Solids Bag

Heating Loop Assembly:

Creates a drier atmosphere for the solids by intermittently heating and recirculating air around the Aging Solids Bin. An air vent on one side allows fresh dry air to be drawn into the heating loop assembly while an outlet vent on the other side is connected to the Filling Solids Bin and allows process air to exhaust to the Filling Solids Bin. Key components include:

- 300W, 24V PTC Heater
- 24V Fan
- Heating Loop Conduit with recirculation and inlet vents.
- Filling Bin Flexible Connection

Outlet Ventilation Assembly:

Creates an odor free environment by using a fan to actively draw air from the Filling Solids Bin and through an activated carbon filter. The activated carbon requires periodic replacement to maintain effectiveness. Key components include:

- Removable Activated Carbon Compartment
- 24V Fan
- 1” Sch. 40 Outlet Vent Port
- Filling Bin Flexible Connection

Collar Assembly:

Provides an air-tight seal between the Auger Screen Assembly and the Solids Bin Assembly. Key components include:

- Latching Collar
- Rubber Collar Seal

Controls Panel Assembly:

Digital, programmable panel that incorporates multiple timing and logic functions used to:

1. Activate the sump pump and auger when the high level of the working volume is reached until the low level of the working volume is reached.
2. Activate the heating loop when a set number of pump events has occurred.
3. Activate an audible, visual, and remote alarm after a set number of pump events occurred indicating time to swap and empty the filling bin.
4. Activate an audible, visual, and remote alarm if an emergency level alarm condition is reached.
5. Activate a remote alarm if a malfunctioning part is sensed and requires preventative maintenance.

Key components in the control panel include:

- 120-VAC controls circuit breaker
- 120-VAC pump circuit breaker
- 120-VAC 24V circuit breaker
- Motor-start contactors for pump and heating circuits
- Automatic/Off/Manual (Auto/Off/Man) toggle switch
- 7⁄8-in (22-mm) red visible alarm
- 95 dB audible alarm
- Automatic alarm silence reset
- Type 4X (IP 66) rated enclosure

PROHIBITED AND ACCEPTED LOADING

Unlike traditional wastewater systems (Septic/ATU) that rely on "good bacteria" to digest waste, the Mata uses mechanical auger separation to separate waste. If your Mata system discharges into a specific secondary treatment unit or specialized drain field, you should follow the chemical usage recommendations provided for those components.

Accepted Items

Mata is designed to handle a home's typical blackwater solids, including food waste from garbage disposals.This includes:

- Standard household cleaning products and mild bleaches
- Antibacterial soaps and detergents
- Urine, feces, toilet tissue
- Food waste from garbage disposals

Prohibited Items

The user acknowledges that Mata is designed specifically for residential blackwater management and therefore holds the sole responsibility for ensuring that no improper items are introduced into the system. This is critical to ensuring the mechanical longevity of the Mata and for protecting the downstream disposal environment. Prohibited items include, but are not limited to:

- Hazardous Chemicals: Motor oil, gasoline, paint thinners, and pesticides.
- Heavy Grease: Large quantities of cooking oil or lard (which can solidify in your home's pipes before they even reach the Mata).
- Construction Debris: Drywall mud, gravel, or wood scraps.
- Non-biodegradable objects: clothing, fabrics, metal, or heavy plastics

IMPORTANT NOTE: WaiHome is not responsible for the condition or performance of downstream treatment products.

SIZING EXAMPLES

As a Solid Waste Interceptor with no biological treatment component, the Mata is sized for solids retention time in the dehydration process. Maximum loading is recommended to be 5 persons. Design flow for residential domestic sewage is normally considered to be 200 gallons per bedroom containing 0.2 pounds of TSS per capita. Check with local and/or state agencies to find out what the actual requirements are. The following examples are reasonable methods for plant sizing:

Example 1: *Select a treatment plant for a one bedroom house.*

2 people (Bed 1) = 2 persons
200 GPD X 1 Bed = 200 GPD
200 GPD / 15 Gallons per dose = 13 pump events/day
Mata will require solids removal roughly every 8 weeks (see chart).

Example 2: *Select a treatment plant for a three bedroom house.*

Assume two people in the first bedroom and one in each additional bedroom.
2 persons (Bed 1) + 1 (Bed 2) + 1 (Bed 3) = 4 persons
200 GPD X 3 Bed = 600 GPD
600 GPD / 15 Gallons per dose = 40 pump events/day
Mata will require solids removal roughly every 4 weeks (see chart).

Example 3: *Select a treatment plant for a 3 bedroom house and 1 bedroom ADU.*

Assume two people in the first bedroom and one in each additional bedroom.
2 persons (Bed 1) + 1 (Bed 2) + 1 (Bed 3) + 2 (ADU Bed 1) = 6 persons
Require 2 Mata's
Main House: 200 GPD X 3 Bed = 600 GPD (40 pump events/day, emptying every 4 weeks)
ADU: 200 GPD X 1 Bed = 200 GPD (13 pump events/day, emptying every 8 weeks)

Table 1: Estimated solids emptying frequency.

Users	1	2	3	4	5
Estimated Solids Loading (lbs/day)	0.2	0.4	0.6	0.8	1
Fill Cycle Time (weeks)	16	8	6	4	3

SYSTEM MAINTENANCE AND MONITORING

The Mata is designed for a hands-off experience from the homeowner by utilizing an intelligent,wifi monitoring system to ensure reliable operation with minimal manual intervention.

Smart Controls and Monitoring

The Mata features a top-of-the-line control system that connects via Wi-Fi to provide status updates. This system is designed to notify WaiHome if any operational anomalies occur.

- *Automated Alarms:* The system monitors for several critical conditions, including:
    - High Water Alarm: Triggered if tank levels exceed safe operating parameters.
    - *Component Malfunctions:* Detects issues with the auger motor or heater.
- *Usage Tracking:* The control system tracks usage patterns to predict and schedule servicing needs. Dehydration times and emptying frequencies should be set conservatively initially and tuned by a WaiHome approved technician based on usage.

General Servicing and Solids Removal

General servicing involves the professional removal of processed solids. WaiHome technicians will track your system's capacity through the control panel and schedule a convenient service appointment once the bin reaches its threshold.

To maintain system function, technicians follow a 5-step process (Figure 6):

1. Preparation: The technician switches off the heating loop and removes it from the aging bin. Use caution as components may be hot.
2. Extraction: Unlatch the lid of the aging solids bin and withdraw the bag of aged solids.
3. Bag Replacement: Insert new collection bag within the bin and replace and latch its lid.
4. Move Filling Bin: Release collar and disconnect vents from the filling solids bin then slide it into the aging position.
5. Reinstatement: Place empty bin into filling position and reconnect collar seal and vents. Replace heating loop and switch back into the Auto position.

Figure 6: Mata Solid Waste Interceptor solids emptying procedure.

IMPORTANT NOTE: This procedure is designed to be completed by WaiHome Technicians only. Solids are air dried for a period greater than 3 weeks and heat treated above 50C for a period greater than 12 hours. Per 11-62-41(c)(6), the use or disposal of screenings is not regulated by Subchapter 4, Chapter 62 of Title 11, Hawaii Administrative Rules.

Long-Term Maintenance Schedule

Beyond routine solids removal, the Mata system requires periodic professional inspections and component replacements to ensure its 20+ year design life:

- Carbon Filter Replacement (Every 6 Months): Ensures the outlet ventilation assembly remains odor-free.
- Annual Inspection (Every 1 Year): A general inspection of all mechanical components and sensors to verify optimal performance.
- Mechanical Overhaul (Every 10 Years): Proactive replacement of the motor and pump units to prevent unexpected downtime.

ELECTRICAL POWER OUTAGE

The Mata Solid Separator requires a consistent electrical supply to perform as designed. The system's advanced monitoring, mechanical separation, and sterilization cycles are all dependent on active power.

Short-Term Outages: For power outages lasting less than 24 hours, the system is designed to remain stable. Once power is restored, the Mata will automatically power up and resume its normal functions. Water is designed to flow through the interceptor by gravity in the interim. Loading should be kept to a minimum to avoid overaccumulation of solids on the screen.

Prolonged Outages: A prolonged power outage will eliminate the efficacy of the system's screening potential and may lead to backups if not addressed.

Required Action: If an electrical outage exceeds 24 hours, the homeowner should contact WaiHome immediately. A service technician may be required to inspect the unit and ensure the system continues to operate as expected once power returns.

IMPORTANT NOTE: Intentionally disconnecting the power for a prolonged period will result in a total failure of the treatment process and can lead to significant plumbing and repair expenses.

FLOODING

When anchored to a concrete pad, the Mata Solid Separator is engineered to withstand minor flooding conditions and will continue to operate as designed during such events. Any major flooding where water levels exceed 15 inches will result in the submersion of the heating loop assembly, which will cause immediate component failure and create significant electrical hazards. If your system has been subjected to major flooding, do not attempt to inspect or reset the unit. Instead, contact WaiHome immediately to schedule a professional evaluation and repair.

DANGER-ELECTRICAL HAZARD: Any electrical equipment located in flooded areas presents an immediate electrical hazard. You must stay away from the area surrounding the Mata system if flooding is present. Failure to do so may result in electrical shock causing serious injury or death.

EVALUATION OF SYSTEM PERFORMANCE

System monitoring is primarily conducted remotely and is intended for use by WaiHome technicians only. Homeowners can identify signs of proper operation through several indicators:

- Visual Indicators: The PLC inside the control box should be on.
- Acoustic Indicators: You may hear periodic pumping and auger motor sounds during normal operation; these sounds should not exceed 60 dB five feet from the unit.
- Odor Control: There should be no noticeable odor present around the unit.

If you detect any unusual odors or if the status lights on the control box change, please contact a WaiHome technician immediately to evaluate the system.

INTERMITTENT USE

The Mata Solid interceptor is designed for homes with varying occupancy levels, such as vacation rentals or seasonal residences. Because the system utilizes mechanical separation and heat sterilization rather than a continuous biological process, it does not require a constant "food" source of wastewater to remain effective.

The Mata is equipped with an intelligent control system that automatically detects when a house is vacant based on influent flow. Once vacancy is identified, the system will autonomously adjust its scheduled maintenance and sterilization cycles to conserve energy while maintaining a sterile environment within the solids bin. No special winterization or manual "hibernation" steps are required by the homeowner. Upon your return, the system will immediately resume standard operation as wastewater flow begins.

While the system handles these adjustments automatically, if you anticipate the home being vacant for longer than six months, please notify WaiHome. This allows us to ensure that our remote monitoring and long-term service planning are perfectly aligned with your home's usage patterns.

Important Note: Do not unplug the Mata if intermittent use is expected.

ABANDONMENT OR DECOMMISSIONING

If the residence is being connected to a municipal sewer system, integrated with different downstream treatment units, or if the Mata system is otherwise no longer required, the homeowner should contact WaiHome directly. Decommissioning must be performed by authorized technicians to ensure the system is safely disconnected, the solids bin is properly processed for the final time, and all mechanical components are handled in accordance with Hawaii regulations.

SPECIFICATIONS

Specifications can be found on the dataplate attached to the Mata separation tank.

Power Requirements: 120VAC, 60HZ, 15A

LIMITED 24-MONTH WARRANTY

WaiHome warrants each Mata to be free from defects in material and workmanship under normal use and service for a period of two (2) years from the date of installation. During this period, WaiHome will, at its discretion, repair or replace any component—including the auger motor, pump, and control panel—that is proven to be defective.

This warranty does not cover service charges for any replacement parts. This warranty also does not include damage caused by natural disasters (including major flooding exceeding 15 inches), unauthorized modifications, or external plumbing failures not associated with the Mata unit itself. Please see warranty agreement for more details.

If you suspect a mechanical failure or receive a system malfunction alert, contact WaiHome support immediately. Our technicians will remotely evaluate the system performance and schedule a service visit if a warranted repair is necessary.

Terms and Conditions

This warranty is specifically contingent upon the following:

> Authorized Service Only: The warranty is valid only if all maintenance, including bin exchanges and component inspections, is performed exclusively by authorized WaiHome service personnel. Any unauthorized repair or tampering with the internal mechanics or control panel will void this warranty.

Intended Use: The system must be used in accordance with the guidelines provided in this manual. Damage resulting from the introduction of prohibited substances (e.g., hazardous chemicals, heavy grease, or non-biodegradable debris) is not covered.

Power and Connectivity: The homeowner is responsible for maintaining a consistent electrical supply and Wi-Fi connectivity as required for system monitoring. Damage caused by intentional power disconnection or prolonged neglect of system alerts is excluded from coverage.