Final Grant Report: Sustainable Water Solution CMS# 161950

Period of Grant: June 15th, 2020 – Dec 31st, 2024

Submitted to:
Kevin Reidy
Colorado Water Conservation Board

Submitted by;
Greyter Water Systems, Inc

Date: February 22, 2024

Summary

Project Summary

The Sustainable Water Solution Pilot project (the "Project"), CMS# 161950, was initiated November, 2018 to further the measurable objectives of conservation, land use, education, outreach, and innovation articulated in Colorado's Water Plan and the South Platte Basin Implementation Plan. In addition, it was undertaken to highlight a consistency with the water education efforts described in the applicable Education Action Plans.

The Project was designed to demonstrate the water savings in new home construction made possible by the inclusion of the Greyter HOME™ graywater system, the Phyn Plus water consumption / leak detection monitoring system and Uponor Logic Plumbing for efficient water distribution within the home.

The Project was extended beyond its original timeline of 12 months to approximately 48 months and its size was decreased from 40 to 25 homes. The project plan was modified due to pandemic related unforeseen circumstances such as travel restrictions and social distancing requirements and real time learning. The 4-year project met its goals with many major findings and lessons learned.

The Project's objectives were defined as outlined below in support of key stakeholders including municipalities/water utilities, builders/developers and homeowners:

1. Awareness – Provide education to the stakeholders on the value and availability of the water conservation technologies utilized within the Project ("Technologies").
2. Training – Educate builders and plumbers on the rough in / installation requirements and homeowners on the daily operation of the Technologies.
3. Data Monitoring / Performance – Obtain real world data on reduced water consumption levels accomplished through the use of the Technologies

The project was organized into 9 major tasks:

1. Pre-construction
2. Marketing
3. Rough-in
4. Rough-in inspections
5. Unit delivery
6. Product cost
7. Training
8. Commissioning
9. Reporting

Project Completion

Awareness

- A demonstration unit was installed and operated through the duration of the project for use as an education and training tool.
- Numerous stakeholder meetings were held using the demonstration unit including county officials, inspectors, plumbers and builders (Lennar)
- The Technologies based solution was showcased at the Colorado Water Congress' annual conference.
- Numerous speaking engagements were completed highlighting the Project and the importance of graywater reuse in Colorado.
- After engaging in discussions regarding the Project, counties such as Fort Collins, Broomfield, Golden and Grand Junction adopted Reg 86.

Training

- Technical documents for the rough-in and installation were created to assure proper installation
- Plumbers were trained and rough-ins / installations were completed according to specifications during the construction phase.
- Initial orientation was provided to homeowners during the final walk through before occupancy.
- A detailed tutorial was provided during homeowner orientation 2-4 weeks after occupancy.
- Greyter went door to door to meet all the homeowners to get feedback, and relay to customers those lessons learned from the pilot were shaping a new design.

Rough-in and Installation Training Document

THE GREYTER HOME™ INSTALLATION GUIDE

Greyter Water Systems

Greyter is a registered trademark of Greyter Water Systems Inc.
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Outside North America: 1-416-883-2411

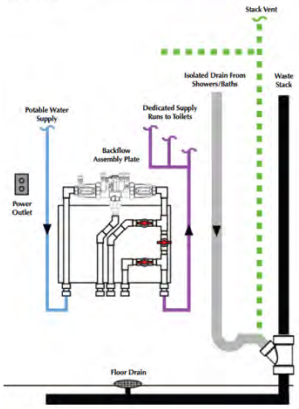
Greywater Ready

With the Greyter HOME™, shower and bath water is captured, treated, and reused for toilet flushing. This will require that the house be plumbed in advance to isolate the drain lines from showers/baths from the drains of other water sources (such as sinks and toilets) to ensure that only greywater is fed into the system. The isolated drain line from the house's showers/baths will be tied into a sanitary drain within close proximity of the Greyter HOME's™ designated installation area. To maximize the amount of greywater available for capture by the system, we recommend tying all shower/bath drains (master shower/bath mandatory) to this isolated drain line.

The toilet fixtures will have dedicated supply runs (isolated from potable water), tied into a single supply line that will be accessible from the Greyter HOME's™ designated installation area. The dedicated supply runs must be in purple pipe, or marked with labeling tape that reads "Non-Potable Water, Do Not Drink".

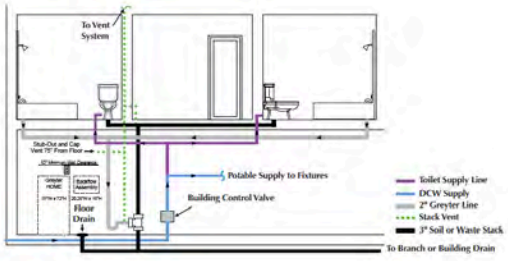
The house's vent stack will be accessible from the designated installation area for proper venting of the Greyter HOME™. A dedicated power outlet (110V, 15A) shall also be made available.

Backflow cannot be higher than 1.5 meters (4' 9") and has to be a minimum 12" off the floor.



Greyter Water Ready: Rough-In Only

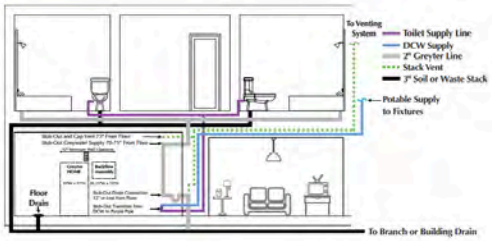
(Unfinished Basement or Mechanical Room)



1. Isolate greywater - Minimum 2 showers (2"), and home run greywater to mechanical room or where future Greyter Home will be installed.
2. If overflow is tying a 3" soil or waste stack, connection is a 3"x4" clean out with 2" side fitting. If tying into a 2" soil or waste stack, connection is a 2"x2" clean out with 2" side fitting. Fitting to be tight to the slab.
3. Isolate supply lines to toilets (purple pipe only, must read "Non-Portable Water, Do Not Drink")
4. Provide access to future 1.5" vent, must be minimum 75" off finished floor.
5. Provide single gang 15 Amp (dedicated), 120V. Plug should be 70-75" above finished floor, within12" of the right side of unit.
6. To accommodate backflow assembly plate, allow a minimum clearance of 3" to the right of the Greyter Home. Backflow plate is 15" x 20.25", and should be mounted securely to the wall at a minimum height of 36-48" from the finished floor (as measured from the top of the backflow plate).
7. Where space permits, install Greyter Home within 24" of floor drain is available, drain to daylight or alternate location which permits the Greyter Home mechanical tank to drain under gravity. **Drain port connection should be hard piped (pvc suggested) and secured to floor drain with metal strap and fastened to floor, or 90 elbow into floor drain.**

Greyter Water Ready: Rough-In Only

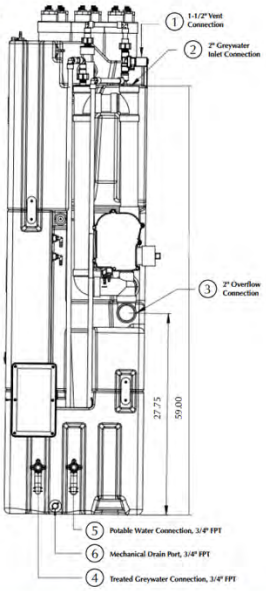
(Finished Basement or Mechanical Room, or Garage)

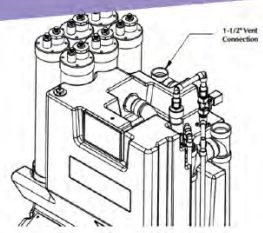


1. Isolate greywater - Minimum 2 showers (2"). Home run greyter to future location of Greyter Home, and stub-out 70-75" off finished floor, loop down and trap before going in behind wall. Bring into wall at lowest connection possible..
2. Isolate supply lines to toilets (purple pipe only, must read "non-Portable Water, Do Not Drink).
3. Provide access to future 1.5" vent, must be minimum 75" off finished floor.
4. Provide single gang 15 Amp (dedicated), 120V. Plug should be 70-75" above finished floor, within 12" of the right side of unit.
5. To accommodate backflow assembly plate, allow a minimum clearance of 2" to the right of the Greyter Home. Backflow plate is 15" x 20.25", and should be mounted securely to the wall at a height of 36-48" from the finished floor (as measured from the top of the backflow plate).
6. Where space permits, install Greyter Home within 24" of floor drain. If no floor drain is available, drain to daylight or some other location which permits the Greyter Home mechanical tank to drain under gravity. **Drain port connection should be hard piped (pvc suggested) and secured to floor drain with metal strap and fastened to floor or 90 elbow into floor drain. If no floor drain ensure proper slope for drain port connection or build up a curb (minimum 1" concrete pad) where entire base of system rests on and direct drain port connection to day light or front of the garage.**

The Greyter HOME™ requires six connections

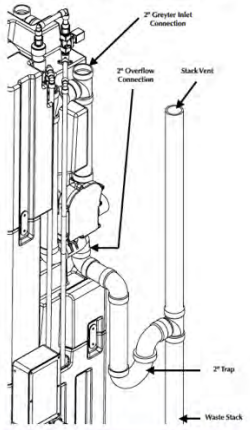
1. 1-1/2" ABS or PVC Vent Connection near the top of the This will tie into the house's venting system. A 1-1/2" flexible coupling is provided to connect between the unit and the vent.
2. 2" shower/bath drain in ABS or PVC to the Greyter HOME™ Greywater Inlet Connection. The unit's inlet is a 2" port on a flexible tee located 59" above the finished floor.
3. 2" Overflow Connection from the Greyter HOME™ in ABS or PVC to the sanitary waste stack. The unit's overflow is a 2" port on the Pre-Filter located 27-3/4" above the finished floor. A 2" flexible 90 degree fitting is provided to connect between the unit and sanitary waste stack; a trap must be installed between these two connections.
4. 3/4" FPT "Treated Greywater" connection on the Greyter HOME™ for supplying the toilet fixtures. The line from the unit ties into a 3/4" push-it coupling on the backflow assembly plate.
5. 3/4" FPT "Potable Water" connection on the Greyter HOME™ for freshwater make-up. The line from the unit ties into a 3/4" push-fit coupling on the backflow assembly plate.
6. 3/4" FPT Mechanical Drain Ports at the base of the Greyter HOME™ on both the left and right sides. Select side nearest to floor drain and use PVC for hard-pipe drain connection. If unit is installed in a garage with no floor drain, consider elevating unit on a platform and hard pipe drain to daylight.





Connection 1: Vent

Stub small piece of ABS or PVC, glue into 1-1/2" ABS tee on Greyter HOME™ and connect to vent using supplied 1-1/2" flexible coupling. The system **MUST** vent to open air in accordance with local plumbing code through a vent stack. Devices such as Air Admittance Valves will prevent off gasses from venting from the system and may result in gases leaking from the system or connected fixtures. **DO NOT USE** Air Admittance Valves.



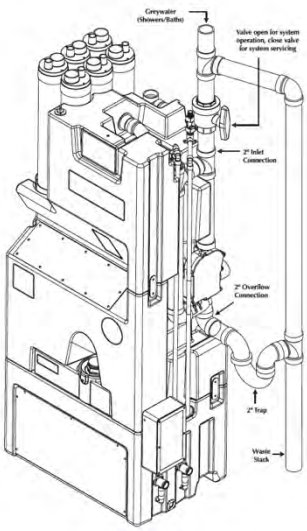
Connection 2: Greywater Inlet

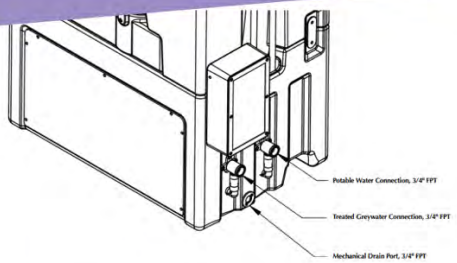
Attach 2" bath/shower drain into flexible tee installed above the Greyter HOME™ Pre-Filter.

Connection 3: Overflow

Attach 2" overflow from the Greyter HOME™ to the trap connecting to the sanitary waste stack using supplied 2" flexible 90 degree fitting.

Each install requires ability to divert greywater to sanitary. Install diverter valves as shown or use a 3-way valve. Valves need to be labelled to show flow direction.





Connection 4: Potable Water

Install 3/4" line from Greyter HOME™ freshwater make-up connection to the corresponding 3/4" push-fit coupling on backflow assembly plate.

Connection 5: Treated Greywater

Install 3/4" line from Greyter HOME™ toilet fixture supply connection to the corresponding 3/4" push-fit coupling on backflow assembly plate

Connection 6: Mechanical Drain Port

Install tubing between 3/4" mechanical drain port connection at the base of the Greyter HOME™ (either right or left side) to the floor drain.

Freshwater By-Pass

It is recommended that all installations include a freshwater by-pass, which allows the toilet fixtures to be supplied with city water should there be a system failure or power outage. A 3/4" connection with a shut off valve is required between the freshwater connection and greywater feed to the toilet fixtures.

When a by-pass is installed, the freshwater line needs to be protected by a backflow preventer. Please confirm with the local building authority as to the type of backflow preventer required (i.e. testable RP backflow, dual check, etc).

Greyter recommends all Greyter HOME™ units be installed with the Greyter backflow assembly plate which includes the A.R.I. RP 500 (¾" backflow preventer), mounting plate, shut-off valves for manual by-pass, and six 3/4" push-fit coupling fittings for connecting between the system, domestic freshwater supply, and the toilet fixtures.

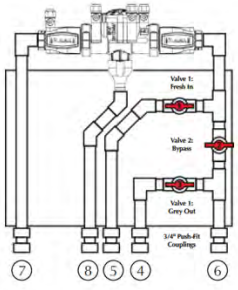
Backflow Assembly Plate

Valve 1 - Freshwater feed to Greyter HOME™
Valve 2 - Bypass Greyter HOME™ to feed toilet fixtures with freshwater
Valve 3 - Greyter HOME™ feed to toilet fixtures

To feed toilet fixtures from the Greyter HOME™: Open Valves 1 and 3, close Valve 2.
To bypass Greyter HOME™ : Open Valves 1 and 2, close Valve 3.

Connections

Connection 4: 3/4" feed from Greyter HOME™ Greywater-Out connection
Connection 5: 3/4" feed into Greyter HOME™ freshwater make-up connection
Connection 6: 3/4" feed to toilet fixtures
Connection 7: 3/4" city water connection
Connection 8: 3/4" backflow drain



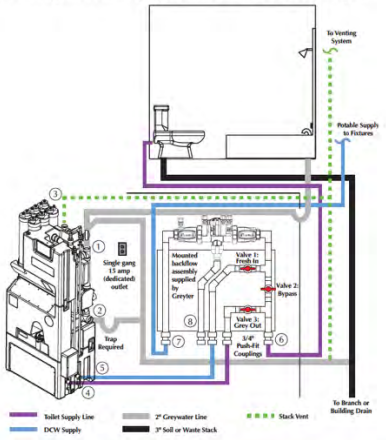
Backflow cannot be higher than 1.5 meters (4' 9") and has to be a minimum 12" off the floor.

Note – Connection 8 from the air gap on the backflow preventer needs to be connected to a floor drain, wash basin, piped to daylight, or can be tied into the overflow before the trap. If tying into the overflow before the trap, install a sealed hub drain to prevent venting of sanitary into surrounding area.

Following installation, leave the Greyter HOME™ powered-off and in the by-pass position to supply toilet fixtures with freshwater; a Greyter authorized representative will commission the unit to conclude the installation process.

Greyter HOME Connections

1. Building shower/bath drains only, connected to Greyter HOME Pre-Filter inlet (2" flexible tee).
2. 2" Greyter HOME overflow connection tied into a waste stack, either dedicated 6-8" from right side of unit or near unit (2" flexible coupling supplied)
3. 1-1/2" Greyter HOME vent tied into building venting system (1-1/2" flexible coupling supplied)
4. 3/4" greywater-out connection from Greyter HOME to backflow assembly (Valve 3 - Grey Out)
5. 3/4" freshwater-in connection from Greyter HOME to backflow assembly (Valve 1 - Fresh In)
6. 3/4" dedicated supply to toilets; Purple pipe only, must read "Non-Potable Water. Do Not Drink"
7. 3/4" potable connection from main or potable connection from main or potable supply into backflow assembly
8. 3/4" backflow drain; plumber to determine appropriate connection (i.e. floor drain, hub drain, laundry tub)



Version Date 2022-01-14

Homeowner Manual

The Greyter HOME™ Model #: GH-2100

Residential Greywater Recycling System Owner's Manual

Welcome home and congratulations on your new purchase. Like my home, yours includes the award-winning **Greyter HOME™** residential greywater recycling system that captures, treats, and filters shower and bath water so that it can be reused for toilet flushing.

John, Chris and I founded the company in 2012 with the goal of addressing a simple but important question: with water demands increasing and nearly one quarter of all water within the home used for toilets, why then do we flush with perfectly good drinking water? With the **Greyter HOME™**, you no longer have to.

Mark Sales | Co-Founder & CEO | msales@greyter.com

Greyter® Water Systems

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Outside North America: 1-416-883-2411

Version Date 10-13-2022

TWO YEAR WARRANTY

Write down the following information found on your Greyter HOME™ to better help you obtain assistance or service if you ever need it.

CUSTOMER RECORD Date of Purchase: Model No:

THIS WARRANTY APPLIES TO PRODUCTS PURCHASED AND USED IN THE U.S. AND CANADA ONLY. This is the only express warranty for this product and is in lieu of any other warranty or condition. Greyter Water Systems Inc.® (Greyter) warrants that all components of the Greyter HOME™ are to be free from defects in material and workmanship for two years from the date of installation by a licensed plumber or an authorized representative. Sole obligation under this warranty is as follows:

Greyter shall fulfill the warranty, stated above, by repairing or exchanging any component part(s) (F.O.B. factory) that in Greyter Water Systems' judgment show evidence of defects provided the Greyter HOME™ has been installed, operated and maintained in accordance with the written instructions provided by Greyter and said component part(s) have been returned through an authorized Greyter Representative.

This warranty is void if the product is used for other than single family household use. The warranty does not cover use not in conformity with the specified directions, or damage to the product resulting from accident, alteration, abuse or misuse. The warranty does not cover systems that have been flooded by external means, or that have been disassembled or tampered with by unauthorized persons, improperly installed, subjected to external damage, or damage due to improper wiring or overload protection. The warranty does not cover damage by freezing or overheating. The warranty will not cover damage to the Ultra-Filter caused by handling or misuse by unauthorized persons. The warranty will not cover damage resulting from paints, hazardous and toxic chemicals or other potentially damaging products (specified in the Owner's Manual) sent down bathtubs or showers drains that are directly tied to the Greyter HOME™.

The warranty applies only to the parts and components of the Greyter HOME™ system and does NOT include any of the residential plumbing, wiring, drainage, or disposal system. Greyter is not responsible for any delay or damages caused by defective components of materials, for loss incurred because of interruption of service, or for any other special consequential damages or incidental expenses arising from the manufacture, sale, or use of the system.

Greyter reserves the right to revise, change, and modify the construction and design of the Greyter HOME™ water recycling solution or any component part(s) of the system without incurring any obligation to make such changes for modifications in previously sold equipment. Greyter Water Systems Inc. also reserves the right, in making replacements of component parts under this warranty, to furnish a component part which, in its judgment, is equivalent to the component part replaced.

Under no circumstances will Greyter be responsible to the warrantee for any other direct or consequential damages which result from defects in material and/or workmanship of the system. Some states and provinces do not allow limitations on implied warranties or special, incidental, or consequential damages, so the foregoing limitations may not apply to you.

TO OBTAIN WARRANTY SERVICE AND/OR TROUBLESHOOTING INFORMATION:
Call Customer Service at 1-844-GREYTER (473-9837) ext. 232 | Go online at www.greyter.com

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ABOUT THE GREYTER HOME™

The **Greyter HOME™** is the first of its kind residential water recycling system that incorporates proprietary and patent pending technology within a compact solution. The system treats your bathing and shower water with multiple levels of filtration and disinfection to ensure the post-processed greywater meets a very high water quality standard. For more information on how it works visit **https://greyter.com/greyter-home-video/**.

PLEASE READ THIS MANUAL THOROUGHLY:

Failure to follow the instructions in this manual may result in personal injury or damage to the system and may void your warranty. Store this manual in a safe place. **Greyter Water Systems®** assumes no responsibility for any damage caused by misuse or mishandling. If you have questions regarding this manual, please contact **Greyter Water Systems®** customer support at **1-844-GREYTER ext. 232**. As the information in this manual is subject to change, please contact **Greyter Water Systems®** to receive the latest version.

The following graphics are used to draw your attention to proper usage and prevent injury or damage.

NOTE: Procedures and techniques that are considered important and emphasized.

CAUTION: Procedures and techniques which, if not followed correctly, will result in damage to the system.

WARNING: Procedures and techniques which, if not carefully followed, may expose the user to risk of injury.

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1. SAFETY WARNINGS & PRECAUTIONS

The Greyter HOME™ is designed to filter and treat residential shower and bathing water only. It is **NOT** intended to process other sources of greywater such as laundry or water from sinks. The treated greywater from the Greyter HOME™ is **NOT** potable water and should only be used to supply toilets with water for flushing. All greywater pipes should be marked according to local and state building codes and treated greywater should **NEVER** be ingested by humans or animals. Of course, **DO NOT** consume water from toilet tanks or bowls that have been supplied with treated greywater. Contact a Greyter authorized representative before ever disconnecting the system from power and/or freshwater.

1.1 Use of Household Cleaners

When cleaning bathtubs or showers use non-corrosive cleaning agents. Highly corrosive chemicals poured down the drain will enter the Greyter HOME™ and may reduce the life of the system's mechanical components. In the case where a corrosive cleaning agent is accidentally drained from the bath/shower and into the system, contact the Greyter HOME™ Technical Support team at **1-844-GREYTER** (473-9873) ext. 232 and immediately dilute the cleaning agent by running bath/shower for several minutes.

1.2 Bathing Products

The Greyter HOME™ is capable of handling typical shower and bathing products. However, excessive usage of products such as dyes, oils, salts, binding agents, or other bathing additives may cause premature clogging or failure of the system's filters.

1.3 Disposal of Products

DO NOT dispose of hazardous materials including paints down the bath and shower drains that feed into the Greyter HOME™.

2. SYSTEM & INSTALLATION

The Greyter HOME™ water recycling system was installed by a licensed plumbing contractor. In order for your home to be "Greyter-Water-Readied", your builder's plumbing contractor isolated your home's shower and bath drain lines to feed into the Greyter HOME™, as well as the toilet supply lines to be fed from the Greyter HOME™. All toilet supply lines that are fed with treated greywater must be labelled in accordance with your local building code regulations. A drip hose **MUST** be installed between the connections at the bottom of the Greyter HOME™'s Mechanical Tank and a nearby floor drain.

For full installation instructions, see the Greyter HOME™ Installation Manual.

2.1 System Capacity and Space Requirements

The Greyter HOME™ has a total capacity of 63.5Gal (240L), capable of storing 41Gal (155L) of raw greywater in the Collection Tank and 22.5Gal (85L) of treated greywater in the Permeate Tank. The system is 31 inches wide, 19 inches deep, and 72 inches tall, allowing it to be installed in a discreet location such as a basement, garage or mechanical room. Ensure access to the front and right sides of the system remains unobstructed to facilitate servicing and maintenance.

2.2 Electrical Requirements

The Greyter HOME™ requires a single gang dedicated 15A, 120V GFCI electrical outlet located 70-75 inches above the floor and within 12 inches of the unit. The included 24VDC, 11.67A power supply connects into the bottom of the Controller Housing to power up the system. Do not disconnect the power supply from the controller housing; should the system need to be restarted, unplug the power supply from the electrical outlet only.

3. SYSTEM OPERATION & PROCESSES OVERVIEW

Greywater passes through the self-cleaning Pre-Filter, where hair and solids are screened out before entering the system's Collection Tank. A self-cleaning Ultra-Filter is installed at the bottom of the Collection Tank, filtering out micro-organisms, suspended solids, and

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most dissolved surfactants (i.e. soaps). The filtered water is then passed through Absorption Media Cartridges that remove the remaining surfactants, colouration, or odour before being stored in the Permeate Tank for toilet flushing. Chlorine bleach is used throughout the system to prevent biological growth and maintain optimal water quality. If the system's Collection Tank is full, excess incoming greywater flows out an overflow to the Drain Connection. When the volume of treated greywater in the Permeate Tank drops below a minimum level, the system draws from the potable water supply through an air gap to ensure water is available for toilet flushing. The main system processes are as-follows:

3.1 Greywater Processing

The system draws greywater from the Collection Tank through the Ultra-Filter and then passes through the absorption media on its way to the Permeate Tank, where it is dosed with chlorine bleach and stored for toilet flushing. The system will continue to process water so long as the Collection Tank is above the minimum level and the Permeate Tank is not full.

3.2 Ultra-Filter Backwash

The Ultra-Filter is regularly backwashed and aerated to maintain optimal processing efficiency.

3.3 Pre-Filter Backwash

The self-cleaning Pre-Filter periodically backwashes in order to clean the filter screen and purge any accumulated debris to the sanitary drain.

3.4 Permeate Tank Disinfection

The system doses the Permeate Tank with chlorine bleach to mitigate biological growth and maintain a level of residual chlorine in the water being supplied to the toilets.

3.5 Collection Tank Disinfection

The system doses the Collection Tank with chlorine bleach to mitigate biological growth.

3.6 Freshwater Make-Up

Freshwater is used to maintain a minimum level of water in the Permeate Tank when not enough processed Greywater is available for toilet flushing or other system functions.

3.7 Maintenance Clean and Purge

The Ultra-Filter periodically undergoes a deep cleaning cycle followed by a complete purge of the Collection Tank.

3.8 System Idle

When there is no incoming greywater or toilet flushing activity for an extended period of time, the Greyter HOME™ will maintain basic system functions such as dosing the Permeate and Collection Tanks with chlorine bleach and periodically draining the system of standing greywater. Furthermore, the Ultra-Filter must remain submerged in water at all times. Because of this, during periods of extended vacation, the Greyter HOME™ should remain powered on and the potable water supplying the system should be left on. Failure to keep the Ultra-Filter submerged in water may cause damage that is not covered by the warranty.

4. SYSTEM MAINTENANCE

Proper operation and maintenance is critical to the long-term performance of the system. All NSF (National Sanitation Foundation)/ANSI Standard 350 Class R certified greywater treatment systems (GH-2100) have an initial two-year service agreement included (two service calls per year). Each appointment will include a mechanical, electrical and overall system diagnostic check and a visual and olfactory assessment of the system's effluent for clarity and smell. The owner will be notified of any improper system operations that cannot be remedied during the service appointment along with an estimated date of correction in writing. Extended service policies are available which may include comparable services as the initial service agreement. Contact Greyter Water Systems® or your Authorized Representative for information on extended service policies.

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4.1 Chlorine Bleach

The Greyter HOME™ draws chlorine bleach from the Chlorine Tank in order to dose the Collection and Permeate Tanks. A warning alarm on the system will signal when the Chlorine Tank must be refilled. Bleach is used to treat and clean the different components and filters of your Greyter HOME™. It is important to check labels for details and to ensure that the concentration of sodium hypochlorite in the chlorine bleach is 10%. The 2.3Gal (9L) Chlorine Tank will need to be refilled two or three times per year. Actual consumption of bleach will depend on individual household water demands.

WARNING: Read and follow proper safety procedures written on the bleach bottle.

Instructions for Refilling the Chlorine Tank:

Remove the Chlorine Tank cap and carefully pour 2.3Gal (9L) of bleach into the opening of the tank. Tighten and secure cap back on the Chlorine Tank once filled.

NOTE: Not all bleach solutions are the same strength and some solutions do not indicate the percentage concentration. Only use bleach that is labelled as having 10% sodium hypochlorite. Bleach will degrade over time; only use sufficient bleach to refill the Chlorine Tank, and store any leftover bleach in a cool, dry location.

4.2 Absorption Media

The Absorption Media should be examined and, if required, exchanged during the scheduled service visit. If you are unsure of the date of your next service visit, contact Greyter Water Systems® or your local authorized maintenance professional.

4.3 Ultra-Filter

DO NOT handle or touch Ultra-Filter membrane sheets as this can cause damage and may void warranty. The condition of system's Ultra-Filter will be inspected by a local authorized maintenance professional during your scheduled maintenance. As noted in Section 3.8 (System Idle), the Ultra-Filter must remain submerged in water at all times. Failure to keep the Ultra-Filter submerged in water may cause damage that is not covered by the warranty.

4.4 Pre-Filter

DO NOT remove the Pre-Filter cover. If you suspect a blockage in the Pre-Filter preventing water from entering the Collection Tank, please contact Greyter Water Systems®. The Greyter HOME™ Pre-Filter must ONLY be serviced and inspected by authorized service professionals. Removal of the cover or any of the parts may cause damage to internal components and improper sealing may cause leaks. Furthermore, the warranty does NOT cover systems that have been disassembled or tampered with by unauthorized persons.

5. GETTING STARTED

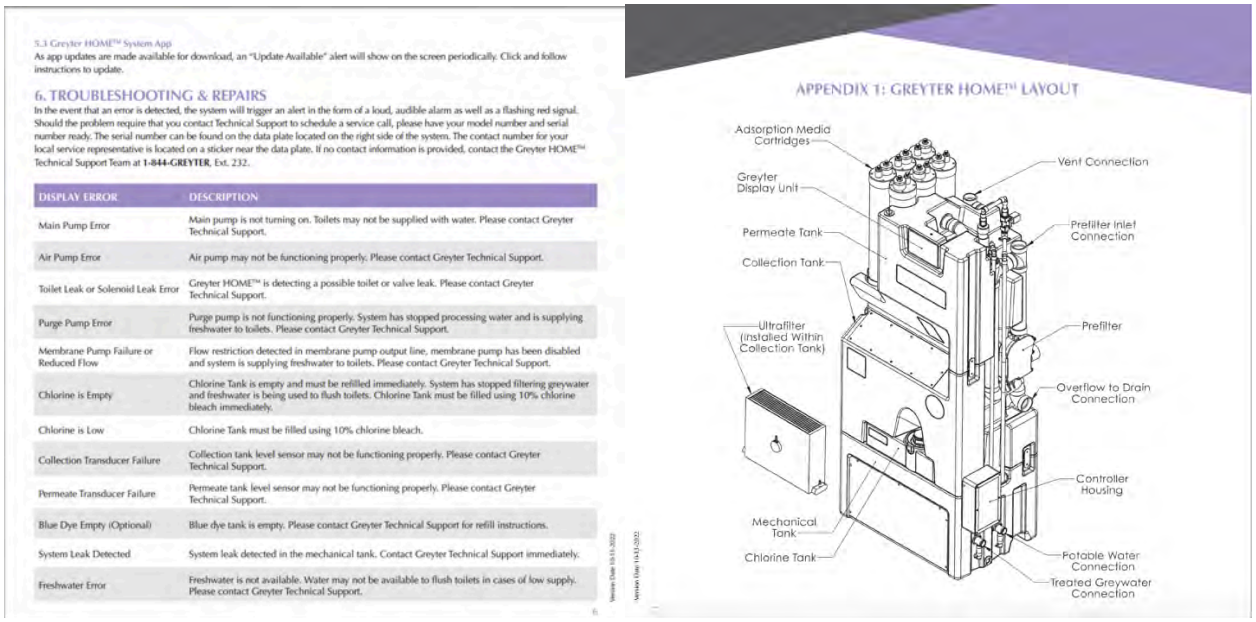
An authorized representative must commission the Greyter HOME™ prior to start-up. Following this, the system's Controller can be connected to a 110VAC outlet using the supplied power adapter. Ensure the Greyter Display Unit (GDU) is powered on.

5.1 Network Connection

It is important that the Greyter HOME™ is connected to your local Wi-Fi network in order to receive performance data, software updates, maintenance reminders, and many other features to help ensure that your Greyter HOME™ water recycling system is running smoothly over the long term. For instructions on how to connect the Greyter HOME™ to your local network, follow the step by step instructions that can be found online at **www.greyter.com/connecting-network**.

5.2 Setting Date/Time

Upon connection to the local WiFi network, the Greyter Display Unit (GDU) will automatically synchronize with the network-provided time. This can be verified by scrolling to the Settings screen, and scrolling to "Time/Date".



5.3 Greyter HOME™ System App

As app updates are made available for download, an "Update Available" alert will show on the screen periodically. Click and follow instructions to update.

6. TROUBLESHOOTING & REPAIRS

In the event that an error is detected, the system will trigger an alert in the form of a loud, audible alarm as well as a flashing red signal. Should the problem require that you contact Technical Support to schedule a service call, please have your model number and serial number ready. The serial number can be found on the data plate located on the right side of the system. The contact number for your local service representative is located on a sticker near the data plate. If no contact information is provided, contact the Greyter HOME™ Technical Support Team at **1-844-GREYTER**, Ext. 232.

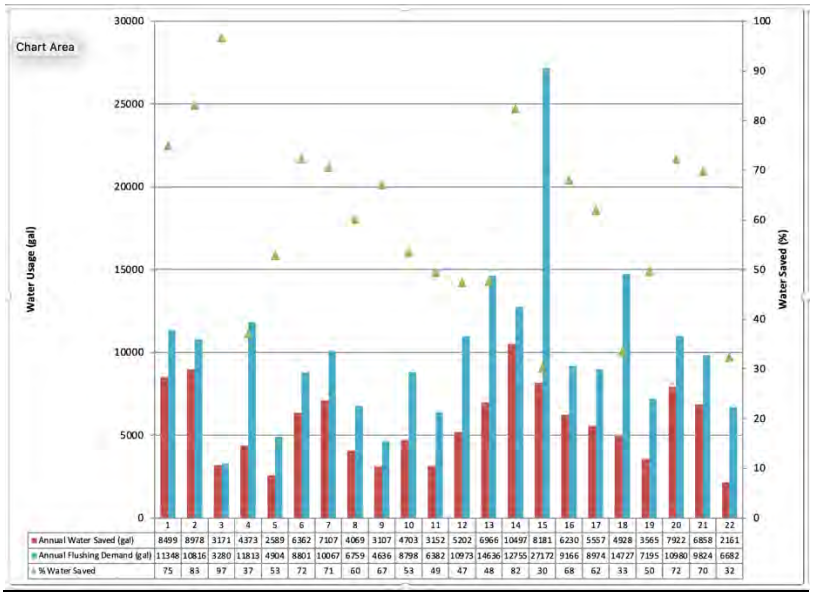
DISPLAY ERROR	DESCRIPTION
Main Pump Error	Main pump is not turning on. Toilets may not be supplied with water. Please contact Greyter Technical Support.
Air Pump Error	Air pump may not be functioning properly. Please contact Greyter Technical Support.
Toilet Leak or Solenoid Leak Error	Greyter HOME™ is detecting a possible toilet or valve leak. Please contact Greyter Technical Support.
Purge Pump Error	Purge pump is not functioning properly. System has stopped processing water and is supplying freshwater to toilets. Please contact Greyter Technical Support.
Membrane Pump Failure or Reduced Flow	Flow restriction detected in membrane pump output line, membrane pump has been disabled and system is supplying freshwater to toilets. Please contact Greyter Technical Support.
Chlorine is Empty	Chlorine Tank is empty and must be refilled immediately. System has stopped filtering greywater and freshwater is being used to flush toilets. Chlorine Tank must be filled using 10% chlorine bleach immediately.
Chlorine is Low	Chlorine Tank must be filled using 10% chlorine bleach.
Collection Transducer Failure	Collection tank level sensor may not be functioning properly. Please contact Greyter Technical Support.
Permeate Transducer Failure	Permeate tank level sensor may not be functioning properly. Please contact Greyter Technical Support.
Blue Dye Empty (Optional)	Blue dye tank is empty. Please contact Greyter Technical Support for refill instructions.
System Leak Detected	System leak detected in the mechanical tank. Contact Greyter Technical Support immediately.
Freshwater Error	Freshwater is not available. Water may not be available to flush toilets in cases of low supply. Please contact Greyter Technical Support.

Data Monitoring / Performance

- Lennar constructed 25 homes which incorporated the Technologies
- Greyter HOME™ systems, Phyn Plus units and Uponor Logic Plumbing were installed in all homes
- The Technologies successfully obtained significant operating performance data
- Offset of potable water usage for toilet flushing utilizing NSF-350 certified graywater from the Greyter HOME™ systems achieved 56%
- Summary Finding are as outline below:

Average Toliet Water Use (Graywater + Potable Water)	10,031
Average Graywater Supply to Toliets	5,644
% Potable Water Avoidance to Toilets	56%

Pilot Summary Findings - Annual use (gallons)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Annual Water Saved (gal)	8499	8978	3171	4373	2589	6362	7107	4069	3107	4703	3152	5202	6966	10497	8181	6230	5557	4928	3565	7922	6858	2161
Annual Flushing Demand (gal)	11348	10816	3280	11813	4904	8801	10067	6759	4636	8798	6382	10973	14636	12755	27172	9166	8974	14727	7195	10980	9824	6682
% Water Saved	75	83	97	37	53	72	71	60	67	53	49	47	48	82	30	68	62	33	50	72	70	32

3 Homes removed from data (1-bidet)

Obstacles Encountered

Occupant Behavior

Showering habits of occupants (frequency, duration, scheduling) limited graywater availability for use in toilets. Although occupant behavior can not be fully controlled, additional education of homeowners helped to improve showering habits.

Water Holding Capacity

The volume capacity of the Greyter HOME™ system related to storing shower water prior to processing was intermittently insufficient as a result of occupant shower scheduling habits. The holding capacity of the system has been increased in Greyter's next generation system, currently scheduled for release in late 2024. Practically, capacities of the system are physically limited by the constraints of the unit's size as defined by the builder stakeholder.

Premature Component Failures

Within the Greyter HOME™ unit, unforeseen component failures reduced the graywater system availability in certain homes. Data obtained from the Project, along with component life cycle testing performed by Greyter, has resulted in the inclusion of enhanced components within the next generation system. In addition, the elimination of certain components to increase unit availability has also been incorporated.

Bidet Use

The installation of toilet seat bidets by homeowners after the graywater systems were installed was not anticipated. Bidets are not approved for use of graywater per Reg 86 which required the units to be bypassed until a potable supply could be installed. In future

homes, toilets will be provided with an optional, secondary feed of potable water during the construction phase to accommodate the possibility of bidet use.

Confirmation of Matching Commitments

Matching Commitment was exceeded for the Project. As outlined below, contributions from the participating parties exceeded $175k in comparison to the grant value of $130k

	Greyter Contribution						Lennar Contribution			Phyn Contribution			TOTAL
	Greyter Direct Exp			Purchased Services			Rough-Ins / Installs			Phyn Plus Units			
	Inv 1	Inv 2	Inv 3	Inv 1	Inv 2	Inv 3	Inv 1	Inv 2	Inv 3	Inv 1	Inv 2	Inv 3	
1. Pre-construction				$3,021									$3,021
2. Marketing				$5,553									$5,553
3. Rough-in								$30,000	$20,000				$50,000
4. Rough-in inspections													$0
5. Unit delivery					$1,850	$14,420		$7,500	$5,000				$28,770
6. Product cost					$6,000	$8,612					$7,000	$3,500	$25,112
7. Training			$10,000										$10,000
8. Commissioning					$1,050	$43,018							$44,068
9. Reporting					$480	$8,020							$8,500
TOTAL	$0	$0	$10,000	$8,573	$9,380	$74,070	$0	$37,500	$25,000	$0	$7,000	$3,500	$175,023

Subtotal - Invoice 1	$0			$8,573			$0			$0			$8,573
Subtotal - Invoice 2		$0			$9,380			$37,500			$7,000		$53,880
Subtotal - Invoice 3			$10,000			$74,070			$25,000			$3,500	$112,570

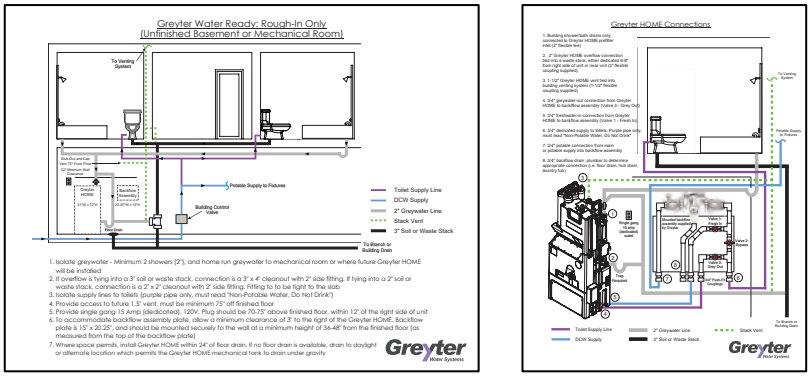
Additional Information Regarding Project Objectives

1. Training

Given the Greyter HOME™ was the first NSF 350 Residential graywater system installed in Colorado, there were numerous stakeholders which required training / education as outlined below:

- Builder – (construction manager, customer care manager, contract manager)
- Plumber
- Denver Planning Department
- Denver Building Inspector
- Denver Water
- Homeowner
- Local Field support

Education included detail information regarding plumbing connections and rough-in requirements. Training included both in-person discussions and proper documentation. Examples of training documents are as follows:

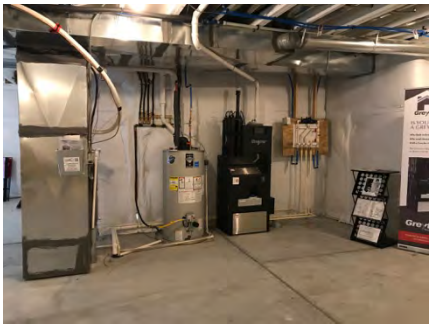


Greyter Training Document Examples

2. Activities

Pre-construction (Pre-Pandemic)

Before the first 3-homes broke ground, there were many discussions with the project's builder and partner, Lennar Homes, and their plumber. Creating the technical documents for the rough-in and installation was required as this was new to the plumber and understanding the plumbing requirements was critical for systems to be properly installed.



Greyter HOME installed for training

Colorado's state Regulation 86 ("Reg 86") defines strict guidelines permitting non-potable graywater reuse. Within the project, this included shower and bath graywater for use in toilet flushing. The regulation also outlines some of the mandatory plumbing requirements. Initial meetings were conducted with Lennar and the plumber in a model home where a demonstration unit was set up to be displayed through the duration of the project. Although the unit was not operational (the home was built before the graywater could be isolated to the unit), it was plumbed in for training purposes. This set up was used for many stakeholder meetings which included Lennar internal employees, County officials and inspectors and plumbers. The unit installation is as depicted below.
One of the most significant challenges of the project occurred when travel restrictions were imposed during the pandemic. This forced the team to shift its approach to remote

training as Greyter was unable to facilitate local on-site training for field support. Lennar utilized its site superintendent as Greyter's representative, providing service, maintenance, and field support for the early systems. Lennar was also able to assist Greyter while the pandemic continued, as construction halted for the better part of 12+ months. During this period and due to the pandemic, the project was reduced from 40 to 25-homes. Between January and August of 2022, 22 of the final 25-homes were installed.

Construction (Post Pandemic)

In January and March of 2022, Greyter made 2 trips to Colorado to perform in-person site inspections of rough-ins and installations. This was completed during the height of construction completion for the final 22-homes. Most occupancy closings were held from May to August 2022. At this point, the plumbers were well trained, and rough-ins and installations were installed according to specifications.

Construction Phase Example

Closings

During the last walk through before final occupancy, Lennar provided the initial orientation to homeowners, completing a basic overview of how the system works. Greyter would subsequently provide a more detailed tutorial during the homeowner orientation which typically occurred 2-4 weeks after the homeowner moved in and had WIFI availability. During this detailed tutorial, the system would be taken out of by-pass and put into operation.

Outreach and Education

Shortly after the first 3-homes were completed Greyter had the opportunity to showcase its solution at Colorado Water Congresses annual conference. This included participating on a panel about the importance of graywater reuse for the state. The panel represented one of many speaking opportunities where the pilot project was showcased and where important discussions were held regarding residential graywater reuse in Colorado.

Colorado Water Congress Conference (January 2020)

Housing Innovation Alliance, Denver University (April 2023)

Advocacy continued south of Denver. Inspectors first visited the Central Park site before hosting their own informational. During this event, Castle Rock stakeholders saw first-hand an installation within Castle Rock's Red Hawk site in Douglas County, where 29-units were installed.

Castle Rock, City Officials and Inspectors Orientation. 1st of 29 installations

Continued Outreach

Since the first installation in 2020, there has been continued advocacy drawing attention to the 25-home Pilot. At the time of project approval, graywater reuse indoors was only approved in the City and County of Denver, Castle Rock and Pitkin County, which had adopted some form of Reg 86. As awareness and importance of graywater reuse garnered attention, counties including Fort Collins, Broomfield, Golden and Grand Junction adopted some form of Reg 86 to allow graywater reuse. During the current 2024 legislative session, a bill will be introduced that will make Reg 86 an Opt Out structure versus its current structure of Opt In.[1] Within this bill, jurisdictions are provided the ability to choose what part of the Reg 86 they want to Opt in to. This will pave the way for expanded use of graywater reuse for both Residential and Commercial projects.

[1.] *No grant funds used in this effort, led by Greyter Water Systems in parallel to the Pilot*

3. Performance, Customer Experience and Lessons Learned

The Greyter HOME™ unit is a mechanical treatment system which relies on a self-cleaning prefilter that removes hair and solids, a membrane that does the majority of filtration and a polishing step performed by activated, which is the system's final step before the treated water is delivered to the supply tank and available for flushing. The certification body, NSF, requires the system to be inspected 2-times annually for the first 2-years to maintain its NSF 350 certified status. The design intent of the system was to have a single requirement for annual service which would include adding chlorine and exchanging the carbon cartridges. Although the system delivers an extremely high-water quality it became evident during the Pilot that the addition of chlorine and replacement of carbon would not meet the 1-year goal. Servicing would likely be required 2-3 times annually, an important finding from the Pilot. The pilot also identified components, such as the membrane and main pumps, which were not robust enough to achieve projected life-cycle time. With more than 2+ years of operation time for some systems, Greyter was able to gather significant data on key performance measures which has ultimately shaped a redesign of the residential system.

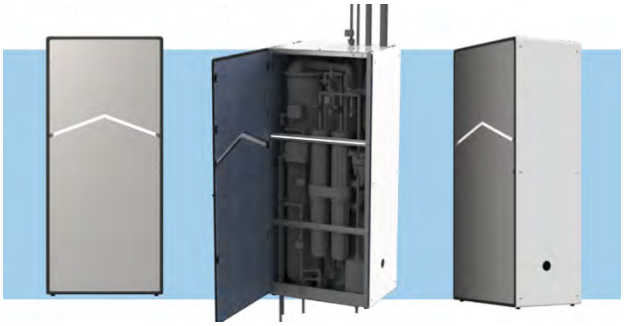
The education of the builder and plumber was performed without difficulties or complications. With proper documentation and specifications on plumbing requirements, there were little issues when it came to the rough-in and installation. During homeowner orientation, since the builder had the first interaction with the customer, it became clear that consistent messaging wasn't always delivered, and it was concluded that this communication needs improvement when installing numerous systems with large scale production builders. Revisions to this process will include:

- One page information document within the Builder Customer Care binder of all mechanical equipment
- Short video presentation – available for viewing on final homeowner walk thru
- QR code on graywater system for instant information

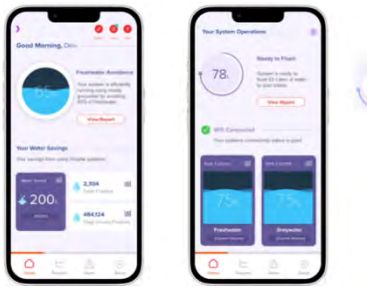
In March 2023, Greyter went door to door to meet all homeowners involved in the Pilot to obtain feedback and relay that lessons learned from the pilot were helping shape a new product design. The feedback provided on the value of graywater reuse was consistent. Those interviewed expressed strong support for the use of graywater to flush toilets to save potable water, however improved system performance was important.

The Pilot findings contributed to a new Greyter HOME™ system, launching in late 2024, that will address the lessons learned and provide:

- Improved reliability
- Decreased maintenance
- Increased holding capacity and efficiency
- Improved customer satisfaction and user experience (new mobile app)
- Improved visual appeal

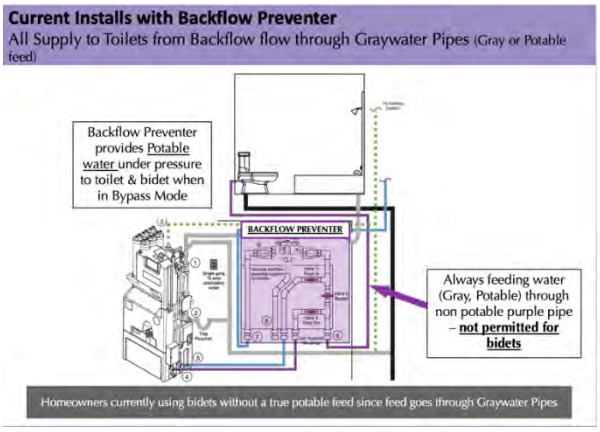


Greyter HOME™ Next Generation System



Greyter HOME™ mobile application

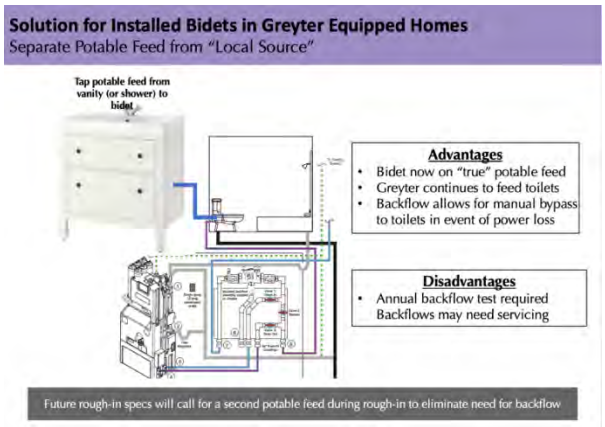
In addition to information about the systems operation, concern around annual testing of the backflow preventer was highlighted. The backflow preventer system ("Backflow"), separate from the Greyter unit, was required for the Pilot when the system includes the option of a manual by-pass. This Backflow gives the ability to switch between potable water and graywater in the event of a power failure or system error to keep toilets flushing. The annual cost of a required inspection of the Backflow is approximately $75. Greyter has agreed to pay this cost for the initial four years.



Schematic of graywater system and backflow preventer

For future installations, the Backflow and its inspection requirement have been removed. The rough-in spec will require a potable feed stubbed out at the toilet, providing each toilet two feeds (one graywater supply line, one potable supply line). This will eliminate the need for a backflow preventer and will give homeowners the ability to bypass the system without cross contamination. Since the system has an air gap, the backflow preventer is not required, and in the long run this saves the homeowner money eliminating annual testing fees.

An additional lesson learned from the Pilot centered on an unexpected desire of certain homeowners to install toilet seat bidets. After the graywater system was installed within a Pilot home, the homeowner installed a bidet on a toilet feed with the graywater system. Bidets are not approved for use with graywater and must use potable water. This occurrence has led directly to an update of Reg 86. In its most recent update of November 2023, Reg 86 included language that bidets cannot be supplied by graywater. As a solution for this homeowner, the graywater system was bypassed until the plumbing is re-configured with a potable supply to the bidet. The strategy of providing a second feed (potable) at the toilet as outlined previously will allow homeowners to install toilet seat bidets with a graywater system.

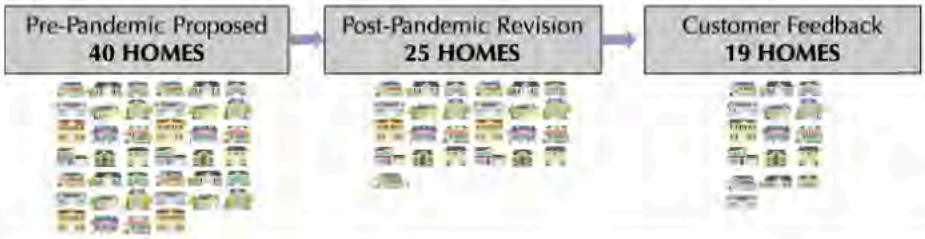


Schematic of graywater system and backflow preventer

Survey

Customer Feedback and General Remarks from Stakeholders

Pilot Participants



Of the 25-homes participating in the Pilot, 19 were interviewed in-person in March of 2023. For the early installs (3), participants had more than 2-years of operation, while most installs had one year. On site meetings were typically 15-30 minutes in length, gathering feedback on everything from aesthetics, performance, maintenance, and overall satisfaction with the system. Any concern raised was overridden by the fact the participants understood that flushing toilets with potable water doesn't make sense and reusing filtered and treated shower water to flush their toilets was a good idea.

The most common questions and concerns raised centered around the overall maintenance of the system, consumables, and the on-going annual backflow testing required. For the Pilot, all above associated costs are being covered by Greyter for 4-years.

Many of the homeowners had nothing but positive feedback, and the chart below is a summary of the most common concerns documented. Those concerns were relayed to Greyter's Technical Team and were a driving influence in shaping the design of Greyter's Next Gen system.

Homeowner Summary	
Participants	25
In Person Conversations	19
General Concerns	
Noise	2
Backflow Testing Requirement	2
High Chlorine Consumption	3
Frequency of Service/Maintenance	5

Concern	Corrective Action
Noise	Next Gen Uses Sound Dampening Panels
High Chlorine Consumption	Next Gen Uses 1-Gallon Annually
Maintenance: Membrane Fouling	Next Gen - Eliminated
Maintenance: Carbon	Next Gen - Eliminated

The most significant concerns have all been addressed with Greyter's Next Gen system, and the customer feedback was critical information. With an entirely different approach to treatment, the only annual maintenance requirement will be filling a chlorine reservoir (which a homeowner can do), once a year. The volume required has been significantly reduced, which is also an important advancement.

During the Pilot Denver Water was updated on the Pilot findings, and data was presented that represented a snapshot at that point in time (June,2023).

Summary Findings
(annually per home)

Avg Toilet Water use (Fresh & Grey)	8,951
Avg Greywater Supply to toilets	5,168
% Freshwater avoidance in toilets	58%
Avg Total Freshwater use (from Phyn)	34,956
Avg Total Water use (Fresh + Grey)	40,124
% of Total Water used for toilets	22%
% Freshwater savings via Greywater	13%

Like a couple of homeowners, Denver Water also addressed the backflow preventer, and was curious about the strategy moving forward. At the time of the installations and project roll out (during a Pandemic) it was determined this was the best strategy that would allow homeowners a manual bypass, while being compliant with the state plumbing code and Regulation 86. It has since been determined that providing a second potable feed at the toilets is the most practical and economical way to provide a bypass that meets code requirements and allows flexibility in case of power outages or any downtime with future greywater systems. This would eliminate the need for a backflow preventer which required annual testing.

From the builder and plumber perspective, although there was a learning curve from permitting submittals, to the rough-in and installation, the process was seamless after a couple of rough-ins and installations. Adopting a new fixture into a home takes a little pre-planning but this is not an appliance that is overly complicated. All greywater systems will require the following when using for indoor toilet flushing:

- Inlet (greywater)
- Outlet (overflow to sanitary)
- Vent
- Greywater feed to toilets (dedicated)
- Potable water feed to system (makeup water)
- Power

An important tie into to all of this is the builder Customer Care team. They are the conduit to the homeowners and do multiple walk throughs with the buyers throughout the various phases of construction. The takeaway after discussions with the Customer Care Team, they require more information that can be easily shared before the home closes.

- One page information document within the Builder Customer Care binder of all mechanical equipment
- Short video presentation – available for viewing on final homeowner walk thru
- QR code on graywater system for instant information

4. Data

Annualized data for the Pilot over the 25-homes is obtained from the external water meters on the Greyter HOME™. One meter measures the volume of water flushed to toilets, the second meter measures the volume of potable water used as makeup water

System Efficiency = Total water delivered to toilets - Potable water used / Total water delivered to toilets

System Efficiency Formula

when the system does not have sufficient graywater. To calculate the system's efficiency, the ratio of graywater delivered to total water delivered to toilets was utilized.
It is generally accepted that toilet flushing accounts for ~20% of indoor water consumption. One full time occupant is assume to flush 5 times per day with an average toilet consuming 1.28-gallons per flush. A family of four (4) is therefore estimate to use approximately 9,300 gallons annually for toilet flushing (4 occupants x 5 flushes daily 1.28 per flush x 365 days = 9,344 gallons).

The targeted offset of potable water for toilet flushing by graywater reuse is generally accepted as 80-95%. However, factors which contribute to this offset include those controlled by users and the system such as:

- Occupant behaviour (showering habits – length of showers and frequency of showers)
- Holding capacity – systems must be a minimum of 52-gallons (code)
  - The larger the better, but size of systems are a big factor
  - Practically, systems can't be more than 3' x 3'
- Volume of water collected – sometimes it's not possible to capture all the shower and bath drains

5. Results

The Pilot demonstrated annual use of approximately 10,031 gallons (with an average of 3.5 occupants per home) – in line with the estimated usage. Although the average of full-time occupants was below 4, the total annual toilet flushing was above the estimated value. It is believed this higher value was a result of homeowner's increased time within the home due to higher rates of working from the home.

Average Toliet Water Use (Graywater + Potable Water)	10,031
Average Graywater Supply to Toliets	5,644
% Potable Water Avoidance to Toilets	56%

Pilot Summary Findings - Annual use (gallons)

The Greyter HOME supplied 56% of the annual toilet flushing demand. The shortfall against the targeted offset is due to causes such as outlined previously including homeowner behaviour, system size and system component reliability. A significant number of the causes have contributed to the design of the new generation system which includes:

- Increased holding capacity from 64-gallons to ~80-gallons
- Faster process rate – Gen 3 will be ~ 2X's faster, making more treated water available
- Elimination of the variability of process rate (membrane)