Graywater System Specification

Issued by the Kansas Department of Health & Environment
December 19, 2013

Introduction and Specification Purpose

The drought that has affected Kansas since 2012 has prompted a closer look at water reuse opportunities. One option to conserve potable water is to recycle "graywater." Such an option would include diverting the graywater from acceptable sources within a home to below the earth's surface to irrigate lawns and other vegetation. This approach would allow the reuse of the graywater while preserving potable drinking water.

There are obvious benefits to graywater reuse; however, these benefits must be balanced with possible risks. Graywater is a source of bacteria, virus, protozoa and other pollutants that can pose health risks. The level of risk depends on the concentration of such sources, which varies depending on the graywater source. One of the primary risks associated with graywater reuse is illness from pathogens. It is commonly accepted that Fecal Coliform Bacteria or E. Coli, which are found in the digestive systems of warm blooded animals, are indicators of potential disease causing organisms. A literature review of graywater research resulted in a finding that indicator organisms were present in all sources of graywater. The key is to minimize or eliminate exposure and eliminate sources of graywater in which the concentration of indicator bacteria is highest. Measures must be taken to minimize the risks and to insure the safety of public health and the environment.

The purpose of this Graywater System Specification (Specification) is to provide homeowners with a graywater system design that allows for the benefits of graywater reuse for subsurface irrigation while minimizing human health and environmental risks. This Specification establishes the guidelines for which a homeowner may seek a standard variance from K.A.R. 28-5-2 through K.A.R. 28-5-7, adopted pursuant to K.S.A. 2012 Supp. 65-171d, from the Kansas Department of Health & Environment, and where applicable, the Local Authority. The intent is to offer a Specification that minimizes public health and environmental risks while allowing for conservation of potable water.

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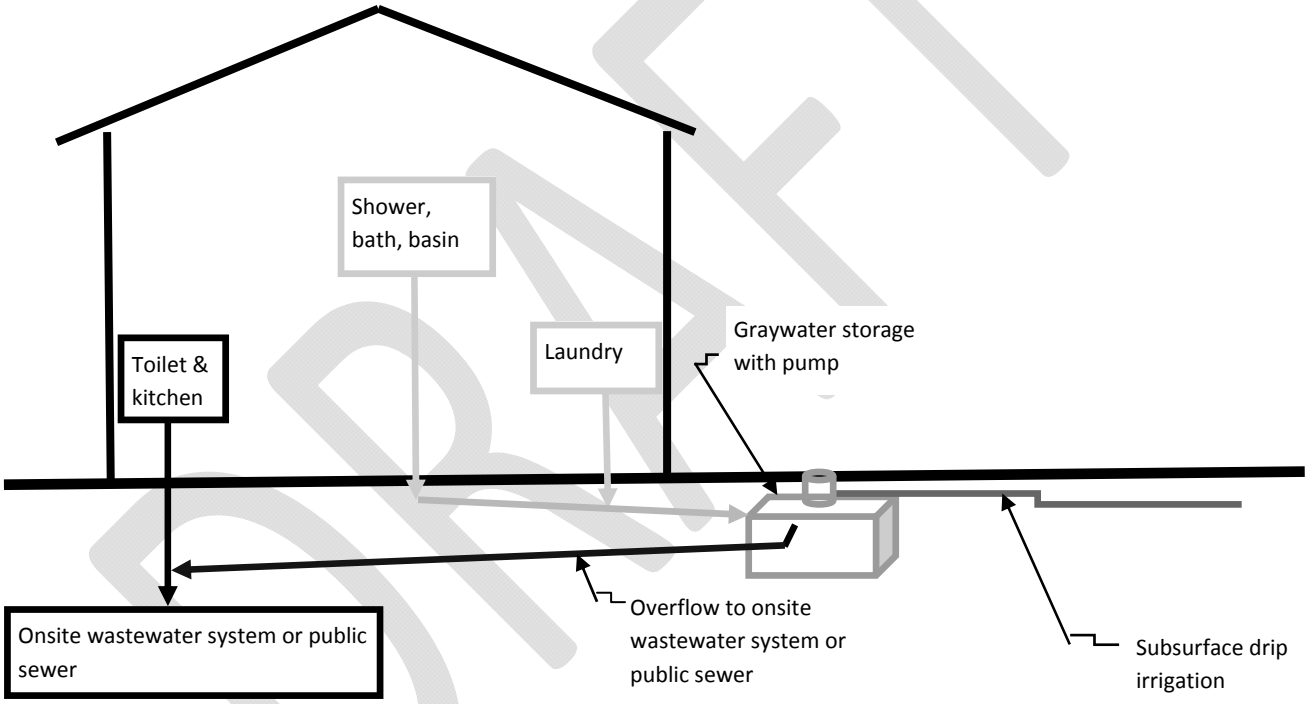
What is Graywater?

For the purpose of this Specification, "graywater" is defined as wastewater from sources within single-family residences, including showers, bathtubs, clothes-washing machines, hand-washing lavatories and sinks that are not used for disposal of hazardous or toxic ingredients. Wastewater from sinks used for food preparation or disposal, sinks from workshops or garages, dishwashers, bidets, urinals, floor drains, reverse osmosis reject water and other water that has come in contact with toilet waste is defined as blackwater and is prohibited for a graywater reuse system. Any other source of wastewater not mentioned above is considered blackwater and therefore ineligible as part of this Specification.



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Graywater System Specifications

Article I. General Specifications

Section 1.01 Graywater shall only originate from a single-family residence that has an approved public or private onsite wastewater system. Wastewater from sources other than from a single-family residence is prohibited.

Section 1.02 Wastewater from sinks used for food preparation or disposal, sinks from workshops or garages, dishwashers, bidets, urinals, floor drains, reverse osmosis reject water and other water that has come in contact with toilet waste is defined as blackwater and is prohibited for a graywater reuse system.

Section 1.03 The total flow of graywater shall not exceed the subsurface drip irrigation system flow, as designed.

Section 1.04 An existing or proposed onsite wastewater treatment system shall not be reduced in size with the addition of a graywater system.

Section 1.05 Graywater System operation: Graywater shall not be applied to food-producing plants. Graywater shall only be used during the growing season. Graywater shall not be applied when the soil is saturated.

Article II. Plumbing Specifications

Section 2.01 All graywater system components shall be designed and manufactured for the intended use of wastewater and/or graywater reuse systems.

Section 2.02 The graywater system plumbing shall include a diversion valve and an overflow pipe so graywater is redirected to an approved public or private onsite wastewater system when warranted. Such warranted cases include, but are not limited to: saturated or frozen soils, surface ponding and/or runoff, unusual odors, system back up, clogging of the filter, or when the graywater system has met flow capacity per the approved design calculations.

Section 2.03 All installers of the plumbing shall meet any and all licensing, certification, training or registration requirements as required by county or municipal code.

Section 2.04 All piping outside of the house shall be schedule 40 pipe or heavier with the exception of the subsurface drip irrigation lines.

Section 2.05 All plumbing materials shall be clearly labeled to designate their use for graywater.

Article III. Subsurface Drip Irrigation Specifications

Section 3.01 Irrigation lines shall be designed and manufactured for the use of wastewater and/or graywater systems. Irrigation lines designed and manufactured for the use of potable water for use in traditional irrigation systems are prohibited.

Section 3.02 The graywater system shall utilize a filter designed and manufactured for use with wastewater and/or subsurface drip irrigation systems.

Section 3.03 The filter shall be accessible, and maintained and cleaned per manufacturer instructions.

Section 3.04 All subsurface drip irrigation systems shall be designed by a landscape architect, engineer licensed to practice in the State of Kansas, or by a designer licensed by the local authority.

Section 3.05 All graywater system designs shall consider the graywater flow, land use and the vegetation being irrigated, the evapotranspiration rate, the type of soil, the grade of the site, and the total lot size to be irrigated when selecting appropriate tubing, valves, flush points and pipe size.

Section 3.06 All installers of subsurface irrigation systems shall meet any and all licensing, certification, training or registration requirements, required by the Local Authority.

Section 3.07 The subsurface drip irrigation system shall meet the following setback requirements:

(a) 1 foot from all building foundations;

(b) 2 feet from all property lines and/or easements;

(c) 25 feet from a public water main;

(d) 10 feet from an in-ground swimming pool;

(e) 50 feet from a spring, or from the bank of a surface water course, or from the overflow level (full pool elevation) of a pond, lake, or reservoir;

(f) 50 feet from a private domestic water well or suction line;

(g) 3 feet from the lateral field and tank of an approved private onsite wastewater system; and

(h) 100 feet from a public water supply well.

Section 3.08 The subsurface drip irrigation system lines and components shall be installed with minimum of 4 inches of soil cover and a maximum of 10 inches of soil cover.

Section 3.09 The subsurface drip irrigation system lines and components shall be a minimum of 12 inches apart.

Section 3.10 If the subsurface drip irrigation system fails or failure is suspected, the owner shall divert the graywater to the approved public or private onsite wastewater system until corrected.

Article IV. Tank and Pump Specifications

Section 4.01 All tanks, pumps and related components shall be designed and manufactured for the use of wastewater and/or graywater reuse systems.

Section 4.02 All tanks and pumps shall be installed according to manufacturer specifications.

Section 4.03 Graywater shall not be stored in the tank for more than 24 hours.

Section 4.04 Tanks must meet the setback requirements in Bulletin 4-2 table 5.

Section 4.05 All tank and tank components shall be exterior of the home and all structures.

Section 4.06 The tank including all extensions to the surface shall be watertight to prevent leakage into or out of the tank. It shall be structurally sound, meet H-10 loading rate standards, and made of materials resistant to corrosion from soil and acids produced from tank gases. Because of corrosion, steel tanks are prohibited.

Section 4.07 Tanks shall have an access opening with 20 inches minimum dimension to grade. Any opening extending to the surface shall be child and tamper resistant. Ways to accomplish this include lids weighing at least 65 pounds, locks, or anchors that are not removable without special tools.

Article V. Variance Requirements and Enforcement

Section 5.01 Variance Procedure for a graywater system in jurisdictions with authority as stringent as state law

(a) Homeowner must to submit an application to the local authority. The application shall contain the following:

(i) Location / Address of proposed system;

(ii) Whether the proposed system is for a new construction or existing home;

(iii) Whether the home is/will be on an approved public or private onsite wastewater system;

(iv) Number of bedrooms and bathrooms;

(v) Number of fixtures for the following– Showers, hand washing lavatories and sinks, bathtubs, clothes washing machines;

(vi) Lot size;

(vii) Plot plan showing the following (if applicable): foundation of all structures, proposed location of graywater system lines, tank, pump, property lines, easement locations, waterways, public water main, swimming pools, surface water course (creek, pond, lake, stream, river), private water wells and lines, public water supply well, approved private onsite wastewater system or public wastewater lines;

(viii) Subsurface drip irrigation system must be stamped or sealed by a landscape architect, engineer licensed to practice in the State of Kansas, or by a designer licensed by the local authority.

(ix) A copy of the designs indicating the amount of graywater captured per day, the proposed watering rate and maximum gallon per day allowances.

(x) Identification of the diversion valve, tank, pump, irrigation lines and filter.

(b) Local Authorities must review the design for variance purposes under local code, and may review the design for compliance with this Specification.

(c) If the design is compliant with this Specification, the local authority will submit a memorandum to the Kansas Department of Health & Environment (KDHE) verifying compliance and requesting a standard graywater system variance to K.A.R. 28-5-2 through K.A.R. 28-5-7, adopted pursuant to K.S.A. 2012 Supp. 65-171d.

(d) KDHE will grant a variance for a compliant graywater system by submitting a memorandum of approval to the local authority. The graywater system may be permitted and/or subject to a fee by the local authority to the extent required by the applicable county or municipal code.

(e) If the local authority determines the submitted graywater system design is not compliant with this Specification, the homeowner may:

(i) Pursue revising the graywater system design until compliant; or

(ii) Submit the graywater system design directly to KDHE along with a written review from the local authority indicating how it does not comply. If the homeowner elects to submit the graywater system design to KDHE, KDHE will review the submitted graywater system design and either grants or denies a special variance and communicate this with the local authority and the homeowner. If the special variance is approved by KDHE, the local authority will be notified so a permit may be issued if applicable.

(f) Construction of all Graywater Systems is prohibited until a standard or special graywater system variance is granted by KDHE. Please see Article VIII for a flowchart of the variance procedure.

Section 5.02 Homeowners residing in jurisdictions without a sanitary code should submit the variance request directly to KDHE following the procedure in Section 5.01(a).

Section 5.03 Homeowners residing in jurisdictions with a code that includes a provision on graywater systems should submit the variance request to both the Local Authority and to KDHE following the procedure in Section 5.01(a).

Section 5.04 During construction of an approved graywater system, no changes to the design shall be made. A new variance shall be required if changes to the graywater system design are made.

Section 5.05 If modifications are made to an existing graywater system at anytime, a new variance shall be required adhering to the processes identified in this section.

Section 5.06 Abandoned or unused graywater systems that have received graywater shall be emptied and plugged in compliance with state law.

Section 5.07 Inspections of graywater systems shall be required to the extent private wastewater system inspections are otherwise required.

Section 5.08 Graywater system resale inspections shall be required to the extent private onsite wastewater system resale inspections are required by the local authority. Upon change of ownership or occupancy, the new owner or tenant shall be notified that the residence contains a graywater system.

Section 5.09 Compliance with the terms of an approved variance must be required. Failure to comply may result in an enforcement action. Enforcement actions may include, but are not limited to:

(a) Issuing a stop work order during the construction or installation phase until all approvals have been acquired by the local authority and/or KDHE as required by statute or regulation.

(b) Requiring graywater to be diverted to an approved public or private onsite wastewater system until all approvals have been acquired by the local authority and/or KDHE as required by statute or regulation.

(c) Removal of the Graywater System entirely until all approvals has been acquired by the local authority and/or KDHE as required by statute or regulation.

Article VI. Best Practice Recommendations

Section 6.01 It is recommended that graywater system owners maintain records that show the system design, location, identifies the fixtures that are the source of the graywater, describes maintenance requirements of this Specification and shows how the minimum irrigation area was calculated.

Section 6.02 It is recommended that during the growing season the soil is kept at a constant moisture level without over-saturating the soil.

Section 6.03 Pathogens, excreta, FOG (Fat, Oil, and Greases) and other impurities exist in a Graywater system. Care should be taken to not introduce an excess amount of these items to the graywater system.

Section 6.04 The following should be washed in a system that is connected to an approved public or private onsite wastewater system:

(a) Soiled diapers, under garments and bedding.

(b) Bedding, rags, and clothing, etc. from persons infected with the flu, communicable diseases, or other illnesses.

(c) Washing hands that have been in contact with the above items.

Section 6.05 Subsurface drip irrigation lines will be shallow. Care should be taken when excavating, coring, or verticutting in a subsurface drip irrigation area.

Section 6.06 Use plant friendly products, which are biodegradable, non-toxic and free of salt (sodium), boron (borax), and chlorine bleach. These products can be damaging to plants. Never wash anything containing, harsh cleaners or oil.

Section 6.07 Beauty products can affect pH levels in water and can be harmful to plants.

Section 6.08 Avoid contact with graywater and soil irrigated by graywater at all times.

Section 6.09 At the beginning of the irrigation season and periodically thereafter check for even distribution of graywater.

Section 6.10 Special considerations for homes with lagoons and their function without graywater:

(a) Graywater systems will reduce the amount of flow to a lagoon. This may result in lower water levels and may require the periodic addition of water to a lagoon. Downspouts may be connected to the lagoon as necessary to add water. In drought time, potable water may need to be added to the lagoon.

(b) Lagoon maintenance is essential to the operation of the system:

(i) Not maintaining an adequate level in the lagoon will allow for increased vegetation growth and make it harder to prevent unwanted plants (i.e. smartweed, cattails, cottonwood/willow trees).

(ii) Increased concentration of organic load from toilets and kitchens could lead to odor issues and mosquito breeding in the lagoon.

(iii) The lagoon may have an over abundance of unfavorable or harmful bacteria or algae due to the lack of incoming water, which could lead to odor issues and mosquito breeding.

(iv) The lagoon may have structural issues due to low water levels and insufficient soil saturation (e.g. cracks).

(v) A lagoon with low water, odor and vegetation issues could be considered an "attractive nuisance" or may become a septic condition.

Article VII. Effective

Section 7.01 This Specification takes effect on (TBD), 2014.

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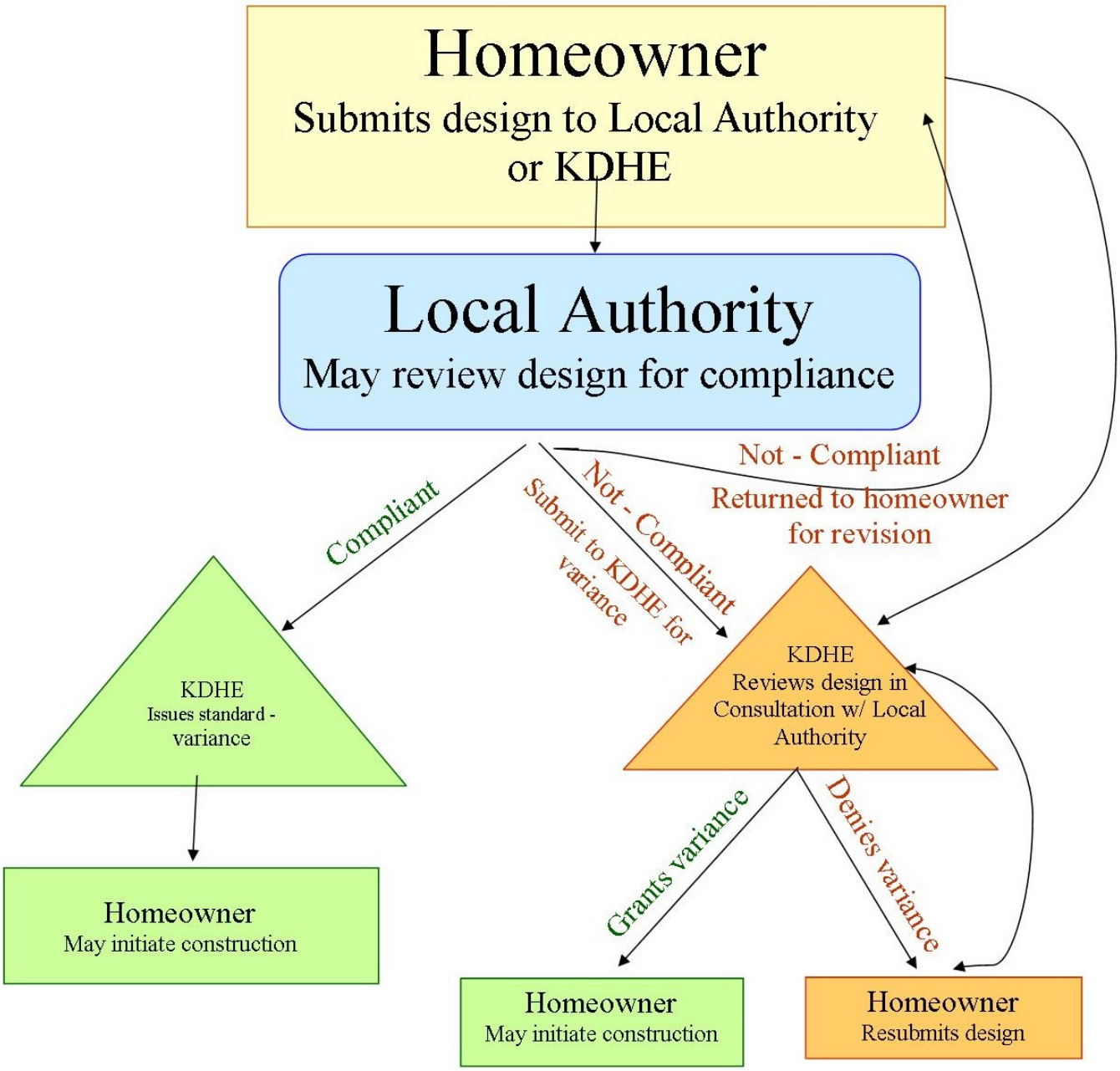
Article VIII. Variance Procedure Flow Chart



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Article IX. Definitions

For purposes of this Specification:

"Blackwater" shall mean wastewater from sinks used for food preparation or disposal, sinks from workshops or garages, dishwashers, bidets, urinals, floor drains, reverse osmosis reject water and other water that has come in contact with toilet waste.

"Disposition" shall mean the act of disposing or transferring to the care or possession of another.[9]

"Easement" shall mean an interest in real property consisting of the right to use or control the land, or an area above or below it, for a specific limited purpose benefitting a separate parcel of real property.

"Grade" shall mean the inclination of a physical feature, landform or constructed line to the horizontal.[8]

"Graywater" shall mean wastewater from sources within single-family residences, including showers, bathtubs, clothes-washing machines, hand-washing lavatories and sinks that are not used for disposal of hazardous or toxic ingredients.

"Graywater system" or "graywater reuse system" shall mean a system used to recycle or reuse graywater for a purpose, instead of disposing the graywater to an onsite waste water system or a public sewer system that contains plumbing from applicable sources, a diversion and overflow valve, a filter, a pump, a tank and subsurface drip irrigation lines.

"Growing season" shall mean a period of time in a year when plant growth occurs. On average in Kansas this time period ranges from 180 to 190 days between March 1st and October 31st annually.

"H-10 loading rate standard" shall mean a structural load rate of 16,000 lb/axle and following manufacturer's recommendation for amount of properly compacted fill.

"Local authority" shall mean the governing body of a county or municipality.[7]

"Public water supply" shall mean a system for the provision to the public of piped water for human consumption, if such system has at least ten (10) service connections or regularly serves an average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year. Such term includes any source, treatment, storage or distribution facilities under control of the operator of the system and used primarily in connection with the system, and any source, treatment, storage or distribution facilities not under such control but which are used in connection with such system.

"Private onsite wastewater system" shall mean a system present on the subject property designed for the collection, storage, treatment, neutralization, or stabilization of sewage.

"Resale inspection" shall mean a procedure performed by the local authority to determine the functional status of a private onsite wastewater system prior to the conveyance of property.

"Schedule 40 pipe" shall mean pipe that has a wall thickness of 6.02 millimeters, and the bored hole for stream movement is 102.26 mm in diameter.[2]

"Setback requirements" shall mean a distance from one location to another location, between which installation is prohibited.

"Single-family residence" shall mean a house that is not used for multi-residential, commercial, or other nonresidential purpose.

"Subsurface drip irrigation system" shall mean a network of pipes or tubes for controlled delivery of graywater directly to plants.[3]

"Suction line" shall mean a pipe or tubing feeding into the inlet of a fluid impelling device (for example, pump, compressor, or blower), consequently under suction.[5]

"Variance" shall mean an official authorization from KDHE or a local authority to depart from wastewater management regulations.

"Wastewater" shall mean any water that contains waste products; for example, water used for washing, flushing or in a manufacturing process.