



GUIDELINES FOR USE OF CLASS IV RECLAIMED WATER:

High Potential for Human Contact

Prepared by:
Wastewater Permits Program



Reclaimed Water Supply Pipe at Howard County
Fort Meade Reclaimed Water Pumping Station

MDE-WMA-002-07/16



MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard | Baltimore, MD 21230 | www.mde.state.md.us/recycling
410-537-3314 | 800-633-6101 x3314 | TTY Users: 800-735-2258
Lawrence J. Hogan, Jr., Governor | Boyd K. Rutherford, Lt. Governor | Ben Grumbles, Secretary



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Chapter 1 – Purpose and Scope

Reclaimed water is **wastewater** from a municipal **sewage** treatment facility that has been treated to be suitable for beneficial use. Reclaimed water is categorized into four water quality Classes (I-IV) which govern their potential uses based on the level of treatment (or quality) attained. These guidelines apply only to use of Class IV reclaimed water generated from a centralized **wastewater treatment works**. Guidance on the use of **Class I, II and III reclaimed water** can be found in the **Department's** *Guidelines for Land Application/Reuse of Treated Municipal Wastewaters* (MDE-WMA-001-04/10).

Under § 9-303.1(a) of the Annotated Code of Maryland, the Maryland Department of the Environment is directed to encourage use of reclaimed water¹ as an alternative to discharging treated sewage **effluent to surface waters** of the State. This guidance provides additional approved uses for reclaimed water, as water quality **Class IV**, to be implemented in applicable **construction** and/or **discharge permits** issued by the Department including design criteria for **water reclamation** and distribution systems, recommended water quality treatment standards, and monitoring and reporting requirements.

This document does not address the use of other non-potable waters (e.g. the use of graywater, rainwater, etc.). The uses of other nonpotable waters are addressed under applicable local plumbing codes as implemented by the local authority having jurisdiction. Additionally, certain uses of reclaimed water are excluded from the requirements of this guidance, including the use of nonpotable water produced and utilized on-site by a treatment works holding a valid discharge permit from the Department. In order to qualify for this exclusion, the treatment works

¹ **Bold face type** indicates that the phrase (or the individual bolded terms) is defined in Glossary Section of the document.

must be using the nonpotable water for incidental landscape **irrigation** on its own site (on property contiguous to or in the immediate vicinity of the plant) and the site must maintain a 25 foot buffer from the property line if the adjoining property is accessible by the public. The use of nonpotable water for recycle flows within the treatment works is also excluded from the requirements of this guidance.

These guidelines are directed to the facility **owner** or **operator** who is applying for or has obtained a **permit** for water reclamation or **satellite water reclamation** to produce or distribute Class IV reclaimed water for **reuse**. The owner, operator, applicant or **permittee** for a Class IV reclaimed water reclamation or distribution system will be referred to as ‘you’ throughout this document.

All criteria reported in this document are subject to exception, and changes will be considered on a case-by-case basis. Deviation from the criteria reported herein must be discussed with the Maryland Department of the Environment prior to the incorporation of the deviations into written documents such as Facilities Plans or design processes.

Chapter 2 – General Conditions

A. Class IV Reclaimed Water is defined as Sewage for Construction Permits

You must obtain an **MDE** construction permit to install a Class IV reclaimed water system, pursuant to **COMAR** 26.03.12.03. There are two different processes for MDE construction permit applications, water and sewerage. The Department will review your application as sewerage system construction because Class IV reclaimed water does not meet the standards for **potable water** in **COMAR** 26.03.12.02.

B. Use of Class IV Reclaimed Water Must Comply with the Applicable County Water and Sewerage Plan

To obtain a new or renewed permit for a system producing or seeking to produce Class IV reclaimed water, the reclamation or satellite reclamation and distribution system (including the pumping station) must be in compliance with an approved County Water and Sewerage Plan (Plan) adopted under Environment Article, Title 9, Subtitle 5, Annotated Code of Maryland, pursuant to “Requirements for the Issuance and Reissuance of Discharge Permits” under **COMAR** 26.08.04.02. To be in compliance, treatment works operators must follow all requirements of the Plan, including but not limited to the following:

1. identify the wastewater treatment works and its capacity; and
2. designate the area to be served by the wastewater treatment works as ‘S-1’ or ‘S-2’ as defined in **COMAR** 26.03.01.04(G)(2).

This requirement does not apply to facilities that are not otherwise required to be included in a water and sewerage plan.

Chapter 3 –Types of Reuse vs. Classes of Reclaimed water

The designated class of reclaimed water indicates the water quality standard to which the water has been treated. The type of reuse intended determines the level of treatment or “Class” of reclaimed water required for that use. A Class IV designation is the highest attainable level of treatment, and as shown in Table 1 below, it is applicable to uses involving the highest potential for human contact with reclaimed water. The corresponding water quality treatment standards for each class are outlined separately in Table 2 of the following chapter. The Guidelines included in this document are not applicable to the use of reclaimed water for Power Plant operation which is regulated by the Maryland Public Service Commission.

**Table 1 – Class IV Reclaimed Water
Acceptable Types of Reuse ^{a)}**

Aesthetic Fountains	Manufacturing Processing Water ^{c)}
Aggregate Washing	Ornamental Nurseries Irrigation
Car Washing	Park Irrigation
Cemetery Irrigation	Parts Cleaning
Closed Loop Cooling	Pasture Irrigation For Foraging Livestock
Concrete Mixing	Play Ground Irrigation
Cooling Water System	Pressure Cleaning
Crops Irrigation ^{b)}	Lawns Irrigation (residential and non-residential)
Dust Control and Soil Compaction	School Yards Irrigation
Equipment Washing	Silviculture irrigation
Fiber and Seed Crops Irrigation	Snow Making
Fire Protection	Sod Farm Irrigation
Forested Land Irrigation	Toilet and Urinal Flushing ^{d)}
Golf Course Irrigation	Turf (including Fodder) Irrigation
Green Open Spaces Irrigation	Water for Filling Ponds and Lagoons
Highway Landscape Irrigation	Window Washing
Laundry Water	

- a) This list of acceptable type of reuse is not exhaustive. Other reuse activities may be approved by the Department via a permit on a case by case basis depending on the potential for human contact.

- b) Class IV reclaimed water used for food crop irrigation, where the reclaimed water contacts the edible portion of the food crops, must be produced with a minimum treatment technology comparable to **advanced waste treatment** that includes filtration and disinfection, or their equivalent, to achieve the Class IV water quality standards shown on Table 1.
- c) Uses of reclaimed water for an industry shall adhere to Occupational Safety & Health Administration (OSHA) regulations found in 29 CFR 1926.51(b) to prevent inadvertent and inappropriate use of reclaimed water.
- d) Only applicable to commercial buildings, apartments, condominiums or multi-family residences managed by a property management company or other similar corporate entity acceptable to the Department.

Chapter 4 –Water Quality Treatment Standards

A. Corrective Action Thresholds for Class IV Reclaimed water

Each class of reclaimed water is assigned different water quality treatment standards that must be met, and corrective action thresholds (CATs) which must be maintained. Though these guidelines apply only to Class IV reclaimed water, treatment standards for Classes I through III are also included in Table 2 for reference.

The water quality treatment standard is met when the pollutant concentration is at or below the quality shown in Table 2. The CAT is the quality at which you must implement measures to correct any operational problem(s) occurring within a specified time period, causing pollutant concentrations in excess of the threshold. The Department has determined CATs for turbidity, E. coli, fecal coliform and total residual chlorine (TRC) in Class IV reclaimed water listed in Table 2. If an exceedance of CAT levels cannot be corrected within the time allowed by the permit, you must divert any reclaimed water and potentially stop production in accordance with section D below.

Table 2 – Water Quality Treatment Standards and Class IV Corrective Action Thresholds

Parameter ^a	Class IV Water Quality Requirements ¹	Comparison with Requirements for Other Existing Classes		
		Class I ^b	Class II	Class III
Biochemical Oxygen Demand ^c (monthly average)	10 mg/l	70 mg/l	10 mg/l	10 mg/l
Turbidity/ Suspended Solids	2 NTU ^d (daily average)	90 mg/l (monthly average)	10 mg/l (monthly average)	2 NTU ^d (daily average) Not to exceed 5 NTU ^d at any time
	CAT >5 NTU ^d (at any time)			

Parameter ^a	Class IV Water Quality Requirements ¹	Comparison with Requirements for Other Existing Classes		
		Class I ^b	Class II	Class III
<i>E. coli</i> (monthly median) ^f	1 MPN ^e /100 ml or meeting the fecal coliform limit below	N/A*	N/A*	N/A*
	CAT >23 MPN/100 ml (monthly maximum)			
Fecal Coliform	2.2 MPN ^e /100 ml (monthly median) ^f	200 MPN ^e /100 ml (monthly geometric mean) ^g	3 MPN ^e /100 ml (monthly geometric mean) ^g	2.2 MPN ^e /100 ml (monthly geometric mean) ^g
	CAT >23 MPN ^e /100 ml (monthly maximum)	or 3 MPN ^e /100 ml (monthly geometric mean) ^g for use on golf courses		
pH ^h (any time)	6.5-8.5 s.u. ⁱ	6.5 - 8.5 s.u. ⁱ	6.5-8.5 s.u. ⁱ	6.5-8.5 s.u. ⁱ
Total Nitrogen (monthly average)	10 mg/l	case by case ^j	case by case ^j	case by case ^j
Total Residual Chlorine (measured at the treatment system outlet)	1.5 – 4.0 mg/l (any time)	N/A*	N/A*	N/A*
	CAT < 1.5 mg/l or >4.0 mg/l			
Total Residual Chlorine (measured at designated sampling locations in the distribution system) ^k	0.5 – 4.0 mg/l (any time)	N/A*	N/A*	N/A*
	CAT < 0.5 mg/l or >4.0 mg/l			

*N/A or “not applicable” means there is no standard for that parameter for the class of reclaimed water indicated.

- a) Class I, II, and III parameters (not including *E. coli*) were taken from *Guidelines for Land Application/Reuse of Treated Municipal Wastewaters* (MDE-WMA-001-04/10). Levels equivalent to the fecal coliform requirements are the basis of the requirements for *E. coli*.
- b) Class I water quality requirements do not meet the definitions of reclaimed water under § 9-301 of the Annotated Code of Maryland.
- c) Biological Oxygen Demand (BOD₅ or CBOD₅) means the quantity of oxygen utilized in the biochemical oxidation of organic matter present in water or wastewater, reported as a five-day value determined using approved laboratory methods specified in 40 CFR Part 136 or the latest edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association et al, 2012).

- d) Nephelometric Turbidity Unit or “NTU” is a ratio of the intensity of light scattered by the sample to the intensity of incident light, as determined using approved laboratory methods specified in 40 CFR Part 136, or the latest edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association et al, 2012).
- e) Most Probable Number or “MPN” is a statistical value representing the viable bacterial population in a sample identified through the use of dilution and multiple tube inoculations.
- f) Median is defined as the mean of the two middle values from an even number of monthly samples.
- g) Geometric mean is a value derived from a set of numbers by using the product of their values, expressed as the *n*th root of the product of *n* numbers (i.e., the geometric mean of 2 and 8 is the square root of their product (16) which = 4; if multiplying a set of 3 numbers, then geometric mean = the cubed root of the product of the 3 numbers, and so on).
- h) pH means the negative common logarithm of hydrogen ion activity determined using approved laboratory methods specified in 40 CFR Part 136 or the latest edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association et al, 2012).
- i) Standard unit of deviation
- j) Determined by the permit writer using nitrogen balance calculations to achieve a desirable nitrogen concentration in percolate below the root zone.
- k) Permittee must designate sampling locations with the concurrence of the Department.
- l) Use of Class IV reclaimed water for building, industrial cooling towers, centralized air cooling systems or other usage causing concern for potential Legionellosis shall be consistent with the ANSI/ASHRAE Standard 188 - 2018 or the latest edition entitled “Legionellosis: Risk Management for Building Water Systems” in minimizing or eliminating the transmission of Legionella

No TRC end user requirement is required for non-human contact uses if there is little to no opportunity for direct ingestion near the point of use. Examples include, but are not limited to, use at a commercial, industrial or government owned facility for closed loop cooling or use by a golf course for irrigation if the course is closed to the public when the reclaimed water is being used.

B. Point of Compliance for Water Quality Treatment Standards

The point of compliance is the point in the treatment process where water quality treatment standards listed in Table 2 must be met. For BOD, total nitrogen, fecal coliform/E coli, and pH the point of compliance must be after all treatment but prior to discharge to a Class IV reclaimed water distribution system. The point of compliance for turbidity must be

at a point prior to the **disinfection** process. There are two points of compliance for TRC: (1) at the outlet of the treatment system prior to entering the distribution system, and (2) at an accessible location near the point of use. The second point of compliance is only required if the end use is any of the following and if there is a potential for **public access** to the reuse facilities at times when reclaimed water is being used: aesthetic fountains, ponds or lagoons; snow making (Commercial, Industrial, and Government owned Facilities); lawns and non-edible vegetation (Residential Outdoor Irrigation); cemeteries; golf courses; lawns; parks; playgrounds; school yards; and other green open spaces (Non-Residential Irrigation).

Consistent with Chapter 4, section A, footnote k, there is no requirement for a second point of compliance near the point of use for non-human contact uses. C. Managing Reclaimed Water Not in Compliance with Water Quality Treatment Standards

1. If reclaimed water reaches a CAT for a parameter as described above, you must immediately review treatment operations and monitoring data to identify what is causing the exceedance of the treatment standard. You must either resample or divert reclaimed water within one hour of first reaching CAT levels. CATs for turbidity and TRC may be used as a surrogate for bacterial CATs due to the length of time required to obtain results from bacterial monitoring samples. If a CAT is reached **you** must follow procedures for operational review, resampling and diversion established in an approved system Operations and Maintenance Manual as described in Chapter 9.
2. If you elect to resample and the new samples (collected within one hour of the first monitoring result showing a CAT was reached) continue to reach or exceed the CAT, the reclaimed water must be considered **reject water**. Reject water must be diverted to either storage for additional treatment or retreatment, or discharged to another

permitted reuse system requiring a lower level of treatment not less than Class II.

Reject water may also be discharged to another MDE/NDPES permitted effluent disposal system provided the reject water meets the effluent limits of the permit.

3. If the reclamation system is unattended, system equipment must automatically divert any reject water. After reaching a CAT you may not discharge reclaimed water to a distribution system until the water meets water quality treatment standards for its intended use, and you shall use only manual (not automated) equipment to restart discharges to the distribution system. After correcting a water quality problem and within one hour of resuming discharges to the distribution system, you must verify that monitoring results are below CAT levels.

D. Violations of Class IV Reclaimed Water Treatment Standards

The following actions are violations of this chapter:

1. Repeated, even temporary failure to comply with water quality treatment standards may be considered a permit violation depending on the frequency and magnitude of noncompliance and other relevant factors.
2. Failure to resample or divert reclaimed water within one hour of reaching CAT after monitoring results indicate reclaimed water is not in compliance with water quality treatment standards
3. Failure to adjust treatment methods (additional treatment or retreatment) to bring reclaimed water into compliance with water quality treatment standards for Class IV reclaimed water.
4. Failure to divert reject water in accordance with section D of this chapter.

E. Alternative or Additional Treatment

Under the terms of the required permit, if there are individual circumstances that are unique to a particular wastewater treatment works that may have a non-de minimis impact on the quality of reclaimed effluent, the Department may require you to treat Class IV reclaimed water for additional parameters or to stricter standards.

Chapter 5 – Monitoring Requirements for Reuse of Class IV Reclaimed Water

A. Monitoring requirements to maintain water quality treatment standards

1. Baseline and Additional Monitoring for Pollutants of concern

Prior to using the water reclamation/distribution system you may submit sampling results from Class IV reclaimed water monitoring to the Department at your discretion; including but not limited to results for the following chemical pollutants in accordance with National Primary Drinking Water Regulations (40 CFR Part 141, Subpart C) under the Safe Drinking Water Act (42 U.S.C. 300f et seq. (1974)). You may use existing baseline data for this purpose, if available. The Department does not expect facility owners or operators to supply these sampling results for non-human contact uses if there is little to no opportunity for direct ingestion near the point of use, although a facility owner or operator is free to do so at its discretion. Examples include, but are not limited to, use at a commercial, industrial or government owned facility for closed loop cooling or use by a golf course for irrigation if the course is closed to the public when the reclaimed water is being used.

- a.
 - i. Inorganic Chemicals
 - ii. Organic Chemicals
 - iii. Radionuclides
 - iv. Cryptosporidium
- a. The Department may require you to conduct additional monitoring based on initial sampling results.

2. Turbidity Monitoring

- a. You must monitor turbidity at a point in the treatment process after filtration and prior to disinfection. Filtration is defined as the passing of wastewater through a conventional technology such as sand, anthracite or cloth; or an advanced technology such as microfiltration, ultrafiltration, nanofiltration or reverse osmosis.
- b. You must use a continuous on-line turbidity meter to perform turbidity monitoring and analysis. The turbidity meter must be equipped with an automated data logging or recording device and alarm to automatically notify personnel by means of visual and audible signals when the turbidity standard has been exceeded.
- c. You shall measure and report compliance with the daily average turbidity standard based on the arithmetic mean of all hourly or more frequent discrete measurements recorded during the 24 hour period.
- d. If the on-line turbidity meter malfunctions or stops operating, you must manually collect samples for turbidity analysis at one-hour intervals for a maximum of 48 hours. If continuous on-line monitoring with a turbidity meter cannot be conducted within 48 hours, you must stop producing reclaimed water until continuous on-line monitoring can be resumed.

3. Disinfection Monitoring

- a. Chlorine at the treatment works
 - i. You must monitor residual chlorine at the outlet of the treatment system prior to discharge to a Class IV reclaimed water distribution system.
 - ii. You must use a continuous on-line monitoring system to sample residual chlorine. The monitoring system must be equipped with an automated data logging or

recording device and alarm to automatically notify the operator by means of visual and audible signals when the treatment standard is approached (low alarm), or exceeded (high alarm).

- iii. If the continuous on-line chlorine monitoring device malfunctions or stops operating, you must manually collect samples for chlorine analysis at one-hour intervals for a maximum of 48 hours. If continuous on-line monitoring cannot be conducted within 48 hours, you must stop producing reclaimed water until continuous on-line monitoring for residual chlorine can be resumed.
- b. Chlorine in the distribution system - You must monitor residual chlorine at the locations associated with the point(s) of use at the frequencies specified in an MDE-approved **Reclaimed water Management Plan** (described in Chapter 6, section C) and as identified in the permit.
- c. Non-chlorine disinfection (such as ozone or UV light)
 - i. You must employ continuous on-line monitoring with automated data logging or recording at the point of application.
 - ii. You must apply supplemental disinfection using chlorine to ensure measureable residual chlorine is present to prevent pathogen re-growth in the reclaimed water distribution system.

4. Total nitrogen and Biochemical Oxygen Demand Monitoring
 - a. You must test samples for total nitrogen and biochemical oxygen demand using the same sampling type and frequency specified in the permit.
 - b. You shall measure and report compliance with monthly average treatment standards for total nitrogen and biochemical oxygen demand based on averages derived from all samples collected during the month.

5. Bacteria Monitoring

You must obtain grab samples for E. coli or fecal coliform at times when flow and pollutant concentrations are representative of the general characteristics of wastewater generated from the treatment facility and disinfection process. You must take the samples at frequencies determined by flow capacity as shown in table 3 below.

Table 3 – Bacteria Sampling Frequency for Class IV Reclaimed Water Systems

Reclamation system Design Flow Capacity (MGD*)	Bacterial Sampling Frequency
>0.500	Daily
0.050 to 0.500	Four days per week in accordance with the permit
<0.050	Three days per week in accordance with the permit

* Million gallons per day (i.e., 0.050 MGD is equal to 50,000 gallons per day).

6. pH - You must collect grab samples for pH at least once daily.

B. Analysis of Water Quality Monitoring Samples

You must analyze all water quality samples in accordance with approved laboratory methods specified in 40 CFR Part 136 or the latest edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association et al, 2012).

C. Monitoring Requirements for Intermittent or Seasonal Operations

If the Class IV reclamation system produces reclaimed water intermittently or seasonally, you must monitor water treatment quality only when the reclamation system discharges to a reclaimed water distribution system, a non-**system storage** facility, or directly for a reuse.

Chapter 6 – Applying for a Permit

A. Permits Are Required to Produce or Distribute or Discharge Reclaimed water

You must apply for and obtain a discharge permit from the Department before producing or distributing water from a new, modified or expanded reclamation system, satellite reclamation system; or reclaimed water distribution system that provides Class IV reclaimed water directly to one or more end users, including instances where the permittee is the end user.

1. If you hold an existing discharge permit for a wastewater treatment works you must apply for a modified permit before producing or distributing Class IV reclaimed water. The permit application must contain the information and supporting documentation described in this chapter.
2. You must also obtain a construction permit from the Department for a new or existing facility prior to the start of any construction, expansion, or **modification** of a reclamation or satellite reclamation system that treats and distributes Class IV reclaimed water.
3. You shall address in the permit application any potential discharge to ground or surface waters of the State from the reclamation system and the end use(s).

B. General Information to Include in a Permit Application

For projects that involve the reclamation or distribution of Class IV reclaimed water you must submit the following information with the permit application. This requirement may be satisfied by referencing information previously submitted to the Department, unless changes have occurred at the facility that dictate more current information should be provided:

1. A description of the project design and a site plan showing operations and unit processes of the proposed project; including as applicable any treatment, storage, distribution, reuse and disposal facilities, and reliability features and controls. The chosen design approach must be consistent with accepted engineering practice and any applicable State regulations. Treatment works, reclamation systems, and reclaimed water distribution systems that have an existing permit do not need to be included in the design description and site plan, unless they are directly related to the new units or critical to understanding the complete project.
2. A general location map for both the treatment and distribution systems showing the orientation of the project in relation to at least two geographic features (such as numbered roads or named water bodies).
3. Unless the project is only for reclaimed water distribution, you must provide the Department with information for each wastewater treatment works that will divert effluent to the proposed reclamation or satellite reclamation system, including:
 - a. All processes used for the treatment of wastewater at the wastewater treatment works prior to diversion to the reclamation system.
 - b. Any **significant industrial users** (as defined in COMAR 26.06.01.01) that discharge to the wastewater treatment works; and
 - c. Analyses of any effluent that will be diverted from the treatment facility to the reclamation system.
4. Information for each Class IV reclamation or satellite reclamation system to be permitted including:

- a. Class IV reclaimed water quality treatment standards the system must meet in accordance with these guidelines,
 - b. Any other physical, chemical or biological characteristics, or pollutant concentrations that may adversely impact public health or the environment based on the intended reuse of the Class IV reclaimed water ; and
 - c. The design flow capacity anticipated for the proposed reclamation system.
5. Information for each Class IV reclaimed water distribution system to be permitted, including:
- a. The name of the distribution system and owner of the system; and
 - b. The design plans and specifications for the distribution system.
6. If the proposed reuse is not listed in Table 1 of Chapter 3 above, you must provide information on the intended reuse for the reclaimed water to the Department. The information must provide sufficient detail for the Department to determine any necessary treatment and/or monitoring requirements.
7. If you enter into a contract with an owner/operator of a wastewater treatment works for further treatment of water intended for diversion to the proposed reclamation or satellite reclamation system, before the treatment works may supply you with the treated water, the additional owner/operator must be included in your permit as a co-permittee unless the Department has approved the contract.

C. Reclaimed Water Management Plan

You must submit a Reclaimed Water Management Plan (**RWMP**) to the Department for review and approval in support of any application for a permit to produce or distribute Class IV reclaimed water.

1. All RWMPs must contain the following:
 - a. A description and map of the **service area** to be covered by the RWMP for the term of the permit (i.e., five years for NPDES or State **groundwater discharge permits**).
On the map you must identify all reuses according to the service categories shown in Table 1 of Chapter 3, and show their locations within the service area. You must also identify all public potable water supply wells and springs, and all public water supply intake structures on the map showing their locations within the service area; and must update the service area description and map for each permit renewal.
 - b. A current inventory of all system and non-system storage facilities and/or equipment holding reclaimed water or reject water within the service area of the RWMP.
 - c. A water balance analysis that accounts for the volumes of reclaimed water that will be generated, stored, reused and discharged (either through a NPDES permitted outfall, to a sewage collection system, or by another Department approved disposal method). The balance analysis must include projected volumes of seasonal and annual reclaimed water demands for each reuse category.
 - d. An example of any **service agreement** or contract (agreement) you will implement with end users in compliance with the RWMP. The agreement must contain conditions and requirements specified in this chapter and Chapter 10 that apply to the particular reuse planned for each end user. The terms of the agreement must require property owners to report all potable and non-potable water supply wells on their property to you; and comply with any appropriate buffer zone distance requirements for wells where the reclaimed water will be used. The agreement must also include a provision reserving your right to terminate the agreement and

withdraw service for any failure by the end user to comply with the terms and conditions of the agreement, if appropriate corrective action for such failure is not taken by the end user.

- e. A description of the monitoring plan that will be used to verify all outlets and end users are in compliance with the terms of any agreement, and ensure adequate residual chlorine levels are maintained throughout the system.
 - i. Monitoring must include metering for the volume of reclaimed water consumed by end users.
 - ii. Residual chlorine monitoring must be conducted at a frequency sufficient to ensure the safety of the end user at both the outlet of the treatment system prior to entering the distribution system, and at a location where samples can be obtained that are representative of the quality near the point of use. The RWMP must propose and describe all monitoring locations.
- f. An Education and Notification Program developed in accordance with requirements in Chapter 10, section A.
- g. A **Cross-connection** Control and Backflow Prevention Program in compliance with local plumbing code that:
 - i. evaluates the potential for (1) cross-connections between the reclaimed water distribution system and a potable water system; and (2) backflow to the reclaimed water distribution system from end users;
 - ii. evaluates possible public health risks associated with potential backflow to the distribution system from end users;

- iii. describes inspections you must perform at the time an end user connects to a distribution system and periodically thereafter as determined necessary through the evaluation described in item “i” above; and
 - iv. ensures cross-connection control and backflow prevention methods applied in the design and installation of the distribution system meet requirements of either the Maryland State Plumbing Code, the Baltimore County Plumbing Code, the Washington Suburban Sanitary Commission (WSSC) Plumbing Code, or other applicable plumbing code that meets or exceeds minimum requirements of the Maryland State Plumbing Code, depending on which Code is in effect in the corresponding State or local jurisdiction.
2. If the Class IV reclaimed water production or distribution system will provide water for irrigation (not including residential lawn irrigation), the RWMP must also include:
- a. Information to substantiate that the end use will meet all requirements for irrigation with Class IV reclaimed water described in Chapter 10, section E.
 - b. Crop specific vegetative water demand data: If the irrigation rate is greater than the vegetative water demand, you must submit the following documentation to the Department with the RWMP:
 - i. You must conduct a hydrogeological or irrigation pilot study to ensure the irrigation rate will not cause persistent surface runoff, ponding, or contribute nutrients or other pollutants of concern to groundwater. The hydrogeological study must investigate any applicable conditions described in the “Outline for Hydrogeologic Report” found in Appendix B of the

Guidelines for Land Application/Reuse of Treated Municipal Wastewaters,
(MDE-WMA-001-04/10).

- ii. You must engage a certified nutrient management consultant to prepare a nutrient Management Plan as defined in COMAR5.20.08.
 - iii. The plan must be developed accordance with COMAR 15.20.07.04 to maintain a healthy vegetative ground cover and minimize nitrogen leaching to groundwater.
 - iv. If the irrigation rate is less than or equal to the vegetative water demand, a hydrogeological investigation of the proposed site is not required.
- c. For irrigation using Class IV reclaimed water on a site that is 5 acres or larger in size, the RWMP must include a site plan for each irrigation site displayed on the most current USGS topographic maps (7.5 minutes series, where available) and show the following:
- i. boundaries of the irrigation site,
 - ii. locations of all potable and non-potable water supply wells and springs, public water supply intake structures, occupied dwellings, property lines, areas accessible to the public; outdoor eating, drinking and bathing facilities, any surface waters (including wetlands) that exist within the site, any limestone rock outcroppings or sinkholes present within 250 feet of the irrigation site; and
 - iii. Any buffer zone areas in place around the irrigation site in accordance with buffer zone requirements established in Chapter 10, section I. Where expansion of an existing irrigation site is anticipated the same information must be provided for the area of the proposed expansion.

- d. If Class IV reclaimed water does not meet nutrient levels equal to or less than those achieved using Enhanced Nutrient Removal technology (≤ 4 mg/l total nitrogen and ≤ 0.3 mg/l total phosphorous), you must include nutrient management requirements for irrigation reuse in the RWMP, based on concentrations of total nitrogen and total phosphorus in the reclaimed water .
 - i. A certified nutrient management consultant must prepare the nutrient Management Plan pursuant to COMAR 15.20.08.
 - ii. The plan must be developed in accordance with requirements established in COMAR 15.20.08.04 to maintain a healthy vegetative ground cover and minimize nitrogen leaching to groundwater.
3. The following criteria determine who must submit an irrigation site plan:
 - a. If you are the permittee of a reclamation system or satellite reclamation system and you also own or manage the irrigation site receiving reclaimed water, you must submit the site plan to the Department with the RWMP.
 - b. If you are the permittee for a reclamation system or satellite reclamation system and you do not own or manage the irrigation site receiving the reclaimed water, the end user must submit the site plan to you with the service agreement or contract. A state discharge permit authorizing discharge of reclaimed water to ground waters of the State is required for any non-residential end user.
4. If you wish to add a new end user(s) not identified in the original RWMP submitted with the permit application, an amendment to the RWMP identifying any new end user(s) must be submitted to the Department not less than 30 days prior to connecting and providing Class IV reclaimed water to the new user(s).

- a. The amendment must include all applicable information required by this chapter for each new end user.
- b. The amendment will not be considered a permit modification request unless the Department notifies you that additional reclaimed water standards, monitoring requirements or conditions are necessary due to the new reuse.

Chapter 7 – Design Criteria

A. Class I Reliability Requirements for Class IV Water Reclamation systems

Reclamation and satellite reclamation systems must adhere to standards for design and construction specified in *Design Guidelines for Wastewater Facilities* (MDE, 2012); and Class I Reliability requirements defined in *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability* (EPA 430-99-74-001), as well as other applicable engineering standards and guidelines as specified by the Department.

1. “Class I Reliability” differs from “Class I reclaimed water” previously defined in this document. Class I Reliability is a measure of reliability applied to design criteria for wastewater treatment works which requires such facilities to incorporate additional capacity (e.g., additional electrical power sources, flow storage, and treatment units); to maintain operations in accordance with permit requirements during power failures, flooding, peak loading, equipment failures, and maintenance shut-downs.
2. Class I Reliability requirements do not apply if the facility has a permitted alternate treatment or discharge system with sufficient capacity to process reclaimed water flows that do not meet water quality treatment standards addressed in Chapter 4, or performance criteria developed in the Operations and Maintenance Manual described in Chapter 9.
3. The Department may approve alternative measures to achieve Class I Reliability if you can demonstrate in an engineering report using accepted and appropriate engineering principles and practices, that the alternative measures will achieve a level of reliability equivalent to Class I Reliability.

B. Design Criteria for Class IV Reclaimed Water Distribution systems

1. General Design Requirements: All reclaimed water distribution systems must be designed and constructed in accordance with this chapter and the chapter pertaining to force mains in *Design Guidelines for Wastewater Facilities* (MDE, 2012) to ensure:
 - a. reclaimed water does not come into contact with, or otherwise contaminate a potable water system,
 - b. measures are taken to safeguard the structural integrity of the system and assure it is properly constructed and maintained; and
 - c. the capability to inspect, maintain and test the system is supported.
2. Cross-connection and Backflow Prevention: the following conditions must be implemented as part of a cross-connection and backflow prevention program submitted with the RWMP pursuant to Chapter 6, section C.1.g.
 - a. There may not be any direct cross-connections between the reclaimed water distribution system and a potable water supply system.
 - b. The reclaimed water distribution system and reuse connections must be in compliance with cross-connection control and backflow prevention requirements of either Maryland State Plumbing Code, Baltimore County Plumbing Code, WSSC Plumbing Code, or plumbing code that meets or exceeds the minimum requirements of Maryland State Plumbing Code, depending on which is in effect in the corresponding State or local jurisdiction.
 - c. You may use potable water to supplement reclaimed water for a reuse, if the potable water supply is protected against backflow from back pressure and back-siphonage from both the reclaimed water supply and the reuse. You must use either an air gap

- separation device, or a reduced pressure principle backflow prevention device for this purpose.
- d. You must protect the reclaimed water supply against backflow from back pressure and back-siphonage from the applied reuse by using either air gap separation, reduced pressure principle backflow prevention, or a double check valve assembly. The device chosen for this purpose must be based on the degree of hazard potential associated with the reuse, defined as either a health hazard, a non-health hazard, a high hazard, or a low hazard; in accordance with backflow prevention requirements established in either Maryland State Plumbing Code, Baltimore County Plumbing Code, WSSC Plumbing Code, or a plumbing code that meets or exceeds the minimum requirements of Maryland State Plumbing Code, depending on which is in effect in the corresponding State or local jurisdiction.
 - e. An air gap separation is a physical break between a water supply pipe and a receiving pipe or vessel. Air gap separations must be at least two (2) times the nominal pipe size (i.e., diameter) of the supply pipe being protected with a separation of no less than eight (8) inches. You must measure the separation vertically from the potable water outlet or reclaimed water outlet, to the overflow level of the reclaimed water or reuse.
 - f. Reduced pressure principle backflow prevention devices must comply with American Society of Sanitary Engineering (ASSE) Standard 1013.
 - g. Double check valve assemblies must comply with ASSE Standard 1015.
 - h. Reclaimed water may not be returned to the reclaimed water distribution system after delivery to an end user.

3. In-Ground Pipeline Separation and Configuration: In-ground reclaimed water distribution pipelines conveying Class IV reclaimed water must be installed and maintained to achieve the following minimum separation distances and configurations:
- a. Horizontal Separation Requirements:
 - i. A reclaimed water distribution pipeline must not pass within 50 feet of a potable water supply well or potable water supply spring. A 50 foot separation is also required between any reclaimed water distribution pipeline and water supply intake structure for a regulated waterworks. The Department may approve reducing the separation distance to not less than 35 feet if special construction and pipe materials are used to adequately protect the potable water supply.
 - ii. Reclaimed water distribution pipelines must be separated horizontally from any potable water main by at least 10 feet measured edge-to-edge. Where conditions prohibit horizontal separation by at least 10 feet, the reclaimed water distribution pipeline may be laid closer to a potable water main (horizontally) only if the potable water main is:
 - (1) laid in a separate trench or drilled using horizontal drilling techniques leaving undisturbed earth; and
 - (2) located to one side and at least 12 inches above the top of the reclaimed water distribution pipeline measured from the bottom of the potable water main.
 - (3) Where a 12 inch vertical separation cannot be attained the reclaimed water distribution pipeline must be constructed of water pipe material that meets American Water Works Association (AWWA) specifications, and

pressure tested in place without leakage prior to backfilling. The hydrostatic (pressure) test must be conducted in accordance with the latest version of AWWA Standard ANSI/AWWA C600 for the specific pipe material utilized.

- iii. A reclaimed water distribution pipeline must not pass through or come into contact with any part of a sewer manhole. Whenever possible a Class IV reclaimed water distribution pipeline must be separated horizontally from any sewer manhole by at least 2 feet measured from the edge of the pipe to the edge of the manhole structure. When conditions prohibit a 2 foot horizontal separation you must conduct testing to ensure any manhole which may come into contact with a distribution pipeline is watertight.
- iv. Reclaimed water distribution pipelines must be separated horizontally from any sewer line by at least 2 feet measured edge-to-edge. When conditions prohibit a 2 foot horizontal separation the reclaimed water distribution pipeline may be laid closer to the sewer line provided the sewer line is:
 - (1) laid in a separate trench or drilled using horizontal drilling techniques leaving undisturbed earth; and
 - (2) located to one side and at least 12 inches below the bottom of the reclaimed water distribution pipeline measured from the top of the sewer line.
 - (3) Where a 12 inch vertical separation from a sewer line cannot be attained the reclaimed water distribution pipeline must be constructed of water pipe material that meets AWWA specifications, and pressure tested in place without leakage prior to backfilling. The hydrostatic (pressure) test must be

conducted in accordance with the latest version of AWWA Standard ANSI/AWWA C600 for the specific pipe material utilized; or the sewer line must be encased in 10 feet of concrete on each side of the reclaimed water main.

b. Vertical Separation Requirements:

i. A reclaimed water distribution pipeline must cross under any potable water main so that the top of the reclaimed water distribution pipeline is at least 12 inches below the bottom of the water main.

(1) Where a reclaimed water distribution pipeline cannot cross under a potable water main, it may cross over it provided the reclaimed water distribution pipeline:

(a) is laid with a separation of at least 18 inches between the bottom of the reclaimed water distribution pipeline and the top of the potable water main,

(b) has adequate structural support to prevent damage to the potable water main,

(c) has joints placed equidistantly and as far from the potable water main joints as possible,

(d) is encased in 10 feet of concrete on each side of the crossing point of the potable water main; or

(e) is equipped with equivalent joint protection measures approved by the Department.

- (2) Where a 12 inch vertical separation from a potable water main cannot be attained, the reclaimed water distribution pipeline must be constructed of water pipe material that meets AWWA specifications and pressure tested in place without leakage prior to backfilling. The hydrostatic (pressure) test must be conducted in accordance with the latest version of AWWA Standard, ANSI/AWWA C600 for the specific pipe material utilized.
- ii. A reclaimed water distribution pipeline must cross over any sewer line so that the top of the sewer line is at least 12 inches below the bottom of the reclaimed water distribution pipeline.
 - (1) Where a reclaimed water distribution pipeline cannot cross over a sewer line, it may cross under it provided the sewer line:
 - (a) is laid with a separation of at least 12 inches between the bottom of the sewer line and the top of the reclaimed water distribution pipeline,
 - (b) has adequate structural support to prevent damage to the reclaimed water distribution pipeline,
 - (c) has joints placed equidistantly and as far from the reclaimed water distribution pipeline joints as possible,
 - (d) is encased in 10 feet of concrete on each side of the crossing point of the reclaimed water distribution pipeline; or
 - (e) is equipped with equivalent joint protection measures approved by the Department.
 - (2) Where a 12 inch vertical separation from a sewer line cannot be attained, the reclaimed water distribution pipeline must be constructed of water pipe

material that meets AWWA specifications and pressure tested in place without leakage prior to backfilling. The hydrostatic (pressure) test must be conducted in accordance with the latest version of AWWA Standard, ANSI/AWWA C600 for the specific pipe material utilized.

4. Above-Ground Separation: No separation distances are required between above-ground reclaimed water distribution pipelines and potable water, sewer, or wastewater pipelines.
5. Securing Outlets: All reclaimed water outlets must be secured in a manner that only allows operation by authorized personnel. In areas where reclaimed water outlets are accessible to the public, access must be controlled as follows:
 - a. If quick connection couplers are used on above-ground portions of a reclaimed water distribution system, they must be made from a different material than that used for couplers on the potable water supply.
 - b. If above-ground hose spigots or other hand-operated connections are used on the reclaimed water distribution system, they must be clearly distinguishable from any potable water connections (e.g., painted **purple** with valves that operate only with a special tool) to prevent any potential for reclaimed water to be mistaken for potable water.
 - c. If under-ground vaults are used to house reclaimed water connections, the vaults must be identified as part of the reclaimed water distribution system (e.g., conspicuously labeled or painted purple).
6. Pipeline Conversion: Prior to converting any existing potable water, sewer or wastewater pipeline for use as reclaimed water distribution pipeline, you must obtain a

sewerage construction permit as described in Chapter 2 and submit the following information to the Department in the permit application for the pipeline conversion:

- a. the location and identification of the pipeline to be converted,
 - b. the location of all connections to the pipeline to be converted,
 - c. a description of the measures and procedures you will undertake to ensure all existing connections and cross-connection will be eliminated,
 - d. a description of the markings, signage, labeling, or color coding that will be used to identify the converted pipeline as a reclaimed water distribution pipeline,
 - e. a description of cleaning and disinfection procedures that will be undertaken prior to using the converted pipeline for reclaimed water distribution,
 - f. an assessment of the physical condition and integrity of the pipeline to be converted; and
 - g. reasonable assurance that cross-connections will not occur, public health will be protected; and the integrity of all potable water, wastewater, and reclaimed water systems will be maintained after the pipeline is converted.
7. Tank Truck Designation: You may only use tank trucks designated for the exclusive purpose of transporting and distributing reclaimed water. You may not use tank trucks designated for any other use(s) for the transportation or distribution of reclaimed water.
8. Distribution system Identification: You must use the following methods to distinguish reclaimed water distribution systems from other water systems:
- a. All reclaimed water piping must have the words "CAUTION: RECLAIMED WATER - DO NOT DRINK" embossed, integrally stamped, or otherwise

permanently affixed to the piping, and must be identified by at least one of the following methods:

- i. painting the piping purple and stamping it with the required caution statement on opposite sides of the pipe at intervals of three to four feet,
 - ii. stenciling the piping with two-to three-inch letters on opposite sides of the pipe at intervals of three to four feet. For pipes less than four inches in diameter lettering must be at least 5/8 inch, placed on opposite sides of the pipe at intervals of one foot,
 - iii. affixing purple polyethylene vinyl wrap or adhesive tape to the pipe longitudinally (so that the tape runs parallel to the pipe) at three to four foot intervals. The width of the wrap or tape must be at least three inches and must display the above caution statement in either white or black lettering; or
 - iv. affixing purple vinyl adhesive tape to the top of the pipe, running continuously for the entire length of the piping, and fastened at least every 10 feet to each pipe section. The tape must display the required caution statement in either white or black lettering.
- b. All visible above-ground portions of the reclaimed water distribution system including reclaimed water piping, valves, outlets (including fire hydrants) and other appurtenances must be clearly marked to notify the public and employees that the source of the water is reclaimed water which is not suitable for drinking or food preparation.
 - c. Each mechanical accessory of a reclaimed water distribution system must be colored purple and conspicuously marked "RECLAIMED WATER" to identify it as

part of the reclaimed water distribution system, and distinguish it from any mechanical accessories to a potable water distribution system or wastewater collection system.

- d. Where an existing distribution or collection pipeline crosses within 10 feet of a potable water supply line or sanitary sewer line, underground distribution or collection pipelines and appurtenances retrofitted for the purpose of distributing reclaimed water must be conspicuously marked as described in sections B.8.a through c above.
- e. Valve boxes for reclaimed water distribution systems must be painted purple. Valve covers for reclaimed water distribution lines must not be interchangeable with potable water supply valve covers.

9. Maintenance: All reclaimed water distribution systems must be maintained in accordance with these guidelines to minimize leakage, ensure safe and reliable conveyance of reclaimed water, and maintain water quality treatment standards required for the intended reuse(s) of the reclaimed water.

C. Storage Requirements and Alternatives for Managing Class IV Reclaimed water and Reject Water

- 1. Managing Excess Reclaimed water : To ensure reliable reclamation system operation in accordance with these guidelines all reclamation systems must have the ability to implement at least one of the following storage alternatives (as available or approved by the Department):
 - a. store excess reclaimed water for future distribution;
 - a. discharge excess reclaimed water to another permitted reuse system;

- b. discharge excess reclaimed water to surface waters of the State under a NPDES permit;
 - c. suspend water reclamation activities for planned periods; or
 - d. discharge excess reclaimed water from a satellite reclamation system to the sewage collection system from which it originally received water for reclamation.
2. Managing Reject Water: Where reject water is stored, the reclamation system must have the design capacity to distribute it from storage back to the reclamation system for additional or repeat treatment. Separate off-line storage must be provided for reject water unless it can be managed by at least one of the options below:
- a. divert reject water to another permitted reuse system;
 - b. discharge reject water to surface waters of the State under a NPDES permit or State groundwater discharge permit;
 - c. return reject water directly to an appropriate point of treatment in the reclamation system; or
 - d. divert reject water from a satellite reclamation system to the sewage collection system from which it originally received water for reclamation.
3. Permit Requirements: In order to discharge reclaimed or reject water to a storage facility; you must obtain a separate discharge permit and construction permit from the Department prior to installing the storage facility.
4. Impoundment Requirements: All impoundments used for reclaimed or reject water (with the exception of impoundments specified in section 7 of this chapter) are required to meet the following conditions:

- a. A minimum two-foot freeboard or vertical separation between the top of the impoundment and the surface of the reclaimed water it contains must be maintained at all times. Any emergency discharge or overflow device used must be identified in the supporting engineering documentation required in Chapter 8, section A, which must include a description of how the discharge or overflow will ultimately be disposed.
- b. There must be a minimum two-foot vertical separation between the bottom of an impoundment and the seasonal high water table.
- c. The impoundment (excluding tanks) must have a properly designed and installed liner as described below. A quality assurance and quality control plan which substantiates the adequacy of the liner and its installation must accompany, or be included in the preliminary engineering report with the MDE Construction permit Application. Copies of the construction completion certificate and as-built drawings for any system components that changed during installation from the original drawings must be submitted to the Department within 60 days after installation of the storage facility is complete.
 - i. Synthetic liners must be at least 30 millimeters thick and installed in accordance with manufacturers' specifications and recommendations. The maximum coefficient of permeability for the synthetic liner must not exceed 1×10^{-6} cm/sec.
 - ii. Soil liners must be at least 12 inches thick and composed of separate lifts not exceeding six inches. The maximum coefficient of permeability for soil liners must not exceed 1×10^{-7} cm/sec.

- iii. A liner is not required for existing impoundments storing reject or reclaimed water, if a leakage test conducted via a water balance evaluation demonstrates the leakage rate is less than 500 gallons/day/acre at a water depth of six feet.
- d. Reclaimed or reject water may be stored in water-tight tanks only if the tank is clearly labeled identifying the contents as either reclaimed or reject water.
- e. The design of the impoundment must prevent entry of surface water or stormwater runoff from outside the storage facility.
- f. Where an embankment for an impoundment is composed of soil, the embankment must have:
 - i. a top width of at least five feet,
 - ii. interior and exterior slopes no steeper than one vertical foot to three horizontal feet, unless an alternate slope stabilization ratio is approved by the Department,
 - iii. shallow-rooted vegetative cover or another soil stabilization method to prevent erosion; and
 - iv. erosion stops and water seals installed on all piping that penetrates the embankment.
- g. You must conduct routine maintenance of the impoundment liner, embankments, and access areas as prescribed in the Operations and Maintenance Manual addressed in Chapter 9.
- h. Impoundments must be sited to avoid areas with uneven subsidence, sinkholes, or unstable soils unless provisions are made for their correction. Results from field

and laboratory tests derived from a number of test borings and soil samples, as determined adequate by the Department, must be the basis for computations used for permeability and stability analyses.

- i. Impoundments may not be located on a floodplain unless they are protected from inundation or damage by the probability of a 100-year flood event.
 - j. There must be a minimum buffer zone distance of 100 feet measured horizontally from the perimeter of the storage impoundment to any potable water supply wells and springs, and public water supply intake structures.
5. Storage Capacity: Storage facility capacity must be as follows:
- a. Reject water: The capacity of the storage facility for reject water must be a volume greater than or equal to the average daily permitted flow of the reclamation system, unless other options exist for immediate disposal or retreatment of reject water in addition to storage.
 - b. Reclaimed water: Storage for reclaimed water must be approved by the Department. The capacity of the storage facility must be determined by evaluating seasonal variability in demand, intended reuses with intermittent variable demand (such as fire fighting); and the availability of other options to generate or manage reclaimed water as specified in section C.1 of this chapter.
6. Storage Inventory: You must maintain current inventories of all storage within the RWMP service area described in Chapter 6, section C.1. For the addition of new storage capacity after a permit is issued, you must submit an amended inventory to the Department at least 30 days prior to use of the new facility, which must include the following:

- a. name or identifier for each storage facility,
 - b. location of each storage facility (including latitude and longitude),
 - c. function of each storage facility (e.g., reject water storage, system storage or non--system storage),
 - d. type of each storage facility (e.g., covered tank, uncovered tank, lined pond, unlined pond, etc.); and
 - e. location (latitude and longitude) and distance of the nearest potable water supply well and spring, and public water supply intake structure in relation to each storage facility within 450 feet of a potable water source.
7. Exception for Industrial Permittees: Storage requirements as specified in this chapter do not apply to reclaimed water storage facilities provided at the site of an industrial end user regulated under an existing discharge permit issued by the Department.

Chapter 8 – Construction Requirements

A. Supporting Engineering Documentation

You must submit supporting engineering documentation for the reclaimed water facility to the Department in accordance with COMAR 26.03.12.04.

B. Construction Completion Certification and System Operation

Within 60 days after completing installation of the reclaimed water facility, you must submit copies of the construction completion certification and as-built drawings for any system components installed differently than those submitted to the Department in the original plan. Operation of the reclaimed water facility may not commence until the certification and as-built drawings have been received by the Department.

Chapter 9 – Operations and Maintenance

A. Operator Supervision Requirements

You must assign a classification to the reclamation system based on the treatment process used in accordance with Maryland Board of Waterworks and Waste Systems Operators (The Board) requirements, and other applicable operator requirements established by local jurisdictions. The classifications for both the reclamation system and “Operator in **Responsible Charge**” must be consistent with COMAR 26.06.01.16 for facilities using similar treatment processes. An Operator in Responsible Charge must maintain operation of the reclamation system under their direct supervision, unless the system is equipped with remote monitoring and automated diversion capabilities for reject water (as applicable) in accordance with Chapter 4, section D.

B. Operations and Maintenance Manual

The Operations and Maintenance Manual (OMM) is a set of detailed instructions developed by the permittee to facilitate the operator's understanding of operational constraints and maintenance requirements for the Class IV distribution, reclamation, or satellite reclamation system. The manual should outline monitoring and reporting requirements specified in the permit issued for each system. The scope and content required in the manual depends on the complexity of the system or systems involved.

1. Review and Submission Requirements: You must review and revise all OMMs periodically, as well as after any system modification or expansion to ensure the manual addresses all requirements of this document for satisfactory system performance. You must document any revisions to the OMM and submit them to the Department within 90 days of the effective date of the change.

2. Reclamation systems Operations and Maintenance Manual: You must develop and submit a facility Operations and Maintenance Manual to the Department for each reclamation system, satellite reclamation system, or combination of facilities covered by the same permit. If your reclamation system is authorized under the permit of a wastewater treatment works that provides effluent to the reclamation system, the facility manual may be made a part of the OMM for the wastewater treatment works. At a minimum the reclamation or satellite reclamation system OMM must contain the following:
- a. a description of unit treatment processes within the reclamation or satellite reclamation system and step-by-step instructions for the implementation of such processes,
 - b. a description of routine maintenance and the maintenance schedule for each unit treatment process in the system,
 - c. criteria used to make continuous determinations of the acceptability of any reclaimed water produced, including the fixed locations established to sample parameters measured by continuous on-line monitoring equipment,
 - d. descriptions of sampling, monitoring, and record keeping procedures that comply with requirements established in this document and any applicable permit conditions,
 - e. physical steps and procedures which must be followed when reject water is produced pursuant to Chapter 4, section D, including procedures for resampling and operational review,

- f. physical steps and procedures which must be followed when the reclamation system is again producing reclaimed water with acceptable quality and resumes normal operation,
 - g. procedures to be followed when an operator is not present at the treatment works,
 - h. information necessary for the proper management of sludge or residuals from the reclamation process not specifically requested in the MDE/NPDES permit application; and
 - i. a contingency plan to eliminate or minimize potential for distribution of untreated or inadequately treated water to reuse areas. The plan must reference and be compatible with the Education and Notification Program specified in Chapter 10, section A (as applicable) for any release of untreated or inadequately treated water to the reclaimed water distribution system.
3. Distribution system Operations and Maintenance Manual: You must develop an OMM for each reclaimed water distribution system which must be made available to operations and maintenance staff from a central location in the system. If the distribution system and reclamation or satellite reclamation system are covered by the same permit, the OMM for the distribution system may be included in the facility OMM described in Section B.2 of this chapter. At a minimum the OMM for a reclaimed water distribution system must contain the following:
- a. a description of all components within the distribution system and step-by-step instructions for the operation of specific mechanical components,

- b. a schedule for routine inspection and procedures for unplanned inspection of the distribution system, including inspections required for the cross-connection and backflow prevention program as specified in Chapter 6, section C.1.g,
 - c. a description of routine maintenance and maintenance schedules for all components of the distribution system. Maintenance must include but is not limited to initial and routine flushing of the distribution system, measures to prevent or minimize corrosion, fouling, and clogging of distribution lines; and detect and repair broken distribution lines, flow meters or pumping equipment; and
 - d. procedures to manage and dispose of any wastes or wastewater generated by maintenance of the distribution system in a manner protective of the environment.
4. Operations and Maintenance Manual Training: You must ensure that all operations and maintenance staff for the reclaimed water distribution or reclamation system and any reclaimed water end users have access to and are familiar with the OMM specific to the permitted system. You must use the OMM as the basis for training new and existing operations and maintenance staff, and must document all OMM training sessions. Training must be provided to new operators and maintenance staff in a timely manner, and repeated at least every three years for all existing staff.

C. Protecting Public Health and the Environment

You are responsible for ensuring the facility is protective of the environment and public health at all times, including during periods of inactivation or closure. The OMM for the reclamation, satellite reclamation, or reclaimed water distribution system must include a plan

specifying what steps will be taken to protect the environment and public health in the event of inactivation or closure of the facility.

Chapter 10 – Requirements for the End-Use Location

The following requirements must be met at the location where Class IV reclaimed water is applied by the end user. Where requirements must be met by an end user, you must ensure the end user fulfills such requirements through the contractual agreement described in Chapter 6, section C.

A. Education and Notification Program

You must develop and submit an Education and Notification Program (Program) with the RWMP described in Chapter 6, section C, for reuse intended in areas accessible to the public or where human contact is likely. You and not the end user shall be responsible for implementing the Program.

1. Education

The purpose of the education component of the Program is to ensure end users and members of the public who are likely to have contact with the reclaimed water are informed about its origin, nature, characteristics, the manner in which the reclaimed water can be used safely, and uses for which the reclaimed water is prohibited or limited. The Program must describe all modes of communication that will be used to educate and inform the public, including but not limited to holding public meetings, distributing written information, placing notices in the news media, and using advisory signs as described in Chapter 11. Program education for individual end users must be conducted at the time of their initial connection to the reclaimed water distribution system and provided in either the service agreement or contract established with the end user in accordance with Chapter 6, section C.

2. Notification

The notification component of the Program must contain procedures to notify end users and affected public of treatment failures at the reclamation system that can adversely impact human health or result in loss of reclaimed water service. In the event of a treatment failure where non-compliant reclaimed water is discharged to the reclaimed water distribution system; you must notify the end user of the failure and advise them of precautions to be taken to protect public health, when using the non-compliant reclaimed water in areas accessible to the public or where human contact with the reclaimed water is likely. Such precautions must be implemented for a period of seven days or longer depending on the frequency and magnitude of the treatment failure.

Where reclaimed water service will be interrupted due to planned causes such as scheduled repairs, you must provide advance notice of the anticipated date and duration of the service interruption to the end user(s). Where reclaimed water service is disrupted due to unplanned causes such as an upset at the reclamation system, you must notify the end user(s) and affected public of the service disruption if service cannot or will not be restored within eight hours of discovering the disruption.

B. Use of Reclaimed water Must Be Consistent with the Permit

Reclaimed water must be used in a manner that is protective of public health and the environment, and consistent with this chapter and conditions established in the permit issued by the Department to produce and distribute reclaimed water.

C. Quality of Reclaimed water

Reclaimed water must be of acceptable quality for the intended reuse at the point of delivery to the end user.

D. Prohibition of Nuisance Conditions

There must be no nuisance conditions such as offensive odors or liquid spills from sewage overflow resulting from distribution, use or storage of reclaimed water.

E. Pipeline Separation Distances

Minimum separation distances specified in Chapter 7, section B.3 for in-ground reclaimed water distribution pipelines also apply to in-ground piping for irrigation systems using reclaimed water.

F. Prohibition of **Overspray**

Overspray of surface waters (including wetlands) from irrigation or other reuses of reclaimed water is prohibited.

G. Buffer Zone Requirements for Aesthetic Features Using Reclaimed water

A buffer zone of 100 feet measured horizontally must be maintained from indoor public eating and drinking facilities within the same room or building space as an indoor aesthetic feature that uses reclaimed water and has potential to create aerosols (such as decorative waterfalls or fountains).

H. Buffer Zone Requirements for Open Cooling Towers

A buffer zone of 100 feet measured horizontally must be maintained from the site property line to any open cooling towers using reclaimed water; unless (1) a drift or mist eliminator is installed and properly operated, or (2) reclaimed water used in the tower is treated to Class IV disinfection standards. If either of these conditions is met then no buffer zone is required.

I. Buffer Zone Requirements for Irrigation

1. All reuses of reclaimed water for irrigation (excluding residential lawn irrigation) must meet the following buffer zone requirements:
 - a. Buffer zones are required for irrigation using reclaimed water on sites that contain the following facilities:
 - i. Unconfined potable water supply wells and springs, and public water supply intake structures must have a 100 foot buffer zone.
 - ii. Confined potable water supply wells must have a 50 foot buffer zone.
 - iii. Outdoor licensed public eating, drinking, and bathing facilities must have a 100 foot buffer zone.
 - b. No buffer zone distances are required from occupied dwellings or outdoor eating, drinking, and bathing facilities when reclaimed water is applied using low trajectory spray irrigation nozzles, above-ground drip irrigation methods, or by other means which minimize formation of aerosols from reclaimed water. However any aerosol formation within 100 feet of such facilities must be minimized.
 - i. Drip irrigation means the slow and uniform above or below ground application of water to individual plants and vegetative cover using tubing and drip devices or emitters, installed at an elevation with a 2-ft minimum separation from the seasonable high water table.
 - ii. Spray irrigation means application of reclaimed water to land by spraying it from sprinklers or orifices in piping.
 - c. For irrigation reuses where more than one buffer zone distance may apply, the greater distance is required.

- d. Unless specifically stated otherwise all buffer zone distances must be measured horizontally.

J. Additional Requirements for Irrigation Reuse

- 1. All reuses of reclaimed water for irrigation must meet the following general requirements:
 - a. The method of irrigation chosen must minimize human contact with reclaimed water.
 - b. Reclaimed water must be prevented from coming into contact with drinking fountains, water coolers, or eating surfaces.

- 3. Prohibitions for sites using reclaimed water for irrigation:
 - a. Irrigation using reclaimed water on bare soil is prohibited except as necessary for providing adequate moisture for seed germination in the seeding area. In addition irrigation areas must be planted with a healthy vegetative cover.
 - b. Irrigation using reclaimed water is prohibited during periods when the water table is elevated or soils are saturated, frozen, covered with ice or snow; or during periods of rainfall which may result in persistent surface runoff or ponding.

3. Hydrogeological study requirements for sites using reclaimed water for irrigation:

For irrigation reuses where the irrigation rate is greater than the vegetative water demand, you must conduct a hydrogeological or irrigation pilot study and develop a nutrient Management Plan for the site pursuant to Chapter 6, section C.2.

4. Signage for sites using reclaimed water for irrigation:

Signage reading “Reclaimed water, Do Not Drink” must be posted in the irrigation area to inform the public that irrigation using treated wastewater is being applied. Signs

greater than 4 inches in height and 8 inches in width using purple as the prominent color must be conspicuously posted at each entrance to the site and visible to the public.

5. Irrigation on sites greater than 5 contiguous acres:

All irrigation reuses of reclaimed water on areas greater than five acres on one contiguous property must meet the following additional requirements:

- a. Irrigation systems must be designed, installed, and adjusted to:
 - i. provide uniform distribution of the reclaimed water over the designated irrigation site as appropriate,
 - ii. prevent persistent ponding or pooling of reclaimed water or runoff at the site,
 - iii. facilitate maintenance and harvesting of irrigated areas and preclude damage to the irrigation system from the use of maintenance or harvesting equipment;
 - iv. prevent aerosol carry-over or overspray from the irrigation site to areas beyond the buffer zone distances described in section I.1 of this chapter; and
 - v. prevent clogging from algae or suspended solids.
- b. All pipes, pumps, valve boxes and outlets for the irrigation system must be designed, installed, and identified in accordance with Chapter 7.
- c. Any reclaimed water runoff must be confined to the irrigation reuse site unless alternative management methods are authorized by the Department.

Chapter 11 – Access Control and Advisory Signs

- A. There must be no uncontrolled public access to any reclamation or satellite reclamation system or system storage facility. Access to any wastewater treatment works directly associated with a reclamation or satellite reclamation system must be controlled in accordance with applicable State and local regulations. System storage ponds must be enclosed with a fence or otherwise designed with appropriate features to discourage entry of animals and unauthorized persons.
- B. You must post signs reading “Reclaimed water, Do Not Drink” where advisory signs or placards are required as described in sections C and D of this chapter. You must also post signage at each site entrance. Signs must be visible to the public, larger than 4 inches in height and 8 inches in width; and purple must be the prominent color of the sign. The Department may approve alternative signage and wording if the alternative assures an equal degree of public notification and protection.
- C. You must post advisory signs or placards within and at the boundaries of any reuse area(s) which state the nature of the reuse. For example, advisory signs posted at entrances to a residential neighborhood where reclaimed water is used for landscape irrigation.
- D. You must post advisory signs adjacent to all impoundments used for non-system storage of reclaimed water, including landscape impoundments. A landscape impoundment is a body of water that contains reclaimed water not intended for public contact, and used primarily for aesthetic enjoyment. Landscape impoundments include but are not limited to decorative pools, fountains, ponds, and lagoons which may be located outdoors or indoors.

E. For industrial reuses advisory signs must be posted around areas of the industrial site where reclaimed water is used, and at the main entrance to the site to notify employees and the visiting public that reclaimed water is being used.

Chapter 12 – Recordkeeping

You must maintain operating records at the site of the reclamation system or at a central depository within the reclaimed water distribution system. Operating records must include all analyses specified in this document and any records of operational problems, alarm failures, unit process and equipment breakdowns; diversions to reject or emergency storage, discharge to another permitted reuse system requiring a lower level of treatment, or disposal via a permitted effluent discharge; and all corrective or preventive actions taken.

Chapter 13 – Reporting

- A. To demonstrate compliance with applicable reclaimed water treatment standards established in this document, if you are the permittee for a water reclamation or satellite reclamation system you must submit monthly monitoring reports to the Department which include monitoring results for parameters addressed in Chapter 4, and any other parameters included in the permit.
- B. In accordance with Noncompliance Notification Procedures specified in the permit, you must report to the Department the discharge of any untreated or partially treated water to the service area that fails to comply with treatment standards specified in the permit.
- C. The incidental discharge of reclaimed water with commingled stormwater from storage water reservoirs, or reclaimed water main breaks should be managed in the same manner as overflows of stormwater or potable water alone. You must report any incidental discharge to the Department in accordance with notification procedures specified in the permit.
- D. If you are the permittee for a reclaimed water distribution system, you must submit an annual report to the Department on or before February 28 of the following year. The annual report is in addition to any other notifications required by the Department addressed previously in this guidance. At a minimum the annual report for a distribution system must:
1. Report monthly totals and daily maximums of the volume of reclaimed water distributed to the service area for each reuse category from January 1 through December 31.
 2. For reclaimed water not treated to achieve Enhanced Nutrient Removal quality (≤ 4 mg/l total nitrogen and ≤ 0.3 mg/l total phosphorous) used within the reclaimed water service area, provide (1) the monthly total nitrogen and phosphorus loads entering surface

water via surface runoff (only where authorized under a discharge permit), if any and (2) the monthly nitrogen and phosphorus loads removed by vegetative uptake.

3. Provide a summary of ongoing education and notification program activities, including copies of education materials as required in Chapter 10, section A.
4. Describe any changes or anticipated changes to the treatment facilities or processes specific to the production of reclaimed water.
5. Provide a summary of annual permit violations and corrective actions taken.

Glossary

The following words and terms when used in this document have the following meanings unless the context clearly indicates otherwise:

"Advanced waste treatment" means treatment of wastes or wastewaters to:

(a) Reduce the level of specific constituents which are not sufficiently controlled by best available technology (BAT) for industrial discharges or by secondary treatment for municipal discharges; or

(b) Reduce organic oxygen demand beyond the level attainable by BAT or secondary treatment to comply with waste load allocations in water quality limited waters.

"Buffer zone" means the area that lies between the perimeter of the Class IV reclaimed water application (the area wetted by application) and a location of public health concern such as a property line, public water supply intake structure or well.

"Class I, Class II, Class II, and Class IV" reclaimed water refers to the degree to which water is treated, corresponding to specific reuses for which that class is authorized (*See* Chapter 3).

"COMAR" means the Code of Maryland Regulations.

"Construction permit" means a permit issued by the Department of the Environment under Environment Article § 9-204, Annotated Code of Maryland to authorize installation of a water or sewerage system.

"Cross-connection" is an unprotected, actual or potential connection between any two water systems including by-pass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could potentially occur; where one system contains a substance(s) that would reduce the water quality of the other in the event of contact between the water systems.

"Department" or **"MDE"** means the Maryland Department of the Environment.

"Discharge permit" means a permit issued by the Department for the discharge of any pollutant, or combination of pollutants into waters of the State.

"Disinfection" means the destruction, inactivation, or removal of pathogenic microorganisms by chemical, physical, or biological means.

"Disposal" means the discharge of effluent to injection wells, outfalls, subsurface drain fields, or other facilities utilized primarily for the release of effluent into the environment, without deriving a direct beneficial use prior to discharging the effluent to waters of the State.

"Effluent" means treated wastewater from a wastewater treatment works, unless specifically stated otherwise.

“**End user**” means a person or entity that directly uses reclaimed water.

“**Graywater**” means untreated sewage from bathtubs, showers, lavatory fixtures, wash basins, washing machines, and laundry tubs. Graywater does not include sewage from toilets, urinals, kitchen sinks, dishwashers; or laundry water from soiled diapers.

“**Groundwater**” means water that naturally lies, percolates, or flows through underground aquifers, i.e., water in any formation of soil, sand, rock, gravel, limestone, sandstone; or any other material or crevice from which underground water is or may be produced.

“**Impoundment**” means any structure storing reclaimed or reject water (such as ponds or tanks).

“**Irrigation**” means the application of water to land for plant use at a rate that prevents undesirable plant water stress.

“**Modification**” means any alteration, expansion, upgrade, extension, addition; or replacement of an existing wastewater or reuse facility for which a permit is required from the Department.

“**National Pollutant Discharge Elimination System (NPDES)**” means the national system for issuing permits established under §402 of the Clean Water Act (1972).

“**Operator**” means an individual who participates in the operation of: (1) a waterworks, including control of flow, processing, or distribution of water, (2) a wastewater works, including collection, control of flow, processing, or discharge of wastewater and effluent.

“**Overspray**” means reclaimed water which is transmitted through the air to a location other than the site where direct application is intended.

“**Owner**” means the State or any of its political subdivisions including but not limited to sanitation district commissions and authorities; and any public or private institution, corporation, association, firm; or company organized or existing under the laws of this or any other state or country, or any officer or agency of the United States, or any person or group of persons acting individually or as a group that owns, operates, charters, rents; or otherwise exercises control over or is responsible for the production or distribution of reclaimed water .

“**Pathogen**” means a microorganism including bacteria, viruses, rickettsiae, parasites, and fungi; or other agent such as a proteinaceous infectious particle (also known as a prion) that can cause disease in humans or animals.

“**Permit**” means an authorization, certificate, license, or equivalent control document issued by the Department to implement these guidelines for production, distribution, and use of reclaimed water.

“**Permittee**” means a person holding a permit issued by the Department. “**Person**” means an individual, partnership, association, society, joint venture, joint stock company, firm, company, corporation, cooperative or other business organization; and any agency, unit, or instrumentality

of federal, state, or local government; including any publicly owned utility or publicly owned corporation of federal, state, or local government.

“**Potable water**” means water free from levels of impurities sufficient to cause disease or harmful physiological effects, and which conforms to standards for the Quality of Drinking Water in Maryland established in COMAR 26.04.01.

“**Public access**” means an area accessible to the general public, including private property not open to the public at large. The presence of authorized farm personnel or other authorized personnel for the treatment works, utilities system, or reuse system does not constitute public access.

“**Purple**” for purposes of identification of a Class IV reclaimed water pipe, means the color of the pipe is Pantone 522 as indicated on a Pantone Color Chart.

“**Reclamation**” or “**reclamation system**” or “**reclaimed water system**” means the treatment of municipal wastewater to produce reclaimed water for reuse that would not otherwise occur.

“**Reclaimed water**” means municipal wastewater that is treated to remove impurities and thereby made suitable for beneficial reuse.

“**Reclaimed water distribution system**” means a network of pipes, pumping facilities, storage facilities, and appurtenances designed to convey and distribute reclaimed water from one or more reclamation systems to one or more end users.

“**Reclaimed Water Management Plan (RWMP)**” means the plan described in Chapter 6, section C.

“**Reject water**” means water that does not meet applicable reclaimed water standards after treatment which is diverted by the reclamation or satellite reclamation system.

“**Responsible Charge**” means responsibility for operation and supervision of all or any part of a waterworks, wastewater works, industrial wastewater works, or water reclamation system.

“**Reuse**” or “**Water reuse**” means use of reclaimed water for one of the following applications: (1) Direct beneficial use in a manner protective of the environment and public health that involves transport of reclaimed water from the point of reclamation to the point of reuse, without an intervening discharge to waters of the State. (2) Indirect potable use that involves discharge of reclaimed water to receiving surface water or groundwater for the purpose of intentionally augmenting a water supply source, with transport to a withdrawal location and subsequent withdrawal after mixing with ambient surface or groundwater; followed by treatment and distribution for drinking water and other potable water purposes. (3) Another use authorized by the Department in accordance with these guidelines.

“**Reuse area**” means the area of reclaimed water use with defined boundaries.

“**Reuse system**” means an installation or method of operation that applies reclaimed water for a reuse in accordance with these guidelines.

“**Satellite reclamation system**” means a wastewater treatment works or reclamation system that operates within or parallel to a sewage collection system, to treat a portion of the wastewater flow from the sewage system to produce reclaimed water for reuse. Satellite reclamation systems do not have wastewater or residual discharges to surface waters, but may return treatment process wastewater and residuals to the sewage collection system.

“**Service area**” means a geographic area that receives reclaimed water from a reclaimed water distribution system, or directly from a reclamation system for approved uses within that area.

“**Service agreement**” means an agreement or contract between the permittee and end user(s).

“**Sewage**” means water-carried human, domestic, and other wastes, and includes all human and animal excreta.

Significant industrial user means (i) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and (ii) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment works; or is designated as such by the Department on the basis that the industrial user has a reasonable potential for adversely affecting the POTW’s operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

“**Surface waters**” means water from rain, melting snow, springs, or seepage that lies or flows on the surface of the earth, including a watercourse, lake, or tidewater.

“**System storage**” means storage on or off site considered part of a reclamation, satellite reclamation, or reclaimed water distribution system, used to store the reclaimed water produced and equalize flow to or within a reclaimed water distribution system.

“**Total nitrogen**” is the sum of nitrate plus nitrite and total Kjeldahl nitrogen (TKN); TKN is the sum of organic nitrogen and ammonia nitrogen.

“**Wastewater**” means any liquid waste substance derived from agricultural, commercial, industrial, institutional, municipal, recreational, residential; or other operation or development including all buildings, structures, mobile homes, accompanying lands; and any other liquid waste containing liquid, gaseous, or solid matter with characteristics that have potential to pollute waters of the State.

“**Wastewater treatment works**” means any plant or other works used for the purpose of treating or stabilizing wastewater to generate reclaimed water.

“Water reclamation” means the treatment of municipal effluent for reuse.

“Waters of the State” means groundwater as well as tidal and nontidal waters located within the boundaries of the State including the Chesapeake Bay and its tributaries, all ponds, lakes, rivers, streams, public ditches, tax ditches, public drainage systems; and that portion of the Atlantic Ocean within the boundaries of the State.

“Waterworks” means a facility used to collect, store, pump, treat, or distribute water. Waterworks does not include a facility only used by a private residence.

“You” means the owner or operator who is applying for or has obtained a permit for a reclamation, satellite reclamation, or reclaimed water distribution system to produce or distribute Class IV reclaimed water for reuse. The owner, operator, applicant and permittee for a reclaimed water reclamation or distribution system are referred to as ‘you’ throughout this document.