State of Idaho
Department Of Environmental Quality
Technical Guidance Committee

Technical Guidance Committee Meeting

Agenda*

Thursday February 4, 2016

8:30 a.m. – 4:30 p.m.

Conference Room C
Department of Environmental Quality
1410 North Hilton
Boise, ID

8:30 AM Call to Order/Roll Call
- Sign in sheet for attendees who wish to comment or present to the committee members
- Introduction of committee members, guests, and attendees

8:35 AM Open to Public Comment – 30 minutes reserved for the public to provide comments to the TGC on subjects not on the agenda, if no public comment is presented at the start of comment period the agenda will move forward

9:05 AM November 5, 2015 Draft TGC Meeting Minutes: Review, Amend, or Approve (**Appendix A**)

9:15 AM 1.8 Easement (**Appendix B**) **
- Review for final approval

9:25 AM 4.22.3.2 Intermittent Filter Dosing (**Appendix C**)
- Review for final approval

9:30 AM 4.27 Subsurface Flow Constructed Wetland (**Appendix D**)
- Review for final approval

10:00 AM Break – Ten Minutes

10:10 AM Presby Environmental, Inc. Advanced Enviro-Septic Treatment System (**Appendix E**)
- Review for product approval recommendation

11:40 AM 2.2.5.2 In-Trench Sand Filters and the Method of 72 (**Appendix F**)
- Review for preliminary approval

12:00 to 1:00 PM Lunch

1:00 PM 2.2.4.2 Reduction in Separation Distance to Surface Water with a Variance (**Appendix G**)
- Review for preliminary approval

1:30 PM 4.19.3.1 Piping (**Appendix H**)
- Review for preliminary approval

2:00 PM 4.21 Recirculating Gravel Filter (**Appendix I**)
- Review for preliminary approval

2:45 PM Break – Ten Minutes

2:55 PM 4.5 Drip Distribution System (**Appendix J**)
- Review for preliminary approval

3:40 PM 2.1 Soils Texture and Group Determinations (**Appendix K**)
- Review for preliminary approval

4:10 PM 2.3 Standard Percolation Test (**Appendix L**)
- Review for preliminary approval

4:30 PM Adjourn
- Meeting may adjourn early dependent upon discussion, interest, and participation for each agenda item

*Begin and end time will be observed. Agenda items and their allotted times my vary dependent upon the amount of interest and participation for each item.

** Agenda appendices starting at Appendix B are color coded to track changes. Blue text indicates changes that were made in previous Technical Guidance Committee (TGC) meetings. Red text indicates changes that are newly proposed for this TGC meeting. All green text indicates text that was moved from one area of a section to the new area. ~~All text with strikeout markings regardless of color is either proposed to be deleted from the guidance or moved to another location within that section.~~

The call in number is (208) 373-0101 Bridge # 1

To Join a Conference Call

1) Auto-Attendant Transfer Option

Conference Call Auto-Attendant Number:

- Extension 0101: Inside DEQ phone system
- (208) 373-0101: Outside callers

Participants call auto-attendant number and are then prompted to enter their pre-arranged conference call bridge number and in this case press the number **1**. Once the bridge number has been entered, callers are automatically connected to their conference call.

Notification

As participants are added to a conference call, an audible chime is heard by participants already connected to the call. If the conference is in progress when the chime is sounded, it is advisable to acknowledge the new participant and ask who has joined the call. This will ensure that the new caller has gained access to the proper call.

HP MyRoom Instructions

To Join HP MyRoom

This will allow users joining the meeting via online video conference to view the same computer material that the subcommittee members are seeing at the meeting location. To hear audio users will still need to call the conference call number above from their telephone. Login information is below.

1) Visit the Website Below

- https://www.myroom.hpe.com/attend/MEPAZ4KR3DU
- Enter your first and last name in the area provided
- Enter the room key: MEPAZ4KR3DU

Appendix A

Technical Guidance Committee Meeting

Draft Minutes

Thursday, November 5, 2015

Conference Room C
Department of Environmental Quality
1410 North Hilton
Boise, Idaho

TGC ATTENDEES:

Tyler Fortunati, REHS, On-Site Wastewater Coordinator, DEQ
Joe Canning, PE, B&A Engineers
Bob Erickson, REHS, Senior Environmental Health Specialist, SCPHD
Dale Peck, PE, Environmental & Health Protection Division Administrator, PHD
Michael Reno, REHS, Environmental Health Supervisor, CDHD
Jason Holm, J.T. Holm Construction, LLC

GUESTS:

Chas Ariss, PE, Wastewater Program Engineering Manager, DEQ
Tammarra Golightly, Administrative Assistant, DEQ
Ryan Spiers, Alternative Wastewater Systems, LLC
Allen Worst, R.C. Worst & Company, Inc.
PaRee Godsill, Northern Services, Inc.
Kellye Eager, REHS, Environmental Health Direction, EIPH
Don Belk, Presby Environmental, Inc. (via telephone)
Christina Connor-Cerezo, Presby Environmental, Inc. (via telephone)

CALL TO ORDER/ROLL CALL:

Meeting called to order at 8:30 a.m.
Committee members and guests introduced themselves.

OPEN PUBLIC COMMENT PERIOD:

This section of the meeting is open to the public to present information to the TGC that is not on the agenda. The TGC is not taking action on the information presented.

No public comments were submitted during the allotted agenda timeframe.

MEETING MINUTES:

July 22, 2015 Draft TGC Meeting Minutes: Review, Amend, or Approve

No public comment was received on the draft minutes. The minutes were reviewed by the committee. Dale Peck had questions regarding the timeframe to implement the general and provisional ETPS approvals. Tyler Fortunati clarified that the general and provisional approval classifications would begin July 1, 2016.

Motion: Bob Erickson moved to approve the minutes.

Second: Mike Reno.

Voice Vote: Motion carried unanimously.

Minutes will post as final. See DEQ website and **Appendix A**

August 20, 2015 Draft TGC Meeting Minutes: Review, Amend, or Approve

No public comment was received on the draft minutes. The minutes were reviewed by the committee and no suggestions for amendments were made.

Motion: Dale Peck moved to approve the minutes.

Second: Joe Canning.

Voice Vote: Motion carried unanimously.

Minutes will post as final. See DEQ website and **Appendix B**

OLD BUSINESS/FINAL REVIEW

1.8 Easement

This TGM Section was posted for public comment. Tyler Fortunati read the only public comment received by DEQ to the committee regarding the interchangeable references to parcel, lot, and property. The public comment requested that the guidance use a single definition of property throughout the document.

Tyler Fortunati informed the committee that the new changes presented in the document were developed by DEQ's Deputy Attorney General to address the public comment received on the easement guidance. Bob Erickson stated that he felt the changes were extensive enough that he felt the document should undergo another round of public comment prior to being finalized by the committee.

Motion: Bob Erickson moved that the TGC recommend to DEQ that Section 1.8 Easement undergo another public comment period as presented.

Second: Mike Reno.

Voice Vote: Motion carried unanimously.

See **Appendix C** and provide public comment to Tyler Fortunati at 208-373-0140 or by email at tyler.fortunati@deq.idaho.gov**.**

1.4.2.2 Extended Treatment Package System Approvals

This TGM Section was posted for public comment. There were no public comments received on this section.

Mike Reno inquired about DEQ's change in the BioMicrobics BioBarrier classification change from the general level the committee proposed back to provisional. Tyler Fortunati stated this change was presented to the committee as DEQ had discovered that there are only seven BioBarrier systems installed in the state at this time and that there are roughly 30 total data points obtained on these installations, several of which were obtained on a monthly basis after installation. Tyler Fortunati stated this was far less than the 30 systems for 3 years, or equivalent 90 data points described in the policy. Mike Reno stated that he felt this was equivalent to going back on a product approval that was provided to a manufacturer who has not had an issue with any of their systems remaining in compliance with Idaho's operation, maintenance, and monitoring requirements. Mike Reno stated that if the product approval went through as provisional the testing costs would change to the manufacturer which was not how the system was originally approved and felt this was an approval switch mid-course. Tyler Fortunati stated that DEQ felt the change was warranted as it followed the developed policy and its minimum data collection requirements. Mike Reno disagreed and stated that changing the manufacturer's approval of a functioning system that has not had any compliance issues was not warranted. Bob Erickson stated that he would like all systems to be treated the same. Joe Canning and Dale Peck agreed with Bob Erickson and Mike Reno. The committee discussed what equal treatment of existing approvals would mean.

The committee stated that they would like to see all of the manufacturer approvals for ETPS units that do not have a recent or historic issue of compliance with DEQ's mandated operation, maintenance, and monitoring requirements to be provided general approval. The committee would like existing manufacturer approvals for ETPS that are not installed in the state or that have a recent or historic issue of compliance with DEQ's mandated operation, maintenance, and monitoring requirements to be provided provisional approval. All new ETPS approvals moving forward would be subject to the ETPS approval policy as presented today.

Bob Erickson provided a few revisions due to grammar issues.

Motion: Dale Peck moved that the TGC recommend final approval to DEQ for Section 1.4.2.2 Extended Treatment Package System Approvals as revised.

Second: Jason Holm.

Voice Vote: Motion carried unanimously.

DEQ Decision: DEQ rejects the recommendation to provide general approval to the BioMicrobics BioBarrier. BioMicrobics will need to obtain the minimum 90 data points meeting the minimum performance criteria for the product prior to the BioBarrier product being moved to the general ETPS approval category. All other recommendations related to this section were approved.

Section will post to TGM as final. See DEQ website and **Appendix D.**

5.4 Extended Treatment Package Systems

This TGM Section was posted for public comment. There were no public comments received on this section.

Mike Reno stated that he would like to see the BioMicrobics BioBarrier product moved from the provisional category to the general category. Tyler Fortunati polled the committee and they were all in agreement with this change. Tyler Fortunati changed the BioBarrier product to general approval.

Bob Erickson questioned Ryan Spiers as to whether his company was mainly installing BioBarriers at this time. Ryan Spiers stated due to cost that the majority of BioMicrobics systems being installed are the MicroFast units.

Motion: Dale Peck moved that the TGC recommend final approval to DEQ for Section 5.4 Extended Treatment Package Systems as amended and with the understanding that the approval classifications of provisional and general does not occur until July 1, 2016.

Second: Mike Reno.

Voice Vote: Motion carried unanimously.

Section will post to TGM as final. See DEQ website and **Appendix E.**

5.13 Total Nitrogen Reduction Approvals

This TGM Section was posted for public comment. There were no public comments received on this section.

Tyler Fortunati presented the sand mound research data on the mound's ability to reduce total nitrogen as requested by the committee at the August meeting. Based on the information obtained Tyler Fortunati stated that he didn't see the need or the justification for adding the sand mound to the total nitrogen reduction approval list. The agreed with Tyler Fortunati's assessment.

The committee discussed whether there was a need to keep any systems not capable of obtaining total nitrogen reduction ≤ 27 mg/L on the total nitrogen approval list. Joe Canning stated that he thinks DEQ and the health districts will begin to see total nitrogen levels greater than 27 mg/L used in nutrient-pathogen evaluations by the consultants and developers based on the changes that the committee has been making in the subsurface program. Based on Joe Canning's input the committee decided to leave the product listings in the total nitrogen reduction approval list as is.

Motion: Bob Erickson moved that the TGC recommend final approval to DEQ for Section 5.13 Total Nitrogen Reduction Approvals as presented.

Second: Joe Canning.

Voice Vote: Motion carried unanimously.

Section will post to TGM as final. See DEQ website and **Appendix F.**

1.4.2.4 Proprietary Product Approval Policy

This TGM Section was posted for public comment. There were no public comments received on this section.

Tyler Fortunati stated that based on statements and information provided to him by the committee since the last meeting that he would like the committee to provide any lingering statements or hold any remaining discussion they felt needs to be held on this policy prior to any motions being made.

Mike Reno stated that he would like to see annual maintenance be required for all ETPS units. Mike Reno believes that the Orenco AdvanTex units need annual maintenance regardless of what the committee would like to classify them as. Mike Reno read a statement from the manufacturer developed operation and maintenance manual supporting his claim that annual operation and maintenance is necessary for the Orenco AdvanTex product. Mike Reno stated that in the proposal to the committee made by Allen Worst he provided three recommendations to meet his concerns. Mike Reno felt that a compromise on this is to require annual operation and maintenance on all recirculating gravel filters required to obtain a total nitrogen reduction level of 27 mg/L as required through a nutrient-pathogen evaluation. Mike Reno stated that he does not want to go back on the existing recirculating gravel filters that are installed under these requirements but that annual operation and maintenance should be required on all newly installed recirculating gravel filters required to obtain a total nitrogen reduction level of 27 mg/L as required through a nutrient-pathogen evaluation. Bob Erickson stated that he agreed with Mike Reno but thought it was clear where DEQ was willing to go on this issue. Joe Canning stated that he had concerns regarding impacts to the environment if there is no operation and maintenance requirement on the mechanical treatment systems.

Mike Reno stated that he feels if there is a total nitrogen requirement on a particular installation that environmental damage could occur if annual maintenance was not performed or required on that system. Mike Reno stated he wants to see required operation and maintenance on recirculating gravel filters required to achieve 27 mg/L total nitrogen and does not feel that this should be a problem with the service provider system being developed by DEQ. Joe Canning agreed with Mike Reno.

The committee held general discussion on how the system classifications and policies should change so that the proprietary wastewater treatment products did not overlap with the extended treatment package system approvals. Tyler Fortunati thought he could address this with some minor changes to the existing policy.

Joe Canning stated that part of the proposal provided by Allen Worst was to provide a level playing field between the engineered systems allowed through TGM guidance and his manufactured product. Joe Canning stated that as a member of the Technical Guidance Committee he wasn't concerned with a level playing field, his main concern is protection of the environment. Joe Canning also stated that he doesn't believe the current policy would level the playing field as is. Allen Worst disagreed with Joe Canning and stated that a property owner perceives both types of systems the same coming in but that they shy away from the ones that have state mandated operation, maintenance, and monitoring once they understand the requirements.

9:54 a.m. Break

10:15 a.m. Meeting Resumed

Tyler Fortunati presented the minor changes he made to the proposed policy at the request of the committee during the break. The change as proposed would allow the committee to review incoming products seeking approval as a proprietary wastewater treatment product on a case-by-case basis to determine if they fit the committee's perception of a proprietary product or another alternative system classification.

Motion: Bob Erickson moved that the TGC recommend final approval to DEQ for Section 1.4.2.4 Proprietary Wastewater Treatment Product Approval Policy as amended.

Second: Dale Peck.

Voice Vote: Motion carried unanimously.

Section will post to TGM as final. See DEQ website and **Appendix G.**

5.14 Proprietary Wastewater Treatment Products

This TGM Section was posted for public comment. There were no public comments received on this section.

Dale Peck and Mike Reno held a general discussion on how to move forward with this section based on the discussion held for the last guidance section reviewed and the committee's desired direction. Dale Peck stated he felt the table could move forward as presented if the committee simply removed the Orenco AdvanTex product from the table, thus removing their approval of this product as a proprietary wastewater treatment product. Tyler Fortunati stated that he would like to obtain a motion on removing the product to record the committee's official position.

Motion: Mike Reno moved that the TGC recommend removal of the Orenco AdvanTex product from the Proprietary Wastewater Treatment Product listing and additionally recommend that all newly permitted recirculating gravel filters required to achieve a total nitrogen reduction limit of 27 mg/L as part of a nutrient-pathogen evaluation be required to perform annual operation and maintenance upon implementation of the service provider model and the health districts will begin to write recirculating gravel filter permits impacted by this recommendation with these requirements to be effective July 1, 2017.

Second: Bob Erickson.

Voice Vote: Motion carried unanimously.

DEQ Decision: DEQ approves the recommendations made by the committee.

Tyler Fortunati removed the Orenco AdvanTex product from the Proprietary Wastewater Treatment Product list as requested by the committee.

Motion: Dale Peck moved that that the TGC recommend final approval of Section 5.14 Proprietary Wastewater Treatment Products.

Second: Mike Reno.

Voice Vote: Motion carried unanimously.

Section will post to TGM as final. See DEQ webpage and **Appendix H**.

NEW BUSINESS/DRAFT REVIEW

Proposal for Drip Distribution Guidance Amendment

Tyler Fortunati read a proposal submitted by Ryan Spiers for the committee's consideration. Mr. Spiers requests that the committee consider allowing drip distribution systems to be installed without the requirement for pre-treatment of the effluent by an extended treatment package system, recirculating gravel filter, or intermittent sand filter if site conditions would warrant the installation. Tyler Fortunati stated that based on a couple conferences he had attended drip distribution without pre-treatment was being allowed in different parts of the United States. Tyler Fortunati stated that there should be current research regarding this issue available for review. Tyler Fortunati also stated that due to pressurization requirements with or without pretreatment he didn't see the professional engineer requirement to change. Tyler Fortunati stated that he would like to obtain the committee's recommendation to research these types of changes prior to drafting any guidance.

The committee held general discussion on their current knowledge and desire to pursue information on drip distribution systems without pre-treatment. The committee agreed that they would like to see current research information on this proposal.

Action Item: Provide the committee with a summary of current research on drip distribution systems that do not require pre-treatment as part of the system's design.

See **Appendix I**.

Update on DEQ Service Provider Rule

Tyler Fortunati provided the committee an update on the current status of DEQ's rulemaking efforts related to a service provider based operation, maintenance, and monitoring system. Tyler Fortunati informed the committee that a negotiated rulemaking session was held on October 22, 2015 and that a public comment period was open through November 6, 2015. Tyler Fortunati informed the committee about the proposed rulemaking schedule and that the implementation date of the rule if successful would be July 1, 2017. Tyler Fortunati informed the committee that they could obtain updates on the rulemaking from the TGM webpage or directly from the negotiated rulemaking webpage for Docket No. 58-0103-1501 at http://www.deq.idaho.gov/laws-rules-etc/deq-rulemakings/docket-no-58-0103-1501/.

4.22.3.3 Intermittent Filter Dosing

Tyler Fortunati explained that the filter dosing rate for intermittent sand filters needed to be adjusted from 4% of the daily design flow to 5% so that the pump could keep up with the system's wastewater demand.

Motion: Joe Canning moved that the TGC recommend preliminary approval to DEQ for section 4.22.3.3 Intermittent Filter Dosing as proposed.

Second: Jason Holm.

Voice Vote: Motion carried unanimously.

See **Appendix J** and provide public comment to Tyler Fortunati at 208-373-0140 or by email at tyler.fortunati@deq.idaho.gov.

4.21 Recirculating Gravel Filter

Tyler Fortunati presented a revision to the recirculating gravel filter system design that required effluent return from the filter to an equalization tank that also receives clarified effluent from a septic tank as requested by the committee at the July meeting. A new flow splitting device was also added to the design guidance.

Joe Canning had questions on the flow splitting and effluent return. Tyler Fortunati stated that the ratios included in the guidance were based on the requirements used by other states and EPA design guidance. Tyler Fortunati also stated that the flow splitting for effluent return was to be determined by the design engineer.

Dale Peck inquired as to what the benefit of the effluent return to a recirculation tank was. Tyler Fortunati stated that it is used in design guidance and other state requirements to achieve better nitrogen reduction based on the additional mixing of aerobic effluent and anaerobic effluent in the equalization tank which aids in the nitrification/denitrification cycle. Dale Peck requested that there be two design options for the recirculating gravel filter that include a design with, and without the effluent return to an equalization tank. The design option without the equalization tank can be used for all recirculating gravel filter designs that don’t require total nitrogen reduction and are used for ground water or soil conditions. The design option with the equalization tank should be required for all recirculating gravel filters that are required to obtain total nitrogen reduction. The committee agreed with Dale.

Action Item: Amend guidance to allow two different recirculating gravel filter design options, one with and one without an equalization tank and additional effluent return, based on the system’s treatment needs.

Motion: Mike Reno moved to table Section 4.21 Recirculating Gravel Filter and to bring back the guidance with the committee’s recommended changes at the next meeting.

Second: Joe Canning.

Voice Vote: Motion carried unanimously.

See **Appendix K**.

4.27 Subsurface Flow Constructed Wetland

Bob Erickson showed the committee pictures of subsurface flow wetlands that were installed in Blaine County around 2007/2008. Bob Erickson stated that the initial plan was that the systems would be installed and that DEQ would be providing money to test the effluent from the systems to determine their treatment capability but the testing plan fell apart when the economy turned and government money was no longer available. Bob Erickson stated the systems are still installed and functioning today.

The committee inquired about the design guidance that DEQ was presenting and where the requirements came from. Tyler Fortunati stated the draft guidance was developed based on EPA guidance and guidance from other states that is currently in place. Dale Peck inquired as to whether the systems would function in cold weather and if precipitation would impact them. Tyler Fortunati stated that the design guidance from other states came from Ohio, Iowa, and Indiana and the systems functioned year-round there. Bob Erickson also stated that the article he provided to DEQ to begin the conversation on submerged wetlands came from installations in Colorado that were installed at elevations of 9,000+ feet and those systems were also functioning. Tyler Fortunati also stated that based on the footprint and retention time of the system precipitation should not be an issue.

Action Item: Move the arrow in Figure 4-46 identifying the liner location.

Motion: Mike Reno moved that the TGC recommend preliminary approval to DEQ for section 4.27 Subsurface Flow Constructed Wetland as proposed.

Second: Joe Canning.

Voice Vote: Motion carried unanimously.

See **Appendix L** and provide public comment to Tyler Fortunati at 208-373-0140 or by email at tyler.fortunati@deq.idaho.gov.

11:45 a.m. Lunch

1:26 p.m. Meeting Resumed

Committee Review of the Presby Environmental, Inc. Advanced Enviro-Septic Treatment System

Tyler Fortunati discussed with the committee that several documents were submitted by Presby Environmental, Inc. in support of their Advanced Enviro-Septic Treatment System. Tyler Fortunati stated that the most relevant document provided by Presby was the Idaho Design and Installation Manual that they developed which will be specific to their product in Idaho and contain all the information on sizing and installation requirements that they are proposing. The design manual applies to their advanced enviro-septic, enviro-septic, and simple-septic products.

Tyler Fortunati reviewed several issues with the committee and Presby representatives that he saw in the design manual that conflicted with Idaho's subsurface rules or other alternative system design allowances. The committee questioned why the three different products would warrant the same installation allowances in regards to separation distances and sizing. Christina Connor-Cerezo stated that NSF Standard 40 was passed using the simple-septic product and through engineering review the NSF Standard 40 approval was provided to the other two products as well due to the increase in treatment area provided by the other two products. Christina Connor-Cerezo stated that New Hampshire was the only state requiring different separation distances to their three products. Tyler Fortunati stated he would contact New Hampshire to discuss why they have these requirements and their experience with the product.

Mike Reno stated that he wants to see the system sized similar to the intermittent sand filter and recirculating gravel filter for drainfield application rates. The committee agreed that the sand footprint of the Presby system would need to meet the total disposal area required based on the design flow and increased application rates allowed for the intermittent sand filter and recirculating gravel filter. The committee also stated that based on the issues with the Idaho Design and Installation Manual brought up by Tyler Fortunati and the committee that they did not feel approval was possible at this time. Tyler Fortunati stated that he would draft a revision letter for Presby Environmental, Inc. to address and request the resubmit the manual for the committee's review.

Motion: Joe Canning moved that the committee table the Presby Environmental, Inc. product review and that DEQ provide Presby Environmental, Inc. the necessary revisions to the Idaho Design and Installation Manual.

Second: Mike Reno.

Voice Vote: Motion carried unanimously.

NEXT MEETING:

The next committee meeting is scheduled to be on February 4, 2016 at the Idaho Department of Environmental Quality's state office.

Motion: Mike Reno moved to adjourn the meeting.

Second: Joe Canning.

Voice Vote: Motion carried unanimously.

The meeting adjourned at 3:06 p.m.

TGC Parking Lot.
This is a running list of issues requested to be prepared and presented at a future TGC meeting.

- Provide the committee with a summary of current research on drip distribution systems that do not require pre-treatment as part of the system's design.
- Amend the recirculating gravel filter guidance to allow two different recirculating gravel filter design options, one with and one without an equalization tank and additional effluent return, based on the system's treatment needs.

Appendix B

1.8 Easement

Revision: ~~March 20~~February 4, ~~2015~~2016

The “Individual/Subsurface Sewage Disposal Rules” (IDAPA 58.01.03) provide that every owner of real property is responsible for storing, treating, and disposing of wastewater generated on that property. This responsibility includes obtaining necessary permits and approvals for installing an individual or subsurface sewage disposal system. Often the storage, treatment and disposal of wastewater remain solely on the real property from which it was generated. However, sometimes other real property is needed for the storage, treatment or disposal of that wastewater. When that is the case, an easement is required as part of the permit application. The real property from which the wastewater is generated is known as the dominant estate because it is entitled to the benefit of the easement. The other real property needed for storage, treatment or disposal is known as the servient estate. The servient estate is the real property subject to the easement. Therefore, a real property owner wishing to install an individual or subsurface sewage disposal system must obtain a permit under IDAPA 58.01.03 and any other necessary approval for installing the system, including any authorization needed to install the system on ~~an~~other real property that does not contain the wastewater-generating structure. The owner of the dominant estate may also own the servient estate, or the servient estate may be owned by another individual. ~~This property may be owned by the same individual who owns the parcel with the wastewater-generating structure or another individual.~~ Consistent with this requirement, IDAPA 58.01.03.005.04.l requires a permit applicant to include in the application copies of legal documents relating to access to the system.

This section provides guidance regarding the circumstances under which the health district should permit a system when there is both a dominant estate and a servient estate ~~to be located on another property that does not contain the wastewater-generating structure~~ and the legal documents that must be included in or with an application for such a system.

1. The health district will consider allowing an owner to install a subsurface sewage disposal system on other property~~the installation of a subsurface sewage disposal system on another property (e.g., lot or parcel)~~. However, this option should be considered ~~a last resort for use~~ only when other practical solutions for subsurface sewage disposal are not available on the ~~applicant’s property~~property where the wastewater is generated. In addition, the entire site (i.e., the area for both the primary and replacement drainfield) on the ~~other~~ servient estate ~~property~~ must be reviewed by the health district, and the site must meet all requirements of IDAPA 58.01.03.
2. The placement of an individual subsurface sewage disposal system on ~~another~~ other property requires that an easement be in place before subsurface sewage disposal permit issuance. Easements are required anytime a subsurface sewage disposal system is proposed on another property regardless of property ownership. With one exception, e~~E~~asements must be obtained for ~~each~~ any real property~~, other than the wastewater-generating parcel that the application is submitted for, that~~ upon which any portion of the subsurface sewage disposal system is proposed to be installed~~ upon~~. Easements are not necessary for any portion of the system located on the ~~wastewater-generating parcel~~ dominant estate ~~that~~ for which the application is submitted~~ for~~. It is the applicant’s responsibility to include an easement that is prepared by an attorney and:

a. Contains a sufficient description of the easement area and of the dominant estate ~~property to be benefited by the easement~~ (the real property of the applicant where wastewater is generated).

b. Contains language ensuring that the ~~other property~~servient estate can be used for the system, and that the applicant or a subsequent purchaser of the ~~applicant's property~~dominant estate has access to make repairs or perform routine maintenance until the system is abandoned. The language must ensure such use and access even when the ~~applicant's property or the other property~~dominant or servient estate is sold or otherwise transferred.

c. Contains language that restricts the use of the easement area in a manner that may have an adverse effect on the system functioning properly.

d. Is surveyed, including monumenting the corners of the entire easement area, to supply an accurate legal description of the easement area for both the primary and replacement drainfield areas and enable the health district to properly evaluate the site. The survey and monumenting of the easement area must be performed by an Idaho licensed professional land surveyor.

3. The applicant is responsible for ensuring that a legally sufficient document is prepared to establish the necessary easement ~~for the subsurface sewage disposal system located on another property~~. The applicant must submit the easement to the health district with the permit application~~This document must be submitted to the health district with the permit application~~. ~~The health district must ensure that an easement document is included in the application.~~ However, the health district does not have the expertise, nor is it the duty of the health district, to determine the legal adequacy of the easement document, and the issuance of a permit does not in any way represent or warrant that an easement has been properly created. To issue a permit that includes a ~~system on another property~~servient estate, the health district ~~must ensure that~~evaluates whether the easement document included with the application:

a. Has been prepared by an attorney.

b. Includes a survey that was prepared and monumented by an Idaho licensed professional land surveyor.

~~b~~c. Has been recorded in the county with jurisdiction. Evidence that the document has been recorded must be provided to the health district.

If the easement document meets the ~~two~~ criteria described in 3.a-3.c ~~above~~, the health district may issue a permit. It is not the health district's responsibility to ensure the easement document meets the requirements in item 2 above. The applicant and the applicant's attorney are responsible for ensuring that the easement is legally sufficient and will meet the requirements in item 2 above.

Easement Restrictions

1. If easements for drainfields under separate ownership result in more than 2,500 GPD of effluent being disposed of on the same property, the drainfields must be designed as a large soil absorption system and undergo a nutrient-pathogen (NP) evaluation.
2. Easement boundaries that are not adjacent to the ~~permit applicant's/grantee's~~dominant estate's property line must meet the separation distance of 5 feet between the drainfield and/or septic tank and the easement boundary.

Appendix C

4.22.3.2 Intermittent Filter Dosing

1. Timed dosing is required, and the filter dosing cycle should meet the following minimum recommendations:
   a. Pumps are set to dose each cell once per hour.
   b. Dose volume delivered to the filter surface for each cycle should be 45% of the daily design flow.
   c. A pump on override float should be set at a point that equates to 70% of the dosing chamber's volume.
   d. A high-level audio and visual alarm float should be set at 90% of the dosing chamber's volume.
   e. A low-level off float should be placed to ensure that the pump remains fully submerged at all times.
2. The pump controls should meet the following:
   a. Be capable of monitoring low- and high-level events so that timer settings can be adjusted accordingly.
   b. Have event counters and run-time meters to be able to monitor daily flows.

Appendix D

* This system will be added to the engineered list in section 4.1.

4.27 Subsurface Flow Constructed Wetland

Revision: February 4, 2016

4.27.1 Description

Subsurface flow constructed wetlands are secondary wastewater treatment systems that receive and treat wastewater that has undergone primary treatment in a septic tank. Wastewater flows through a lined constructed wetland cell filled with porous media in which climate and anaerobic, water-tolerant vegetation is planted. The vegetation provides up-take of the wastewater in addition to a surface for microorganisms to grow that aid in wastewater treatment. Wastewater exits the horizontal constructed wetland cell and proceeds to a watertight overflow basin which then either discharges to another constructed wetland cell in series with the first or to a subsurface sewage disposal drainfield. Figure 4-46 provides a diagram of a subsurface flow constructed wetland.

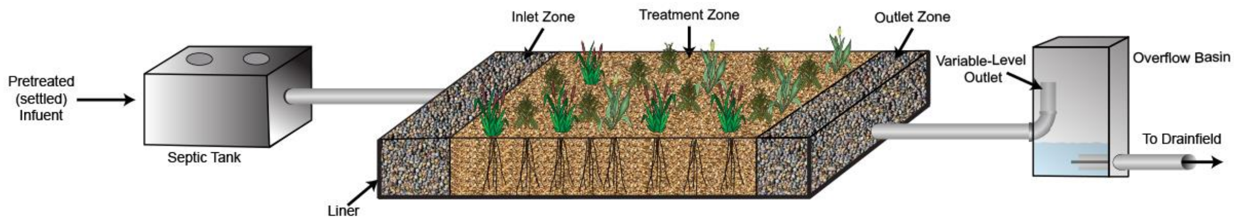


Figure 4-46. Cross-sectional view of a subsurface flow constructed wetland.

4.27.2 Approval Conditions

1. The system must be designed by a PE licensed in Idaho.
2. Wastewater must remain below the ground surface in the constructed wetland.
3. Nondomestic wastewater must be pretreated to residential strength before discharge to the constructed wetland.
4. Effluent shall not discharge to the drainfield without passing through the constructed wetland first.
5. The bottom of the constructed wetland must not come within 12 inches of seasonal high ground water.
6. The constructed wetland shall meet the same separation distance requirements as a septic tank.
7. The design engineer shall provide an O&M manual for the system to the health district before permit issuance.
8. All pressure distribution components shall be designed according to the pressure distribution system guidance (section 4.19).

4.27.3 Design Requirements

Minimum design requirements for the subsurface flow constructed wetland are provided below.

4.27.3.1 Septic Tank

1. The septic tank shall be sized according to the requirements of IDAPA 58.01.03.007.07.
2. The septic tank shall have an approved effluent filter (section 5.9) installed at the outlet.
3. The outlet manhole shall be brought to grade utilizing a riser and secured lid to provide maintenance access to the effluent filter.

4.27.3.2 Effluent Transport to the Subsurface Flow Constructed Wetland

1. Gravity flow is the preferred method to transport wastewater from the septic tank to the subsurface flow constructed wetland.
2. If gravity flow is not possible a dosing chamber may be installed meeting the requirements of section 4.19.3.4 and the effluent shall break to gravity following the requirements of section 4.19.3.6 prior to entering the subsurface flow constructed wetland.
3. If the installation of a pump to gravity distribution component is necessary the drop box shall be accessible from grade for maintenance purposes.
4. Pressurized doses should have a small volume so the subsurface flow constructed wetland does not receive large surge flows.

4.27.3.3 Subsurface Flow Constructed Wetland

1. The subsurface flow constructed wetland container shall be constructed of reinforced concrete or other materials where equivalent function, workmanship, watertightness, and at least a 20-year service life can be documented, or
2. The subsurface flow constructed wetland container shall be constructed of a flexible membrane liner meeting the following requirements:
   a. Have properties equivalent to or greater than 30-mil PVC and be compatible with wastewater.
   b. Have field repair instructions and materials provided to the purchaser of the liner.
   c. Have factory fabricated boots for waterproof field bonding of piping to the liner.
   d. Liner must be placed against smooth, regular surfaces free of sharp edges, nails, wire, splinters, or other objects that may puncture the liner. A 4-inch layer of clean sand should provide liner protection.
3. The subsurface flow constructed wetland shall have a berm that is at least 1 foot above the surface of the planting media with sides that are as steep as possible, consistent with the soils, construction methods and materials.
4. Filter construction media shall meet the following specifications:
   a. Section 3.2.8.1.3 for planting media (pea gravel)
   b. Section 3.2.8.1.1 for inlet and outlet zone media (drainrock)
   c. Treatment zone media shall have an average diameter between 3/4 inch to 1 inch and be free of fines.
5. The surface of the subsurface flow constructed wetland shall be level.

6. The bottom of the subsurface flow constructed wetland shall maintain a uniform slope from the inlet to the outlet of 1/2% to 1% to maintain flow conditions and allow for complete drainage.
7. Minimum filter construction specifications shall also meet the dimensions, ratios, and locations depicted in Figure 4-47.
8. The inlet and outlet zones should be designed to prevent accidental contact with effluent from the surface including:
   a. Chain-link fence or another acceptable protective barrier shall be placed below the planting media and at the top of the inlet/outlet media and cover the entire surface of the inlet and outlet areas to prevent access, unless fencing is placed around the entire system to prevent access.
   b. Geotextile fabric shall be placed over the ~~access barrier~~ entire wetland surface.

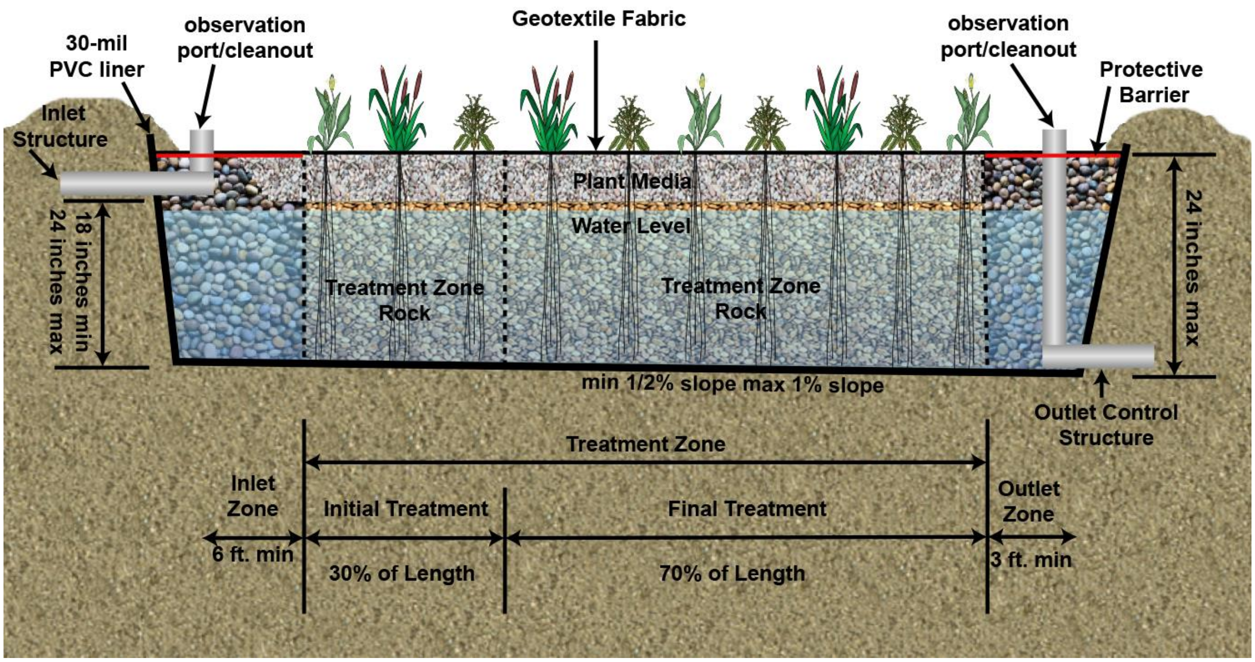


Figure 4-47. Cross sectional view of a constructed wetland cell.

4.27.3.4 Subsurface Flow Constructed Wetland Sizing

Sizing of a subsurface flow constructed wetland must take into account the loading of BOD and TSS from the wastewater. In addition the treatment zone of the subsurface flow constructed wetland should be capable of maintaining a hydraulic retention time of at least 2 days. Use Table 4-31 with the information provided in this subsection to size the wetland correctly.

1. Determine the minimum treatment zone surface area for both pollutants (BOD and TSS) and utilize the largest area.

   (a) BOD surface area: $A_{SB} = (Q)(B)/(53.5 \text{ lb/acre/day})$

   (b) TSS surface area: $A_{ST} = (Q)(T)/(44.5 \text{ lb/acre/day})$

   Equation 4-17. BOD and TSS surface area in square feet.

   Where:

A_{SB} and A_{ST} = total surface area of the treatment zone in square feet (ft^2) for BOD (A_{SB}) and TSS (A_{ST}).

Q = total daily design flow in gallons per day (gal/day).

B = 0.0018 lb/gal (constant value for the maximum BOD discharged to the system per gallon).

T = 0.00071 lb/gal (constant value for the maximum TSS discharged to the system per gallon).

Example:

A_{SB} = (250 GPD)(0.0018 lb/gal)/(53.5 lb/acre/day) = 0.0084 acres

(0.0084 acres)(43560 ft^2/acre) = 366 ft^2

A_{ST} = (250 GPD)(0.00071 lb/gal)/(44.5 lb/acre/day) = 0.004 acres

(0.004 acres)(43560 ft^2/acre) = 175 ft^2

Use A_{SB} = 366 ft^2

2. Apply a 25% safety factor to the required size of the treatment zone.

   Example:

   (366 ft^2)(1.25) = 458 ft^2

3. Determine the size of the initial treatment zone and final treatment zone within the total treatment zone using the following requirements:

   a. Initial treatment zone = 30% of the overall treatment zone area

      Example:

      A_{IT} = 0.3(458 ft^2) = 138 ft^2

   b. Final treatment zone = 70% of the overall treatment zone area

      Example:

      A_{FT} = 0.7(458 ft^2) = 321 ft^2

4. The hydraulic conductivity (K) of clean treatment zone media meeting the sizing requirements in section 4.XX.3.3(4) is 30,500 ft/day. Due to filtration and settling of materials the hydraulic conductivity of the treatment zone is:

   a. Initial treatment zone is 1% of the clean K, or 305 ft/day.

   b. Final treatment zone is 10% of clean K, or 3,050 ft/day.

5. Determine the minimum width based on the hydraulic loading rates that will maintain all flow below the surface of the submerged flow constructed wetland using Darcy's Law. The largest width should be used for the overall system design.

   $Q = KWD_W(d_h/L)$

   Equation 4-18 Darcy's Law

   Where:

   L = length of treatment zone = area/width; therefore:

   $W^2 = (QA_{si})/(KD_w d_h)$

Where:

A_{si} = Surface area of the treatment zone (ft^2)

D_w = Depth of water (ft)

W = Width of cell (ft)

Q = Flow into cell (ft^3/day) (1 ft^3 = 7.48052 gal)

K = Hydraulic conductivity (ft/day)

d_h = Maximum permissible headloss (ft) (assume = 50% of difference between depth of media and depth of water)

Example:

Initial Treatment Zone = W^2 = [(33.42)(458 ft^2)]/[(305 ft/day)(1.33 ft)(0.167 ft)] = (15306.36 ft^2)/(67.74 ft) = 226 ft →(√226) = 15 ft

Final Treatment Zone = W^2 = [(33.42)(458 ft^2)]/[(3050 ft/day)(1.33 ft)(0.167 ft)] = (15306.36 ft^2)/(677.4 ft) = 22.6 ft →(√22.6) = 4.8 ft

Use 15 ft. for both treatment zone widths.

6. Determine the maximum length of each treatment zone by dividing the required treatment area by the width.

$L_{IT} = (0.3A_T)/W$

Equation 4-19. Initial Treatment Zone Length

Where:

L_{IT} = Total length of the initial treatment zone

A_T = Total required treatment area

W = Width (determined in step 5)

0.3 = Constant described in step 3

Example:

L_{IT} = [(0.3)(458 ft^2)/(15 ft) = 9.2 ft. → use 10 ft.

$L_{FT} = (0.7A_T)/W$

Equation 4-20. Final Treatment Zone Length

Where:

L_{FT} = Total length of the final treatment zone

A_T = Total required treatment area

W = Width (determined in step 5)

0.7 = Constant described in step 3

Example:

L_{IT} = [(0.7)(458 ft^2)/(15 ft) = 21.4 ft. → use 22 ft.

7. Verify that the total treatment zone has a hydraulic retention time of at least 2 days assuming a porosity of the treatment media of 30% and that the length to width ratio of

the submerged flow constructed wetland (inlet zone, total treatment zone, and outlet zone) is 3:1 or less. If the hydraulic retention time and/or the length to width ratio of the system do not meet the requirements above adjust the system dimensions to meet the requirements while maintaining the minimum treatment area and minimum width required.

$HRT = (L_{TZ} W_{TZ}(1.33)(0.3))/Q$

Equation 4-21. Hydraulic Retention Time

Where:

HRT = Hydraulic retention time

L_{TZ} = Length of the total treatment zone

W_{TZ} = Width of the treatment zone

1.33 = Depth of the water level within the submerged flow constructed wetland at normal operating level

0.3 = Porosity of the treatment zone media

7.48052 = Gallons per cubic foot

Q = Total daily design flow

Example:

$HRT = [(41\ ft)(15\ ft)(1.33\ ft)(0.3)(7.48052\ gal/ft^3)]/(250\ GPD) = (1835.6\ gal)/(250\ GPD) = 7.34\ days$

$L:W = (L_{TZ}+L_{IZ}+L_{OZ})/W_{TZ}$

Equation 4-22. Length to Width Ratio of the Subsurface Flow Constructed Wetland

Where:

$L:W$ = Length to width ratio

L_{TZ} = Length of the treatment zone

L_{IZ} = Length of the inlet zone

L_{OZ} = Length of the outlet zone

W_{TZ} = Width of the treatment zone

Example:

$L:W = (32\ ft+6\ ft+3\ ft)/15\ ft = 41\ ft/15\ ft = 2.73/1$

Table 4-31. Subsurface flow constructed wetland sizing checklist.

	Treatment Zone Surface Area	
1	Determine daily design flow (Q)	Q = ________ GPD
2	Determine the treatment zone surface area based on BOD and TSS A_{SB} = *[(Q)(0.0018 lb/gal)]/(53.5 lb/acre/day); and* A_{ST} = *[(Q)(0.00071 lb/gal)]/(44.5 lb/acre/day)* *Convert acreage to square feet and add safety factor using* *[(Acres)(43560 ft^2/acre)(1.25)] = ft^2*	A_{SB} = ________ ft^2 A_{ST} = ________ ft^2 *Use largest value (A)*
	Initial Treatment Zone and Final Treatment Zone	
3	Determine the size of the initial treatment zone A_{IT} = 0.3 (A)	Initial Treatment Zone = ________ ft^2 (B)
4	Determine the size of the final treatment zone A_{FT} = 0.7(A)	Final Treatment Zone = ________ ft^2 (C)
5	Determine the minimum width of the treatment zones $W^2 = (QA_{si})/(KD_w d_h)$ Round up to nearest foot	Initial Treatment Zone Width = ________ ft Final Treatment Zone Width = ________ ft *Use largest value (D)*
6	Determine the maximum length of the initial treatment zone L_{IT} = (B)/(D) Round up to nearest foot	Maximum Length of the Initial Treatment Zone Length = ________ ft (E)
7	Determine the maximum length of the final treatment zone L_{FT} = (C)/(D) Round up to nearest foot	Maximum Length of the Final Treatment Zone Length = ________ ft (F)
	Retention Time	
8	Verify the total treatment zone has a hydraulic retention time of at least 2 days HRT = $(L_{TZ}W_{TZ}(1.33)(0.3))/Q$	Hydraulic Retention Time = ________ days
	Length to Width Ratio	
9	Verify that the length to width ratio of the wetland is 3:1 or less L:W = $((E+F)+L_{IZ}+L_{OZ})/D$	Length to Width Ratio = ________

Notes: gallons per day (GPD); pounds per gallon (lb/gal); pounds per acre per day (lb/acre/day); square feet per acre (ft^2/acre); square feet (ft^2); feet (ft)

4.27.3.5 Subsurface Flow Constructed Wetland Cells

1. Subsurface flow constructed wetlands may be divided into multiple cells in series to maintain length to width ratios (Figure 4.48).
2. Subsurface flow wetlands shall be divided into multiple parallel trains that contain one or more cells as described in Table 4-31.
3. For wetlands with daily design flows of 2,500 gallons per day or more piping shall be included in the design that allows each cell to be taken off line and bypassed for maintenance and repair needs.
4. Daily flows must be divided equally among each train.
5. Each subsurface flow constructed wetland cell shall contain its own watertight overflow basin described in section 4.27.3.6.

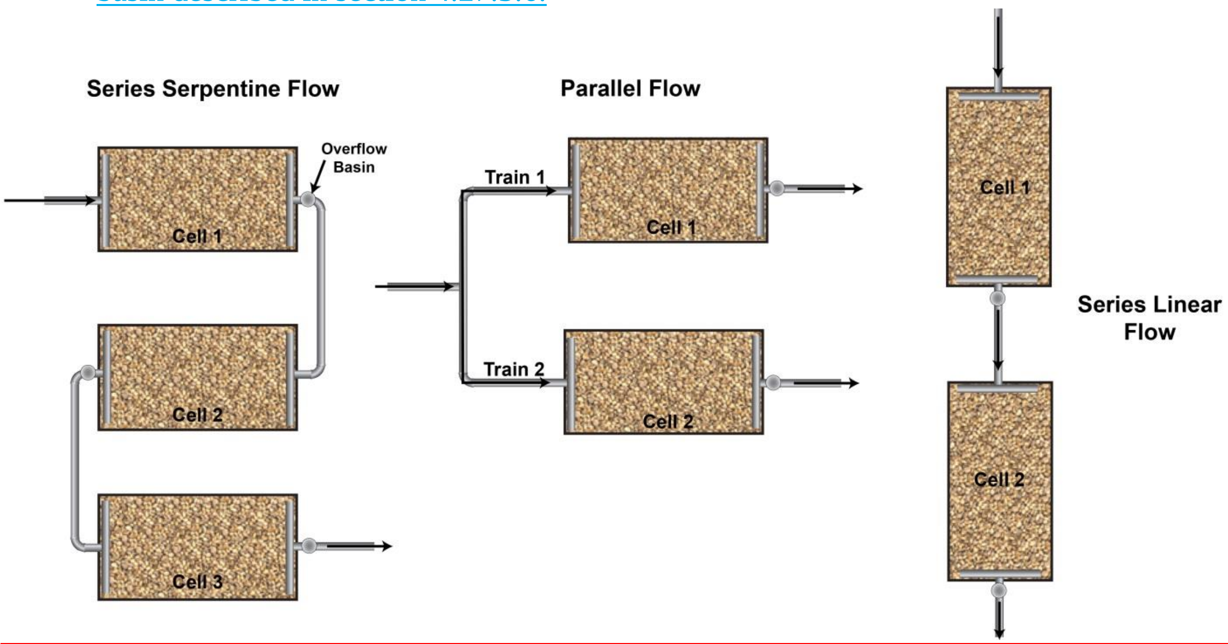


Figure 4-48. Configuration of wetland cells in series and parallel.

Table 4-31. Required subsurface flow constructed wetland trains and cells based on daily design flow.

Daily Design Flow (GPD)	Minimum Number of Trains	Minimum Number of Cells per Train	Minimum Number of Cells
< 2,500	1	1	1
2,500-4,999	2	2	4
≥5,000	4	2	8

Note: GPD – gallons per day

4.27.3.6 Inlet and Outlet Structures in the Subsurface Flow Constructed Wetland

1. The inlet control structure should uniformly distribute the inflow across the entire width of the constructed wetland (Figure 4.49).
2. The inlet and outlet piping and control structures shall have a minimum diameter of 4 inches.
3. The inlet and outlet control structures shall have cleanouts that are accessible from grade.

4. The inlet control structure shall be located at the top of the drainrock in the inlet zone, be located as close to the inlet wall of the wetland as possible, and be level across its entire length.
5. Orifices on the inlet and outlet control structures should be evenly spaced with a maximum distance between orifices equal to 10% of the wetland width.
6. The outlet control structure should uniformly collect wastewater effluent across the entire width of the wetland.
7. The outlet control structure shall be located at the bottom of the drainrock in the outlet zone, be located as close to the outlet wall of the wetland as possible, and be level across its entire length.
8. The outlet control structure shall discharge to a watertight overflow basin located outside of the constructed wetland.
9. The watertight overflow basin (Figure 4.50) shall:
    a. Have a minimum diameter of 20 inches and be accessible from grade.
    b. Contain a water level control device that allow the operator to flood the constructed wetland to a point that is level with the surface of the planting media, completely drain the constructed wetland, and maintain the water level within the constructed wetland anywhere in between these two points and maintain a 2 day hydraulic retention time. *Note: Normal operating level is located 4 inches below the surface of the treatment media.*
    c. Gravity flow to the drainfield. If gravity flow is not achievable and/or pressurization of the drainfield or transport piping is necessary then the watertight basin must be an approved dosing chamber or septic tank that meets the requirements of section 4.19.3.4.

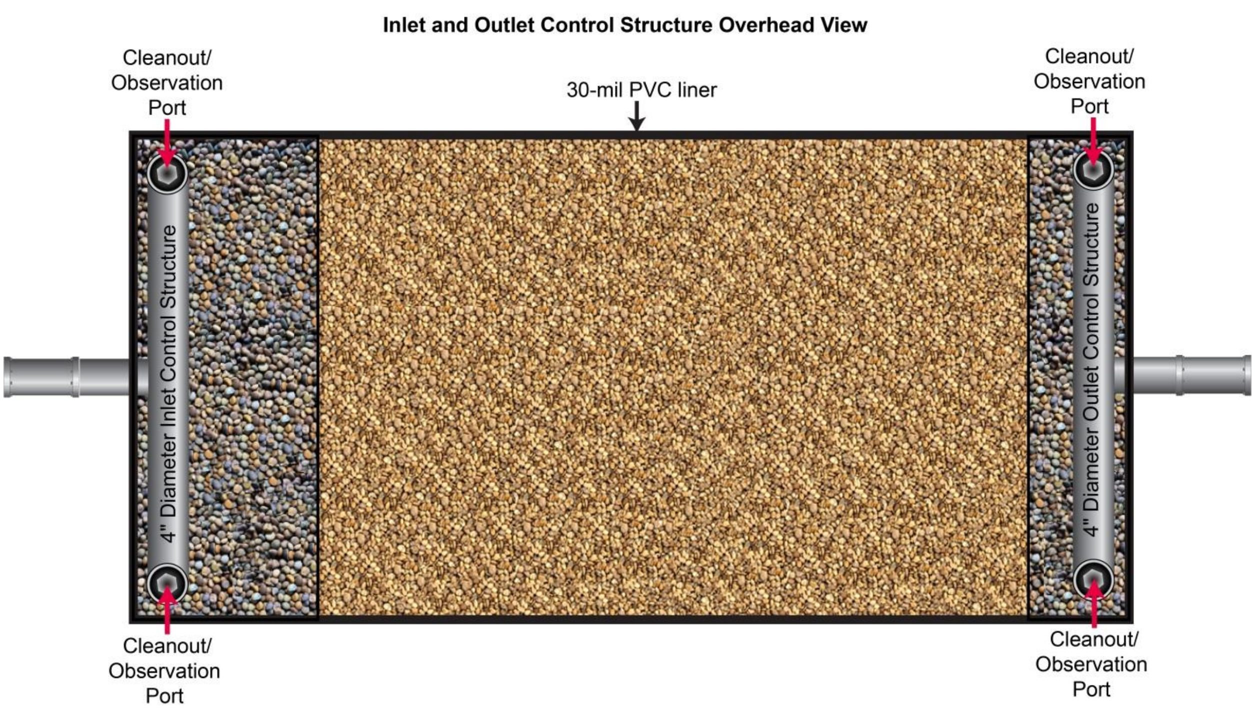


Figure 4.49. Overhead view of a wetland showing the inlet and outlet control structures in relation to the wetland width.

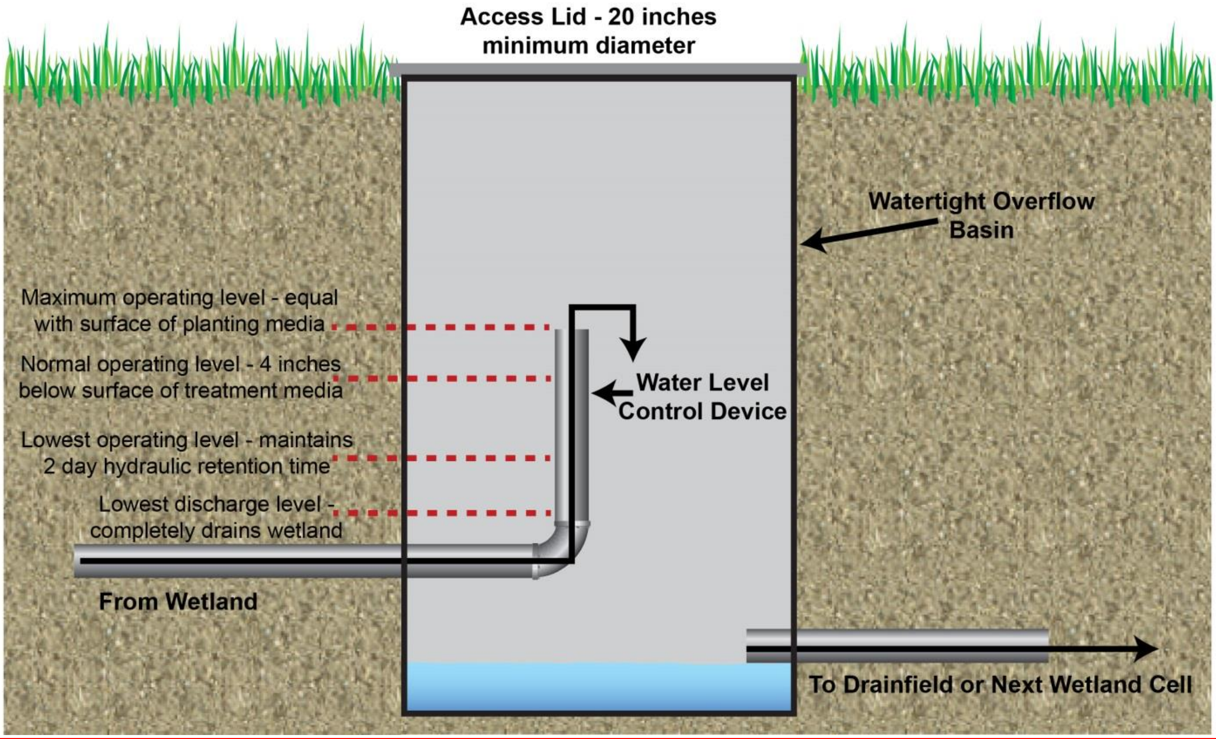


Figure 4.50. Cross-sectional view of an overflow basin.

4.27.3.7 Subsurface Flow Constructed Wetlands Vegetation

1. Planting densities shall be 1 ft. to 2 ft. on center in staggered rows throughout the treatment zone of the wetland (Figure 4.51).
2. Vegetation should not be established within the inlet and outlet zones of the wetland.
3. Vegetation shall not be established from seed.
4. Plant species should:
   a. Be capable of producing root depths that will extend to the bottom of the wetland (20 in.)
   b. Be tolerant of local climates and continuous submersion of their roots in anaerobic water
   c. Not be considered noxious or invasive plants
   d. Not be flowering or soft tissue plants that decompose rapidly
   e. Not be emergent woody plants or riparian trees and shrubs
   f. Not be submerged or floating aquatic plants
   g. Recommended species include, but are not limited to:
      i. Alkali bulrush (*Schoenoplectus maritimus*)
      ii. Baltic rush (*Juncus balticus*)
      iii. Broadleaf cattail (*Typha latifolia*)
      iv. Creeping spikerush (*Eleocharis palustris*)
      v. Hardstem bulrush (*Schoenoplectus acutus*)

vi. Nebraska sedge (*Carex nebrascensis*)

5. Plants should be allowed to be established prior to discharging wastewater to the wetland for a period up to 6 weeks. This is done by raising the water level in the wetland to the top of the planting media. After rooting establishment the water level in the wetland should be lowered to the normal operating depth of 4 inches below the treatment media surface.

6. To promote plant growth and enhance root development it is beneficial to lower the water level within the wetland on an annual basis from the normal operating level to a level that is equivalent to a 2 day hydraulic retention time within the treatment zone. The water level should be lowered and raised back to a normal operational level over a several week period.

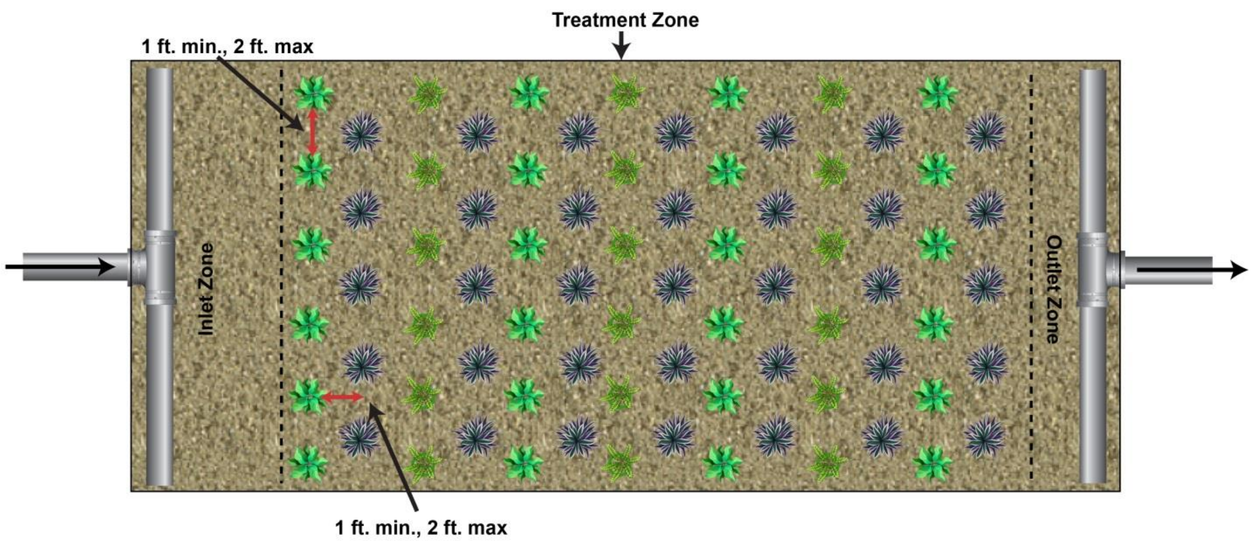


Figure 4.51. Vegetation and planting spacing throughout the wetland treatment zone.

4.27.3.8 Subsurface Flow Constructed Wetlands Temperature Protection

1. Temperature protection of the subsurface flow constructed wetlands and its components should be taken into consideration by the design engineer.
2. Several inches (≥ 6 inches) of insulating mulch or peat should be placed on a layer of geotextile fabric that covers the surface of the planting media.
3. Plants should not be cut back prior to the non-growing season.

4.27.4 Submerged Flow Constructed Wetlands Construction

1. All vegetation in the placement area of the wetlands should be cleared and grubbed to remove large roots and stumps. Large rocks should also be removed.
2. All soil used in constructing the wetland bottom and berm shall be compacted to at least 95% standard Proctor density.
3. When grading and constructing a wetland cell care must be exercised so as not to create low spots or preferred flows down a particular side of the wetland that will encourage short circuiting.
4. After grading and compaction construction equipment should not enter the constructed wetland cell.

5. If used, the flexible liner containment system shall be constructed on top of a protective layer of sand. The protective layer of sand shall consist of a 4 inch layer of clean sand placed, graded, and compacted to match the wetland slope requirements on the compacted native grade.
   a. The liner should be installed according to the manufacturer's recommendations and extend to a height of 12 inches above the treatment media and be located within the containment berm at all locations above the planting media.
   b. It is recommended that a geotextile fabric with a weight of 4 ounces be placed over the liner prior to placing media in the constructed cell.
6. All media should be washed on site prior to placement in the constructed cell.

4.27.5 Drainfield Trenches

1. Distances shown in Table 4-32 must be maintained between the trench bottom and limiting layer.
2. Capping fill may be used to obtain adequate separation distance from limiting layers but must be designed and constructed according to the guidance for capping fill trenches in section 4.3.
3. Pressure distribution may be used with the following design considerations:
   a. The pressure distribution system related to the drainfield is designed according to section 4.19.
   b. The dosing chamber for the drainfield trenches may be substituted for the overflow basin from the constructed wetland cell.
4. The drainfield shall be sized by dividing the maximum daily flow by the hydraulic application rate for the applicable soil design subgroup listed in Table 4-33.

Table 4-32. Submerged flow constructed wetland vertical separation distance to limiting layers (feet).

Limiting Layer	Flow < 2,500 GPD	Flow ≥ 2,500 GPD
	All Soil Types	All Soil Types
Impermeable layer	2	4
Fractured rock or very porous layer	1	2
Normal high ground water	1	2
Seasonal high ground water	1	2

Note: gallons per day (GPD)

Table 4-33. Secondary biological treatment system hydraulic application rates.

Soil Design Subgroup	Application Rate (gallons/square foot/day)
A-1	1.7
A-2a	1.2
A-2b	1.0
B-1	0.8
B-2	0.6
C-1	0.4
C-2	0.3

4.27.6 Inspection

1. A preconstruction meeting between the health district, responsible charge engineer, and installer should occur before commencing any construction activities.
2. The site must be inspected when the wetland cell has been excavated and formed, and prior to installation of the containment structure. Compaction test results for all fill materials, containment berms, and the wetland bottom shall be provided at this time.
3. The health district should inspect all system components before backfilling and inspect the filter container construction before filling with drainrock and treatment construction media.
4. The responsible charge engineer shall conduct as many inspections as needed to verify system component compliance with the engineered plans.
5. The responsible charge engineer shall provide the health district with a written statement that the system was constructed and functions in compliance with the approved plans and specifications. Additionally, the responsible charge engineer shall provide as-built plans to the health district if any construction deviations occur from the permitted construction plans (IDAPA 58.01.03.005.15).

4.27.7 Operation and Maintenance

1. The subsurface flow constructed wetland design engineer shall provide a copy of the system's operation, maintenance, and monitoring procedures to the health district as part of the permit application and prior to subsurface sewage disposal permit issuance (IDAPA 58.01.03.005.04.k).
2. Fertilizing the system is not required.
3. System irrigation is not required.
4. Systems with multiple cells must have directions on how each cell may be isolated so repair work can be performed without additional wastewater entering the cell.
5. Periodic surface maintenance may be required for any of the following reasons:
   a. In the spring, the thick layer of leaves and any other organic material that has been built up on the system surface should be removed and disposed of with other yard refuse. Some wetland plants may require trimming, but should not be cut back or harvested.

b. In the summer, if the surface contains weeds, they should be removed and disposed of with other yard refuse. Some wetland plants may require trimming, but should not be cut back or harvested.

c. Autumn maintenance may include gently spreading leaves over the surface and/or replacing the thick layer of mulch or peat over the system. Wetland plants should not be cut back or harvested. Wetland plants and a thick layer of leaves will provide a thermal blanket that will help prevent the system from freezing during the winter.

d. All woody or fibrous plant starts (e.g., tree saplings, bushes, etc.) should be removed any time they are noticed as they may result in damage to the wetland cells or liners.

6. Inspection/maintenance schedule and instructions for the constructed wetland cell(s), septic tank, inlet and outlet control devices, overflow basin, and any mechanical parts associated with system design.

7. Methods to address odors if they become noticeable.

8. Methods to address burrowing animals if they become a problem in or around the wetland cell.

9. A plan to address freezing issues that may arise during colder months. Suggestions include placing a thick layer of mulch or peat over the wetland cell, placing a thick layer of leaves over the wetland cell, temporarily raising and then lowering the water level within the wetland cell after the top water level has frozen.

10. Operation and maintenance directions should be included describing the replacement of the wetland cell media and informing the system owner that a repair permit must be obtained from the health district for this activity.

11. Vegetation management instructions should be included for vegetation start-up, harvesting (if necessary), and replacement. Vegetation sourcing information should also be included.

Appendix E

5.14 Proprietary Wastewater Treatment Products

Revision: ~~November 5, 2015~~February 4, 2016

Table 5-15 lists proprietary wastewater treatment products approved by DEQ. Proprietary wastewater treatment products shall be installed by a permitted complex installer.

Table 5-15. Proprietary wastewater treatment products approved by DEQ.

Proprietary Wastewater Treatment Product Manufacturer and Model	Treatment Limits (GPD)	Designer Requirements	Operation, Maintenance, and Monitoring Requirements	Drainfield Sizing and Size Limits	Vertical Separation Distances	Approval Date	Comments
Presby Environmental, Inc. Advanced Enviro-Septic Enviro-Septic Simple-Septic	1,500	None	Homeowner managed O&M	Table 4-21 for application rates Drainfield may not exceed 1,500 ft^2	Table 4-20	XX/XX/XX	All products must be installed according to the DEQ approved Idaho Design and Installation manual available from Presby Environmental, Inc. Design and Installation must be per the approved manual version dated XX/XX/XX.

Notes: gallons per day (GPD); operation and maintenance (O&M); square feet (ft^2)~~; milligrams per liter (mg/L)~~

Appendix F

2.2.5.2 In-Trench Sand Filters and the Method of 72

The method of 72 may also be used in determining the necessary depth of medium sand required for installation between a drainfield and the native soils overlying a limiting layer. Installation of medium sand may be necessary to access suitable soils below an unsuitable layer. Medium sand may be installed to any depth necessary to reach suitable soils as long as the excavation and installation of the medium sand meet the requirements in section 4.23. For porous limiting layers or normal high ground water, the drainfield installation depth must be sufficient to meet the method of 72 and maintain the drainfield at a depth where the sidewalls are within suitable soils (IDAPA 58.01.03.008.02.b). For impermeable limiting layers (e.g., bedrock), the drainfield installation depth must be sufficient to meet the minimum separation distance to impermeable layers required by IDAPA 58.01.03.008.02.c or Table 2-6 if the approval conditions can be met and maintain the drainfield at a depth where the sidewalls are within suitable soils (IDAPA 58.01.03.008.02.b). Separation distances to impermeable layers cannot be reduced to less than the requirements above through the method of 72. The following example is based on the soil profile identified in Figure 2-4.

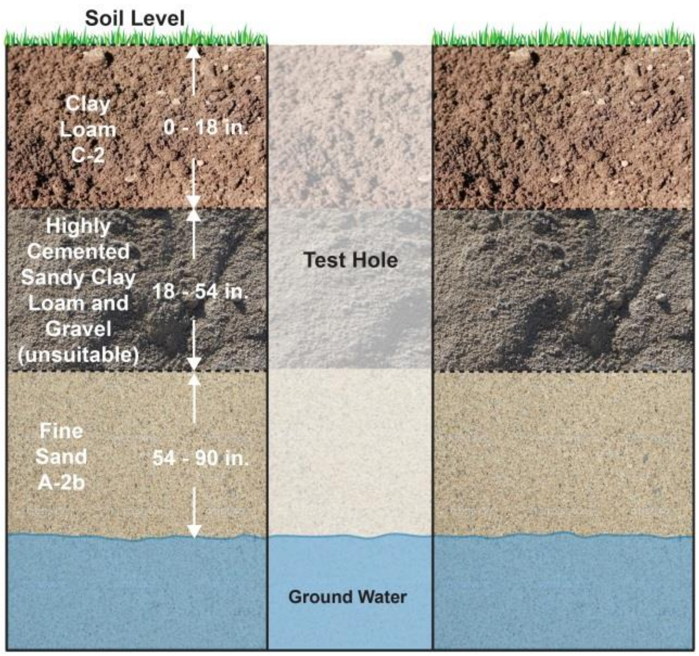


Figure 2-4. Test hole profile used in example 2.

Example 2*:*

In this example, the site soils must be excavated down to 54 inches to access suitable soils. This leaves 36 inches of A-2b soils, providing 43.2 treatment units. The amount of medium sand required to be backfilled prior to system installation would be determined as follows:

- Remaining treatment units = 72 – 43.2 = 28.8
- Depth of medium sand required = 28.8 treatment units remaining/1 treatment unit per inch
- Depth of medium sand required to meet the method of 72 = 29 inches

Thus the medium sand would be backfilled to a depth of 25 inches below grade to meet the method of 72. At a depth of 25 inches the drainfield sidewalls would not be within suitable soils as required by IDAPA 58.01.03.008.02.b. Based on this condition the medium sand would need to be backfilled to a depth of 18 inches below grade to meet the method of 72 and IDAPA 58.01.03.008.02.b.The drainfield would then be installed on top of the leveled medium sand with above-grade capping fill cover requirements.

Note: Regardless of the soil profile and treatment units needed, drainfields must be installed no deeper than 48 inches below grade per IDAPA 58.01.03.008.04. Drainfield depth restrictions only apply to the aggregate as defined in IDAPA 58.01.03.008.08 or the gravelless trench components approved in section 5.7. Medium sand may be installed to any depth necessary to reach suitable soils as long as the excavation and installation of the medium sand meet the requirements in section 4.23.

Appendix G

2.2.4.2 Reduction in Separation Distance to Surface Water with a Variance

~~The s~~Separation distances to surface water are in place to protect water quality, ecological health and current and future ~~the~~ beneficial uses of the ~~surface water~~resource. Septic tank effluent ~~carries~~contains both nitrogen and phosphorous which are ~~constituents~~nutrients that pose a eutrophication threat to surface water. If ~~a~~the separation distance from a drainfield to surface water is proposed to be ~~reduced~~decreased ~~further~~more than the ~~reductions~~limits outlined in section 2.2.4.1, ~~it~~an assessment must be done ~~through a variance supported by models that~~to evaluate the potential adverse effects that ~~the total~~ nitrogen and phosphorous loading may have on ~~the~~receiving surface waters ~~body~~. If the evaluation is favorable (i.e., no adverse impact is determined) then a variance may be issued for a reduced separation distance.

2.2.4.2.1 Supporting ~~Variance~~ Documentation for a Reduced Separation Distance to Surface Water Variance

~~The m~~Minimum documentation requirements ~~for the~~to support~~ing~~ a variance ~~documentation~~ request are: ~~included below.~~

1. The variance must follow all requirements ~~provided~~specified in IDAPA 58.01.03.010 and be filed with the health district ~~along~~ with a subsurface sewage disposal permit application.
2. The ~~necessary~~ site evaluation process must be followed to obtain the minimum information necessary to support a subsurface sewage disposal permit ~~and the required effluent nutrient evaluations~~, nutrient-pathogen (NP) evaluation, and phosphorous evaluation.
3. An ~~nutrient-pathogen (~~NP~~)~~ evaluation must be performed ~~for the~~to demonstrate site suitability ~~and be acceptable~~ based on ~~the required~~ minimum system design~~s~~ requirements, proposed system placement, and model outputs as outlined in section 2.2.4.2.3 prior to performing a phosphorous evaluation as described in the on-site system surface water separation distance determination guidance and model.
4. The phosphorous evaluation must be performed to demonstrate site suitability based on minimum system design requirements, proposed system placement, and model outputs as outlined in section 2.2.4.2.3.

2.2.4.2.2 Drainfield Design Requirements for a Reduced Separation Distance to Surface Water

A drainfield proposed with a reduced separation distance to surface water as allowed under this variance procedure must meet the following minimum design requirements:

1. The drainfield shall be pressurized and designed based on section 4.19 of this manual.
2. The maximum installation depth of the drainfield in the native soil profile shall be 6 inches and the proposed drainfield sites must meet the above-grade capping fill system criteria (section 4.3) or drip distribution system criteria (section 4.5).
3. Two full-size drainfields shall be installed under the initial permit, and alternating dosing between each drainfield shall be included in the system's ~~pressurized~~operational design.
4. Replacement area for a third drainfield must be reserved on the property.
5. No separation distance to surface water shall be reduced to less than 100 feet.

6. An alternative pretreatment system shall be installed after the septic tank that is capable of reducing total nitrogen to at least 27 mg/L. A greater total nitrogen reduction level may be required depending on the outcome of the NP evaluation.

Restrictions on Drainfield Designs Necessary to Obtain Successful Outputs in Nutrient Evaluation Models

IDAPA 58.01.03 specifies the minimum drainfield area required to adequately handle the specified volume of wastewater generated in the structure being permitted. It is acceptable for a system design to be in excess of the drainfield area required by IDAPA 58.01.03. To reduce the drainfield's separation distance to permanent or intermittent surface water, it may require that the drainfield area is in excess of the minimum requirements stipulated in IDAPA 58.01.03. This may be due to the surface area and volume of soil below the drainfield necessary to sequester phosphorous constituents in the wastewater and reduce ~~the~~ potential adverse impacts ~~on~~to surface water. If it is necessary to expand the drainfield to obtain successful outputs for the models described in section 2.2.4.2.3, the drainfield area in excess of the minimum requirements provided in IDAPA 58.01.03 is strictly limited to the original wastewater flows evaluated for the original permit application and cannot be used in the future for additional structures or existing structure expansion.

2.2.4.2.3 Nutrient Evaluation Model Outputs for a Reduced Separation Distance to Surface Water

To support a variance request for a reduced separation distance to surface water, two nutrient evaluations must be performed based on the following specific effluent nutrient values and minimum model outputs:

Nutrient-Pathogen Evaluation

1. The maximum total nitrogen concentration of the effluent discharged to the drainfield shall be 27 mg/L.
2. All other standard NP evaluation criteria and output requirements apply.

On-Site System Surface Water Separation Distance Determination Guidance and Model

1. The average phosphorous output from the septic tank shall be 8.6 mg/L.
2. The minimum phosphorous site life of receiving soils shall be ~~100~~50 years for each drainfield.
3. If the minimum phosphorous site life can be met, then the surface water body must be evaluated to determine if it has a Total Maximum Daily Load (TMDL) limit for phosphorous based on the following:
    a. If the water body is not TMDL limited for phosphorous, the subsurface sewage disposal permit may be issued.
    b. If the water body is TMDL limited for phosphorous, its' impact on the surface water body must be evaluated through an equivalency comparison between what may be permitted by rule (standard separation distances) and the reduced separation distance proposed.
        i. If the modeled impact of the system at the reduced separation distance is equivalent to, or less than, the impact of what could be permitted by rule then the subsurface sewage disposal permit may be issued.

ii. If the modeled impact of the proposed system at the reduced separation distance is greater than the impact of what could be permitted by rule then the subsurface sewage disposal permit may not be issued.

34. All other standard On-Site System Surface Water Separation Distance Determination Model criteria and output requirements apply as described in DEQ's guidance *On-Site System Surface Water Separation Distance Determination Guidance.*

Restrictions on Drainfield Designs Necessary to Obtain Successful Outputs in Nutrient Evaluation Models

IDAPA 58.01.03 specifies the minimum drainfield area required to adequately handle the specified volume of wastewater generated in the structure being permitted. It is acceptable for a system design to be in excess of the drainfield area required by IDAPA 58.01.03. To reduce the drainfield's separation distance to permanent or intermittent surface water, it may require that the drainfield area is in excess of the minimum requirements stipulated in IDAPA 58.01.03. This may be due to the surface area and volume of soil below the drainfield necessary to sequester phosphorous constituents in the wastewater and reduce the potential impacts on surface water. If it is necessary to expand the drainfield to obtain successful outputs for the models described in section 2.2.4.2.3, the drainfield area in excess of the minimum requirements provided in IDAPA 58.01.03 is strictly limited to the original wastewater flows evaluated for the original permit application and cannot be used in the future for additional structures or existing structure expansion.

Appendix H

4.19.3.1 Piping

Pressure distribution system piping typically consists of several sections including transport piping, manifold, and laterals. Each of these piping selections have components and design factors that are unique to that particular section.

Lateral Piping

Lateral piping is placed within the drainfield and is used to evenly distribute wastewater effluent to the drainfield infiltrative surface. To distribute the effluent, several small diameter orifices are drilled into each lateral. Recommendations for the design of lateral piping and the associated orifices are included below.

Distribution Laterals

1. Lateral length should be shorter than the trench length by at least 6 inches but not more than 36 inches.
2. Laterals in trenches should be placed equidistant from each trench sidewall and from each other.
3. Lateral spacing in beds is recommended to be equal to orifice spacing.
    a. The outside laterals should be placed at one-half the selected lateral spacing from the bed's edge.
    b. Laterals should not be placed farther apart than 3 feet on center in bed designs and should not be placed farther than 1.5 feet from the bed's edge regardless of orifice spacing.
    c. The maximum lateral spacing in sand mounds, intermittent and in-trench sand filters, and recirculating gravel filters is 2.25 ft.
4. Determine the lateral diameter based on distribution lateral network design.
    a. Lateral diameter typically ranges from 0.75 to 4 inches for most system applications.
    b. Lateral diameter for typical individual dwelling systems range from 0.75 to 2 inches.
5. Lateral length should be selected based on the lateral diameter, orifice spacing, and piping schedule/class.

    Lateral length is constrained by the minimum pressure at the distal end of the lateral, which shall not drop below 90% of the manifold pressure. This uniform pressure ensures relatively uniform effluent discharge down the length of the lateral.
6. Individual ball or gate valves shall be installed on each lateral to balance residual head on terraced systems.
7. Sweeping cleanouts should be placed at the terminal end of each lateral and accessible from grade.
    a. Cleanout sweeps should be the same diameter piping as the main lateral.
    b. A ball valve or threaded cap should be located on the end of the cleanout that allows the lateral to be flushed.
    c. Prior to pressurization of the distribution laterals, the system should be flushed with clean water while all of the terminal ball valves are open or caps are removed.

   d. Cleanout access risers shall not extend past the installation depth of the drainfield (i.e. drainrock or gravelless system component) and native soil or medium sand interface.

Orifices

1. Orifice sizing, spacing, and quantity, coupled with each lateral's pressure, establish the flow rate of the distribution network.
2. Orifice placement should occur
   a. Along the same axis of the distribution lateral.
   b. In a staggered location between any two adjoining laterals so they are located half of the orifice spacing from one another along the drainfield length.
   c. Orifices should be placed to serve a circular area as best as possible with limited overlap (e.g., 6-foot wide trench with two laterals and orifice placement to serve an area 3 feet in diameter).
3. Orifice orientation
   a. Is typically toward the bottom of the trench in aggregate-filled drainfields to facilitate lateral drainage and towards the top of the trench in gravelless trench component drainfields.
   b. If the orifices in the distribution laterals are oriented up, the distribution lateral must slope back towards the manifold to aid in drainage. Sloping of the distribution lateral should be as minimal as possible. All manifold and distribution lateral drainage not drained to the drainfield shall drain back to the dosing chamber if not retained in the transport piping below frost levels.
4. Orifice diameter
   a. Typical orifice diameter is 0.25 inch but may be smaller or larger depending upon system design requirements.
   b. Orifices smaller than 0.25 inch may lead to clogging, which should be considered in system design.
   c. Typical discharge rates based on orifice size are provided in Table 4-18.
5. Orifice spacing should distribute effluent as evenly and uniformly as possible over the infiltrative surface.
   a. Typical orifice spacing is 30–36 inches but may be closer or farther apart depending upon system design requirements, system flow rate, and soil type.
   b. For most installations, the spacing will be between 18–36 inches.
   c. The maximum ~~disposal area per~~ orifice .spacing for sand mounds, intermittent and in-trench sand filters, and recirculating gravel filters is ~~4 ft~~^{2}2.25 ft.
6. Orifices should be drilled with a sharp bit, and any burs, chips, or cuttings from the drilling process should be removed from the piping prior to assembly.
7. Orifice shields are recommended to be used when orifices are oriented up.

Appendix I

4.21 Recirculating Gravel Filter

Revision: ~~May 21~~February 4, ~~2015~~2016

4.21.1 Description

A recirculating gravel filter is a bed of filter media in a container that filters and biologically treats septic tank effluent. The filter effluent is returned to the recirculation tank for blending with untreated septic tank effluent and recirculated back to the filter. The treated effluent is distributed to a disposal trench of reduced dimension. The effluent returned from the filter may either return to the recirculating tank or a combination of the equalization tank and recirculating tank depending on effluent treatment requirements. Minimum ~~S~~system components include, but are not limited to, the following:

1. ~~a s~~Septic tank~~,~~
2. Equalization tank (if nitrogen reduction is required)
3. ~~r~~Recirculati~~o~~n~~g~~ tank~~,~~
4. ~~l~~Low-pressure distribution system~~,~~
5. ~~f~~Free-access filter~~s, dosing chamber, mechanical~~
6. ~~f~~Flow splitter~~, and~~
7. Dosing chamber (if drainfield is pressurized)
8. ~~d~~Drainfield.

4.21.2 Approval Conditions

1. Nondomestic wastewater ~~with biological oxygen demand (BOD) or TSS exceeding~~ must be pretreated to normal domestic wastewater strengths (section 3.2.1, Table 3-1) ~~is required to be pretreated to these levels~~ before discharge ~~in~~to the recirculating gravel filter system.
2. The bottom of the filter must not come within 12 inches of seasonal high ground water.
3. All pressurized distribution components and design elements of the recirculating gravel filter system that are not specified within section 4.21 must be designed and installed according to the guidance for pressure distribution systems in section 4.19.
4. ~~The~~All tanks and the recirculating gravel filter container shall meet the same separation distance requirements as a septic tank.
5. Recirculating gravel filters required to reduce total nitrogen shall meet the additional design requirements in section 4.21.3.2.3.
5. System must be designed by a PE licensed in Idaho.
6. Recirculating gravel filters required reduce total nitrogen to < 27 mg/L shall follow the operation, maintenance, and monitoring requirements for extended treatment package systems (section 4.8.3) effective July 1, 2017.
   a. Operation, maintenance, and monitoring must be performed by a permitted complex installer that maintains a current service provider endorsement.
   b. All subsurface sewage disposal permits issued for recirculating gravel filters meeting the above requirements shall contain the following statement beginning July 1, 2016:

Annual treatment system equipment servicing, testing of effluent quality, and reporting is required per IDAPA 58.01.03.005.14. Effluent quality must be less than or equal to [XX] mg/L Total Nitrogen. Operation, maintenance, and monitoring must be conducted by a complex installer maintaining a current service provider endorsement.

Minimum design requirements for the recirculating gravel filter components are provided below.

4.21.3.1 Recirculating Tank

1. Minimum recirculating tank volume shall be capable of maintaining two times the daily design flow of the system (Figure 4-27).
2. The recirculating tank may be a modified septic tank or dosing chamber selected from section 5.2 or section 5.3.
    a. Alternatively, the recirculation tank may be designed by the system's design engineer to meet the minimum requirements of this section and IDAPA 58.01.03.007.
    b. Recirculating tank design is exempt from subsections .07, .08, .10, and .11~~, and .13~~ of IDAPA 58.01.03.007.
3. The recirculating tank shall be accessible from grade and the return line, pump, pump screen, and pump components shall be accessible from these access points.
4. The recirculating filter effluent return point shall be located before the recirculation tank and shall enter at the inlet of the recirculating tank, unless a gravity float valve is used in which case the return point shall be located near the inlet.
5. The recirculating tank shall meet all other minimum design and equipment requirements of section 4.19.3.4.

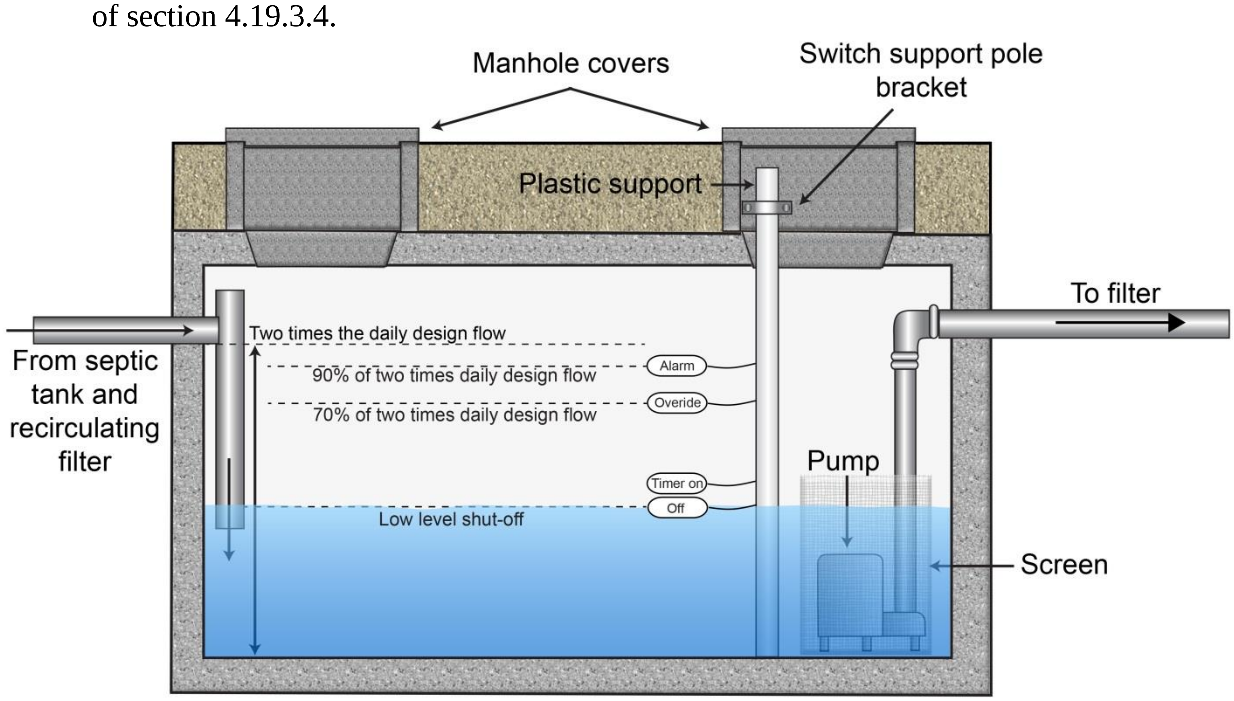


Figure 4-27. Recirculating tank.

4.21.3.2 Recirculating Filter

1. The filter container shall be constructed of reinforced concrete or other materials where equivalent function, workmanship, watertightness, and at least a 20-year service life can be documented.
2. The following requirements must be met for flexible membrane liners when used in place of concrete:
    a. Have properties equivalent to or greater than 30-mil PVC.
    b. Have field repair instructions and materials provided to the purchaser of the liner.
    c. Have factory fabricated *boots* for waterproof field bonding of piping to the liner.
    d. Liner must be placed against smooth, regular surfaces free of sharp edges, nails, wire, splinters, or other objects that may puncture the liner. A 4-inch layer of clean sand should provide liner protection.

~~2~~3. The filter surface area is sized at a maximum of 5 gallons/ft^2/day forward flow (forward flow is equivalent to the daily design flow from the structure).

~~3~~4. Filter construction media shall meet the specifications in section 3.2.8.1.3 for pea gravel and section 3.2.8.1.1 for drainrock.

~~4~~5. Minimum filter construction specifications (i.e., media depth, geotextile fabric placement, cover slopes, filter container height, and piping placement) shall meet the dimensions and locations depicted in Figure 4-28.

~~5~~6. The bottom of the filter may be sloped at least 1% to the underdrain pipe.

~~6~~7. An underdrain must be located at the bottom of the filter to return filtered effluent to the dosing chamber meeting the following requirements:
    a. May be placed directly on the bottom of the filter.
    b. Placed level throughout the bottom of the filter.
    c. Constructed of slotted drain pipe with 0.25-inch slots, 2.5 inches deep and spaced 4 inches apart located vertically on the pipe, or perforated sewer pipe with holes located at 5 and 7 o'clock.
    d. One underdrain should be installed for each filter cell zone.
    e. The distal end is vented to the atmosphere, protected with a screen, and located within the filter to allow entry of air flow into the bottom of the filter and access for cleaning and ponding observation.
    f. Connected to solid pipe that meets the construction requirements of IDAPA 58.01.03.007.21, extends through the filter, and is sealed so the joint between the filter wall and pipe is watertight.

~~7~~8. Two observation tubes should be placed in the recirculating filter to monitor for ponding and clogging formation.
    a. The monitoring tubes must be secured and perforated near the bottom.
    b. The monitoring tubes must extend through the recirculating filter cover and have a removable cap.

~~8~~9. The surface of the recirculating filter must be left open to facilitate oxygenation of the filter. No soil cover shall be placed above the upper layer of drainrock in the recirculating gravel filter. However, the filter must be designed to prevent accidental contact with effluent from the surface. The following minimum requirements must be followed:

a. Chain-link fence or another acceptable protective barrier (Figure 4-28) shall be placed at the top of the filter container and cover the entire surface of the filter to prevent access, unless fencing is placed around the entire system to prevent access.
b. Geotextile fabric shall be placed over the access barrier.
c. Fencing around the recirculating gravel filter is recommended for all central systems.

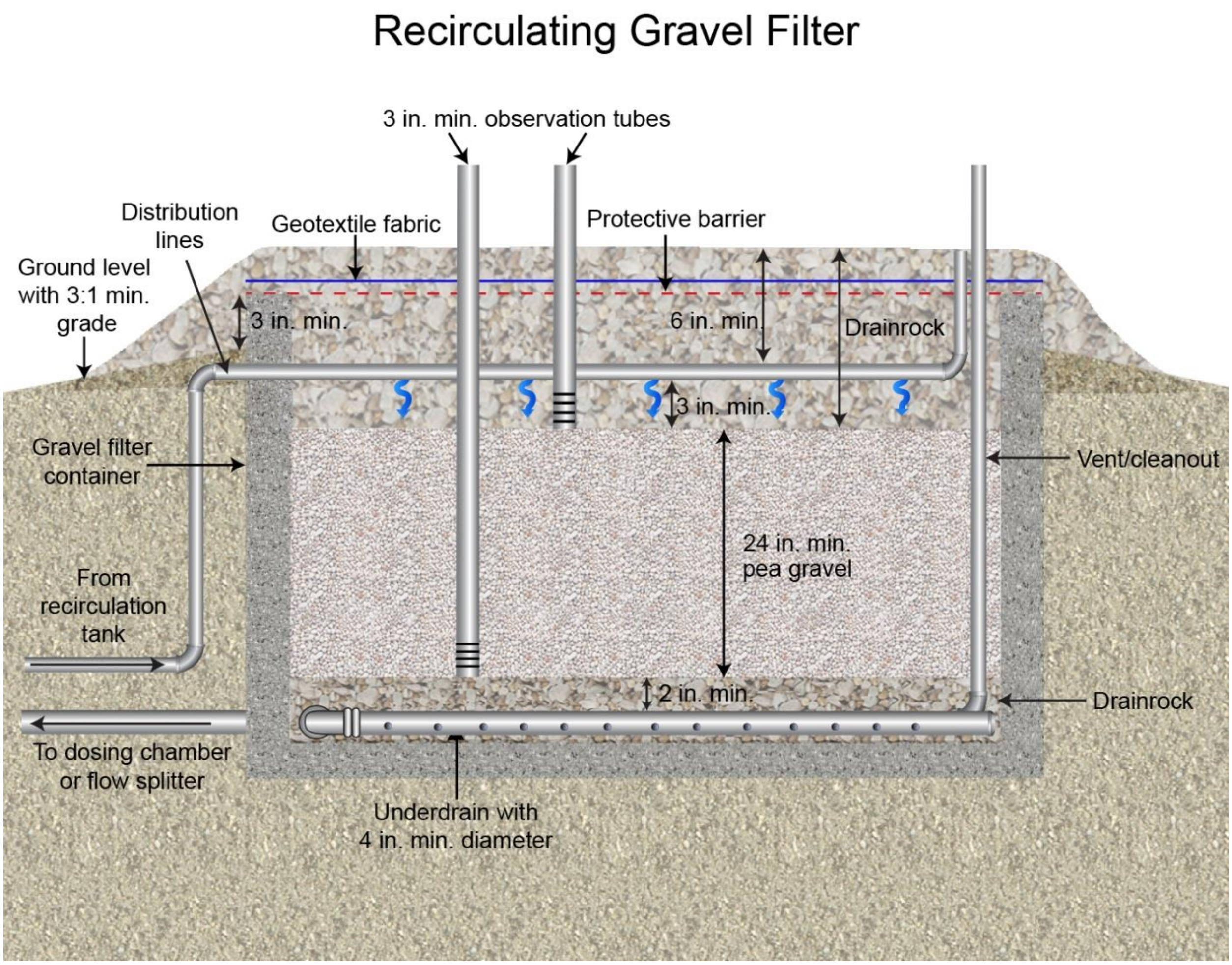


Figure 4-28. Recirculating gravel filter.

4.21.3.2.1 Recirculating Filter Cells

Depending on the volume of effluent and type of structure using a recirculating gravel filter, the recirculating filter may need to be split into cells that contain dosing zones (Figure 4-29). A filter cell is the total filter area that can be served by a single dosing pump or set of pumps. A filter zone is the area of a cell that can be dosed by a single dosing pump at any one time. Zone sizing depends upon pump size, lateral length, perforation size, and perforation spacing. The minimum filter design requirements for cells, zones, and pumps include the following:

1. Single-family homes: one cell, one zone, and one pump. If more than one cell or zone is used for a single-family home, duplex pumps are not required.
2. Central systems or systems connected to anything other than a single-family home (flows up to 2,500 GPD): one cell, two zones, and one pump per zone.

3. Large soil absorption systems (flows of 2,500 to 5,000 GPD): one cell, three zones, and one pump per zone.
4. Large soil absorption systems (flows over 5,000 GPD): two cells, two zones per cell, and one pump per zone.
5. An alternative to installing one pump per zone is to install duplex pumps connected to sequencing valves that alternate zones for each pressurization cycle. For systems with multiple cells, each cell must have a dedicated set of duplex pumps. Pumps should alternate between each cycle.
6. Filter cells are recommended to be hydraulically isolated from one another and shall be constructed according to the minimum requirements in section 4.21.3.2.
7. Each cell shall be equivalent in surface area and volume and have the same number of zones.
8. Each zone shall have the same number of laterals and perforations.

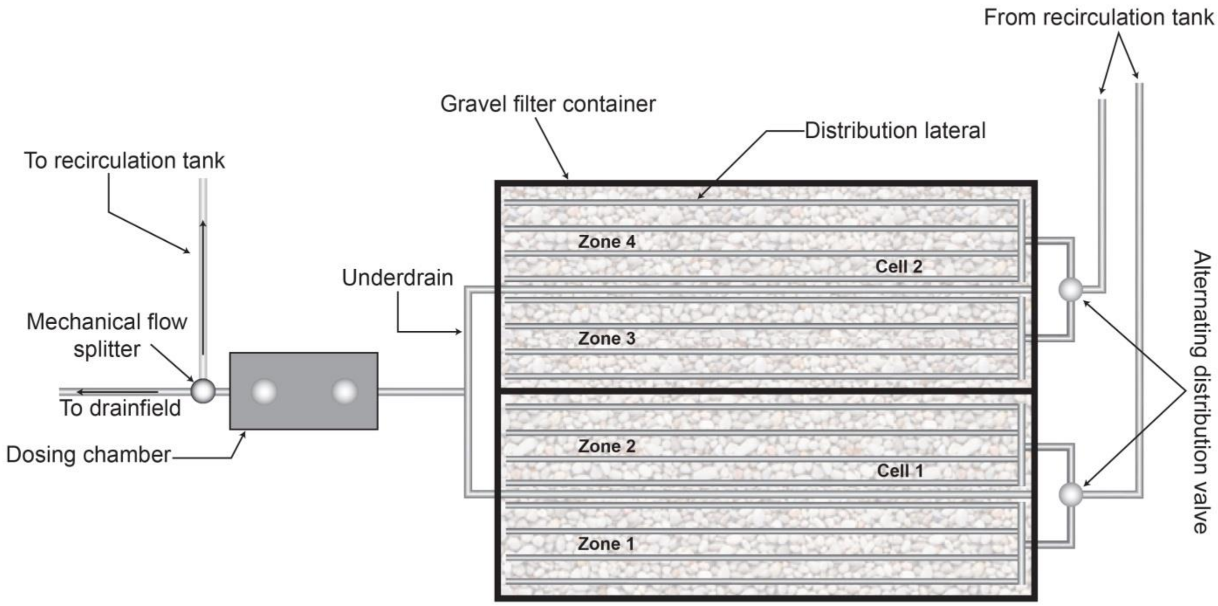


Figure 4-29. Overhead view of a recirculating gravel filter with multiple cells and dosing zones discharging to a dosing chamber utilizing mechanical flow splitting.

4.21.3.2.2 Recirculating Filter Dosing

1. The minimum recirculation ratio of the filter is 5:1, and the maximum recirculation ratio is 7:1 (the daily flow moves through the filter a minimum of five times or a maximum of seven times before discharge to the drainfield).
2. Timed dosing is required, and the filter dosing cycle should meet the following minimum recommendations:
   a. Pumps are set to dose each zone approximately two times per hour.
   b. Dose volume delivered to the filter surface for each cycle should be 10.4% of the daily flow from the structure (forward flow).
   c. A pump-on override float should be set at a point that equates to 70% of the recirculating tank’s volume.
   d. A low-level off float should be placed to ensure that the pump remains fully submerged at all times.
3. The pump controls should meet the following:

   a. Be capable of monitoring low- and high-level events so that timer settings can be adjusted accordingly.
   b. Have event counters and run-time meters to monitor daily flows.

4.21.3.3 ~~Dosing Chamber~~Effluent Return

1. Effluent must be returned from the filter to the recirculation tank which may occur by gravity or under pressure.
2. Gravity return must occur utilizing a float valve (Figure 4-30) within the recirculating tank, float valve must:
   a. Be located on the inlet side of the recirculating tank.
   b. Allow for continual splitting of filtered effluent when the buoy is fully seated and discharging to the drainfield.
   c. Be capable of returning 83% of the filtered effluent to the recirculation tank when the buoy is fully seated.
3. Other types of gravity flow splitters shall not be used to split recirculation flows.
4. Pressurized return must be done utilizing a dosing chamber meeting the minimum requirements of section 4.19.3.4, the dosing chamber must:
   a. Be located after the recirculating filter.
   b. Utilize a mechanical flow splitter (Figure 4-31 and Figure 4-32) that is capable of simultaneously returning effluent to the recirculating tank and discharging effluent to the drainfield.
5. Mechanical flow splitters shall:
   a. Be located outside of the dosing chamber and prior to the recirculation tank.

~~2. A dosing chamber meeting the minimum requirements of section 4.19.3.4 shall be installed after the recirculating filter, and all effluent passing through the recirculating filter shall be returned to the dosing chamber.~~

~~2. A mechanical flow splitter (Figure 4-30~~31 ~~and Figure 4-31~~32~~) capable of simultaneously returning effluent to the recirculating tank and discharging effluent to the drainfield shall be located outside of the dosing chamber and before the recirculation tank. The flow splitter shall meet the following minimum requirements:~~

   ~~a~~b. ~~The flow splitter must b~~Be capable of returning effluent to the recirculating tank and discharging to the drainfield in a volume ratio equivalent to the designed recirculation ratio (e.g., if a recirculation ratio of 5:1 is used, ~~80~~83% of the filtered effluent by volume shall be returned to the recirculating tank, and ~~20~~17% shall be discharged to the drainfield).

   ~~b. Float valves that do not allow for continual splitting of filtered effluent before discharge to the drainfield and nonmechanical weirs and flutes shall not be used to split flows.~~

~~3. Dosing of effluent from the dosing chamber may be either timed or on-demand.~~

~~4~~6. Discharge of effluent to the drainfield must occur after filtration and flow splitting.

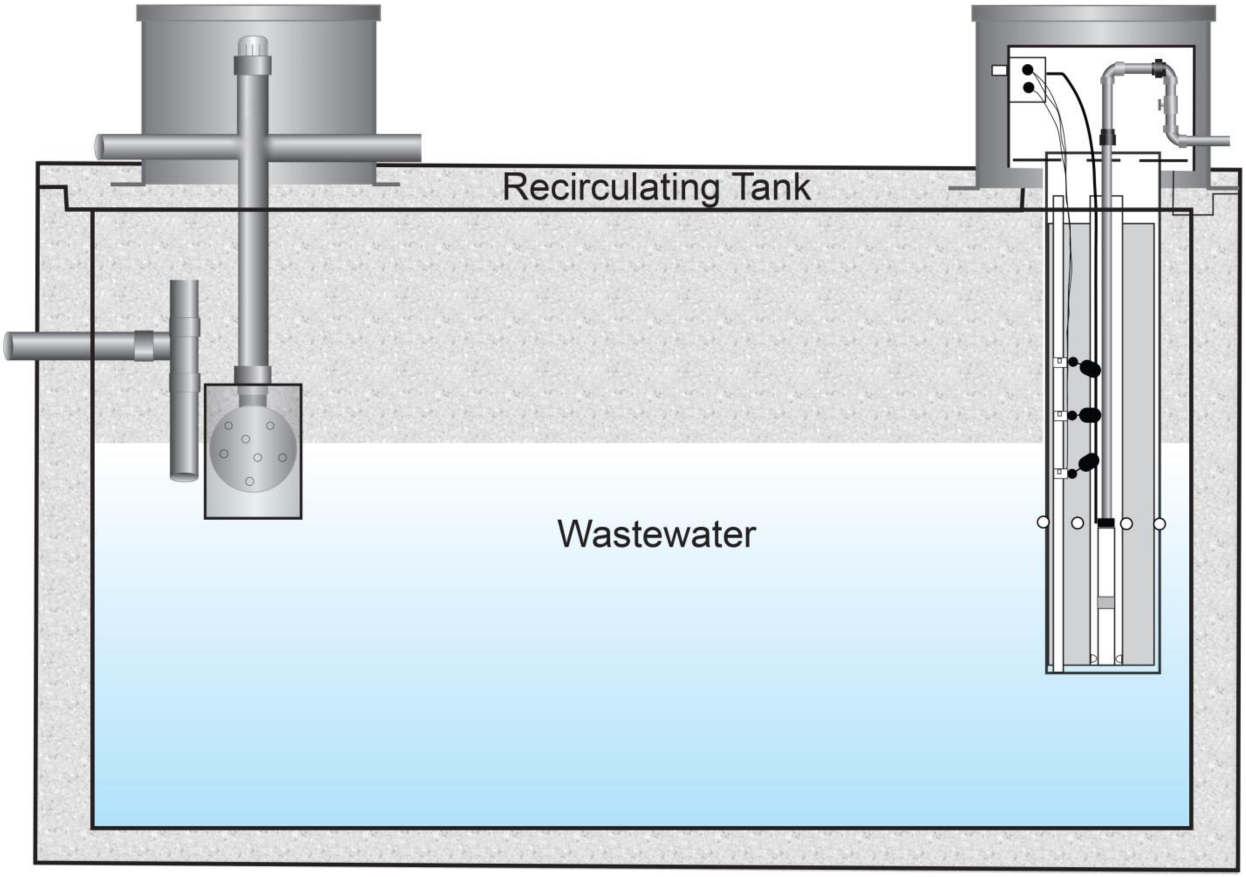


Figure 4-30. Gravity float valve return location within the recirculating tank.

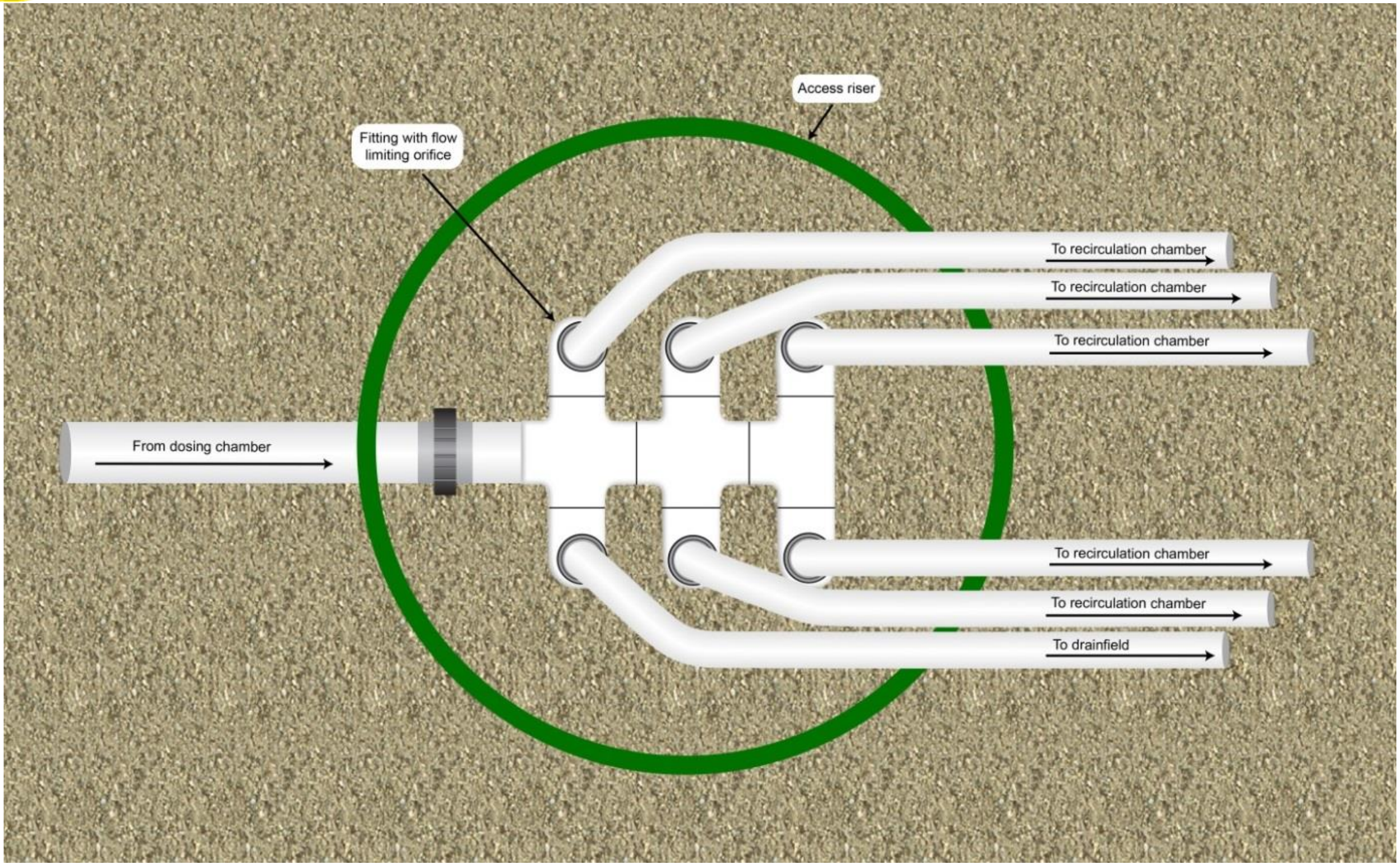


Figure 4-~~30~~31. Bottom view of a mechanical flow splitter for gravity distribution that delivers wastewater to all transport pipes with each dose.

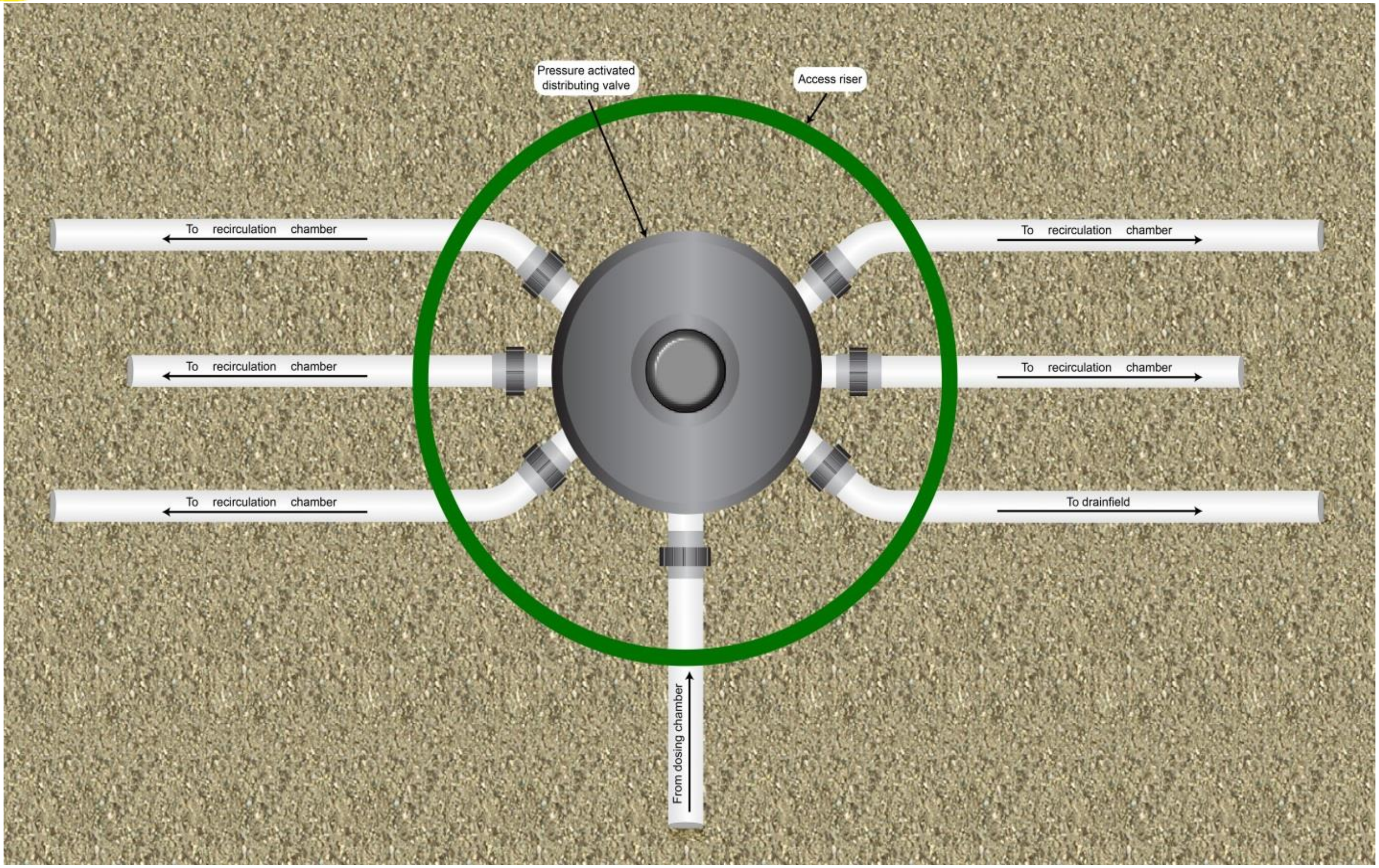


Figure 4-~~31~~32. Overhead view of a mechanical flow splitter for pressure distribution that only delivers wastewater to one transport pipe with each dose.

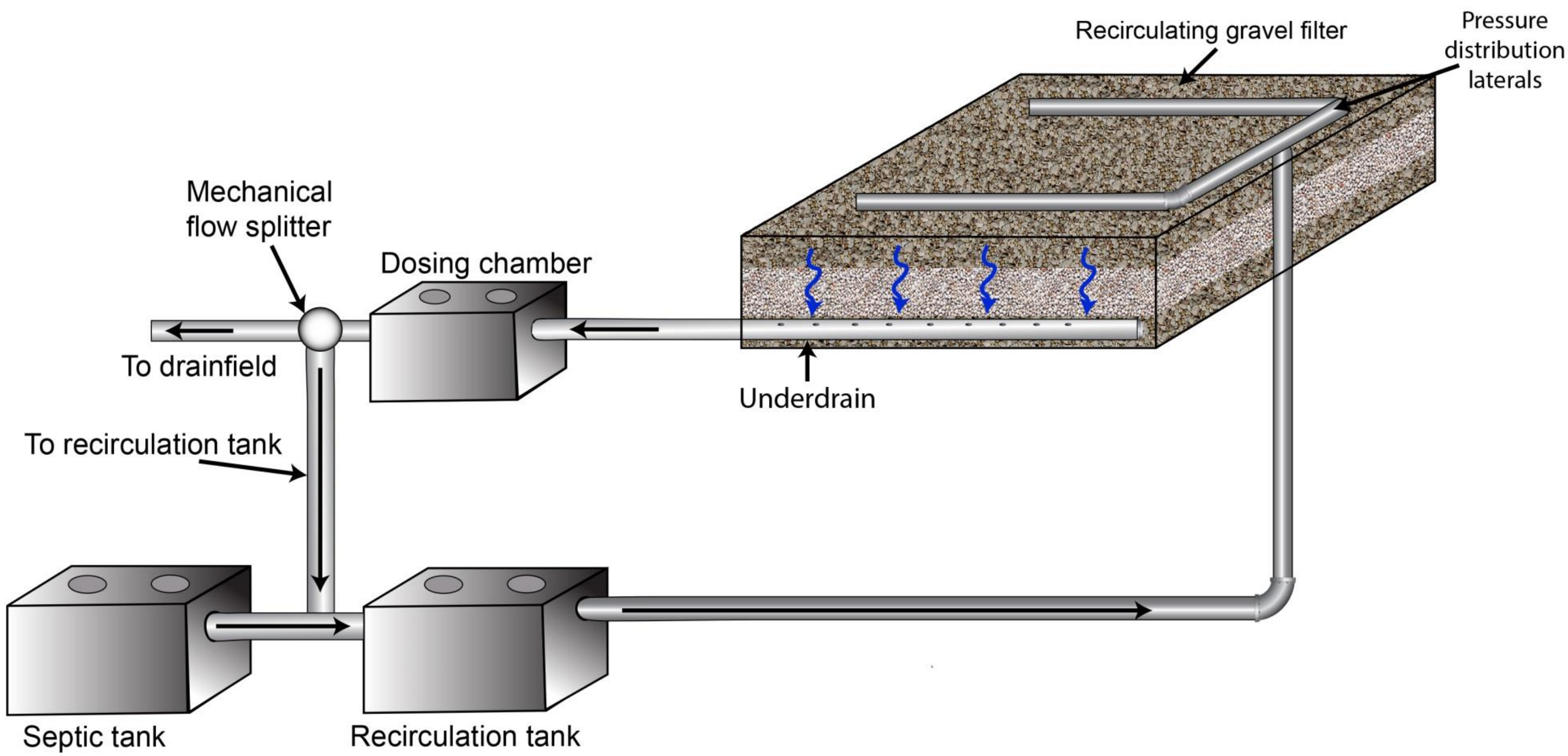


Figure 4-33. Cross section of a recirculating gravel filter system with pressure transport to, and/or within, the drainfield.

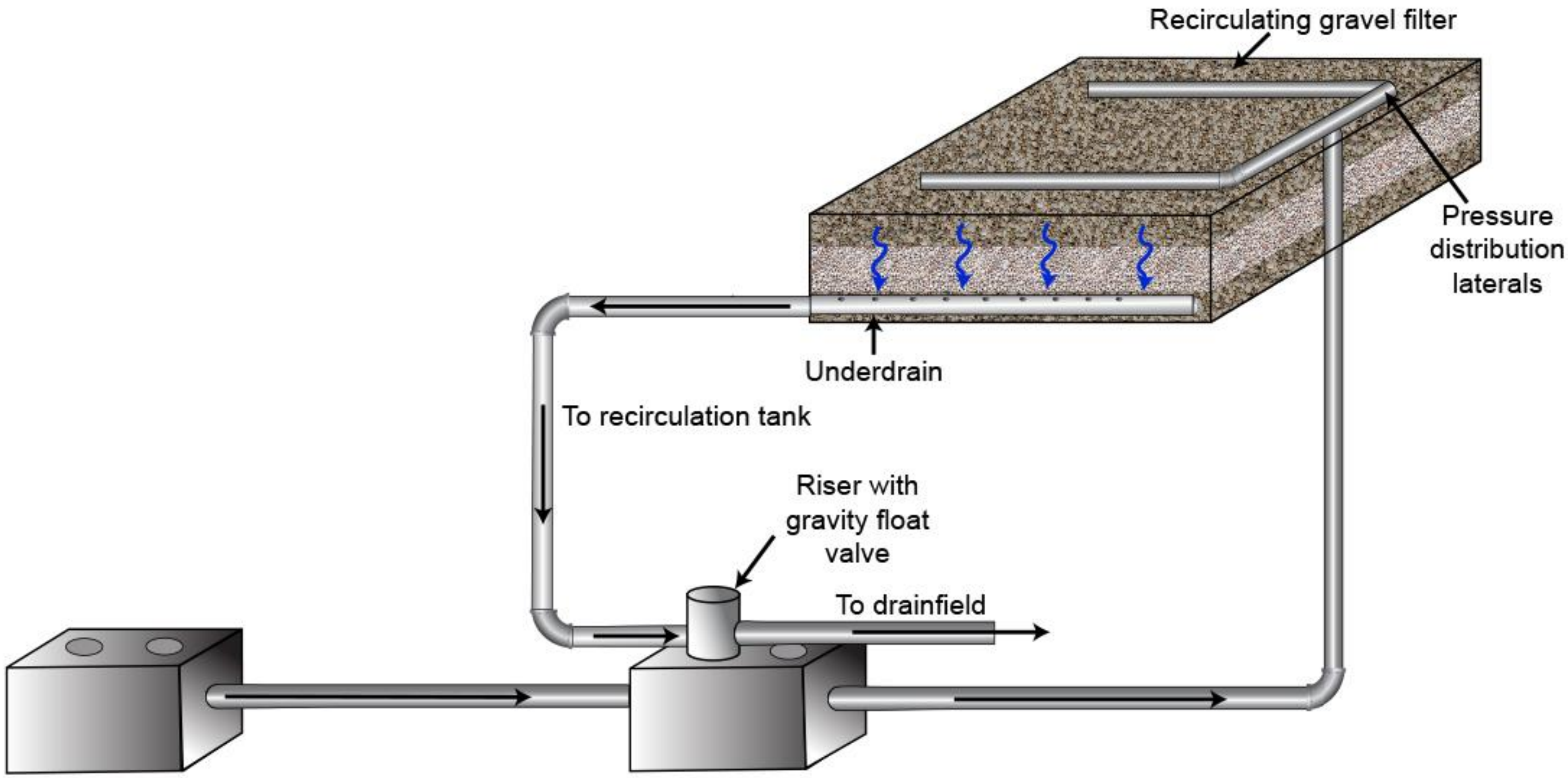


Figure 4-34. Cross section of a recirculating gravel filter system with gravity transport to the drainfield.

4.21.3.4 Additional Design Elements for Recirculating Gravel Filter Systems Required to Reduce Total Nitrogen

4.21.3.4.1 Equalization Tank

1. An equalization tank is required for all recirculating gravel filters treating effluent for total nitrogen.
2. A septic tank sized according to IDAPA 58.01.03.007.07 shall precede the equalization tank.
3. Minimum equalization tank volume shall be capable of maintaining two times the sum of the daily design flow of the system and recirculation volume returned to the equalization tank.
4. The equalization tank may be a modified septic tank or dosing chamber selected from section 5.2 or section 5.3.
    a. Alternatively, the equalization tank may be designed by the system's design engineer to meet the minimum requirements of this section and IDAPA 58.01.03.007.
    b. Equalization tank design is exempt from subsections .07 and .08 of IDAPA 58.01.03.007.
5. The recirculating filter effluent return point shall be located before the equalization tank and shall enter at the inlet of the equalization tank.

4.21.3.4.2 Effluent Return

1. Effluent shall be returned from the recirculating gravel filter in a ratio of 20% to the equalization tank and 80% to the recirculation tank (Figure 4-35).
2. Effluent return from the filter to the equalization tank and recirculation tank may be done by gravity or under pressure.
3. The design engineer must specify how the return ratio will be met with the system design and document the return flow in the system design calculations.

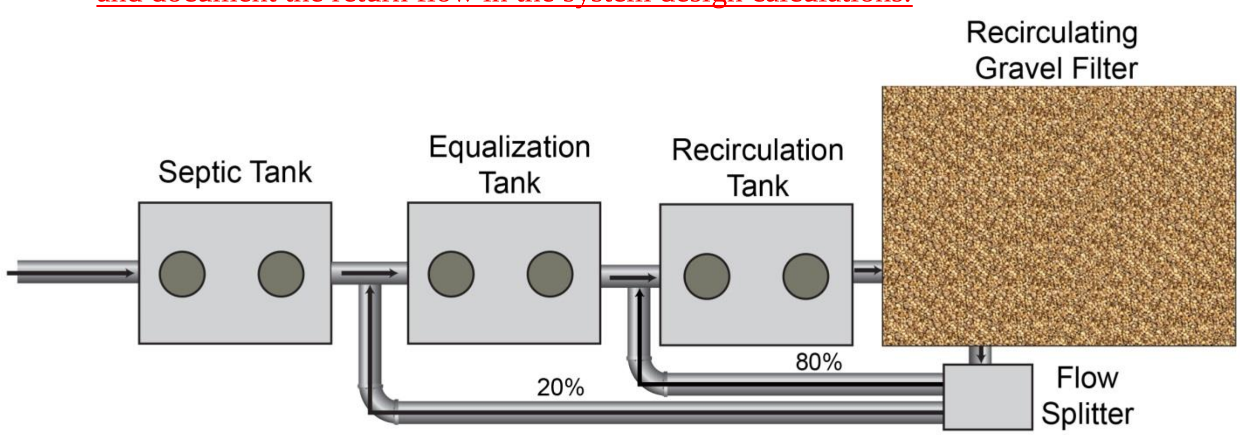


Figure 4-35. Effluent return locations and ratios from the recirculating gravel filter and flow splitter for systems treating total nitrogen.

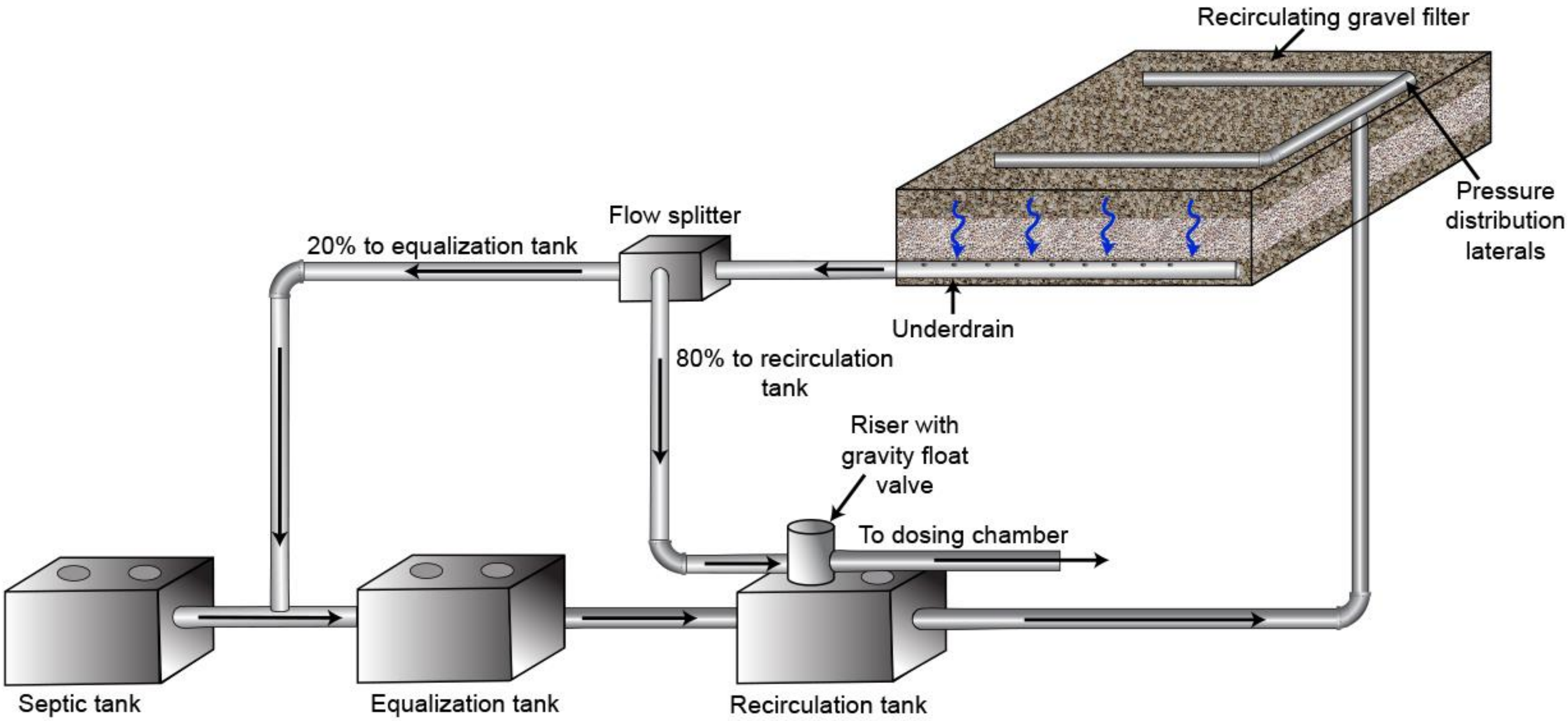


Figure 4-~~32~~36. Cross section of a nitrogen-reducing recirculating gravel filter system with pressure transport to, and/or within, the drainfield.

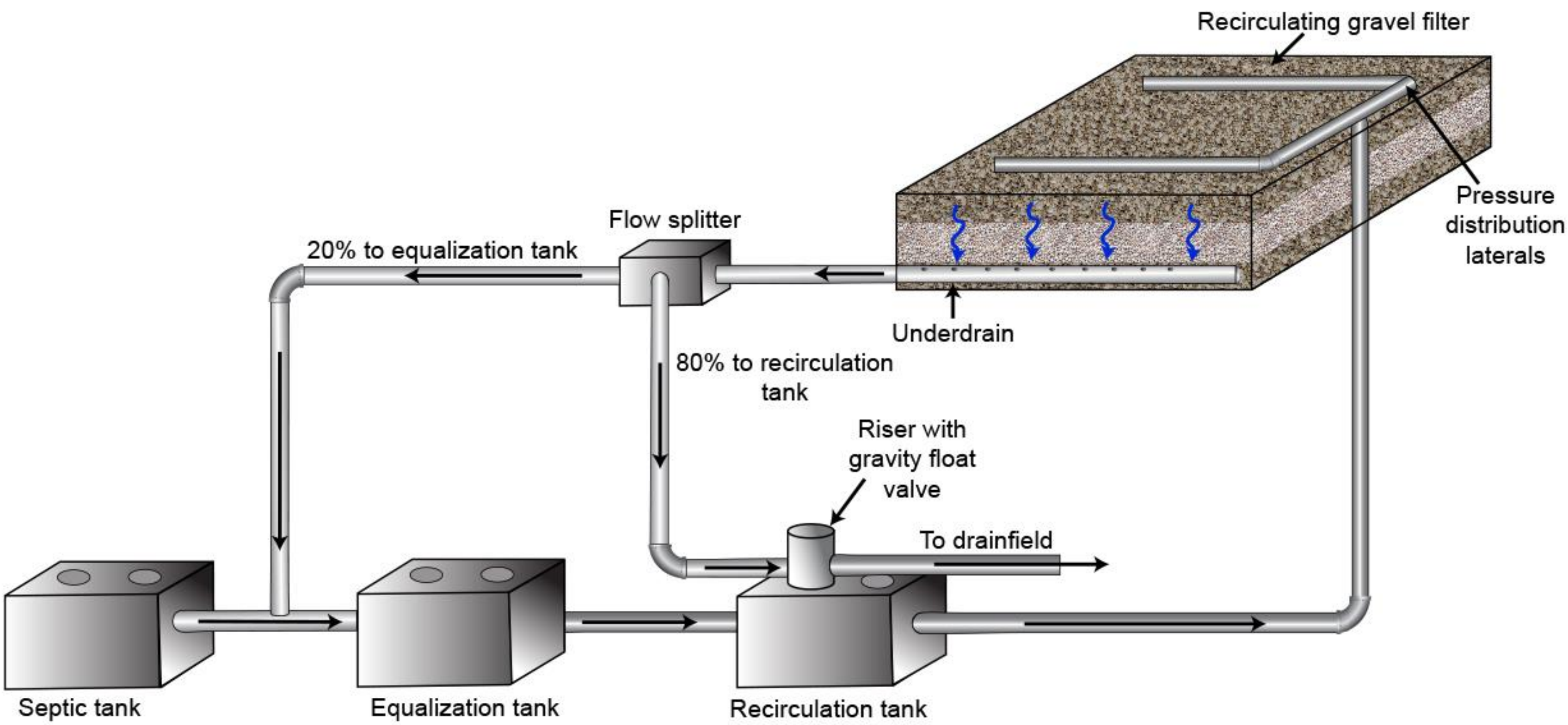


Figure 4-37. Cross section of a nitrogen-reducing recirculating gravel filter system with gravity transport to the drainfield.

4.21.4 Filter Construction

1. All materials must be structurally sound, durable, and capable of withstanding normal installation and operation stresses ~~(Figure 4-32)~~.
2. Components that may be subject to excessive wear must be readily accessible for repair or replacement.
3. All filter containers must be placed over a stable level base.
4. Geotextile filter fabric shall be placed only over the top of the filter and must not be used in-between the filter construction media and underdrain aggregate.
5. Access to the filter surface must be provided to facilitate maintenance.

4.21.5 Drainfield Trenches

1. Distances shown in Table 4-20 must be maintained between the trench bottom and limiting layer.
2. Pressure distribution, when used, shall meet the following design considerations:
   a. If a pressure distribution system is designed within the drainfield, it must be designed according to section 4.19.
   b. If the pressurized line from the mechanical flow splitter breaks to gravity before the drainfield, it must be done according to section 4.19.3.6.
   c. The recirculation tank and recirculating filter may not be used as the dosing chamber for the drainfield or for flow-splitting purposes.
3. The minimum area, in square feet of bottom trench surface, shall be calculated from the maximum daily flow of effluent divided by the hydraulic application rate for the applicable soil design subgroup listed in Table 4-21.

Table 4-20. Recirculating gravel filter vertical separation to limiting layers (feet).

Limiting Layer	Flow < 2,500 GPD	Flow ≥ 2,500 GPD
	All Soil Types	All Soil Types
Impermeable layer	2	4
Fractured rock or very porous layer	1	2
Normal high ground water	1	2
Seasonal high ground water	1	2

Note: gallons per day (GPD)

Table 4-21. Secondary biological treatment system hydraulic application rates.

Soil Design Subgroup	Application Rate (gallons/square foot/day)
A-1	1.7
A-2a	1.2
A-2b	1.0
B-1	0.8
B-2	0.6
C-1	0.4
C-2	0.3

4.21.5 Inspection

1. A preconstruction meeting between the health district, responsible charge engineer, and installer should occur before commencing any construction activities.
2. The health district should inspect all system components before backfilling and inspect the filter container construction before filling with drainrock and filter construction media.
3. The responsible charge engineer shall conduct as many inspections as needed to verify system and component compliance with the engineered plans.
4. The responsible charge engineer shall provide the health district with a written statement that the system was constructed and functions in compliance with the approved plans and specifications. Additionally, the responsible charge engineer shall provide as-built plans to the health district if any construction deviations occur from the permitted construction plans (IDAPA 58.01.03.005.15).

4.21.6 Operation and Maintenance

1. The recirculating gravel filter design engineer shall provide a copy of the system's operation, maintenance, and monitoring procedures to the health district as part of the permit application and before subsurface sewage disposal permit issuance (IDAPA 58.01.03.005.04.k).
2. Minimum operation, maintenance, and monitoring requirements should follow each system component manufacturer's recommendations.
3. Instructions on how to trouble shoot the pump control panel should be included to allow adjustment to pump cycle timing if the low-level off or high-level alarm switch is frequently tripped in order to maintain the minimum 5:1 recirculation ratio.
4. Operation and maintenance directions should be included describing replacement of the filter construction media and informing the system owner that a permit must be obtained from the health district for this activity.
5. Maintenance of the septic tank should be included in the O&M manual.
6. All pressure distribution system components should be maintained as described in section 4.19.5.

7. Check for ponding at the filter construction media/underdrain aggregate interface through the observation tube in the recirculating filter.
8. Clean the surface of the filter regularly to remove leaves and other organic matter that may accumulate in the aggregate or rock cover.
9. Regularly check the recirculating gravel filter for surface odors. Odors should not be present and indicate that something is wrong. Odors are likely evidence that the dissolved oxygen in the filter is being depleted and that BOD and ammonia removal are being impacted.

Appendix J

Summary of Research Regarding Use of Drip Distribution Without Pretreatment of Effluent

An Investigation for the Need of Secondary Treatment of Residential Wastewater when Applied with a Subsurface Drip Irrigation System – J.R. Buchanan and B.S. Hillenbrand

Pretreatment requirement is typically based on protecting the emitters. Requirement is debated because good design and management practices are shown to protect emitters through filtration and flushing. Primary purpose of paper is to show secondary treatment is not needed to purify residential wastewater if drip distribution is used. To prove/disprove they analyzed soil and soil solution near and below drip emitters. Looked at hydraulic conductivity, nitrate-nitrogen, total nitrogen, total phosphorous, and total carbon for water quality differences. Used two subdivisions served by STEP collection systems with recirculating sand filters, and subsurface drip. Constructed two plots at each subdivision using 0.5" tubing with 0.62 gal/hr emitter ratings. One plot received standard effluent, the other filtered effluent. Each plot received 200 GPD, through 1,000' of drip tubing (20 50' laterals). Allowed plots to operate for 3-5 years prior to sampling. One site consisted of high end homes on large lots with sandy loam and ~3'-8' to ground water, second site was starter homes with small lots with clay loam and ~2' to bedrock. 4 rounds of samples (soil cores) were taken from each plot. Background samples were taken outside the plots and used as controls. Obtained samples using soil cores obtained from 30 cm and 60 cm below emitter levels. Purpose was to evaluate two strengths of wastewater to determine the need for secondary treatment, did not evaluate the performance of drip as a whole. Found that pore water in the soil was of slightly higher quality when pretreatment is used. One site the parameters evaluated were statistically the same. At the second site the N-N and TN levels were significantly higher in the non-treated effluent side but TC and TP were not statistically different. Author does not believe the benefits of secondary treatment are significant enough to make it necessary to use with a drip system and believes the soil provides much of the same treatment as a pre-treatment system.

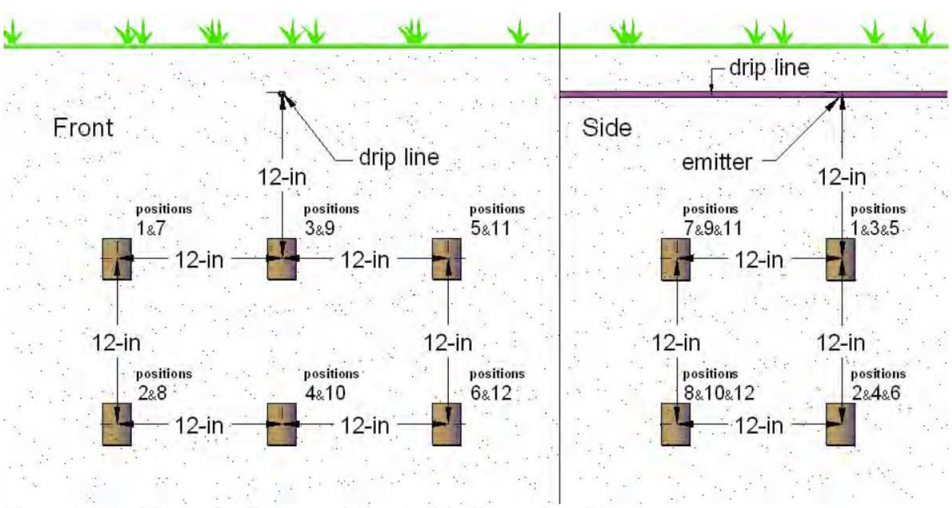


Figure 1. Positions of soil cores relative to drip line and emitter.

Performance and Cost of Decentralized Unit Processes: Drip Distribution (Fact Sheet D3) – WERF

At a minimum wastewater must pass through primary treatment and a 100-120 micron filter prior to entering the tubing. It is generally recommended that dissolved organic be removed, via an aerobic treatment process, before drip distribution. Inclusion of aerobic treatment may reduce long-term maintenance requirements of the drip dispersal system. Apply effluent at 0.01-0.4 GPD/ft^2. Drip dispersal is only as good as its management. Recommend semi-annual O&M visits.

Report for 2004TN14B: In-Field Comparison of Drip Distribution Dosed with Septic Tank Effluent vs. Secondary Quality Effluent – J.R. Buchanan

Objectives were to determine whether biomat forms around drip tubing and determine whether quality of effluent influences biomat formation around the tubing, determine the extent of soil moisture saturation around drip tubing, determine the renovation of the water at various depths below the point of application, and determine the reduction in coliform bacteria as water moves through the soil. Two fields established at two locations (4 total), each with 1,000 ft. of drip line. Lines were installed 24” on center with emitters rated at 0.6 gph with 24” spacing. At each site one field receives standard effluent while the other receives secondary effluent and both are loaded at 300 GPD. One site is loaded at 0.15 GPD/ft^2 and the other at 0.2 GPD/ft^2.

As of July 2006 (9 months of operational data) – Samples taken from lysimeters for total nitrogen, total phosphate, total carbon, and chemical oxygen demand are not statistically different between the STE and RSF effluent fields. Current samples are not different from background levels. Author believes the soil is renovating the higher strength wastewater. High strength wastewater field is slowly losing pressure due to emitter and filter clogging but the lines and filters have not been flushed at this time.
http://onsite.tennessee.edu/Buchanan%20KY-TN%20%20AWWA%202006.pdf

Evaluation of Drip Irrigation Emitters Distributing Primary and Secondary Wastewater Effluents – Mike Rowan, Karen Mancl, and Olli Tuovinen

Clogging of emitters is a major concern with drip irrigation systems due to suspended solids, organic matter, and nutrients. Clogging is caused due to physical blockage (suspended solids), chemical (precipitation reactions), and biological (growth and metabolism of microorganisms). Emitter clogging is usually the result of two or more of these causes working together. State filtration alone will not prevent clogging of emitters. They evaluated 4 types of emitters, 3 designed for wastewater and one designed for potable water. Emitters were tested by tracking the flow rates as they discharged tap water, septic tank effluent, and effluent from a sand filter over a one year period. Eurodrip gr emitters showed no clogging for tap water, a 16% reduction for STE, and a 3% reduction for SFE. Geoflow pc emitters showed no clogging for tap water, a 12% reduction for STE, and no significant clogging for SFE. Geoflow npc emitters showed no clogging for tap water and SFE and 6% for STE. Netafim bioline emitters showed little to no signs of clogging after one year with the exception of one emitter distributing STE. A gradual reduction in flow rate followed by a partial recovery was observed in emitters of each type. Authors noted that each type of wastewater emitter maintained a high level of uniformity overall and believe this indicates the clogging does not negatively impact the overall performance of the irrigation system. Influence of wastewater type on emitter discharge was +3.3% for tap water, -9.4% for STE, and -0.3% for SFE. Primary septic tank effluent was successfully distributed with drip emitters designed for use with treated wastewater, but secondary effluent provided a better performance. Using emitters designed for wastewater and using a sand filter will reduce the extent of emitter clogging and improve overall distribution uniformity. Clogging process is not linear over time or unidirectional as flow rates fluctuate over time and emitters have the ability to self-clean during normal startup and dose cycles. Self-correction is most evident in emitters distributing SFE.

Wastewater Subsurface Drip Distribution – Peer-Reviewed Guidelines for Design, Operation, and Maintenance – Technical Report – Electric Power Research Institute co-sponsored by the Tennessee Valley Authority (section 3.2.3 wastewater quality considerations)

Report available at http://onsite.tennessee.edu/Drip_Guidelines.pdf. Systems designed for anaerobic effluent eliminate the capital and O&M costs associated with secondary treatment, but require a larger drip system. Soil hydraulic application rates are typically lower for primary effluent and may also include many more emission points due to closer emitter and line spacing in a larger footprint. Sizing a primary effluent drip system is based on biomat considerations and the need to assure the oxygen demand for the wastewater can be met. An alternate perspective is that the footprint loading rate is strictly a landscape loading issue and should not depend on effluent quality. Higher organic loads are addressed by increasing the infiltration surface area rather than the footprint size by adding more dripline but keeping the same footprint. 24”x24” spacing is typical may be reduced to 12” or 18” depending on soil characteristics. Another option is to keep 24” emitter spacing and use the infiltrative surface area of 1 ft^2 per 5 linear feet of dripline (actual surface area of ½” tubing) or reducing spacing to 12”x12” and use a infiltrative surface area of 1 ft^2 per linear foot of dripline (retains original footprint but doubles the tubing). These approaches reduce daily per emitter loading rates by a factor of 4 compared to standard 24”x24” (4 ft^2/emitter) loading. Filtering and flushing are critical. Filter system is larger for primary effluent systems due to higher solids and organic loading rates. Filters are typically flushed at the start of each dosing cycle and zones are flushed after 20-50 cycles for anaerobic systems. Secondary effluent systems have filter flushing ranging from once per day to every 6 months and zone flushing once or twice per year. Advocates for aerobic systems consider them more robust since the effluent quality is more consistent day-to-day and the system is designed for it where a secondary effluent system is vulnerable to O&M, toxics, flow surges, freezing, etc. There is agreement that biomat will form around tubing of primary effluent systems, but there is not agreement on the importance of the biomat with respect to hydraulics or pollutant attenuation. Drip systems should be designed so that soil moisture tension is high beneath the tubing (keeps effluent in the unsaturated zone longer). Effectiveness of the soil to provide treatment depends on the residence time of the wastewater in soil and maintaining predominantly aerobic conditions. Existing information is generally adequate to ensure that the products can be selected to perform reliably within the environment in which they will be placed. Use hydraulic loading rates suggested by manufacturers only as a guide. Limit linear loading rates by utilizing closer spacing of drip tubing within the footprint area. There is a consensus to design conservatively as the least expensive part of the drip system is tubing.

Drip Distribution of Domestic Wastewater – James Converse

Use 100-150 micron filters for primary effluent. Backflush the filters before each dosing cycle. Filters provide very little change in BOD, nitrogen, fecal coliform concentrations and other parameters. Because of the high oxygen demand of the wastewater (BOD and nitrogen) there is potential for soil clogging around the emitters if the oxygen demand is not met. Based on experience though this is normally not a problem, but can be if the loading rates are high and BOD is high. Filters are the heart of a primary effluent system and the filter openings are usually 7-8 times smaller than the emitter opening. Filters need to be inspected periodically and hand cleaned if necessary. May be appropriate to use 6”-12” emitter spacing with higher strength BOD wastewater. A minimum of two zones should be used for mechanically filtered primary effluent. The potential for clogging mat development with drip distribution is reduced because the effluent is applied in the upper horizon where oxygen is readily available and the effluent is applied more uniformly and more frequently though loading rates for primary effluent need to be less than that of secondary effluent. Only domestic strength wastewater should be distributed via drip distribution. There are several loading rates that need to be considered in a drip design including:

- Areal loading (footprint) – GPD/ft^2. 24” drip line spacing and 24” emitter spacing is an area of 4 ft^2/emitter. 12” drip line spacing and 12” emitter spacing is an area of 1 ft^2/emitter. For the same areal loading rate the emitter serving the 1 ft^2 area would discharge ¼ of the effluent/dose of the emitter serving the 4 ft^2 area. Smaller service area provides 4 times the number of treatment points and more access to oxygen.
- Infiltrative surface rate – This is the surface area in contact with the effluent as it infiltrates into the soil. For drip distribution it is typically the area around the emitter and surface area of the drip lines. Every 5 linear feet of drip line has ~1ft^2 of infiltrative area. If each emitter serves a 2’x2’ area the calculated infiltrative rate is ~10 times the areal loading rate. If each emitter serves a 1’x1’ area the calculated infiltrative area is ~5 times the areal loading rate.
- Linear loading rate – This is the amount of effluent applied along the length of a single drip line in GPD/lineal foot.
- Landscape linear loading rate – Amount of effluent applied along the length of the drip system or zone in GPD/lineal foot of system along the contour.
- Instantaneous loading rate – How much effluent can be applied per dose (GPH/dose) so the soil will accept it.

The separation distances required for primary effluent should be greater than that of secondary effluent. 12” is standard separation for secondary effluent. Longer and narrower installations are preferred. 12” drip line spacing helps move water away from the emitters.

Soil Treatment Performance and Cold Weather Operations of Drip Distribution System – R.M. Bohrer and J.C. Converse

In 1999 soil was sampled below six drip systems to evaluate treatment performance of the soil. Soil ranged from coarse sand to clay loam. Three sites received primary effluent and three received secondary effluent. Driplines were installed from 4”-20” below grade. The systems receiving primary effluent showed very low fecal coliforms 18”-24” below the drip tube with no detect below 24”. The nitrate-nitrogen levels below the systems at 42” below the dripline had median values ranging from 26-83 mg N/L of soil water regardless of treatment type, but these levels were close to the background levels which were unexplainably high. Ammonium-nitrogen levels at 42” below the drip line were also similar to background levels. Authors recommend a separation distance of 18” below the drip line to limiting layers for systems receiving primary effluent depending on the level of acceptable risk as there were very few fecal coliforms and E. coli concentrations below that distance. The nitrogen impact from the systems reviewed in this study was inconclusive due to the high background levels.

Onsite Wastewater Treatment Systems Manual – Dripline Pressure Network – EPA

Injection of a mild bleach solution into the dripline is usually effective in restoring emitter performance if clogging is due to biofilms. Other appropriate engineering controls should also be used to prevent emitter clogging (i.e., prefiltration of wastewater, regular dripline flushing, and vacuum release valves). Prefiltration needs to be through self-cleaning emitters designed to remove particles larger than 100-115 microns. Filters must be cleaned regularly by backflushing. Dripline must also be flushed on a regular schedule to keep it scoured of solids. If emitter and/or dripline spacing are reduced the overall footprint of the system should not be reduced and discharge rates per orifice should be reduced to ensure that wetting front overlapping is minimized and hydraulic performance isn’t minimized.

4.5 Drip Distribution System

Revision: ~~September 18, 2014~~February 4, 2016

4.5.1 Description

Drip distribution systems are comprised of a shallow network of thin-walled, small-diameter, flexible tubing with self-cleaning emitters to discharge filtered septic tank effluent or pretreated effluent into the root zone of the receiving soils. The drip system is flushed either continuously or noncontinuously depending upon the system design. Minimum system components include, but are not limited to, the following:

1. Septic tank
2. Pretreatment system (not required in grey water system designs or septic tank effluent drip distribution designs):
    a. Intermittent sand filter
    b. Recirculating gravel filter
    c. Extended treatment package system
3. Filtering system: spin filter (screen filter), cartridge or disk filters (flushable filter cartridge), and filter flush return line
4. Effluent dosing system: dosing chamber~~pump tank,~~ ~~and dose~~ pump, and timed dosing control
5. Process controller: programmable logic controller (PLC)
6. Flow meter
7. Drip tubing network, ~~and~~ associated valving, supply line and manifold, pressure regulators, return manifold and line, and air/vacuum relief valves

4.5.2 Approval Conditions

1. ~~Drip distribution systems shall only be installed at locations that meet the criteria in the site suitability subsection of IDAPA 58.01.03.008.02 and 58.01.03.013 (section 8.1).~~ Site slope may not exceed 45%.
2. ~~The effective soil depths that are established for the alternative pretreatment systems listed in section 4.5.1(2) may be applied to drip distribution systems when they are used in the system design.~~ All components that are in contact with wastewater must be rated by the manufacturer for wastewater applications.

~~3~~2. All pressurized distribution components and design elements of the drip distribution system that do not have design criteria specified within section 4.5 shall follow the design guidance provided in section 4.19.

~~4. Pretreatment system design, installation, operation, and maintenance will follow the specific pretreatment system guidance provided in this manual.~~

~~5~~3. System must be designed by a PE licensed in Idaho.

4. The design engineer shall provide an O&M manual for the system to the health district prior to permit issuance.

4.5.3 Design Requirements

Many considerations need to be made in the design of a drip distribution system based on site-, flow-, and effluent-specific characteristics. These characteristics will affect several system components depending on each specific design scenario. The design of a drip distribution system should be approached as an integrated system rather than individual components. System design should account for, but is not be limited to:

1. Tubing material and emitter type
2. Brand of drip tubing to be used and associated proprietary components
3. Level and type of pretreatment to be provided
4. System configuration based on site conditions and constraints
5. Extent of automation, monitoring, and timing of critical operation processes and procedures.

Design requirements vary dependent upon the allowable effluent quality and system flushing. Requirements based on these system parameters are included in the subsequent sections.

4.5.3.1 Basic Design Requirements

The following minimum design elements apply to both septic tank and pretreated effluent systems and continuous and noncontinuous flush drip distribution systems:

1. ~~Application areas up to 2 square feet per foot (ft²/ft) of drip irrigation line may be used.~~ The septic tank must have a volume sufficient to meet the minimum size requirements of IDAPA 58.01.03.007.07 (section 8.1) plus two-times the additional volume of flushing wastewater returned to the septic tank during flushing events.

~~2. Drip tubes may be placed on a minimum of 2-foot centers.~~

~~3~~2. Drip distribution tubes are placed directly in native soil at a depth of 6–18 inches with a minimum final cover of 12 inches.

3. Drip distribution tubes should be placed on contour and laid out to drain through the emitters as evenly as possible to prevent localized overloading of the drip distribution system.
    a. A minimum of two zones are recommended regardless of system size and zones should be kept as small as is reasonable.
    b. Lateral lengths within a zone should be close to equal to achieve efficient flushing.
    c. Zones within a system should be close to equal in size to achieve efficient and consistent application of wastewater.
    d. Steep slope installations must account for depressurization flow and be designed to prevent movement of the wastewater to the bottom of the drip distribution zone during this time, the following design suggestions may help:
        i. Isolation of lateral lines using horizontal manifolds or check valves.
        ii. Installing long, narrow zones when possible.
        iii. Elevating a section of tubing between the manifold and lateral or elevating looped ends may also help maintain effluent within tubing runs.
    e. In lower permeability soils (i.e. clayey soils) it is recommended that drip tubing and emitter spacing be reduced while maintaining the minimum square footage to increase the emission points and maintaining the dosing volume to decrease wastewater travel distance through the soil.

44. The design application rate is based on the most restrictive soil type encountered within 2 feet of the drip tubes the minimum effective depth of soil below the drip distribution tubing required to meet the necessary separation distance to limiting layers.

5. The effective soil depth to limiting layers below the drip tubes should meet the depths specified in section 4.21.5, Table 4-20.

65. Effluent is required to be filtered with a 100 micron or smaller disc or flushable filter cartridge spin/screen filter or disk filter that is flushable before prior to discharge into the drip distribution tubing network.

6. Effluent filters are required to:
   a. Be automatically backflushed to flush the solids off the filter surface and return them to the inlet pipe of the septic tank.
   b. Be inspected periodically and hand cleaned if necessary.

76. A minimum of two vacuum relief valves are required per zone.
   a. The valves are located at the highest points on both the distribution and return manifolds.
   b. Vacuum relief valves are located in a valve box that is adequately drained and insulated to prevent freezing.

87. Pressure regulators and pressure compensating emitters should be used on sloped installations.

98. Pressure should be between 25 and 40 psi unless pressure compensating emitters are used.

9. The hydraulic design of the drip distribution system should achieve discharge rates and volumes that vary no more than ±10% between all the emitters within a zone during a complete dosing event.
   a. Consideration should be given to the unequal distribution during flow pressurizing and depressurizing periods.
   b. The designer must be able to mathematically support the design for equal distribution.

1010. Timed dosing is requiredDosing requirements in all drip distribution systems. include:
   a. Timed dosing is required.
   b. Dosing will only occur when there is sufficient volume in the dosing chamber to deliver a full design dose to the drip distribution system.
   c. Sufficient rest time shall be programmed to provide time for effluent to distribute away from the drip lines.
   d. Shall include a flow meter or run time/event counter.
   e. The capability to monitor flow rates both during dosing and flushing events.
   f. Small, frequent doses should be avoided and dose volumes should be several times the total supply and return manifold and drip tubing volumes within the dosing zone.

11. Dosing chambers shall:
   a. Provide sufficient storage for equalization of peak flows.
   b. Hold one day’s flow above the pump-enable water level regardless of whether a single or duplex pump system is installed.
   c. The high-level alarm should be located so that there is storage for at least one quarter of a day’s flow above the alarm.

~~11~~12. Each valve, filter, pressure regulator, and any other nondrip tube or piping component is required to be accessible from grade and should be insulated to prevent freezing.

4.5.3.2 Additional Design Requirements for Septic Tank Effluent Drip Distribution Systems

Septic tank effluent drip distribution systems are systems that discharge filtered effluent that has only passed through an appropriately sized septic tank, dosing chamber, and 100 micron filter prior to entering the drip distribution tubing. The following additional minimum design elements apply only to septic tank effluent drip distribution systems:

1. Soil application rates used for system design shall meet the rates provided in Table 2-9.
2. Effective soil depth to limiting layers below the drip tubes shall meet the minimum depths specified in IDAPA 58.01.03.008.02.c (Section 8.1) for daily design flows < 2,500 gallons per day (GPD) or IDAPA 58.01.03.013.04.c (Section 8.1) for daily design flows ≥ 2,500 GPD.
3. Application areas up to 1 square foot per foot (ft^2/ft) of drip distribution line may be used, application area is equivalent to drip tube spacing used in the system design.
4. Drip distribution tubes may be placed on a maximum of 1-foot centers.
5. Emitter spacing may be a maximum of 12 inches.
6. Emitter flow rate shall be ≤ 0.6 gallons per hour (GPH).
7. Filters should be flushed at the start of each dosing cycle and zones should be flushed every 20-50 dosing cycles.

4.5.3.3 Additional Design Requirements for Pretreated Effluent Drip Distribution Systems

Pretreated effluent drip distribution systems are systems that discharge filtered effluent that has passed through an appropriately sized septic tank, pretreatment system, dosing chamber, and 100 micron filter prior to entering the drip tubing. The following additional minimum design elements apply only to pretreated effluent drip distribution systems:

1. Soil application rates used for system design shall meet the rates provided in Table 2-9.
2. Effective soil depth to limiting layers below the drip tubes shall meet the minimum depths specified in section 4.21.5, Table 4-20.
3. Application areas up to 2 ft^2/ft of drip distribution line may be used.
4. Drip distribution tubes may be placed on a minimum of 2-foot centers.
5. Emitter spacing may be a maximum of 24 inches.
6. Emitter flow rate shall be ≤ 1.0 GPH.
7. Filters should be flushed at least once per day and zones should be flushed every two weeks.

4.5.3.4 Additional Design ~~Elements~~Requirements for Noncontinuous Flush Drip Distribution Systems

The following additional minimum design elements apply only to noncontinuous flush drip distribution systems:

1. In noncontinuous flush systems, drip distribution laterals are flushed ~~at least once every 2 weeks~~ at regular intervals to prevent biofilm and solids buildup in the tubing network.
   a. Minimum flushing velocity is based on the tubing manufacturer's recommendations for the return ends of the distribution lines and in the drip ~~irrigation~~ distribution tubing during field flush cycles, must be high enough to scour the drip distribution tubing, and is recommended to exceed the manufacturer's recommended velocity.
   b. The minimum flushing duration is long enough to fill all lines and achieve several pipe volume changes in each lateral.
2. In noncontinuous flush systems, the return manifold is required to drain back to the septic tank.
3. In noncontinuous flush systems, timed or event-counted backflushing of the filter is required.
4. In noncontinuous flush systems, filters, flush valves, and a pressure gauge may be placed in a head works (between the dose pump and drip field).

4.5.3.5 Additional Design ~~Elements~~Requirements for Continuous Flush Drip Distribution Systems

The following additional minimum design elements apply only to continuous flush drip distribution systems:

1. Filter must be a flushing type~~, a. The filter~~ is required to be backwashed according to the manufacturer's recommendations, and the process must be automated ~~unless the automated backwashing requirement has been waived~~.
   ~~b. The automated backwashing requirement may be waived if the filter is configured with an alarm to indicate when velocity is reduced below the manufacturer's minimum recommended flow velocity.~~
2. Drip distribution laterals are flushed during the dosing cycle.
   a. The continuous flush system must be designed to the manufacturer's minimum recommended flow velocity, must be high enough to scour the drip distribution tubing, and is recommended to exceed the manufacturer's recommended velocity.
   b. The dose duration must be long enough to achieve several pipe volume changes in each drip tubing e lateral to adequately accomplish flushing the drip tubing lines.
3. Filters and pressure gauges may be placed in a head works (between the dose tank and drip distribution field), and supply and return pressure gauges are needed to ensure that the field pressurization is within the required range specified by the drip tube manufacturer.
4. In continuous flush systems, both supply and return manifolds are required to drain back to the ~~dose~~ septic tank.
5. Due to the nature of the continuous flush process, the filter shall be examined after initial start-up and cleaned if necessary to prevent incorrect rate of low readings for the controller.
6. The drip distribution system will operate to the manufacturer's minimum recommended flow velocity for the duration of each cycle, and the total flow minus the emitter uptake flow would be the return and flushing flow.

4.5.4 Construction

1. No wet weather installation is allowed.
2. Excavation and grading must be completed before installing the subsurface drip distribution system.
3. Drip distribution tubing may be installed using a trencher, static plow, or vibratory plow.
   a. Care must be taken when using a trencher to ensure the tubing is in contact with the trench bottom and does not have many high and low points in the line.
   b. Trenchers may limit the potential for smearing in clay soils.
   c. When using a static or vibratory plow care must be taken to ensure the drip distribution tubing does not snag and stretch when unrolling.
   d. Use of a gage wheel with a static plow will assist in installing tubing to grade on level sites.
   e. Vibratory plows allow for minimal site disturbance and may be best for cutting through roots in the soil.

4. Drip distribution systems may not be installed in unsettled fill material.

~~4~~5. No construction activity or heavy equipment may be operated on the ~~drainfield~~ drip distribution area other than the minimum to install the drip distribution system.

~~5~~6. Do not park or store materials on the ~~drainfield~~ drip distribution area.

~~6~~7. For freezing conditions, the bottom drip ~~tube~~ distribution line must be higher than the supply and return line elevation at the dosing ~~tank~~ chamber.

~~7~~8. All PVC pipe and fittings shall be PVC schedule 40 type 1 or higher rated for pressure applications.

9. Flexible PVC pipe should be used for connecting individual drip lines together when making turns in laterals.

~~8~~10. All glued joints shall be cleaned and primed with purple (dyed) PVC primer before being glued.

~~9~~11. All cutting of PVC pipe, flexible PVC, or drip tubing should be completed using pipe cutters.

~~10~~12. Sawing PVC, flexible PVC, or drip distribution tubing is allowed only if followed by cleaning off any residual burs from the tubing or pipe and removing all shavings retained in the tubing or pipe.

~~11~~13. All open PVC pipes, flexible PVC, or drip distribution tubing in the work area shall have the ends covered during storage and construction to prevent construction debris and insects from entering the tubing or pipe.

~~12~~14. Prior to gluing, all glue joints and tube or pipe interior shall be inspected and cleared of construction or foreign debris.

~~13~~15. Dig the return manifold ~~ditch~~ trench along a line marked on the ground and back to the dosing ~~tank~~ chamber.
   a. The return manifold ~~ditch~~ trench should start at the farthest end of the manifold from the dosing ~~tank~~ chamber.
   b. The return manifold must slope back to the dosing ~~tank~~ chamber.

~~14~~16. Prior to start-up of the drip distribution system, the air release valves shall be removed and each zone in the system shall be flushed as follows:

a. System flushing is accomplished by the manufacturer or engineer using the control panel's manual override.

b. Use ~~ing~~ an appropriate length of flexible PVC pipe with a male fitting and attach it to the air release connection to direct the flush~~ing~~ water away from the construction and drip distribution system area.

c. Flush ~~the~~ each zone with a volume of clean water ~~(clean water to be provided by contractor) equal to~~ at least two times the volume of ~~the~~ all piping ~~es~~ and tubing from the ~~central unit~~ dosing chamber to the air release valve within the zone being flushed ~~or the equivalent of 5 minutes of flushing~~.

~~d. Repeat this procedure for each zone.~~

Note: filters are not backflushed during start-up as any clogging could cause incorrect rate of flow readings for the controller.

~~15~~17. If existing septic tanks or dosing chambers are to be used, they shall be pumped out by a permitted septic tank pumper, checked for structural or component problems, and repaired or replaced if necessary.

a. After ~~the~~ a tank is emptied, the tank shall be rinsed with clean water, pumped again, refilled with clean water, and leak tested.

b. Debris in ~~the septic~~ any tank should be kept to a minimum because it ~~could~~ may clog the filters during start-up.

~~16~~18. Once completed, cap ~~drainfield~~ the drip distribution areas for shallow installations (less than 12 inches) with 6–8 inches of clean soil and suitably vegetate.

a. Cap fill material shall be the same as or one soil group finer than that of the site material, except that no fill material finer than clay loam may be used.

b. Cap fill shall be free of debris, stones, frozen clods, or ice.

c. The cap should be crowned to promote drainage of rainfall or runoff away from the drip field.

~~c~~d. Suitable vegetation should consist of typical lawn grasses or other appropriate low-profile vegetation that will provide thermal insulation in cold climates.

~~d~~e. Trees, shrubs, and any other vegetation that aggressively seeks water should not be planted within 50 feet of the drip tubing network.

19. Development of a diversion berm around the drip distribution field site will aid in the diversion of runoff around the system.

4.5.5 Inspection

1. A preconstruction meeting between the health district, responsible charge engineer, and installer should occur prior to commencing any construction activities.
2. The health district shall inspect all components and fill material used in constructing the drip distribution system prior to backfilling or cap fill placement.
3. The responsible charge engineer should conduct as many inspections as necessary to verify system and component compliance with the engineered plans.
4. The responsible charge engineer shall provide the health district with a written statement that the system was constructed and functions in compliance with the approved plans and specifications. Additionally, the responsible charge engineer shall provide as-built plans to the health district if any construction deviations occur from the permitted construction plans. (IDAPA 58.01.03.005.15)

4.5.6 Operation and Maintenance

1. The drip distribution system design engineer shall provide a copy of the system's operation, maintenance, and monitoring procedures to the health district as part of the permit application and prior to subsurface sewage disposal permit issuance (IDAPA 58.01.03.005.04.k).
2. Minimum operation, maintenance, and monitoring requirements should follow each system component manufacturer's recommendations.
   a. Monitoring should be based on the most limiting process in the system design.
   b. Regular monitoring of flow rates and pressures should be specified to diagnose possible overuse.
3. Additional operation, maintenance, and monitoring may be required for the pretreatment component of the drip distribution system.
   a. The minimum operation, maintenance, and monitoring of the pretreatment component will be based on the manufacturer's recommendations and the minimum requirements specified within this manual for the specific pretreatment system.
   b. Additional operation, maintenance, and monitoring may be based on specific site conditions or pretreatment component type.

4.5.7 Suggested Design Example

1. Determine square feet needed for the drip distribution system, as follows.
   a. Wastewater flow in GPD is divided by the soil application rate (based on the soil classification from an on-site evaluation).
   b. Result is the square feet (ft^2) needed for the system.

   Example conditions: three-bedroom home discharging pretreated effluent in subgroup C-2 soils.

   Example calculation: (250 GPD)/(0.2 gallons/ft^2) = 1,250 ft^2
2. System design will use an application area of 2 ft^2/ft of drip distribution tube. Divide the required square feet by the drip distribution tube application area (2 ft^2/ft). This will determine the length of drip distribution tube needed for the system.

   Example: (1,250 ft^2)/(2 ft^2/ft) = 625 feet of drip tube
3. Determine pumping rate by finding the total number of emitters and multiplying by the flow rate per emitter (~~1.32~~ 0.9 gallons/hour/emitter at 20 psi). Adjust output to GPM and add 1.5 GPM per connection for flushing to achieve, for example, a 2 feet/second flushing velocity.

   Note: For continuous flush systems, the number of emitters will vary depending on the product selected.

   Example: (625 feet)/(2 feet/emitter) = 312.5, use 313 emitters

   (313 emitters) x (~~1.32~~ 0.9 gallons/hour/emitter) = ~~413.2~~ 281.7 gallons/hour

   (~~413.2~~ 281.7 gallons/hour)/(60 minutes/hour) = ~~6.89~~ 4.695 GPM, or ~~7~~ 5 GPM

   10 connections at 1.5 GPM per connection = 15 GPM

   Pumping rate: ~~7~~ 5 GPM + 15 GPM = 2~~2~~0 GPM

4. Determine feet of head. Multiply the system design pressure (20 psi for this example ~~is standard~~, ~~but~~ values can vary depending on the drip distribution tube used) by 2.31 feet/psi to get the head required to pump against.

   Example: (20 psi) x (2.31 feet/psi) = 46.2 feet of head

   Add in the frictional head loss from the drip distribution tubing and piping.

5. Select a pump. Determine the size of the pump based on gallons per minute (step 3 of suggested design example) and total head (step 4 of suggested design example) needed to deliver a dose to the system. The pump selected for this example must achieve a minimum of ~~22~~20 GPM plus the flush volume at 46.2 feet of head.

Figure 4-7 shows an overhead view of a typical drip distribution system. Figure 4-8 shows a potential layout of a filter, valve, and meter assembly, and Figure 4-9 illustrates a cross-sectional view of the filter, valve, and meter assembly. Figure 4-10 provides a view of the continuous flush system filter and meter assembly.

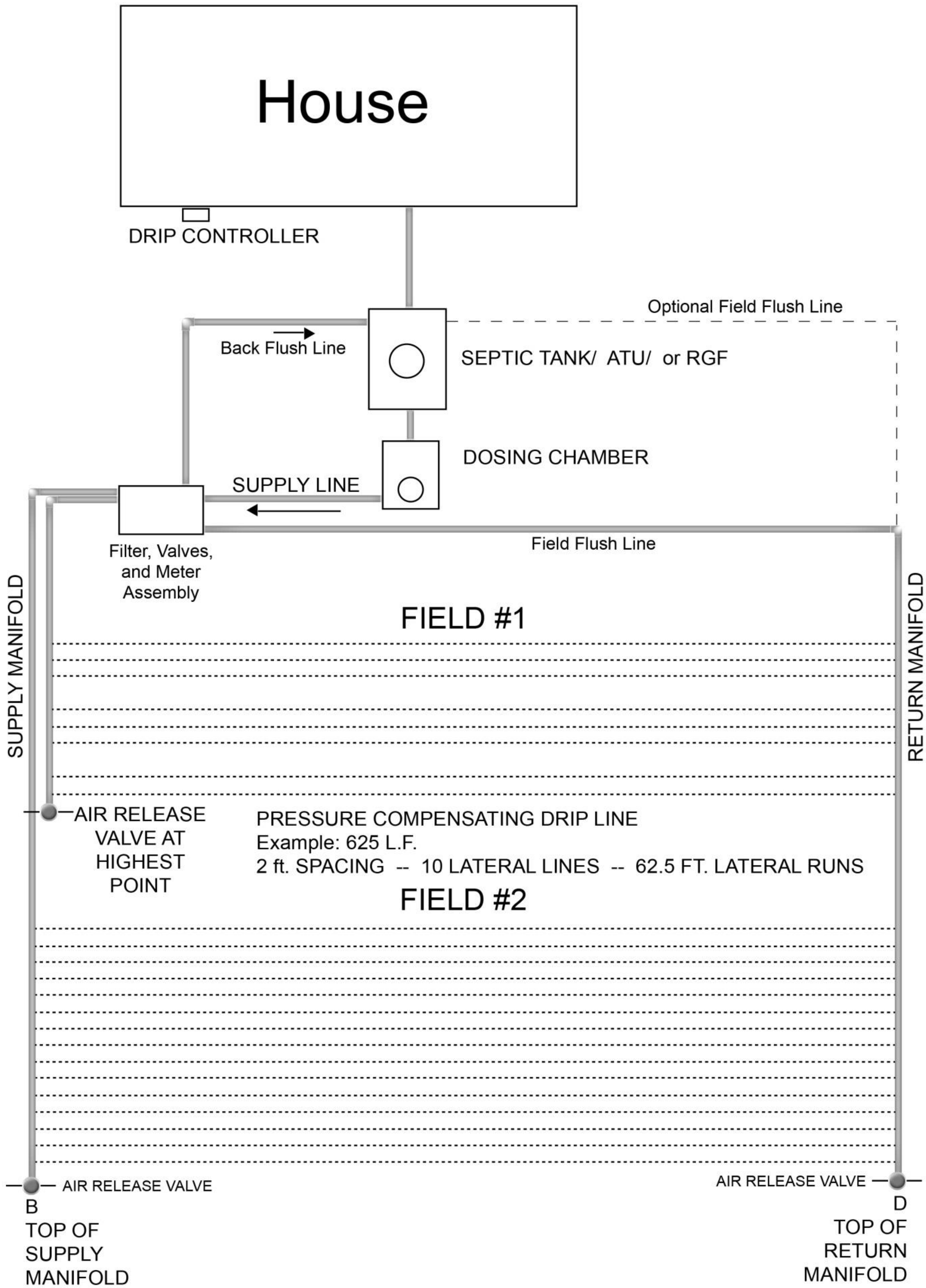


Figure 4-7. Overhead view of typical drip distribution system.

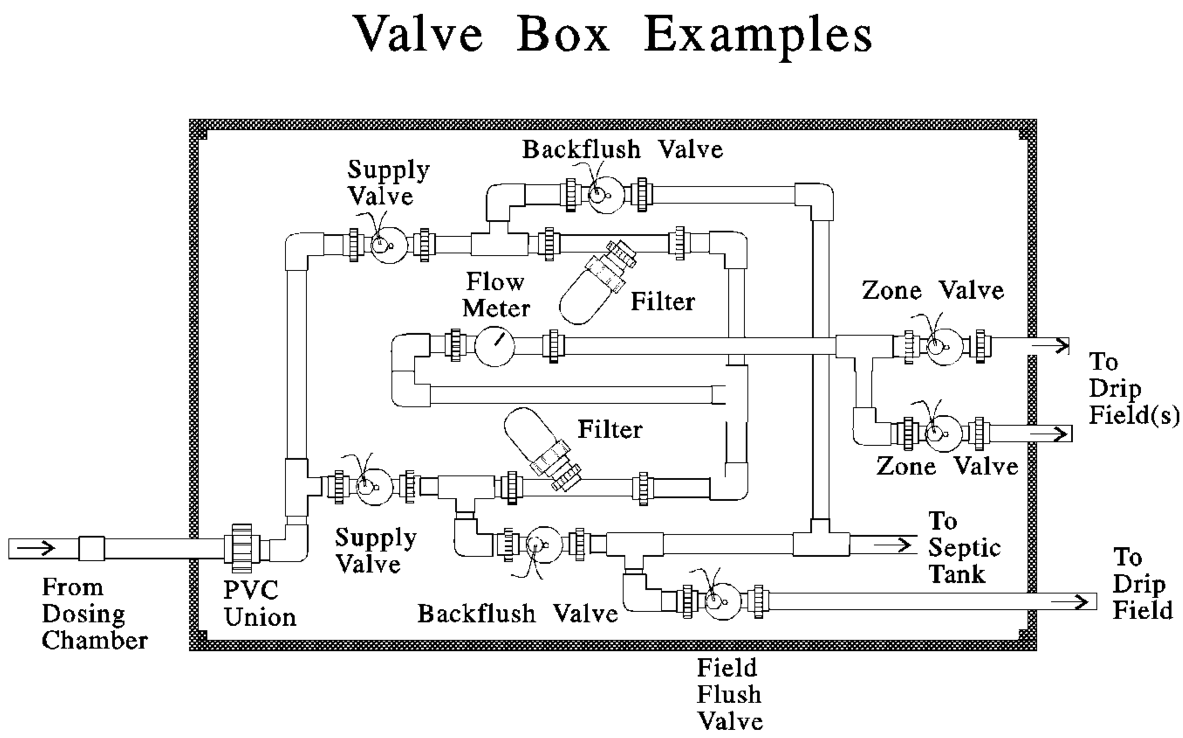


Figure 4-8. Overhead view of filter, valve, and meter assembly.

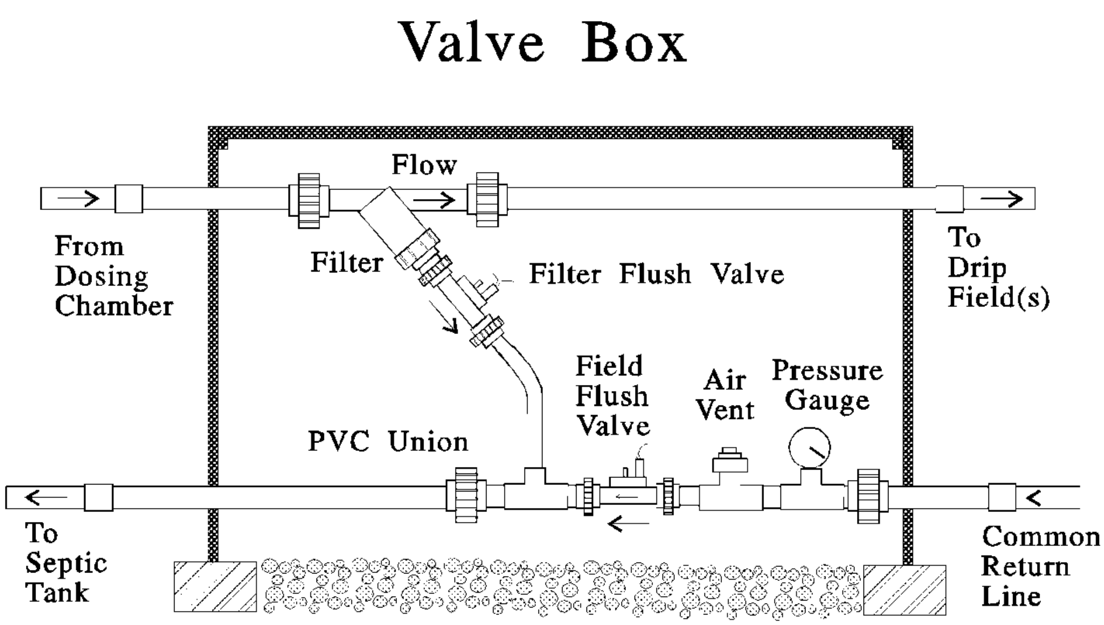


Figure 4-9. Cross-sectional view of typical filter, valve, and meter assembly.

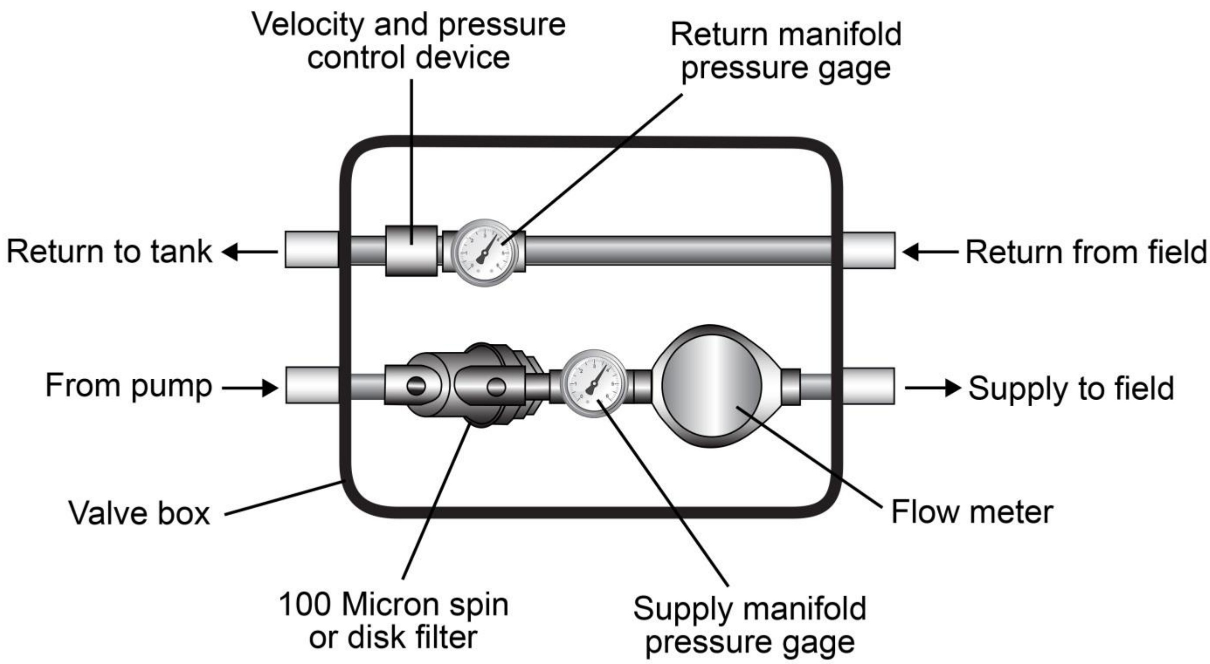


Figure 4-10. Overhead view of continuous flush system filter and meter assembly.

Appendix K

2.1 Soils Texture and Group Determinations

Revision: January 30, 2013February 4, 2016

2.1.1 Determining Soil Textural Classifications

Soil texture is determined by the proportion of three separates: sand, silt, and clay. It is one of the most important characteristics of soil for water movement because of its relationship to pore size, pore size distribution, and pore continuity. Permeability, aeration, and drainage are all related to the soils' ability to filter and adsorb or otherwise retain, pollutants for treatment. Sizes of the major separates are shown in Table 2-1.

Table Error! No text of specified style in document.**-1. Sizes of mineral, soil, and rock fragments.**

Material	Equivalent Diameter[a]	Passes Sieve #
Clay	<0.002 mm[b]	425
Silt	0.002–0.05 mm	270
Very fine sand	0.05–0.10 mm	140
Fine sand	0.10–0.25 mm	100
Medium sand	0.25–0.50 mm	50
Coarse sand	0.50–1.00 mm	16
Very coarse sand	1.00–2.00 mm	10
Gravel	2.00 mm–7.5 cmmm	3 in.[b]
Cobbles	7.5–250.4 cmmm	10 in.
Stones	250.4 –6001 cmmm	24 in.
Boulders	>6001 cmmm	—

a. NRCS National Soil Survey Handbook (NSSH) Part 618 (Subpart A), 618.46 (D) and 618.31(K) 3ii
b. Notes: millimeter (mm); centimeter (cm); inches (in)

The Soil Textural Classification used by Idaho was adopted from the United States Department of Agriculture (USDA). Soil textures of proposed soil absorption sites are determined according to these guidelines. Once the textures have been determined, then the soil design groups may be specified for the absorption system design. Characteristics of each soil texture are shown in Table 2-2. To determine the texture classification of soils, refer to Table 2-32, Table 2-3, and Figure 2-1 for summaries of the soil particle distributions and percentages in each of the textures. Refer to Figure 2-2 for a flowchart of the steps for determining soil classification.

Table 2-2. Soil textural characteristics[a].

~~Soil Texture~~	~~Visual Detection of Particle Size and General Appearance of Soil~~	~~Squeezed by Hand and Pressure Released When Air-Dry~~	~~Squeezed by Hand and Pressure Released When Moist~~	~~Ribbon Between Thumb and Finger~~
~~Sand~~	~~Soil has a granular appearance, loose, gritty grains visible to the eye. Free flowing when dry.~~	~~Will not form a cast. Falls apart easily.~~	~~Forms cast that crumbles at least touch.~~	~~Cannot ribbon~~
~~Sandy loam~~	~~Somewhat cohesive soil; aggregates easily crushed. Sand dominates but slight velvety feel.~~	~~Cast crumbles easily when touched.~~	~~Cast will bear careful handling.~~	~~Cannot ribbon~~
~~Loam~~	~~Uniform mixture of silt, clay, and sand. Aggregates crushed under moderate pressure. Velvety feel that becomes gritty with continued rubbing.~~	~~Cast will bear careful handling.~~	~~Cast can be handled freely.~~	~~Cannot ribbon~~
~~Silt loam~~	~~Quite cloddy when dry. Can be pulverized easily to a fine powder. Over 50% silt.~~	~~Cast can be freely handled. Flour-like feel when rubbed.~~	~~Cast can be freely handled. When wet, flows into puddle.~~	~~Will not ribbon but has slight plastic look.~~
~~Silt~~	~~Over 80% silt with little fine sand and clay. Cloddy when dry pulverizes readily to a flour-like powder.~~	~~Cast can be freely handled.~~	~~Cast can be freely handled. Puddles readily. "Slick" feeling.~~	~~Ribbons with a broken appearance.~~
~~Silty clay loam~~	~~Hard lumps when dry, resembling clay. Takes strong pressure to break the lumps.~~	~~Cast can be freely handled.~~	~~Cast can be freely handled. Can be worked into a dense mass.~~	~~Forms thin ribbon that breaks easily.~~
~~Clay~~	~~Very fine-textured soil breaks into very hard lumps that take extreme pressure to break.~~	~~Cast can be freely handled.~~	~~Cast can be freely handled. "Sticky" feeling.~~	~~Forms long, thin ribbons.~~

Soil Texture	USDA Soil Textural Classification	Dry Soil Description (0-25% available moisture percent[b])	Moist Soil Description (75-100% available moisture percent)	
			Ball[c] Formation	Ribbon[d] Between Thumb and Finger
Coarse	Fine sand Loamy fine sand Sand Coarse sand Loamy coarse sand Loamy sand Very fine sand	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure	Wet, forms a weak ball[1], loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers	Will not ribbon
Moderately Coarse	Sandy loam Fine sandy loam Very fine sandy loam Coarse sandy loam Loamy very fine sand	Dry, forms a very weak ball, aggregated soil grains break away easily from ball	Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers	Makes a weak ribbon between thumb and forefinger
Medium	Sandy clay loam Loam Silt loam Silt	Dry, soil aggregations break easily, no moisture staining on fingers, clods crumble with applied pressure	Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers	Ribbons between thumb and forefinger
Fine	Clay Clay loam Silty clay loam Sandy clay Silty clay	Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure	Wet, forms a ball, uneven medium to heavy soil/water coating on fingers	Ribbons easily between thumb and forefinger

a. Adapted from USDA Natural Resource Conservation Service (NRCS). April 1998, Reprinted June 2005. Estimating Soil Moisture by Feel and Appearance. Program Aid Number 1619.
b. Available moisture percent is that percent of the available water-holding capacity of the soil occupied by water.
c. Ball is formed by squeezing a hand full of soil very firmly with one hand.
d. Ribbon is formed when soil is squeezed out of hand between thumb and forefinger.

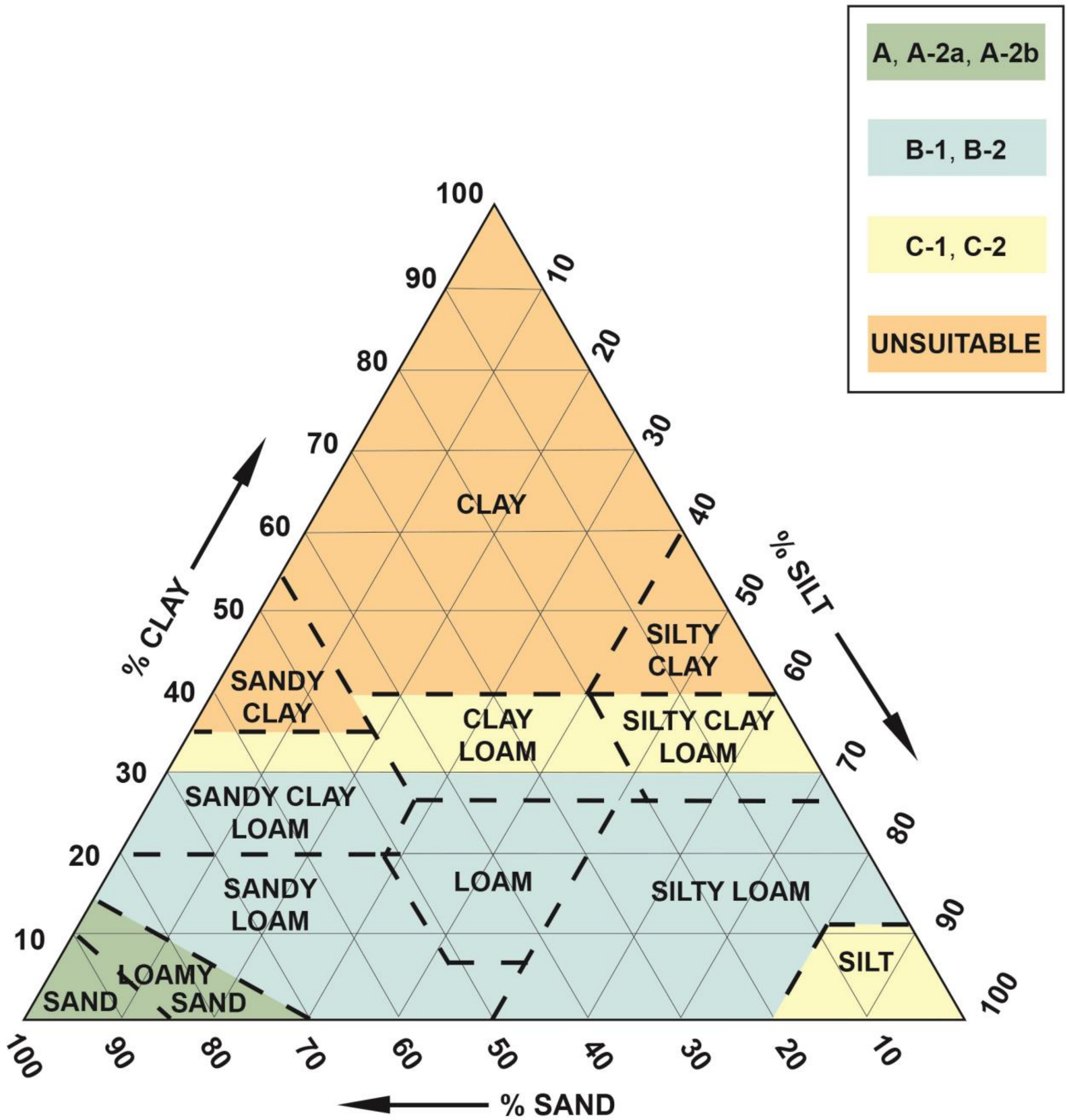
Table 2-3. Soil textural proportions.

Soil Texture	Sand (%)	Silt (%)	Clay (%)
Sand	>85	<15	<10
Loamy sand	70–90	<30	~~1~~0-15
Sandy loam	43–85	<50	<20
Loam	23–52	28-~~<~~50	7–27
Silty loam	<50	50–88	<27
Silt	<20	>80	<12
Sandy clay loam	45–80	<28	20–35
Clay loam	20–45	15–53	27–40
Silty clay loam	<20	~~6~~40–73	27–40
Sandy clay	45–65	<20	35–55
Silty clay	<20	40–60	40–60
Clay	<45	<40	>40

Basic textural names may be modified if the soil mass contains 15%–95% of stones, cobble, or gravel by adding the name of the dominant rock fragment:

- Gravelly or stony = 15%–35% of the soils volume is rock fragments.
- Very gravelly or very stony = 35%–60% of the soils volume is rock fragments.
- Extremely gravelly or extremely stony = 60%–95% of the soils volume is rock fragments.
- 95% or more should take the name of the geological type, such as granite, gneiss, limestone, or gravel.

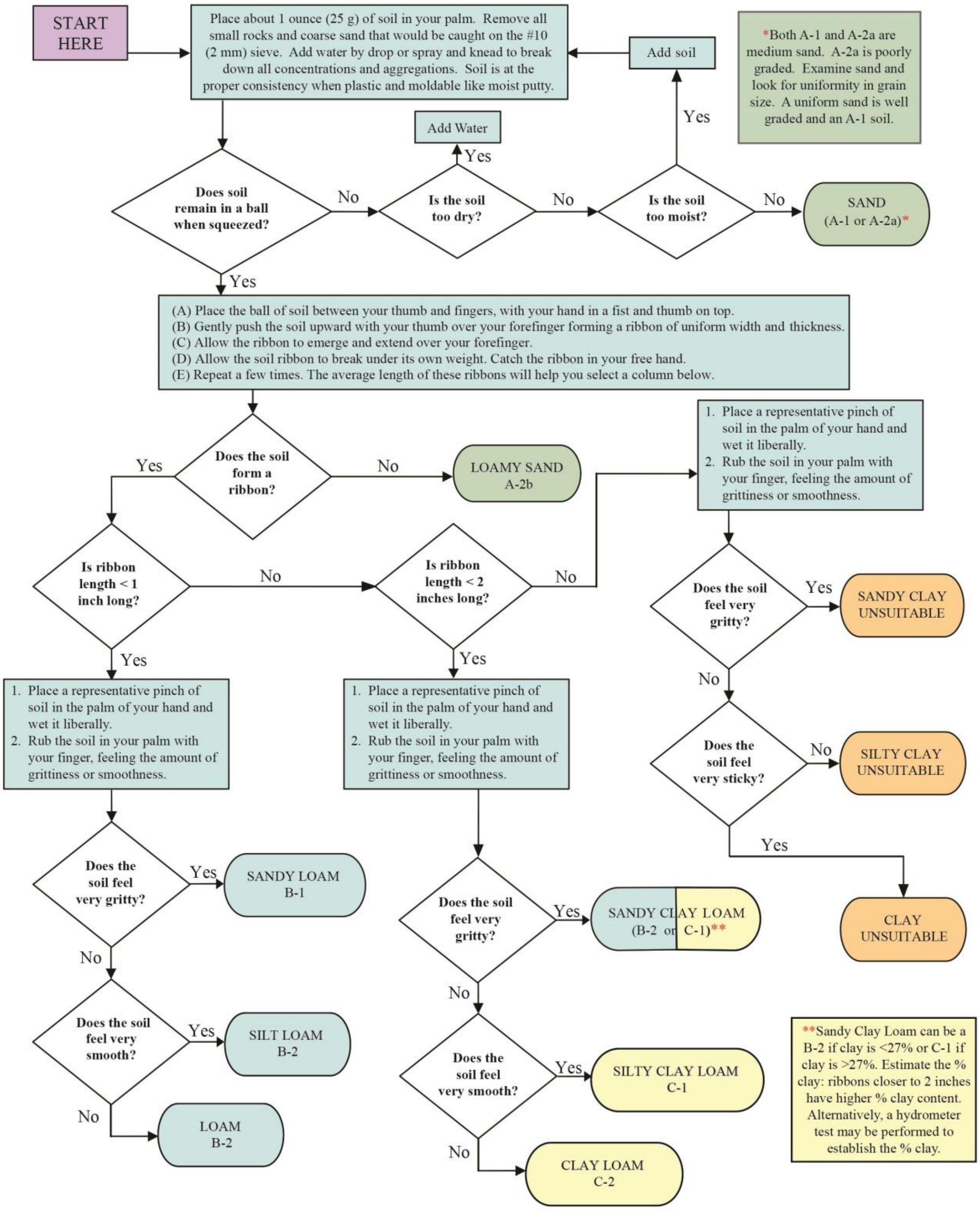
TGM-Soil Texture Flowchart Triangle



A black and white version is provided in Appendix B.

Figure 2-1. United States Department of Agriculture soil textural triangle.

TGM-Soil Texture Flowchart



A black and white version is provided in Appendix B.

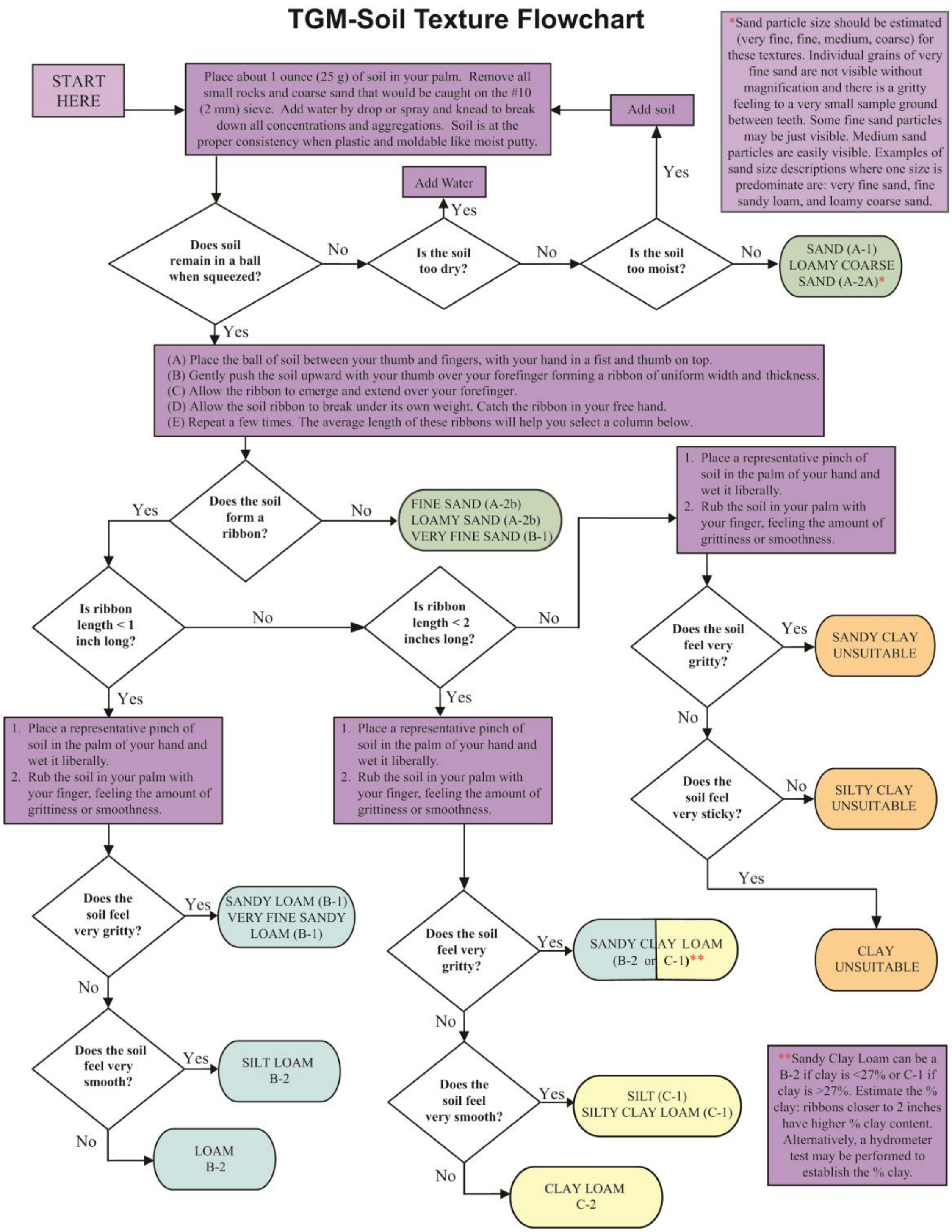


Figure 2-2. Soil texture determination flowchart.

2.1.2 Soil Design Groups and Subgroups

This section is provided as a guide to field environmental health personnel in making technical allowances for standard systems and for health districts to use in selecting alternative systems.

The required absorption area of a subsurface sewage disposal system depends on the texture of the soils in the proposed disposal system location. In a similar manner, required separation distances between the disposal area and features of concern, such as wells, surface water, and ground water, depend on soil texture. Soils surrounding the disposal system and those below it may not be the same.

The soil design group or subgroup (Table 2-4) used to determine the minimum effective soil depth, and applicable separation distances, describes the finest-textured soils adjacent to the drainfield trenches and beneath the drainfield for the effective soil depth.

All other soil textures and some soil features (i.e., gravel, coarse sand, all clays, organic muck, claypan, hardpan, and duripan) are unsuitable for installing a standard drainfield system.

Table 2-4. Soil textural classification design groups.

Soil Design	Soil Design	Soil Textural Classification	Application Rate[a] (GPD/ft^2)[b]
NS[c]	NS	Gravel Coarse sand	NS
A	A-1	~~Medium s~~Sand[d]	1.2
	A-2a	~~Medium~~ Loamy coarse sand	1.0
	A-2b	Fine sand Loamy sand	0.75
B	B-1	Very fine sand Sandy loam Very fine sandy loam	0.6
	B-2	Loam Silt loam Sandy clay loam (≤27% clay)	0.45
C	C-1	Silt Sandy clay loam[e] Silty clay loam[e]	0.3
	C-2	Clay loam[e]	0.2
NS	NS	Sandy Clay Silty Clay Clay Organic muck Duripan Hardpan Claypan	NS

a. Application rates are for domestic strength wastewater. ~~A safety factor of 1.5 or more should be used for wastes of significantly different characteristics.~~
b. Gallons per day per square foot (GPD/ft^2).
c. Not suitable (NS) for installation of a subsurface sewage disposal system.
d. See medium sand definition (section 3.2.8.1.2) for a manufactured material that may be acceptable for use.
e. Soils without expandable clays.

2.1.3 Soil Design Subgroup Corrections

A soil design subgroup may be lowered as indicated in this section. **(Subgroup correction is used to determine the application rate only; it will not change surface water or ground water separation requirements.)**

1. Soil with moderate or strong platy structure should be lowered one subgroup for design purposes.
2. Soil should be lowered one subgroup if 35%–60% of its volume is rock fragments (very gravelly, very stony).
3. Soil should be lowered by two subgroups if 60%–95% of its volume is rock fragments (extremely gravelly, extremely stony).
4. Soil with 95% or greater rock fragments is unsuitable as an effective soil for subsurface sewage disposal.
5. Uniform fine and very fine sand (e.g., blow sands) should be lowered two subgroups for design purposes. Soils that qualify for this modification have a coefficient of uniformity less than three ($C_u < 3.0$).

Example:

A soil evaluation results in the designation of loamy sand with rock fragment~~s~~ volumes estimated at 70% of the total soil volume ~~below~~ within the effective soil depth ~~of~~ below the drainfield installation. The loamy sand would be assigned a soil design subgroup of A-2b consistent with Table 2-4. Due to the estimated volume of rock fragments, the soil design subgroup would then be lowered by two subgroups resulting in an assigned soil design subgroup of B-2. Based on these determinations, the drainfield would be sized consistent with the B-2 soil application rate (0.45 GPD/ft^2; ~~section 2.3,~~ Table 2-~~9~~4) to increase the available soil surface available for effluent treatment due to the soil surface being reduced by large fraction rock. However, both the required vertical (effective soil depth, IDAPA 58.01.03.008.02.c) and the horizontal separation distances (IDAPA 58.01.03.008.02.d) shall meet the requirements for soil design group A soils.

Appendix L

*Table 2-9 is proposed to be incorporated in to Table 2-4 in section 2.1.2.

2.3 Standard Percolation Test

Revision: September 3, 2009

A percolation test checks on-site surveys and soil analysis data *only*. It is not to be used as the sole qualifier of a proposed disposal site's infiltrative capability. The most recent version of the following ASTM standards should be applied when evaluating a site's infiltrative capability:

- ASTM D3385, Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer
- ASTM D5093, Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring

Percolation and application rates by soil type are shown in Table 2-9.

Table 2-9. Percolation and application rates by soil type.

Soil Design Subgroup	Soil Type	Percolation Rate (minutes/inch)[a]	Application Rate (GPD/ft^2)[b]
NS[c]	Gravel, coarse sand[d]	<1	NS
A-1	Medium sand	1–3	1.20
A-2a	Medium sand, poorly graded	4–5	1.0
A-2b	Fine sand, loamy sand	6–15	0.75
B-1	Sandy loam	16–30	0.60
B-2	Loam, silt loam	31–60	0.45
C-1	Sandy or silty clay loam[e]	45–60	0.30
C-2	Clay loam[e]	61–120	0.20
NS	Clays, organic muck, duripan, hardpan, claypan	>120	NS

a. Estimates only; actual percolation rates as determined using ASTM D5093 or ASTM D3385 may differ.

b. Application rates are for domestic wastes. A safety factor of 1.5 or more should be used for wastes of significantly different characteristics. Gallons per day per square foot (GPD/ft^2).

c. Not suitable (NS) for installation of a subsurface sewage disposal system.

d. See medium sand definition for a material that may be acceptable for use.

e. Soils without expandable clays.