PLUMAS COUNTY

Guidelines for Advanced Treatment Intermittent Sand Filters

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I. Introduction

Some areas of Plumas County are unsuitable for the installation of standard on-site sewage disposal systems. These areas may be affected by conditions such as shallow soils over underlying fractured rock (insufficient treatment of effluent), impermeable strata, or elevated seasonal groundwater. Due to the potential for contamination of groundwater and potential hazards to public health, Plumas County Code (PCC) precludes the installation of standard on-site sewage disposal systems where these conditions occur.

Intermittent Sand Filter (ISF) systems can be successfully installed on existing parcels affected by elevated groundwater table or shallow soils.

Note: Advanced treatment systems, sand filters included, are limited to existing lots and are not suitable for land division.

A. The Purpose of this Guide:

Establish a minimum design and construction standard for ISF systems as advanced treatment in Plumas County.

Promote designs that are based on sound engineering practices and scientific principles and have received prior approval for installation by the Central Valley Regional Water Quality Control Board (CVRWQCB).

Note: Alternative and/or other types of advanced treatment systems that have not received CVRWQCB approval will not be considered for permit approval.

B. Authority to Evaluate:

In all cases, Plumas County Environmental Health (PCEH) reserves the right to deny deviations from the guidelines that are not supported by the CVRWQCB or would not be in the best interest of Plumas County public health.

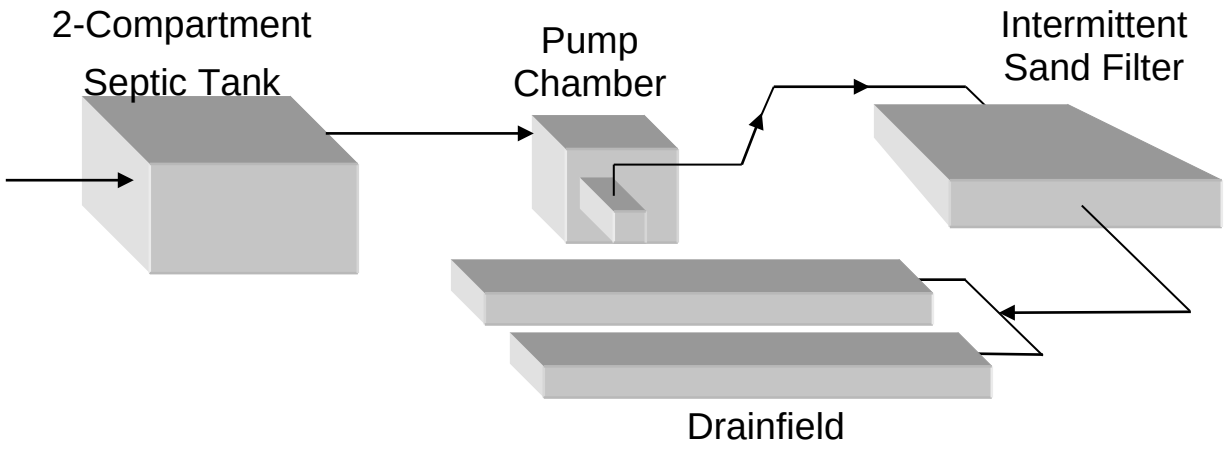
C. Property Owner Requirements:

1. Maintain the system for the life of the structure or until decommissioned and replaced with a connection to a community sewer system;
2. Maintain a contract with a qualified service contractor for routine and emergency system maintenance and monitoring; and
3. Maintain an annual renewable operating permit from PCEH.

II. Description of ISF Systems:

In an ISF system, wastewater receives primary treatment in the anaerobic environment of a septic tank, secondary treatment in the aerobic environment of a sand filter, and is disposed in soil where additional biodegradation occurs.

Mechanically, it works like this: A septic tank is equipped with a pump that discharges effluent under pressure to the sand filter. Piping on the surface of the filter distributes effluent uniformly over the surface of the sand bed. The effluent trickles by gravity through the sand, is collected at the bottom of the sand filter, and either by gravity or by pump is transferred to a drainfield for disposal.



Intermittent Sand Filter System – Typical Layout

III. Applications for ISF Systems

A. Shallow Groundwater:

In areas where groundwater is recorded less than 3 feet and greater than or equal to 1-1/2 feet below the ground surface, an ISF can be installed to increase the effective groundwater separation to the minimum of 5 feet as required by the CVRWQCB.

Note: Parcels with highest seasonal groundwater at less than 1-1/2 feet (18 inches) below ground surface are not suitable for on-site septic systems.

B. Shallow Soils:

In areas where soil depth is between 2 to 3 feet to an impermeable layer or areas with fractured bedrock, an ISF can be installed to increase the effective separation to the PCC required minimum of 4 feet.

Note: Parcels with soil depth less than 2 feet (24 inches) are not suitable for on-site septic systems.

IV. Permit Procedure

ISF permit application procedures are similar to those used for other engineer-designed sewage disposal systems:

A. Engineered Septic System Permit Application:

An engineered sewage disposal system permit application must be completed and submitted to the Plumas County Planning and Building Agency. The completed application will be forwarded internally from Planning and Building to PCEH.

B. A Complete Application Package Will Include:

1. Payment of appropriate application fees

   Note: An additional operating permit fee is due upon system completion and recurs annually thereafter.

2. Obtaining a valid electrical permit from the Planning and Building Services Agency for the installation of the electrical circuits required for the system operation and control.

3. Site suitability information including:

   a) Percolation test data;

   b) Soil profile (mantle) test data;

   c) Seasonal groundwater elevation data;

   d) Any other data that could be used to establish site suitability for both the disposal field and disposal field replacement area

4. Construction and installation design prepared by a Registered Professional Engineer that includes:

   a) A detailed system design including pump timer and float switch settings;

   b) Site plot plan (including leachfield monitoring wells);

   c) System installation, maintenance, and monitoring procedures; and

5. Owner's Manual:

   The manual must contain the following:

   a) Diagrams of the system components including the locations of effluent sampling points.

   b) Explanation of general system function, operational expectations, owner responsibility, and description of each pump control float position, operation; and alarm control.

   c) Names and telephone numbers of the following:

      (1) Environmental Health;

      (2) System maintenance and monitoring contractor;

      (3) System designer;

      (4) System and/or system component manufacturer(s);

      (5) System installation contractor

   d) Provide information on "trouble-shooting" common operational problems that might occur. This information should be as detailed and complete as needed to assist the system owner to make accurate decisions about when and how to attempt corrections of operational problems, and when to call for professional assistance.

   e) Include the sand filter and pressure dosed disposal field clear tube water column heights for each distribution line and anticipated change in column height that would indicate the need to clean distribution lines.

   Omission of any of the required elements, including but not limited to the designing engineer's wet stamp, will delay processing.

C. Design Approval / Permit Issuance:

   The system design, in combination with the system maintenance and monitoring procedures, site suitability information, plot map, owner manual, and the results of the PCEH site visit will be reviewed for approval or corrections.

D. Permit Requirements:

1. The designing engineer is required to:

   a) Oversee the installation of the system including the sand filter, disposal field, and monitoring wells;

   b) Verify the operation of the system including, and not limited to, pumps and controls and documentation of the operational parameters of the sand filter and disposal field “squirt” tests;

   c) At system installation completion:

      (1) Write a letter of conformance that certifies the system was installed and functions according to design.

      (2) Submit an as-built plot map of the system.

2. PCEH staff will conduct construction inspections and witness system operations as necessary prior to final approval.

3. The property owner must enter into a contract with a qualified service contractor for system routine and emergency maintenance and monitoring.

E. Final System Approval:

System approval is dependent upon completion of the following:

1. Verification of system construction and witness of the “squirt” tests by the designing engineer, the maintenance and monitoring contractor, and PCEH staff;

2. Receipt of the letter of certification, operating parameters, and as-built plot map from the designing engineer;

3. Receipt of a copy of the signed system maintenance and monitoring contract;

4. Confirmation from Planning and Building that the electrical installation meets with their approval.

5. Payment of the annual operating permit fee.

V. Required Site Suitability Characterization:

A. Soil Analysis:

In order to demonstrate adequate homogeneity of soil conditions the following are required within the boundaries of both the disposal field and the designated replacement area(s):

1. Two (2) percolation tests performed according to the requirements established in PCC Title 6, Chapter 6, Sec 6-6.10.

2. Two (2) soil profiles or borings performed in accordance with ASTM D 5921-96, including a particle size analysis in accordance with ASTM D 422-63 if requested by the County or Regional Board staff. Should testing results from the sites differs significantly, additional testing may be required or the site may be determined as unsuitable. Soils testing must show a classification of sandy loam or finer in accordance with the USDA soil texture triangle.

B. Groundwater depth measurement:

The depth of seasonal groundwater shall be measured by piezometer or other methods as approved by Environmental Health in those areas where site characteristics, soil profile data, and/or existing information indicates the potential for an elevated seasonal groundwater table.

Note: Due to the inherent problems of using redoximorphic features (commonly referred to as mottles), this method is not acceptable for determination of seasonal groundwater levels.

C. Horizontal Setback Requirements:

TABLE 1

MINIMUM HORIZONTAL SEPARATION DISTANCES IN FEET

FACILITY	SEPTIC TANK or SEWER LINES	LEACHFIELD
Water Supply Well	50' *	100'
GeoThermal Heat Exchange Well (GHEW)	25'	50'
Perennial Streams or Springs	50'	100' from seasonal high water line
Drainage courses, ephemeral springs	25'	50'
Meadows, wet marshy areas	25'	50'
Lakes, reservoirs, ponds or other surface water impoundments	50'	200' from high water line **
Cut or fill banks	10'	4X vertical bank height or a max of 100'
Natural escarpments in excess of 50% slope	10'	4X vertical bank height or a max of 100'
Private Property Lines	5'	5' ***
Buildings or structures	5'	8'
Public water supply main	10'	10'
Sewage drain systems	3'	6' ****
Roads, driveways, areas of vehicular traffic, or utility easements	Clear	Clear

*	Distance must be increased to 100' for community water supply wells.
**	Lake Almanor drainage system separation shall be 100' from high water line.
***	Distance shall be increased to 50' where wells have not been installed or well sites have not been designated on the subject and adjacent properties.
****	15' minimum separation required for deep trench disposal systems.

VI. System Design Standards:

A. Wastewater Flow Parameters:

Daily wastewater flow design estimates must be consistent with the *Uniform Plumbing Code*, the *Manual of Septic Practice*, or other acceptable reference sources.

The following minimum standards should be used as a guide for the designer on an Intermittent Sand Filter system:

1. Residential:

   The daily design sewage flow rate should be estimated at a minimum of 150 gallons per day per bedroom (gal/day/bedroom).

2. Non-Residential - Light Commercial:

   The daily design flow for usages such as offices, etc. will be considered and reviewed on a case by case basis.

Note: Groups of five (5) or more structures, or single structures with 5 or more units, will require Regional Water Board concurrence and approval prior to permit approval.

B. Pretreatment:

A properly sized 2-compartment septic tank with water-tight risers and gas-tight securable lid per PCC, Title 6, Chapter 6, Sec 6-6.12.

Refer to Appendix A for septic tank details.

C. Dosing Tank:

Septic Tank Pumped Effluent System (STEP) with water-tight risers and gas-tight securable lids per PCC, Title 6, Chapter 6, Sec 6-6.12:

1. Septic tank internal effluent pump – minimum tank size is bedroom count plus one bedroom – recommend a minimum of 1500 gallons.

2. Standard septic tank with external pump vault – no minimum pump vault size - recommend largest practical for added free-board.

D. Maximum Recommended Application Rate:

Residential & commercial is 1.2 gallons per day per square foot (12 gpd/ft^2).

E. Disposal Field:

The size of raised disposal field (leachfield) should be established from the percolation data obtained from a site evaluation and constructed according to PCC, Title 6, Chapter 6, Section 6-6.12.

F. Disposal Field Monitoring Wells:

In areas where elevated groundwater is the reason for the installation of an ISF system, the disposal field must have a minimum of three (3) shallow monitoring wells (minimum 8ft deep) installed around the perimeter of the disposal field for the purpose of monitoring seasonal groundwater elevations.

VII. Sand Filter Construction and Installation:

A. Minimum Recommended Filter Surface Area:

1. Residential: The recommended minimum surface area per bedroom is derived by dividing the design flow estimate of 150 gal/day/bedroom by the maximum recommended loading rate of 1.2 gal/day/square foot.

   The minimum recommended surface area is 125 square feet/bedroom.

2. Commercial: The minimum recommended filter surface area for non-residential / light commercial facilities should be determined by fixture count or other acceptable means of estimating flows from each commercial unit.

B. Filter Container:

A watertight container usually made with a 30 mil polyvinyl chloride (PVC) liner inside a support structure or another approved container structure. See figure 1 below.

The filter container and/or liner must be visually checked for punctures, rips, tears and seam discontinuities before placement of any backfill or filter materials. All repairs must provide leak-free containment and must be performed per manufacturer specifications.

C. Filter Underdrain:

The filter underdrain is a system of slotted pipes that collect the filtered effluent from the filter media and transport it to the pumpwell or pump tank for discharge to the disposal field.

Underdrains must be designed with sufficient void storage volume to provide for drainfield dosing and have reserve capacity to maintain an unsaturated filter media condition above the underdrain system.

The collection pipes must be sloped, sized, and slotted sufficiently to allow the filtrate to flow freely to the underdrain storage to the pumpwell or pump vault.

D. Filter Media Specification and Certification:

Media used in constructing a sand filter must be accompanied with written certification from the supplier that the media conforms to ASTM C-33 as determined by ASTM D136 and ASTM C-117.

Filter media must meet the particle size criteria detailed in the table below or the designing engineer must obtain approval for alternative particle sizing from the CVRWQCB.

TABLE 2
RECOMMENDED PARTICLE SIZE DISTRIBUTION

SIEVE	PARTICLE SIZE	PERCENT PASSING
3/8 in	9.50 mm	100
No. 4	4.75 mm	95 to 100
No. 8	2.36 mm	80 to 100
No. 16	1.18 mm	50 to 85
No. 30	0.60 mm	25 to 60
No. 50	0.30 mm	10 to 30
No. 100	0.15 mm	2 to 10 (prefer <4)
No. 200	0.075 mm	0 to 3 (prefer 0)

E. Pumpwells and Pump Vaults:

A pumpwell or a pump vault is a water-tight receiver where the filtrate is held for the pumping system that sends the effluent to the disposal field.

The pump well or vault must have a gas-tight and securable lid for access to the pump system. The pump system includes the pump and control float switches, shut-off-valve, a check valve, and a pipe union.

1. Pumpwells:

Pumpwells may be designed in a variety of ways.

a) At a minimum they must be constructed of non-corrosive materials such as plastic or other approved materials and have a large enough access for maintenance and removal of internal equipment. The riser and lid must be water-tight, gas-tight, and securable.

b) The system must be designed to allow the free flow of filtrate from the underdrain system into the holding portion of the pumpwell. The walls must be adequately supported to ensure stability and to ensure that the filter container liner is not damaged.

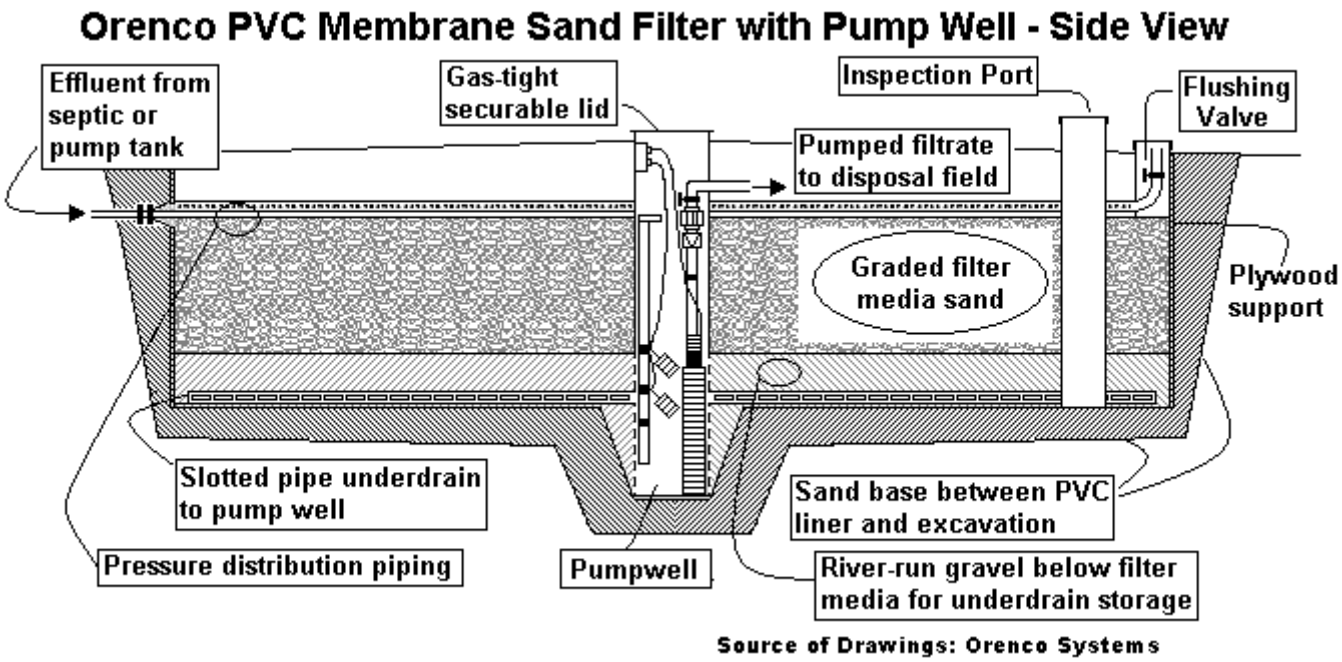


FIGURE 1

2. Pump Vaults:

Pump vaults must be water-tight, have at least a 20 inch diameter water-tight riser with a securable and gas-tight lid. The vault must be large enough to accommodate the flows from the filter and to properly dose the disposal field.

Pump vaults can be used in several process locations in an ISF system:

a) To move the effluent from the septic tank to the sand filter (dosing tank); and

b) To move filtrate liquid from the filter underdrain to the disposal field.

Refer to Appendix A for pump tank details.

F. Pressure Distribution System:

The operation of the distribution system must be witnessed by both the system design engineer and Environmental Health staff.

Orifices in the distribution laterals must be covered with orifice shields to prevent the orifices from being blocked by rocks or sand resting against the pipe.

A flushing valve in a valve box must be installed at the end of each lateral to permit periodic flushing of the laterals and to install a clear tube manometer for flow testing the line (an increasingly elevated water column over time would indicate clogging distribution lines and/or orifices).

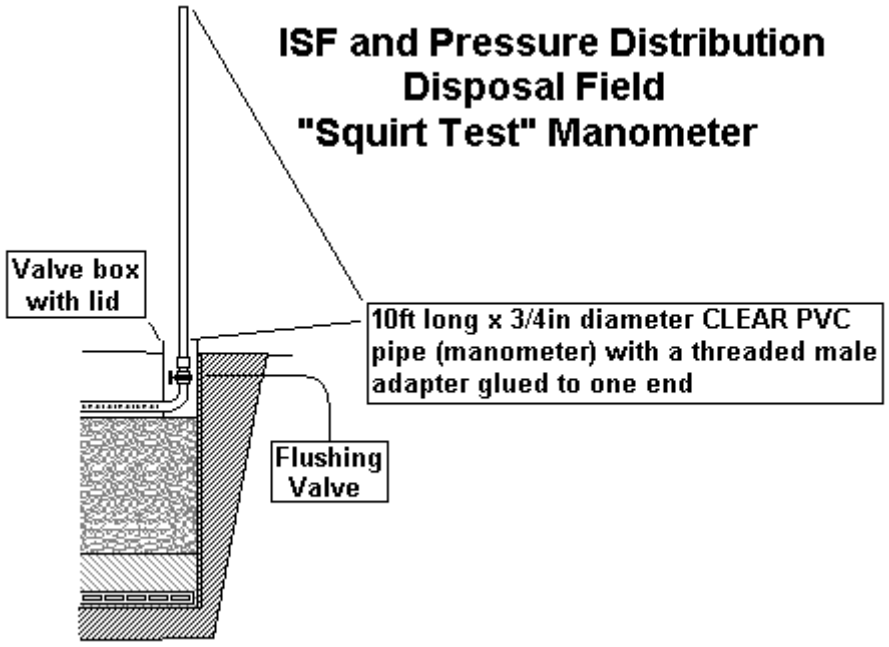


FIGURE 2

G. Soil Cover:

The soil cover shall be sandy loam or loamy sand sloped to provide drainage away from the filter. Its purpose is to provide insulation against cold winter temperatures, to allow the free movement of air into the sand filter below. A grass cover over the sand filter is beneficial. Trees and deep-rooted plants are to be avoided.

H. Effluent Pumps and Float Switches:

Pump(s) must be listed devices and selected by a knowledgeable professional according to the hydraulic design calculations provided by the designing engineer.

The float switches and pump assembly should be easily removed for maintenance. All components should be constructed of moisture and corrosion resistant materials.

The high water alarm float must be connected to the pump control panel in such a manner that the high water alarm in the sand filter will disable the pump in the dosing septic tank until the high water alarm is canceled.

Electrical power must be provided via a Ground Fault Interrupter (GFI) circuit. All electrical junction box(s), conduits, cords and cord grips must be approved for wet environments and made from corrosion proof materials. Electrical connections must be installed under an approved electrical permit issued by Planning and Building Service Agency. A final electrical inspection is required before PCEH will approve the ISF system.

VIII. Environmental Health Construction Inspections

During the construction of an ISF, inspections must be performed by PCEH staff to verify compliance with the approved plans and County Code. Inspections by this PCEH must be performed at the following phases of construction:

A. First Construction Inspection:

1. Filter pit and liner or container placement:

   a) Pit location; and

   b) Bedding material (usually sand).

2. Filter underdrain and wet well installation:

   a) Plumbing layout; and

   b) Drainage orientation (holes/slots up or down).

B. Second Construction Inspection:

1. Sand filter (filter open for inspection):

   a) Type of sand / gravel used;

   b) Distribution plumbing layout, pipe diameter, orientation and placement of orifice holes and orifice shields, and location of flushing valve / test fitting connections.

2. Disposal field (leachfield is open for inspection):

   a) Field size and plumbing layout;

      (1) Gravity flow – equal distribution: depth of gravel, location, orientation of distribution box(es) with no “Tees” in the field, and pipe center to center separations (max at 6ft).

      (2) Pressure dosed: distribution manifold plumbing layout (no d-box required and Tee type manifolds are ok), pipe diameter, orientation and placement of orifice holes and orifice shields, and location of flushing valve / test fitting connections.

3. Septic tank and pump tank visual inspections (tanks are open for inspection):

   a) Sanitary tees in place on all septic (inflow and outflow) and pump tanks used for dosing (inflow only);

   b) Baffles with modified porting for septic tanks with internal pumps;

c) Risers at all access points for septic and pump tanks.

Refer to Appendix A for septic and pump tank examples

C. Final Construction and System Operation Inspection:

The following must be witnessed/performed with the installing contractor, designing engineer, and maintenance contractor present:

1. Alarm panels are mounted to a fixed location and wired per electrical code to a ground-fault-interrupter (GFI) circuit (no open wiring);
2. Test pumps, alarms, and pressure distribution systems at both the sand filter and disposal field(s);
3. Establish and record clear tube water column height baselines for each distribution line at the sand filter and any pressure dosed disposal fields for future maintenance reference (Environmental Health does not have the tube necessary to perform these tests). See figure 2 above.

Note: Other inspections may be required if deemed necessary by Environmental Health.

IX. Operation and Maintenance Responsibility:

For the on-site treatment and disposal system to operate properly, its various components need periodic inspection and maintenance. The maintenance is ultimately the responsibility of the homeowner, however, must be performed by an experienced and qualified service provider.

X. Monitoring and Reporting:

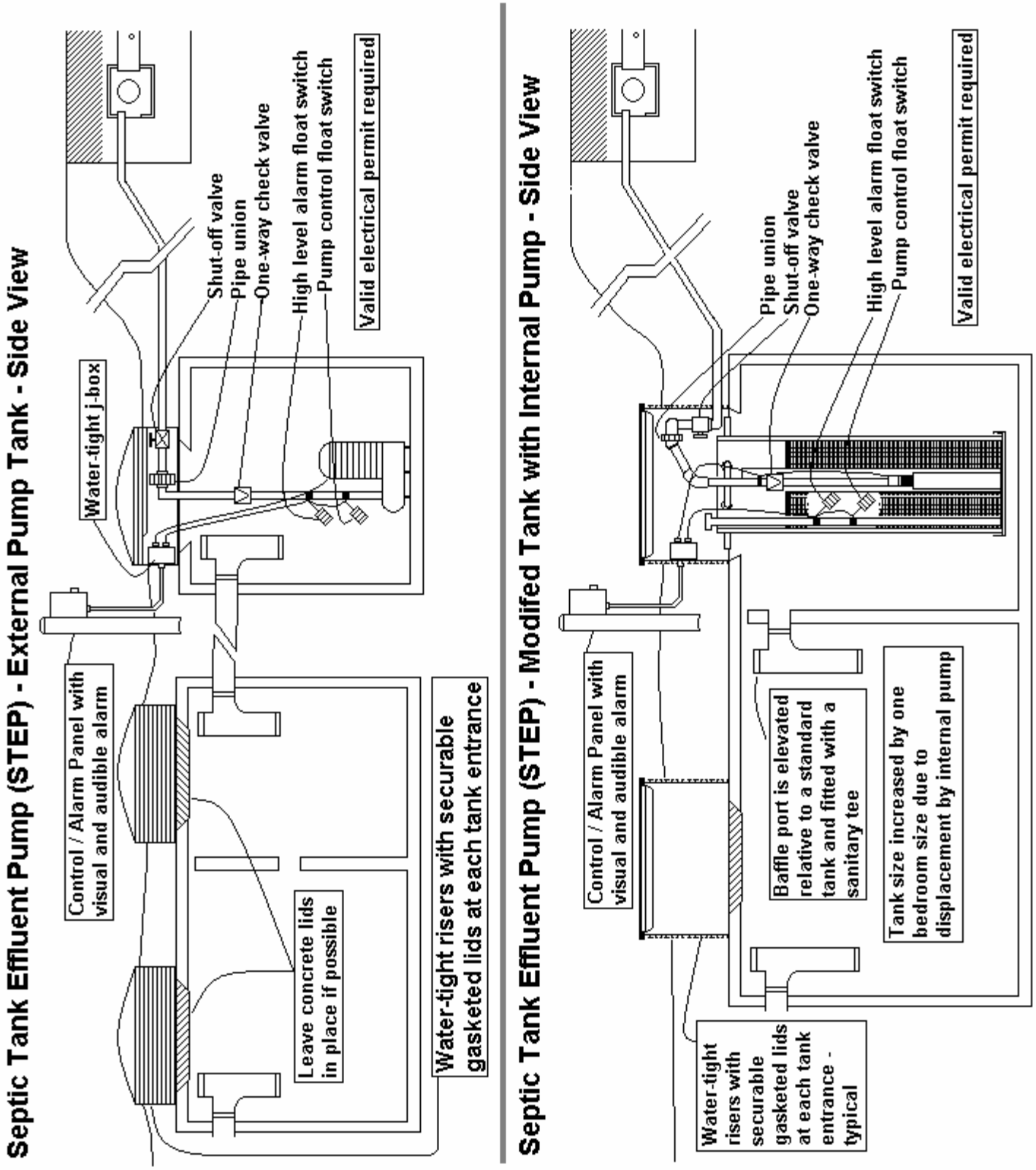
For these systems it is important to monitor both the system performance and any effects that this technology will have on groundwater and surface water.

A. Routine ISF Monitoring:

The Central Valley Regional Water Quality Control Board (CVRWQCB) requires a reasonable random sampling of these systems conducted quarterly for effluent BOD, Total Kjeldahl nitrogen, nitrate, and coliform. Monitoring the quality of the effluent from these systems is currently the responsibility of Environmental Health.

B. Monitoring Groundwater Levels at Reduced Separation Areas:

In reduced groundwater separation applications (areas where high groundwater table was a factor in installing ISF), the CVRWQCB requires Environmental Health to oversee the monitoring and performance of ISF systems via the groundwater monitoring wells around the perimeter of the ISF. Monitoring these wells is currently the responsibility of Environmental Health.


Septic Tank Effluent Pump (STEP) - External Pump Tank - Side View
Control / Alarm Panel with visual and audible alarm
Water-tight j-box
Shut-off valve
Pipe union
One-way check valve
High level alarm float switch
Pump control float switch
Valid electrical permit required
Leave concrete lids in place if possible
Water-tight risers with securable gasketed lids at each tank entrance
Septic Tank Effluent Pump (STEP) - Modifed Tank with Internal Pump - Side View
Control / Alarm Panel with visual and audible alarm
Pipe union
Shut-off valve
One-way check valve
High level alarm float switch
Pump control float switch
Valid electrical permit required
Baffle port is elevated relative to a standard tank and fitted with a sanitary tee
Tank size increased by one bedroom size due to displacement by internal pump
Water-tight risers with securable gasketed lids at each tank entrance - typical