Travis County Commissioners Court Agenda Request

Meeting Date: December 2, 2014
Prepared By: Stacey Scheffel, Permit Program Manager **Phone #:** (512) 854-7565
Division Director/Manager: Anna Bowlin Division Director Development Services Long Range Planning

Carol B. Joyce for

Department Head: Steven M. Manilla, P.E., County Executive-TNR
Sponsoring Court Member: County Judge Samuel T. Biscoe

AGENDA LANGUAGE: Consider and take appropriate action on the proposed Chapter 48, Rules of Travis County, Texas for On-Site Sewage Facilities

BACKGROUND/SUMMARY OF REQUEST:

The State of Texas has adopted basic statewide rules for the installation and maintenance of On-Site Sewage Facilities (OSSFs). Travis County is an Authorized Agent of the state for OSSFs and as such is required to enforce the state rules. The County can adopt more stringent rules in order to protect public health and the environment. In fact, the county adopted more stringent rules in 2000, but the rules are in need of updating.

In order to adopt more stringent requirements, the state requires that a public hearing be held, but not before they approve a draft of the proposed rule. TNR and County Attorney staff prepared a draft based on what we have heard from our customers over the years on what they would like to see in our rules. The state has approved the draft.

STAFF RECOMMENDATIONS:

Staff recommends receiving input from county citizens on the propsoed rules. Staff recommends taking action on the rules at a later date so that public input can be incorporated and the state can approve any revisions.

ISSUES AND OPPORTUNITIES:

Although staff has incorporated many suggestions of our customers into the draft, we anticipate that there will be some comments that will require revising the draft and getting the state to approve the revisions prior to adoption. As such staff does not recommend posting the proposed rule for action on the date of the public hearing. Staff will request that the court take action once a revised draft is approved by the state.

Although not required in order to adopt new OSSF rules, the County Attorney's Office completed a Takings Impact Analysis for the proposed rules. The analysis found that the rules do not constitute a taking.

FISCAL IMPACT AND SOURCE OF FUNDING:

None

ATTACHMENTS/EXHIBITS:

Proposed Chapter 48, Rules of Travis County, Texas for On-Site Sewage Facilities
More Stringent Requirements Justification Memo
TCEQ Approval Letter
Takings Impact Analysis
Summary of Public Comments regarding Chapter 48
Comments on Travis CountyChapter 48 Rules Revision with Attachments
Chapter 48 Comments-Concerns

REQUIRED AUTHORIZATIONS:

Cynthia McDonald	Financial Manager	TNR	(512) 854-4239
Steven M. Manilla	County Executive	TNR	(512) 854-9429

CC:

Rodney Sherrill	Engineer	TNR	512-854-7591
Brandon Couch	Engineer Associate	TNR	512-854-6435
Julie Joe	Assistant County Attorney	County Attorney	512-854-9415

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1701 - Private Sewage Facilities - 1705

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COUNTY
CHAPTER

10-1-2014 TCEQ-approved revisions
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Chapter 48. Rules of Travis County, Texas for On-Site Sewage Facilities

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CHAPTER 48. RULES OF TRAVIS COUNTY, TEXAS FOR ON-SITE SEWAGE FACILITIES

Subchapter A

48.001 Policy and Purpose

(a) Background and Policy.

(1) The Texas Commission on Environmental Quality has established rules for on-site sewage facilities to provide the citizens of this State with adequate public health protection and to minimize environmental pollution.

(2) The Legislature has enacted legislation, codified as Texas Health and Safety Code Chapter 366, which authorizes a local governmental entity to regulate the use of on-site sewage facilities in its jurisdiction in order to abate or prevent pollution or injury to public health arising out of the use of on-site sewage facilities.

(3) Due notice was given of a public meeting to determine whether the Commissioners Court of Travis County, Texas should enact an order controlling or prohibiting the installation or use of on-site sewage facilities in Travis County, Texas.

(4) The Commissioners Court of Travis County, Texas finds that the use of on-site sewage facilities in Travis County, Texas is causing or may cause pollution, and is injuring or may injure the public health.

(5) The Commissioners Court of Travis County, Texas has considered the matter and deems it appropriate to enact an order adopting rules regulating on-site sewage facilities to abate or prevent pollution or injury to public health in Travis County, Texas.

(b) Findings and Adoption of Rules. The Commissioners Court of Travis County, Texas finds that:

(1) The matters and facts recited in subsection (a) are true and correct;

(2) The use of on-site sewage facilities in Travis County, Texas, is causing or may cause pollution and is injuring or may injure the public health; and

(3) It is necessary and appropriate to adopt this chapter of the Travis County Code, which is to be entitled "Rules of Travis County, Texas for On-Site Sewage Facilities.

48.002. Definitions and Acronyms.

Words and phrases in this chapter have the same meaning they have in Chapter 366 (On-Site Sewage Disposal Systems) of the Texas Health and Safety Code and Chapter 285 (On-Site Sewage Facilities) of Title 30 of the Texas Administrative Code. The following words and terms in this section, when used in this chapter, have the following meanings:

(1) "Accessory use" means a use which is incidental and subordinate to the principal use of the parcel of land on which it is located.

(2) "Accessory structure" means a structure which is on the same parcel of property as the principal structure to be insured and which is incidental to the use of the principal structure.

(3) "Authorized Agent" means the Travis County Commissioners Court or its designee, the Travis County Transportation and Natural Resources Department.

(4) "Commissioners Court" means the Travis County Commissioners Court.

(5) "County Executive" means the county executive of the Travis County Transportation and Natural Resources Department or his designee.

(6) "Development" means any man-made change to improved or unimproved real estate, including, but not limited to, the construction of buildings or other structures, a change in the use of improved or unimproved real estate, mining, dredging, filling, grading, paving, surfacing, excavation operations, drilling operations, the storage of equipment or materials, and the clearing of land for the purpose of preparing a site for any man-made change to improved or unimproved real estate.

(7) "License to Operate" means written permission from the Permitting Authority to operate an on-site sewage facility.

(8) "Lot" or "site" means the unit of land area served by an on-site sewage facility.

(9) "Maintenance" means required or routine performance checks, examinations, upkeep, cleaning, or mechanical adjustments to an on-site sewage facility, including replacement of pumps, filters, aerator lines, valves, or electrical components. Maintenance does not include alterations.

(10) "On-site sewage facility" or "OSSF" means a system that:

   (a) does not treat or dispose of more than 5,000 gallons of sewage each day; and

   (b) is used only for disposal of sewage produced on a site where any part of the system is located.

(11) "Permit to Construct" means written permission from the Permitting Authority to construct an on-site sewage facility showing the date the permission was granted.

(12) "Permitting Authority" means the Travis County Commissioners Court or its designee, the Travis County Transportation and Natural Resources Department.

(13) "Person" means an individual, association, partnership, corporation, organization, business trust, political subdivision, state or federal agency, or an agent or employee thereof.

(14) "Repair" means to replace any components of an on-site sewage facility in situations not included under emergency repairs according to 30 TAC § 285.35 (relating to emergency repairs), excluding maintenance. The replacement of tanks or drainfields is considered a repair and requires a permit for the entire OSSF system.

(15) "Residential unit" means a structure that is used for habitation.

(16) "Sewage" means waste that:

(a) is primarily organic and biodegradable or decomposable; and

(b) generally originates as human, animal, or plant waste from certain activities, including the use of toilet facilities, washing, bathing, and preparing food.

(17) "TAC" means the Texas Administrative Code.

(18) "TCEQ" means the Texas Commission for Environmental Quality or its successive agencies.

(19) "TCEQ Rules" means the rules promulgated by the Texas Commission on Environmental Quality for on-site sewage facilities in Title 30 Texas Administrative Code Chapter 30, Subchapters A and G, and Chapter 285 and all future amendments and revisions to those rules.

48.003 Conflicts

(a) This chapter repeals and replaces any other on-site sewage facility orders or parts of orders of Travis County, Texas.

(b) All Codes or policies, or parts of Codes or policies of Travis County related to this chapter that are in conflict with the provisions of this chapter are hereby repealed.

48.004 On-Site Sewage Facility Regulation and Enforcement

Travis County, Texas clearly understands there are technical criteria, legal requirements, and administrative procedures and duties associated with regulating on-site sewage facilities, and will fully enforce Chapter 366 of the Texas Health and Safety Code, Chapters 7 and 37 of the Texas Water Code, and associated rules referenced in section 48.006 of this chapter.

48.005 Jurisdictional Area/Applicability

This chapter applies to:

(a) the unincorporated areas of Travis County, Texas except:
  (1) the areas regulated under an order adopted by a local governmental entity other than Travis County; and
  (2) the areas have been annexed by the City of Austin for the limited purpose of public health;

(b) areas within the corporate limits of Webberville and San Leanna;

(c) areas within the corporate limits of Leander located within Travis County; and

(d) areas within the territorial limits of a local governmental entity located in whole or in part in Travis County that:
  (1) has been delegated the authority by the TCEQ executive director to implement and enforce the rules adopted under Texas Health and Safety Code, Chapter 366; and
  (2) has entered into an interlocal agreement with Travis County for the enforcement of that local governmental entity's OSSF rules.

48.006 Compliance with On-Site Sewage Facility Rules

(a) Any person who has an ownership interest in an on-site sewage facility or who participates in any activity relating to the development of planning materials, construction, installation, alteration, repair, extension, operation, maintenance, permitting, inspection, or investigation of an on-site sewage facility within the jurisdictional area of Travis County, Texas must comply with the TCEQ Rules and all applicable provisions of this chapter.

(b) A person must obtain a Permit to Construct from the County in accordance with this chapter before the person constructs, installs, alters, repairs, extends, or modifies an OSSF unless the OSSF is excluded or exempted under State law or this chapter.

(c) Any person who has an ownership interest in an on-site sewage facility within the jurisdictional area of Travis County must obtain a License to Operate from the County before the person operates or allows any person to operate the on-site sewage facility.

48.007 TCEQ Rules Adopted; Incorporation by Reference

(a) Travis County adopts the rules promulgated by the Texas Commission on Environmental Quality for on-site sewage facilities in Title 30 Texas Administrative Code Chapter 30, Subchapters A and G, and Chapter 285.

(b) The TCEQ Rules and all future amendments and revisions to them are incorporated by reference and made a part of this chapter.

48.008 Authority to Act

All officials and employees of Travis County, Texas who have duties under the TCEQ Rules are authorized to perform those duties as are required of them under the TCEQ Rules and the provisions of this chapter.

48.009 Adoption of Rules that are More Stringent

(a) Travis County, Texas adopts certain OSSF rules that are more stringent than those adopted by the TCEQ.

(b) The more stringent rules adopted by the Travis County Commissioners Court shall take precedence over any less stringent rules adopted by TCEQ.

(c) Travis County's more stringent rules are set forth in subchapter B.

48.010 Additional Findings

The Travis County Commissioners Court finds that it is proper and necessary to adopt OSSF standards that are more stringent than the standards adopted by TCEQ because:

(a) Protecting water resources is vital to human health, and some residents within Travis County depend heavily upon groundwater for their drinking water;

(b) The population of Travis County is projected to double by the year 2050;

(c) A significant amount of the projected future growth within the unincorporated areas of Travis County is expected to rely on on-site sewage facilities;

(d) The adoption of OSSF regulations that are more stringent within the Recharge Zone of the Edwards Aquifer (including those land areas situated above the Trinity Aquifer Recharge Zones) and other aquifers which have environmentally sensitive rapid recharge conditions is necessary and appropriate to avert public health hazards resulting from the projected increased use of on-site sewage facilities and the increased usage of water; and

(e) The more stringent rules will provide greater public health and safety protection for the residents of Travis County.

48.011 Local Administrative Procedures

The County's local administrative procedures are set forth in subchapter C.

48.012 Duties and Powers of Designated Representatives

(a) The Transportation and Natural Resources Department of Travis County, Texas will ensure that each individual who acts as a designated representative for Travis County within Travis County's jurisdictional area is certified by the Texas

Commission on Environmental Quality before that individual assumes duties and responsibilities as a designated representative of Travis County, Texas.

(b) Each of Travis County's designated representatives is authorized to review permit applications, site evaluations, and planning materials and to conduct inspections of on-site sewage facilities.

48.013 Collection of Fees

(a) All fees collected under this chapter must be made payable to Travis County, Texas and must be paid in accordance with fee schedules adopted by the Commissioners Court as authorized by law.

(b) Each fee collected by Travis County for an application for a Permit to Construct must include a fee of $10 that Travis County must forward to the TCEQ Water Resources Management Account in accordance with Chapter 367 of the Texas Health and Safety Code.

48.014 Appeals

Persons aggrieved by an action or decision of the designated representative may appeal such action or decision by mailing, within 30 days of the action or decision, a written appeal to the Travis County Commissioners Court.

48.015 Enforcement Plan

(a) Travis County, Texas clearly understands that, as a minimum, it must follow the requirements in 30 TAC Section 285.71 (Authorized Agent Enforcement of OSSFs).

(b) This chapter adopts and incorporates all applicable provisions related to on-site sewage facilities, which includes, but is not limited to, those found in Chapters 341 and 366 of the Texas Health and Safety Code, Chapters 7, 26, and 37 of the Texas Water Code, 30 TAC Chapter 30, Subchapters A and G, and 30 TAC Chapter 285.

(c) At the request of the Commissioners Court, the County Attorney or other prosecuting attorney for the County may file an action in a court of competent jurisdiction to do one or more of the following:

(1) Enjoin the violation or threatened violation of a requirement established by or adopted by the Commissioners Court under this chapter;

(2) Seek civil or criminal penalties as provided by law; and

(3) Take all actions or seek any penalty authorized under law, including the penalties and enforcement provisions of Chapters 341 and 366 of the Texas Health and Safety Codes, Chapters 7 and 26 of the Texas Water Code, 30 TAC Chapter 285, and the provisions of this chapter.

48.016 Severability

It is the intention of the Commissioners Court of Travis County, Texas, that the phrases, clauses, sentences, paragraphs, and sections of this chapter are severable, and if any phrase, clause, sentence, paragraph, or section of this chapter is declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, or sections of this chapter, since the same would have been enacted by the Commissioners Court without incorporation in this chapter of such unconstitutional phrases, clause, sentence, paragraph, or section. If any provision of this chapter or the application thereof to any person or circumstances is held invalid, the validity of the remainder of this chapter and the application thereof to other persons and circumstances shall not be affected.

48.017 Relinquishment of Order

(a) If the Commissioners Court of Travis County, Texas decides that it no longer wishes to regulate on-site sewage facilities in its area of jurisdiction, the Commissioners Court, as the authorized agent, and the TCEQ shall follow the procedures outlined in 30 TAC Section 285.10 (d) (1) through (4).

(b) After relinquishing its OSSF authority, the authorized agent understands that it may be subject to charge-back fees in accordance with 30 TAC Section 285.10(d)(5) and Section 285.14 after the date that delegation has been relinquished.

48.018 Effective Date

This chapter shall be in full force and effect from and after its date of approval as required by law and upon the approval of the Texas Commission on Environmental Quality.

Subchapter B

48.031 Travis County's More Stringent Rules

This subchapter sets forth the more stringent rules adopted by Travis County, Texas.

48.032 Facility Planning [285.4]

(a) All property that will use an on-site sewage facility for sewage disposal must be evaluated for overall site suitability.

(b) Unless the lot or tract is exempted under 30 TAC Section 285.4(b)(1), the minimum lot size for a structure served by an OSSF, regardless of whether the lot or tract is served by a public water supply, is one acre.

(c) Residential Structures Served by OSSFs.

(1) Each residential unit served by an OSSF is considered a separate structure. Except as provided in Paragraph (2), multiple residential units may be on a single lot or site only if the lot or site contains at least one acre of land for each residential unit.

(2) A lot or site of at least one acre in size that was created before TCEQ's approval of this chapter and that has a single-family dwelling located on it may have one additional residential unit placed on the lot or site as an accessory structure for accessory use if:

(A) having more than one residential unit on the lot or site does not violate restrictions in a plat, deed, or restrictive covenant for the lot;

(B) all other requirements of Chapter 285 of Title 30 of the Texas Administrative Code and the Travis County Code are met; and

(C) the lot or site owner files a restrictive covenant in the Official Public Records of Travis County, Texas that:

(i) prohibits the addition of any more habitable structures on the lot or site without approval by the local entity having OSSF jurisdiction over the lot;

(ii) prohibits the residential units from being conveyed or transferred to separate owners without approval by the local entity having OSSF jurisdiction over the lot;

(iii) prohibits any further subdivision of the lot or site without approval by the local entity having OSSF jurisdiction over the lot; and

(iv) provides that the restrictive covenant is enforceable by the owners of adjacent land, TCEQ, and the local governmental entity having OSSF jurisdiction over the lot.

(3) If the County Executive determines that having more than one residential unit on the lot or site will not adversely affect public health, safety, or welfare, the County Executive may waive the requirement that a plat be approved for structures and a lot or site meeting the requirements of this subsection.

(d) Review of Planning Materials. Persons proposing single-family residential developments, condominium developments, multi-unit residential developments, manufactured housing communities, commercial developments, or any other type of development with structures served by OSSFs must submit planning materials for these developments to the Permitting Authority as set forth in Subchapter C, Travis County Local Administrative Procedures, and obtain the Permitting Authority's written approval of the planning materials before submitting an OSSF application.

(e) Notice in Deed and Plat Records.

(1) Where approval of on-site sewage facilities in a development will be granted based on conditions that restrict lots with regard to on-site sewage facilities, those conditions shall be reflected by appropriate plat notes or restrictive covenants filed in the Official Public Records of Travis County, Texas. The County will not issue a Permit to Construct or a License to Operate unless a property owner has recorded all plat notes and restrictive covenants required by the County.

(2) In addition to the requirements set forth in 30 TAC Chapter 285, on each new plat, the following note shall be included (along with any specific restrictions imposed):

> This subdivision is subject to all the terms and conditions of Chapter 48, Travis County Code, Rules of Travis County, Texas for On-Site Sewage Facilities. These rules require, among other things, that a construction permit be obtained from Travis County before an on-site sewage facility can be constructed, altered, modified, or repaired in the subdivision and that a license to operate be obtained from Travis County before an on-site sewage facility can be operated in the subdivision.

48.033 Application and Permitting Procedures (§§285.3, 285.5 and 285.6)

(a) No Exemptions. All OSSFs in the jurisdictional area of Travis County are subject to the provisions of this chapter regardless of the size of the lot on which the OSSF is located.

(1) Except for emergency repairs that are authorized by 30 TAC Section 285.35, a person must obtain a Permit to Construct from the County before constructing, installing, altering, extending, or repairing an OSSF.

(2) An individual who makes an emergency repair to an OSSF must notify the Permitting Authority, in writing, within 72 hours after starting the emergency repair. The notice must include a detailed description of the methods and materials used in the repairs.

(3) The Permitting Authority has discretion to require an inspection of the emergency repairs.

(b) Local Procedures. Local Administrative Procedures to be used in Travis County in administering 30 TAC Section 285.5 are set forth in Subchapter C.

(c) Time Limit on Applications. An application for an OSSF Permit to Construct expires one year after the date the application fee is paid for if the applicant has been unable to obtain an OSSF Permit to Construct from the County during that one-year period. After an application has expired, an applicant for an OSSF Permit to Construct must submit a new application and pay a new application fee.

(d) Permit to Construct/License to Operate. Under Travis County procedures, the licensing of an on-site sewage facility is separated into two parts: the Permit to Construct, which is a permit that is issued by Travis County for construction of an onsite wastewater system specifically designed for a specific use, and the License to Operate, which is a license that is issued by Travis County that allows an onsite wastewater system constructed in accordance with the Permit to Construct to be operated as designed, to actively put through, treat, and dispose of sewage waste being generated by the use for which the system is designed.

(1) A Permit to Construct expires 12 months from the date of issuance, or upon completion of construction, whichever is sooner. The County may grant a 30-day permit extension if there have been no changes to the design plan approved by the Permitting Authority and the owner applies for the extension at least 30 days prior to the expiration of the Permit to Construct. A fee will be charged towards the cost of the extension and re-issuance of permits. After a Permit to Construct has expired, a person who seeks to construct an OSSF must submit a new application and pay a new application fee in order to obtain a new Permit to Construct.

(2) Certification by Designer. The Permitting Authority will not issue a License to Operate for an OSSF that was designed by a professional engineer or registered sanitarian until the owner provides the Permitting Authority with:

(A) the engineer or sanitarian's written assurance that the engineer or sanitarian has inspected the OSSF and determined that it has been installed as designed and specified; and

(B) an accurate as-built drawing of the OSSF.

(3) A License to Operate is limited to authorization to operate an OSSF in accordance with the design and use approved by the Permitting Authority.

(4) Termination of License to Operate. A License to Operate issued under this chapter or previous OSSF rules adopted by the County may be revoked by the Permitting Authority if:

(A) the OSSF fails;

(B) the OSSF receives more sewage than the amount for which it was approved;

(C) the OSSF receives non-sewage wastewater;

(D) a structure connected to the OSSF exceeds or violates the terms of the License to Operate;

(E) the property on which the OSSF is located is used for a purpose other than that described in the original application for the Permit to Construct the OSSF; or

(F) the OSSF is operated in a manner that does not conform to the design and use approved by the Permitting Authority.

(5) It is a violation of this Chapter for any person to operate or allow any person to operate an OSSF for which the License to Operate has been terminated or for which a License to Operate has not been issued by the Permitting Authority.

(6) An owner of an OSSF for which a License to Operate has been terminated may apply in writing to the Permitting Authority to have the License to Operate re-instated. The Permitting Authority may re-instate a License to Operate if the owner of the OSSF has paid all applicable fees, and the Permitting Authority determines, after conducting an inspection of the OSSF, that the OSSF is functioning properly and that the owner of the OSSF has taken affirmative steps to ensure that the OSSF will be operated only in accordance with the design and use previously approved by the Permitting Authority.

(e) The County will not issue a suitability letter for a TCEQ stormwater pollution prevention plan permit until the Permitting Authority determines that an application for an OSSF Permit to Construct is administratively complete.

48.034 Maintenance Requirements (§285.7)

(a) This section applies to OSSFs for which maintenance is required as specified in Table XII of 30 TAC Section 285.91 and that serve single-family dwellings.

(b) At the end of the initial two-year service policy, a homeowner may perform maintenance activities for an OSSF that serves the homeowner's single family dwelling only if the homeowner:

(1) has taken the training and passed the test required for a TCEQ registered

maintenance technician, as required in 30 TAC Section 30.245(b), and has provided the results of the test and proof of attendance at the training to the County; or

(2) has taken equivalent training specifically for homeowners, as determined by the County, has passed any tests that were required as part of the training, and has provided to the County the results of any tests that were part of the training and proof of attendance at the training.

(c) A homeowner who performs maintenance activities for an OSSF that serves the homeowner's single family dwelling must comply with the testing and reporting requirements set forth in 30 TAC Section 285.7(e)(1)-(3) for maintenance providers.

(d) Notwithstanding any provision to the contrary, the owner of a single-family dwelling who has been personally maintaining the OSSF for the single-family dwelling must obtain a maintenance contract for the OSSF and provide a copy of the contract to the County within ten days after the County notifies the owner that:

(1) The owner has violated Texas Health and Safety Code Chapter 366, a rule adopted pursuant to Texas Health and Safety Code Chapter 366, or this chapter, and the owner chooses to enter into a contract for the maintenance of the system instead of personally correcting the violation; or

(2) The owner has, within three years of a previous violation, committed another violation of Texas Health and Safety Code Chapter 366, a rule adopted pursuant to Texas Health and Safety Code Chapter 366, or this chapter.

(e) In addition to the information required by 30 TAC Chapter 285, all maintenance/inspection reports, including reports prepared by homeowners who provide maintenance on their own OSSFs, must include the following:

(1) the reporting of any alterations to the OSSF that have not been authorized by the County;

(2) the condition of the spray area (if applicable);

(3) the permit number for the Permit to Construct;

(4) the printed name and signature of the maintenance provider or homeowner/property owner if the homeowner is submitting the report;

(5) the physical address of the OSSF location; and

(6) the physical address, business address, business telephone number, and emergency phone number of the maintenance provider.

(f) In addition to the information required by 30 TAC Chapter 285, all

maintenance/inspection contracts must include the following:

(1) the permit number for the Permit to Construct;

(2) the printed name and signature of the maintenance provider or homeowner if the homeowner is submitting the report;

(3) the physical address of the OSSF location; and

(4) the physical address, business address, business telephone number, and emergency phone number of the maintenance provider.

48.035 Site Evaluation (§285.30)

Travis County requires that backhoe pits be excavated to a depth of two feet below the bottom of the proposed excavation or to a restrictive horizon, whichever is less for soil evaluations. Profile holes are required to be excavated and soil analysis reports must be submitted with all applications for Permits to Construct on-site sewage facilities.

48.036 Criteria for Sewage Treatment Systems (§285.32)

(a) Testing of Tanks. Following installation and prior to final backfilling, all tanks in the system, including but not limited to septic tanks, pump tanks, trash tanks, and aerobic treatment units, shall be tested by being filled to the outlet with clean water and checked 24 hours later for leaks and structural integrity.

(b) Non-residential Treatment Requirements - Non-residential systems shall have a minimum of six-day retention time in a septic tank, or in a pre-treatment tank prior to a treatment unit; or provide equalization tanks per 30 TAC Section 285.34 (b)(4)

48.037 Criteria for Sewage Disposal Systems (§285.33)

(a) Limits on Daily Application Rate – Except as provided in Paragraphs (1) and (2), the total daily application of effluent from an OSSF may not exceed 60 gallons per tenth of an acre of the lot or site. Fractional acreage shall be rounded down to the nearest tenth of an acre.

(1) For parcels that were legally platted before TCEQ's approval of this chapter and that are less than or equal to four-tenths of an acre, up to 240-gallons per day may be allowed.

(2) For proposed developments with less than 50% total impervious cover, including OSSF drainfield as impervious cover, an exemption may be granted to allow a higher effluent application rate.

(b) Disposal Processes - Proprietary - Drip Irrigation.

(1) There shall be a minimum of two feet of soil between the drip emitter and

groundwater; however, only one foot of soil is required where secondary treatment is used.

(2) Drip irrigation systems shall be designed using a maximum application rate of 0.15 gallon per square foot per day.

(3) Drip irrigation systems shall provide a minimum of two feet per second flushing velocity.

(4) There shall be a minimum of one foot of soil between the drip emitter and solid or fractured rock.

(c) Disposal Processes - Non-Standard - Low Pressure Dosed Drainfield - Drainfield Criteria.

(1) There shall be a minimum of three feet of undisturbed soil between the sidewalls of multiple excavations.

(2) Low pressure dose designs shall include consideration for elevation changes between laterals and friction losses in manifold piping between lateral lines.

(3) When on sloping ground, supply manifolds shall connect to the highest lateral in a drainfield zone.

(d) Disposal Processes - Non-standard - Surface Irrigation Systems.

(1) Surface irrigation shall be conducted during the night-time hours, preferably just before sunrise.

(2) Consideration must be given towards controlling run-off from the disposal area during rain events.

(3) The minimum setback to a property line is 25 feet.

(e) Disposal Processes - Non-Standard - Soil Substitution Drainfields. Soil Substitution beds are required to use pressure dose application. Pipe and orifice spacing for the distribution piping is to be the same as for current mound design requirements.

(f) Pipe Bedding – Pipes such as sewer pipes from the structure to the treatment facility and from the treatment facility to the disposal component shall be bedded with four inches of Class Ib, Class II, or Class III soil with less than 30% gravel. The bedding soil shall be free of organic material and any rocks or grains larger than ½ inch.

(g) Pump Tank Sizing – Pump tank shall be sized to provide at least one full day of flow above the alarm on setting unless dual pumps are used per requirements of 30 TAC 285.34(b)(3).

(h) Installations on Slopes Exceeding 10% - Drainfields with finished grades exceeding 10% shall either provide erosion control matting or 80% vegetative cover prior to final inspection.

Subchapter C.

48.051 Local Administrative Procedures

(a) This Subchapter sets forth procedures that must be followed by persons who are applying for a Permit to Construct or a License to Operate an OSSF. This Subchapter also sets out the County's enforcement authority.

(b) The Local Administrative Procedures set forth in this Subchapter are designed to further the ability of the Permitting Authority in assuring that a person does not:

(1) install, construct, alter, extend, or repair an OSSF without obtaining a Permit to Construct from the Permitting Authority;

(2) operate or maintain an OSSF or discharge (includes deposit, conduct, drain, throw or otherwise release or dispose of wastewater or effluent, or to allow any of these acts) sewage or sewage effluent into an OSSF without obtaining a License to Operate from the Permitting Authority; or

(3) cause, permit or allow the operation of or the maintenance of an OSSF in a manner that will cause, or may tend to cause pollution, injury to the public health, or nuisance conditions.

48.052 Enforcement

In order to enforce this chapter, the Permitting Authority is authorized to:

(a) enter private property to inspect or monitor incipient or existing OSSFs at all reasonable times and at any time there is reasonable cause to believe a violation of this chapter has been committed or is being committed. Notwithstanding the foregoing, the Permitting Authority or TCEQ may inspect an on-site sewage system using aerobic treatment at any time.

(b) order the work being done on an OSSF in violation of this chapter to be stopped by notice in writing of the suspension or revocation of the permit to the person doing or causing the work to be done.

(c) issue a written order to a person to immediately cease using any OSSF causing pollution or constituting a nuisance, or otherwise operating in violation of this chapter, and may seek legal process to enforce its orders.

(d) revoke a License to Operate an individual onsite wastewater system if the system for which it has been issued is being operated in violation of this chapter, is not being operated within the manufacturer's specifications, does not have a valid maintenance contract when one is required, or becomes a public nuisance. A Notice of Violation for inappropriate operation shall first be issued by Travis County. If the violation for which the property owner is cited is not corrected within the time specified in the Notice of Violation, Travis County may revoke the

License to Operate.

(e) take any other action authorized by law to enforce local, state, and federal rules relating to OSSFs within the County's jurisdictional area.

48.053 Notice

(a) Unless otherwise specified, any notice prepared by the County may be given by hand delivery or by US Mail. Notice by the County may also be accomplished by posting a sign on the property to which the notice refers.

(b) Any notice that is required to be sent to the County must be given by:

(1) hand delivery or overnight courier to the Permitting Authority at 700 Lavaca, Suite 500, Austin, Texas 78701,

(2) United States Mail, postage prepaid, return receipt requested, to the following address:
Travis County Transportation and Natural Resources Department
On-Site Wastewater Program
P.O. Box 1748
Austin, Texas 78767

48.054 Permit to Construct and License to Operate.

To facilitate the efficient implementation of this chapter:

(a) The Permit to Construct is limited to the authorization to install, construct, alter, extend, or repair an OSSF in accordance with the planning materials approved by the Permitting Authority. It does not include authorization to operate the OSSF.

(b) The License to Operate is not included in the Permit to Construct, but will be issued upon certification by the designer of record and final approval of construction by the Permitting Authority. The License to Operate will allow an OSSF to be operated in accordance with the approved planning materials for the discharging of sewage into the facility for treatment and disposal or reuse.

(c) Because wastewater collection systems provide greater public health protection than OSSFs, the Permitting Authority may elect to not issue a Permit to Construct if the Permitting Authority determines that any portion of the proposed OSSF is located within 500 feet of the boundary of an area served by a private or public wastewater collection system that would, in the opinion of the Permitting Authority, be legally and technically feasible for the OSSF to connect to.

48.055 Variance Procedures

Variances from this chapter may be granted as provided in this subsection.

(a) Requests for variances from this chapter shall be considered on an individual basis in accordance with the criteria specified in 30 TAC Section 285.3(c) and where site conditions (such as lot size, separation distance and setbacks) are such that no alternative that complies with this chapter can be found.

(b) The Commissioners Court authorizes the Permitting Authority to grant variances involving exceptions to technical construction standards or local setback and separation distances more stringent than State standards as long as the variance granted results in a system which ensures public health protection equivalent to that provided under the TCEQ Rules. The Permitting Authority is authorized to grant administrative variances, including, for example, a variance to allow the construction of an OSSF in a drainage easement if the applicant has taken concrete steps to vacate the easement and there is no known opposition to the vacation of the drainage easement. The Permitting Authority may refer any request for variance to the Commissioners Court for direction.

(c) A person desiring a variance to any requirement of this chapter shall file a written request with the Permitting Authority, stating the specific provision from which a variance is requested, and including any information which the requestor feels is pertinent to the request.

(d) In granting a variance, the Commissioners Court or the Permitting Authority may specify terms and conditions determined to be necessary or advisable to ensure equivalent public health protection, such as requiring certain treatment levels, monitoring equipment, and procedures for design and/or operating and/or maintenance. The owner of the property shall allow the Permitting Authority to enter the property for the purpose of inspecting the facility at any reasonable time to ascertain that conditions are met.

(e) Requests for variances requiring approval by the Commissioners Court will be submitted for Court consideration as follows:

(1) The Permitting Authority shall review the request within 30 days of the completed request, formulate a recommendation to the Court, and make a written reply either requesting additional information or notifying the applicant of a Court date and of the Permitting Authority's recommendation to the Court.

(2) Notwithstanding any other provision of this chapter, if the variance request is made in conjunction with an application for final plat approval under Chapter 82, Travis County Code, the request must be reviewed, acted on, and appealed within the time periods established under Chapter 82 in lieu of this chapter.

(f) Procedures for consideration of requests for variances that may be granted by the Permitting Authority will be as follows:

(1) Not later than 30 days after the receipt of a complete request for variance, the Permitting Authority shall review the request and reply to the applicant in writing, granting or denying the request, or requesting additional information. If the Permitting Authority does not reply in writing to an applicant within 30 days after receiving the applicant's request for variance, the request is denied.

(2) A person aggrieved by an action or decision of the Permitting Authority regarding the person's request for a variance may, within 30 days after the date of the document giving notice of the action or decision, or within 30 days after the action if no document is given, appeal to the Commissioners Court. The appeal shall be initiated by filing a written objection with the Permitting Authority. The written objection shall state the specific action or decision being appealed, the relief requested, the person's reasons for requesting the relief, and a copy of the document, if any, giving notice of the action or decision appealed.

(3) The Permitting Authority shall notify the County Judge who shall place the matter on the agenda of the Commissioners Court in accordance with usual Court procedures. The Permitting Authority shall provide written notice of the time and place of the hearing before the Court to the person making the appeal.

(4) The Commissioners Court shall review the matter in the scheduled hearing, considering the materials submitted by the Permitting Authority and the person seeking the appeal, as well as any information and evidence that it considers relevant. The Commissioners Court shall render its decision no later than ten days after the conclusion of the hearing. If the Commissioners Court does not approve a request for variance within ten days after the hearing, the request is denied unless the Commissioners Court schedules an additional hearing and approves the variance at the subsequent hearing.

(g) The Permitting Authority shall keep complete records of variances granted. The Permitting Authority shall make periodic reports to the Commissioners Court including locations, descriptions of the variances requested, the reasons for the variances, and Permitting Authority's justifications for the granting of the variances, as specified by the Court.

48.056 Submission of Planning Materials

The following planning materials, which must be prepared by a professional engineer or registered sanitarian, must be submitted with an application for a preliminary plan, final plat, or when proposing a manufactured housing community, condominium

development, multi-unit residential development, business park, or other similar use that will use OSSFs for sewage disposal:

(a) An accurate plan that complies with all applicable State of Texas and County standards and that shows each existing or proposed lot, its size, source of water, and the area available for disposal fields.

(b) The geographic location of the development or subdivision and its proximity to streams and lakes.

(c) Identification on the plan of the location of recharge features, which features must be indicated on the final plat.

(d) Identification on the plan of planned or existing well locations and a sanitary zone with a 100-foot radius around private wells, and a 150-foot radius around public wells, within which no effluent disposal fields may be sited as set forth in this chapter.

(e) A comprehensive drainage and 100-year floodplain impact plan.

(f) Identification on the topographic map or plan of the 100-year floodplain and the floodway.

(g) A report detailing the types of OSSFs to be considered and their compatibility with area-wide drainage and groundwater.

(h) Results of a site evaluation for soil suitability in accordance with section 48.035 of this chapter based upon a number of soil profile holes which will provide a representative sample of soils. Profile holes shall be to a depth of five feet or to a limiting condition, whichever is shallower. Test locations shall be evenly distributed throughout the development and be representative of the soils within the development. Where soil conditions are variable, additional soil profile hole testing may be required in test sites determined by the Permitting Authority. An analysis of each soil layer in each profile hole shall be provided including soil classification, structure, gravel content percentage, and presence of mottles and/or groundwater.

(i) Depiction on the plan of the areas and depths of scalping or fill and road cuts for the purpose of addressing setback requirements.

(j) Notification on the plan of the presence of mottled soils or water in soil profile holes indicating the groundwater table is less than five feet below the surface as the surface exists or as it will be after grading and filling that may be required in the development.

(k) Depiction on the plan of areas of greater than 30% slope with a cumulative total of areas with greater than 30% per lot.

(l) Any additional planning materials that the Permitting Authority and/or staff of the Permitting Authority determine are necessary to demonstrate the applicant's compliance with the requirements of this chapter.

48.057 Procedures for Reviewing Planning Materials

(a) Preliminary Review. Preliminary review may be requested by the applicant, including scheduling an on-site inspection by the Permitting Authority. To obtain preliminary review, an applicant shall submit at least the materials listed in Section 48.056(a), (b), (d), and (f).

(b) Final Review. The Permitting Authority shall review the final planning materials for compliance with this chapter and recommendations made for the preliminary review, if any. Changes in the planning materials may require additional review. Survey and staking of individual lots is required before the final review.

(c) Final Plat Approval. If reviewed in conjunction with an application for final plat approval, the Permitting Authority shall make a written recommendation to the Commissioners Court within 45 days of a proper and complete submittal of planning materials.

(1) Approval. If the recommendation is for approval of the subdivision as proposed for use with OSSFs, the Permitting Authority shall continue to process the plat, preliminary plan, or basic development permit for approval.

(2) Approval with Conditions or Denial. If the recommendation is for approval with conditions or for denial, the applicant may appeal as provided in Chapter 82, Travis County Code.

(d) Limits of Approval. An approval recommendation under this subsection does not constitute either a Permit to Construct or a License to Operate for a specific OSSF.

48.058 Permit to Construct

(a) Application.

(1) Except for making emergency repairs that are authorized by 30 TAC Section 285.35, no person may construct, install, repair, alter, or extend an OSSF unless the person has first obtained a Permit to Construct from the Permitting Authority.

(2) In addition to other requirements, a property owner who seeks to have an OSSF constructed, installed, repaired, altered, or extended on that person's property shall submit a complete "Application for On-Site Sewage Facility Permit to Construct" to the Permitting Authority. The owner or an agent of the owner may seek information and/or assistance pertaining to the requirements for design of an OSSF for a specific property once application has been made.

(3) To be considered administratively complete, an application must include all the information specified in the "Application for On-Site Sewage Facility Permit to Construct," including:

(A) construction planning materials that demonstrate that the proposed OSSF complies with this chapter. Construction planning materials that are prepared by a registered sanitarian or licensed professional engineer must include the signature and official seal of the professional as well as the date of preparation.

(B) the results of a site evaluation as required by section 48.035 of this chapter.

(C) the floor plan of all the structures serving as the generating unit shall be included with the application for a permit to construct an onsite wastewater system. Square footages, labels, and dimensions must be included for clarity.

(D) a statement stating that the site has been marked by a sign, visible from the road frontage, that is at least 12" x 24", bearing the street address.

(4) An application must be accompanied by payment of required fees.

(b) Site Inspection.

(1) After an administratively complete application has been received by the County, the Permitting Authority shall conduct an inspection of the site on which the OSSF is to be constructed, and shall make a finding on the issuance of a Permit to Construct, based upon the information in the complete application and any other information available to the Permitting Authority.

(A) Upon a finding by the Permitting Authority that construction may begin, the County will issue a Permit to Construct to the applicant. The applicant must post the permit in a conspicuous manner at the site at all times during construction.

(B) If the Permitting Authority determines that a Permit to Construct cannot be issued, the Permitting Authority shall notify the applicant in writing of the reasons why the permit cannot be issued.

(2) The construction, installation, extension, or repair of an OSSF shall be made in accordance with the approved design and requirements of the Permit to Construct.

(c) Construction Inspections.

(1) The Permitting Authority shall inspect installations of OSSFs in accordance with the inspection schedule established in the Permit to Construct. Each type of system will have an included number of

inspections given in the inspection schedule. Any additional inspections required will incur an additional fee per inspection.

(2) Components of an OSSF may not be installed or covered until required inspections have been made and approval has been obtained from the Permitting Authority for that stage of construction.

(3) The applicant or installer shall notify the Permitting Authority that an inspection is desired at least two working days, excluding weekends and County-designated holidays, before the need for each inspection.

(4) The applicant or installer shall provide whatever reasonable assistance the Permitting Authority requests in order to make each inspection.

(5) The inspection of drip emitters in place and uncovered is required except where drip emitters are installed by the "plowed-in" method. When "plowed-in" the connections of all drip emitter tubing to the header piping will be uncovered for inspection.

48.059 License to Operate

(a) New OSSFs. After final inspection of a newly installed OSSF, the Permitting Authority shall make a finding on whether to issue a License to Operate, based upon the information obtained from the inspections and any other information available to the Permitting Authority.

(b) Upon a finding that the use of the new OSSF will not cause pollution, injury to the public health, or nuisance conditions and is not in conflict with this chapter, other provisions of the Travis County Code, the Permitting Authority will issue a License to Operate the OSSF.

(c) Upon a finding that a License to Operate cannot be issued, the Permitting Authority shall notify the applicant in writing and shall include the reasons for denying the issuance of a license.

48.060 Affidavit Forms

Sample affidavit forms for use under this chapter will be provided by the Permitting Authority. The maintenance affidavit must include the following language:

> The OSSF shall be covered by a continuous service policy for the first two years. After the initial two-year service policy, the owner of an aerobic treatment system for a single family residence shall either obtain a maintenance contract within 30 days or maintain the system personally.

48.061 Recording of Designated Representative's License Number

The Designated Representative must record the Designated Representative's license

number on all items prepared by the Designated Representative.

COUNTY OF TRAVIS §

STATE OF TEXAS §

AFFIDAVIT

Before me, the undersigned authority, personally appeared Dana DeBeauvoir, who, being by me duly sworn, deposed as follows:

My name is Dana DeBeauvoir. I am of sound mind, capable of making this affidavit, and personally acquainted with the facts herein stated:

I am the custodian of the records of the County Clerk's office for the County of Travis, Texas. Attached hereto are _____ pages of records known as ""Order Adopting Rules of Travis County, Texas, for On-Site Sewage Facilities." The records are kept by me as County Clerk, County of Travis, in the regular course of business with knowledge of the act, event, condition, opinion, or diagnosis, recorded to make the record or to transmit information thereof to be included in such record; and the record was made at or near the time or reasonably soon thereafter. The record attached hereto is the original or exact duplicate of the official record.

_____
Dana DeBeauvoir
Travis County Clerk

Before me, the undersigned authority, a Notary Public in and for said County, Texas, on this day personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument and having acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this ____ day of _____, 20__.

(SEAL)

Notary Public, State of Texas
My commission expires:

Chapter 48- Travis County Code, Rules of Travis County, Texas for On-site Sewage Facilities

This is an outline of the material contained in Chapter 48. For details regarding the more stringent items refer to the entire document.

The Texas Commission on Environmental Quality has established rules for on-site sewage facilities (OSSFs) in Title 30 TAC Chapter 285. Travis County has adopted Chapter 285 in its entirety, but has also adopted more stringent requirements. Travis County Transportation and Natural Resources (TNR) believes the more stringent rules are necessary to protect the public health and environment in the unique geologic and groundwater conditions of Travis County, Texas.

Items that are more stringent than the requirements of Chapter 285 are as follows:

- Addition of definitions of "accessory use," "accessory structure," and "development"
- Enforcement Plan
- Lot size requirements have been increased
- Additional Requirements for placement of additional residence(s) on lot or site (exemption to minimum lot size).
- Requirement for planning materials for single family, multi-family, condominium, commercial, or other developments when served by OSSF
- Notice of OSSF conditions for developments in deed records
- All OSSF's in jurisdiction must follow rules (regardless of lot size)
- Application and Permitting Procedures (timelines, expiration, designer certification, licensing, and revocation)
- Maintenance requirements to require credentials for homeowner maintenance
- Terms for termination of homeowner maintenance
- Additional maintenance report requirements
- Requirements for test holes for site evaluation
- Requirement for filling and leak testing tanks prior to backfill
- Requirement for additional retention time on non-residential OSSF
- Daily application rate limit in terms of gallons per area of lot
- Drip irrigation soil depth requirements
- Drip irrigation at minimum of 0.15 gallons per sq. ft. per day
- Drip irrigation to require minimum of 2-feet per second flushing velocity
- Drip irrigation emitter requirement for 1-foot separation to fractured or solid rock
- Low Pressure Dose (LPD) to require 3-feet between sidewalls of excavation
- LPD design materials to include friction losses in manifold between laterals and elevation change between laterals
- LPD supply manifold to connect at highest lateral on sloping ground
- Surface Irrigation to be at night time
- Surface Irrigation to provide consideration for rainfall runoff from disposal area
- Minimum setback from surface irrigation area to property line at 25-feet
- Soil substitution drainfields shall require same distribution piping requirements as mound
- Pipe bedding requirements for piping outside of disposal areas
- Pump tank sizing to require one full day flow above alarm (except when duplexed)
- Erosion controls for disposals areas on slopes exceeding 10% (erosion matting or 80% vegetative cover)

(More stringent requirement.) (Each new more stringent requirement must be justified (in a separate document) based on greater public health and safety protection.)

Note: Format was updated to match other Travis County Codes
48.002 (Definitions and Acronyms) New Section for Clarification of Terms

Subchapter B
48.032 (Previously 48.010.2(a))
(Facility Planning)

(a) Added: As much of the land being developed were previously areas either too remote or difficult to allow for OSSF; the additional challenges must be carefully considered to ensure public health is protected.

(b) Larger lot sizes are necessary to protect the public health and environment in Travis County because of the predominance of unsuitable soils, steep rocky slopes, and the demand for construction of larger than normal size houses. Research of the literature revels that many jurisdictions increase lot size requirements to protect groundwater through the reduction of septic tank densities (GA Extension Service, Septic Systems Handbook, Kaplan). "The range of [minimum] lot sizes ... appears to be from ½ to 1 acre, based on reported data, and from ¾ to 1 acre based on theory." (Bauman and Schafer 1985) Estimating groundwater quality impacts from on-site sewage treatment systems. (ASAE Pub. 007-85, pp. 285-295. ASAE St. Joseph, M.I.)

Additional space is needed for lots utilizing both individual and wells and on-site wastewater systems to ensure that groundwater quality is protected by providing adequate buffer space around the wells without having to encroach onto adjacent properties. Additionally, many areas of western Travis County have rapidly recharging conditions, with thin soils and karst rock or layered limestone. These conditions are particularly vulnerable to well contamination from either surface sources or OSSF's. Larger lot sizes will reduce the potential for contamination in these sensitive areas, thus providing additional protection for the public health and environment.

Since small lots are commonly cited as the number one problem with siting on-site sewage systems, future health hazards can be averted by adhering to minimum required lot sizes, providing greater protection to the public health and environment. Once a minimum lot size standard is set, there should be only rare occasions when a new subdivision would be created with lots smaller than those required. A pre-existing single lot that has never been legally platted is an example of such an occasion.

Western Travis County requires the additional protection to public health and the environment afforded by this requirement because its topography typically has steep rocky slopes with thin soils which are not favorable for on-site sewage disposal. Each lot in new subdivisions should initially be created with on area suitable for a sewage disposal field and a replacement area in order to prevent health and pollution problems resulting from poorly sited sewage systems or from the inability to relocate a new system in case of failure. Each newly created lot should have an area with flat enough slopes (30% or less) to allow the installation of a variety of on-site sewage systems in most soil conditions, giving the owner the maximum options for types of facilities which will provide protection to the public health and environment equivalent to the State Rules.

(c) Per AG opinion No. GA-1007 Travis County Attorneys have interpreted subdivision to include additional uses which includes additional residences. A second residence on same site or lot may constitute lower threshold for review of subdivision and provides specifics for exemption.

(d) Local review procedures to be used in Travis County in administering 30 TAC §285.4(c),

"Facility Planning — Review of subdivision or development plans," are set forth in Attachment A, Local Administrative Procedures. Aligns order with other Travis County codes.

(e) This provision ensures that purchasers are informed that lots in a subdivision require an OSSF and are subject to certain OSSF-related requirements. In addition, adding restrictions as plat notes or covenants enhances the county's legal ability to enforce the restrictions.

48.033 (Application and Permitting Procedures)

(a) All new sewage systems need to be permitted and inspected to ensure protection of public health and the environment in every situation. Site-specific needs which must be met to ensure protection of the public health and environment can only be determined if every system receives regulatory attention.

(a)(3) Addition protection to public health by having confirmation of repair and completion.

(c) Prolonged archiving of inactive applications and permits unnecessarily waste and consume the County's limited resources. Utilization of resources in that manner detracts from our ability to focus on our primary mission of protecting the public health by diverting resources from enforcement to record-keeping, the result being the increased exposure of the public to health and environmental damage.

(d)(1) (see (c) above)

(d)(2) Requiring this additional certification would provide additional protection to the public health and environment by having the professional who designed the system also monitor the on-going installation of the designed system to be certain that it was constructed as specified. Designers who know that they will be certifying that the final product is consistent with the design will be more cautious to ensure that the construction has been accomplished such, that the system will function according to design. Inspections by the designer throughout the installation process will also expand the review process beyond that which can be provided by the limited required inspections by the Permitting Authority.

(d)(3) A stated license with specific use limitations provides clarity to both private and public sector as to the legitimacy and continued operation of an OSSF.

(d)(4) Provides means for regulatory and enforcement enhancement to ensure compliance and protect public health by administrative removal of license

(d)(5) Clarifies and enhances enforcement of order regarding forbidden use of OSSF

(d)(6) Provides enhanced protection of public health by ensuring failed systems are properly remediated and licensed.

(e) It places an undue burden on Travis County staff to issue statement on suitability without first having a formal submittal that provides justification for such a statement

(48.034)(Maintenance Requirements)

(a-g)-Due to the density and quantity of OSSF's throughout Travis County, it is important to ensure properly certified/qualified persons are properly inspecting and reporting on the operation of OSSF's requiring maintenance. Contact for information requirements allows for improved communication with regulatory staff to more quickly remedy issues.

(48.035) (Site Evaluation)

- Requiring a backhoe pit for evaluation and soil analysis report for all OSSFs ensures a substantial profile of the soil for evaluation and opportunity for inspection by Travis County Staff which increases the likelihood of an appropriate OSSF for the site and thereby provides a higher protection to public health.

(48.036)(Criteria for Sewage Treatment Systems)

(a) Leaking septic tanks are a common cause of failure. The additional testing will ensure protection of public health by requiring better quality control at the time of initial installation, resulting in fewer failures in the fixture. Literature supports this requirement by showing that there are other states which test all tanks to ensure better quality, and thus increased public health protection.

(b) Non-standard treatment units are individually designed systems generally utilizing

mechanical components in systems designed to provide a higher level of sewage treatment on a given site due to unsuitable site conditions. Unsuitable site conditions and additional mechanical components increase the need for assurance of proper functioning and performance monitoring of these units which is provided by a more stringent maintenance requirement. Increased public health and environment protection is the result of this additional ongoing upkeep of the more complex systems needed to serve in less than ideal conditions.

(48.037)(Criteria for Sewage Disposal Systems)

(a) With increasing home sizes and densities over the rapid recharge areas of western Travis County and poorly draining soils of eastern Travis County, there is concern with the organic loading of the soils, infiltration of harmful nitrogen compounds (nitrate and ammonia), potassium, and other trace chemicals into groundwater. By limiting the total daily volume loading based on acreage, the concentration can be evenly limited.

(b)(1) The State has established 1 foot as the base minimum soil depth to achieve adequate land treatment using drip emitters. Due to the fluctuating depth of seasonal groundwater conditions, the 'factor of safety" provided by the increased soil is required to ensure adequate separation between the sewage disposal fields and groundwater. The requirement is reduced where a higher quality effluent through secondary treatment is provided before discharge to the disposal area.

(b)(2) Due to variation in recommended hydraulic loading rates for soils in the Class III zone of the USDA Soil Textural Classifications (30 TAC §285.91 Table VI), generally poor site conditions (rocky soils and slopes of areas with Class III soils), and historic failure rates of many drip irrigation systems using the loading rate for Class III soils, the minimum requirement of 0.15 gallons per day per square foot provides a protection to the public health by decreasing the total loading per square foot and potentially reducing the frequency of system failures.

(b)(3) By ensuring drip emitter systems are providing adequate flushing when serviced, the frequency of failure can be reduced and allow optimal service life of emitters to be achieved.

(b)(4) By required additional volume of suitable material below the emitter lines, additional protections are provided by decreasing the likelihood for effluent to travel along shallow restrictive horizons. Further it is felt the inclusion of soils with up 60% gravel as suitable greatly reduces the soil pore space and requiring additional soil depth will aid in ensuring sufficient hydraulic capabilities are met.

(c)(1) As low pressure dosed drainfields are credited sidewalls as absorptive area, it is desired the sidewall area be given the necessary protection and volume to allow for absorption. A 1' absorption area is assumed along each sidewall with a central foot area to be considered as compacted during installation. This consideration will prevent a less than optimal sidewall between excavations to ensure intended operation.

(c)(2) As demonstrated by the locally accepted and developed 'Travis County Method' hydraulic friction losses due to flow along manifolds between laterals can affect the head in low pressure dosed systems and thereby the consistent and even distribution. By requiring the consideration of this loss in the design, a more accurate hydraulic loading can be achieved thereby reducing the potential for over loading an area causing a failure.

(c)(3) As demonstrated by the locally accepted and developed 'Travis County Method', bottom loading of a low pressure dose system on sloping ground is more likely to overload lower trenches and thereby increase potential for failures.

(d)(1) Irrigation is limited to the period of least human activity to minimize the likelihood of human contact. Night time irrigation provides for greater protection of public health since it is generally the period of least human activity.

(d)(2) In order to protect public health and environment, the design of all surface irrigation systems should address some means of providing control of effluent runoff onto neighboring properties which can increase during rain events; in addition, this practice will aid in the prevention of the creation of nuisance conditions.

(d)(3) Due to an average wind speed of 8.5 mph (NOAA National Climatic Data Center. Comparative Climatic Data Publication.), an increase setback to property lines can decrease the likelihood of wind induce carriage of irrigation effluent across property lines.

(e) To prevent pooling and uneven distribution that can lead to failure, low pressure dosed soil-substitution systems maintain even distribution.
(f) Fewer broken lines due to shifting clay soils and improper backfill (rocks, debris).
(g) The state minimum pump tank volume only provides 1/3 of a day volume. This requires immediate attention and does not allow the owner opportunity to wait for service or parts. By requiring additional alarm volume the owner may be afforded more time to make repairs and reduce the likelihood of surfacing.
(h) As less "ideal" building sites are available, development of sloping property is becoming more prevalent. In order to minimize erosion that could lead to exposed media and or lines in the drainfield. Erosion controls and establishing vegetation can significantly reduce the likelihood of this type of file drainfield failure.

(48.051) (Local Administrative Procedures) Local procedures may be used to provide a clear path for permitting, enforcement, review, inspection, and licensing. (applies for 48.051-48.061)
(48.052) (Enforcement) – Providing clear and defined enforcement policies and criteria will aid in protecting public health by enhancing abilities to address situations that violate 30 TAC 285 and this order. Codified policy can provide constituents with clear expectations of actions and penalties should they violate this order.
(48.053) (Notice)
(48.054) (Permit to Construct and License to Operate)
(48.055) (Variance Procedures)
(48.056) (Submission of Planning Materials)
(48.057) (Planning Materials)
(48.058) (Permit to Construct)
(48.059) (License to Operate)
(48.060) (Affidavit Forms)
(48.061) (Recording of Designated Representative's License Number)

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Zak Covar, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 1, 2014

Brandon Couch, R.S., D.R.
Travis County TNR
On-Site Wastewater Program
PO Box 1748
Austin, Texas 78767

Re: County of Travis On-site Sewage Facility Order

Dear Brandon:

The TCEQ staff has reviewed the proposed County of Travis' On-Site Sewage Facility Order. Based on our review of your draft proposal submitted September 30, 2014, this order meets minimum State requirements. Please proceed with the adoption process as outlined in Title 30 TAC Chapter 285, Section 285.10 (b)(5)(A)-(C) and 285.0 (b)(6)(A)-(D), with particular consideration of the following items:

1. Publish notice of a public meeting at least 72 hours before the public meeting, but not more than 30 days before the meeting. The notice must appear in a regularly published newspaper(s) of general circulation in the area of jurisdiction and the notice must include the time, date and location of the public meeting.

2. After the public meeting is held, submit a copy of the following items:
   * A public notice as it appeared in the newspaper(s);
   * A publisher's affidavit from the newspaper(s) in which the public notice appeared;
   * A certified copy of the minutes of the meeting when the order was adopted; and
   * A certified copy of the order that was adopted by the County of Travis Commissioner's Court.

Please remove all cross references to the model order. The otherwise approved draft order is enclosed. If further information or assistance is needed, please contact me at (512) 239-2150 or by email at mike.price@tceq.texas.gov.

Sincerely,

Michael Price
On-site Sewage Facility Program

Enclosure

TRAVIS COUNTY CODE CHAPTER 48

9-29-2014 revisions to draft sent to TCEQ
317403

Chapter 48. Rules of Travis County, Texas for On-Site Sewage Facilities

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CHAPTER 48. RULES OF TRAVIS COUNTY, TEXAS FOR ON-SITE SEWAGE FACILITIES
[with references to the TCEQ's Model Order

Subchapter A

48.001 Policy and Purpose

(a) Background and Policy. [Preamble in Model Order, page 2]

(1) The Texas Commission on Environmental Quality has established rules for on-site sewage facilities to provide the citizens of this State with adequate public health protection and to minimize environmental pollution. [First recital in Model Order, page 2]

(2) The Legislature has enacted legislation, codified as Texas Health and Safety Code Chapter 366, which authorizes a local governmental entity to regulate the use of on-site sewage facilities in its jurisdiction in order to abate or prevent pollution or injury to public health arising out of the use of on-site sewage facilities. [Second recital in Model Order, page 2]

(3) Due notice was given of a public meeting to determine whether the Commissioners Court of Travis County, Texas should enact an order controlling or prohibiting the installation or use of on-site sewage facilities in Travis County, Texas. [Third recital in Model Order, page 2]

(4) The Commissioners Court of Travis County, Texas finds that the use of on-site sewage facilities in Travis County, Texas is causing or may cause pollution, and is injuring or may injure the public health. [Fourth recital in Model Order, page 2]

(5) The Commissioners Court of Travis County, Texas has considered the matter and deems it appropriate to enact an order adopting rules regulating on-site sewage facilities to abate or prevent pollution or injury to public health in Travis County, Texas. [Fifth recital in Model Order, page 2]

(b) Findings and Adoption of Rules. The Commissioners Court of Travis County, Texas finds that:

(1) The matters and facts recited in subsection (a) are true and correct; [Section 1 of Model Order, page 2]

(2) The use of on-site sewage facilities in Travis County, Texas, is causing or may cause pollution and is injuring or may injure the public health; and [Section 2 of Model Order, page 2]

(3) It is necessary and appropriate to adopt this chapter of the Travis County Code, which is to be entitled "Rules of Travis County, Texas for On-Site Sewage Facilities. [Section 3 of Model Order, page 2]

48.002. Definitions and Acronyms.

Words and phrases in this chapter have the same meaning they have in Chapter 366 (On-Site Sewage Disposal Systems) of the Texas Health and Safety Code and Chapter 285 (On-Site Sewage Facilities) of Title 30 of the Texas Administrative Code. The following words and terms in this section, when used in this chapter, have the following meanings:

(1) "Accessory use" means a use which is incidental and subordinate to the principal use of the parcel of land on which it is located.

(2) "Accessory structure" means a structure which is on the same parcel of property as the principal structure to be insured and which is incidental to the use of the principal structure.

(3) "Authorized Agent" means the Travis County Commissioners Court or its designee, the Travis County Transportation and Natural Resources Department.

(4) "Commissioners Court" means the Travis County Commissioners Court.

(5) "County Executive" means the county executive of the Travis County Transportation and Natural Resources Department or his designee.

(6) "Development" means any man-made change to improved or unimproved real estate, including, but not limited to, the construction of buildings or other structures, a change in the use of improved or unimproved real estate, mining, dredging, filling, grading, paving, surfacing, excavation operations, drilling operations, the storage of equipment or materials, and the clearing of land for the purpose of preparing a site for any man-made change to improved or unimproved real estate.

(7) "License to Operate" means written permission from the Permitting Authority to operate an on-site sewage facility.

(8) "Lot" or "site" means the unit of land area served by an on-site sewage facility.

(9) "Maintenance" means required or routine performance checks, examinations, upkeep, cleaning, or mechanical adjustments to an on-site sewage facility, including replacement of pumps, filters, aerator lines, valves, or electrical components. Maintenance does not include alterations.

(10) "On-site sewage facility" or "OSSF" means a system that:

   (a) does not treat or dispose of more than 5,000 gallons of sewage each day; and

   (b) is used only for disposal of sewage produced on a site where any part of the system is located.

(11) "Permit to Construct" means written permission from the Permitting Authority to construct an on-site sewage facility showing the date the permission was granted.

(12) "Permitting Authority" means the Travis County Commissioners Court or its designee, the Travis County Transportation and Natural Resources Department.

(13) "Person" means an individual, association, partnership, corporation, organization, business trust, political subdivision, state or federal agency, or an agent or employee thereof.

(14) "Repair" means to replace any components of an on-site sewage facility in situations not included under emergency repairs according to 30 TAC § 285.35 (relating to emergency repairs), excluding maintenance. The replacement of tanks or drainfields is considered a repair and requires a permit for the entire OSSF system.

(15) "Residential unit" means a structure that is used for habitation.

(16) "Sewage" means waste that:

(a) is primarily organic and biodegradable or decomposable; and

(b) generally originates as human, animal, or plant waste from certain activities, including the use of toilet facilities, washing, bathing, and preparing food.

(17) "TAC" means the Texas Administrative Code.

(18) "TCEQ" means the Texas Commission for Environmental Quality or its successive agencies.

(19) "TCEQ Rules" means the rules promulgated by the Texas Commission on Environmental Quality for on-site sewage facilities in Title 30 Texas Administrative Code Chapter 30, Subchapters A and G, and Chapter 285 and all future amendments and revisions to those rules.

48.003 Conflicts [Section 4 of Model Order, page 3]

(a) This chapter repeals and replaces any other on-site sewage facility orders or parts of orders of Travis County, Texas.

(b) All Codes or policies, or parts of Codes or policies of Travis County related to this chapter that are in conflict with the provisions of this chapter are hereby repealed.

48.004 On-Site Sewage Facility Regulation and Enforcement [Section 5 of Model Order, page 3]

Travis County, Texas clearly understands there are technical criteria, legal requirements, and administrative procedures and duties associated with regulating on-site sewage facilities, and will fully enforce Chapter 366 of the Texas Health and Safety Code, Chapters 7 and 37 of the Texas Water Code, and associated rules referenced in section 48.006 of this chapter.

48.005 Jurisdictional Area/Applicability [Section 6 of Model Order, page 3]

This chapter applies to:

(a) the unincorporated areas of Travis County, Texas except:
  (1) the areas regulated under an order adopted by a local governmental entity other than Travis County; and
  (2) the areas have been annexed by the City of Austin for the limited purpose of public health;

(b) areas within the corporate limits of Webberville and San Leanna;

(c) areas within the corporate limits of Leander located within Travis County; and

(d) areas within the territorial limits of a local governmental entity located in whole or in part in Travis County that:
  (1) has been delegated the authority by the TCEQ executive director to implement and enforce the rules adopted under Texas Health and Safety Code, Chapter 366; and
  (2) has entered into an interlocal agreement with Travis County for the enforcement of that local governmental entity's OSSF rules.

48.006 Compliance with On-Site Sewage Facility Rules [Section 7 of Model Order, page 3]

(a) Any person who has an ownership interest in an on-site sewage facility or who participates in any activity relating to the development of planning materials, construction, installation, alteration, repair, extension, operation, maintenance, permitting, inspection, or investigation of an on-site sewage facility within the jurisdictional area of Travis County, Texas must comply with the TCEQ Rules and all applicable provisions of this chapter.

(b) A person must obtain a Permit to Construct from the County in accordance with this chapter before the person constructs, installs, alters, repairs, extends, or modifies an OSSF unless the OSSF is excluded or exempted under State law or this chapter.

(c) Any person who has an ownership interest in an on-site sewage facility within the jurisdictional area of Travis County must obtain a License to Operate from the County before the person operates or allows any person to operate the on-site sewage facility.

48.007 TCEQ Rules Adopted; Incorporation by Reference [Sections 8 and 9 of Model Order, page 3]

(a) Travis County adopts the rules promulgated by the Texas Commission on Environmental Quality for on-site sewage facilities in Title 30 Texas Administrative Code Chapter 30, Subchapters A and G, and Chapter 285. [Section 8 of Model Order, page 3]

(b) The TCEQ Rules and all future amendments and revisions to them are incorporated by reference and made a part of this chapter. [Section 9 of Model Order, page 3]

48.008 Authority to Act [Section 8 of Model Order, page 3]

All officials and employees of Travis County, Texas who have duties under the TCEQ Rules are authorized to perform those duties as are required of them under the TCEQ Rules and the provisions of this chapter.

48.009 Adoption of Rules that are More Stringent [Section 10 of Model Order, Page 4]

(a) Travis County, Texas adopts certain OSSF rules that are more stringent than those adopted by the TCEQ.

(b) The more stringent rules adopted by the Travis County Commissioners Court shall take precedence over any less stringent rules adopted by TCEQ.

(c) Travis County's more stringent rules are set forth in subchapter B.

48.010 Additional Findings [Section 10 of Model Order, Page 4]

The Travis County Commissioners Court finds that it is proper and necessary to adopt OSSF standards that are more stringent than the standards adopted by TCEQ because:

(a) Protecting water resources is vital to human health, and some residents within Travis County depend heavily upon groundwater for their drinking water;

(b) The population of Travis County is projected to double by the year 2050;

(c) A significant amount of the projected future growth within the unincorporated areas of Travis County is expected to rely on on-site sewage facilities;

(d) The adoption of OSSF regulations that are more stringent within the Recharge Zone of the Edwards Aquifer (including those land areas situated above the Trinity Aquifer Recharge Zones) and other aquifers which have environmentally sensitive rapid recharge conditions is necessary and appropriate to avert public health hazards resulting from the projected increased use of on-site sewage facilities and the increased usage of water; and

(e) The more stringent rules will provide greater public health and safety protection for the residents of Travis County.

48.011 Local Administrative Procedures

The County's local administrative procedures are set forth in subchapter C.

48.012 Duties and Powers of Designated Representatives [Section 10 or 11

Model Order, Page 4]

(a) The Transportation and Natural Resources Department of Travis County, Texas will ensure that each individual who acts as a designated representative for Travis County within Travis County's jurisdictional area is certified by the Texas Commission on Environmental Quality before that individual assumes duties and responsibilities as a designated representative of Travis County, Texas.

(b) Each of Travis County's designated representatives is authorized to review permit applications, site evaluations, and planning materials and to conduct inspections of on-site sewage facilities.

48.013 Collection of Fees [Section 11 or 12 of Model Order, Page 4]

(a) All fees collected under this chapter must be made payable to Travis County, Texas and must be paid in accordance with fee schedules adopted by the Commissioners Court as authorized by law.

(b) Each fee collected by Travis County for an application for a Permit to Construct must include a fee of $10 that Travis County must forward to the TCEQ Water Resources Management Account in accordance with Chapter 367 of the Texas Health and Safety Code.

48.014 Appeals [Section 12 or 13 of Model Order, Page 4]
Persons aggrieved by an action or decision of the designated representative may appeal such action or decision by mailing, within 30 days of the action or decision, a written appeal to the Travis County Commissioners Court.

48.015 Enforcement Plan [Section 13 or 14 of Model Order, Page 4]

(a) Travis County, Texas clearly understands that, as a minimum, it must follow the requirements in 30 TAC Section 285.71 (Authorized Agent Enforcement of OSSFs).

(b) This chapter adopts and incorporates all applicable provisions related to on-site sewage facilities, which includes, but is not limited to, those found in Chapters 341 and 366 of the Texas Health and Safety Code, Chapters 7, 26, and 37 of the Texas Water Code, 30 TAC Chapter 30, Subchapters A and G, and 30 TAC Chapter 285.

(c) At the request of the Commissioners Court, the County Attorney or other prosecuting attorney for the County may file an action in a court of competent jurisdiction to do one or more of the following:

    (1) Enjoin the violation or threatened violation of a requirement established by or adopted by the Commissioners Court under this chapter;

    (2) Seek civil or criminal penalties as provided by law; and

(3) Take all actions or seek any penalty authorized under law, including the penalties and enforcement provisions of Chapters 341 and 366 of the Texas Health and Safety Codes, Chapters 7 and 26 of the Texas Water Code, 30 TAC Chapter 285, and the provisions of this chapter.

48.016 Severability [Section 14 or 15 of Model Order, Page 5]

It is the intention of the Commissioners Court of Travis County, Texas, that the phrases, clauses, sentences, paragraphs, and sections of this chapter are severable, and if any phrase, clause, sentence, paragraph, or section of this chapter is declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, or sections of this chapter, since the same would have been enacted by the Commissioners Court without incorporation in this chapter of such unconstitutional phrases, clause, sentence, paragraph, or section. If any provision of this chapter or the application thereof to any person or circumstances is held invalid, the validity of the remainder of this chapter and the application thereof to other persons and circumstances shall not be affected.

48.017 Relinquishment of Order [Section 15 or 16 of Model Order, Page 5]

(a) If the Commissioners Court of Travis County, Texas decides that it no longer wishes to regulate on-site sewage facilities in its area of jurisdiction, the Commissioners Court, as the authorized agent, and the TCEQ shall follow the procedures outlined in 30 TAC Section 285.10 (d) (1) through (4).

(b) After relinquishing its OSSF authority, the authorized agent understands that it may be subject to charge-back fees in accordance with 30 TAC Section 285.10(d)(5) and Section 285.14 after the date that delegation has been relinquished.

48.018 Effective Date [Section 16 or 17 of Model Order, Page 5]

This chapter shall be in full force and effect from and after its date of approval as required by law and upon the approval of the Texas Commission on Environmental Quality.

Subchapter B

48.031 Travis County's More Stringent Rules

This subchapter sets forth the more stringent rules adopted by Travis County, Texas.

48.032 Facility Planning [285.4]

(a) All property that will use an on-site sewage facility for sewage disposal must be evaluated for overall site suitability.

(b) Unless the lot or tract is exempted under 30 TAC Section 285.4(b)(1), the minimum lot size for a structure served by an OSSF, regardless of whether the lot or tract is served by a public water supply, is one acre.

(c) Residential Structures Served by OSSFs.

(1) Each residential unit served by an OSSF is considered a separate structure. Except as provided in Paragraph (2), multiple residential units may be on a single lot or site only if the lot or site contains at least one acre of land for each residential unit.

(2) A lot or site of at least one acre in size that was created before TCEQ's approval of this chapter and that has a single-family dwelling located on it may have one additional residential unit placed on the lot or site as an accessory structure for accessory use if:

(A) having more than one residential unit on the lot or site does not violate restrictions in a plat, deed, or restrictive covenant for the lot;

(B) all other requirements of Chapter 285 of Title 30 of the Texas Administrative Code and the Travis County Code are met; and

(C) the lot or site owner files a restrictive covenant in the Official Public Records of Travis County, Texas that:

(i) prohibits the addition of any more habitable structures on the lot or site without approval by the local entity having OSSF jurisdiction over the lot;

(ii) prohibits the residential units from being conveyed or transferred to separate owners without approval by the local entity having OSSF jurisdiction over the lot;

(iii) prohibits any further subdivision of the lot or site without approval by the local entity having OSSF jurisdiction over the lot; and

(iv) provides that the restrictive covenant is enforceable by the owners of adjacent land, TCEQ, and the local governmental entity having OSSF jurisdiction over the lot.

(3) If the County Executive determines that having more than one residential

unit on the lot or site will not adversely affect public health, safety, or welfare, the County Executive may waive the requirement that a plat be approved for structures and a lot or site meeting the requirements of this subsection.

(d) Review of Planning Materials. Persons proposing single-family residential developments, condominium developments, multi-unit residential developments, manufactured housing communities, commercial developments, or any other type of development with structures served by OSSFs must submit planning materials for these developments to the Permitting Authority as set forth in Subchapter C, Travis County Local Administrative Procedures, and obtain the Permitting Authority's written approval of the planning materials before submitting an OSSF application.

(e) Notice in Deed and Plat Records.

(1) Where approval of on-site sewage facilities in a development will be granted based on conditions that restrict lots with regard to on-site sewage facilities, those conditions shall be reflected by appropriate plat notes or restrictive covenants filed in the Official Public Records of Travis County, Texas. The County will not issue a Permit to Construct or a License to Operate unless a property owner has recorded all plat notes and restrictive covenants required by the County.

(2) In addition to the requirements set forth in 30 TAC Chapter 285, on each new plat, the following note shall be included (along with any specific restrictions imposed):

> This subdivision is subject to all the terms and conditions of Chapter 48, Travis County Code, Rules of Travis County, Texas for On-Site Sewage Facilities. These rules require, among other things, that a construction permit be obtained from Travis County before an on-site sewage facility can be constructed, altered, modified, or repaired in the subdivision and that a license to operate be obtained from Travis County before an on-site sewage facility can be operated in the subdivision.

48.033 Application and Permitting Procedures (§§285.3, 285.5 and 285.6)

(a) No Exemptions. All OSSFs in the jurisdictional area of Travis County are subject to the provisions of this chapter regardless of the size of the lot on which the OSSF is located.

(1) Except for emergency repairs that are authorized by 30 TAC Section 285.35, a person must obtain a Permit to Construct from the County before constructing, installing, altering, extending, or repairing an OSSF.

(2) An individual who makes an emergency repair to an OSSF must notify the Permitting Authority, in writing, within 72 hours after starting the

emergency repair. The notice must include a detailed description of the methods and materials used in the repairs.

(3) The Permitting Authority has discretion to require an inspection of the emergency repairs.

(b) Local Procedures. Local Administrative Procedures to be used in Travis County in administering 30 TAC Section 285.5 are set forth in Subchapter C.

(c) Time Limit on Applications. An application for an OSSF Permit to Construct expires one year after the date the application fee is paid for if the applicant has been unable to obtain an OSSF Permit to Construct from the County during that one-year period. After an application has expired, an applicant for an OSSF Permit to Construct must submit a new application and pay a new application fee.

(d) Permit to Construct/License to Operate. Under Travis County procedures, the licensing of an on-site sewage facility is separated into two parts: the Permit to Construct, which is a permit that is issued by Travis County for construction of an onsite wastewater system specifically designed for a specific use, and the License to Operate, which is a license that is issued by Travis County that allows an onsite wastewater system constructed in accordance with the Permit to Construct to be operated as designed, to actively put through, treat, and dispose of sewage waste being generated by the use for which the system is designed.

(1) A Permit to Construct expires 12 months from the date of issuance, or upon completion of construction, whichever is sooner. The County may grant a 30-day permit extension if there have been no changes to the design plan approved by the Permitting Authority and the owner applies for the extension at least 30 days prior to the expiration of the Permit to Construct. A fee will be charged towards the cost of the extension and re-issuance of permits. After a Permit to Construct has expired, a person who seeks to construct an OSSF must submit a new application and pay a new application fee in order to obtain a new Permit to Construct.

(2) Certification by Designer. The Permitting Authority will not issue a License to Operate for an OSSF that was designed by a professional engineer or registered sanitarian until the owner provides the Permitting Authority with:

(A) the engineer or sanitarian's written assurance that the engineer or sanitarian has inspected the OSSF and determined that it has been installed as designed and specified; and

(B) an accurate as-built drawing of the OSSF.

(3) A License to Operate is limited to authorization to operate an OSSF in accordance with the design and use approved by the Permitting Authority.

(4) Termination of License to Operate. A License to Operate issued under this chapter or previous OSSF rules adopted by the County may be revoked by the Permitting Authority if:

(A) the OSSF fails;

(B) the OSSF receives more sewage than the amount for which it was approved;

(C) the OSSF receives non-sewage wastewater;

(D) a structure connected to the OSSF exceeds or violates the terms of the License to Operate;

(E) the property on which the OSSF is located is used for a purpose other than that described in the original application for the Permit to Construct the OSSF; or

(F) the OSSF is operated in a manner that does not conform to the design and use approved by the Permitting Authority.

(5) It is a violation of this Chapter for any person to operate or allow any person to operate an OSSF for which the License to Operate has been terminated or for which a License to Operate has not been issued by the Permitting Authority.

(6) An owner of an OSSF for which a License to Operate has been terminated may apply in writing to the Permitting Authority to have the License to Operate re-instated. The Permitting Authority may re-instate a License to Operate if the owner of the OSSF has paid all applicable fees, and the Permitting Authority determines, after conducting an inspection of the OSSF, that the OSSF is functioning properly and that the owner of the OSSF has taken affirmative steps to ensure that the OSSF will be operated only in accordance with the design and use previously approved by the Permitting Authority.

(e) The County will not issue a suitability letter for a TCEQ stormwater pollution prevention plan permit until the Permitting Authority determines that an application for an OSSF Permit to Construct is administratively complete.

48.034 Maintenance Requirements (§285.7)

(a) This section applies to OSSFs for which maintenance is required as specified in Table XII of 30 TAC Section 285.91 and that serve single-family dwellings.

(b) At the end of the initial two-year service policy, a homeowner may perform maintenance activities for an OSSF that serves the homeowner's single family dwelling only if the homeowner:

(1) has taken the training and passed the test required for a TCEQ registered maintenance technician, as required in 30 TAC Section 30.245(b), and has provided the results of the test and proof of attendance at the training to the County; or

(2) has taken equivalent training specifically for homeowners, as determined

by the County, has passed any tests that were required as part of the training, and has provided to the County the results of any tests that were part of the training and proof of attendance at the training.

(c) A homeowner who performs maintenance activities for an OSSF that serves the homeowner's single family dwelling must comply with the testing and reporting requirements set forth in 30 TAC Section 285.7(e)(1)-(3) for maintenance providers.

(d) Notwithstanding any provision to the contrary, the owner of a single-family dwelling who has been personally maintaining the OSSF for the single-family dwelling must obtain a maintenance contract for the OSSF and provide a copy of the contract to the County within ten days after the County notifies the owner that:

(1) The owner has violated Texas Health and Safety Code Chapter 366, a rule adopted pursuant to Texas Health and Safety Code Chapter 366, or this chapter, and the owner chooses to enter into a contract for the maintenance of the system instead of personally correcting the violation; or

(2) The owner has, within three years of a previous violation, committed another violation of Texas Health and Safety Code Chapter 366, a rule adopted pursuant to Texas Health and Safety Code Chapter 366, or this chapter.

(e) In addition to the information required by 30 TAC Chapter 285, all maintenance/inspection reports, including reports prepared by homeowners who provide maintenance on their own OSSFs, must include the following:

(1) the reporting of any alterations to the OSSF that have not been authorized by the County;

(2) the condition of the spray area (if applicable);

(3) the permit number for the Permit to Construct;

(4) the printed name and signature of the maintenance provider or homeowner/property owner if the homeowner is submitting the report;

(5) the physical address of the OSSF location; and

(6) the physical address, business address, business telephone number, and emergency phone number of the maintenance provider.

(f) In addition to the information required by 30 TAC Chapter 285, all maintenance/inspection contracts must include the following:

(1) the permit number for the Permit to Construct;

(2) the printed name and signature of the maintenance provider or homeowner if the homeowner is submitting the report;

(3) the physical address of the OSSF location; and

(4) the physical address, business address, business telephone number, and emergency phone number of the maintenance provider.

48.035 Site Evaluation (§285.30)

Travis County requires that backhoe pits be excavated to a depth of two feet below the bottom of the proposed excavation or to a restrictive horizon, whichever is less for soil evaluations. Profile holes are required to be excavated and soil analysis reports must be submitted with all applications for Permits to Construct on-site sewage facilities.

48.036 Criteria for Sewage Treatment Systems (§285.32)

(a) Testing of Tanks. Following installation and prior to final backfilling, all tanks in the system, including but not limited to septic tanks, pump tanks, trash tanks, and aerobic treatment units, shall be tested by being filled to the outlet with clean water and checked 24 hours later for leaks and structural integrity.

(b) Non-residential Treatment Requirements - Non-residential systems shall have a minimum of six-day retention time in a septic tank, or in a pre-treatment tank prior to a treatment unit; or provide equalization tanks per 30 TAC Section 285.34 (b)(4)

48.037 Criteria for Sewage Disposal Systems (§285.33)

(a) Limits on Daily Application Rate – Except as provided in Paragraphs (1) and (2), the total daily application of effluent from an OSSF may not exceed 60 gallons per tenth of an acre of the lot or site. Fractional acreage shall be rounded down to the nearest tenth of an acre.

(1) For parcels that were legally platted before TCEQ's approval of this chapter and that are less than or equal to four-tenths of an acre, up to 240-gallons per day may be allowed.

(2) For proposed developments with less than 50% total impervious cover, including OSSF drainfield as impervious cover, an exemption may be granted to allow a higher effluent application rate.

(b) Disposal Processes - Proprietary - Drip Irrigation.

(1) There shall be a minimum of two feet of soil between the drip emitter and groundwater; however, only one foot of soil is required where secondary treatment is used.

(2) Drip irrigation systems shall be designed using a maximum application rate of 0.15 gallon per square foot per day.

(3) Drip irrigation systems shall provide a minimum of two feet per second flushing velocity.

(4) There shall be a minimum of one foot of soil between the drip emitter and solid or fractured rock.

(c) Disposal Processes - Non-Standard - Low Pressure Dosed Drainfield - Drainfield Criteria.

(1) There shall be a minimum of three feet of undisturbed soil between the sidewalls of multiple excavations.

(2) Low pressure dose designs shall include consideration for elevation changes between laterals and friction losses in manifold piping between lateral lines.

(3) When on sloping ground, supply manifolds shall connect to the highest lateral in a drainfield zone.

(d) Disposal Processes - Non-standard - Surface Irrigation Systems.

(1) Surface irrigation shall be conducted during the night-time hours, preferably just before sunrise.

(2) Consideration must be given towards controlling run-off from the disposal area during rain events.

(3) The minimum setback to a property line is 25 feet.

(e) Disposal Processes - Non-Standard - Soil Substitution Drainfields. Soil Substitution beds are required to use pressure dose application. Pipe and orifice spacing for the distribution piping is to be the same as for current mound design requirements.

(f) Pipe Bedding – Pipes such as sewer pipes from the structure to the treatment facility and from the treatment facility to the disposal component shall be bedded with four inches of Class Ib, Class II, or Class III soil with less than 30% gravel. The bedding soil shall be free of organic material and any rocks or grains larger than ½ inch.

(g) Pump Tank Sizing – Pump tank shall be sized to provide at least one full day of flow above the alarm on setting unless dual pumps are used per requirements of 30 TAC 285.34(b)(3).

(h) Installations on Slopes Exceeding 10% - Drainfields with finished grades exceeding 10% shall either provide erosion control matting or 80% vegetative cover prior to final inspection.

Subchapter C.

48.051 Local Administrative Procedures

(a) This Subchapter sets forth procedures that must be followed by persons who are applying for a Permit to Construct or a License to Operate an OSSF. This Subchapter also sets out the County's enforcement authority.

(b) The Local Administrative Procedures set forth in this Subchapter are designed to further the ability of the Permitting Authority in assuring that a person does not:

(1) install, construct, alter, extend, or repair an OSSF without obtaining a Permit to Construct from the Permitting Authority;

(2) operate or maintain an OSSF or discharge (includes deposit, conduct, drain, throw or otherwise release or dispose of wastewater or effluent, or to allow any of these acts) sewage or sewage effluent into an OSSF without obtaining a License to Operate from the Permitting Authority; or

(3) cause, permit or allow the operation of or the maintenance of an OSSF in a manner that will cause, or may tend to cause pollution, injury to the public health, or nuisance conditions.

48.052 Enforcement

In order to enforce this chapter, the Permitting Authority is authorized to:

(a) enter private property to inspect or monitor incipient or existing OSSFs at all reasonable times and at any time there is reasonable cause to believe a violation of this chapter has been committed or is being committed. Notwithstanding the foregoing, the Permitting Authority or TCEQ may inspect an on-site sewage system using aerobic treatment at any time.

(b) order the work being done on an OSSF in violation of this chapter to be stopped by notice in writing of the suspension or revocation of the permit to the person doing or causing the work to be done.

(c) issue a written order to a person to immediately cease using any OSSF causing pollution or constituting a nuisance, or otherwise operating in violation of this chapter, and may seek legal process to enforce its orders.

(d) revoke a License to Operate an individual onsite wastewater system if the system for which it has been issued is being operated in violation of this chapter, is not being operated within the manufacturer's specifications, does not have a valid maintenance contract when one is required, or becomes a public nuisance. A Notice of Violation for inappropriate operation shall first be issued by Travis County. If the violation for which the property owner is cited is not corrected within the time specified in the Notice of Violation, Travis County may revoke the License to Operate.

(e) take any other action authorized by law to enforce local, state, and federal rules relating to OSSFs within the County's jurisdictional area.

48.053 Notice

(a) Unless otherwise specified, any notice prepared by the County may be given by hand delivery or by US Mail. Notice by the County may also be accomplished by posting a sign on the property to which the notice refers.

(b) Any notice that is required to be sent to the County must be given by:

(1) hand delivery or overnight courier to the Permitting Authority at 700 Lavaca, Suite 500, Austin, Texas 78701,

(2) United States Mail, postage prepaid, return receipt requested, to the following address:
Travis County Transportation and Natural Resources Department
On-Site Wastewater Program
P.O. Box 1748
Austin, Texas 78767

48.054 Permit to Construct and License to Operate.

To facilitate the efficient implementation of this chapter:

(a) The Permit to Construct is limited to the authorization to install, construct, alter, extend, or repair an OSSF in accordance with the planning materials approved by the Permitting Authority. It does not include authorization to operate the OSSF.

(b) The License to Operate is not included in the Permit to Construct, but will be issued upon certification by the designer of record and final approval of construction by the Permitting Authority. The License to Operate will allow an OSSF to be operated in accordance with the approved planning materials for the discharging of sewage into the facility for treatment and disposal or reuse.

(c) Because wastewater collection systems provide greater public health protection than OSSFs, the Permitting Authority may elect to not issue a Permit to Construct if the Permitting Authority determines that any portion of the proposed OSSF is located within 500 feet of the boundary of an area served by a private or public wastewater collection system that would, in the opinion of the Permitting Authority, be legally and technically feasible for the OSSF to connect to.

48.055 Variance Procedures

Variances from this chapter may be granted as provided in this subsection.

(a) Requests for variances from this chapter shall be considered on an individual basis in accordance with the criteria specified in 30 TAC Section 285.3(c) and where site conditions (such as lot size, separation distance and setbacks) are such that no alternative that complies with this chapter can be found.

(b) The Commissioners Court authorizes the Permitting Authority to grant variances involving exceptions to technical construction standards or local setback and separation distances more stringent than State standards as long as the variance granted results in a system which ensures public health protection equivalent to that provided under the TCEQ Rules. The Permitting Authority is authorized to grant administrative variances, including, for example, a variance to allow the construction of an OSSF in a drainage easement if the applicant has taken concrete steps to vacate the easement and there is no known opposition to the vacation of the drainage easement. The Permitting Authority may refer any request for variance to the Commissioners Court for direction.

(c) A person desiring a variance to any requirement of this chapter shall file a written request with the Permitting Authority, stating the specific provision from which a variance is requested, and including any information which the requestor feels is pertinent to the request.

(d) In granting a variance, the Commissioners Court or the Permitting Authority may specify terms and conditions determined to be necessary or advisable to ensure equivalent public health protection, such as requiring certain treatment levels, monitoring equipment, and procedures for design and/or operating and/or maintenance. The owner of the property shall allow the Permitting Authority to enter the property for the purpose of inspecting the facility at any reasonable time to ascertain that conditions are met.

(e) Requests for variances requiring approval by the Commissioners Court will be submitted for Court consideration as follows:

(1) The Permitting Authority shall review the request within 30 days of the completed request, formulate a recommendation to the Court, and make a written reply either requesting additional information or notifying the applicant of a Court date and of the Permitting Authority's recommendation to the Court.

(2) Notwithstanding any other provision of this chapter, if the variance request is made in conjunction with an application for final plat approval under Chapter 82, Travis County Code, the request must be reviewed, acted on, and appealed within the time periods established under Chapter 82 in lieu of this chapter.

(f) Procedures for consideration of requests for variances that may be granted by

the Permitting Authority will be as follows:

(1) Not later than 30 days after the receipt of a complete request for variance, the Permitting Authority shall review the request and reply to the applicant in writing, granting or denying the request, or requesting additional information. If the Permitting Authority does not reply in writing to an applicant within 30 days after receiving the applicant's request for variance, the request is denied.

(2) A person aggrieved by an action or decision of the Permitting Authority regarding the person's request for a variance may, within 30 days after the date of the document giving notice of the action or decision, or within 30 days after the action if no document is given, appeal to the Commissioners Court. The appeal shall be initiated by filing a written objection with the Permitting Authority. The written objection shall state the specific action or decision being appealed, the relief requested, the person's reasons for requesting the relief, and a copy of the document, if any, giving notice of the action or decision appealed.

(3) The Permitting Authority shall notify the County Judge who shall place the matter on the agenda of the Commissioners Court in accordance with usual Court procedures. The Permitting Authority shall provide written notice of the time and place of the hearing before the Court to the person making the appeal.

(4) The Commissioners Court shall review the matter in the scheduled hearing, considering the materials submitted by the Permitting Authority and the person seeking the appeal, as well as any information and evidence that it considers relevant. The Commissioners Court shall render its decision no later than ten days after the conclusion of the hearing. If the Commissioners Court does not approve a request for variance within ten days after the hearing, the request is denied unless the Commissioners Court schedules an additional hearing and approves the variance at the subsequent hearing.

(g) The Permitting Authority shall keep complete records of variances granted. The Permitting Authority shall make periodic reports to the Commissioners Court including locations, descriptions of the variances requested, the reasons for the variances, and Permitting Authority's justifications for the granting of the variances, as specified by the Court.

48.056 Submission of Planning Materials

The following planning materials, which must be prepared by a professional engineer or registered sanitarian, must be submitted with an application for a preliminary plan, final plat, or when proposing a manufactured housing community, condominium development, multi-unit residential development, business park, or other similar use that will use OSSFs for sewage disposal:

(a) An accurate plan that complies with all applicable State of Texas and County standards and that shows each existing or proposed lot, its size, source of water, and the area available for disposal fields.

(b) The geographic location of the development or subdivision and its proximity to streams and lakes.

(c) Identification on the plan of the location of recharge features, which features must be indicated on the final plat.

(d) Identification on the plan of planned or existing well locations and a sanitary zone with a 100-foot radius around private wells, and a 150-foot radius around public wells, within which no effluent disposal fields may be sited as set forth in this chapter.

(e) A comprehensive drainage and 100-year floodplain impact plan.

(f) Identification on the topographic map or plan of the 100-year floodplain and the floodway.

(g) A report detailing the types of OSSFs to be considered and their compatibility with area-wide drainage and groundwater.

(h) Results of a site evaluation for soil suitability in accordance with section 48.035 of this chapter based upon a number of soil profile holes which will provide a representative sample of soils. Profile holes shall be to a depth of five feet or to a limiting condition, whichever is shallower. Test locations shall be evenly distributed throughout the development and be representative of the soils within the development. Where soil conditions are variable, additional soil profile hole testing may be required in test sites determined by the Permitting Authority. An analysis of each soil layer in each profile hole shall be provided including soil classification, structure, gravel content percentage, and presence of mottles and/or groundwater.

(i) Depiction on the plan of the areas and depths of scalping or fill and road cuts for the purpose of addressing setback requirements.

(j) Notification on the plan of the presence of mottled soils or water in soil profile holes indicating the groundwater table is less than five feet below the surface as the surface exists or as it will be after grading and filling that may be required in the development.

(k) Depiction on the plan of areas of greater than 30% slope with a cumulative total of areas with greater than 30% per lot.

(l) Any additional planning materials that the Permitting Authority and/or staff of the Permitting Authority determine are necessary to demonstrate the applicant's compliance with the requirements of this chapter.

48.057 Procedures for Reviewing Planning Materials

(a) Preliminary Review. Preliminary review may be requested by the applicant, including scheduling an on-site inspection by the Permitting Authority. To obtain preliminary review, an applicant shall submit at least the materials listed in Section 48.056(a), (b), (d), and (f).

(b) Final Review. The Permitting Authority shall review the final planning materials for compliance with this chapter and recommendations made for the preliminary review, if any. Changes in the planning materials may require additional review. Survey and staking of individual lots is required before the final review.

(c) Final Plat Approval. If reviewed in conjunction with an application for final plat approval, the Permitting Authority shall make a written recommendation to the Commissioners Court within 45 days of a proper and complete submittal of planning materials.

(1) Approval. If the recommendation is for approval of the subdivision as proposed for use with OSSFs, the Permitting Authority shall continue to process the plat, preliminary plan, or basic development permit for approval.

(2) Approval with Conditions or Denial. If the recommendation is for approval with conditions or for denial, the applicant may appeal as provided in Chapter 82, Travis County Code.

(d) Limits of Approval. An approval recommendation under this subsection does not constitute either a Permit to Construct or a License to Operate for a specific OSSF.

48.058 Permit to Construct

(a) Application.

(1) Except for making emergency repairs that are authorized by 30 TAC Section 285.35, no person may construct, install, repair, alter, or extend an OSSF unless the person has first obtained a Permit to Construct from the Permitting Authority.

(2) In addition to other requirements, a property owner who seeks to have an OSSF constructed, installed, repaired, altered, or extended on that person's property shall submit a complete "Application for On-Site Sewage Facility Permit to Construct" to the Permitting Authority. The owner or an agent of the owner may seek information and/or assistance pertaining to the requirements for design of an OSSF for a specific property once application has been made.

(3) To be considered administratively complete, an application must include all the information specified in the "Application for On-Site Sewage Facility Permit to Construct," including:

(A) construction planning materials that demonstrate that the proposed

OSSF complies with this chapter. Construction planning materials that are prepared by a registered sanitarian or licensed professional engineer must include the signature and official seal of the professional as well as the date of preparation.

(B) the results of a site evaluation as required by section 48.035 of this chapter.

(C) the floor plan of all the structures serving as the generating unit shall be included with the application for a permit to construct an onsite wastewater system. Square footages, labels, and dimensions must be included for clarity.

(D) a statement stating that the site has been marked by a sign, visible from the road frontage, that is at least 12" x 24", bearing the street address.

(4) An application must be accompanied by payment of required fees.

(b) Site Inspection.

(1) After an administratively complete application has been received by the County, the Permitting Authority shall conduct an inspection of the site on which the OSSF is to be constructed, and shall make a finding on the issuance of a Permit to Construct, based upon the information in the complete application and any other information available to the Permitting Authority.

(A) Upon a finding by the Permitting Authority that construction may begin, the County will issue a Permit to Construct to the applicant. The applicant must post the permit in a conspicuous manner at the site at all times during construction.

(B) If the Permitting Authority determines that a Permit to Construct cannot be issued, the Permitting Authority shall notify the applicant in writing of the reasons why the permit cannot be issued.

(2) The construction, installation, extension, or repair of an OSSF shall be made in accordance with the approved design and requirements of the Permit to Construct.

(c) Construction Inspections.

(1) The Permitting Authority shall inspect installations of OSSFs in accordance with the inspection schedule established in the Permit to Construct. Each type of system will have an included number of inspections given in the inspection schedule. Any additional inspections required will incur an additional fee per inspection.

(2) Components of an OSSF may not be installed or covered until required inspections have been made and approval has been obtained from the Permitting Authority for that stage of construction.

(3) The applicant or installer shall notify the Permitting Authority that an inspection is desired at least two working days, excluding weekends and County-designated holidays, before the need for each inspection.

(4) The applicant or installer shall provide whatever reasonable assistance the Permitting Authority requests in order to make each inspection.

(5) The inspection of drip emitters in place and uncovered is required except where drip emitters are installed by the "plowed-in" method. When "plowed-in" the connections of all drip emitter tubing to the header piping will be uncovered for inspection.

48.059 License to Operate

(a) New OSSFs. After final inspection of a newly installed OSSF, the Permitting Authority shall make a finding on whether to issue a License to Operate, based upon the information obtained from the inspections and any other information available to the Permitting Authority.

(b) Upon a finding that the use of the new OSSF will not cause pollution, injury to the public health, or nuisance conditions and is not in conflict with this chapter, other provisions of the Travis County Code, the Permitting Authority will issue a License to Operate the OSSF.

(c) Upon a finding that a License to Operate cannot be issued, the Permitting Authority shall notify the applicant in writing and shall include the reasons for denying the issuance of a license.

48.060 Affidavit Forms

Sample affidavit forms for use under this chapter will be provided by the Permitting Authority. The maintenance affidavit must include the following language:

> The OSSF shall be covered by a continuous service policy for the first two years. After the initial two-year service policy, the owner of an aerobic treatment system for a single family residence shall either obtain a maintenance contract within 30 days or maintain the system personally.

48.061 Recording of Designated Representative's License Number

The Designated Representative must record the Designated Representative's license number on all items prepared by the Designated Representative.

COUNTY OF TRAVIS §

STATE OF TEXAS §

AFFIDAVIT

Before me, the undersigned authority, personally appeared Dana DeBeauvoir, who, being by me duly sworn, deposed as follows:

My name is Dana DeBeauvoir. I am of sound mind, capable of making this affidavit, and personally acquainted with the facts herein stated:

I am the custodian of the records of the County Clerk's office for the County of Travis, Texas. Attached hereto are _____ pages of records known as ""Order Adopting Rules of Travis County, Texas, for On-Site Sewage Facilities." The records are kept by me as County Clerk, County of Travis, in the regular course of business with knowledge of the act, event, condition, opinion, or diagnosis, recorded to make the record or to transmit information thereof to be included in such record; and the record was made at or near the time or reasonably soon thereafter. The record attached hereto is the original or exact duplicate of the official record.

_____
Dana DeBeauvoir
Travis County Clerk

Before me, the undersigned authority, a Notary Public in and for said County, Texas, on this day personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument and having acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this ____ day of ____, 20__.

(SEAL)

Notary Public, State of Texas
My commission expires:

TAKINGS IMPACT ASSESSMENT: REVISION OF TRAVIS COUNTY'S RULES FOR ON-SITE SEWAGE FACILITIES

This takings impact assessment is prepared using the series of questions in the Private Real Property Rights Preservation Act Guidelines ("Guidelines") promulgated by the Attorney General's Office under Chapter 2007 of the Texas Government Code (the "Act"). The proposed action is Travis County's adoption of revisions to rules regarding on-site sewage facilities ("OSSFs"), Chapter 48 of the Travis County Code. Some of the revisions are substantive, and some of them are procedural.

Guidelines Question 1: Is Travis County a governmental entity covered by the Act?

Yes.

Guidelines Question 2: Is the proposed action covered by the Act?

All of the amendments are exempt from the Act. The amendments are exempt under the following provisions of the Guidelines or the Act for the reasons indicated:

a. §2.18 of the Guidelines.

The procedural amendments and many of the substantive amendments impose no new burden on private real property. To the extent the amendments impose no new burden on private real property, the amendments are not subject to the requirement in §2007.042 to perform a takings impact assessment.

b. §2007.003(b)(11)(B) of the Act.

The revisions to the County's OSSF regulations are exempt under §2007.003(b)(11)(B) because they constitute an action taken by a political subdivision to regulate on-site sewage facilities.

c. §2007.003(b)(13) of the Act.

The substantive and procedural amendments are exempt under §2007.003(b)(13) because the amendments respond to real and substantial threats to public health and safety, significantly advance that purpose, and do not impose a greater burden than is necessary. The purpose of the amendments is to eliminate and prevent health hazards by regulating and properly planning the location, design, construction, installation, operation, and maintenance of on-site sewage disposal systems in the unincorporated areas of Travis County.

Guidelines Questions 3 and 5: Does the proposed action result in a burden on private real property as that term is defined in the Act? How does it burden private real property?

Yes. The proposed action burdens private real property because it may cause some property owners to delay plans for developing their property for certain uses. The proposed revisions include lot size requirements and other safety standards that are more stringent than the minimum standards required by the Texas Commission on Environmental Quality ("TCEQ"). On the other hand, the proposed revisions allow property owners greater flexibility because they would allow the construction, under certain circumstances, of an additional residential unit on a lot that already has an existing single-family dwelling located on it. The proposed revisions also include a process through which property owners can request variances.

Guidelines Questions 4 and 6: What is the specific purpose of the proposed action? How does it benefit society?

Texas Health and Safety Code Section 366.002(7) defines an on-site sewage disposal system (also known as an on-site sewage facility) as:

> [O]ne or more systems of treatment devices and disposal facilities that:
>
> (A) produce not more than 5,000 gallons of waste each day; and
>
> (B) are used only for disposal of sewage produced on a site on which any part of the system is located.

Every on-site sewage disposal system in the unincorporated areas of Travis County must comply with the minimum safety standards established by the TCEQ. On-site sewage disposal systems that are improperly located, designed, constructed, installed, operated, or maintained can cause sewage to be discharged or exposed in a manner that contaminates groundwater and makes the sewage a potential instrument or medium in the transmission of disease to or between persons. Compliance with the proposed revisions will help OSSF owners to abate or prevent pollution or injury to their real property and to help abate or prevent pollution or injury to public health in Travis County.

As an authorized agent designated by the TCEQ, Travis County is a local governmental entity that has the legal authority to regulate the use of on-site sewage disposal systems in its jurisdiction and has been doing so for almost two decades. The County's most recent OSSF rules were adopted in June 2000. Since that time, the County's population has continued to grow, and the TCEQ has revised some of its rules regarding OSSFs.

The purpose of the substantive and procedural revisions is to clarify and strengthen the standards for the location, design, construction, installation, operation, and maintenance of on-site sewage disposal systems in Travis County in order to abate or prevent pollution or injury to public health arising out of the use of on-site sewage facilities.

It is proper and necessary for the County to adopt OSSF standards that are more stringent than the standards adopted by TCEQ because:

(a) Protecting water resources is vital to human health, and some residents within Travis County depend heavily upon groundwater for their drinking water;
(b) The population of Travis County is projected to double by the year 2050;
(c) A significant amount of the projected future growth within the unincorporated areas of Travis County is expected to rely on on-site sewage facilities;
(d) The adoption of OSSF regulations that are more stringent within the Recharge Zone of the Edwards Aquifer (including those land areas situated above the Trinity Aquifer Recharge Zones) and other aquifers which have environmentally sensitive rapid recharge conditions is necessary and appropriate to avert public health hazards resulting from the projected increased use of on-site sewage facilities and the increased usage of water; and
(e) The more stringent rules will provide greater public health and safety protection for the residents of Travis County.

Strengthening the County's standards protects the public's health and safety. Clarifying the County's standards makes them easier for property owners to comply with them and for the County to enforce them.

Guidelines Question 7: Will the proposed action constitute a taking?

Even if the amendments are not exempt, they do not constitute a taking. The amendments do not eliminate all viable uses of any private real property.

Guidelines Question 8: Are there reasonable alternatives to the proposed action that would accomplish its purpose?

An alternative to the amendments would be to leave unchanged the current provisions of Chapter 48, including provisions that are outdated and provisions that need clarification.

Summary of Public Comments Regarding Travis County Code Chapter 48 Proposed Changes (Received before 12pm 11/25/2014)		
New/Changed Rule Item	**Summary of Comments**	**Staff Response**
48.032 (b) – 1 acre for minimum for each structure on OSSF	Concern for requirements for commercial sites with multiple structures	Need revising to require 1 acre per residence; keep gpd/acre for commercial limits
48.037 (b)(1) – 2' to ground water with drip emitters; 1' with secondary treatment	Concern this item is not more restrictive than State, but separation to rock/fractured rock is more restrictive	Consider State requirement sufficient for groundwater separation.
48.037 (b)(2) – maximum application rate of 0.15 gal/sq.ft./day for drip emitters	Concern as unnecessary and/or costly. Soil info supporting rate provided	Higher application rates most commonly found with surfacing effluent on drip systems; adjacent jurisdiction (CWLH) has max application rate of 0.1-gal/sq.ft./day; majority of county with poor soils or shallow soils
48.037 (b)(3) – minimum 2.0 ft/s flushing velocity for drip emitters	Concern for cost of compliance; maybe ineffective/unnecessary	Minimal cost for compliance; flushing recommend by manufacturers ; 2.0'ft/s was considered to be adequate for all types of emitter line to clear slime/debris
48.037 (b)(4) – 1' min separation to emitter lines from fractured or solid rock	Concern for being more restrictive than state with secondary treatment. Soil info supporting separation provided.	State changed allowable gravel content in soil for drip irrigation (up to 60%); loss of volumetric capacity for holding water as justification
Other Comments/Requests	**Summary of Comment/Request**	**Staff Response**
Dissatisfaction with Rule Process	Request for input prior to Public Comment period	Procedure followed based on TCEQ guidance
Request for Studies and Empirical Data	Questions for specific studies and data regarding OSSF and pollution as prerequisite for rule changes; fiscal impact concern	Basis for rule change based on locally observed issues; Takings review was enclosed in proposal
Request for removal of local order (regress to state rules); consideration of termination of OSSF program	Question for cost analysis of state implementing program; variation in local orders for OSSF	Local administration and rules address issues that are specific for region and may not be statewide concerns
Request for smaller minimum lot size on OSSF	Allow for smaller lot size based on soils at each individual lot; restrict daily flow on each lot	Cumbersome for developer and staff to implement
Increase availability of Subdivision OSSF Reports and/or Request to add note on plats for owners	Notice to be placed on plat suggesting owners have soil/site evaluation prior to purchase; Owners are unaware of OSSF reports for subdivisions	OSSF reports placed in subdivision file on record with TNR; owners can request files
Dissatisfaction with jurisdictional overlaps	Difficult to determine jurisdiction for OSSF and development; difficult to know if dual permitting area	
Request for setback reduction with drip irrigation at 0.15 gal/sq.ft./day	Reduce setback to 15' at this application rate	Less restrictive that state rules; cannot be considered for local order. Can send comment to state for next rule change, if local order adopted.
Groundwater separation	3' separation to groundwater for soil absorption systems (keep current)	At time of adoption, gravel content/rock not considered and systems cut into fractured and solid rock; state rules no prohibit soil absorption systems in >30%

		gravel/rock
Require nitrogen reduction systems in EARZ and Barton Springs Segment of contribution zone	Provide protection to ground and surface waters to reduce degrading quality and/or pollution of waters	Benefit for cost questionable; wide estimations of nitrogen contribution by OSSF; gallons/acre limit may provide similar benefit

To Travis County:

Comments on the proposed Chapter 48, Rules of Travis County, Texas, for On-Site Sewage Facilities

These comments are rooted in these fundamental principles:

1. The regulated community has a right to expect that rules have a reasonable and rational justification relative to the underlying reason for the creation of this rule system to begin with, the protection of public health and environmental values.
2. The regulated community has a right to expect that the rules are reasonably and rationally internally consistent.

The rule in the proposed Chapter 48 which is the most egregious violation of these principles is 48.037(b)(4): "There shall be a minimum of one foot of soil between the drip emitter and solid or fractured bedrock." This rule is not only lacking in justification on technical grounds and rooted in badly misplaced concerns, but also reflects an extreme bias, as there is no similar concern shown for the *far* more problematic practice of surface spray dispersal. It is neither reasonable nor rational, nor internally consistent, for Travis County to express the degree of concern this rule does about subsurface drip dispersal, in one and only one circumstance, and to not show any meaningful concern about spray dispersal. Nor is it reasonable, rational or internally consistent to impose this rule on the grounds Travis County has set forth for doing so. Both the lack of technical grounding and this disparity of concern are reviewed below.

The stated "justification" set forth by Travis County for this 100% increase of standoff to rock over what is set forth in Chapter 285 is: "By required additional volume of suitable material below emitter lines, additional protections are provided by decreasing the likelihood for effluent to travel along shallow restrictive horizons. Further it is felt that the inclusion of soils with up to 60% of gravel as suitable greatly reduces the soil pore space and requiring additional soil depth will aid in assuring sufficient hydraulic capabilities are met."

Chapter 48.037(b)(1) states, "There shall be a minimum of two feet of soil between the drip emitter and groundwater; however, only one foot is required where secondary treatment is used." The "justification" stated for this provision is, "The State has established 1 foot as the base minimum soil depth to achieve adequate land treatment using drip emitters. Due to the fluctuating depth of seasonal groundwater conditions, the 'factor of safety' provided by the increased soil is required to ensure adequate separation between the sewage disposal fields and groundwater. The requirement is reduced where a higher quality effluent through secondary treatment is provided before discharge to the disposal area."

The provisions in Chapter 285 for standoff to groundwater and rock are stated in 285.33(c)(3)(E): "Vertical separation distance. There shall be a minimum of one foot of soil (with less than 60% gravel) between the pressure reducing emitter and groundwater and six inches between the pressure reducing emitter and solid rock, or fractured rock. For proprietary disposal systems that do not pretreat to secondary treatment, there shall be two feet of soil (with less than 30% gravel) between the groundwater and pressure reducing emitter and one foot of soil between solid rock or fractured rock and the pressure reducing emitter."

As can be seen by comparing the Travis County "justification" with the Chapter 285 language, the Travis County "justification" is not an accurate reflection of what "The State has established …." The standoff provisions set forth in Chapter 285 are compared to the standoff provisions of the proposed Chapter 48 in the table below:

Limiting Condition	Level of Treatment	Chapter 285 standoff	Chapter 48 standoff
Groundwater	Less than secondary	2 feet	2 feet
Groundwater	Secondary	1 foot	1 foot
Solid or fractured rock	Less than secondary	1 foot	1 foot
Solid or fractured rock	Secondary	6 inches	1 foot

As this comparison shows, the only standoff which is proposed to be modified by Chapter 48 from that set forth in Chapter 285 is the standoff to rock with secondary pretreatment. This is neither reasonable nor rational nor internally consistent.

Regarding the "justification" that "additional volume of suitable material" provides "additional protections … by decreasing the likelihood for effluent to travel along shallow restrictive horizons", the presumption of the rules is that after having percolated vertically through the soil over the specified standoff, the water has been "renovated". Indeed, both Chapter 285 and Chapter 48 presume that this water is "good" to become *groundwater* after having traveled the specified distances vertically through the soil. Therefore, it is called to question what "hazard" Travis County imagines that requires "additional protections" if the water, after receiving secondary pretreatment and having percolated vertically through 6 inches of soil, were to "travel along shallow restrictive horizons", to some unspecified location where that "hazard" might be manifested. This "hazard" is, from all appearances, merely an expression of irrational fear by Travis County, lacking any technical justification.

Indeed, research has shown that, at least for secondary treatment provided by a sand filter, even seeded virus is effectively removed after travel through only 6 inches of *mound sand*, when the effluent is *bulk loaded* on top of a column of that material. See the attached research paper reviewing this, entitled "Passage of Microorganisms in Septic System Effluents Through Mound Sand in a Controlled Laboratory Environment", included as a part of these comments. Note the vast difference between that situation, with a loading rate ***20 times*** that typically applied in a drip system, and drip dispersal into a much less coarse clayey or loamy soil, even a gravelly one, with the drip emitters up in the biologically active root zone of that soil, with the water slowly oozing out of the emitter, rather than being dumped in bulk onto the top of a *sand* column lacking the biological diversity of the root zone. Drip dispersal can only be *much more effective* in treating the water as it percolates through the soil. Therefore, Travis County has provided no reasonable and rational justification that any such hazard may occur, at least if the pretreatment system indeed provides the level of treatment imparted by a sand filter.

Regarding the treatment level, a TNR employee once stated during a discussion of this rule, "Not all secondary treatment is created equal." Travis County is in complete control of the type of secondary treatment units it permits. If the "hazard" imagined by Travis County is due to an *expectation* that inadequate pretreatment would have been imparted prior to drip dispersal, that is a matter to be dealt with in the rules governing the design and operation/oversight of the pretreatment unit. (See below.) That would be a reasonable and rational response to any such concern. To penalize *all* systems, no matter what sort of pretreatment unit it may entail, by applying this "factor of safety", a 100% increase in the standoff to rock, is not a reasonable or rational response.

Regarding the "justification" referring to allowing up to 60% gravel in a "suitable" soil, Travis County can address that with a rule modifying that requirement. It appears that Travis County has no problem with the "less than 30% gravel" requirement specified in Chapter 285 for systems that do not provide secondary pretreatment. So Travis County could simply stipulate that this provision also be applied to systems that do provide secondary pretreatment. A 6-inch depth of soil with 30% gravel provides the same soil mass as a one-foot depth of soil with 60% gravel, so that concern would be fully met by responding in that manner. That would be a reasonable and rational response to this concern. To

penalize *all* systems entailing secondary pretreatment and drip dispersal, regardless of what quality of soil would *actually* be in place, is not a reasonable and rational response.

In addition, the provisions of 48.037(b) are internally inconsistent. If Travis County actually believes that a "hazard" exists such that the standoff to rock for drip dispersal of water having received secondary treatment must be increased 100% over the depth stipulated in Chapter 285, then by what rationale can it leave unaltered the standoff for water that has *not* received secondary pretreatment to rock, at one foot, *equal* to the proposed standoff for water that *has* received secondary pretreatment? By what rationale can it leave unaltered the standoff to groundwater, so that *the required standoff to rock and groundwater is the same* for water having received secondary pretreatment? If a "hazard" is inherent in this wastewater management strategy, how can that "hazard" be manifested *only* in the case where secondary pretreatment is provided and *only* in regard to standoff to rock?

Travis County has unreasonably and irrationally varied one and only one of the standoffs between drip emitters and a limiting condition. It must rationalize its regulations to deal with the actual nature of the "hazards" it perceives and to make the provisions internally consistent. For the reasons set forth above, I assert this must be done by removing 48.037(b)(4), and if Travis County deems the concerns noted must be addressed, to address them by focusing on the actual hazard, rather than to "punish" drip dispersal in all cases for those problems. 48.037(b)(1) is also superfluous, as it simply restates the Chapter 285 provisions.

Chapter 48.037(b)(2) states, "Drip irrigation systems shall be designed using a maximum application rate of 0.15 gallon per square foot per day." The "justification" stated for this provision is, "Due to variation in recommended hydraulic loading rates for Class III zone of the USDA Soil Textural Classifications (30 TAC 285.91 Table VI), generally poor site conditions (rocky soils and slopes of areas with Class III soils), and historic failure rates of many drip irrigation systems using the loading rate for Class III soils, the minimum requirement of 0.15 gallons per square foot provides a protection of public health by decreasing the total loading per square foot and potentially reducing the frequency of system failures."

Travis County has first provided no definition of what "system failure" is or any quantification of what "many" has been, so immediately calling to question if this provision would have any impact on "potentially reducing the frequency of system failures." Therefore, Travis County is proposing to impose a "solution" for a "problem" it has not analyzed and determined the causes, extent or severity of, penalizing *all* drip dispersal systems, no matter the particular circumstances of each system. This is neither reasonable nor rational.

Second, the issues noted would be due to poor design to meet the constraints of the site and/or issues with "qualifying" a soil as "suitable", in which case again Travis County would rationally and reasonably deal with those matters, rather than imposing this loading rate restriction on *all* drip dispersal systems, no matter the actual circumstances of each one. The latter is neither reasonable nor rational.

Third, as reviewed in the attached document "Decentralized Reuse with Subsurface Drip Irrigation Fields: Issues and Opportunities", included as a part of these comments, the propensity for water issuing from a drip emitter to surface – which is perhaps what Travis County means by "system failure" – is a characteristic of the instantaneous flow rate out of the emitter, along with the character and moisture level of the soil around the emitter, and the length of a loading event, NOT of the hydraulic application rate onto the field. As reviewed in that paper, in a soil having the available infiltration rate of a Class III soil, loaded appropriately, the potential for water issuing from a drip emitter to be forced to the surface is *extremely* low, and most definitely would not be a chronic characteristic. Any observed "failures" are due to design and/or operational flaws, not inherent in loading Class III soils up to the rate of 0.2

gallon/sq.ft./day allowed by Chapter 285. A reasonable and rational response to any actual problem is for Travis County to properly regulate so as to impose a sound design and operational regime. To impose the proposed restriction on *all* drip systems is not a reasonable or rational response.

Fourth, it is called to question, if the issues noted are indeed a hazard, why is the proposed restriction on hydraulic application rate not also imposed on low-pressure-dosed drainfields? The concerns expressed about "generally poor site conditions" would apply even more severely to that design. So the proposed restriction on only drip systems is neither reasonable nor rational nor internally consistent.

If Travis County believes that drip dispersal of water having been treated to secondary quality constitutes such a "hazard" that it merits increasing the standoff to rock 100% above that stipulated in Chapter 285, then Travis County *must* also believe that there are hazards inherent in allowing surface spray dispersal of effluent in uncontrolled access areas – AT ALL. It is understood that Travis County lacks the political will to take on the interests it would have to confront if it were to ban this practice, but if Travis County indeed believes the "hazard" noted above merits the action it is proposing, then Travis County *must* address spray dispersal at least as "sternly", if it is to maintain any pretense that its rules are reasonable and rational and internally consistent.

However, the only manner in which Travis County has chosen to reduce the hazards of spray dispersal is in 48.037(d), which states:

(1) Surface irrigation shall be conducted during the night-time hours, preferably just before sunrise.
(2) Consideration must be given towards controlling run-off from the disposal area during rain events.
(3) The minimum setback to a property line is 25 feet.

Regarding (3), the "justification" stated for it is, "Due to an average wind speed of 8.5 mph …, an increase [sic] setback to property lines can decrease the likelihood of wind induce [sic] carriage of irrigation effluent across property lines." In this regard, 25 feet is a cruel joke on the neighbors of a property with a spray dispersal system. A setback that would have meaning in regard to aerosol drift is something on the order of 200 feet. This would sequester spray dispersal systems to very large lots, rather than allow them to be lined up lot after lot over whole subdivisions, with aerosols drifting throughout the neighborhood. If it wishes to assert its rules are reasonable, rational and internally consistent, Travis County *must* consider this action.

Regarding (1), the "justification" stated for it is, "Irrigation is limited to the period of least human activity to minimize the likelihood of human contact. Night time irrigation provides for greater protection of public health since it is generally the period of least human activity." ***This is an explicit stipulation by Travis County that hazard is inherent in spray dispersal.*** Yet there is *nothing* in Chapter 48 that would mitigate that hazard, except for (2), which sets forth the milquetoast provision that "consideration" be given to controlling run-off during rain events. This circumstance is neither reasonable nor rational nor internally consistent.

Regarding the ability of Travis County to control spray dispersal much, much better than the very lax regulation of this practice imposed by Chapter 285, it is noted that Clay County has completely *banned* spray dispersal, requiring drip dispersal in its stead. So simply imposing common sense controls on spray dispersal is clearly within the purview of Travis County.

Chapter 285.33(d)(2) imposes no specification of a minimum soil requirement or "qualifying" the soil suitability in any manner for the use of spray dispersal. This is in *stark* contrast to the soil depth and quality requirements for subsurface drip irrigation of water having received the same level of

pretreatment, just not having been run through the fiction that is disinfection under these rules (see below). That is neither reasonable nor rational nor internally consistent.

Nor does 285.33(d)(2) impose any meaningful standard for the design of a surface application system. In 285.33(d)(2)(A), it is stated that "Land acceptable for surface application … shall be covered with grasses, evergreen shrubs, bushes, trees or landscaped beds containing mixed vegetation." However, there is no standard for determining what "covered" means. This subsection also states that land with a slope greater than 15% may be used "… if it is properly landscaped and terraced to preclude runoff." Yet there is no standard for what is "proper" landscaping or what "terraced" means. 15% is a HUGE slope for this purpose, no matter the landscaping. Allowing spray dispersal over a 15% slope is tantamount to declaring there is *no* "consideration" given to controlling runoff, which as noted above Travis County has stipulated must be given. Terracing should be relegated to a variance situation, as this would almost certainly be done only if other acceptable areas are not available, so that the specific situation would be explicitly reviewed in detail, as is required by the variance process.

This all *must* be addressed if Travis County is to maintain that its rules are reasonable, rational and internally consistent. Travis County can do this in Chapter 48 by modifying 285.33(d)(2)(A) to read:

Land acceptable for surface application shall be covered with soil with a gravel content of less than 60% of a depth that it will support the plant cover stipulated herein, and shall have a slope of less than 10%, shall not contain depressions or flow channels, and shall have a plant coverage of at least 90% of the total application area (after restoration, if necessary to attain 90% coverage), consisting of grasses, evergreen shrubs, bushes, trees or landscaping beds containing mixed vegetation. For shrubs and bushes, the plant canopy shall be deemed 100% coverage of the area within the drip line of the plants. Any unplanted area under shrubs and bushes must be covered with mulch, it must not be bare soil. For areas under trees, the understory must have 90% minimum plant coverage of the area. Documentation that the spray dispersal area meets all these requirements must be provided in the "Technical Report" specified in 285.33(d)(2)(C).

Design of the dispersal field should be addressed in the "Technical report" covered in paragraph (C). The language of a Chapter 48 modification of 285.33(d)(2)(C) to stipulate that appropriate consideration has been given to the design could read:

Technical report. A technical report covering the design and installation of the surface application system shall be submitted with the planning materials required in 285.5(a) of this title. The technical report shall provide a layout of the surface application system and a description of the system and calculations as necessary to show how uniform coverage of the application area would be achieved. The sprinkler heads or other distribution devices shall be identified by brand and model, and spray heads must have a spray angle of 15 degrees or less. All other materials shall be specified to the level of detail required to specify the quality of the installation. The report shall detail how the distribution devices will be fed so that production of aerosols is minimized, and shall specify the timing of distribution events. The nature of the application area, including soil type and plant cover, shall be characterized in regard to potential to induce runoff, and the precipitation rate imparted by the distribution devices and the precipitation depth in each application shall be justified in regard to this characterization, showing that runoff will not occur due solely to the effluent application when soil antecedent moisture is at ANC III. The actual landscaping to be provided by the finished application area shall be described and shown on a layout plan, confirming that the required plant and ground coverage shall be assured.

Note that an *actual design* to produce the results expected – e.g., no runoff – *must* be required, which this language does. The present language in Chapter 285 is quite deficient in that regard – it does not require anything that might be reasonably graced with the term "design". Also, the "landscaping plan" is an essential element of this "technical report", so that the stipulations of 285.33(d)(2)(F) would be

incorporated here. Part of 285.33(d)(2)(G) would be moot, since there is a requirement in the above that the applicant demonstrate uniform coverage. The details offered in (G)(i) and (ii) are redundant with the requirements specified for the "technical report".

If Travis County believes that subsurface drip dispersal of water having received secondary treatment presents such a "hazard" that it must increase the standoff between drip emitters and rock by 100% over what is specified in Chapter 285, then it *must* address 285.33(d)(2)(D), "Effluent disinfection", to require much better control of disinfection. There is considerable evidence that disinfection with drop-feed tablet chlorinators is hit or miss at best, due to lack of appropriate maintenance and operation of drop-feed tablet chlorinators and to insufficient clarity of the treated effluent. Dose control with a drop-feed tablet chlorinator is an illusion even when the device is kept supplied with chlorine tablets and is operating properly. Keeping the chlorinator supplied with tablets *must* be defined as maintenance that must be performed by the duly authorized maintenance provider, not left to the whim of the system user, as experience has shown this has resulted in a high instance of chlorinators being out of chlorine tablets. The lack of concern for this shown by Travis County is neither reasonable nor rational nor internally consistent.

Regarding 285.33(d)(2)(E), "Minimum required application area", there needs to be language to the effect that the actual location of the project must use the application rate interpolated from the chart in 285.90(1) for that location, rather than applying the rate at the nearest line with the *higher* application rate, as 285.90(1) specifies. This "dumbing down" of the procedure to determine the application rate results in a rate of 0.064 gpd/sq. ft. being applied all over Travis County. A location toward the eastern edge of Travis County would have an application rate of ~0.050, a location in the center of Travis County would have an application rate of ~0.053 gpd/sq. ft., and a location at the western edge of Travis County would have an application rate of ~0.056, if the rate were interpolated from the chart. Allowing an application rate of 0.064 results in a very significant increase over the proper application rate for that location, if the chart has any validity. Allowing this to persist while proposing to impose the limit on the hydraulic application rate of drip dispersal stated in 48.037(b)(2) is not reasonable or rational or internally consistent. Language to implement a requirement to interpolate the surface application rate could modify 285.33(d)(2)(E) to read:

The minimum surface application area required shall be determined by dividing the daily usage rate (Q), established by 285.91(3) of this title, by the allowable surface application rate (Ri = effective loading rate in gallons per square foot per day) as derived from 285.90(1) of this title. The value of Ri for the actual location of the OSSF shall be interpolated if it lies between the lines shown on 285.90(1).

Section 285.33(d)(4), "Soil substitution drainfields", modified by Chapter 48.037(e), is a *very environmentally unsound* idea. Where there is insufficient soil for a "conventional" style drainfield, one should simply NOT BE ALLOWED. The regulatory system shouldn't turn handsprings trying to "justify" the use of one in those circumstances. To do so is internally inconsistent with the concern shown for drip dispersal, as noted. The ONLY type of field, other than a mound (which is itself a de-optimized buried sand filter), that should be allowed in fill soil is subsurface drip dispersal. Chapter 48.037(e) must read, "Soil Substitution beds are not allowed in Travis County."

Section 285.33(d)(5), "Drainfields following secondary treatment and disinfection", is a *highly irresponsible* idea. Especially given the practically non-existent attention so far shown to assuring that secondary quality effluent and effective disinfection is indeed attained, consistently and reliably. At least until TCEQ, or at least Travis County, chooses to ensure that proper attention is required, allowing drainfields IN fractured or fissured rock is a MOST HIGHLY IRRESPONSIBLE action. There is absolutely no reason why the conditions presumed here cannot be addressed with drip dispersal in

sufficient fill depth to attain the required soil depth between the drip emitters and the limiting condition. A provision must be written into Chapter 48 to eliminate drainfields following secondary treatment and disinfection in fractured or fissured rock as an option in Travis County. To not do this is not reasonable nor rational nor internally consistent.

If Travis County believes that drip dispersal of water having received secondary treatment presents such a "hazard" that it must increase the standoff between drip emitters and rock by 100% of the standoff specified in Chapter 285, then Travis County *must* also believe it must impose a higher level of oversight on the home-sized activated sludge treatment units known as the "aerobic treatment unit", abbreviated ATU, than is imposed by Chapter 285. To do otherwise would be irrational and inconsistent.

Regarding Chapter 48.034, allowing homeowners to maintain an activated sludge treatment unit is tantamount to conceding that anything except "physical" maintenance – e.g., replacement of a broken part – is not to be expected. But then, as things now sit, that is the case even with licensed maintenance providers, since there is little that *can* be done through visits every 4 months to actually maintain a home-sized, episodically loaded activated sludge treatment unit operating in the on-lot environment in "working order", if that is defined as consistently and reliably producing secondary quality effluent.

In particular, Chapter 48 *must* modify 285.32(c)(1) to *require* flow equalization of ATUs, if Travis County is going to continue to allow ATUs to be installed. Travis County well understands that these home-sized activated sludge treatment units cannot consistently and reliably produce secondary effluent under the episodic flow regime in on-lot systems without being flow equalized. Indeed, Standard 40 allows ATUs to violate secondary effluent standards during a "stress test" typical of the flow regime in the on-lot environment and still "pass". Again, if Travis County believes that drip dispersal of water having received secondary treatment presents such a "hazard" that it must increase the standoff between drip emitters and rock by 100% of the standoff specified in Chapter 285, then it *must* believe that it must regulate ATUs in a manner that renders them as likely as practical to consistently and reliably produce secondary quality effluent, particularly since the effluent produced by ATUs is almost universally routed to a spray dispersal field. To fail to regulate in that manner is neither reasonable nor rational nor internally consistent.

A very basic measure would be assure that the maintenance protocol for each ATU placed on the approved list by dint of having obtained an NSF Standard 40 "certification" is the maintenance protocol that is faithfully executed. Standard 40 stipulates that "Manufacturers ***shall*** provide comprehensive and detailed operations and maintenance instructions to authorized representatives." [emphasis added] It should be stipulated in these rules that this required manual be provided with the planning materials, along with a copy of the actual maintenance contract, requiring that contract to delineate the maintenance protocol, so that the proposed O&M program can be verified to meet the manufacturer's requirements. Since this is a stipulation of NSF Standard 40, and an ATU that obtained a place on the "approved list" by dint of having obtained a Standard 40 "certification" must continuously comply with that standard, it must be confirmed that a *homeowner undertaking to maintain an ATU shall have also received those instructions and been trained to execute those instructions*. Otherwise, Travis County would be colluding to violate the requirements of Standard 40. Language, as additional sentences added to 285.32(c)(3) by Chapter 48, might read:

The applicant shall provide a copy of the proposed maintenance contract and a copy the manufacturer's "comprehensive and detailed operations and maintenance instructions" (a required standard document for all proprietary systems placed on the approved list upon the basis of having "passed" NSF Standard 40) with the planning materials for an OSSF application that includes a proprietary treatment system. The provisions of the proposed maintenance contract shall conform to these "comprehensive and detailed operations and

maintenance instructions". If a homeowner proposes to conduct maintenance on the OSSF, the manufacturer must certify that the homeowner has received those instructions and been trained by the manufacturer to conduct maintenance on that OSSF.

Chapter 48 must modify 285.32(c)(5)(A)(ii), dealing with the use of proprietary units in OSSF's that do not meet the stipulations of the "certification" under which the proprietary unit gained a place on the approved list. It must be made clear that the system must be permitted as a "non standard" system. This and the provision in (i) are stated in a manner that seems to want to "squirm" around this central issue. Not just influent strength but any aspect of the OSSF that does not conform to the stipulations of the "certification" standard must disqualify the unit from being considered for permitting under this section. For example, commercial systems may have important differences from residential systems in regards other than influent strength, such as the timing of influent flows—e.g., weekdays only instead of all week.

NSF Standard 40 is valid *only* for treatment units serving an *individual residence*. It states under "Scope": "This Standard contains minimum requirements for residential wastewater treatment systems having rated treatment capacities between 1514 L/day (400 gal/day) and 5678 L/day (1500 gal/day)." In the "Definitions" section, "residential wastewater" is defined as "Human body waste and liquid waste generated by the occupants of an *individual residence*." [emphasis added] And "residential wastewater treatment system" is defined as "An organized and coordinated system of components that functions to treat wastewater generated by *individual residences*." [emphasis added] Thus, any system which has gained the status of approved "proprietary unit" by virtue of possessing the Standard 40 "certification" which serves a multi-family or commercial application does not qualify to be approved as a "proprietary unit" under this section, since the unit would not qualify to be placed on the approved list for that use. Rather, that treatment unit must be explicitly designed for that application under the provisions of 285.32(d).

If the OSSF in question uses a "proprietary unit" in a way that violates the conditions of the "certification" standard which gained it a place on the approved list, then that unit may not be considered as a "proprietary treatment system" or "proprietary unit" as that term is intended under 285.32(c), even though it still meets the definition of "proprietary system" in 285.2. To clarify this, Chapter 48 must modify 285.32(c) in a manner such as this:

This subsection applies to a "proprietary system" as defined in 285.2(57) only when it is used in an OSSF in which the system characteristics conform in all regards with the stipulations, presumptions, conditions, etc., of the "certification" procedure through which the proprietary unit gained a place on the executive director's approved list of proprietary units, as set forth in 285.32(c)(5). If the characteristics of the OSSF do not conform in all regards with that "certification" procedure, then the OSSF must be considered as a "non standard" system and be permitted under the procedures set forth in 285.32(d).

Chapter 48 *must* modify 285.32(f) relating to "Other Design Considerations", so that ATU's must have a means to prevent the flow through of untreated water to the effluent tank during a power outage or when the compressor fails to function. To fail to do this is neither reasonable nor rational nor internally consistent. Chapter 48 must amend 285.32(f) to add this provision:

(f) All treatment units shall be designed and operated so that untreated water would not flow through the unit during any time that treatment system function is lost due to equipment failure or power outage, and to assure proper operation is restored when the equipment or power is restored. An application for a permit to install an OSSF that includes a proprietary or non-standard treatment unit shall provide a description of how this requirement is attained:

(1) The application shall be accompanied by calculations as required to demonstrate that the required function is attained. The volume of storage that must be available in the event treatment system function is lost shall be that volume specified to be provided above the alarm level in 285.34(b) relating to "Pump tanks" in this title.
(2) The application shall be accompanied by drawings showing the equipment used to provide this function. The drawings shall detail the size and construction of the tank(s) used to provide storage and shall detail all other equipment.
(3) The application shall be accompanied by a specification of the procedures to be followed to restore the treatment unit to routine operation following an event that interrupts treatment system function prior to allowing any effluent to exit the treatment unit and flow to the dispersal field.

Providing flow equalization may be the most "practical" way to meet this standard. It appears that TCEQ does not feel that the prospect of untreated water reaching the effluent tank and then being sprayed around an area with no area controls is sufficiently alarming to merit the inclusion of the above language, and the only thing it has chosen to do is add a provision that "the designer should consider whether flow-equalization will be needed for the treatment system to function properly". That is obviously meaningless, as there is no standard of "need", or even any real requirement for a system to "function properly" in these rules. Unless Travis County wishes to show that same disregard for this hazard, it must include the above language or its equivalent, to prevent untreated water being able to freely flow through a treatment unit all throughout the time a power outage is occurring and/or when a critical component of the system, without the proper functioning of which secondary treatment cannot reasonably be expected to be achieved, is not operating properly.

While all of the above would more reasonably and rationally govern the use of ATUs, the real "bottom line" is to assure that a pretreatment unit produces secondary quality effluent consistently and reliably. Therefore, some degree of monitoring must be considered. It is understood that collecting grab samples for analysis of BOD_5 and TSS at 4-month intervals – the presently required frequency of maintenance visits for a "proprietary unit" – is rather meaningless surveillance, and that collecting and analyzing samples *at all* is deemed "unaffordable" for on-lot systems. It is suggested that very frequent turbidity monitoring would be a sufficient surrogate for testing of samples. A continuous turbidity monitor, with an alarm function signaling "out of range" turbidity, would be a reasonable way to implement that monitoring. If Travis County believes that drip dispersal of water having received secondary treatment presents such a "hazard" that it must increase the standoff between drip emitters and rock by 100% of the standoff specified in Chapter 285, then it *must* also believe that allowing effluent to be sprayed over the surface without taking any measures to assure that effluent has been treated to the standard required of it is an unacceptable hazard. To believe otherwise is neither reasonable nor rational nor internally consistent.

Regarding pump tanks, Travis County will be well served to rationalize the rules pertaining to pump tank design by modifying 285.34(b)(1), (2), (3) & (4), and adding (5) and (6), as follows:

(b) Pump tanks and pump systems. When water within the system must be pumped for any purpose, a pump tank or chamber and a pump system conforming to the requirements of section shall be incorporated into the system design. A technical report detailing all items required by this subsection shall be submitted with the planning materials required in 285.5(a) of this title. All requirements of 285.32(b)(1)(D)-(F) of this title (relating to Criteria for Sewage Treatment Systems) also apply to construction and installation of pump tanks. The pump tank and pump system shall be designed and installed according to the following specifications.
(1) Pump tank and pump system criteria. The pump tank or chamber shall be water-tight. The pump line shall be protected against backflow or siphoning, as required by the circumstances of each

application. The pump system shall be equipped with an audible and a visible alarm that will signal if the pump fails to function as required by the design for each application. The visible alarm must be readily discernible at a distance of 50 feet from the alarm panel in normal daylight. The audible alarm must be readily discernible at a distance of 50 feet from the alarm panel. A manual "silence" switch shall be provided on the exterior of the alarm panel to turn off the audible alarm. The visual alarm must stay illuminated until the condition which caused the alarm has been remedied and/or the alarm panel has been reset. Power to any alarm circuits shall be provided by a separate circuit from that which powers the pump. Batteries may be used for back-up power supply only. All electrical components shall be listed and labeled by Underwriters Laboratories (UL).

(2) Pump tank sizing.

(A) Pump tanks for simplex pump systems. Pump tanks or chambers shall be sized to contain all of these volumes:

(i) The permanent liquid depth in the bottom of the tank required to protect the pump from thermal overload.

(ii) A volume equal to the dose that is allowed to build up in the pump tank before the pump is actuated to evacuate this volume, or a volume equal to the operating storage as set forth in 285.34(b)(5) of this title.

(iii) An emergency storage volume above the high water alarm switch equal to at least the design daily flow rate of the system in which the pump tank or chamber is utilized. This requirement may be waived in a tank or chamber of a tank in which the pump alarm in that chamber is arranged to disable a pump that causes water to be fed into that chamber.

(B) Pump tanks for duplex pump systems. Pump tanks or chambers shall be sized to contain all of these volumes:

(i) The permanent liquid depth in the bottom of the tank required to protect the pumps from thermal overload.

(ii) A volume equal to the dose that is allowed to build up in the pump tank before a pump is actuated to evacuate this volume, or a volume equal to the operating storage as set forth in 285.34(b)(5) of this title.

(iii) An emergency storage volume above the high water alarm switch equal to at least 4 hours flow at the design daily flow rate of the system in which the pump tank or chamber is utilized.

(C) The specified total volume shall be attained either:

(i) At or below the flow line of the inlet into the pump tank or chamber.

(ii) *At any elevation below the interior depth of the pump tank or chamber, provided that any impacts of back-ponding into any chambers upstream of this pump tank or chamber caused by ponding to a depth above the flow line of the inlet to the pump tank or chamber are addressed, as set forth in 285.34(b)(4), in regard to restoring proper system function once pump function is restored and the storage volume above the alarm level is dissipated.*

(3) Pump specifications. All pumps shall be rated by the manufacturer for pumping sewage or sewage effluent. A duplex pump system shall be used for all systems serving commercial establishments. Either a simplex pump system or a duplex pump system may be used in all other systems with a design daily flow rate of 1,000 gallons/day or less. A duplex pump system must be used in all systems with a daily design flow rate of greater than 1,000 gallons/day. A duplex pump system shall be designed so that each pump is activated alternately each time that the pump function is demanded by the control system. In the event the pump first activated fails to operate, the control system shall activate the other pump, and the control system shall set an alarm to indicate a pump has failed and shall "lock out" the pump which failed and start the other pump each time the control system

demands a pump to function. This operation shall persist until the control system is reset to duplex operation, which shall not be done until the cause of the pump failure has been remedied.

Modify 285.34(b)(4)(B) as follows: "A pump low-level cutoff switch shall be set in the tank at a depth such that thermal protection of the pump is always provided. The equalization volume – the depth between the low-level cutoff switch and the high water alarm – shall be specified by the designer based on analysis of the expected temporal variations into the treatment unit. If the tank is serving a residence, the minimum equalization volume shall be 50% of the daily design flow rate. The pump system shall be designed to run doses of a set run time at equal intervals throughout the diurnal cycle. The maximum dosing frequency shall be 2 hours."

Add 285.34(b)(5) as follows:

(5) An application for a system that incorporates a pump tank or chamber shall be accompanied by calculations and drawings as required to demonstrate that the required storage volume, as specified in 285.34(b)(2), is provided, and to demonstrate that the pump system is designed to accomplish the functions it must for the system to operate as designed, including specification of the alarm system and a description of its operation. If attaining the required storage volume entails back-ponding into an upstream chamber, the application shall be accompanied by a description of how proper system function would be restored once pump function is restored without a hazard accruing due to the back-ponding into the upstream chamber.

Add 285.34(b)(6) as follows:

(6) Special provisions for pump tanks for surface application systems. Surface application shall be allowed only between midnight and 5 a.m. The pump system for a surface application system shall be controlled by equipment that allows all effluent to be dispersed in this time period, with the volume of multiple applications limited as required to preclude runoff, as set forth in the "technical report" required by 285.33(d)(2)(C) of this title. The effluent storage tank shall contain a volume for operating storage, defined as the volume available between the minimum operating level in the tank – typically delineated by a switch which turns the pump off when water level is drawn down to that level – and the level at which the high water alarm would be tripped. The minimum volume of this operating storage shall be:

(i) Equal to the design daily flow rate of the system if the treatment system incorporates flow equalization so that no more than the design daily flow can enter the effluent storage tank in a 24-hour period, or

(ii) Equal to 150% of the design daily flow rate of the system if the system does not incorporate flow equalization.

These modifications address critical design issues that the current and proposed rules do not. Again, Travis County will be well served to require all this to be demonstrated in the application for a permit.

The proposed Chapter 48.036(b) states, "Non-residential Treatment Requirements – Non-residential systems shall have a minimum of six-day retention time in a septic tank, or in a pre-treatment tank prior to a treatment unit; or provide equalization tanks per 30 TAC Section 285.34." The "justification" stated for this rule is, "Non-standard treatment units are individually designed systems generally utilizing mechanical components in systems designed to provide a higher level of sewage treatment on a given site due to unsuitable site conditions. Unsuitable site conditions and additional mechanical components increase the need for assurance of proper functioning and performance monitoring of these units which is provided by a more stringent maintenance requirement. Increased public health and environmental protection is the result of this additional ongoing upkeep of the more complex systems needed to serve in less than ideal conditions."

The "justification" had it right at "Non-standard treatment units are individually designed systems." All the rest of it is highly specious. Indeed, the "non-standard" systems that I design are functionally *simpler*, not "more complex", than the "proprietary" home-sized activated sludge units, for which no such stipulations are set forth. In regard to the stipulation of a six-day HRT in the septic tank, since each "non-standard" system is an individually designed system, the appropriate HRT in a septic tank or pretreatment tank would be part of the individual design, which Travis County must require the designer to specify and justify. It is inappropriate to "artificially" specify this very high minimum; it violates the very idea of a "non-standard" design. There is no need for this provision.

Chapter 48.032 (b) states, "… the minimum lot size for a structure served by an OSSF … is one acre" and Chapter 48.032 (c) states, "… multiple residential units may be on a single lot or site only if the lot contains at least one acre of land for each residential unit." The "justification" for these provisions is, "Larger lot sizes are necessary to protect the public health and environment in Travis County because of the predominance of unsuitable soils, steep rocky slopes, and the demand for construction of larger than normal houses. Research of the literature revels that many jurisdictions increase lot size requirements to protect groundwater through the reduction of septic tank densities ….

"Additional space is needed for lots utilizing both individual and [sic] wells and on-site wastewater systems to ensure that groundwater quality is protected by providing adequate buffer space around the wells without having to encroach on adjacent properties. Additionally, many areas of western Travis County have rapidly recharging conditions, with thin soils and karst rock or layered limestone. These conditions are particularly vulnerable to well contamination from either surface sources or OSSFs. Large lot sizes will reduce the potential for contamination in these sensitive areas, thus providing additional protection for the public health and environment.

"Since small lots are commonly cited as the number one problem with siting on-site sewage systems, future health hazards can be averted by adhering to minimum required lot sizes, providing greater protection to the public health and environment. Once a minimum lot size standard is set, there should be only rare occasions when a new subdivision would be created with lots smaller than those required. …

"Western Travis County requires the additional protection to public health and the environment afforded by this requirement because its topography typically has steep rocky slopes with thin soils which are not favorable for on-site sewage disposal. Each lot in new subdivisions should initially be created with on [sic] area suitable for a sewage disposal field and a replacement area in order to prevent health and pollution problems resulting from poorly sited sewage systems or from the inability to relocate a new system in case of failure. Each newly created lot should have an area with flat enough slopes (30% or less) to allow the installation of a variety of on-site sewage systems in most soil conditions, giving the owner the maximum options for types of facilities which will provide protection to the public health and environment equivalent to the State Rules."

For starters, Travis County should not be in the business of "giving the owner the maximum options for types of facilities", *Travis County should be in the business of assuring appropriate design to cope with the site constraints of each lot. That the regulatory system has historically failed to do this is the reason why most of the other problems cited might have any "validity"*. While it is understood that it is part of the "voodoo" of this field, lot size is by itself not the determinant of these outcomes, rather it is whether or not the system has been designed to cope with the site constraints so as to protect public health and environmental values. While the issue of fitting a well and OSSF onto a lot, and not having the sanitary easement around the well encroaching onto neighboring lots, is indeed a legitimate concern, this is a matter that can be addressed, with restrictions on well siting specified, in the platting process. In any

case, in that situation, Chapter 285 already stipulates a minimum lot size of one acre, so that is a red herring argument here.

The aspect of this of most concern is the creation of condo-ized projects. By clustering the houses, creating a so-called "conservation development", an environmentally benign OSSF can be designed into the site plan without a "need" for there to be one acre per living unit of lot area, in regard to the issues set forth in the "justification". This too is a matter that can be addressed in the platting process, with it being incumbent on the applicant to demonstrate ample room for an OSSF on whatever size lot is proposed. As long as the lot size is over one acre, it complies with Chapter 285, since that document is silent on required lot sizes for projects with more than one housing unit on one lot.

One "justification" that has been posed previously, which is not explicitly stated in this "justification", is to protect groundwater quantity, by limiting the number of houses which might be built in an area. However, this rule is to be applied without regard to a defined need to protect groundwater quantity, or to the source of water supply. In the case of, for example, a project proposing to obtain water supply by building-scale rainwater harvesting, the ability to creatively plan the development would be hamstrung by a presumed "restriction" that would not exist.

Then too, there is a lot of Travis County that is not "western Travis County [with] rapidly recharging conditions, with thin soils and karst rock or layered limestone" and other such "hazards" as are noted in the "justification". This rule poses a roadblock to more creative land planning where those "hazards" are not present. Thus it is neither reasonable nor rational.

Travis County should reconsider this rule and figure out how to address the "proper" sizing of lots in the platting process, rather than impose a "one size fits all" approach in Chapter 48 which hamstrings creative design of development, in particular "conservation developments". This would tend, indeed it has tended, to drive developers to install much more intense development served by wastewater systems permitted through the "municipal" process at TCEQ. *Which is contrary to what appears to be the intent as set forth in the "justification"*, to provide "better" protection of public health and environmental values. Those more intense developments will create more non-point source pollution, including due to more cars running over the roads. They will also create a need for more roads and other services – which the tax base created by development typically does not cover. And that TCEQ-permitted wastewater system would itself be a major source of pollution, unless it were designed in the manner of the very best sort of on-site system for the site conditions in western Travis County, recirculating packed bed treatment unit and subsurface drip irrigation dispersal – a strategy which no one will advocate that the developers employ and that TCEQ would actively resist. So again, this rule is likely to be a classic case of unintended consequences. Please reconsider it.

Respectfully submitted,
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Passage of Microorganisms In Septic System Effluents Through Mound Sand In a Controlled Laboratory Environment

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Introduction

Pristine groundwater is a greatly treasured Wisconsin resource. Protection of this resource in part relies on removal of organisms from anthropogenic activities that are likely to contaminate ground water. While there is a fairly large literature on the passage of microbes through soil, the specific question of the passage of organisms from relatively clean wastewater effluents through mound sand has received little attention. The basic question to be answered by the research described in this report is: "Do microorganisms suspended in wastewaters from private onsite wastewater treatment systems pass through mound sand in laboratory scale column experiments" This is a complex, multi-faceted question that could be answered with many approaches. The intent of this report is to capture all experimental data with minimal interpretation and discussion.

Experimental Design

As water passes through a mound sand matrix, organisms are removed in three ways, filtration, adsorption or die-off. These mechanisms of removal are complex. Filtration relies on depth, preferential flow paths, saturation, biofilms, surface matting, temperature, flow rate, and dosing frequency. Adsorption depends on microbial flora, surface matting, cation concentration, temperature and pH. Die-off depends on microbial predation, temperature, saturation, drying, organic matrix, microbe multiplication and time. This leads to the following list of experimental variables which could be evaluated.

- Depth
- Saturation
- Time
- Dosing rate
- pH
- Cation concentration
- Dosing schedule
- Temperature
- Dosing effluent quality

This list yields thousands of possible experimental variable combinations. In order to reduce the number of variables to a manageable number, we chose to standardize them as follows.

-Depth- Columns were prepared in a variety of depths from 12 inches to 60 inches (see table 5. below)

-Dosing rate- For the first six months of the experiment the mound sand columns were dosed at two gallons per square foot per day for high quality effluents, and one gallon per day for the lower quality effluents. The actual daily dose volumes for the three inch (.25 ft) inside diameter columns were calculated by determining the surface area of the column, as pi R^2 [3.14 x 0.125 ft x 0.125 ft = 0.049 ft^2], which means 0.049 gallons (186 mL) would be added daily to each column for a one gallon per square foot per day dose and 0.098 gallons (372 mL) for a two gallon per square foot per day dose. The effluent was administered in five equal doses (37 and 74 mL respectively) per day with four doses spaced four hours apart and the last dose of the day administered after an eight hour interval. An exception to this dosing schedule was that one 24" column was dosed once per day only. During the final ten weeks of the experiment, the dosing volumes were doubled for eight weeks, and then doubled again (four times the original volume) for the final two weeks.
-Saturation- Saturation was never achieved. Some drying occurred between each dosing.
-pH- For this study pH of the effluent was unaltered.
-Temperature- All tests were run at 20^0 C.
-Time- The leachate from each column was tested for organism pass through every three weeks during the first 30 weeks of the study and then with increasing frequency during the last weeks, peaking at three times per week at the end of the experiment.
-Cation- concentrations were unaltered.
-Dosing effluent quality- Two small scale on-site waste water facilities were chosen for collection of septic tank effluent to be used for dosing the experimental sand columns.
Site one. This system consisted of a septic tank vault followed by a single pass sand filter, preceding the infiltration field. Samples were collected from the pumping tank just after the sand filter. This site was chosen to represent a high quality effluent with biological oxygen demand (BOD) and suspended solids (SS) values of less than 30/30 mg/L.
Site two. Samples were collected from a small scale on-site treatment system serving a mobile home park. The system consisted of three septic tank vaults in series followed by a recirculating sand filter in line prior to the infiltration beds. The samples were collected directly from the surface of the third septic vault. Site two was chosen to represent a typical effluent from a conventional septic tank with BOD/SS levels of approximately 220/150 mg/L.

Effluents from both systems were collected once per week and stored at 2-4° C prior to being dosed to the columns. Each weekly collection of effluents was tested for BOD and SS. These results are summarized in tables 1 and 2 below.

Table 1.

Site one - single pass sand filter effluent

Date	Source	BOD mg/L	SS mg/L
10/9/00	sand filter	<6	<5
11/20/00	sand filter	<2	<5
11/29/00	sand filter	<2	<5
12/7/00	sand filter	<2	<5
12/14/00	sand filter	<2	<5
1/10/01	sand filter	<2	<5
1/17/01	sand filter	<6	<5
1/24/01	sand filter	<3	<5
1/31/01	sand filter	<3	<5
2/7/01	sand filter	<3	<5
2/14/01	sand filter	<3	ND
2/21/01	sand filter	<2	ND
2/28/01	sand filter	<3	ND
3/7/01	sand filter	<2	ND
3/16/01	sand filter	<2	<2.5
3/22/01	sand filter	<2	ND
3/28/01	sand filter	<2	ND
4/4/01	sand filter	<3	ND
4/12/01	sand filter		
4/19/01	sand filter	<3	ND
4/25/01	sand filter	<3	ND
5/2/01	sand filter	<3	ND
5/10/01	sand filter	<2	ND
5/17/01	sand filter	<2	ND
5/24/01	sand filter	<2	ND
5/31/01	sand filter	>40.3	ND
6/6/01	sand filter	<3	ND
6/11/01	sand filter	<2	ND
6/14/01	sand filter	<2	ND
6/18/01	sand filter	<2	ND
6/20/01	sand filter	<2	ND
6/25/01	sand filter	<2	17
6/27/01	sand filter	2.9	6
7/2/01	sand filter	<2	<2.2

Table 2.

Conventional septic tank vault effluent

Date	Source	BOD mg/L	SS mg/L
10/17/00	septic vault	162	276
11/11/00	septic vault	220	196
11/20/00	septic vault	151	96
11/29/00	septic vault	166	79
12/7/00	septic vault	212	72
12/14/00	septic vault	217	50
1/10/01	septic vault	240.8	<5
1/17/01	septic vault	301	160
1/24/01	septic vault	255	176
1/31/01	septic vault	361	204
2/7/01	septic vault	324	148
2/14/01	septic vault	226	41
2/21/01	septic vault	232	255
2/28/01	septic vault	268	168
3/7/01	septic vault	244	54
3/16/01	septic vault	239	34
3/22/01	septic vault	179	35
3/28/01	septic vault	252	136
4/4/01	septic vault	289	128
4/19/01	septic vault	341	120
4/25/01	septic vault	210	120
5/2/01	septic vault	266	200
5/10/01	septic vault	305	630
5/17/01	septic vault	217	185
5/24/01	septic vault	267	146
5/31/01	septic vault	241	184
6/6/01	septic vault	275	60
6/11/01	septic vault	214	40
6/14/01	septic vault	361	332
6/18/01	septic vault	217	50
6/20/01	septic vault	279	94
6/25/01	septic vault	360	175
6/27/01	septic vault	314	206
7/2/01	septic vault	271	94

In addition to the traditional BOD/SS measures of effluent strength, the microbial makeup of the spiking effluents is also important. There are virtually thousands of pathogenic and non pathogenic organisms that could be present in septage and therefore enumerated as part of this project. To keep the project costs within reason, we chose to use the traditional total coliform, fecal coliform and *E. coli* indicators of fecal pollution as well as two innovative indicators, enterococci and male specific coliphages.

Total coliform and *E. coli* counts were performed using the standard minimal media ONPG-MUG enzyme based test system (Colilert$_{TM}$) with the Quantitray$_{TM}$ enumeration system. Total coliform is the indicator that has been traditionally used by water microbiologists since 1920 to detect microbial contamination of wells. While total coliform does, in fact, detect outside contamination of a water well system, its ability to accurately predict the presence of fecal material is limited. None the less, it is important to include this indicator since Wisconsin groundwater standards are still based on total coliform occurrence. *E. coli* is included since it does accurately predict the presence of fecal contamination in a water sample, and thus, is considered an excellent predictor of imminent health risk from consuming water from a positive well.

Fecal coliform is a traditionally used indicator of fecal contamination in water. While it has generally been replaced by *E. coli*, we are including it in this study to tie the data to previously published studies. The detection method used was the standard membrane filter fecal coliform test (MFFCC).

While *E. coli* has generally been proven to be an excellent indicator organism and public health tool, its utility can be challenged in situations where contaminated water is filtered through soil. The surface characteristics and shape of *E. coli* allow it to be easily removed as it moves through a soil column, unlike the small round virus often associated with waterborne disease outbreaks, that might move through more readily. For this proposal we chose to include two additional indicators, enterococci and coliphage, that behave more like the viral pathogens in their ability to move through soil.

Enterococci are small round bacteria found in the intestinal track of warm blooded animals. For fifteen years, they have been suggested by the USEPA as the best indicator organism to be used in testing of recreational waters, because of the strong correlations with their presence in water with the occurrence of illness in swimmers. Enterococci counts were performed using a proprietary defined substrate enzyme based test system called Enterolert$_{TM}$ combined with the Quantitray$_{TM}$ enumeration system.

Male specific coliphages have been suggested by several researchers as the fecal indicator of choice because of their increased likelihood of behaving like a pathogenic virus in ground water contamination situations. Coliphage are viruses that infect *E. coli* bacteria. Male specific coliphages are viruses of *E. coli* that infect the bacterial cells through sex pili appendages that are only found on the bacteria when they are at or near body temperatures. In other words, the detection of male specific coliphages is strong evidence of fecal contamination from a warm blooded animal. Additionally, since the coliphages are in fact viruses, they behave in the environment much as human pathogenic virus do. For this study, samples were extracted with freon or chloroform. Recovered phage were then detected using the double agar layer plating method using a host organism vulnerable to infection by male specific coliphages.

Since the main focus of the research was to characterize the passage of microbes through mound sand, the microbiological indicator flora of the effluents was determined

and altered when necessary. The high BOD/SS septic tank effluent was tested on five occasions to determine the concentrations of the five chosen indicators. These data are presented below in table 3.

Table 3. Naturally occurring flora for high strength septic tank effluent

total coliform /100mL	*E. coli* /100mL	fecal coliform /100mL	*Enterococcus* / 100mL	male-specific coliphage pfu/mL
4,245,000	120,330	117,000		
1,789,000	197,000	170,000	5290	340
4,352,000	256,000	320,000	43,520	5700
5,475,000	158,000	480,000	30,760	15,850
12,997,000	1,153,000	930,000	7760	5600

Due to the variability noted in Table 3, it was determined that the effluent should be always be spiked with additional organisms in order to be sure the columns were being challenged with a large number of organisms. The additional organism spike levels were based on the approximate ratios of the organisms to the levels detected in the actual septic effluent. The target spike levels for the high BOD/SS septic tank effluent for each of the indicators were: Fecal coliform (510,000 cfu/100mL), total coliform (6,100,000 cfu/100mL), *E.coli* (490,000 cfu/100mL), *Enterococci* (24,000 cfu/100mL) and male-specific coliphage (7600 pfu/100mL).

Known concentration bacteria spikes were prepared by growing bacterial suspensions of the indicators from stock cultures to a 0.5 McFarland Standard ($1.5x10^8$) optical density measured using a Mini 20^{tm} Spectrophotometer. The male-specific coliphage stock supply was prepared by viral extraction followed by culture confirmation titering to produce a ($9.3x10^9$) suspension. Each known concentration suspension was then diluted to the pre-calculated target number of organisms used to spike the effluent.

For the clean sand filtered septic effluent, two spiking effluents representing fecal coliform levels of both 1,000 and 10,000 were required. Once again the background levels of naturally occurring total coliform, fecal coliform, *E.coli*, enterococci and coliphage were determined by testing the first five septic effluent collections. These results are presented below in Table 4. The levels were generally so low that organisms needed to be added to achieve the 1000 and 10,000 fecal coliform levels needed. The spiking solutions were prepared as described above. The actual target spike levels for the clean sand filtered septic tank effluent for each of the indicators was: Fecal coliform (1,000) total coliform (36,000 cfu/100mL), *E.coli* (1,500 cfu/100mL), *Enterococci* (1,400 cfu/100mL) and male-specific coliphage (1,000pfu/100mL)for the 1000 fecal coliform spike and fecal coliform (10,000) total coliform (360,000 cfu/100mL), *E.coli* (15,000 cfu/100mL), *Enterococci* (14,000 cfu/100mL) and male-specific coliphage (10,000pfu/100mL) for the 10,000 fecal coliform level spike.

Table 4. Natural microbial levels from the high quality sand filtered septic effluent

total coliform /100mL	*E. coli /100mL*	*fecal coliform /100mL*	*Enterococcus / 100mL*	*coliphage pfu/mL*
	118.7	190		
88.2	11	5	47.9	<5
1119.9	17.1	19	6.3	<5
365.4	33.1	18	3.1	<5
11	3.1	2	1	<5

A matrix chart of the septic effluent dosing to the columns is summarized in table 5. Table 6 presents the summarized information with numbers assigned to each column that will be used when referring to the data generated from the columns.

Table 5. Summary of column dosing

Column depth	BOD/SS 30/30 Five doses/day 2 gpd/ft^2 10^3 organisms/100ml	BOD/SS 30/30 Five doses/day 2 gpd/ft^2 10^4 organisms/100ml	BOD/SS 220/150 Five doses/day 1 gpd/ft^2 10^{6-7} organisms/100ml	BOD/SS 30/30 one dose/day 2 gpd/ft^2 10^4 organisms/100ml
12"	Column 1			
18"	Column 2	Column 4		
24"	Column 3	Column 5	Column 8	Column 10
30"		Column 6		
36"		Column 7	Column 9	
48"			Column 11	
60"			Column 12	

Table 6. Summary of column dosing

Column number	*Column length*	*BOD/SS target*	*Fecal coliform target*	*Dosing volume*	*dose/day*
1	12 inches	30/30	1000	2 gpd/ft^2	5
2	18 inches	30/30	1000	2 gpd/ft^2	5
3	24 inches	30/30	1000	2 gpd/ft^2	5
4	18 inches	30/30	10,000	2 gpd/ft^2	5
5	24 inches	30/30	10,000	2 gpd/ft^2	5
6	30 inches	30/30	10,000	2 gpd/ft^2	5
7	36 inches	30/30	10,000	2 gpd/ft^2	5
8	24 inches	220/150	1,000,000 - 10,000,000	1 gpd/ft^2	5
9	36 inches	220/150	1,000,000 - 10,000,000	1 gpd/ft^2	5
10	24 inches	30/30	10,000	2 gpd/ft^2	1
11	48 inches	220/150	1,000,000 - 10,000,000	1 gpd/ft^2	5
12	60 inches	220/150	1,000,000 - 10,000,000	1 gpd/ft^2	5

Column construction was based on the recommendations found in the review paper published by Bitton et al (1979). This paper reviews and evaluates column construction protocols outlined in the literature. Columns were constructed of 3 inch PVC pipe with the pipe sections mounted vertically in a bench top rack. The bottom of each pipe section was fitted with a glazed ceramic buechner funnel lined with nylon screening. The funnel was sealed in place with silicone caulk. The mound sand was purchased from a Dane County sand and gravel dealer and was tested by the University of Wisconsin Soil and Plant Analysis Lab. This analysis was determined suitable by Leroy Jansky, Department of Commerce Wastewater Specialist as meeting the ASTM C-33 standard for use in Wisconsin mound systems. The dry mound sand was scooped into the columns and compacted by tapping the sides of the column. Each column was topped off with six inches of 3/4 inch washed gravel. The spiked septic tank effluent was delivered to the top of the columns through 1/8th inch inside diameter Tygon$_{TM}$ tubing. (See figures 1a/b below).

Figure 1a (drawing).

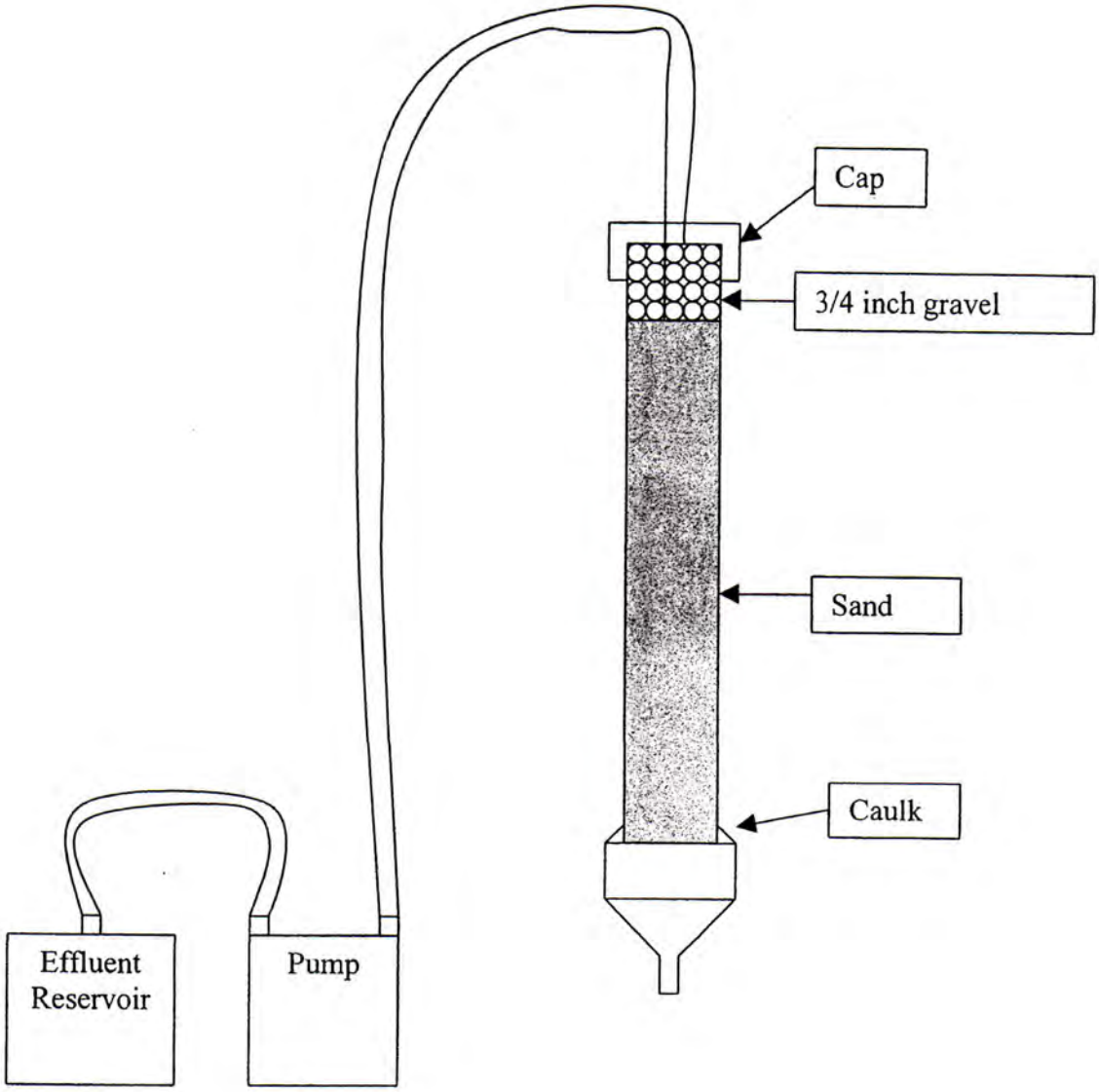
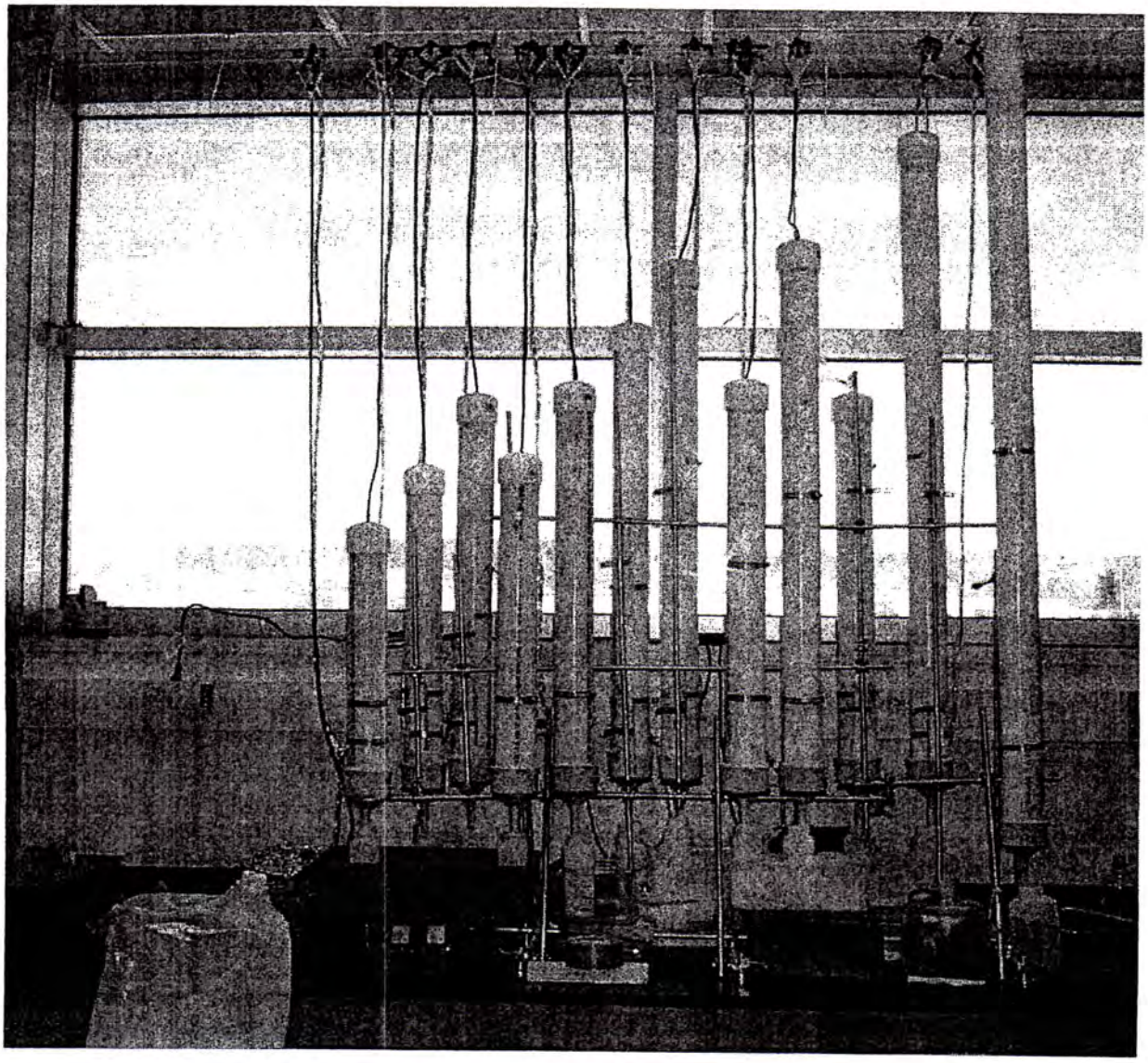


Figure 1.b (photo)



Since the microbe counts of the spiking solutions were measured in the spiking reservoirs, there was some concern as to whether the microbe levels actually dripping from the 1/8th inch tubing would be the same as in the reservoirs. Simultaneous determinations of microbial content of the reservoirs compared to the microbial content at the column end of the spike delivery tubing were made. The results are summarized in table 7. Analysis of this data indicates that there is no difference between the microbial content of the microbial reservoir and the microbial content of the effluent being delivered through the tubing to the columns.

Table 7.

Effluent straight from spiking reservoir		**Effluent at column input**	
	Column 1		**Column 1**
total coliform	64,400	total coliform	52,000
E. coli	1440	*E. coli*	3100
fecal coliform	1000	fecal coliform	240
Enterococci faecalis	1350	*Enterococci faecalis*	>2419.2
male-specific coliphage	1000	male-specific coliphage	<5
	Column 7		**Column 7**
total coliform	644,000	total coliform	644,000
E. coli	14,528	*E. coli*	19,180
fecal coliform	10,000	fecal coliform	15,500
Enterococci faecalis	13,620	*Enterococci faecalis*	7490
male-specific coliphage	10,000	male-specific coliphage	10,000
	Column 12		**Column 12**
total coliform	32,200,000	total coliform	10,900,000
E. coli	1,313,000	*E. coli*	906,000
fecal coliform	1,160,000	fecal coliform	1,130,000
Enterococci faecalis	31,000	*Enterococci faecalis*	52,000
male-specific coliphage	410,000	male-specific coliphage	160,000

Flows through the tubing were periodically monitored and adjusted to specifications. Clogged lines were occasionally observed and immediately corrected. Generally we were able to keep the flow rates within 10% of the target throughout the duration of the experiment.

To further characterize column function, dissolved oxygen and conductivity determinations were made on the both the septage being dosed to the column top and the effluent collected from the bottom of the column. These results are presented in table 8. below. The conductivity values remained unchanged as the septage passed through the columns. The dissolved oxygen values remained unchanged for the low strength wastes, but increased significantly for the high strength wastes as the septage passed through the columns.

Table 8.

Dissolved oxygen and conductivity at inlet and outlet of columns

	Pre-Column Effluent		*Post-Column Effluent*	
Column	DO mg/L	Conductivity umho's/cm	DO mg/L	Conductivity umho's/cm
1	8	1340	8.2	1340
2	7.8	1290	8.3	1330
3	7.5	1320	8.3	1290
4	7.1	1310	8.3	1340
5	7.3	1390	8.3	1300
6	7.3	1300	8.3	1290
7	6.8	1370	8.3	1300
8	6.5	3670	8.2	3630
9	4.1	3460	8.2	3470
10	8.5	1360	8	1340
11	5.6	3280	8.05	3490
12	4.8	3610	8.1	3500

Preliminary dosing of the columns was begun onto dry sand. The longer columns were dosed many times before the sand was saturated enough so that effluent would drip from the bottom of the column in response to the dosing. At week 22, data was collected to characterize the flow volumes from the bottom of each column immediately after each dosing. Since the columns were dosed at four hour intervals, the effluent was captured for various time intervals from the bottom of the columns and measured. These data are presented graphically for representative column lengths in figures 2-12 below. Generally, the drip rate of effluent from the bottom of the columns was related to the depth of the sand. The twelve inch column would begin dripping almost immediately after dosing and the longer columns would have a slower response with the longest columns dripping fairly steadily at all times. The strength of the effluent also affected the drip rate. Figures 4 and 5 present data from 24 inch columns both receiving low strength wastes. The graphs are very similar. Almost all of the 74 mL dose

passed through the column during the four hour observation period. On both columns there was an immediate flush of about 10mL followed by a steady increase in flow peaking at 60 to 90 minutes. Figure 6 contains the data for the 24 inch column dosed with the high strength waste. Once again there is an immediate flush but the flow is steady for the four hour observation period. Only 24 of the 34 mLs applied had passed through by the end of the period. This phenomenon could be explained either by the lower hydraulic loading or by biofilm formation interfering with flows. The same observations can be made in the 36 inch columns presented in figures 8 and 9.

Figure 2. 12 inch column receiving 2 gallons/day low strength effluent (column 1)

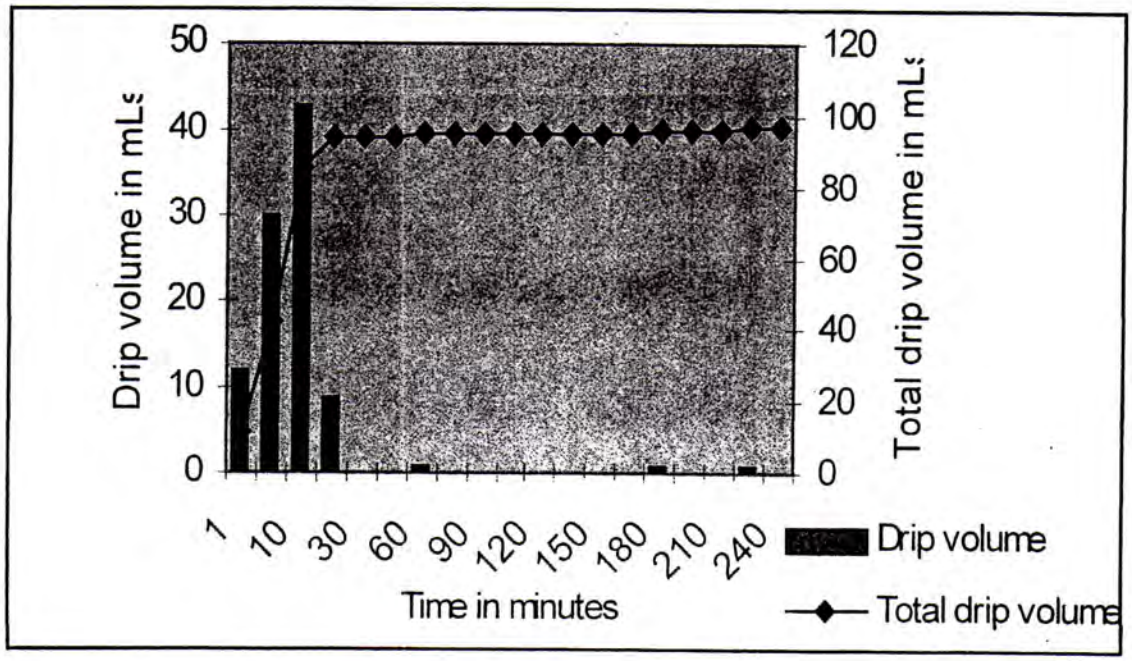


Figure 3. 18 inch column receiving 2 gallons/day low strength effluent (column 2)

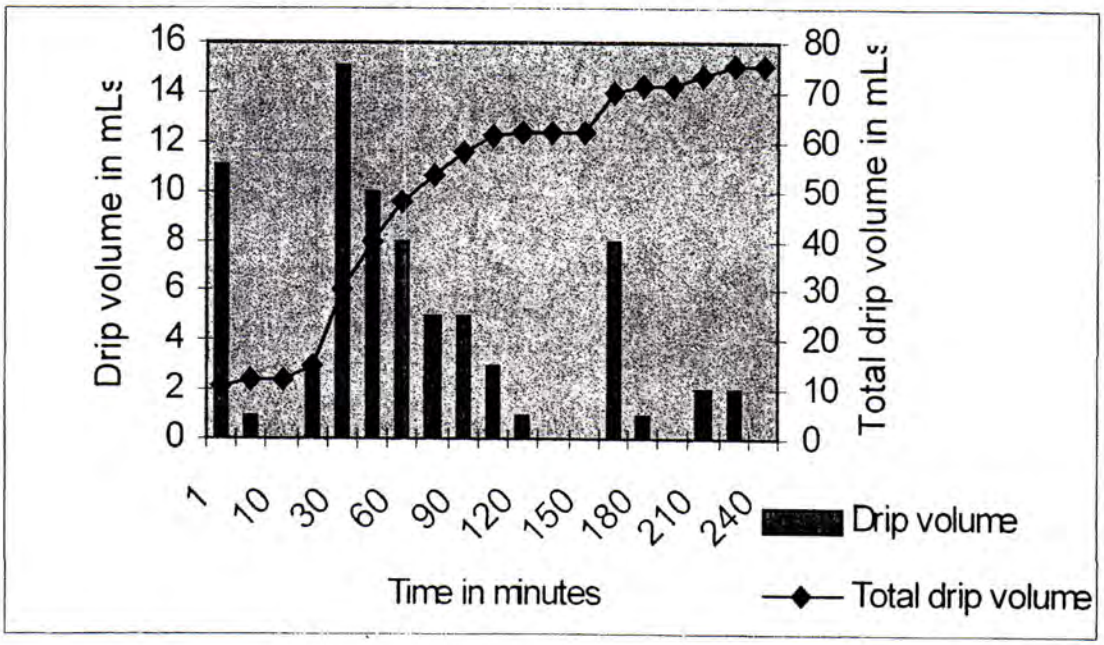


Figure 4. 24 inch column receiving 2 gallons/day low strength effluent (column 3)

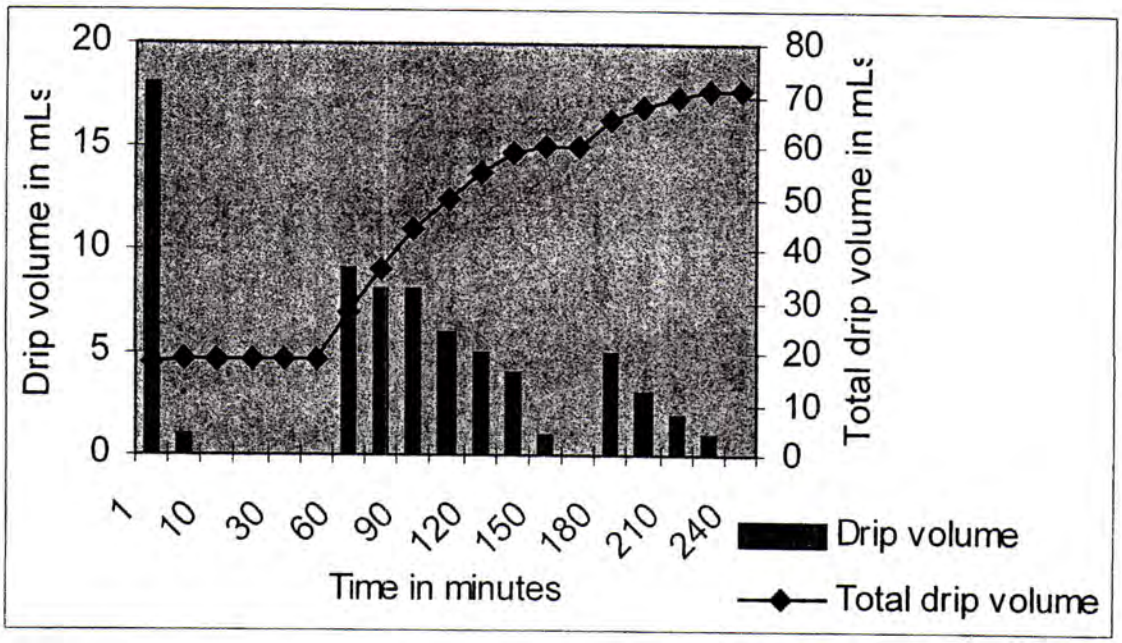


Figure 5. 24 inch column receiving 2 gallons/day low strength effluent (column 5)

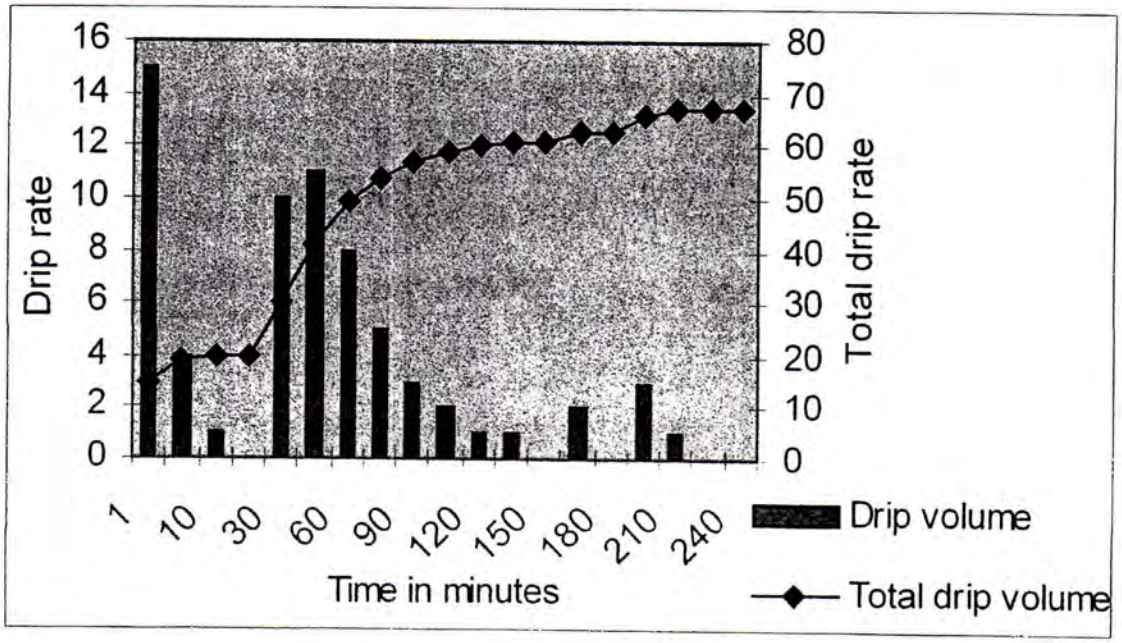


Figure 6. 24 inch column receiving 1 gallon/day high strength effluent (column 8)

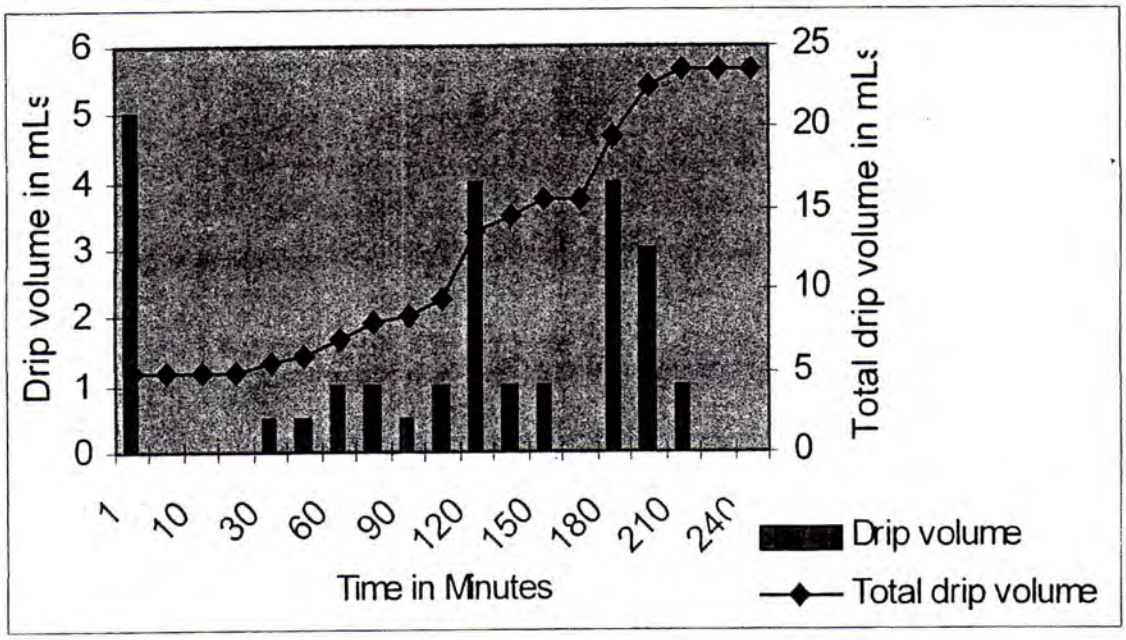


Figure 7. 30 inch column receiving 2 gallon/day low strength effluent (column 6)

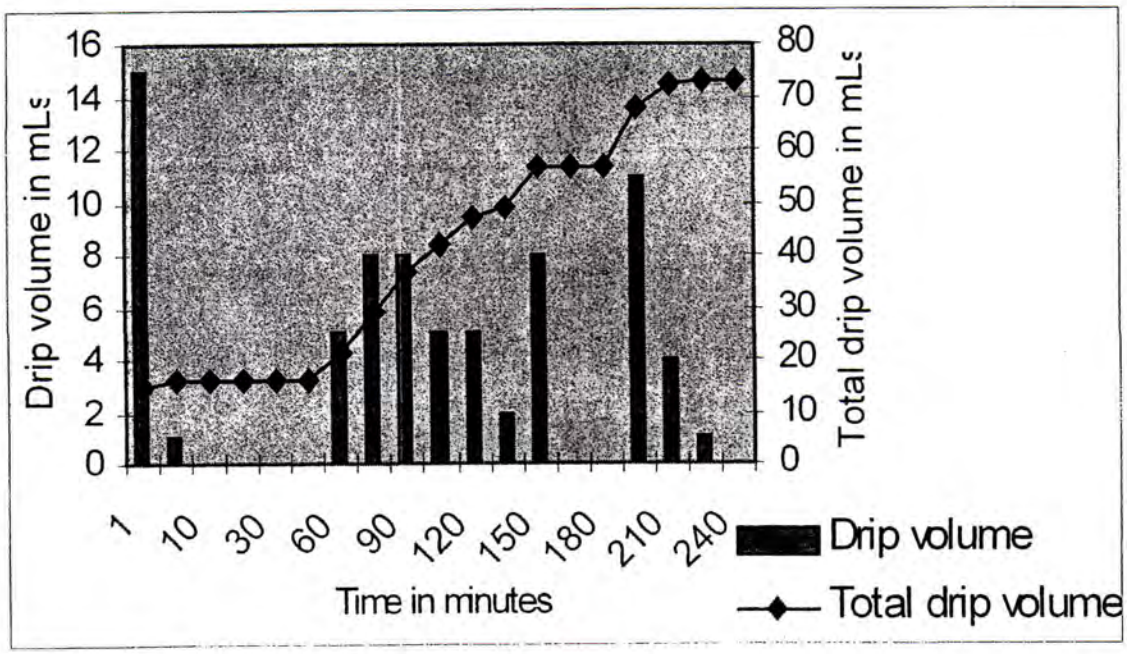


Figure 8. 36 inch column receiving 2 gallon/day low strength effluent (column 7)

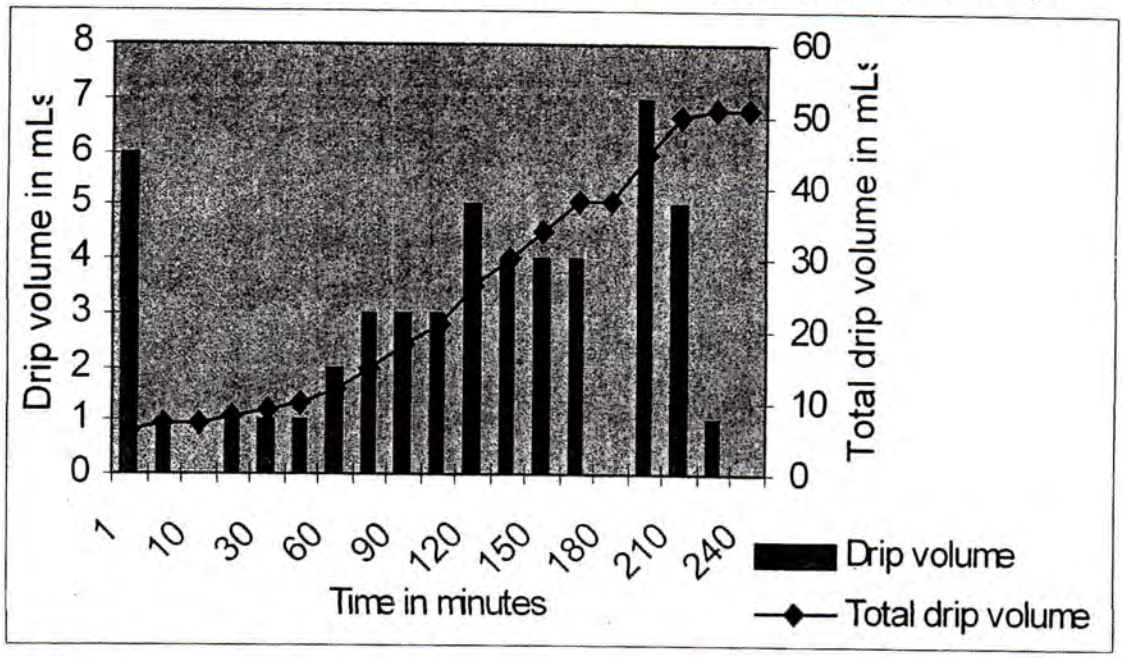


Figure 9. 36 inch column receiving 1 gallon/day high strength effluent (column 9)

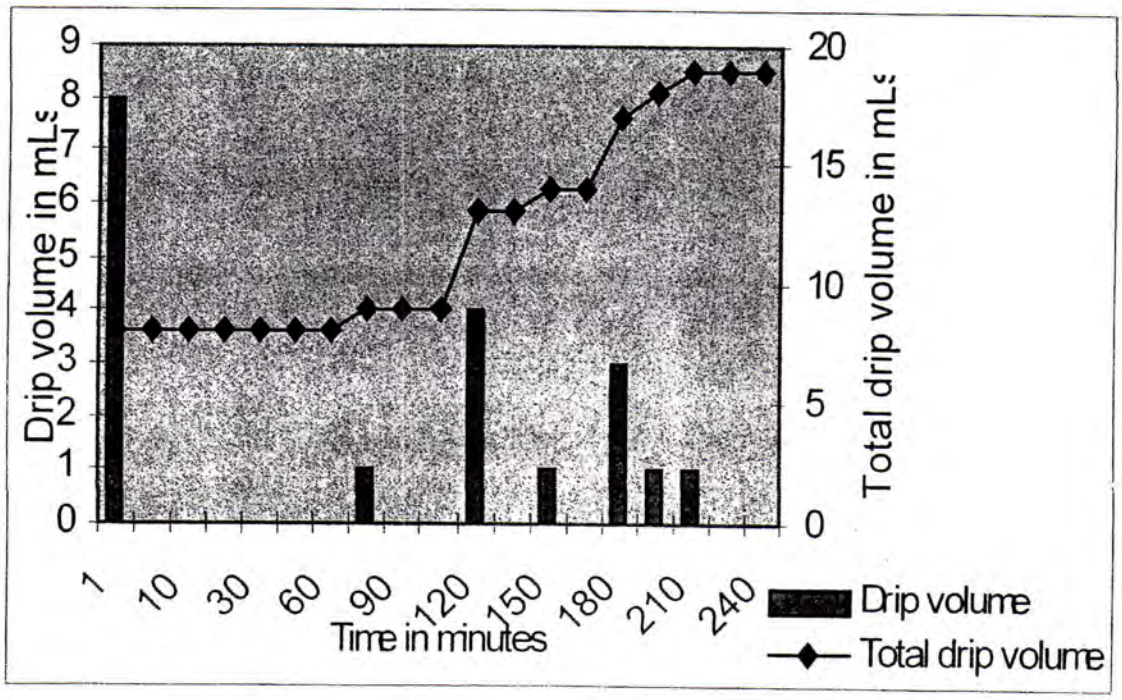


Figure 10. 48 inch column receiving 1 gallon/day high strength effluent (column 11)

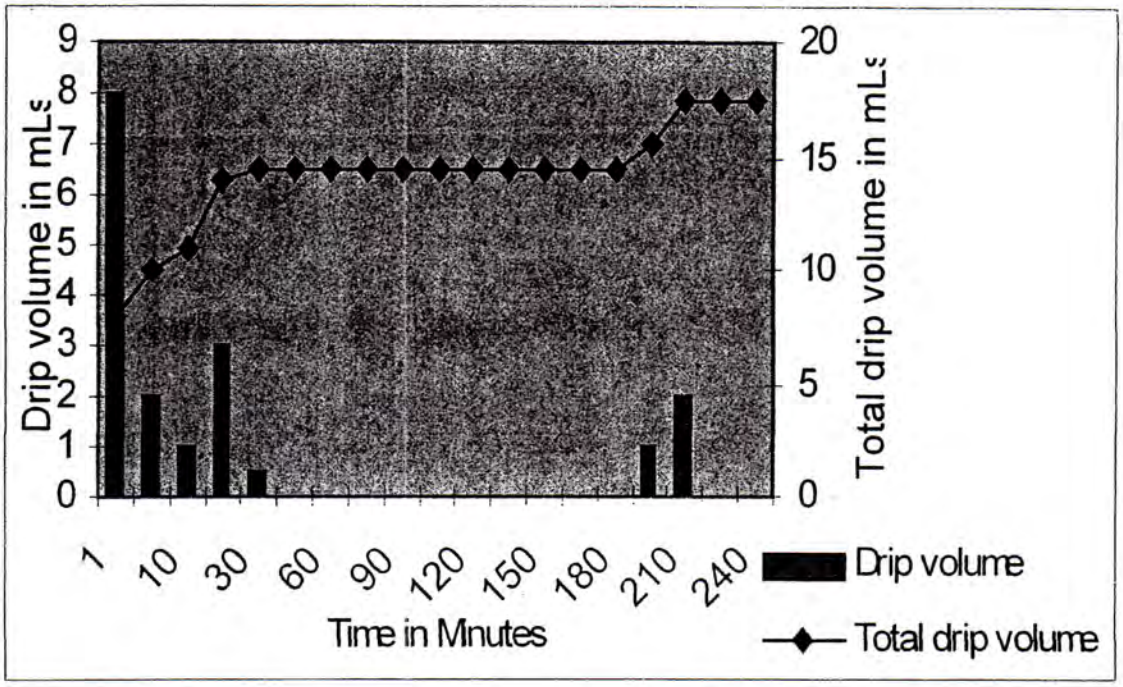


Figure 11. 60 inch column receiving 1 gallon/day high strength effluent (column 12)

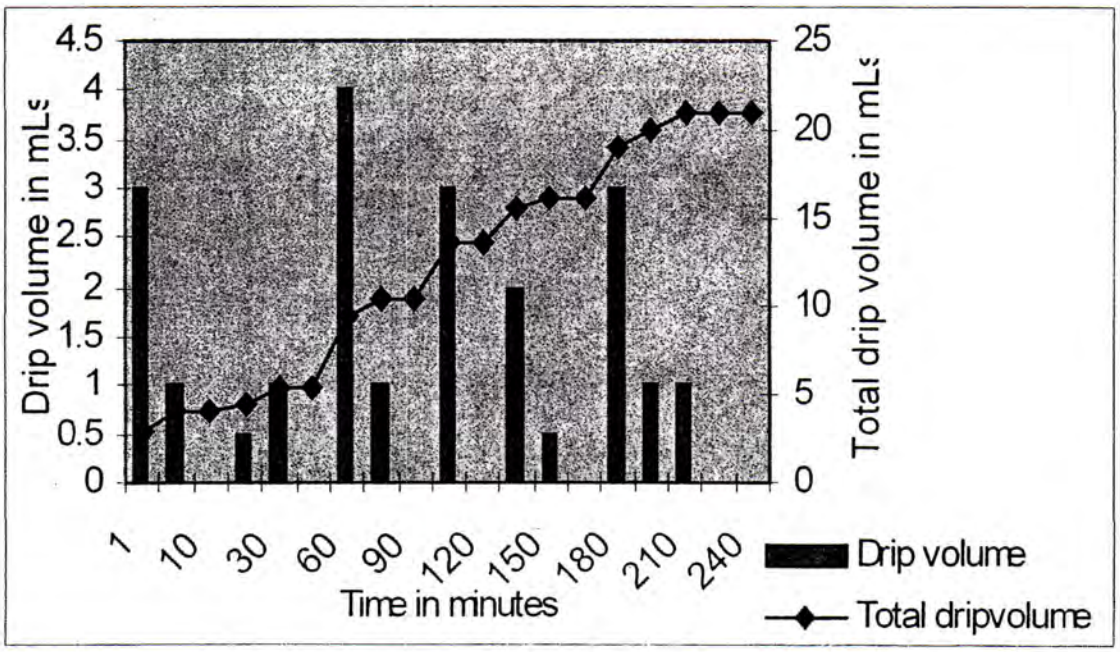
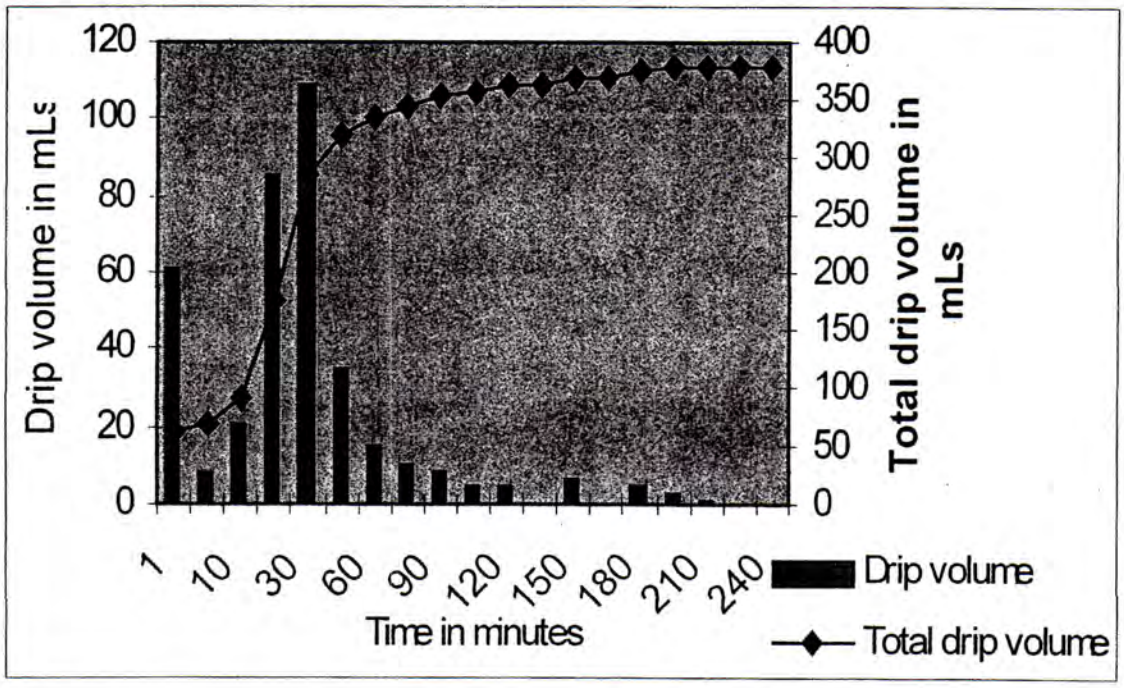


Figure 12. 24 inch column receiving 1 gallon/day high strength effluent, dosed once per day (column 10)



Counts of the microbial indicators for all five target organisms were determined for each batch of spike material prepared. This data is presented in tables 9-11. Preparing consistent spikes over the duration of the experiment was one of the most difficult aspects of this study. Although there was some week to week variability in the spiking doses, we are generally very pleased with the results. The spiked septic tank effluents always contained sufficient numbers of organisms to be representative of organism levels that could be expected in actual systems. Tables 9-11 are divided into two portions where the top portion summarizes the target levels for each organism followed by the geometric mean(average) of all the counts for each organism. The second portion of each table contains the raw data from the analysis of each week's spike preparation used to calculate the geometric means.

Table 9. Organism spike concentrations for columns 1-3.

Columns 1-3	total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci / 100mL	male-specific coliphage / 100mL
Target #/100mL	35,640	1440	1000	1350	1000
geometric mean Of all data	33,035	3,002	1,247	520	459

Columns 1-3	Total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci /100mL	Male-specific coliphage / 100ml
Target #/100mL	*35,640*	*1440*	*1000*	*1350*	*1000*
12/14/00	727	548	300)	119	<5
1/4/01	6370	2010	270	200	6500
1/5/01	4410	1300	260	77.1	1000
1/7/01	4640	1850	230	54.7	<5
1/8/01	3680	940	220	77.1	<5
1/9/01	3,730	1414	168	79.4	500
1/10/01	2,210	921	120	63.7	<5
1/11/01	129,970	1,320	160	107	26,000
1/18/01	54,750	1,730	900	145	1500
1/25/01	43,500	1,565	730	81.6	200
2/1/01	36,900	6,867	6000	1313	500
2/8/01	37,300	13,200	9600	813	300
2/15/01	51,200	2,602	1400	749	100
2/22/01	41,000	9,700	5300	1233	100
3/1/01	239,200	17,500	11,200	1565	200
3/9/01	52,900	14,136	3,200	1565	100
3/16/01	24,000	12,997	1,400	2000	100
3/23/01	29,900	450	390	201	100
3/29/01	13,400	1,000	17	2000	500
4/5/01	12,000	98	11	74	1200
4/12/01	13,500	1,000	LA	107	1000
4/19/01	64,400	3,448	2,200	2000	1000
4/26/01	23,100	1,565	660	1000	600
5/3/01	106,700	5,172	4,000	1112	1500
5/10/01	17,500	1,669	1,900	1000	1000
5/17/01	31,300	5,200	760	1354	900
5/24/01	>2,419,200	9,800	14,300	2000	1000
5/31/01	57,600	8,600	6,000	1669	1100

Table 9. continued

Columns 1-3	Total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci /100mL	Male-specific coliphage / 100ml
Target #/100mL	*35,640*	*1440*	*1000*	*1350*	*1000*
6/6/01	29,900	28,200	19,800	1956	300
6/11/01	75,400	7,400	9,900	884	200
6/14/01	75,400	9,700	8,200	836	500
6/18/01	129,100	8,500	7,000	4100	200
6/20/01	117,800	3,000	1,200	860	300
6/25/01	49,600	3,100	770	733	100
6/27/01	24,600	1,145	1,300	677	100
7/3/01	54,800	2,000	16,000	703	200

Table 10. Organism spike concentrations for columns 4,5,6,7, and 10.

Columns 4-7,10	total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci / 100mL	male-specific coliphage / 100mL
Target #/100mL	359,568	14,528	10,000	13,620	10,000
Geometric mean all data	295663	27075	9952	5160	3516
12/14/00	2,400	2,400	2500	1733	1000
1/4/01	81,640	15,410	1,000	1,210	12000
1/5/01	57,940	12,590	1000	860	8500
1/7/01	98,040	8,050	900	866	5500
1/8/01	48,840	13,330	900	740	500
1/9/01	30,760	10,810	690	980	2000
1/10/01	32,550	8650	460	866.4	500
1/11/01	677,000	13,170	1900	1414	140,000
1/18/01	496,000	14,970	3900	1450	10,000
1/25/01	435,000	15,650	7300	816.4	2000
2/1/01	369,000	68,670	60,000	13,130	5000
2/8/01	373,000	132,000	96,000	8,130	3000
2/15/01	512,000	26,020	14,000	7,490	1000
2/22/01	410,000	97,000	53,000	12,330	1000
3/1/01	2,392,000	175,000	112,000	15,650	2000
3/9/01	529,000	141,360	32,000	15,650	1000
3/16/01	240,000	129,970	14,000	20,000	1000
3/23/01	299,000	4,500	3,900	2,010	1000

Table 10. continued

Columns 4-7,10	Total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci /100mL	Male-specific coliphage / 100ml
Target #/100mL	359,568	14,528	10,000	13,620	10,000
3/29/01	134,000	10,000	170	20,000	5000
4/5/01	120,000	1,046	110	740	12,000
4/12/01	135,000	10,000		1,070	10,000
4/19/01	644,000	34,480	22,000	20,000	10,000
4/26/01	231,000	15,650	6,600	10,000	6000
5/3/01	1,067,000	51,720	40,000	11,120	15,000
5/10/01	175,000	16,690	19,000	10,000	10,000
5/17/01	313,00	52,000	7,600	13,540	9,000
5/24/01	24,000,000	98,000	143,000	20,000	10,000
5/31/01	576,000	86,000	60,000	16,690	11,000
6/6/01	299,000	282,000	198,000	19,560	3,000
6/11/01	754,000	74,000	99,000	8,840	2,000
6/14/01	754,000	97,000	82,000	8,360	5,000
6/18/01	1,291,000	85,000	70,000	41,000	2,000
6/20/01	1,178,000	30,000	12,000	8,600	3,000
6/25/01	496,000	31,000	7,700	7,330	1,000
6/27/01	246,000	11,450	13,000	6,770	1,000
7/3/01	548,000	20,000	160,000	7,030	2,000

Table 11. Organism spike concentrations for columns 8,9,11 and 12

Columns 8,9,11,12	Total coliform / 100mL	E. coli / 100mL	Fecal coliform / 100mL	Enterococci / 100mL	Male-specific coliphage / 100mL
Target #/100mL	6,768,575	485,100	475,000	24,015	7559
Geometric mean All data	16,517,310	595,418	525,223	45,931	194,446
12/14/00			3,100,000		310,000
1/4/01	19,863,000	487,000	200,000	14,390	229,500
1/5/01	24,192,000	189,000	200,000	18,500	290500
1/7/01	17,329,000	74,000	100,000	5,880	290,000
1/8/01	10,462,000	86,640	95,000	7630	88,500
1/9/01	12,033,000	104,620	108,000	7,980	95,000
1/10/01	7,701,000	81,640	86,000	4500	18,000
1/11/01	48,700,000	1,850,000	1,060,000	29,090	28,000
1/18/01	1,000,000	985,000	470,000	46,110	160,000
1/25/01	19,900,000	637,000	400,000	18,500	64,500
2/1/01	29,800,000	473,000	430,000	20,000	350,000
2/8/01	21,800,000	1,145,000	1,000,000	63,000	440,000

Table 11, continued

Columns 8,9,11,12	Total coliform / 100mL	E. coli / 100mL	fecal coliform / 100mL	Enterococci /100mL	Male-specific coliphage / 100ml
Target #/100mL	6,768,575	485,100	475,000	24,015	7559
2/15/01	17,500,000	496,000	200,000	38,730	96,000
2/22/01	3,000,000	318,000	140,000	30,760	41,000
3/1/01	24,192,000	408,000	400,000	2,000,000	140,000
3/9/01	5,475,000	278,000	92,000	3,255,000	62,000
3/16/01	17,329,000	908,000	140,000	910,000	100,000
3/23/01	14,800,000	324,000	610,000	246,000	20,000
3/29/01	12,000,000	594,000	640,000	213,000	30,000
4/5/01	24,192,000	285,000	200,000	31,000	400,000
4/12/01	7,701,000	173,000	30,000	96,000	570,000
4/19/01	32,200,000	1,313,000	1,160,000	31,000	410,000
4/26/01	6,300,000	613,000	200,000	54,750	240,000
5/3/01	39,900,000	455,000	440,000	54,750	970,000
5/10/01	51,200,000	780,000	5,400,000	20,000	2,300,000
5/17/01	25,900,000	313,000	2,600,000	20,000	440,000
5/24/01	27,200,000	862,000	820,000	86,640	450,000
5/31/01	22,800,000	1,529,000	2,300,000	30,000	200,000
6/6/01	14,600,000	1,000,000	1,030,000	31,000	300,000
6/11/01	13,400,000	1,259,000	1,430,000	52,000	140,000
6/14/01	15,531,000	1,789,000	1,800,000	97,000	340,000
6/18/01	47,300,000	5,172,000	3,100,000	40,000	370,000
6/20/01	24,900,000	2,187,000	1,600,000	30,760	490,000
6/25/01	24,196,000	2,603,000	2,000,000	98,000	290,000
6/27/01	14,600,000	2,000,000	1,520,000	30,000	750,000
7/3/01	24,900,000	1,722,000	2,500,000	18,500	270,000

Results and Discussion

The overall objective of this study was to determine if a variety of microbes in septic tank effluents of varying qualities could in fact be removed by passage through mound sand in a controlled laboratory environment. The results are summarized in a series of tables below. All of the data is presented in pairs of tables where the eight columns dosed with the high quality effluent (BOD and suspended solids <30 mg/L) are separated from the four columns that received the low quality septic tank effluent (BOD and suspended solids>100).

In addition to the microbial occurrence data collected on the column effluents, pH values were also determined. Table 12 presents the low, high and average pH values

for the weekly effluent samples collected from the bottom of the experimental columns. In all experiments the pH was extremely stable.

Table 12.
Summary of column effluent pH's for columns dosed with high quality septic system effluent.

Column number	1	2	3	4	5	6	7	10
Column Length	**12 inch**	**18 inch**	**24 inch**	**18 inch**	**24 inch**	**30 inch**	**36 inch**	**24 inch**
Doses per day	**5/day**	**5/day**	**5/day**	**5/day**	**5/day**	**5/day**	**5/day**	**1/day**
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Target microbe Dose/ 100 mL	1,000	1,000	1,000	10,000	10,000	10,000	10,000	10,000
Low pH	7.9	8.1	8.3	8.3	8.3	8.4	8.4	8.2
High pH	8.6	8.6	8.6	8.6	8.7	8.6	8.6	8.7
Average pH	8.3	8.4	8.5	8.4	8.5	8.5	8.5	8.4

Table 13.
Summary of column effluent pH's for columns dosed with low quality septic system effluent.

Column number	8	9	11	12
Column Length	**24 inch**	**36 inch**	**48 inch**	**60 inch**
Doses per day	**5/day**	**5/day**	**5/day**	**5/day**
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Target microbe dose/100mL	1,000,000	1,000,000	1,000,000	1,000,000
Low pH	7.8	7.6	8.0	7.8
High pH	8.5	8.4	8.5	8.4
Average pH	8.1	8.1	8.3	8.0

Total coliform is the indicator that has been traditionally used by water microbiologists since 1920 to detect microbial contamination of wells. While total coliform does, in fact, detect outside contamination of a water well system, its ability to accurately predict the presence of fecal material is limited. The total coliform data is presented in tables 14 and 15. The data collected through week 18 on the columns dosed with the high quality effluent 5 times per day at 2 gpd/ft^2 conclusively demonstrates the ability of mound sand to remove almost all of the total coliform organisms introduced to the tops of the columns. The occasional low level detections were most likely due to the difficulty in maintaining sterile conditions during sample collection. The removal efficiency could be characterized as four log reduction, or 99.99% removal.

The 24 inch column dosed once per day with high quality effluent spiked with 10,000 organisms/ 100 mL, presents a different picture. Total coliforms appeared in the effluent of this column at week three and continued to increase in numbers over time. This once per day dosing scenario resulted in a removal efficiency of 3 logs or 99.9%. Additionally when increases in dosing volume were begun on the remainder of the columns at week 19, with a doubling of the flow rate, passage of total coliform can be observed in the 18 inch column dosed with $3x10^5$ organisms but not in the longer columns, or in the columns dosed with $3.3x10^4$ organisms. At week 29 the flow rate was again doubled, resulting in total coliform breakthrough in all of the columns. For the 24, 36,48 and 60 inch columns dosed with the low quality effluent and $1.7x10^7$ organisms, breakthrough also didn't occur until the second phase of dose increases was begun. Once the columns failed, removal efficiencies on these columns dropped to less than 2 logs and was similar for all three dose levels. There is one quirk in the data that we were unable to explain. Of the four columns dosed with the low quality effluent and the highest microbial counts, the shortest (24 inch) performed the best.

It should be noted that the 48 inch column became bio-fouled two weeks after the dosing rate was increased. A microbial mat formed at the surface of the column resulting in an over flow from the top of the column which in turn dripped down the outside of the column contaminating the effluent. The counts for this column from weeks 24 and 27 are most likely from the dripping contamination. Testing on this column was terminated at this point.

Table 14. Total coliform levels/ 100 mLs for columns dosed with high quality septic system effluent.

Column number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*10*
Column Length	12 inch	18 inch	24 inch	18 inch	24 inch	30 inch	36 inch	24 inch
Doses per day	5/day	5/day	5/day	5/day	5/day	5/day	5/day	1/day
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Volume/dose	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	372mLs
Microbe dose level/100mL	33,000	33,000	33,000	300,000	300,000	300,000	300,000	300,000
Week 3 12/15/00	2	1	0	0	0	2	0	47.2
Week 6 1/04/01	0	0	0	0	0	0	0	410.6
Week 9 1/25/01	2	0	0	6.3	0	0	0	129.6
Week 12 2/15/01	1	0	0	0	0	0	0	16,160
Week 15 3/7/01	0	0	0	0	0	0	0	24,810
Week 18 3/28/01	0	0	0	0	0	0	0	3270
Week 21 4/19/01*	0	0	0	0	0	0	0	
Volume/dose	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	744 mLs
Week 23 5/3/01	7.4			200				816.4
Week 24 5/9/01	0	1	0	53.8	14.6	sacrificed	0	81,640
Week 27 6/1/01	0	0	0	365.4	28.2		0	
Week 29 6/14/01**	57.6	310	13.5	13,960	114.5		310	
Volume/dose	296 mL	296 mL	296 mL	296 mL	296 mL		296 mL	
Week 30 6/19/01	58.3	116.2	8.4	3,950	0		630	
Week 30 6/21/01	27.9	66.3	6.3	3,310	95.9		410	
Week 30 6/22/01	18.5	29.5	8.6	2430	113.7		285.1	
Week 31 6/26/01	17.3	56.3	12.2	1732.9	107.1		261.3	
Week 31 6/28/01	23.1	45.5	9.8	3360	435.2		78.9	

- *Flow rate doubled at end of week 19
- **Flow rate quadrupled at end of week 28

Table 15. Total coliform levels/100mLs for columns dosed with low quality septic system effluent.

Column number	*8*	*9*	*11*	*12*
Column Length	24 inch	36 inch	48 inch	60 inch
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Dosing volume	37 mLs	37 mLs	37 mLs	37 mLs
Doses per day	5/day	5/day	5/day	5/day
Microbe dose level/100mL	17,000,000	17,000,000	17,000,000	17,000,000
Week 3 12/15/00	0	0	0	0
Week 6 1/04/01	0	0	0	0
Week 9 1/25/01	0	0	0	0
Week 12 2/15/01	0	0	0	0
Week 15 3/7/01	0	0	0	0
Week 18 3/28/01*	0	0	0	0
Dosing volume	74mLs	74mLs	74mLs	74mLs
Week 21 4/19/01	0	0	0	12.1
Week 23 5/3/01	0			
Week 24 5/9/01	0	0	20.3	3.1
Week 27 6/1/01	0	0	>2419.2	0
Week 29 6/14/01**	>241,920	310	biofouled	>241,920
Dosing volume	148mLs	148mLs	148mLs	148mLs
Week 30 6/19/01				
Week 30 6/21/01	3590	>241,960		>241,960
Week 30 6/22/01	2750	6050		>241,960
Week 31 6/26/01	23,590	241,960		>241,960
Week 31 6/28/01	98,040	>241,960		>241,960
	141,360	>241,960		>241,960

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

The fecal coliform data is presented in tables 16 and 17. Once again, the total absence of this indicator in the effluents from all columns before the dose rates were increased, supports the observation that the mound sand is very capable of removing enteric bacteria. With one exception, the conclusions and observations that can be drawn from this data are the same as those outlined above related to the total coliform data set. The exception is that the columns dosed with the high quality effluent with the lowest concentrations of organisms showed very little passage of fecal coliform, even after dosing rates were increased.

Table 16. Fecal coliform levels/100 mLs for columns dosed with high quality septic system effluent.

Column number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*10*
Column Length	12 inch	18 inch	24 inch	18 inch	24 inch	30 inch	36 inch	24 inch
Doses per day	5/day	5/day	5/day	5/day	5/day	5/day	5/day	1/day
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Volume/dose	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	372mLs
Microbe dose level/100mL	1,200	1,200	1,200	10,000	10,000	10,000	10,000	10,000
Week 3 12/15/00	0	0	0	0	0	0	0	17
Week 6 1/04/01	0	0	0	0	0	0	0	100
Week 9 1/25/01	0	0	0	0	0	0	0	60
Week 12 2/15/01	0	0	0	0	0	0	0	5600
Week 15 3/7/01	0	0	0	0	0	0	0	1000
Week 18 3/28/01*	0	0	0	0	0	0	0	10
Volume/dose	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	744 mLs
Week 21 4/19/01	0	0	0	0	0	0	0	0
Week 23 5/3/01	0			1				
Week 24 5/9/01	0	0	0	0	0	sacrificed	0	3900
Week 27 6/1/01	0	0	0	10	2		0	810
Week 29 6/14/01**	10	40	<10	4500	50		100	11,500
Volume/dose	296 mL	296 mL	296 mL	296 mL	296 mL		296 mL	
Week 30 6/19/01	10	20	0	360	40		230	
Week 30 6/21/01	0	0	0	400	20		80	
Week 30 6/22/01	0	0	0	300	0		30	
Week 31 6/26/01	0	0	0	40	30		40	
Week 31 6/28/01	0	0	0	50	0		0	

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

Table 17. Fecal coliform levels/100 mLs for columns dosed with low quality septic system effluent.

Column number	*8*	*9*	*11*	*12*
Column Length	24 inch	36 inch	48 inch	60 inch
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Dosing volume	37 mLs	37 mLs	37 mLs	37 mLs
Doses per day	5/day	5/day	5/day	5/day
Average microbe dose level/100mL	530,000	530,000	530,000	530,000
Week 3 12/15/00	0	0	0	0
Week 6 1/04/01	0	0	0	0
Week 9 1/25/01	0	0	0	0
Week 12 2/15/01	0	0	0	0
Week 15 3/7/01	0	0	0	0
Week 18 3/28/01	0	0	0	0
Week 21 4/19/01*	0	0	0	0
Dosing volume	74mLs	74mLs	74mLs	74mLs
Week 23 5/3/01	0			
Week 24 5/9/01	0	0	0	0
Week 27 6/1/01	0	0	15,000	0
Week 29 6/14/01**	2500	20	biofouled	800
Dosing volume	148mLs	148mLs	148mLs	148mLs
Week 30 6/19/01	470	190,000		190,000
Week 30 6/21/01	90	500		270,000
Week 30 6/22/01	330	18,000		220,000
Week 31 6/26/01	4700	120,000		0
Week 31 6/28/01	5100	238,000		8,600

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

The data from the *E. coli* testing is presented in tables 18 and 19. The data and subsequent conclusions and observations tracks well with the fecal coliform data with one exception. The *E. coli* counts tend to be slightly higher and there are a few more detections in columns 1-3. This is most likely due to the testing methodology. It has been well documented that the Colilert™ test system is more effective at recovering stressed organisms and thus is expected to have higher counts and more detections at low levels than the fecal coliform (MFFCC) test.

Table 18. *E. coli* levels/100 mLs for columns dosed with high quality septic system effluent

Column number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*10*
Column Length	12 inch	18 inch	24 inch	18 inch	24 inch	30 inch	36 inch	24 inch
Doses per day	5/day	5/day	5/day	5/day	5/day	5/day	5/day	1/day
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Volume/dose	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	372mLs
Microbe dose level/100mL	3,000	3,000	3,000	27,000	27,000	27,000	27,000	27,000
Week 3 12/15/00	0	0	0	0	0	0	0	39.3
Week 6 1/04/01	0	0	0	0	0	0	0	172.3
Week 9 1/25/01	0	0	0	0	0	0	0	58.1
Week 12 2/15/01	0	0	0	0	0	0	0	5280
Week 15 3/7/01	0	0	0	0	0	0	0	6760
Week 18 3/28/01	0	0	0	0	0	0	0	40.8
Week 21 4/19/01*	0	0	0	0	0	0	0	3.1
Volume/dose	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	744 mLs
Week 23 5/3/01	0			6.3				
Week 24 5/9/01	0	0	0	6.3	2	sacrificed	0	5280
Week 27 6/1/01	0	0	0	11.9	1		0	9330
Week 29 6/14/01**	100	100	3.1	6050	17.3		200	31,000
Volume/dose	296 mL	296 mL	296 mL	296 mL	296 mL		296 mL	
Week 30 6/19/01	14.5	14.5	3.1	860	0		410	
Week 30 6/21/01	1	3.1	1	410	12		100	
Week 30 6/22/01	2	5.2	3.1	300	11		103.9	
Week 31 6/26/01	0	1	0	85.5	2		38.4	
Week 31 6/28/01	0	0	0	210	4.1		13.4	

Table 19. *E. coli* levels/100 mLs for columns dosed with low quality septic system effluent

Column number	***8***	***9***	***11***	***12***
Column Length	24 inch	36 inch	48 inch	60 inch
Doses per day	5/day	5/day	5/day	5/day
Dosing volume	37 mLs	37 mLs	37 mLs	37 mLs
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Microbe dose level/100mL	600,000	600,000	600,000	600,000
Week 3 12/15/00	0	0	0	0
Week 6 1/04/01	0	0	0	0
Week 9 1/25/01	0	0	0	0
Week 12 2/15/01	0	0	0	0
Week 15 3/7/01	0	0	0	0
Week 18 3/28/01	0	0	0	0
Week 21 4/19/01*	0	0	0	0
Dosing volume	74mLs	74mLs	74mLs	74mLs
Week 23 5/3/01	0			
Week 24 5/9/01	0	0	0	0
Week 27 6/1/01	0	0	>2419.2	0
Week 29 6/14/01**	2090	1	biofouled	173,290
Dosing volume	148mLs	148mLs	148mLs	148mLs
Week 30 6/19/01	410	241,960		241,960
Week 30 6/21/01	310	980		>241,960
Week 30 6/22/01	630	26,130		>241,960
Week 31 6/26/01	4040	>241,960		16,070
Week 31 6/28/01	6700	>241,960		48,840

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

The data from the enterococci testing is presented in tables 20 and 21. This bacteria was included in the study because its physical characteristics allow it to pass through a soil matrix more readily than coliforms. Once again the mound sand was capable of removing the organism as long as the columns were not hydraulically overloaded.

Table 20. Enterococci levels/100 mLs for columns dosed with high quality septic system effluent.

Column number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*10*
Column Length	12 inch	18 inch	24 inch	18 inch	24 inch	30 inch	36 inch	24 inch
Doses per day	5/day	5/day	5/day	5/day	5/day	5/day	5/day	1/day
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Volume/dose	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	372 mLs
Microbe dose level/100mL	460	460	460	3,500	3,500	3,500	3,500	3,500
Week 6 1/04/01	0	0	0	1	0	0	0	0
Week 9 1/25/01	0	0	0	0	0	0	0	4.1
Week 12 2/15/01	0	0	0	0	0	0	0	16.1
Week 15 3/7/01	0	0	0	0	0	0	0	122.3
Week 18 3/28/01	0	0	0	0	0	0	0	310
Week 21 4/19/01*	0	0	0	0	0	0	0	21.8
Volume/dose	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	744 mLs
Week 23 5/3/01	0	0	0	0	0	0	0	14.8
Week 24	0			0				
Week 27 6/1/01	0	0	0	0	0	sacrificed	0	344.8
Week 29 6/14/01**	1	0	0	1	0		0	648.8
Volume/dose	296 mL	296 mL	296 mL	296 mL	296 mL		296 mL	1488mL
Week 30 6/19/01	0	0	0	7980	0		0	410
Week 30 6/21/01	0	0	0	200	0		3.1	
Week 30 6/22/01	3.1	1	0	30.9	1		2	
Week 31 6/26/01	2	1	0	21.6	0		0	
Week 31 6/28/01	0	0	0	16	0		0	

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

Table 21. Enterococci levels/100 mLs for columns dosed with low quality septic system effluent.

Column number	*8*	*9*	*11*	*12*
Column Length	24 inch	36 inch	48 inch	60 inch
Doses per day	5/day	5/day	5/day	5/day
Dosing volume	37 mLs	37 mLs	37 mLs	37 mLs
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Microbe dose level/100mL	46,000	46,000	46,000	46,000
Week 3 12/15/00	0	0	0	0
Week 6 1/04/01	0	0	0	0
Week 9 1/25/01	0	0	0	0
Week 12 2/15/01	0	0	0	0
Week 15 3/7/01	0	0	0	0
Week 18 3/28/01	0	0	0	0
Week 21 4/19/01*	0	0	0	0
Dosing volume	74mLs	74mLs	74mLs	74mLs
Week 23 5/3/01	0			
Week 24	0	0	0	0
Week 27 6/1/01	0	0	324.1	0
Week 29 6/14/01**	410	6.3	biofouled	12,100
Dosing volume	148mLs	148mLs	148mLs	148mLs
Week 30 6/19/01	35.9	3590		0
Week 30 6/21/01	32.3	100		5,290
Week 30 6/22/01	58.3	410		100
Week 31 6/26/01	200	1320		620
Week 31 6/28/01	410	4640		850

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

Male specific coliphage were included in this study as a surrogate for enteric virus. The extremely small size of virus particles as well as their surface charge characteristics make them the most likely organisms to pass through mound sand. Virus passage is particularly worrisome since the majority of gastro-intestinal disease in the U.S. is caused by viruses. The data collected to determine the passage of coliphage through the columns is presented in tables 22 and 23. For almost all of the columns dosed with the high quality effluent, even those spiked with the higher organism levels of organisms, all of the coliphage were removed. The exception was one occasion where a low level was detected from the 24 inch column dosed once per day. The organism was detected in each of the columns receiving the low quality effluent with the highest organism doses after the dosing rates were increased.

Table 22. Male Specific Coliphage/100 mLs levels for columns dosed with high quality septic system effluent.

Column number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*10*
Column Length	12 inch	18 inch	24 inch	18 inch	24 inch	30 inch	36 inch	24 inch
Doses per day	5/day	5/day	5/day	5/day	5/day	5/day	5/day	1/day
Dosing Rate	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2	2 gpd/ft^2
Volume/dose	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	74 mLs	372 mLs
Microbe dose Level/100 mL	460	460	460	3,500	3,500	3,500	3,500	3,500
Week 3 12/15/00	0	0	0	0	0	0	0	0
Week 6 1/04/01	0	0	0	0	0	0	0	0
Week 9 1/25/01	0	0	0	0	0	0	0	0
Week 12 2/15/01	0	0	0	0	0	0	0	0
Week 15 3/7/01	0	0	0	0	0	0	0	0
Week 18 3/28/01	0	0	0	0	0	0	0	0
Week 21 4/20/01*	0	0	0	0	0	0	0	0
Volume/dose	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	148 mL	744 mLs
Week 24 5/9/01	0	0	0	0	0	sacrificed	0	10
Week 27 6/1/01	0	0	0	0	0		0	0
Week 29 6/14/01**	0	0	0	0	0		0	0
Volume/dose	296 mL	296 mL	296 mL	296 mL	296 mL		296 mL	
Week 30 6/19/01	0	0	0	0	0		0	
Week 30 6/21/01	0	0	0	0	0		0	
Week 30 6/22/01	0	0	0	0	0		0	
Week 31 6/26/01	0	0	0	0	0		0	
Week 31 6/28/01	0	0	0	0	0		0	

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

Table 23. Male Specific coliphage/100mLs levels for columns dosed with low quality septic system effluent.

Column number	*8*	*9*	*11*	*12*
Column Length	24 inch	36 inch	48 inch	60 inch
Doses per day	5/day	5/day	5/day	5/day
Dosing volume	37 mLs	37 mLs	37 mLs	37 mLs
Dosing Rate	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2	1 gpd/ft^2
Microbe dose Level/100 mL	190,000	190,000	190,000	190,000
Week 3 12/15/00	0	0	0	0
Week 6 1/04/01	0	0	0	0
Week 9 1/25/01	30	0	0	100
Week 12 2/15/01	0	0	0	0
Week 15 3/7/01	0	0	0	0
Week 18 3/28/01	0	0	0	0
Week 21 4/20/01*	0	0	0	0
Dosing volume	74mLs	74mLs	74mLs	74mLs
Week 23 5/3/01	0			
Week 24 5/9/01	0	0	0	0
Week 27 6/1/01	0	0	1170	0
Week 29 6/14/01**	20	0	Bio-fouled	1350
Dosing volume	148mLs	148mLs	148mLs	148mLs
Week 30 6/19/01	40	30		3270
Week 30 6/21/01	140	0		20
Week 30 6/22/01	120	0		0
Week 31 6/26/01	250	280		120
Week 31 6/28/01	190	390		180

*Flow rate doubled at end of week 19

**Flow rate quadrupled at end of week 28

Five months into the study the researchers were surprised that very few organisms were passing through the columns. At week number 23 of the study it was decided to sacrifice the 30 inch column being dosed with the high quality effluent with the middle microbe dose to determine how far into the column the organisms had traveled. The column was removed from the rack and the sand was removed by pushing it up from the bottom using a piston device. Two inch sand segments from the first 12 inches were collected into separate sterile sampling bags as were four inch segments from the remainder of the column. Organisms from these sand samples were then extracted into sterile buffer which was subsequently tested for each of the study organisms. Interpretation of the data from the examination of sand samples for the organisms must be done with the understanding that the sample size tested is only 1% of what can be tested for a water sample. Additionally, the extraction of the organisms from the sand matrix may result in substantial loss. It was beyond the scope of this study to characterize this loss. The results are presented in table 24. None of the coliphage or enterococci were able to penetrate or survive in any part of the column. The total coliform, and to some

extent the *E. coli* and fecal coliform were detected in decreasing amounts as you moved down the column.

Table 24. Organism counts in sand from sacrificed 30 inch column - high quality effluent, 1000 FC/100mL dose rate, dosed 5 times per day, 2gpd/ft^2

	total coliform /gm	*E. coli /gm*	*Enterococci /gm*	*fecal coliform /gm*	*coliphage /gm*
gravel / sand interface	91	4	<1	10	<300
0 - 2 inches	74	1	<1	<10	<300
2 - 4 inches	85	3	<1	<10	<300
4 - 6 inches	18	<1	<1	<10	<300
6 - 8 inches	11	1	1	<10	<300
8 - 10 inches	10	1	<1	<10	<300
10 - 12 inches	3	<1	<1	<10	<300
12 - 16 inches	5	1	<1	<10	<300
16 - 20 inches	5	<1	<1	<10	<300
20 - 24 inches	5	<1	<1	<10	<300
24 - 28 inches	4	<1	<1	<10	<300
28 - 30 inches	<1	<1	<1	<10	<300
Residual	<1	<1	<1	<10	<300

At the completion of all dosing, the sand from various depths in four additional columns was collected and analyzed as described above. The data is presented in tables 25-28. For column 3, a 24 inch column dosed with high quality effluent with the lowest organism spike dose, decreasing levels of total coliforms were detected as the sampling moved down the column. While few sporadic low level enterococci and *E. coli* detections occurred, no coliphage or fecal coliforms were observed. For column 5, a 24 inch column dosed with high quality effluent with the middle organism spike dose, the findings were the same as for column 3 with the exception that the organism levels were somewhat higher. Column 8, a 24 inch column dosed with the low quality septic tank effluent with the highest organism dose, the trends are the same as columns 3 and 5 but with higher levels and significant amounts of enterococci found. Fecal coliform also shows up in this column, while no coliphage was detected. In this column the fecal coliform levels are significantly higher than the *E. coli* levels. A possible explanation for this would be that *Klebsiella*, which is the organism detected in the fecal coliform test in addition to *E. coli* is not only passing through the column, but multiplying. This phenomenon has been reported in other studies and is the main reason the fecal coliform has been replaced by the *E. coli* test as the preferred monitoring tool. The data from column12, the 60 inch column dosed with the low quality effluent and high microbe concentration, is similar to the column 8 data.

Table 25. Column 3- 24 inches, high quality effluent, 1000 FC/100mL dose rate, dosed 5 times per day, 2gpd/ft^2

	total coliform / gm	*E. coli* /gm	Enterococci /gm	fecal coliform /gm	coliphage /gm
0-1 inches	137.6	2	<1	<10	<300
1-2 inches	101.9	<1	1	<10	<300
2 - 4 inches	65	<1	2	<10	<300
4 - 6 inches	23.1	4.1	3.1	<10	<300
6 - 8 inches	10.8	<1	<1	<10	<300
8 - 10 inches	12.2	<1	1	<10	<300
10 - 12 inches	2	<1	<1	<10	<300
12-14 inches	1	<1	<1	<10	<300
14-16 inches	1	<1	<1	<10	<300
16-18 inches	1	<1	<1	<10	<300
18-20 inches	<1	<1	<1	<10	<300
20-22 inches	<1	<1	<1	<10	<300
22-24 inches	2	<1	<1	<10	<300
Residual	1	<1	<1	<10	<300

Table 26. Column 5 -24 inches, high quality effluent, 10,000 FC/100mL dose rate, dosed 5 times per day, 2gpd/ft^2

	total coliform /gm	*E. coli* /gm	Enterococci /gm	fecal coliform /gm	coliphage /gm
0-1 inches	1732.9	6.3	26.5	<10	<300
1-2 inches	387.3	13.4	27.9	<10	<300
2 - 4 inches	344.8	12.2	13.4	<10	<300
4 - 6 inches	105.4	8.6	3.1	<10	<300
6 - 8 inches	67	3.1	<1	<10	<300
8 - 10 inches	27.5	2	2	<10	<300
10 - 12 inches	14.8	1	1	<10	<300
12-14 inches	8.5	2	1	<10	<300
14-16 inches	10.9	<1	1	<10	<300
16-18 inches	12	3.1	1	<10	<300
18-20 inches	9.7	<1	<1	<10	<300
20-22 inches	8.6	<1	<1	<10	<300
22-24 inches	10.6	<1	<1	<10	<300
Residual	6.3	<1	<1	<10	<300

Table 27. Column 8 - 24 inches, low quality effluent, 1,000,000 FC/100mL dose rate, dosed 5 times per day, 1gpd/ft^2

	total coliform /gm	*E. coli* /gm	Enterococci /gm	fecal coliform /gm	male-specific coliphage /gm
0-1 inches	>2419.6	488.4	70.8	10,000	<300
1-2 inches	>2419.6	435.2	98.7	9000	<300
2 - 4 inches	>2419.6	260.3	24.3	12,000	<300
4 - 6 inches	>2419.6	72.3	52.1	2000	<300
6 - 8 inches	>2419.6	40.4	24.6	1000	<300
8 - 10 inches	>2419.6	4.1	5.2	240	<300
10 - 12 inches	>2419.6	5.2	4.1	170	<300
12-14 inches	>2419.6	12.1	7.4	150	<300
14-16 inches	>2419.6	4.1	1	100	<300
16-18 inches	>2419.6	9.7	2	20	<300
18-20 inches	2419.6	9.6	4.1	70	<300
20-22 inches	1119.9	7.4	1	40	<300
22-24 inches	>2419.6	12.1	3.1	20	<300
Residual	325.5	4.1	2	10	<300

Table 28. Column 12- 60 inches, low quality effluent, 1,000,000 FC/100mL dose rate, dosed 5 times per day, 2gpd/ft^2

	total coliform /gm	*E. coli* /gm	Enterococci /gm	fecal coliform /gm	coliphage /gm
0-1 inches	>2419.6	613.1	344.8	7300	<300
1-2 inches	>2419.6	770.1	117.8	5000	<300
2 - 4 inches	>2419.6	206.4	30.1	1900	<300
4 - 6 inches	>2419.6	35.5	6.2	450	<300
6 - 8 inches	>2419.6	5.2	2	70	<300
8 - 10 inches	>2419.6	9.8	3	110	<300
10 - 12 inches	579.4	<1	4.1	50	<300
12-14 inches	547.5	<1	1	<10	<300
14-16 inches	344.8	2	<1	20	<300
16-18 inches	1732.9	13.4	6.3	<10	<300
18-20 inches	770.1	7.4	4	30	<300
20-22 inches	224.7	<1	<1	10	<300
22-24 inches	125.9	<1	<1	10	<300
24-30 inches	37.9	<1	1	<10	<300
30-36 inches	5.2	<1	<1	<10	<300
36-42 inches	9.8	<1	<1	<10	<300
42-48 inches	12.2	<1	<1	<10	<300
48-54 inches	1	<1	<1	<10	<300
54-60 inches	<1	<1	<1	<10	<300

One of the goals of this project was to compare various microbial indicators regarding their ability to pass through the mound sand. The researchers expected that enterococci and coliphages would pass through the sand matrix more readily than coliforms and *E. coli*, and thus prove to be better indicators of septic system failure. Interestingly this was not the case.

Conclusions

The objective of this project was to determine if microbes can be removed as they pass through a mound sand matrix in a controlled laboratory environment. It must be noted that all of the conclusions drawn below are based on a laboratory controlled environment may or may not represent what actually happens in "real world" systems. The study looked at a matrix of several variables which could influence passage; sand depth, general quality of effluent (strength as measured by biological oxygen demand and suspended solids), hydraulic dosing rate, and microbe dose level. The results can be summarized as follows

1. Organisms in reasonably clean effluents do not pass through mound sand in columns 12 inches or longer when dosed evenly throughout the day at the rate of two gallons per day per square foot of surface area.

2. Organisms in low quality septic tank effluents do not pass through mound sand in columns 24 inches or longer when dosed evenly throughout the day at the rate of one gallon per day per square foot of surface area.
3. If mound sand columns are loaded with either poorly spaced dosing or excessive flows, organisms will pass through the sand, even when the column length is 60 inches.
4. Mound sand removes all of the organisms tested with equal efficiency.

DECENTRALIZED REUSE WITH SUBSURFACE DRIP IRRIGATION FIELDS ISSUES AND OPPORTUNITIES

David Venhuizen[1]

Subsurface drip irrigation (SDI) has experienced increasing use as a wastewater management tool since it was first used for this application in the 1980's. Many address this technology as a "disposal" process, as simply a "better" or more efficient way to make the wastewater "go away". This paper focuses on using this tool to maximize beneficial reuse, using effluent to satisfy the irrigation and fertilization functions. But since the source water is wastewater, this entails review both of how to "best" serve those functions and of how to protect water resources from whatever pollutants remain in the effluent after treatment.

The degree of pretreatment required prior to dispersal is an evaluation based on the public health and environmental considerations that come into play in each situation. However, with SDI, there are also practical operational issues to be considered, most importantly prevention of emitter clogging. Those issues urge the use of pretreatment to produce a highly clarified effluent prior to dispersal. There is a whole school of thought—supplied and serviced by a number of equipment vendors—that using SDI systems to disperse septic tank effluent, forcing it through physical filters to clarify it, is merited. However, the inelegance and inherent risk of this approach are obvious. It is also questionable strategy to dedicate resources to the expensive physical filtration devices, which leave most of the pathogens and nutrients in the water, instead of a pretreatment process that removes the majority of them. This pretreatment also renders the effluent more suitable as an irrigation resource. Therefore, the discussion in this paper is predicated on the presumption that effluent flowing into SDI systems is highly pretreated, thus highly clarified, water.

Hydraulic Application Rates for SDI Reuse Systems

In small-scale wastewater systems, rarely is provision made for long-term storage of effluent, rather the amount generated each day is dispersed in fairly short order. Once injected into the soil, the water can only exit via one of two pathways – evapotranspiration (ET) or deep percolation. So if the system generates effluent without regard to variations in climate, the SDI system has to function as a "drainfield" some of the time. This is so without regard to the general climate at the site, as even during times when the ET rate is generally high, there will be rainy periods that fill up the soil moisture storage capacity. Under these conditions, any pollutants remaining in the effluent may percolate to a limiting condition, and thus impact upon public health or environmental values.

Determining the "optimum" design hydraulic application rate (HAR) for a system to obtain significant irrigation benefit, while being mindful of the "drainfield" design issues, entails an analysis of site climate and the plants being irrigated. Such an analysis is presented here for a project in the Texas Hill Country, presuming the "crop" is turf. Since this analysis is for illustrative purposes only, derivation of inputs to this analysis are not detailed here. They are reviewed in a design report for this project, available to interested parties from the author. (Venhuizen, 1993) In Tables 1 and 2, ET_o is the reference crop ET rate, ET_{crop} is the ET rate for

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the specified crop, and P_e is effective precipitation—the portion of rainfall that infiltrates into the soil and remains as water available to the crop.

Table 1. Monthly Evapotranspiration and Total Rainfall Data—Example System

	ET_o		ET_{crop}	Average Rainfall	
Month	mm/day	mm/month	mm/month	in./month	mm/month
January	2.2	68	61	1.60	41
February	2.8	78	70	2.49	63
March	3.8	118	106	1.68	43
April	5.2	156	140	3.11	79
May	6.7	208	187	4.19	106
June	7.9	237	213	3.06	78
July	8.2	254	229	1.89	48
August	7.7	239	215	2.24	57
September	6.0	180	162	3.60	91
October	4.1	127	114	3.38	86
November	2.9	87	78	2.20	56
December	2.2	68	61	20.6	52

Table 2. Irrigation Loading Rates – Example System

	ET_{crop}	P_e	$ET_{crop} - P_e$	HAR	
Month	mm/month	mm/month	mm/month	cm/day	gal/ft^2/day
January	61	27	34	0.11	0.027
February	70	42	28	0.10	0.025
March	106	31	75	0.24	0.059
April	140	59	81	0.27	0.066
May	187	85	102	0.33	0.081
June	213	68	145	0.48	0.119
July	229	49	180	0.58	0.143
August	215	51	164	0.41	0.130
September	162	70	92	0.31	0.075
October	114	61	53	0.17	0.042
November	78	38	40	0.13	0.033
December	61	32	29	0.09	0.023

These calculations suggest setting the design HAR at about 0.4 cm/day (0.1 gal/ft^2/day) for this project. Decreasing the HAR further would hold it at or below the average ET demand in more months, but with increasing costs for diminishing returns. Taking into account that some percolation losses would occur no matter how large the field were made, it is not considered cost efficient to employ the HAR which would evapotranspirate the average effluent load throughout the whole year. Also, lowering the HAR would decrease the portion of irrigation demands met by effluent in the peak months. So, the HAR is set at about 0.4 cm/day in this climate, and the SDI field must function as "drainfield" when ET demand is less than that, on either a short-term basis—e.g., rainy days during the summer—or a long-term basis, through periods when ET

demand is low. Loading rates in that range result in irrigation applications of around 2.5 cm/week (1 inch/week), a little less than the average landscape plant water demands over the growing season in this region. (Borrelli, et al., 1998) Thus, most of the effluent routed to the SDI field would be effectively utilized to supply irrigation demand through the peak irrigation season, greatly defraying demands during the time when this would have the maximum benefit to the local and regional water economy.

Water Savings Potential with SDI

An indication of the potential water savings available from this strategy was provided by an analysis conducted as part of a water conservation study prepared for the Barton Springs/Edwards Aquifer Conservation District. (Venhuizen, 1990) Water records for customers of a small water district were reviewed. Customers with significant differences in winter (December-February) and summer (June-August) usage were taken as an example group who maintained highly irrigated landscapes. Winter usage, presumed to be an estimate of wastewater flow, was deducted from total summer usage in each month during the May-September peak irrigation season. This provided an estimate of how much water these customers would have saved if wastewater system effluent had been used to defray irrigation demands. When these estimates were compared to their actual usage, it indicated that savings of 40% to 70% of total water demand through the peak irrigation season would have been realized. Clearly, the potential water savings from this strategy in this climate are anything but trivial.

Hydraulic Function of SDI System as a "Drainfield"

Understanding the hydraulic function of an SDI system as a "drainfield" requires an examination of soil moisture at the micro level, considering the flow out of each emitter. An SDI field is composed of drip hose runs on specified spacings, with emitters on each hose at specified intervals. A typical array has hose runs on 2-foot centers and emitters at 2-foot spacings on each hose, as illustrated in Figure 1. (Note that other spacings are employed to suit the needs of the landscaping being irrigated—e.g., closer hose and emitter spacings are used for turf if a high quality grass cover, free of "striping", is desired.) Therefore, on average, the water issuing from each emitter would "spread"—drawn by matric potential, the "suction" force created by capillary action of the soil pore spaces—to a little more than one foot from each emitter before the entire surface would become wetted, after which further emissions of water would continue to increase soil moisture level, eventually filling the voids to field capacity, the point at which capillary action can no longer counteract the force of gravity, and water would begin to drain downward.

However, if the soil were already at high moisture content—either from a recent rainfall or because ET rate had recently been lower than the rate of effluent application—then moisture level would be at, or would be driven above, field capacity around the emitter before the water could be spread to any distance away from it. When this occurs, water coming out of the emitter would percolate downward; that is, the SDI system would function as a "drainfield".

This dictates that the *instantaneous* emitter flow rate, expressed as flow out of the emitter over some prescribed radius around the it, needs to be lower than the saturated hydraulic conductivity,

or permeability, of the receiving soil. Note that this is a characteristic of the drip emitter used, unrelated to the overall field HAR. The situation is illustrated in Figure 2. If the soil is very wet—above field capacity—when the emitter begins to flow, the radius the water might spread before it begins to percolate downward under the force of gravity would be small.

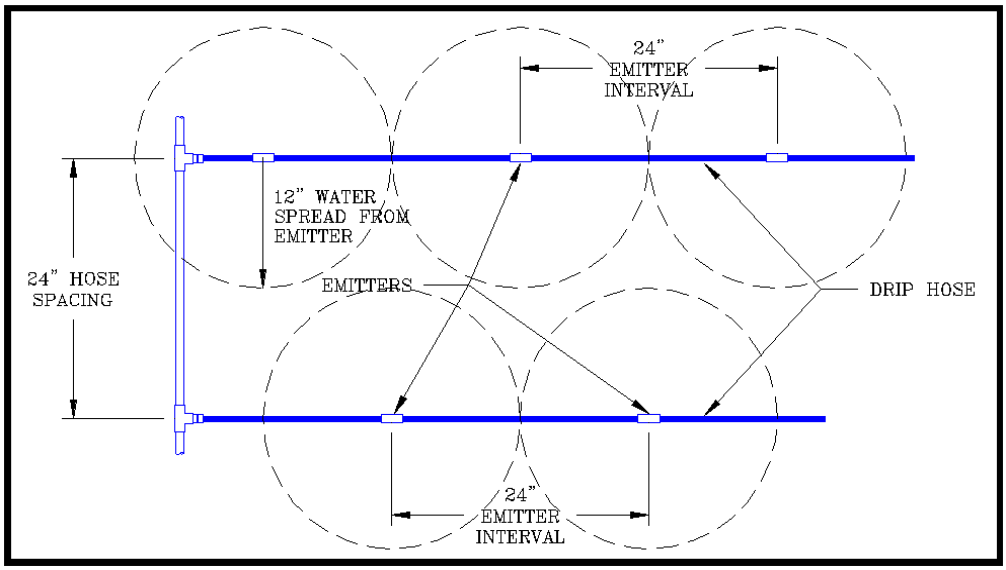

Fig. 1. Typical SDI Hose and Emitter Layout

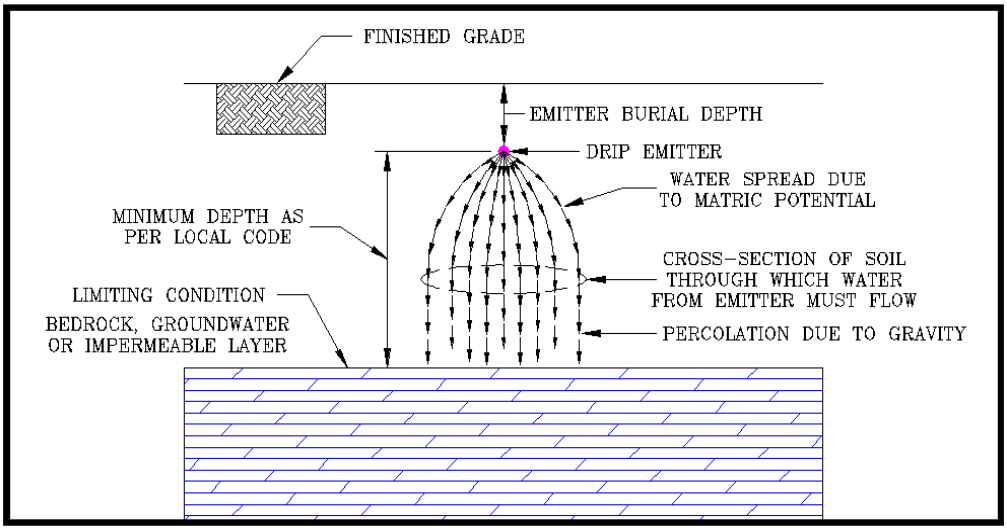

Fig. 2. Percolation of Emitter Flow Under "Wet Soil" Conditions

As an example, consider a pressure-compensating emitter with a flow rate of 0.53 gallons/hour (gph). This translates to a flow rate of 0.53 gal/hr x 1 ft^3/7.48 gal = 0.071 ft^3/hr. Taking a guess that under high antecedent moisture conditions the radius around the emitter that water would spread before it all percolated downward is 6 inches, then the area through which this flow must pass would be 0.5^2 x pi = 0.79 ft^2. The required permeability of the soil would therefore be

0.071 ft^3/hr/0.79 ft^2 = 0.09 ft/hr = 1.08 in/hr. This is in the 0.6 – 2.0 range listed in SCS soil surveys for loams, silt loams, and the like.

If the soil were "tighter" than this and the water could not percolate downward at that rate (or the soil were *so* wet that water coming out of the emitter could not spread even 6 inches, thus requiring that the permeability be even higher), then water may "pool" around the emitters under this "wet soil" condition. This "pooling" would create a hydraulic head that would cause the water to spread further, and at some point a balance between emitter flow rate and soil transmission rate would be established.

If, however, the effluent application time were "long", then some of the effluent may be forced to the surface before it could percolate. This urges the use of short dosing times, breaking the total daily flow into multiple doses if required. For the situation where each emitter "covers" 4 ft^2 (the "2 X 2" spacing noted above) and the HAR is 0.1 gal/ft^2/day, total daily flow out of the emitter would be 0.4 gallons. At an emitter flow rate of 0.53 gph, the dosing time would be 0.4/0.53 = 0.75 hr, or 45 minutes. By splitting this up into 3 doses per day, the run time would be reduced to 15 minutes, minimizing the amount of water that must be "held" in the soil, waiting for it to percolate away, and thus minimizing the potential for any of the effluent to surface.

In a "well-drained" soil, such a "wet soil" condition would likely persist only during and shortly after a significant rainfall event. An analysis was done for a project in Austin, Texas, to estimate the percent of the time this condition might exist. (Venhuizen, 2002) Rainfall records were reviewed for an 8-year period, 1987-1994. While this period contained some "dry" years, the overall average rainfall for this period was slightly above the long-term average. The USDA definition of antecedent moisture condition (AMC) III was used as the definition of "high" antecedent moisture – defined as at least 2.1 inches of rainfall over the previous 5 days. (USDA, 1972) Adding the effluent application—at 0.1 gal/ft^2/day = 0.16 in/day, so it is noted that effluent applications by themselves would never drive moisture condition to AMC III, as 5 days flow would total to only 0.8 inch—to the rainfalls and using that as the AMC criterion, it was observed that AMC III would have existed on a total of 328 days over this 8-year (2,922-day) period, about 11% of the time. However, any rainfall at all occurred on only 101 of these days, or about 3.5% of the time. This then is an estimate of the *maximum* amount of the time that effluent application might induce surfacing of effluent-derived water.

Any hazard due to this condition would be vanishingly small. First, the run time each day would be a small fraction of the total time – 0.75/24 = 3.1% of the day in the example above. Second, when there is that much water already in the soil, the effluent addition would be a fairly minor fraction of the total soil water. Third, as this condition would occur for all but very "heavy" soils only during and shortly after a significant rainfall event, the likelihood of human exposure to any surfacing effluent-derived water is very low – people are highly unlikely to be rolling around in, or even walking over, the grass when the ground is *that* wet.

The preceding discussion was about what happens *while* the SDI system is being dosed. As noted, the time that flow issues from the emitter would be a small fraction of the day. If the

water could not percolate at the rate applied, it would "pool" as noted previously and drain at the available rate over time. Note that the overall field average permeability required to accommodate the design HAR is 0.1 gal/ft^2/day X 1ft^3/7.48 gal = 0.134 ft/day = 0.00056 ft/hr = 0.0067 in/hr. If the instantaneous application rate were 1.08 in/hr, as estimated above for a "wet soil" condition, that implies the "effective application time" could be 1.08/0.0067 = 162 hours. There being only 24 hours in a day, clearly water could not be applied fast enough by the emitter to require that high of a permeability for anything but a minor fraction of the whole day. This confirms that even in soils with significantly lower permeability, the water *would* percolate – the only question is how much "pooling" would occur while the emitter is flowing, and how often these conditions would occur, given climatic conditions at the site.

Treatment Function in SDI Systems

An SDI system disperses effluent into the soil in a manner that allows whatever soil resources that are available to remove and assimilate pollutants as efficiently as practical. A review of the assimilation and elimination mechanisms operating in the soil/plant/water system shows that, for all the pollutants of concern, three factors can be controlled to make these mechanisms more effective (Venhuizen, 1995):

- Shallow dispersal into the biologically active soil horizon (the root zone);
- Low areal loading rates (HAR's), to reduce flow rate through the soil pores;
- Uniform distribution over the field area, with a dose/rest loading cycle, limiting the amount of water loaded per dose to minimize the degree of saturation.

SDI technology practically maximizes all these factors. As noted, once effluent is injected into the soil, it can only exit by one of two pathways—deep percolation or evapotranspiration. Pollution potential would be minimized by maximizing the ET losses at the expense of deep percolation losses. This would limit the movement of pollutants through the soil to a limiting condition (groundwater or bedrock). Even if much of the water eventually does percolate—which, as reviewed previously, it will during portions of the year in *any* climate—the pollutants would be held in the root zone longer, providing greater opportunity for the assimilation and elimination mechanisms to work on them. Evapotranspiration is itself enhanced by maximizing the three factors listed above.

When the aim is to maximize irrigation efficiency, drip emitters are installed well up in the root zone, typically only a few inches deep into the soil. They are installed directly into the soil, requiring no gravel envelope around them to receive and hold water coming out of them before it can be absorbed into the soil, because drip emitters flow at very low rates, typically less than 3.8 liters/hour (1 gph). Emitter spacing is typically quite close—as reviewed above, 61 cm (2 foot) spacings being typical. These factors provide a very slow, controlled, and uniform wetting of the soil throughout the root zone over the entire field area.

Drip hose is fairly inexpensive and being shallowly placed is relatively cost efficient to install, so increasing field area to provide a lower HAR—at irrigation rates—can be accommodated fairly cost efficiently. As noted, the system should be designed to deliver the total daily flow in small

doses. This combination of small dose volumes and a low HAR—requiring a small daily flow out of each emitter—works together to minimize the degree of saturation imparted by each dose, thus minimizing the potential for deep percolation losses.

Evapotranspiration potential will be greater in hotter and drier climates, of course, which is why demand for irrigation water is greater in those climates. However, even in climates where significant ET losses do not occur through much of the year, these same design principles still result in the water being held in the root zone longer before percolating. In colder climates, where ET potential is limited to the growing season, this design would still limit annual mass loadings of pollutants by taking advantage of whatever ET losses do occur to minimize total deep percolation losses over the year. The design factors noted above would maximize soil treatment efficiency the rest of the time.

Of particular concern in some watersheds are nitrogen inputs. Some nitrogen in effluent routed to an irrigation system would be a fertilizer, a beneficial component rather than a pollutant. Any excess must be assimilated or eliminated in the soil, or it will percolate into environmental waters. Venhuizen (1995) reviewed the assimilation/elimination mechanisms and presented an analysis indicating that, in the climate of Washington Island, Wisconsin, effluent total nitrogen concentration should be reduced to about 20 mg/L in order to preclude leaching into a dolomite aquifer at concentrations sometimes exceeding 10 mg/L. In climates where ET is higher, and especially where there is significant ET demand year-round, significantly greater assimilation and elimination would be expected.

Almost all of the nitrogen in the effluent would transform to nitrate in the soil under all but highly saturated conditions—and as noted, given a "suitable" HAR, moisture level around the emitters would be below field capacity most of the time throughout the year. Once in the nitrate from, the nitrogen can only exit the root zone via one of three pathways – plant uptake, in-soil denitrification, or deep percolation. As noted, the SDI system minimizes percolation losses by design. In any case, with the effluent injected into the root zone, the opportunities are enhanced for plant uptake and denitrification in anaerobic micro-sites—which are present even in well-drained, near-surface soils. (Venhuizen, 1995)

For all other pollutants, most importantly pathogens, it has been demonstrated that highly pretreated effluent—intermittent sand filter effluent in this instance—is "renovated" by flow through as little as 6 inches of soil, even when it is bulk-loaded onto a column of mound sand, a very coarse soil. (Stanbridge, et al., undated) For all the reasons just reviewed, a high degree of soil treatment is provided with greater assurance when the effluent is applied through an SDI system. The conclusion is that SDI, dispersing highly pretreated effluent, can be employed in marginal soil resources with minimal risk of hazards to public health or environmental values.

SDI Installation and Maintenance

Due to experiences with SDI systems that disperse septic tank effluent and effluent from pretreatment systems prone to periodic upsets, there is a general expectation that SDI systems "need" to include a complex prefiltration and control system that provides very frequent flushing

of the drip lines. However, when preceded by a pretreatment system that will consistently and reliably produce a high quality, low turbidity effluent—e.g., a recirculating biofilter—a much less complex design employing an automatic flush valve, as illustrated in Figure 3, can be employed.

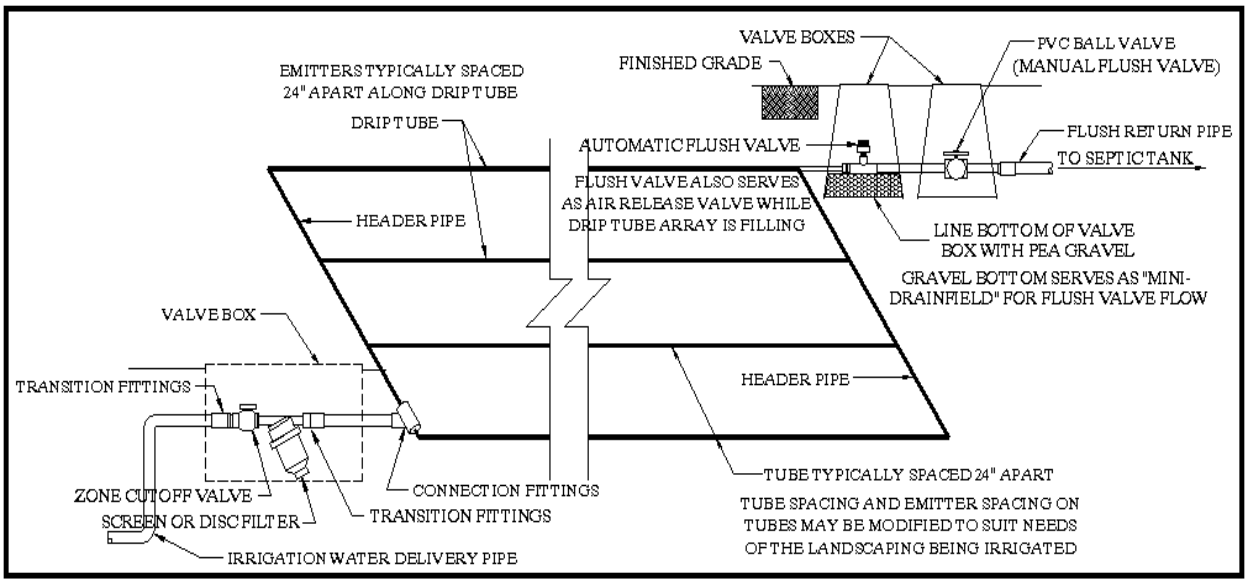

Fig. 3. Typical Installation of SDI System Receiving High Quality Effluent

With high quality effluent flowing to the drip irrigation hose, a simple screen or disc strainer suffices for prefiltration. The main function of this strainer is to intercept secondary growth solids (slimes that may grow on and slough off of the delivery pipe walls) and to serve as a "fail-safe" device in case maintenance of the treatment unit is neglected or secondary regrowth solids build up in the effluent tank. The field is generally designed with a number of zones, as dictated by the landscaping plan. A cutoff valve at each hose entry is suggested so that a zone can be isolated for repairs while the rest of the field remains in service.

A small flush flow is provided each time the drip hose array is pressurized by installing an automatic flush valve at the downstream end of the array. This valve remains open, serving as an air release valve, while the drip hose is filling. Just before the hose array completely fills up and fully pressurizes, a small squirt of water issues from this valve and then it closes. This allows any debris in the pipes to be flushed to the end of the line and out of this flush valve instead of being trapped in the hose and forced out of emitters.

To provide maintenance flushing of the drip hose, typically required only at very long intervals, a manual flush valve is also installed at the end of the hose array. This is opened when the zone is pressurized so that a high volume flush of the entire array is provided. This flush water is routed back to an appropriate tank in the pretreatment system so that any solids washed out of drip hose will be retained in the pretreatment system.

The strainers or filters at the drip hose entries must be observed, and cleaned if required, at fairly frequent intervals—e.g., every 3 months, but this may vary depending on the dependability of the

treatment system and operating experience with that system. The automatic flush valves, which have proven to be very reliable, should also be check during each maintenance interval. Experience has shown that the protection provided by the entry strainer and automatic flush valve is effective at preventing significant emitter clogging, even when the pretreatment system experienced problems resulting in poor quality effluent.

To assure that any emitter clogging which does occur is addressed in a timely manner, arrangements must be made to monitor the degree of emitter clogging over time. This would be done by either measuring the pump run time for a dose of a given volume or by measuring the instantaneous flow rate into a zone of the drip hose array. A reading that indicates degradation in flow rate below that observed when the system was installed would signal the onset of significant emitter clogging. This would trigger maintenance procedures.

The flow rate out of an emitter may degrade due to biological clogging or due to chemical clogging. The latter occurs when water remaining in the emitter labyrinth between doses evaporates and leaves behind the chemicals in it that are measured as total dissolved solids (TDS). Chemical clogging may be a significant liability only for waters with "high" TDS—to which wastewater may contribute, but this is mainly determined by the quality of the source water—and when conditions are conducive to the water in the emitter evaporating between doses. The latter is a problem in applications like vineyards, where the drip hose is exposed to full sun, but is rather unlikely in buried drip lines that are dosed very frequently. In an SDI system designed and operated as detailed above, therefore, chemical clogging is not likely to occur, so maintenance activities would focus first upon biological clogging.

This is addressed by dosing a strong chlorine solution into the drip hose array, assuring a sufficient volume of solution is injected to completely fill the volume of drip hose in the zone being serviced. After allowing the emitters to "soak" in this solution, the drip hose is flushed, then the flow test is repeated. If the flow test does not indicate that emitter clogging has been remediated, this procedure may be repeated using an acid solution to address chemical clogging.

Regulatory Issues with SDI

When dispersing high quality effluent in an SDI system, both the level of pretreatment provided and use of SDI as the dispersal process dictate that many restrictions created for septic tank effluent being dispersed in a drainfield become meaningless, or at least of far lesser concern. These include various setback and standoff requirements, and the very nature of "failure" and need for a redundant dispersal field area.

As noted previously, only a small standoff from a limiting condition is required with SDI dispersal of high quality effluent. However, many jurisdictions apply the standoff requirements for septic tank effluent drainfields to SDI. The most "progressive" rules appear to be in Texas, where a 12-inch standoff to groundwater and a 6-inch standoff to other limiting conditions are required. Based on the work of Standbridge, et al. (undated) and the factors reviewed by Venhuizen (1995), these are quite sufficient to protect public health and environmental values, subject of course to appropriate nitrogen control in watersheds where that is of concern.

However, these same rules also require that a drip emitter may be installed no closer than 10 feet from a slope break where a seep might occur. Setback regulations like this are essentially irrelevant to SDI systems receiving high quality effluent. Matric potential is the only force that can draw water laterally any distance from the emitter, but this would be highly unsaturated flow, and that would *never* produce a seep. There is no force that would cause water coming out of a drip emitter to be driven even one foot sideways, as saturated flow that could produce a seep, before it could traverse at least a 12-inch vertical depth through the soil. If the water is good to go into the groundwater after traversing the 12-inch vertical depth, what possible hazard could it pose even if it did surface in a seep at the edge of the field? The ideology driving such a rule, however, is that the slightest possibility of any seep containing *any* effluent-derived water is a hazard. This ideology is of course rooted in concerns about conventional dispersal fields receiving septic tank effluent. Engineering analysis of the actual situation is simply not considered, resulting in the application of these essentially irrelevant rules to SDI systems.

Another issue is the nature of how a drip irrigation field might "fail" and requirements for redundant field areas. As reviewed previously, there is a very small potential for effluent to be forced to the surface because the field is hydraulically overloaded. Therefore, concerns about "failure" focus upon the hydraulic function of the drip dispersal system, which essentially comes down to control and remediation of drip emitter clogging. Routing poorly treated water to the field might eventually result in the soil around the emitters also becoming "clogged", but that is highly unlikely to occur without emitter clogging having become problematic first. This simply highlights that the very first line of defense against any sort of field "failure" is to assure that the pretreatment system consistently and reliably produces a highly clarified effluent. Beyond that, controlling and remediating emitter clogging is a matter of ensuring a proper O&M protocol, and the regulatory system only needs to require the appropriate oversight to monitor, and respond if needed, to emitter clogging.

While those procedures are expected to maintain the drip emitters in acceptable operating condition for the life of the system, the ultimate fallback in case clogging becomes so severe that it cannot be remediated (which is likely to happen only if O&M procedures are neglected) is to replace the drip hose. This can be done by removing old hose and placing new hose on the same alignment, or by laying a new line of hose in the space between the original hoses. Since the "failure" is in the drip emitters, which are replaced, rather than in the soil, there is no need to provide a replacement area in another location. This is another regulatory issue, as some jurisdictions still require a complete redundant field area to be available. Hose replacement can be executed a zone at a time—or even a line of hose at a time if new hose is laid between the old hose lines—so the overall system does not have to be taken out of service to effect such a repair.

In some jurisdictions, rules for drip irrigation are written around a specific commercial "package" and the specification of equipment presupposes that the effluent routed to the drip irrigation field would be poorly treated, containing significant levels of solids. So all systems using drip irrigation, regardless of the quality and reliability of the pretreatment system employed, have to use a system that may be needlessly costly, needlessly complex—and thus needlessly failure-prone—and needlessly expensive to operate and maintain. The end result of these rules is that the use of SDI—the method that practically maximizes those three principles

of optimal soil treatment noted previously—is retarded, almost certainly to the overall detriment of public health and environmental values.

Examples of Installed SDI Systems

As drip hose is made of flexible polyethylene, drip lines can be laid out in any number of configurations. This flexibility allows fields to fill any available landscaped area, to serve the irrigation needs of a variety of plant types. A few examples of field plans and installed SDI systems are shown in Figures 4-10.

Figure 4 shows the layout for a system serving a very large home and guest house, with a design flow rate of 2,500 L/day (660 gpd). The drip field covers an area of approximately 615 sq. m. (6,620 sq. ft.), resulting in a loading rate of 0.41 cm/day. The large area of drip field on the left side of the figure is a front yard covered with turf. This area is shown in the photo in Figure 5. A hose spacing of 18 inches and an emitter interval of 12 inches along each hose are used in this area to provide very uniform irrigation of the turf to avoid a "striping" pattern in the grass. The more irregular spaces wrapping around the back of the house are landscaped beds. This area is shown in the photo in Figure 6. This illustrates that the SDI system can be designed to accommodate a wide range of irrigation needs.

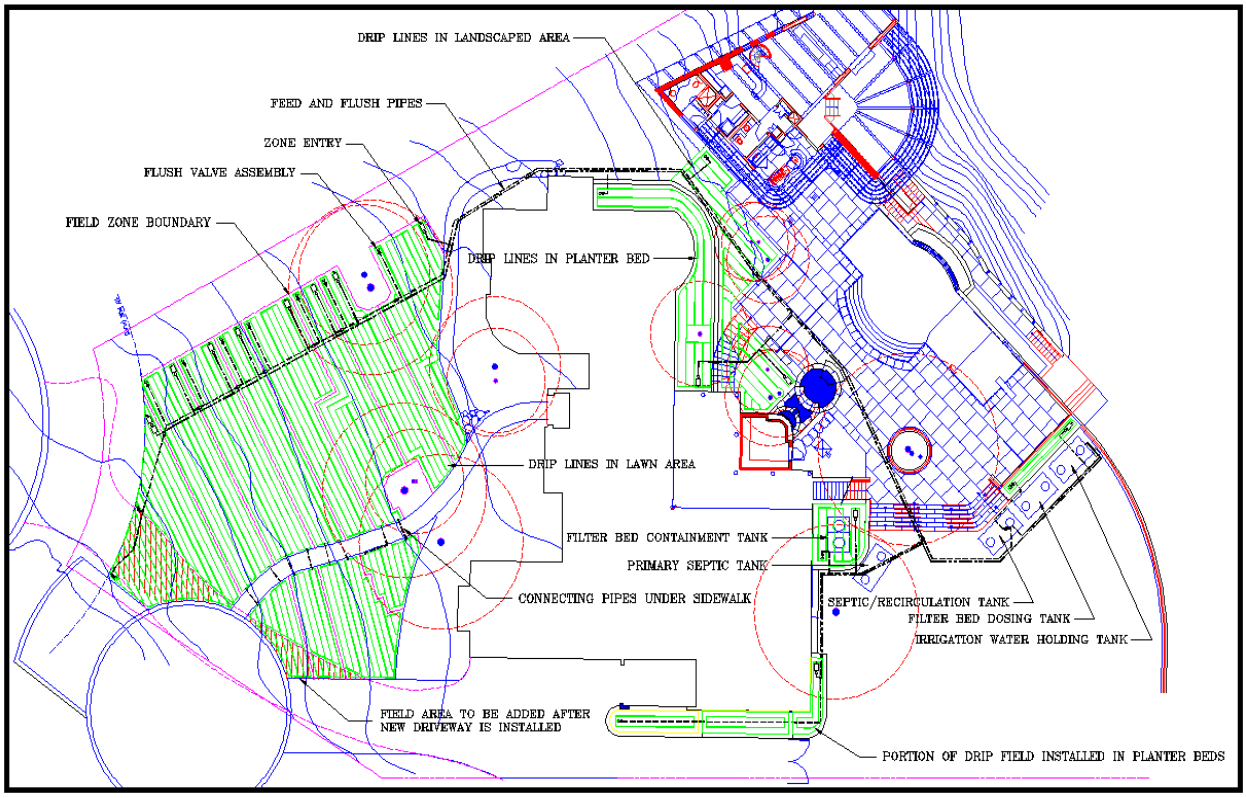

Fig. 4. Example SDI System Layout Plan

Fig. 5. Installed SDI System in Turf Area

Fig. 6. Installed SDI in Landscape Planter Beds

Figure 7 shows pictures of a part of the SDI field for another project, located in the driveway island. On the left is a picture taken during installation of the drip lines, showing the drip hose laid in trenches hoed out of fill material. Native soils on this site are thin and rocky, so imported fill soil was needed to assure at least 12 inches of soil between the drip lines and bedrock. On the right is a picture showing the same area after it had been restored with ground cover. Note

how the drip hose works around the trees and tree wells. The field zone entry is contained in the valve box visible in the "after" picture.

Fig. 7. SDI Field During Installation and After Completion

Shown below is the SDI field layout plan at another house, this one with a design flow rate of 1,800 L/day (480 gpd) and a total field area in 5 zones—to serve a variety of landscaping—of 457 sq. m. (4,900 sq. ft.), a design HAR of 0.40 cm/day. Pictures of a portion of the field before and after installation and landscaping are shown in Figure 9, showing the severity of site conditions that are being routinely addressed with high quality pretreatment and SDI.

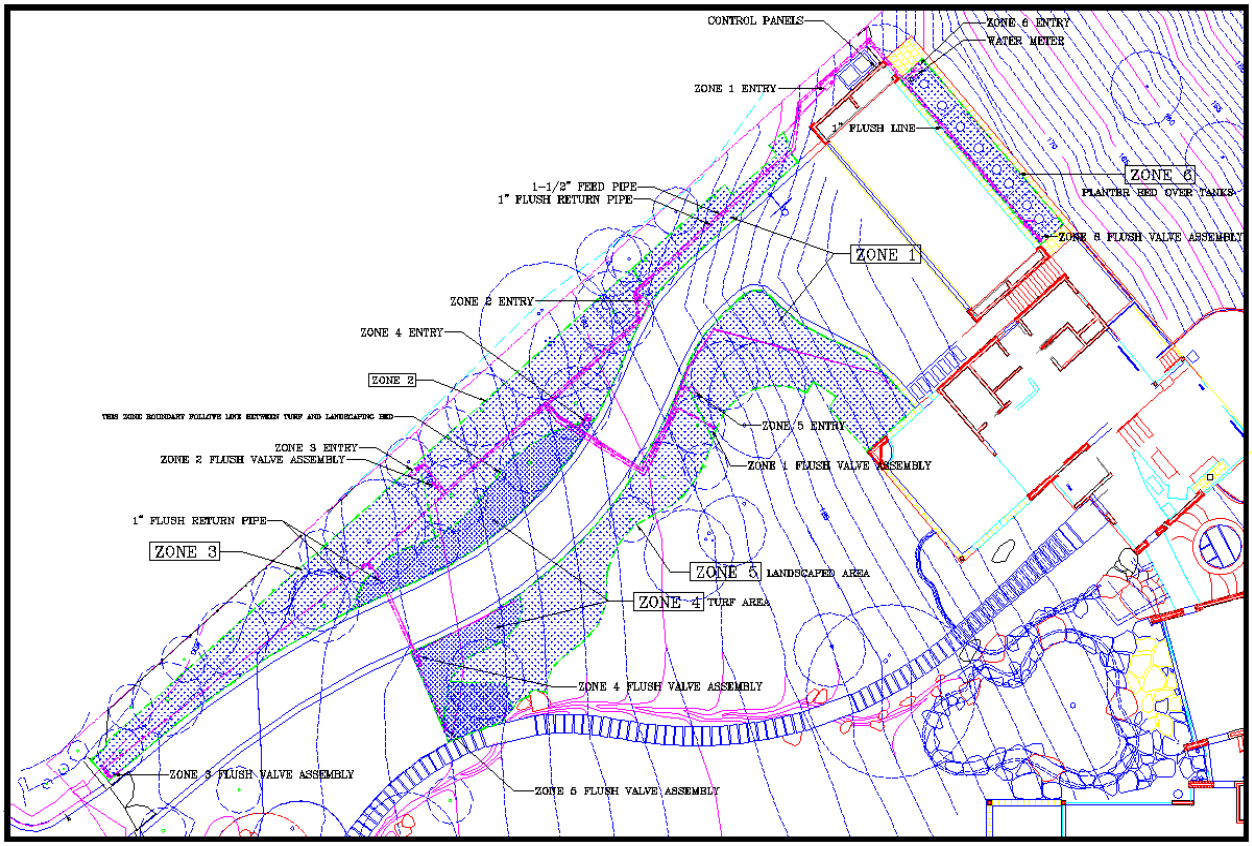

Fig. 8. Example SDI Field Plan

Fig. 9. Field Area Before and After Installation and Landscaping

Figure 10 shows the field area for a larger-scale system at an interstate highway rest stop. The total field area of approximately 5,100 sq. m. (55,000 sq. ft.) covers all the landscaping, including the shrubs around the sign, up to the buildings in the background. Wastewater generated in the restrooms is treated and dispersed in this field to defray irrigation demands. This illustrates that SDI can be applied in systems of any scale in any variety of circumstances.

Fig. 10. Large-Scale SDI Field at Highway Rest Stop

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Cc: Stacey Scheffel; Brandon Couch
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

So I see that they did not "fix" the rule regarding separation of drip lines to rock, to bring it in line with the state rule and rationalize it relative to what is allowed for drip without secondary treatment. When they originally did this bit of irrationality, their explicitly stated justification was that they felt they needed greater separation to groundwater -- with no more actual justification than, it just seems better to us. And then they did not increase the standoff to groundwater, only the standoff to rock WITH secondary treatment. They STILL have not "rationalized" that difference -- the required standoff to both groundwater and rock is one foot with secondary treatment. And by its silence, the state reg of one foot to rock WITHOUT secondary treatment is the Travis County rule as well, so their rules stipulate one foot of standoff to rock with or without secondary treatment. This is highly irrational, and utterly unjustifiable. (Of course TCEQ will make no bones about this, because they basically don't care -- indeed there is so much that is irrational all over Chapter 285.)

I can make available a pretty definitive study that will make it pretty clear that, after sand filter treatment at least, 6" of soil is a quite safe standoff to a limiting condition. Unfortunately, my pdf of it is over 20 meg, so I cannot attach it, and it is apparently no on-line. If you are vitally interested in this, I urge you to review it, and I trust you will understand that there is no rational justification for upping the standoff to rock for drip after secondary treatment. And there is clearly no rationality in having the same standoff to both rock and groundwater for drip with secondary treatment (if one believes that there is greater hazard for groundwater than rock, which Travis County has explicitly stated it does). And there is clearly no rationality in imposing the same standoff to rock with or without secondary treatment.

This has been pointed out to Travis County over and over and over in the last couple years, since it came to my attention that Chapter 48 had contained this irrationality. They have never issued any defense of their action. They told me I would be "involved" in some way in their revision process, in which I had hoped I would be able to present them with the case that 6" to rock is good, then I never heard a thing, and here is the revision. I trust you all will join me in protesting this irrationality.

Thank you.

David Venhuizen, P.E.
Venhuizen Water Works
Planning & Engineering as if Water and Environmental Values Matter
www.venhuizen-ww.com
www.waterblogue.com

Your old road is rapidly agin'
Please get out of the new one
If you can't lend a hand
For the times they are a-changin'
- Bob Dylan

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Subject: Travis County Proposed Chapter 48 OSSF Rules

Earlier today, Travis County Commissioners Court approved a public hearing to be held on held on Tuesday, December 2, 2014 for the proposed Chapter 48, Rules of Travis County, Texas for On-Site Sewage Facilities. Please review the attached proposed rules which will also be posted on the Travis County website. Public comments regarding these proposed rules can be emailed to OSSF@traviscountytx.gov or mailed to Travis County TNR, Attention OSSF Program, P.O. Box 1748, Austin TX 78767 until November 30, 2014. Otherwise you will need to attend the public hearing for your concerns to be considered.

Free language assistance can be provided upon request.
Ayuda gratuita en su idioma se puede proporcionar por petición.

Rodney Sherrill, P.E.
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On-Site Wastewater Program
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Cc: Stacey Scheffel; Brandon Couch
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

hats off to you. but i think you are just "blowin in the wind" when speaking about the REGULATORS and their attempted justification for revision or acceptance of policy.
you must understand, they do not care about whats in the regulation, just that they show their bosses that they are doing something. that makes them 1) feel better about their existence and 2) in line for a raise since they are "so concerned" ??.

I have found, in the past 32 years of septic design, that things would run alot better if they would not think of a septic system as a nuclear reactor. arguing with them whether a design rate is either 400gpd or 420gpd even when you have proof, but the book does not state it, only justifies the statement " FRANKLY MY DEAR, I DONT GIVE A DAMN"

On Friday, October 31, 2014 8:56 AM, David Venhuizen <waterguy@ix.netcom.com> wrote:

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Cc: Stacey Scheffel
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I'd please ask discussion/comments, etc. to not be sent to all recipients as is not the designated forum.

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On-Site Wastewater Program
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Please Note: New applications can be made online via www.mypermitnow.org

---

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Cc: Stacey Scheffel
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

I would like to see all of the comments and compliments or critical discussion even if it is not the "proper forum"

David T. Smith, P.E.

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Me too.
Joe spillman

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Sent: Friday, October 31, 2014 12:00 PM
To: Joe Spillman; David Smith
Cc: Kim Geary; Stephen Jetton; JMock@kingengineering.com; Monica Osburn; specificsites@aol.com; David Coombs' <dwcoombs1@gmail.com>, 'David Price' <austexltd@aol.com>, 'David Price; David Coombs; amontes6755@sbcglobal.net; Rey Cedillos; Brian Wendland; Danny Gonzalez' <dgonzalez3@austin.rr.com>, 'Danny Gonzalez' <oznog22@gmail.com>, 'Dave Mcghee; Dan Balboa' <balboaspetic@gmail.com>, 'Dan Balboa' <dbalboa@austin.rr.com>, 'Dan Reddon; David Venhuizen; Bryan Porter; Hugo Elzonado' <hugo@cuatroconsultants.com>, 'Jack Ward' <wardseptic@yahoo.com>, 'James Kuykendall; Jashinski, Katherine; Dan Reeder; Stacey Scheffel; Rick Waldrop; Sarah Calvert; Wayne Dolezal Old?; Eric Scheibe; Wayne Dolezal Old?; Mike Moore; Kurt Prossner; ossf@sbcglobal.net; Danny Gonzalez; Jim Bettridge; Texaschang; marc_dickey@ats-engineers.com; Russel Cain; 'Jashinski; Hugo Elzonado; jay.fox@landman-environmental.com; Stan Burrier; septicsolutions@gmail.com; Dan Balboa; acesepticsolutions@gmail.com; Wmoriarty@kingengineering.com; Keith Schoenfelt; 'Cameron Smiley' <cameron@smileysepticdesign.com>, 'Chris Osburn' <alohaseptic@yahoo.com>, 'Clifford Conner'; Rodney Sherrill; Joe Wells; Brain Padden; aggienoble@cebridge.net; Derrick Lormand <delcon@austin.rr.com>, 'Doug Dowlearn' <dougdowlearn@yahoo.com>, 'Dwayne Poteet'; asepticservices@suddenlink.net; Jason Clark; Tommy Partridge; Derrek Eckermann; vis_designs@yahoo.com; Derrick Lormand; Stewart Polvado; gaynell@baileyhomes.com; Hoyt Seidensticker; Kevin Moore; Clint Vandervoort; Steve Gilmer; alcamservices@aol.com; Robert Wright; Sarah Calvert; Brandon Couch; Jonothan Maass; Janet Dunkelberg; gaynell@baileyhomes.com <gaynell@baileyhomes.com>, 'George Gonzalez' <engineer1 @genesis1engineering.com>, 'Glenn Gardner'; David Boston; Suzanne Wukasch; Marc Pate; VSE Septic Services, LLC; Keith Schoenfelt; Jay Fox; triplecseptic@yahoo.com; Steve Wenzel; Brian Wendland; Robert Childress
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

THE ONLY WAY WE CAN PROTECT WHAT IS RIGHTFULLY OURS IS OCCUPY OUR POSITION IN FORCE. DAVY CROCKETT

long live the rights and attitudes of the people of Texas

On Friday, October 31, 2014 11:51 AM, Joe Spillman <backhoejoe@gmail.com> wrote:

Me too.
Joe spillman
On Oct 31, 2014 11:47 AM, "David Smith" <dtsmith@msn.com> wrote:
I would like to see all of the comments and compliments or critical discussion even if it is not the "proper forum"

David T. Smith, P.E.

From: Brandon.Couch@traviscountytx.gov
To: highlandlakes.engineering@yahoo.com; waterguy@ix.netcom.com; Rodney.Sherrill@traviscountytx.gov;

Rodney Sherrill

From: Joe Wells <joe.wells@wwdengineering.net>
Sent: Friday, October 31, 2014 12:48 PM
To: Brandon Couch; BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Janet Dunkelberg'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; ''Marc Pate''; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com
Cc: Stacey Scheffel
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

Brandon

Designated Forum for discussion seems inappropriate for an action that will impact so many. If you had email for all Travis County residents, I feel they should be advised about what is being proposed also.

Joe K. Wells, Jr., P.E.

From: Brandon Couch [mailto:Brandon.Couch@traviscountytx.gov]
Sent: Friday, October 31, 2014 10:49 AM
To: BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Janet Dunkelberg'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; Joe Wells; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; ''Marc Pate''; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop';

Rodney Sherrill

From: Janet Dunkelberg <janet@necessaryinc.com>
Sent: Friday, October 31, 2014 12:50 PM
To: Rodney Sherrill
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

OK, so next time hide the list.

On Tue, Oct 28, 2014 at 2:24 PM, Rodney Sherrill <Rodney.Sherrill@traviscountytx.gov> wrote:

Earlier today, Travis County Commissioners Court approved a public hearing to be held on held on Tuesday, December 2, 2014 for the proposed Chapter 48, Rules of Travis County, Texas for On-Site Sewage Facilities. Please review the attached proposed rules which will also be posted on the Travis County website. Public comments regarding these proposed rules can be emailed to OSSF@traviscountytx.gov or mailed to Travis County TNR, Attention OSSF Program, P.O. Box 1748, Austin TX 78767 until November 30, 2014. Otherwise you will need to attend the public hearing for your concerns to be considered.

Free language assistance can be provided upon request.

Ayuda gratuita en su idioma se puede proporcionar por petición.

Rodney Sherrill, P.E.

D.R. # OS29417

Travis County TNR

On-Site Wastewater Program

700 Lavaca Street - 5th Floor

Travis County Administration Building

P.O. Box 1748

Austin, Texas 78767

Ph. (512) 854-7581

Rodney Sherrill

From: Janet Dunkelberg <janet@necessaryinc.com>
Sent: Friday, October 31, 2014 12:51 PM
To: Joe Wells
Cc: Brandon Couch; BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; Brain Padden; Brian Wendland; Brian Wendland; Bryan Porter; Cameron Smiley; Chris Osburn; Clifford Conner; Clint Vandervoort; Dan Balboa; Dan Balboa; Dan Reddon; Dan Reeder; Danny Gonzalez; Danny Gonzalez; Dave Mcghee; David Boston; David Coombs; David Price; David Price; David Smith; Derrek Eckermann; Derrick E. Lormand, R.S.; Doug Dowlearn; Dwayne Poteet; Eric Scheibe; gaynell@baileyhomes.com; George Gonzalez; Glenn Gardner; Hoyt Seidensticker; Hugo Elzonado; Jack Ward; James Kuykendall; Jashinski, Katherine; Jason Clark; Jay Fox; jay.fox@landman-environmental.com; Jim Bettridge; JMock@kingengineering.com; Joe Spillman; Jonothan Maass; Keith Schoenfelt; Keith Schoenfelt; Kim Geary; Kurt Prossner; Marc Pate; marc_dickey@ats-engineers.com; Mike Moore; Monica Osburn; ossf@austin.rr.com; ossf@sbcglobal.net; Rey Cedillos; Rick Waldrop; Robert Childress; Robert Wright; Russel Cain; Sarah Calvert; Sarah Calvert; septicsolutions@gmail.com; specificsites@aol.com; Stan Burrier; Stephen Jetton; Steve Gilmer; Steve Wenzel; Stewart Polvado; Suzanne Wukasch; Texaschang; Tommy Partridge; triplecseptic@yahoo.com; vis_designs@yahoo.com; VSE Septic Services, LLC; Wayne Dolezal Old?; Wayne Dolezal Old?; Wmoriarty@kingengineering.com; Stacey Scheffel
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

This is not FaceBook. It is a standard rules process. Get a grip.

On Fri, Oct 31, 2014 at 12:47 PM, Joe Wells <joe.wells@wwdengineering.net> wrote:

Brandon

Designated Forum for discussion seems inappropriate for an action that will impact so many. If you had email for all Travis County residents, I feel they should be advised about what is being proposed also.

Joe K. Wells, Jr., P.E.

From: Brandon Couch [mailto:Brandon.Couch@traviscountytx.gov]
Sent: Friday, October 31, 2014 10:49 AM
To: BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net;

Rodney Sherrill

From: David Venhuizen <waterguy@ix.netcom.com>
Sent: Friday, October 31, 2014 1:45 PM
To: Brandon Couch; 'BRAD SHAW'; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Janet Dunkelberg'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Joe Wells'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; ''Marc Pate''; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com
Cc: Stacey Scheffel
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

Again, I ask all concerned to submit comments through the proper channels, requesting that Travis County rationalize the rule addressing standoff from drip lines to limiting conditions. I just wanted to alert this group, which TNR had apparently identified as the community of interest in regard to these matters, of this egregious aspect of the proposed revisions -- or more correctly, the failure to appropriately revise. Any further discussion of the general behavior of TNR is the right of anyone to offer, it is not the right of anyone to dictate such speech, but I agree with Brandon this was not meant as a "forum". However, we all have a delete key, don't we? Thank you.

David Venhuizen, P.E.
Venhuizen Water Works
Planning & Engineering as if Water and Environmental Values Matter
www.venhuizen-ww.com
www.waterblogue.com

Your old road is rapidly agin'
Please get out of the new one
If you can't lend a hand
For the times they are a-changin'
- Bob Dylan

From: Brandon Couch [mailto:Brandon.Couch@traviscountytx.gov]
Sent: Friday, October 31, 2014 10:49 AM
To: BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa';

Rodney Sherrill

From: Sarah Calvert <info@sarahcalvertseptic.com>
Sent: Friday, October 31, 2014 4:43 PM
To: 'Janet Dunkelberg'; 'Joe Wells'
Cc: Brandon Couch; 'BRAD SHAW'; 'David Venhuizen'; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; 'Marc Pate'; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com; Stacey Scheffel
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

I appreciate the effort made to notify everyone about the revisions. I just think the emails should have been sent BCC. I don't want to be included on mass emails regarding everyone's comments. If there needs to be a forum discussion someone should put together a group everyone can voluntarily join and comment that way between ourselves prior to the public meeting. Sarah

Sarah Calvert
Sarah Calvert Septic
8702 El Rey Blvd.
Austin, TX 78737
(o) 512 288-6738
info@sarahcalvertseptic.com
www.sarahcalvertseptic.com

From: Janet Dunkelberg [mailto:janet@necessaryinc.com]
Sent: Friday, October 31, 2014 12:51 PM
To: Joe Wells
Cc: Brandon Couch; BRAD SHAW; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; Brain Padden; Brian Wendland; Brian Wendland; Bryan Porter; Cameron Smiley; Chris Osburn; Clifford Conner; Clint Vandervoort; Dan Balboa; Dan Balboa; Dan Reddon; Dan Reeder; Danny Gonzalez; Danny Gonzalez; Dave Mcghee; David Boston; David Coombs; David Price; David Price; David Smith; Derrek Eckermann; Derrick E. Lormand, R.S.; Doug Dowlearn; Dwayne Poteet; Eric Scheibe; gaynell@baileyhomes.com; George Gonzalez; Glenn Gardner; Hoyt Seidensticker; Hugo Elzonado; Jack Ward; James Kuykendall; Jashinski, Katherine; Jason Clark; Jay Fox; jay.fox@landman-environmental.com; Jim Bettridge; JMock@kingengineering.com; Joe Spillman; Jonothan Maass; Keith Schoenfelt; Keith Schoenfelt; Kim Geary; Kurt Prossner; Marc Pate; marc_dickey@ats-engineers.com; Mike Moore; Monica Osburn; ossf@austin.rr.com; ossf@sbcglobal.net; Rey Cedillos; Rick Waldrop; Robert Childress; Robert Wright; Russel Cain; Sarah Calvert; Sarah Calvert; septicsolutions@gmail.com; specificsites@aol.com; Stan Burrier; Stephen Jetton;

Rodney Sherrill

From: Sarah Calvert <info@sarahcalvertseptic.com>
Sent: Friday, October 31, 2014 4:46 PM
To: Rodney Sherrill; Stacey Scheffel; Brandon Couch
Subject: Blind CC's

Thank you for the work putting out the proposed revisions. I was hoping in the future everyone could receive notifications by blind CC. I really do appreciate getting info. Thanks, Sarah

Sarah Calvert
Sarah Calvert Septic
8702 El Rey Blvd.
Austin, TX 78737
(o) 512 288-6738
(f) 512 301-6958
info@sarahcalvertseptic.com
www.sarahcalvertseptic.com

Rodney Sherrill

From: David Venhuizen <waterguy@ix.netcom.com>
Sent: Saturday, November 01, 2014 10:51 AM
To: Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brad Shaw'; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Janet Dunkelberg'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Joe Wells'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; ''Marc Pate''; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com
Cc: Stacey Scheffel; Brandon Couch
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules
Attachments: Wisconsin SF column study-reduced.pdf

I figured out how to shrink the pdf of that "definitive study" I noted, so I've attached it for the benefit of those who are interested in pursuing good public policy on this matter. An astute reading of it reveals how, after "sand filter" treatment at least (understanding that all "secondary treatment" is not created equal -- the ATUs are very problematic in the on-lot environment), when the effluent is BULK-LOADED onto a column of MOUND SAND, even seeded virus is pretty well removed after travel through only 6 inches. Now consider drip dispersal, with the water slowly oozing out of emitters at about 1 gph, or less, into a much less coarse soil in the biologically active root zone, and it seems pretty much in the no-brainer class that 6 inches is highly protective. Please consider offering this argument regarding the rationality of the rule.

Then add on the irrationality of having the same standoff to both groundwater and rock after secondary treatment and having the same standoff to rock both with and without secondary treatment -- they have altered ONLY the standoff to rock with secondary treatment and repeated all the other standoffs already imposed in Chapter 285 -- and I trust we can make the point that this just was not very rationally addressed. Also note there is no rational basis for imposing a maximum hydraulic application rate of 0.15 or minimum flushing velocity of 2 fps. Indeed, we get the impression they're saying, we don't much like drip, we'd rather you do spray. About which they have set forth no meaningful "overlay" rules, even though Chapter 285 is quite "deficient" in how a spray dispersal system is to be "qualified".

Thank you to all who take this matter seriously. And apologies to all who feel this is an imposition. But like I said, we all have a "delete" key.

David Venhuizen, P.E.
Venhuizen Water Works
Planning & Engineering as if Water and Environmental Values Matter

Rodney Sherrill

From: Joe Wells <joe.wells@wwdengineering.net>
Sent: Saturday, November 01, 2014 2:03 PM
To: Sarah Calvert; 'Janet Dunkelberg'
Cc: Brandon Couch; 'BRAD SHAW'; 'David Venhuizen'; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; 'Marc Pate'; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com; Stacey Scheffel
Subject: RE: Travis County Proposed Chapter 48 OSSF Rules

Sarah

The someone that should have put together the group to discuss these issues should have been TNR.

As of now, the TNR developed the rules, TCEQ blessed it, and the court will allow time to comment on draft regulations prior to a public hearing and eventual adoption.

As one who is not available the week of December 2, 2014, I request for myself, and any others not available, a second public be scheduled.

I would also hope TNR would publish the requests from customers on what they would like to see in the rules. The TNR definition of customers would be helpful in understanding how TNR developed the new rules.

Joe K. Wells, Jr., P. E.

From: Sarah Calvert [mailto:info@sarahcalvertseptic.com]
Sent: Friday, October 31, 2014 4:43 PM
To: 'Janet Dunkelberg'; Joe Wells
Cc: 'Brandon Couch'; 'BRAD SHAW'; 'David Venhuizen'; 'Rodney Sherrill'; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net;

Rodney Sherrill

From: Joe Wells <joe.wells@wwdengineering.net>
Sent: Sunday, November 02, 2014 7:31 PM
To: Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brad Shaw'; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'
Subject: FW: Comments for proposed Chapter 48
Attachments: CCE11022014_00000.jpg

From: Joe Wells, Jr. [mailto:jwellsjr@austin.rr.com]
Sent: Sunday, November 02, 2014 7:28 PM
To: 'Stacey Scheffel'; 'Brandon Couch'
Cc: Erin Banks
Subject: Comments for proposed Chapter 48

Stacy

It appears that Chapter 48 has been revised by TNR, blessed by the Commissioners, and will soon be discussed one time in public. TNR seems to expect to make a few edits and re-present to the Commissioners for their final blessing.

It seems wrong that something this significant can be done without the input and ideas from the professionals that interface with the OSSF applicants and TNR.

I am further frustrated that I can not participate in the ONE TIME public hearing due to a prior week long educational commitment.

Please find my comments about the Proposed Chapter 48 attached.

Joe Wells
Joe Wells

JOE K. WELLS, JR., P.E.
4124 KACHINA DRIVE
AUSTIN, TEXAS 78735
512-251-7290
jwellsjr@austin.rr.com

November 2, 2014

COMMENTS ON PROPOSED CHAPTER 48, RULES OF TRAVIS COUNTY, TEXAS FOR ON-SITE SEWAGE FACILITIES

1. The process used to draft the proposed Chapter 48 Rules involved TNR and the legal staff. There was no effort to incorporate the thoughts and ideas of the many designers with many years of experience. **This has resulted in a proposal that has flaws and needs revising.**
2. The stated problem that needs addressing is the "use of OSSFs in Travis County, Texas is causing, or may cause, pollution and is injuring, or may cause injury, to public health in Travis County". **How was this problem identified?**
3. Chapter 48.001(1)(b)(5) states the Travis County has "considered the matter and deems it appropriate to enact an order adopting rules regulating OSSFs to abate or prevent pollution or injury to the public health in Travis County". **What was considered?**
4. What factors were considered in reaching the conclusion that the rules needed to be more stringent? **What was considered?**
5. In the 10 years since the existing rules were adopted, how many OSSF failures have occurred and what was the cause of failure? How will the new rules eliminate these failures?
6. Are there studies showing or claiming that 53% population growth will damage the Edwards Aquifer by pollution from properly designed and operating OSSF? If yes please provide a copy.
7. What percentage of Travis County OSSF land jurisdiction is over the Edwards Aquifer Recharge Zone?
8. On what basis is the application rate for drip irrigation limited to 0.15 gpd regardless of the soil evaluation determination?
9. Was any effort made to compare the budget for the TNR program to the cost to relinquish the OSSF duties to the TCEQ?
10. There is no definition for "causing pollution" or "injuring public health". Since these are the activities causing the rules to be more stringent, it would seem reasonable to define them so they can be identified by TNR personal and the members of the public.

Please make responses available to all. Any documents relied on to reach conclusions, or respond to questions are requested .

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Rodney Sherrill

From: BRAD SHAW <highlandlakes.engineering@yahoo.com>
Sent: Monday, November 03, 2014 9:32 AM
To: Joe Wells; Sarah Calvert; 'Janet Dunkelberg'
Cc: Brandon Couch; 'David Venhuizen'; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; 'Brain Padden'; 'Brian Wendland'; 'Brian Wendland'; 'Bryan Porter'; 'Cameron Smiley'; 'Chris Osburn'; 'Clifford Conner'; 'Clint Vandervoort'; 'Dan Balboa'; 'Dan Balboa'; 'Dan Reddon'; 'Dan Reeder'; 'Danny Gonzalez'; 'Danny Gonzalez'; 'Dave Mcghee'; 'David Boston'; 'David Coombs'; 'David Price'; 'David Price'; 'David Smith'; 'Derrek Eckermann'; 'Derrick E. Lormand, R.S.'; 'Doug Dowlearn'; 'Dwayne Poteet'; 'Eric Scheibe'; gaynell@baileyhomes.com; 'George Gonzalez'; 'Glenn Gardner'; 'Hoyt Seidensticker'; 'Hugo Elzonado'; 'Jack Ward'; 'James Kuykendall'; 'Jashinski, Katherine'; 'Jason Clark'; 'Jay Fox'; jay.fox@landman-environmental.com; 'Jim Bettridge'; JMock@kingengineering.com; 'Joe Spillman'; 'Jonothan Maass'; 'Keith Schoenfelt'; 'Keith Schoenfelt'; 'Kim Geary'; 'Kurt Prossner'; 'Marc Pate'; marc_dickey@ats-engineers.com; 'Mike Moore'; 'Monica Osburn'; ossf@austin.rr.com; ossf@sbcglobal.net; 'Rey Cedillos'; 'Rick Waldrop'; 'Robert Childress'; 'Robert Wright'; 'Russel Cain'; 'Sarah Calvert'; septicsolutions@gmail.com; specificsites@aol.com; 'Stan Burrier'; 'Stephen Jetton'; 'Steve Gilmer'; 'Steve Wenzel'; 'Stewart Polvado'; 'Suzanne Wukasch'; 'Texaschang'; 'Tommy Partridge'; triplecseptic@yahoo.com; vis_designs@yahoo.com; 'VSE Septic Services, LLC'; 'Wayne Dolezal Old?'; 'Wayne Dolezal Old?'; Wmoriarty@kingengineering.com; Stacey Scheffel
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

what we have here is a FAILURE TO COMMUNICATE. i am not talking about TNR, i am talking about TCEQ. They are the ones that started Chapter 285. I was there at their initiation of the rules. their point was " this is necessary since there are many different opinions that regulators all over the state are requiring in installations, and this rule will make a LEVEL PLAYING FIELD AND CONSISTANCY" for the entire state. Boy, were they wrong, now it is even more confusing than ever. The answer is very basic, you have designers, you have installers, both are regulated they know the rules. it is the little differences that really do not make a difference, that we are talking about. Let the professionals do what they are paid and licensed to do. we have toooo much regulation that only boggs down our output. I have spent 30 years designing this stuff, and most of the time i find myself involved in knit picking reviews. In general, most systems work just fine when using state rules. leave it at that, or have the state change the rule. dont add to it as an individual regulator, cause that means that, just as it is now, everyone is different.

On Saturday, November 1, 2014 2:03 PM, Joe Wells <joe.wells@wwdengineering.net> wrote:

Sarah

The someone that should have put together the group to discuss these issues should have been TNR.

As of now, the TNR developed the rules, TCEQ blessed it, and the court will allow time to comment on draft regulations prior to a public hearing and eventual adoption.

As one who is not available the week of December 2, 2014, I request for myself, and any others not available, a second public be scheduled.

I would also hope TNR would publish the requests from customers on what they would like to see in the rules. The TNR definition of customers would be helpful in understanding how TNR developed the new rules.

Joe K. Wells, Jr., P. E.

Rodney Sherrill

From: Jay Fox <jfox@landman-environmental.com>
Sent: Monday, November 03, 2014 10:08 AM
To: BRAD SHAW
Cc: Joe Wells; Sarah Calvert; Janet Dunkelberg; Brandon Couch; David Venhuizen; Rodney Sherrill; acesepticsolutions@gmail.com; aggienoble@cebridge.net; alcamservices@aol.com; amontes6755@sbcglobal.net; asepticservices@suddenlink.net; Brain Padden; Brian Wendland; Brian Wendland; Bryan Porter; Cameron Smiley; Chris Osburn; Clifford Conner; Clint Vandervoort; Dan Balboa; Dan Balboa; Dan Reddon; Dan Reeder; Danny Gonzalez; Danny Gonzalez; Dave Mcghee; David Boston; David Coombs; David Price; David Price; David Smith; Derrek Eckermann; Derrick E. Lormand, R.S.; Doug Dowlearn; Dwayne Poteet; Eric Scheibe; gaynell@baileyhomes.com; George Gonzalez; Glenn Gardner; Hoyt Seidensticker; Hugo Elzonado; Jack Ward; James Kuykendall; Jashinski, Katherine; Jason Clark; jay.fox@landman-environmental.com; Jim Bettridge; JMock@kingengineering.com; Joe Spillman; Jonothan Maass; Keith Schoenfelt; Keith Schoenfelt; Kim Geary; Kurt Prossner; Marc Pate; marc_dickey@ats-engineers.com; Mike Moore; Monica Osburn; ossf@austin.rr.com; ossf@sbcglobal.net; Rey Cedillos; Rick Waldrop; Robert Childress; Robert Wright; Russel Cain; Sarah Calvert; septicsolutions@gmail.com; specificsites@aol.com; Stan Burrier; Stephen Jetton; Steve Gilmer; Steve Wenzel; Stewart Polvado; Suzanne Wukasch; Texaschang; Tommy Partridge; triplecseptic@yahoo.com; vis_designs@yahoo.com; VSE Septic Services, LLC; Wayne Dolezal Old?; Wayne Dolezal Old?; Wmoriarty@kingengineering.com; Stacey Scheffel
Subject: Re: Travis County Proposed Chapter 48 OSSF Rules

Brad Shaw hit the nail on the head. I have worked on both sides of the fence. I retired from TCEQ in the Drinking Water Program and later worked for SW Engineers for eight years and transitioned into doing consulting and septic design.

Regulators do just that but when all is said and done they must have confidence that projects are completed as designed and within the guidelines of the rules (30 TAC 285) and quit knit picking what regulator or what index valve is used. The installer stands behind their work and if there are problems the designer gets involved again along with the DR to get a fix.

More rules mean more expense for the home owner that feels slammed anyway. More rules do not equate to a better product or to a more efficient septic system.

Failed systems are going to occur. When they do fail a fix need to be a top priority but perspective seems to fall short.

On Mon, Nov 3, 2014 at 9:32 AM, BRAD SHAW <highlandlakes.engineering@yahoo.com> wrote:
what we have here is a FAILURE TO COMMUNICATE. i am not talking about TNR, i am talking about TCEQ. They are the ones that started Chapter 285. I was there at their initiation of the rules. their point was " this is necessary since there are many different opinions that regulators all over the state are requiring in installations, and this rule will make a LEVEL PLAYING FIELD AND CONSISTANCY" for the entire state. Boy, were they wrong, now it is even more confusing than ever. The answer is very basic, you have designers, you have installers, both are regulated they know the rules. it is the little differences that really do not make a difference, that we are talking about. Let the professionals do what they are paid and licensed to do. we have toooo much regulation that only boggs down our output. I have spent 30 years designing this stuff, and most of the time i find myself involved in knit picking reviews. In general, most systems work just fine when using state rules. leave it at that, or have the state change the rule. dont add to it as an individual regulator, cause that means that, just as it is now, everyone is different.

Rodney Sherrill

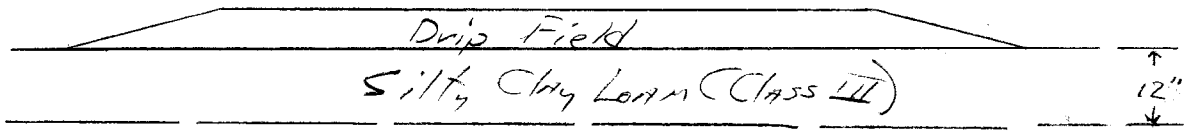
From: Brandon Couch
Sent: Monday, November 03, 2014 11:28 AM
To: Rodney Sherrill
Cc: OSSF
Subject: FW: Rule change
Attachments: tnr new rules.pdf

From: tom partridge [mailto:topart1140@gmail.com]
Sent: Monday, November 03, 2014 10:18 AM
To: Brandon Couch
Subject: Rule change

Brandon
Attached is my two cents worth. I wish for u to use for tnr consideration only. I have not checked all the calculations and choose not to send it to all 73 people if u know what I mean. If this is a problem let me know and maybe I will type it up and proof the thing.
Please share with Rodney if u don't mind.
Thanks

Consider a typical drip system as follows:

3 BR, 240 gpd $R_a = 0.15$ $A = 1600\ ft^2$



Bedrock

(1) Case 1 - Calculate Potential Flow Thru Silty Clay loam

See P. 79 (M. Whorter, attached)

$$q_z = -K\left(\frac{y+L}{L}\right)A = -K\left(1 + y/L\right)A$$

where: $A = 1600\ ft^2$ (assumes three BR home (240 gpd) & $R_a = 0.15$ gpd/ft^2)

K = hydraulic conductivity

$\cong 0.2 - 0.6$ in/hr (See Williamson Co. Soil report - attached.)

$= $ Use 0.2 in/hr

$\cong 1.4 \times 10^{-4}$ cm/sec (~ 3 gpd/ft^2)

Note: I have performed permeability tests on the silty clay loam at home & can verify that 1×10^{-4} cm/sec is reasonable.

$1 + y/L = 1$ where: $y/L \rightarrow 0$ (i.e. unit gradient)

$$q_z = 3 \times 1 \times 1600 = \underline{4800\ gpd}$$

Note: Silty Clay Loam is more than capable of transmitting 240 gpd from 3 BR.

This case also assumes underlying bedrock is at least as permeable as silty clay loam.

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2) Case 2 - Assume Bedrock is Impermeable

As such, flow will only occur laterally out the perimeter of the Silty Clay Loam. See attached P. 96 (M. Whorton)

$$Q = q_x(x, r_f) z_f L = -K \frac{dh}{dx} z_f L$$

where: $K = 3$ gpd/ft^2 (as before)

$$\frac{dh}{dx} = \frac{1'}{5'} = 0.20$$

Assumes silty clay loam is saturated beneath drainfield, and water table slopes over 5' beyond drainfield perimeter to feather thickness (i.e. zero)

$z_f = 1'$ Saturated Thickness

$L = 160'$ Perimeter of Drainfield

$$Q = 3 \times 0.20 \times 1 \times 160$$

$$= \underline{\underline{96 \text{ gpd}}}$$

Note: Silty clay loam will not discharge 240 gpd w/ bedrock impermeable.

Thus, for drainfield to perform properly bedrock must be fractured to some degree.

3) Case 3 - Calculate required permeability of bedrock if 96 gpd flows laterally.

$$K = \frac{Qz}{(1 + y/L)A} = \frac{240 - 96}{1 \times 1600}$$

$$K = \underline{0.09 \text{ gpd/ft}^2}$$

Note: This permeability is $\frac{0.09}{3} = 0.03$ only 3 % of the permeability of silty clay loam.

(4) Case 4 - Calculate required permeability of bedrock if 96 gpd flows laterally & homeowners use a reasonable amount of water. Assume 40 gpd/person x 4 = 160 gpd

$$K = \frac{\phi z}{(1 + 4/L)A} = \frac{160 - 96}{1 \times 1600}$$

$$= 0.04 \text{ gpd/ft}^2$$

Note: This permeability is $\frac{0.04}{3} = 0.013$ only 1.3 % of permeability of silty clay loam.

The actual permeability in cm/sec is $K = 0.013 \times 1.4 \times 10^{-4}$ cm/sec

$$= 1.8 \times 10^{-6} \text{ cm/sec}$$

This is <u>100 times</u> less permeable than silty clay loam & simply means bedrock does not need to be highly fractured for drainfield to work. On the other hand, the drainfield will not work in unfractured bedrock.

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Permeability of Fractured Bedrock

A long time back, I conducted "Old Fashioned Perc. Tests" in fractured bedrock (i.e. limestone). I had my foundation auger rig drill 12" dia. perc. holes to 30". I did the saturation procedure & the following day I conducted the perc. test. I conducted these tests on 4-5 lots, not a large number. But, most perc. rates were on the order of 4-6"/hr. The slowest was around 1"/hr.

The permeability at 1"/hr. can be calculated w/ Darcy equation as follows:

$$Q = KIA$$

$$K = \frac{Q}{IA}$$

$$= \frac{0.065}{1 \times 3.93}$$

$= 0.0[illegible]$ ft/hr
$= 0.2$"/hr
$= 1.4 \times 10^{-4}$ cm/sec

Q = flowrate – holes were filled w/ 12" of water both days

$Q = \frac{1}{12}' \times \pi d^2/4 = 0.065\ ft^3/hr$

$A = \pi d \times 1' + \pi d^2/4$

$= \pi + \pi/4 = 3.14 + 0.785$
$= 3.93\ ft^2$

Notes: ① Coincidentally, this permeability is the same as the silty clay loam.

② Published values of permeability in Texas Water Board reports range from 0.54-15.4 ft/day and average ~5.5 ft/day (i.e. 1.9×10^{-3} cm/sec)

As shown, the typical Hill Country limestone is permeable enough to transmit 240 gpd thru a 1600 ft^2 drainfield.

But, it is also possible to find individual drainfield locations where the limestone is relatively impermeable.

Case 5 Add evapotranspiration to Cases 1-2 & 4

$$A = \frac{1.6\,Q}{.14} = \frac{1.6\,(240\ gpd)}{.14} = 2743\ ft^2$$

For a 1600 ft^2 drainfield, ET equals as follows:

$$ET = \frac{1600}{2743} \times 240\ gpd \cong 140\ gpd$$

Hopefully, ET equation is "conservative".

Case 1 - Obviously, w/ permeable silty clay loam & bedrock, ET only helps.

Case 2 - Flow = 96 + 140 = 236 gpd

If bedrock is impermeable, drainfield will not really work but it is close.

Case 4 - If family uses ~160 gpd, drainfield will work w/ impermeable bedrock

TOPS

Case 6 - Now let's look at 1200 ft^2 drainfield w/6" soil.

1- Lateral Flow - Perimeter $\cong$ 140'

$Q_B = 3 gpd/ft^2 \times 0.20 ft/ft \times 0.5' \times 140$

$= 42$ gpd

2- ET = 140 gpd

Total 1 & 2 = 182 gpd (Won't handle 240 gpd)
If family uses 160 gpd (Barely works)
Therefore, rock must be fractured.
And under typical circumstances of rock permeability ranging from 1×10^{-4} to 1×10^{-3} cm/sec, drainfield will work OK.

In summary, the new criteria are marginally better. With new criteria, impermeable bedrock & 160 gpd flow 1600 ft^2 will work, but won't work at 240 gpd.
The existing 1200 ft^2 & 6" soil, bedrock must be fractured.
So in both cases, ET & fractured bedrock are really required for an "adequate design".

<u>Case 7</u> Here's what will work. Consider a 1200 ft^2 drainfield using 400' of pressure close trench (18" deep, 6" wide) (w/18" gravel in trench) w/aerobic treatment (i.e. no effluent in trenches). Let's keep the 6" of natural soil.

$K = 1.4 \times 10^{-4}$ cm/sec
≈ 3 gpd/ft^2

$Q = KIA$ where:

I = hydraulic gradient
$= 1.0$ (unity)

$A = 400 \times (1.5 + 1.5 + 0.5)$
$= 1400$ ft^2 in trenches

$Q = KIA$
$= 3 \times 1 \times 1400$
$= 4200$ gpd

Now let's conservatively lower rock permeability to 1×10^{-5} cm/sec (0.21 gpd/ft^2)

$Q_{soil} = 3 \times 1 \times [400 \times (0.5 + 0.5)]$
$= 1200$ gpd

$Q_{rock} = 0.21 \times 1 \times [400 \times (1 + 1 + .5)]$
$= 210$ gpd

Total = 1410 gpd

TOPS

If trench were totally in rock at 1×10^{-5} cm/sec (0.21 gpd/ft^2)

$Q = K I A$

$= 0.21 \times 1 \times 1400$

$= 294$ gpd (still exceeds 240 gpd)

And I have not included the following:

(1) Any lateral flow

(2) Any infiltration between trenches

(3) Any evapotranspiration

From a practical standpoint, consider a typical 60 gal. dose for a LPD system. This dose is $\frac{60}{7.48} = 8.02$ ft^3 spread over 200 ft^2 of pressure dose trench. Assume gravel in trenches has a porosity of 30%, then the dose will be ~ 1.6" thick at the bottom of the 18" trench. At 4 doses/day w/several hours between doses, the system should have no substantial reason for not working unless rock is absolutely unfractured. And fracturing can be assessed via profile hole inspection w/holes required minimum 2' into rock.

I close with the following points:

(1) If the aerobic unit works properly, the soil layer (6" or 12") provides additional treatment as a backup. Thus, relatively clean water w/no biomat forming potential enters the subsurface. As such, the problem under consideration is a permeability (i.e. flow) problem, <u>not a treatment problem</u>, as some comments have stressed.

(2) If "R_a" is reduced, then the setback of 25' to potential seep should be reduced to 15'. I have a site right now that is not big enough for 0.15 gpd/ft^2. R_a = 0.2 gpd/ft^2 barely fits. However, 0.15 gpd/ft^2 will work w/ setback = 15 ft. This is same rationale as using R_a = 0.1 gpd/ft^2 and allowing a setback of 10 ft.

If the setback remains 25', these changes are overly cumbersome given the large number of small & rough lots around.

(3) Pressure dose w/aerobic at 0.2 gpd/ft^2 should be allowed. Verify functioning by profile hole inspection 2' into rock.

TOPS

(4) Perc. tests in rock should be allowed with drip emitters at $R_a = 0.2$ gpd/ft^2 to verify fractured rock. A minimum of 3 per site should be required.

GROUND-WATER HYDROLOGY AND HYDRAULICS

by

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and

Daniel K. Sunada

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EXAMPLE 3-7

Water is ponded to a shallow depth over a column of aquifer material (Fig. 3-5). The elevation of the terminal end of

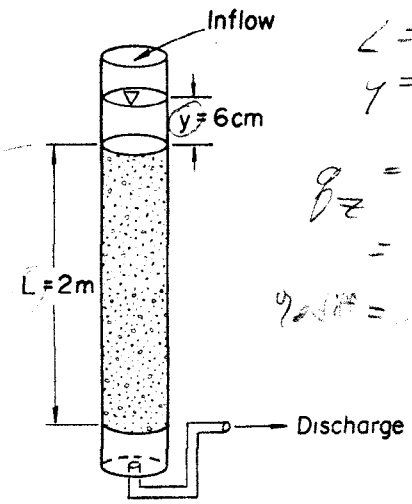

Figure 3-5. Steady downward flow in a vertical column.

the discharge tube is maintained equal to the elevation of the bottom of the column. Head loss through the discharge tube is negligible. Water is added at the top at the same rate it is discharged from the bottom. The hydraulic conductivity of the porous material is 1.1×10^{-3} cm/s. Calculate the Darcy velocity in the column. Also, derive a general formula for q in terms of K; the depth of ponded water, y; and the length of column, L.

Solution:

The equation of Example 3-5 applies to this case since, again, the flow is parallel to the z-coordinate, and both q and K are constants. The bottom of the porous material in the column is selected as the datum. The pressure head at the bottom of the porous solid is zero since the discharge tube is maintained at the same elevation as the bottom of the material. Also, z=0, at this location, so $h_1=0$.

The pressure head at the top of the porous solid is 6 cm, and the elevation is 2 m. Thus, $h_2=2.06$ m. The length of flow path is 2 m, and

$$q_z = -1.1 \times 10^{-3} \left(\frac{2.06 - 0}{2.0} \right) = -1.13 \times 10^{-3} \text{ cm/s} \quad .$$

The negative sign indicates that q is in the direction of decreasing z (i.e. downward).

In general, for any datum

$$h_1 = 0 + z_1 = z_1$$

and

$$h_2 = y + z_1 + L.$$

Thus, gradient = 1

$$q_z = -K\left(\frac{-y+L}{L}\right) = -K(1 + y/L)$$ ← unit gradient, A = for unit field

Note that $y/L \to 0$ for either very shallow pond depths or large L, and $|q_z| \to K$. This is the condition of a unit gradient of piezometric head. When $dh/dz = 1$, $dp/dz = 0$ (i.e. the pressure is constant) and the downward flow results from the gravitational driving force only. This condition is sometimes approached by downward seepage from shallow lakes or recharge ponds, below which the water table depth is large relative to the pond depth.

Laboratory Determination of Hydraulic Conductivity

The most reliable method of determining the hydraulic conductivity and intrinsic permeability is from aquifer tests conducted in the field. These methods are discussed in Chapter V. Values of hydraulic conductivity, determined by carefully conducted experiments in the laboratory, are quite accurate and reproducible. By necessity, laboratory samples are extremely small compared to the aquifer as a whole, however. Furthermore, some degree of disturbance always accompanies the collection of the samples. For these reasons, it is extremely difficult to characterize the hydraulic conductivity of an aquifer, or even a small portion, by means of laboratory measurements.

Hydraulic conductivity and intrinsic permeability can be measured directly with *permeameters*. Two commonly used permeameters are shown in Fig. 3-6. Figure 3-6a depicts a constant-head permeameter in which steady upward flow through the sample is established. Darcy's equation can be applied directly in this case to compute K,

$$K = \frac{QL}{\Delta hA} \qquad (3\text{-}23)$$

The total head loss through the permeameter is indicated by the difference in elevation between the inflow and outflow water levels. In a properly designed permeameter, the head loss through the retaining screens and the inflow and outflow

position is an outcome of the solution, yet the water-table position is required (a priori) to define the flow domain in which Eq. 3-64 applies, makes it very difficult to obtain the required solutions. Even for steady flows, when the water table is fixed in time, calculation of its configuration via the above approach is not a simple task.

The Dupuit-Forchheimer Approximations

The difficulties attending the solution of Eq. 3-64, or appropriate less general forms, in water-table aquifers have led hydrologists to use a more practical, if less rigorous, approach. Consider a sloping water table above a horizontal impermeable boundary as shown in Fig. 3-14. The slope has been greatly exaggerated for clarity. The discharge, per unit width into the plane of the paper, across any vertical plane is

$$Q = \int_0^{z_f} q_x(x,z)\, dz \quad . \tag{3-65}$$

Evaluation of the integral in Eq. 3-65 requires that $q_x(x,z)$ be known. However, provided that the slope δ of the water table is small, q_x at the water table does not differ significantly from that on the impermeable boundary and $q_x(x,z) \approx q_x(x,z_f)$.

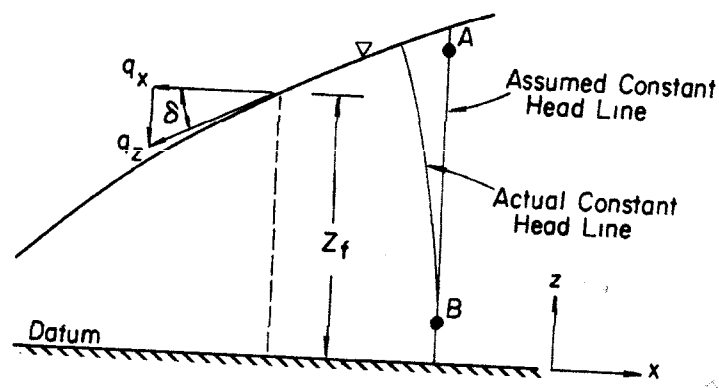

Figure 3-14. Flow in a water table aquifer.

In this case

$$Q = q_x(x,z_f)\, z_f = -K \frac{dh}{dx} z_f \quad , \tag{3-66}$$

where h is the piezometric head at the water table. By definition of a water table, the pressure head must be zero there,

so $h=z_f$ and

$$Q = -Kh \frac{dh}{dx} \quad . \tag{3-67}$$

In Eq. 3-67, h represents both the thickness of the flow and the piezometric head at the water table. The quantity dh/dx is the tangent of the angle the water table makes with the horizontal. Equation 3-67 actually implies that the flow is entirely horizontal, and that the pressure-head distribution along any vertical is hydrostatic. In other words, the piezometric head along any vertical is constant. It is emphasized that Eq. 3-67 is valid for situations in which the water-table slope is small. More explicitly

$$(dh/dx)^2 << 1 \tag{3-68}$$

is the condition that must be satisfied (Bear, 1972).

The Boussinesq Equation

The Dupuit-Forchhiemer assumption of horizontal flow permits the use of a material-balance control volume that extends from the horizontal floor of the aquifer to the water table (Fig. 3-15). Because changes in water density are unimportant in unconfined aquifers, mass balance is assured by a volume balance. Following the procedures of the previous section, the rate of net outflow from the control volume is

$$\text{Net Outflow Rate} = \frac{\partial Q_x}{\partial x} \Delta x + \frac{\partial Q_y}{\partial y} \Delta y \quad . \tag{3-69}$$

From Eq. 3-67, written for both the x and y directions in an isotropic aquifer,

$$\frac{\text{Net Outflow Rate}}{\Delta x \Delta y} = - \frac{\partial}{\partial x} \left(Kh \frac{\partial h}{\partial x}\right) - \frac{\partial}{\partial y} \left(Kh \frac{\partial h}{\partial y}\right) . \tag{3-70}$$

As before, the net rate of outflow must equal the negative time rate of reduction of stored water volume. The change in water volume associated with a change, dh, of water-table level follows from the definition of apparent specific yield discussed in Chapter II.

$$\frac{\partial V_w}{\partial t} = S_{ya} \frac{\partial h}{\partial t} \Delta x \Delta y \tag{3-71}$$

Combining Eqs. 3-70 and 3-71 yields

›il survey of
'illiamson County, Texas

By Leroy E. Werchan and John L. Coker, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Texas Agricultural Experiment Station

.LIAMSON COUNTY is in east-central Texas. ɜetown is the county seat. Taylor is the leading ɔltural community. Urban sprawl is rapid, particularly Interstate 35 and U.S. Highway 183 in the western part of the county.

gular in shape, this county covers 426 square . about 720,640 acres. The lakes at Granger and ɜetown make up 5,710 surface acres of water. The ushy Creek watershed structures, which have a ɔf 1,318 surface acres of water, and hundreds of ponds and several streams add 7,052 surface acres › water resources of the county.

the total land area, about 34,930 acres are in urban and other nonagricultural uses, 372,000 acres are for crops, 62,000 acres are in pasture, and 246,000 are in native grass, according to records of the field office of the Soil Conservation Service.

ɜ main watercourses, the San Gabriel River and ıy Creek, flow through the county in a west-east ion. All drainage is into the Brazos River shed.

s soil survey supersedes the soil survey of mson County published in 1938 (*4*). This survey ɔes additional information and larger maps that the soils in greater detail.

scriptions, names, and delineations of soils in this urvey do not fully agree with those on soil maps for ent counties. Differences are the result of better ledge of soils, modifications in soil series concepts, ɜity of mapping, or the extent of soils within the y.

General nature of the county

This section provides general information on the history, natural resources, climate, agriculture, industry, and transportation in the county.

History

There were many Indian tribes in Williamson County and the surrounding area in about 1746, when the Spanish established the first missions at the junction of Brushy Creek and the San Gabriel River.

In 1821, settlers from Stephen F. Austin's first colony in adjoining Travis County began to settle along Brushy Creek and the San Gabriel River. By the late 1850's, competition for land drove the price up from 23 cents an acre to about 5 dollars an acre.

Williamson County was established in 1836 from the western part of Milam County and was annexed by the State of Texas in 1845. It was named after Robert McAlpin Williamson, a prominent circuit judge and Texas Ranger. Georgetown was named after George Glasscock, who donated land for the courthouse.

Early agriculture consisted mainly of growing crops and raising livestock to provide the basic food for human consumption. Later, beef cattle were raised for trade. The advent of barbed wire in 1873 made ranching more practical. Cotton became a major cash crop in about 1870. Five railroad lines, built between 1876 and 1900, provided a means for marketing agriculture products outside the county (*3*).

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
Pct	In/hr	In/in	pH				Pct
40-55	0.06-0.2	0.14-0.18	6.6-8.4	High----------	0.32	5	1-3
18-45	0.06-0.2	0.14-0.22	7.9-8.4	High----------	0.32		
5-15	2.0-6.0	0.05-0.10	5.6-7.3	Very low--------	0.17	5	<1
35-50	0.2-0.6	0.15-0.18	5.1-6.5	Moderate-------	0.24		
20-45	0.2-0.6	0.14-0.18	5.1-6.5	Moderate-------	0.24		
35-60	0.06-0.2	0.15-0.20	7.9-8.4	High----------	0.32	2	1-4
35-60	0.06-0.2	0.15-0.20	7.9-8.4	High----------	0.32		
---	---	---	---	----------	----		
32-48	0.2-0.6	0.15-0.20	7.9-8.4	Moderate-------	0.24	1	1-3
---	---	---	---	----------	----		
35-60	0.2-0.6	0.05-0.12	6.6-8.4	Moderate-------	0.10	1	1-3
---	---	---	---	----------	----		
35-60	0.2-0.6	0.05-0.12	6.6-8.4	Moderate-------	0.10	1	1-3
---	---	---	---	----------	----		
35-60	0.2-0.6	0.05-0.12	6.6-8.4	Moderate-------	0.10	1	1-3
---	---	---	---	----------	----		
20-40	0.6-2.0	0.10-0.13	7.9-8.4	Low----------	0.24	1	<2
---	---	---	---	----------	----		
32-50	<0.06	0.14-0.20	7.4-8.4	Very high------	0.32	5	1-4
35-60	<0.06	0.14-0.20	7.4-8.4	Very high------	0.32		
---	---	---	---	----------	----		
40-60	<0.06	0.15-0.18	7.9-8.4	Very high------	0.32	4	.5-2
40-60	<0.06	0.15-0.20	7.9-8.4	Very high------	0.32	5	1-4
40-60	<0.06	0.12-0.20	7.9-8.4	Very high------	0.32		
20-40	0.2-0.6	0.15-0.20	6.1-7.8	Moderate-------	0.32	2	1-4
60-80	0.06-0.2	0.12-0.20	6.1-7.8	High----------	0.32		
---	---	---	---	----------	----		
20-40	0.2-0.6	0.11-0.19	6.1-7.8	Moderate-------	0.28	2	1-4
60-80	0.06-0.2	0.11-0.20	6.1-7.8	High----------	0.32		
---	---	---	---	----------	----		
40-60	<0.06	0.15-0.20	7.9-8.4	Very high------	0.32	5	1-4
40-60	<0.06	0.12-0.20	7.9-8.4	Very high------	0.32		
40-60	<0.06	0.11-0.18	7.9-8.4	Very high------	0.28	5	1-4
40-60	<0.06	0.12-0.20	7.9-8.4	Very high------	0.32		
40-60	<0.06	0.15-0.20	7.4-8.4	Very high------	0.32	5	1-4
40-60	<0.06	0.15-0.20	7.4-8.4	Very high------	0.32		
35-55	0.2-0.6	0.15-0.20	7.4-8.4	High----------	0.32	5	1-3
40-60	0.2-0.6	0.14-0.20	7.9-8.4	High----------	0.32		
35-60	0.2-0.6	0.14-0.20	7.9-8.4	High----------	0.32		
25-43	0.6-2.0	0.12-0.19	7.9-8.4	Moderate-------	0.32	5	1-3
2-10	6.0-20	0.05-0.08	5.6-7.3	Very low--------	0.17	5	<1
18-35	0.6-2.0	0.14-0.18	5.1-6.5	Low----------	0.24		

of table.

Chap 48 Proposed rules Comments From Wenzel

1. The bases referenced in the rule changes on min "residential" lot sizes vary from .5-1.0 AC. Sounds like TNR just picked 1.0 AC because of the general statement of "thin soils" & groundwater protection. I think that the lots in each subdivision should be based o the Planning Report-that's what it's for. If there is a min lot size that should accommodate the max drainfield and a replacement, why be required to do a Planning Report.
2. TNR should define a "residential flow" since it can vary from 180 GPD - 540 GPD + I suggest that if the density of lots in the County is the concern, state a GPD/AC as the goal of the rules, and not the lot sizes as the ONLY density control. A WW flow/AC can also be based on the Facility Planning Report of the subdivision to determine the Ra. A density based on flow/AC allows the plat to govern the size of the houses which can help promote more affordable housing-i.e. a 3 bedroom house of 240 GPD will be on a smaller lot than an 8 bedroom house. This will give guidance for designers to determine the min. lot sizes of duplexes, commercial, and mixed uses lots. 285 has already established the min. treatment levels of WW before it can be disposed of. Commercial designs must have adequate treatment and surge considerations before sizing the drainfield. The dirt doesn't know the difference of residential or commercial WW. The min. residential sizes of 1 AC will make it very unviable for a City to annex and provide public utilities to a spread out development; it will also drive developers to gerrymander lot lines to flag to flood plains, steep slopes, and around environmentally undevelopable areas to get the 1 ac. and move the house sites to the street to save money.
3. How will commercial lots be sized and how will they relate to "residential lot" sizes?
4. Can TNR require an overall SUBDIVISION WW flow/AC density which will allow the developer to utilize all the area of the tract?
5. I haven't talked to a lot owner yet that knows that there is a Subdivision Facility Planning Report, so they obviously did not use it to make a decision to buy the lot. The plat never says anything about it, the types of OFFS's, the assumed house size, or even where to get a copy. TNR mentions the basis of this is to "give the owner the maximum options of facilities to provide protection to the environment", most lot owners don't know what the acronym OSSF even stands for, much less them picking the best OSSF for the environment. I suggest that TNR establish the contents of the Subdivision Planning Report so that future lot owners can make that decision strictly based on the report to include the discussions of types, pro & cons of each, size of the assumed house, and costs of each, etc. OR make a general statement on the plat that ***the future LOT owner should get a site evaluation of each lot before buying it.*** Typical new residential lots are bought by builders and the end user never even sees this.
6. My personal complaint: ***Some portions of Travis have the COA crisscrossing OSSF regs outside of their limits-"No this is the COA Health and Safety"- that means the COA reviews the septic and TNR does the house and driveway; "No this lot is in the Limited purpose of the COA" I think that you have to get a complex detailed COA building permit and TNR septic permit," In the supporting guidelines for the proposed rules,it Sounds like TNR wants lot owners to know***

how to make informed decisions on the best OSSF for the protection of the environment, COME ON!!! I don't even know who's on first. I can't tell you the frustration of figuring it out. Home owners and home builders are confused on who is even the regulator of what. When I was 6 or 7 playing football in a field with my buddies, the first thing we did was picked a Captain and establish the rules-what do you say-PICK ONE!! PICK the lots and give them BOTH the house and septic to them-be good boys and SHARE. This is ridiculous when both entities are supposedly meeting the Chap 285 criteria-who cares who's Captain unless it a power thing-I can tell you it's confusing as hell thing from this angle. A homeowner can't go to one entity and get records of what's on the lot. Getting the permits requires us to go to Mom and get her permission, then to DAD. Sometimes they say NO-check back with MOM cause I need her approval first-but "MOM says she needs yours first.... we bounce back & forth like little kids and look like idiots to our clients trying to get & coordinate a development permit.

CODE: 1105

City of Austin

Founded by Congress, Republic of Texas, 1839
P.O. Box 1088, Austin, Texas 78767

Received
NOV 20 2014
Travis County-TNR

November 12, 2014

Travis County Transportation and Natural Resources
Attention: OSSF Program
P.O. Box 1748
Austin, TX 78767

RE: City of Austin comments on proposed Travis County On-Site Sewage Facility (OSSF) rules

Dear Sir or Madam:

The City of Austin (the "City") provides these comments for consideration by Travis County (the "County") on the proposed modifications to County Code Chapter 48 regarding OSSF.

Vertical Separation and Nitrogen Reduction

In October 2013, the City adopted more stringent OSSF rules (see attachment). City rules now require: a minimum of 3 feet of vertical separation distance from groundwater for soil adsorption systems following septic tank treatment; use of a nitrogen reduction system prior to OSSF drainfields installed over the Edwards Aquifer recharge zone; use of a nitrogen reduction system prior to OSSF drainfields within the contributing zone of the Barton Springs Segment of the Edwards Aquifer when standard absorption systems are not suitable; and use of a nitrogen reduction system prior to OSSF drainfields within 75 feet of Lake Austin.

The Barton Springs Segment of the Edwards Aquifer (the "Barton Springs Segment") provides drinking water for approximately 60,000 central Texans, provides discharge for the regionally important cultural resource of Barton Springs, and is habitat for multiple sensitive and endangered species. Land disposal of effluent within the contributing and recharge zones of the Barton Springs Segment continues to increase substantially over time (Herrington, Menchaca and Westbrook 2010). A recent United States Geological Survey study (Mahler et al. 2011) that was partially funded by Travis County correlate degrading surface water quality in the contributing zone of the Barton Springs Segment and degrading groundwater quality with increasing wastewater disposal by land application.

Similarly, the Northern Edwards Aquifer provides critical habitat to the federally threatened Jollyville Plateau Salamander (*Eurycea tonkawae*). Elevated nitrogen levels are suspected of potentially deforming *Eurycea* salamanders in developed spring locations in northwest Austin. One segment of Bull Creek is currently identified by the Texas Commission on Environmental Quality as having depressed dissolved oxygen concentrations impairing aquatic life uses, which may be related to increased organic matter loading to groundwater.

Water quality of Lake Austin, the primary drinking water withdrawal point for the City, is also degrading over time. The frequency, duration and severity of planktonic algae blooms in Lake Austin is increasing over time, and planktonic algal communities in Lake Austin are becoming increasingly dominated by nuisance blue-green algal groups (Richter 2010). OSSF along the lake may be contributing excess nutrients exacerbating nuisance algal blooms.

To protect surface water and groundwater quality, the City respectfully requests that Travis County consider adopting equivalent groundwater vertical separation distances and nitrogen reduction system requirements to current City of Austin regulations.

Thank you for your consideration of these comments. If you have questions about City OSSF permitting, please contact David Juarez, P.E. at 512-972-0191. If you have questions about ambient water quality issues, please contact Mike Personett at 512-974-2652.

Sincerely,

David Juarez, P.E., Assistant Director
Austin Water

Mike Personett, Assistant Director
Watershed Protection Department

Attachment 1: City of Austin OSSF Regulations Code excerpt
Attachment 2: Literature Cited

Attachment 1

City of Austin Code 15-5-10 (OSSF Regulations) excerpt:

(F) This subsection establishes additional design criteria.

(1) A spray irrigation system may only be used for a single-family residence. Spray irrigation may only be conducted during nighttime hours (after 12:00 AM and before 5:00 AM). The minimum setback to a property line or the residence from the edge of the spray area shall be 25 feet for a spray irrigation system.

(2) Soil Absorption Systems following septic tank treatment require a minimum depth to indications of groundwater of 36 inches, measured from the bottom of the media or the bottom of the excavation, whichever is applicable. The use of drip irrigation or low-pressure dosing after septic treatment reduces this vertical separation requirement to 24 inches.

(3) An impervious liner must be used between the excavated surface and an evapotranspiration system where 36 inches of suitable soil (as referenced in 30 TAC § 285.91 Table XIII) does not exist between the excavated surface and indications of groundwater.

(4) A drainfield may not be installed within the Edwards Aquifer Recharge Zone, as it is defined in Section 15-5-2, unless it follows a City-approved nitrogen reduction system.

(5) If a site is not suitable for a standard absorption system based on the criteria of 30 TAC § 285.91 (Table V) and the additional vertical separation criteria of this ordinance, a City-approved nitrogen reduction system must be installed within the Barton Springs Segment of the Edwards Aquifer Contributing Zone.

(6) A drainfield may not be installed within 75 feet of the control elevation of Lake Austin unless it follows a City-approved nitrogen reduction system.

Attachment 2

Literature Cited

Herrington, C., and M. Menchaca, M. Westbrook. 2010. Wastewater disposal practices and change in development in the Barton Springs Zone. City of Austin Watershed Protection Department. SR-11-01.
http://www.austintexas.gov/watershed_protection/publications/document.cfm?id=186346

Mahler, B.J., and M. Musgrove, C. Herrington, T. Sample. 2011. Recent (2008-2011) Concentrations and Isotopic Compositions of Nitrate and Concentrations of Wastewater Compounds in the Barton Springs Zone, South-Central Texas, and Their Potential Relation to Urban Development in the Contributing Zone. United States Geological Survey Scientific Investigations Report 2011-5018.
http://pubs.usgs.gov/sir/2011/5018/pdf/sir2011-5018.pdf

Richter, A. 2010. Lake Austin and Lake Travis Algae Counts. City of Austin Watershed Protection Department. SR-10-13.
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November 25, 2015

ADDITIONAL COMMENTS ON PROPOSED CHAPTER 48, RULES OF TRAVIS COUNTY, TEXAS FOR ON-SITE SEWAGE FACILITIES

I would hope, and expect, the Travis County Commissioners would need, and demand, answers to the following questions:

What statement, study, or information does TNR staff have:
1. that indicates the 30TAC285 rules are no longer effective in protecting the public health and safety?
2. showing any impact from OSSFs discharges on the waters of the Edwards Aquifer?
3. describing groundwater pollution problems for Travis County ground water users?
4. indicating the acres subject to TNR control that are in the Edwards Aquifer recharge zone?
5. that indicates the proposed changes will in any way change the effluent quality discharged by OSSFs in Travis County.?
6. that indicate OSSFs designed, and operated as designed, under the current 30TAC285 rules are causing degradation of the environment and/or the public safety?
7. that would show the economic impact on the cost of design and construction under the new rules proposed?
8. that would indicate more OSSFs would cause the microbiological waste treatment of the effluent as it passes thru the soil to not continue to operate?

With a discussion of these questions, I am expecting to show that we do not currently have a problem, and that there is no reason to take action even if there is significant growth.

The proposed rules will restrict an owner's use of his land for OSSFs, and the cost of design and construction of LPD OSSFs will increase 20 to 40 %. The effluent quality from OSSFs designed under the current rules will be the same under the proposed rules.

Adoption of these proposed rules will not decrease the impact of growth or change the quality of the effluent. It will impact the cost of OSSFs for the Travis County residents that do not have sewer service.

Joe K. Wells, Jr., P. E.

STATE OF TEXAS
JOE K. WELLS JR.
29742
LICENSED
PROFESSIONAL ENGINEER

Joe K. Wells, Jr.
F-771