

## Section 5 – Site Assessment and Soil Evaluation

### 1. Site and Soil Evaluation

- a. A site and soil evaluation must be conducted for each property on which an OWTS is proposed, to determine the suitability of a location to support an OWTS, and to provide the design engineer a sound basis to select the most appropriate OWTS design for the location and application.
- b. The soil evaluation must be conducted by a Competent Technician, see Section 5.7 for qualifications.
- c. Each site evaluation must consist of:
  - i. Preliminary investigation;
  - ii. Reconnaissance;
  - iii. Detailed soil investigation; and
  - iv. Report and Site Plan

### 2. Preliminary Investigation

- a. Research of information relative to the site and anticipated conditions must be conducted. Information gathered as part of the preliminary investigation must include, but is not limited to:
  - i. Property Information:
    - i. Physical Address
    - ii. Legal Description
    - iii. Existing Structures; and
    - iv. Location of existing or proposed wells on the property.
- b. Clear Creek Environmental Health Department Records.
- c. Published Site Information
  - i. Topography; and
  - ii. Soil Data
- d. Location of physical features, on and off the property that will require setbacks as identified in Table 8-1.

- e. Preliminary soil treatment area size estimate based on information on existing or planned facility and local regulations.
- f. Easements, if applicable;
- g. Floodplain maps, if applicable;
- h. Delineated wetland maps, if applicable;
- i. Any other information as required by the Department.

### **3. Reconnaissance**

- a. A visit to the property to evaluate the topography and other surface conditions that will impact the location and design of the OWTS must be conducted. Information gathered as part of the site reconnaissance may include, but is not limited to:
  - a. Landscape position;
  - b. Topography;
  - c. Vegetation;
  - d. Natural and cultural features; and
  - e. Current and historical land use.

### **4. Detailed Soil Investigation**

- a. Soil investigations to determine the long-term acceptance rate of a soil treatment area must be conducted per the following criteria:
  - i. Visual and tactile evaluation of two or more soil profile test pit excavations must be conducted to determine soil type as well as to determine whether a limiting layer is encountered.
  - ii. In addition to the two soil profile test pit excavations, percolation testing may be conducted to obtain additional information regarding the long-term acceptance rate of the soil.
  - iii. If the site evaluation includes both a visual tactile evaluation of soil profile test pit excavations and percolation tests, and the results from these two evaluations do not coincide with the same LTAR as noted in Table 11-1 the designer must use the more restrictive LTAR in determining the size of the soil treatment area.
  - iv. Procedure for performing visual and tactile evaluations of soil in order to determine a long-term acceptance rate.

- v. Evaluation of two or more soil profile test pit excavations must be performed to determine soil types limiting layers, and best depth for the infiltrative surface. The total number of soil profile test pit excavations beyond the required two shall be based on the judgment of the competent technician.
  - vi. At least one of the soil profile test pit excavations must be performed in the portion of the soil treatment area anticipated to have the most limiting conditions.
  - vii. The minimum depth of the soil profile test pit excavation must be to any limiting layer, or four feet below the infiltrative surface of the in-situ soil, whichever is encountered first.
  - viii. Layers and interfaces that interfere with the treatment and dispersal of effluent must be noted. Thus, any limiting soil characteristic such as consistence also needs to be evaluated. The evaluation of consistence may also include an evaluation of excavation difficulty, rupture resistance, and/or penetration resistance.
  - ix. The soil observations must be conducted at or immediately adjacent to the location of the proposed soil treatment area, but if possible, not under the final location of a trench or bed.
  - x. Each soil profile test pit excavation observed at the proposed soil treatment area must be evaluated under adequate light conditions with the soil in an unfrozen state.
  - xi. The soil observation method must allow observation of the different soil horizons that constitute the soil profile.
  - xii. Soil profile test pit observations must be conducted prior to percolation tests to determine whether the soils are suitable to warrant percolation tests and, if suitable, at what depth percolation tests must be conducted.
  - xiii. The soil type at the proposed infiltrative surface of the soil treatment area or a more restrictive soil type within the treatment depth must be used to determine the long-term acceptance rate from Table 11-1 or Table 11-1A. The treatment depth is two to four feet depending on the required thickness for the treatment level below the infiltrative surface from Item 4, Table 8-2.
  - xiv. Soils data, previously collected by others at the site can be used for the purposes of an OWTS design if approved by the Department. The data must be verified, at a minimum, by performing an evaluation of a soil profile test pit excavation.
- b. Soil descriptions for determination of a limiting layer must include:
- i. The depth of each soil horizon measured from the ground surface and a description of the soil texture, and structure of each soil horizon;
  - ii. Depth to the bedrock;

- iii. Depth to the periodically saturated soil as determined by:
  - 1. Redoximorphic features and other indicators of water levels, or
  - 2. Depth of standing water in the soil observation excavation, measured from the ground surface, if observed, unless redoximorphic features indicate a higher level.
  
- c. Procedure for performing percolation tests:
  - i. The percolation testing shall be performed by a professional engineer or by a trained person under the supervision of a professional engineer or by a competent technician.
  
  - ii. Number of test holes; Location
    - 1. Soil percolation tests shall be performed in at least three test holes in the area in which the soil treatment area is to be located, spaced evenly over the proposed area.
  
    - 2. If the likely depth of a proposed infiltrative surface is uncertain, percolation tests must be performed at more than one depth to determine the depth of the infiltrative surface.
  
  - iii. Dimensions
    - 1. The percolation test hole must have a diameter of eight to 12 inches and be terminated a minimum of six inches and a maximum of 18 inches below the proposed infiltrative surface.
  
  - iv. Change in Soil
    - 1. If a change of soil type, color or structure is present within those soils comprising the depth of soil below the infiltrative surface as required in Table 8-2 for vertical separation, a minimum of two soil percolation holes must be terminated in the changed soil, and percolation tests must be conducted in both holes.
  
  - v. Percolation Tests
    - 1. The percolation tests must be conducted using the hole preparation, soil saturation and rate measurement procedures described below.
  
  - vi. Preparation of Percolation Test Holes
    - 1. Excavate the hole to the depth and diameter required.
  
    - 2. Carefully scrape the bottom and sides of the hole with a knife blade or sharp instrument to remove any smeared soil surfaces and provide a natural soil interface into which water may percolate.

3. Remove all loose soil from the hole.
4. Add two inches of very coarse sand or fine gravel to protect the bottom of the hole from scouring and sediment.

vii. Presoak

1. The hole must be presoaked adequately to accomplish both saturation, which is filling the void spaces between the soil particles, and swelling, which is the intrusion of water into the individual soil particles.
2. To presoak the hole, carefully fill the hole with clean water to a minimum depth of 12 inches over the gravel placed in the bottom of the hole. In most soils, it is necessary to refill the hole by supplying a surplus reservoir of clean water, possibly by means of an automatic siphon, to maintain water in the hole for at least four hours and preferably overnight. Determine the percolation rate 24 hours after water is first added to the hole. This procedure is to ensure that the soil is given ample time to swell and to approach the condition it will be in during the wettest season of the year. In sandy soils containing five percent or less particles passing the #200 sieve, by weight, the swelling procedure is not essential and the test may be conducted after the water from one filling of the hole has completely seeped out of the hole.

viii. Percolation Rate Measurement

1. With the exception of sandy soils containing five percent or less particles passing the #200 sieve, by weight, percolation rate measurements must be made on the day following the presoak procedure.
2. If water remains in the percolation test hole after the swelling period, adjust the depth to approximately six inches above the gravel in the bottom of the hole. From a fixed reference point, measure the drop in water level over a 30 minute interval. The drops are used to calculate the percolation rate.
3. If no water remains in the hole after the swelling period, carefully add clean water to bring the depth of water in the hole to approximately six inches above the top of the gravel in the bottom of the hole. From a fixed reference point, measure the drop in water level at 30 minute intervals for four hours, refilling to six inches over the top of the gravel as necessary. The drop in water level that occurs during the final 30-minute period is used to calculate the percolation rate. If the water level drops during prior periods provide sufficient information, the procedure may be modified to suit local circumstances. The requirement to conduct a four hour test under this section is waived if three successive water-level drops do not vary by more than 1/16 inch; however, in no case shall a test under this section be less than two hours in duration.

ix. Sandy Soils

1. In sandy soils or other soils in which the first six inches of water seeps out of the hole in less than 30 minutes, after the 24 hour swelling period, the time interval between measurements must be ten minutes and the test conducted for one hour. The drop that occurs during the final ten minutes must be used to calculate the percolation rate.
2. If the soil is so sandy or coarse-textured that it will not retain any water, then the infiltration rate must be recorded as less than one minute per inch

x. Special Soil Types

1. The Clear Creek Environmental Health Department may identify soil types in its area for which different procedures such as extra presoaking or an extended testing time to obtain a valid percolation rate will be required.

xi. Percolation Rate Determination and Reporting

1. The field percolation rate will be the average rate of the percolation rates determined for all percolation test holes observed in the proposed soil treatment area in minutes per inch. The average percolation rate determined by the tests must be used in determining the long-term acceptance rate for the proposed system from Table 11-1.
2. The technician performing the percolation tests shall furnish an accurate scale drawing, showing the location of the soil profile test pit excavations and/or percolation holes tied to lot corners or other permanent objects. The drawing must meet the criteria in Section 6.1.e.vii. The information in the subsections following Section 6.1.e.vii.1-5 may be included but is not required for this drawing. All holes must be clearly labeled to relate to the information provided for the profile test pits and percolation tests.

xii. Alternate Percolation Testing

1. Alternate percolation test procedures may be approved, provided the test results of alternate procedures are substantially equivalent to those determined using the test procedures described in this section.
2. Prior approval from the Department of alternate percolation test procedures is required.

## **5. Marking of Soil Profile Test Pit Excavation or Percolation Holes**

- a. The engineer or technician conducting the soil profile test pit excavations or percolation tests must, upon completion of the tests, flag or otherwise mark each excavation or hole to allow easy location by others. Soil profile test pit excavations and percolation holes must remain open until after evaluation by the local public health agency, if required by the agency. Excavations must be suitably barricaded to prevent unauthorized access and to address safety concerns.

## **6. Site Protection**

- a. Prior to and during construction, the proposed soil treatment area and replacement area, if any, must be protected from disturbance, compaction, or other damage by means of staking, fencing, posting, or other effective methods.

## **7. Qualifications for a Competent Technician**

- a. Visual and Tactile Evaluations of Soil
  - i. Qualification required:
    1. Proof of a completed degree in soil science, agronomy, geology, or other majors if a course(s) in soil morphology was included; or
    2. Attendance at a training or workshop for soil evaluations for OWTS including both class and field work.
      - a. If the training or workshop includes an exam to verify acceptable completion of the course, a passing grade on the exam must be attained.
      - b. The Division must approve training for visual and tactile evaluations of soil.
  - ii. Competencies needed to conduct visual and tactile evaluation:
    1. Identify soil types by hand texturing and observation;
    2. Identify presence or absence of soil structure;
    3. Identify type and grade of soil structure;
    4. Recognize evidence of highest seasonal water surface;
    5. Identify layers and interfaces that will interfere with effluent movement;
    6. Determine the most promising depth for infiltrative surface of OWTS and for percolation tests, if used; and
    7. Understand basic principles of OWTS siting and design.

b. Percolation Tests

i. Qualification Required

1. The Clear Creek Environmental Health Department may require training for percolation testing based on technician background and familiarity with conducting percolation tests.

ii. Competencies needed to conduct percolation testing:

1. Set up equipment;
2. Perform and run percolation tests according procedure in this regulation;  
and
3. Record results and calculate percolation rates.