VILLAGE OF LAKE ISABELLA
BASELINE SEPTIC SYSTEM CRITERIA
for
"LAKE ISABELLA SOUTH" and "LAKE ISABELLA GOLF ESTATES 2"
(Subdivisions within the Village of Lake Isabella)

REPORT INDEX

July 2017

CRITERIA FOR ON-SITE WASTEWATER TREATMENT

Introduction
This Baseline Criteria has been created to provide additional guidance to allow the design, construction and operation of septic systems on residential sites that otherwise would not fully meet the Administrative Rules.

Table of Contents:

Tables

Definitions

Administrative Rules – The MDEQ Administrative Rules for on-site water supply and sewage disposal for land divisions and subdivisions (dated 02/2001) as it applies to residential on-site sewage treatment and disposal.

Above-Grade – means a soil dispersal system where the entire infiltrative surface is located above natural ground surface elevation.

Activated Sludge Pretreatment Unit – A pretreatment system that utilizes a blower to push air (oxygen) into a treatment module to accelerate the growth of bacteria that in turn digest the wastewater. Pretreatment system shall be "MicroFAST 0.5" by Bio-Microbics or approved equal meeting the requirements of NSF-ANSI Standard 40. Pretreatment system shall be designed and installed per manufacturer's specifications.

Agency – means district health department having jurisdiction.

Alternative System – means a treatment and soil dispersal system which is not a conventional system and provides for an equivalent or better degree of protection for public health and the environment than a conventional system.

Aquifer – means a subsurface water-bearing geologic material that transmits water in sufficient quantities to supply a well.

At-Grade – refers to a soil dispersal system where the infiltrative surface is located at the natural ground surface elevation.

Authorized LHD – district health department whom has been granted authority to administer these criteria by the DEQ.

Bedrock – means consolidated and continuous geologic material, such as limestone, dolomite, shale, sandstone, basalt, or granite.

Below-Grade – refers to a soil dispersal system where the infiltrative surface is below the natural ground surface elevation.

BOD5 – means the quantitative measure of the amount of oxygen consumed by bacteria while stabilizing, digesting, or treating biodegradable organic matter in a sample under aerobic conditions over a five-day incubation period; expressed in milligrams per liter (mg/L).

Baseline Criteria – Criteria for On-Site Wastewater Treatment developed for this document to be used in conjunction with and/or to provide alternatives to the Administrative Rules.

Certified Operator – means a municipal wastewater operator certified under Part 41, Sewerage Systems, of the NREPA, and/or an industrial/commercial wastewater operator certified under Part 31, Industrial and Commercial Waste Treatment Facilities, of the NREPA.

CMDHD – Central Michigan District Health Department or Central Michigan District Health Department Sanitary Code.

Competent Professional – means an individual who can demonstrate the knowledge, skills, and abilities necessary to perform specific functions under the criteria.

Competent Soil Evaluator – means an individual who can demonstrate the knowledge, skills, and abilities necessary to conduct and report soil evaluations based upon the USDA classification system pursuant to these criteria.

Confining Layer – means geologic material which has a low hydraulic conductivity which impedes or prevents vertical groundwater movement.

Confining Layers of Sufficient Areal Extent – means the presence of contiguous/continuous confining layers in an area proposed for soil dispersal sufficient to protect a drinking water aquifer.

Conventional System – means an on-site wastewater treatment and soil dispersal system that contains a watertight septic tank with nonuniform distribution of effluent to subsurface soil trenches or an absorption bed.

DEQ – means the Michigan Department of Environmental Quality.

Direct Hydraulic Connection – means a condition where wastewater effluent is dispersed into permeable soils that provide a direct conduit to an aquifer that is used or intended to be used for drinking water purposes.

Dispersal System – means a system used for the subsurface distribution of wastewater effluent to soil.

Disturbed Soil – means a soil layer that has been changed from its natural condition by excavation or other activities such as soil compaction, removal, and smearing that would be expected to affect the function of the soil dispersal system. Traditional planting and tilling activities from historic agricultural practices are not considered disturbed soil.

Domestic Equivalent Wastewater – means wastewater that falls outside the definition of sanitary sewage but which has similar wastewater characteristics and is amenable to on-site wastewater treatment and subsurface soil dispersal.

Enhanced Treatment – means the biological and physical/chemical treatment of filtered septic tank effluent to reduce the amount of biochemical oxygen demand (BOD5), total suspended solids (TSS) or nutrients including phosphorous and nitrogen prior to discharge to a soil dispersal system.

Established 100-Year Floodplain – means the area of land adjoining surface water which will be inundated by a 100-year flood.

ETV – means the Environmental Technology Verification Program instituted by the U.S. EPA to verify the performance characteristics of commercial-ready environmental technologies.

Existing Water Well Records – means the available water well construction information (private residential, public, irrigation, industrial, and test wells) in the vicinity of the area being evaluated for on-site wastewater treatment and soil dispersal.

Facility – means a structure generating wastewater that discharges to an on-site treatment and soil dispersal system. It does not refer to the definition under Act 201, Environmental Remediation, of the NREPA.

FOG – means fats, oils and greases, the constituents of sewage typically originating from foodstuffs (animal fats or vegetable oils) or consisting of compounds of alcohol or glycerol with fatty acids (soaps and lotions), typically measured in milligrams per Liter (mg/L).

Force Main/Transport Line – means a segment of pipe which conveys wastewater effluent from a pump reservoir to the soil dispersal piping network.

Fragipan – means a loamy, brittle subsurface horizon low in porosity and content of organic matter and low to moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Geotextile Sand Filter Pretreatment – A passive pretreatment system that is installed as a part of the final disposal bed by replacing the stone layer. The system provides treatment of the effluent prior to soil contact. Pretreatment system shall be "Eljen GSF" by the Eljen Corporation or approved equal. Pretreatment system shall be designed and installed per manufacturer's specifications.

Groundwater – means the water in the ground that is in the zone of saturation.

Groundwater Flow – means the directional movement of groundwater travelling through soil and/or rock.

Groundwater Mounding – means the localized increase in the elevation of a water table resulting from the downward percolation of additional liquid toward groundwater.

Groundwater Venting – means the recharging of surface water by groundwater.

High Groundwater Elevation - means the uppermost part of the soil or underlying material wholly saturated with water. The term includes perched and apparent conditions that are seasonally saturated for a time period in excess of two weeks, or permanently saturated.

Hydraulic Loading Rate – means the volume of wastewater effluent that can be applied per unit time per unit area of infiltrative surface, e.g. gallons per day per square foot (gpd/ft2). The hydraulic loading rate varies based upon soil texture, structure and wastewater effluent strength.

Infiltrative Surface – means the designated interface where effluent moves from distribution media or a distribution device into treatment media.

Native Soil/Natural Soil – means the top layer of the earth's surface, consisting of rock and mineral particles, often mixed with organic matter and unaltered by mechanical processes (excluding accepted agricultural practices).

Notice to Deed – A document or "deed restriction" to be recorded at the county Register of Deeds and will be "linked" to the parcel title.

NREPA – means the Natural Resources and Environmental Protection Act, 1194 PA 451, as amended.

NSF – means the National Sanitation Foundation, International.

NSF Standard 40 – is a standard applicable to residential on-site wastewater treatment systems having rated capacities between 400 gallons (1,514 liters) and 1,500 gallons (5,678 liters) per day.

NSF Standard 245 – is a standard applicable to residential on-site wastewater treatment systems meeting Standard 40 and which are designed to provide for nitrogen reduction.

On-Site Wastewater Treatment System – means a system of components used to collect and treat sewage from one or more dwellings, buildings, or structures and discharge the resulting effluent to a soil dispersal system on property owned by the individual or entity.

Operating Permit – a renewable and revocable authorization to operate and maintain an on-site wastewater treatment system.

Ordinary High Water Mark – means the line between upland and bottomland that persists through successive changes in water level, below which the presence and action of the water is so common or recurrent that the character of the land is marked distinctly from the upland and is apparent in the soil itself, the configuration of the surface of the soil, and the vegetation. On an inland lake that has a level established by law, it means the high established area. Where water returns to its natural level as a result of the permanent removal or abandonment of a dam, it is the natural ordinary high-water mark.

Organic Loading – means biodegradable fraction of chemical oxygen demand (biochemical oxygen demand, biodegradable fats, oils and greases (FOG), and volatile solids) delivered to a treatment component in a specified time interval expressed as mass per time or area; e.g., pounds per day or pounds per cubic foot per day (pretreatment); pounds per square foot per day (infiltrative surface or pretreatment).

Outlet Baffle – means the pipe tee or wall segment at or near the outlet pipe of a tank designed to collect flow from the clear zone, isolate scum from the outlet pipe, and allow ventilation.

Packed Bed Filter Pretreatment – A pretreatment system that utilizes "fixed film textile media" that is arranged or "packed" into a basin and a pump that sprays septic tank effluent onto the media. Pretreatment system shall be "AdvanTex AX20" by Orenco Systems Inc. or approved equal meeting the requirements of NSF-ANSI Standard 40. Pretreatment system shall be designed and installed per manufacturer's specifications.

Permanent Reference Point – means a reference point that once identified is used as a point of reference for one or more components of an installed on-site wastewater treatment system and one which expected to be present throughout the life of the component(s).

Permeability – means the ability of a porous medium such as soil to transmit fluids (liquids or gases).

Pressure Distribution – means a system of small diameter pipes intended to equally distribute effluent throughout a soil dispersal system. A subsurface drip system may also be used wherever a pressure distribution system is called for.

Private Practice – means conduct of activities by a competent professional whom is not an employee of the agency.

Professional Engineer – means a private practice professional engineer licensed in the State of Michigan who is familiar with the design principles of Onsite Wastewater.

Public Sanitary Sewer System – means a sewerage system as defined in section 4101 of the NREPA, being R 324.4101 of the Michigan Compiled Laws. Public sewerage systems are generally those that collect and treat sanitary sewage generated by two or more dwellings or structures not under the same ownership.

Qualified Maintenance Provider – means a person who performs maintenance of an on-site wastewater treatment system and possesses adequate skills and knowledge regarding system components obtained through a combination of experience and training. For proprietary treatment components, the qualified maintenance provider has received specific training administered by the proprietary equipment manufacturer.

Redoximorphic Feature – spots or blotches of contrasting colors, such as, but not limited to, gray or brown or gray and brown colors in close proximity, which results from the reduction and oxidation of iron and manganese compounds in the soil after periodic saturation with water.

Registered Sanitarian – means a person in private practice that is registered by the State of Michigan or having a registration recognized by the State of Michigan.

Reliable Reference Point –is one of a permanent nature expected to be present at the time of the soil dispersal system installation and one which can be re-established in the field.

Reserve Area – means the area of land with demonstrated capacity for use as a final treatment and soil dispersal component upon which no permanent structure should be constructed and which is intended for replacement of the initial system.

Residence Time – the amount of time necessary for wastewater to be retained in the treatment process in order to achieve the desired level of biological, chemical and/or physical treatment.

Restrictive Soil Horizon – Horizon or condition in the soil profile or underlying strata that restricts movement of fluids; a restrictive layer may constitute a limiting soil/site condition; examples include fragipan, spodic horizons, massive structural grade, certain bedrock, etc.

Sanitary Sewage/Sanitary Wastewater – means water and contaminants discharged from sanitary conveniences, including bathroom, kitchen, and household laundry fixtures of dwellings, office buildings, industrial plants, commercial buildings, and institutions. Commercial laundry wastes and industrial and commercial processes are not considered sanitary sewage.

Soil Mottling – see redoximorphic features.

Soil Texture – means the USDA classification system and refers to the coarseness or fineness of the soil relative to the proportion of sand, silt, and clay.

Subsurface – means below the natural or altered ground surface elevation.

Surface water – means any of the following:
1. The Great Lakes and their connecting waterways.
2. Inland lakes.
3. Rivers.
4. Streams.
5. Impoundments.
6. Perennial open drains.

7. Any other watercourses within the jurisdiction of the state as defined in section 3101 of the NREPA being R 324.3101 of the Michigan Compiled Laws.

U.S. EPA – means the United States Environmental Protection Agency

Waters of the State – means groundwater, lakes, rivers, and streams and all other watercourses and waters, including the Great Lakes, within the jurisdiction of this state

Chapter 1 – General Provisions

1.1 General

Prior to the construction of a system under the jurisdiction of this criteria, construction approval, and required permits must be obtained from the agency having jurisdiction. Construction of the facility or modification of the site served by a soil dispersal system shall not begin until a construction permit and plan approval for the sewage system has been obtained.

1.2 System Designer Qualifications and Other Competent Professionals

The design and submittal of plans for systems under the criteria should only be made by those licensed professional engineers or registered sanitarians, as allowed by law. These professionals must possess competence in wastewater treatment and soil dispersal systems gained through a combination of education and experience.

1.3 Construction Plans

The agency shall require the submittal of detailed construction plans for all systems constructed under the criteria. The detailed construction plans are to be submitted to the agency after the site suitability, wastewater strength and design flow have been determined pursuant to Chapter 2, Chapter 3 and Chapter 4, respectively. The agency shall require that detailed plans have been prepared by either a licensed professional engineer or a registered sanitarian in private practice that are licensed and registered by the state of Michigan.

1.4 Construction Supervision

The agency shall require the submission of detailed construction plans and shall also require that the system designer provide for the supervision of construction adequate to assure compliance with approved permit conditions, plans and specifications. The agency shall require written certification from the system designer that construction was completed in accordance with approved plans and specifications. System construction shall not deviate from the approved design unless authorized by the system designer and the agency. The agency shall ensure all deviation requests are made in writing.

1.5 Construction Inspection and Final Approval

The agency is to make such inspections as deemed necessary during construction to assure proper construction practices compliance with approved permit conditions, plans, and specifications or utilize an alternate process to accomplish this. Treatment system components including the soil dispersal system shall not be backfilled until the agency has given its approval unless waived by the agency due to mitigating circumstances. Waivers to the requirement for final inspection shall be documented in writing by the agency. The final approval of the system construction by the agency shall be withheld pending receipt of written certification from the system designer and documentation of a final inspection by the agency.

1.6 Other Regulations

Beyond the approval gained pursuant to the revised criteria, it remains the responsibility of the owner, applicant or their agents to comply with any and all other applicable codes, rules, ordinances, or other criteria. Issuance of an approval under the criteria does not constitute approval, nor in any way authorize violation of other applicable federal, state, or local laws and regulations.

Chapter 2 – Establishing Site Suitability for Soil Dispersal

2.1 General

Multiple factors establish the suitability for soil dispersal at a specific site. This section addresses these various site and soil factors which must be assessed during the initial site evaluation. All information gathered during the site evaluation process must be provided for review, with sufficient information to confirm the availability of an acceptable soil dispersal area and reserve area. This information also provides the basis for detailed design of the treatment and dispersal system.

The agency shall not approve the site when site conditions inclusive of soils, high groundwater elevation, terrain, and/or area available for soil dispersal or other conditions will prevent the satisfactory operation of a system in a manner which fulfills the purpose of the criteria. Necessary field tests and evaluation of other factors by the agency shall be completed under the supervision of a licensed professional engineer or registered sanitarian to assess the suitability of a site. The site evaluation process should only be completed by agency staff and individuals in private practice who have competency in the design of on-site wastewater treatment systems or who have retained the services of other competent professionals. It is the responsibility of the system designer to coordinate the field aspects of the site evaluation with the agency.

2.2 Preapplication Meetings

A preapplication meeting is an opportunity for the applicant or designated representative to meet with the system designer and the agency to discuss the proposed project. Such a meeting is most beneficial when it occurs early in the planning phase when a project proposal is defined enough to discuss it conceptually, but still flexible enough to incorporate recommendations from the meeting. The preapplication meeting can also be beneficial regardless of the projected flow for the facility. The applicant or designated representative should provide and be prepared to discuss, the following information at the meeting:

1. Type of existing or proposed facility; anticipated flows and type or character of the wastewater.
2. Location map - such as a county road map, showing the general location of the site.
3. General Site map - showing all existing and proposed features of the site.
4. USDA soil survey map – identifying the predominant soil series of the site. (Map must include Township, Range, and Section)
5. Conceptual plans, if available.

2.3 Preliminary Site Evaluation

The agency shall require that a preliminary site evaluation is completed by the system designer prior to completing the field site evaluation. The preliminary site evaluation shall consist of gathering the information contained in Section 2.2 and the following additional information:

1. Existing and proposed buildings or improvements on the lot or site.
2. Documentation confirming the location of buried on-site utilities, if available. It is required that the system designer contact a utility locating service (e.g. Miss Dig).
3. Easements or deed restrictions on the site.
4. Current and past land use (if it can be determined).
5. The ordinary high water level of surface waters, if established.
6. Established 100-year floodplain elevation and boundary on the site if applicable.
7. A site survey including current and proposed property or boundary lines.
8. All required horizontal isolation distances from the proposed subsurface dispersal system as indicated in Table 2.1.

2.4 Field Site Evaluation

The agency shall assure that there is a coordinated joint field site evaluation with the system designer. The field site evaluation shall establish the following information:

1. Site boundaries.
2. Proposed and existing site improvements, required setbacks, and easements must be identified.
3. Underground utilities must be located by calling a utility locating service (e.g. Miss Dig) and other appropriate utilities before soil excavations and observations are undertaken.
4. Topographic information and other factors that may influence dispersal system design.
5. Any evidence of cut or filled areas or disturbed or compacted soil.
6. The flooding or run-on potential to the proposed dispersal area(s).
7. A sufficient number of soil profile evaluations to confirm the existence of suitable soils for both the initial and reserve soil dispersal areas with at least one soil observation performed in the portion of the soil dispersal area anticipated to have the most limiting conditions. However, a minimum of three soil observations are required for systems with design flows greater than 1,000 gpd. In areas of complex soils, additional evaluations may be necessary. The competent soil evaluator shall evaluate enough test pits to characterize soil type (per United States Department of Agricultural [USDA] classification) and conditions across both the initial and reserve soil dispersal areas.
8. Soil evaluations should be completed by observation of shallow soil pits of adequate size, depth, and construction to safely enter and exit the pit and complete a soil profile description. If test pits are left open or unattended measures should be taken to secure against unauthorized entry.
   Note: Required safety precautions must be taken before entering soil test pits.
9. Each test pit must be prepared so that the soil profile can be viewed in an original undisturbed position to a depth of at least six (6) feet; to a restrictive soil horizon or bedrock; or to the high groundwater elevation, whichever is shallower. Soil excavations shall always be of sufficient depth to provide adequate information for the design of the system.
10. Optimally, soil evaluations should be completed during those time periods where soils are sufficiently dry and completed in a manner which avoids damage to the proposed absorption area.
11. The agency or system designer shall assure that soil evaluations are completed and accurately reported by a competent soil evaluator experienced with the USDA Soil Classification system. All of the following shall be reported:
    a. Soil horizon depths (as measured from the ground surface);
    b. Soil texture (per USDA soil classification system);
    c. Soil structure;
    d. Soil mottling;
    e. Depth to high groundwater elevation or bedrock;
    f. Groundwater levels observed at the time of the soil evaluation; and
    g. The reporting of soil color.
12. The agency or system designer shall assure that the location of all soil boring(s) or excavation(s) completed on the site are documented in a verifiable manner. Each soil observation shall be located with measurements from two permanent reference points, or equivalent. A reliable benchmark shall be established on the site that can be used for horizontal and vertical control.
13. The agency or system designer shall assure that the boundaries of the proposed area for the soil dispersal system(s) shall be visually marked. All proposed initial and reserve soil dispersal areas shall be protected from disturbance, compaction, or other damage by staking, fencing, posting, or other effective method as soon as practical.

2.5 Site Evaluation Reporting/Final Site Plan and Evaluation

Information gathered by the system designer/evaluator during the preliminary and field site evaluations shall be documented on a site report to the agency. The report shall also address any of the following if present:

1. Construction related issues such as rocks, tree stumps, high clay content soils, slope, and topography.
2. An initial recommendation of the type and number of soil dispersal areas, size of those areas, system layout, dimensions, and distribution.
3. Any special design considerations (highly permeable soils (e.g. coarse sand), floodplain, disturbed soil, low permeability soils (e.g. clay loams, etc.).
4. Impacts from upslope run-on areas.
5. Future surrounding land use changes (if known).

2.6 Dispersal Area Suitability

2.6.1 Soils – Areas to be utilized for soil dispersal shall consist of undisturbed natural soils.

2.6.2 Soil texture and structure – Must be a suitable soil texture and structure as indicated in Table 2.2 for which a soil hydraulic loading rate (see Section 2.7) has been shown.

2.6.3 Depth to high groundwater elevation – An 18-inch minimum isolation from the undisturbed natural ground surface to high groundwater elevation over the entire area to be used for soil dispersal must be present. The depth to high groundwater elevation shall be confirmed by a soil profile with six (6) inches or more of soil without redoximorphic features (a.k.a. mottling) below the "A" horizon (topsoil). Increased vertical isolation to high groundwater may be necessary in consideration of groundwater elevation mounding.

2.6.4 Reserve Area – For new or increased uses, an accessible area shall be available and reserved to provide for a minimum of one replacement system without utilization or disruption of the initial installation. The reserve area shall be planned and maintained to facilitate replacement system installation, as needed.

2.6.5 Slope - Natural ground slope should be less than 25 percent in the system area to promote safety of workers during construction.

2.6.6 Location and Horizontal Isolation – Table 2.1 identifies the minimum horizontal isolation distances which shall be provided to allow proper installation, maintenance, and to be protective of the environment and public health. These minimums may only be increased based upon site specific conditions and the nature of the proposed discharge.

2.6.7 100-year Floodplain - the areas for initial and replacement on-site sewage disposal systems shall have natural ground surface elevation above the elevation defining the 100-year floodplain, where a floodplain exists.

The agency shall ensure that the soil infiltrative surface of the sewage disposal system is located at an elevation that is above the elevation defining the 100-year floodplain.

Table 2.1
Minimum Horizontal Isolation Distances

From Soil Dispersal and Tank[1] To:	Minimum Horizontal Isolation Distance (feet)[2]
Type I Public Well	200
Type II-a Public Well	200
Type II-b Public Well	75
Type III Public Well	75
Private Individual Well	50
Other Wells	50
Surface Waters	100
Building Foundation or Basement Walls	10
Top of Drop-Off	20
Property Lines	10
Footing Drains Installed in Water Table Without Direct Connection to Surface Water	25
Footing Drains Installed in Water Table with Direct Connection to Surface Water	50
Drains Designed to Lower the Water Table	100
Pressurized Water Lines	10

[1] as measured from perimeter of dispersal system or tank.
[2] Increase may be required due to site specific conditions

2.7 Soil Hydraulic Loading Rates

The system design must allow for soil hydraulic loading rates as shown in Table 2.2. The soil hydraulic loading rates shall be determined by the USDA soil texture and structure of the infiltrative surface or the most limiting soil texture as described in Table 2.2.

The soil hydraulic loading rates in Table 2.2 are not the only factors that must be considered in determining the acceptability of a design and layout of a soil-based dispersal system. Additional factors that must be considered in evaluating groundwater mounding potential include ground slope, available soil infiltrative depth above restrictive layers, and established high groundwater elevation. In general, the potential for groundwater mounding will increase with the volume and rate discharged.

Table 2.2
Soil Loading Rates for Infiltrative Surfaces

SOIL TEXTURE	SOIL STRUCTURE		HYDRAULIC LOADING RATE (gpd/ft2)	
	SHAPE	GRADE	BOD>30 mg/L and < 140 mg/l*	BOD<30 mg/L
Coarse sand, Sand, Loamy coarse sand, Loamy sand	Single grain	Structureless	0.8	1.6
Fine sand, Very fine sand	Single grain	Structureless	0.6	1.2
Loamy fine sand, Loamy very fine sand	Single grain	Structureless	0.4	1.0
Coarse sandy loam, Sandy loam	Massive	Structureless	0.2	0.6
	Platy	Weak	0.2	0.5
		Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	0.4	0.7
		Moderate, Strong	0.6	1.0
Fine sandy loam, Very fine sandy loam	Massive	Structureless	0.2	0.5
	Platy	Weak, Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	0.2	0.6
		Moderate, Strong `	0.4	0.8
Loam	Massive	Structureless	0.2	0.5
	Platy	Weak, Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	0.4	0.6
		Moderate, Strong `	0.6	0.8
Silt Loam	Massive	Structureless	-	0.2
	Platy	Weak, Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	0.4	0.6
		Moderate, Strong `	0.6	0.8
Sandy clay loam, Clay loam, Silty clay loam	Massive	Structureless	-	-
	Platy	Weak, Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	0.2	0.3
		Moderate, Strong `	0.4	0.6
Sandy clay, Clay, Silty clay	Massive	Structureless	-	-
	Platy	Weak, Mod, Strong	-	-
	Prismatic, Blocky, Granular	Weak	-	-
		Moderate, Strong `	0.2	0.3

Source: Adapted from Tyler, 2000 – U.S. Environmental Protection Agency (U.S. EPA) On-site Wastewater Treatment Systems Manual

Table 2.3
Dispersal System Design Criteria

BOD5	Dispersal Type	Distribution[1]	Dispersal System Sizing[2]
BOD5 > 30 mg/l< 140 mg/l	Below Natural Grade	Gravity distribution only acceptable for systems < 1,000 gpd. All others must use pressure distribution or equal.	Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon soils at infiltrative surface unless other treatment/dispersal restrictions imposed.
	At Natural Grade	Pressure distribution or equal for all systems > 1,000 gpd or soils with hydraulic loading rate ≤ 0.3.	Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon most limiting soil texture and structure in upper 18-inches of natural soil.
	Above Natural Grade	Pressure distribution or equal for all systems > 1,000 gpd or soils with hydraulic loading rate ≤ 0.3.	Sizing based upon hydraulic loading rate for BOD < 30 mg/l with a minimum of one (1) foot of fill and pressure distribution. Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon most limiting soil texture and structure in upper 18-inches of natural soil.
BOD5 < 30 mg/l	Below Natural Grade	Gravity distribution only acceptable for systems < 1,000 gpd. All others must use pressure distribution or equal.	Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon soils at infiltrative surface unless other treatment/dispersal restrictions imposed.
	At Natural Grade	Pressure distribution or equal for all systems > 1,000 gpd or soils with hydraulic loading rate ≤ 0.3.	Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon most limiting soil texture and structure in upper 18-inches of natural soil.
	Above Natural Grade	Pressure distribution or equal for all systems > 1,000 gpd or soils with hydraulic loading rate ≤ 0.3.	Must have hydraulic loading rate not to exceed values as listed in Table 2.2. Sizing based upon most limiting soil texture and structure in upper 18-inches of natural soil.

[1] All Deep Cut Systems (see Section 2.9) must utilize pressure distribution or equivalent.

2.8 Isolation to High Groundwater Elevation

To provide for adequate soil treatment capability, a minimum of three (3) feet of unsaturated soil shall exist between the bottom of the infiltrative surface and the high groundwater elevation or restrictive layer for residential strength wastewater (see Chapter 3). Greater vertical separation may also be required where groundwater mounding underneath the soil absorption system or other factors would limit the treatment to protect groundwater or surface waters. For systems utilizing an approved alternative treatment technology, pursuant to Chapter 6, a one (1) foot reduction in vertical isolation is acceptable.

2.9 Deep Cut Excavations

If suitable soils as specified in Table 2.2 are not present within the upper six (6) feet of the soil profile and alternative methods of sewage treatment and dispersal have been considered under Chapter 6 or Chapter 10, then the agency may approve a variance request for the use of deep cut excavations to expose acceptable underlying soils that exist within 20 feet of the natural grade must address all of the following:

1. Acceptable underlying soils shall consist of a minimum of four (4) feet of soils which have a USDA texture no finer than sandy loam and which are not permanently or seasonally saturated as confirmed by soil profile evaluations and supportive hydrogeological information. Groundwater elevation monitoring should be utilized in situations where this information is inconclusive to the agency. Underlying soils shall be of sufficient areal extent to promote movement of treated effluent.
2. The level of treatment required prior to dispersal shall be established pursuant to the requirements of Chapter 3.
3. Discharge to the soil-based dispersal system shall be accomplished by pressure distribution.
4. For deep cut excavations, the agency may require alternative methods of sewage treatment (see Chapter 6).
5. The system design must allow for complete deep cut excavations over 100 percent of the required initial and reserve dispersal system area for the upper five (5) feet; however, excavations may be reduced to a minimum of 50 percent of the required dispersal system area between five (5) and 20 feet deep.
6. Deep cut excavations shall not cut through soils that are seasonally or permanently saturated. Exceptions may be considered where a demonstration of the drainage of groundwater from overlying soils would not be expected to adversely impact the function of the soil-based dispersal system.
7. Hydrogeological information is provided that confirms that the underlying soils being connected to have no direct hydraulic connection to a useable aquifer intended for drinking or household purposes.

Chapter 3 – Wastewater Strength

3.1 Waste Strength for Residential Wastewater

Typical values for influent wastewater and filtered primary septic tank effluent (FP) produced by residential dwellings are assumed to fall within those shown in Table 3.1 and need not be assessed further.

Table 3.1
Residential Wastewater Strength

Residential Wastewater	Influent Strength[1]	Typical FP[2]
BOD5	155 – 286 mg/l	100-140 mg/l
TSS	155 – 330 mg/l	20-55 mg/l
FOG	70 – 105 mg/l	10-20 mg/l
TKN	26-75 mg/l	50-90 mg/l
NH4	4-13 mg/l	30-50 mg/l
TP	6-12 mg/l	12-20 mg/l

[1]Source: EPA On-site Wastewater EPA/625/R-00/008
[2]Source: Crites Tchobanoglous, 1998 Small and Decentralized Wastewater Management Systems

Chapter 4 – Wastewater Flow

4.1 Residential Wastewater Flow Rate

The determination of wastewater design flow is one of the most important items in the planning of a new or expanded treatment system. The Administrative Rules shall be utilized to determine peak daily flow rates (design rates) for residential dwellings.

Chapter 5 – Treatment System Objectives

5.1 Treatment System Design Concepts

The overall design of the treatment system inclusive of soil dispersal must address the waste character and site conditions. Compliance criteria in Table 5.1 apply to treatment systems with soil dispersal. Once the design concept has been selected, the agency shall require that a detailed design of the system's specific components be submitted. The design is to be reviewed by the agency in accordance with standards and guidance prescribed herein.

Table 5.1
Treatment System Design Criteria

Measure	**Review Criteria**	**Applicable to:**
Site Suitability	Site must meet all requirements of Chapter 2.	Undeveloped or developed site under consideration
Protection of Groundwater and Surface Water	Treatment and dispersal system must be designed to meet all minimum requirements of the criteria.	Entire system
No direct human exposure to wastewater or inadequately treated effluent from collection treatment and dosing components	Design must exclude exposure to sewage or inadequately treated effluent.	All collection, treatment, and dosing devices
No direct exposure to sewage effluent from soil dispersal system	No exposed sewage surface discharge or surfacing of effluent.	Soil dispersal system
Hazardous/Industrial Wastes excluded from discharge	No hazardous or industrial waste allowed into any part of the system.	Influent
Operation and Maintenance	Operated per manufacturer's recommendations, management plan, and/or discharge permit conditions.	Entire system
Safety-free from physical injury and harm	System design must eliminate potential for personal injury: confined space entry, drowning, electrocution, falling, etc.	Entire system

Chapter 6 – Alternative Treatment Technologies

6.1 Proprietary Treatment Technology

Proprietary treatment technology includes any treatment product held under patent or trademark which significantly contributes to the treatment performance and attainment of effluent quality. The system designer shall verify to the satisfaction of the agency that the proprietary product can be expected to meet treatment objectives for the defined wastewater characteristics and site conditions. Verification shall be supported by the following information:

1. Manufacturer: name, mailing address, street address, and phone number.
2. Manufacturer Contact: individual's name, mailing address, street address, and phone number. The contact individual must be vested with the authority to represent the manufacturer in this capacity.
3. Name, including specific brand and model, of the proprietary treatment product.
4. A description of the function of the proprietary treatment product along with any known limitation on the use of the product.
5. Product description and technical information, including process flow drawings and schematics; materials and characteristics; component design specifications; design capacity, wastewater characteristics, volumes and flow assumptions, and calculations; components; dimensioned drawings and photos.
6. Detailed description, procedure, and schedule of routine service and system maintenance events.
7. Copies of product brochures and manuals: Sales and Promotional; Design; Installation; Operation and Maintenance; and Owner Instructions, etc.
8. The most recently available product test protocol and third party results report (E.G. National Sanitation Foundation (NSF) Standard 40, NSF Standard 245, Environmental Technology Verification Program or independent third party results).
9. A signed and dated certification by the manufacturer's agent specifically including the following statement language:

   "I certify that I represent (insert MANUFACTURING COMPANY NAME) and I am authorized and do hereby attest, under penalty of law, that this document and all attachments are true, accurate, and complete. I understand and accept that the product testing results reported with this application for registration are the parameters and values to be used for determining conformance with Treatment Objective (insert APPLICABLE OBJECTIVES). We have reviewed the intended usage of our product for this defined wastewater characteristic and are supportive of installation".

A list of representatives and/or manufacturer certified installers and service providers.

10. A signed copy of the maintenance contract with a certified maintenance provider for a minimum of three (3) years.

Chapter 7 – System Management

7.1 System Management Plan

The owner of the on-site wastewater system is responsible for ensuring that the system is permanently monitored, inspected, serviced, and otherwise maintained after construction. Routine and proper operation, maintenance, and documentation, thereof ensures that the system will perform as designed. For any system designed and approved for soil dispersal, under the criteria, the agency shall require that a draft System Management Plan be included in the overall construction plan submittal. As a condition of overall final approval and before placing the on-site system into operation, the final System Management Plan shall be provided to the agency for review and approval. A System Management Plan required by any permit issued by the agency shall also be considered a condition of the approval granted by the agency.

7.2 System Management Plan Content

The system management plan shall include all necessary information and procedures for maintenance to allow the system to reliably function as designed and permitted. The System Management Plan details will vary on a site by site basis depending upon the nature of the facility, the type of treatment, and method of final soil dispersal. In general, management oversight increases as wastewater flow, strength, and level of treatment prior to dispersal increases. In addition to a copy of the as-built construction plan, the management plan shall include but not be limited to the following, as appropriate:

1. A general description of the overall treatment and dispersal system, operation, and proper use.
2. A copy of the current operating permit or discharge authorization, if applicable.
3. Start-up and shut-down procedures.
4. Meter monitoring, sampling (e.g. sample frequency, sample location, sample analytical units needed, etc.) and reporting procedures.
5. Accumulated wastewater solids monitoring and removal procedures.
6. Servicing frequency of key treatment and dispersal components.
7. Detailed specifications and specific maintenance schedules for any mechanical treatment system components.
8. Manufacturer's mechanical equipment and/or control settings.
9. Contingency plan due to malfunction of system components.
10. Contact information for system owner, service providers and regulatory agencies.

As part of the on-going system oversight, the agency shall ensure that the system management plan be periodically updated as necessary.

7.3 System Management Objectives

Table 7.1 indicates the minimum system management and reporting objectives deemed appropriate based upon overall treatment system classification and design flow. These objectives can vary due to site specific concerns and/or treatment technology.

Table 7.1
System Management Objectives

Treatment System Classification	System Description	Operating Permit and/or Maintenance Contract	Minimum Monitoring1/Reporting[2] Frequency[2]	Qualified Maintenance Provider[3]
Conventional	System with flows <1,000 gpd with non-uniform dispersal of FP effluent to soils.	Recommended	Self-monitoring and Records. Complete System Evaluation Every five (5) years recommended.	Owner Oversight

Alternative	Systems with flows <1,000 gpd with uniform dispersal of FP effluent to soils via pressure distribution only.	Recommended	Self-monitoring and Records. Complete System Evaluation Every five (5) years recommended.	Recommended
	Systems with flows ≤ 1,000 gpd incorporating enhanced treatment.	Operating Permit & Maintenance Contract	Annual	Yes

[1] Higher monitoring frequency may be necessary at start-up.
[2] Increased reporting requirements may be based on local regulation.
[3] See Section 7.4.

7.4 Qualified Maintenance Providers

The performance of operation and maintenance activities should only be undertaken by those qualified maintenance providers who possess adequate training and experience related to the specific treatment and dispersal system. It is the system owner's responsibility to retain the services of such qualified maintenance provider to conduct/document necessary routine operation and maintenance activities. The qualified maintenance provider shall be identified in the System Management Plan.

7.5 Inspections

The Village of Lake Isabella shall create a master database of Alternative systems installed under the Baseline Criteria. The purpose of the this database will be to track when inspections are required under a System Management Plan. The Village shall notify the owner of record of the property via first class mail that their system is due for an inspection or other routine maintenance as required in their applicable System Management Plan at least one-hundred (120) days before such activity is required. A copy of the notice shall be supplied to the agency.

If a property owner fails to undertake a required inspection or conduct required maintenance as required by the applicable System Management Plan, the operating permit for the system shall be deemed to be violated, and the property in violation of the Village of Lake Isabella Blight Code which requires all dwellings to be in a habitable condition.

All reports and required maintenance to be documented shall be supplied to the agency. The agency shall then inform the Village of when the next inspection or maintenance date is for the system.
The Village and/or agency are both permitted and authorized to collect a nominal fee to cover their actual expenses in tracking inspections and required maintenance to be documented by the System Management Plan.

It shall be unlawful for any person to occupy, or permit to be occupied, any premise that is not equipped with an adequate onsite sewage disposal system for the proper disposal of all forms of sewage in a sanitary manner.

Chapter 8 – Tank Design and Construction

8.1 General

Septic tanks are often considered the single most important component for an on-site treatment system. Their ability to separate solids from the liquid, provide digestion of organic matter, and store solids result in a clarified liquid suitable for discharge from the tank for further treatment and/or soil dispersal.

8.2 Location

Tanks shall be located:

1. Where they can be accessed easily for inspection and service, such as septage removal and other service requirements.
2. Away from drainage swales or other depressions where water can collect. Non-sewage discharges (e.g. roof downspouts, water softeners, sump pumps, etc.) shall not be allowed near the tank area.
3. Where the minimum horizontal setback distance is obtained from buildings, property boundaries, wells, water lines, etc., pursuant to Table 2.1.
4. Where there is minimal risk from vehicular traffic.
5. Above saturated soil whenever possible.

8.3 Tank Construction

Tanks shall be:

1. Watertight (see Section 8.10). If tanks are installed in saturated soils, they shall be designed and installed to protect against flotation when empty, per manufacture's recommendations and information included by the system designer in the plan.
2. Constructed of durable material that is resistant to excessive corrosion and deformation from external soil and internal load pressures.
3. Structurally engineered for the depth of bury of the specific site. If vehicular traffic is a concern the tank shall be engineered for the intended load.

8.4 Septic Tank Design

Septic tanks shall have the following design:

1. Have a minimum size of 1,000 gallons, regardless of flow.
2. Have an effective liquid capacity sufficient to provide a minimum retention time of 2-times the daily peak design flow for typical domestic strength waste water.
3. The length to width ratio of a single tank shall be no less than 2:1, however 3:1 is preferred. The greater ratio allows more opportunity for the flotation and settling processes to occur. The installation of multiple tanks may be accepted as a means to provide protection against short-circuiting of flow.
4. The water depth shall be no less than four (4) feet to provide an adequate zone for the separation and stratification of raw waste materials into three zones within the tank commonly referred to as scum, sludge, and clear effluent zones.
5. When design flows are greater than 1,000 gpd, tank partitioning or multiple tanks must be utilized. The first compartment or tank in a series must have a greater volume than any following compartment or tank. It is recommended that the first compartment have a capacity of one-half to two-thirds of the total volume required.
6. When the tank has compartments, flow between compartments can occur in the baffle wall via piping located in the clear zone of the tank (mid-depth of tank). Adequate venting must be provided between compartments.
7. Have adequate tank volume prior to a proprietary treatment unit in compliance with the manufacturer's requirements.

8.5 Tank inlet and outlet piping

Tank inlet and outlet piping shall:

1. Locate the outlet pipe at minimum two (2) inches lower than the inlet pipe.
2. Attach the inlet and outlet pipe to the tank in a watertight manner using a flexible gasket or boot.
3. Be constructed in a manner to allow proper venting of gasses.

8.6 Tank Inlet/Outlet Baffles and Sanitary Tees

Tank inlet/outlet baffles and sanitary tees shall:

1. Consider an inlet baffle or tee or other method of energy dissipation when raw sewage is being pumped into a tank to minimize disruption to the scum layer. The inlet baffle or tee should not extend as deep as does the outlet baffle or tee.
2. Be installed so that there is an air gap (for venting) between the top of the baffle and the underside of the tank lid.
3. Be installed to prevent the scum layer from exiting the tank. The outlet baffle or tee must extend into the clear zone of the tank, typically into the middle third of the liquid depth. .

8.7 Effluent Filters

Effluent filters are effective in reducing the amount of suspended solids in effluent from the septic tank, providing an added measure of protection for the soil dispersal system. Effluent filters can also reduce the effects of water that surges through the septic tank as well as reduce or prevent damage to treatment components that may follow the septic tank.

For new or existing septic tank installations, an effluent filter shall be used in lieu of the outlet baffle or tee in a single tank installation or the outlet of the last tank where multiple tanks are utilized.

For existing septic tanks, installation of an effluent filter may be difficult or impossible. Whenever an effluent filter is required but cannot be physically installed in an existing septic tank other options shall be considered.

Effluent filters shall be sized to handle the peak daily flow in accordance with manufacturer's specifications.

Consideration should be given to installation of a high-water alarm to signal need for filter maintenance.

8.8 Access Risers and Lids

Risers which terminate at or above final grade are required on all tank openings.
Access risers and lids shall:

1. Have (at minimum) an opening over the inlet pipe/baffle and over the outlet baffle or effluent filter. Additional openings shall be provided over any tank baffle wall that contains a baffled outlet port. Large tanks require additional openings to allow ample ability for inspection and/or to pump out tank contents. Opening size shall be a minimum of 24 inches. For deeper tanks or duplex pump installations a larger diameter riser may be warranted.
2. Be corrosion-resistant, watertight, and maintain structural integrity.
3. Be constructed of durable materials such as concrete, PVC, fiberglass, or high density polyethylene plastics.
4. Lids should be heavy enough to prevent access by children, or otherwise be secured to prevent unauthorized access. If screws are used to secure the lid, stainless steel screws are required. Typical Phillips-head or slotted-head screws are not recommended. Screws with hex heads or other designs that require a special tool to remove them are recommended.
5. Have a secondary safety device installed in the riser to prevent an accidental fall into the tank should the riser lid become unsecured.

6. Have a watertight connection between the riser and tank. Manufacturer's installation requirements shall be followed.
7. Contain an adequate seal at the riser lid to prevent the escape of gases, water infiltration, and intrusion by vermin.
8. Minimize the potential of a riser lid flipping or dislodging when stepped upon.

8.9 Tank Installation

Septic tank(s) shall be installed:

1. To rest on a uniform bearing surface. It is good practice to provide a level, compacted granular base such as coarse sand or pea stone for the tank bedding. The underlying soils must be capable of bearing the weight of the tank and its contents when full. Soils with a high organic content or containing large boulders or massive rock edges are not suitable, unless properly prepared.
2. To meet all manufacturer's specifications.
3. To have the tank excavation carefully planned to avoid over digging around the perimeter of the tank, except as necessary for the safety of workers. Unless it is done carefully, backfill operations can result in damage to the tank and pipe connections. The system installation contractor shall ensure excavations are conducted in a safe manner.
4. Using backfill material of a granular nature free of stones larger than three (3) inches in diameter, debris, ice, or snow. Fill should be added in lifts no greater than 12 inches and each lift well compacted. For fine-textured native soils (e.g. silts, silt loams, clay loams, and/or clay) imported granular material should be used. This is a must where freeze and thaw cycles are common because the soil movement during such cycles can work tank joints open. When using plastic and fiberglass tanks, strict accordance to the manufacturer's bedding and backfill requirements must be followed.
5. To protect against flotation when empty, tank manufacturers should be consulted for appropriate anti-flotation methods or devices.
6. Using joint sealant conforming to ASTM C990 or equivalent, adhering to proper placement procedures and joining techniques for the sealant.

8.10 Tank Water Tightness Testing

Watertight, structurally sound tanks are essential to the performance of onsite wastewater systems. Wastewater that leaks out of a septic tank that is not watertight may not be adequately treated and can contaminate ground and surface waters. In addition, infiltration of the ground water into a leaky tank can hydraulically overload the downstream components of the treatment system. Furthermore, infiltration leading to tank mixing can result in a loss of the clear effluent zone allowing solids to carry over resulting in organic overloading. In order to ensure that a tank will adequately perform as intended, field testing of the tank for water tightness is essential. Septic tanks and pump-dose tanks shall be tested for water tightness using either a vacuum test or water test - reference ASTM C-1227. A certification of such shall be provided to the agency.

Chapter 9 – Pumps, Controls and Appurtenances

9.1 General

Dosing and pressure distribution are standard practices for soil dispersal and many other secondary treatment processes. The primary method for dosing and distributing effluent is with a pump. Typical applications utilize submersible pumps designed specifically for effluent. Effluent pumps are available in many models and styles, from single-stage centrifugal pumps to multistage turbine pumps. The advantages/disadvantages of choosing one pump type over the other must be considered by the system designer with pump selection based upon the intended application.
Pump selection for the design pumping rate is made by determining the total dynamic pumping head (TDH) typically expressed in feet of water pressure. The system's TDH calculation, pump rate (gpm) basis of design and manufacturer's pump curve must be included with the plan submittal for review and approval.

9.2 Time Dosing

Current and best practice recognizes the importance and benefit of reducing instantaneous hydraulic and organic loading. Small doses followed by resting periods spread evenly throughout the day enhances microbial activity, improves treatment, and system longevity. Control of pumping units by means of programmable timers is preferred.

Time dosing could be considered in conjunction with pressure distribution for all soil dispersal systems over 1,000 gpd. Time dosing is strongly encouraged for all systems whenever a pump is used to dose a soil dispersal system.

Time dosing provides a means of monitoring the treatment system and can also provide a means for detection of leaking plumbing fixtures (e.g. leaking toilet), infiltration, and inflow. Should the volume within the dosing tank exceed the design surge volume, a high-level alarm will activate.

9.3 Demand Dosing

Discharge of wastewater or effluent with demand dosing provides for delivery of hydraulic and organic loads which more closely match diurnal flow patterns. Demand dosing delivers flows to downstream components in predetermined amounts only controlled by the established dosing tank's liquid level control settings. While acceptable, demand dosing is not encouraged in situations where dosing is required. Demand dosing should only be considered when flows are <1,000 gpd. Unless flows are carefully monitored, demand dosing will not provide protection of the system from leaking fixtures and infiltration, unlike time dosing.

9.4 Distribution Valves

Pump sizes may be kept smaller, even for large systems, by dividing the distribution system into "zones" with the use of hydraulic sequencing valves. Such valves permit a small portion of the soil dispersal system to be dosed at any one time, while the remaining zones rest. Like an underground irrigation system, the valve rotates from zone to zone during pump cycles. Small doses with intermittent resting can optimize treatment performance. Other advantages include the use of smaller pumps, smaller diameter pipe network, and more uniform effluent distribution on slopes. The system designer must be familiar with the proper installation and operation of such valves and show installation details and specifications on construction plans. A description of the necessary operation and maintenance of these components needs to be included in the O & M Manual for the system.

9.5 Number of Pumping Units

Wherever continuous service without interruption is necessary or desired, pumping installations must include a minimum of two alternating pumping units each equipped to discharge at the design flow rate.

9.6 Pump Controls and Electrical Components

The pump controls and sensors ensure the system will operate efficiently and sound an alarm when malfunctions occur. The pump controls, therefore, need to be of sufficient quality that will ensure the long-term reliability expected of permanent systems. To ensure this, controls, alarm panels, floats and appurtenances need to be listed by an accredited agency (e.g. Underwriters Laboratories, Inc. (UL) or Canadian Standards Association (CSA)).

9.7 Controls

Basic control functions that need to be provided for all pumps shall include:

1. HOA switch - “Hand, Off & Automatic”;
2. Audio/Visual high-water alarm & overrides;
3. Elapsed time meters and pump event counters;
4. Circuit protection;
5. Electrical disconnect;
6. Motor contactor;
7. Locking enclosure; and
8. Audio/visual low-water alarms and redundant “pump off”.

Other control functions that may be appropriate include, but are not limited to:

1. Programmable timers for dose control operations;
2. Surge arrestor;
3. Current sensor;
4. Manual alarm resets; and
5. Visual pump run light.

9.8 Pump Control Panels and Location

Control/alarm panels must be installed above grade and where conveniently accessible for maintenance. Panels must be located near and within clear line of sight of the pump(s). Panels must be protected from the elements and have a locking enclosure appropriately rated for the environment.

9.9 Pumps and Electrical Hookups

Pumps and electrical hook-ups must conform to all state and local electrical codes, as follows:

1. Pumps and controls should have gas-tight and water-tight junction boxes (splice boxes) and electrical disconnects as per Applicable Local Codes.
2. Splice boxes should be placed so that they do not interfere with the servicing of other components. The splice box, cord grips and appurtenances must be noncorrosive and rated as water resistant with an accredited agency.
3. All electrical conduit piping shall have water tight joints and shall include an approved sealing method to prevent the migration of gasses or moisture into the controls.

9.10 Pump Floats and Switches

For all pumping systems, the following requirements should be satisfied:

1. Floats should always be securely attached to a separate support stem or bracket designed for that purpose and not attached to the pump discharge pipe. Floats or other level sensors need to be impact resistant, constructed of noncorrosive materials, watertight, and listed for water and sewage with an accredited agency.

2. Float settings need to be adjusted to ensure that the pump motors remain submerged at all times. A redundant off float switch may be required to ensure submergence of the pump motors and to keep the pump(s) from running dry.
3. The motor cord is service rated and oil resistance (SO) as listed in accordance with Applicable Local Codes.
4. The use of pump switches built into the pump, or affixed to the pump, by the manufacturer should not be used in a wastewater system.

9.11 Pump Installation and Fittings

All pumps and valves must be installed so that they can be easily removed and/or replaced from the ground surface. Under no circumstances shall pump replacement and/or repair require service personnel to enter the pump tank. Pumps must be fitted with unions, valves, and electrical connections deemed necessary for easy pump removal and repair. Lift chains or rope must be of size and strength to allow safe pump removal. Lift chain shall be stainless steel or other noncorrosive material. Lift rope must be of material that will not be subject to deterioration in a wastewater environment.
All effluent pumps must be suitably protected against clogging, normally by approved septic tank outlet filters or by screened pump vaults. Pump vaults provide the added benefit of suspending the pump off the bottom of the pump tank, allowing room on the bottom for biosolids to accumulate without being picked up by the pump and discharged to the soil dispersal system. Most vault designs also hold floating scum in the tank as well. Pump vaults or effluent screens or filters must be well maintained as part of routine O&M.

If any portion of the pump fittings or transport line is at a higher elevation than the soil dispersal system, the system must be equipped with an air vacuum release valve or other suitable device to avoid siphoning. The force main should have a weep hole inside the pump chamber, be buried below the frost line, or have additional measures to address freezing concerns. If a weep hole is used to allow drainback of effluent remaining in the transport line at the end of a pumping event, the system designer must factor the volume of the transport line into the dosing volume design. This is also necessary when a check valve is omitted in the pump discharge piping. It may also be necessary to consider the quantity of discharge through the weep hole when determining pump run times. All of this becomes more important as the length and diameter of the transport line increases.

9.12 Effluent Pump Selection

Effluent pumps are generally one of two types - submersible centrifugal pumps or multistage high-head turbine pumps. Each type of pump is better suited for certain types of applications than the other. The difference is typically in the TDH against which the pump is capable of operating. Turbine pumps will generally pump against much higher TDH than centrifugal pumps which is advantageous when the system may experience increased back pressure during its operation (e.g. the clogging of orifices in a pressure distribution network). In general, multistage high-head turbine pumps produce less flow, but more head (steep pump curve). In contrast, single stage centrifugal pumps generally produce more flow with less head (flatter pump curve). The system designer needs to refer to the specific manufacturer's pump curve for pump selection and performance.
Submersible turbine pumps may also require a draft tube sometimes called a flow inducer to route flow past the pump motor for cooling. Other specific installation requirements may also be recommended or required by the pump manufacturer so as not to void the warranty.

9.13 Remote Monitoring

Remote monitoring capability, when installed in conjunction with controls, gives qualified maintenance providers the ability to remotely monitor and control performance from an off-site location. This results in more reliable and effective operation and maintenance by service providers. An additional benefit is the

capability to provide immediate notification of the operator in the event of an alarm condition at a system. Remote monitoring has its advantages for all systems.
Remote monitoring is required for all community systems and, in general, for those soil dispersal systems utilizing alternative treatment technology more complex than simple pressure distribution. Exceptions for remote monitoring may be considered for facilities employing full time on-site maintenance personnel. The remote monitoring capabilities that can be provided are:

1. Automatic alarm notification to operator(s).
2. Self-adjusting based on trend data.
3. Remote access to change control settings.
4. Data logging for access to historical data for troubleshooting problems.
5. Data logging for access to historical flow data.
6. Detection of high/low liquid levels, stuck float switches, pump failures, excessive cycles/run times, clogging, and many other conditions.

9.14 Flow Measurement

The ability to collect and record accurate flow data is an essential tool to optimize the treatment process and comply with treatment objectives. Collection, review, and reporting of flow data by the qualified maintenance provider allows for preventative trouble shooting and adjustments to be made based on real time data for the treatment system. Basic flow data can be obtained with any system using pump event and pump run-time records, and should be included as part of the system management plan. Where flow meters are installed, the flow meters should not incorporate paddle wheels, turbines, or other protrusions into the flow stream, and should be designed specifically for wastewater applications. The initial readings of the flow measurement device must be recorded at start up and during any O&M assessment. Flow measurement must be available upon request of the reviewing agency.

9.15 Use of Wastewater Siphons

Siphons have been used in the past and occasionally today for dosing of larger soil dispersal systems, usually in combination with larger diameter (four [4] inch or larger) piping. Siphons offer the advantage of dosing without the need for electrical service or pumps. However, siphons are not effective when trying to use small diameter pipes and orifices for uniform pressure distribution and shall not be used with such systems.

Chapter 10 – Soil Dispersal System Design and Construction

10.1 Introduction

The design and construction of the soil dispersal component system is a key element contributing to successful operation. A variety of design options are detailed below for the system designer's consideration. It is important for the system designer to utilize distribution components and methodologies that are appropriate for the strength and volume of wastewater produced by a facility. The objective in any soil dispersal system design is to maintain a consistent aerobic soil environment. The utilization of pressure distribution providing controlled, equally distributed doses of effluent is preferred in most cases. This provides for a well-balanced aerobic ecosystem to flourish within the soil environment offering better long-term treatment results and overall system longevity.

10.2 Gravity Distribution

Gravity Distribution systems shall be limited to facilities having an established design flow of less than 1,000 gal/day.

ITEM	REVIEW CRITERIA
Pipe Size	4-inch utilizing same wall thickness standards between perforated and non-perforated.
Perforated Pipe	Maximum 2 square inches/lineal foot in lower 150˚ of arc of pipe.
Header	Distribution box recommended, otherwise level solid pipe SCH 40 PVC or equivalent.
Footer	Perforated pipe tied into all laterals.
Lateral Length	100 ft maximum.
Lateral Slope	Level to a maximum of 2-inches per 100 feet.
6A Stone Under Pipe	Minimum of 6-inches.
6A Stone Over Pipe	Minimum of 2-inches.
Space Between Laterals in Bed	2-ft minimum to a maximum of 6 ft.
Space Between Sidewall and Distribution Pipe	1-ft minimum.
Soil Barrier Over Stone	Required. Non-woven geotextile fabric. Less than 2 oz./yd2, 10# minimum tear, 8# min puncture.
Final Soil Cover	Sandy loam to loamy sand with thin layer of topsoil to establish vegetative growth. Shall be crowned to divert water off the system. Total thickness to range from 4-inch minimum to 24-inch maximum.
Inspection/Observation Ports	Minimum of 1 per distribution cell required. Installed to base of stone.
Surface Drainage	Diverted away from system.

10.3 Low Pressure Distribution

The objective of low pressure distribution systems is to provide uniform distribution of effluent to the soil environment in a controlled manner to increase the system's efficiency and overall long-term performance.

The design requirements detailed in the table below are considered time tested best practices for pressure distribution network design. However, due to the number of dependent interchangeable variables in a pressure system design; system designer discretion is allowed.

For example, force main and manifold sizing are a system designer choice based on pump characteristics, distance between pump and distribution laterals, minimum velocity, flow rate, and pipe volume. Orifice size, spacing, and orientation on the lateral pipe are also a system designer choice based on system hydraulics and system designer preference.

ITEM	REVIEW CRITERIA
Lateral Size	¾-inch to 3-inches.
Force Mains	System designer choice.
Manifold	System designer choice.
Clean-out at Terminal End	Long sweep elbow with threaded caps with accessible clean out box.
Orifice Shields	Required in stone aggregate installations.
Orifice Position	System designer choice.
Lateral Orientation	Level to slight fall toward tank for drainback. Hole inside tank to allow for draining of distribution line.
Orifice Diameter	1/8-inch minimum to ¼-inch maximum for septic tank effluent. Smaller orifices may be considered for highly treated effluent.
Residual Design Head	Minimums: 2 ft (1/4" orifice) 3 ft (3/16" orifice) 5 ft (1/8" orifice)

10.4 Distribution Systems and Components

ITEM	REVIEW CRITERIA
Building Sanitary Lead	Designed and constructed per applicable plumbing codes.
Slope of Sanitary Lead	Slopes greater than 20 percent require special design consideration.

10.5 Septic Tank Effluent Pipe (for gravity flow)

ITEM	REVIEW CRITERIA
Pipe	Solid Schedule 40 PVC or equivalent.
Joints	Water-tight connections.
Slope	Minimum 1 percent laid on compact base material.

10.6 Distribution Boxes

The distribution box connects a single effluent line from the septic tank to a network of dispersal piping or components in gravity fed systems. The distribution box outlet design allows for adjustment of the flow among the various outlets.

ITEM	REVIEW CRITERIA
Construction Material	Durable and resistant to corrosion.
Distribution Box Footing	Compacted sand, or gravel to prevent differential settling.
Water-Tight Pipe Connections	Required per manufacture specifications.
Flow Dialers or Adjusters	Required.
Accessible Cover	Required.
Pumping into Distribution Box	Discharge must be directed away from an outlet pipe and must not overflow the box.

10.7 Drop Boxes

Drop Boxes are used to distribute effluent through sequential distribution to trenches in a gravity-fed soil dispersal system. They can be used on sloping or level sites and allow for flexibility in the number and length of trenches. There is no maximum slope of site in which they can be used and they allow for quick inspection of flows to the trenches. The concept consists of gravity effluent diversion into one trench. When the effluent fills the trench and reaches the pipe outlet it then flows into a second trench until it reaches capacity, then to a third or more as needed.

ITEM	REVIEW CRITERIA
Construction Material	Durable and resistant to corrosion.
Footing	Compacted sand, or gravel to prevent differential settling.
Water-tight Pipe Connections	Required.
Internal Flow Control Mechanism	Required.
Accessible Cover	Required.
Connecting Piping	Non-perforated pipe.
Back fill around connecting piping	Compacted native soil only – no stone allowed.

10.8 Mechanical Distribution Valves

The use of distribution valves allows a system designer to break a large dispersal field into smaller zones, thus minimizing pipe size and pump size resulting energy conservation. Furthermore, the valves can help optimize treatment by allowing a zone to receive a small volume dose while the remaining zones can "rest" between dose cycles. Valves can also be utilized to provide equal distribution of effluent to trenches located on slopes.

ITEM	REVIEW CRITERIA
Elevation	Highest point of dispersal field for proper sequencing of valve.
Valve Accessibility and Freeze Protection	Required - Must be accessible and placed in an insulated housing to prevent freezing.
Force Main to the Valve	Should remain full to increase operational reliability of the valve.
Pump Selection	Must consider frictional losses through valve.

10.9 Final Cover and Grading

The total depth of the final cover should be minimized to promote aerobic conditions. A minimum of 4-inches and a maximum of 24-inches of suitable earth cover shall be placed over the soil dispersal system. Suitable earth cover means a permeable soil that will allow aeration and that will support the growth of grass. Loamy sand soils are preferred. Loam or heavier soil textures shall be prohibited. The surface must be graded such that water will not pond on the system. Vegetative cover over the soil dispersal area should be established as soon as possible after construction in order to prevent soil erosion and promote aerobic conditions within the treatment area.

Chapter 11 – Lake Isabella South & Lake Isabella Golf Estates 2 Specific Septic System Conditions

11.1 Purpose

The Septic System Conditions as defined below are proposed to be utilized as a guideline in determining if a subdivision lot(s) is suitable for construction of a residential septic system to dispose of wastewater from a residential dwelling. The conditions are based on normal residential wastewater strength and flows. These conditions shall not be considered for nonresidential lots or developments.

Proposed Septic System Condition "A" shall be the "default condition" utilized on all lots unless site investigation/preliminary design indicates the need for an alternative condition/design.

Soil Texture and Structure shall be field evaluated and classified by a Registered Sanitarian, Engineer or Surveyor that have been trained to classify soils and have at least five years of experience. Soils shall be classified per the USDA soil classification system. Soil evaluations shall be performed by excavating a test pit or trench and not by hand augers. See Chapter 2 of the Baseline Criteria for more information.

11.2 Septic System Condition "A"

A septic system can be constructed to meet the Administrative Rules with the inclusion of the Baseline Criteria and the CMDHD will be able to issue a permit without an alternate design or variance(s).

- Soil Conditions:
  - Will meet Criteria for Soil Texture and Structure per Chapter 2 of the Baseline Criteria.

- Site and Design Considerations:
  - Will meet the 36" of isolation from high ground water or restrictive layer to the bottom of stone bed/trench per the Administrative Rules and will meet the soil isolation requirements as per 2.6.3 of the baseline criteria.
  - Available lot size after accounting for setbacks, isolations, slope of the land and etc. per the Chapter 2 of the Baseline Criteria will allow construction of a septic system meeting the minimum absorption square footage areas per the CMDHD.
  - Size and slope of lot will allow the septic system to be elevated if needed to maintain the separation to ground water requirements.
  - Lot size is large enough for a set aside/reserve area for future construction of a replacement septic system being the same size as the primary system.

11.3 Septic System Condition "B"

An alternate design septic system can be constructed with the inclusion of the Baseline Criteria and the CMDHD will be able to issue a permit without a variance(s).

- Soil Conditions:
  - Will meet the requirements as outlined above in Soil Condition "A".

- Site and Design Considerations:
  - Available lot size **will not** allow construction of a septic system meeting all of the requirements as outlined above in Site Condition "A".

- Septic system will include **pretreatment** to allow **a reduction in disposal area square footage**. Amount of reduction will vary from lot to lot and will depend on the existing soil texture/structure as well as other lot considerations.
- Reduction of the disposal area will allow the construction of a septic system to meet all of the requirements as outlined above in Septic System Condition "A".
- Final Disposal shall utilize low pressure distribution as described within Chapter 11 of the Baseline Criteria.

- Pretreatment Requirements:
  - Pretreatment units shall be either a packed bed type or activated sludge type that has a NSF Standard 40 Certification and that can meet the Treatment Objectives within the Baseline Criteria.
  - Homeowner shall have a perpetual maintenance contract with a qualified service contractor to monitor and maintain the pretreatment system and low pressure distribution system. Annual copy of service contract and maintenance report to be submitted to CMDHD and Village.
  - Homeowner shall record a "Notice to Deed" that indicates the onsite wastewater disposal system is an alternate design system to overcome limitations of the property in regard to wastewater disposal. Deed notice shall also include the requirement of a perpetual maintenance contract with a service contractor.

11.4 Septic System Condition "C"

An alternate design septic system can be constructed with the inclusion of the Baseline Criteria and the CMDHD will be able to issue a permit without a variance(s).

- Soil Conditions:
  - Will meet the requirements as outlined above in Soil Condition "A".

- Site and Design Considerations:
  - Location and size of lot **will not** allow construction of a septic system meeting all of the requirements as outlined above in Septic System Condition "A".
  - Septic system will include **pretreatment** to allow a **reduction of the required 100 feet horizontal isolation distance to surface water**. The amount of reduction shall not reduce the isolation distance to less than 50 feet.
  - Reduction of the isolation distance will allow the construction of a septic system to meet all of the remaining requirements as outlined above in Septic System Condition "A".
  - Final Disposal shall utilize low pressure distribution as described within Chapter 10 of the Baseline Criteria.

- Pretreatment requirements:
  - Pretreatment units shall be either a packed bed type or activated sludge type that has a NSF Standard 40 Certification and that can meet the Treatment Objectives within the Baseline Criteria.
  - Final Disposal area shall not be reduced with pretreatment if the isolation distance to surface water is reduced to less than 75 feet.

- Homeowner shall have a perpetual maintenance contract with a qualified service contractor to monitor and maintain the pretreatment system and low pressure distribution system. Annual copy of service contract and maintenance report to be submitted to CMDHD and Village.
- Homeowner shall record a "Notice to Deed" that indicates the onsite wastewater disposal system is an alternate design system to overcome limitations of the property in regard to wastewater disposal. Deed notice shall also include the requirement of a perpetual maintenance contract with a service contractor.

11.5 Septic System Condition "D"

An alternate design septic system can be constructed with the inclusion of the Baseline Criteria and the CMDHD will be able to issue a permit without a variance(s).

- Soil Conditions:
  - Soil Texture and Structure will meet the requirements as outlined above in Soil Condition "A".

- Site and Design Considerations:
  - Will meet of the requirements as outlined above in Site and Design Considerations "A" with the **addition of pretreatment** that will allow a 12" reduction of the required 36" isolation from groundwater or restrictive layer to bottom of stone bed/trench.
  - Reduction of the separation distance will allow the construction of a septic system to meet all of the remaining requirements as outlined above in Septic System Condition "A".
  - Final Disposal shall utilize low pressure distribution as described within Chapter 10 of the Baseline Criteria.

- Pretreatment requirements:

  Option 1:
  - Pretreatment units shall be either a packed bed type or activated sludge type that have a NSF Standard 40 Certification and that can meet the Treatment Objectives within the Baseline Criteria.
  - Final Disposal area could be reduced as outlined in Septic System Condition "B".
  - Homeowner shall have a perpetual maintenance contract with a qualified service contractor to monitor and maintain the pretreatment system and low pressure distribution system. Annual copy of service contract and maintenance report to be submitted to CMDHD and Village.
  - Homeowner shall record a "Notice to Deed" that indicates the onsite wastewater disposal system is an alternate design system to overcome limitations of the property in regard to wastewater disposal. Deed notice shall also include the requirement of a perpetual maintenance contract with a service contractor.

  Option 2:
  - Passive pretreatment with a Geotextile Sand Filter system that can meet the Treatment Objectives within the Baseline Criteria.
  - Final Disposal area shall not be reduced unless NSF Standard 40 Certified.
  - Homeowner shall record a "Notice to Deed" that indicates the onsite wastewater disposal system is an alternate design system to overcome limitations of the property in regard to

wastewater disposal. Deed notice shall also include that the low-pressure distribution system will require periodic maintenance.

11.6 Septic System Condition "E"

A septic system **CANNOT** be constructed to meet the Administrative Rules, even with alternative design .

AGREEMENT AND PROPERTY USE RESTRICTIONS
FOR THE WASTEWATER DISPOSAL SYSTEM PERMIT

FOR VALUABLE CONSIDERATION, the sufficiency and receipt of which is hereby acknowledged by the parties, this AGREEMENT is made on this ___ day of _____, 20____ by and between _____ at _____, Lake Isabella, MI 48893, hereinafter called the "Owner", and the Village of Lake Isabella, a Michigan home rule village, with its offices at 1010 Clubhouse Drive, Lake Isabella, MI 48893, hereinafter called "Village".

WITNESSETH:

WHEREAS, the Owner is the owner in fee simple of the following described real property located in the Village of Lake Isabella, Isabella County, Michigan (the "Property").

Parcel I.D.:

Address:

Legal Description:

WHEREAS, the Owner has expressed to the Village an interest in building a dwelling on the Property;

WHEREAS, the Owner states that the intended use for the Property will be a single-family residential dwelling;

WHEREAS, the Owner acknowledges that the water supply and wastewater disposal systems serving the dwelling will be reliant on an on-site water supply and wastewater disposal system as permitted by the Central Michigan District Health Department or successor ("CMDHD") in coordination with the Village; and

WHEREAS, the Owner has fulfilled the permit requirements as set forth by the CMDHD in coordination with the Village for the installation and use of on-site water supply and wastewater disposal systems to serve a single-family residential dwelling use on the Property.

AGREEMENT

NOW, THEREFORE, the parties mutually agree as follows:

1. Ownership of the Property must be kept under one person, a married couple or one entity who will be solely responsible for maintenance of the water supply and wastewater disposal system on the Property.
2. The wastewater disposal system has been designed and permitted based upon single-family residential use. Said design is per CMDHD permit number _____.
3. Low flow fixtures shall be utilized throughout the dwelling. In the event of a sewage disposal failure as determined by the CMDHD, the Owner shall promptly abate the failure and repair or replace the wastewater disposal system under permit from the CMDHD.
4. The Owner shall hire an Operation and Maintenance Provider ("OMP") to perform all required maintenance and inspections on this system as prescribed by the approved permit and System Management Plan. The OMP shall submit required reports to the CMDHD that indicate the measurement of water use, observation of the system and how it is functioning, and other information as may be required by the System Management Plan.
5. This Agreement and any required permits, together with the covenants and restrictions herein, are permanent and shall run with the land, and shall bind, and inure to the benefit of the heirs, executors, administrators, devisees, successors, legal representatives, and assigns of the respective parties to whom the whole or any part of the land so made subject to said permit shall at any time become or belong. Any violation of the restrictions and covenants contained in this Agreement shall void any required permits, including the right to occupy the structure. Any property in violation of its approved permit or System Management Plan shall be deemed to be in violation of the Village's Blight Code which requires that dwellings be maintained in a habitable condition.
6. Failure of the Village or CMDHD to enforce any covenant or restriction contained in this Agreement shall not be construed as a waiver of any further breach of the same covenant or restriction in the future.
7. This Agreement and any amendments hereto shall be recorded by the Owner within three (3) calendar days from the date of this Agreement or any amendment with the County Register of Deeds.
8. This Agreement shall only be modified upon the written approval of the Village and CMDHD.
9. In the event the dwelling on the Property is connected to a municipal sewer system, the wastewater limitations listed herein shall be deemed null and void.
10. All devices including flush toilets, urinals, lavatories, sinks, bathtubs, showers, laundry sinks, dishwashers, and any other device from which sewage emanates shall be connected to an approved onsite sewage disposal system.

11. It is the responsibility of the Owner to secure, obtain and post any Performance Bond which may be required by the System Management Plan to ensure that the next required round of maintenance or inspections will be carried out.

12. The monetary consideration for this Agreement is less than $100.00. Therefore, the recording of this Agreement is exempt from state and county recording taxes/fees pursuant to MCL 207.526(a) and 207.505(a).

13. This Agreement may be enforced in court by either the Village, CMDHD or their respective successors. Should the Village or CMDHD (or their successors) prevail in court pursuant to any lawsuit to enforce or involving this Agreement, the Owner shall reimburse the Village and/or CMDHD (whichever agency is involved in the lawsuit or both) for their reasonable attorney fees and costs, including legal fees related to the preparation for any such lawsuit and any appeals.

14. This Agreement has been executed in triplicate, although it constitutes only one contract or agreement overall.

OWNER

By _____
_____

And by _____
_____

STATE OF MICHIGAN)
) ss.
COUNTY OF _____)

The foregoing was acknowledged before me on this _____ day of_____, 201__, by _____, and _____, _____, who are personally known to me or who have produced their Michigan driver's licenses as identification.

_____

Notary public, _____County, Michigan
Acting in _____ County
My commission expires _____

* * *

VILLAGE OF LAKE ISABELLA, a
Michigan home rule village

By _____
Timothy Wolff
Its Manager

And by _____
Jeffrey P. Grey
The Village Clerk

STATE OF MICHIGAN)
) ss.
COUNTY OF _____)

The foregoing was acknowledged before me on this _____ day of_____, 201__, by Timothy Wolff, Manager of the Village of Lake Isabella, and Jeffrey P. Grey, Clerk of the Village of Lake Isabella, who are personally known to me or who have produced their Michigan driver's licenses as identification.

_____

Notary public, _____County, Michigan
Acting in _____ County
My commission expires _____

DRAFTED BY AND RETURN TO:

Timothy Wolff, Village Manager
The Village of Lake Isabella
1010 Clubhouse Drive
Lake Isabella, MI 48893
(989) 644-8654