

A NUMERICAL CLASSIFICATION SYSTEM TO DETERMINE
OVERALL SITE SUITABILITY FOR SUBSURFACE WASTEWATER DISPOSAL
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Donald C. Hoxie, PE*

Russell C. Martin, PE*

David P. Rocque, SS*

The State of Maine abandoned the traditional percolation test in 1974 and replaced it with a system of site evaluation to determine suitability for subsurface wastewater disposal. These evaluations are performed by individuals licensed by the Department of Human Services. In 1986 there were 10,037 permits issued for subsurface wastewater disposal systems including new and replacement systems.

THE MAINE SUBSURFACE WASTEWATER CODE

The Maine system is based on identification and description of the soils using the United States Department of Agriculture classification terminology. Parent material and texture determine the wastewater application rate and the depth to seasonal high water table (SHWT), impervious layer or bedrock determines the elevation of the bottom of the disposal field and the suitability or unsuitability of the property. Undeveloped properties with less than fifteen inches of original soil above the limiting factor are considered unsuitable for any form of subsurface wastewater disposal.

The U.S. Soil Conservation Service rates 93% of Maine soils as having "severe" limitations for subsurface disposal with less than 2% rated as having "slight" limitations. Table 1 illustrates the soil types by parent material and the percentage of systems installed on these soil groups in 1986.

Table 1. Percentage of State and Systems by Soil Parent Material

Parent Material	Percentage of State	Percentage of Systems
Glacial Till	77.0	63.5
Lacustrine & Marine	9.5	9.2
Stratified Drift	8.5	22.1
Organic	3.4	0.0
Alluvial	1.3	0.1
Mixed Origin	0.5	5.1

D.C. Hoxie, Director; R.C. Martin, Program Manager; D.P. Rocque, State Site Evaluator; Maine

Table 2. Percentages of State and Systems by Soil Limiting Factor

<i>Limiting Factor</i>	<i>Percentage of State</i>	<i>1986 Percentage of Systems</i>
Shallow to Bedrock (<48*)	19.4	13.0
Well Drained (SHWT>48*)	30.5	22.0
Mod. Well Drained (SHWT48-15*)	22.9	57.0
Somewhat Poorly Drained (SHWT15-6*)	22.1	7.0
Poorly & Very Poorly Drained (SHWT<6*)	5.0	1.0

THE NEW SYSTEM VARIANCE PROCEDURE

Because of the diminishing number of sites with “suitable soils” and the belief that other site characteristics should be taken into consideration the Department developed the New System Variance procedure. This procedure assigns points to various site and system design characteristics and sets a minimum passing score of 50 points, with 65 points required for properties in Shoreland Zoning areas, and 75 points for lots in proposed subdivisions. Properties not meeting the requirement of original soil over limiting factor are judged by this system. Table 3 includes the current point assignments.

Table 3. Current New System Variance Criteria

Soil Profile	2, 3, 7	1, 8, 9	4	5,6,11	10				
Soils Points	15	10	7	3	--				
Depth to SHWT(cm)	35	33	30	28	25	23-15	Less than 15		
Drainage Points	20	15	9	6	3	0	- -		
Size of Hectares	+4	4.0	2.4	2.0	1.6	1.2	0.4	0.2	<0.2
Property Points	20	15	10	8	6	4	2	-10	--
Terrain Position Points	Knoll	Sideslope	Lowland	Depression					
	5	3	-5	--					
Waterbody Distance(s)	+76	75-46	45-30	Less than 30					
Setback Points	5	3	0	--					
Water Supply Zone	Type	Public	Drilled	Other	Resource Protection				
	Points	5	3	0	--				
Type of Comm>2838	Type	Comm<378	Comm 378-1135	SFD	Comm 1139-2838				
Development Points	3		3	0	-5				-10
Design Flow	Volume Points	Minimum+66%	Minimum+33%	Minimum					
		10	5	0					

Separation Distance	Depth Points	Minimum+100% 10		Minimum+50% 5		Minimum 0
Additional Treatment	Technique Points	Sand Filter 5	Peat Filter 5	Curtain Drain 5	Loam Liner 3	Press. 3

Il new system variances are reviewed by the Department. Since the program's inception in 1981 almost 2,000 variances have been considered with 81% approved and 19% denied. The failure rate for these systems has been no higher than for all new systems; approximately 1 in 1000. The number of variance applications has increased dramatically in the last year, up 67% over 1986. Applications for the first quarter of the current year suggest that new system variances will be up by 44% in 1988.

Table 4. Number of New Systems Variances by Year

Fiscal year (Jul 1 – June 30)	Total	Approved	Denied
1982	274	227	47
1983	277	216	61
1984	208	155	53
1985	282	248	34
1986	313	254	59
1987	324	424	100
Totals	1878	1524	354
1 st Qtr. 1988	196	167	29

OVERALL POINT CLASSIFICATION SYSTEM

In response to the increase in the number of new system variances and our good experiences with these systems, we are proposing a point classification system to be used for all properties. This system would base the suitability for building on an assessment of the overall site instead of a single parameter, depth of original soil to limiting factor. As envisioned, this system would

incorporate all the current approved new system variances as systems in full compliance with the rules. Minimum point totals would be established for individual lots (65 pts.), subdivision (70 pts.), shoreland lots (75 pts.), and sand and gravel aquifers (80 pts.).

Limiting Factors in the Soil

The important limiting factors are seasonal water table, restrictive layer, and bedrock. The first two elements of the classification system assign points based on the depth of original soil present above the limiting factor(s). More points are assigned for deeper soil strata assuming a greater degree of treatment before the effluent reaches the groundwater table. Figure 1 is a graphical representation of the points assigned in Tables 5.1 and 5.2.

Table 5.1 Limiting Factor – Seasonal High Water Table or Restrictive Layer

(cm)											
Depth To	122+	122-110	109-99	98-86	85-76	75-66	65-56	55-46	45-33	32-25	24-15
Points	20	18	16	14	12	10	8	6	4	2	0

Table 5.2 Limiting Factor – Bedrock

(cm)											
Dept	122+	122-114	113-104	103-97	96-89	88-79	78-71	70-64	63-56	55-46	45-38
Points	20	18	16	14	12	10	8	6	4	2	0

Property Size

Decreased overall development density is achieved by assigning higher point values for larger lots. No attempt is made to determine lot size by soil type due to the extreme variability of soils within the boundaries of typical house lots. These points are assigned in Table 5.3.

Table 5.3 Size of Property

(he)											
Average	+4.0	4.0-3.6	3.6-3.2	3.2-2.8	2.8-2.4	2.4-2.0	2.0-1.6	1.6-1.2	1.2-0.8	0.8-0.4	0.4-
	3.6	3.2	2.8	2.4	2.0	1.6	1.2	0.8	0.4	0.2	
Points	20	18	16	14	12	10	8	6	4	2	0

Position in the Landscape

Table 5.4 attempts to encourage development on sloping sites which usually have better

drainage. This is illustrated by Figure 2.

Table 5.4 Terrain

Position	Knoll	Upland	Sideslope	Lowland	Depression
Points	6	4	2	0	-

Setback from Waterbodies

The minimum setback by rule is 30 m (100 ft.). Table 5.5 awards more points at this horizontal setback distance is increased.

Table 5.5 Waterbody Setback (m)

Distance To	+70	70-56	55-41	40-30	Less Than 30
Points	10	7	3	0	

Property Line Setback

This criteria was included to encourage greater separation between individual disposal fields and to reduce the potential interference with abutting properties during construction. Table 5.6 assigns these points.

Table 5.6 Property Line Setback

Distance To	+30	30-26	25-21	20-11	10-06	5-3 Less than 3 5-3 Less than 3
Points	5	4	3	2	1	0 -

Total Wastewater Flow

This section provides a slight penalty for large cluster systems. With a greater wastewater flow concentrated in a smaller area they present a greater potential for outbreak and groundwater contamination than individual systems. Table 5.7 assigns these points.

Table 5.7 Total Wastewater Flow

(l/d) Volume	Less Than 1100	1101-2200	2201-2300	3301-4400	4401-.5500	5501-7500
Points	15	12	9	6	3	0

Table 5.8 Design Wastewater Flow

(l/d) Volume	Min+70%	Min+55%	Min+40%	Min+25%	Min+10%	Min
Points	10	8	6	4	2	0

Separation Distance from Limiting Factor

Table 5.9 assigns points for an increased vertical separation distance between the bottom of the disposal field and the limiting factor. This will provide for more treatment of the wastewater prior to contact with the groundwater table and will in part make up for the lack of depth of original soil in the less well drained conditions.

Table 5.9 Separation Distance from Limiting Factor

(cm) Depth	Min+40	Min+32	Min+24	Min+16	Min+8	Min
Points	10	8	6	4	0	

Type of Water Supply

Table 5.10 recognizes the lesser potential for water supply contamination when an off-site source is utilized, and the greater security of a drilled well over that of a dug well.

Table 5.10 Type of Water Supply

Type	Off-site Water Supply	On-site Drilled Well	On-site Dug Well
Points	5	3	0

Width of Disposal Field

This section is designed to encourage narrower disposal fields to provide a) an increased sidewall to bottom area ratio to minimize the problem of compaction, smearing, and dirty stone; b) a greater soil profile area downslope to intersperse and treat the wastewater; and c) generally less fill and reduced opportunity for differential settling.

Table 5.11 Disposal Field Design

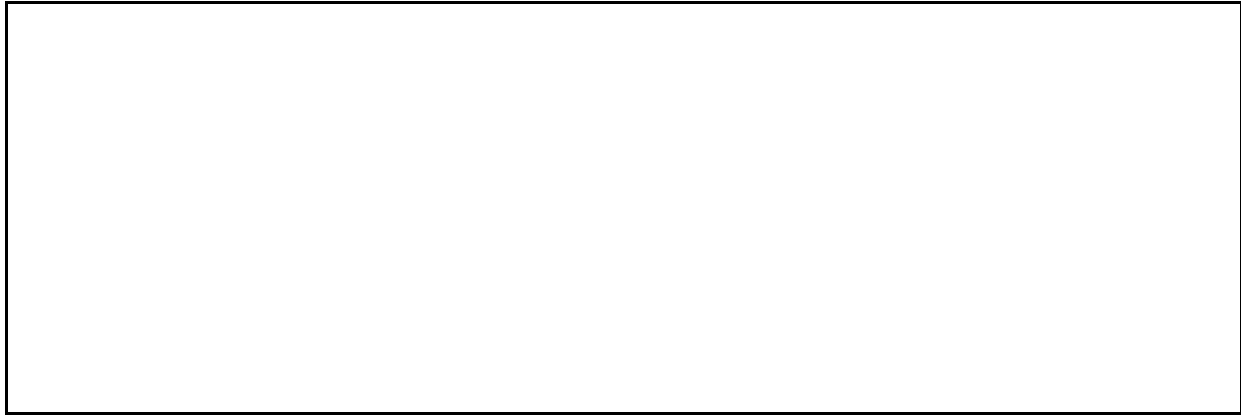
(m) Width	Less Than 1.5	1.5-2.5	2.6-4.0	4.1-5.0	Greater Than 5.0
Points	10	8	6	4	2

Additional Treatment

The last portion of the classification system provides additional points for site modification on properties with perched seasonal water tables and the use of pretreatment technologies to provide a higher quality effluent reaching the disposal field.

Table 5.12 Additional Treatment

Technique	Sand/Peat Filters Profiles 4,5, 6 & 8	Curtain Drains Profiles 4,5,6 & 11	Nitrate Removal
Points	5	5	10



The following table is an illustration of the application of the point classification system described in this paper to a sample five lot subdivision. The system clearly shows which lots are well suited for on-site wastewater disposal in their native state and which lots will need to use additional design factors to achieve acceptable scores. It is anticipated that this process will be of great use to local planning boards in evaluating subdivisions. Instead of simply knowing that all proposed lots “pass” they will be able to identify the marginal lots and either eliminate them or require additional on-site engineering in the system design.

Table 6. Application of Table 5 to a Five Lot Subdivision

Point Group	Lot #1	Lot #2	Lot #3	Lot #4	Lot #5
Limiting Factor	SHWT @ 30cm (2 pts)	SHWT @40cm (4 pts)	SHWT @ 50cm (6 pts)	SHWT @ 80 (12 pts)	SHWT>122cm (20 pts)
Dept to Bedrock	BDRK @ 60cm (4 pts)	BDRK @75 cm (8 pts)	BDRK @ 78cm (8 pts)	BDRK @115cm (18 pts)	BDRK> 122cm (20 pts)
Size of Property	0.8 HE (3 pts)	1.0 HE (4 pts)	0.9 HE (4 pts)	0.5 HE (2 pts)	1.1 HE (4 pts)
Position in Landscape	Upland (4 pts)	Upland (4 pts)	Sideslope (2 pts)	Sideslope (2 pts)	Sideslope (pts)
Water Body Setback	> 70m (10 pts)	>70m (10 pts)	>70m (10 pts)	60m (7 pts)	60m (pts)
Property Line	20m (2 pts)	10m (1 pt)	5m (0 pts)	6m (1 pts)	25m (3 pts)
Total Waste Flow	2000 LPD (12 pts)	2000 LPD (12 pts)	2000 LPD (12 pts)	2000 LPD (12 pts)	2000 LPD (12 pts)
Site Points	37	43	42	54	64
Design Flow	MIN + 70% (10 pts)	MIN + 55% (8 pts)	MIN + 40% (6 pts)	MIN +25% (4 pts)	MIN + 10% (2 pts)
Separation Distance	MIN + 40cm (10 pts)	MIN + 32cm (8 pts)	MIN +24cm (6 pts)	MIN + 16cm (4 pts)	MIN + 8cm (2 pts)

Water Supply	Drilled (3 pts)	Drilled (3 pts)	Drilled (3 pts)	Drilled (3 pts)	Drilled (3 pts)
Design Width	1.0m (10 pts)	1.0m (10 pts)	Om (10 pts)	Om (10 pts)	Om (10 pts)
Additional Treatment	NONE (0 pts)	NONE (0 pts)	NONE (0 pts)	NONE (0 pts)	NONE (0 pts)
Engineering Points	33	29	25	18	16
Total Points	70	72	67	72	80

In summary we believe our point classification system for all lots utilizing subsurface wastewater disposal is a more thorough, rational, and logical method for determining site suitability than our present method of looking only at the depth of original soil over the limiting factor. This classification system will provide for better overall land utilization, protection of the natural environment, and a careful integration of the disposal field with the unique characteristics of each site.