Supplementary Information for

Onsite Wastewater Management System Installations

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Manitoba Conservation
Onsite Wastewater Management Systems Program

July 2005

Revised July 2010

Manitoba
Conservation

DIRECTOR VARIANCE OF MANITOBA REGULATION 83/2003

ONSITE WASTEWATER MANAGEMENT SYSTEMS REGULATION

(PURSUANT TO SECTION 25 OF THE REGULATION)

Whereas section 25 of Regulation 83/2003 reads as follows:

"Upon written application by the owner of an installation site and notwithstanding any other provision of this regulation, the director may vary the requirements of this regulation with respect to the installation of an onsite wastewater management system or privy, subject to such terms and conditions as the director may require, and the variation shall be complied with as if it were a part of this regulation."

And whereas,

to prevent contamination of soil and ground water in the Province of Manitoba, notwithstanding the provisions currently found in Schedules A and B of the *Onsite Wastewater Management Systems Regulation*, it is advisable to permit alternative type disposal fields, for use throughout the Province of Manitoba in a variety of soil types.

And whereas,

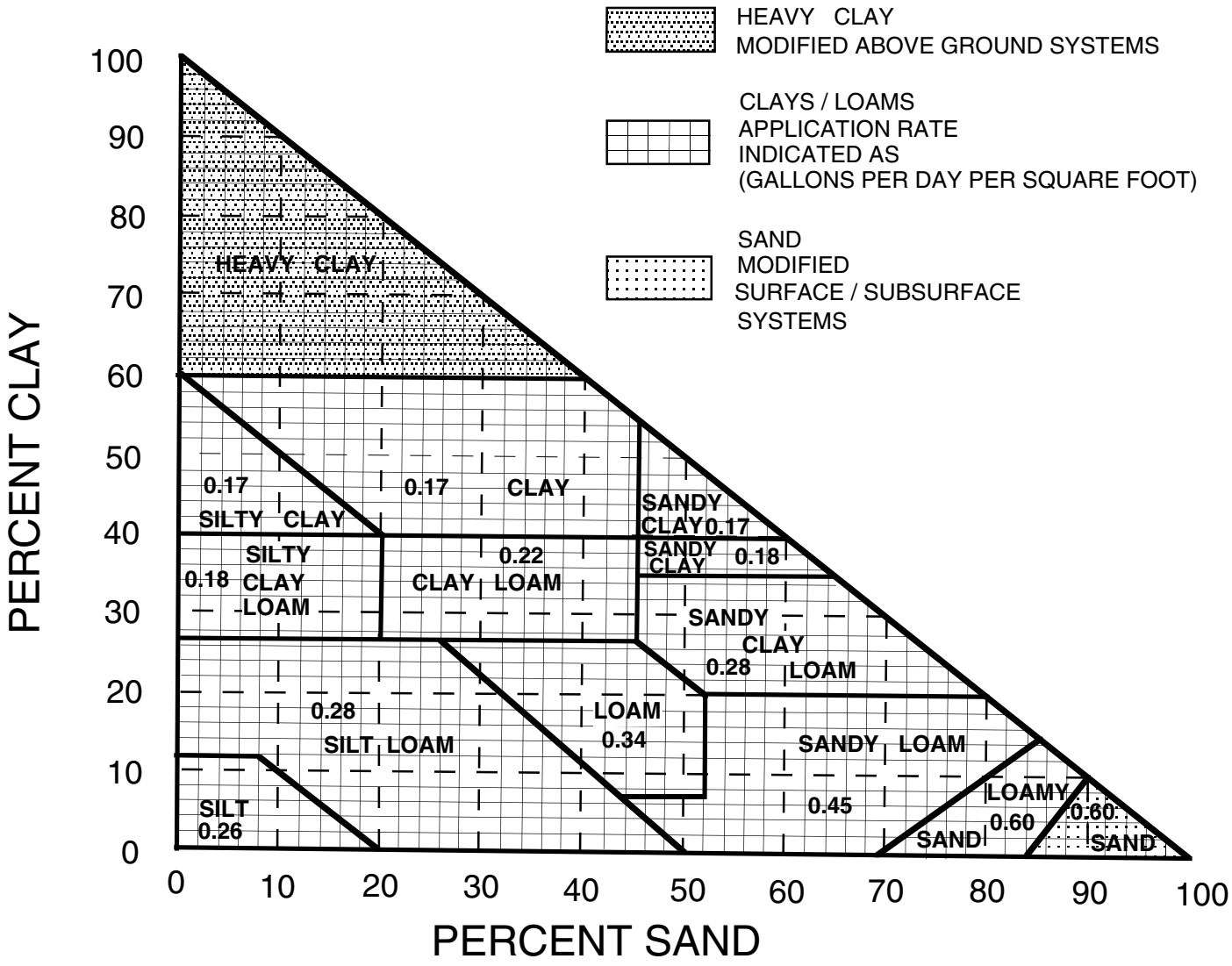
Manitoba Conservation has issued a set of documents dated July 2005 and collectively titled as *Supplementary Information for Onsite Wastewater Management System Installations.*

Now therefore, I, Steve Davis, Director of Environmental Programs, Manitoba Conservation, hereby vary the requirements of the regulation to allow for the approval of any registration for installation of any onsite wastewater management system that conforms to the methodologies and requirements detailed in the said documents.

July 18, 2005

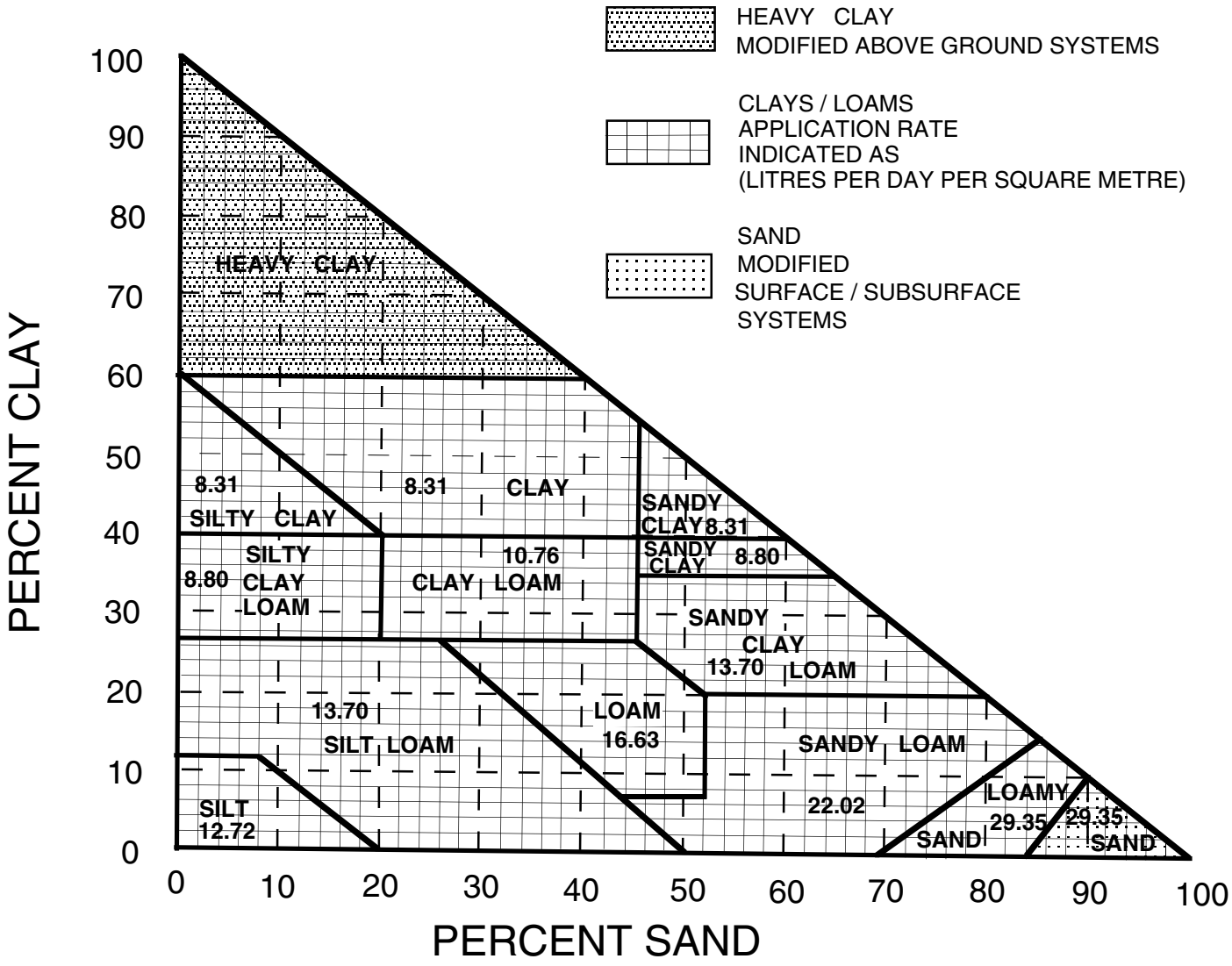
Original signed by:
Steve Davis, Director

SOIL TEXTURE CLASSIFICATION TRIANGLE



***APPLICATION RATE-IMPERIAL GALLONS PER DAY PER SQUARE FOOT**

SOIL TEXTURE CLASSIFICATION TRIANGLE



***APPLICATION RATE-LITRES PER DAY PER SQUARE METRE**

Soil Texture Classification Triangle
Effluent Loading Rate Table

When using the results of a soil texture classification to size a system, the disposal field shall be sized using the application rates applicable for the soil type. The application rate is the volume of effluent that can be applied to the given soil type per day. Effluent loading rates per day for various soil types are as follows:

	Soil Type	**Application Rate (igpd/sq.ft.)**	**Application Rate (lpd/sq.m.)**
(a)	Heavy Clay >60-100% clay	Modified aboveground systems. See soil texture classification matrix.	No subsurface systems. See soil texture classification matrix.
(b)	Clay 40-60% clay	Modified systems. See soil texture classification matrix. 0.17	Modified systems. See soil texture classification matrix. 8.31
(c)	Silty Clay 40-60% clay		
(d)	Sandy Clay 40-60% clay		
(e)	Sandy Clay 35-<40% clay	0.18	8.80
(f)	Silty Clay Loam	0.18	8.80
(g)	Clay Loam	0.22	10.76
(h)	Sandy Clay Loam	0.28	13.70
(i)	Loam	0.34	16.63
(j)	Silt Loam	0.28	13.70
(k)	Silt	0.26	12.72
(l)	Sandy Loam	0.45	22.02
(m)	Loamy Sand	0.60	29.35
(n)	Sand 85-100% sand	Modified subsurface systems. See soil texture classification matrix. 0.60	Modified subsurface systems. See soil texture classification matrix. 29.35

Average Daily Flows

The daily effluent flow rate is required to calculate the area of the septic field or the length of trench required. In Manitoba flow rates are based on the number of bedrooms in the dwelling. Flow rates for commercial properties and other facilities are listed in the document entitled "Manitoba Minimum Expected Volume of Sewage Per Day Typical Wastewater Flow Rates".

Manitoba effluent flow for dwellings is listed as follows:

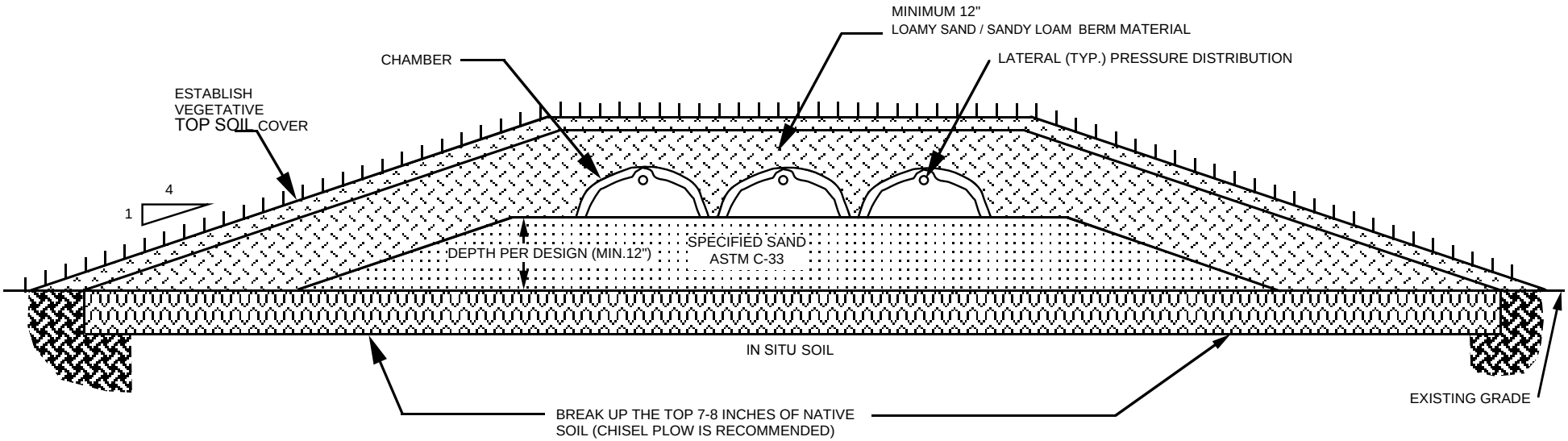
Number of Bedrooms	Effluent Flow (Imperial Gallons per day)	Effluent Flow (Litres per day)
2	220	1000
3	330	1500
4	440	2000
5	550	2500

Note* Manitoba Conservation may consider the use of metered flow volumes for larger dwellings or other facilities (i.e.: commercial, institutional, recreational).

SOIL TEXTURE CLASSIFICATION MATRIX

Soil Type	Type of System	Minimum Requirements	Intent
>60 – 100% heavy clay	• holding tank • package sewage treatment plant to aboveground field • peat system • pressurized sand treatment mound • sand filter • modified aboveground total area field	• NO SUBSURFACE SYSTEMS • 80% clay – sand treatment mound – pressure distribution 70% clay – minimum 150 yd^3 stone (2538 sq. ft.) minimum 200 yd^3 sand 60% clay – minimum 250 yd^3 stone (2538 sq. ft.) minimum 100 yd^3 sand (effluent must be pumped to the distribution box or laterals) • perforated distribution pipe must be equally distributed over the total area of the field • loamy top soil to be used as final cover material (based on 330 gal/day – 3 bedroom home)	• to provide alternative systems in heavy clay soils as subsurface systems have insufficient evapotransporation and absorption qualities • field sizing shall increase per each additional bedroom • Note: modified aboveground total area fields may be an alternative to sand treatment mounds
40 – 60% clay	• modified total area (MTA) • modified trenches - stone (MTS) - chamber (MTC) • holding tank • package sewage treatment plant to a modified field • peat system • pressurized sand treatment mound • sand filter • modified aboveground total area field	• MTA - 190 yd^3 stone (1941 sq. ft.) - 72 yd^3 sand (high quality, clean, graded sand) - maximum depth 12” • MTS - maximum depth 24” - minimum amount of stone under pipe is 14” (using - 24/36” bucket) - length of trench in tables for 0.17 app. rate - 555’ for 24” W x 18” H - 431’ for 36” W x 18” H • MTC - maximum depth 12” - minimum amount of chamber 555’ EQ 36/ARC 24 • loamy material to be used as cover (based on 330 gal/day – 3 bedroom home)	• to allow for shallow depth subsurface system installations in clay soils • to minimize the depth of the subsurface system to allow for adequate evapotransporation and infiltration in these types of soils • to use application rate of 0.17 • high quality, clean, graded sand with less than 5% No. 200 and must pass the jar test for fines
<40% clay <85% sand	• traditional subsurface systems	• minimum requirements as set out in regulation • application rates vary from 0.18 - 0.60 • loamy material to be used as cover	• Note: the base of all fields must be 3.25 feet above the bedrock or high water table
85 - 100% sand	• holding tank • modified subsurface systems - lined trenches - stone - chamber - lined total area field - pressurized sand treatment mound - peat system - package plant to modified aboveground field	• application rate 0.60 • the base of fields must be 3.25 feet above bedrock or high water table • all systems must be pressurized • lined trenches (stone) - 12” minimum layer of loamy material • lined trenches (chamber) - 12” minimum layer of loamy material on bottom and sides • lined total area field - 12” minimum layer of loamy material - minimum of 110 $yard^3$ of stone (1100 sq. ft.) • loamy material to be used as cover • saturated zones - sand treatment mounds – pressurized	• to provide alternative systems in coarse grained soils • to protect ground water sources • to slow the percolation rate and to facilitate treatment, lined trenches and total area fields are to be used • to provide alternate system in saturated soil conditions

PRESSURIZED SAND TREATMENT MOUND SYSTEM-CHAMBERS



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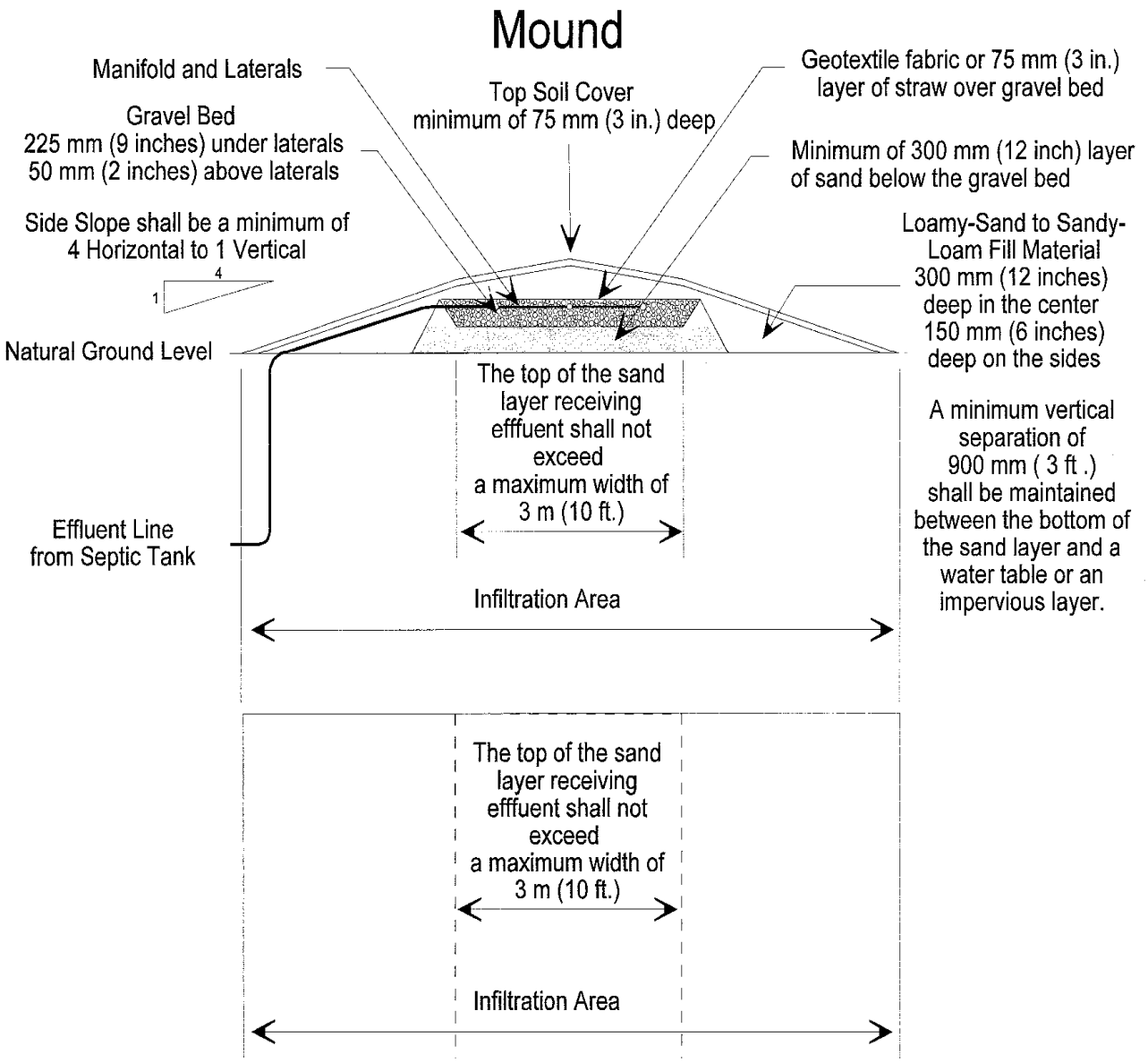
***FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE**

NOTE: INTENDED FOR >60%-100% HEAVY CLAY SOILS

NOTE: BERM MATERIAL MUST BE LOAMY SAND / SANDY LOAM OR ASTM C-33 SAND.

FIGURE 1

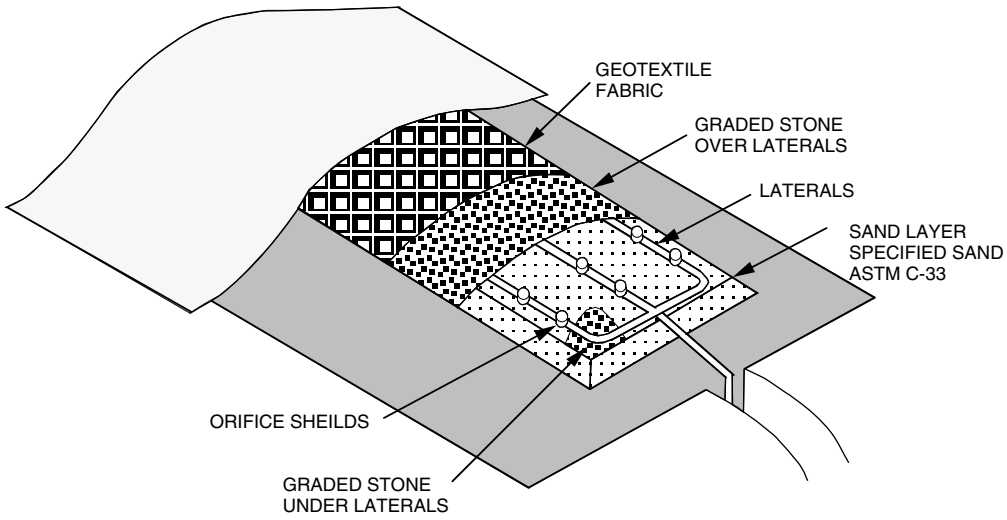
JULY 2010



Pressurized Sand Treatment Mound
Note: Wastewater Effluent Chambers may also be used.
Intended for use in heavy clay soils
*for illustrative purposes only , not to scale

Source: Alberta Private Sewage Systems Standard of Practice 1999 Handbook, Alberta Municipal Affairs, page 198

PRESSURIZED SAND TREATMENT MOUND SYSTEM-STONE

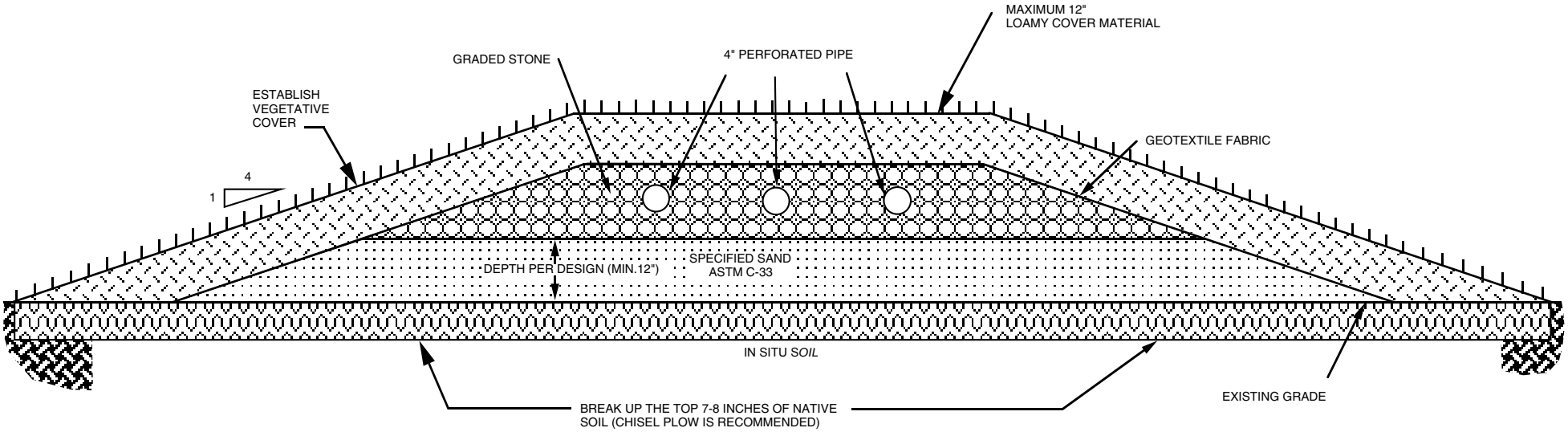


NOTE: INTENDED FOR >60%-100% HEAVY CLAY SOILS

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

NOTE: ALL SEPTIC FIELDS MUST BE BERMED WITH SUITABLE MATERIAL.

MODIFIED ABOVEGROUND TOTAL AREA FIELD

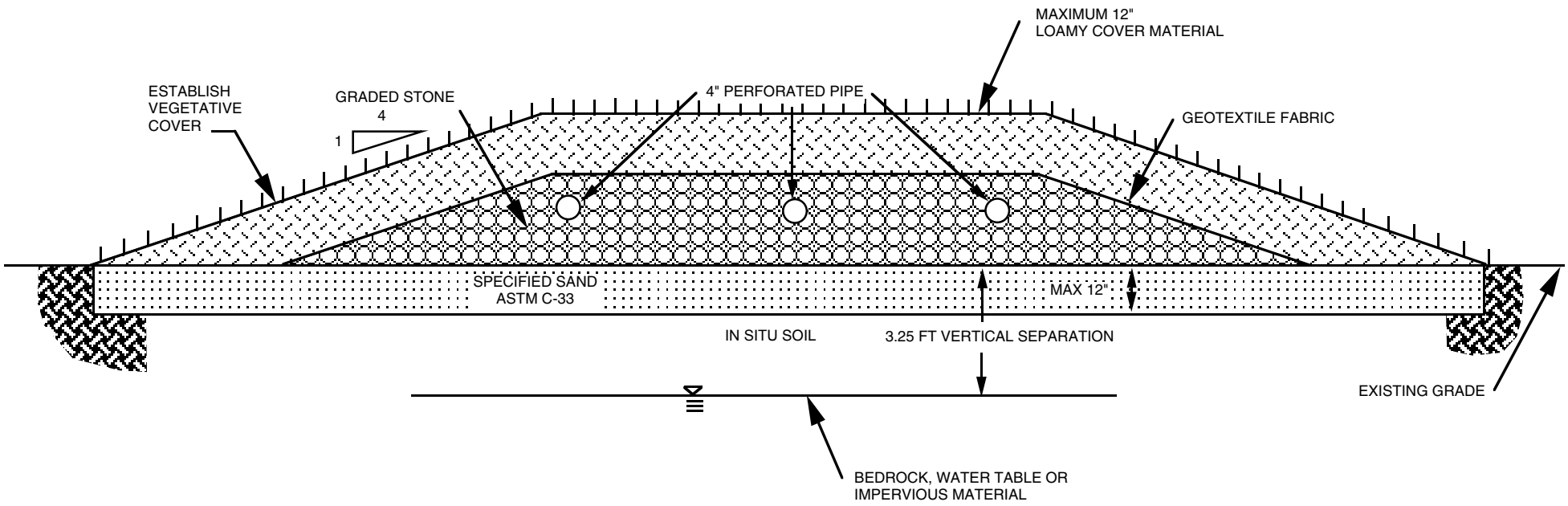


NOTE: INTENDED FOR > 60%-100% HEAVY CLAY SOILS

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

NOTE: ALL SEPTIC FIELDS MUST BE BERMED WITH SUITABLE MATERIAL.

MODIFIED TOTAL AREA (MTA)



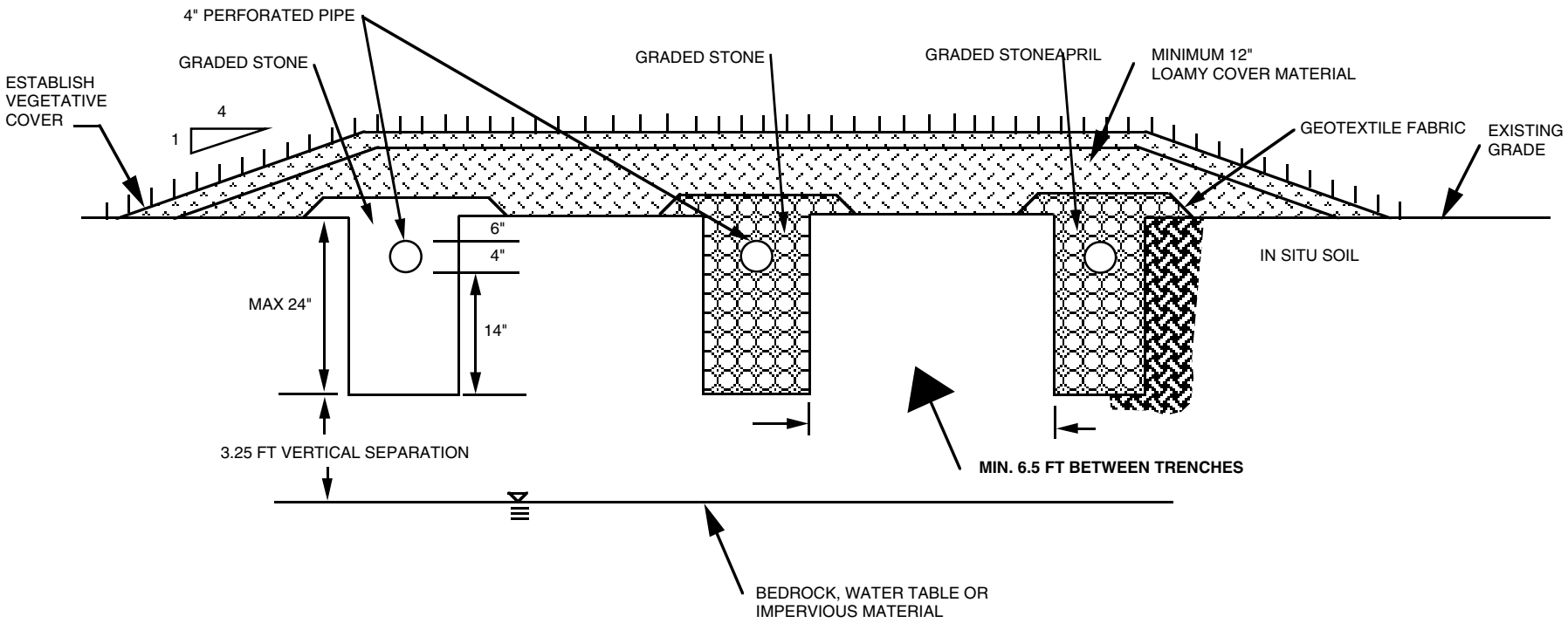
NOTE: INTENDED FOR 40-60% CLAY SOILS

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

NOTE: ALL SEPTIC FIELDS MUST BE BERMED WITH SUITABLE MATERIAL.

MODIFIED TRENCH-STONE (MTS)

SHALLOW IN-GROUND SYSTEM

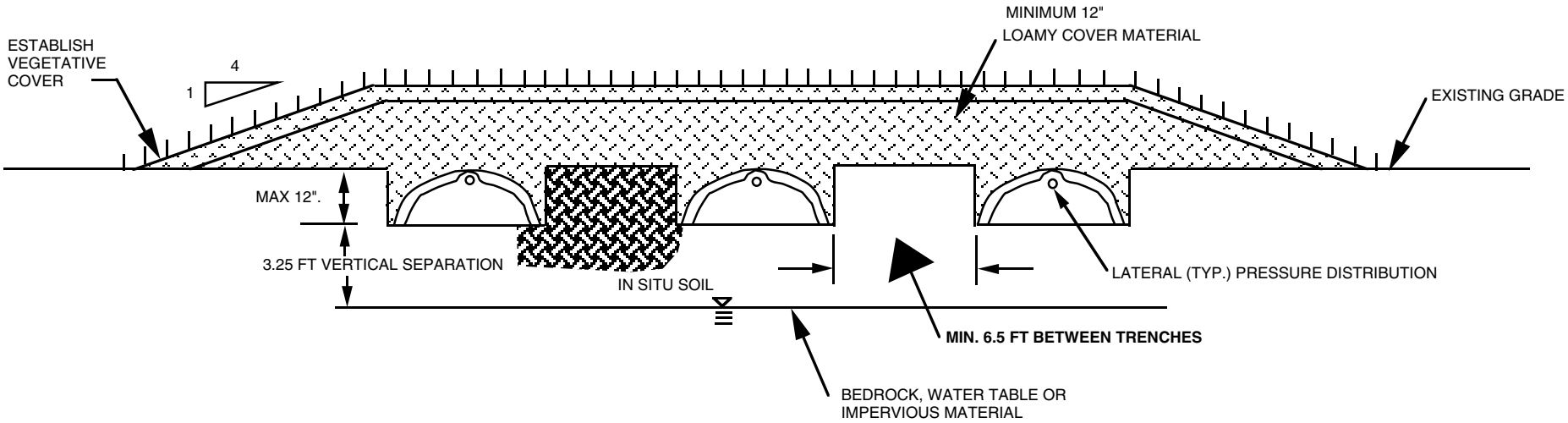


NOTE: INTENDED FOR 40-60% CLAY SOILS

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

MODIFIED TRENCH-CHAMBER (MTC)

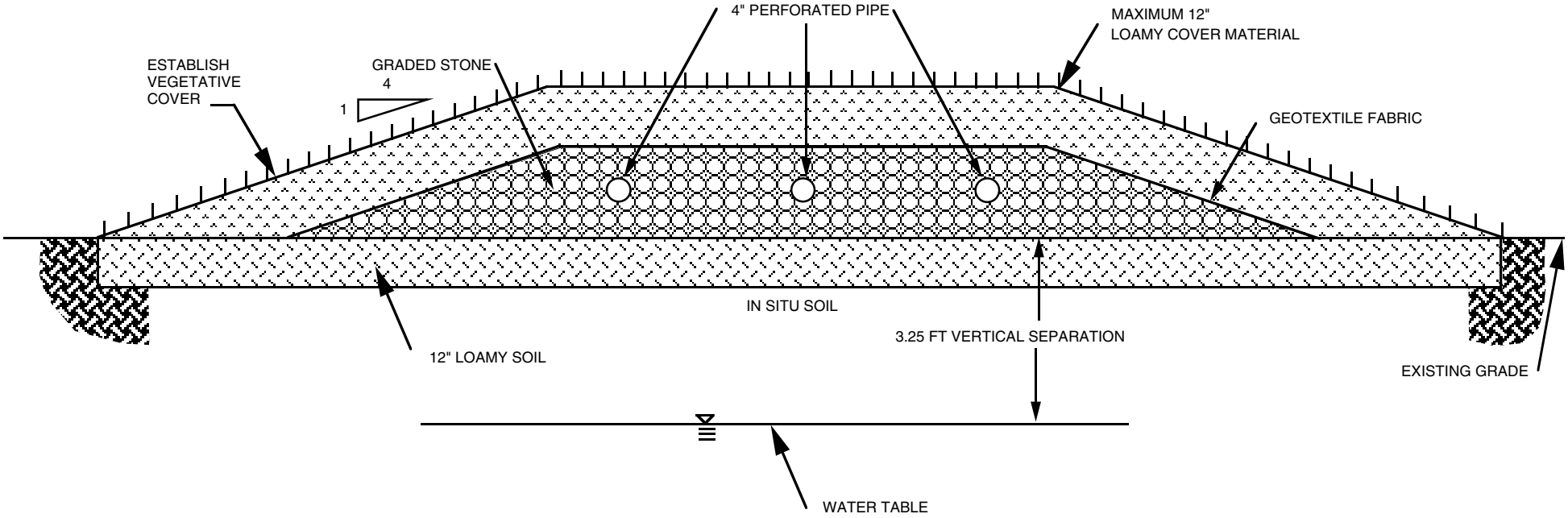
SHALLOW IN-GROUND SYSTEM



NOTE: INTENDED FOR 40-60% CLAY SOILS

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

LINED TOTAL AREA FIELD-STONE

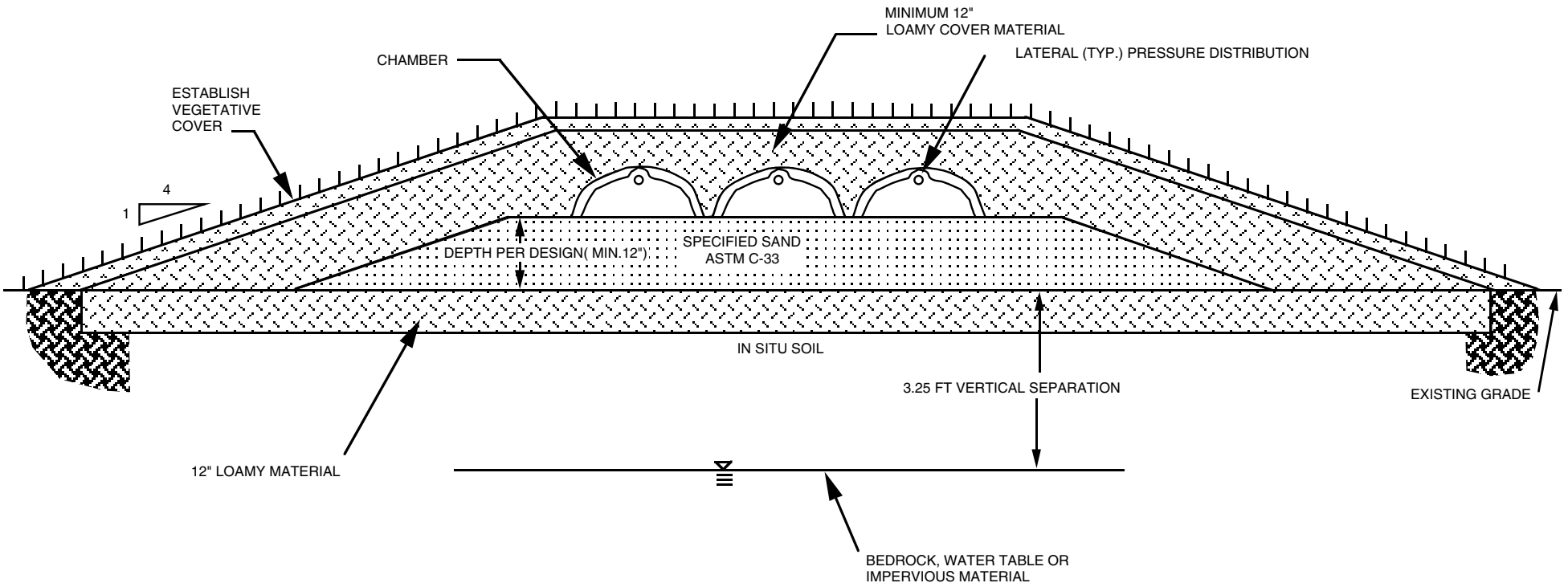


NOTE: INTENDED FOR 85-100% SAND

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

NOTE: ALL SEPTIC FIELDS MUST BE BERMED WITH SUITABLE MATERIAL.

LINED TOTAL AREA FIELD-CHAMBERS



NOTE: INTENDED FOR 85%-100% SAND

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

NOTE: ALL SEPTIC FIELDS MUST BE BERMED WITH SUITABLE MATERIAL.

LINED TRENCHES FOR POROUS SOILS

FOR INSTALLATIONS WHERE THE EXISTING SOIL HAS A SOIL ANALYSIS GREATER THAN OR EQUAL TO 85% SAND THE TRENCH MAY BE OVER EXCAVATED AND A 300 mm (12 INCH) LAYER OF LOAMY SOIL IS INSTALLED ACROSS THE BOTTOM, AND UP THE SIDES OF THE TRENCH.

THIS LAYER OF SOIL IS INTENDED TO SLOW THE MOVEMENT OF THE EFFLUENT AND PREVENT SATURATED FLOW OF EFFLUENT THROUGH THE MORE POROUS SURROUNDING SOILS.

LEAVE THE SOIL MOUNDED OVER THE TRENCH TO ALLOW FOR SETTLEMENT.

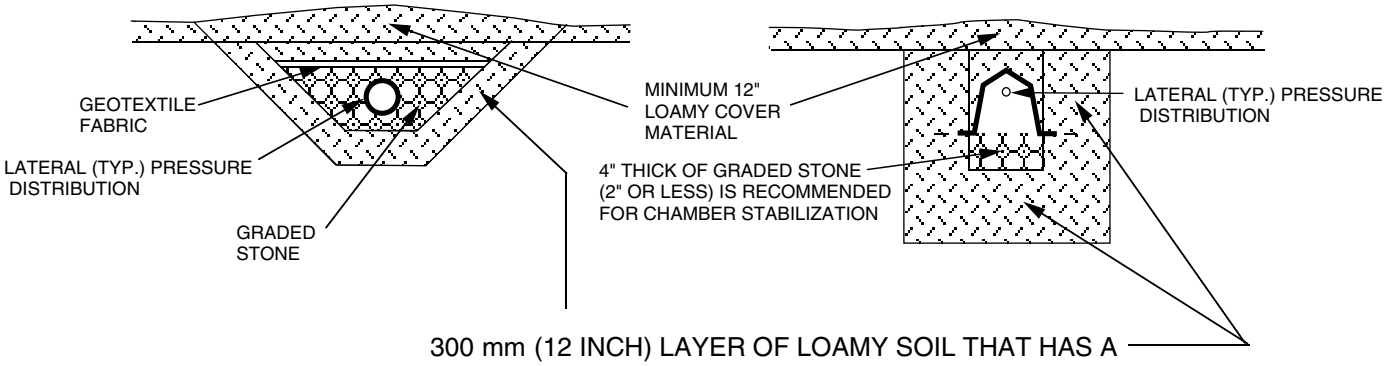
PRESSURE DISTRIBUTION LATERALS SHALL BE USED TO ENSURE EVEN DISTRIBUTION OF THE EFFLUENT AND REDUCE THE POSSIBILITY THAT EFFLUENT WILL QUICKLY ESCAPE THROUGH CRACKS IN THE IMPORTED SOILS.

GRAVEL FILLED TRENCH

NORMAL WEEPING LATERAL TRENCH WITH GRAVEL, PERFORATED PIPING AND GEOTEXTILE FABRIC COVERING THE GRAVEL

TRENCH USING CHAMBERS

NORMAL WEEPING LATERAL TRENCH WITH CHAMBER INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS



NOTE: INTENDED FOR 85%-100% SAND

*FOR ILLUSTRATIVE PURPOSE ONLY, NOT TO SCALE

Manitoba Sizing Chart for 24" Wide Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (igpd shown below bedrooms) - Length of Trench (feet)														
		Stone Trench (24"W x 12"H)					Stone Trench (24"W x 18"H)					Stone Trench (24"W x 24"H)				
Soil Type	App. Rate (igpd/sf)	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR
Sand - modified surface/ subsurface systems	0.60	122	183	244	306	61	105	157	210	262	35	92	138	183	229	31
Loamy Sand	0.60	122	183	244	306	61	105	157	210	262	35	92	138	183	229	31
Sandy Loam	0.45	163	244	326	407	81	140	210	279	349	47	122	183	244	306	41
Loam	0.34	216	324	431	539	108	185	277	370	462	62	162	243	324	404	54
Silt Loam	0.28	262	393	524	655	131	224	337	449	561	75	196	295	393	491	65
Sandy Clay Loam	0.28	262	393	524	655	131	224	337	449	561	75	196	295	393	491	65
Silt	0.26	282	423	564	705	141	242	363	484	604	81	212	317	423	529	71
Clay Loam	0.22	333	500	667	833	167	286	429	571	714	95	250	375	500	625	83
Silty Clay Loam	0.18	407	611	815	1019	204	349	524	698	873	116	306	458	611	764	102
Sandy Clay	0.18	407	611	815	1019	204	349	524	698	873	116	306	458	611	764	102
Silty Clay	0.17	431	647	863	1078	216	370	555	739	924	123	324	485	647	809	108
Clay	0.17	431	647	863	1078	216	370	555	739	924	123	324	485	647	809	108
Sandy Clay	0.17	431	647	863	1078	216	370	555	739	924	123	324	485	647	809	108
Heavy Clay	Modified aboveground system. See soil texture classification matrix.															

Length of System (feet)

Notes:

1. Length of trench is calculated based on loading rates defined in the EPA Design Manual: "Onsite Wastewater Treatment and Disposal".

   (the application rate (gpd/sf) has been reduced from 1.2 to 0.8 in coarse to medium sands and from 1.0 to 0.7 in fine to loamy sands based on current research).

   Stone Trench Rating (24"W x 12"H) = 3 sq. ft./ ft.

   Stone Trench Rating (24"W x 18"H) = 3.5 sq. ft./ ft.

   Stone Trench Rating (24"W x 24"H) = 4 sq. ft./ ft.

2. The minimum size home for wastewater system design shall be a 2 bedroom house.

3. Length of System Based upon the following: Length of Trench = (Daily Sewage Flow)/[(Application Rate) x (Application Area)]

   Length of Trench (ft) - lineal length of trench required for field

   Daily Sewage Flow (igpd) - volume produced on a daily basis, 110 igpd/bedroom

   Application Rate (igpd/sq. ft.) - application rate given, based upon US EPA

   Application Area (sq. ft.) - area of base of trench plus area of .5 of height of trench

Table 1: 24" Stone Trench - Imperial

Manitoba Sizing Chart for 36" Wide Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (igpd shown below bedrooms) - Length of Trench (feet)														
		Stone Trench (36"W x 12"H)					Stone Trench (36"W x 18"H)					Stone Trench (36"W x 24"H)				
Soil Type	App. Rate (igpd/sf)	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR
Sand - modified surface/ subsurface systems	0.60	92	138	183	229	31	81	122	163	204	27	73	110	147	183	24
Loamy Sand	0.60	92	138	183	229	31	81	122	163	204	27	73	110	147	183	24
Sandy Loam	0.45	122	183	244	306	41	109	163	217	272	36	98	147	196	244	33
Loam	0.34	162	243	324	404	54	144	216	288	359	48	129	194	259	324	43
Silt Loam	0.28	196	295	393	491	65	175	262	349	437	58	157	236	314	393	52
Sandy Clay Loam	0.28	196	295	393	491	65	175	262	349	437	58	157	236	314	393	52
Silt	0.26	212	317	423	529	71	188	282	376	470	63	169	254	338	423	56
Clay Loam	0.22	250	375	500	625	83	222	333	444	556	74	200	300	400	500	67
Silty Clay Loam	0.18	306	458	611	764	102	272	407	543	679	91	244	367	489	611	81
Sandy Clay Loam	0.18	306	458	611	764	102	272	407	543	679	91	244	367	489	611	81
Silty Clay	0.17	324	485	647	809	108	288	431	575	719	96	259	388	518	647	86
Clay	0.17	324	485	647	809	108	288	431	575	719	96	259	388	518	647	86
Sandy Clay	0.17	324	485	647	809	108	288	431	575	719	96	259	388	518	647	86
Heavy Clay	Modified aboveground system. See soil texture classification matrix.															

Notes:

1. Length of trench is calculated based on loading rates defined in the EPA Design Manual: "Onsite Wastewater Treatment and Disposal".
   (the application rate (gpd/sf) has been reduced from 1.2 to 0.8 in coarse to medium sands and from 1.0 to 0.7 in fine to loamy sands based on current research).
   Stone Trench Rating (36"W x 12"H) = 4 sq. ft./ft.
   Stone Trench Rating (36"W x 18"H) = 4.5 sq. ft./ ft.
   Stone Trench Rating (36"W x 24"H) = 5 sq. ft./ ft.
2. The minimum size home for wastewater system design shall be a 2 bedroom house.
3. Length of System Based upon the following: Length of Trench = (Daily Sewage Flow)/[(Application Rate) x (Application Area)]
   Length of Trench (ft) - lineal length of trench required for field
   Daily Sewage Flow (igpd) - volume produced on a daily basis, 110 igpd/bedroom
   Application Rate (igpd/sq. ft.) - application rate given, based upon US EPA
   Application Area (sq. ft.) - area of base of trench plus area of .5 of height of trench

Table 2: 36" Stone Trench - Imperial

Manitoba Infiltrator® Chamber Sizing Chart for Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (igpd shown below bedrooms) - Length of Trench (feet)														
		Quick4 Equalizer® 36					Quick 4 Standard					Quick 4 High Capacity				
Soil Type	App. Rate (igpd/sf)	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR
Sand - modified surface/ subsurface systems	0.60	105	157	210	262	35	85	128	171	213	28	76	115	153	191	51
Loamy Sand	0.60	105	157	210	262	35	85	128	171	213	28	76	115	153	191	51
Sandy Loam	0.45	140	210	279	349	47	114	171	227	284	38	102	153	204	255	68
Loam	0.34	185	277	370	462	62	150	226	301	376	50	135	202	270	337	90
Silt Loam	0.28	224	337	449	561	75	183	274	365	457	61	164	246	327	409	109
Sandy Clay Loam	0.28	224	337	449	561	75	183	274	365	457	61	164	246	327	409	109
Silt	0.26	242	363	484	604	81	197	295	394	492	66	176	264	353	441	118
Clay Loam	0.22	286	429	571	714	95	233	349	465	581	78	208	313	417	521	139
Silty Clay Loam	0.18	349	524	698	873	116	284	426	568	711	95	255	382	509	637	170
Sandy Clay	0.18	349	524	698	873	116	284	426	568	711	95	255	382	509	637	170
Silty Clay	0.17	370	555	739	924	123	301	451	602	752	100	270	404	539	674	180
Clay	0.17	370	555	739	924	123	301	451	602	752	100	270	404	539	674	180
Sandy Clay	0.17	370	555	739	924	123	301	451	602	752	100	270	404	539	674	180
Heavy Clay	Modified aboveground system. See soil texture classification matrix.															

Notes:

1. Number of chambers is calculated based on loading rates defined in the EPA Design Manual: "Onsite Wastewater Treatment and Disposal" and the following chamber equivalencies: (the application rate (gpd/sf) has been reduced from 1.2 to 0.8 in coarse to medium sands and from 1.0 to 0.7 in fine to loamy sands based on current research).

   Q4 EQ36 Rating = 3.5 sf.kf

   Q4 Standard Rating = 4.3 sf/lf

   Q4 High Capacity = 4.8 sf/lf

2. The minimum size home for wastewater system design shall be a 2 bedroom house.

3. Length of System Based upon the following: Length of Trench = (Daily Sewage Flow)/[(Application Rate) x (Application Area)]

   Length of Trench (ft) - lineal length of trench required for field

   Daily Sewage Flow (igpd) - volume produced on a daily basis, 110 igpd/bedroom

   Application Rate (igpd/sq. ft.) - application rate given, based upon US EPA

   Application Area (sq. ft.) - area of base of trench plus area of .5 of height of trench

Table 3: Infiltrator® Chamber - Imperial

July 2005 revised Jan 2008

ARC 24 Chamber System Sizing for Trench Fields to be used with Soil Texture Classification Triangle

Soil Type		Perc Rate	Application Rate		ARC 24 dimensions are 22.5"W x 2" H x 5' L Length of Trenches (Feet)				
		(min/inch)	(igpd/sq.ft.)	(lpd/sq.m)	2 Bdrm 220 gpd	3 Bdrm 330 gpd	4 Bdrm 440 gpd	5 Bdrm 550 gpd	Each Add'l Bdrm
(n) Sand 85-100%	Modified Subsurface System[1]	1-8	0.60	29.35	105	157	210	262	35
(m) Loamy Sand	Traditional Subsurface Chamber Systems	9-15	0.60	29.35	105	157	210	262	35
		16-20	0.55	26.90	114	171	229	266	38
(l) Sandy Loam		21-25	0.50	24.45	126	189	251	314	42
		26-30	0.45	22.02	140	210	279	349	47
		31-35	0.41	20.10	153	230	307	383	51
		36-40	0.37	18.10	170	255	240	425	57
(i) Loamy Sand		41-45	0.34	16.63	185	277	270	462	62
		46-50	0.31	15.16	203	304	406	507	68
(j) Silty Loam		51-55	0.28	13.70	224	337	449	561	75
(h) Clay Loam									
(k) Silt		56-60	0.26	12.72	242	363	484	604	81
(g) Clay Loam		61-65	0.24	11.75	262	393	524	655	87
		66-70	0.22	10.76	286	429	571	714	95
		71-75	0.20	9.78	314	471	629	786	105
(f) Silty Clay Loam		76-80	0.18	8.80	349	524	698	873	116
(e) Sandy Clay <35-40%									
(d) Sandy Clay 40-60%	Modified System[1]	81-120	0.17	8.31	370	555	739	924	123
(c) Silty Clay 40-60% Clay									
(b) Clay 40-60% Clay									
(a) Heavy Clay >60-100% Clay	Modified Above Ground System [2]	>120							

Notes:

1. Number of chambers is calculated based on loading rates defined in the EPA Design Manual: "Onsite Wastewater Treatment and Disposal" and the following chamber equivalencies: (the application rate (gpd/sf) has been reduced from 1.2 to 0.8 in coarse to medium sands and from 1.0 to 0.7 in fine to loamy sands based on current research).
   ARC 24 Rating = 3.5 sf.kf

2. The minimum size home for wastewater system design shall be a 2 bedroom house.

3. Length of System Based upon the following: Length of Trench = (Daily Sewage Flow) / (Application Rate) x (Application Area)]
   Length of Trench (ft) - lineal length of trench required for field
   Daily Sewage Flow (igpd) - volume produced on a daily basis, 110 igpd/bedroom
   Application Rate (igpd/sq. ft.) - application rate given, based upon US EPA
   Application Area (sq. ft.) - area of base of trench plus area of .5 of height of trench

[1 & 2] See soil texture classification matrix

Table 4: ARC 24

July 2010

ARC 36 Chamber System Sizing for Trench Fields to be used with Soil Texture Classification Triangle

Soil Type		Perc Rate	Application Rate		ARC 36 Length of Trenches (Feet) 2 Bdrm 220 gpd	3 Bdrm 330 gpd	4 Bdrm 440 gpd	5 Bdrm 550 gpd	Each Add'l Bdrm
		(min/inch)	(igpd/sq.ft.)	(lpd/sq.m)					
(n) Sand 85-100%	Modified Subsurface System[1]	1-8	0.60	29.35	85	128	171	213	28
(m) Loamy Sand	Traditional Subsurface Chamber Systems	9-15	0.60	29.35	85	128	171	213	28
		16-20	0.55	26.90	93	140	186	233	31
(l) Sandy Loam		21-25	0.50	24.45	102	153	205	256	34
		26-30	0.45	22.02	114	171	227	284	38
		31-35	0.41	20.10	125	187	250	312	42
		36-40	0.37	18.10	138	207	277	346	46
(i) Loamy Sand		41-45	0.34	16.63	150	226	301	376	50
		46-50	0.31	15.16	203	248	330	413	55
(j) Silty Loam		51-55	0.28	13.70	183	274	365	457	61
(h) Clay Loam									
(k) Silt		56-60	0.26	12.72	197	295	394	492	66
(g) Clay Loam		61-65	0.24	11.75	213	320	426	533	71
		66-70	0.22	10.76	233	349	465	581	78
		71-75	0.20	9.78	256	384	512	640	85
(f) Silty Clay Loam		76-80	0.18	8.80	284	426	568	711	95
(e) Sandy Clay <35-40%									
(d) Sandy Clay 40-60%	Modified System[1]	81-120	0.17	8.31	301	451	602	752	100
(c) Silty Clay 40-60% Clay									
(b) Clay 40-60% Clay									
(a) Heavy Clay >60-100% Clay	Modified Above Ground System [2]	>120							

[1 & 2] See soil texture classification matrix

ARC 36 dimensions are 34.5" W x 13" H x 5' L

Table 4(a): ARC 36

July 2010

ARC 36HC Chamber System Sizing for Trench Fields to be used with Soil Texture Classification Triangle

Soil Type		Perc Rate	Application Rate		ARC 36HC Length of Trenches (Feet)				
		(min/inch)	(igpd/sq.ft.)	(lpd/sq.m)	2 Bdrm 220 gpd	3 Bdrm 330 gpd	4 Bdrm 440 gpd	5 Bdrm 550 gpd	Each Add'l Bdrm
(n) Sand 85-100%	Modified Subsurface System[1]	1-8	0.60	29.35	76	115	153	191	51
(m) Loamy Sand	Traditional Subsurface Chamber Systems	9-15	0.60	29.35	76	115	153	191	51
		16-20	0.55	26.90	83	125	167	208	56
(l) Sandy Loam		21-25	0.50	24.45	92	138	183	229	61
		26-30	0.45	22.02	102	153	204	255	68
		31-35	0.41	20.10	112	168	224	279	75
		36-40	0.37	18.10	124	186	248	310	83
(i) Loamy Sand		41-45	0.34	16.63	135	202	270	337	90
		46-50	0.31	15.16	148	222	296	370	99
(j) Silty Loam		51-55	0.28	13.70	164	246	327	409	109
(h) Clay Loam									
(k) Silt		56-60	0.26	12.72	176	264	353	441	118
(g) Clay Loam		61-65	0.24	11.75	191	286	382	477	127
		66-70	0.22	10.76	208	313	417	521	139
		71-75	0.20	9.78	229	344	458	573	153
(f) Silty Clay Loam		76-80	0.18	8.80	255	382	509	637	170
(e) Sandy Clay <35-40%									
(d) Sandy Clay 40-60%	Modified System[1]	81-120	0.17	8.31	270	404	539	674	180
(c) Silty Clay 40-60% Clay									
(b) Clay 40-60% Clay									
(a) Heavy Clay >60-100% Clay	Modified Above Ground System [2]	>120							

[1 & 2] See soil texture classification matrix

ARC 36HC dimensions are 34.5" W x 16" H x 5' L

Table 4(b): ARC 36HC

July 2010

ARC Chamber System Sizing for Total Area Fields to be used with Soil Texture Classification Triangle

Soil Type		Perc Rate (min/inch)	App. Rate (igpd/sf)	Chamber Total Area System (Area of Field in Square Feet) 2 200	3 330	4 440	5 550	Each Add'l BR
Coarse to Medium Sand	Modified Surface/ Subsurface Systems	1-5	0.60	550	825	1100	1375	275
Fine Sand Sandy Loam		6-10	0.60	550	825	1100	1375	275
		11-15	0.60	550	825	1100	1375	275
		16-20	0.55	600	900	1200	1500	300
		21-25	0.50	660	990	1320	1650	330
		26-30	0.45	733	1100	1467	1833	367
Silty Loam		31-35	0.41	805	1207	1610	2012	402
		36-40	0.37	892	1338	1784	2230	446
		41-45	0.34	971	1456	1941	2456	485
		46-50	0.31	1065	1597	2129	2661	532
		51-55	0.28	1179	1768	2357	2946	589
		56-60	0.26	1269	1904	2538	3173	635

ARC Chamber Ratings (sf/chamber):
ARC 24: 17.5 sf/chamber(3.5 sf/lin.ft.)
ARC 36: 21.5 sf/chamber(4.3 sf/lin.ft.)
ARC 36HC: 24.0 sf/chamber(4.8 sf/lin.ft.)

$$\text{Area of Field} = \frac{\text{Daily Sewage Flow} \times \text{Safety Factor}}{\text{Application Rate}}$$

Area of Field (sq.ft.) – total required disposal field surface area
Daily Effluent Flow (igpd) – volume produced on a daily basis, 110 igpd/bedroom
Application Rate (igpd/sq.ft.) – application rate of the soil, based upon US EPA
Safety factor – 2.0 for graded stone and pipe systems; 1.5 for chamber/aggregate-free systems

Glossary: min/inch – minutes per inch
Igpd - imperial gallons per day
igpd/sf – imperial gallons per day per square foot
BR - bedroom

Table 4(c): ARC Total Area Fields

July 2010

Manitoba Sizing Chart for Total Area Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (igpd)									
		Stone Total Area System Area of Field (sq.ft.) + cubic yards of stone required					Chamber Total Area System Area of Field (sq.ft.)				
Soil Type	App. Rate (igpd/sf)	2 220	3 330	4 440	5 550	Each Add. BR	2 220	3 330	4 440	5 550	Each Add. BR
Sand - modified surface/ subsurface systems	0.60	733 75	1100 110	1467 145	1833	367	550	825	1100	1375	275
Loamy Sand	0.60	733 75	1100 110	1467 145	1833	367	550	825	1100	1375	275
Sandy Loam	0.45	978 95	1467 145	1956 190	2444	489	733	1100	1467	1833	367
Loam	0.34	1294 130	1941 190	2588 256	3235	647	971	1456	1941	2426	485
Silt Loam	0.28	1571 155	2357 235	3143 310	3929	786	1179	1768	2357	2946	589
Sandy Clay Loam	0.28	1571 155	2357 235	3143 310	3929	786	1179	1768	2357	2946	589
Silt	0.26	1692 170	2538 250	3385 335	4231	846	1269	1904	2538	3173	635

Notes:

1. Total Area Field is calculated based on loading rates defined in the EPA Design Manual: "Onsite Wastewater Treatment and Disposal".
   (the application rate (gpd/sf) has been reduced from 1.2 to 0.8 in coarse to medium sands and from 1.0 to 0.7 in fine to loamy sands based on current research).
2. The minimum size home for wastewater system design shall be a 2 bedroom house.
3. Area of Field Based upon the following: Area of Field = (Daily Effluent Flow) x (Safety Factor) / (Application Rate)
   Area of Field (sq.ft.) - total required disposal field surface area
   Daily Effluent Flow (igpd) - volume produced on a daily basis, 110 igpd/bedroom
   Application Rate (igpd/sq. ft.) - application rate given, based upon US EPA
   Safety Factor - is a factor of 2.0 for graded stone and pipe systems and 1.5 for chamber/aggregate-free systems

Table 5: Total Area - Imperial

Manitoba Sizing Chart for 60 CM Wide Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (lpd shown below bedrooms) - Length of Trench (metres)														
		Stone Trench (60cmW x 30 cmH)					Stone Trench (60cmW x 45cmH)					Stone Trench (60cmW x 60cmH)				
Soil Type	App. Rate (lpd/sm)	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR
Sand - modified surface/subsurface systems	29.35	37	56	75	93	19	32	48	64	80	16	28	42	56	70	14
Loamy Sand	29.35	37	56	75	93	19	32	48	64	80	16	28	42	56	70	14
Sandy Loam	22.02	50	75	99	124	25	43	64	85	106	21	37	56	75	93	19
Loam	16.63	66	99	131	164	33	57	85	113	141	28	49	74	99	123	25
Silt Loam	13.70	80	120	160	200	40	69	103	137	171	34	60	90	120	150	30
Sandy Clay Loam	13.70	80	120	160	200	40	69	103	137	171	34	60	90	120	150	30
Silt	12.72	86	129	172	215	43	74	111	147	184	37	65	97	129	161	32
Clay Loam	10.76	101	152	203	254	51	87	131	174	218	44	76	114	152	191	38
Silty Clay Loam	8.80	124	186	248	310	62	107	160	213	266	53	93	140	186	233	47
Sandy Clay	8.80	124	186	248	310	62	107	160	213	266	53	93	140	186	233	47
Silty Clay	8.31	131	197	263	329	66	113	169	225	282	56	99	148	197	247	49
Clay	8.31	131	197	263	329	66	113	169	225	282	56	99	148	197	247	49
Sandy Clay	8.31	131	197	263	329	66	113	169	225	282	56	99	148	197	247	49
Heavy Clay	Modified aboveground systems. See soil texture classification matrix.															

Length of System (metres)

Table 6: 60cm Stone Trench - Metric

Manitoba Sizing Chart for 90 CM Wide Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (lpd shown below bedrooms) - Length of Trench (metres)														
		Stone Trench (90cmW x 30cmH)					Stone Trench (90cmW x 45cmH)					Stone Trench (90cmW x 60cmH)				
Soil Type	App. Rate (lpd/sm)	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR
Sand - modified surface/subsurface systems	29.35	28	42	56	70	14	25	37	50	62	12	23	34	45	56	11
Loamy Sand	29.35	28	42	56	70	14	25	37	50	62	12	23	34	45	56	11
Sandy Loam	22.02	37	56	75	93	19	33	50	66	83	17	30	45	60	75	15
Loam	16.63	49	74	99	123	25	44	66	88	110	22	39	59	79	99	20
Silt Loam	13.70	60	90	120	150	30	53	80	106	133	27	48	72	96	120	24
Sandy Clay Loam	13.70	60	90	120	150	30	53	80	106	133	27	48	72	96	120	24
Silt	12.72	65	97	129	161	32	57	86	115	143	29	51	77	103	129	26
Clay Loam	10.76	76	114	152	191	38	68	102	135	169	34	61	91	122	152	30
Silty Clay Loam	8.80	93	140	186	233	47	83	124	166	207	41	75	112	149	186	37
Sandy Clay	8.80	93	140	186	233	47	83	124	166	207	41	75	112	149	186	37
Silty Clay	8.31	99	148	197	247	49	87	131	175	219	44	79	118	158	197	39
Clay	8.31	99	148	197	247	49	87	131	175	219	44	79	118	158	197	39
Sandy Clay	8.31	99	148	197	247	49	87	131	175	219	44	79	118	158	197	39
Heavy Clay	Modified aboveground systems. See soil texture classification matrix.															

Length of System (metres)

Table 7: 90cm Trench - Metric

Manitoba Infiltrator® Chamber Sizing Chart for Trench Fields to be used with Soil Texture Classification Triangle

		Number of Bedrooms (lpd shown below bedrooms) - Length of Trench (metres)														
		Quick 4 Equalizer®					**Quick 4** Standard					Quick 4 High Capacity				
Soil Type	App. Rate (lpd/sm)	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR
Sand - modified surface/subsurface systems	29.35	32	48	64	80	16	26	39	52	65	13	19	35	47	58	16
Loamy Sand	29.35	32	48	64	80	16	26	39	52	65	13	19	35	47	58	16
Sandy Loam	22.02	43	64	85	106	21	35	52	69	87	17	26	47	62	78	21
Loam	16.63	57	85	113	141	28	46	69	92	115	23	35	62	82	103	27
Silt Loam	13.70	69	103	137	171	34	56	84	111	139	28	42	75	100	125	33
Sandy Clay Loam	13.70	69	103	137	171	34	56	84	111	139	28	42	75	100	125	33
Silt	12.72	74	111	147	184	37	60	90	120	150	30	45	81	107	134	36
Clay Loam	10.76	87	131	174	218	44	71	106	142	177	35	53	95	127	159	42
Silty Clay Loam	8.80	107	160	213	266	53	87	130	173	217	43	64	116	155	194	52
Sandy Clay Loam	8.80	107	160	213	266	53	87	130	173	217	43	64	116	155	194	52
Silty Clay	8.31	113	169	225	282	56	92	138	183	229	46	68	123	164	205	55
Clay	8.31	113	169	225	282	56	92	138	183	229	46	68	123	164	205	55
Sandy Clay	8.31	113	169	225	282	56	92	138	183	229	46	68	123	164	205	55
Heavy Clay	Modified aboveground systems. See soil texture classification matrix.															

Length of System (metres)

Table 8: Infiltrator® Chamber - Metric

July 2005 rev Jan 2008

ARC 24 Chamber System Sizing for Trench Fields to be used with Soil Texture Classification Triangle (metric)

Soil Type	Application Rate (lpd/sm)	ARC 24 (57cm W x 30cm H x 1.52m L)					
		2 BR 1000	3 BR 1500	4 BR 2000	5 BR 2500	6 BR 3000	Each Additional Bedroom
		Length of trench (metres) & units required					
Sand - modified surface/subsurface systems	29.35	37 22 units	56 32 units	75 43 units	93 53 units	112 63 units	19 7 units
Loamy Sand	29.35	37 22 units	56 32 units	75 43 units	93 53 units	112 63 units	19 7 units
Sandy Loam	22.02	50 29 units	75 46 units	99 56 units	124 70 units	143 85 units	25 10 units
Loam	16.63	66 37 units	99 56 units	131 75 units	164 93 units	183 111 units	33 13 units
Silt Loam	13.70	80 43 units	120 67 units	160 90 units	200 113 units	219 136 units	40 16 units
Sandy Clay Loam	13.70	80 48 units	120 67 units	160 90 units	200 113 units	219 136 units	40 16 units
Silt	12.72	86 49 units	129 72 units	172 97 units	215 122 units	234 146 units	43 18 units
Clay Loam	10.76	101 57 units	152 86 units	203 115 units	254 143 units	273 172 units	51 19 units
Silty Clay Loam	8.80	124 70 units	186 106 units	248 140 units	310 176 units	329 210 units	62 25 units
Sandy Clay	8.80	124 70 units	186 106 units	248 140 units	310 176 units	329 210 units	62 25 units
Silty Clay	8.31	131 75 units	197 149 units	263 149 units	329 186 units	348 233 units	66 26 units
Clay	8.31	131 75 units	197 149 units	263 149 units	329 186 units	348 233 units	66 26 units
Sandy Clay	8.31	131 75 units	197 149 units	263 149 units	329 186 units	348 223 units	66 26 units
Heavy Clay	Modified aboveground systems. See soil texture classification matrix.						

Table 9: ARC 24 Chamber – Metric

Manitoba Sizing Chart for Total Area Fields to be used with Soil Texture Classification Triangle

		Number of Bdrms (lpd below bdrms)									
		Stone Total Area System Area of Field (m2) + cu metres of stone					Chamber Total Area System Area of Field (m2)				
Soil Type	App. Rate (lpd/sm)	2 1000	3 1500	4 2000	5 2500	Each Add. BR	2 1000	3 1500	4 2000	5 2500	Each Add. BR
Sand - modified surface/ subsurface systems	29.35	68 55	102 85	136 110	170	34	51	77	102	128	26
Loamy Sand	29.35	68 55	102 85	136 110	170	34	51	77	102	128	26
Sandy Loam	22.02	91 75	136 110	182 145	227	45	68	102	136	170	34
Loam	16.63	120 100	180 145	240 195	301	60	90	135	180	225	45
Silt Loam	13.70	146 120	219 180	292 235	365	73	109	164	219	274	55
Sandy Clay Loam	13.70	146 120	219 180	292 235	365	73	109	164	219	274	55
Silt	12.72	157 130	236 190	314 255	393	79	118	177	236	295	59

Area of System (m^2)

Table 10: Total Area - Metric

Soil Sampling Protocol for Onsite Wastewater Management Systems

Soil types can vary from region to region within the province and from one sampling point to another within a few metres of one another. **Never assume soil is uniform**.

Soil properties can change dramatically over a very short distance. There may be clay at one point and sandy soil just a few metres away. Soil properties change dramatically with depth as well; surface soil is usually very different than the material present a metre below the surface.

Step 1. Site Assessment and Suitability

► Assess the property for a suitable septic field location.

- Septic fields should be located on high ground in a well drained area.
- Do not locate the septic field near trees as tree roots may eventually penetrate and damage the field.
- Locate the field in an area that will allow adequate space for future repairs or expansion.

Step 2. Obtaining the Soil Sample

► Dig or augur a hole to a depth of one metre (3.25 ft.) near the centre of the proposed septic field area.
- A 2-inch hand auger is beneficial in helping to locate an appropriate test area.

► Record the soil colour and texture, noting the different layers.
- Watch for evidence of saturation or standing water. These are signs that the water table is too near the surface.
- In some instances it may be necessary to obtain more than one soil sample to determine the soil type in the area.
- The Environment Officer or Onsite Wastewater Inspector may request that an additional test hole be dug using a backhoe to determine depth to high groundwater level.

Step 3. Collecting the Soil Sample

► Collect approximately 1 pound of soil from the base of the hole at the one metre (3.25 ft.) depth. Place the soil in a plastic zip lock bag or in a bag that has been supplied by the laboratory.

- Some laboratories may require more than one sample. Check with the laboratory that you are using.

Step 4. Laboratory Analysis

► Have the laboratory conduct a particle size analysis. ASTM Standard Test Method for Particle-Size Analysis of Soils D422-63 (2002).

Notes

Soil samples are required for treatment mounds, modified aboveground systems and subsurface systems.

The holes you make during an investigation should not interfere with the operation of the system when it is installed. They should be strategically placed and not located where the trenches for the system will be dug. Alternatively, they may be filled with bentonite to ensure they do not become conduits for effluent flow.

Manitoba Minimum Expected Volume of Sewage Per Day
Typical Wastewater Flow Rates

Typical Wastewater Flow Rate From Commercial Sources

Facility	Unit	Expected Sewage Volume in litres (Imperial gallons) per day
Boarding House	person	150 (33)
Automobile Service Station	vehicle served	45 (10)
	employee	49 (10.8)
Bar	customer	11 (2.4)
	employee	49 (10.8)
Hotel	guest	190 (41.8)
	employee	38 (8.4)
Industrial Building (sanitary waste only)	employee	49 (10.8)
Laundry (self-service)	machine	2100 (462)
	wash	190 (41.8)
Office	employee	49 (10.8)
Public lavatory	user	19 (41.2)
Restaurant (w/toilet)	meal	11 (2.4)
	conventional - customer	34 (7.5)
	short order - customer	23 (5)
	bar/cocktail lounge - customer	11 (2.4)
Theatre	seat	11 (2.4)

Source: *USEPA Onsite Wastewater Treatment Systems Manual, 2002*

Typical Wastewater Flow Rate From Institutional Sources

Facility	Unit	Expected Sewage Volume in litres (Imperial gallons) per day
Assembly Hall	seat	11(2.4)
Hospital, medical	bed	630 (138.6)
	employee	38 (8.4)
Hospital, mental	bed	380 (83.6)
	employee	38 (8.4)
Rest Home	resident	340 (74.8)
	employee	38 (8.4)
School, day only	w/cafeteria, gym, showers - per student	95 (21)
	w/cafeteria only - per student	57 (12.5)
	w/o cafeteria, gym or showers - per student	42 (9.2)

Source: *USEPA Onsite Wastewater Treatment Systems Manual, 2002*

Manitoba Minimum Expected Volume of Sewage Per Day
Typical Wastewater Flow Rates

Typical Wastewater Flow Rate From Recreational Sources

Facility	Unit	Expected Sewage Volume in litres (Imperial gallons) per day
Bowling alley	alley	760 (167)
Cabin, resort	person	150 (33)
Cafeteria	customer	8 (1.8)
	employee	38 (8.4)
Camps	pioneer type - person	95 (21)
	children's, w/central toilet/bath - person	170 (37.4)
	day, w/meals - person	57 (12.5)
	day, w/o meals - person	49 (10.8)
	luxury, private bath - person	340 (74.8)
	trailer camp - trailer	470 (103.4)
Campground - developed	person	110 (24.2)
Cocktail lounge	seat	76 (16.7)
Coffee shop	customer	23 (5)
	employee	38 (8.4)
Country club	guest's onsite	380 (83.6)
	employee	49 (10.8)
Dining hall	meal served	26 (5.7)
Fairground	visitor	8 (1.8)
Hotel, resort	person	190 (41.8)
Picnic park, flush toilets	visitor	30 (6.6)
Store, resort	customer	11 (2.4)
	employee	38 (8.4)
Swimming pool	customer	38 (8.4)
	employee	38 (8.4)
Theatre	seat	11 (2.4)
Visitor centre	visitor	19 (4.2)

Source: *USEPA Onsite Wastewater Treatment Systems Manual, 2002*

Additional Typical Wastewater Flow Rates

Facility	Unit	Expected Sewage Volume in litres (Imperial gallons) per day
Car Wash	hand wash - per car	200 (44)
	truck wash - per truck	400 (88)
Recreational vehicle park	per space	180 (39.6)