VILLAGE of HYTHE

Treatment Mound
Design Considerations & Details

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Permit Number: **PRPSW** Roll Number:

The following information is to **accompany** the **Private Sewage Disposal Permit Application** for a **Treatment Mound.**

Required Information:

- ☐ **Private Sewage Disposal Permit Application** - Completed (please put N/A in spaces which are not applicable).
- ☐ **Signature of Applicant on Permit Applicant Declaration**
- ☐ **Treatment Mound Design Considerations & Details** - This form Completed.
- ☐ **Site Evaluation Diagram - *Appendix A*** - Attach a *detailed* site diagram including the system location in relation to buildings, distance to water supply and /or surface water
- ☐ **Soil Log Report from *two (2)* test pits with Soil Analysis Report** - ***Appendix B*** - Completed.
- ☐ **Worksheets -** Complete both **'PSDS Design - Worksheet "M"'** - ***Appendix C*** and **'Pressure Distribution, Orifice, Pipe & Pump Sizing'** - ***Appendix D***
- ☐ **Specifications for System Components -** Attached for Initial Treatment Component Design Details, including Septic Tank, Dose Tank, Effluent Pump.
- ☐ **Detailed System Schematics and Drawings** - Attached
- ☐ **Any other qualifications of limitations that in your opinion as the designer/installer are needed.**

This private sewage system is for a _______ (# of) bedroom single family dwelling. Total peak wastewater flow per day used in this design is ________ imperial gallons. The average operating flow is expected to be gallons per day.

The sewage system includes a **septic tank and treatment mound**. This system is suitable for the site and soil conditions of your property. The design reflected in the flowing applies, and meets the requirements of the current **Alberta Private Sewage Systems Standards of Practice** adopted under the **Safety Codes Act** to achieve effective treatment of the wastewater from this residence.

Wastewater Characteristics:

Wastewater Peak Flow:

- The development served is a _____ (# of) bedroom single family dwelling.
- Fixture Unit Loads **(please check all that apply)**:
  - ☐ Main Bathroom = 6 fixture units
  - ☐ Ensuite with Shower = 6 fixture units
  - ☐ Kitchen Sink = 1.5 fixture units
  - ☐ Laundry Stand Pipe = 1.5 fixture units
  - ☐ Bathroom in Basement = 6 fixture units
  - ☐ High-volume plumbing fixtures were identified in the review of this development **(examples: garburator, soaker tubs)**. ***Please include total volume used by these fixtures in the calculation of flow, as per Table 2.2.2.3 of Alberta Private Sewage Systems Standard of Practice 2009.***
  - ☐ No high-volume plumbing fixtures were identified in the review of this development **(examples: garburator, soaker tubs)**.
- Total plumbing fixture unit load in this residence: ____________________
  (based on review of the building)
- Based on the total plumbing fixtures, _____ Imp. Gallons per day is required to be added to the base peak daily flow.

- *Note: When the combined total of fixture units exceeds 20 in an occupancy unit, add 50L for each fixture unit over 20* ***(as per Table 2.2.2.2.A. of the Alberta Private Sewage System Standard of Practice 2009)***

Summary:

Total peak daily flow used in the design is:	________	Imp. Gal/day
Base Flow:	________	Imp. Gal
Additional Flow:	________	Imp. Gal

Wastewater Strength:

- ☐ Characteristics of the development were considered to assess sewage strength. **No garbage grinders or other characteristics** were identified that would cause typical wastewater strength to be exceeded.
- ☐ The Required wastewater strength for the design is:
  - BOD 220 mg/L
  - TSS 220 mg/L
  - Oil and Grease 50mg/L

Wastewater Flow Variation Considerations:

- ☐ The characteristics of this development indicate wastewater flow volumes will not vary substantially during the day, or from day to day. **As a result, no flow variation management is needed.**

Site Evaluation Findings:

Site Evaluation Diagram:

- Lot area: ______________________ ac / Ha

- ☐ The dimensions of the property are shown in the **Site Evaluation Diagram**, attached in ***Appendix A*** .
- ☐ The site evaluation assessed the area within a **100m (330ft) radius** of all components of the system design. The design conforms to all distances set out in the Standard of Practice (SOP), including the distances to adjacent property features. No significant setback constraints were noted.
- ☐ Pertinent features identified during the site review and the required setback distances are identified on the **Site Evaluation Diagram -** ***Appendix A.***

Soil Evaluation:

- ☐ **Two (2)** soil excavations have been investigated on this site.
- ☐ Test Pit 1 is located at the proposed location of the treatment mound.
- ☐ **Soil Logs -** ***Appendix B*** have been completed for Test Pit 1 and Test Pit 2.
- ☐ The location(s) of the Test Pits are shown on the **Site Evaluation Diagram,** ***Appendix A.***

Restrictive Soil Conditions:

- Key aspects of the soil conditions that must be addressed in the design are:
  - A restrictive layer exists at ________ feet below the surface as indicated by:

    ____

    ____

    ____

    ____

    therefore, a treatment mound is required.

Limiting Soil Condition - Effluent Loading Rate Selection:

- The key soil Characteristics of the design is based on (soil type): ______________________
- This soil type has a effluent loading rate of: ______________________
- The effluent loading rate for secondary treated effluent on this soil is : __________ Imperial Gallons/day/ft^2

Effluent Linear Loading Rates and Design Considerations:

- There is a shallow restrictive soil layer at this site. The effluent must move laterally through the soil so linear loading rates must be applied:
  - The dominant soil characteristic is: ______________
  - Infiltration distance to the restrictive layer: ______________
  - **Linear Loading Rate:** __________ Imperial Gallons/day/ft^2

☐ **System Component Designs have been attached.**

Initial Treatment Component Design Details:

☐ Details of the initial treatment components are required for this design are attached.

Septic Tank:

- The working capacity of the septic tank specified for this design is ______ Imp. Gal.
- Tank Model Number: ______________________

☐ Specifications for the Model of Septic Tank used are attached.

- The minimum working capacity required for this development is ______ Imp. Gallons based on Table 4.2.2.2 of SOP 2009 for a ______ bedroom house **(______ Imp. Gal/day plus the additional flow of ______Imp. Gal,** ***as summarized above under Wastewater Characteristics*** **).**

- Burial depth of the septic tank at finished grading will be ______ inches above the top of the tank.
- This tank is rated for a maximum burial depth of : ______________
- Insulation of the tank required?
  - ☐ Yes - ______________________
  - ☐ No

Dose Tank:

- The dose chamber is integral to the septic tank. It has a total capacity of ______ Imp. Gal. This is sufficient capacity to deliver the ______ Imp. Gal required for each dose of effluent. It also provides ______ Imp. Gal emergency storage above the high effluent alarm setting **(a minimum of one (1) day emergency supply is required)**.

☐ Specifications for the Dose Tank are attached.

High Liquid Level Alarm:

- Alarm Model Number: ______________________
- The alarm is set to activate______ inches above the floor of the dose tank.

Effluent Filter:

- Filter Model Number: ______________________
- Filter diameter: ______________________ inches

☐ The Filter creates a head loss of 0.5 feet at its rated flow of 80 Imp. Gal/min. A 5.5 foot pressure head allowance has been included in the pump selection to allow for partially clogged conditions.

☐ A one year service interval is expected with typical flow volumes and wastewater characteristics.

Soil Treatment Component Design Details:

☐ The system designed for this site is a septic tank and treatment mound.

- Key design requirements:
  - Expected Peak Daily Flow: ____________________
  - Soil Loading Rate: ____________________
  - Linear Loading Rate: ____________________
- Minimum in-site soil infiltration area:
  - Soil Infiltration Surface Area: ____________________
  - Minimum Soil Infiltration Width: ____________________

☐ The location of the treatment mound and the layout of laterals are shown on the **Site Evaluation Diagram, *Appendix A***

☐ The mound sizing worksheets are completed and attached - ***Appendix C.***

☐ The layout of the laterals have been included with the **detailed system schematics and drawings**.

Effluent Distribution Design Detail:

Effluent Pressure Distribution:

☐ The Pressure Distribution, Orifice, Pipe & Pump Sizing worksheets are completed and attac

- The Effluent Pressure Distribution is: ____________________

Effluent Pressure Distribution Lateral Design:

- The ________________ foot long pressure distribution laterals are center fed resulting in (# of) pressure distribution laterals. Each lateral is ___________ inch schedule 40 PVC pipe. Each lateral has _________ (# of) 1/8 inch orifices drilled at ____________ foot spacing. Orifices will be offset between the two laterals along its length.
- The design achieves a minimum of 5 foot pressure head at each orifice, resulting in a design flow of _____________ Imp. Gal/Minute from each 1/8 inch orifice.
- There are ___________ (# of) orifices throughout the effluent pressure distribution system resulting in **a total flow** of ______________ Imp. Gal/minute. An additional 3.2 Imp. Gal/minute is added for the 1/4 inch drain back orifice drilled at the lowest elevation of the effluent piping in the dose tank to achieve drain back of the laterals and supply piping.
- **Total flow required for the effluent pressure distribution system is _________ Imp. Gal./minute.**

Pressure Head:

Pressure Head Requirements:

- The total length of supply piping from the pump to the start of the pressure distribution laterals is __________ feet. The supply piping is **2 inch Schedule 40 PVC pipe.** The allowance for equivalent length of pipe due to fittings is ___________ feet of pipe. The equivalent length of pipe is _________ feet. This is detailed in ***Appendix D.***

Pressure Head Loss Due to Friction:

- The friction loss through the _________ feet of piping and filter at the flow of ______Imp. Gal/min is _______ feet of head pressure.

Other Friction Loss Considerations:

☐ Allowance for head loss through the effluent filter under partial plugging is 5.5 feet.

☐ Allowance for pressure head loss along the pressure distribution laterals is 1 foot.

- **The total pressure head required to overcome friction loss is ________ feet pressure head.**

Pressure Head to Meet Vertical Lift Requirements Included:

- ☐ A pressure head at each orifice of 5 feet.
- Light distance of effluent from the low effluent level in the tank to the pressure distribution laterals is _________ feet.
- The vertical lift and friction loss results in a **total pressure head** requirement of _________

Pump Specifications:

- Demand for this pressure distribution lateral system is _________ Imp. Gal/minute at ___________feet of pressure head.
- ☐ The pump capacity exceeds these demands to allow for variations in the design and decreased pump performance over time.
- Effluent Pump Model specified for this system: ____________________________
- Horsepower of Effluent Pump: ____________________________
- ☐ The pump specifications with the effluent distribution system demands plotted on the pump curve are attached.

Effluent Dosing Volume and Control Settings:

- The volume of effluent discharge in a single dose event needs to be less than 20% of the daily flow, which is ___________ gallons.
- The volume of an individual dose must be at least 5 times the volume of the pressure distribution laterals, which is _________ Imp. Gallons.
- Therefore, the individual dose volume selected is ___________ gallons.

Effluent Level Float Control Settings:

- The volume in the __________ feet of **2 inch PVC** effluent supply is ________ gallons.
- The **total individual dose volume** determining float settings is ___________ Imp. gallons to fill the effluent supply line and deliver the ___________ Imp. gallons per dose.
- The dose tank dimensions result in _________ gallons per inch of depth.
- The float control elevations shall be set at:
  - _________ inches between float off and on elevations.
  - Off: ___________ inches off floor of dose tank.
  - On: ___________ inches off floor of dose tank.
  - inches off floor based on elevations set out in this design.

☐ **The effluent level control floats will be attached to an independent PVC pipe float mast.**

Operation Monitoring:

The following components are included in the system design and detailed drawings showing locations have been attached:

- ☐ Monitoring Ports - provided at both ends of the laterals to enable inspection of the effluent ponding depth that may result.
- ☐ Pressure Distribution Lateral Clean Outs - provided at the end of each pressure distribution lateral with access to grade through an access box suitable for its purpose and anticipated traffic.

Effluent Quality Sampling:

- ☐ Effluent samples can be taken from the effluent dose tank if required.

Initial Operational Setup Parameters:

The following activities need to be conducted to commission the system:

- ☐ Clean the septic tank and effluent chamber of any construction debris.
- ☐ Flush effluent distribution laterals.

- ☐ Conduct a squirt test to assess the residual head pressure required by the design is achieved and that the volume from each orifice is within allowed tolerances.
- ☐ Confirm the correct float levels and ensure this delivers the dose volume required by this design.

Operation and Maintenance Manual:

- ☐ The Owner's Manual detailing the design, operation, and maintenance of the installed system will be provided to the owner in accordance with **Article 2.1.2.8.** of the **Standard of Practice**.

Signature and Closing by the Designer/Installer:

This design has been developed by ____. This design meets the requirements of the **Alberta Private Sewage System Standard of Practice 2009** unless specifically noted otherwise and in such case special approval is to be obtained prior to proceeding with installation of this design.

Signature of Designer/Installer: ____

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix A - Site Evaluation Diagram:

Please show the proposed location of the onsite sewage system and indicate the distances from the following:

- Trees
- Floodplains
- Wells
- Waste Sources
- Bedrock
- Outcrops
- Buildings
- Property Lines
- Easement Lines
- Ditches or Interceptors
- Banks or Steep Slopes
- Fills
- Driveways
- Existing Sewage Systems
- Underground Utilities
- Soil Test Pits

↑N

Please indicate:

Drainage Course	Slope Direction	Test Pit 1	Test Pit 2
		Test Pit 1 ☐	Test Pit 2 ☐

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix B - Soil Log Report: Test Pit 1

Alberta Private Sewage Treatment System Soil Profile Log Form

Owner Name or Job ID.									
Legal Land Location								Test Pit GPS Coordinates	
LSD-1/4	Sec	Twp	Rg	Mer	Lot	Block	Plan	Easting	Northing

Vegetation notes:		Overall site slope %	
		Slope position of test pit:	

Test hole No.	Soil Subgroup	Parent Material	Drainage	Depth of Lab sample #1	Depth of Lab sample #2

Hori-zon	Depth (cm) (in)	Texture	Lab or HT	Colour	Gleying	Mottling	Structure	Grade	Consistence	Moisture	% Coarse Fragments

Depth to Groundwater		Restricting Soil Layer Characteristic	
Depth to Seasonally Saturated Soil		Depth to restrictive Soil Layer	
Site Topography		Depth to Highly Permeable Layer Limiting Design	
Key Soil Characteristics applied to system design effluent loading			
Weather Condition notes:			
Comments: such as root depth and abundance or other pertinent observations:			

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix B - Soil Log Report: Test Pit 2

Alberta Private Sewage Treatment System Soil Profile Log Form

Owner Name or Job ID.									
Legal Land Location								Test Pit GPS Coordinates	
LSD-1/4	Sec	Twp	Rg	Mer	Lot	Block	Plan	Easting	Northing

Vegetation notes:		Overall site slope %	
		Slope position of test pit:	

Test hole No.	Soil Subgroup	Parent Material	Drainage	Depth of Lab sample #1	Depth of Lab sample #2

Hori-zon	Depth (cm) (in)	Texture	Lab or HT	Colour	Gleying	Mottling	Structure	Grade	Consistence	Moisture	% Coarse Fragments

Depth to Groundwater		Restricting Soil Layer Characteristic	
Depth to Seasonally Saturated Soil		Depth to restrictive Soil Layer	
Site Topography		Depth to Highly Permeable Layer Limiting Design	
Key Soil Characteristics applied to system design effluent loading			
Weather Condition notes:			
Comments: such as root depth and abundance or other pertinent observations:			

Treatment Mound

Permit Number: **PRPSW** Roll Number:

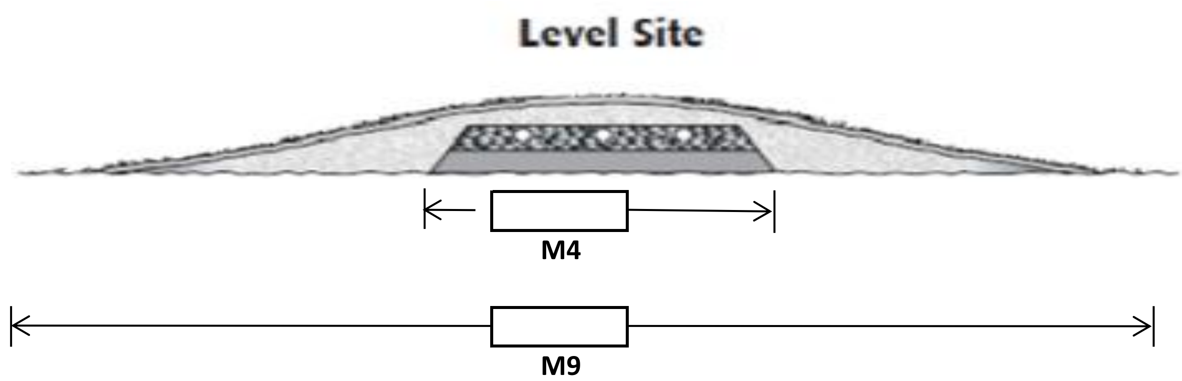
Appendix C - PSDS Design Worksheet "M"

Treatment Mound: Area Sizing

The complete system is to comply with Alberta Private Sewage Standard of Practice 2009

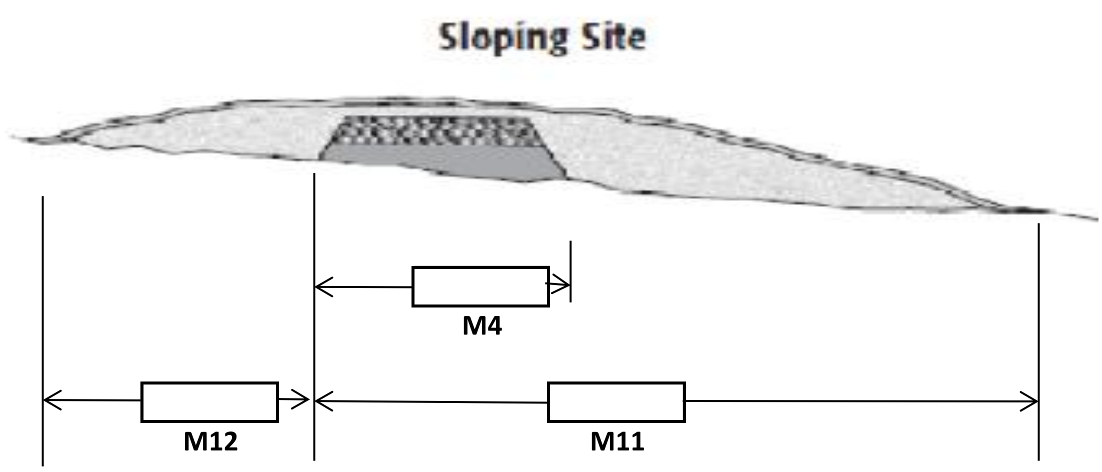
This worksheet does NOT consider all of the requirements of the Mandatory Standard.

Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc…)



Sand Layer Length (ft.)

Overall Length of Mound (ft.)



Slope

M8

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix C - PSDS Design Worksheet "M"

Treatment Mound: Area Sizing

Alberta Onsite Wastewater MANAGEMENT ASSOCIATION

The complete system is to comply with Alberta Private Sewage Standard of Practice 2009
This worksheet does NOT consider all of the requirements of the Mandatory Standard.
Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc…)

Step 1) Determine the expected volume of sewage per day:

Volume of sewage per day. Provide allowance for additional load factors as detailed in Table 2.2.2.3 - (p. 27)

Assure that the sewage strength does not exceed the requirements of 2.2.2.1 (1) - (p.27)

Expected Volume of Sewage per Day: ______ gal. / day **M1**

Step 2) Calculate the treatment area of the sand layer:

Expected Volume of Sewage per Day		Sand Layer Loading Rate		Area Required for Sand Layer	
gal. / day	÷	0.83 gal. / sq.ft. per day	=	sq.ft.	**M2**
From **M1** (this worksheet)		Note: Reduction required by 8.4.1.4 (1)(6) or 8.4.1.5 (1)(d)			

Step 3) Calculate the length of the sand layer:

Expected Volume of Sewage per Day		Hydraulic Linear Loading Rate (if applicable)		Length of Sand Layer	
gal. / day	÷	gal./day/lin.ft.	=	ft.	**M3**
M3a From **M1** (this worksheet)		M3b Table A.1.E.1 - (p. 151)			

Step 4) Calculate the minimum width of the sand layer:

Area of the Sand Layer		Length of the Sand Layer		Width of the Sand Layer	
sq.ft.	÷	ft.	=	ft.	**M4**
From **M2**		From **M3**			

Step 5) Determine the infiltration soil effluent loading rate:

Note: Effluent loading rate can be determined from soil texture classification according to 8.4.1.7 (1)(a & b) - (p. 118) and Table A.1.E.1 (pp. 151 - 152) with consideration for Article 8.1.2.2 - (p. 101)

Soil Effluent Loading Rate: ______ gal./sq.ft./day **M5**

Step 6) Calculate the in situ soil infiltration area required:

Expected Volume of Sewage per Day		Soil Effluent Loading Rate		Required Soil Infiltration Area	
gal./day	÷	gal./sq.ft./day	=	sq.ft.	**M6**
From **M1** (this worksheet)		From **M5** (this worksheet)			

Step 7) Calculate the required width of the infiltration area:

Required Infiltration Area		Length of Sand Layer		Width of Required Soil Infiltration Area	
sq.ft.	÷	ft.	=	ft.	**M7**
From **M6** (this worksheet)		From **M3** (this worksheet)			

Step 8) Determine the slope criteria of the installation site:

If the slope of the installation site exceeds 1%, proceed to Step 11. If the slope is 1% or less, proceed to Step 9.

Slope of Installation Site: ______ % **M8**

Note: The following calculations apply ONLY to the minimum height configuration of a mound. If it is necessary to raise the sand layer, (for example to provide vertical seperation from restrictive layer to the water table) the following calculations are NOT adequate for the design.

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix C - PSDS Design Worksheet "M"

Treatment Mound: Area Sizing

Alberta Onsite Wastewater Management Association

The complete system is to comply with Alberta Private Sewage Standard of Practice 2009
This worksheet does NOT consider all of the requirements of the Mandatory Standard.
Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc…)

For Slopes of 1% or Less, Use Steps 9 to 10.

Step 9) Determine the toe to toe width of the mound:

Toe to Toe Width Based on 3:1 Slope Requirement		Width of Area Required Infiltration Area Within Berm		Toe to Toe Width of Mound	
ft.	or	ft.	=	ft.	M9
M9a 3:1 Slope Requirement - 8.4.2.9. Refer to Berm Dimensions Diagram (this worksheet or determine by calculation)		M9b From **M7** (this worksheet)		The greater of M9a or M9b	

Step 10) Proceed to Step 14:

Steps 11 to 13 are used only for installations where the slope exceeds 1%.

For Slopes Exceeding 1%, Use Steps 11 to 14.

Step 11) Determine the width of the sand layer plus downslope berm:

The width of the mound is based on the greater of:
- the width as determined by the 1:3 slope requirement, or
- the width required to provide adequate infiltration area

Downslope Berm Width Based on 3:1 Slope Requirements

ft.

M11a
Refer to Berm Dimensions Diagram (this worksheet)

+

Width of Sand Layer

ft.

M11b
From **M4** (this worksheet)

		Width of Required Infiltration Area Under Sand Layer and Downslope Berm		Width of Sand Layer and Downslope Berm	
ft.	or	ft.	=	ft.	M11
M11c		M11d From **M7** (this worksheet)		3:1 Slope Requirement is the greater of **M11c** or **M11d**	

Step 12) Determine the width of the upslope berm:

Width based on 3:1 Slope Requirement (refer to 8.4.2.9)
Refer to Berm Dimensions Diagram (this worksheet) or determine by calculation.

Width of Upslope Berm	
ft.	M12

Step 13) Determine the toe to toe width of the mound:

Width of Sand Layer and Downslope Berm		Width of Upslope Berm		Toe to Toe Width of Mound	
ft.	+	ft.	=	ft.	M13

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix C - PSDS Design Worksheet "M"

Treatment Mound: Area Sizing

Alberta Onsite Wastewater Management Association

The complete system is to comply with Alberta Private Sewage Standard of Practice 2009
This worksheet does NOT consider all of the requirements of the Mandatory Standard.
Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc...)

Summary

Step 14) Summarize the information:

Width of Sand Layer (From M4 this worksheet)	ft.
Length of Sand Layer (From M3 this worksheet)	ft.
Slope of Installation Site (From M8 this worksheet)	%
Toe to Toe Width of Mound (From M9 or M13 this worksheet)	ft.

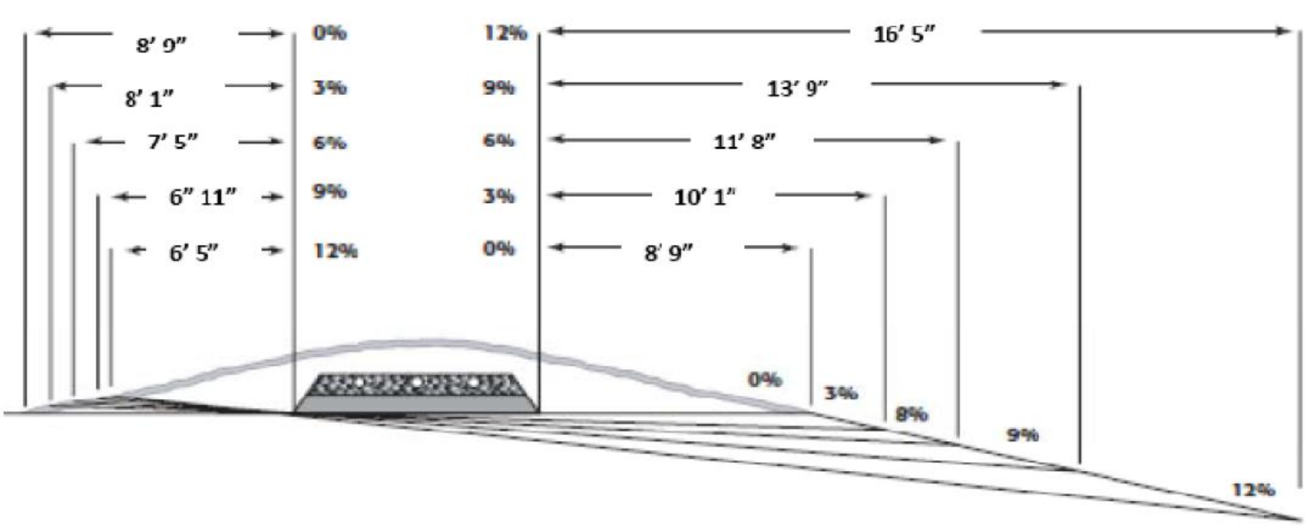
Step 15) Complete the berm diagram dimensions on the first page:

Fill the appropriate diagram on the first page with the numbers calculated in this worksheet.

Step 16) Confirm the design complies with the Standard of Practice:

This worksheet does NOT consider all the requirements of the mandatory Standard. Please work safely and follow safe practices near trenches and open excavations.

Treatment Mound Berm Dimensions on Slopes



This Diagram is Based on a Minimum Mound Height and a Minimum Berm Slope of 3:1

Based on:3 inches top soil
6 inches fill material
12 inches of chamber height
2 inches of washed rock
12 inches of sand media

Based on minimum height
requirements from 2009 SOP

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix D - Pressure Distribution, Orifice, Pipe & Pump Sizing

This design worksheet was developed by Alberta Municipal Affairs and Alberta Onsite Wastewater Management Association.
The completed installation is to comply with Alberta Private Sewage Standard of Practice 2009.

This worksheet is for use in Alberta to: size the orifices in distribution lateral pipes, size effluent delivery piping, and to calculate the required capacity and pressure head capability of the effluent pump.
It can be used for: calculating deliver of effluent to laterals in disposal fields, mounds and sand filters.
This worksheet does NOT consider all of the mandatory requirements of the Standard.
It is intended for use by persons having training in the private sewage discipline.
Note: Page numbers refer to the Private Sewage Systems Standard of Practice 2009.

Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc…).

Step 1) Select the pressure head to be maintained at the orifices:
Minimum pressure at the orifice:
3/16" or less orifice = 5 ft. Minimum - 2.6.2.5 (1), (p 48)
larger than 3/16" orifice = 2 ft. Minimum - 2.6.2.5 (1) (p 48)

Design pressure at lateral orifices ______ ft. P1

Note: worksheet will not provide an adequate design if laterals are at different elevations. Differing elevations will result in a different pressure head and volume of discharge at the orifices in each lateral. Additional considerations must be made for laterals at differing elevations.

Step 2) Select the size of orifice in the laterals:

Minimum size: 2.6.1.5. (1)(e) p. 46 **1/8"**

Orifice Diameter selected ______ in. P2

Note: larger sizes are less likely to plug.

Step. 3) Select the spacing of orifices and determine the number of orifices to be installed in distribution laterals:

Length of Distribution Lateral From system design drawings		Spacing of Orifices selected for design		Resulting number of orifices per lateral	
______ ft.	÷	______ ft.	=	______	P3a

Select a spacing of orifices to attain even distribution over the treatment area:
Maximum spacings are determined for :
* 5 ft. Primary treated effluent: 2.6.1.5 (e) (pp. 46 - 47)
* 3 ft. Secondary treated effluent: 8.1.1.8 & 2.6.2.2 (c) (pp 98 & 47 - 48)
* 3 ft. On sandy textured soils: 8.1.1.8 (p. 98)

______	X	______	=	______	P3b
From P3a		Number of Laterals		Total Number of Orifices All Laterals	

If laterals are of differing lengths, calculate each separately and add the number of orifices together.

Step 4) Determine the minumum pipe size of the distribution laterals:

Enter the system design information into the 3 boxes below. If distribution laterals are of differing lengths, each lateral must be considered separately.

Orifice Diameter	Length of Distribution Lateral	Total Orifices Each Lateral
______ in.	______ ft.	______
From P2	From System Design Drawings	From P3a

Use Table A.1.A. (pp 140 - 143) when applying the information entered in this step to determine the minimum size of the distribution lateral pipe.

Size of Distribution Lateral Pipe From Table A.1.A. ______ in. P4

Treatment Mound

Permit Number: **PRPSW** Roll Number:

Appendix D - Pressure Distribution, Orifice, Pipe & Pump Sizing

Step 5) Determine the total flow from all orifices:

Total Number of Orifices in all laterals		Gal/min for each Orifice at Head Pressure Selected			Total flow from all lateral orifices		
	X		Imp. gal /min.	=		Imp. gal /min.	P5
From P3b		From Table A.1.B. (pp 144 & 145)					

Step 6) Select the type and size of effluent delivery pipe:

Use Tables A.1.C.1 to A.1.C.4 (pp 146 - 149) to aid in decision. A larger pipe will reduce pressure loss.

Type of pipe used for effluent delivery	Pipe size selected		
		inch - NPS	P6

Choose a friction loss from Tables A.1.C.1 to A.1.C.4 in between the bolded lines to ensure a flow velocity between 2 to 5 feet per second. The pipe size selcted will affect the amount of friction loss the pump must overcome to deliver effluent.

Step 7) Calculate the equivalent length of pipe for pressure loss due to fittings:

Insert total from Worksheet "A" on last page (p.5) of this Pressure Distribution Worksheet

Equivalent Length of All Fittings		
	ft.	P7
For Pressure Loss		

Step 8) Calculate the equivalent length of pipe from pump to the farthest end of header of distribution laterals for pressure loss:

Length of Piping (ft)		Equivalent Length of Fittings (ft)		Length of Pipe for Friction Loss (ft)	
	+		=		P8
Length from pump to farthest end of distribution header supplying laterals.		Equivalent fitting length from P7.		Used to determine total pressure head loss due to friction loss in piping.	

Step 9) Calculate the pressure head loss in delivery pipe including fittings:

Total Length of Pipe for Friction Loss		Friction Loss per 100 feet of pipe			Delivery Piping Pressure Head Loss		
	Divide by 100 ft.		ft.	=		ft.	P9
From P8 Don't forget to divide the length by 100 feet to match the factors in the tables.		Use Tables A.1.C. On pp 146 - 150 using flow volume from P5.					

Treatment Mound

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Appendix D - Pressure Distribution, Orifice, Pipe & Pump Sizing

Step 10) Calculate the total pressure head required at pump:

Delivery piping pressure loss		ft.	From P9
+			
Lift distance of effluent from effluent level in tank to orifices		ft.	Measure from lowest effluent level in tank to elevation of orifices.
+			
Design pressure at orifices		ft.	From P1
+			
Head loss allowed if an inline filter is used in pressure piping		ft.	Explain Pressure Loss Allowed if Applied
+			
Add 1 ft to allow for pressure loss along the distribution lateral	1	ft.	
Total minimum pressure head pump must provide at Imp. gal/min required to supply orifices		ft.	P10

Step 11) Select the size of the drain back orifice if used and determine the flow from the drain back orifice. Then calculate total flow requirement for pump:

Size of Drain Back Orifice		**Determine flow using Head Pressure at Drain Back Orifice**			**Flow from all lateral orifices**			**Total Imp. Gallons per Minute from the pump**		
	in.		**Imp. gal /min**	**+**		**Imp. gal /min**	**=**		**Imp. gal /min**	**P11**
		Use pressure head from P10 to find flow from Extended Table A.1.B.1			**From P5**					

Step 12) Details of the pump specifications required:

Required Flow Rate (Imp. gal/min)		**Required Pressure Head (ft)**
	@	
From P11		**From P10**

Select the appropriate pump by reviewing the pump curve of available pumps. Select a pump that exceeds the requirments set out in this step by approximately 10% considering both pressure head and volume.

Imp. gal (P11) multiplied by 1.2 = U.S. gallons

Required Flow Rate (US gal/min):

Step 13) Consider the pumping demands of the system. If they are considered excessive, redesign the pressure distribution system and recalculate the pump demands.

Treatment Mound

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Appendix D - Pressure Distribution, Orifice, Pipe & Pump Sizing

Worksheet "Appendix A" Determine Equivalent Length of Pipe due to fittings in piping system.

Determine the equivalent length of pipe to allow for friction loss due to fittings in the piping system:

	Number of Fittings		Friction loss as per Table A.1.C.5 or 6 (p. 150)		Total
90° Elbows		x		=	
					+
45°Elbows		x		=	
					+
Gate and Ball Valves		x		=	
					+
Tee-on-Branch (TOB)		x		=	
					+
Tee-on-Runs (TOR)		x		=	
					+
Male Iron pipe Adaptors (M/F Threaded Adaptors)		x		=	
					=
Total Equivalent Length of pipe to allow for fittings in piping system			**(Enter this total, Box P7)**		