BARNARD & GERVAIS, LLC

Land Surveyors, Licensed Designers, Environmental Consultants

www.barnardandgervais.com

May 23, 2023

Ms. Allison Lowry
Regional Engineer
Agency of Natural Resources
111 West Street
Essex Junction, VT 05452

Subject: Bradley Jay LaRose & Karin C. LaRose, Two-Lot Subdivision, 156 Wortheim Road, Richmond, Vermont - Wastewater System and Potable Water Supply Permit Application

Dear Allison:

Attached are electronic copies of the Bradley Jay LaRose & Karin C. LaRose design drawings and supporting documents relative to their 3.8+/- acre parcel located at 156 Wortheim Road, Richmond, Vermont. Bradley and Karen are proposing to subdivide the existing parcel to create one (1) new parcel. Proposed Lot 1 will be 1.4+/- acres in size and will contain the existing single-family residence that is served by the existing on-site wastewater system and is provided water by the existing on-site drilled well. Proposed Lot 2 will be 2.4+/- acres in size and will be improved by a 3-bedroom single-family residence that will be served by an on-site mound wastewater disposal system and will be provided water by an on-site drilled well. To subdivide the property and create a new developable lot, Mr. and Mrs. LaRose are applying for a State of Vermont Wastewater System and Potable Water Supply Permit.

Included to facilitate your review of this permit application are the following:

1. Cover Letter.
2. Electronic Application Submission Summary Pages.
3. Notification Form 4.
4. Certified Mail Receipts.
5. Wastewater System and Water Supply Component Details Worksheet.
6. Consultant/Designer Signature Sheet.
7. Landowner Signature Sheet.
8. Test Pit Logs.
9. Lot 1 & 2 Effluent Mounding Analysis.
10. Lot 1 Replacement Mound System Basis of Design.
11. Lot 2 Mound System Basis of Design.
12. Effluent Pump.
13. Pressure Analysis.
14. High Water Alarm.
15. Mound Construction Instructions.
15. Drawings S-1 & D-1 dated January 4, 2023.

Should you have any questions or comments relative to the information submitted herein, please do not hesitate to call me at (802) 482-2597.

Sincerely,

Jason Barnard
Licensed Designer #126179

c: Bradley Jay LaRose & Karin C. LaRose

Certification of Notification
(Notification Form 4)

An applicant or permittee is required to complete and submit this certification to the Regional Office when notification is required using Notification Forms 1, 2, or 3.

I hereby certify that the property owner(s) identified below were notified, using the Agency's notification form, that the presumptive isolation zones for potable water supplies and/or wastewater systems proposed in my application extend onto their property.

I certify that the notification forms were sent by certified mail to the property owners and were accompanied by the site plan(s) accurately depicting the presumptive isolation zones that extend onto their property.

I certify that I attached to this certification form a copy of all certified mail receipts for the notifications that were sent to the property owners.

Signature: 

Name: Bradley Jay LaRose

Date: **5/18/23**

SPAN: 519-163-10861

Please list all of the property owners who were sent a notification. Click on the plus sign in the bottom right of the section below to add additional property owners. Add as many rows as you need.

Name: Sally Maxwell Hess Living Trust

Address: 194 Wortheim Road, Richmond, VT 05477

Name: Laurie A. Aunchman & Scott M. Danzig

Address: 126 Wortheim Road, Richmond, VT 05477

Name: Keith J. & Connie L. Engle

Address: 403 Collins Mountain Road, Richmond, VT 05477

Name: Jacob M. & Jessica B. Clements

Address: 386 Collins Mountain Road, Richmond, VT 05477

Name: Robert T. & Joy H. Reap

Address: PO Box 442, Richmond, VT 05477

VERMONT

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Sent To
Laurie A. Auchman & Scott M. Danzig
Street and Apt. No., or PO Box No.
176 Wolfheim Road
City, State, ZIP+4®
Richmond, VT 05477

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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- ☐ Adult Signature Restricted Delivery $ ____

Postage
$ 1.74

Total Postage and Fees
$ 5.89

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MAY 03 2023

Sent To
Sally Maxwell Hess Living Trust
Street and Apt. No., or PO Box No.
194 Wolfheim Road
City, State, ZIP+4®
Richmond, VT 05477

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Total Postage and Fees
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Jacob M. & Jessica B. Clemmons
Street and Apt. No., or PO Box No.
396 Collins Mountain Road
City, State, ZIP+4®
Richmond, VT 05477

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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- ☐ Adult Signature Required $ ____
- ☐ Adult Signature Restricted Delivery $ ____

Postage
$ 1.74

Total Postage and Fees
$ 5.89

Postmark Here
RICHMOND VT 05461
MAY 03 2023

Sent To
Keith J. & Connie L. Engle
Street and Apt. No., or PO Box No.
483 Collins Mountain Road
City, State, ZIP+4®
Richmond, VT 05477

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

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Extra Services & Fees *(check box, add fee as appropriate)*
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- ☐ Return Receipt (electronic) $ ____
- ☐ Certified Mail Restricted Delivery $ ____
- ☐ Adult Signature Required $ ____
- ☐ Adult Signature Restricted Delivery $ ____

Postage
$ 1.74

Total Postage and Fees
$ 5.89

Postmark Here
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Sent To
Robert T. & Judith A. Reap
Street and Apt. No., or PO Box No.
PO Box 442
City, State, ZIP+4®
Richmond, VT 05477

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

Department of Environmental Conservation

Wastewater System & Potable Water Supply Permit Application

Wastewater System and Water Supply Component Details Worksheet

IMPORTANT: This form MUST be completed using Adobe Reader or Adobe Acrobat, otherwise it will not save properly.

Component Information:

PLEASE READ: The purpose of this section is to provide supplementary information for system components when there are proposed changes to existing conditions or previous permits. In the case that the application includes site plans, the component names on this worksheet must match those on the site plans. If there is a prior permit, the component names must be labeled consistent with plans from the prior permit(s). It is ***required*** that, at a minimum, the following component types must be included for each application: final disposal; pre-treatment (if applicable); building unit(s); water treatment (if applicable); and water source. To add components after the third entry, click the green button labeled "Add Another Component". You may also insert components between components you've already added by clicking the "Insert Component Between" button. For large projects with many components, you may consider using the "Show/Hide Component Set Separator" button to separate sets (or groups) of connected components by naming each set. For additional instructions, please review the appendix to the application instructions: http://dec.vermont.gov/sites/dec/files/dwgwp/wastewater/pdf/WWAppInstructionsRules.pdf.

Component 1

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Final Disposal	Component Type	In-ground

--Component 1 Details--

Component Name	Lot 1 Existing Leachfield		
Lot # of Physical Location	1	Change Type	No Change
WW Design Flow	420	Changes	
I/A Dispersal Type			
Variance Requested	☐	Comments	If lot 2 is approved then the physical location of the lot 1 existing leachfield will be lot 2.

Design Approach (select all that apply, press Ctrl and Click to select multiple):

- Alternative Toilets
- Constructed Wetlands
- **Existing - Unknown**
- Filtrate
- Flow equalization
- No discharge (other than holding tank)
- Performance based
- Prescriptive
- Store and dose
- Subsurface drip distribution
- Time dosing
- Wastewater strength

Manufacturer	
Model Name	
Model Number	
As-Built Latitude	44.386572
As-Built Longitude	-73.026029

Insert Component Between

Component 2

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Final Disposal	Component Type	Mound

--Component 2 Details--

Component Name	Lot 1 Replacement Bottomless Sand Filter Area		
Lot # of Physical Location	Lot 2	Change Type	Replacement Area Designation
WW Design Flow	420	Changes	

I/A Dispersal Type			
Variance Requested	☐	Comments	
Design Approach (select all that apply, press Ctrl and Click to select multiple)	Alternative Toilets Constructed Wetlands Existing - Unknown Filtrate Flow equalization No discharge (other than holding tank) Performance based Prescriptive Store and dose Subsurface drip distribution Time dosing Wastewater strength		
Manufacturer			
Model Name			
Model Number			
As-Built Latitude			
As-Built Longitude			

Insert Component Between

Component 3

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Tanks	Component Type	Septic Tank

--Component 3 Details--

Component Name	Lot 1 Existing Septic Tank		
Lot # of Physical Location	1	Change Type	No Change
		Changes	
		Comments	

Insert Component Between

Component 4

Show/Hide Component Set Separator | Remove This Component

Component Group Type	Building	Component Type	Building-Unit

--Component 4 Details--

Component Name	3-Bedroom Single-Family Residence		
Lot # of Physical Location	1	Change Type	No Change
WW Permitted Flow	420	Changes	
WS Permitted Flow	420		
Flow Basis		Comments	

Insert Component Between

Component 5

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WS) Source	Component Type	Potable

--Component 5 Details--

Component Name	Drilled Well		
Lot # of Physical Location	1	Change Type	No Change
Source Type	Drilled/Driven Well	Changes	
WS Design Flow	420		
Allocation Approval	☐	Comments	
Construction Approval	☐		
Variance Requested	☐		
As-Built Latitude	44.385709		
As-Built Longitude	-73.026277		

Insert Component Between

Component Set Name	Proposed Lot 2 Water System and Wastewater Disposal System

Component 6

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Final Disposal	Component Type	Mound

--Component 6 Details--

Component Name	Lot 2 Mound Wastewater Disposal System		
Lot # of Physical Location	2	Change Type	New System
WW Design Flow	420	Changes	
I/A Dispersal Type			
Variance Requested	☐	Comments	
Design Approach (select all that apply, press Ctrl and Click to select multiple)	Alternative Toilets Constructed Wetlands Existing - Unknown Filtrate Flow equalization No discharge (other than holding tank) Performance based Prescriptive Store and dose Subsurface drip distribution Time dosing Wastewater strength		
Manufacturer			
Model Name			
Model Number			
As-Built Latitude			
As-Built Longitude			

Insert Component Between

Component 7

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Conveyance	Component Type	Pump Station

--Component 7 Details--

Component Name	800 Gallon Top-Seam Concrete Pump Station		
Lot # of Physical Location	2	Change Type	New System
Municipal WW System		Changes	

Comments	

Insert Component Between

Component 8

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WW) Tanks	Component Type	Septic Tank

--Component 8 Details--

Component Name	1,000 Gallon Top-Seam Concrete Septic Tank		
Lot # of Physical Location	2	Change Type	New System
		Changes	
		Comments	

Insert Component Between

Component 9

Show/Hide Component Set Separator | Remove This Component

Component Group Type	Building	Component Type	Building-Unit

--Component 9 Details--

Component Name	Proposed 3-Bedroom Single-Family Residence		
Lot # of Physical Location	2	Change Type	New System
WW Permitted Flow	420	Changes	
WS Permitted Flow	420		
Flow Basis	Rule	Comments	

Insert Component Between

Component 10

Show/Hide Component Set Separator | Remove This Component

Component Group Type	(WS) Source	Component Type	Potable

--Component 10 Details--

Component Name	Lot 2 Drilled Well		
Lot # of Physical Location	2	Change Type	New System
Source Type	Drilled/Driven Well	Changes	
WS Design Flow	420		
Allocation Approval	☐	Comments	
Construction Approval	☐		
Variance Requested	☐		
As-Built Latitude			
As-Built Longitude			

Insert Component Between

Add Another Component

Department of Environmental Conservation

Wastewater System & Potable Water Supply Permit Application

Consultant/Designer Signature Sheet

Instructions:

The Submission Number and Version of the online application form being signed **must** be entered in the field below.

Hand Signatures - This signature sheet can be downloaded, printed, signed by hand, and then scanned and uploaded to the **Signatures** section of the online application form.

Electronic Signatures - This signature sheet can be signed electronically using the signing capability available in Adobe Reader (or other PDF software with similar capability) and then uploaded to the **Signatures** section of the online application form. If this sheet contains one or more electronic signatures, it **must** be uploaded in a format that does not compromise the ability to validate the applied signature(s). The electronic signature appearance must include the signer's name, email address, and the date and time of signing. This sheet can not contain both electronic and hand signatures.

ANR Online Submission Number & Version

ANR Online Submission Number and Version (for example: #20J-65KQ-R1ZF, version 1)

HPP-VN8F-GGX70 Revision 1

Consultant(s)/Designer(s) Certification

Consultant/Designer Certification & Copyright License

"I hereby certify that in the exercise of my reasonable professional judgment, the design-related information submitted with this application is true and correct, and that the design included in this application for a permit complies with the Vermont Wastewater System and Potable Water Supply Rules and the Vermont Water Supply Rules.

As the individual who prepared this application, including all documents that are marked as copyrighted, I hereby grant a non-exclusive, limited license to the State to allow the documents to be available for public review and copying in order to properly implement and operate the permitting programs for Wastewater Systems and Potable Water Supplies, and for no other purposes. As a condition to this license, the State agrees that it will not make any changes to such documents, nor will the State delete any copyright notices on such documents."

Consultant/Designer Role	Print Consultant/Designer Name	Consultant/Designer Signature	Signature Date
WW/WS Designer	Jason S. Barnard	Jason S. Barnard	5/10/23

Department of Environmental Conservation

Wastewater System & Potable Water Supply Permit Application

Landowner Signature Sheet

Instructions:

The Submission Number and Version of the online application form being signed **must** be entered in the field below.

Hand Signatures - This signature sheet can be downloaded, printed, signed by hand, and then scanned and uploaded to the **Signatures** section of the online application form.

Electronic Signatures - This signature sheet can be signed electronically using the signing capability available in Adobe Reader (or other PDF software with similar capability) and then uploaded to the **Signatures** section of the online application form. If this sheet contains one or more electronic signatures, it **must** be uploaded in a format that does not compromise the ability to validate the applied signature(s). The electronic signature appearance must include the signer's name, email address, and the date and time of signing. This sheet can not contain both electronic and hand signatures.

ANR Online Submission Number & Version

ANR Online Submission Number and Version (for example: #20J-65KQ-R1ZF, version 1)

HPP-VN8F-GGX70 Revision 1

Signatures & Acknowledgements of Landowner(s)

This application must be signed by each Landowner listed on the property deed or by individuals with legal authority to sign on behalf of each Landowner. In order to insure compliance with the requirements of the regulations administered by the Department of Environmental Conservation, Drinking Water and Groundwater Protection Division, it may be necessary to visit the property. As this would involve a Department employee entering private property, we request your approval to do so.

If we do visit your property, do you have any special instructions?

"By signing this application, I certify that I am a landowner listed on the property deed or that I have the legal authority to sign on behalf of the landowner. I understand that by signing this application I am granting permission for the Department employees to enter the property, during normal business hours, to insure compliance of the property with the applicable rules of the Department.

I also understand that I am not allowed to commence any site work or construction on this project without written approval from the Department of Environmental Conservation.

If my project utilizes an Innovative/Alternative System or Product, I have received a copy of the Drinking Water & Groundwater Protection Division's approval letter and agree to abide by the conditions of the approval.

I also certify that to the best of my knowledge and belief the information submitted above is true, accurate and complete."

Print Landowner Name	Landowner Signature	Signature Date
Bradley Jay LaRose	Bradley LaRose	5/3/2023
Karin C. LaRose	Karin C. LaRose	5/3/2023

Barnard & Gervais, LLC
Soil Test Pit Log

Project Name: Bradley Jay & Karin C. LaRose

Project #: 22356

Project Location: 156 Wortheim Road, Richmond, VT

Date: September 27, 2022

Time: 8:30 am

Weather Conditions: Partly Cloudy 55°

Logged By: Robert A. Walker LD#133655

Also on Site: Tyler Willey

Ground Surface Slope: 10-15%

Method of Excavation: Excavator

Test Pit #	Depth (inches)	Color	Texture	Structure	Consistency	Redoximorphic Features	Comments
1	0-7"	10 YR 3/3	Loam	Granular	Very friable	No	Heavy rain day before, moist
	7-16"	10 YR 3/6	Sandy loam	Granular	Very friable	No	Moist
	16-72"	2.5 Y 5/2	Sandy loam	Sub-angular blocky	Very friable	Prominent, common at 16"	Estimated seasonal high water table (ESHWT) at 16", water entering pit, many small stones, no ledge to 72"
2	0-10"	10 YR 3/3	Loamy, fine sand	Granular	Very friable	No	Moist
	10-28"	10 YR 3/6	Sandy loam	Granular	Very friable	No	Moist
	28-41"	10 YR 3/4	Coarse sand	Single grain	Loose	Prominent at 28"	ESHWT at 28", wet
	41-72"	2.5 Y 5/2	Sandy loam	Sub-angular blocky	Friable	Prominent, common	Water entering pit at 41", no ledge to 72"
3	0-10"	10 YR 3/3	Loam	Granular	Very friable	No	Moist
	10-19"	10 YR 3/6	Sandy loam	Sub-angular blocky	Very friable	No	Moist
	19-36"	2.5 Y 5/2	Sandy loam	Sub-angular blocky	Friable	Prominent and common at 19"	ESHWT at 19", o ledge to 30", water entering pit at 19"
4	0-9"	10 YR 3/3	Loam	Granular	Very friable	No	Moist
	9-13"	10 YR 3/4	Sandy loam	Granular	Very friable	No	
	13-36"	10 YR 5/2	Sandy loam	Sub-angular blocky	Friable	Prominent and distinct at 13"	ESHWT at 13", water entering at 13", no ledge to 36"

Test Pit #	Depth (inches)	Color	Texture	Structure	Consistency	Redoximorphic Features	Comments
5	0-12”	10 YR 3/3	Loam	Granular	Friable	No	Moist
	12-17”	10 YR 3/4	Sandy loam	Granular	Friable	No	Moist
	17-36”	2.5 Y 5/2	Sandy loam	Sub-angular blocky	Friable	Prominent, common at 17”	ESHWT at 17”, water entering pit, no ledge to 36”
6	0-8”	10 YR 3/3	Loam	Granular	Friable	No	Moist
	8-12”	10 YR 2/1	Loam	Granular	Friable	No	moist
	12-36”	2.5 Y 5/2	Sandy loam	Angular blocky	Friable	Prominent, common at 12”	ESHWT at 12”, no ledge to 36”

Bradley Jay & Karin C. LaRose
Two-Lot Subdivision
156 Wortheim Road,
Richmond, Vermont

Lots No. 1 and No. 2 Mound Systems
Desktop Effluent Mounding Analyses

Lot No. 1 Replacement Bottomless Sand Filter:

- Soils present directly beneath, and downslope of the Lot No. 1 replacement performance-based mound system consist of loam extending to 7" over top of sandy loam soil that extends to between 16" and 28" below ground surface. The loam was used in the effluent mounding analysis.

- Depth to the seasonal high water table (SHWT) is 16" (1.33') below ground surface (conservative), based on soil mottling in test pit TP-01.

- The average ground surface slope is 12% in the vicinity of the Lot No. 1 proposed replacement wastewater disposal mound system area.

The following equation is used from the ANR "Simplified Procedure for Prescriptive Desktop Mounding Analysis", dated April 12, 2019:

$$LLR = (f)(h)$$

where: LLR = linear loading rate, gpd/ft.

h = soil thickness available for groundwater mounding in feet.

f = the LLR factor from Table 9-14 of the April 12, 2019 ANR document, which is based on soil texture and slope.

from Table 9-14:

Loam soil with a slope of 12%, therefore $f = 14$

SHWT = 1.33' (16") – 0.5' (6") = 0.83' (10") = h

Using the formula above, the linear loading rate and minimum bottomless sand filter (BSF) size is determined as follows:

- LLR= (0.83')(14) = 11.62 gpd/linear foot.

- 420 gpd/11.62 gpd/linear feet = 36.14 feet minimum BSF length.

- Loading at 1.0 gpd/ft^2, 420 gpd/1.0 gpd/ft^2 = 420 ft^2 of infiltration area is required.

- 426.6 ft^2 of infiltration area is supplied by a 10' foot by 50 foot BSF.

- The actual linear loading rate (ALLR) is: 420 gpd/48.75 ft = 8.6 gpd/linear foot.

- The actual effluent mounding (AEM) is determined by dividing the actual linear loading rate (ALLR) by the linear loading rate factor (*f*) = AEM = (A*LLR*/*f*) = (8.6/14) = 0.61' or 7.3"

- Then, the amount of unsaturated soil ("freeboard") between the top of the induced groundwater mound and the ground surface is determined by subtracting the AEM from the SHWT = 1.33' – 0.61' = 0.72' or 8.6".

Lot No. 2 Primary Mound System:

- Soils present directly beneath, and downslope of the Lot No. 2 primary performance-based mound system consist of a loam soil to a depth of 8" to 12" over top of a sandy loam that extends to 36" below ground surface. The loam was used in the effluent mounding analysis.

- Depth to the SHWT is 12" (1.0') below ground surface (conservative), based on soil mottling in test pit TP-6.

- The average ground surface slope is 12.5% in the vicinity of the Lot No. 2 proposed primary performance-based mound system area.

The following equation is used from the ANR "Simplified Procedure for Prescriptive Desktop Mounding Analysis", dated April 12, 2019:

$$LLR = (f)(h)$$

where: *LLR* = linear loading rate, gpd/ft.

h = soil thickness available for groundwater mounding in feet.

f = the LLR factor from Table 9-14 of the April 12, 2019 ANR document, which is based on soil texture and slope.

Loam soil with a slope of 12.5%, therefore $f = 14$

SHWT = 1.0' (12") – 0.5' (6") = 0.5' (6") = *h* (conservative).

Using the formula above, the linear loading rate and minimum mound size is determined as follows:

- *LLR*= (0.5)(14) = 7.0 gpd/linear foot.

- 420 gpd/7.0 gpd/linear feet = 60' foot minimum mound length.

- Since loading at 1.0 gpd/ft^2, 420 gpd/1.0 gpd/ft^2 = 420 ft^2 of bed area is required.

- 420 ft^2 of infiltration area is supplied via one 7 foot by 60' foot absorption bed.

- The actual linear loading rate (ALLR) is: 420 gpd/60 ft = 7.0 gpd/linear foot.

- The actual effluent mounding (AEM) is determined by dividing the actual linear loading rate (ALLR) by the linear loading rate factor (*f*) = AEM = (A*LLR*/*f*) = (7.0/14.0) = 0.50' or 6".

- Then, the amount of unsaturated soil ("freeboard") between the top of the induced groundwater mound and the ground surface is determined by subtracting AEM from the SHWT = 1.0' – 0.5' = 0.5' or 6.0".

Conclusions

Based on the September 27, 2022, test pit evaluations and the hydrogeologic effluent mounding analysis presented above, the following conclusions are offered:

- Lot No. 1 replacement BSF, if constructed with an 10foot wide by 50 foot long absorption bed with 1 foot of mound sand will maintain the effluent plume at least 6 inches below existing ground surface at all times of the year and will provide a minimum of 20.6 inches (1.72 feet) of unsaturated soil (i.e. 0.72 feet of freeboard + 1.0 feet of mound sand = 1.72 feet) between the top of the induced groundwater mound and the bottom of the BSF absorption bed. Further, with 1.0 foot of mound sand beneath the BSF absorption bed and at least 6 feet (72 inches) to bedrock in the test pits excavated in the vicinity of the replacement BSF area, there is greater than 4 feet (48 inches) of vertical separation between the bottom of the BSF system's absorption bed and any underlying bedrock that may be present.

- Lot No. 2 primary performance-based mound system, if constructed with a 7 foot wide by 60 foot long absorption bed with 2.5 feet (30 inches) of mound sand beneath the absorption bed will maintain the effluent plume at least 6 inches below ground surface at all times of the year and will provide at least 36 inches (6 inches of freeboard + 30 inches of mound sand = 36 inches) of unsaturated soil between the top of the induced groundwater mound and the bottom of the absorption bed at all times of the year. Further, with 2.5 feet of mound sand beneath the bed and at least 36" inches to bedrock in the test pits excavated in the vicinity of Lot No. 2 primary mound system there is greater than 4 feet (48 inches) of vertical separation between the bottom of the absorption bed and any underlying bedrock that may be present.

BOTTOMLESS SAND FILTER WASTEWATER DISPOSAL SYSTEM BASIS OF DESIGN

Bradley Jay LaRose & Karin C. LaRose
Two-Lot Subdivision Wastewater Disposal System Design
156 Wortheim Road, Richmond, Vermont
May 3, 2023

Prepared By: Jason Barnard Licensed Designer #126179

Bottomless Sand Filter Design

I. WASTEWATER FLOWS AND SAND FILTER SIZING

A. WASTEWATER FLOWS (Q)

3	Bedrooms	140	gpd/bedroom=	420	gpd
			Total Flows =	**420**	gpd

B. REQUIRED SEPTIC TANK

Required Septic Tank Capacity = **1,000 gallon** for a **3-bedroom** single-family residence.

C. BOTTOMLESS SAND FILTER SYSTEM APPLICATION RATE (AR)

Per Table 9-3 of the current State of Vermont EPR, loam has an
Application rate (AR) for bottomless sand filters of 0.5 gpd/sf.
Ra maximum = 1.0 gpd/sf using advanced treatment
Selected Ra = **1.00** gpd/sf

D. REQUIRED LEACHFIELD AREA (RLA)

RLA = Q / AR

RLA =	420	/	1.00
RLA =	**420**	sf	

E. PROPOSED LEACHFIELD AREA (PLA)

PLA = LENGTH (L) x WIDTH (W) x NUMBER OF TRENCHES or BEDS (N)

L =	48.75	ft
W =	8.75	ft
N =	1	Sand Filter

PLA= **426.5** sf
PLA > RLA therefore PLA is acceptable

II. BOTTOMLESS SAND FILTER PRESSURE DISTRIBUTION DETAILS

In the event it is necessary to install the replacement bottomless sand filter for the existing residence, the design will be finalized, the advanced treatment system will be selected, and a permit amendment applied for before the system can be installed.

MOUND WASTEWATER DISPOSAL SYSTEM BASIS OF DESIGN

Bradley Jay LaRose & Karin C. LaRose
Two-Lot Subdivision Wastewater Disposal System Design
156 Wortheim Road, Richmond, Vermont
May 3, 2023
Prepared By: Jason S. Barnard, Licensed Designer #126179

Lot 2 Primary Mound Wastewater Disposal System

I. WASTEWATER FLOWS AND MOUND DISPOSAL SYSTEM SIZING

A. WASTEWATER FLOWS (Q)

3	Bedrooms	140	gpd/bedroom=	420	gpd
			Total Flows =	**420**	gpd

B. REQUIRED SEPTIC TANK

Required Septic Tank Capacity = **1,000 gallons** for a **3-bedroom** accessory dwelling.

C. APPLICATION RATE (AR)

Per the current EPR, an application rate of 1.0 gallons per day (gpd) per square foot (sf) was utilized.

D. MOUND SYSTEM APPLICATION RATE (AR)

AR = Application rate for sizing the mound system leachfield area (LA)
Ra maximum = 1.0 gpd/sf for Mounds
Selected Ra = **1.0** gpd/sf

E. REQUIRED LEACHFIELD AREA (RLA)

RLA = Q / AR
RLA = 420 / 1.0
RLA = **420** sf

F. PROPOSED LEACHFIELD AREA (PLA)

PLA = LENGTH (L) x WIDTH (W) x NUMBER OF TRENCHES or BEDS (N)

L =	60	ft
W =	7	ft
N =	1	Absorption Bed

PLA= **420** sf
PLA >= RLA therefore PLA is acceptable

G. MOUND SYSTEM BASAL AREA (BA)

G1. BASAL AREA APPLICATION RATE (BAAR)

BAAR = Application rate for sizing basal area (BA)
BAAR = 0.74 gpd/sf for PR<60 min/inch
BAAR = 0.24 gpd/sf for 60 min/inch < PR < 120 min/inch
Selected BAAR = **0.74** gpd/sf

G2. REQUIRED BASAL AREA (RBA)

RBA = Q / BAAR
RBA = 420 / 0.74
RBA = **568** sf

G3. PROPOSED BASAL AREA (BA)

PBA = Trench or Seepage Bed Length (L) x Distance from uphill side of trench to downhill mound toe (MT).

L =	60	ft
MT =	28	FT

PBA = **1650** sf
PBA > RBA, therefore the PBA is acceptable

MOUND WASTEWATER DISPOSAL SYSTEM BASIS OF DESIGN

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Two-Lot Subdivision Wastewater Disposal System Design
156 Wortheim Road, Richmond, Vermont
May 3, 2023
Prepared By: Jason S. Barnard, Licensed Designer #126179

Lot 2 Primary Mound Wastewater Disposal System

II. MOUND SYSTEM PRESSURE DISTRIBUTION DETAILS

A. PROPOSED MOUND SYSTEM DISTRIBUTION SYSTEM

SEE THE ATTACHED ORENCO SYSTEMS, INC. PUMP SELECT SPREAD SHEET FOR THE PROPOSED MOUND SYSTEM PRESSURE DISTRIBUTION DETAILS.

B. TOTAL NUMBER OF ORIFICES IN THE DISTRIBUTION SYSTEM

Number of Orifices = **30** orifices

C. LEACHFIELD AREA (LA) PER ORIFICE

LA/Orifice = LA / Total Number of Orifices
LA/Orifice = **14.0** sf
LA/Orifice is less than 25 SF per Orifice, therefore the proposed number of orifices is in accordance with the current State of Vermont, EPRs.

III. PROPOSED PUMP STATION DESIGN

A. REQUIRED PUMP STATION

Required Pump Station Capacity = **800 gallons** for a 3-**bedroom** single-family residence.

B. REQUIRED MOUND SYSTEM DOSE

Required Dose Volume = **112** Gallons
Pump Station Dimensions: On-Site Septic Solutions 800 Gallon Pump Station = 4.83 ft x 7.5 ft
Area of Pump Station = 36.2 sf
Volume per Inch of depth = 22.6 gallons / vertical inch
Pump on/off switch difference setting required for dose: 5.0 inches

C. REQUIRED PUMP STATION STORAGE

Storage Required = **420** gallons (1 day's flow)

D. PUMP STATION STORAGE

Pump alarm to overflow point height difference = 21.0 inches
Storage Provided = **475** gallons
Storage provided is greater than 1 day's flow, therefore the proposed pump station is adequately sized.

E. PROPOSED EFFLUENT PUMP

Champion Model Number CPS4A-12 4/10 hp 115 volt 1 phase

F. PROPOSED PUMP STATION EFFLUENT PUMP

See Attached Effluent Pump Curve

Champion Pump

CPE 4/10HP & 1/2HP EFFLUENT

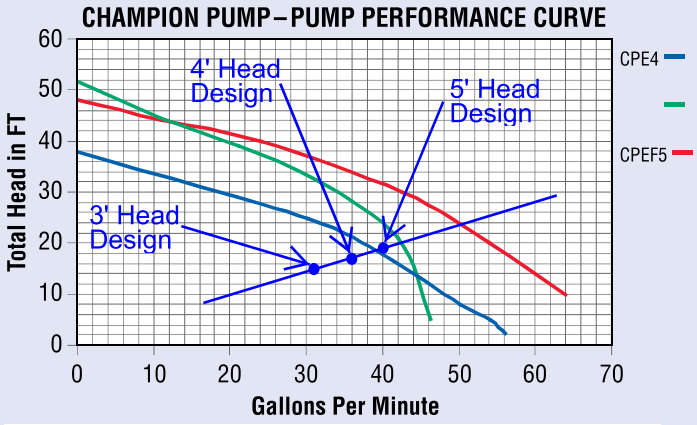
BRADLEY JAY & KARIN C. LAROSE
LOT 2 WASTEWATER DISPOSAL SYSTEM
156 WORTHEIM ROAD, RICHMOND, VERMONT

FEATURES/BENEFITS

- High Efficient Motor With Upper & Lower Ball Bearings/Runs Cooler & Last Longer
- Cast Iron Vortex Impeller/Helps Prevent Clogging
- Inboard Seal-Rotating Components Of Seal Are In The Motor Housing, Lubricated By The Motor Oil/Seal Will Last Longer If Pump Runs Dry, Hair And Debris Cannot Wrap Around Seal Components
- Secondary Exclusion Seal/Keeps Debris From Entering Seal Cavity
- Sealed Entry-Replaceable Power Cord/Easy To Replace In The Field, Prevents Water From Entering The Motor Housing Through A Cut Power Cord (Up To 50' Available)
- Piggy-Back Switch Design/Defective Switches Can Be Diagnosed By Phone; Pump Can Be Operated Manually by Overriding The Switch
- Every Pump Is Tested In Water/Ensures That The Pump Meets Head & Flow Requirements

APPLICATIONS

- Dewatering, Elevator Pits, Septic Systems



Distributed by:

On-site Septic Solutions, LLC
802-644-5500

CPE5V–12

CPE5A–12

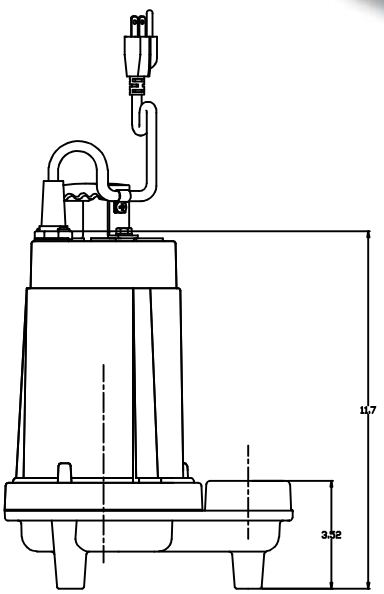
www.championpump.com

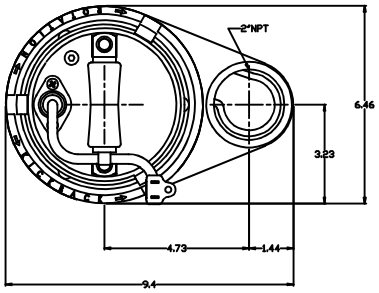
Champion Pump

CPE 4/10HP & 1/2HP EFFLUENT

BRADLEY JAY & KARIN C. LAROSE
LOT 2 WASTEWATER DISPOSAL SYSTEM
156 WORTHEIM ROAD, RICHMOND, VERMONT

DISCHARGE	2" NPT. Vertical
SOLIDS HANDLING	3/4"
LIQUID TEMPERATURE	140 Degrees F. (Intermittent)
MOTOR HOUSING	Cast Iron
VOLUTE	Cast Iron
SEAL PLATE	Cast Iron
IMPELLER	Cast Iron
SHAFT	Stainless Steel
SHAFT SEAL	Inboard Mechanical With Secondary Exclusion Seal Carbon - Rotating Face Ceramic - Stationary Face Buna-N - Elastomer 300 Series Stainless Steel - Hardware
BEARING (UPPER & LOWER)	Single Row, Ball, Oil Lubricated
HARDWARE	300 Series Stainless Steel
SQUARE RINGS	Buna-N
CORD	(UL/CUL) Listed 16 AWG, Type SJTW 20' Length Standard. Other Lengths Available.
CORD ENTRY	Compression Grommet – Outer Jacket Seal Quick Disconnect Pin Terminals
MOTOR (SINGLE PHASE)	4/10 & 1/2 HP, 3450 RPM. 60Hz NEMA L Includes Overload Protection In The Motor. Oil Filled, Class B Permanent Split Capacitor
WEIGHT	35lbs (Manual)





Model	HP	Volts	Phase	Amps	Cord Length	Switch
CPE4-12 • CPE5-12 • CPEF5-12	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	20	Manual
CPE4-22 • CPE5-22 • CPEF5-22	4/10 • 1/2 • 1/2	230	1	3.3 • 3.6 • 4.3	20	Manual
CPE4-13 • CPE5-13 • CPEF5-13	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	30	Manual
CPE4-15 • CPE5-15 • CPEF5-15	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	50	Manual
CPE4A-12 • CPE5A-12 • CPEF5A-12	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	20	Float
CPE4A-22 • CPE5A-22 • CPEF5A-22	4/10 • 1/2 • 1/2	230	1	3.3 • 3.6 • 4.3	20	Float
CPE4A-13 • CPE5A-13 • CPEF5A-13	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	30	Float
CPE4V-12 • CPE5V-12 • CPEF5V-12	4/10 • 1/2 • 1/2	115	1	6.6 • 7.2 • 8.5	20	Vertical Float
CPE4V-22 • CPE5V-22 • CPEF5V-22	4/10 • 1/2 • 1/2	230	1	3.3 • 3.6 • 4.3	20	Vertical Float

Champion Pump Company, Inc • P.O. Box 528 • Ashland, OH 44805
phone 419-281-4500 • toll free 800-659-4491 • fax 419-616-1100

Pump Selection for a Pressurized System - Single Family Residence Project

Bradley Jay & Karin C. LaRose, 156 Wortheim Road, Richmond, Vermont / Project #22356

Parameters

Discharge Assembly Size	2.00	inches
Transport Length	90	feet
Transport Pipe Class	40	
Transport Line Size	2.00	inches
Distributing Valve Model	None	
Max Elevation Lift	8.25	feet
Manifold Length	3.5	feet
Manifold Pipe Class	40	
Manifold Pipe Size	2.00	inches
Number of Laterals per Cell	2	
Lateral Length	56	feet
Lateral Pipe Class	40	
Lateral Pipe Size	2.00	inches
Orifice Size	7/32	inches
Orifice Spacing	4	feet
Residual Head	4	feet
Flow Meter	None	inches
'Add-on' Friction Losses	0	feet

Calculations

Minimum Flow Rate per Orifice	1.19	gpm
Number of Orifices per Zone	30	
Total Flow Rate per Zone	35.7	gpm
Number of Laterals per Zone	2	
% Flow Differential 1st/Last Orifice	1.4	%
Transport Velocity	3.4	fps

Frictional Head Losses

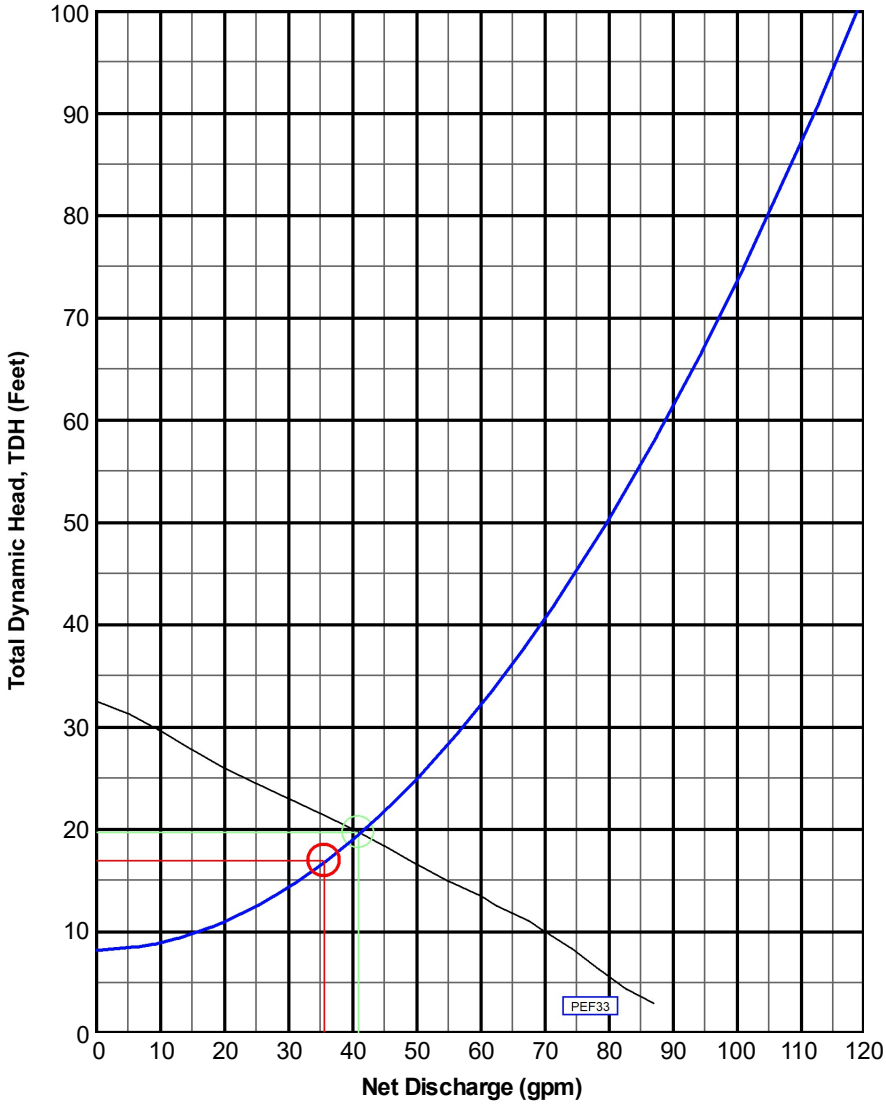
Loss through Discharge	2.5	feet
Loss in Transport	1.9	feet
Loss through Valve	0.0	feet
Loss in Manifold	0.0	feet
Loss in Laterals	0.1	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	0.0	feet

Pipe Volumes

Vol of Transport Line	15.7	gals
Vol of Manifold	0.6	gals
Vol of Laterals per Zone	19.5	gals
Total Volume	35.8	gals

Minimum Pump Requirements

Design Flow Rate	35.7	gpm
Total Dynamic Head	16.9	feet



PumpData

PEF33 Effluent Pump
1/3 HP, 230V 1Ø

Legend

System Curve:
Pump Curve:
Pump Optimal Range:
Operating Point
Design Point

Orenco Systems®
Incorporated
Changing the Way the World Does Wastewater®

BRADLEY JAY & KARIN C. LAROSE
LOT 2 WASTEWATER DISPOSAL SYSTEM
156 WORTHEIM ROAD, RICHMOND, VERMONT

TAN3M (XT Alarm System)

- The Tank Alert® XT can be used as a high level alarm in lift chambers, sump pump basins and holding tanks.
- UL Listed (for indoor and outdoor use) and CSA Certified.
- Voltage: 120 VAC, 50/60 Hz, 8.5 watts maximum, (alarm condition)
- Enclosure meets Type 3R water-tight standards, listed for indoor or outdoor use under UL standard 864. Dimensions are 6.5" x 4.5" x 3.0"
- Premounted terminal block so enclosure can also be used as a junction box for splicing pump, pump switch and pump power. Meets NEC standard for junction boxes.
- N.O. float switch has a 15' long, 18 gauge, 2 conductor SJOW (UL) cord
- Mechanical SignalMaster® Float on TAN3M, switches are rated for a maximum fluid temperature of 140° F (60° C)
- Automatic alarm reset, alarm test switch and horn silence switch
- Alarm Horn: 85 decibels at 10 feet (3 meters)
- Does not control or interface with pump
- Operates even if pump circuit fails when wired on separate circuit
- No power cord.

LR54245 LISTED

TAN4M (4X Alarm System)

- The Tank Alert® 4X can be used as a weatherproof high level alarm in lift chambers, sump pump basins and holding tanks.
- UL and cUL Listed
- Single phase, 120 volt, 60/50 hertz power supply required, 7 watts max. during alarm condition
- NEMA 4X enclosure rated for indoor or outdoor use.
- No power cord.
- Float Switch: Sensor Float® control switch with mounting clamp, 15' long, 18 gauge, SJOW.
- Stainless steel alarm horn sounds at 88db @ 10' (3 meters)
- NEMA 4X alarm beacon
- Automatic alarm reset and alarm test/normal/horn silence switch
- Dimensions are 6.4" x 5.3" x 5.0"
- Switches are rated for a maximum fluid temperature of 140° F (60° C)
- Does not control or interface with pump
- Operates even if pump circuit fails when wired on separate circuit.

Hydraulic LISTED

MOUND CONSTRUCTION INSTRUCTIONS

Mound construction procedures are just as important as the mound design. Good design with poor construction will result in the mound operating poorly and may result in failure. Proper equipment is essential. Small track type excavators work best. Wheel type tractors are too difficult to maneuver in the fill. The following is a step by step procedure for mound construction which has been tried and proven. Other techniques could be used as long as the basic principles of mound design, operation, and construction are not violated.

1. Submit a *representative* sample (enough to fill a 5 gallon bucket) of mound sand from the intended source for testing according to ASTM D 422 (Knight Consulting Engineers and Vermont Testing can perform this test). Submit a copy of the results to the designer.

2. Stake out the mound on this site so that the trenches or bed run perpendicular to the direction of the slope. Reference stakes are recommended in case corner stakes are disturbed.

3. Stake out corners of the bed and determine the bottom elevation of the bed.

4. Determine where the force main from the pump chamber connects to the distribution system in the mound.

5. Trench and lay the force main from the pump chamber to the mound. Lay the pipe 5.5' below the ground surface for frost protection. Where there is less than 5.5' of cover, insulate with 2" of rigid polystyrene insulation 4' wide (2' either side of pipe, placed in two 1" layers with staggered joints). Alternatively, where there is less than 5.5' of soil cover, the force main can be sloped *uniformly* back to the pumping chamber so that it drains after each dosing. Cut and cap the pipe one foot beneath the ground surface. Backfill and compact soil around the pipe to prevent back seepage of effluent along pipe. This step must be done before plowing to avoid compacting and disturbance of surface.

6. Install the curtain drain (if shown on plans).

7. Check the moisture content of the soil at 7 – 8 inches deep. If it is too wet, smearing and compaction will result, thus reducing the infiltration capacity of the soil. Soil moisture can be determined by rolling a soil sample between the hands. If it rolls into a ribbon, the site is too wet to prepare. If it crumbles, soil preparation can proceed.

8. Cut trees to ground level, remove excess vegetation by mowing. Prepare the site by using a moldboard plow to create 8 – 10 inch deep furrows perpendicular to the slope. Furrows must be thrown up hill. Chisel plowing may be used if a

moldboard plow is not available. Rototilling must not be done on heavy soils but can be used on non-structural soil such as sands. Alternatively, plowing can be done by using an excavator bucket to pull the soil into furrows parallel with the ground contours (the resulting surface must look as though it had been plowed with a moldboard plow, as outlined above). Immediate construction after plowing is necessary. Avoid rutting of plowed area with vehicular traffic. Inspection required at this point.

9. Extend the effluent pipe to several feet above the ground surface.

10. Place the approved fill material around the edge of the plowed area. Keep wheels of truck off plowed areas. Minimize the traffic on the downslope side of the mound. Work from the end and upslope side.

11. Move the fill material into place using a small track type tractor with a blade. Always keep a minimum of 6 inches of sand beneath tracks to prevent compaction of the natural soil.

12. Place the fill material to the required depth which is the top of the trenches or bed. Shape sides to the desired slope. Inspection required at this point.

13. With the blade of the tractor form the bed or trenches. Hand level the bottom of the bed. Make sure bottom is at the same elevation and level.

14. Place the coarse aggregate in the trenches or bed. It should be ¾ to 1 ½ inch, washed, durable aggregate (i.e. **not** limestone or marble). Level aggregate to the design depth.

15. Place the distribution system on the aggregate. Connect the manifold to the force main from the pump chamber or siphon chamber. Slope manifold slightly toward distribution laterals. Lay laterals level, removing rises and dips. Place orifices upwards until pressure testing is complete. Inspection required at this point (to observe discharge rate and pressure testing).

16. Rotate orifices downward and properly cement all components. Place 2 inches of aggregate over the distribution pipe.

17. Place a synthetic non-woven filter fabric (Mirafi 140N or equivalent) over the entire stone bed. Overlap joints by 12" minimum. Place an 8'x8' mat of rigid polystyrene insulation, 2 inches thick, centered over force main riser. Place insulation in two layers (1" each) and stagger the joint pattern.

18. Place soil on top of the bed or trench to a depth of 1 foot in center and 6 inches at outer edge of bed or trenches. This may be a subsoil or topsoil.

19. Place 6 inches of good quality topsoil over the entire mound surface. This will raise the elevation at the center of the mound to a minimum of 1.5 feet and the outside edges of bed or trenches 1 foot. Inspection required at this point.

20. Landscape the mound by planting grass, using the best vegetation adaptable to the area. A mixture of 90% birdsfoot trefoil and 10% timothy may be desirable if the mound is not manicured. If manicuring is desired, a combination of 60% bluegrass, 30% creeping red fescue and 10% annual rye grass may be the desired vegetative cover. Shrubs can be planted around the base and up the sideslopes. They should be somewhat moisture tolerant since the toe of the mound may be somewhat moist during various times of the year. Keep all trees and shrubs away from the top of the mound, as root systems can destroy the distribution network.

21. Mound maintenance involves pumping the septic tank and pump chamber every 1 to 3 years to avoid carryover of solids into the mound. A good water conservation plan within the house assures that the mound will not be overloaded. Avoid excess traffic on the mound area. Winter traffic on mound should be avoided to minimize the frost penetration. Inspect pump chamber and septic tank each year to determine the level of sludge accumulation.