Alternative Septic System Update 4

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Project Background

- Located at 1955 North Echo Canyon Rd. Page Springs, AZ
- Alternative septic system design selection
- Irrigation design for vineyard
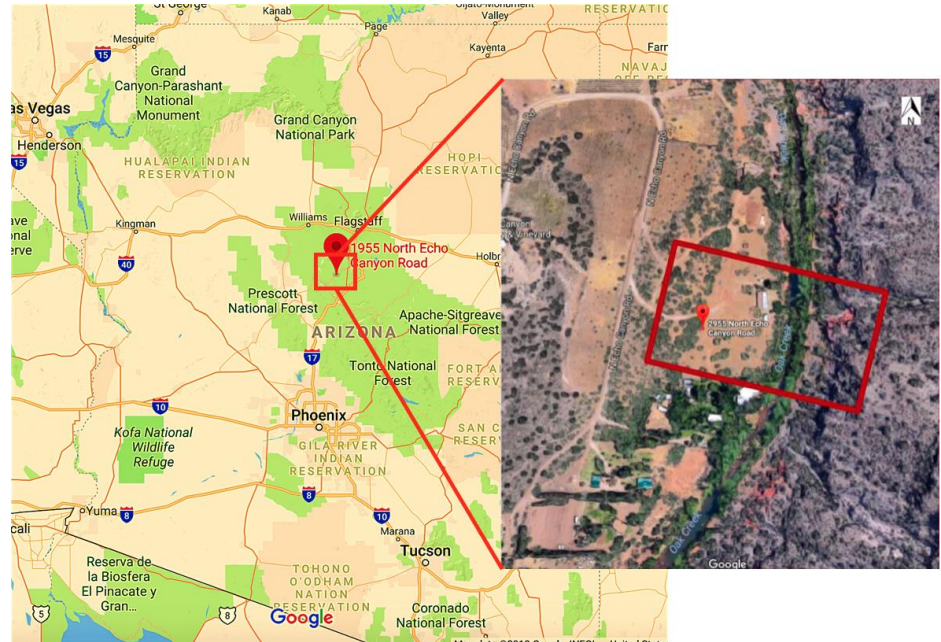- Water quality analysis of well water
- 1-ft topographic map of property

Figure 1: Site Location, provided by Google Maps

Schedule

Table 1: Team Schedule

Task No.	Task	Start Date	End Date
2.0	Off-site Technical Analysis	1/29/18	2/4/18
3.0	Alternative Septic System Design Evaluation	2/5/18	3/25/18
4.0	Irrigation System Design Evaluation	2/5/18	3/25/18
5.0	System Design	3/26/18	4/22/18
5.1	Septic System Design	3/26/18	4/22/18
5.2	Irrigation System Design	3/26/18	4/22/18

Water Quality Analysis

- Three samples tested from each source location.

- Samples were tested against two independently prepared blanks.

- Sample 1 & 2 used to measure average results.

Average Total Nitrogen:

- Well: 0.325 mg/L

- Tap: 0.675 mg/L

Table 2: Total Nitrogen Results

	Source	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)
Blank 1	Well	0.4	0.3	-0.6
	Tap	0.6	0.8	1.6
Blank 2	Well	0.3	0.3	-0.5
	Tap	0.6	0.7	1.6

Method: HACH #10071

Septic System Design

System Requirements:

- 1000 gal system
- Effluent TSS = 30 mg/L
- Effluent BOD = 30 mg/L
- Effluent Total N = 53 mg/L
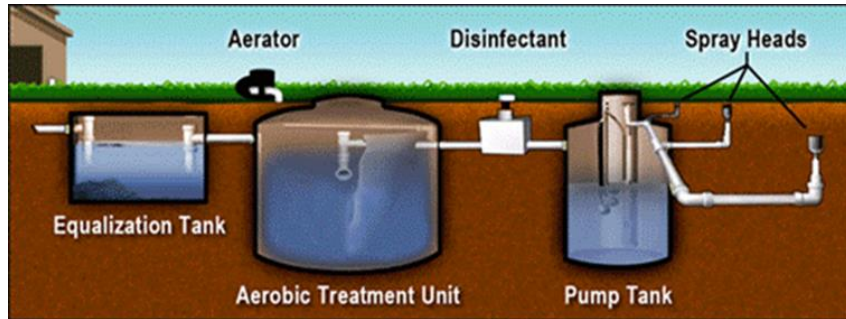- Effluent Coliform = 300,000 colonies/100 mL
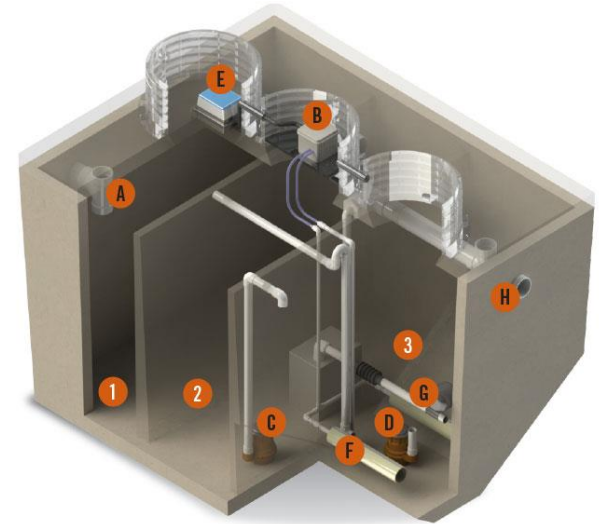

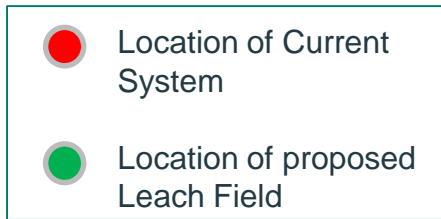Figure 1: Aerobic Septic System [1]

Figure 2: Sequencing Batch Reactor [2]

Septic System Design

🔴 Location of Current System

🟢 Location of proposed Leach Field

- Percolation Rate = 1.58 min/in
- Soil Absorption Rate = 0.93 gpd/ft^2
- According to R18-9-A312 of Arizona Administrative Code an Adjusted Soil Absorption Rate (SAR$_a$) will need to be found

$$SAR_a = \left[\left(\frac{11.39}{\sqrt[3]{TSS + BOD_5}} - 1.87 \right) SAR^{1.13} + 1 \right] SAR$$
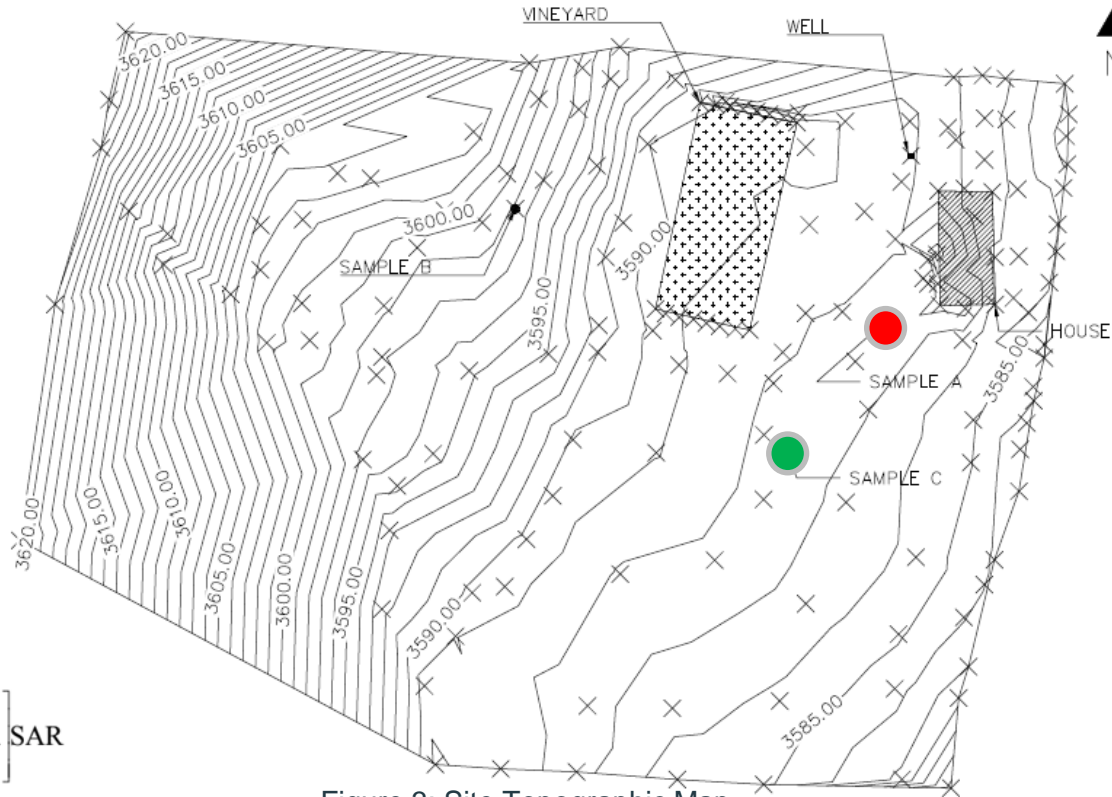

Figure 3: Site Topographic Map

Irrigation System Design
Drip Irrigation

- ¼" Polyethylene Dripline Tubing

- Operating Pressure 10 – 30 psi [3]

- Row length can be no longer than 150 ft

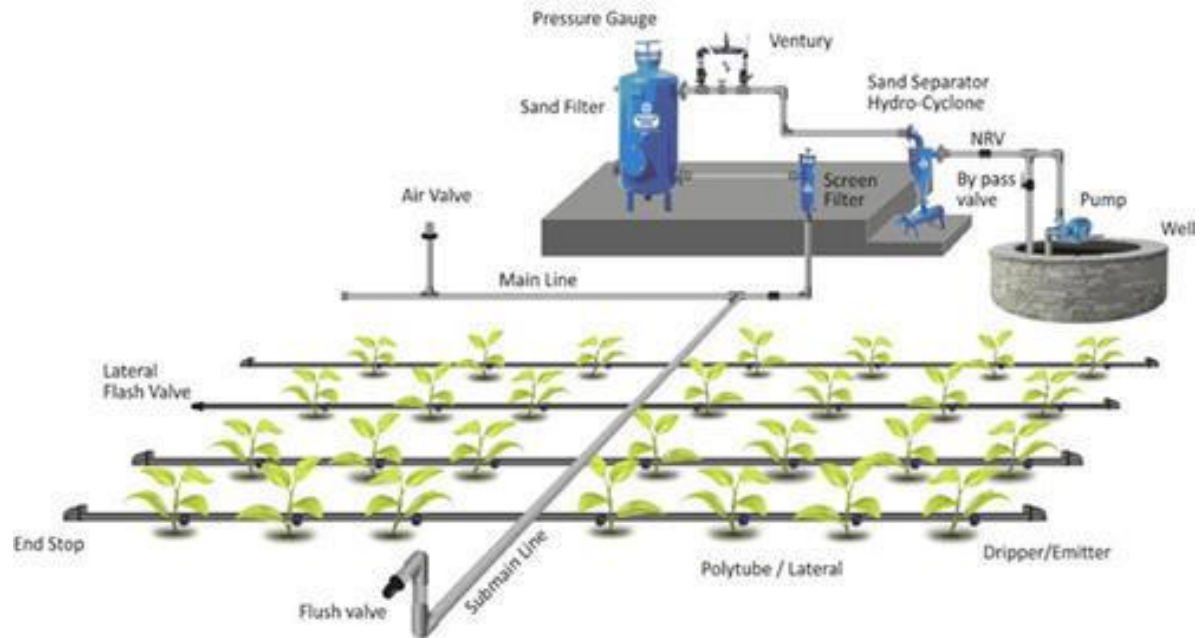- Pressure loss for a length of 150 ft = 17.4 psi [4]

Figure 4: Drip Irrigation [5]

Irrigation System Design
Submersible Pump

Pump Specifications

- Static Head = 63 ft
- Liquid Depth = 8 ft
- Discharge Length = 500 ft
- 3" schedule 40 PVC piping
- Flow of 53 GPM
- Calculated Total Head = 65.4 ft
- *Total head is calculated using PumpFlo Application*

Selected Pump [6]

- Gorman-Rupp Model S2A1
- 2" Inlet/Outlet
- 4.25" diameter
- 115 V

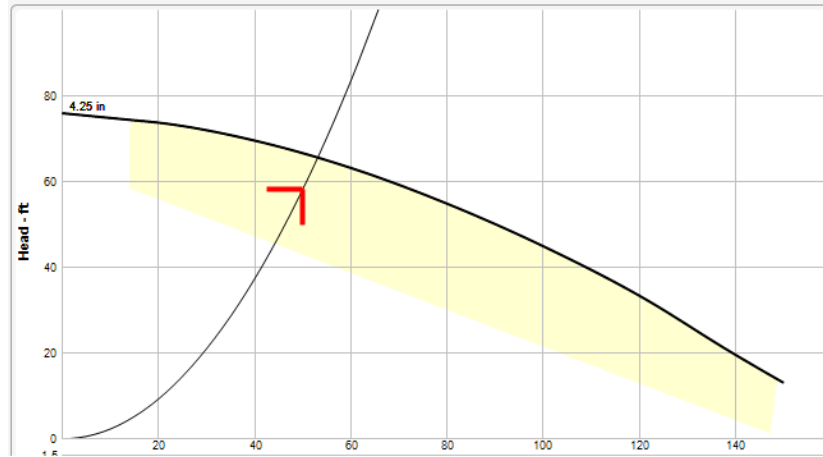Figure 5: Gorman-Rupp Model S2A1 [6]

Figure 6: Pump Performance Curve [7]

References

[1] "Integrated Environment, Inc - Oklahoma Septic System Service, Pumping, and Aerobic," [Online]. Available: http://www.oklahomasepticsystem.com/index.cfm?page=aerobic. [Accessed 27 March 2018].

[2] "Residential Wastewater Treatment System," OnSyte Performance, [Online]. Available: http://onsyte.com/residential-wastewater-treatment-system/. [Accessed 15 April 2018].

[3] D. F. Zoldoske, "Selecting a Drip Irrigation System for Vineyards," Center for Irrigation Technology, 1998.

[4] "Pressure Loss Calculator," DripDepot, [Online]. Available: https://www.dripdepot.com/irrigation-calculators/pressure-loss-calculator. [Accessed 15 April 2018].

[5] "Drip Irrigation System," [Online]. Available: https://www.indiamart.com/proddetail/drip-irrigation-system-15099502830.html. [Accessed 15 April 2018].

[6] "S Series (Widebase Submersible)," Gorman-Rupp, [Online]. Available: https://www.grpumps.com/product/pump/S-Series-Widebase-Submersible. [Accessed 15 April 2018].

[7] "Gorman Rupp Application Selection Program," Gorman Rupp, [Online]. Available: http://gorman-rupp.pump-flo.com/app/pump.aspx?sid=gorman-rupp&CATID=622&SELID=2987936&PSID=38089064. [Accessed 15 April 2018].

Questions?