

# Challenges of building a Slow Sand Filter on a less than optimal site

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# WOODLAND SHORES on Lake Coeur d'Alene



# Woodland Shores Water Assn.

- Developed in early 1970's Location – Rockford Bay on Lake CdA
- Water Right for 400 gpd for 125 residential lots
- 75 existing residents/6 full time
- Source – one 7 gpm well. 4 other wells depleted.
- Storage 30,000 and 10,000 gal reservoirs

# Proposed Solutions

- Construct intake in Rockford Bay
- Construct 70 gpm Slow Sand Filter
- Construct 58,000 gal. reservoir



# Slow Sand Filtration

- Suitable for small systems
- Lower level operator
- 4 other SSF on Lake CdA



# Challenges

- Steep construction site
- Limited budget
- Difficulty obtaining quality sand
- Limited pilot testing
- Wide fluctuations in system demand
- Turbidity from creeks into Rockford Bay
- pH increase from concrete structures
- Managing O & M at the remote site

# Pilot Filter and Source Water

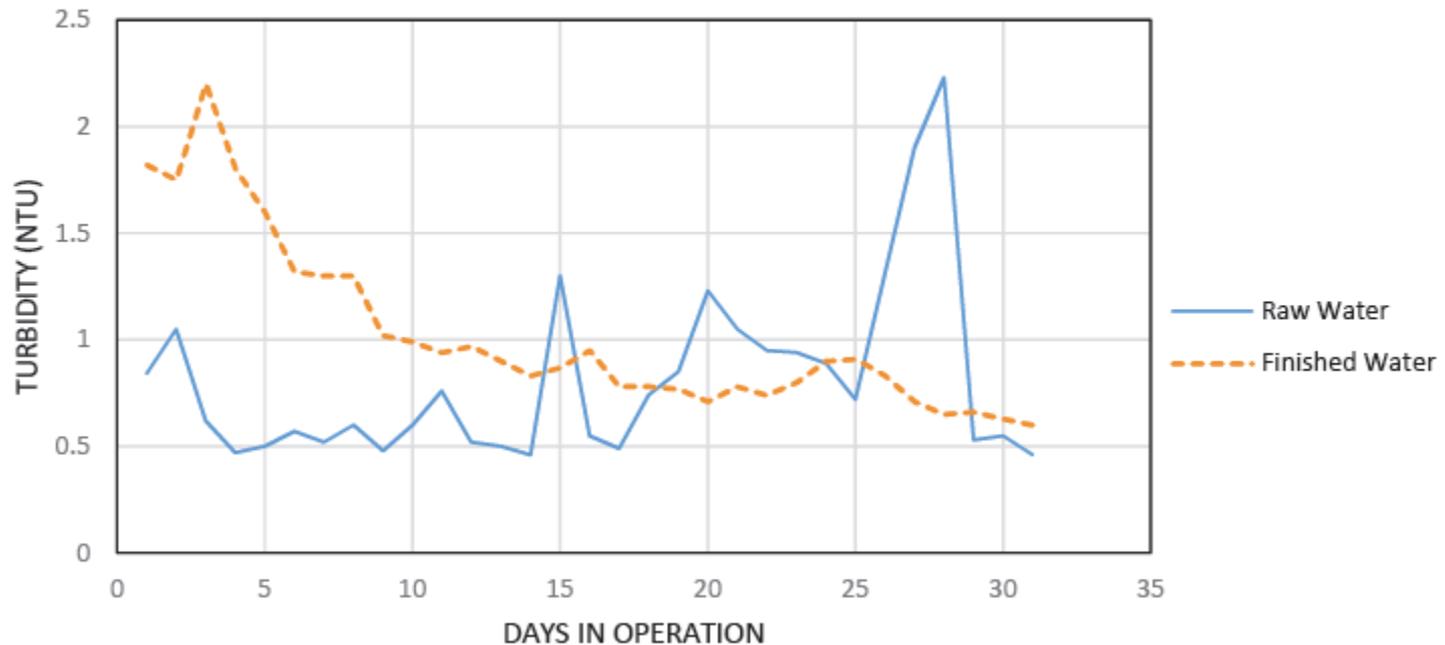


# Pilot Filter Study

- Operated Mid July – Mid October 2014
- Sand effective size 0.18 mm U.C. 1.57
- 30 days to bring turbidity below 1 ntu
- Filter runs 1 and 2 mo. at 0.08 gpm/sq. ft.
- 30 days to bring to full maturity
- pH 6.8 – 7.3

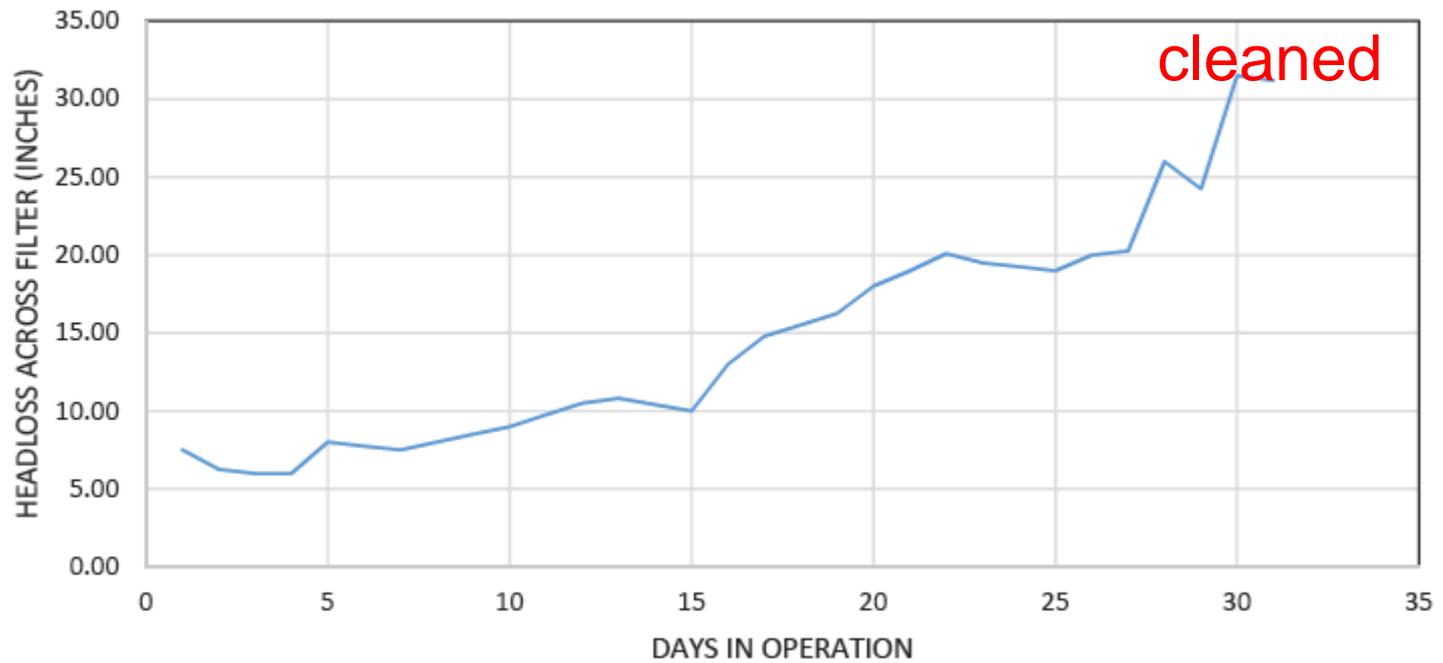
# Pilot Study Turbidity

Figure 2.7 - Woodland Shores Slow Sand Filtration Pilot Project  
Raw and Finished Water Turbidity at Approximately 0.08 gpm/ft<sup>2</sup>  
between August 6 and September 4, 2014



# Pilot Study Head Loss

Figure 2.8 - Woodland Shores Slow Sand Filtration Pilot Project  
Headloss at Approximately 0.08 gpm/ft<sup>2</sup> between August 6 and September 4, 2014



# Pilot Study

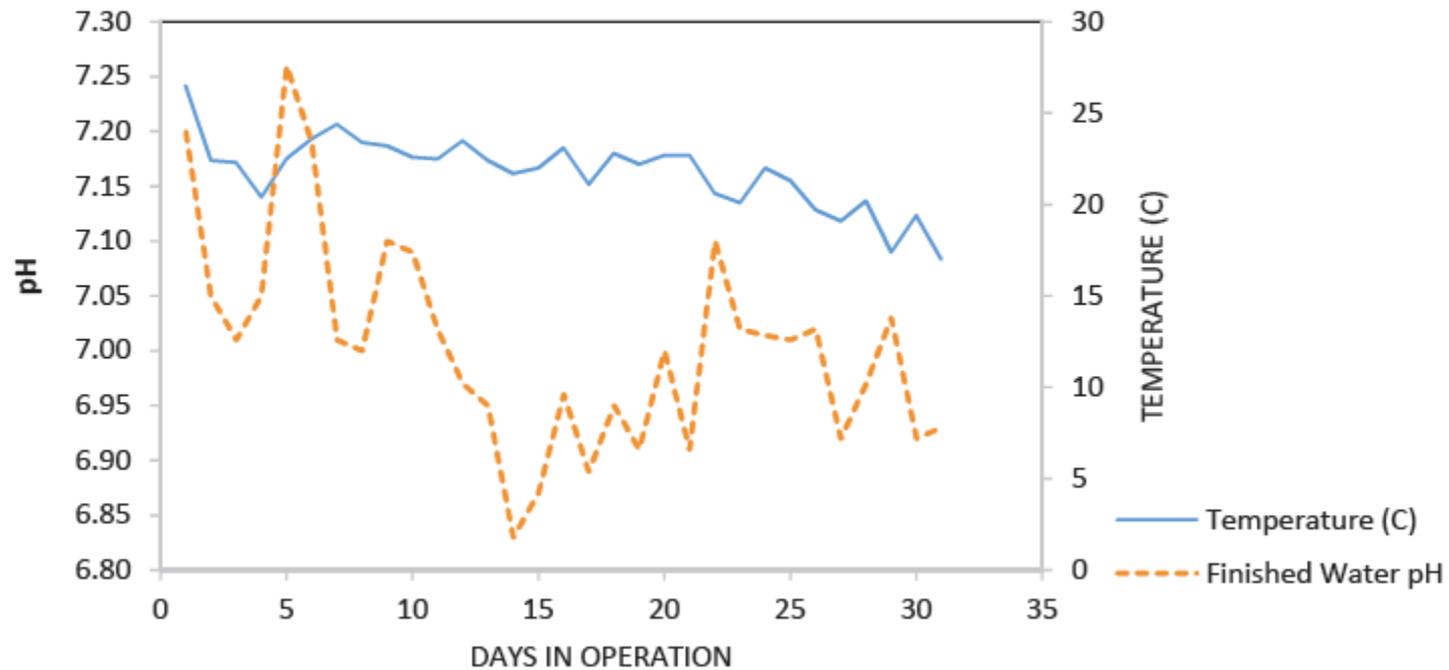
## Coliform Monitoring

Date	Total Coliforms (/100ml)		E. coli (g/100ml)	
	Raw	Finished	Raw	Finished
8/1/2014	38.6	9.5	1	<1
8/7/2014	278.5	5.2	<1	<1
8/19/2014	435	3	12.2	<1
8/22/2014	128	<1	1	<1
8/27/2014	155	2	4.1	<1
8/28/2014	816	4.1	5.2	<1
9/2/2014	285	2	3	<1
9/4/2014	387	1	6.3	<1
9/5/2014	98.7	<1	<1	<1
9/9/2014	225	3.1	2	<1
9/12/2014	150	<1	<1	<1

# Pilot Data

## Temperature and pH

Figure 2.13 Woodland Shores Slow Sand Filtration Pilot Project  
Finished Water Temperature and Finished Water pH  
between August 6 and September 4, 2014



# Location of Intake











# Installation of Underdrain Rock



# Washing the pre-washed underdrain rock



# Sand Source

- Piloted sand no longer available
- Sand was obtained from Emmett, Idaho
  - Effective Size - 3.5 mm
  - Uniformity Coefficient – 1.54
  - NSF 61 listed
  - Successfully used in 3 other SSF in Idaho







# Pipe Gallery/Control Room



3 way  
valve

# Booster Pumps



VFD

# Filtered to Waste Recycle Vault





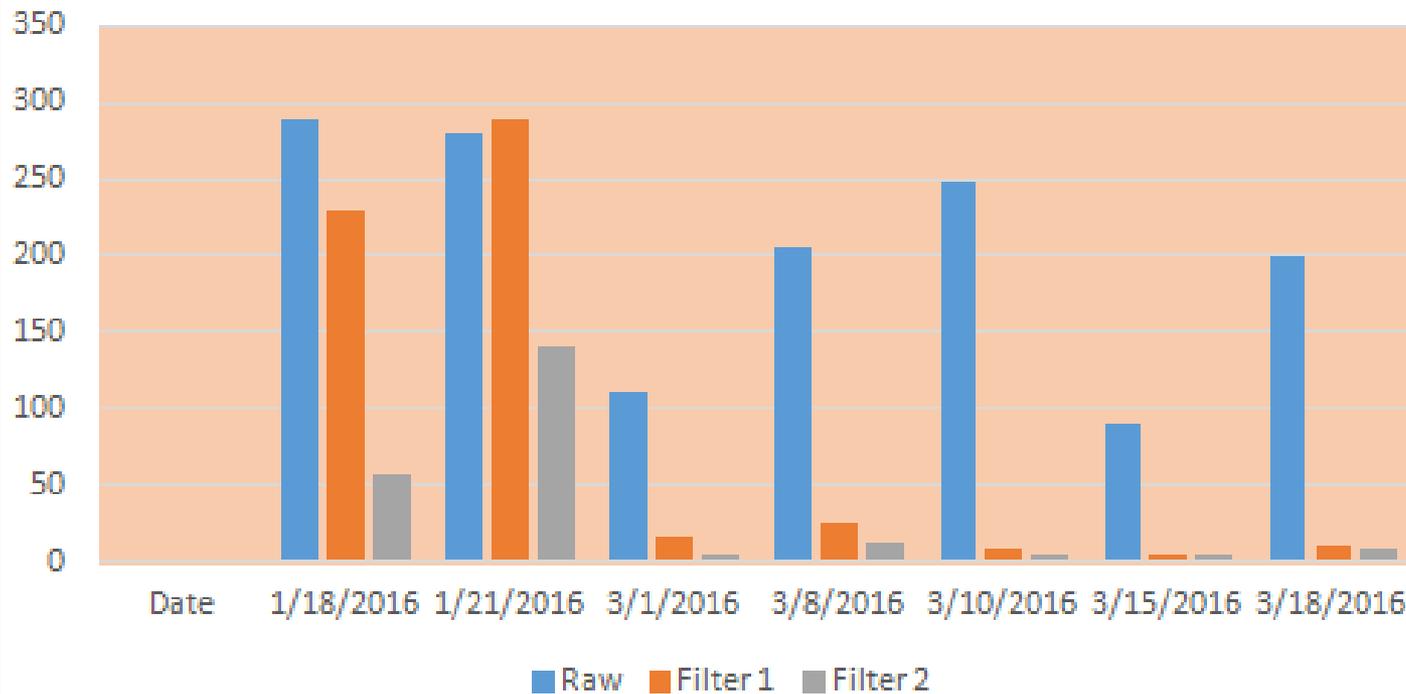


# Start Up Monitoring

	TOTAL COLIFORM			E.COLI		
	Raw	Filter 1	Filter 2	Raw	Filter 1	Filter 2
Date	TC	TC	TC	E.coli	E.coli	E.coli
1/14/2016	2400	370	170	62	30	24
1/18/2016	290	230	57	23	7	4
1/21/2016	280	290	140	13	13	9
3/1/2016	110	16	4	3	0	0
3/8/2016	205	25	13	21	2	0
3/10/2016	248	8	4	31	1	1
3/15/2016	91	5	5	4	0	0
3/18/2016	200	10	8	3	1	0

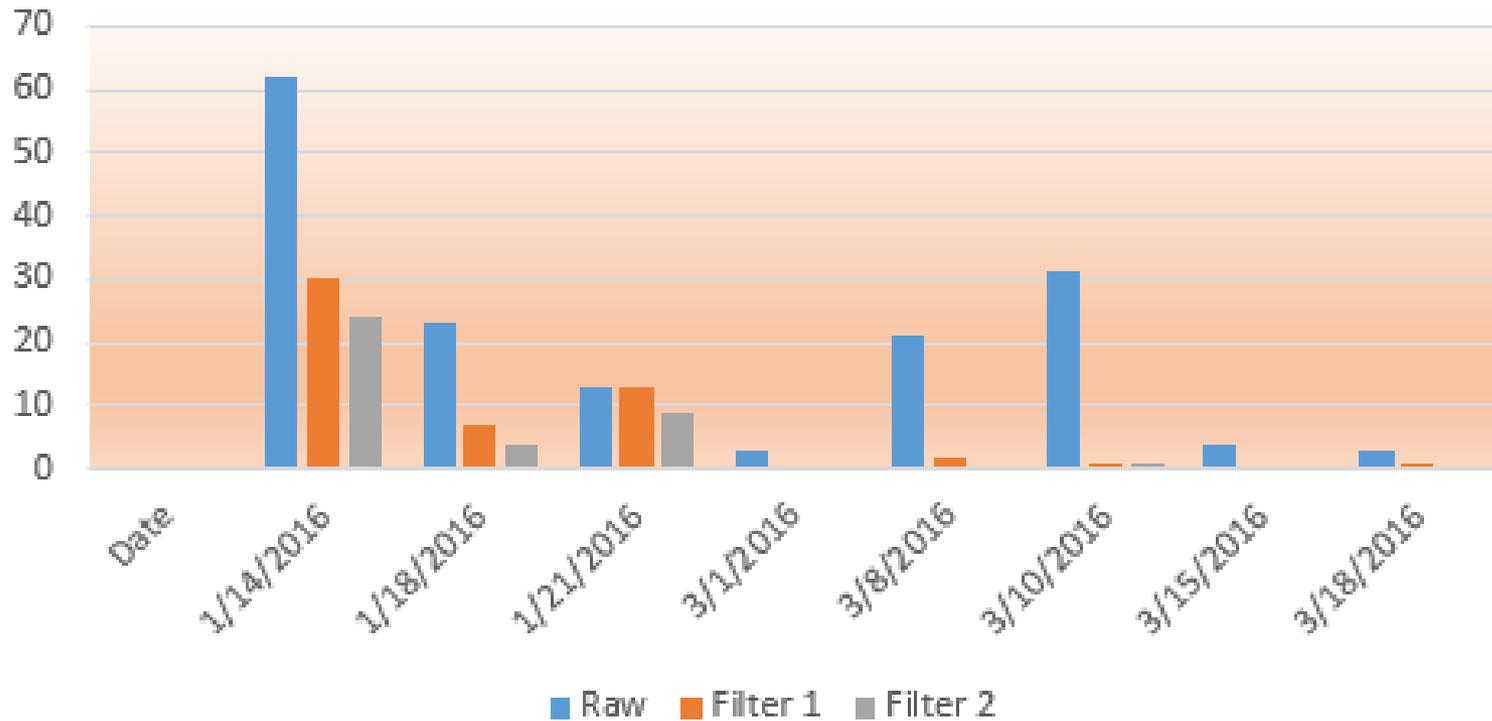
# Start Up Monitoring

**TOTAL COLIFORM MONITORING  
(CFU/100ml)**

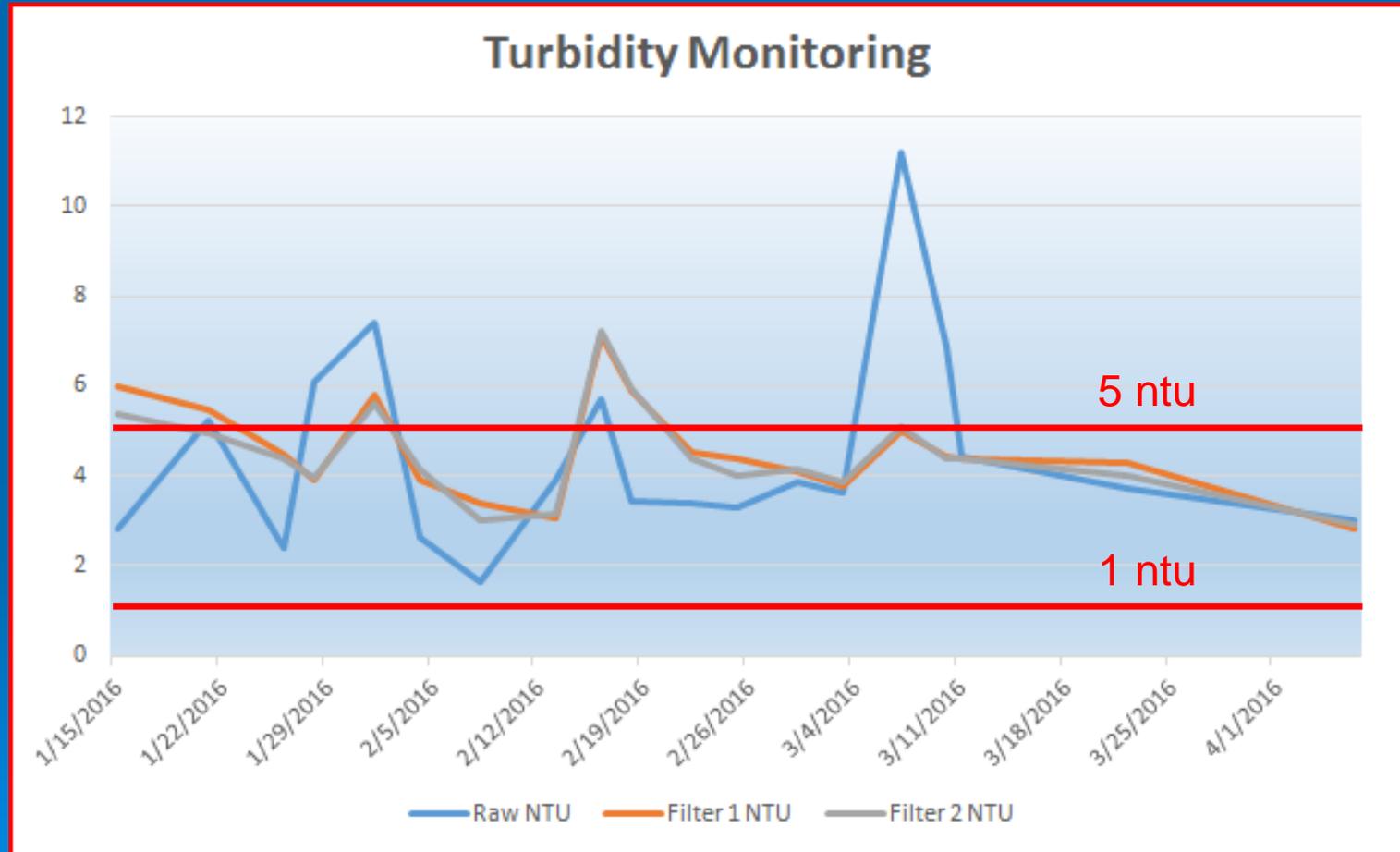


# Start Up Monitoring

## E. COLI MONITORING



# Start Up Monitoring



# Turbidity Size Evaluation

## “Special Study”

- Cartridge filters
  - Nominal 1 micron
  - .35 micron absolute

Results (3/2016)

Raw 4.95 ntu

After SSF – 3.79

After 1 u – 3.77 ntu

After .35 u – 3.35 ntu



**QUESTIONS?**

