

**North Shore Water Commission**  
**Filter Media & Backwash Equipment Improvements**

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Background

Plant personnel have reported changes in filter performance over the last decade. Although effluent turbidity remains within regulatory compliance, a decline in filter run-hours between backwashes has been observed. Moreover, performance has become less consistent, with instances of rapid, unexplained deterioration. Notably, filter stability is compromised, as minor alterations in flow rate result in turbidity breakthrough.

Recommendations

Our filters are using the same sand, gravel, and underdrains that were originally installed. Note that filters 1 through 6 were installed in 1962, and filters 7 and 8 were installed in 1972. After decades of service, staff believes the media has changed in size and shape. Also, staff extracted core samples; those samples revealed sediment is trapped in localized pockets deep inside the filter. Staff experimented with different cleaning methods and have been unable to effectively remove this sediment. Staff concludes that the media needs to be replaced.

Removing the media is challenging. There are too many obstacles to allow for its removal via bucket and shovel. The filter troughs and surface sandwash systems need to be removed first. The fiberglass troughs are mortared in-place, and they will likely be destroyed or significantly damaged during removal.

Considering the 1962 filter backwash pumps are original to the plant, they should be replaced with new equipment with variable frequency drives (VFDs). This allows for the filter to be washed at the appropriate flow rate in the most efficient way possible.

Please note that engineering will be needed for several reasons. First, the installation of new filter media will require design modifications, which, due to DNR regulations, will likely require a pilot study to demonstrate that the chosen filter media configuration meets regulatory standards. Second, the filtration system's hydraulic performance must be optimized. This optimization includes developing an effective backwash sequence and establishing appropriate target flow rates. Third, engineering is needed to create procedures for monitoring filter performance and implementing mudball prevention strategies.

Estimated Cost

This project would be publically bid. In my estimation, the project is likely to cost \$2,100,000. Below is a breakdown of my estimate.

- Filter media replacement: \$1,300,000.
- Trough replacements and filter level instrumentation: \$150,000.
- Replacement of backwash pumps: \$150,000.
- Engineering services with pilot study: \$300,000.
- Contingency: \$200,000.

#### Additional Considerations

1. The paint on the ceiling above the filters is peeling. It is extremely difficult to paint this part of the ceiling due to the water below. The blasting media, paint chips, and new paint cannot fall into the filter. If possible, the ceiling should be sandblasted and painted when each filter is empty.
2. The Public Service Commission (PSC) may not allow us to replace rehabilitate all 8 filters. They may limit the project to fewer filters, given our average day pumpage is below the plant's rated capacity.