Laboratory Report

J0604-032
Earth Tech
5555 Glenwood Hills Parkway, S.E.
Grand Rapids, MI 49512

Report Date: May 06, 2006
Prepared By: John Moser

A sand sample was received by the Krofta Laboratory on April 13, 2006. The composite of several core borings was collected from a Krofta Sandfloat. The objective of the laboratory evaluation was to determine if the level of contamination warranted replacement of the filtration media. The lab tests indicated that there was a significant amount of material entrained in the sand that most likely is affecting unit performance and efficiency. The tests also demonstrated that the contaminants could be dramatically reduced by performing a system boil out at high pH. It was concluded that replacement of the media is not required at this time.

The sample as received was dark in color, tended to remain in a single mass and had a moderate foul odor. Stones averaging 1 cm in length were also present. The contaminants appeared to consist of fine particulates evenly distributed throughout the sand. There was no evidence of extreme fouling or plugging. The free water over the sand was collected then allowed to stand for 2 hours. The turbidity measured 3,124 NTU. Turbidity results were averages of two or more readings from a calibrated Hach 2100P Turbidimeter.

The sand was placed in an evaporating dish and dried overnight in a drying oven at a temperature of 105 °C. The dried sand formed a compacted, hard mass. A mortar was required to break up the sample. The evaporated water left a white layer of residue that covered the bottom of the dish.

The stones were removed from the sand. A 200 g aliquot was weighed out on an analytical balance and placed in a 6 inch funnel over a bed and plug of medium grade steel wool. The sand was wetted with 200 ml of distilled water. A filtration rate test was then conducted with 500 ml of distilled water. Constant head was maintained as long as possible. The filtration rate was calculated to be 286 ml/minute. The filtrate turbidity was 2,486 NTU. The lower value compared to the free water collected above the sand as received was partly attributed to the loss of contaminants from the evaporated water that formed the residue layer during the drying process.

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A boil out simulation was then conducted on a second 200 g dried sand sample. The test was performed in a 1000 ml glass beaker with a total contact time of 4 hours. 500 ml of distilled water was adjusted from an initial pH of 5.23 to 12.43 Units with 8 ml of a 10% sodium hydroxide solution. This solution was made down weight to volume with NaOH pellets. The sand was placed in the beaker followed by the pH adjusted water. The mixture was stirred vigorously for the first minute and then for 10 seconds every 10 minutes. Color and turbidity formed in the water almost immediately. Both grew in intensity during the 4 hour test period. Turbidity measured 4,596 NTU at the two hour mark and 6,620 NTU at the completion of the simulation. The pH level decreased by less than 0.2 Units to 12.26 by the end of the test. Previous boil out tests conducted with very heavily contaminated sand samples resulted in violent reactions, bubbling, foaming, off-gassing and overflow. No visible signs of aggressive activity were noted with this sample.

The sand sample was rinsed until the water remained clear and the pH was in the neutral range. This required 10 rinses, 500 ml each with distilled water. The sand was dried and a final filtration test conducted using the previously outlined procedures. The cleaned sand removed from the drying oven was free flowing. There was no residue in the bottom of the dish. The filtration rate for the cleaned sand was 685 ml/minute, more than double the initial rate. The turbidity of the final filtrate was 1.19 NTU.

Based on the lab tests conducted on this sample, there clearly is a considerable amount of contaminants present in the sand that could be dramatically reduced by boiling out the sand. This procedure is recommended for both initial cleaning and restoration of the Sandfloat beds and as a routine preventive maintenance procedure. Replacement of the media does not appear to be necessary or justifiable at this time.

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Filtration Rate Tests

Sample	Filtration Rate
2 Dried Sand Prior To Boil Out Simulation	**286 ml/min**
3 Dried Sand Following Boil Out Simulation	685 ml/min

Turbidity Tests

Sample	Turbidity
4 Free Water Collected Over Wet Sand As Received	3,124 NTU
5 Filtrate From Initial Filtration Test Prior To Boil Out Simulation	2,486 NTU
6A Supernatant Collected At 2 Hour Mark Of Boil Out Simulation	4,596 NTU
6B Supernatant Collected At Completion Of Boil Out Simulation	6,620 NTU
7 Filtrate From Final Filtration Test Of Cleaned Sand	1.19 NTU

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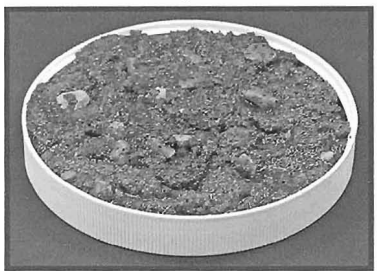

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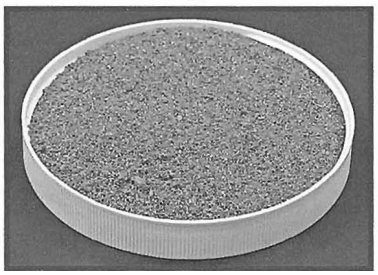

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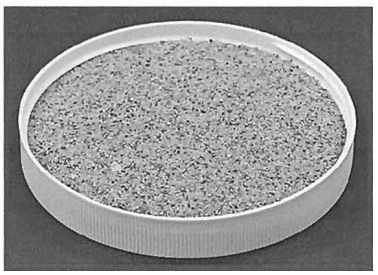
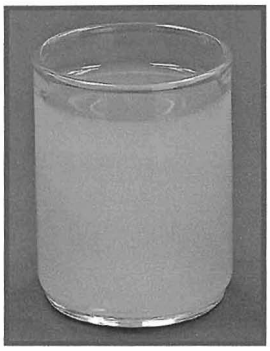


1 Wet Sand As Received
2 Dried Sand Prior To Initial Filtration Test And Boil Out Simulation
3 Dried Sand Following Boil Out Simulation

4



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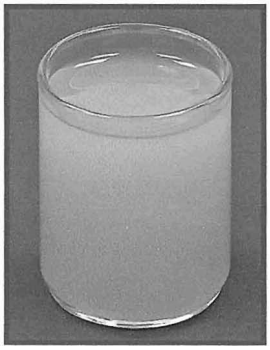

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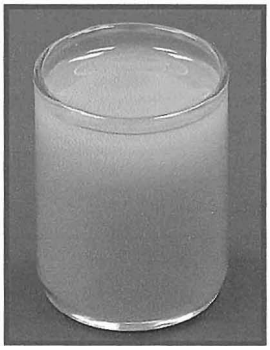

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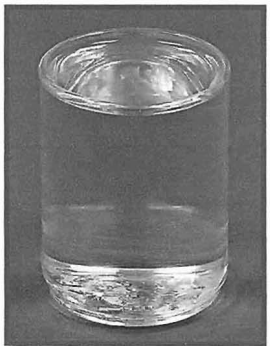

4 Free Water Collected Over Wet Sand As Received
5 Filtrate From Initial Filtration Test Prior To Boil Out Simulation
6 Supernatant Collected At Completion Of Boil Out Simulation
7 Filtrate From Final Filtration Test Of Cleaned Sand