

## VMS Filter Sock Vault Maintenance System Field Test – Observations and Laboratory Data Evaluation

A commercial Vault Maintenance System (VMS) consisting of patented and proprietary technologies, configured as a multi-stage filtration sock, has been developed to remove hydrocarbons and sediments from the water pumped out of underground vaults as part of an ongoing maintenance program. This study was conducted to test the efficacy of the VMS unit in actual field conditions.



Two underground vaults were selected for testing. Each vault had three sampling events labeled A, B, and C.

**Sampling Event A:** The Raw unfiltered water from the vault was taken by placing a submersible pump into the bottom of the vault, circulating the water back into the vault, then collecting a sample of pumped water in a pail. Samples were taken for Extractable Fuel Hydrocarbons “EFH (C8-C40)”, Gas Range Organics “GRO (C4-C12)”, “Oil & Grease”, and Total Suspended Solids “TSS”. The samples were submitted to Test America in Irvine CA.

**Sampling Event B:** The samples were taken from the water exiting the VMS unit after filtration Mid-way through the pumping event. The water was collected in a pail and samples were taken as above for laboratory analysis.

**Sampling Event C:** The sampling procedure was the same as Sampling Event B except that the sample was taken from the water exiting the VMS unit after filtration at the End of the pumping event.

After the vault-pumping test was completed, the two VMS units were sent to Severn Trent Laboratories in Tacoma, Washington. A composite sample was made from the units into a single representative sample for Total Threshold Limits Concentrations (TTLC) waste profiling. Full-length 2-inch strips cut from each VMS unit were analyzed for Oil & Grease, and Sediment. The results were extrapolated to approximate the total Oil & Grease, and Sediment captured within a complete VMS unit. The results for the TTLC for toxic waste profiling were determined to be acceptable for disposal in a land fill, saving the costs associated with toxic waste disposal.

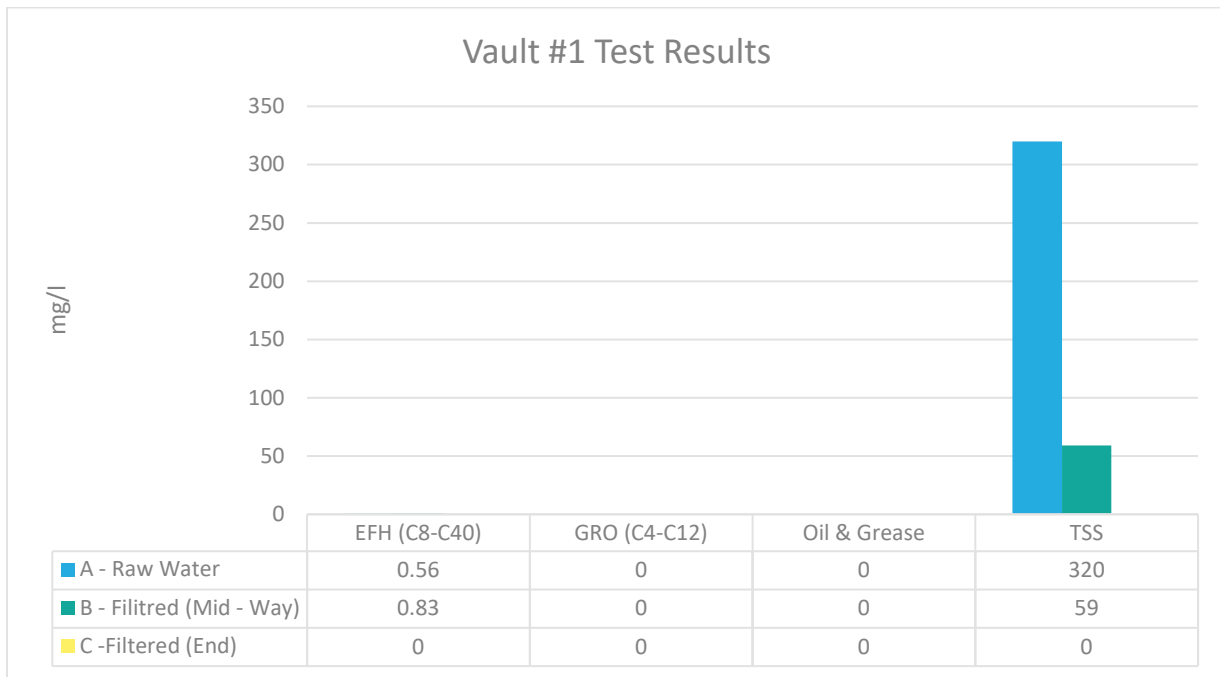
## Presentation of Testing Results:

### Laboratory Results: Vault #1

Water Matrix	EFH (C8-C40)	GRO (C4-C12)	Oil & Grease	TSS
A - Raw Water	0.56 mg/l	ND	ND	320 mg/l
B - Filtered (Mid-way)	0.83 mg/l	ND	ND	59 mg/l
C - Filtered (End)	ND	ND	ND	ND

Total Oil & Grease captured in VMS unit = 26 grams

Total TSS captured in VMS unit = 391 grams



### Evaluation of Vault #1 Results:

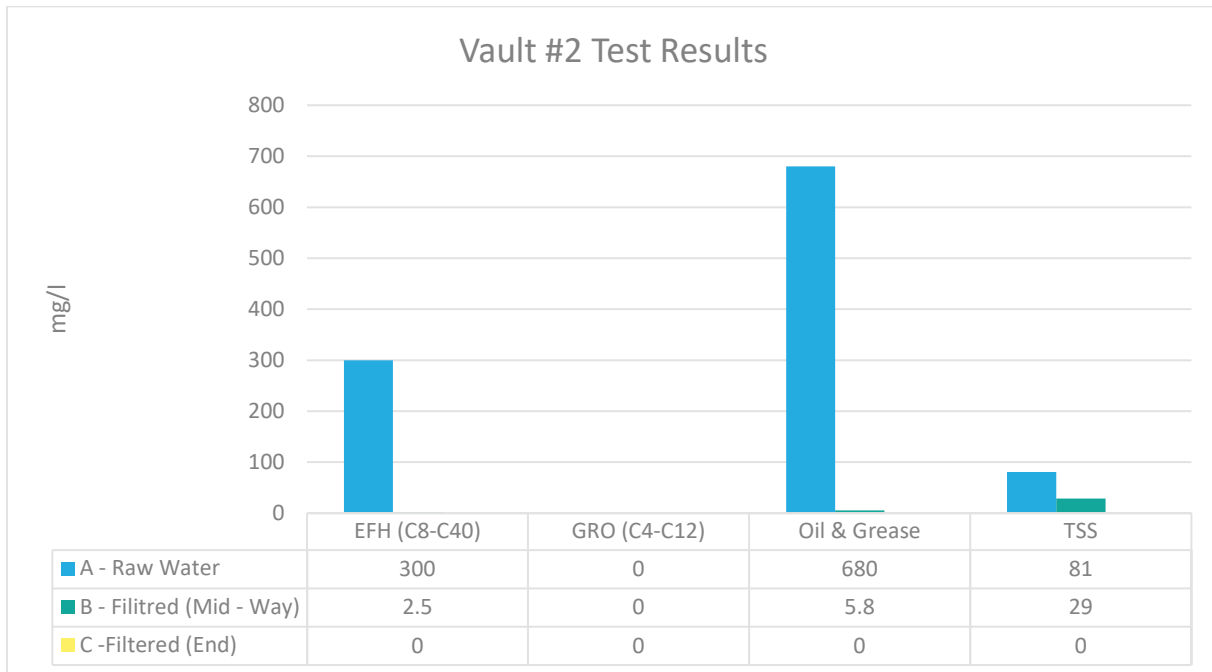
The water in the vault contained low levels of EFH and high levels of TSS. The values for Oil & Grease and GRO were not detected. Half way through the filtration-pumping event, the results showed a higher level of EFH in the filtered water than was found in the raw water. The explanation for this may be due to sampling techniques. The water was pumped from the bottom while oil usually resides on the surface; the sample was pumped into a receiving vessel which would retain oils on the walls before the samples were taken. It is extremely difficult to get representative water samples with dissimilar phases unless they are emulsified. Another reason for the difference could be that the results were just above the reporting limit for the analysis, and chromatographic technique at this level would be significant. The TSS was lowered by 82 percent during the mid-point sampling event. At the end of the filtration pumping event the EFH and the TSS were reduced to non-detectable levels.

## Laboratory Results: Vault #2

Water Matrix	EFH (C8-C40)	GRO (C4-C12)	Oil & Grease	TSS
A - Raw Water	300 mg/l	ND	680	81 mg/l
B - Filtered (Mid-way)	2.5 mg/l	ND	5.8	29 mg/l
C - Filtered (End)	ND	ND	ND	ND

Total Oil & Grease captured in VMS unit = 83 grams

Total TSS captured in VMS unit = 77.5 grams



### Evaluation of Vault #2 Results

The EFH results were 300 mg/l in the raw water. The VMS unit removed 99 percent of these hydrocarbons mid-way through the pumping event and further reduced hydrocarbons to non-detectable levels by the end of the pumping event. The 680mg/l initial concentrations of Oil & Grease in the raw water were reduced to 5.8 mg/l documenting a 99 percent removal efficiency for the VMS unit at the mid-point of the pumping event. These concentrations were further reduced to non-detectable levels at the end of the pumping event. The 81 mg/l initial concentrations of total suspended solids in the raw water were lowered to non-detectable levels at the end of the pumping event.

### Conclusion

The results from these field tests document that the VMS unit can remove oils and sediments from the discharged waters to non-detectable levels, especially with highly contaminated water.