MOTT MACDONALD

THE CITY OF BAYONNE NEW JERSEY

Large Scale Pilot Test of Satellite CSO Technologies

Bayonne, NJ

Presented at NEWEA – CSO and Wet Weather Issues Conference

September 30, 2021

NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
NEWEA
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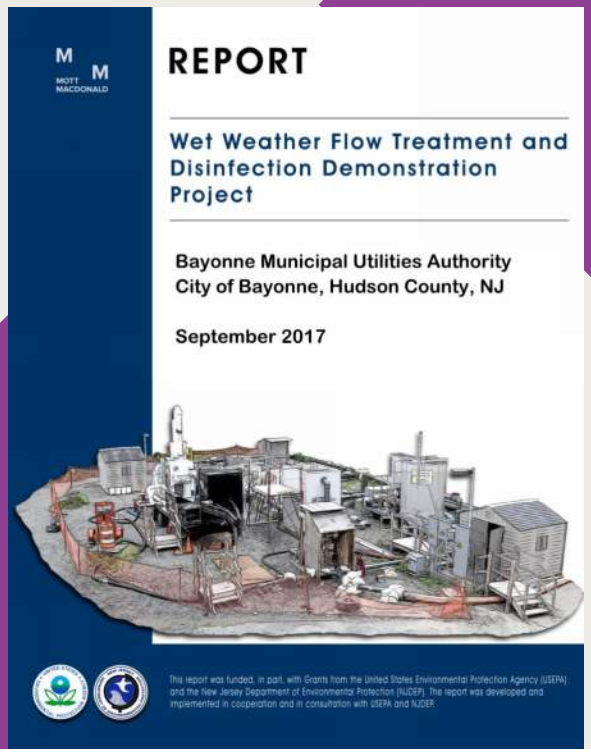
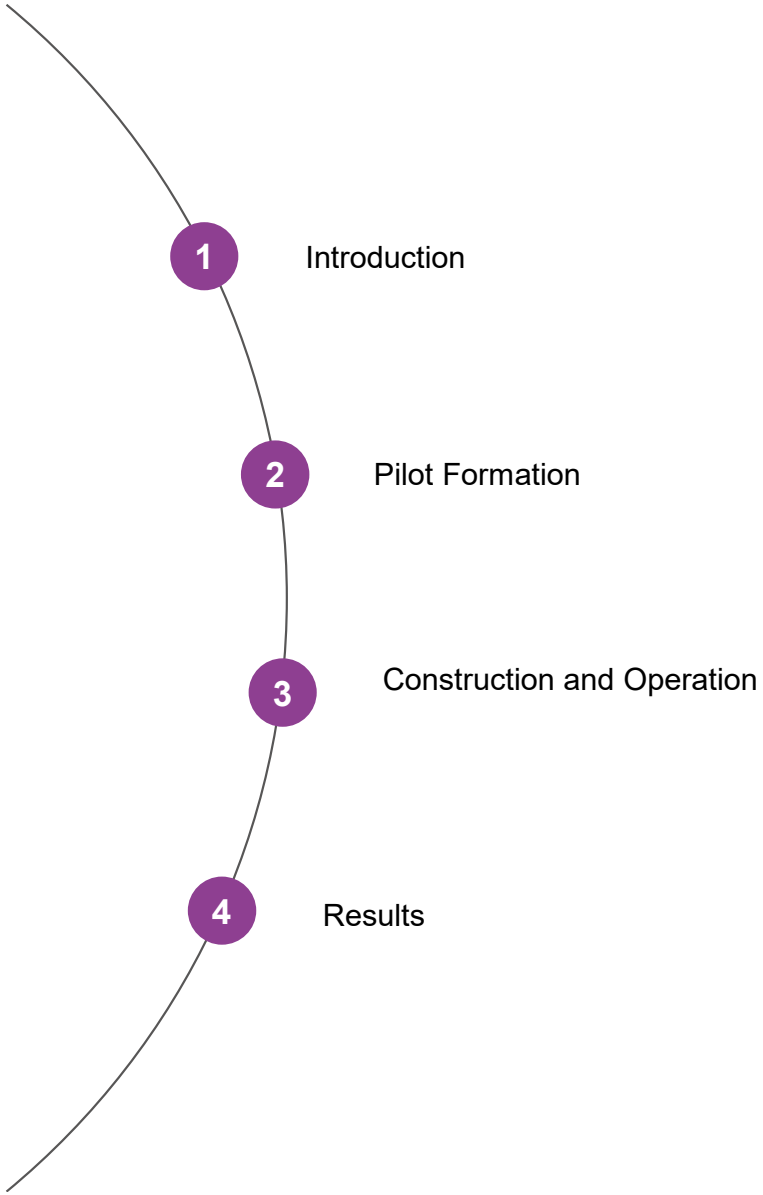
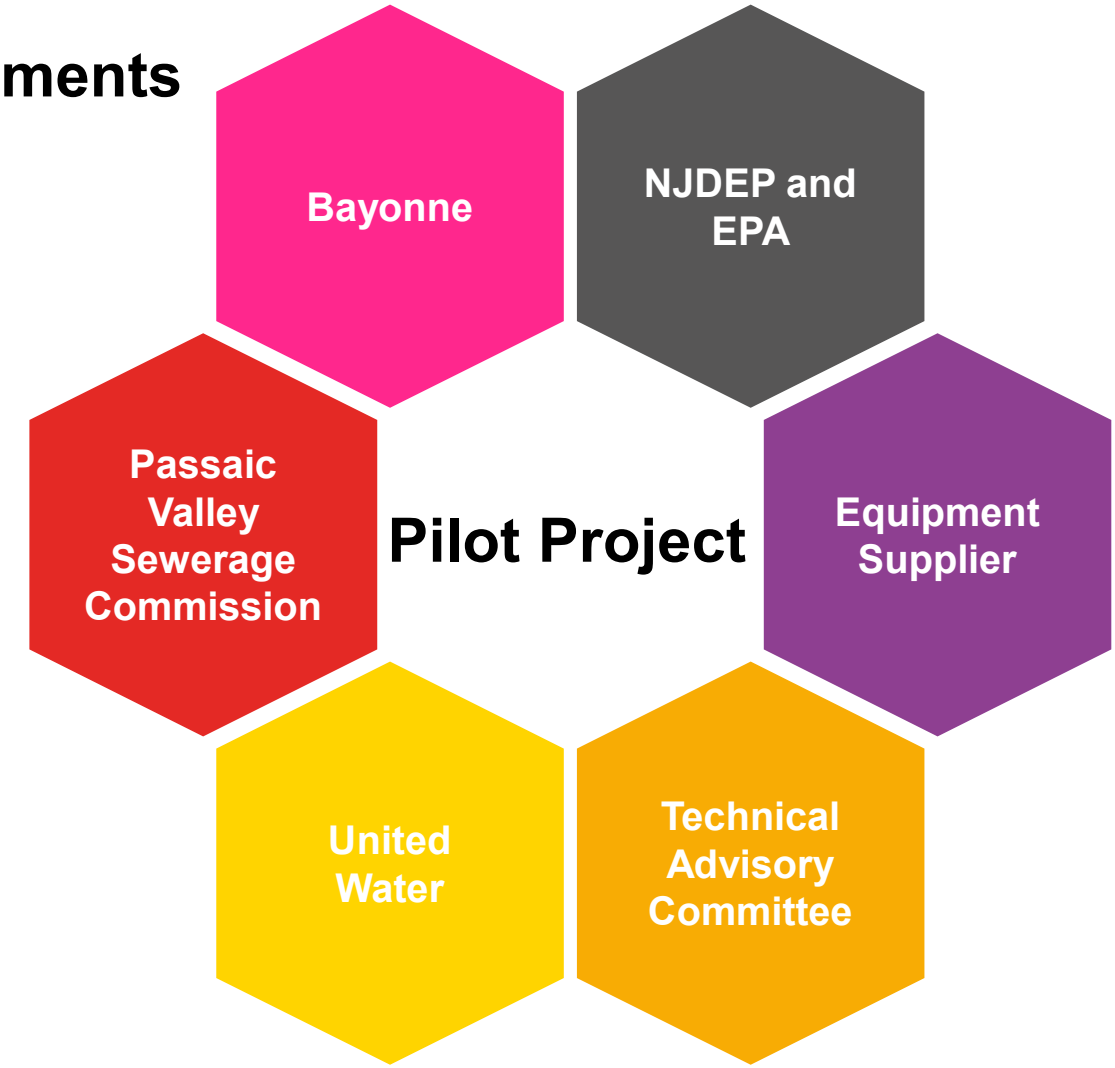


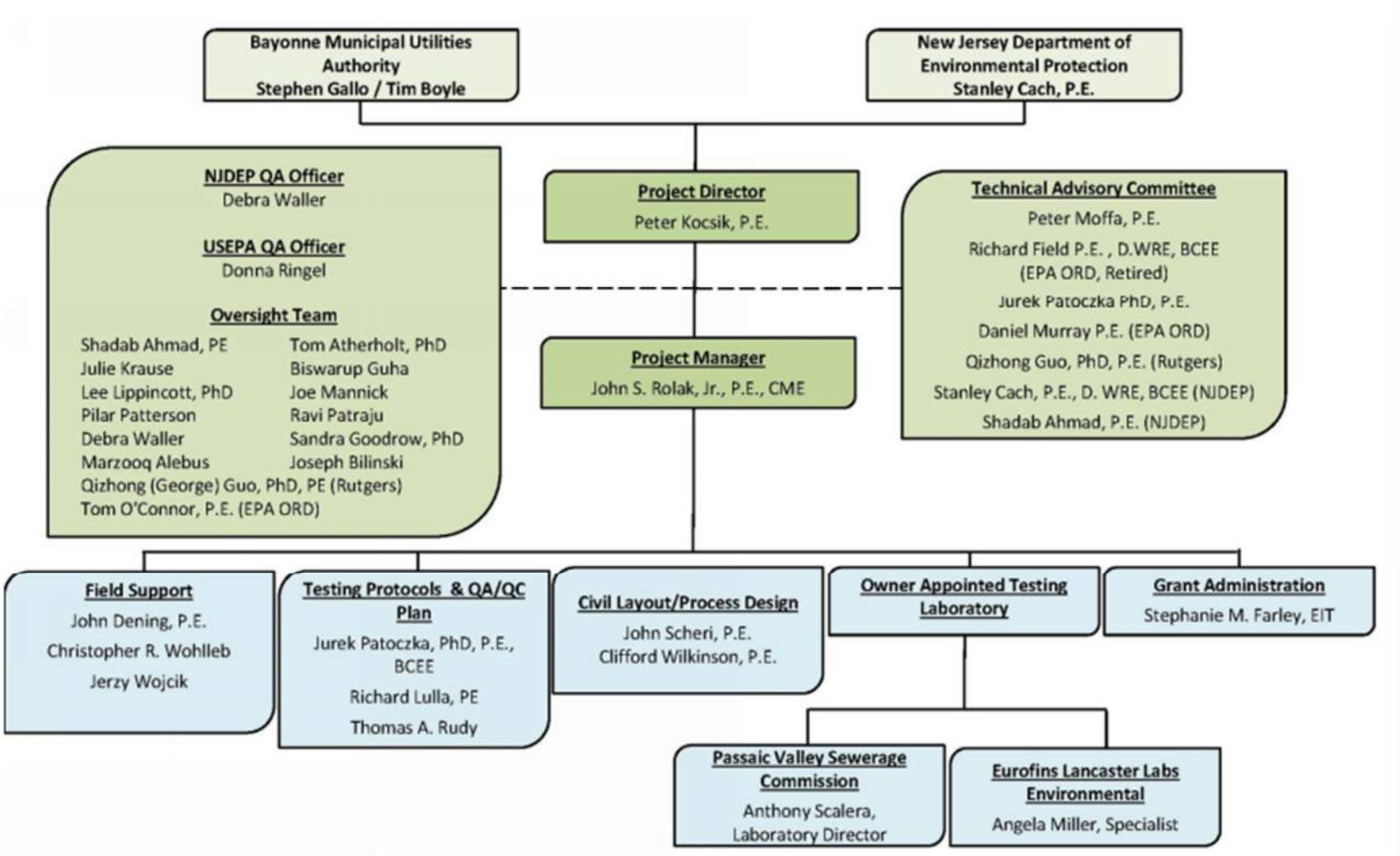
Agenda


1
Introduction
2
Pilot Formation
3
Construction and Operation
4
Results

The goal and objective of the project is to develop performance data to evaluate the effectiveness of CSO treatment technologies and to gain an improved understanding of their potential use as satellite end of pipe water quality treatment for wet weather discharges including CSOs.

Acknowledgements

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Treatment Units Selected

1. Terre Hill Stormwater Systems – Terre Kleen TK09, plate separator

2. Hydro International – Storm King® mobile pilot unit, hydrodynamic separator

3. WWETCO – FlexFilter™, compressible media filter

4. Trojan – TrojanUV3000Plus™, low pressure UV

5. Aquionics InLine 250+W, medium pressure UV disinfection

6. PeraGreen Solutions, LLC – INJEXX™, peracetic acid disinfection

Pretreat

Polish

Disinfect

Bayonne MUA Wet Weather Flow Treatment and Disinfection Demonstration Project Overall Pilot Plant Hard Piping Schematic

Schematic Date January 14, 2014
Rev 04 March 26, 2014

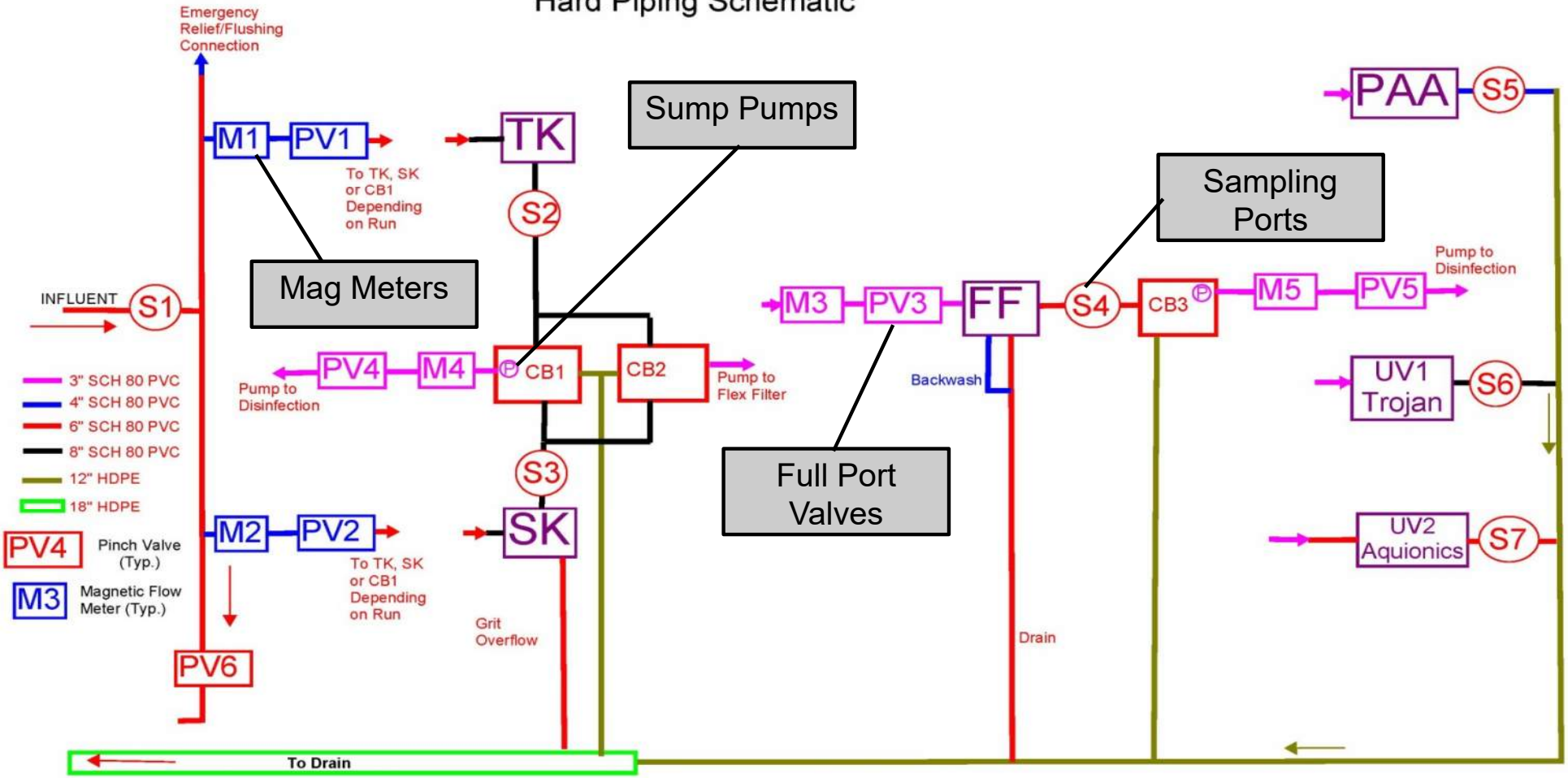

Plate 2

Sample plan

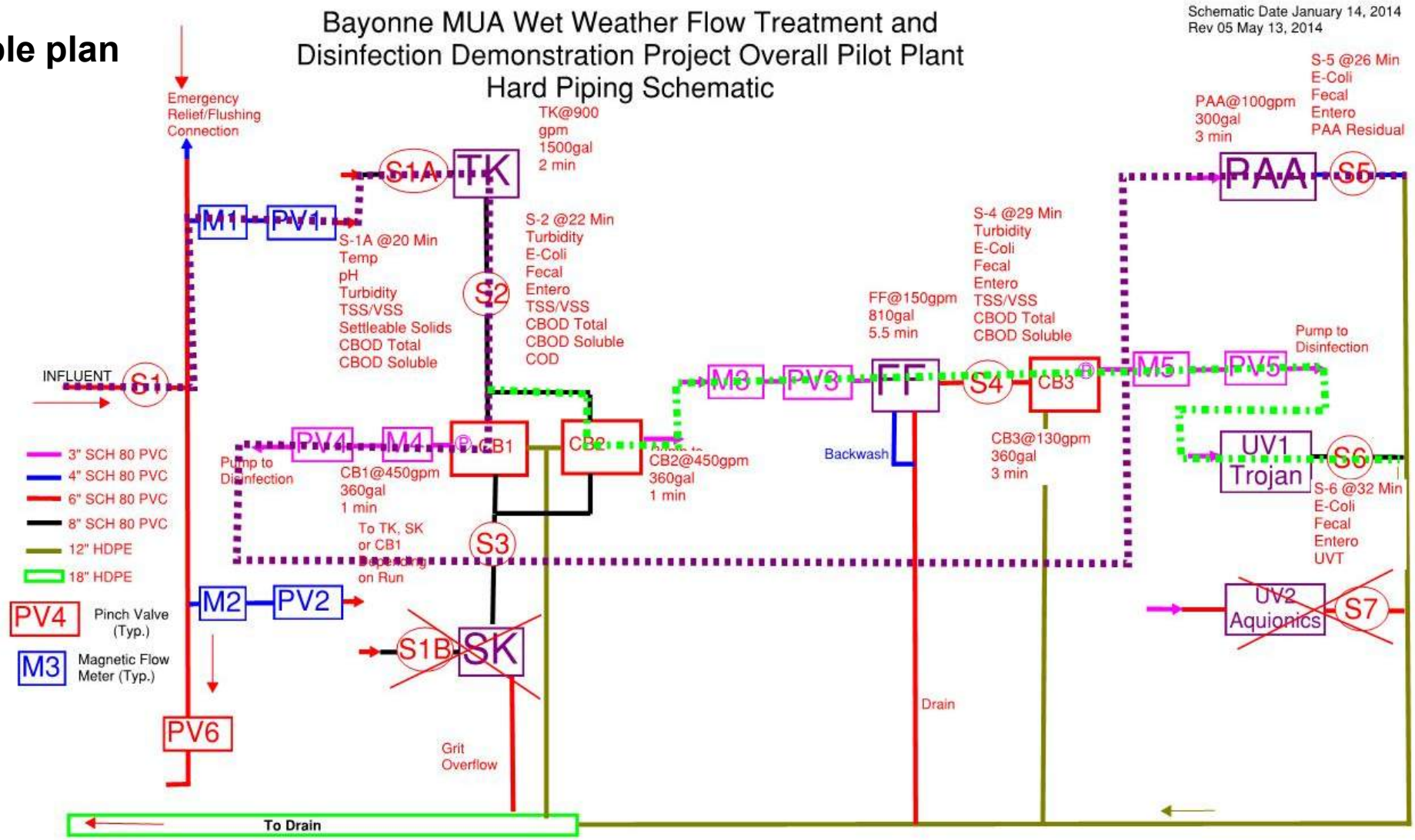

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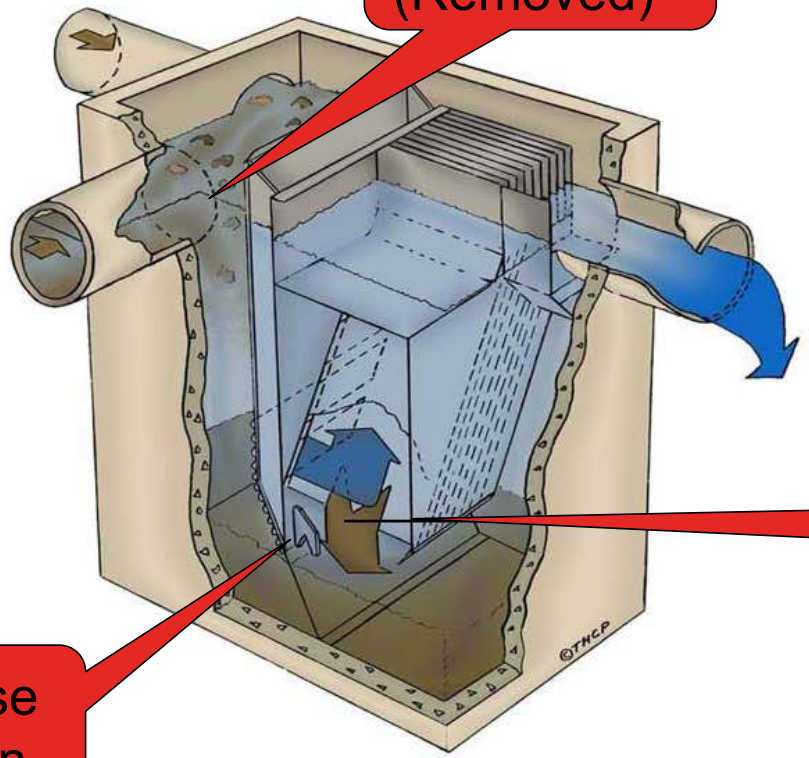
Plate 2

Terre Kleen


TERRE HILL
CONCRETE PRODUCTS
TERRE HILL
CONCRETE PRODUCTS

Terre Kleen



Fine screen (Removed)

Inclined plates

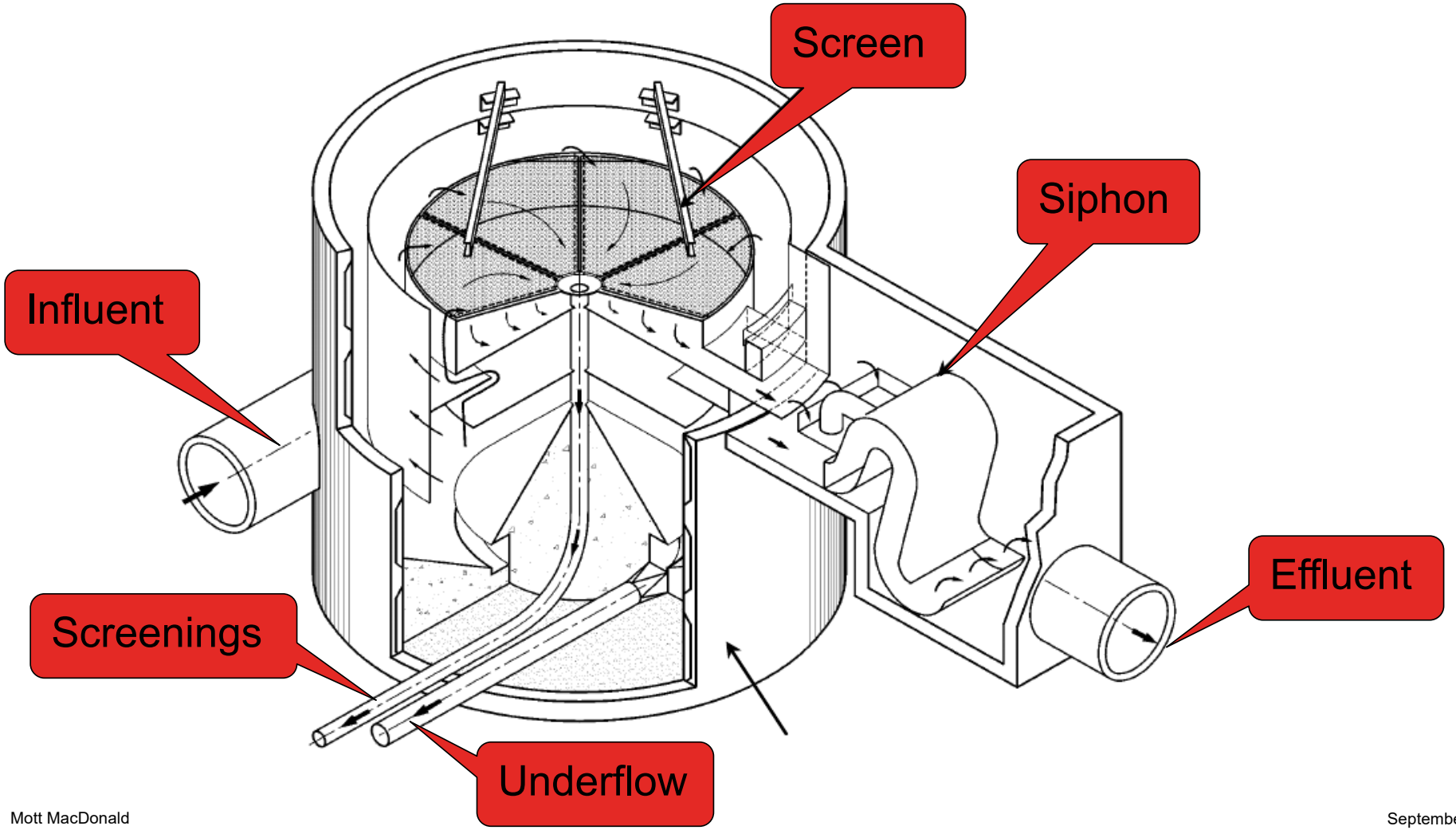
Course screen

Figure 1. Schematic of the Terre Kleen™ TK09

Terre Kleen


Terre Kleen

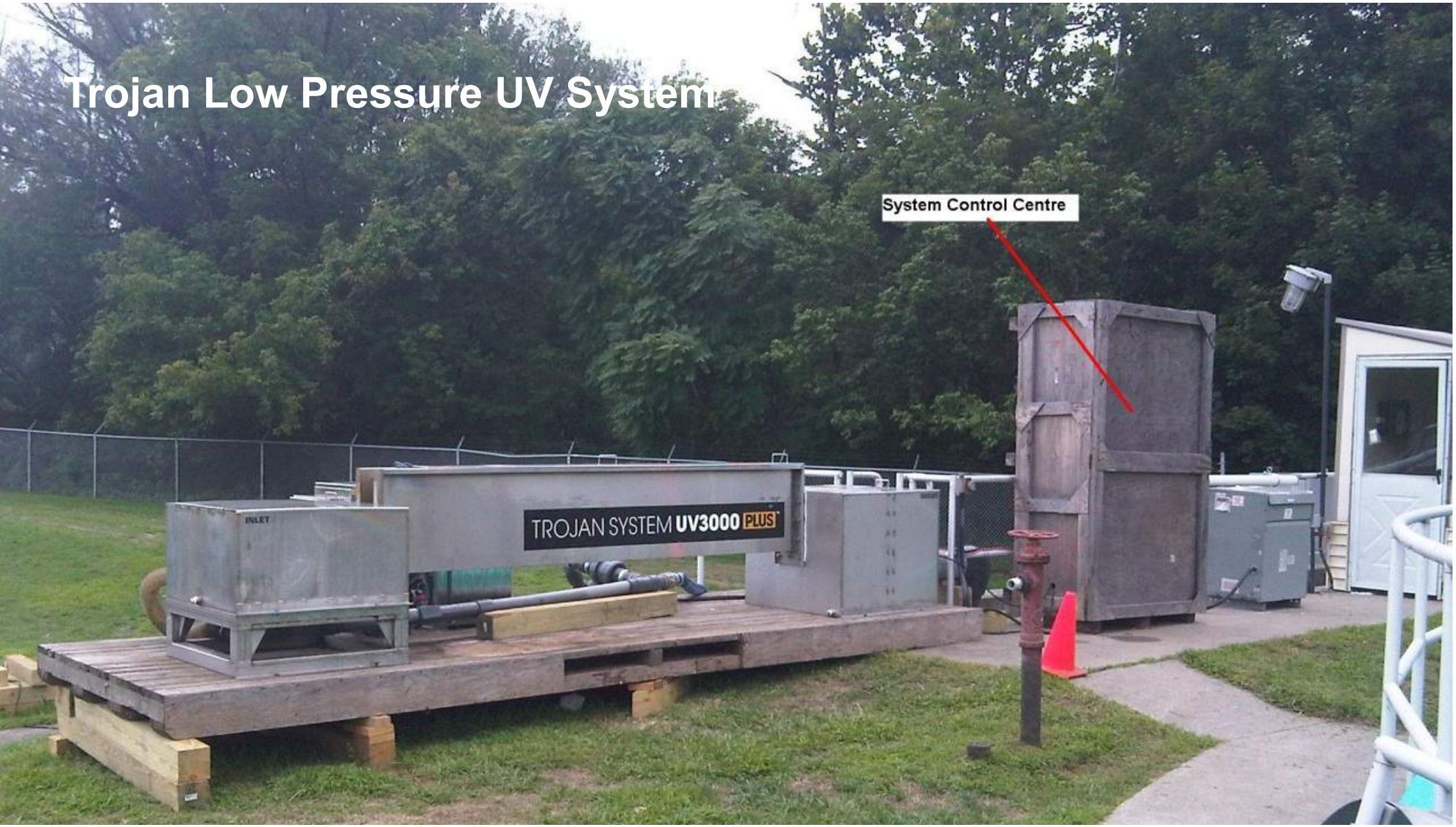
Storm King


Screen
Siphon
Influent
Effluent
Screenings
Underflow

Flex Filter


WARNING

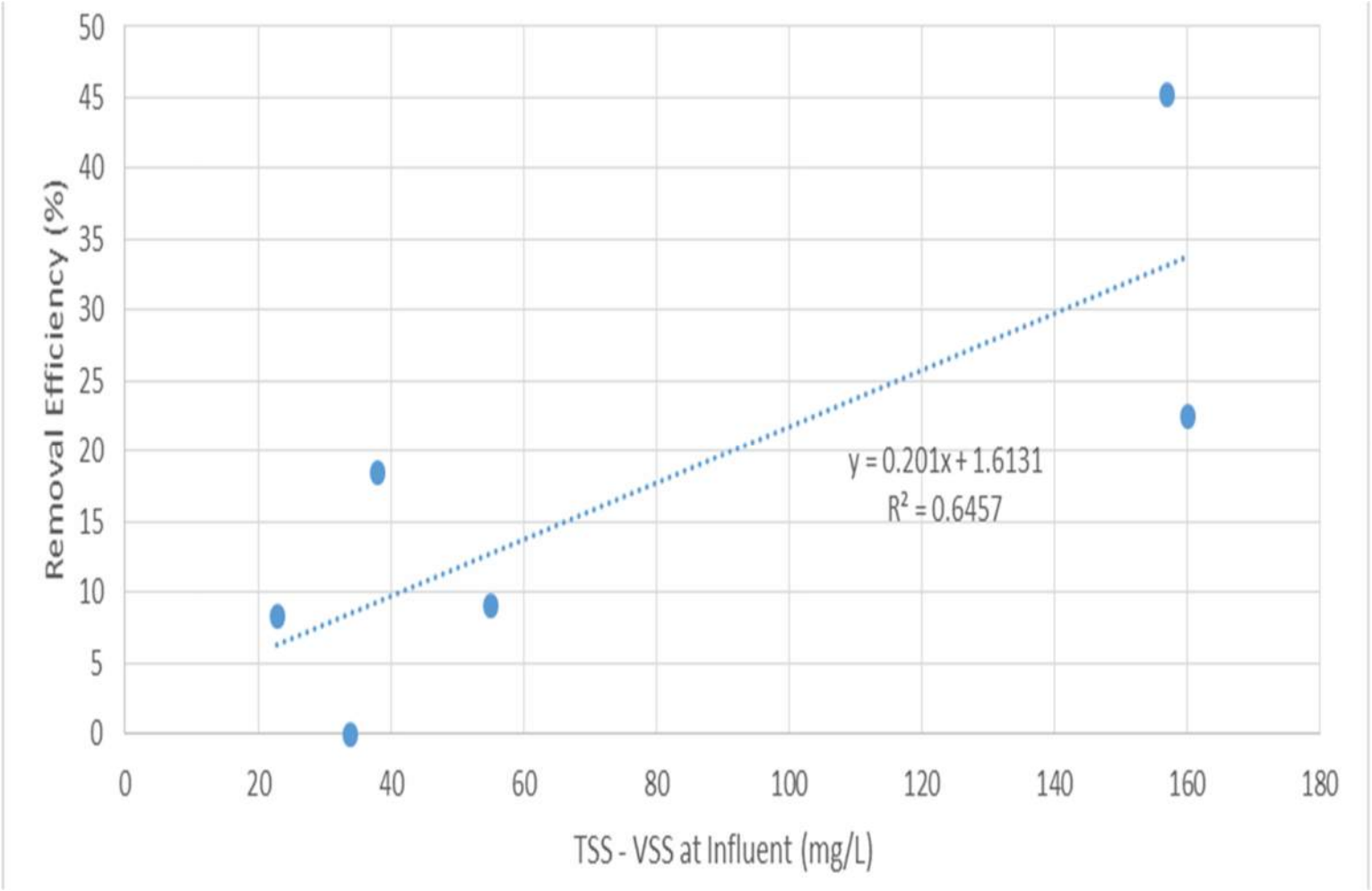
Trojan Low Pressure UV System



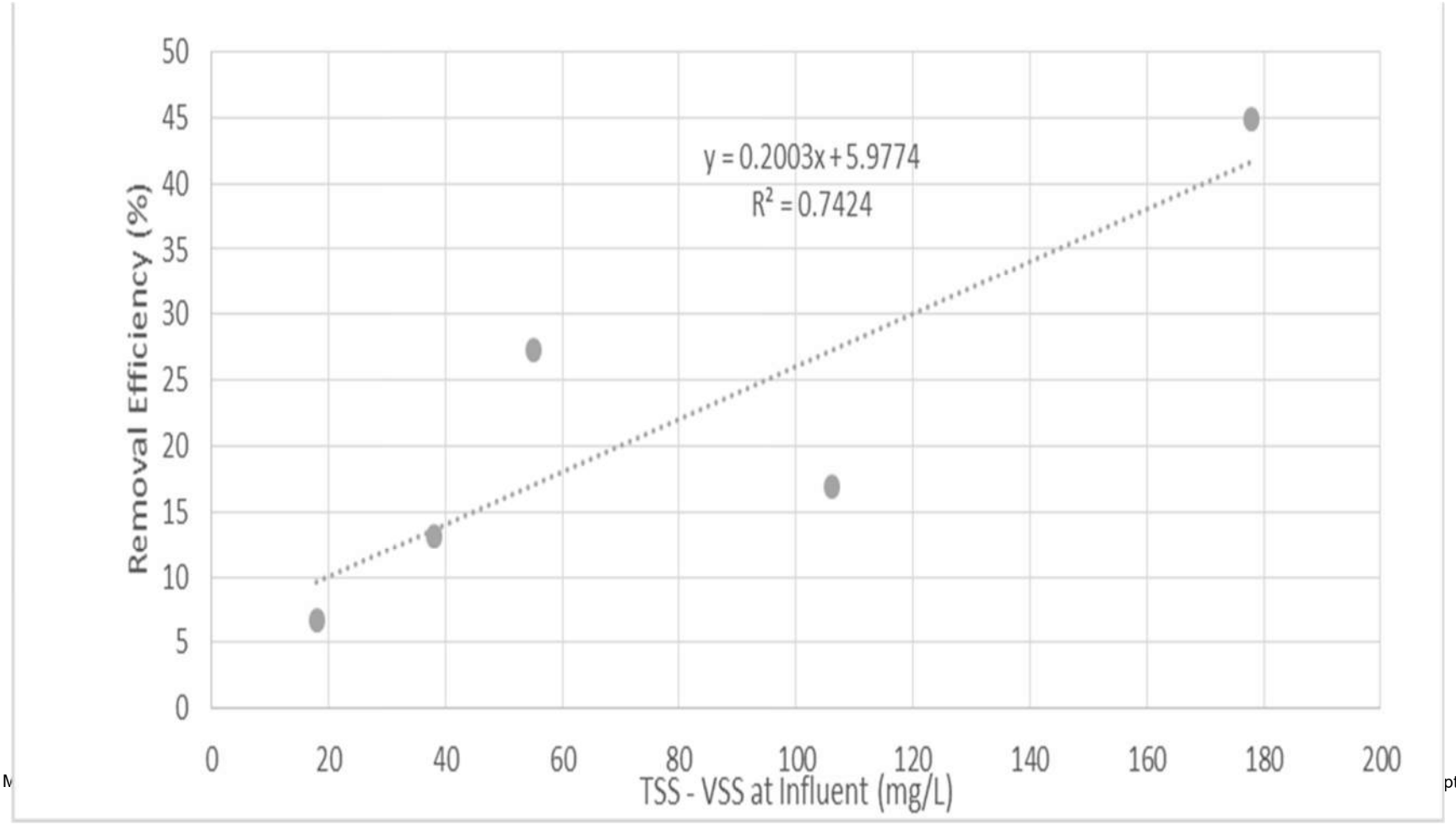
Aquionics Medium Pressure UV System

PAA INJEXX System

Terre Kleen TSS Inorganic Removal



Storm King Inorganic TSS Removal



Flex Filter TSS Removal

Test Run #	Average Raw Waste-water TSS (mg/L)	Average Raw Waste-water VSS (mg/L)	Percent Inorganic Contents (TSS-VSS) /TSS (%)	Percent Settlable TSS, %	Flex Filter (FF)			
					Design [5] Flow (gpm)	Overflow or Flux or Loading [8]		Average TSS Removal Efficiency (%)
						gpm/sq ft	gpd/sq ft	
1	221	157	29%	58.1	100	5.56	8,000	50.4
2	138	83	40%	48.3	150	8.33	12,000	94.3
3	100	62	38%	45.9	100	5.56	8,000	91.0
4	218	172	21%	52.9	150	8.33	12,000	91.9
5	317/337[1]	157/159[1]	52%	72.0[2]	150	8.33	12,000	88.4
6	357/271[1]	200/165[1]	42%	62.6[2]	150	8.33	12,000	86.9
7	121[3]	87[3]	28%	56.2[4]	-			-
8	96.5[2]	78.5[2]	19%	35.8[2]	150	8.33	12,000	67.3
9	111[3]	88.5[3]	20%	35.6[3]	150	8.33	12,000	62.2
		Average	32%					

Peracetic Acid Testing

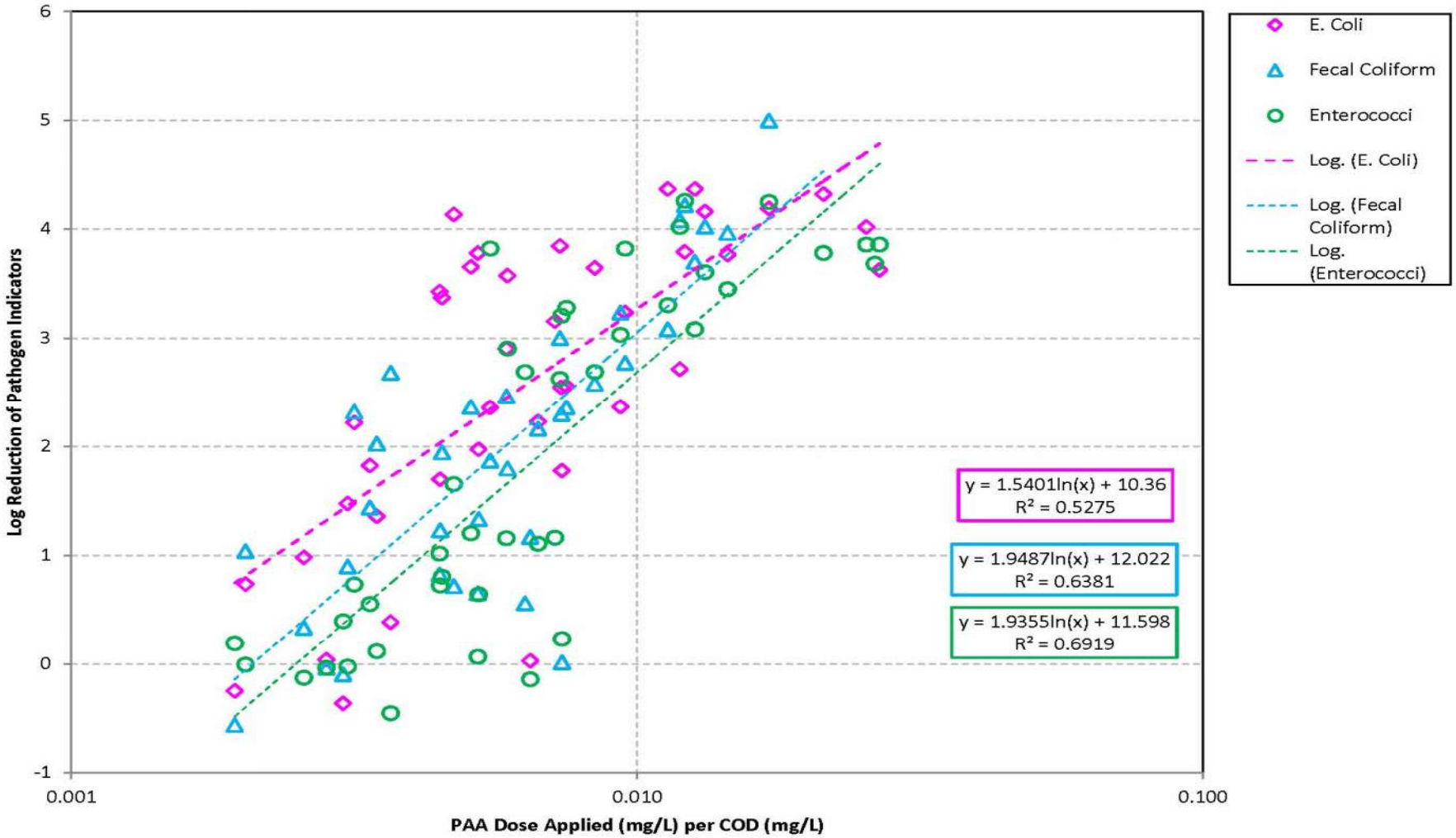
Influent was SK, TK or FF effluent

PAA dose was targeted at 2.5 -3.0 mg/L, with a goal of achieving residual of around 1 mg/L

HRT in PAA reactor was 3 min in most but not all runs

Simulated runs #8 and #9 had elevated TDS and CBOD, there was no residual and no reduction in pathogen indicators – not considered further

Figure 10.17 PAA Dose per COD vs Log Reduction of Pathogen Indicators



PAA findings

PAA dose of 0.01 mg PAA/mg COD results in 3 log reduction of fecal coliforms, on average

PAA is slightly less effective for Enterococci, slightly more effective for E. coli

Dose of 0.015 mg PAA/mg COD improved effectiveness to 4 logs, although limited data

Factoring HRT did not improve correlation

UV disinfection

Trojan – TrojanUV3000Plus™, low pressure, high intensity

Aquionics InLine 250+W, medium pressure, high intensity

Source water varied from Terre Kleen and Storm King through Flex Filter

Figure 11.3 UV Dose vs Log Reduction of E. Coli

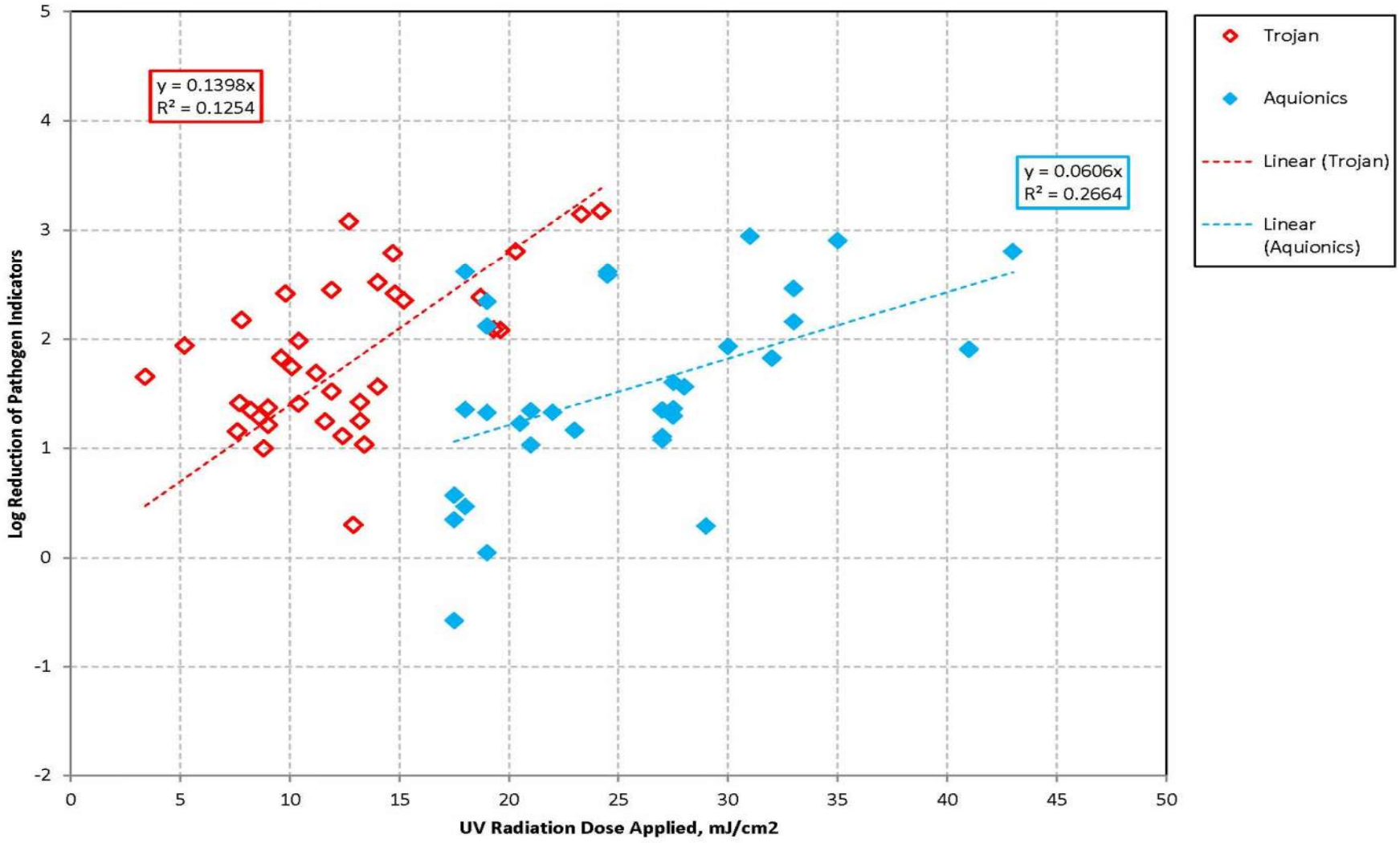


Figure 11.6 UV Dose vs Log Reduction of Fecal Coliforms

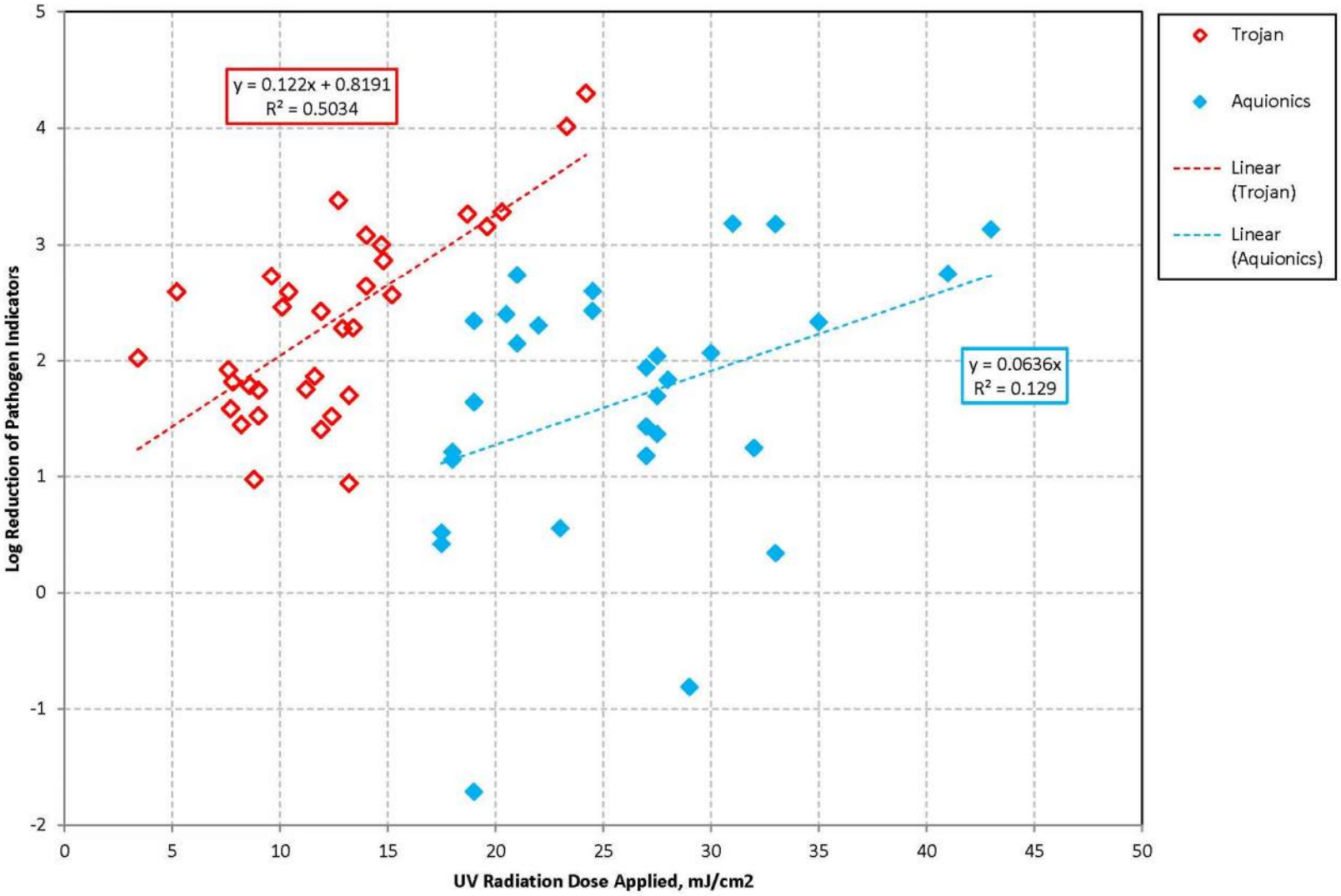


Figure 11.9 UV Dose vs Log Reduction of Enterococci

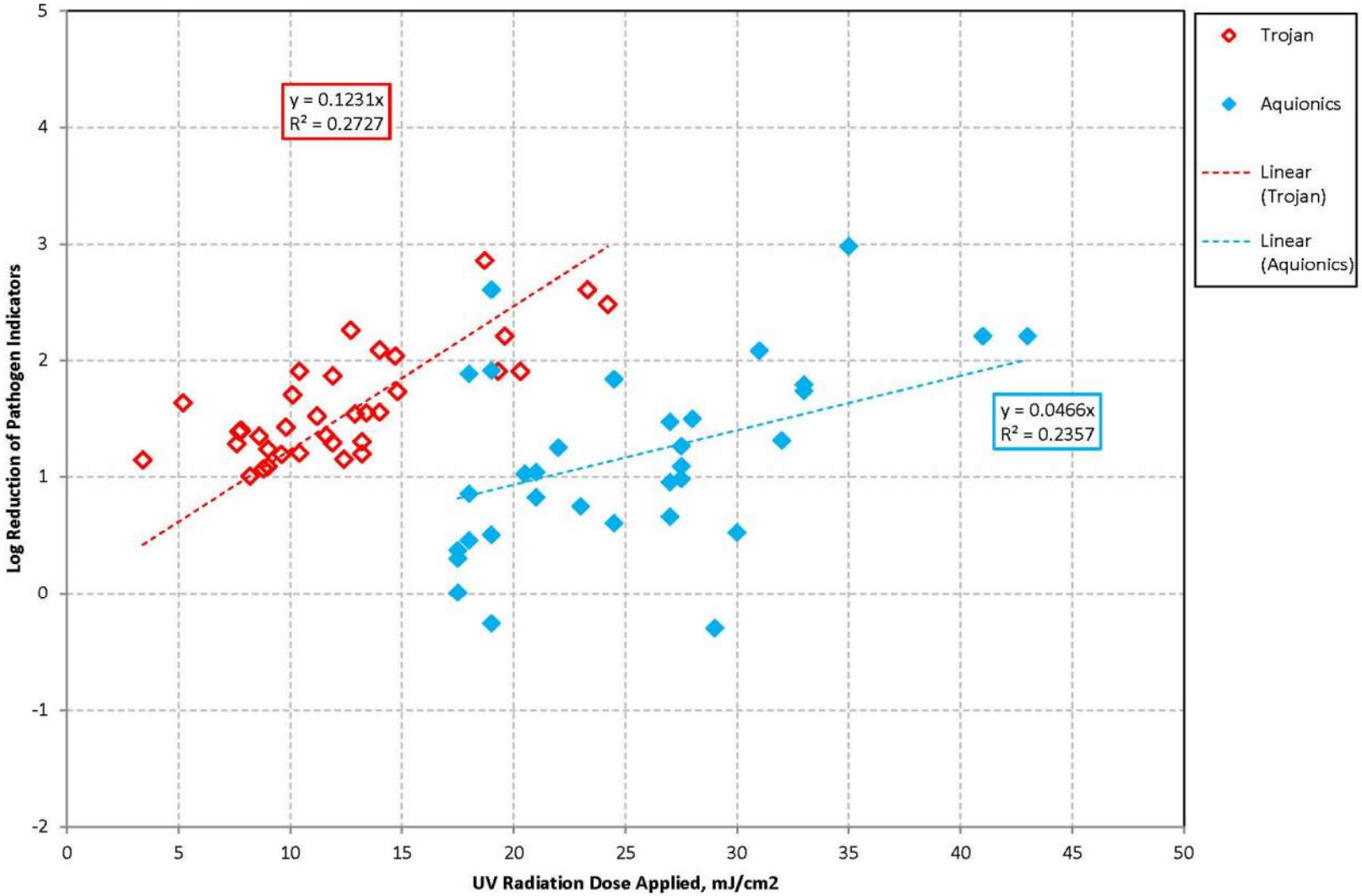


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Figure 11.10 Effect of TSS on UV Transmittance

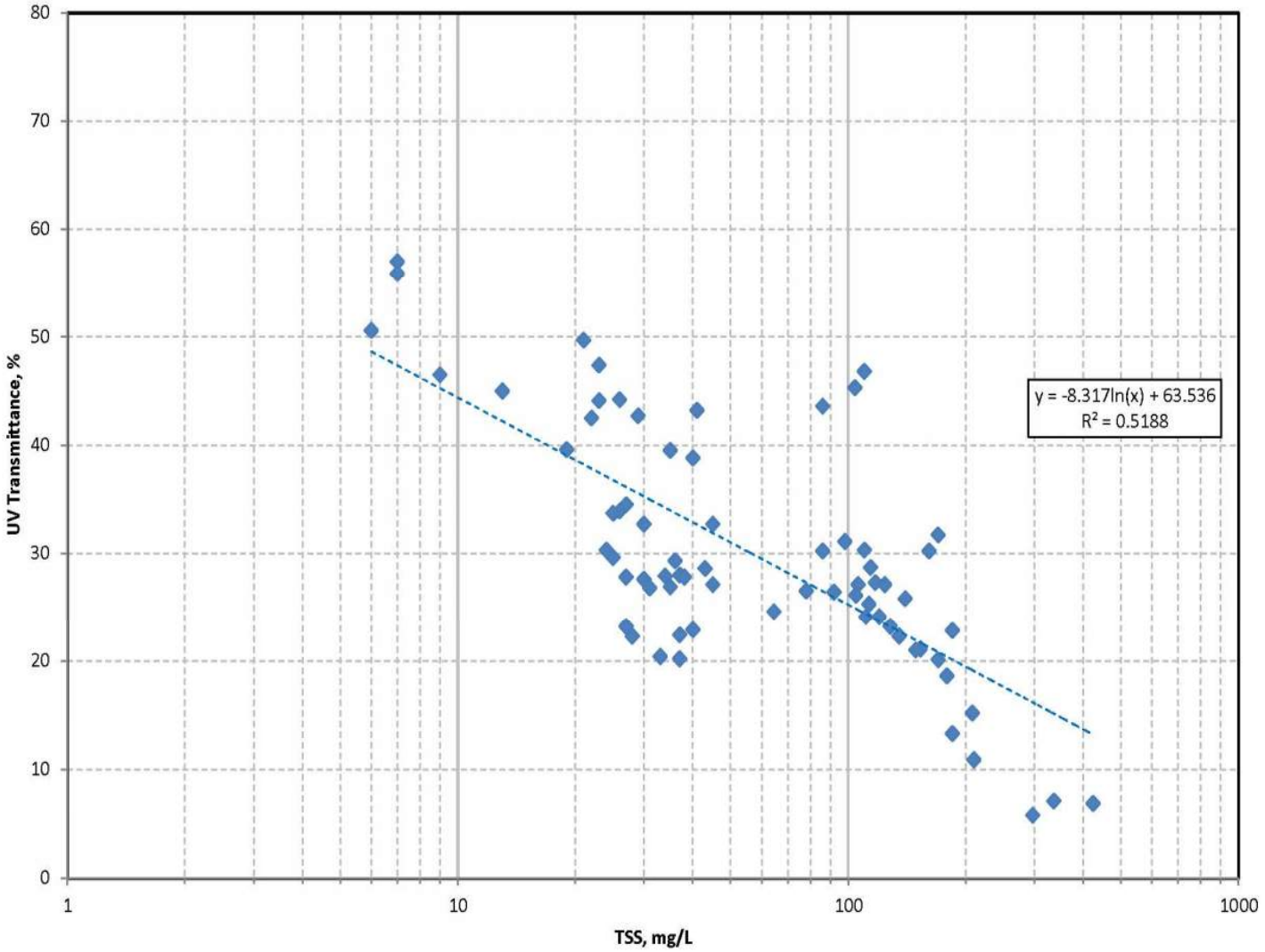


Figure 11.12 Effect of Total CBOD5 on UV Transmittance

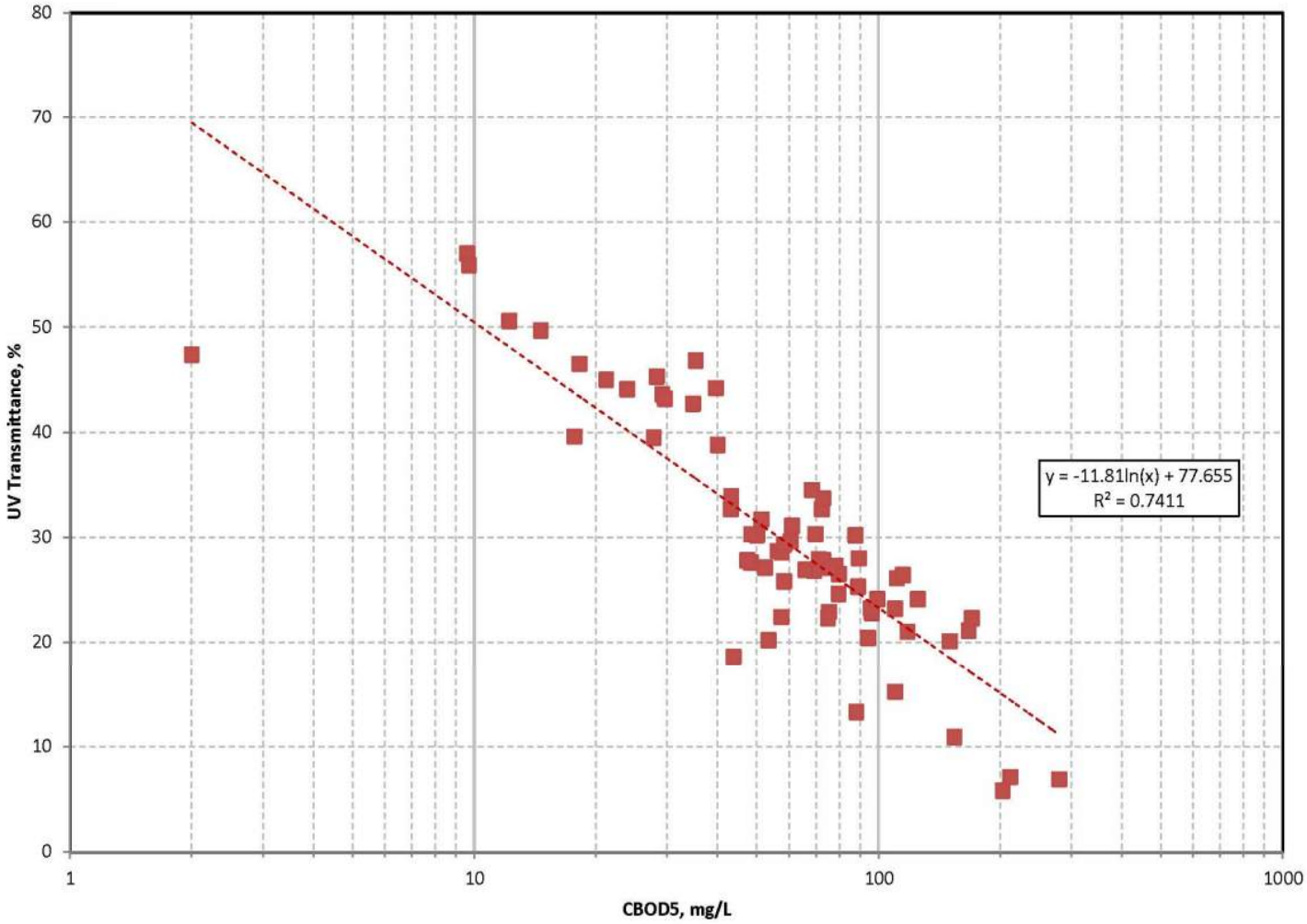
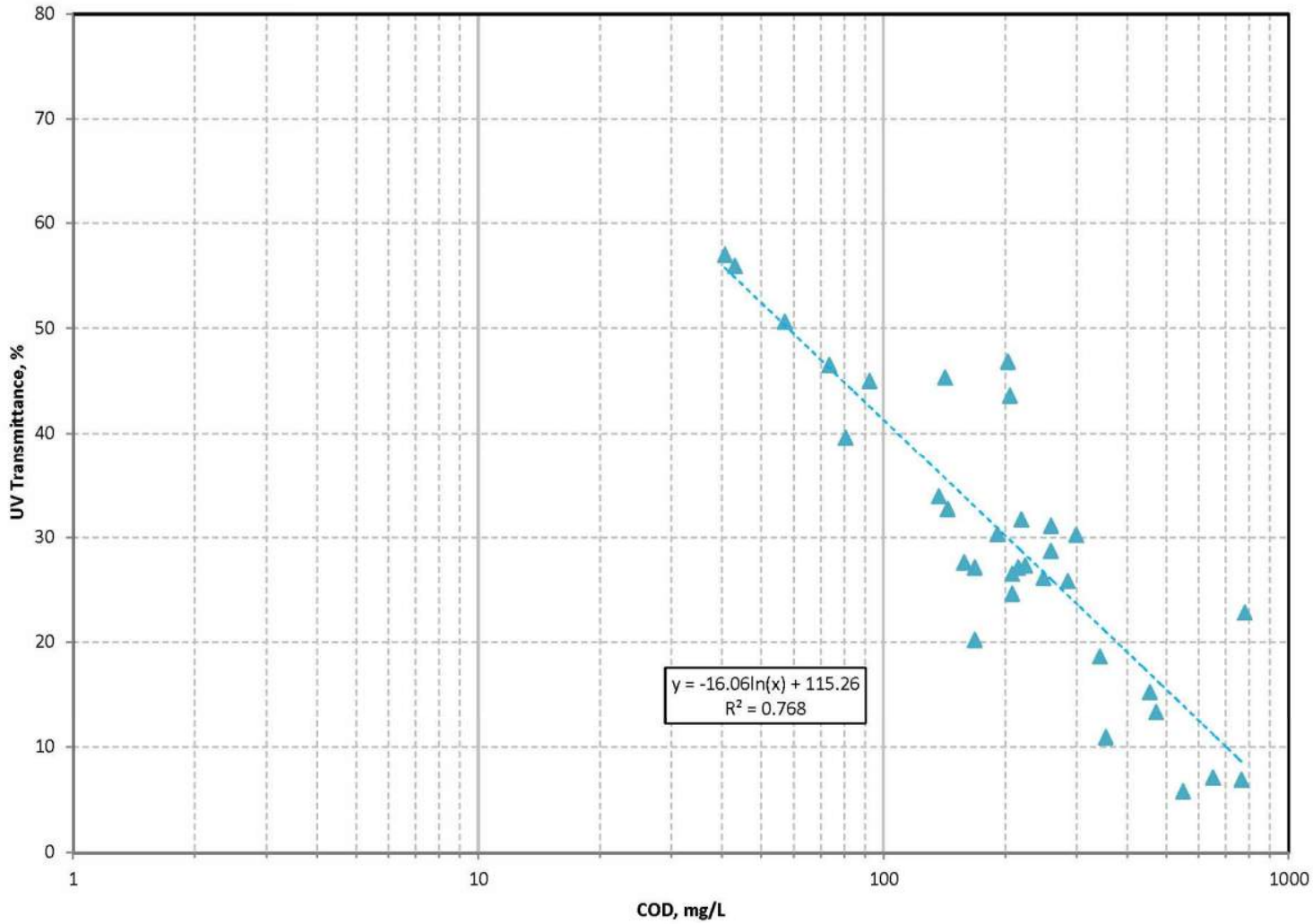


Figure 11.13 Effect of COD on UV Transmittance



Findings on UV disinfection

- Expected effectiveness commensurable with the modest UV dose applied (low UVT!)
- Expected UV dose-effect relationship demonstrated
- UV equipment should be de-rated in accordance with UVT expected
- UVT strongly correlated with TSS, CBOD5 and COD. Correlation with CBOD5 was stronger than with TSS reflecting contribution from dissolved organics

Conclusion

CSO flow is highly variable, which can have a meaningful impact on the performance of the equipment selected. Pilot testing is a critical step in selecting the appropriate satellite treatment equipment.

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Thank you

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https://www.nj.gov/dep/dwq/pdf/WWFTDDP_Report.pdf