

PERACETIC ACID DISINFECTION

Demonstration of PAA as Sole Wastewater Disinfectant at the Berkeley Heights WPCP

Chris Jepson
Van Cleef Engineering Assoc., LLC
Hamilton, NJ

Tom McAndrew
Superintendent, WPCP
Township of Berkeley Heights, NJ



AEA Spring Conference
Caesars's, Atlantic City, NJ
Wednesday, March 14, 2018

Agenda

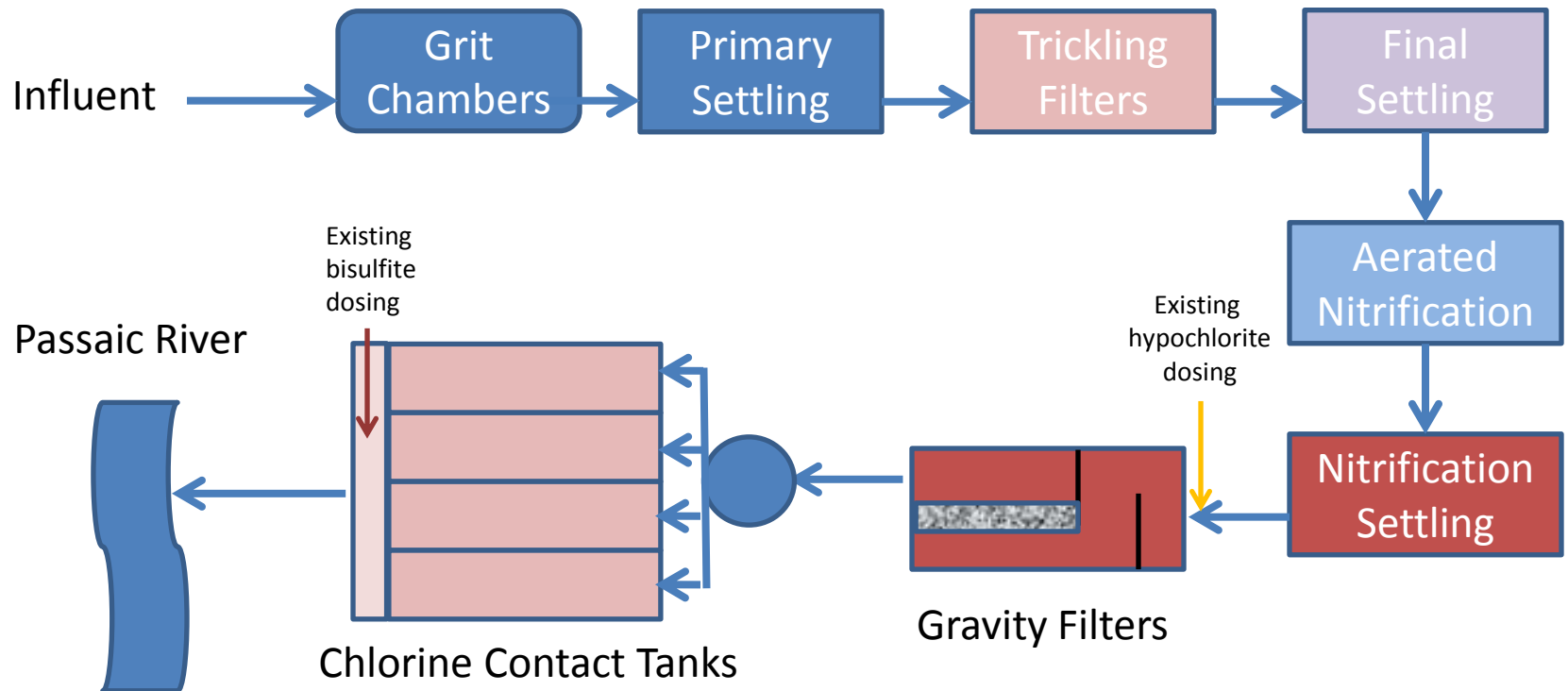
- Introduction to BHWPCP
- Disinfection Alternatives
 - Sodium Hypochlorite; UV
 - Peracetic Acid (Hydrogen Peroxide + Vinegar)
- Planned PAA Demonstration
 - Dosing locations
 - NJDEP permitting interface
- Demonstration Results
- Final Acceptance



BHWPCP Process Flow Diagram

3.1 MGD Capacity , 1.2-1.8 MGD Avg. Flow

Berkeley Heights' Department of Wastewater Treatment includes:
Water Pollution Control Plant (WPCP), 6 pump stations, sewer mains & collection facilities.



Disinfection Alternatives

- BHWPCP has operated with Sodium Hypochlorite disinfection / Bisulfite dechlorination for over two decades
- Due to growing concern & anticipated regulation of chlorine related DBP's, BHWPCP investigated disinfection alternatives
- Use of UV based Disinfection was considered:
 - Concerns over CapEx & OpEx costs
- We identified possible consideration of PAA as a low cost disinfection alternative.

Disinfection Alternatives

- BH & Van Cleef Eng (Owners Engineer) investigated PAA history
 - Discovered use of PAA only as a UV secondary disinfectant
 - No NJ sites had permitted PAA as Sole Disinfectant
- Van Cleef /BH interfaced with NJDEP on PAA path forward
 - Need to conduct study to determine effectiveness as sole wastewater disinfectant (QAPP)
 - Need to develop data to investigate dosing, effectiveness, eventual costs / savings relative to alternatives
 - Designed study to generate data needed satisfy NJDEP and BHWPCP of PAA performance
 - Approval needed to conduct short term study demonstration

Disinfection Alternatives

- Bench Test – March 2015 – Promising Results
- PAA trial was generated in July 2016
 - Several PAA suppliers were vetted
 - Biosafe chosen due to pricing and process knowledge & demo support offered
 - BH / Van Cleef / Bob Freeborn developed trial protocol (QAPP)
- Approval for 11 weeks demonstration obtained from NJDEP in Jan 2017
- Demonstration commenced Feb 2, 2017



State of New Jersey

CHRIS CHUISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code - 401-02B
Water Pollution Management Element
Bureau of Surface Water Permitting
P.O. Box 420 - 401 E. State St
Trenton, NJ 08625-0420
Tel: (609) 292-4860 / Fax: (609) 984-7938

BOB MARTIN
Commissioner

December 1, 2016

Christopher B. Jepson, PE
Van Cleef Engineering Associates
4 AAA Drive, Suite 102
Hamilton, NJ 08691

Re: Approval for Water Quality Monitoring Plan, Peracetic Acid Disinfection Study
NJPDES Permit No. NJ0027961
Berkeley Heights WPCF
Morris County

Dear Mr. Jepson:

The Department has reviewed and hereby approves the study entitled "Water Quality Monitoring Plan, Peracetic Acid Disinfection study, submitted by Van Cleef Engineering Associates as revised October 24th, 2016.

Please notify the Department prior to initial sampling so the Department has the opportunity to observe/ perform an audit of the sampling event. Should you have any questions or comments regarding this matter or the project, please feel free to contact Stephen Seeberger of my staff at (609) 292-4860.

Sincerely,

Tom Jenq, Environmental Scientist I
Bureau of Surface Water Permitting

Enclosures

cc: Central File
Stephen Seeberger, Principal Scientist, Bureau of Surface Water Permitting
Magan Kanzaria, Bureau of Surface Water Permitting
Marc Ferko, Office of Quality Assurance

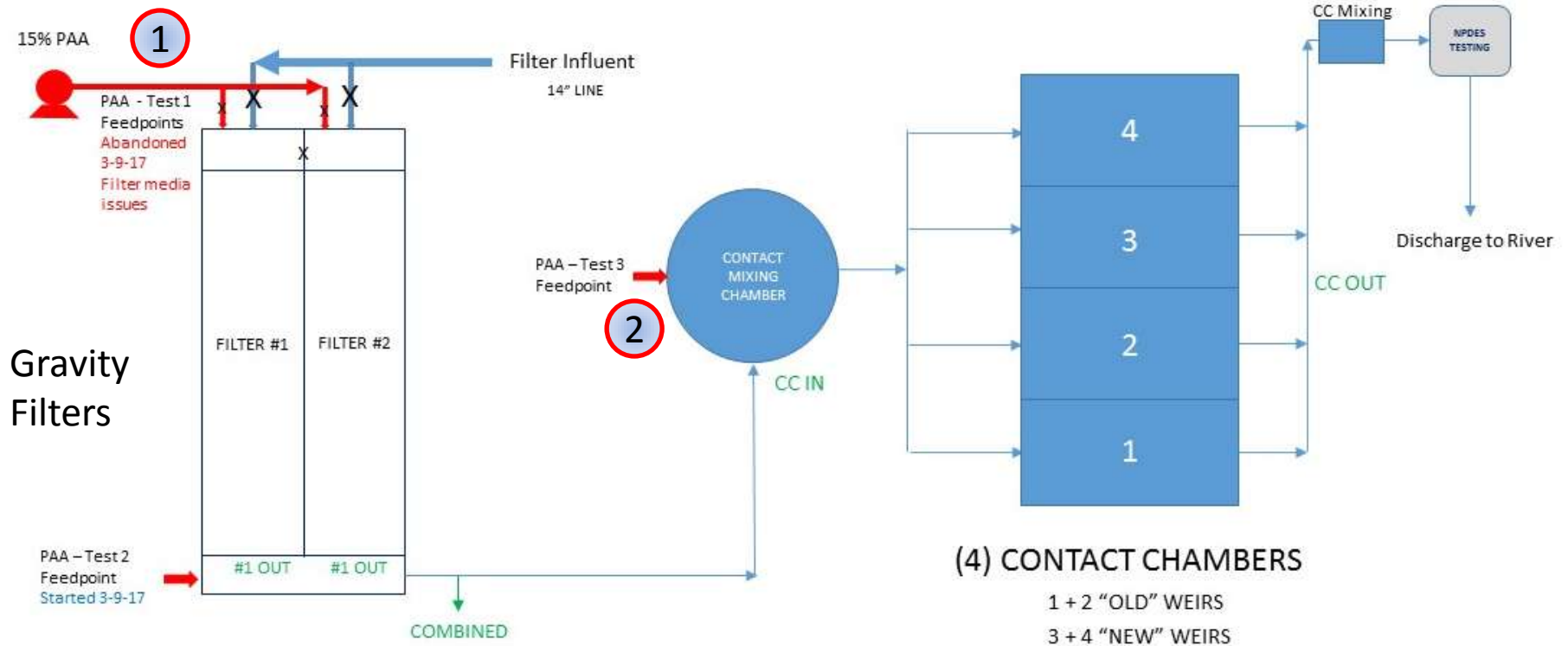
PAA Demo Study

Original Plan - conduct 11 week study:

- 3 weeks of data under existing conditions prior to PAA dosing (2/2)
- 4 weeks of data w/ PAA feed at inlet of Gravity Filters (2/23)
- 4 weeks of data w/ PAA feed at contact mixing chamber
- Review Disinfection performance data, dosages, performance variations.
- Develop final report on effectiveness, projected costs.



Township of Berkeley Heights, NJ WPCP PAA Disinfection Study - Process Flow Diagram



Wastewater

PAA Feed

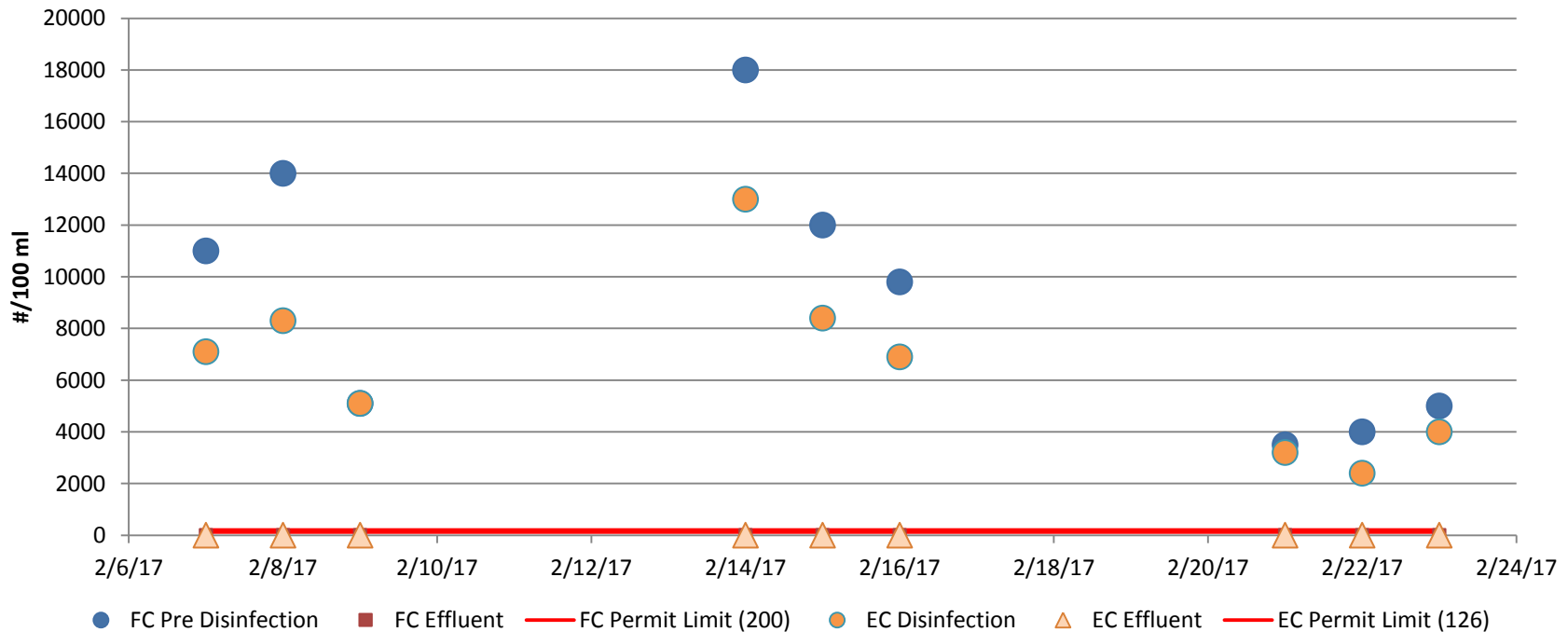
Sample Points

1

PAA Demo Study – Initial Results

Existing Hypochlorite disinfection performance documented prior to PAA dosing

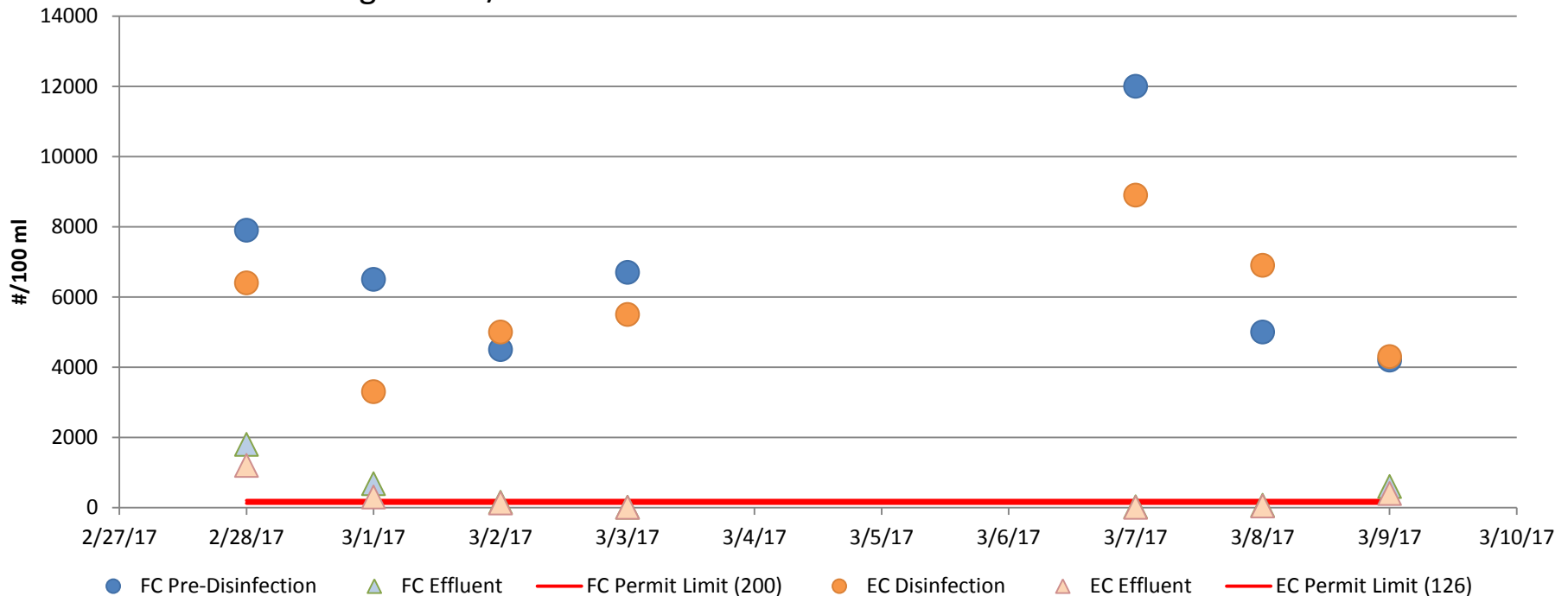
- Avg. FC Effluent and Avg EC Effluent = 2/100 ml.
- Both below permit limits.



PAA Demo Study – Test 1

Initial dosing of PAA at inlet of Gravity Filters (1.5 mg/l)

- Effluent E.Coli & Fecal Coliform disinfection results inadequate
 - FC Effluent Avg.: 660 #/ 100 ml
 - EC Effluent Avg.: 380 #/ 100 ml
- Dosages adjusted to improve performance, based on results
 - FC Effluent Avg.: 229 #/ 100 ml
 - EC Effluent Avg.: 150 #/ 100 ml



PAA Demo Study – Test 1

Initial dosing of PAA at inlet of Gravity Filters

- Residual deposits on sand in the filters
- Deposits caused higher consumption of PAA
- Reduced effective disinfection dosage



Paracetic Acid Disinfection					
Application Location: Sand Filter Influent					
Date	Flow	AM (mg/L)		PM (mg/L)	
		Sand Filter Influent	Effluent (Sampler)	Sand Filter Influent	Effluent (Sampler)
2/28/17	1.079	2.20	0.03	2.20	0.03
3/1/17	1.326	1.58	0.04	1.09	0.05
3/2/17	1.181	2.20	0.04	2.20	0.04
3/3/17	1.215	2.05	0.03	2.20	0.64
3/4/17	1.247	2.20	0.31	2.20	0.48
3/5/17	1.266	0.83	0.02	0.50	0.45
3/6/17	0.999	2.20	0.06	2.20	0.18
3/7/17	1.004	1.27	0.04	2.20	0.14
3/8/17	0.958	2.20	0.03	2.19	0.09
3/9/17	0.915	2.20	0.02	1.40	0.06
Average:				1.60	0.16
Maximum:				2.20	0.78



Revising PAA Demo Study

- Eliminate remaining two week of dosing from Gravity Filters inlet
- Add 2 weeks of dosing at Gravity Filters outlet
- Eliminate 4 weeks of data w/ PAA feed at contact mixing chamber - Due to excellent results at Gravity Filter outlet
- Review Disinfection performance data, dosages, performance variations.
- NJDEP provided approval to continue to dose PAA at Gravity Filter outlet beyond study time period.
- Develop final report on effectiveness, projected costs.



PAA Demo Study – Preliminary Results

- Dosing at inlet to Gravity Sand Filters produced variable , unsatisfactory disinfection results
 - Deposits on Filter media caused variable performance

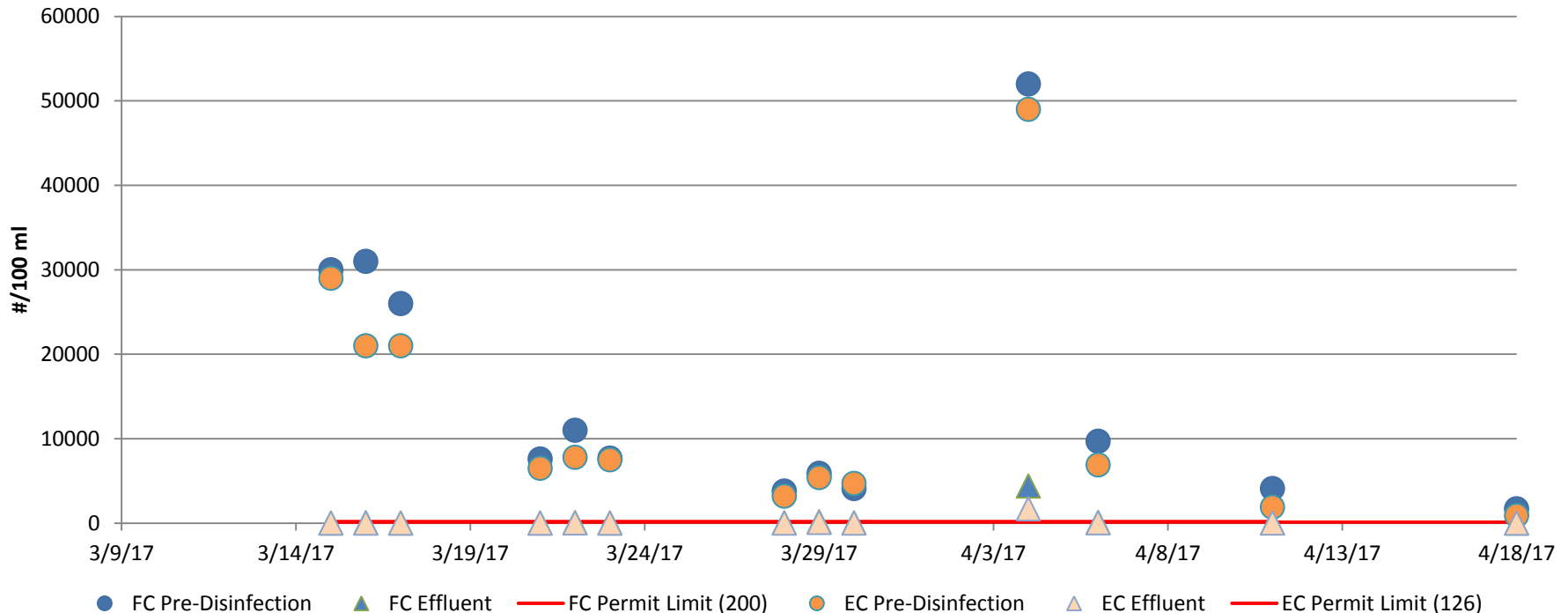
PAA Demo Study – Preliminary Results

- Dosing at outlet of Gravity Sand Filters produced improved, satisfactory disinfection results
 - Improved, more uniform results achieved
 - Working on improving dosages to minimize dose while providing adequate performance
 - Designing flow pacing procedures for dosing equipment

PAA Demo Study – Test 2

Test 2 PAA dosing located at effluent of Gravity Sand Filters

- Subsequent disinfection results improved
- Fecal Coliform avg. results reduced from 229 to 41
- E. Coli avg. results reduced from 150 to 18
- Excluded data when flow was greater than 3 MGD due to lack of flow pacing in dosing equipment



PAA Demo Study – NJDEP Interface

NJDEP has been very receptive to the PAA Study:

- Approved continued use of PAA for disinfection at the current dosing location (Sand Filter Effluent) while data and subsequent permit requests are processed
- Authorized continued use of the PAA after completion of the study (on a “temporary” basis), while they review the report/data and formulate an official response.
- Answered questions on CPO monitoring & communications with NJDEP Enforcement (with regard the DMR submittal).
- Interested in lab info BHWPCP obtains on alternative CPO testing for their usage with other Townships.

PAA Demo Study – Cost Analysis

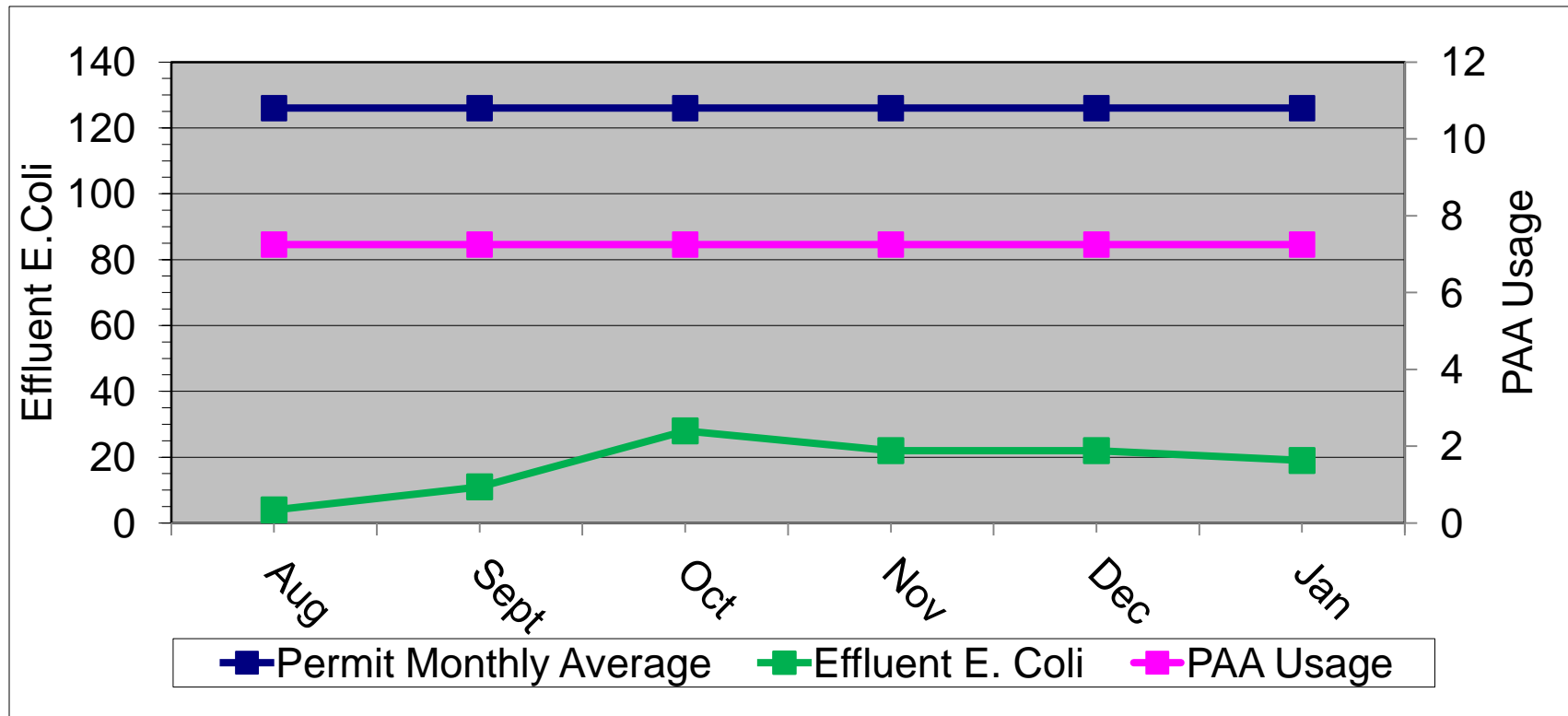
Various costs were initially evaluated:

- Annual costs for Hypochlorite / Bisulfite dosages were established as baseline:
 - Hypochlorite @ 40 gallons a day: \$19,403
 - Bisulfite @ 10 gallons a day: \$7,366
 - Total: \$26,769
- Projected costs for PAA at current dosing levels were estimated.
 - PAA @ 9.0 gallons a day: \$29,460
- Cost to switch to PAA is an annual increase of: \$2,691 or 10%

PAA Demo Study – Usage/Results

PAA cost reductions after optimization of dosages and delivery:

- New costs for PAA at current dosing levels were estimated.
 - PAA @ 7.25 gallons a day: \$23,575
- Cost to switch to PAA is an annual **DECREASE** of: \$3,194 or 12%



Potential Advantages

- Cost of Equipment (Pumps, Storage Tank, Piping)
- Ease of operation
- Ease of maintenance
- No CPO's on NJPDES
- Elimination of toxicity issues
- Potential to integrate new process into existing chlorine contact tanks

Potential Drawbacks

- Metals issues with Fe, Mn and Cu in unoxidized state can cause interference
- Carbonate scale as seen in sand filtration units. PAA consumed neutralizing the scale.
- Landfill leachates and industrial discharges with reducing agents (automotive facilities, etc.)
- Reported interferences caused by titanium (water champs impellers).



State of New Jersey

PHIL MURPHY
Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code - 401-02B
Division of Water Quality
Bureau of Surface Water Permitting
P.O. Box 420 - 401 E State St
Trenton, NJ 08625-0420
Phone: (609) 292-4860 / Fax: (609) 984-7938

CATHERINE R. McCABE
Acting Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7007 0220 0002 1037 3134

January 29, 2018

Thomas McAndrew, Plant Superintendent
Berkeley Heights Township
29 Park Avenue
Berkeley Heights, New Jersey 07922

Re: Final Surface Water Minor Mod Permit Action
Category: A - Sanitary Wastewater
NJPDES Permit No. NJ0027961
Berkeley Heights WPCF
Berkeley Heights Township, Union County

Dear Mr. McAndrew:

Enclosed is a **final** New Jersey Pollutant Discharge Elimination System (NJPDES) permit action identified above which has been issued in accordance with N.J.A.C. 7:14A.

This facility is in the process of switching disinfection treatment systems from chlorination to peracetic acid (PAA). Therefore, the Department has modified the permit to include monitoring for PAA. The monitoring frequency for PAA will be **once per day** with a **grab** sample type. Additionally, requirements for CPO have been modified to include the following provisions in Part IV:

H. Custom Requirement

1. Chlorine Produced Oxidants (CPO) Monitoring Requirements:
 - a. Beginning on the effective date of the permit modification (EDPM), the existing CPO limitations and conditions remain in effect.
 - b. Once the permittee has a) completed their PAA study, b) converted to PAA treatment and c) no longer uses chlorine in their treatment process, the permittee shall report "Code=N" on their DMRs for CPO.
 - c. If chlorine is ever used in the treatment process, the permittee shall promptly notify the Bureau of Surface Water Permitting and the Northern Bureau of Water Compliance and Enforcement.
2. Peracetic Acid (PAA) Monitoring Requirements:
 - a. Beginning on the EDPM, the permittee will begin reporting PAA on their DMRs (new permit requirement).

As per N.J.A.C. 7:14A-4.2(e)3, any person planning to continue discharging after the expiration date of an existing NJPDES permit shall file an application for renewal at least 180 calendar days prior to the expiration of the existing permit.

All monitoring shall be conducted in accordance with 1) the Department's "Field Sampling Procedures Manual" applicable at the time of sampling (N.J.A.C. 7:14A-6.5(b)4), and/or 2) the method approved by the Department in Part IV of the permit. The Field Sampling Procedures Manual is available at <http://www.nj.gov/dep/srp/guidance/fspm/>.

For your convenience, a schedule of submittal requirements has been included with this permit package.

Questions or comments regarding the final action should be addressed to Johnathan Lakhicharran either by phone at (609) 292-4860 or by email at Johnathan.Lakhicharran@dep.nj.gov.

Sincerely,

Michele Christopher
Supervising Environmental Engineer
Bureau of Surface Water Permitting

Enclosures

cc: Permit Distribution List

Masterfile #: 1317; PI #: 46122

Thank You!

Questions?

Chris Jepson, Van Cleef Engineering Assoc., LLC

609.689.1100

cjepson@vcea.org

Tom McAndrew, Township of Berkeley Heights, NJ

908. 464.5700 ext. 2139/2140

tmcandrew@bhtwp.com

