

MCHD

Fluorometric Detection of Optical Brighteners as an Indicator of Human Sources of Water Pollution



Optical Brighteners (OBs)

- Optical Brighteners are fluorescent white dyes that are added to laundry soaps, detergents, paper products, and textiles that make clothing appear whiter

OBs may indicate

- Leaky sewage pipes
- Failing Septic Systems
- Direct discharge from illegal sewer connections to the storm water system



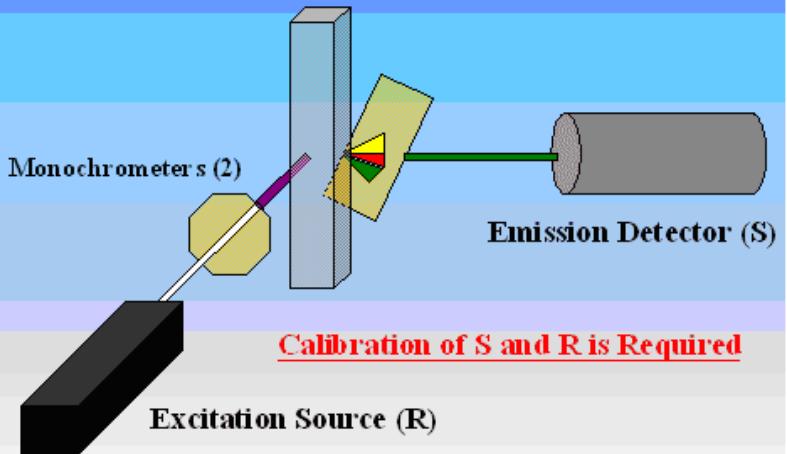
Aquafluor Handheld Fluorometer

- MCHD purchased the Turner Designs hand held Fluorometer
- Development of a Scientific Method & Standard Operating Procedure
 - Calibration
 - Split sampling
 - Result library to determine what the results indicate
 - Confounders
 - Limitation

Use of a Fluorometer

- the excitation source (R) and the emission detector (S) can be obtained and quantified

Fluorometer - Overview



Calibration of S and R is Required

Advantages

- instantaneous results
- examining a large number of samples in a short time
- increased sensitivity



AquaFluor

Background

- Initial sampling event conducted at Comstock Ave in Asbury Park (11/16/2006)
- Leeds Point analyzed OB samples before MCHD's meter arrived
- The OB results did not detect a house lateral
- The OB results did detect a collapsed sewer main
 - Bacteria results were elevated
 - Detergent odor
 - Steam
 - Grey colored water

Background continued

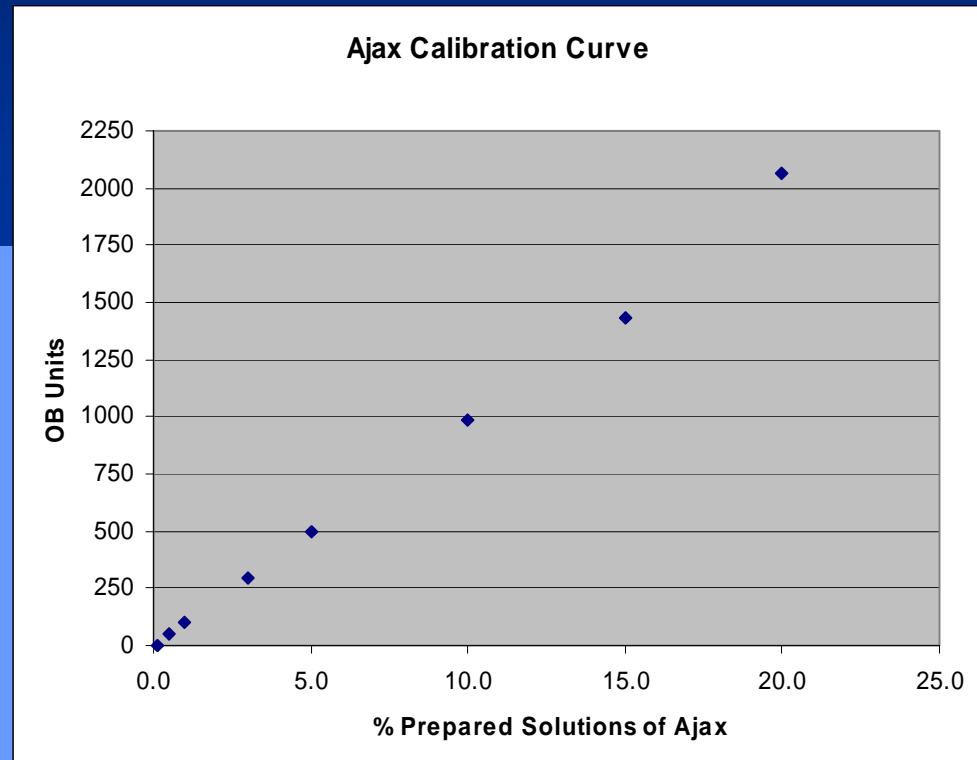
- Leeds Point had not previously conducted OB sampling in storm drains or manholes
 - Leeds Point analyzed samples from the Atlantic City Sewer Utility
 - Raw sewage intake
 - Treated effluent
 - The highest OB results from the storm drain at Comstock Ave was 25% higher than the reading for the raw sewage intake at ACSU
- ** Indicates that there are significant non-sewage confounders in storm drains

Calibration

- MCHD followed Leeds Point guidelines and calibrated the meter with a 5% detergent solution
- The standard value on the meter can be set to 25, 250 or 500
- After trying several detergents AJAX Laundry detergent was selected as the calibration solution
- The standard value on the meter was set to 500 because of more consistent results

Calibration Curves

- Since detergent manufacturers keep the actual concentration of optical brighteners confidential it is not known how much variance there is between brands. We need to establish reference values for our usages.
- Calibration curves will be generated for different detergents



Split Sampling

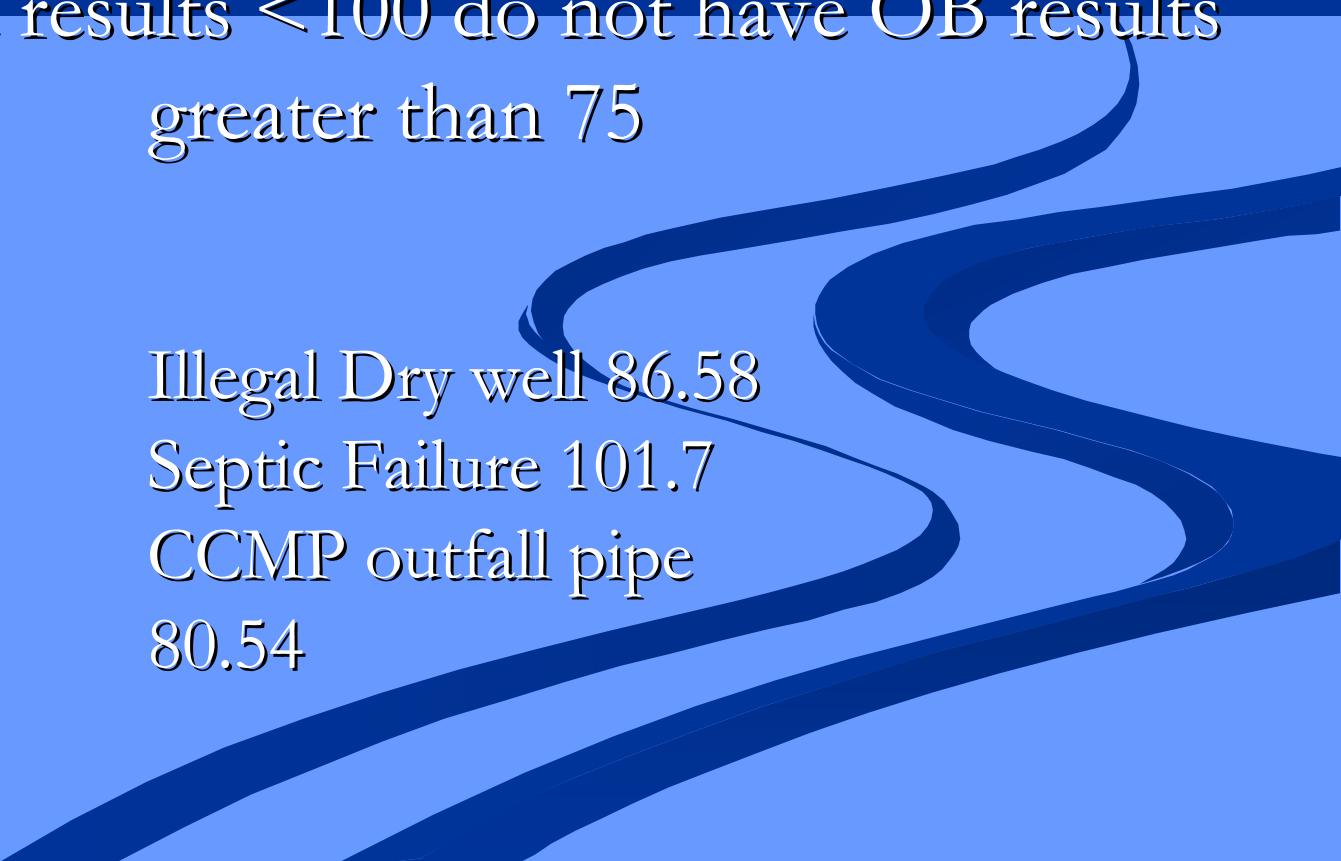
- Was conducted with Leeds Point in March 2007
- Comstock Ave was resampled to determine if repair work on a collapsed sewer line had reduced bacteria and OB results
- OB results were lowered and the trend was consistent between the samples

Development of a Result Library

- The MCHD has been collecting OB samples in conjunction with routine and investigative sampling events
 - Elevated CCMP samples
 - Hot Spots from Monmouth University's MST watershed study
 - Citizen complaints
 - Routine water sampling in the Manasquan River
 - Monmouth Park Sampling
 - Infrastructure Investigations

Interpreting the Numbers (SV of 500)

- ~ 100 OB samples have been collected in conjunction with fecal coliform and enterococcus
 - > 75 indicates a possible problem
- Low bacteria results <100 do not have OB results greater than 75



Illegal Dry well 86.58
Septic Failure 101.7
CCMP outfall pipe
80.54

Current Projects

- Wet weather sampling event in Red Bank using the OB meter to track possible sources with DPW along Maple Ave
- Follow-up sampling for L-Street in Belmar
 - Elevated bacteria and OB results
 - Trying to determine source of elevated counts
 - The DPW has flushed and vacuumed the infrastructure on the street
 - Resampling planned for lower temperatures

Confounders

- Copy paper 2896
- Kimwipe 292.3
- Iron Bacteria 26.54
- Car Wash Albrite 33.53
- Car Wash Turtle Wax 30% 85.31
- Newspaper, New York Post 690.2
- Styrofoam cup 81.45
- Kleenex 51.0
- Cigarette Butts 1616

Limitations

- Rat & cat urine
- Paper / Clothes
- Gypsy moth pesticides
- Hair coloring
- optical brighteners gradually degrade when exposed to direct sunlight
- Avoid highly colored waters, since waters with tannins and lignins contain naturally fluorescing materials.
- Avoid waters with lots of coarse organic matter, since as leaves break down they form naturally fluorescing materials.