APPENDIX A

GLOSSARY

APPENDIX A

GLOSSARY

Biomass
Mass of the biological material within a system.

BMP
Best Management Practices. Technology-based requirements developed in accordance with best professional judgement. These are largely non-structural measures which are designed to maximize pollutant capture and removal from the combined sewer system and the host POTW as a whole.

Biochemical oxygen demand
A measure of the amount of oxygen consumed in biological processes that break down organic matter in water. BOD measurements are used as a measure of the organic pollutant load.

BOD
See biochemical oxygen demand.

Combined sewer
A sewer that is designed as a sanitary sewer and a storm sewer.

Combined sewer overflow
Flows from a combined sewer caused by inflow which is in excess of interceptor or regulator capacity that is discharged into receiving waters without going to the tributary publicly owned treatment works.

Crosby baffle
A peripheral baffle placed in circular clarifiers to direct upward-flowing density currents away from the effluent weir.

CSO
See combined sewer overflow.

DO
Dissolved oxygen.

Flow equalization
Storage and systematic release of wastewater for treatment at a rate determined by plant capacity, used to create constant flow.

Filamentous growth
Organisms that grow in a thread or filamentous form. Common types are thiothrix and actinomycetes. A common cause of sludge bulking in the activated sludge process.

First flush
The initial surge of flow from a storm sewer or combined sewer during a rain event, which often contains high concentrations of grit, settleable solids, floatable material and other pollutants.

I/I
Infiltration and inflow.

Infiltration
Amount of groundwater leaking into a pipe via joints, porous walls, and breaks.

Inflow
Flow entering a sanitary sewer by means other than infiltration, such as basement drains, manhole covers, and improper storm sewer connections.

Interceptor sewer
Sewer receiving dry weather flow from various traverse sewers or outlets, as well as additional stormwater in a combined system, bringing wastewater to a point for treatment.

Invert
Lowest portion of internal cross section of a closed conduit, often referencing sewers, drains, and manholes.

LTCP
Long-term control plan. LTCP required by USEPA CSO Control Policy.

MCRT
Mean cell residence time. Average time for a unit of cell mass to pass through an activated sludge aeration tank, calculated as ratio of MLSS to waste sludge.

Microsand
Fine sand particles which can be mixed into primary or secondary clarifier influent to enhance settling.

MLSS
Mixed liquor suspended solids. Suspended solids in the mixed liquor of an aeration tank.

Nine minimum controls
Nine control measures required by USEPA CSO Control Policy.

NYSDEC
New York State Department of Environmental Conservation.

O&M
Operation and maintenance. The procedures for the proper function of treatment plant equipment and procedures for keeping the treatment plant equipment in proper working condition.

Overflow rate
A criteria for the design of settling tanks in treatment plants. It is stated as the settling velocity of particles that are removed in an ideal basin if they enter at the surface. (Volume of flow per unit water surface area of the tank.) It is typically reported in units of gallons per day per square foot.

Polymer

A chemical formed by the union of many monomers (a molecule of low molecular weight). Polymers are used with other chemical coagulants to aid in binding small suspended particles to larger chemical floc for their removal from water. All polyelectrolytes are polymers, but not all polymers are polyelectrolytes.

POTW

Publicly owned treatment works. A municipal wastewater treatment plant.

PWL

Priority Waterbodies List. A list published periodically by the NYSDEC listing surface waters that either cannot be fully used as a resource or have problems that can damage their environmental integrity.

Receiving water

A body of water into which treated wastewater is discharged.

Regulator

Device used to regulate diversion of flow into combined sewers or combined sewer overflows.

Sanitary Sewer

A conduit intended to carry liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with minor quantities of groundwater, storm, and surface waters that are not admitted intentionally.

Solids loading rate

Rate at which solids are fed to a clarifier, expressed in pounds per day per square foot.

SPDES

State Pollutant Discharge Elimination System. The system under which states issue discharge permits for point discharges to receiving waters.

SSO

Sanitary sewer overflow.

Storm sewer

A sewer that is designed to carry only stormwaters, surface runoff, street washwaters, and drainage.

Surcharge

Height of wastewater above the sewer pipe crown within a sewer manhole with completely full flow.

Surface overflow rate

See overflow rate.

SVI

Sludge Volume Index. The ratio of the volume in milliliters of sludge settled from a 1,000 ml sample in 30 minutes to the concentration of mixed liquor in milligrams per liter multiplied by 1,000. The value is reported in ml/gram. SVI is used to indicate the tendency of activated sludge solids (aerated solids) in the secondary clarifier to thicken or to become concentrated during the sedimentation/thickening process. To determine SVI, allow a mixed liquor sample from the aeration basin to settle for

30 minutes. Also determine the suspended solids concentration for a sample of the same mixed liquor. Calculate SVI by dividing the measured (or observed) wet volume (ml/l) of the settled sludge by the dry weight concentration of MLSS in grams/l. When mixed liquor has an SVI well above 100 ml/gram of solids, it tends to form a thin slurry or billowing sludge blanket or to form bulky sludge.

Throttle

To restrict an opening to regulate flow through the opening.

TOGS

Technical and Operational Guidance Series. A series of documents issued by the New York State Department of Environmental Conservation that provide guidance on how to ensure compliance with regulatory requirements.

Trunk sewer

Sewer receiving flow from numerous tributary branches.

TSS

Total suspended solids. Solids that either float on the surface or are suspended in water, wastewater, or other liquids and which are largely removable by laboratory filtering. Also, the quantity of material removed from wastewater in a laboratory test, as prescribed in AStandard Methods for the Examination of Water and Wastewater,≅ and referred to as total suspended solids dried at 103EC to 105EC.

Weir loading rate

Rate in gallons per minute per foot of weir length at which treated liquid is leaving the unit.

APPENDIX B

LIST OF REFERENCES

APPENDIX B

LIST OF REFERENCES FOR WET WEATHER INFORMATION

1. EPA Manual 625/R-93/004 - Urban Runoff Pollution Prevention and Control Planning, September 1993.

2. EPA Manual 625/R-93/007 - Combined Sewer Overflow Control, September 1993.

3. EPA Manual 832-B-95-002 - Combined Sewer Overflows - Guidance for Long-Term Control Plan, September 1995.

4. EPA Manual 832-B-95-003 - Combined Sewer Overflows, Guidance for Nine Minimum Controls, May 1995.

5. EPA Manual 832-B-95-004 - Combined Sewer Overflows, Guidance for Screening and Ranking Combined Sewer System Discharges, August 1995.

6. EPA Manual 832-B-95-005 (currently in draft) - Combined Sewer Overflows, Guidance for Monitoring and Modeling.

7. EPA Manual 832-B-97-004 - Combined Sewer Overflows, Guidance for Financial Capability Assessment and Schedule Development, March 1997.

8. EPA Manual 832-B-95-007 - Combined Sewer Overflows, Guidance for Funding Options, September 1995.

9. EPA Manual 832-B-95-008 - Combined Sewer Overflows, Guidance for Permit Writers, September 1995.

10. WEF MOP 7 - Wastewater Collection Systems Management, 1992.

11. WEF MOP 23 - Urban Runoff Quality Management, 1998.

12. WEF MOP FD-6, Existing Sewer Evaluation and Rehabilitation, 1994.

13. WEF MOP FD-17, Combined Sewer Overflow Pollution Abatement, 1989.

14. Isco Open Channel Flow Measurement Handbook, Third Edition, 1989, Isco, Inc.

Sources for Reference Publications

1 & 2 USEPA Publications
26 West Martin Luther King Drive
Cincinnati, OH 45268

Telephone: 513-569-7562

3 - 13 National Center for Environmental Publication Information (NCEPI)
11305 Reed Hartman Highway
Suite 219
Cincinnati, OH 45241
Telephone: 800-492-9198

10 - 13 Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994
Telephone: 800-666-0206

14 Isco, Inc.
P.O. Box 82531
Lincoln, NE 68501
Telephone: 800-228-4373

APPENDIX C

DYE TESTING PROCEDURE

APPENDIX C

DYE TESTING PROCEDURE FOR INVESTIGATION OF SETTLING TANK HYDRAULICS

INTRODUCTION

Hydraulic conditions in settling tanks can be evaluated using a fluorescent dye tracer. Two types of dye tracer tests are generally performed: (1) a slug feed test to determine the magnitude of hydraulic short-circuiting by examining how quickly flow moves through the settling tank; and, (2) a continuous feed test to identify the location and intensity of flow currents. The results of these two tests may be used to determine the need for additional baffling to prevent excessive carryover of solids to the settling tank effluent under peak flow conditions.

The recommended tracer for these tests is a fluorescent dye called Rhodamine WT. Fluorescent materials emit light of a specific frequency when subjected to light of another frequency. The concentration of fluorescent dye in a sample can be measured using a fluorometer. The fluorometer subjects the sample to a light source and measures the resulting emitted light. A fluorometer such as the Turner Designs Model 10 can be rented from Turner Designs (Sunnyvale, CA, phone 408-749-0994). For Rhodamine WT concentrations of 0.1 mg/l or less, the fluorometer reading is directly proportional to the dye concentration in the sample. Therefore the volume of liquid dye to be added should be selected to avoid exceeding 0.1 mg/l in the samples.

In the slug feed test, a known quantity of fluorescent dye is added at the influent end of the settling tank to be evaluated. Following addition of the dye, grab samples are collected from the settling tank effluent and analyzed for dye concentration using a fluorometer. The magnitude of hydraulic short-circuiting is determined by how quickly the slug of dye passes through the settling tank to the effluent.

In the continuous feed test, fluorescent dye solution of known concentration is added to the settling tank influent at a constant rate. Core samples are then collected at selected locations along the length of the settling tank. The core samples are used to analyze the dye concentrations observed at various depths through the settling tank. By repeating the sampling over time, the dye testing results can give a picture of how the dye moves through the settling tank. The results of the testing can be useful in identifying the location and intensity of velocity currents in the settling tank.

REQUIRED PLANT INFORMATION

Clarifier volumes and anticipated flow rates must be known to plan the dye tests. The slug and continuous flow tests should be performed to simulate as closely as possible the normal peak flow to the clarifiers. If the plant is experiencing lower flows at the time of the test, clarifiers should be removed from service to create the peak flow condition in the clarifiers which remain in service.

Equipment and Materials Needed

1. Rhodamine WT dye (20% solution)
2. Fluorometer and accessories (cuvettes, cuvette rack)
3. Liquid chemical metering pump (suitable for 150 ml per minute feed rate)

4. Sludge judges
5. Dye solution mix tank (10 gallon capacity or greater)
6. Grab sample collector
7. Sample containers and misc. laboratory glassware (pipettes, beakers, etc.)

Procedures

A. Slug Feed Test

1. Calibrate the fluorometer in accordance with the manufacturer's instructions.

2. Prepare dye solution from concentrated dye. The Rhodamine WT dye is purchased as a concentrated 20% solution. The volume of concentrated dye to be added to the clarifier influent will be selected to produce a concentration of 0.1 mg/l if the entire volume of dye were mixed in a volume of wastewater entering the clarifier in a one minute period. Therefore the volume of concentrated dye required for the slug test is calculated as follows:

$$v = \frac{(c)(Q)(3785 ml / gal)}{(C)}$$

Where: v = Volume of concentrated dye required, ml
c = Concentration of dye desired in 1-minute slug of clarifier influent, mg/l (=0.1 mg/l)
C = Concentration of concentrated dye, mg/l (= 200,000 mg/l)
Q = Flow rate into clarifier, gpm

For example, if the wastewater flow to the clarifier is 0.5 mgd (or 347 gpm) with a 30% return sludge flow, the total mixed liquor flow to the clarifier would be:

(347 gpm)(1.3) = 451 gpm

and the volume of concentrated dye required would be:

$$\frac{(0.1 mg / l)\ (451 gpm)\ (3785 ml / gal)}{200{,}000 mg / l} = 0.85 ml$$

The 0.85 ml of concentrated dye should be diluted to 125 ml or more before addition to the clarifier influent.

a. Before adding the dye, collect grab samples from the settling tank influent channel and effluent weir. Measure the dye concentration using the fluorometer. These concentrations will establish “background” dye concentrations.

b. Add the Rhodamine WT dye solution prepared per step b. to the settling tank influent. The addition point should provide good mixing of the dye solution with the wastewater flow before it enters the clarifier.

c. Collect grab samples at the settling tank effluent weir at regular time intervals and measure dye concentrations. Samples should be collected every 5 minutes until the peak dye concentration is reached at the effluent weir. After the peak dye concentration has passed, sampling should continue every 15 minutes until the background dye concentration is reached.

d. Collect grab samples from the settling tank influent feed channel at 30 minute intervals and determine any changes in "background" dye concentration resulting from recycle flows (e.g. return activated sludge, etc.)

e. Plot dye concentrations versus time. The time at which the peak dye concentration is observed gives an indication of the velocity of flow through the settling tank and the magnitude of short-circuiting that occurs. The "actual" hydraulic detention time can be determined by calculating the centroid of the area under the dye concentration curve. The "actual" detention time can then be compared with the theoretical detention time based on the tank volume and actual wastewater flow during the dye tracer test.

B. Continuous Feed Test

1. Calibrate the fluorometer in accordance with the manufacturer's instructions.

2. Prepare a dye solution which will produce a final concentration of approximately 0.1 mg/l when added to the settling tank influent. The following steps may be used to prepare the dye solution using a concentrated 20% solution of Rhodamine WT dye.

Step 1: Calculate Dye Solution Concentration

$$C = \frac{(0.1\ \text{mg/l})\ * (Q)}{(q)}$$

Step 2: Calculate the Amount of Dye Solution Needed

$$V = (q) * (T)$$

Step 3: Calculate the Amount of Concentrated Dye Needed

$$v = \frac{(C) * (V)}{(200{,}000\ \text{mg/l})}$$

where:

C = Dye solution strength desired, ppm
Q = Settling tank influent flow, gpm

q = Dye solution injection rate, gpm (150 ml/min = 0.040 gpm or whatever rate your feed pump actually delivers)
V = Amount of dye solution needed, gallons
T = Duration of continuous feed test, min (refer to step f. below)
v = Amount of concentrated dye needed, gal

a. Meter the dye solution into the settling tank influent using a chemical feed pump at a rate of 150 ml per minute (or the feed rate q used in Steps 1 and 2 above).

b. Collect core samples using sludge judges at selected locations along the length of the settling tank.

c. Bleed the core samples into sample containers (such as "whirl-pak" sample bags) in 1-foot increments for settling tanks with sidewater depths of less than 9 feet. Use 2-foot increments for sidewater depths in excess of 9 feet. Measure the dye concentration for each sample increment.

d. Repeat the core sampling at the following intervals:

- 10, and 15 minutes for 50 foot settling tanks.
- 10, 20, and 30 minutes for 100 foot settling tanks.
- 20, 40, and 60 minutes for 150 foot settling tanks.

e. Prepare dye concentration contour plots based on sampling data collected for each time interval. Analysis of the contour plots will provide a visual indication of the location and intensity of flow currents in the settling tank and the need for additional baffling.

APPENDIX D

SAMPLE SMALL PLANT
WET WEATHER OPERATIONS PLAN

APPENDIX D

CLEAR CREEK WWTP
WET WEATHER OPERATING PLAN

SECTION 1 - GOALS

The Clear Creek WWTP discharges an average flow of 2 mgd into the lower end of Clear Creek. The plant's collection system has one CSO that discharges to Seven Mile Creek. The goal of this Wet Weather Operating Plan is to maximize flow to the wastewater treatment plant and minimize occurrences of overflows to Seven Mile Creek. The state has indicated that every effort should be made to avoid overflows to Seven Mile creek while maintaining compliance with the discharge permit requirements at the treatment plant.

1.1 Critical Components and Major Objectives

Seven Mile CSO Structures - Remove excessive solids buildups. Prevent creek water from entering system.

Mechanical Bar Screen - Avoid bar screen failures during wet weather.

Hand-Cleaned Bar Screen - Provide extra cleaning during peak flows.

Grit Channels - Utilize second channel during high flows

Primary Clarifiers - Check sludge blankets to prevent high blanket levels during peak flows.

Aeration Tanks - Go to step feed mode during spring runoff. Avoid long MCRT due to decreased sludge settleability.

Final Settling Tanks - Monitor blanket levels and SVI.

Chlorine Contact Tanks - Clean tank before wet weather

Sludge Processing Facilities - Dewater sludge weekly. Stop thickener makeup flow during high flows. Avoid pressing sludge during wet weather.

1.2 Operating Guidelines

Catch Basins - Clean with vac-truck three times per year - Street crew.

Seven Mile CSO Structure

Equipment List
One self cleaning trash rack.
One flap gate with limit switch.

Before Wet Weather
No large grit deposits at sanitary sewer outlet.
Flap gate is fully closed.
No large debris on trash rack or in overflow outlet chamber.

During Wet Weather
Check daily.
If overflow is occurring, check twice daily for large debris on trash rack or in chamber.
When creek level is above overflow headwall, confirm there is no backflow from creek.
If backflow occurs try to push flap gate closed with pole.

After Wet Weather
Clean any large debris from chamber.
Clean grit deposits from sanitary outlet.

Notes
Under certain conditions, overflow can allow creek water in. Investigate flap gate replacement.

Bar Screens

Equipment List
One mechanical bar screen.
One hand cleaned bar screen.

Before Wet Weather
Confirm grit per screenings dumpster is less than 1/2 full.
Confirm spare shear pins on hand for screen drive.

During Wet Weather
Switch screen to continuous operation.
Empty screen cart at beginning of day.
Empty screen cart at end of day.
Check three times per day.
Confirm chains are moving - no shear pin failure.
If channel level is within 6 inches of floor or flows over 4 mgd anticipated, pull stop plate to hand cleaned bar screen.
Clean hand cleaned screen three times per day.

After Wet Weather
Replace stop plates in hand cleaned screen channel.
Return screen to timed operation.

Notes
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Grit Channels

Equipment List
Two horizontal non-aerated grit channels with chain and bucket grit elevators.
One screw-type grit classifier.

Before Wet Weather
Confirm grit per screenings dumpster is less than 1/2 full.
Confirm spare shear pins on hand for bucket elevator drives.

During Wet Weather
If flows over 4 mgd are anticipated, open slide gate to second grit channel and place both bucket elevators and grit classifier in continuous operation.
Check three times per day.
Confirm chains are moving - no shear pin failure.

After Wet Weather
Close gates to second grit channel and allow buckets to empty remaining grit. Shut off second bucket elevator. Return grit collector to timed operation.

Notes
Alternate channels when taking out of service.

Primary Clarifiers

Equipment List
Two chain and flight sludge collector mechanisms.
Two screw-type cross collectors.
Two diaphragm sludge pumps.

Before Wet Weather
Check sludge blankets once per day.

During Wet Weather
Check sludge blankets three times per day.
Adjust sludge pump timers to maintain maximum 2-foot blanket level.

After Wet Weather
Readjust sludge pump timers as necessary.

Notes
Blanket levels above 4 feet during high flows will cause solids washout.

Aeration Tanks

Equipment List
Three centrifugal blowers.
Fine bubble flexible membrane diffused aeration system in two aeration tanks.
Three step feed control gates per tank.

Before Wet Weather
Check MLSS daily
For expected extended wet weather (>2 days) go to step feed mode
Maintain max MLSS 1,900 mg/l in second aeration bay in step mode

During Wet Weather
Check MLSS twice per day (centrifuge test).
If SVI < 110, flow < 5 mgd, and clarifier blanket rising above three feet, increase return sludge pumps (can go up to max speed).
At flows > 6 mgd check clarifier blanket frequently. If blanket reaches eight feet shut off air at last aeration drop, pipe in each aeration tank. Restore air when flows below 6 mgd and blanket below eight feet.
At flow greater than 7 mgd, throttle influent gate to prevent washout if sludge blanket is approaching weir. Shut off all air in last aeration basin.

After Wet Weather
Restore all air.
Return to conventional mode if outside normal wet season (March 1 - May 30).

Notes
Flow only exceeded 7 mgd once, Jan 1996.

Final Settling Tanks - Monitor blanket levels and SVI.

Equipment List
Two circular clarifiers.
Three return sludge pumps.
Two waste sludge pumps.
One scum pump.

Before Wet Weather
Check sludge blankets once per day.
Adjust sludge wasting to maintain MCRT ~10 days.

During Wet Weather
Check sludge blankets three times per day.
See aeration tank recommendations above.

After Wet Weather
Readjust return sludge pumping rates.

Notes
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Chlorine Contact Tanks - Clean tank before wet weather.

Equipment List
Two chlorine contact tanks.
One chlorine diffuser.

Two sodium hypochlorite feed pumps.
Effluent Parshall flume with ultrasonic level sensor.

Before Wet Weather
Check for solids or scum buildup in CCTs. Clean as necessary.
Check calibration of Parshall flume using staff gauge at flume versus meter readout.
Check flow pacing of hypochlorite pump.
Confirm chlorine mixer operational.
Check supply of sodium hypochlorite. Order if <1/2 tank.

During Wet Weather
Check chlorine residual daily. If flow pacing fails, set metering pump feed rate for wastewater flow based on wall chart at pumps.

After Wet Weather
Check sodium hypochlorite supply and reorder as necessary.

Notes
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Sludge Processing Facilities - Dewater sludge weekly. Stop thickener overflow during high flows. Avoid pressing sludge during wet weather.

Equipment List
One gravity thickener.
Two anaerobic digesters.
One belt filter press.

Before Wet Weather
Check secondary digester liquid level. Try to maintain low level (two - three feet above corbels) before extended wet weather periods to avoid digester supernatant production during wet weather and maintain capacity for excess sludge pumping after first flush.

During Wet Weather
Continue primary and WAS pumping to gravity thickener.
Shutoff thickener make-up water.
Continue pumping thickened sludge to digester.
Avoid digester supernatant production.
Avoid pressing sludge when flow is > 5 mgd.

After Wet Weather
If dewatering was temporarily halted during wet weather, accelerate dewatering schedule to catch up with sludge production.

Notes
Do not store excess solids in primary clarifiers, aeration tanks or secondary clarifiers during wet weather.

APPENDIX E

SAMPLE LARGE PLANT
WET WEATHER OPERATIONS PLAN

APPENDIX E

Excerpts From Wet Weather Operating Guidelines for the
Frank E. Van Lare Wastewater Treatment Plant

The following excerpts are from wet weather operating guidelines for a large wastewater treatment facility. This text includes the introductory paragraphs and sample operating guidelines for their aerated grit removal facilities. Each major unit process in the plant has a section in the manual describing wet weather operating guidelines for that process.

SECTION 1 - INTRODUCTION

1.1 Background

This manual contains wet weather operating guidelines for Monroe County's Frank E. Van Lare Wastewater Treatment Plant and the wastewater and stormwater collection system serving the plant. The Van Lare plant serves the City of Rochester and other Monroe County communities, providing preliminary, primary and secondary treatment for all dry weather wastewater flow entering the sewer system. The wastewater collection system is a combined sewer system which collects both wastewater and stormwater. During wet weather events, when stormwater enters the combined sewer system, overflows can occur at combined sewer overflows (CSOs) which discharge to the Genesee River, Irondequoit Bay, Lake Ontario or their tributaries. Monroe County has installed an extensive tunnel system to store combined stormwater and wastewater during wet weather events. Following a wet weather event, combined sewage is removed from the tunnels and sent to the Van Lare plant for treatment. The tunnel system has significantly reduced the frequency and volume of combined sewer overflows and has had a beneficial environmental impact on the area's surface waters.

The plant's NPDES discharge permit requires that flows up to 135 mgd receive full secondary treatment. Flows between 135 and 200 mgd may receive primary treatment and disinfection prior to discharge to Lake Ontario. This mode of operation is referred to as "split flow" by the plant staff. Flows in excess of 200 mgd can be sent to the Additional Treatment Facility (ATF) where they receive preliminary treatment consisting of screening and grit removal prior to discharge to the lake through the 120-inch outfall pipe. This operational mode is called "120 flow" by the plant staff. Total flow to the Van Lare plant can exceed 600 mgd during extreme wet weather events.

SECTION 10 - PLANT AREA: SCREENING AND AERATED GRIT FACILITY (AGF)

10.1 Unit Processes and Equipment List

UNIT PROCESS	EQUIPMENT
AGF Screen and Grit	4 Bar screens 4 Bar screen influent gates 4 Bar screen effluent gates 4 Grit pumps 3 Blowers (Lamson) 2 Hydraulic power packs 4 Grit screws 2 Carbon towers, blowers 2 72" Flow meters 4 Level sensors, 8 heads (Milltronics) Grit screw motion detectors Air header and diffusers Sump pumps Equalization gate 4 Rag canisters (2 yd each) Flush water lines (process water) SYMAX Raw auto sampler

10.2 Wet Weather O&M Practices

WHO DOES IT?		WHAT DO WE DO?
Before Wet Weather Event		
11	11, 8	The day before, check rag canisters - dump if half full.
11	11, 8	Check grit pumps to make sure they are clean, pumping good (steady grit stream - 7 to 10 psi).
11	11, 8	Check grit screws and hydraulic units (temp. >110 deg. F, pressure, oil level of hydraulic units).
13	11, 8	Monitor grit output (steady stream to classifiers).
13	13, 11	Flow equalization - balance flows to east and west channels.
13	IEM	Place all units in service.
During Wet Weather Event		
13	11	If 2 blowers are on, shut off second blower at 100 mgd and valve other blower to go to both east & west grit channels.
13		Over 150 mgd - turn off all blowers.

WHO DOES IT?		WHAT DO WE DO?
13		Divert pump station flow to non-aerated grit facility as needed based on amount of grit loading in the influent.
13	11, PWT	Restrict flow to 180 mgd by throttling 72-inch gates in main influent distribution center.
13	13, 11	Divert remainder of flow to non-aerated grit facility.
13,11	11, 8	Check rag canisters - dump when 2/3 full or anticipated being full.
13,11	11, 8	Check grit pumps for proper operation and 7 to 10 psi pressure.
13,11	11, 8	Check hydraulic units (temp. >110 deg. F, high pressure, oil level sight tube). Report problems to shift supervisor.
	13, 11	Monitor flow rates.
	13, 11	Monitor loadings.
13	11, 8	Make sure bar screens are operating properly (pulling rags and free movement).
13	11, 8	Balance flows to east and west.
13	11, 8	Measure grit output.
	13, 11, PWT	Record flows hourly.
13	11, 8	Pressure readings on classifiers, make sure that nose cones are free allowing grit to flow out slowly.
	(IEM)	Repair failures.
After Wet Weather Event		
13,11	11,8	Reverse order for gates and blowers (< 150 mgd, turn on one blower) (see "During Wet Weather Event").
13,11	11,8	Check grit dumpsters - dump if 2/3 full. Log in operations book.
13,11	11,8	Check rag dumpsters - dump if 2/3 full. Log in operations book.
13,11	11,8	Check hydraulic units - report problems to the supervisor
	(IEM)	Repair any items that failed.

WHY DO WE DO THIS?

To prevent overloading of the aerated grit facility. Maximum flow of 180 mgd is maintained to prevent build up of grit. Overloads can cause screw failures and plugged grit lines. Shutting off blowers during high flows prevents excess grit carryover into primary tanks and the rest of the plant.

WHAT TRIGGERS THE CHANGE?

Specific flow rates described above.

WHAT CAN GO WRONG?

WHAT CAN GO WRONG?
Screw failures. Plugged grit lines. Hydraulic power pack failures. Bar screen failures.

APPENDIX F

FORMULAS FOR
DEPTH OF FLOW OVER WEIRS

APPENDIX F

FORMULAS AND CONVERSIONS FOR WEIR FLOW CALCULATIONS

Formulas

Rectangular Weir - $Q = 3.33\ Lh^{3/2}$

90° V-Notch Weir - $Q = 2.48\ H^{2.48}$

60° V-Notch Weir - $Q = 1.43\ H^{2.5}$

Q = flow over weir (cubic feet per second)

L = length of rectangular weir (feet)

h = depth of flow over rectangular weir (feet)

H = depth of flow in V-notch weir (feet)

Conversions

1 mgd = 1.547 cfs

APPENDIX G

CLARIFIER LOADING CALCULATIONS WORKSHEETS

Solids Loading Rate
Rectangular Clarifier

Required Input Data

(1) Clarifier Length (L) _____ ft

(2) Clarifier Width (W) _____ ft

(3) Number of Clarifiers (N) _____

(4) Flow (Q) *(NOTE - Flow DOES include RAS flow)* _____ mgd

(5) Mixed Liquor Suspended Solids (MLSS) _____ mg/l

Surface Area of One Clarifier

(6) $A_s = (L)(W)$

(7) $A_s = (_____)(_____) = _____\ ft^2$

Enter from line (1) Enter from line (2)

Total Surface Area

(8) $A_{s\ (TOTAL)} = (N)(A_s)$

(9) $A_{s\ (TOTAL)} = (_____)(_____) = _____\ ft^2$

Enter from line (3) Enter from line (7)

Solids Loading

(10) $SL = (Q)(8.34)(MLSS)$

(11) $SL = (_____)(8.34)(_____) = _____\ lbs / d$

Enter from line (4) Enter from line (5)

Solids Loading Rate

(12) $SLR = SL / A_{s\ (TOTAL)}$

(13) $SLR = _____ / _____ = _____\ lbs / ft^2/d$

Enter from line (11) Enter from line (9)

Solids Loading Rate
Circular Clarifier

Required Input Data

(1) Clarifier Diameter (D_c) _____ ft

(2) Number of Clarifiers (N) _____

(3) Flow (Q) *(NOTE - Flow DOES include RAS flow)* _____ mgd

(4) Mixed Liquor Suspended Solids (MLSS) _____ mg/l

Surface Area of One Clarifier

(5) $A_s = (Pi)(D_c^2/4)$

(6) $A_s = (3.14)(_____^2/4) = _____\ ft^2$

Enter from line (1)

Total Surface Area

(7) $A_{s\ (TOTAL)} = (N)(A_s)$

(8) $A_{s\ (TOTAL)} = (_____)(_____) = _____\ ft^2$

Enter from line (2) Enter from line (6)

Solids Loading

(9) SL = (Q)(8.34)(MLSS)

(10) SL = (_____)(8.34)(_____) = _____ lbs / d

Enter from line (3) Enter from line (4)

Solids Loading Rate

(11) $SLR = SL / A_{s\ (TOTAL)}$

(12) $SLR = _____ / _____ = _____\ lbs / ft^2/d$

Enter from line (10) Enter from line (8)

Surface Overflow Rate
Rectangular Clarifier

Required Input Data

(1) Clarifier Length (L) _____ ft

(2) Clarifier Width (W) _____ ft

(3) Number of Clarifiers (N) _____

(4) Flow (Q) _____ mgd

NOTE - Flow does NOT include RAS flow

Surface Area of One Clarifier

(5) $A_s = (L)(W)$

(6) $A_s = (_____)(_____) = _____\ ft^2$

Enter from line (1) Enter from line (2)

Total Surface Area

(7) $A_{s\ (TOTAL)} = (N)(A_s)$

(8) $A_{s\ (TOTAL)} = (_____)(_____) = _____\ ft^2$

Enter from line (3) Enter from line (6)

Surface Overflow Rate

(9) $SOR = (Q)(10^6) / A_{s\ (TOTAL)}$

(10) $SOR = (_____)(10^6) / _____ = _____$ gpd / f

Enter from line (4) Enter from line (8)

Surface Overflow Rate
Circular Clarifier

Required Input Data

(1) Clarifier Diameter (D_c) _____ ft

(2) Number of Clarifiers (N) _____

(3) Flow (Q) _____ mgd

NOTE - Flow does NOT include RAS flow

Surface Area of One Clarifier

(4) $A_s = (Pi)(D_c^2/4)$

(5) $A_s = (3.14)(_____^2/4) = _____\ ft^2$

Enter from line (1)

Total Surface Area

(6) $A_{s\ (TOTAL)} = (N)(A_s)$

(7) $A_{s\ (TOTAL)} = (_____)(_____) = _____\ ft^2$

Enter from line (2) Enter from line (5)

Surface Overflow Rate

(8) $SOR = (Q)(10^6) / A_{s\ (TOTAL)}$

(9) $SOR = (_____)(10^6) / _____ = _____$ gpd / f

Enter from line (3) Enter from line (7)

APPENDIX H

WET WEATHER SURVEY RESULTS

APPENDIX H

SURVEY ON WET WEATHER OPERATING PRACTICES

In December 1995, the NYSDEC distributed a Survey on Wet Weather Operating Practices to operators of wastewater treatment facilities serving combined sewer systems. A copy of the blank survey form is included in this appendix. Also included is a summary of the responses to the survey submitted by the 45 respondents. The responses include descriptions of specific problems and operational adjustments made for major components and unit processes within the collection system and wastewater treatment plant. Essentially, all of the survey respondents noted some adverse impacts of wet weather flows on their collection and treatment facilities. The predominant time period for high wet weather-related flows was the springtime, when a combination of rain and snowmelt produces high inflow and infiltration.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York, 12233-3506

Michael D. Zagata
Commissioner

December 28, 1995

TO: Plant Managers - Chief Operators - Collection System Maintenance Managers

RE: Survey on Wet Weather Operating Practices - We Need Your Help!

Attached is a short questionnaire which is intended to:

1. Collect information on the impact of wet weather events on collection systems and wastewater treatment plant unit processes, and;

2. Identify operational approaches and strategies currently being used by operators to minimize the effects that wet weather events have on plant performance.

We recognize that combined sewers and stormwater cause operating problems at many wastewater plants. This survey is an important first part of a project that will provide training to help you better deal with wet weather situations. The project will ultimately produce an operator training program and a technology transfer document which summarizes operational approaches that are effective in minimizing the impact of wet weather events on plant performance. Information gathered by this survey will be used in the development of this training program and technology transfer document. This important project is part of a national stormwater management effort.

On-site technical assistance (troubleshooting services) to POTWs will also be available and will be delivered by DEC as part of this project. We intend to work closely with six (6) POTWs to optimize operations to better deal with wet weather events. This survey is also intended to provide us with a preliminary indication of which POTWs may be interested in being "host plants" for the six on-site studies.

We appreciate your input and comments on how you deal with wet weather at your plant or in the maintenance of your collection system. We will summarize the survey results and share the information with you.

Please complete the survey form and return it in the self-addressed, stamped envelope by January 20th. Feel free to contact me at (518) 457-4224 or fax (518) 485-7786.

Thanks for your help with this important survey.

Sincerely,

Brandon W. Chew, P.E.
BWCP, Facility Operations Assistance Section

NYSDEC Wet Weather Operating Practices Survey
Facility Operations Assistance Section
50 Wolf Road - Room 340
Albany, New York 12233-3606

Part I - General Information

1. Person Completing Survey

Name:
Title:
Mailing Address:

Phone: Fax:

2. The collection system serving this treatment plant consists of:
- combined sewers only
- sanitary sewers only
- both sanitary & combined sewers (if checked, please also answer the following:)
- mostly combined
- mostly sanitary
- about half & half

3. Type of Secondary Treatment Process:

4. Plant flow information:
- average design flow (mgd)
- peak design flow (mgd)
- peak actual wet weather flow (mgd)

5. Is your plant impacted during wet weather? If so, to what extent are performance and/or removals affected?

6. When do wet weather events impact the plant? (please specify a season or a month or series of months)

Impact of Wet Weather Events

Part II - How Does Wet Weather Affect Your Plant?

We realize that wet weather can have a negative/bad effect on plant operations and plant performance. We want to get some information on what the specific impacts are to various treatment or unit processes.

This important information on how units are affected will help us later on as we try to overcome and deal with these "problem units" (see Part 111).

Listed on the next page are common system components or unit processes. The first question to ask yourself: "A*t my plant, is that unit process affected by wet weather?'*

If you checked "yes" then ask yourself *"What is the specific impact or problem that wet weather causes for that unit?* 0 Please provide a brief comment or note on what the problem is:

Component	Yes, Wet Weather Affects This Unit	Comment on Specific Problem
1. **Collection System**		
2. Pump Stations		
3. Preliminary Treatment		
a. Screens		
b. Grit Removal		
c. Other (Specify)		
4. Primary Treatment		
5. Secondary Treatment		
a. BioUnits		
Aeration Basins		
Trickling Filter		
RBC		
Others (Specify)		
b. Clarifiers		
6. Tertiary Treatment		
a. Sand Filtration		
b. Chemical Coagulation		
c. Others (Specify)		
7. Solids Handling (Specify What Type of Unit You Have)		
a. Thickening		
b. Dewatering		
c. Stabilization		
d. Other		
Other Treatment Units (Units Not Covered Above)		

Operational Practices

Part III - What Operational Adjustments Do You Make During Wet Weather?

We are asking you to help us come up with operational adjustments and changes that seem to work to help overcome or minimize various problems caused by wet weather. For each of the units listed below, ask yourself the question - "What *do we do different or change at our plant to battle problems caused by wet weather?"* Please provide a short comment or note. Additional space is provided at item 8.

Component **Provide Comment on Operational Change or Approach. At Our Plant We**

1. Collection System

2. Pump Stations

3. Preliminary Treatment

    a. Screens
    b. Grit Removal
    c. Other (Specify)

4. Primary Treatment

5. Secondary Treatment
    a. BioUnits,
        Aeration Basins
        Trickling Filter
        RBC
        Others (Specify)

    b. Clarifiers

6. Tertiary Treatment
    a. Sand Filtration
    b. Activated Carbon
    c. Chemical Coagulation
    d. Others (Specify)

7. Solids Handling (Specify What Type of Unit You Have)

    a. Thickening
    b. Dewatering
    c. Stabilization
    d. Other

8. Other Treatment Units (Units Not Covered Above), or additional comments or information

Six (6) Field Studies (Host Plants)

Part IV - What Are Your interests in the Project?

The project provides for on-site technical assistance at six (6) plants for the purpose of optimizing performance during wet weather events. The approach to the field studies will involve a cooperative effort to look at how wet weather events affect your plant and to develop a custom operational strategy to help improve plant performance. These studies may involve some additional testing and data

collection by plant staff and may involve implementation of different operational approaches. If you may be interested in being a host plant and possibly participating in the field study, check the box below or call Brandon Chew at (518) 457-4224.

Yes, we are definitely interested in learning more about being one of the six (6) host plants for the field studies to improve operations during wet weather events.

Contact Name:

Title:

Phone:

(If you are not interested in being a host for the field study, no problem. We appreciate your time completing the survey!)

Remember to use the self-addressed envelope. The postage is already on it. **Please return the survey by January 20th.** If you have any questions, feel free to contact Brandon Chew at (518) 457-4224. Thanks again!

Wet Weather Operating Practices
Survey Summary (45 Respondents)

5. Is your plant impacted during wet weather? If so, to what extent are performance and/or removals affected?

21	Percent removals decrease
15	High flows dilute influent concentration
6	Plant loses solids at peak flows
6	Not much impact on plant
6	Plant generally meets permit limits
5	Treatment unit detention times are reduced
4	Plant occasionally exceeds permit limits due to wet weather
4	Effluent BOD and/or TSS concentrations are usually not impacted
3	Excessive flow can cause secondary process bypass, followed by plant bypass
3	Excessive screenings and grit are carried to downstream processes
3	Impact depends on how well biomass is settling at the time of wet weather event
2	Effluent BOD and/or TSS increase
2	Impact depends on intensity and duration of wet weather event
2	Plant gets leaves during autumn rains
2	No response (blank - might mean plant not impacted?)
1	Primary tanks lose solids which end up in trickling filter
1	Extra wear on pumps and equipment
1	Not much impact on performance - my plant has flow equalization basins
1	Need to use more chemicals (polymer, chlorine, ferric)
1	"First flush" brings heavy organic load to plant
1	Effluent turbidity increases

6. When do wet weather events impact the plant? (please specify a season or a month or a series of months)

3	December	
4	January	Winter (mid-winter thaws & rains)
2	February	

31	March	
35	April	Spring (snowmelt, infiltration, spring showers)
29	May	
6	June	
8	July	Summer (thunderstorms)
8	August	
13	September	
16	October	Fall (autumn rains)
18	November	

25 Any heavy rain event occurring throughout the year

Component: Collection System

Impact or problem that wet weather causes for component:

16	Surcharged sewer lines
7	Debris (eg., bottles, bags, grit, leaves) plugs lines and/or interferes with regulators
5	Increased infiltration and/or inflow to sewer system
3	Catch basins get filled/plugged
2	On the plus side, it cleans out the sewer system
1	Sends spikes of high BOD and TSS to plant
1	Causes odor problems
1	Minimal impact
1	New EPA regulations

Operational adjustments made to component due to wet weather:

11	Increase frequency of sewer and regulator inspections & cleaning
9	Increase frequency of catch basin inspections & cleaning
8	Implementing long-term program to reduce infiltration & inflow
7	Maximize storage in collection system
6	Activate (manual or automatic) bypass/overflows
3	No changes from dry weather procedures
3	Set up portable pumps to bypass/divert excess flow
2	Collection system is not our responsibility
2	Installed trash screens prior to regulators

Component: Pump Stations

Impact or problem that wet weather causes for component:

10	Pumps run more often or longer
9	Flow exceeds pump station capacity and surcharges sewer
6	Debris (stones, grit, rags, trash) clogs/wears pumps
4	Excess flow bypasses pump station
3	Increased electrical costs/energy use
3	Minimal impact
I	Power failures due to storms
I	Hydraulic overload causes pump failures

Operational adjustments made to component due to wet weather:

8	Increase inspection/monitoring frequency
5	Keep all pumps operational
5	Keep all pumps maintained at peak efficiency/capacity
5	Excess flow is diverted to retention basin
3	Set up portable pumps to relieve surcharged sewer
3	Bring stand-by pumps on line
2	Raise floats in wet well & use as surge tank, return floats to normal when done
1	Reduce pumping rates temporarily to store water in collection system
I	Ready standby power generators
I	Pump from storage during off-peak electric rates
I	No changes from dry weather procedures

Component: Preliminary Treatment - Screens

Impact or problem that wet weather causes for component:

17	Increased screenings to handle/disposal
9	Blinding of screens
6	More frequent breakdowns
2	Shears pins on mechanical screens
2	Main rack surcharges/floods
I	Safety hazards from flooding/debris accumulation

Operational adjustments made to component due to wet weather:

10	Clean more often
8	Increase speed/run time of mechanical screen
7	Continuous manual operation/cleaning
7	Inspect more often
6	Place stand-by units on line
3	Assign additional personnel to monitor/clean
3	Throttle main plant gates to reduce flow rate
2	No changes from dry weather procedures
2	Bypass units
1	Plant is upgrading the raking mechanism
I	Have shear pins and tools ready

Component: Preliminary Treatment - Grit Removal

Impact or problem that wet weather causes for component:

18	Increased grit to handle/disposal
12	Grit carries through chamber and impacts downstream processes
2	Grit causes pump plugging
2	Plugging of lines
2	Grit screws shear pins
1	Plugged hydro gritters

Operational adjustments made to component due to wet weather

12	Run grit remover continuously/more often
8	Clean chamber more often
5	Inspect more often
5	Place stand-by units on line
4	No changes from dry weather procedures
3	Adjust/turn off air in chamber to reduce grit washout
2	Assign additional personnel to monitor/operate
2	Plant is upgrading grit removal equipment

Component: Primary Treatment

Impact or problem that wet weather causes for component:

8	Solids loss to downstream processes
7	Heavy grit in tanks
5	Flooding weirs
5	More solids/sludge in tank
4	Shorter detention times
3	Breakdowns due to grit in tank
2	Scum traps/pumps often clog with debris
I	Increased overflow rates
I	Flights trip more often
I	Minimal impact

Operational adjustments made to component due to wet weather:

9	No changes from dry weather procedures
6	Adjust sludge pumping
3	Bypass excess flows
3	Place stand-by units in service
3	Increase chemical feed rates manually
3	Remove sludge from tank promptly to reduce plugging of lines/pumps
2	Backflush sludge pumps frequently
1	Increase withdrawal rate to keep sludge less than I percent solids for cyclone degritter
1	Maintain blanket less than six inches to minimize scouring
1	Frequent flushing of scum traps
1	Balance flows to units

Component: Secondary Treatment - Aeration Basins

Impact or problem that wet weather causes for component:

11	Loss of biomass/MLSS from system
6	Detention time reduced
5	Increased solids and BOD loading from primary tanks
5	Increased flows/hydraulic loading
3	Dilution causes low organic loading
1	High water level increases electric costs (mechanical aerators)
1	Lower initial dissolved oxygen due to organic slug loads
1	Grit accumulates in aeration basins (no primary tanks)
1	Low organic loading from storm dilution causes filaments, affects settleability
1	Minimal impact

Operational adjustments made to component due to wet weather:

12	Bypass excess flows
6	Reduce/turn off aeration/mixing during high flow conditions
5	Bring stand-by units on line or use empty aeration basins for storage
3	Increase observation/monitoring
3	Run plant at lowest practical MLSS
3	Try to maintain a fast settling sludge quality
3	Run plant in contact stabilization mode
3	No changes from dry weather procedures
2	Maintain regular wasting to avoid getting caught with too much MLSS in tank
2	Adjust aeration system to maintain dissolved oxygen levels
2	Run plant in step feed/step aeration mode
1	Add bacteria cultures to improve performance
1	Throttle flow to clarifiers and use freeboard in aeration basins for storage
1	Monitor power demand on mechanical aerators
1	Reduce solids inventory before spring thaw

Component: Secondary Treatment -Clarifiers

Impact or problem that wet weather causes for component:

17	Solids wash out due to high flows
3	Decreased detention time
3	Minimal impact
2	Difficult balance flows to units
1	Flooding weirs
I	Increased solids loads plug sludge pumps

Operational adjustments made to component due to wet weather:

13	Bypass secondary process before solids loss becomes excessive
8	No changes from dry weather procedures
6	Increase return sludge flow/sludge withdrawal
5	More frequent monitoring of sludge blankets
3	Put stand-by units in service
3	Adjust return sludge flow as needed
2	Balance flows to units
2	Change return sludge flow from auto to manual, balance blanket and RAS conc.
2	Add chemicals to improve settling
1	Adding baffles to clarifiers increased hydraulic capacity by 60 percent
1	Adjust waste sludge flow as necessary
1	Pace return sludge flow with influent flow to reduce blanket
1	Stop sludge withdrawal to reduce load on primary clarifiers
1	Increase flight cleaning time
1	Stop chemical addition (phosphorus removal) while flows are high (meet limit w/out it)

Component: Secondary Treatment - Trickling Filters/RBCs

Trickling Filters

Impact or problem that wet weather causes for component:

2 Reduced detention time
2 Increased sloughing during high flows
1 Solids plug arms and media
1 Minor impact

Operational adjustments made to component due to wet weather:

3 No changes from dry weather procedures
2 Reduce recycle as influent flow increases
1 Change units from series operation to parallel
1 Open end caps on filter arms
1 Flood unit in summer to wash out accumulated solids

RBCs

Impact or problem that wet weather causes for component:

1 Reduced detention time
1 Increased sloughing during high flows

Operational adjustments made to component due to wet weather:

1 No changes from dry weather procedures
1 Raise V-notch weir
1 Reduce recycle as influent flow increases

Component: Tertiary Treatment - Sand Filters

Impact or problem that wet weather causes for component:

3	Increased plugging
2	Reduced run times, more frequent backwashing

Operational adjustments made to component due to wet weather:

2	Bypass excess flow
2	Adjust backwashing operation to conditions (auto vs manual, air bump, duration)
2	Put standby units on line
1	Monitor units more often
1	Limit backwashing while flow is up
1	Rotate beds more often
1	Backwash before storm surge hits

Component: Disinfection

<u>Chlorine</u>

Impact or problem that wet weather causes for component:

3 Increased demand due to solids carryover in effluent
3 Solids accumulate in contact tank
2 Reduced contact time

Operational adjustments made to component due to wet weather:

4 Increase chlorine dose
2 Clean solids from contact chamber periodically
1 Check chlorine residuals more frequently

<u>Ultraviolet</u>

Impact or problem that wet weather causes for component:

1 Increased solids in effluent decreases unit efficiency
1 Reduced contact time

Operational adjustments made to component due to wet weather:

1 Bring stand-by units on line

Component: Other Treatment Units

Equalization/Retention Basins

Impact or problem that wet weather causes for component:

1 Grit and organics accumulate in tanks
1 Cleaning tanks puts heavy load on treatment plant

Operational adjustments made to component due to wet weather:

1 Clean tanks regularly

Activated Carbon Adsorption

Impact or problem that wet weather causes for component:

1 Reduced contact time decreases efficiency
1 Partial bypass of system at high flows

Operational adjustments made to component due to wet weather:

1 Put additional units on line
1 More frequent backwash using abbreviated procedure
1 Increase carbon exhaustion rate

Odor Control Units

Impact or problem that wet weather causes for component:

None indicated

Operational adjustments made to component due to wet weather:

Carbon Towers - place more units in service
Hydro Towers - increase product as required

Component: Solids Handling - Thickening

Impact or problem that wet weather causes for component:

4	Increase in sludge voRume
4	Minimal impact
2	Thicker sludge
2	Plugged sludge pumps
2	Excessive grit accumulates in thickener
2	More grit in sludge, lower VSS
1	Grit causes wear on rotors and stators
1	Thickener efficiency decreases
1	Sludge is more difficult to pump
1	Less sludge volume due to clarifier washout

Operational adjustments made to component due to wet weather:

5	No changed from dry weather procedures
2	Increase sludge withdrawal
1	Stop rake if not withdrawing sludge
1	Stock pile spare rotors and stators if degritter fails
1	Clean/unpiug as needed
1	Reduce pumping to maintain concentration

Component: Solids Handling - Dewatering

Impact or problem that wet weather causes for component:

3 More primary sludge
3 Minimal impact
1 Better performance initially (more primary sludge)
1 Poorer performance after storm (more grease)

Operational adjustments made to component due to wet weather:

5 Run unit more often
4 Make normal operating adjustments to unit
2 No dewatering is allowed while plant flows are up and/or bypasses active
1 No septage received while plant flows are up and/of bypasses active

Component: Solids Handling -Stabilization

Anaerobic Digesters

Impact or problem that wet weather causes for component:

1 Less biogas for co-gen
1 Increase in solids feed
1 Decreases temperature
1 Decreases detention time
1 Reduces digester efficiency

Operational adjustments made to component due to wet weather:

2 Monitor and adjust temperature
1 Monitor and adjust feed rates
1 Increase mixing
1 Increase wasting

Incinerators

Impact or problem that wet weather causes for component:

1 Minimal impact
1 Sludge has lower VSS

Operational adjustments made to component due to wet weather:

1 No changes from dry weather procedures

Aerobic Digesters

Impact or problem that wet weather causes for component:

1 Minimal impact

Operational adjustments made to component due to wet weather:

1 No changes from dry weather procedures

APPENDIX I

NYSDEC REGIONS
AND REGIONAL OFFICES

Regional Offices

New York State Department of Environmental Conservation

REGION 9
270 Michigan Avenue
Buffalo, NY 14203-2999
(716) 851-7000

SUB-OFFICES
215 South Work Road
Falconer, NY 14733
(716) 665-5111

128 South Street
Olean, NY 14760-3632
(716) 372-0645

5425 County Route 48
Belmont, NY 14813
(716) 268-5392

REGION 6
State Office Building
317 Washington Street
Watertown, NY 13601-3787

SUB-OFFICES
30 Court Street
Canton, NY 12317
(315) 386-4546

R.D. 3 PO Box 22A, Route 812
Lowville, NY 13367
(315) 376-2554

State Office Building
207 Genesee Street
Utica, NY 13501

225 North Main Street
Herkimer, NY 13350
(315) 866-6330

REGION 5
Route 86, PO Box 296
Ray Brook, NY 12977-0296
(518) 897-1200

SUB-OFFICES
Hudson Street Extension, Box 220
Warrensburg, NY 12885-0220
(518) 623-3671

701 South Main Street, PO Box 458
Northville, NY 12134
(518) 863-4545, 6215, 8601

REGION 4
1150 North Westcott Road
Schenectady, NY 12306-2014
(518) 357-2234

SUB-OFFICES
Route 10, Jefferson Road
Stamford, NY 12167-9503
(607) 652-7364

REGION 3
21 South Putt Corners Road
New Paltz, NY 12561-1969
(914) 256-3000

SUB-OFFICES
Stony Kill Environmental Education Center
Route 9D, Wappingers, NY 12590
(914) 831-8780

200 White Plains Road, 5th Floor
Tarrytown, NY 10591-5805
(914) 332-1835

○ Regional Headquarters

● Sub Offices

August 1997

DEC CENTRAL OFFICE
50 Wolf Road
Albany, NY 12233-0001
(518) 457-5400

REGION 8
6274 E. Avon-Lima Road
Avon, NY 14414-9519
(716) 226-5386

SUB-OFFICES
7291 Coon Road
Bath, NY 14810
(716) 776-2165

276 Sing Sing Road
Horseheads, NY 14845
(607) 739-0639

REGION 7
615 Erie Boulevard West
Syracuse, NY 13204-2400
(315) 426-7400

SUB-OFFICES
PO Box 5170, 1285 Fisher Road
Cortland, NY 13045-5170
(607) 753-3095

1679 Route 11
Kirkwood, NY 13795-9772
(607) 775-2545

PO Box 594, Route 60 West
Sherburne, NY 13460-0594
(607) 674-4036

REGION 2
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11733-5407
(718) 482-4900

REGION 1
Building 40, SUNY Campus
Stoney Brook, NY 11790-2356
(516) 444-0345

MARINE RESOURCE HEADQUARTERS
205 Belle Mead Road
East Setauket, NY 11733
(516) 444-0430

APPENDIX J

WET WEATHER OPERATING PLAN DEVELOPMENT FORMS

WET WEATHER OPERATING STRATEGIES

Process	Strategy	Application at My Plant
General	1. Assure that unused tankage and equipment are available and ready for use when high flows occur. 2. Controlled bypassing of secondary treatment process. 3. Develop sampling and testing regimes to identify the flow rate at which process upsets will occur. 4. Low cost piping additions which increase plant flexibility. 5. Reduce recycle flows (digester supernatant, filtrate, etc.) during wet weather events. 6. 7.	1. 2. 3. 4. 5. 6. 7.

Process	Strategy	Application at My Plant
Collection System	1. Implement regular program for inspecting and cleaning sewers, manholes and catch basins. 2. Adjust weir heights/regulator settings at combined sewer overflow points to maximize system storage. 3. Throttle plant influent gate to increase storage in collection system. 4. Implement regular program to reduce I/I which may include TVing, testing and sealing. 5. Remove unnecessary storm sewer connections. 6. Install simple regulation devices (vortex-type throttling devices, surface retention, manhole cover inserts) to reduce rate of inflow into system. 7. 8.	1. 2. 3. 4. 5. 6. 7. 8.

Process	Strategy	Application at My Plant
Pump Stations	1. Modify pump control system to maximize wet well storage. 2. Modify pump control system to dampen flow surges to treatment processes. 3. Bring stand-by pumps on line. 4. 5.	1. 2. 3. 4. 5.
Screening	1. Place all screening units in service. 2. Increase cleaning frequency (or run mechanical screens continuously) 3. 4.	1. 2. 3. 4.

Process	Strategy	Application at My Plant
Grit Removal	1. Place all grit removal units in service. 2. Shut off or reduce air to aerated grit chambers. 3. Increase grit removal rate or frequency (e.g. run grit collector continuously). 4. Adjust velocity of velocity controlled grit chambers. 5. Utilize alternative grit removal systems. 6. 7.	1. 2. 3. 4. 5. 6. 7.

Process	Strategy	Application at My Plant
Primary Settling	1. Maintain low sludge blanket levels/increase sludge pumping rate or frequency. 2. Improve flow splitting to settling tanks. 3. Improve tank hydraulics through baffle addition. 4. Improve tank hydraulics through weir modifications. 5. Chemical addition and flocculent aids to maximize solids removal. 6. Increase scum removal rate or frequency. 7. Monitor primary sludge concentration more often, especially during early flow. 8. 9.	1. 2. 3. 4. 5. 6. 7. 8. 9.

Process	Strategy	Application at My Plant
Activated Sludge	1. Turn off aeration. 2. Turn down aeration. 3. Cycle aeration. 4. Operate in step feed mode to save biomass in aeration basin. 5. Operate in contact stabilization mode to save biomass in aeration basin. 6. Reduce return sludge pumping rate. 7. Increase return sludge pumping rate. 8. Maintain low MLSS (don't use your aeration/clarifier system for storage of excess solids). 9. Decrease wasting rates to save biomass. Store biomass in extra tankage until flow decreases. 10. Control filamentous growth problems to improve sludge settleability. 11. 12.	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

Process	Strategy	Application at My Plant
Trickling Filters	1. Adjust distributor arm speed. 2. Reduce or stop filter recycle or recirculation flows. 3. Place trickling filters in parallel operation. 4. 5.	1. 2. 3. 4. 5.
Secondary Settling	1. Maintain low sludge blanket levels. 2. Improve flow splitting to settling tanks. 3. Improve tank hydraulics through baffle addition. 4. Improve tank hydraulics through weir modifications. 5. Chemical addition and flocculent aids to maximize solids removal. 6. Dye test clarifiers. 7. 8.	1. 2. 3. 4. 5. 6. 7. 8.

Process	Strategy	Application at My Plant
Sand Filtration	1. Place all filter units in service. 2. Adjust backwash mode. 3. Backwash before storm surge hits. 4. 5.	1. 2. 3. 4. 5.
Disinfection	1. Increase chlorination rates to handle increased chlorine demand from solids losses from clarifiers. 2. Clean solids from contact tank periodically. 3. Place all units in service. 4. Clean UV equipment prior to storm surge. . .	1. 2. 3. 4. 5. 6.

Process	Strategy	Application at My Plant
Solids Processing	1. Assure maximum available solids storage capacity prior to wet weather season 2. Assure all solids processing equipment is in operating condition prior to wet weather conditions 3. Consider alternative solids disposal during wet weather events 4. Reduce solids volume in digesters prior to wet weather events 5. 6.	1. 2. 3. 4. 5. 6.

UNIT PROCESSES AND EQUIPMENT LIST

Plant Area:_____ **Sheet ID:**_____

Date:_____

EQUIPMENT ID	UNIT PROCESS	EQUIPMENT

BEFORE WET WEATHER EVENT

Plant Area: _____ **Sheet ID: _____**

Unit Process/Equipment: _____ **Date: _____**

A. We have decided that we need to get ready for a wet weather event.
What do we do before the flow starts to climb?

1. What operating adjustments do we make?

2. What do we look at, what do we observe?

3. What do we measure, what do we record?

4. What maintenance do we perform?

5. Anything else?

DURING WET WEATHER EVENT

Plant Area:_____ **Sheet ID:** _____

Unit Process/Equipment: _____ **Date:** _____

B. The flow has just started to increase at this unit. **What do we do as the flow climbs, reaches it's peak and begins coming back down?**

1. What operating adjustments do we make?

2. What do we look at, what do we observe?

3. What do we measure, what do we record?

4. What maintenance do we perform?

5. Anything else?

AFTER WET WEATHER EVENT

Plant Area: _____ **Sheet ID: _____**

Unit Process/Equipment: _____ **Date: _____**

C. The flow continues to drop and approaches normal. **What do we do to return this to normal service?**

1. What operating adjustments do we make?

2. What do we look at, what do we observe?

3. What do we measure, what do we record?

4. What maintenance do we perform?

5. Anything else?

SECTION__ - _____

___ Unit Processes and Equipment List

UNIT PROCESS	EQUIPMENT

___ Wet Weather O&M Practices

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
Before Wet Weather Event		

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
During Wet Weather Event		

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	
After Wet Weather Event		

WHO DOES IT?		WHAT DO WE DO?
SUPERVISORY	IMPLEMENTATION	

WHY DO WE DO THIS?
WHAT TRIGGERS THE CHANGE?
WHAT CAN GO WRONG?

SECTION __ (Continued):