PVSC – Long Term Control Plan
Modeling Evaluation Group – Session 4

Hydrologic and Hydraulic Model Overview

Greeley and Hansen LLC
December 5, 2018

Agenda

- Overview of PVSC H&H Model
  - Model Service Area and Network
  - Wet Weather Operating Rules
- H&H Model Calibration & Validation
- H&H Model Application

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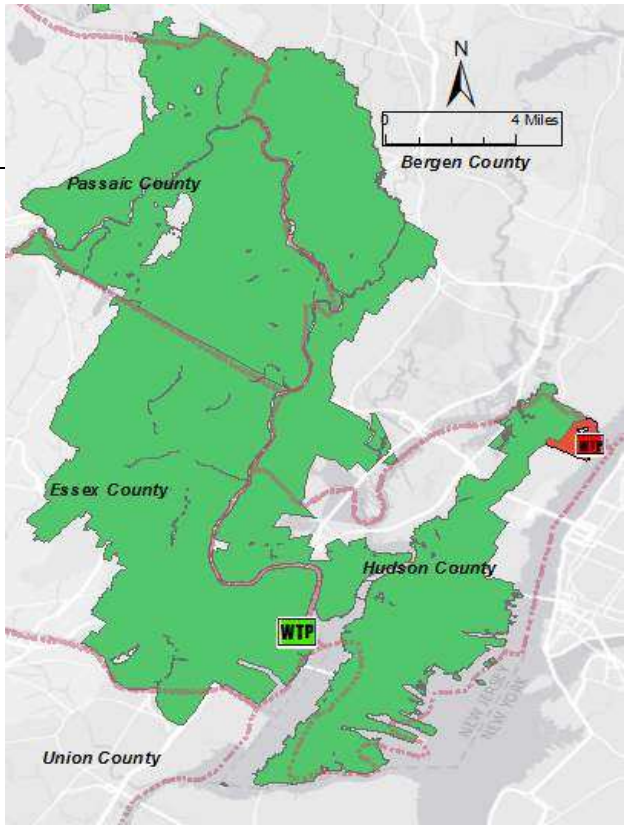
PVSC H&H Model Overview

Sewer Systems

- Passaic Valley Sewerage Commission
  - 48 municipalities
    - 8 CSO municipalities (0.9 million residents)
  - 1.5 million residents
  - 147 mi² service area
  - 22 mile interceptor sewer
  - 330 mgd WPCF
- NBMUA Woodcliff WWTP
  - 2 CSO municipalities
  - 3 mgd Woodcliff WWTP
  - 477 acres (368 acres in North Bergen)



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CSO Communities

Municipality	WWTP	Population	Area (mi²)	Sewerage (miles)	CSOs
Bayonne	PVSC WRRF	63,000	5.8	94	30
East Newark		2,400	0.1	2	1
Harrison		13,600	1.3	18	7
Jersey City		247,600	14.8	230	21
Kearny		40,700	6.5	52	5
Newark		277,100	22.3	579	18
North Bergen		52,600	4.5	59	7
Paterson		146,200	8.7	164	23
Guttenberg	NBMUA Woodcliff	11,200	0.2	5	1
North Bergen		8,200	0.7	8	1
Total		**862,600**	**84**	**1,211**	**114**

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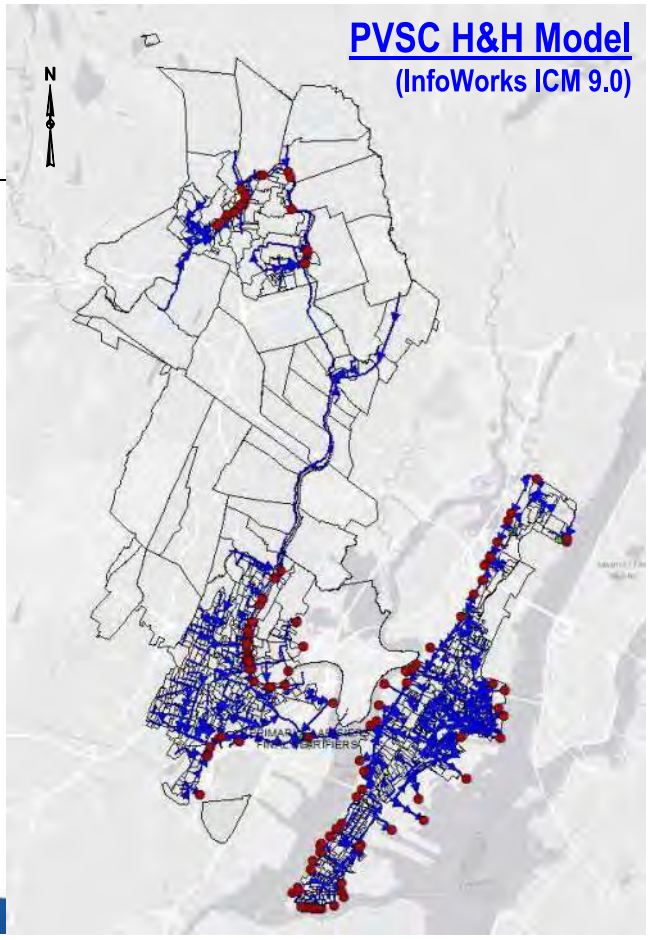
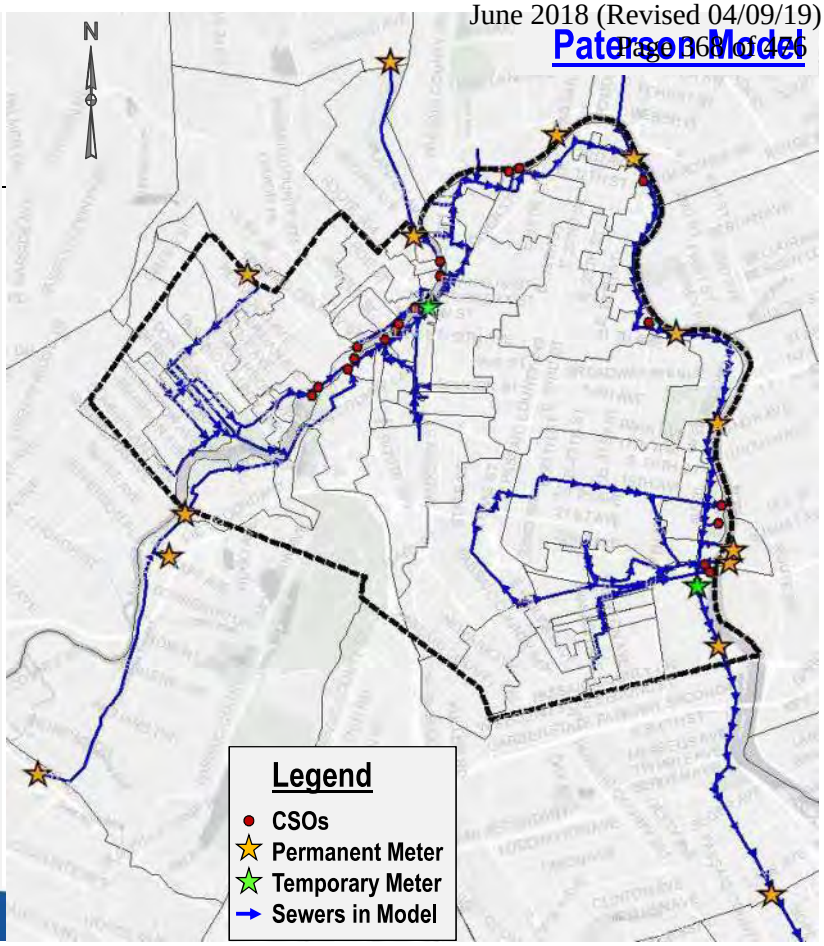
Entire PVSC H&H Model

- Subcatchment: 1121
- Nodes (4216)
  - Manhole: 4081
  - Outfall: 123
  - Storage: 12
- Link (4413)
  - Conduit: 4039
  - Flap Valve: 101
  - Orifice: 42
  - Pump: 16
  - Sluice: 95 (34 variable)
  - Weir: 120



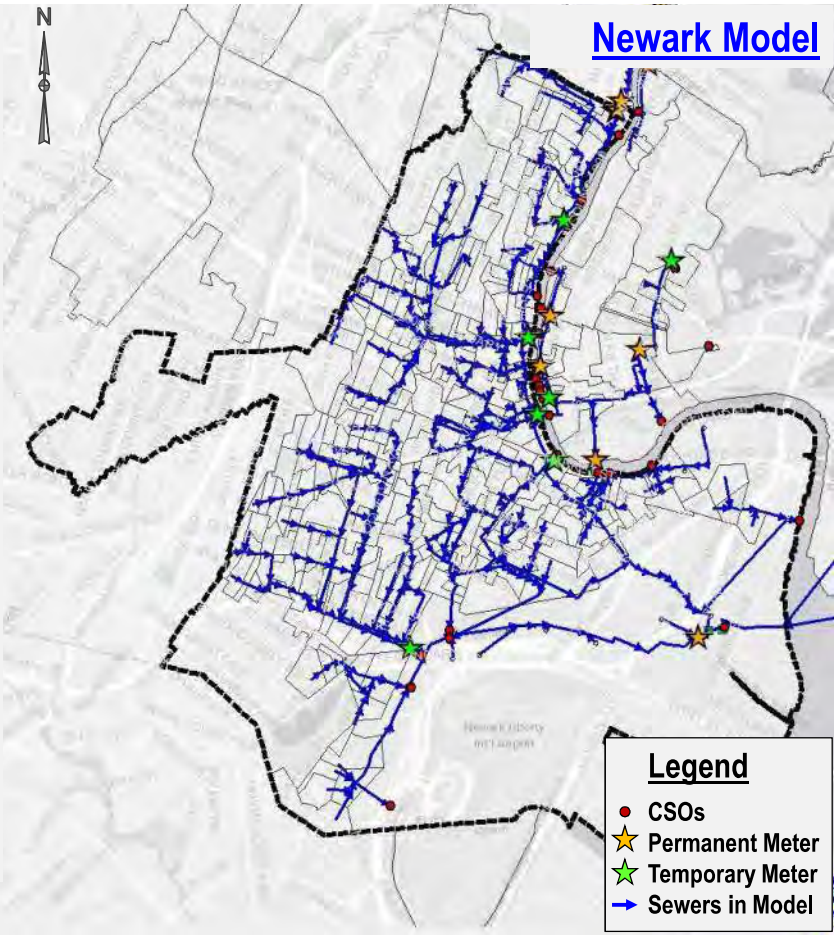
Paterson Model

- Subcatchment: 67
- Nodes (585)
  - Manhole: 562
  - Outfall: 23
  - Storage: 0
- Link (657)
  - Conduit: 503
  - Flap Valve: 82
  - Orifice: 14
  - Pump: 0
  - Sluice: 16 (2 variable)
  - Weir: 42



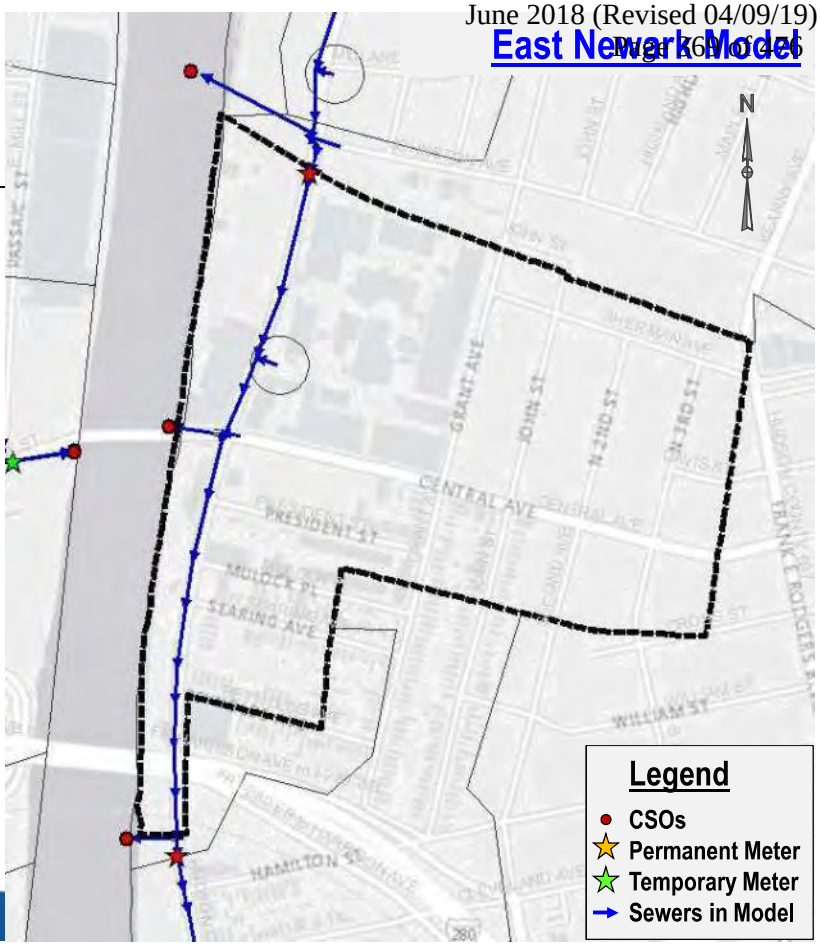
Newark Model

- Subcatchment: 310
- Nodes (758)
  - Manhole: 738
  - Outfall: 18
  - Storage: 2
- Link (819)
  - Conduit: 746
  - Flap Valve: 17
  - Orifice: 3
  - Pump: 3
  - Sluice: 27 (17 variable)
  - Weir: 23



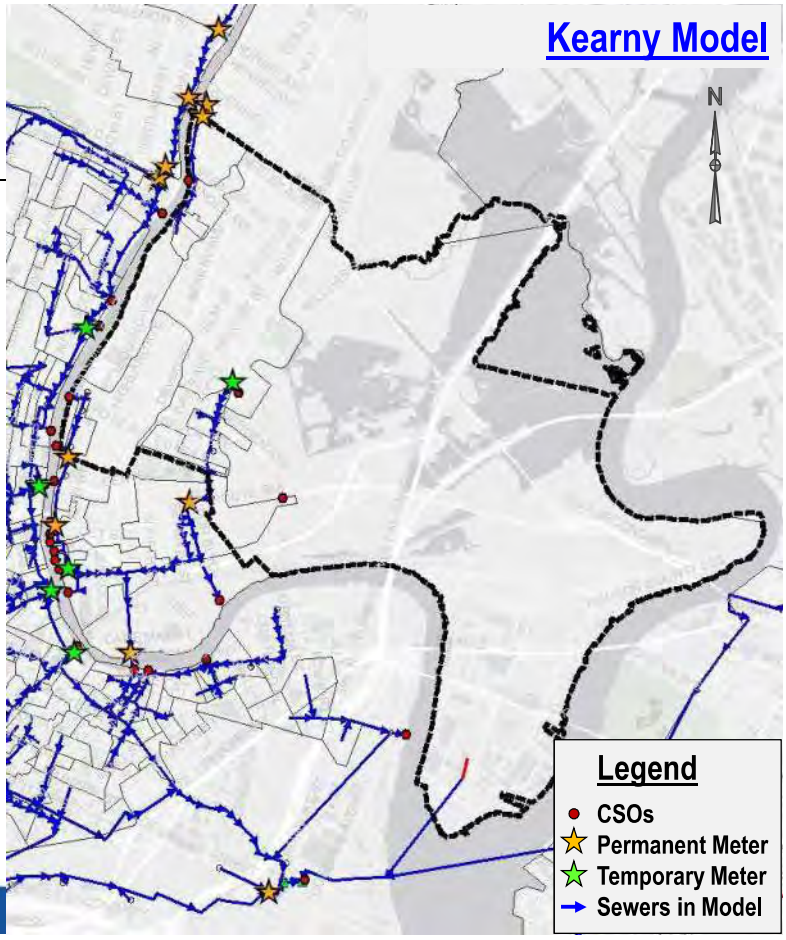
East Newark Model

- Subcatchment: 1
- Nodes (22)
  - Manhole: 21
  - Outfall: 1
  - Storage: 0
- Link (22)
  - Conduit: 19
  - Flap Valve: 1
  - Orifice: 1
  - Pump: 0
  - Sluice: 0
  - Weir: 1



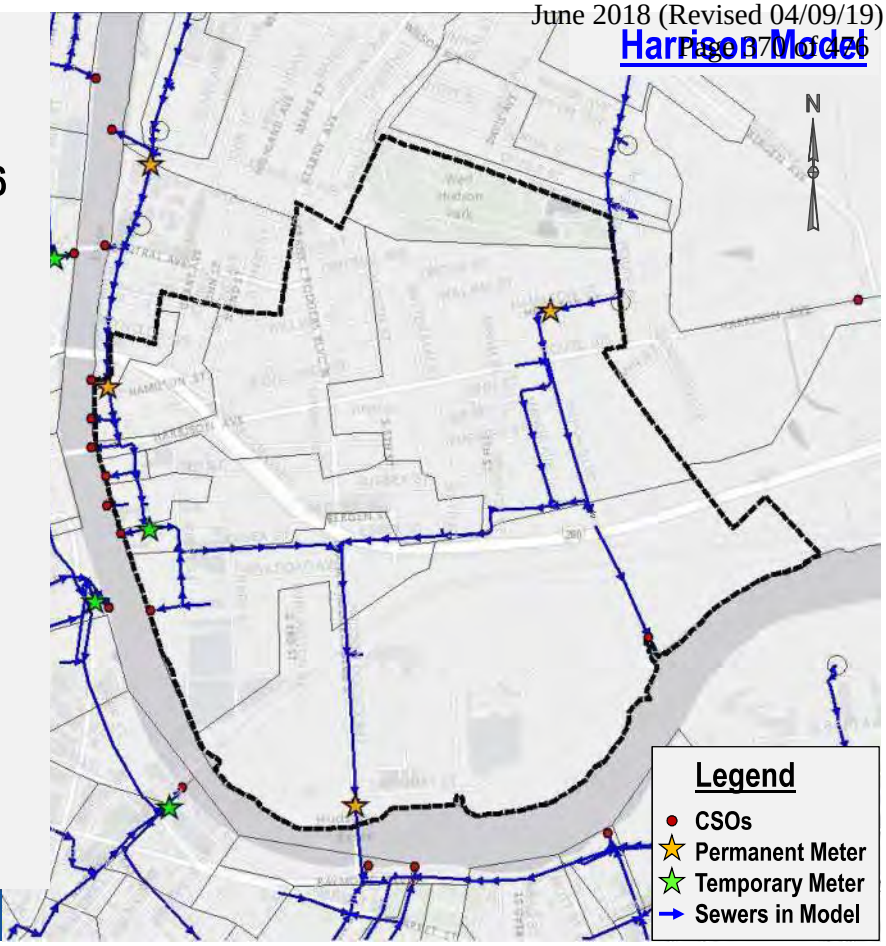
Kearny Model

- Subcatchment: 16
- Nodes (97)
  - Manhole: 91
  - Outfall: 5
  - Storage: 1
- Link (97)
  - Conduit: 78
  - Flap Valve: 5
  - Orifice: 7
  - Pump: 1
  - Sluice: 1
  - Weir: 5



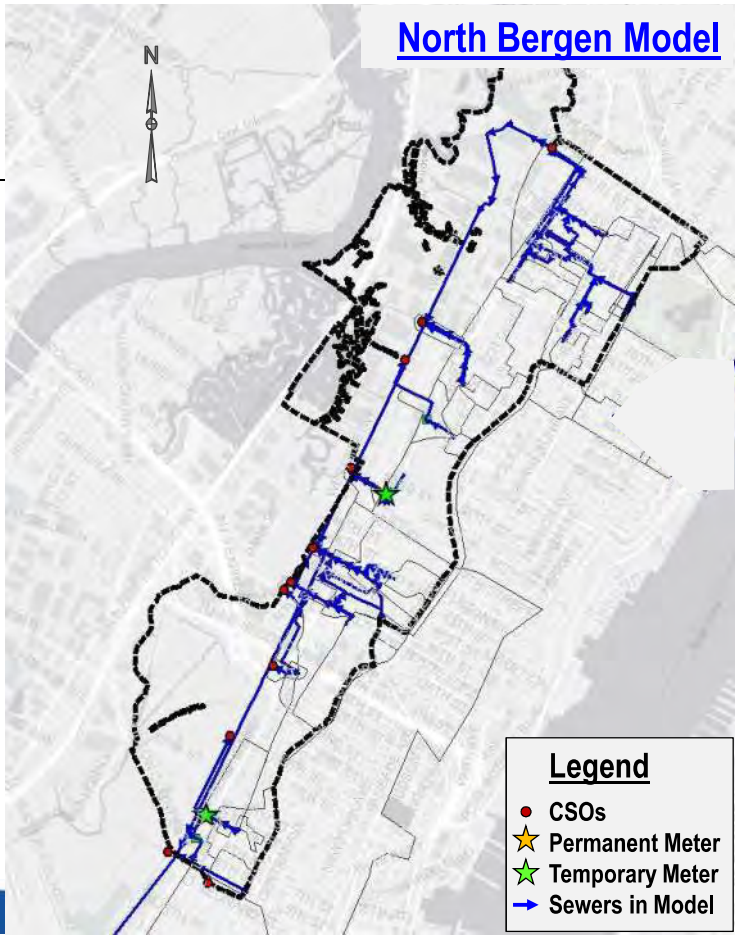
Harrison Model

- Subcatchment: 16
- Nodes (117)
  - Manhole: 110
  - Outfall: 7
  - Storage: 0
- Link (118)
  - Conduit: 97
  - Flap Valve: 7
  - Orifice: 7
  - Pump: 0
  - Sluice: 0
  - Weir: 7



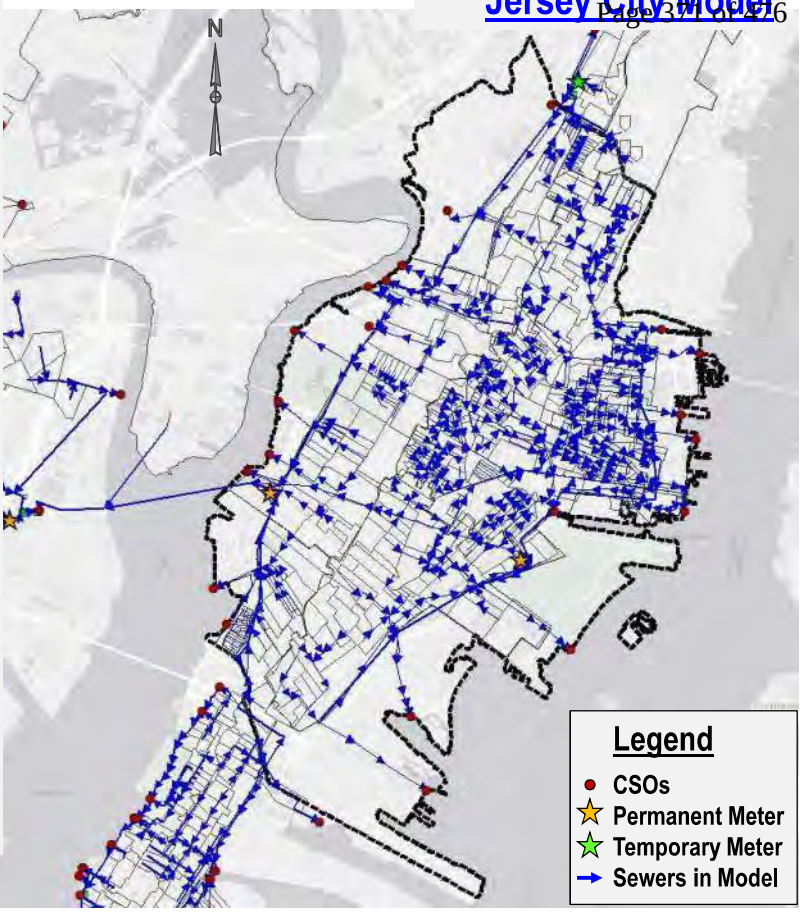
North Bergen Model

- Subcatchment: 41
- Nodes (178)
  - Manhole: 166
  - Outfall: 9
  - Storage: 3
- Link (199)
  - Conduit: 183
  - Flap Valve: 0
  - Orifice: 0
  - Pump: 3
  - Sluice: 5
  - Weir: 8



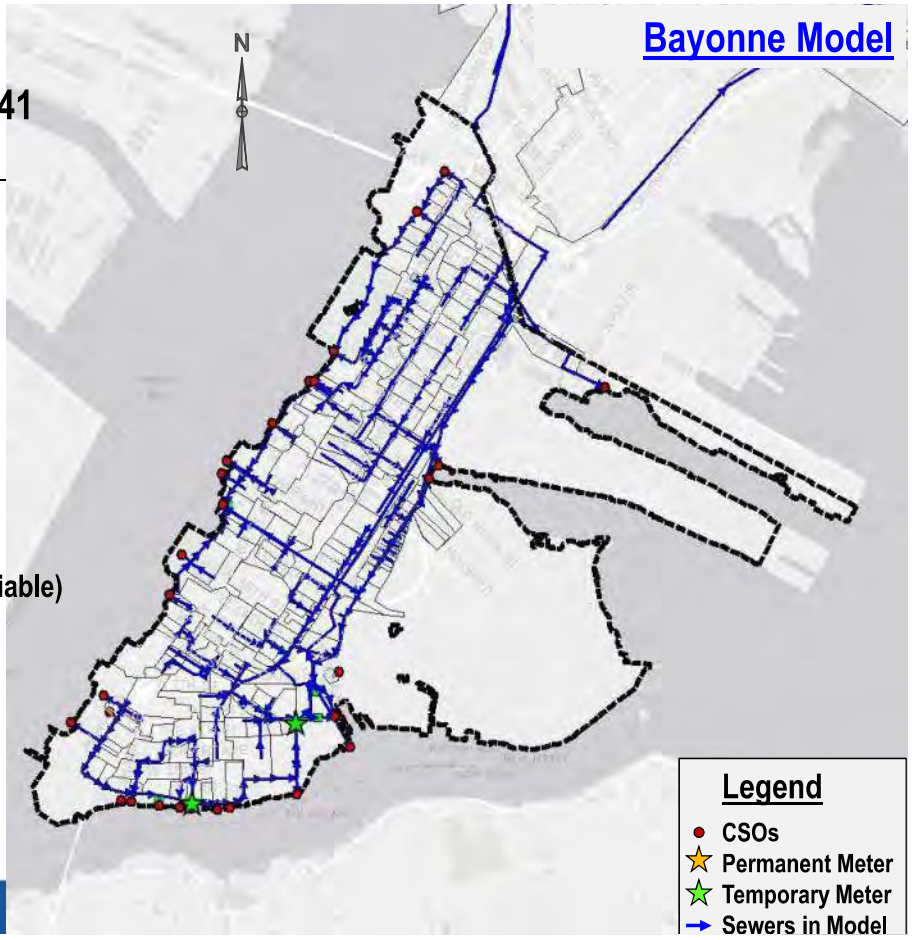
Jersey City Model

- Subcatchment: 393
- Nodes (1498)
  - Manhole: 1476
  - Outfall: 21
  - Storage: 1
- Link (1552)
  - Conduit: 1487
  - Flap Valve: 21
  - Orifice: 1
  - Pump: 3
  - Sluice: 27 (4 variable)
  - Weir: 13



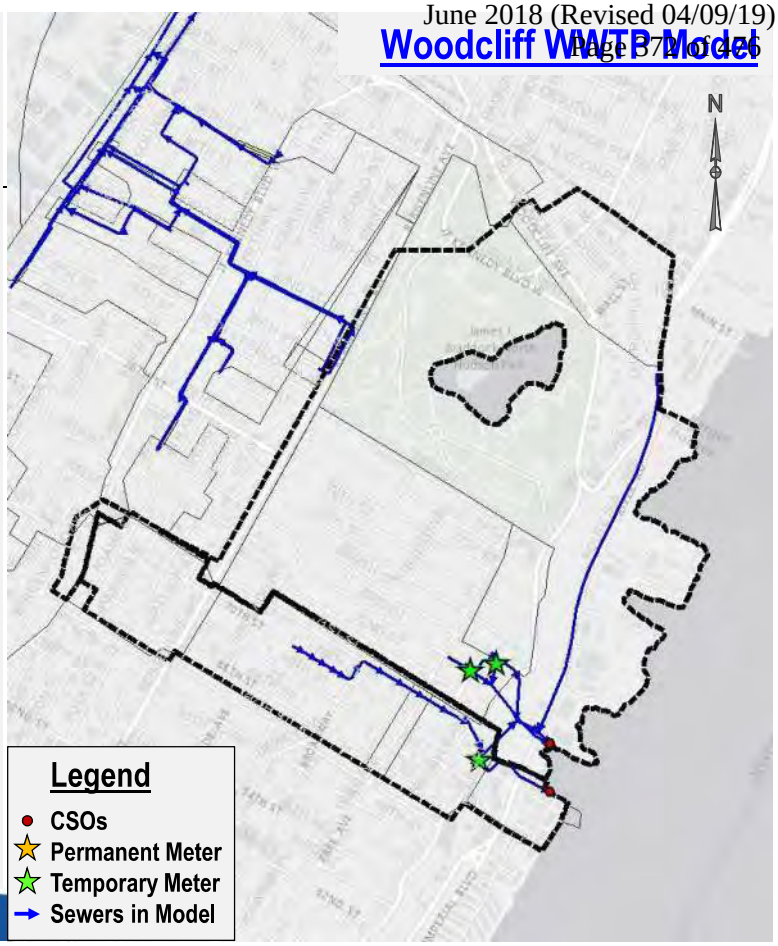
Bayonne Model

- Subcatchment: 41
- Nodes (685)
  - Manhole: 651
  - Outfall: 29
  - Storage: 5
- Link (712)
  - Conduit: 648
  - Flap Valve: 27
  - Orifice: 0
  - Pump: 5
  - Sluice: 20 (11 variable)
  - Weir: 12



Woodcliff WWTP Model

- Subcatchment: 5
- Nodes (38)
  - Manhole: 35
  - Outfall: 2
  - Storage: 1
- Link (39)
  - Conduit: 37
  - Flap Valve: 0
  - Orifice: 0
  - Pump: 0
  - Sluice: 1
  - Weir: 1



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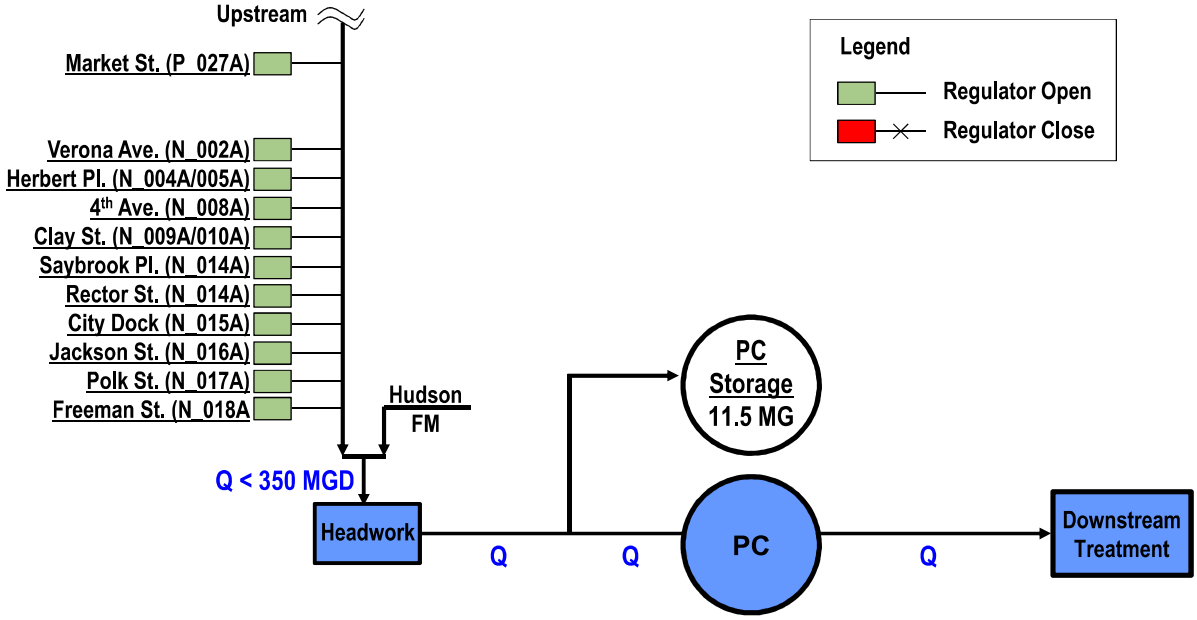
Wet Weather Operating Rules

Wet Weather SOP

Flow < 350 MGD



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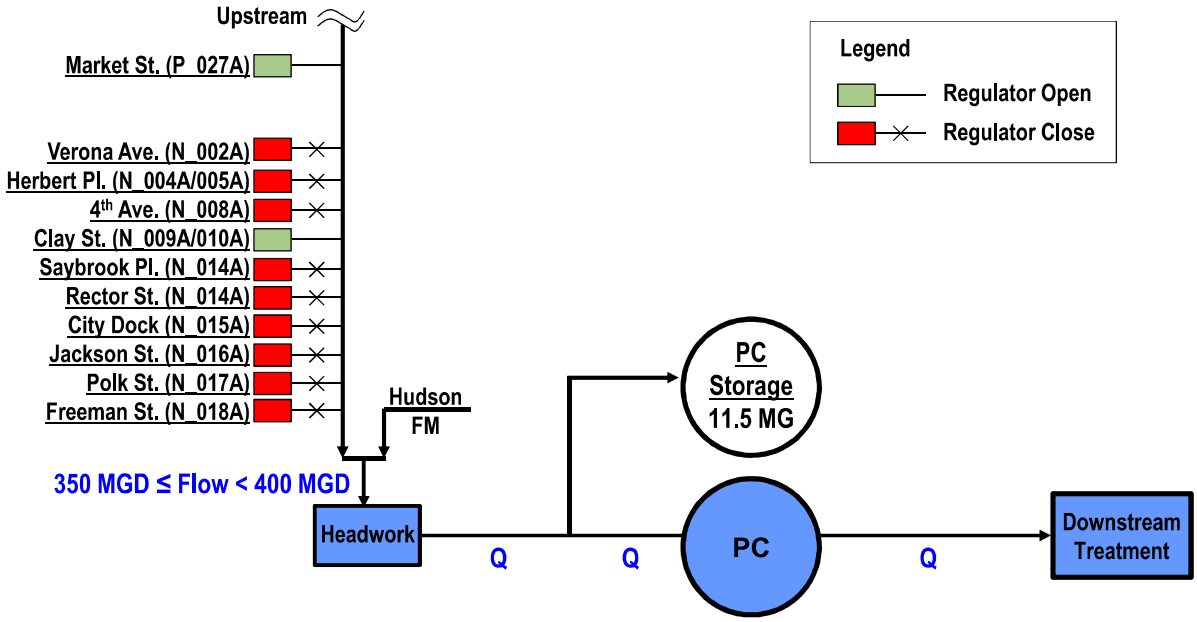
Wet Weather SOP

350 MGD ≤ Flow < 400 MGD



Note: During 10/7/15 to 7/7/16, CSOs were put in use at plant flow 400 MGD.

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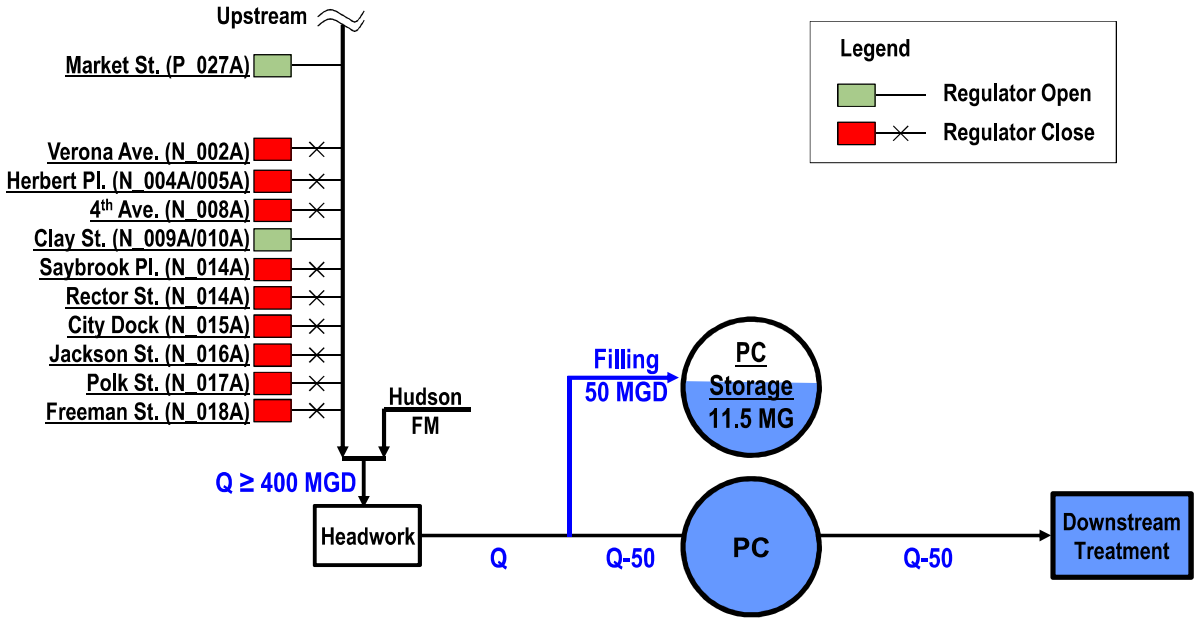
Wet Weather SOP

Flow ≥ 400 MGD



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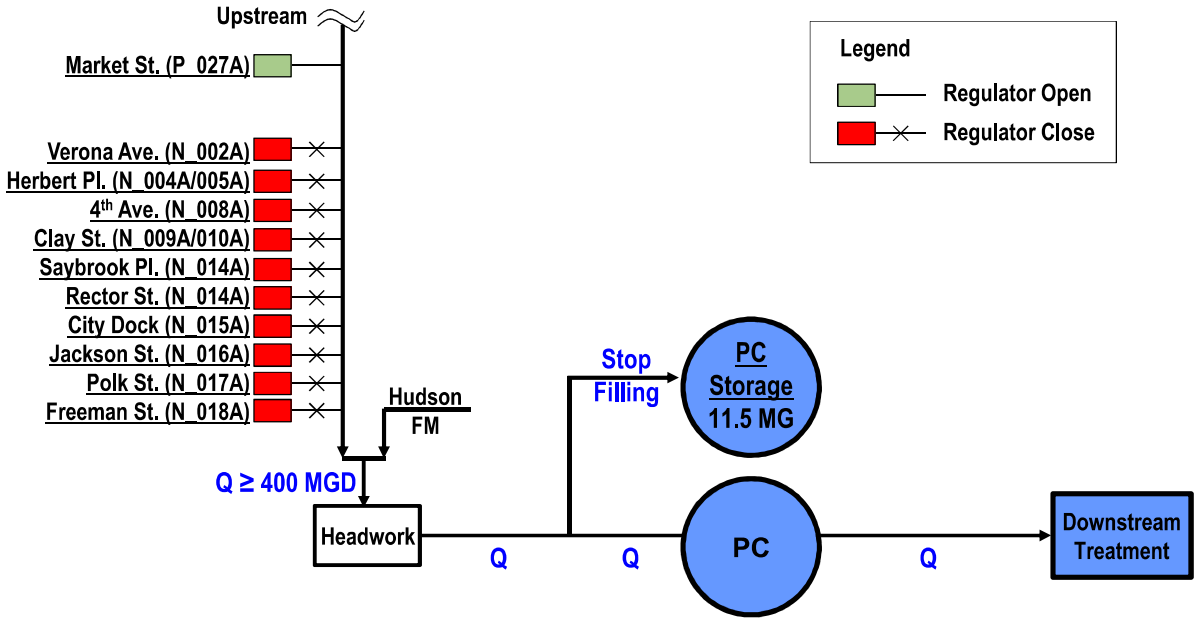
Wet Weather SOP

Flow ≥ 400 MGD, & Storage Full



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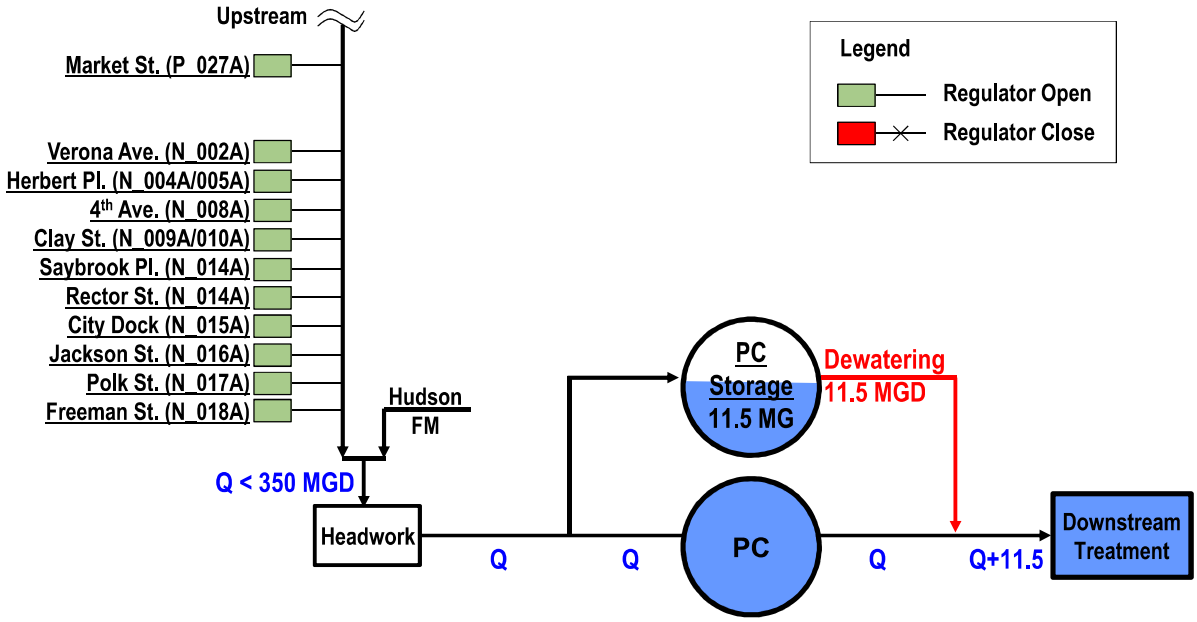
Wet Weather SOP

Flow Drops to 350 MGD



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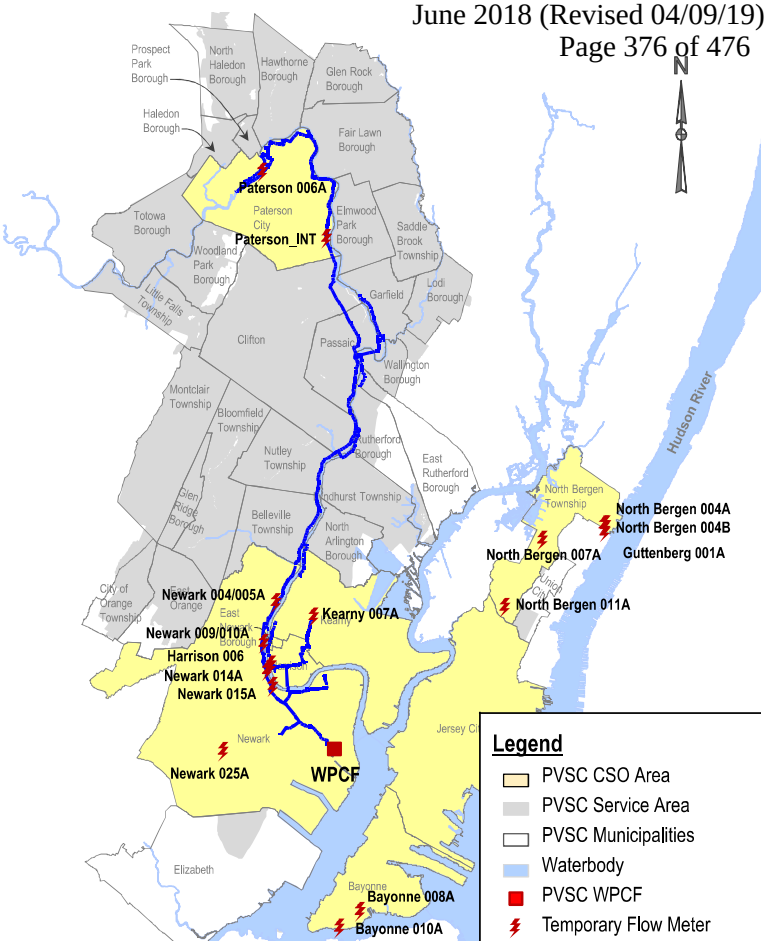
PVSC H&H Model Calibration and Validation

Temporary Flow Meters (April to August 2016)

21 Flow Meters

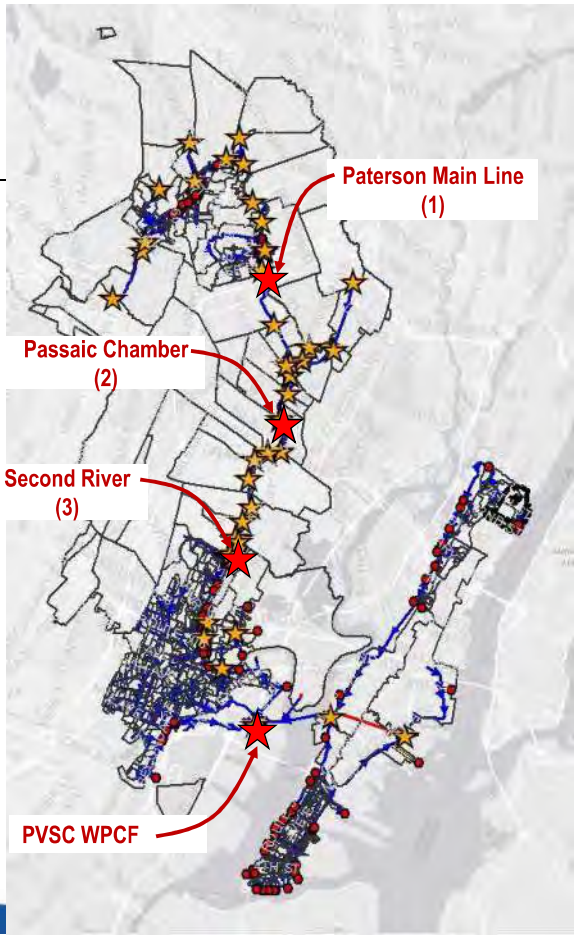
- 13 outfall pipe
- 5 regulator influent
- 2 regulator effluent
- 1 interceptor



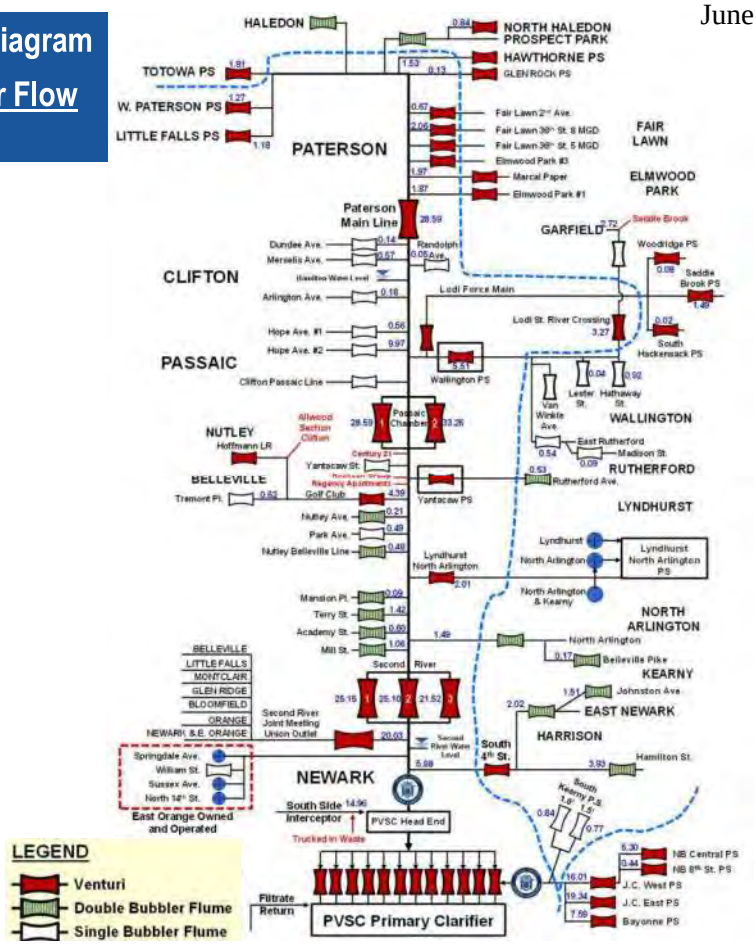
PVSC Permanent Flow Meters

Over 70 Flow Meters, 55 was analyzed for DWF and model calibration

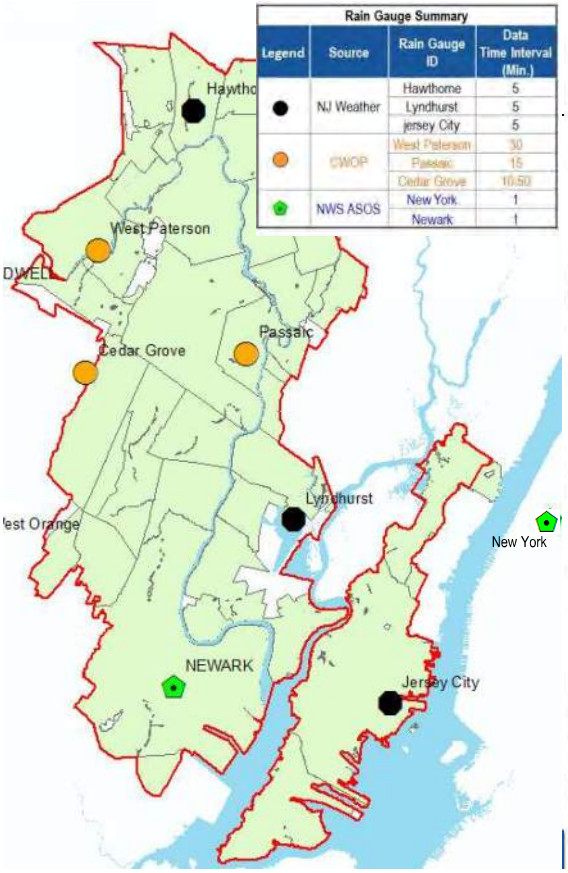
- PVSC Interceptor: 6
- Pump Station: 6
- Combined area: 5
- Separated Area: 38

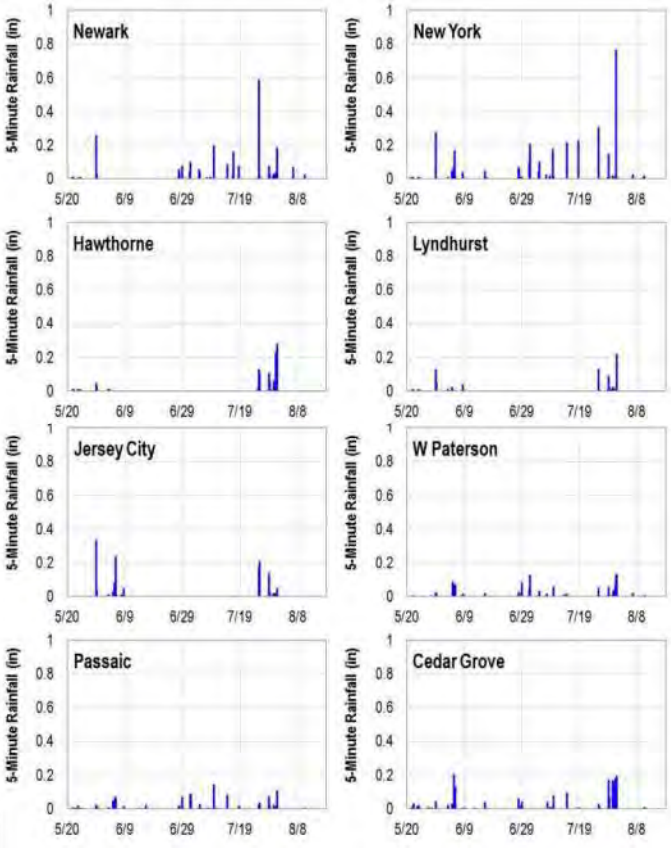


Flow Meter Diagram
Dry Weather Flow (MGD)

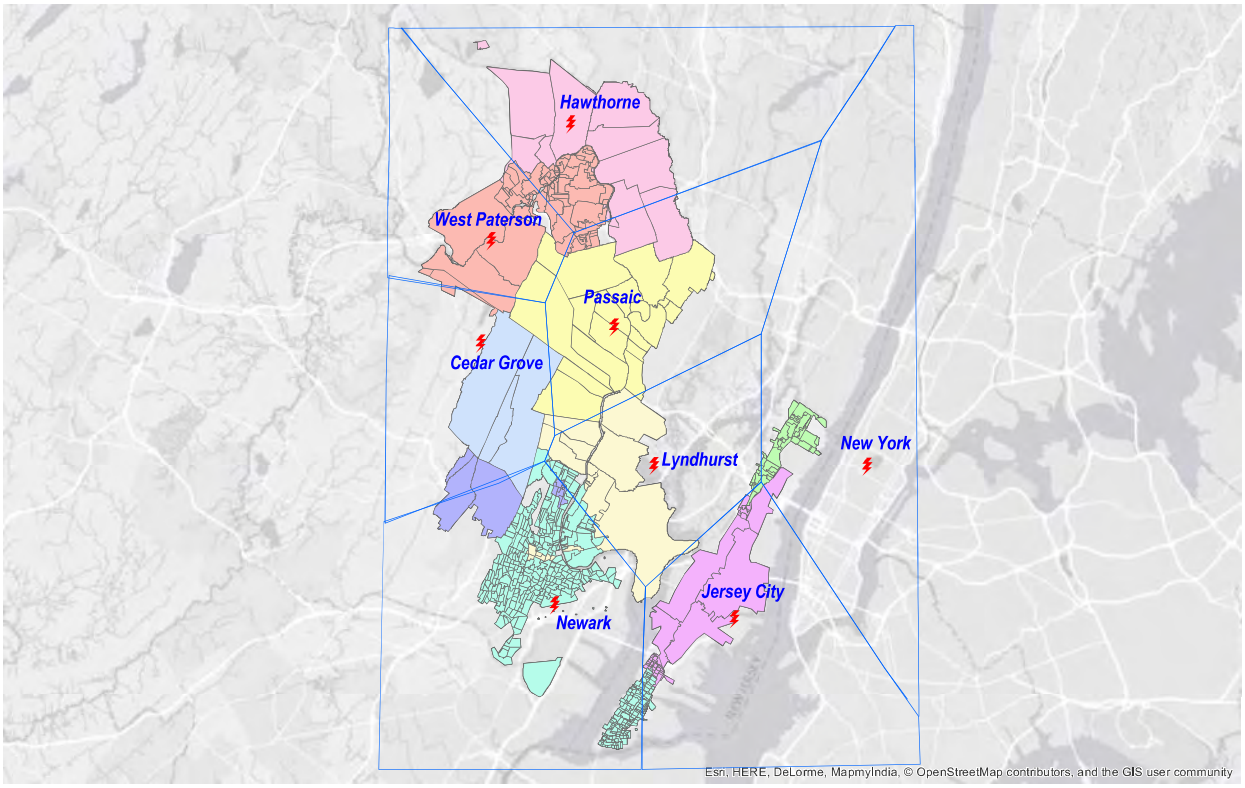


Rainfall Stations





Rainfall Station Assignment



Candidate Storm Events for Calibration

Rainfall Based on Newark

Rain Start	Rain End	Duration (hr)	Depth (in)	Max Intensity (in/hr)	Average Intensity (in/hr)
7/25/16 16:05	7/25/16 18:50	2.75	**1.81**	1.68	0.66
5/29/16 23:50	5/30/16 5:20	5.50	**1.6**	1.09	0.29
7/29/16 0:20	7/29/16 8:35	8.25	**0.85**	0.42	0.10
5/2/16 22:40	5/3/16 9:50	11.17	**0.7**	0.17	0.06
7/31/16 8:35	7/31/16 22:35	14.00	**0.69**	0.49	0.05
7/4/16 19:20	7/5/16 2:50	7.50	**0.63**	0.23	0.08
5/6/16 2:30	5/6/16 12:25	9.92	**0.6**	0.19	0.06
7/16/16 14:50	7/16/16 15:35	0.75	**0.56**	0.75	0.75
6/8/16 11:25	6/8/16 14:10	2.75	**0.49**	0.3	0.18
7/9/16 21:30	7/9/16 22:05	0.58	**0.48**	0.82	0.82
4/4/16 7:45	4/4/16 17:00	9.25	**0.43**	0.12	0.05

Model Calibration and Validation Goals

- Visual match
- +20/-10% volume and
- +25%/-15% peak

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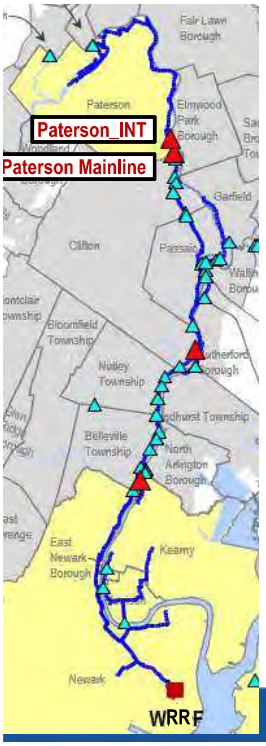
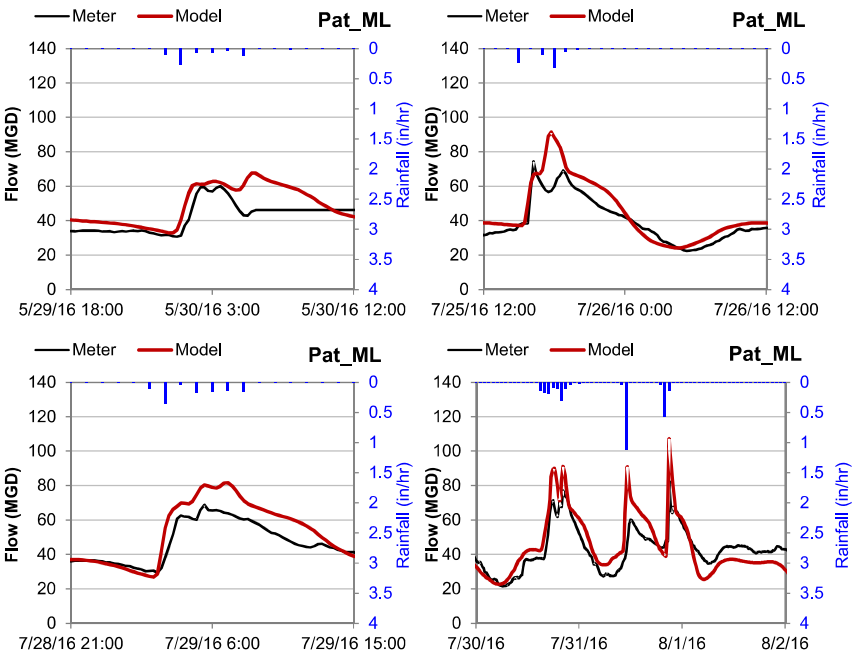
Major Interceptor

Calibration Results – Main Interceptor

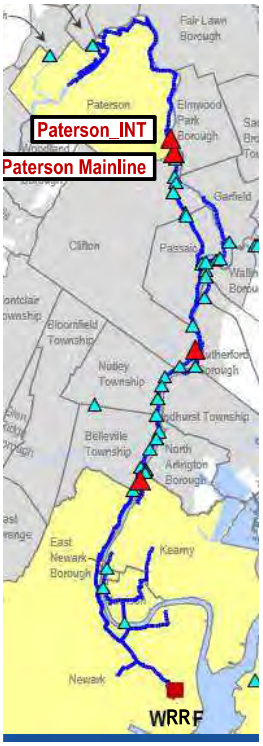
Paterson Main Line

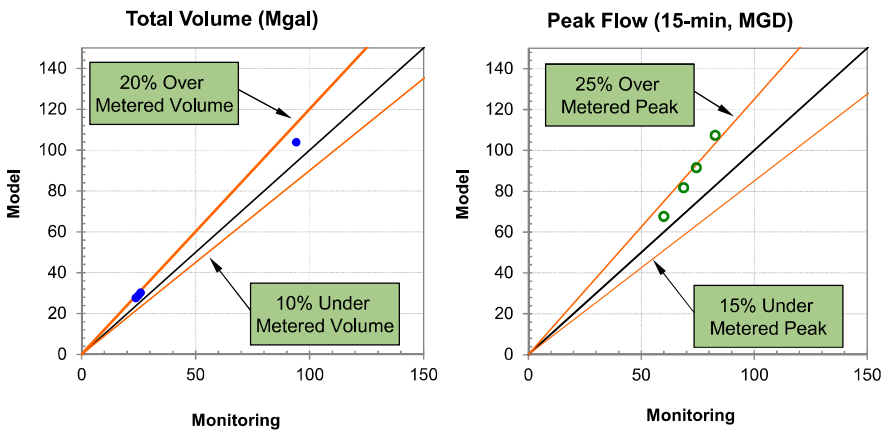




Calibration Results – Main Interceptor

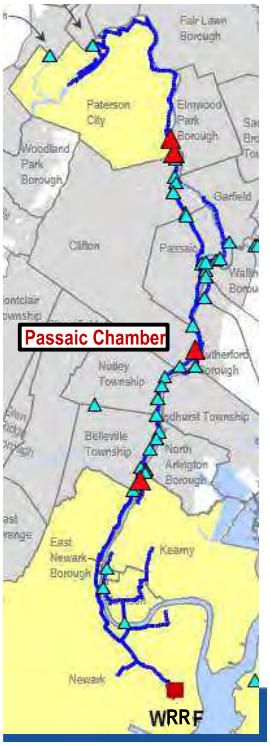
Paterson Main Line: Goodness-of-Fit

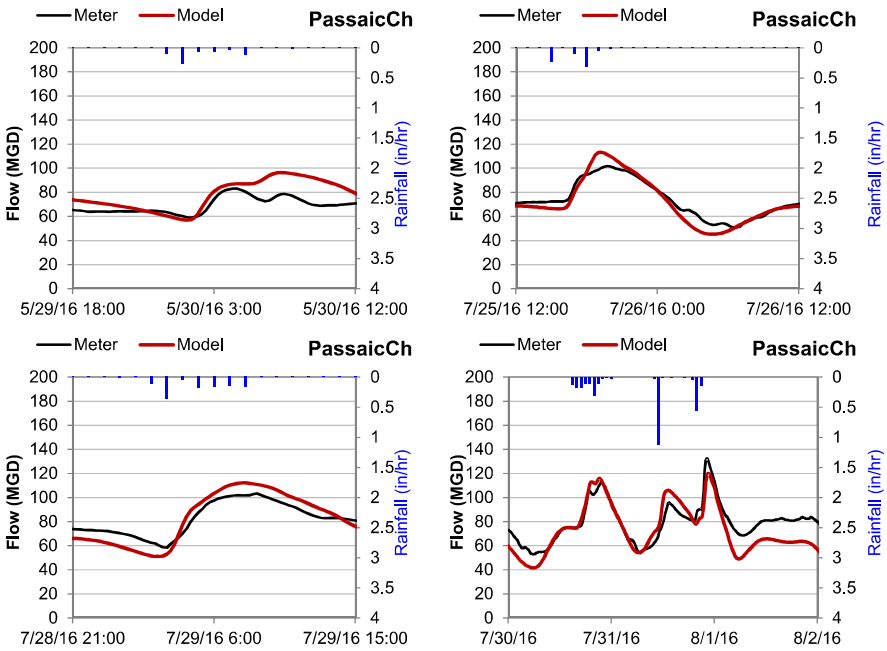




Calibration Results – Main Interceptor

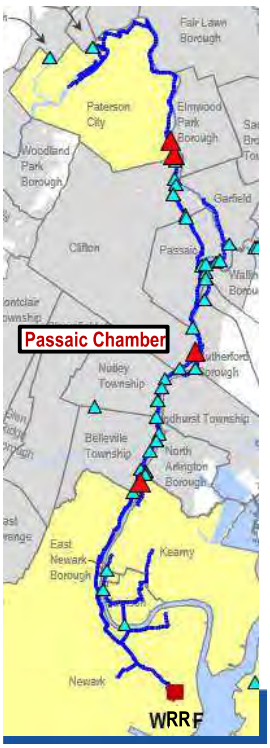
Passaic Chamber

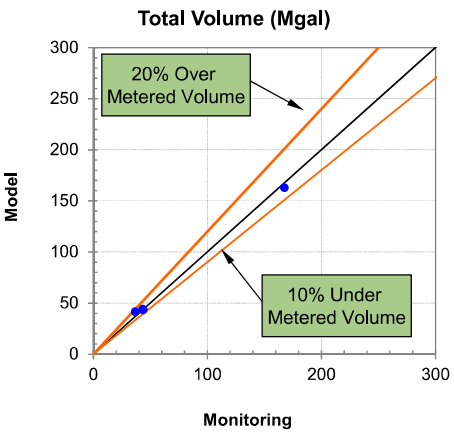


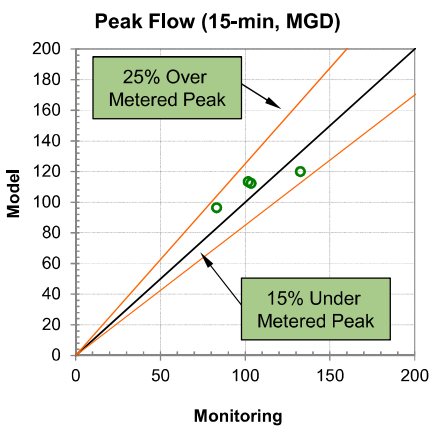


Calibration Results – Main Interceptor

Passaic Chamber: Goodness-of-Fit

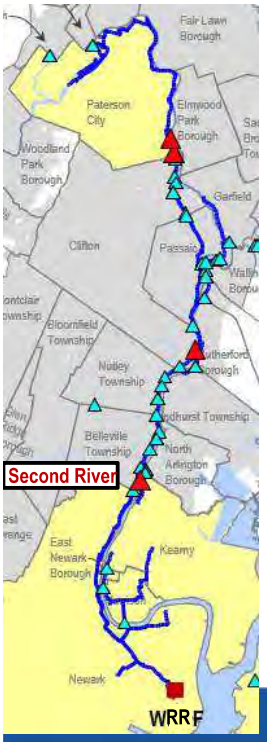


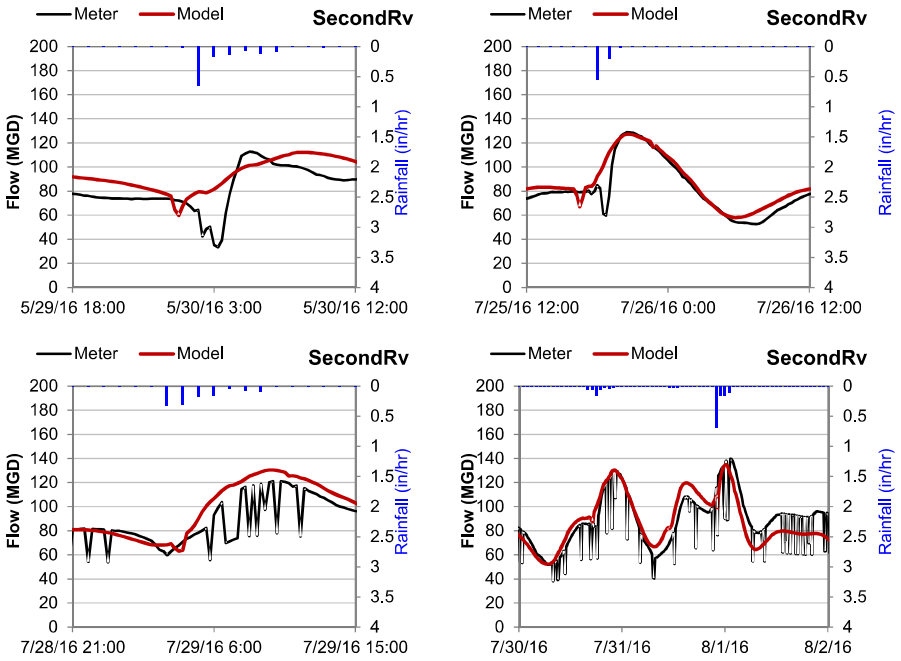




Calibration Results – Main Interceptor

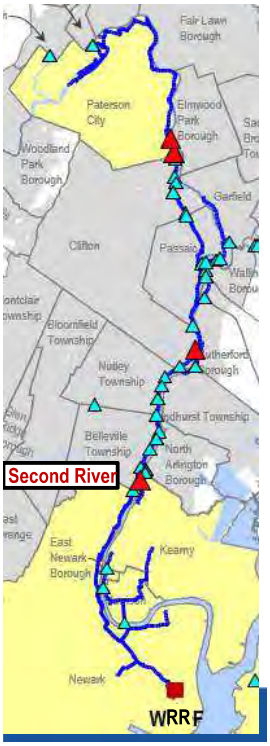
Second River Crossing

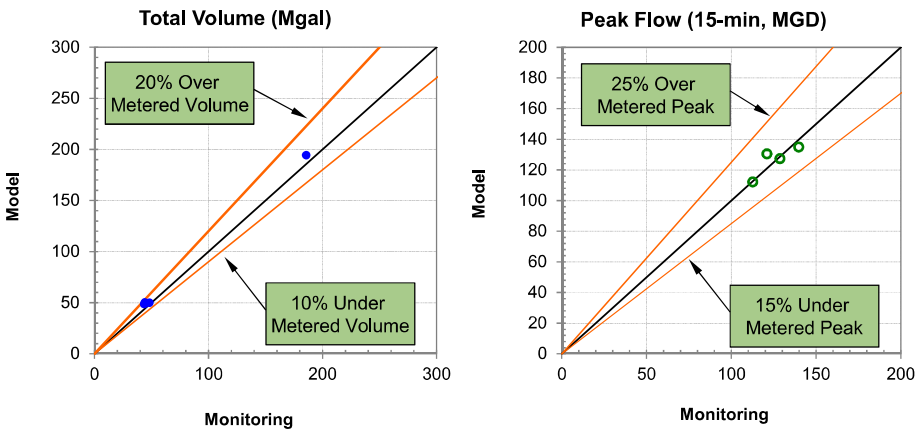




Calibration Results – Main Interceptor

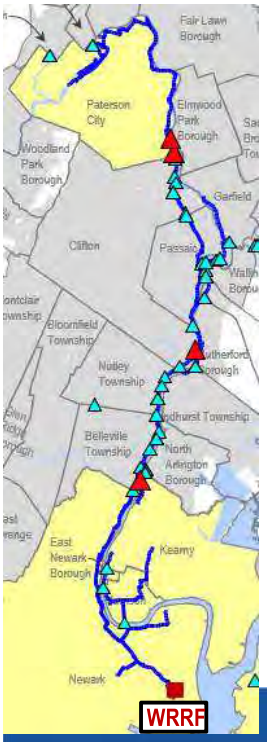
Second River Crossing: Goodness-of-Fit

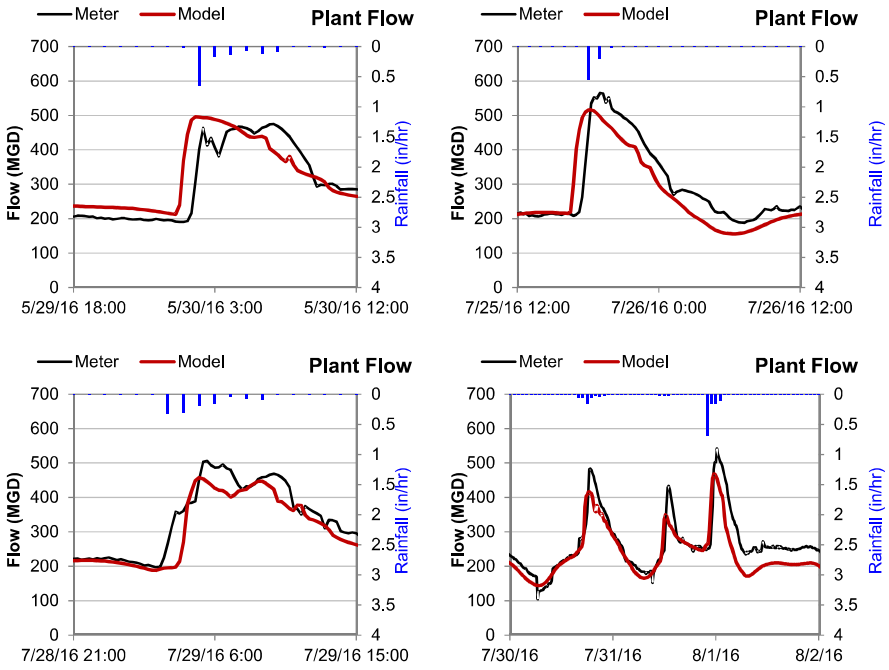




Calibration Results – Main Interceptor

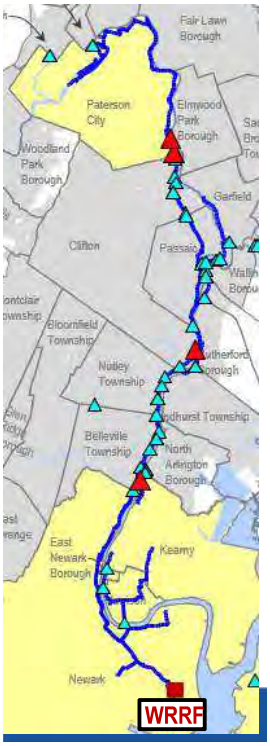
PVSC WPCF

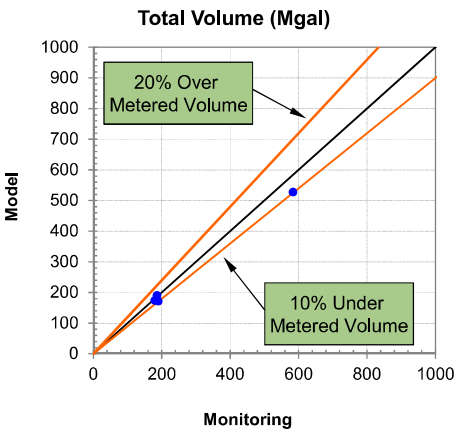


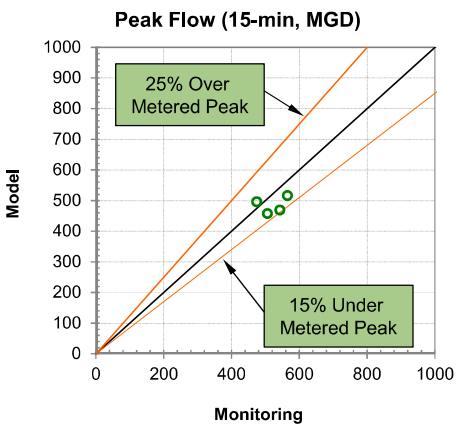


Calibration Results – Main Interceptor

PVSC WPCF: Goodness-of-Fit







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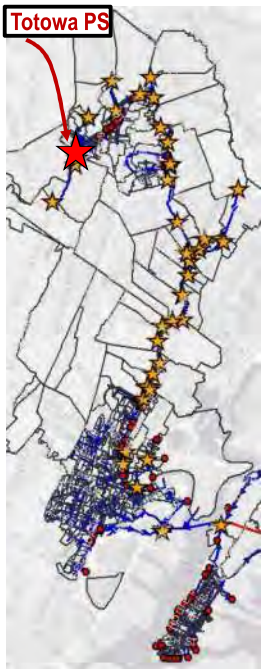
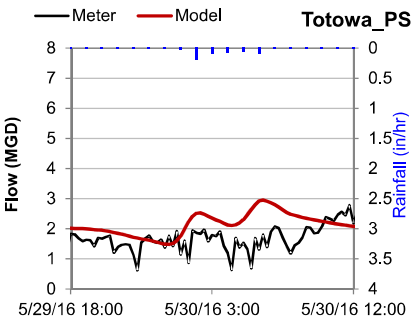
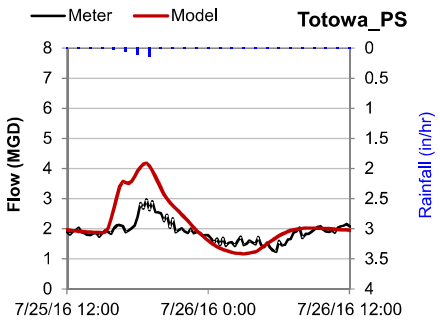
Separated Area

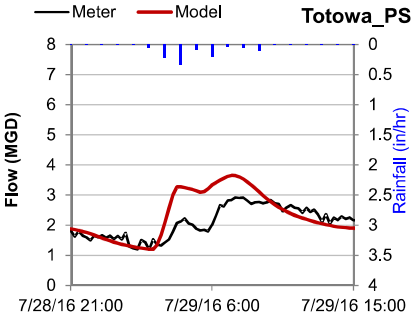
Calibration Results – Separated Area

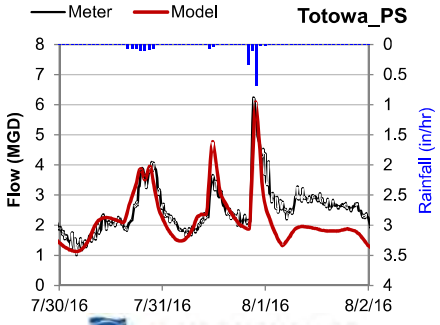
Totowa PS







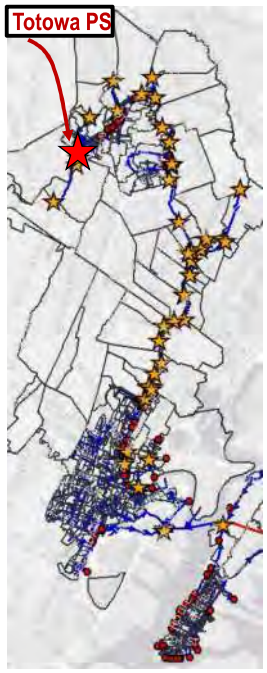


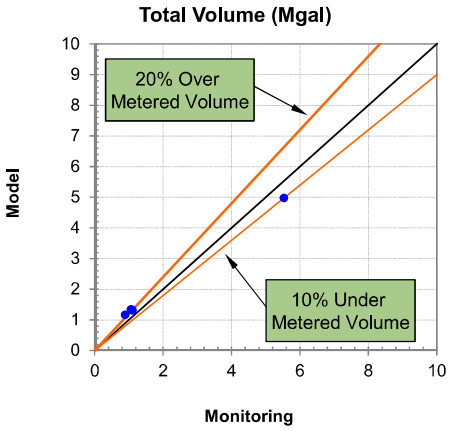


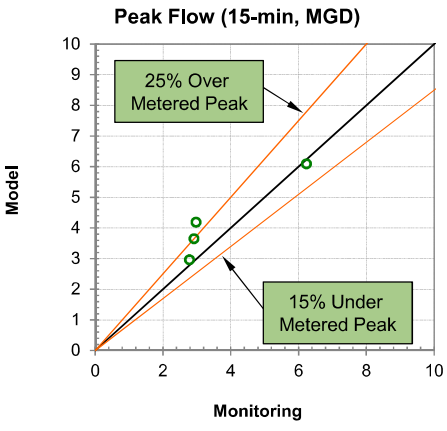
GREELEY AND HANSEN

Calibration Results – Separated Area

Totowa PS: Goodness-of-Fit



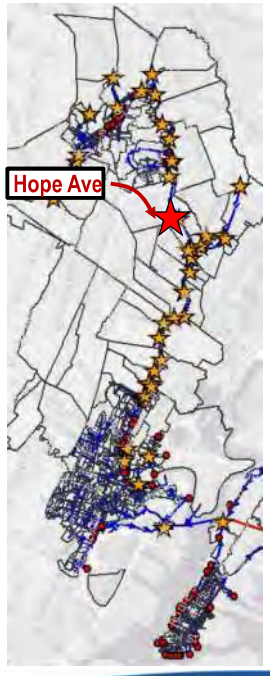


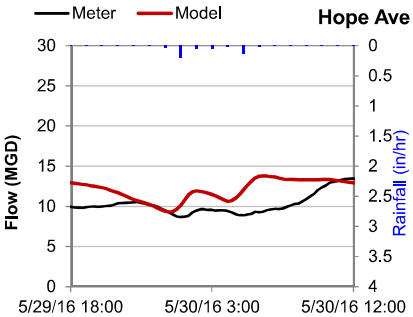


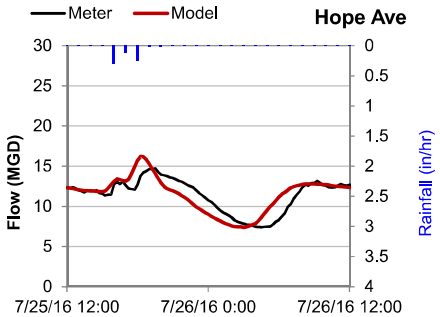
GREELEY AND HANSEN

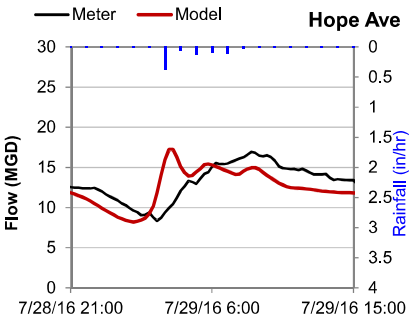
Calibration Results – Separated Area

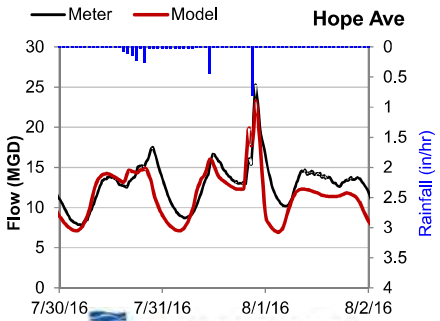
Hope Ave







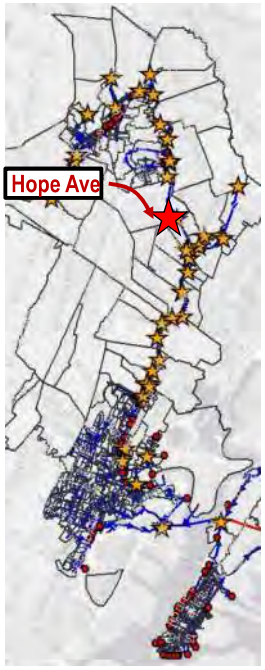


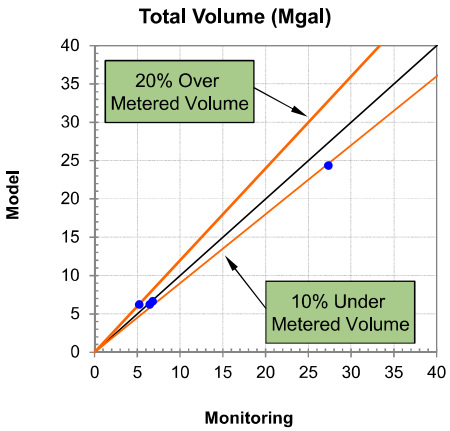


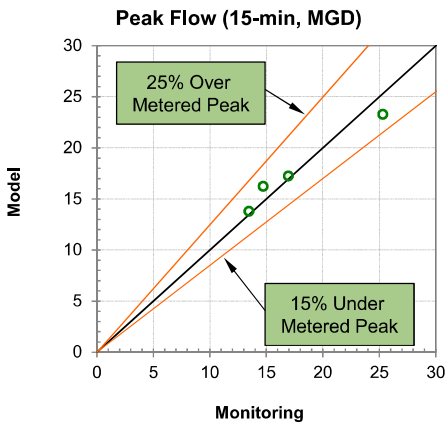
GREELEY AND HANSEN

Calibration Results – Separated Area

Hope Ave: Goodness-of-Fit



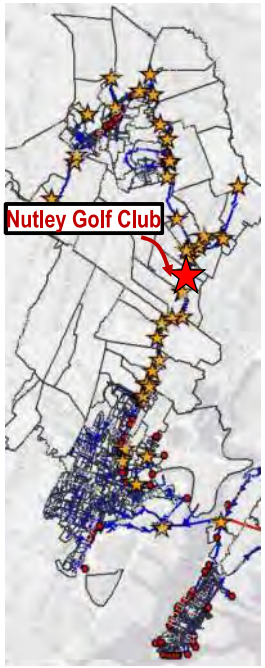


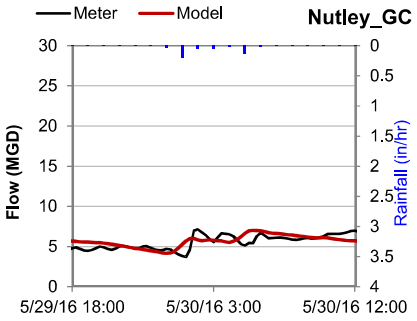


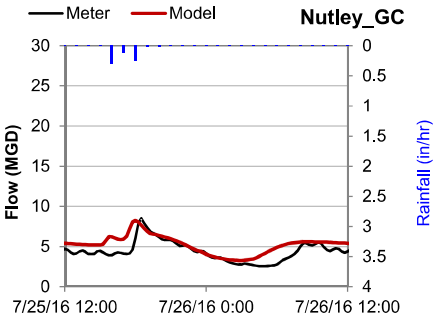
GREELEY AND HANSEN

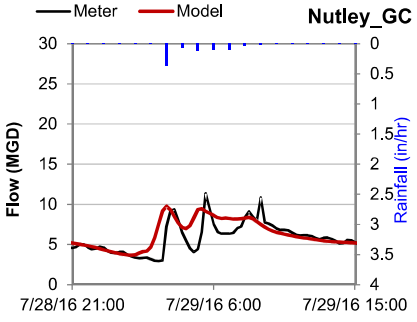
Calibration Results – Separated Area

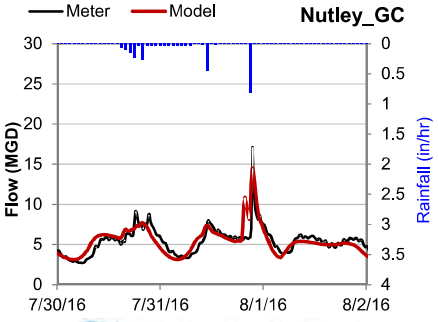
Nutley Golf Club







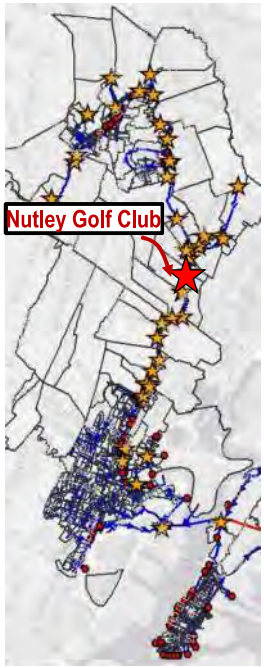


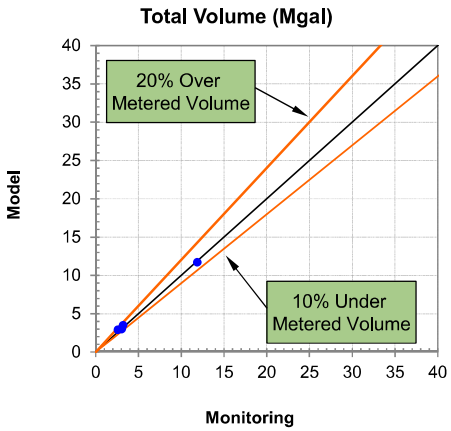


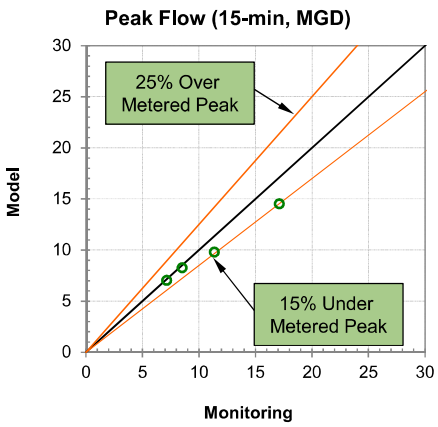
GREELEY AND HANSEN

Calibration Results – Separated Area

Nutley Golf Club: Goodness-of-Fit



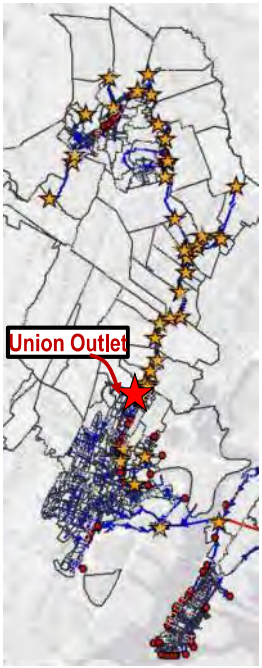


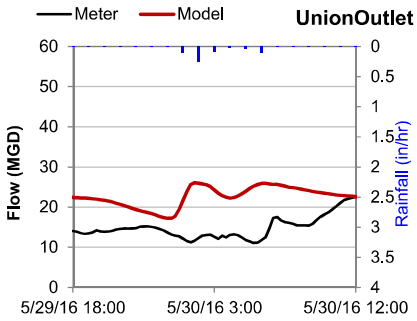


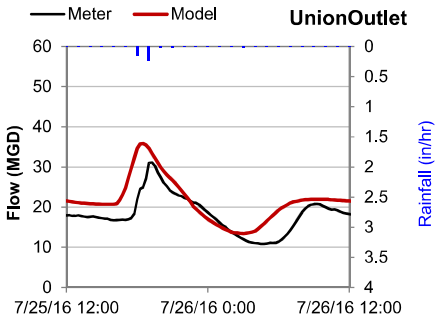
GREELEY AND HANSEN

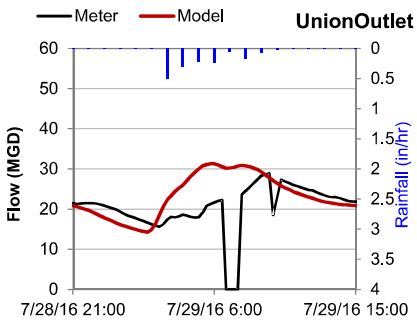
Calibration Results – Separated Area

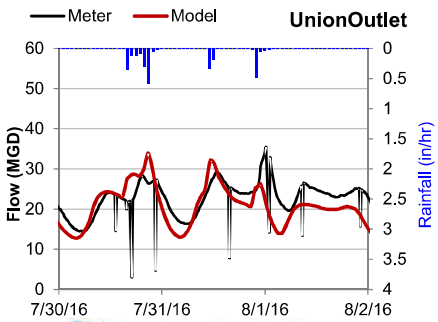
Union Outlet







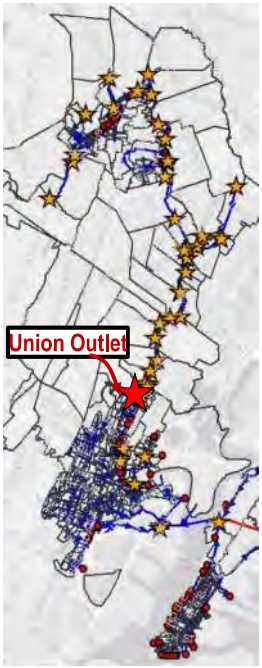


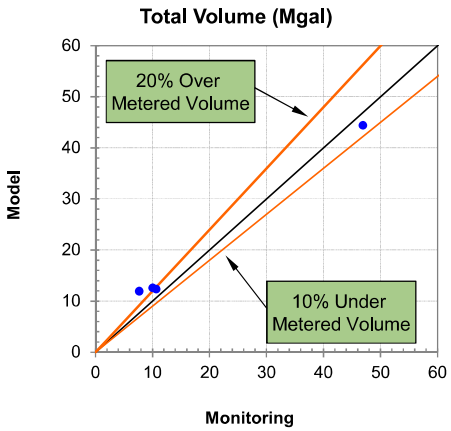


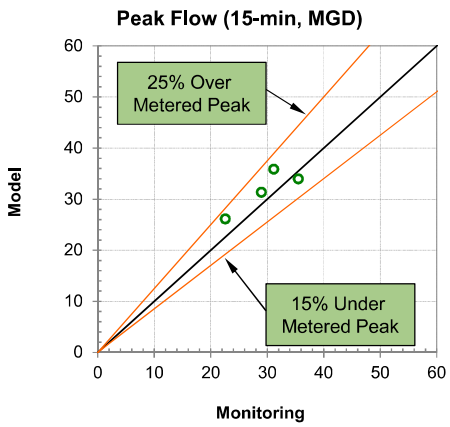
GREELEY AND HANSEN

Calibration Results – Separated Area

Union Outlet







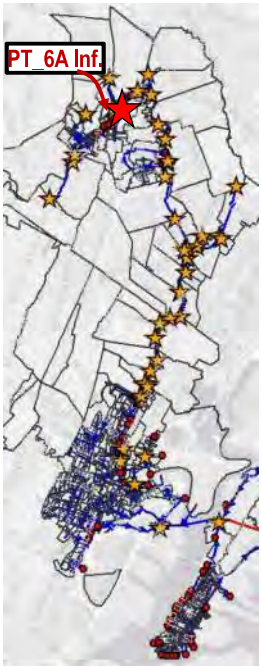
GREELEY AND HANSEN

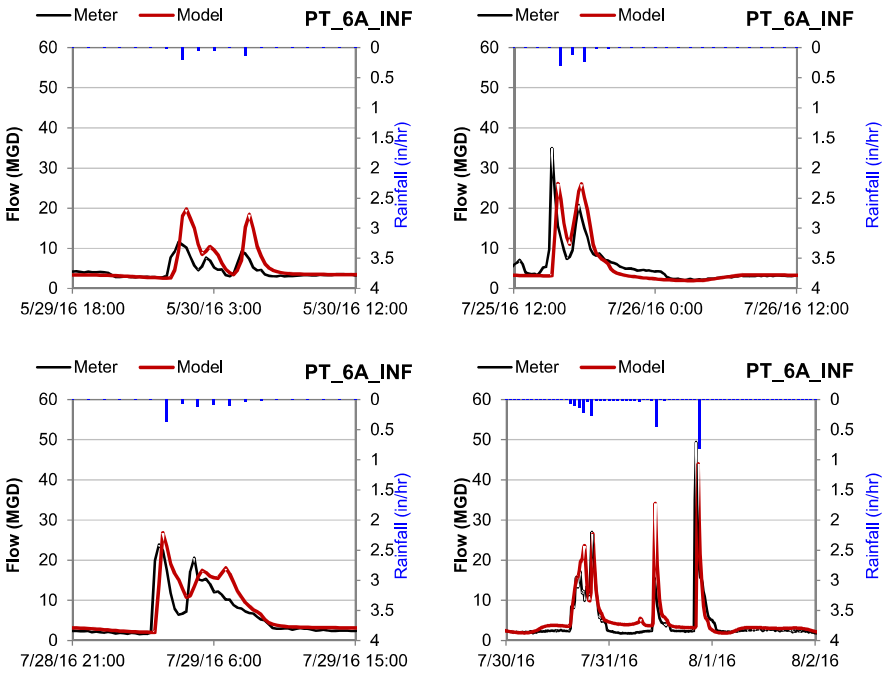
GREELEY AND HANSEN

Combined Area

Calibration Results – Combined Area

Paterson 6A Influent

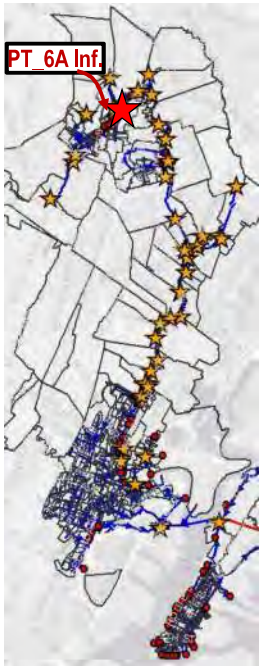


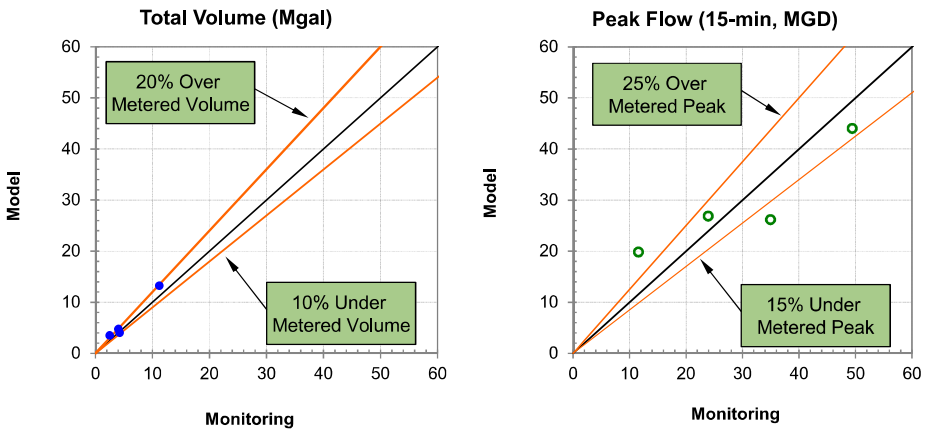


GREELEY AND HANSEN

Calibration Results – Combined Area

Paterson 6A Influent

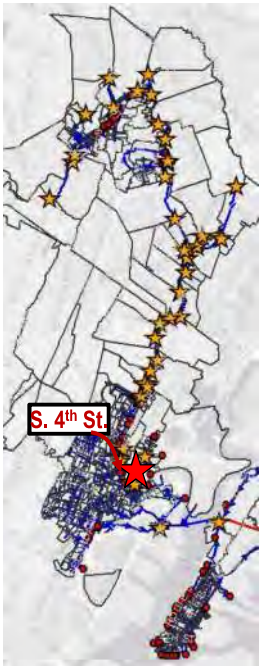


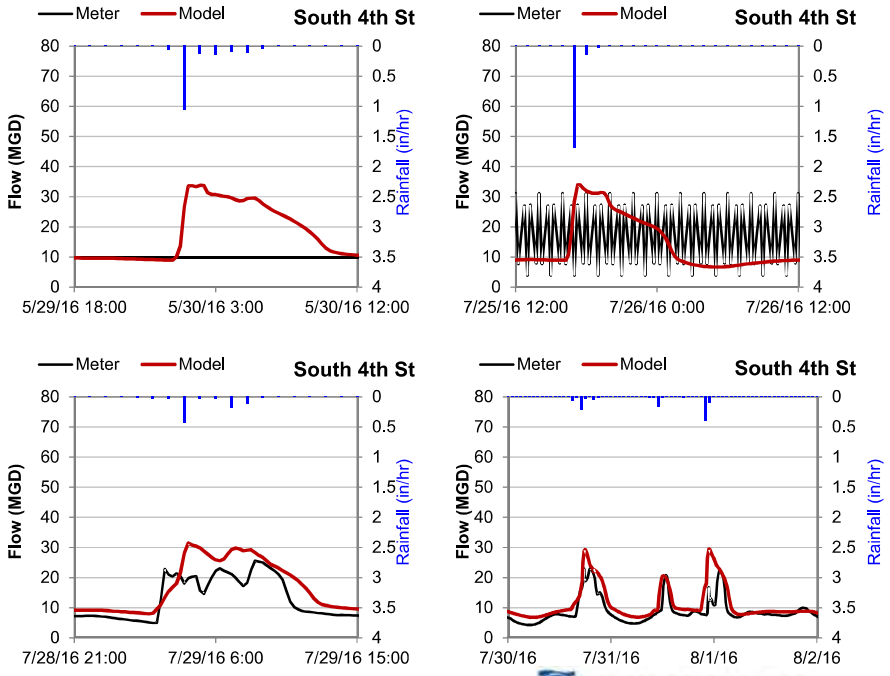


GREELEY AND HANSEN

Calibration Results – Combined Area

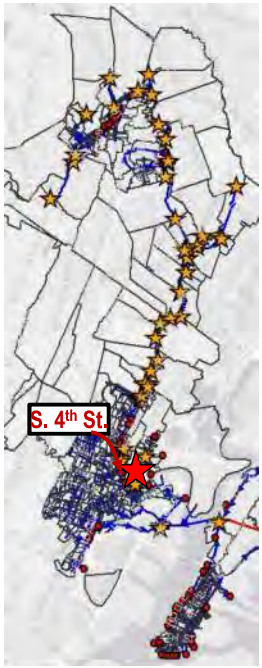
South 4th St.

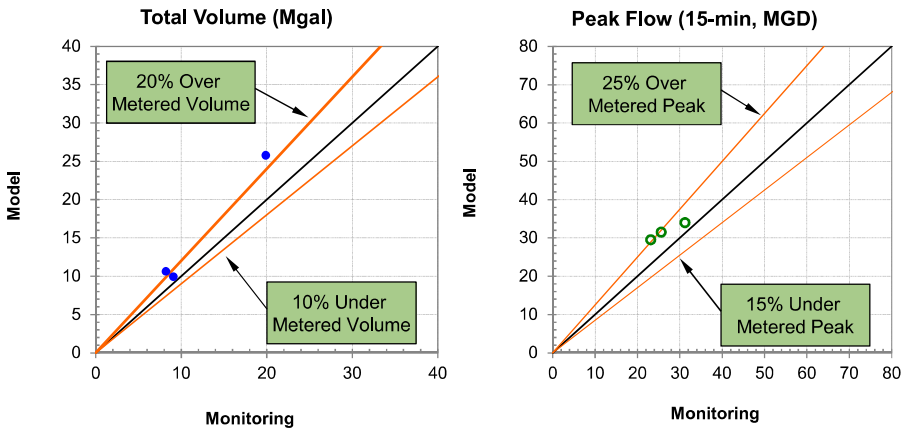




Calibration Results – Combined Area

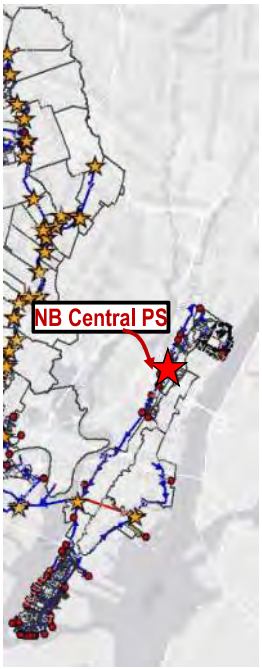
South 4th St.

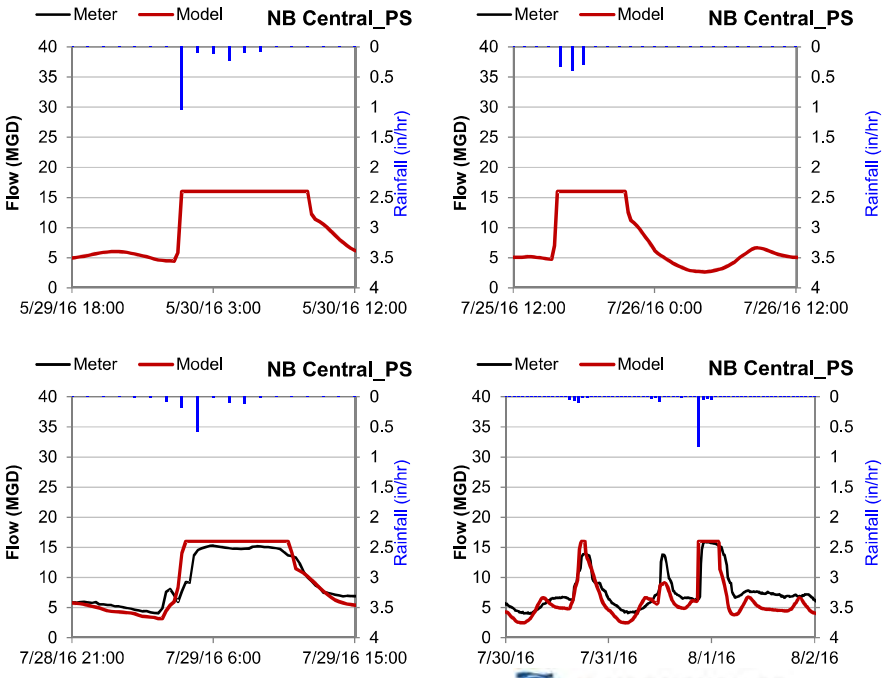




Calibration Results – Combined Area

NB Central PS.

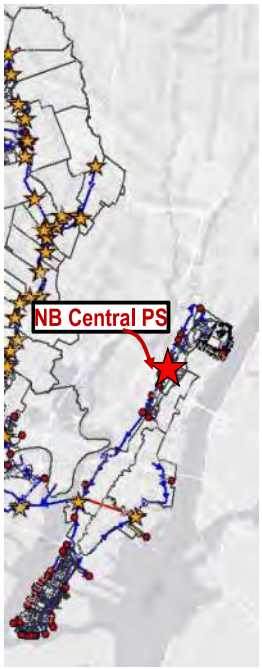


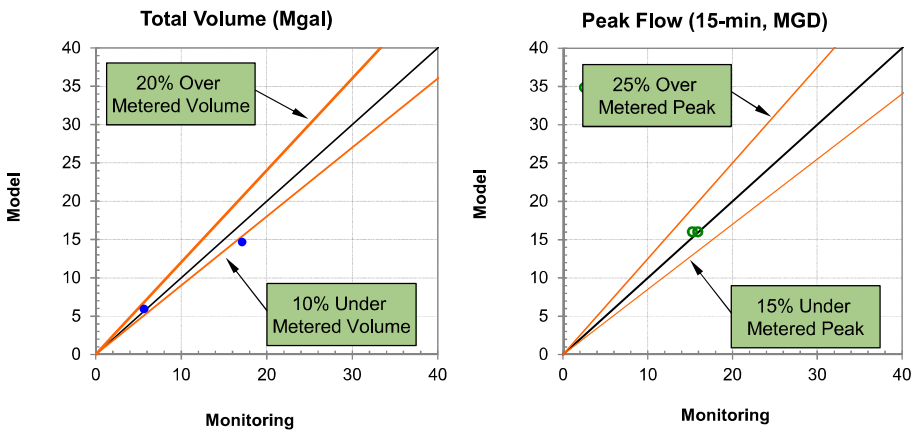


GREELEY AND HANSEN

Calibration Results – Combined Area

NB Central PS.

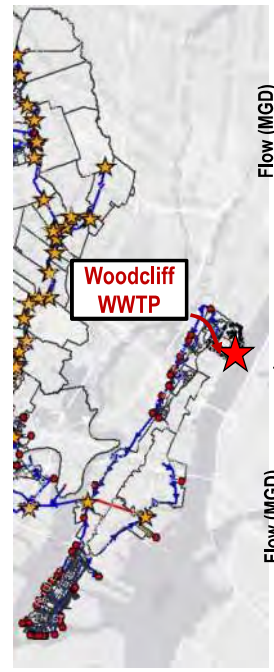


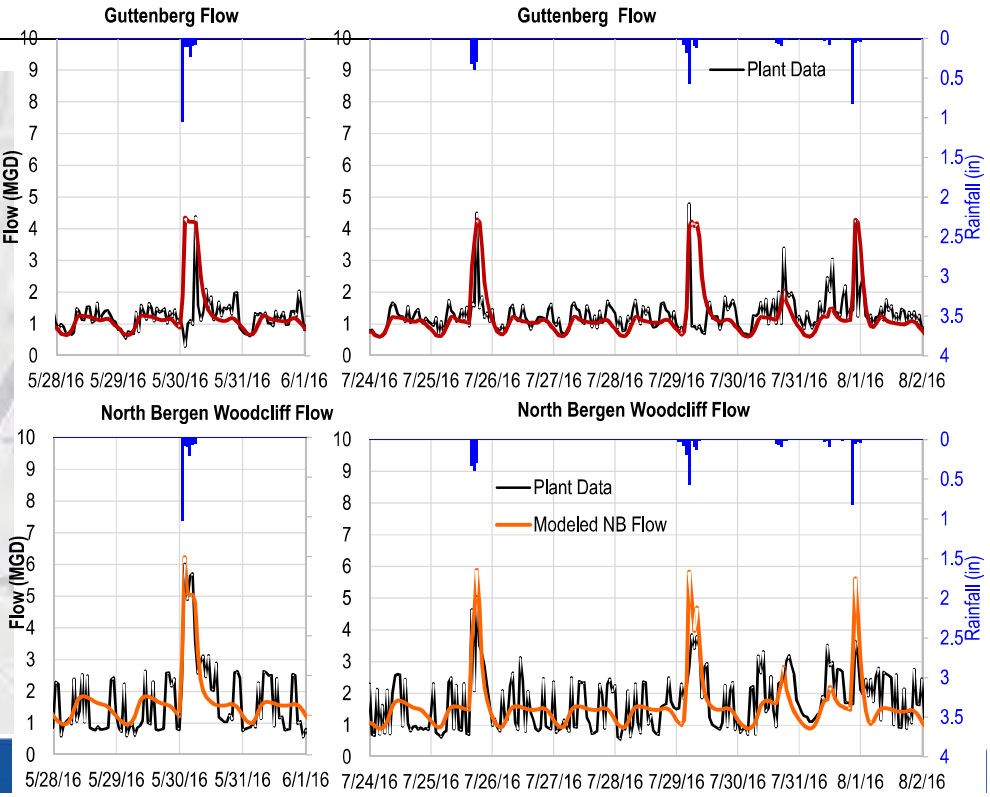


GREELEY AND HANSEN

Calibration Results – Woodcliff WWTP

Influent Flows



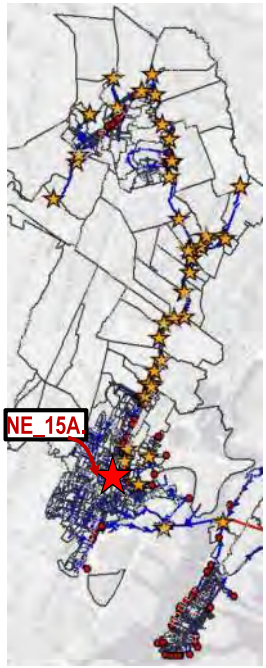


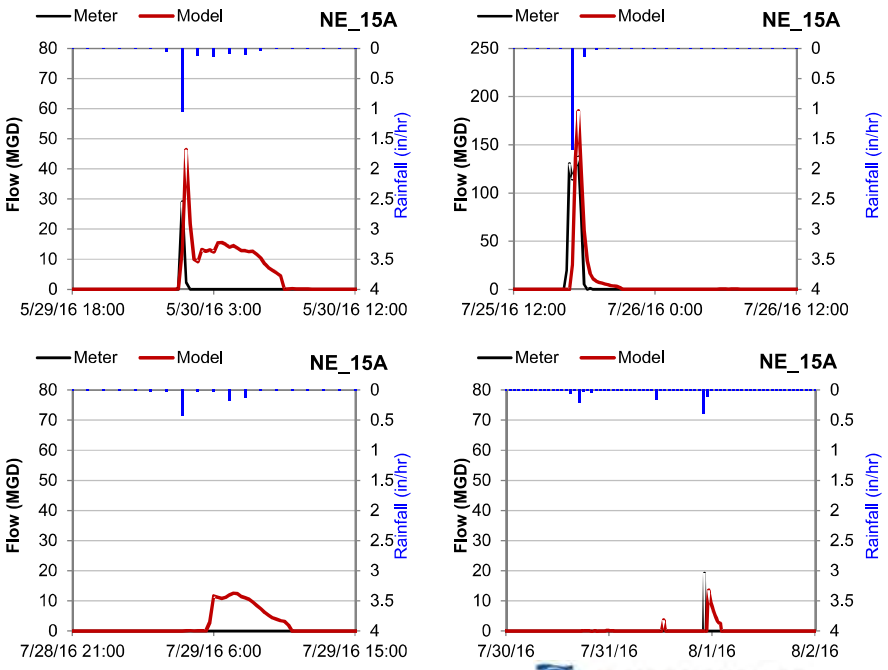
GREELEY AND HANSEN

CSO Meters

Calibration Results – CSO Overflow

NE_15A

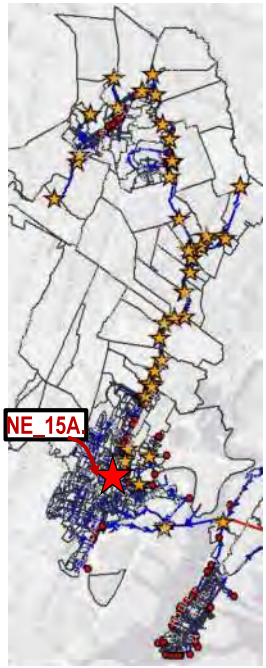


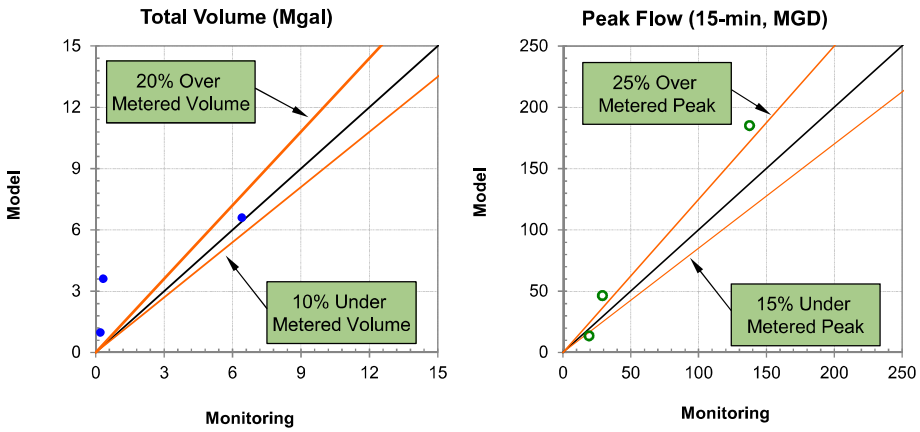


GREELEY AND HANSEN

Calibration Results – CSO Overflow

NE_15A

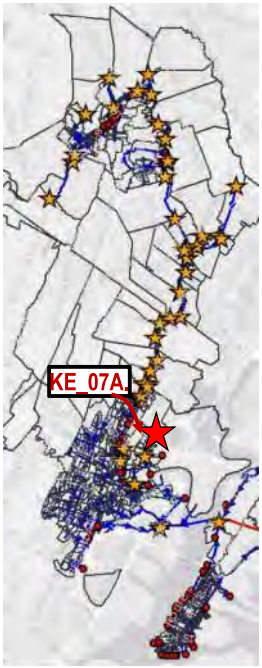


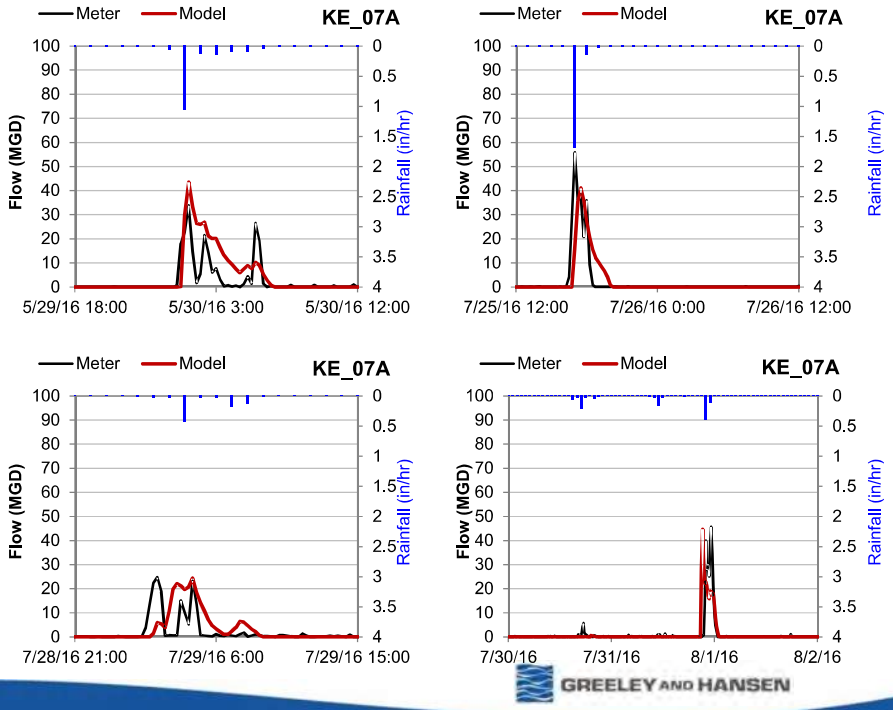


GREELEY AND HANSEN

Calibration Results – CSO Overflow

KE_07A

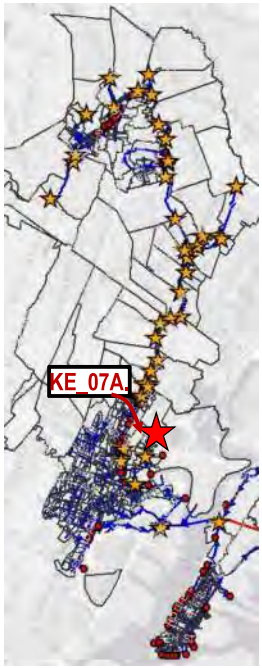


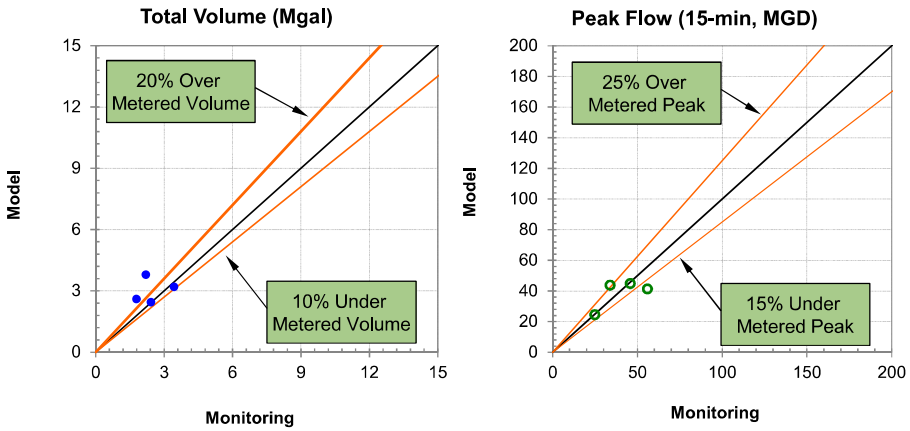


GREELEY AND HANSEN

Calibration Results – CSO Overflow

KE_07A

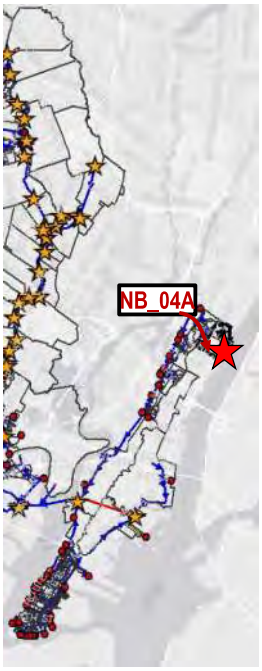


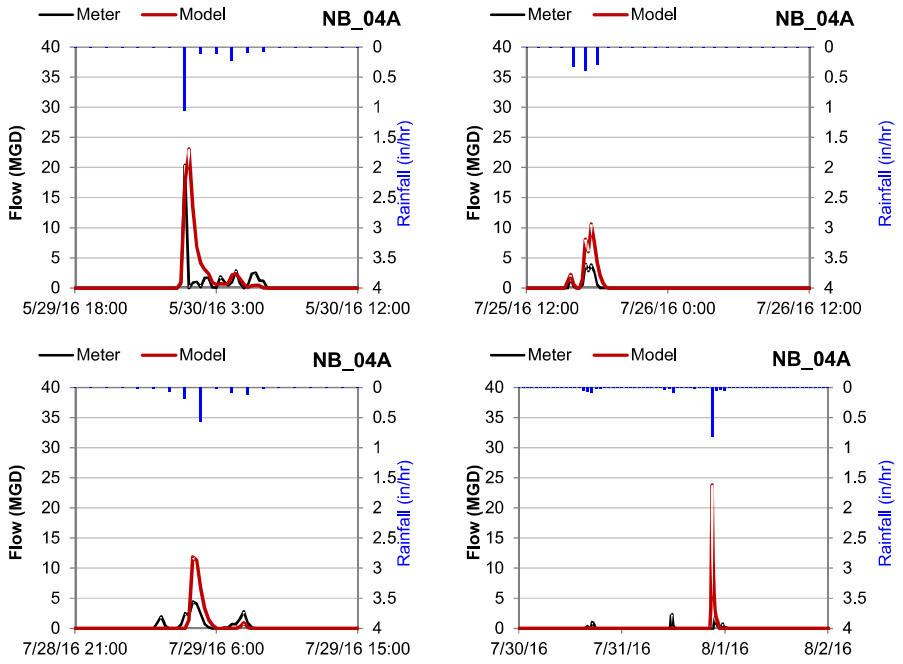


GREELEY AND HANSEN

Calibration Results – CSO Overflow

NB_04A

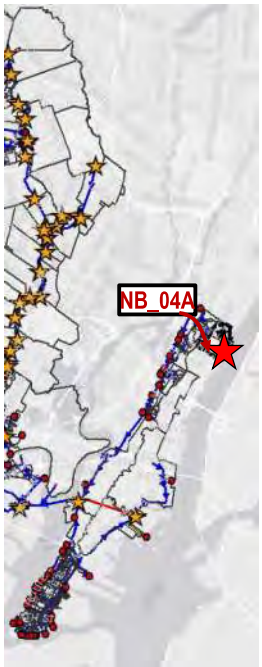


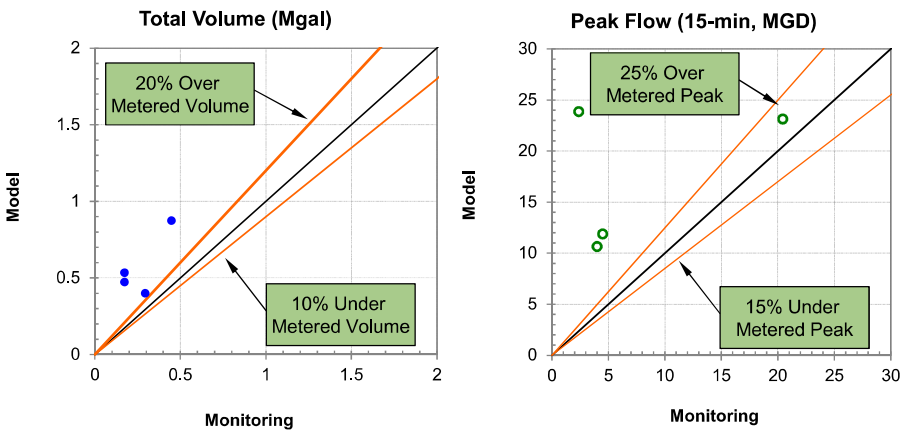


GREELEY AND HANSEN

Calibration Results – CSO Overflow

NB_04A

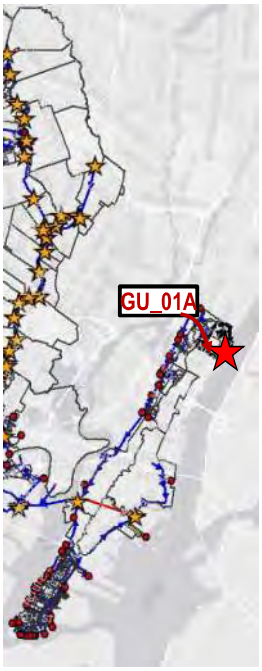


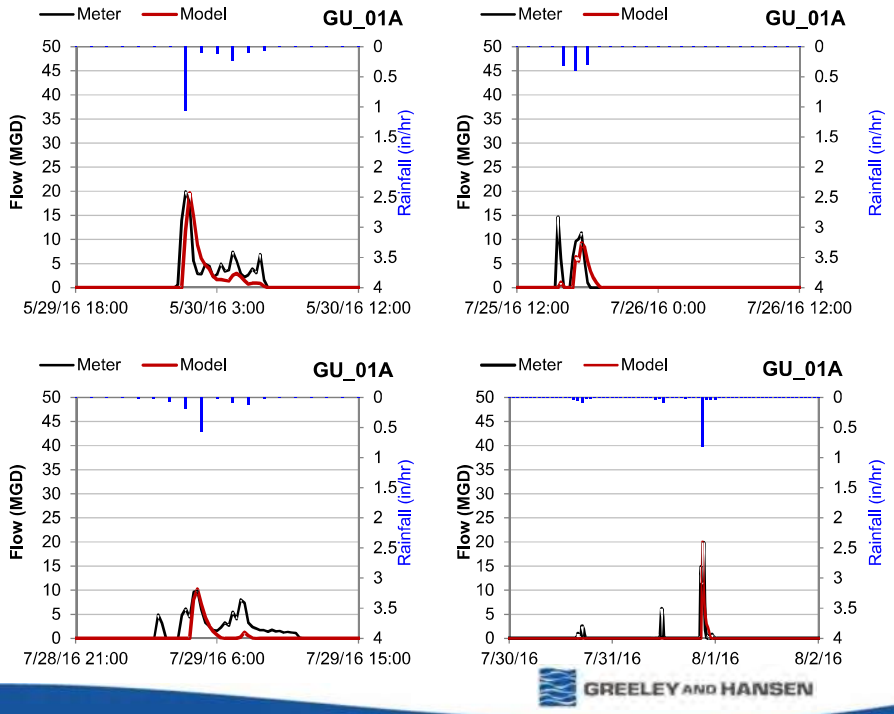


GREELEY AND HANSEN

Calibration Results – CSO Overflow

GU_01A

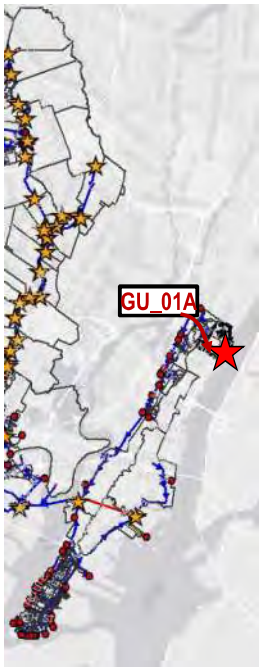


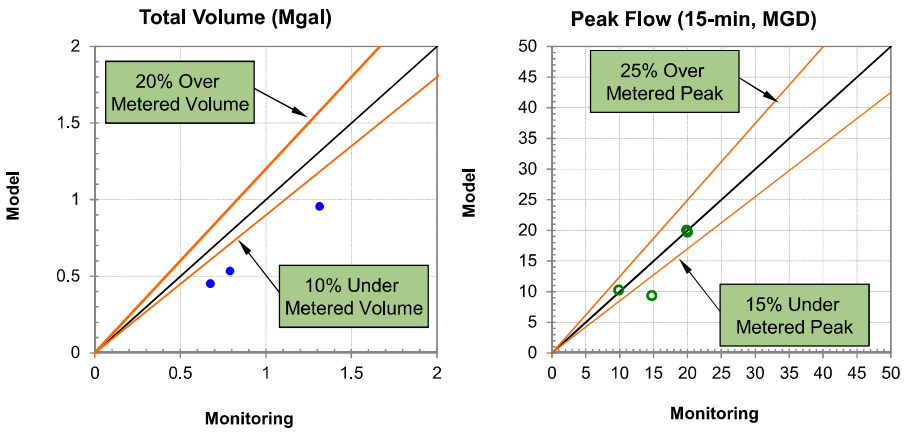


GREELEY AND HANSEN

Calibration Results – CSO Overflow

GU_01A





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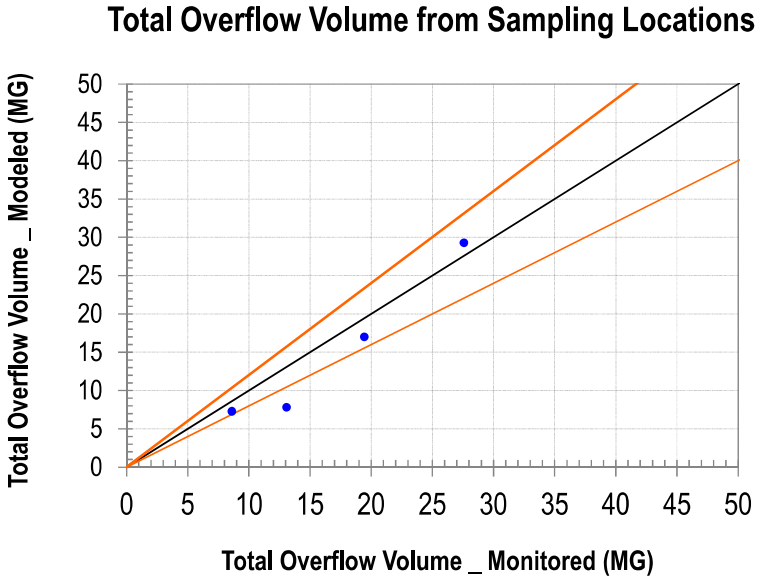
Total Overflow Volume

NE_04&05, NE_09&10, NE_14A , NE_15A , KE_07A ,
BA_08A , BA_10A ,NB_11A , NB_07A, NB_04A, NB_04B, GU_01A



Summary

- The updated PVSC H&H model includes
  - 48 municipalities served by the PVSC WPCF
  - 2 municipalities served by the NBMUA Woodcliff WWTP
  - Dry weather flow based on 2016 flow monitoring data
  - Wet weather flow simulated as runoff from the combined areas and RDII from the separated areas
  - Current PVSC WPCF wet weather operating rules
- The model is calibrated and validated to 2016 flow monitoring data

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PVSC H&H Model Application

PVSC H&H Model Application

- Typical Year Simulation
- CSO Control Alternative Simulation
- Generate CSO flows for WQ model

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CSO ID	Overflow Volume (MG)	Overflow # per Year	Overflow Duration (Hour)
PT001	24.9	38	162
PT003	1.8	20	27
PT005	6.5	27	77
PT006	76.6	38	161
PT007	42.8	37	155
PT010	9.7	26	68
PT013	11.4	29	71
PT014	0.1	5	3
PT015	0.5	18	11
PT016	12.3	30	55
PT017	8.7	33	106
PT021	5.0	30	112
PT022	17.4	33	141
PT023	3.0	17	25
PT024	8.3	31	52
PT025	87.9	56	120
PT026	0.5	15	7
PT027	41.0	46	83
PT028	10.0	28	48
PT029	92.4	48	178
PT030	4.5	4	3
PT031	9.5	27	39
PT032	30.2	32	122

CSO ID	Overflow Volume (MG)	Overflow # per Year	Overflow Duration (Hour)
EN001	16.6	37	97
HR001	1.3	30	36
HR002	2.8	34	50
HR003	13.6	33	60
HR005	18.8	36	133
HR006	6.7	30	48
HR007	13.3	49	133
KE001	3.9	33	54
KE004	12.3	58	177
KE006	118.8	63	246
KE007	86.0	36	165
KE010	26.0	54	144
NE002	91.5	46	268
NE003	0.0	0	0
NE004	1.4	23	29
NE005	21.2	43	249
NE008	93.3	52	327
NE009	163.7	42	210
NE010	163.7	42	210
NE014	180.1	52	387
NE015	74.7	43	248
NE016	54.3	49	252
NE017	107.4	51	281
NE018	75.5	53	326
NE022	45.7	69	262
NE023	16.8	35	108
NE025	58.2	16	30
NE026	16.6	17	25
NE027	11.3	17	39
NE030	10.4	19	21

CSO ID	Overflow Volume (MG)	Overflow # per Year	Overflow Duration (Hour)
NB003	171	51	286
NB005	30.1	55	255
NB006	0.0	0	0
NB007	6.6	32	98
NB008	15.1	30	82
NB009	25.6	45	175
NB010	1.2	25	41
NB011	5.1	37	121
NB014	0.5	7	6
BA001	373.3	71	533
BA002	8.7	9	14
BA003	11.2	34	108
BA004	0.0	3	1
BA006	16.0	37	138
BA007	72.1	37	125
BA008	10.0	34	88
BA009	4.2	33	58
BA010	17.3	52	178
BA011	5.9	34	71
BA012	14.0	57	142
BA013	0.8	33	35
BA014	12.7	43	127
BA015	46.6	54	231
BA016	6.5	48	130
BA017	54.2	62	350
BA018	14.6	58	232
BA019	38.8	35	112
BA020	10.1	33	65
BA021	62.9	54	212
BA022	0.0	0	0
BA024	0.1	3	2
BA026	1.3	9	4
BA028	0.0	0	0
BA029	6.8	24	41
BA030	1.5	16	10
BA034	0.1	7	4
BA037	0.9	8	8

PVSC H&H Model Typical Year CSO Overflow Volume, Frequency, & Duration

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The End

Hydrodynamic Modeling

Northern NJ CSO Long-Term Control Plan

December 5, 2018
Nicholas Kim, HDR

Agenda

- Calibration Period: 2016 – 2017
- Model Calibration
  - Temperature
  - Salinity
  - Note: Tidal elevation and current calibration results were presented in March 2017 MEG

Model Input

- Tidal Forcing:
  - Mid-Atlantic Bight: Global Tidal Prediction Program and observed low frequency variation
- Freshwater Sources:
  - Rivers: USGS gages (28)
  - CSOs: NJ and NYC
  - Stormwater : CDM Smith landside model
  - STP
- Meteorological Forcing: North America Regional Reanalyses (NARR) Model: 30km resolution; 3-hourly
  - Winds
  - Air temperature
  - Barometric pressure
  - Relative humidity
  - Shortwave solar radiation

- Landside Input
  - Stormwater
  - CSO
  - STP

Available Calibration Data

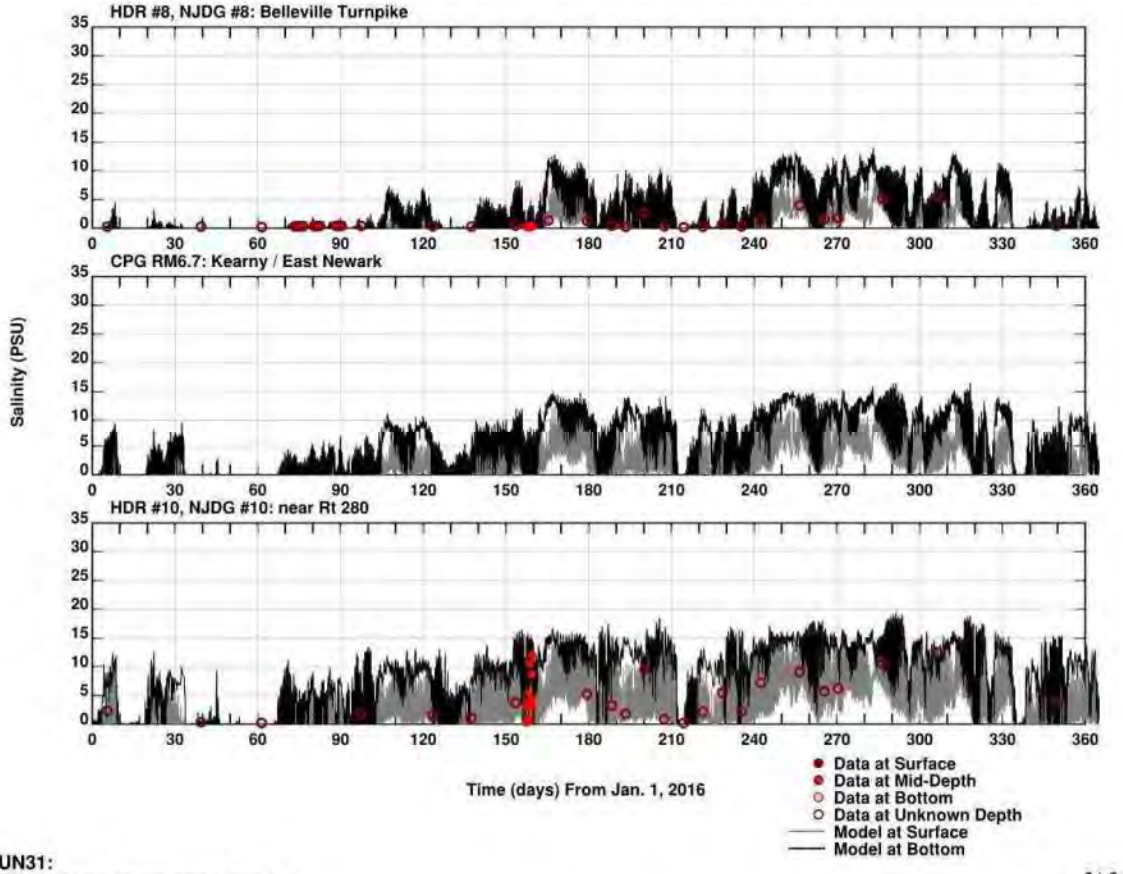
- NJ Harbor Dischargers Group: 2003-2017 (T/S)*
- NJ LTCP WQ Sampling Program: 2016 - 2017 (T/S)
- NYC DEP Harbor Survey Program: 1980's – 2017 (T/S)
- HRECOS *in-situ* monitoring data: T/S
- Meadowlands Environmental Research Institute (MERI): T/S (grab and moored): 2008 - present

* At times, the quality of NJ Harbor Discharge Group salinity data are questionable.

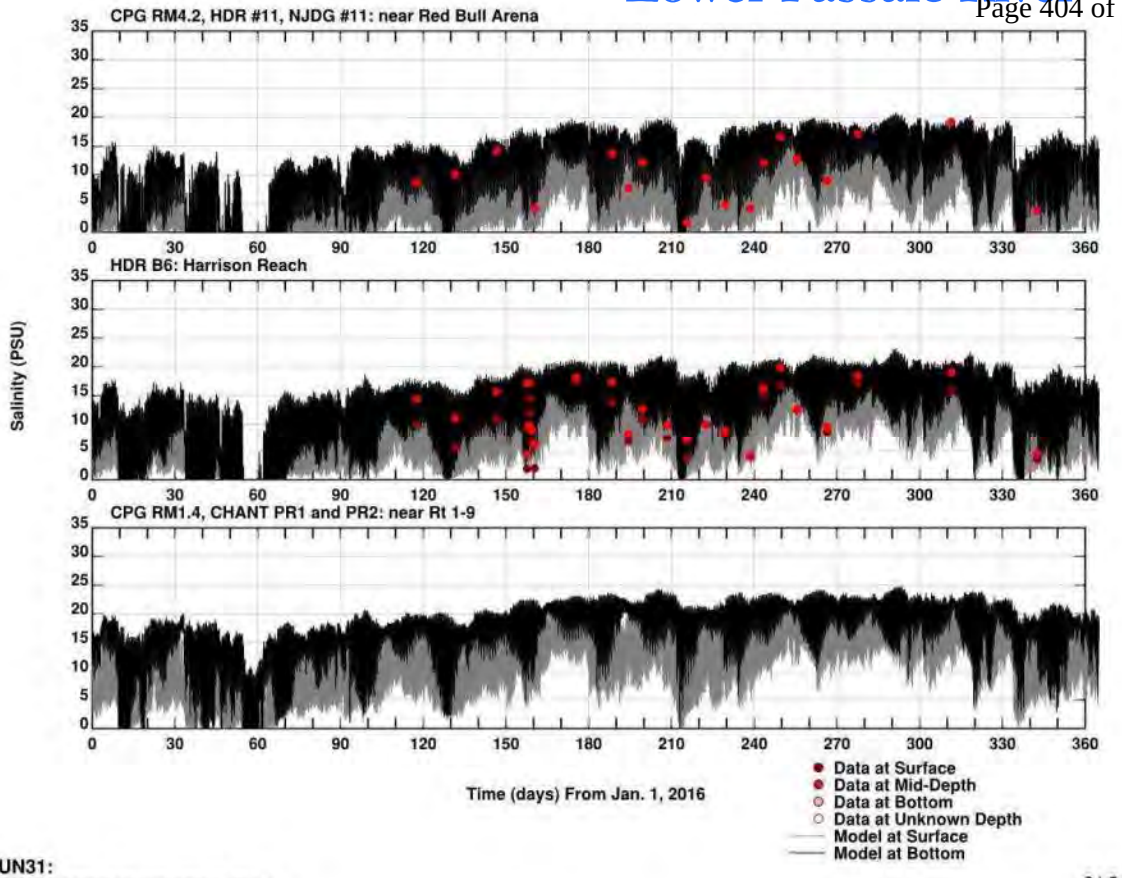
Salinity Results

- Lower Passaic River
- Hackensack River
- Newark Bay
- Kill van Kull
- Arthur Kill
- Raritan Bay
- Hudson River/Upper Bay

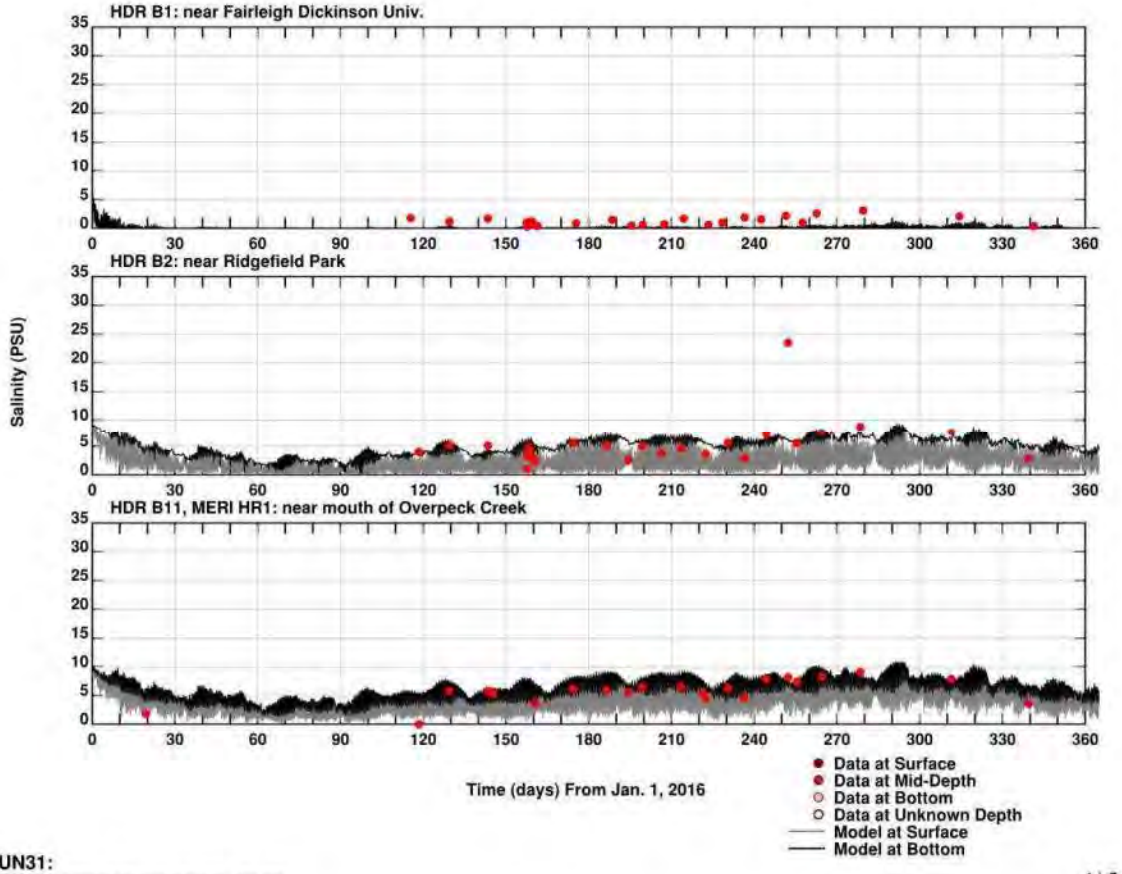
Lower Passaic River



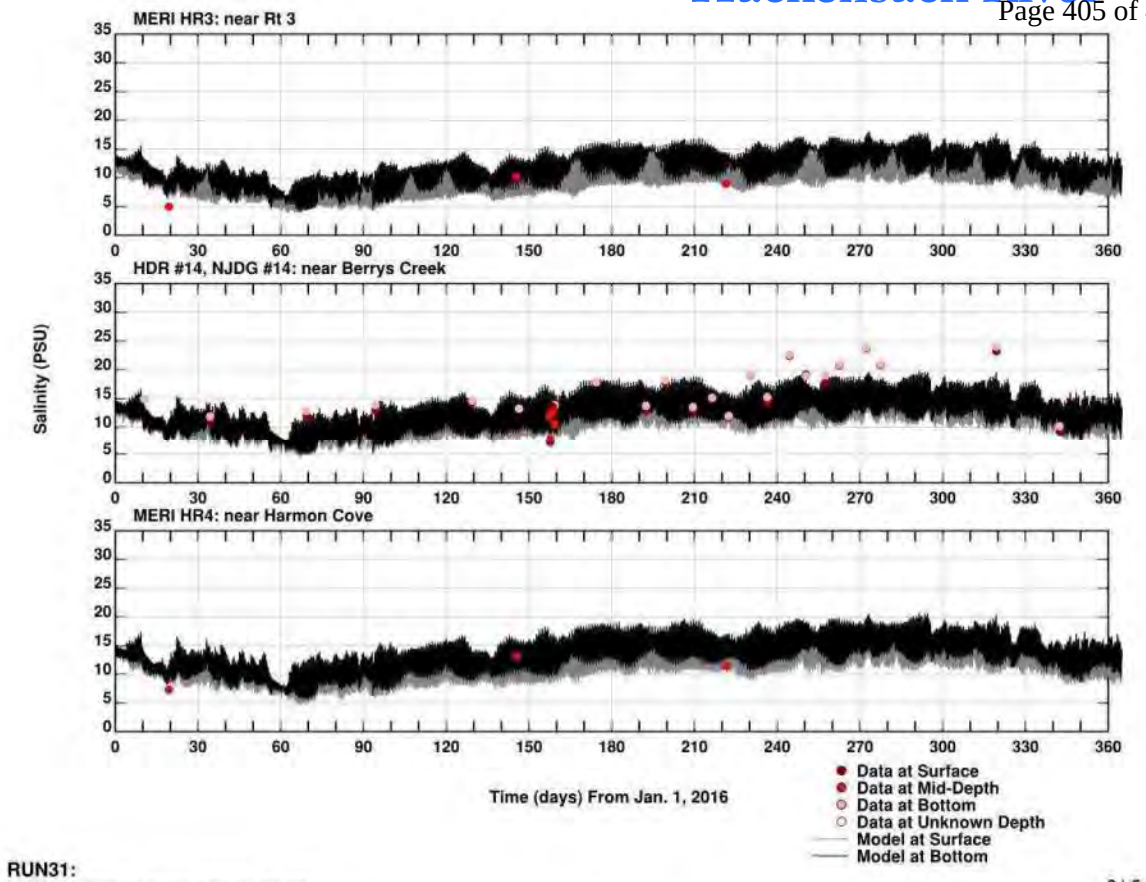
Lower Passaic River



Hackensack River



Hackensack River



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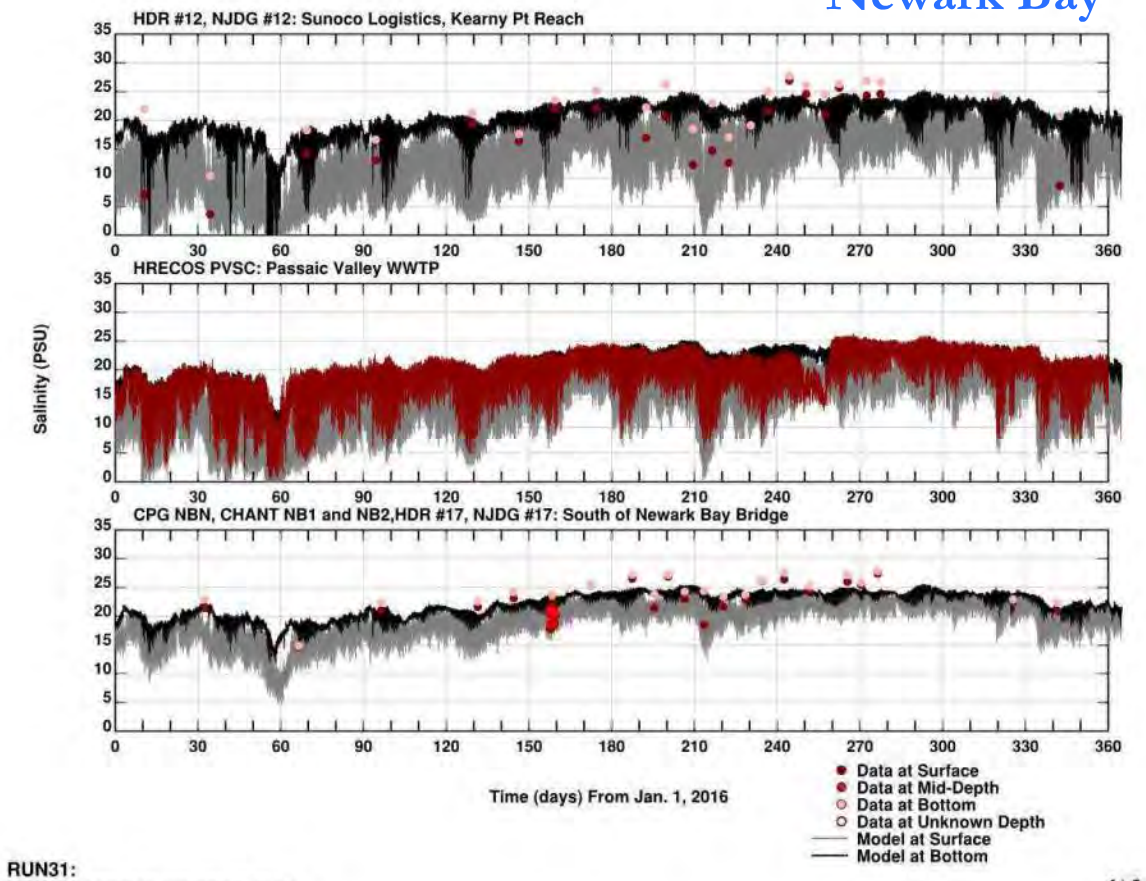
Newark Bay



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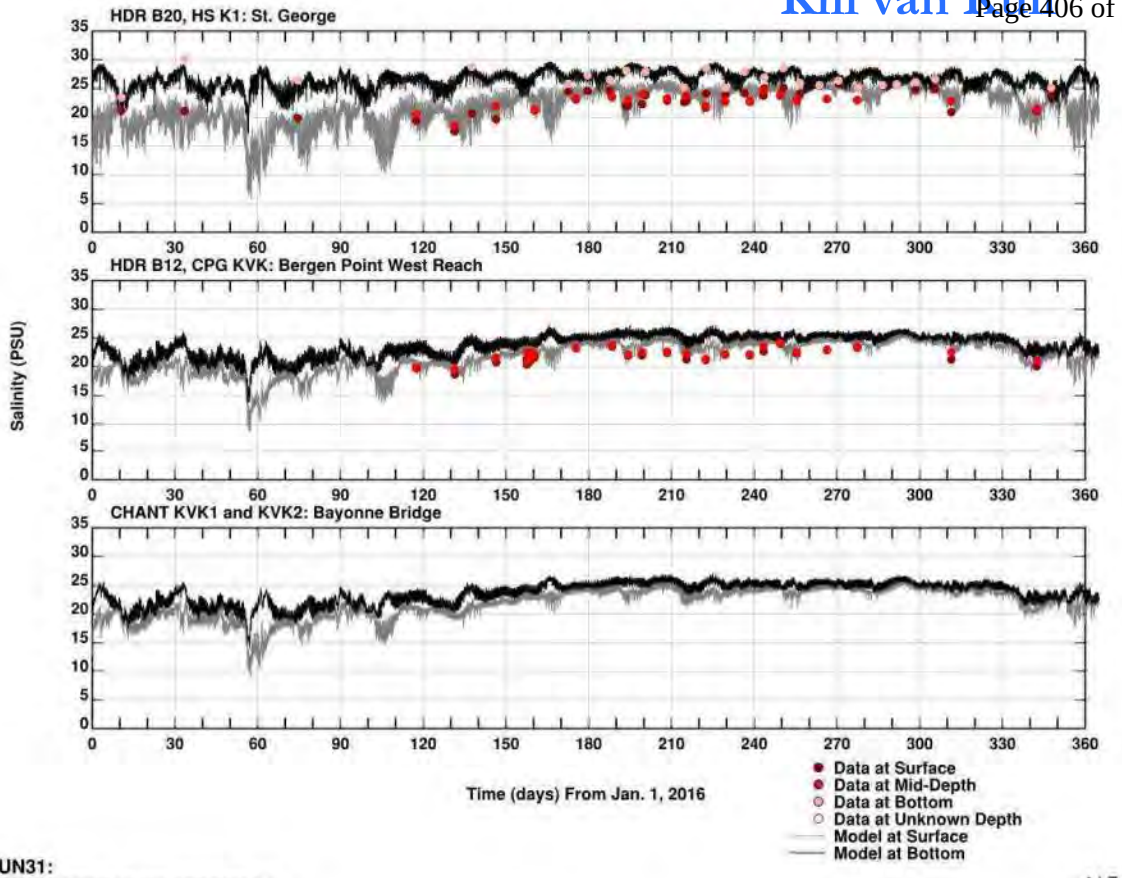
Kill van Kull



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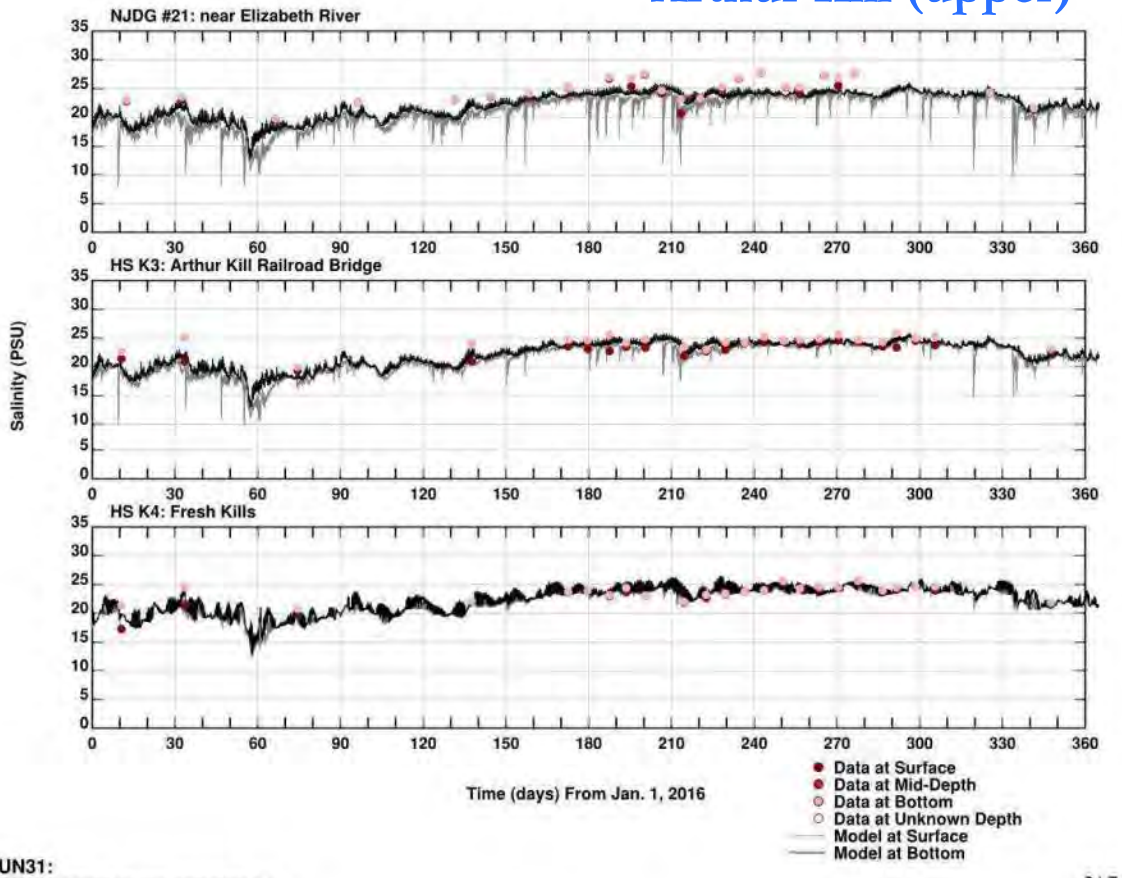
Arthur Kill (upper)



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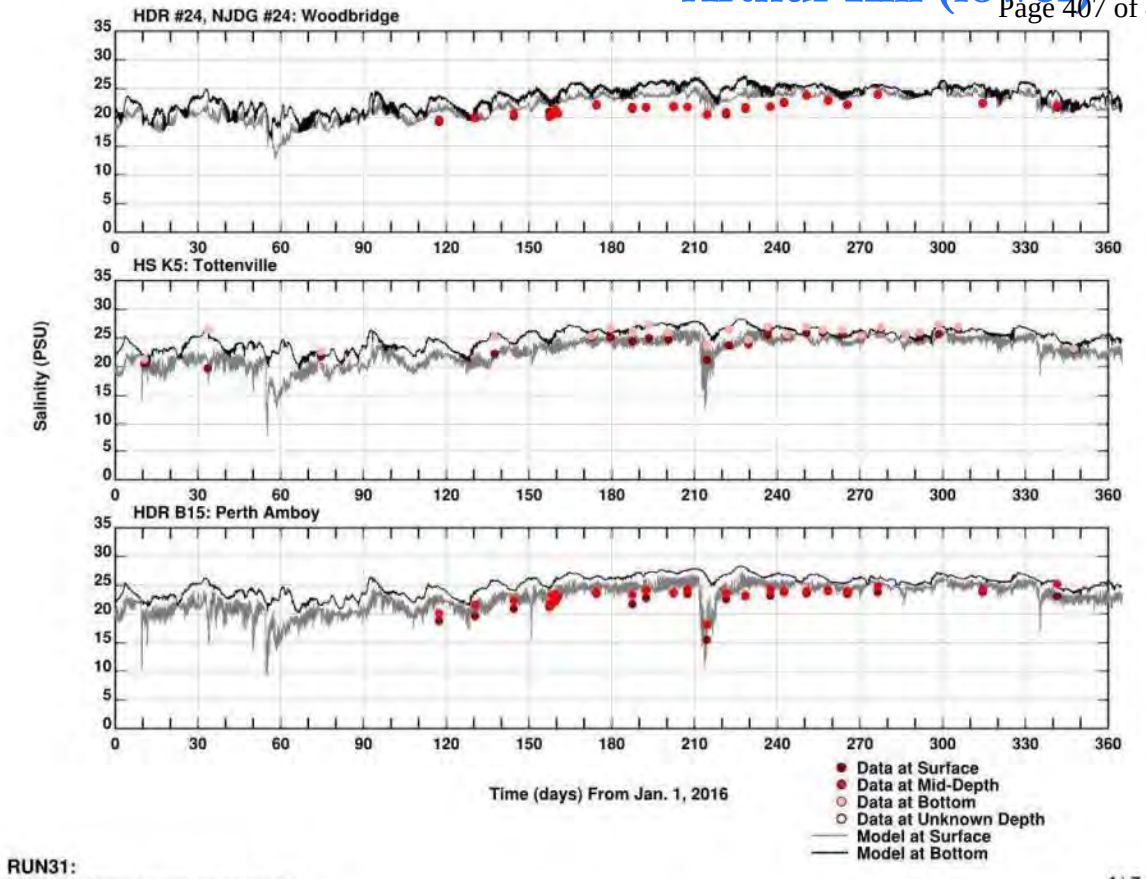
Arthur Kill (lower)



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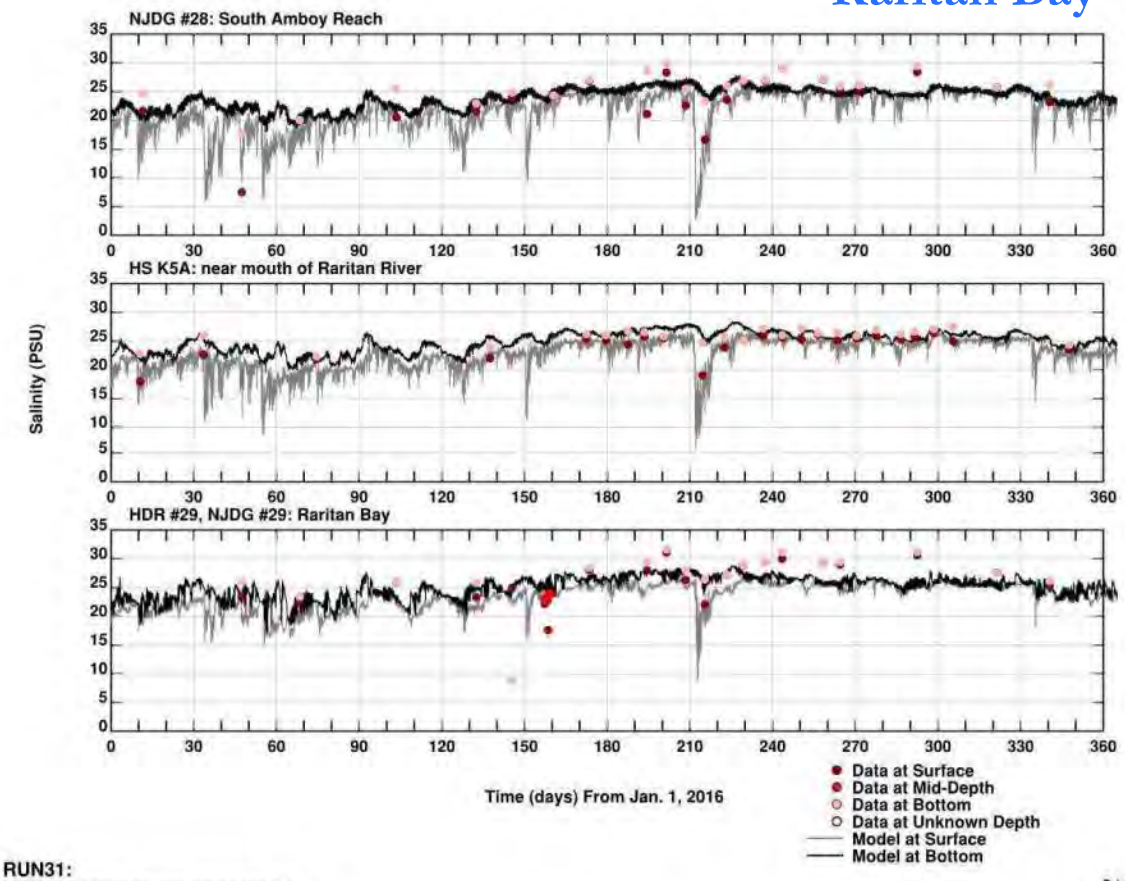
Raritan Bay



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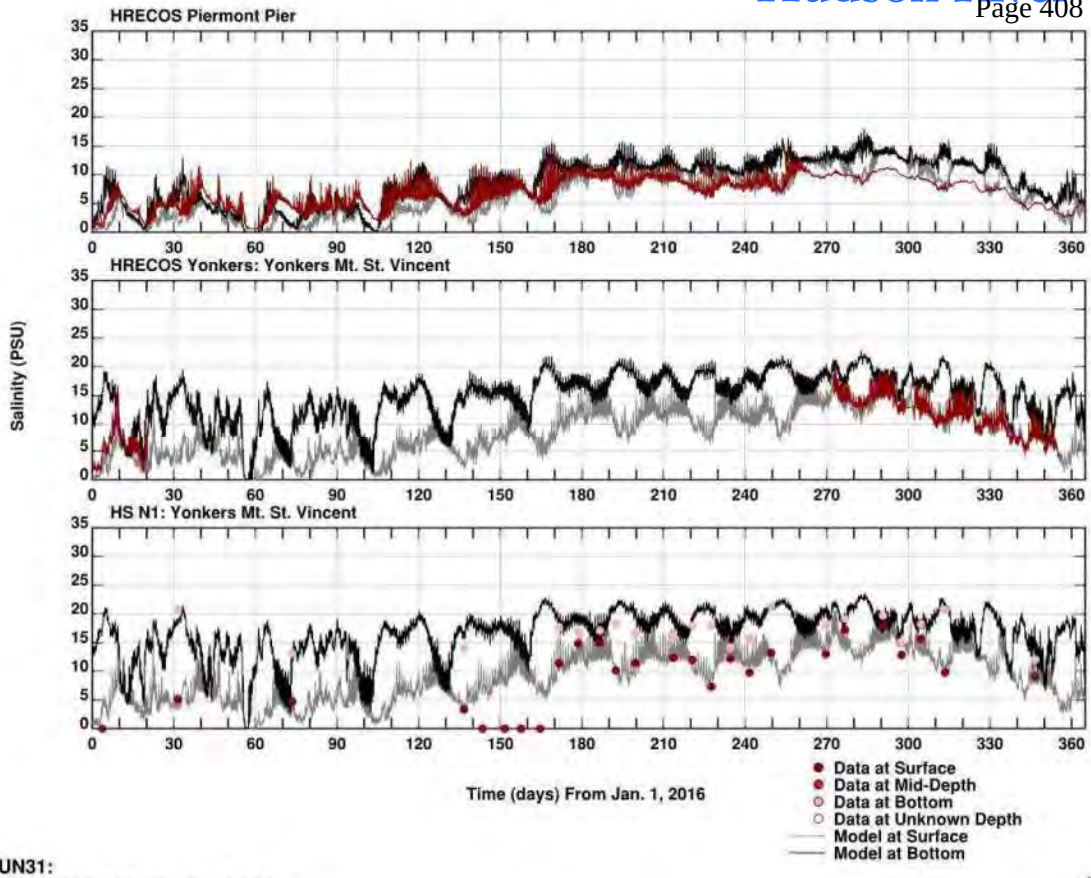
Hudson River



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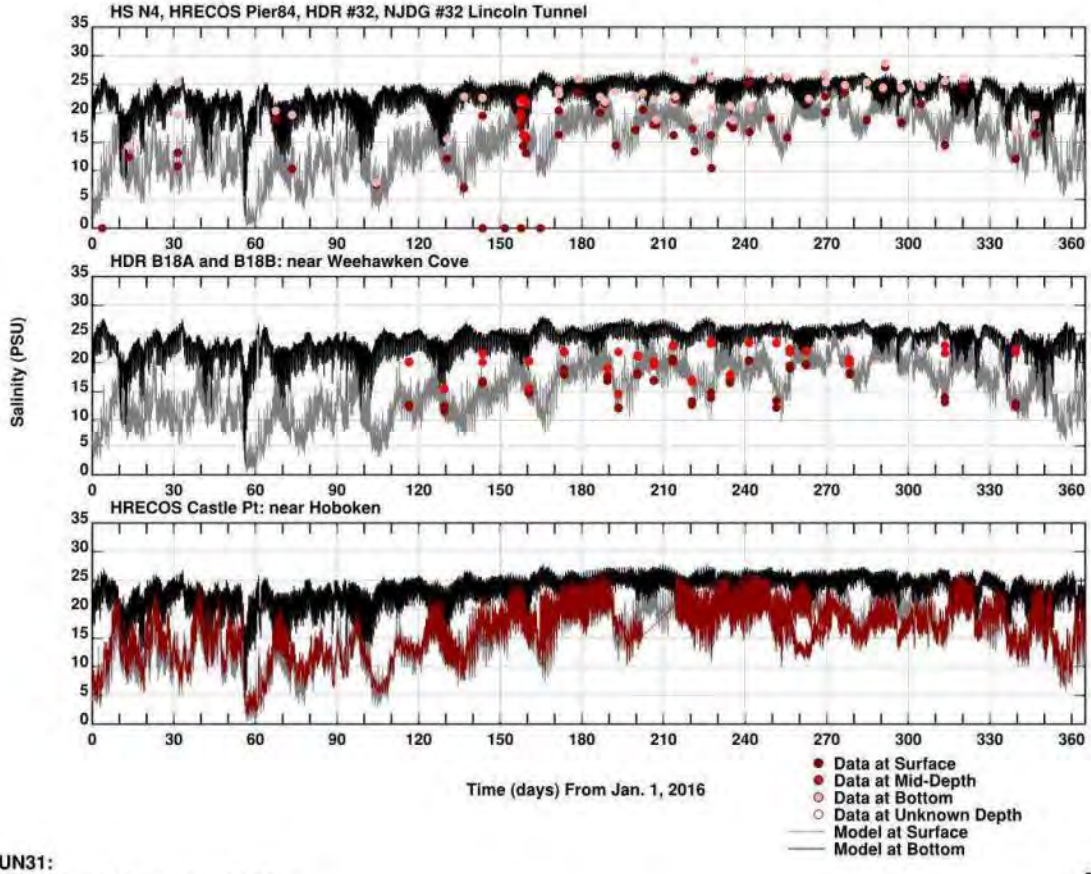
Hudson River



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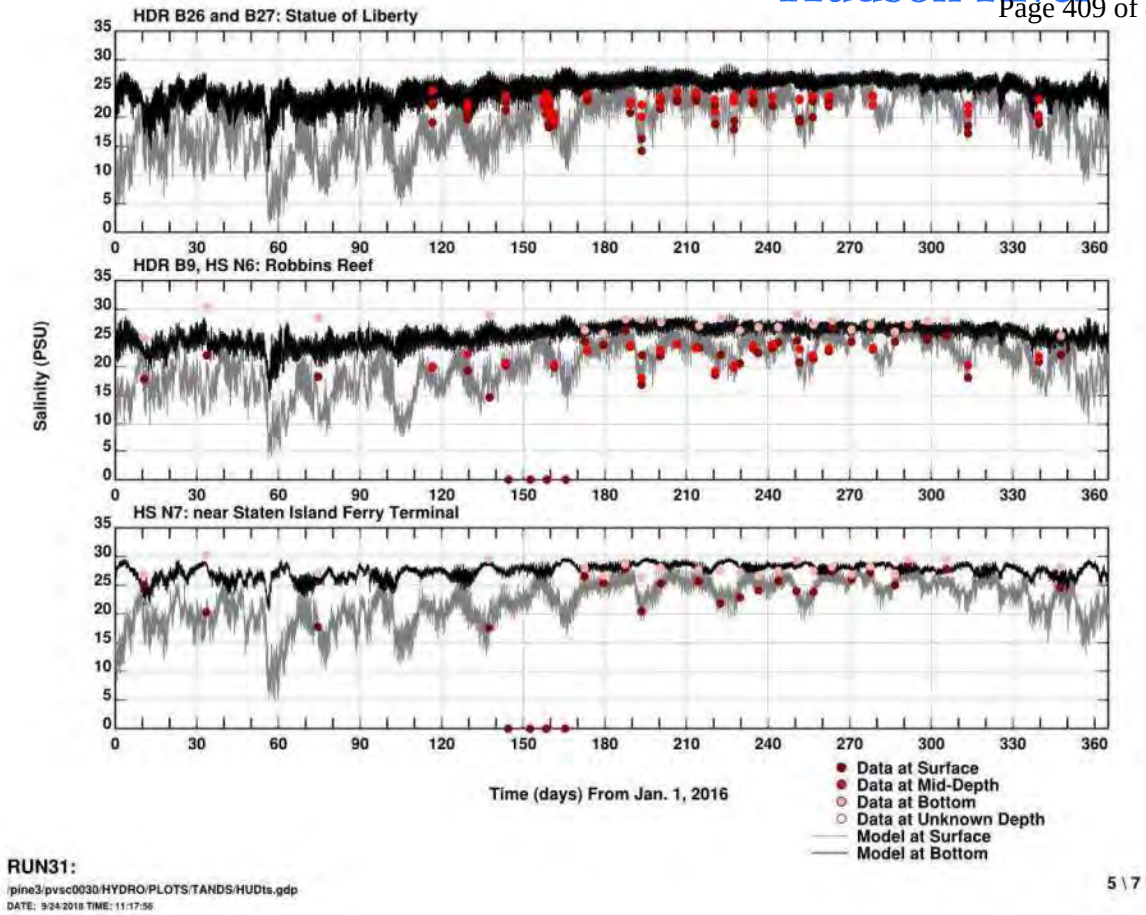
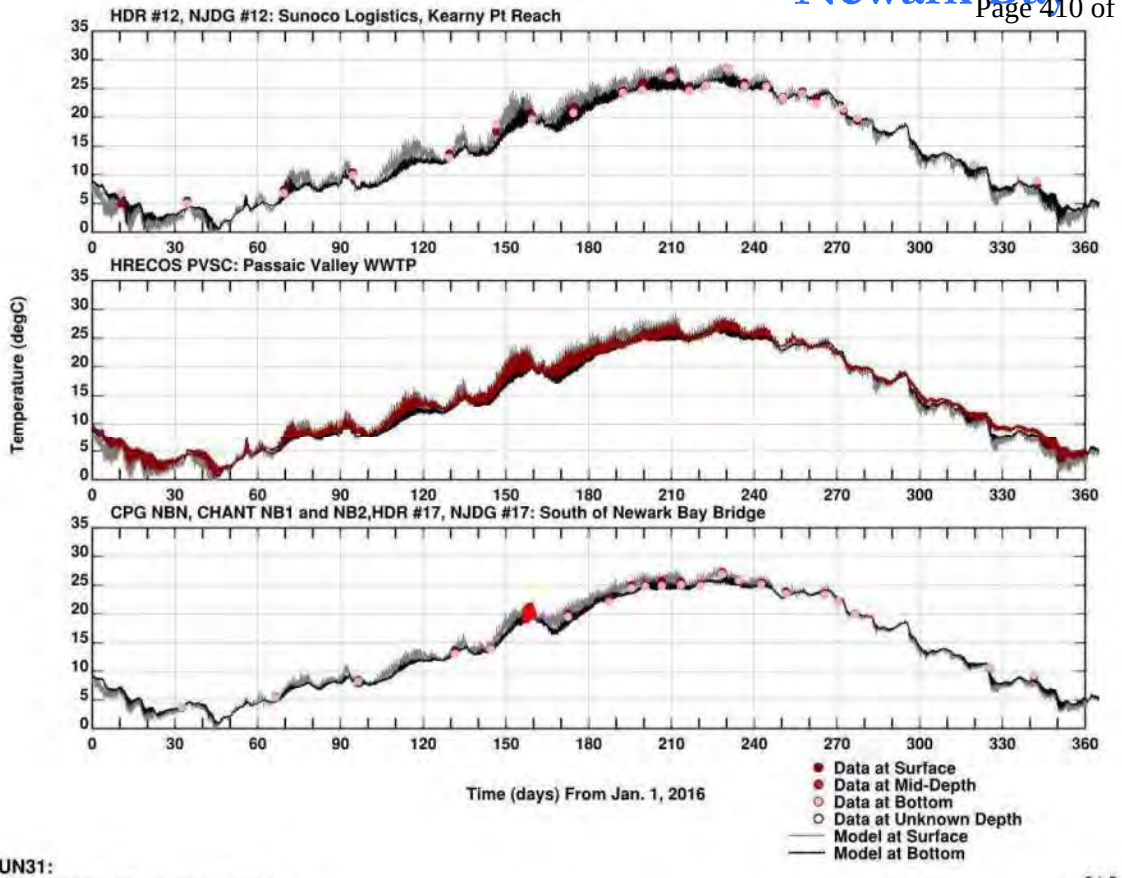


Temperature Results

- Newark Bay
- Hudson River

Newark Bay



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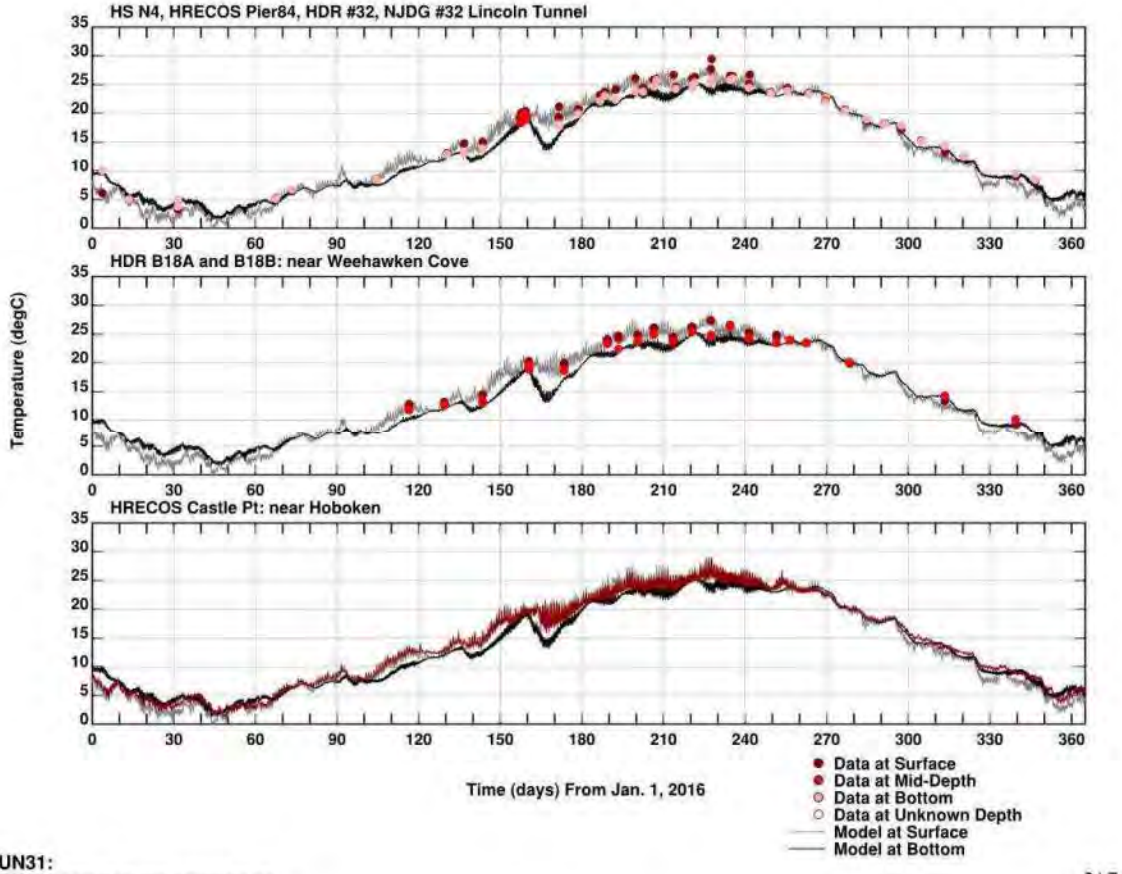
Hudson River



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Summary of Hydrodynamic Model Calibration

- Model has been configured for 2016-2017 with comprehensive model input and compared with data from various sources
- Reasonable reproduction of hydrodynamics in the regions (i.e. water temperature, and salinity) during dry periods and wet events.
- Setup 2004 Projection Conditions

Water Quality Modeling Update

Model Evaluation Group – Session 4

Rich Isleib, HDR

December 5, 2018

PASSAIC VALLEY SEWERAGE COMMISSION

GREELEY AND HANSEN
CDM Smith
HDR

Agenda

- Model Kinetics
- Model Inputs
  - Source Loading
    - Stormwater
    - CSO
    - Rivers
    - Other
    - Bacteria Ratios
  - Constants
- Model Calibration/Validation
  - Time Series
    - Annual
    - Events
  - Probability
- Baseline

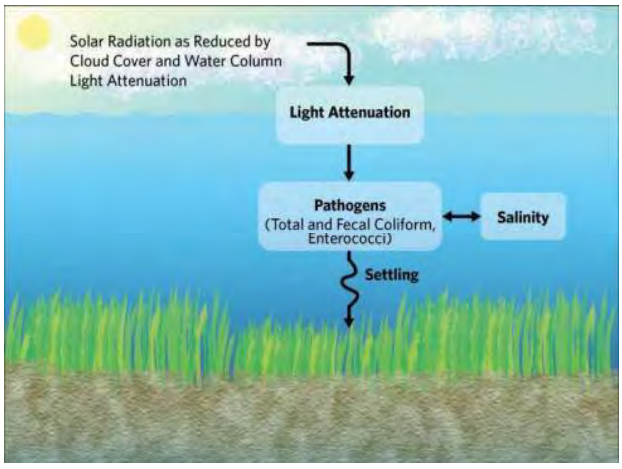
Pathogen Model Kinetics

$$N = N_0 \exp(-KBt)$$

$K_B = [0.8 + 0.006(\%seawater)]1.07^{(T-20)}$

$+ \alpha I_0(t)/K_e H[1-\exp(-K_e H)]$

$+ V_s/H$ (Mancini, 1978)



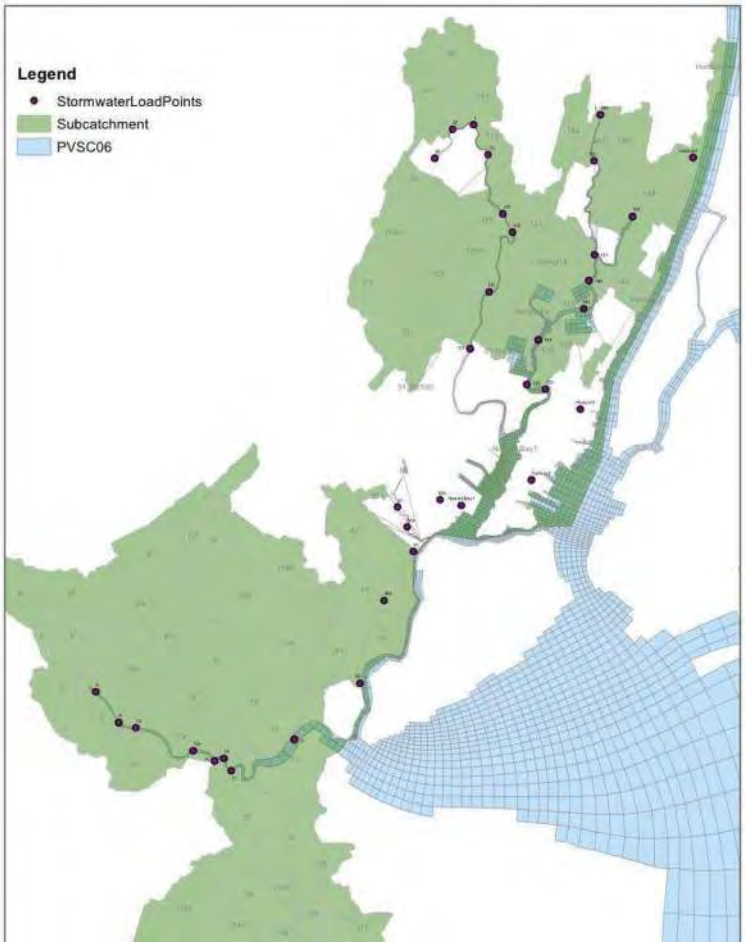
N = Bacteria concentration
K_B = Bacteria loss rate
T = Temperature (°C)
α = proportionality constant
I_0 = Surface solar radiation
t = time
K_e = Extinction coefficient (/m)
H = Depth (m)
V_s = Net settling rate (m/d)

Pathogen Sources

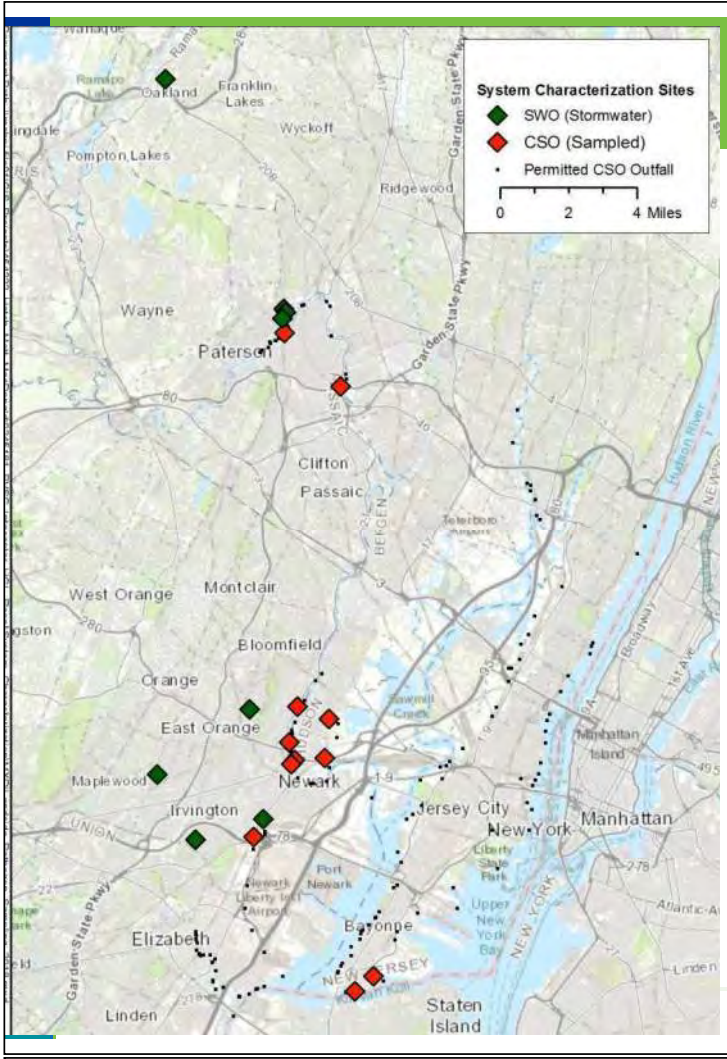
- Source Loading
  - Stormwater
  - CSO
  - Rivers
  - Other
  - Bacteria Ratios

Stormwater Flows

- Flows derived from an InfoWorks model
- Loads were based on constant concentrations

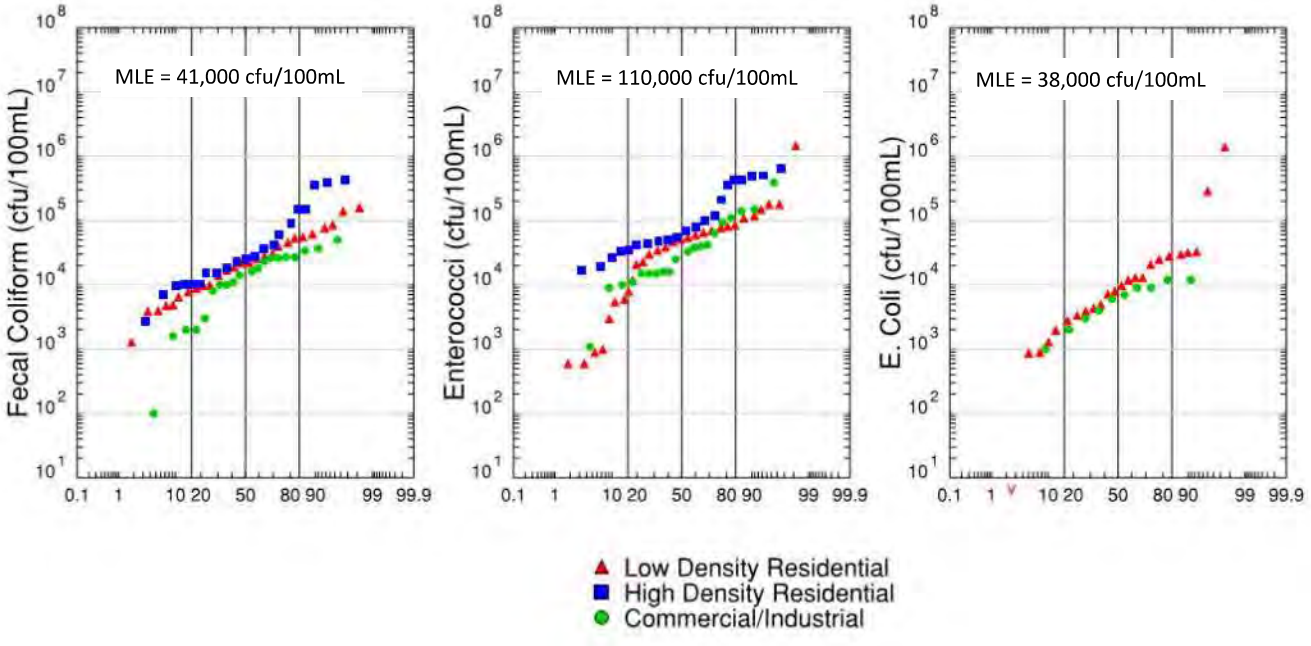


Landside Pathogen Concentration Stations



- Stormwater – 8 locations
  - Low Density Residential (4)
  - High Density Residential (2)
  - Commercial / Industrial (2)
- CSO – 11 Locations/(18 Planned)
  - Paterson (2)
  - Newark (4)
  - Harrison (2)
  - Kearny (1)
  - Bayonne (2)

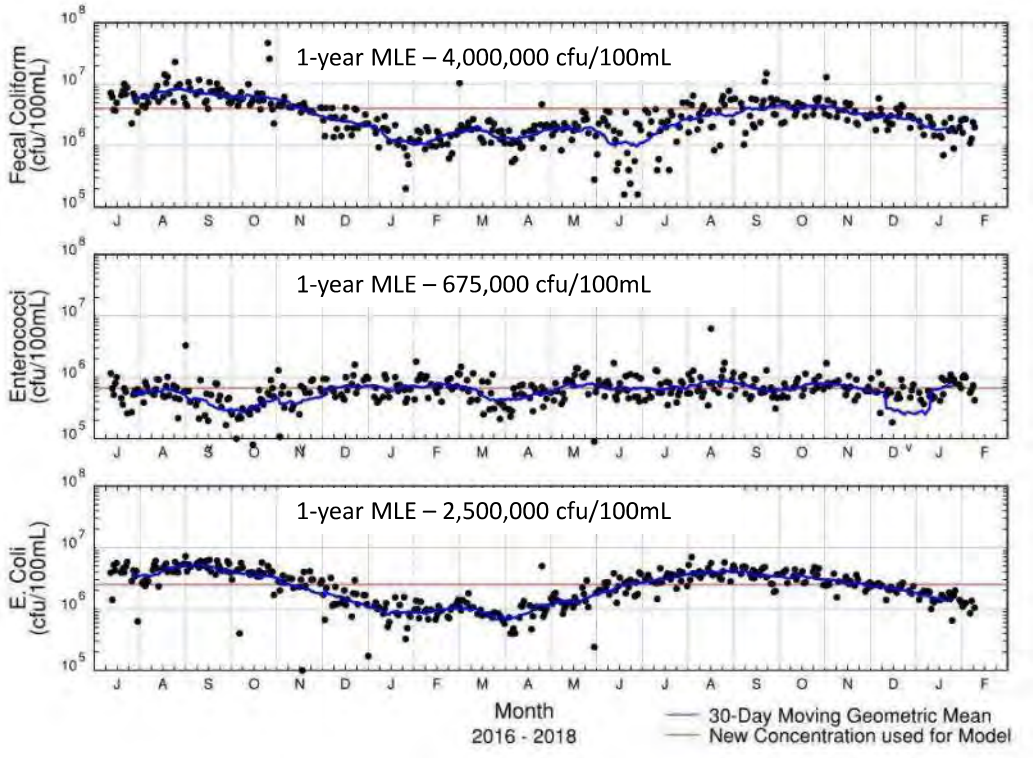
Stormwater Pathogen Concentrations



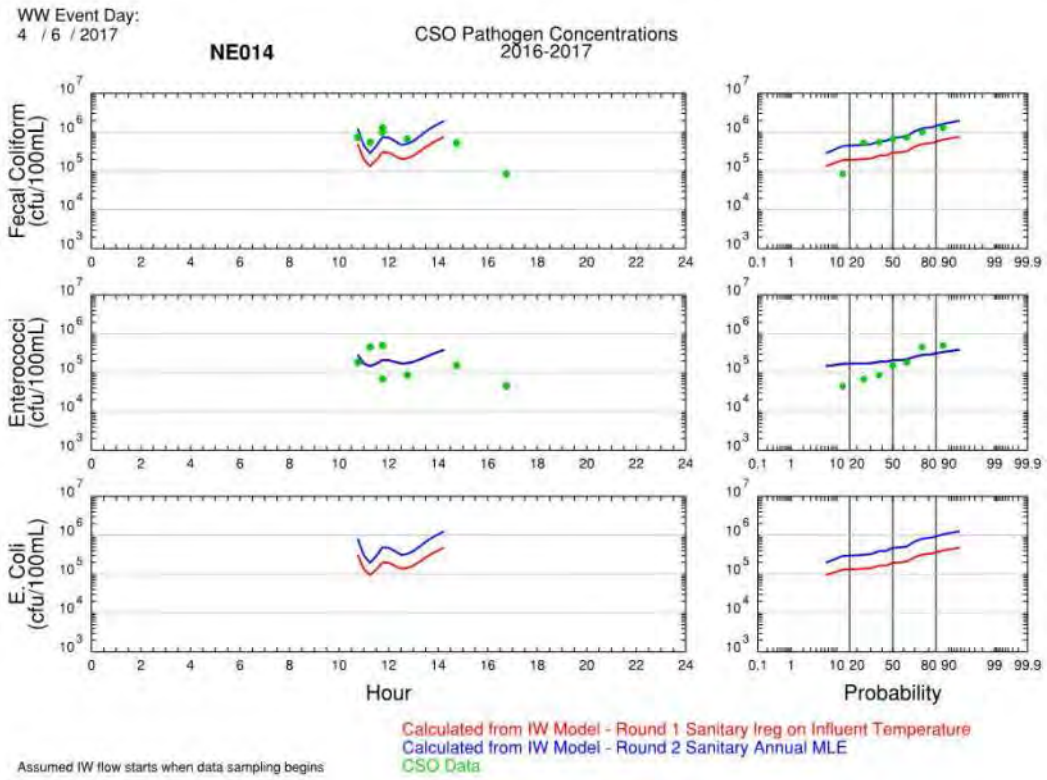
CSO Loading Calculations

- The Mass Balance approach was used to assign loading to the CSOs
- The hydraulic models provided flow and the sanitary/stormwater flow fractions.
- CSO concentrations were calculated using sanitary and stormwater concentrations.
- Estimated CSO concentrations were compared to CSO concentration data.

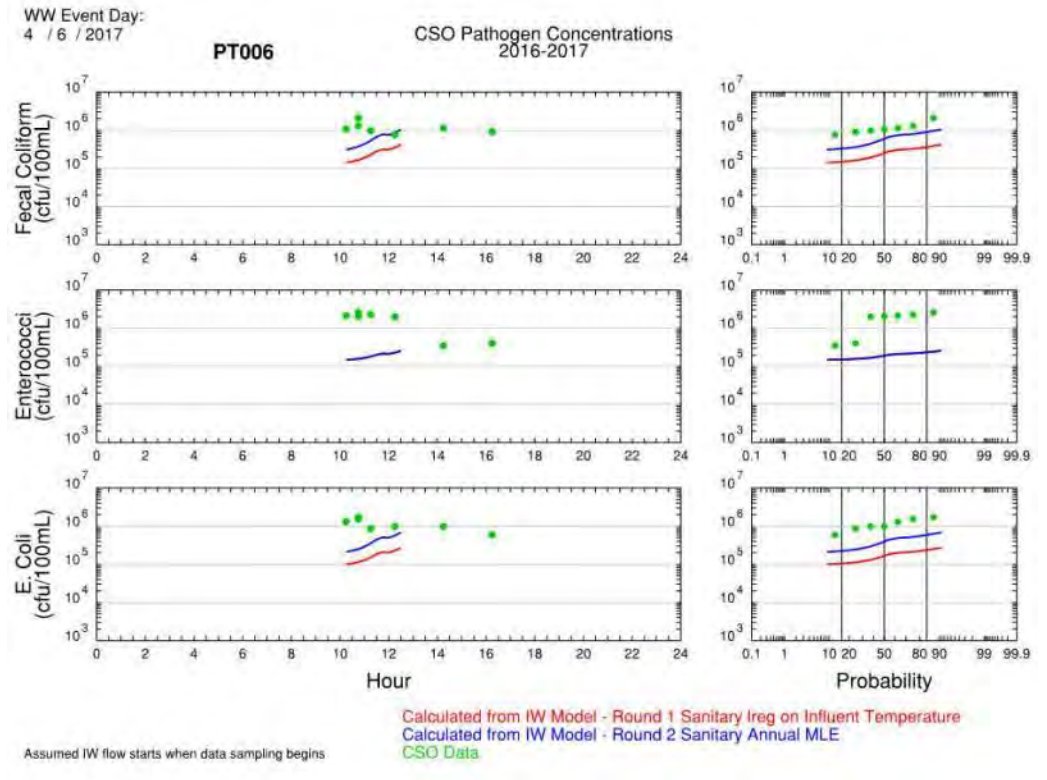
PVSC WWTP Pathogen Influent Concentrations



CSO Mass Balance Check



CSO Mass Balance Check



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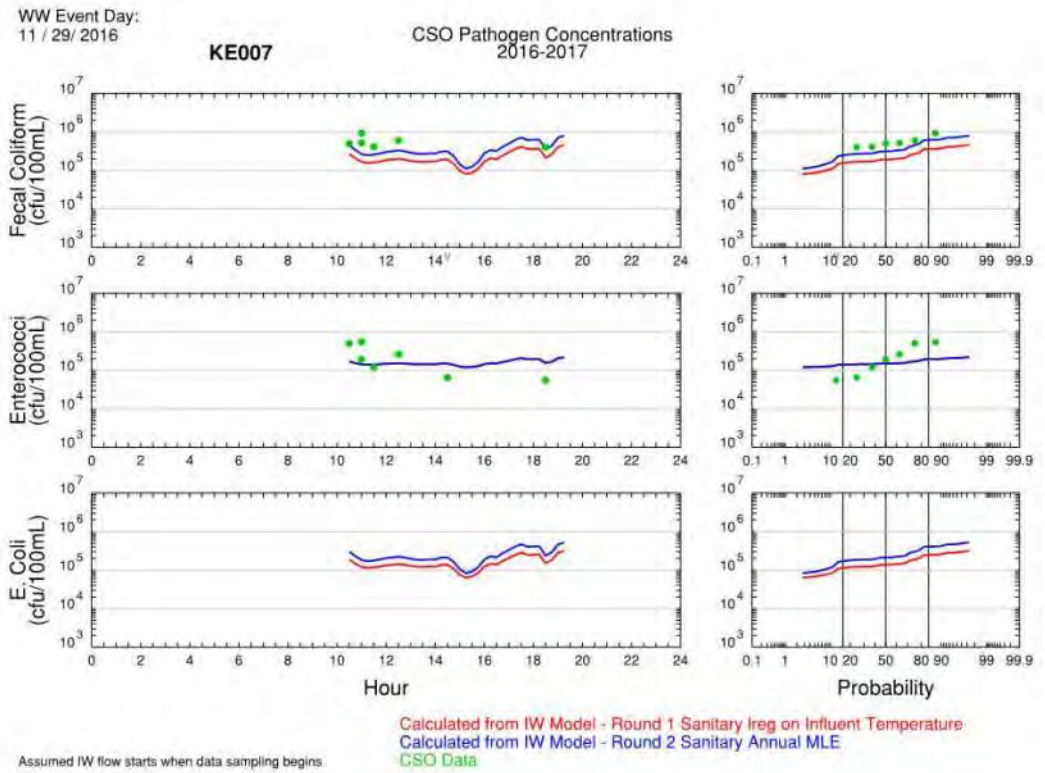
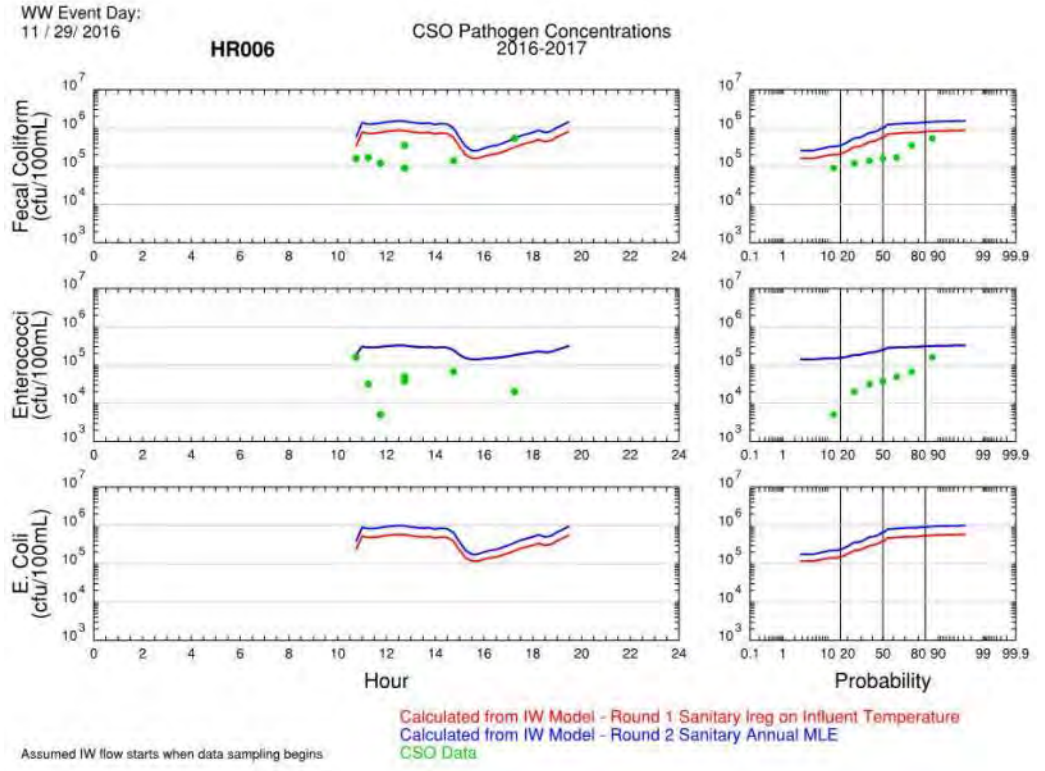
GREELEY AND HANSEN CDM Smith HDR

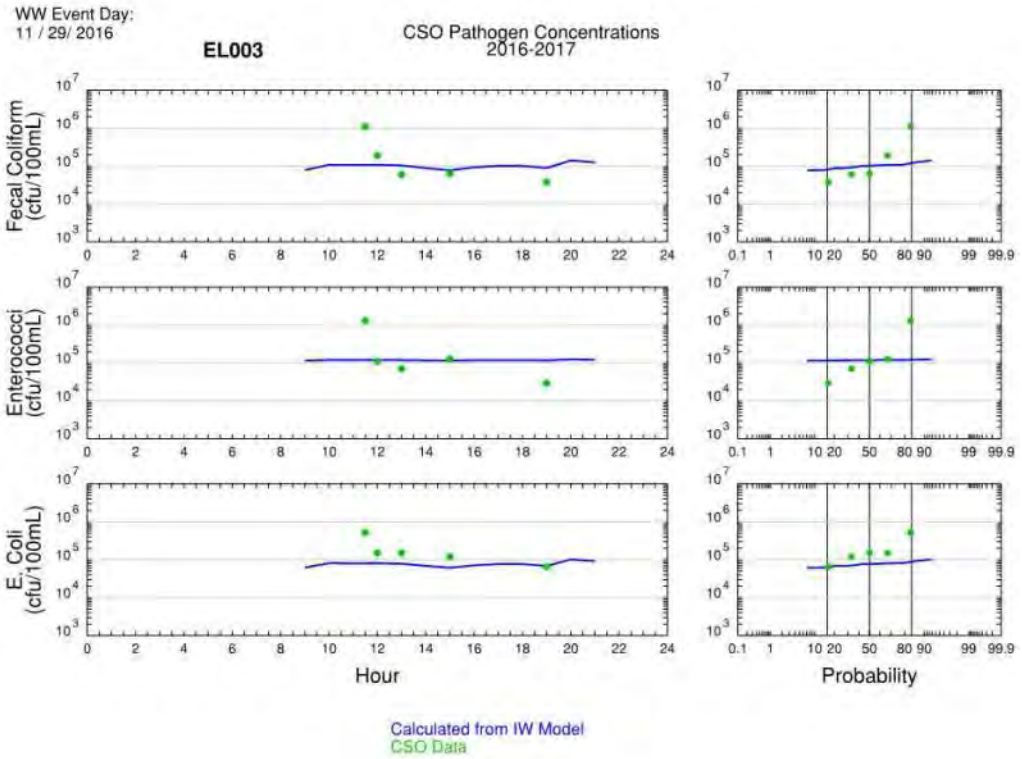
CSO Mass Balance Check



CSO Mass Balance Check



CSO Mass Balance Check



River Loads

- Dry-weather
  - "Monte Carlo" ✔
  - Data Interpolation
  - Data Average
- Wet-weather
  - MLE ✔
  - Concentration vs. Flow

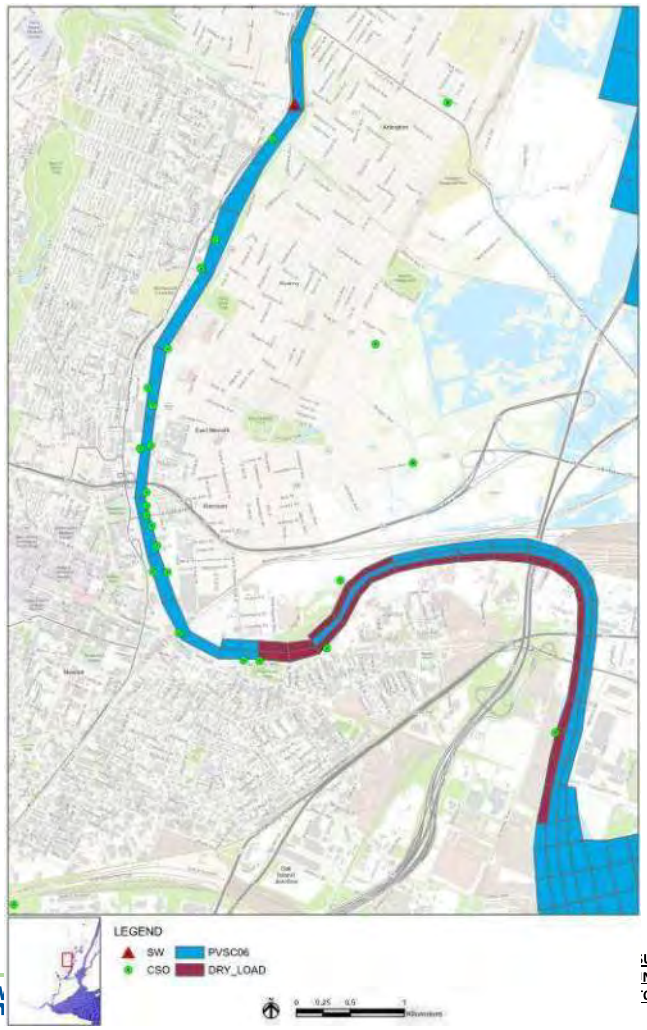
River Boundaries, Stations used for Loading Calculations										
		2004			2016			2017		
Waterbody	Data Station	Data EC	Data FC	Data EN	Data EC	Data FC	Data EN	Data EC	Data FC	Data EN
Hudson River	31	N	Y	Y	N	Y	Y	N	Y	Y
Hackensack River	13	N	Y	Y	Y	Y	Y	Y	Y	Y
Passaic River	1	N	Y	Y	Y	Y	Y	Y	Y	Y
Saddle River	6	N	Y	Y	Y	Y	Y	Y	Y	Y
Raritan River	25	N	Y	Y	Y	Y	Y	Y	Y	Y

Dry-weather Loads

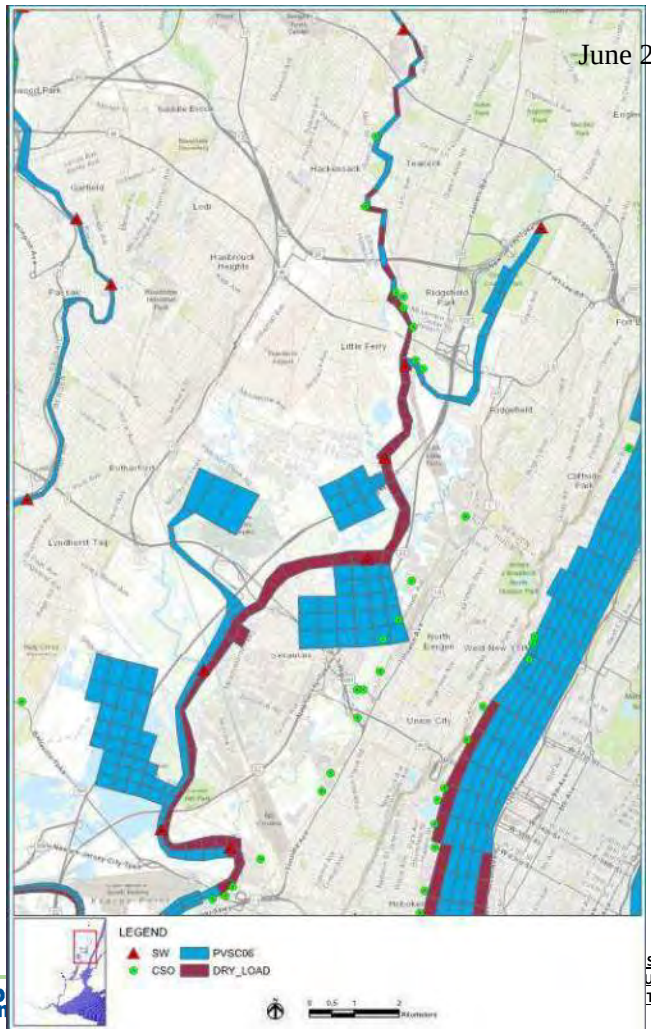
- Clear need for dry-weather sources based on water quality data
- Assumed sanitary flow concentrations
- 150 gal/day-person

Waterbody	Equivalent People
Passaic River	405
Hackensack River	945
Newark Bay	765
Elizabeth River	105
Kill van Kull	300
Arthur Kill	360
Hudson River	405
Upper Bay	1,380

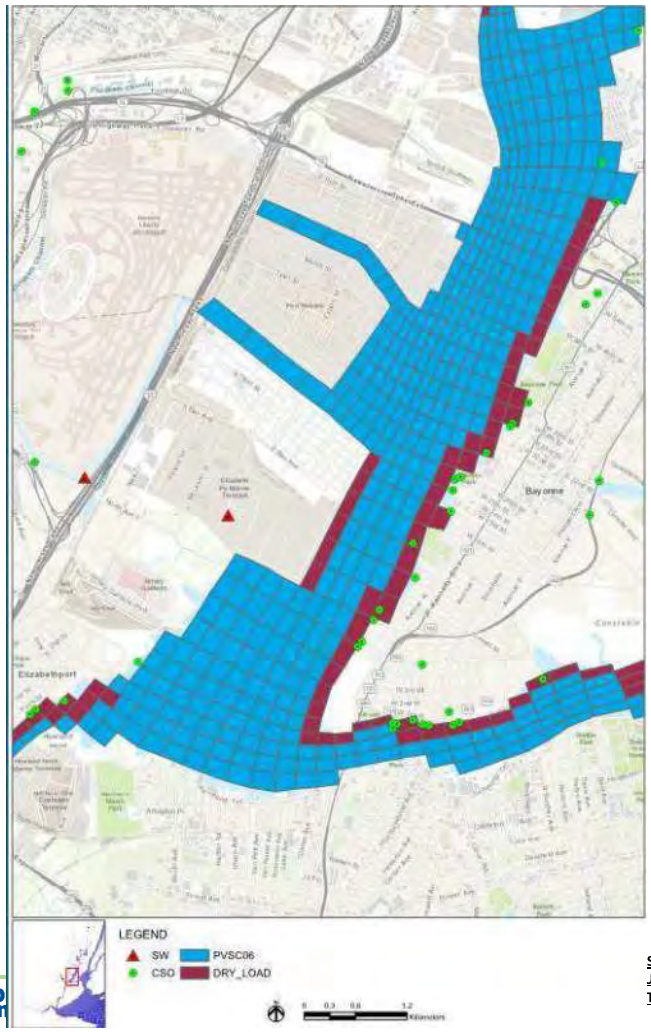
Dry-weather Loads – Passaic River



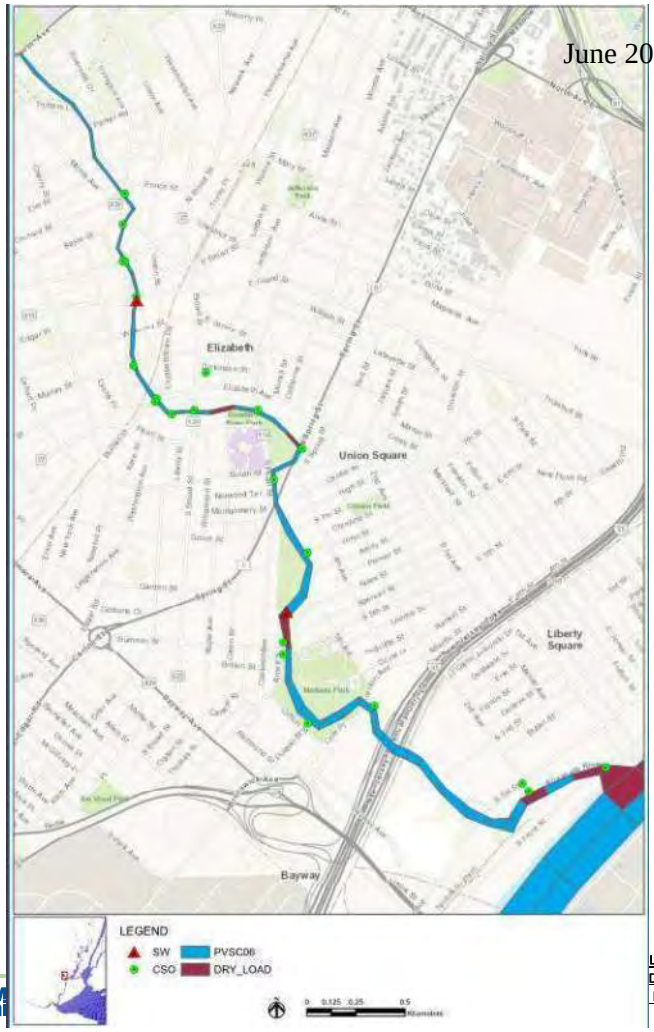
Dry-weather Loads – Hackensack River



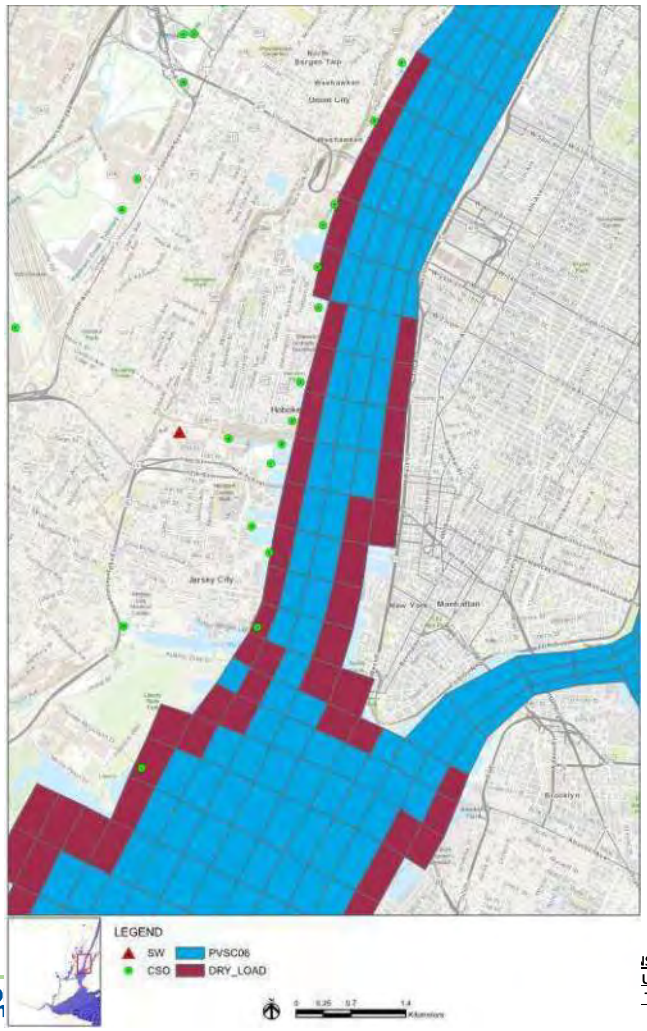
Dry-weather Loads – Newark Bay



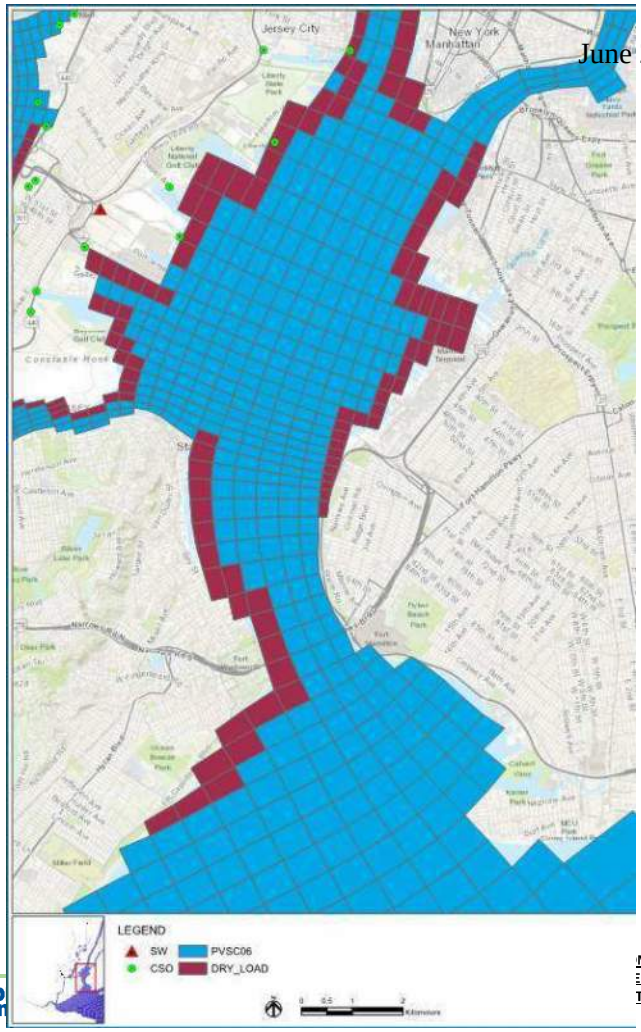
Dry-weather Loads – Elizabeth River



Dry-weather Loads – Hudson River



Dry-weather Loads – Upper Bay



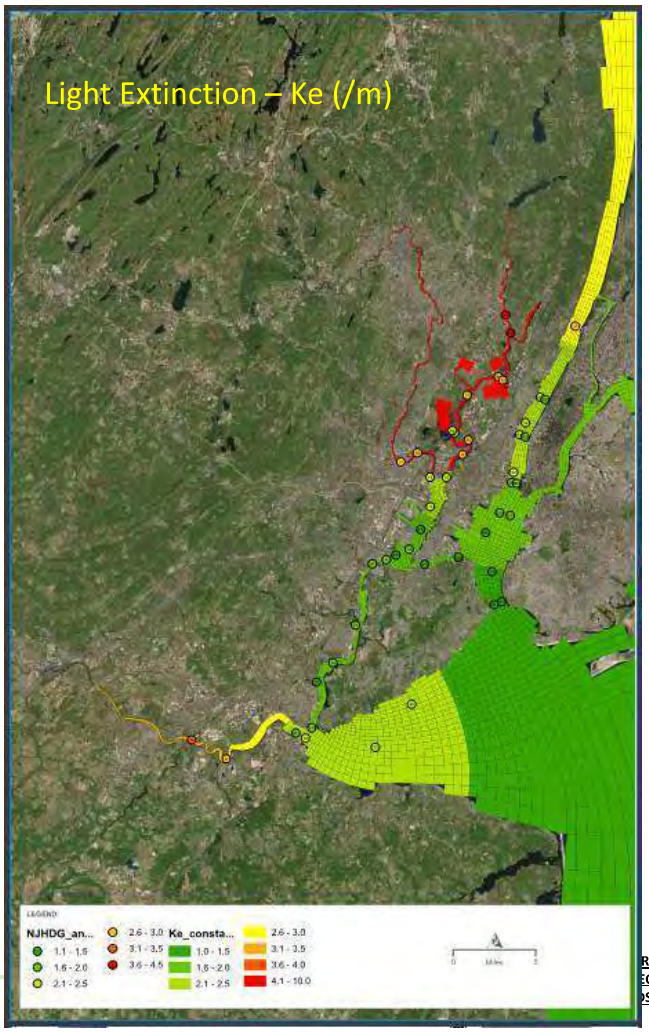
Other Loads

- WWTP
  - Fecal coliform = 200 cfu/100mL
  - E. Coli = 100 cfu/100mL
  - Enterococci = 100cfu/100mL
- Base flow from stormwater model
  - Fecal Coliform = 10 cfu/100mL
  - E. Coli = 5 cfu/100mL
  - Enterococci = 1 cfu/100mL
- Hudson River
  - Artificial load created near study area so that upstream loads did not have to be estimated

Pathogen Loading Ratios

Source	FC:ENT Ratio
Sanitary	5.9
Stormwater	0.4
CSO	0.4-4.6
Hudson River	2.7
Hackensack River	2.7
Passaic River	0.5
Raritan River	0.5

Calibration Constants and Parameters



Calibration Constants and Parameters

Constant	F. Coliform & E. Coli	Enterococci
Base Mortality Rate	0.2/day	0.68/day
Temperature Coefficient	1.07	1.07
Seawater Die-off Rate	0.01875/day	0.01875/day
Solar Radiation Die-off Rate	0.003/ly-day	0.00824/ly-day

Calibration Rates

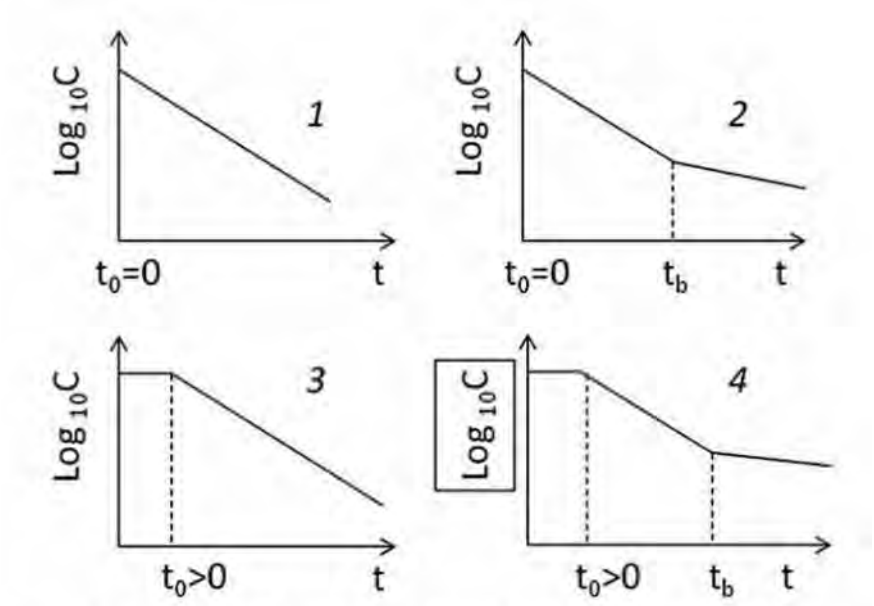
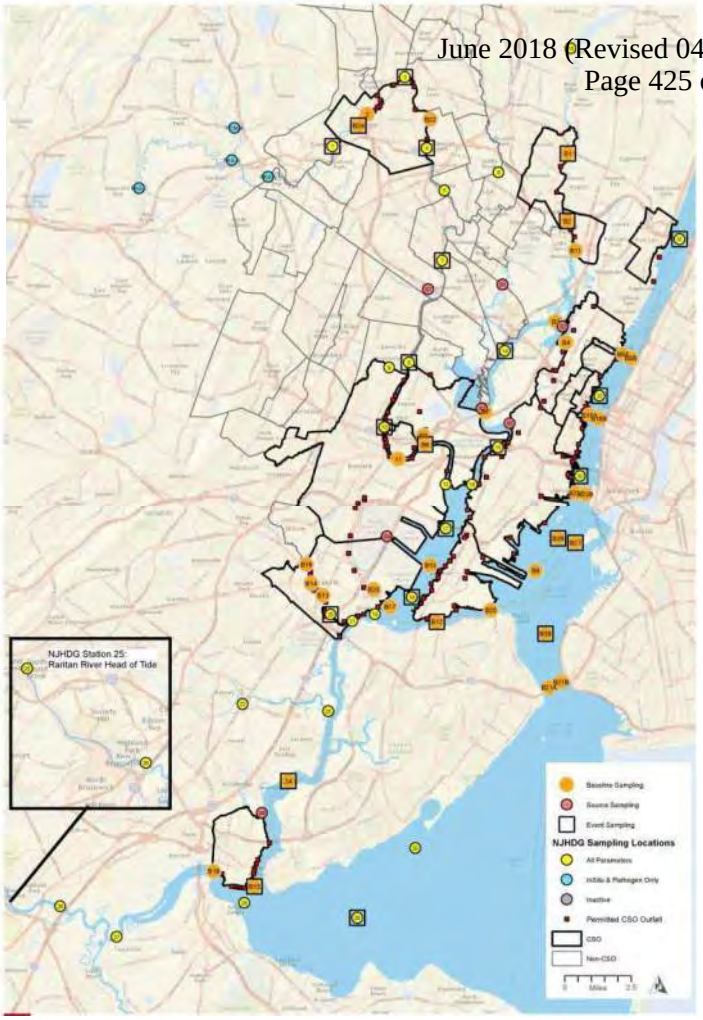


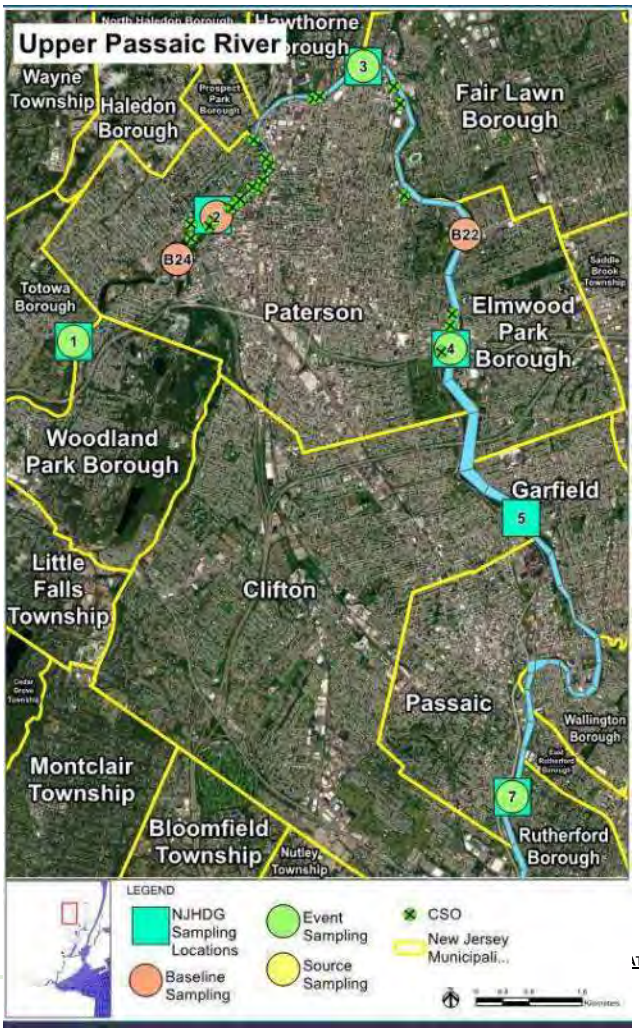
Fig. 1 – Patterns found in data on *E. coli* inactivation in waters.

Blaustein et al., 2013

Receiving Water Sampling Locations

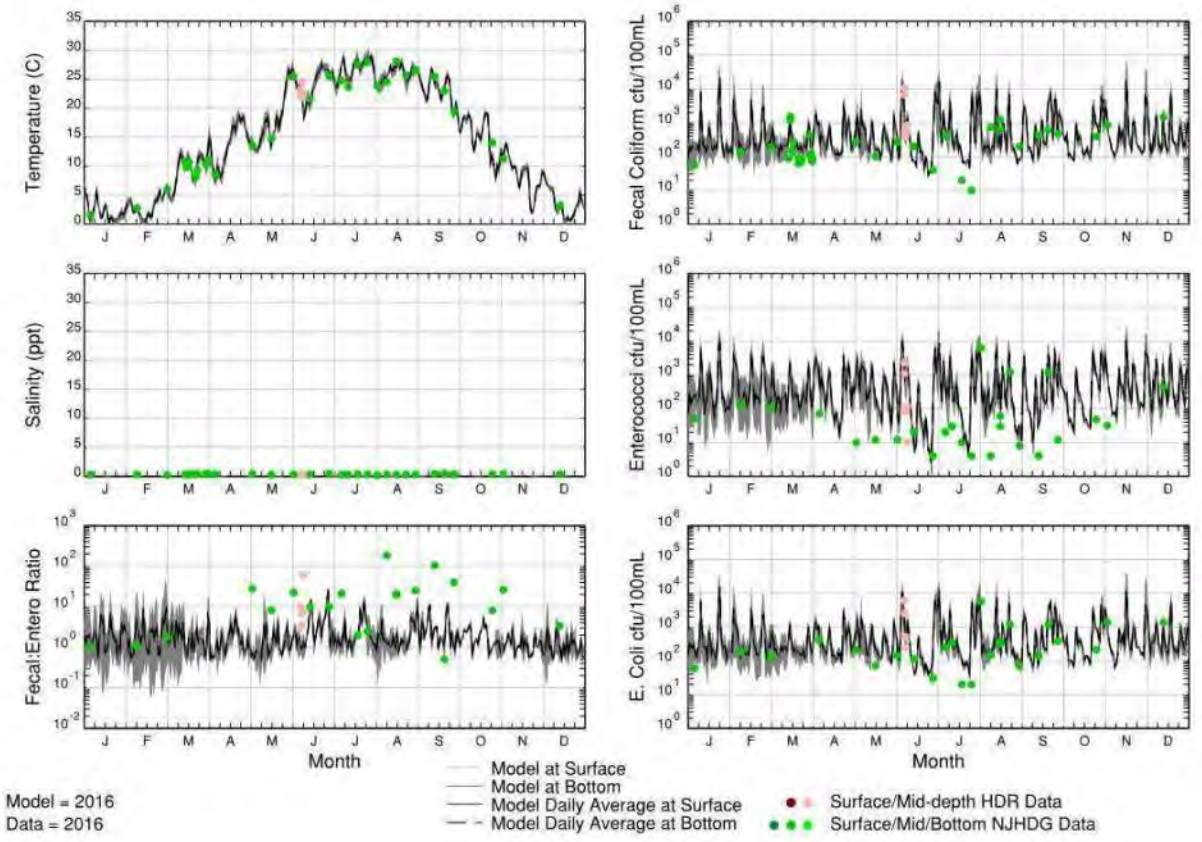


Model Calibration



PASSAIC RIVER

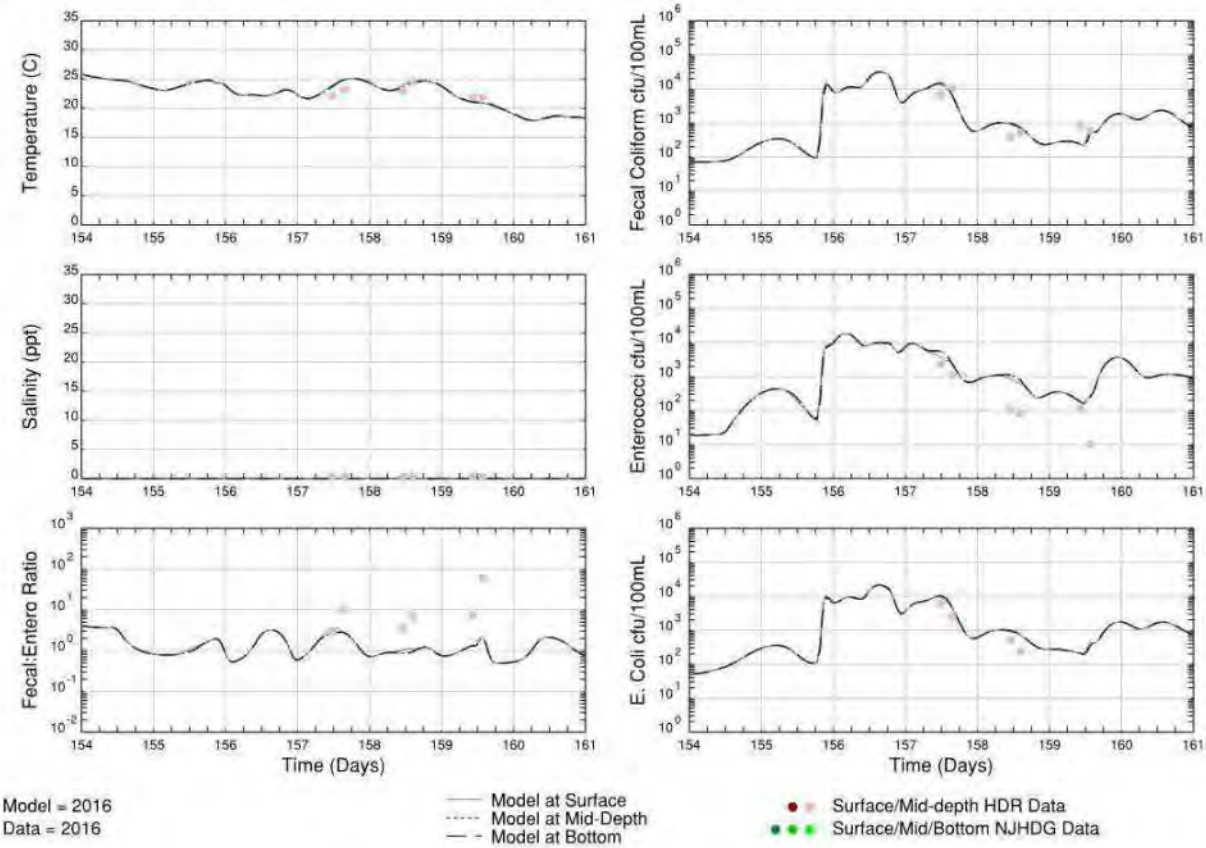
Station: 4

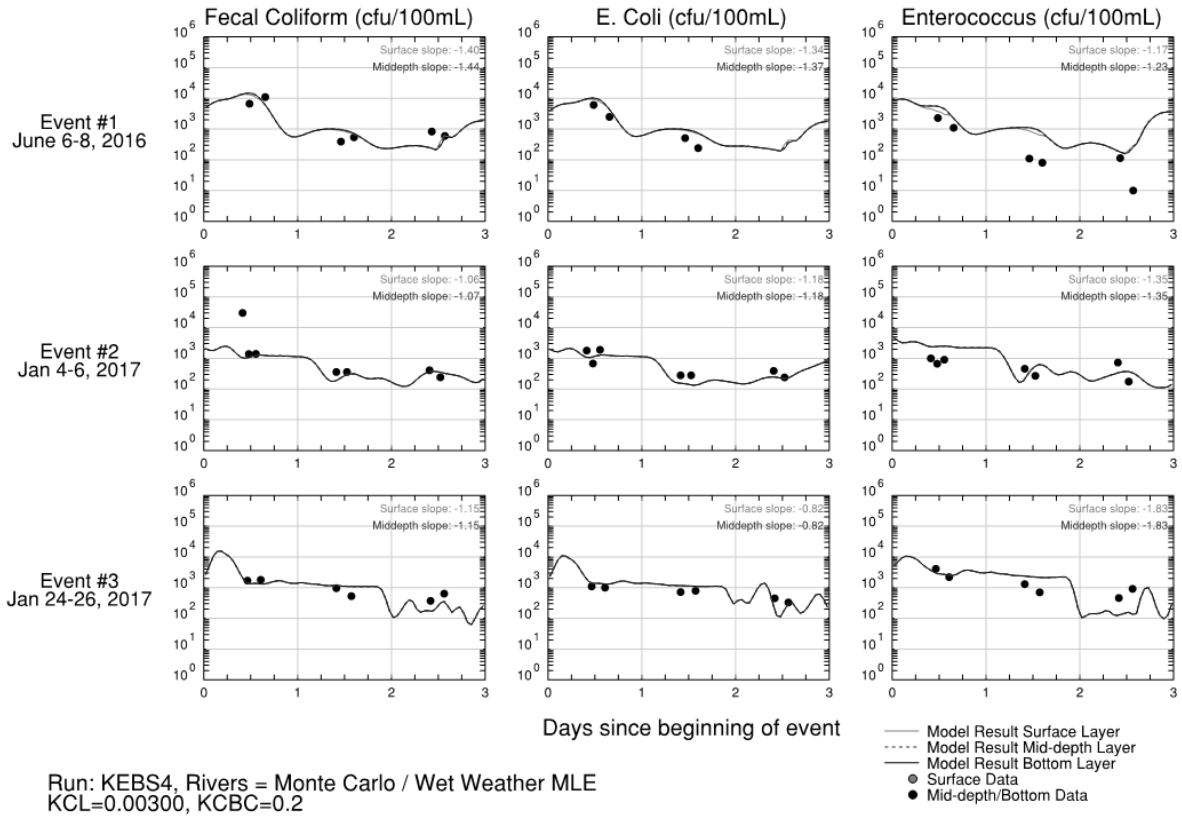


Passaic River & Tributaries
Passaic River

Station: 4 Event 1 (June 3-9)

FW2





Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2

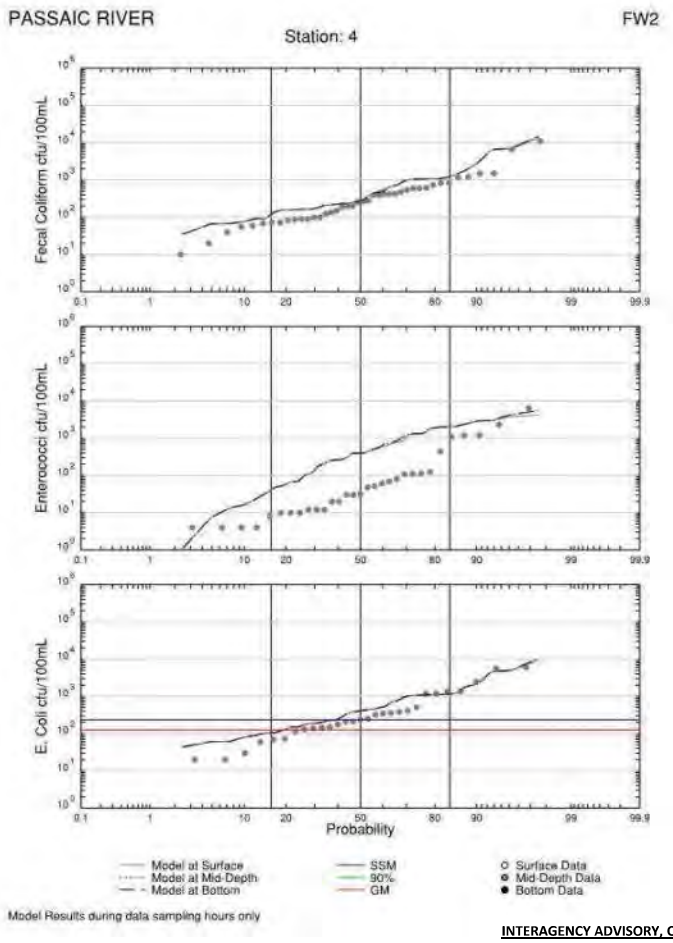
NJ Pathogen Criteria

- Primary Contact Recreation:
  - Enterococci levels shall not exceed a geometric mean of **35/100 ml**, or a single sample maximum of **104/100 ml**. (SE1 and SC)
    - Hackensack R. (upper), Hudson R. (north of Harlem R.), Raritan R., Raritan Bay
  - E. coli levels shall not exceed a geometric mean of **126/100 ml** or a single sample maximum of **235/100 ml**. (All FW2)
    - Elizabeth R., Passaic R., Raritan R.

- Secondary Contact Recreation:
  - Fecal coliform levels shall not exceed a geometric mean of **770/100 ml**. (SE2)
    - Arthur Kill (lower), Hackensack R. (mid), Hudson R., Passaic R. (mid), Rahway R.
  - Fecal coliform levels shall not exceed a geometric mean of **1500/100ml**. (SE3)
    - Arthur Kill (upper), Elizabeth R., Hackensack R. (lower), Kill Van Kull, Newark Bay, Passaic R. (lower)

NJ Pathogen Criteria

The Department shall **utilize a geometric mean to assess compliance** with the bacterial quality indicators at N.J.A.C.7:9B-1.14(d)1ii-iii. The geometric mean shall be calculated using a minimum of five samples collected over a thirty-day period. The **single sample maximum shall be used for beach notification** in accordance with N.J.A.C. 8:26 and to identify where additional ambient water quality sampling is needed to calculate a geometric mean.



Assessment of Model's Ability to Calculate Attainment

- Passaic River – GM Criterion – Mid-depth
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

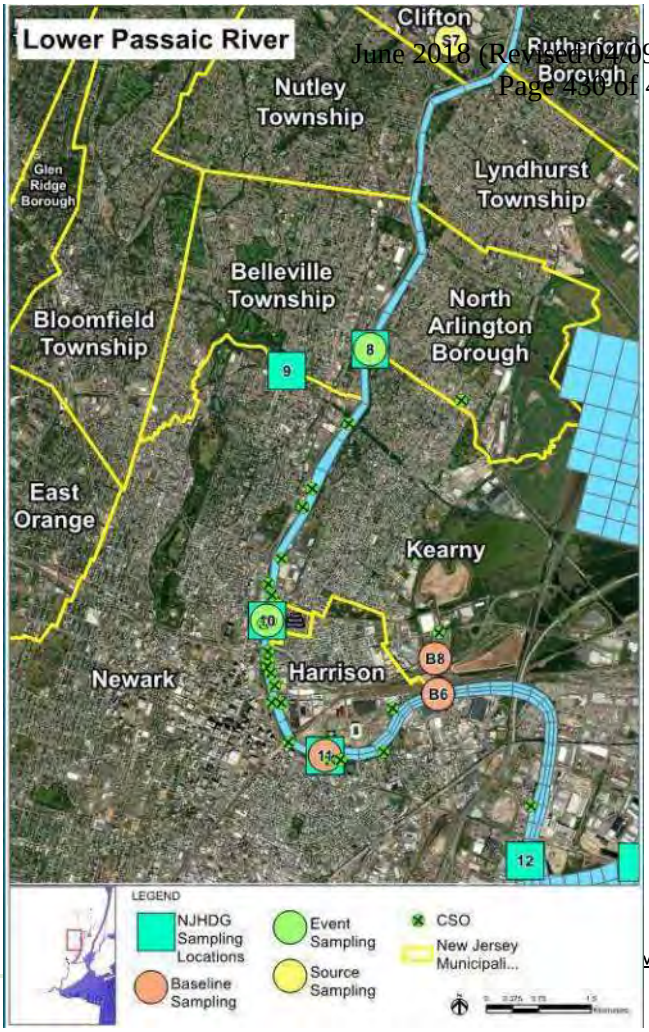
Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
B24	FW2	126	**Y**	**Y**	**Y**	**Y**
2	FW2	126	**Y**	**Y**	-	-
3	FW2	126	**Y**	**Y**	**Y**	**Y**
B22	FW2	126	**Y**	**Y**	-	-
4	FW2	126	**Y**	**Y**	**Y**	**Y**
5	FW2	126	**Y**	**Y**	**Y**	**Y**
7	FW2-SE2	126	**Y**	**Y**	**Y**	**Y**
8	FW2-SE2	126	**Y**	**Y**	**Y**	**Y**

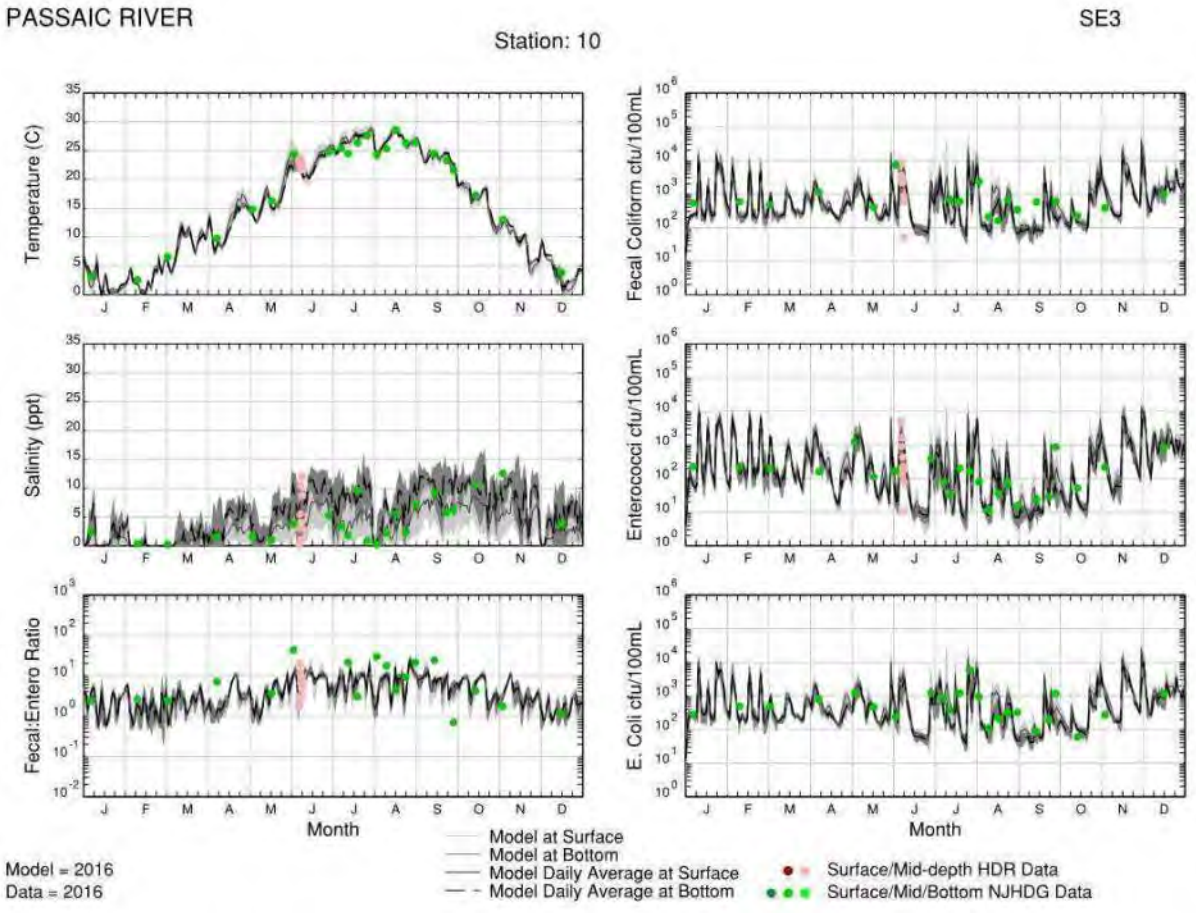
Assessment of Model's Ability to Calculate Attainment

- Passaic River – SSM Criterion – Mid-depth
- Percent of Time Data and Model Exceed Criterion (Using imaginary 30-day period)

Station	Class	Criterion	2016 Data	2016 Model	**diff**	2017 Data	2017 Model	**diff**
B24	FW2	235	33.1	47.8	**14.7**	73.8	59.6	**14.2**
2	FW2	235	46.5	59.0	**12.5**	NA	NA	
3	FW2	235	70.4	37.7	**32.7**	67.8	56.1	**11.7**
B22	FW2	235	53.0	38.0	**15.0**	NA	NA	
4	FW2	235	50.6	60.7	**10.1**	61.9	42.1	**19.8**
5	FW2	235	44.0	49.7	**5.7**	46.8	30.5	**16.3**
7	FW2-SE2	235	80.5	75.0	**5.5**	88.1	55.1	**33.0**
8	FW2-SE2	235	77.1	79.2	**2.1**	91.9	62.5	**29.4**

Model Calibration

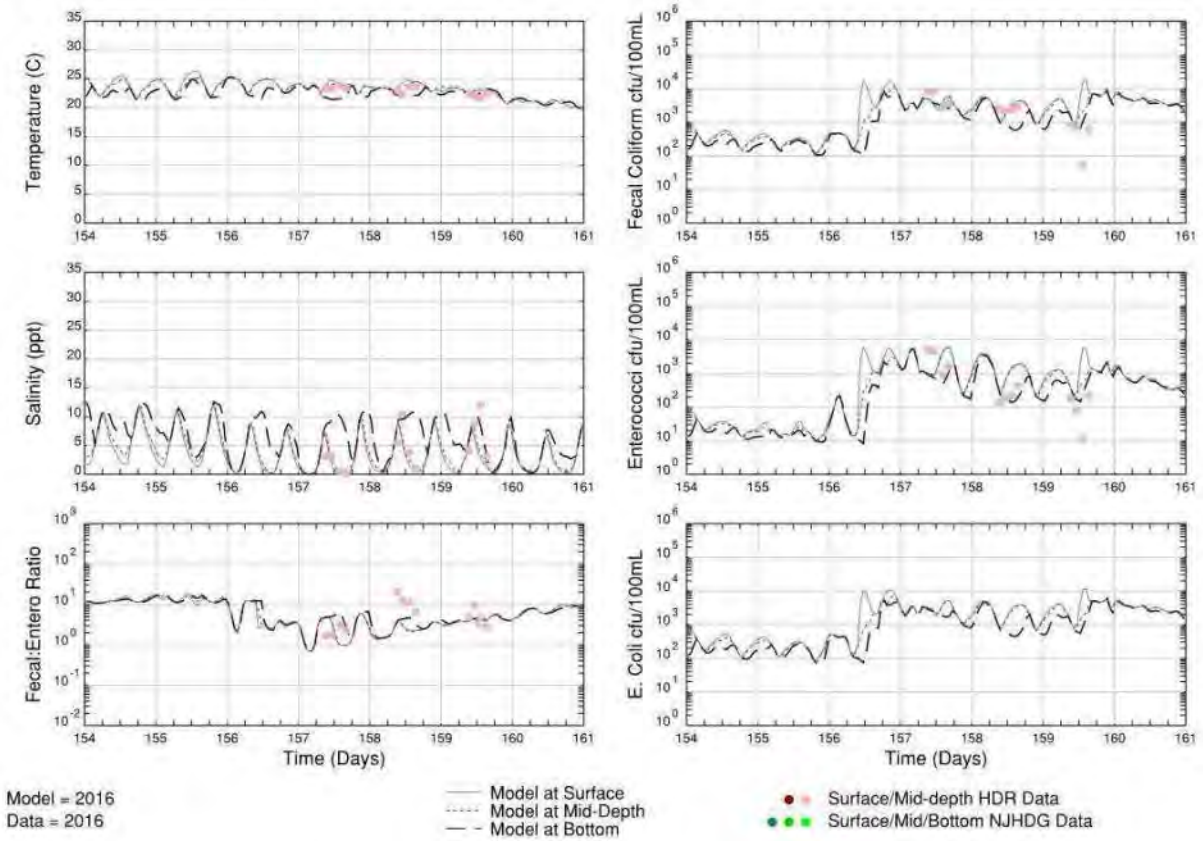




Passaic River & Tributaries
Passaic River

Station: 10 Event 1 (June 3-9)

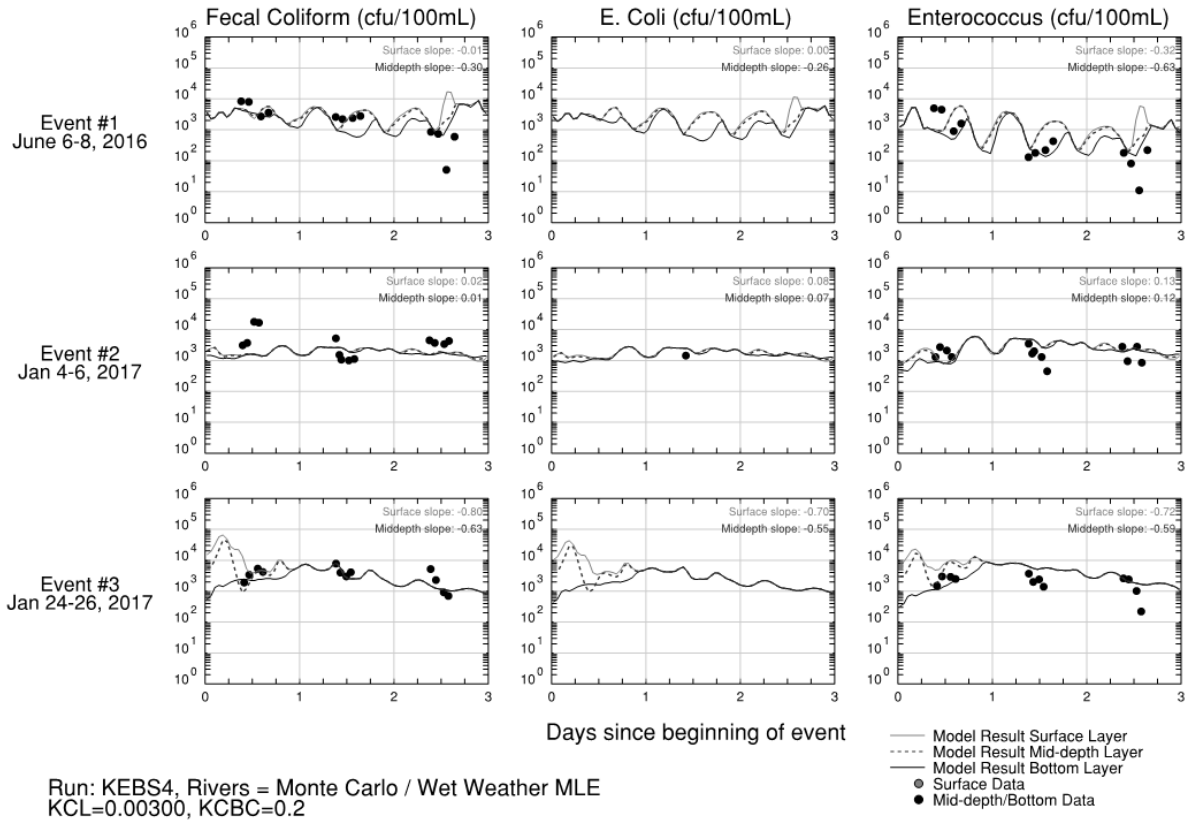
SE3



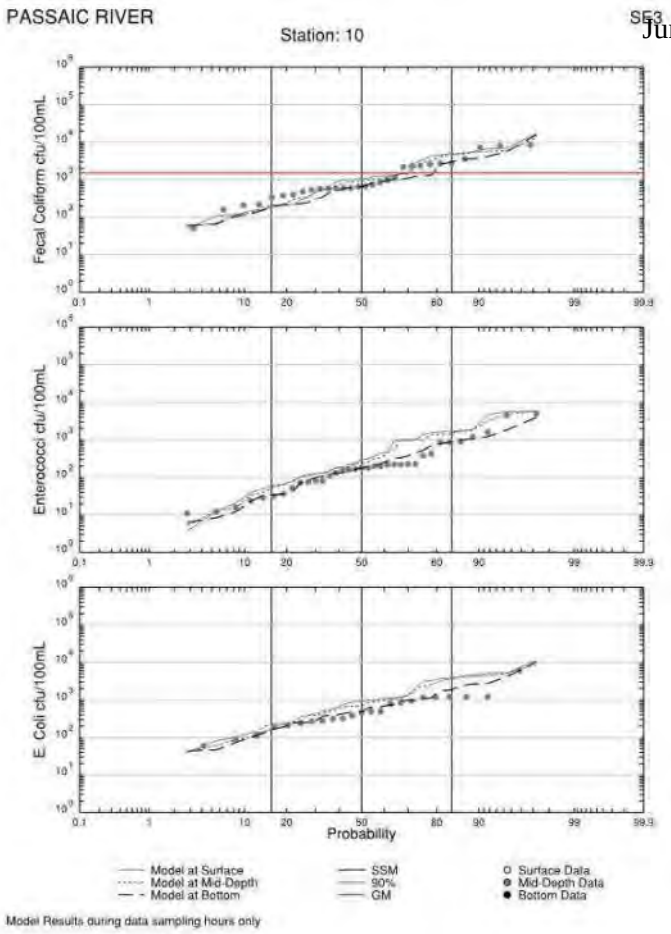
Passaic River & Tributaries
Passaic River

Station: 10

SE3



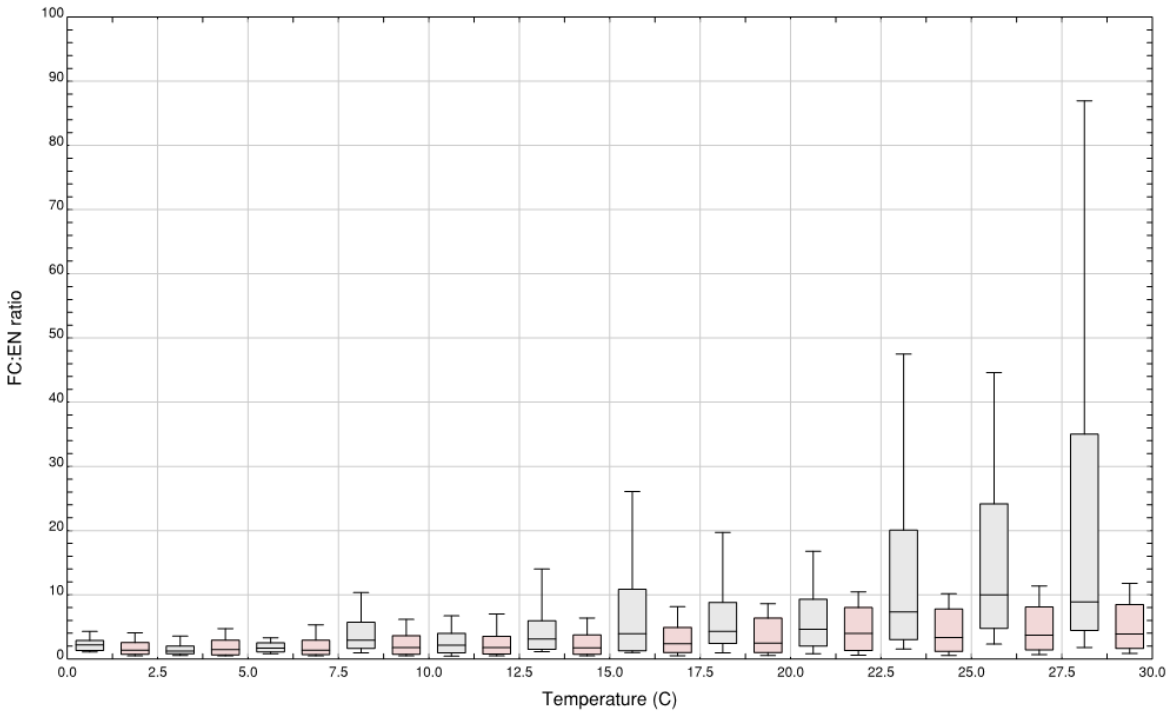
Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Assessment of Model's Ability to Calculate Attainment

- Passaic River – GM Criterion – Mid-depth
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

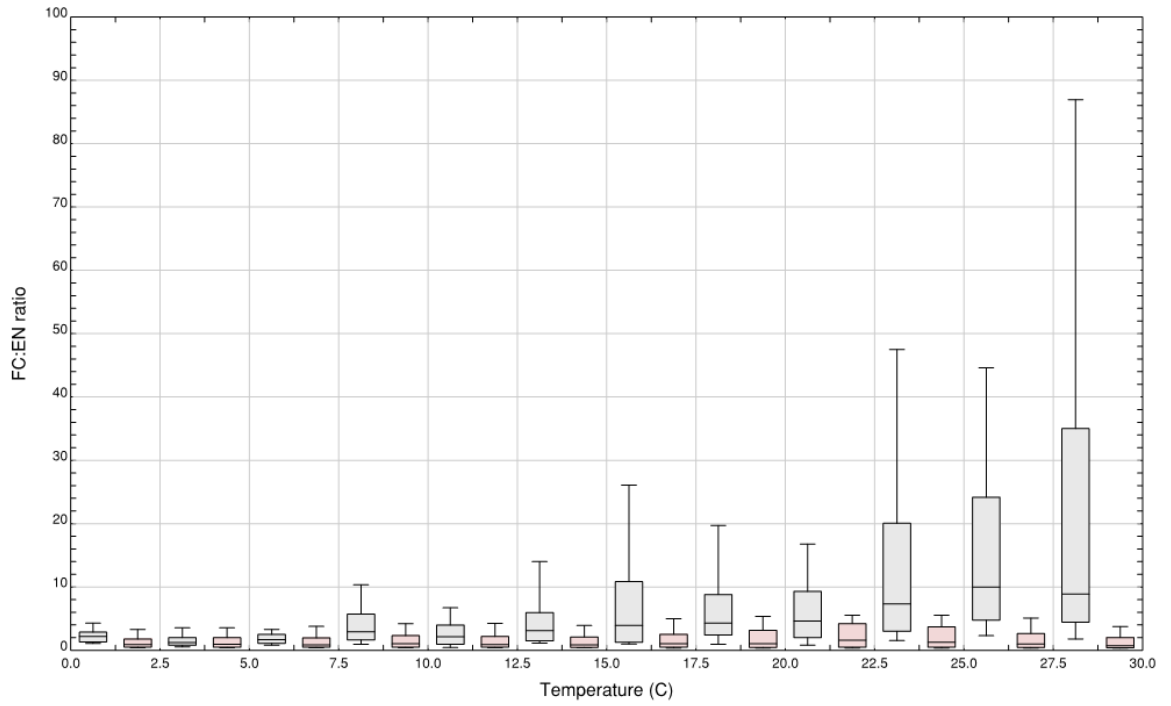
Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
7	FW2-SE2	770	Y	N (49)	N	N
8	FW2-SE2	770	N	Y	Y	Y
10	SE3	1500	N	N	Y	N (49)
11	SE3	1500	N	N	-	-
B6	SE3	1500	N	N	Y	Y
12	SE3	1500	-	-	-	-



Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2

plots show 10, 25, 50, 75, 90 percentiles

Passaic River & Tributaries
2016 / 2017

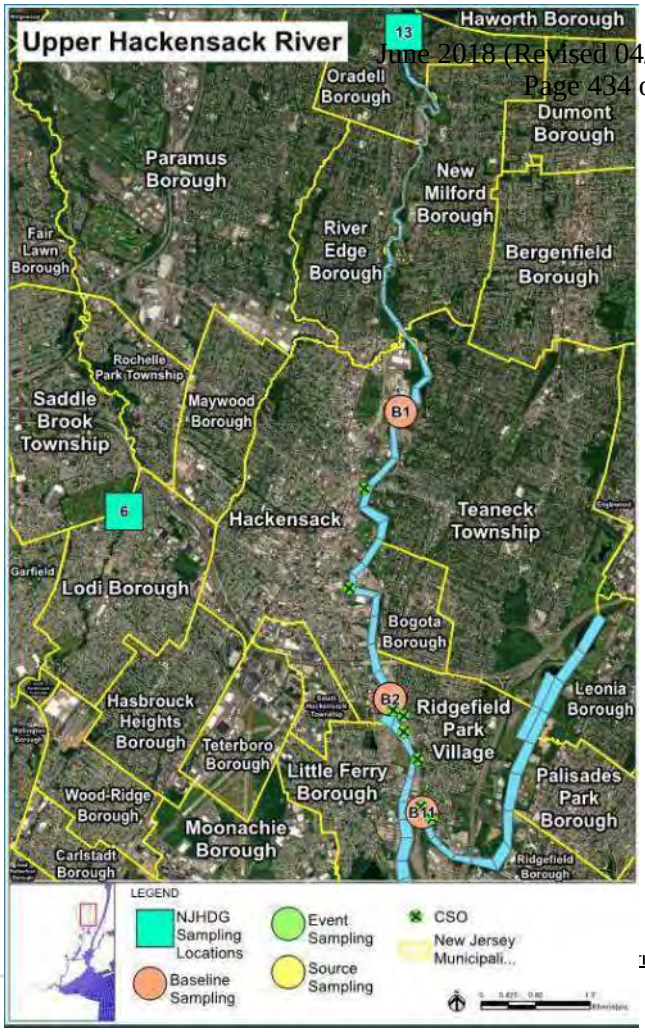


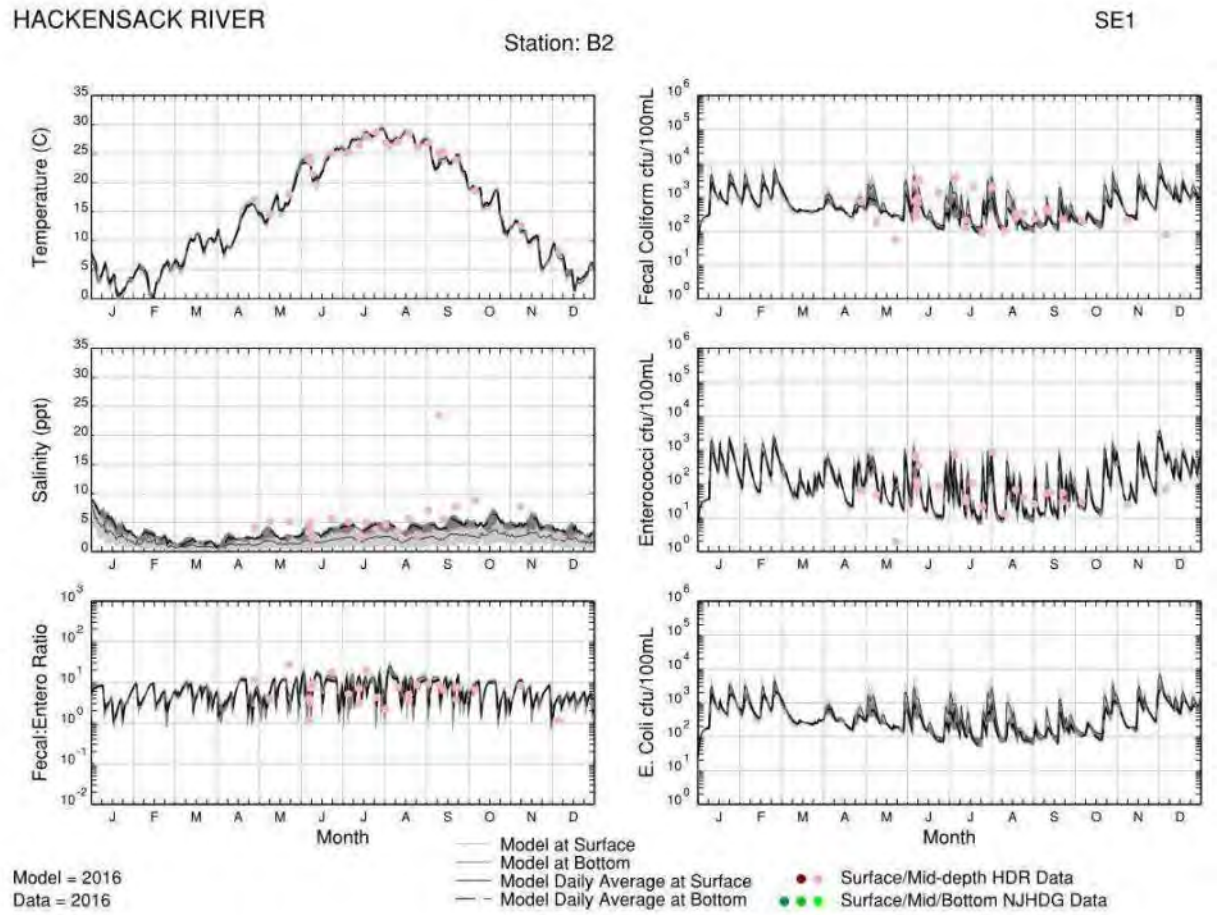
Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00824, KCBC=0.8

plots show 10, 25, 50, 75, 90 percentiles

INTERAGENCY ADVISORY, CONSULTATIVE AND/OR DELIBERATIVE MATERIALS.
NOT SUBJECT TO DISCLOSURE UNDER N.J.S.A 47:1A-1 ET SEQ.
OR THE COMMON LAW RIGHT TO INSPECT PUBLIC RECORDS.

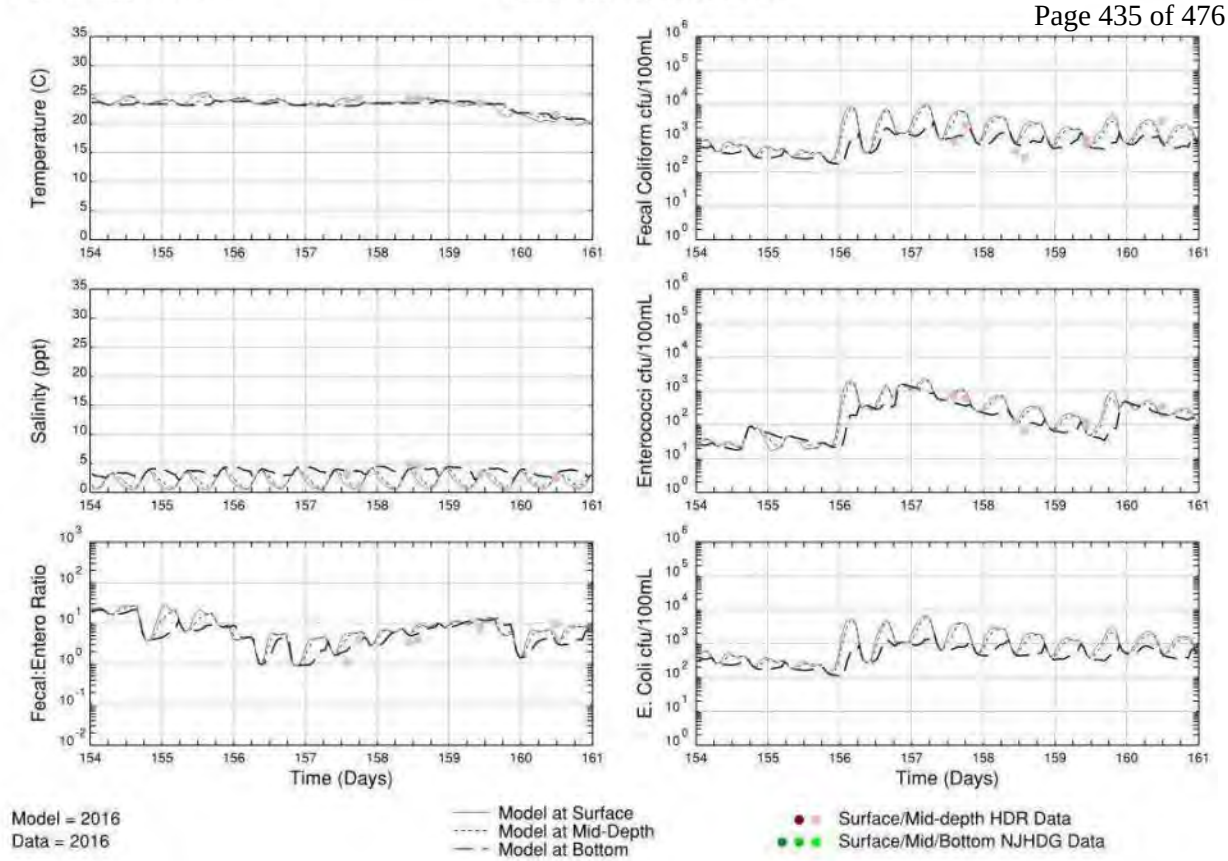
Model Calibration





Hackensack River & Tributaries
Hackensack River

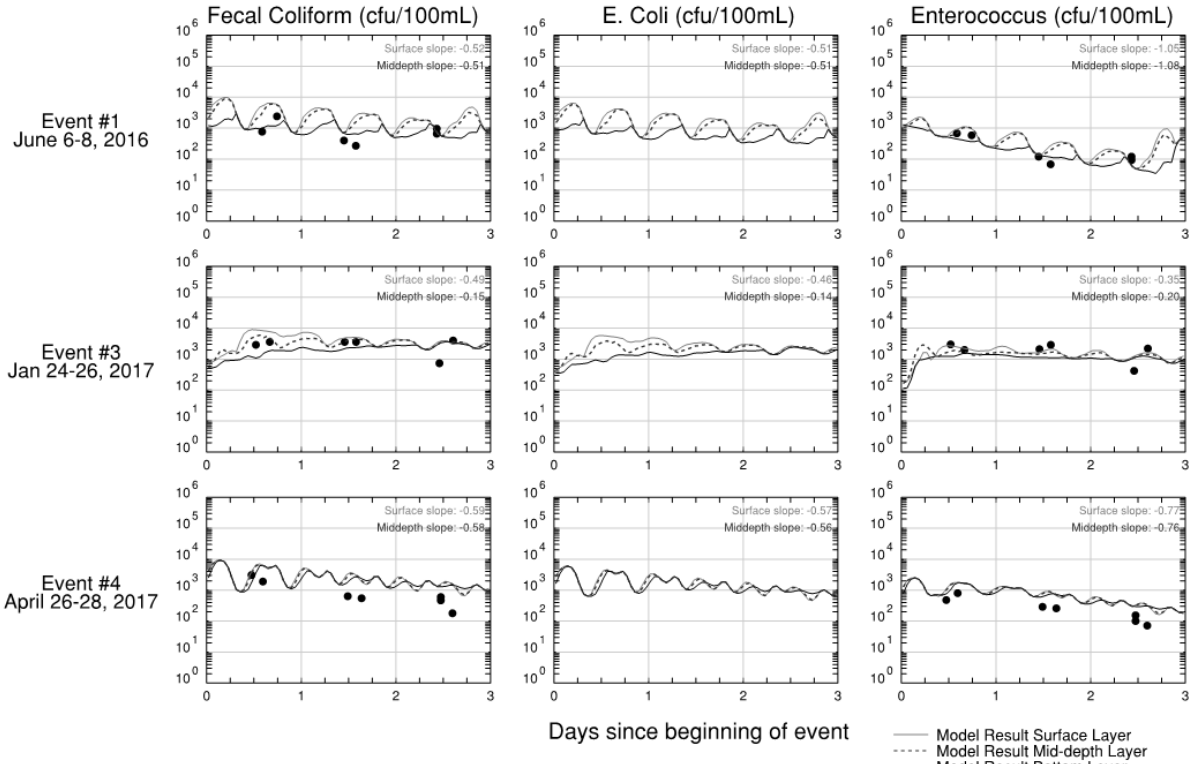
Station: B2 Event 1 (June 3-9)



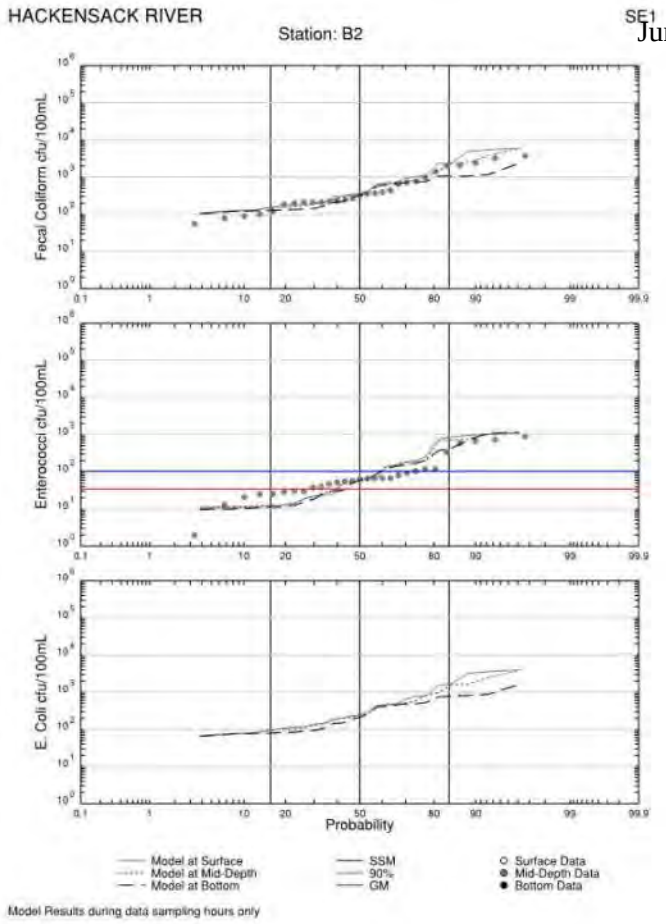
Hackensack River & Tributaries
Hackensack River

SE1

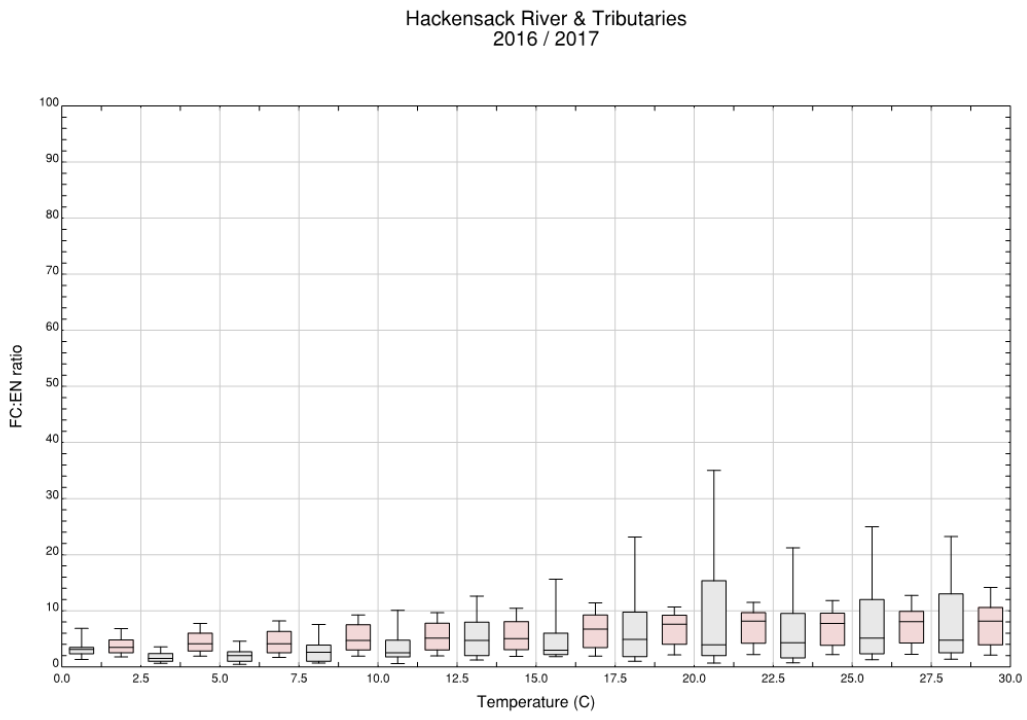
Station: B2



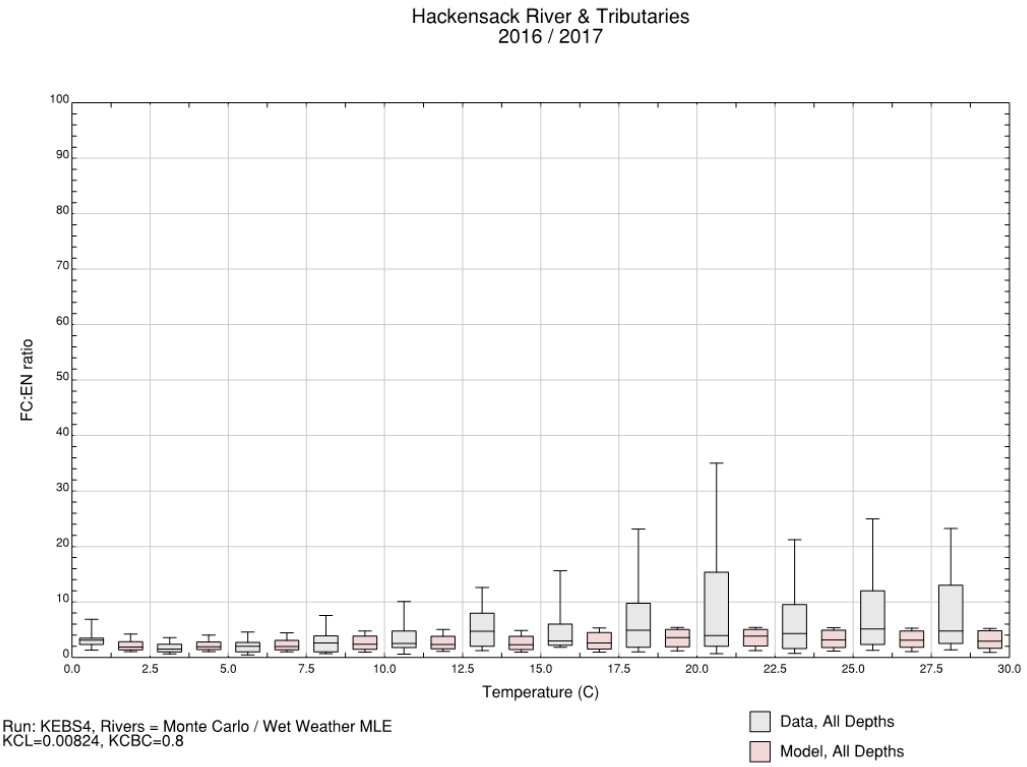
Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Model Calibration



Model Calibration

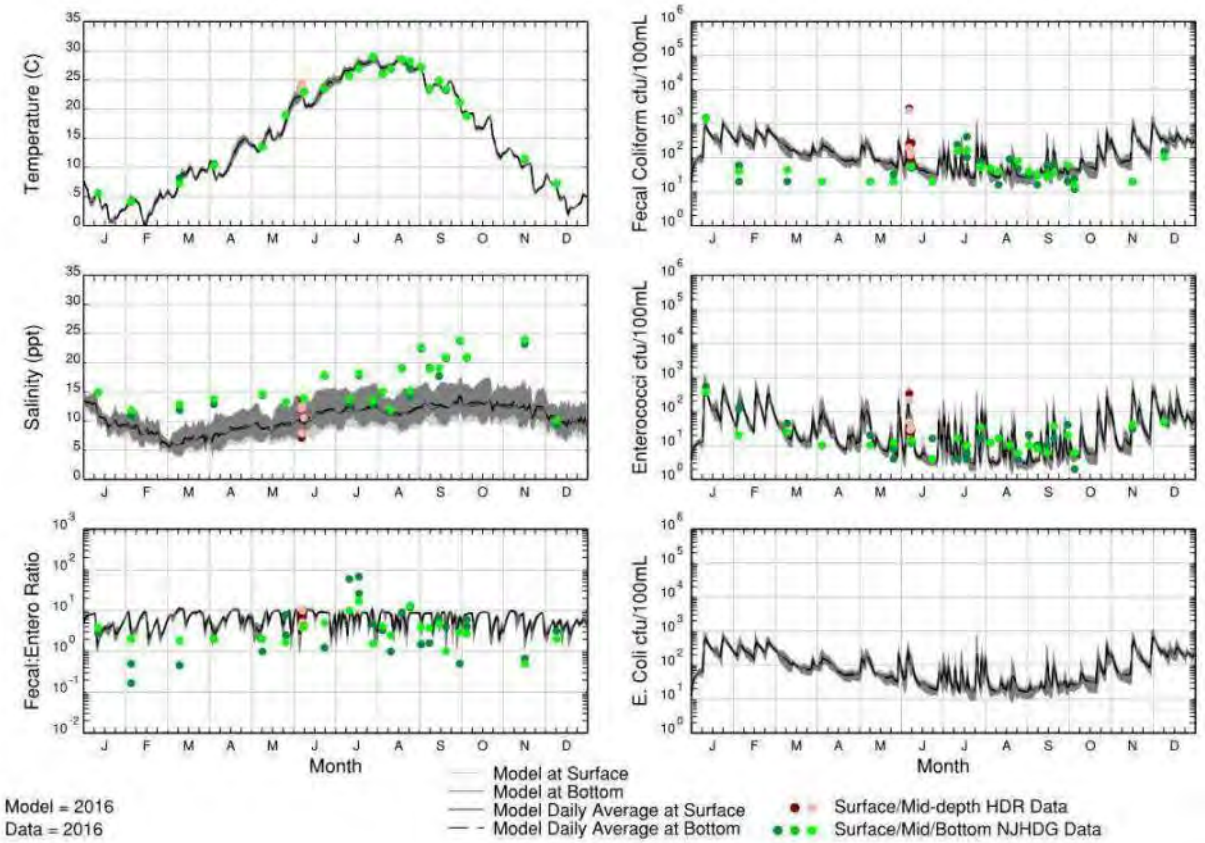


Model Calibration

HACKENSACK RIVER

Station: 14

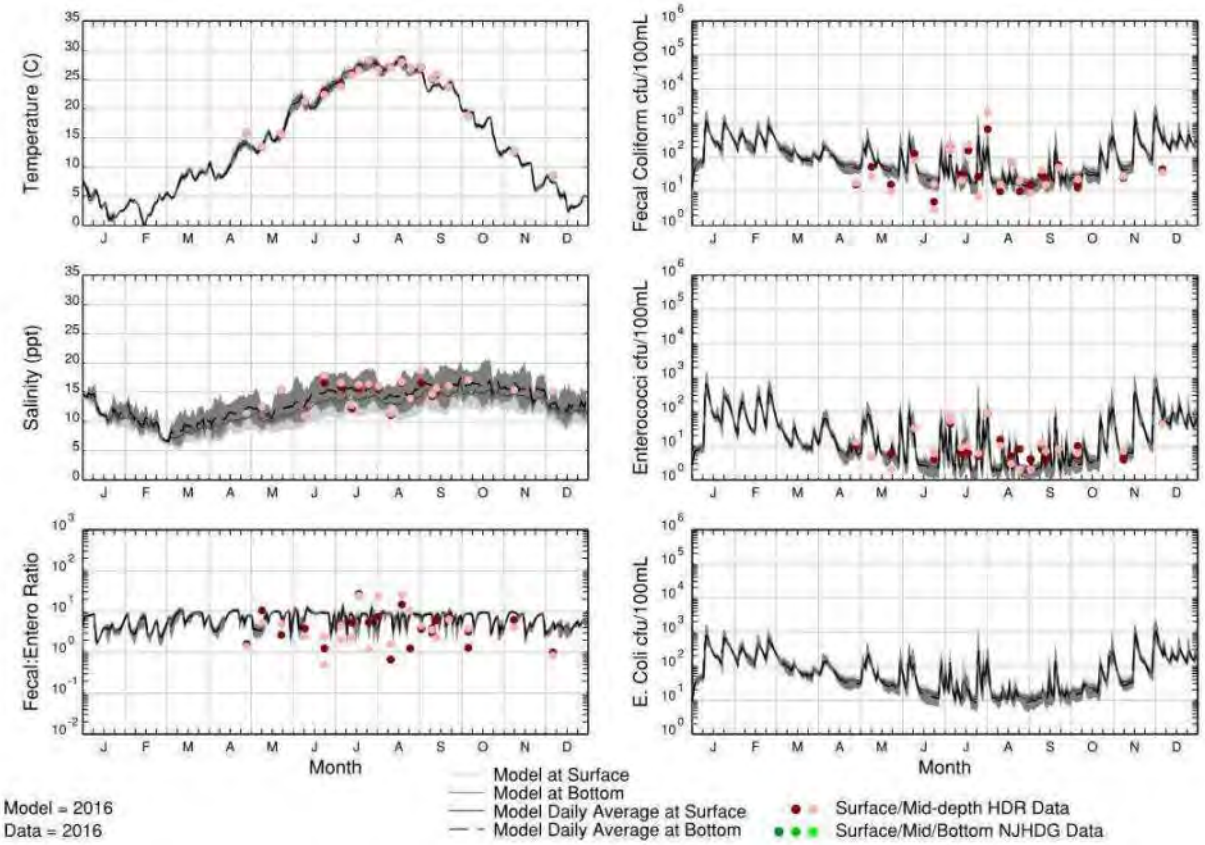
SE1



HACKENSACK RIVER

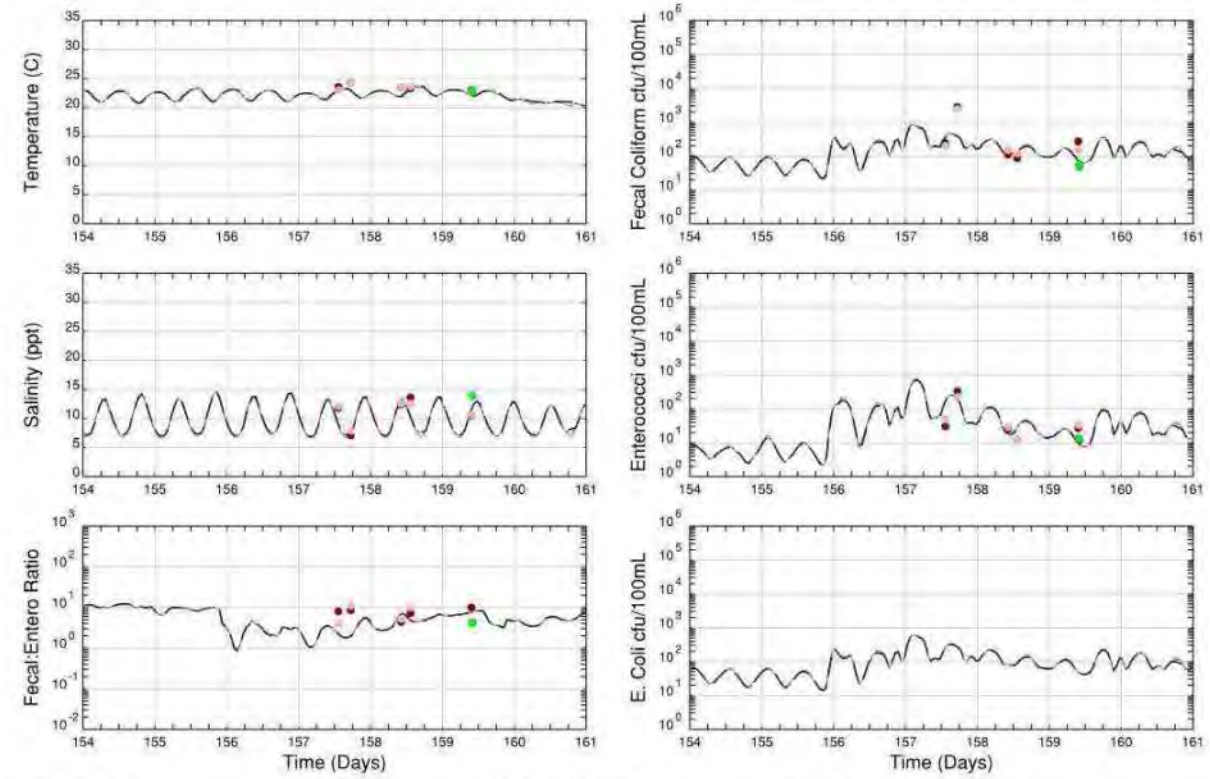
Station: B7

SE2



Hackensack River & Tributaries
Hackensack River

Station: 14 Event 1 (June 3-9)



Model = 2016
Data = 2016

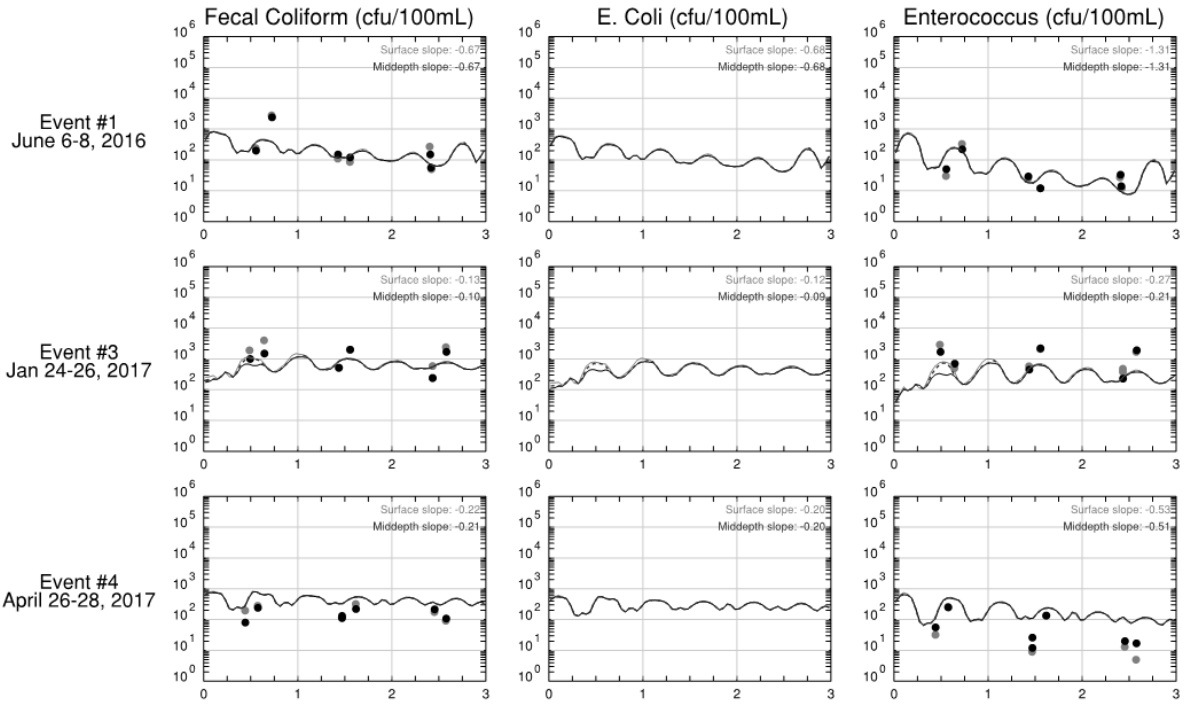
Model at Surface
Model at Mid-Depth
Model at Bottom

Surface/Mid-depth HDR Data
Surface/Mid/Bottom NJHDG Data

Hackensack River & Tributaries
Hackensack River

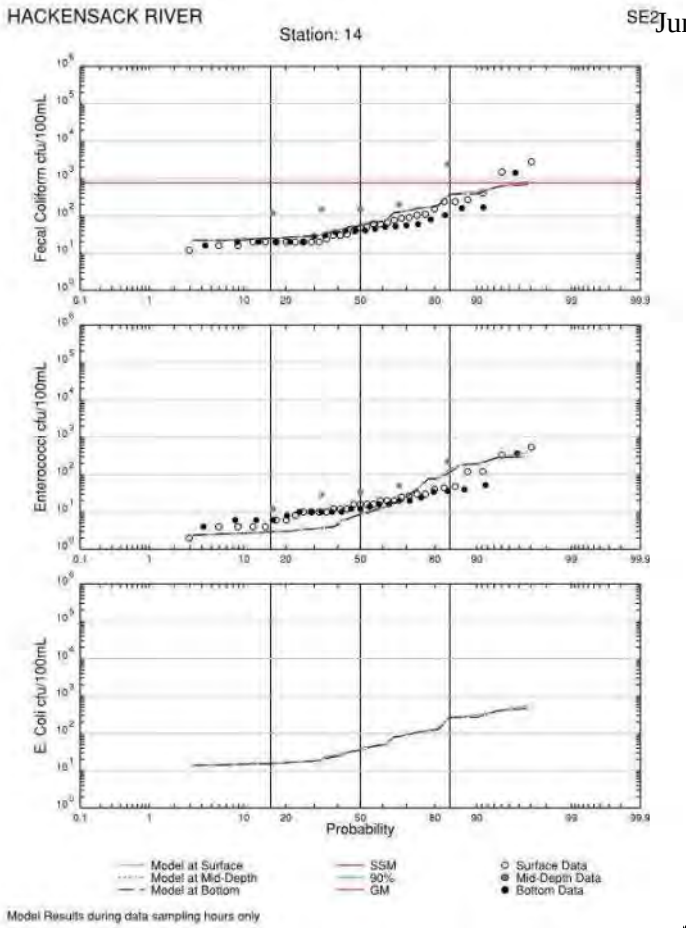
Station: 14

SE2



Model Result Surface Layer
Model Result Mid-depth Layer
Model Result Bottom Layer
Surface Data
Mid-depth/Bottom Data

Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Assessment of Model's Ability to Calculate Attainment

- Hackensack River – GM Criterion – Mid-depth
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

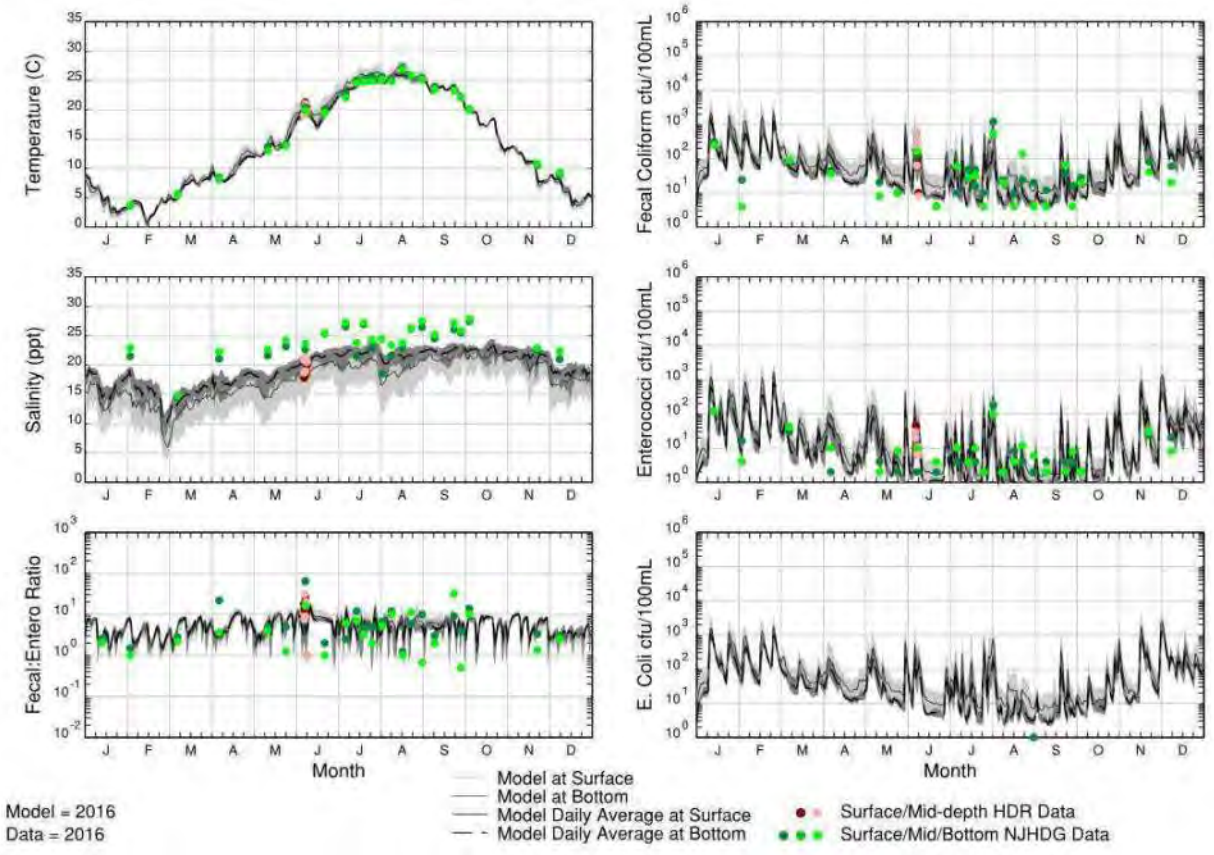
Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
13	SE1	35	N	N	N	N
B1	SE1	35	Y	Y	Y	Y
B2	SE1	35	Y	Y	Y	Y
B11	SE2	770	N	N	-	-
B3	SE2	770	N	N	-	-
B4	SE2	770	N	N	-	-
14	SE2	770	-	-	N	N
B7	SE2	770	N	N	-	-
15	SE2	770	N	N	N	N
16	SE3	1500	-	-	-	-

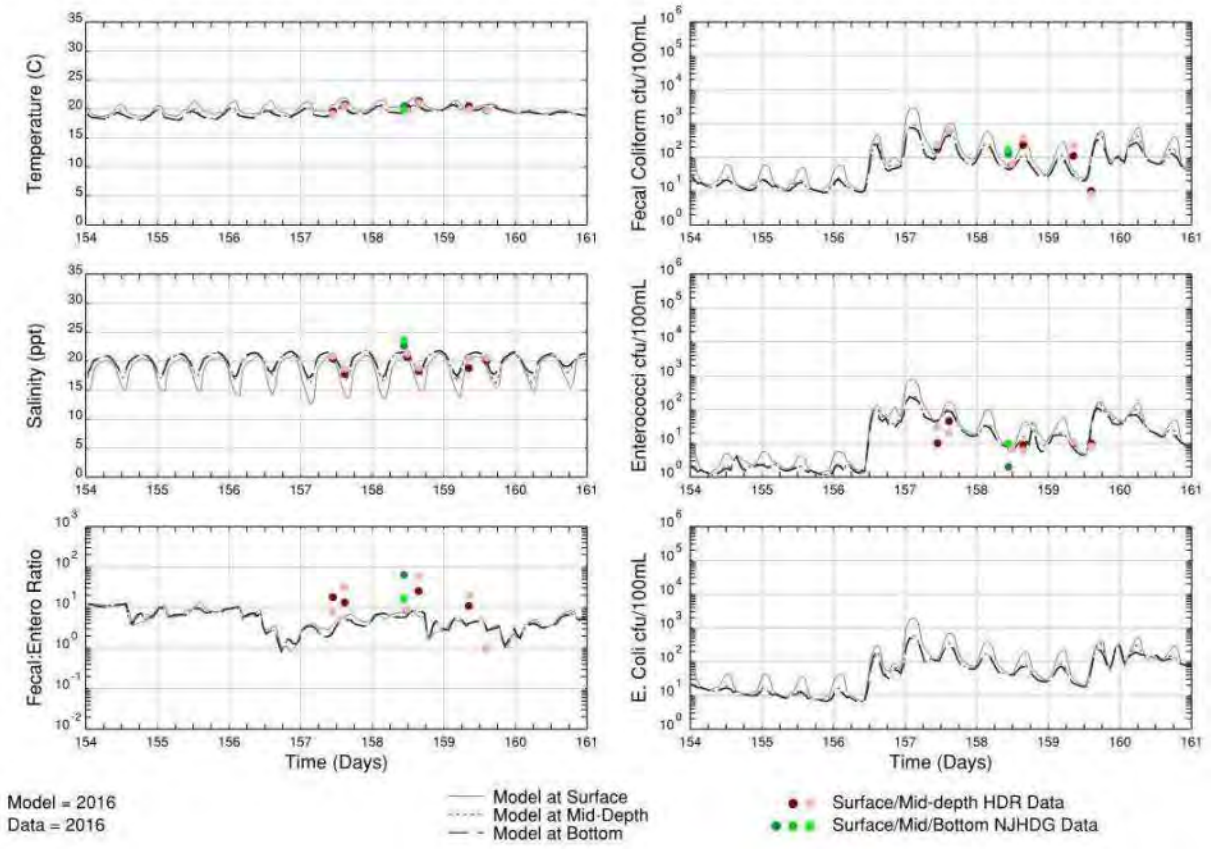
Model Calibration

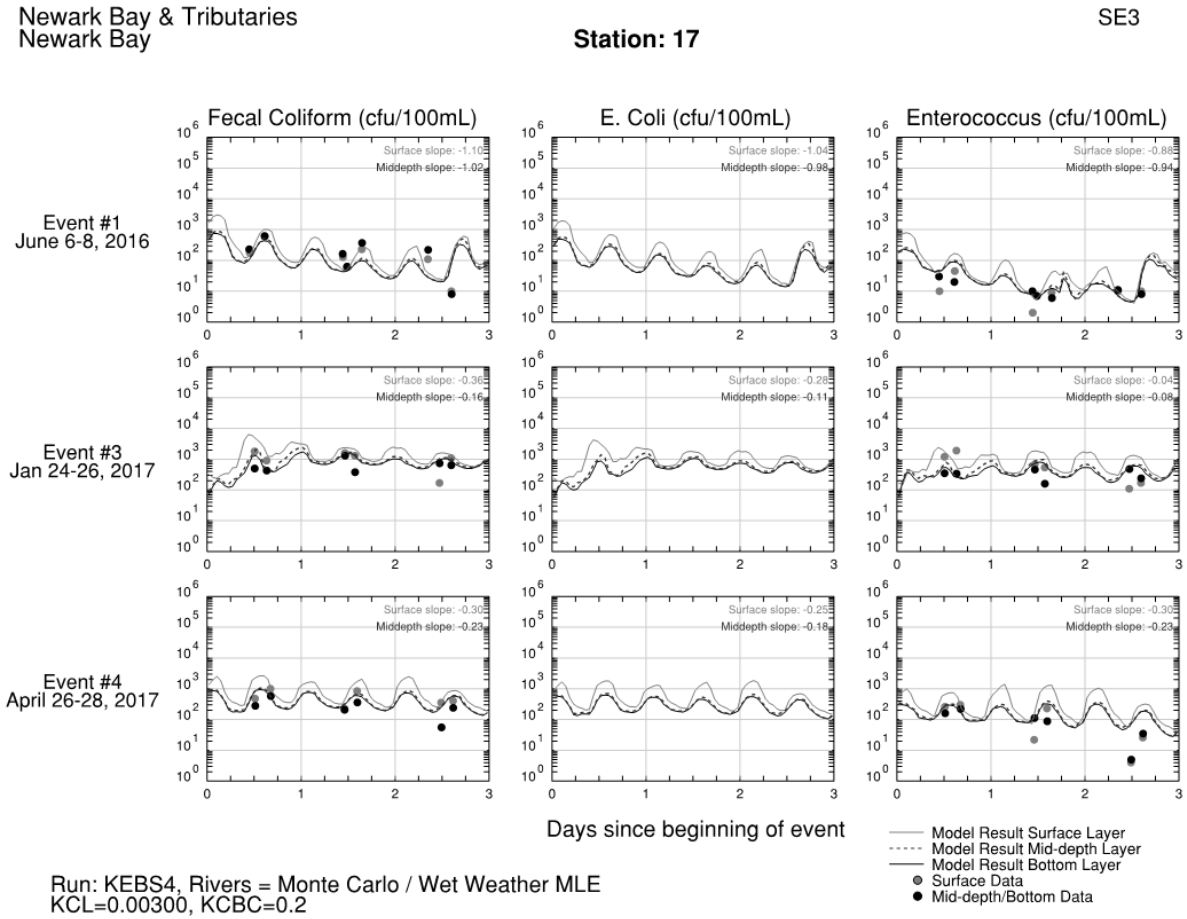
LOWER PASSAIC RIVER

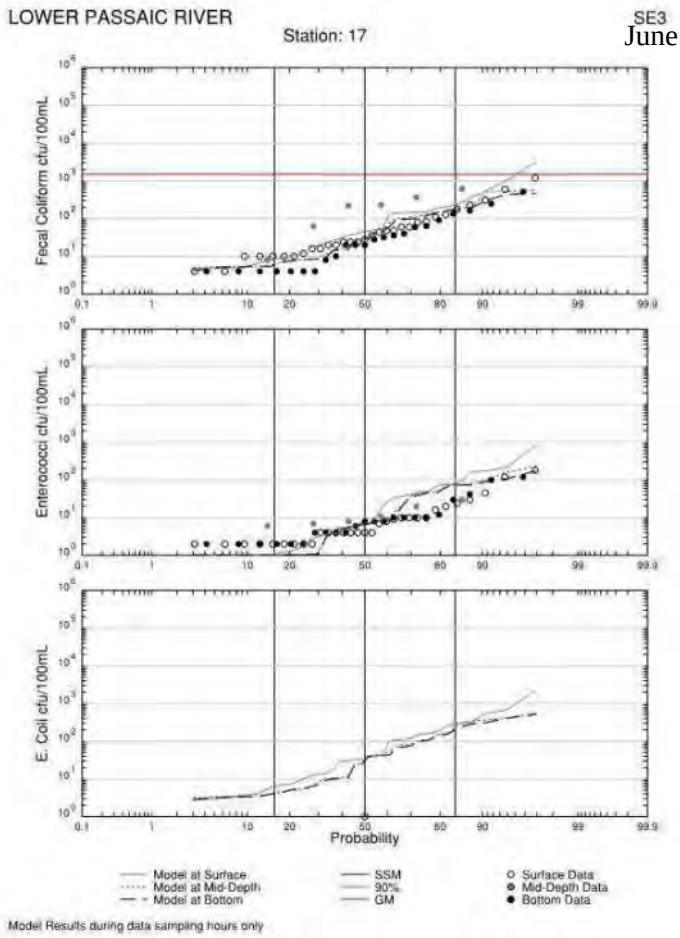
Station: 17

SE3

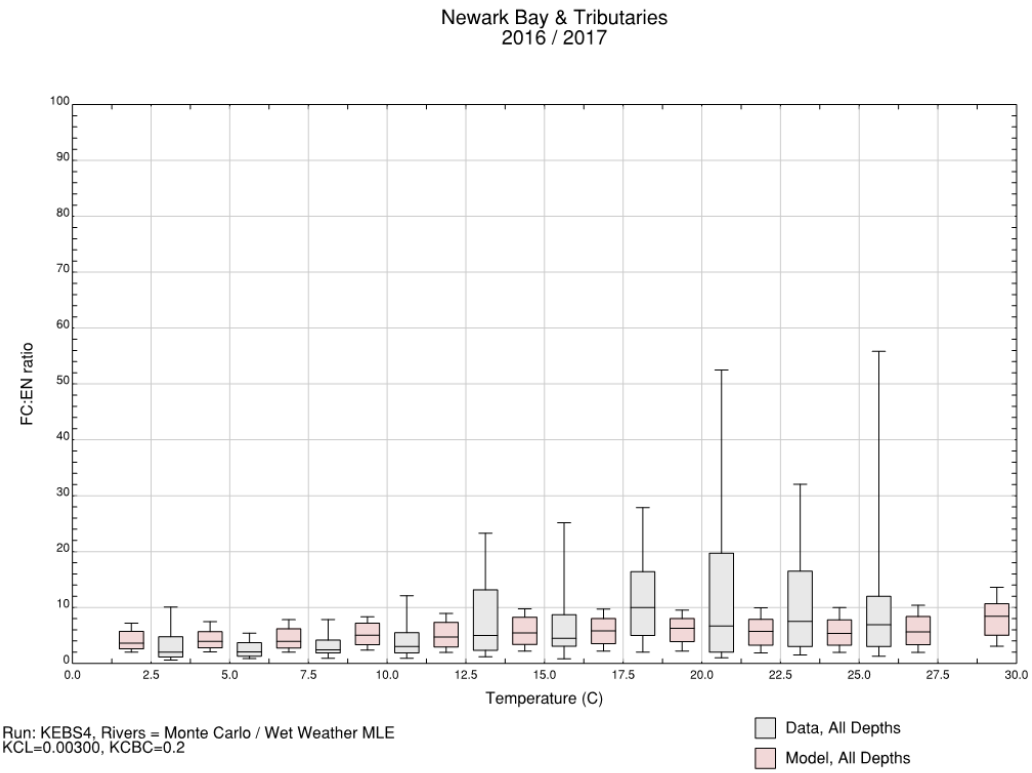




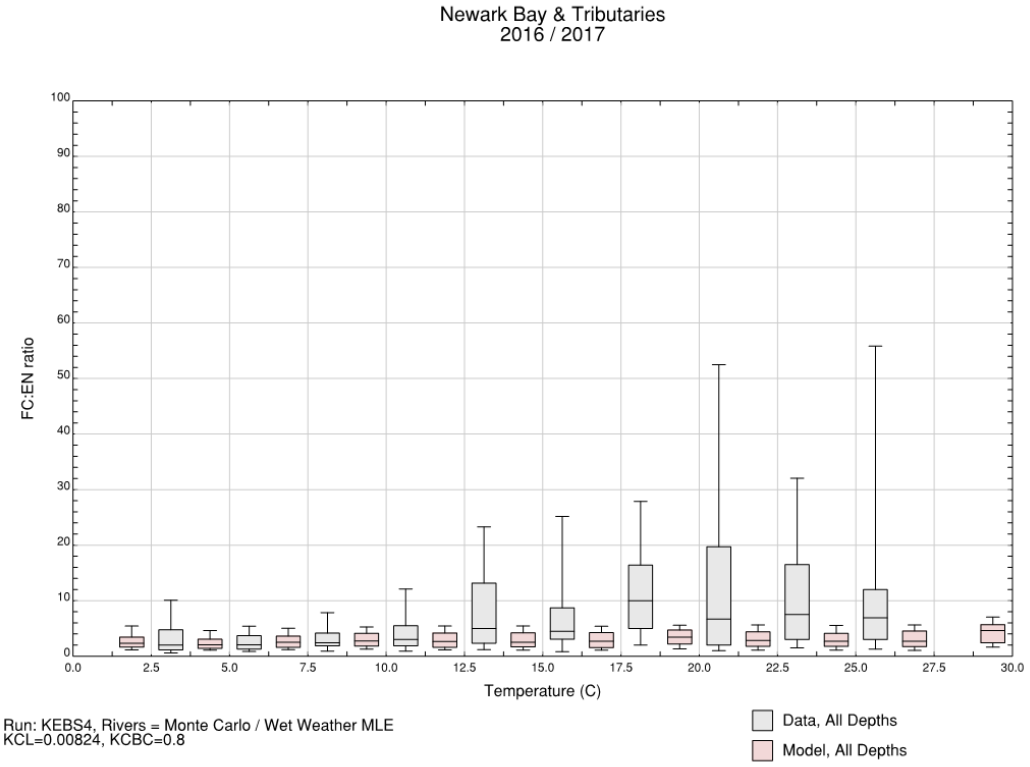




Model Calibration



Model Calibration

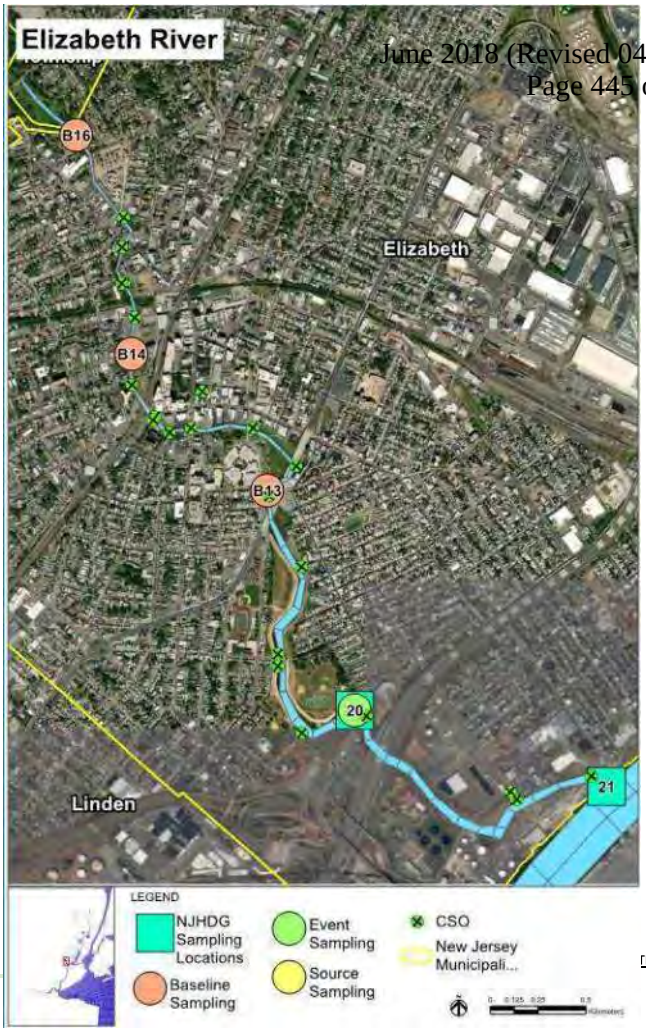


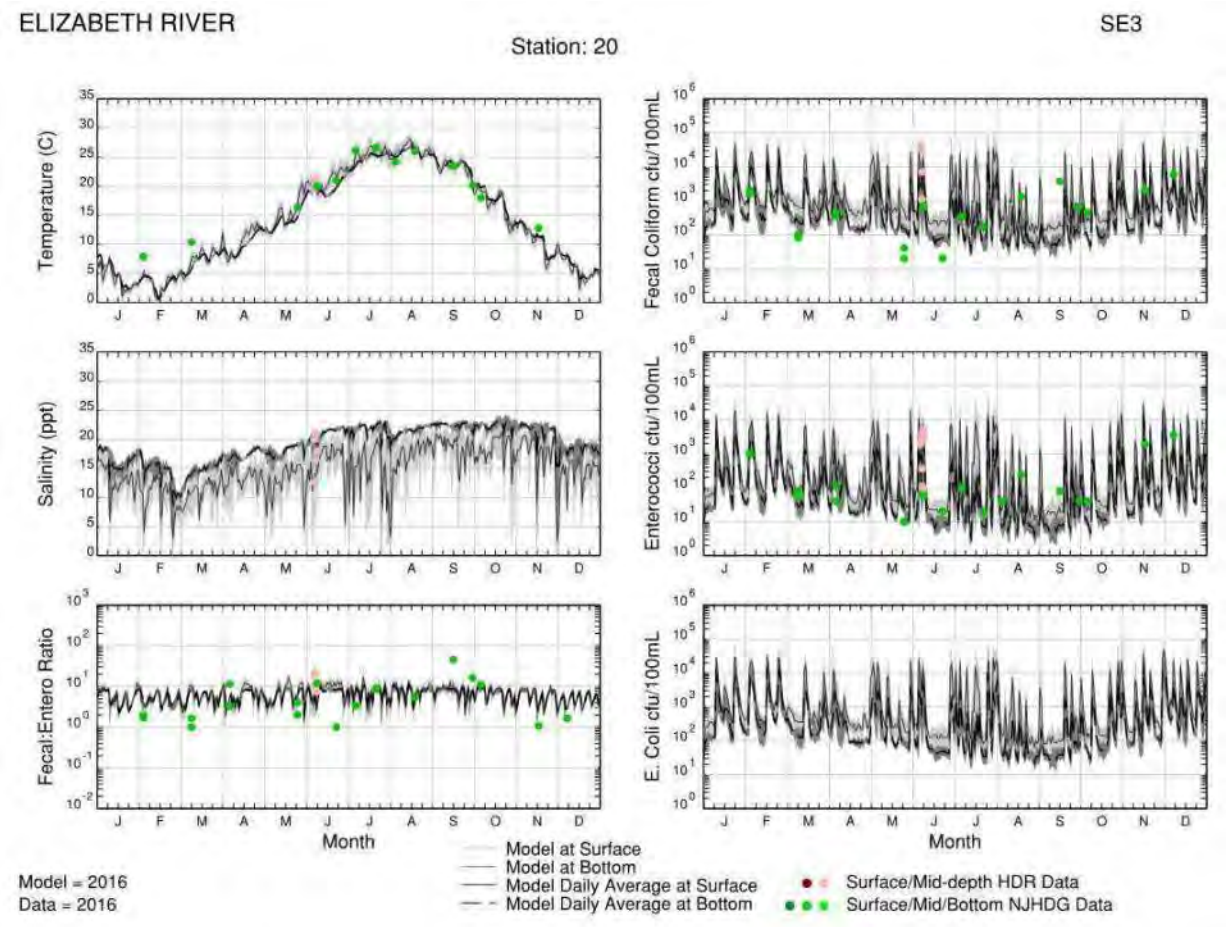
Assessment of Model's Ability to Calculate Attainment

- Newark Bay – GM Criterion – Mid-depth
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
17	SE3	1500	N	N	N	N
B10	SE3	1500	N	N	-	-
18	SE3	1500	N	N	N	N
B17	SE3	1500	-	-	-	-
19	SE3	1500	N	N	N	N

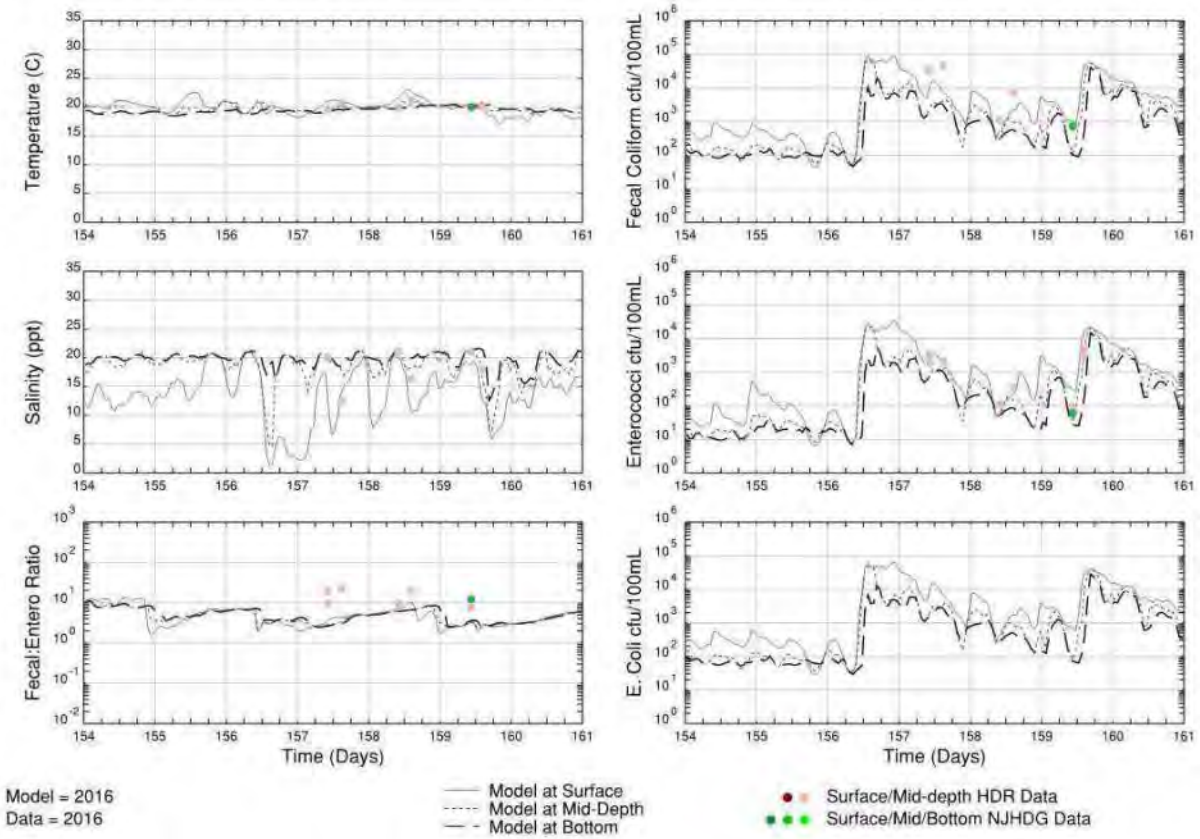
Model Calibration





Newark Bay & Tributaries
Elizabeth River

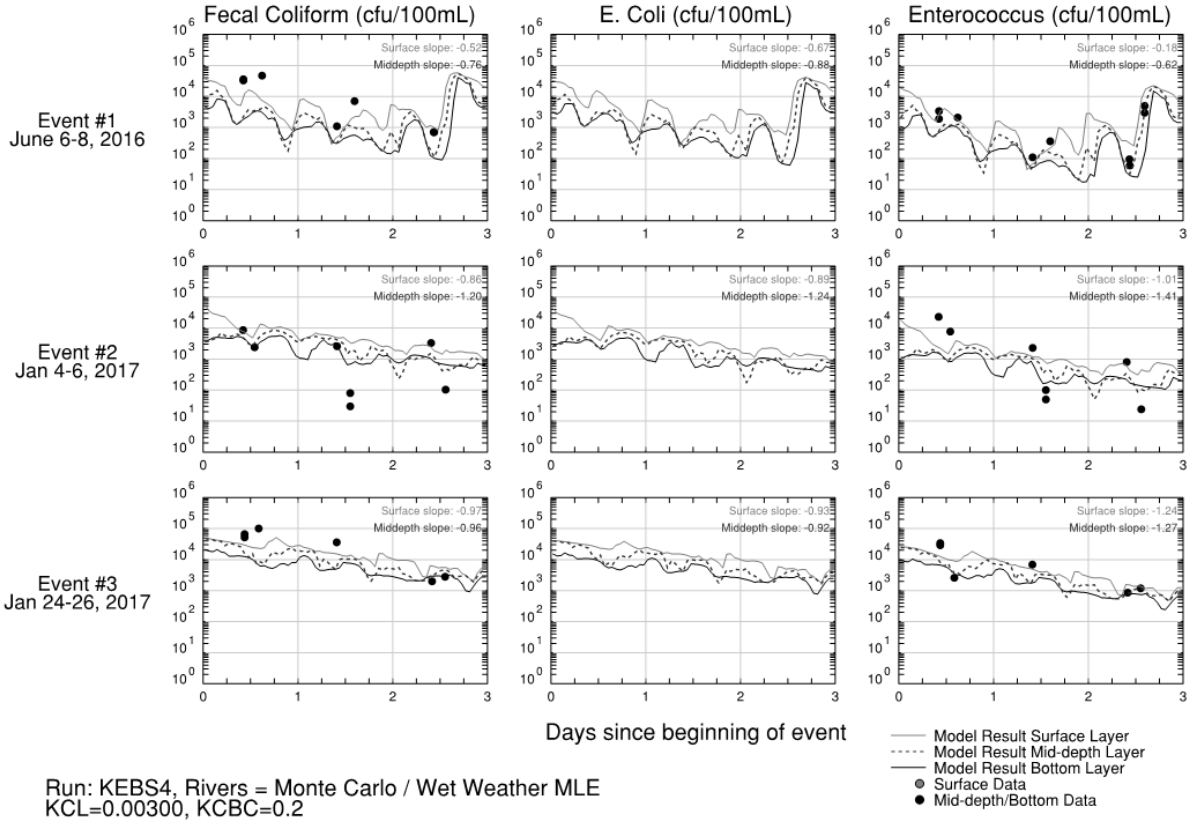
Station: 20 Event 1 (June 3-9)



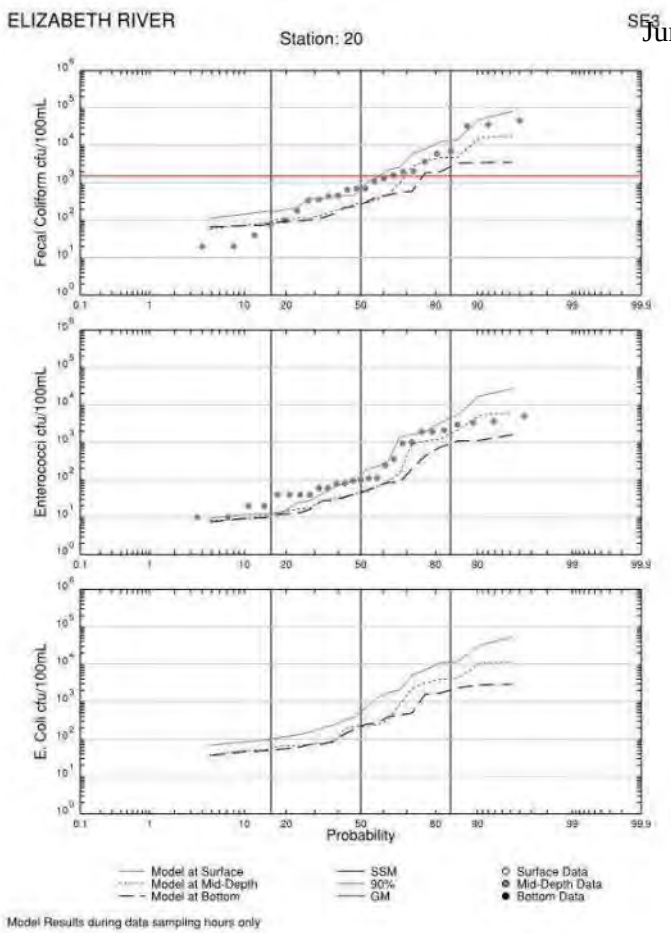
Newark Bay & Tributaries
Elizabeth River

SE3

Station: 20



Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Assessment of Model's Ability to Calculate Attainment

- Elizabeth River – GM Criterion – Mid-depth
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

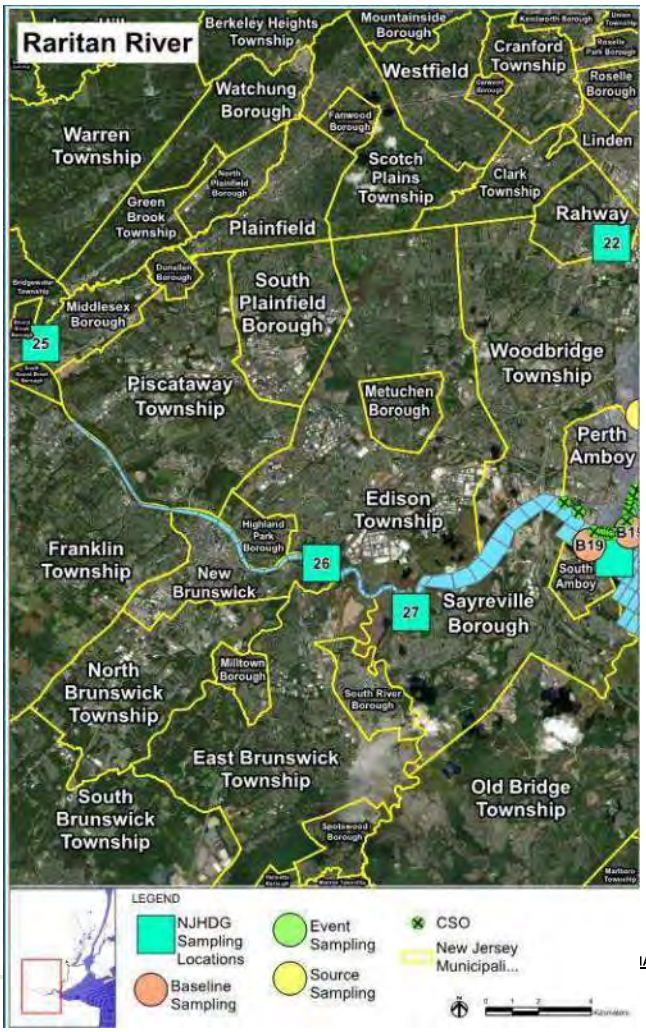
Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
B16	FW2	126	Y	Y	-	-
B14	FW2	126	Y	Y	-	-
B13	SE3	1500	Y	N	-	-
20	SE3	1500	N	N	Y	Y

Assessment of Model's Ability to Calculate Attainment

- Elizabeth River – SSM Criterion – Mid-depth
- Percent of Time Data and Model Exceed Criterion (Using imaginary 30-day period)

Station	Class	Criterion	2016 Data	2016 Model	**diff**
B16	FW2	235	91.1	80.8	**10.3**
B14	FW2	235	86.6	70.7	**15.9**

Model Calibration

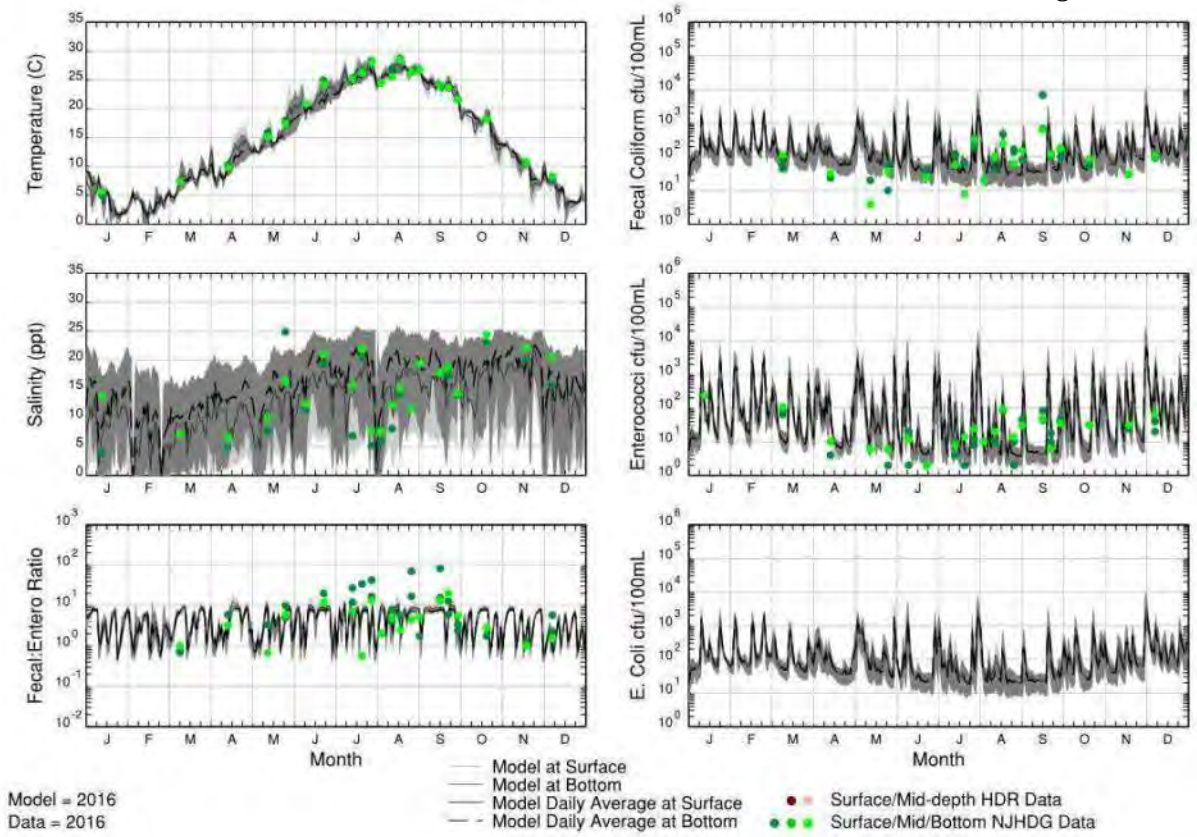


IATERIALS.

RARITAN RIVER

Station: 27

SE1

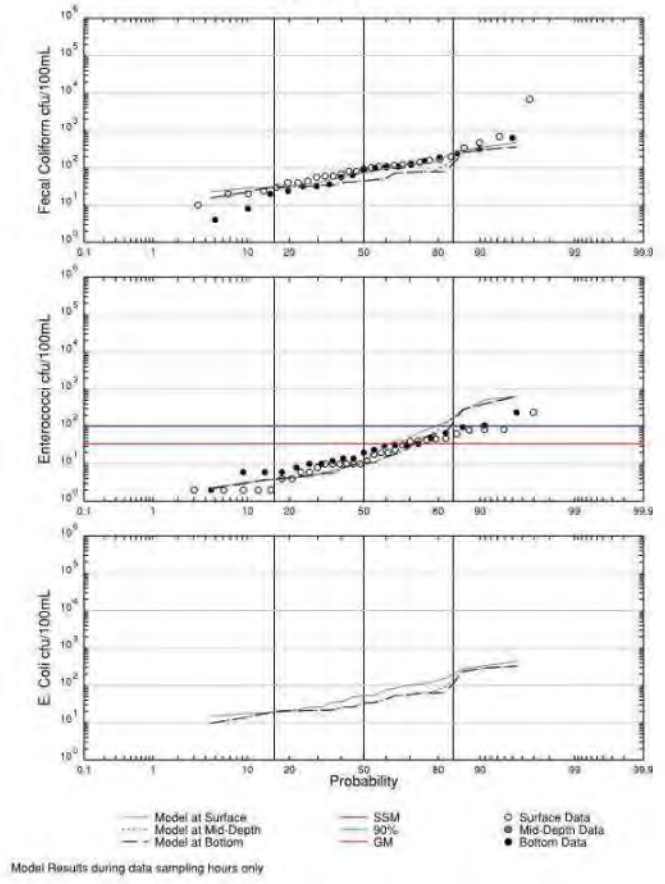


Model = 2016
Data = 2016

RARITAN RIVER

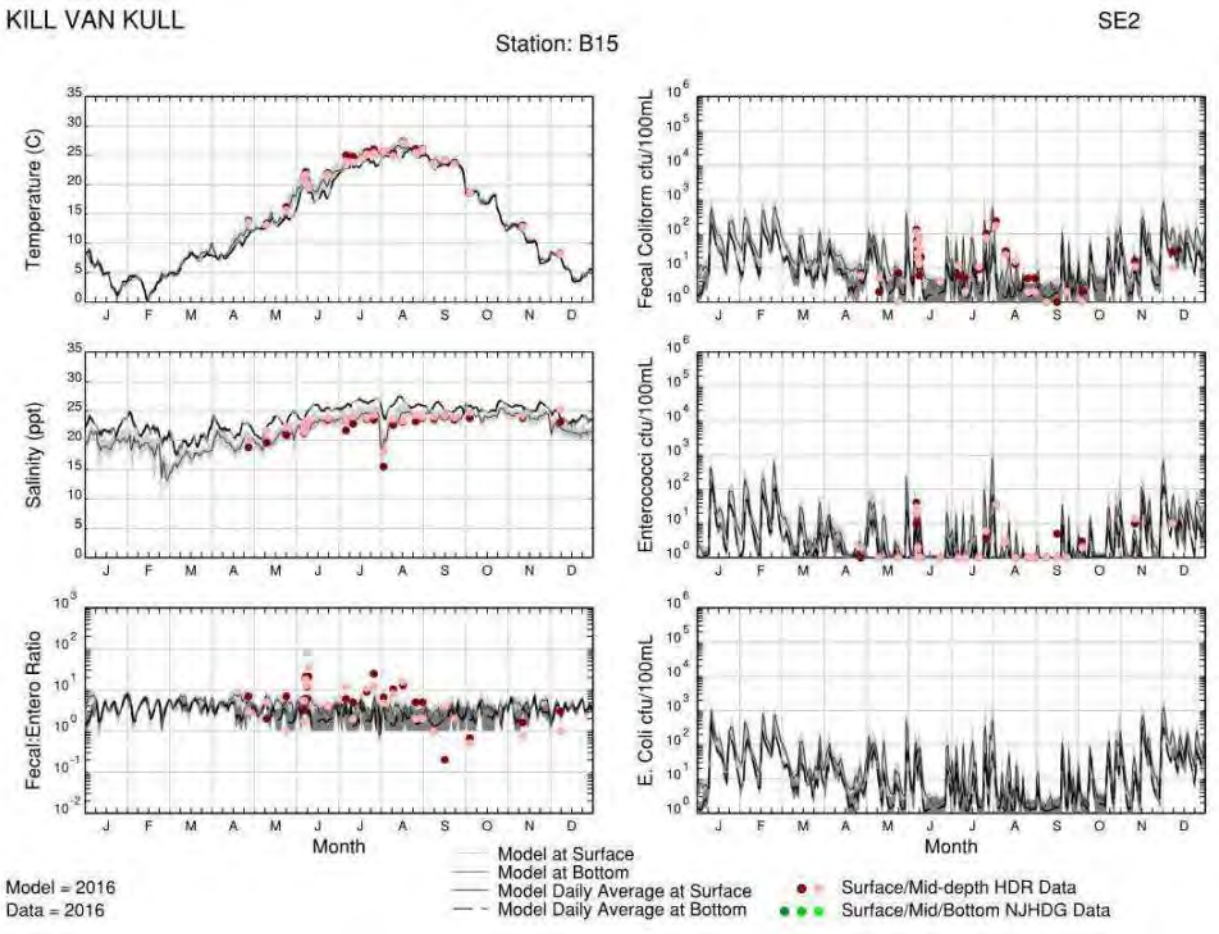
Station: 27

SE1



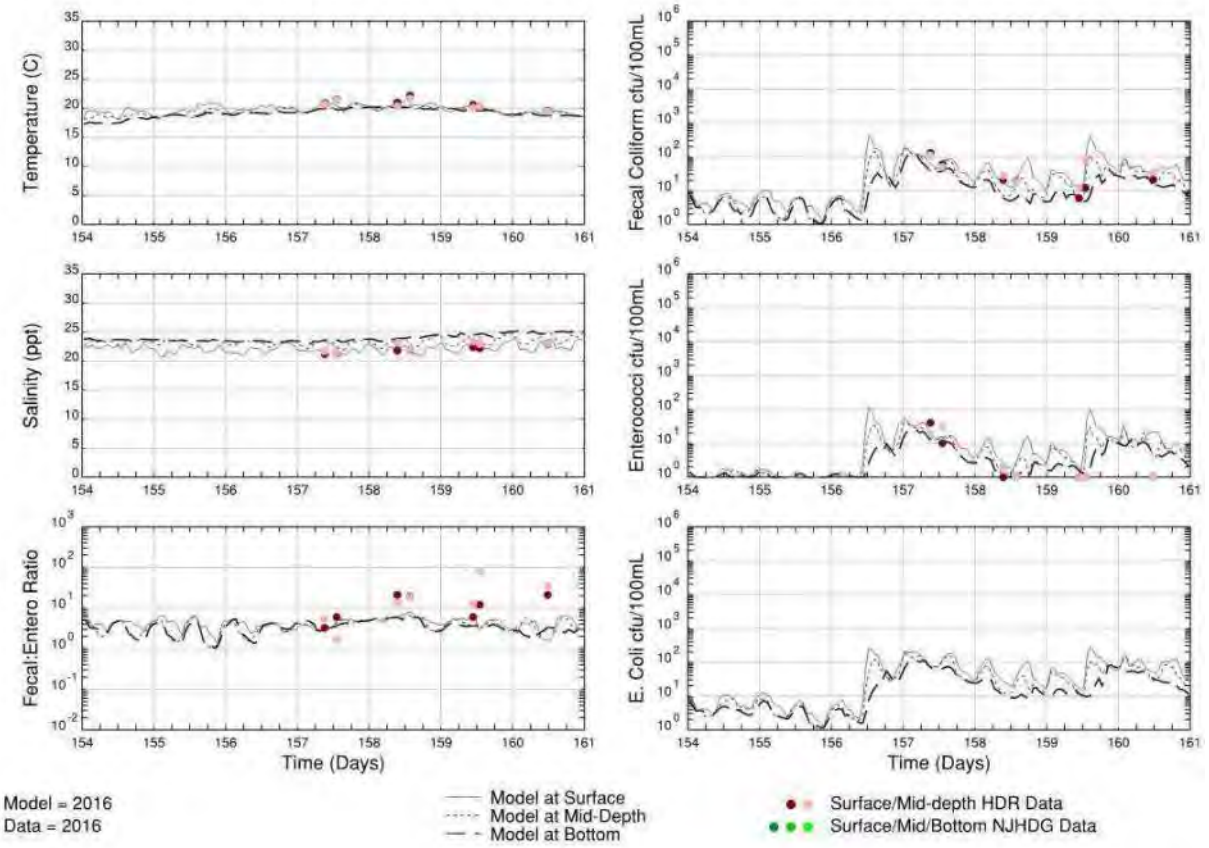
Model Results during data sampling hours only

Model Calibration



Arthur Kill, Raritan River/Bay & Tributaries
Arthur Kill

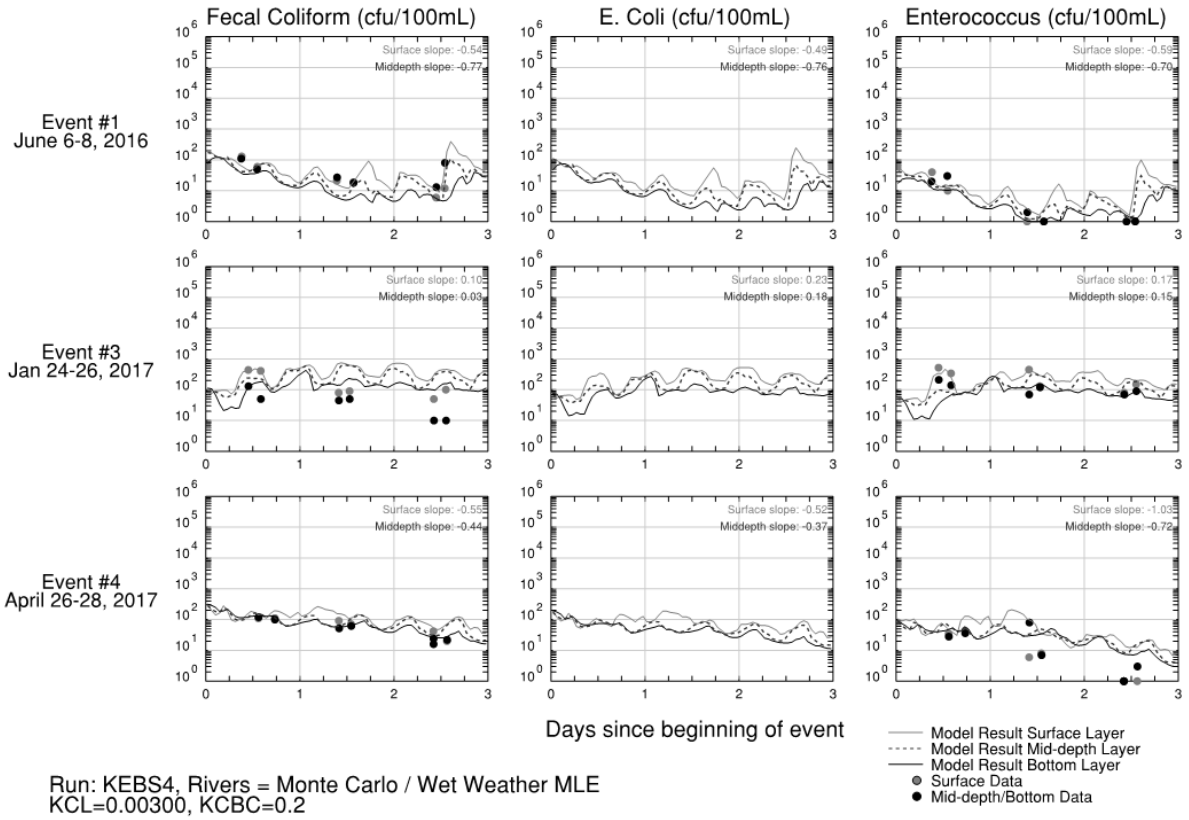
Station: B15 Event 1 (June 3-9)



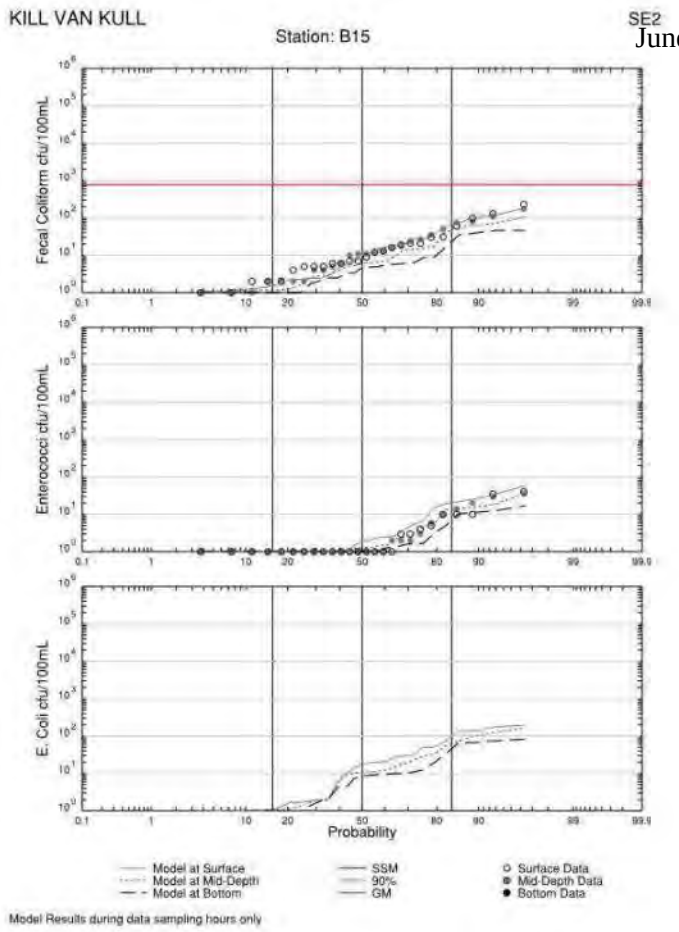
Arthur Kill, Raritan River/Bay & Tributaries
Arthur Kill

Station: B15

SE2



Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Assessment of Model's Ability to Calculate Attainment

- Arthur Kill– GM Criterion – Surface
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
21	SE3	1500	N	N	N	N
23	SE3	1500	N	N	N	N
24	SE3	1500	N	N	N	N
B15	SE2	770	N	N	N	N

Assessment of Model's Ability to Calculate Attainment

- Raritan Bay – GM Criterion – Surface
- Do Data and Model Exceed Criterion (Using imaginary 30-day period)?

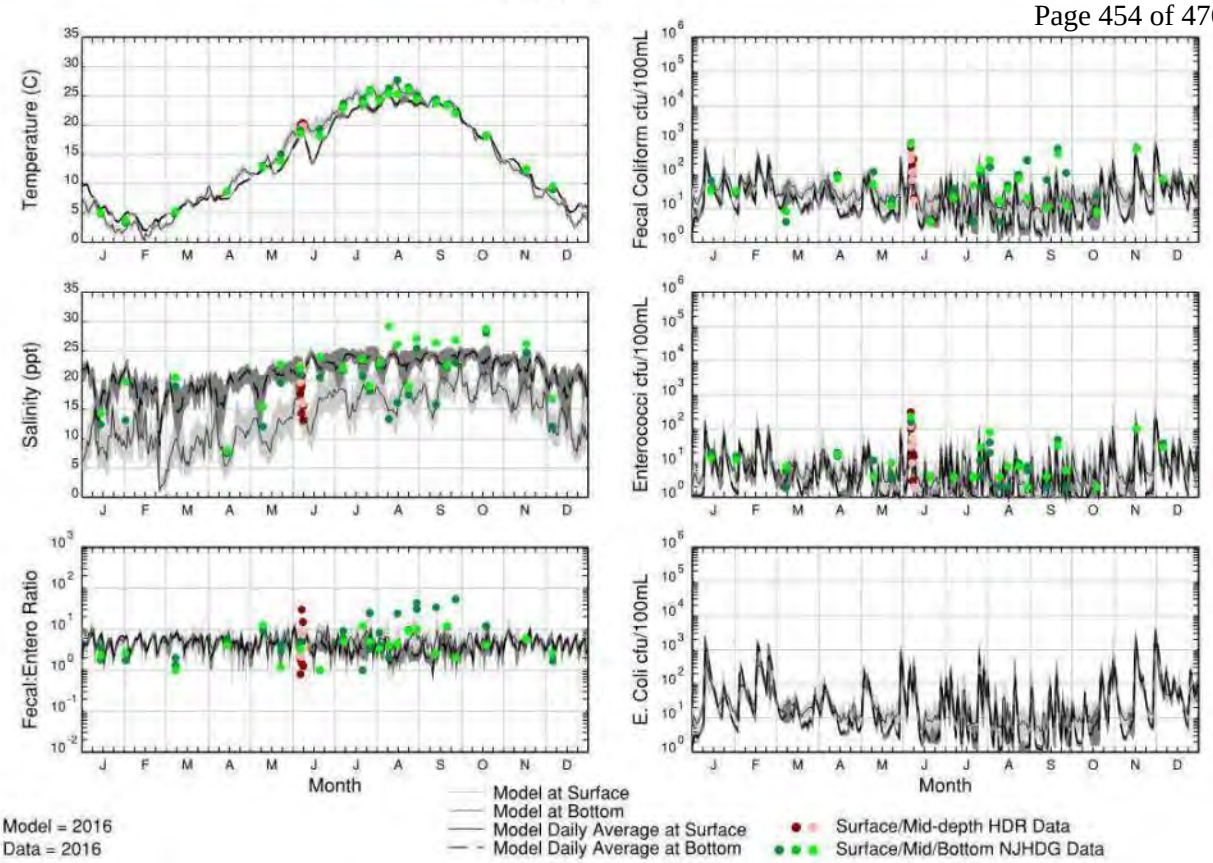
Station	Class	Criterion	2016 Data	2016 Model	2017 Data	2017 Model
28	Shellfish	35	N	N	N	N
29	Shellfish	35	N	N	N	N
30	Shellfish	35	N	N	N	N

Model Calibration

IVE MATERIALS.

HUDSON RIVER

Station: 32

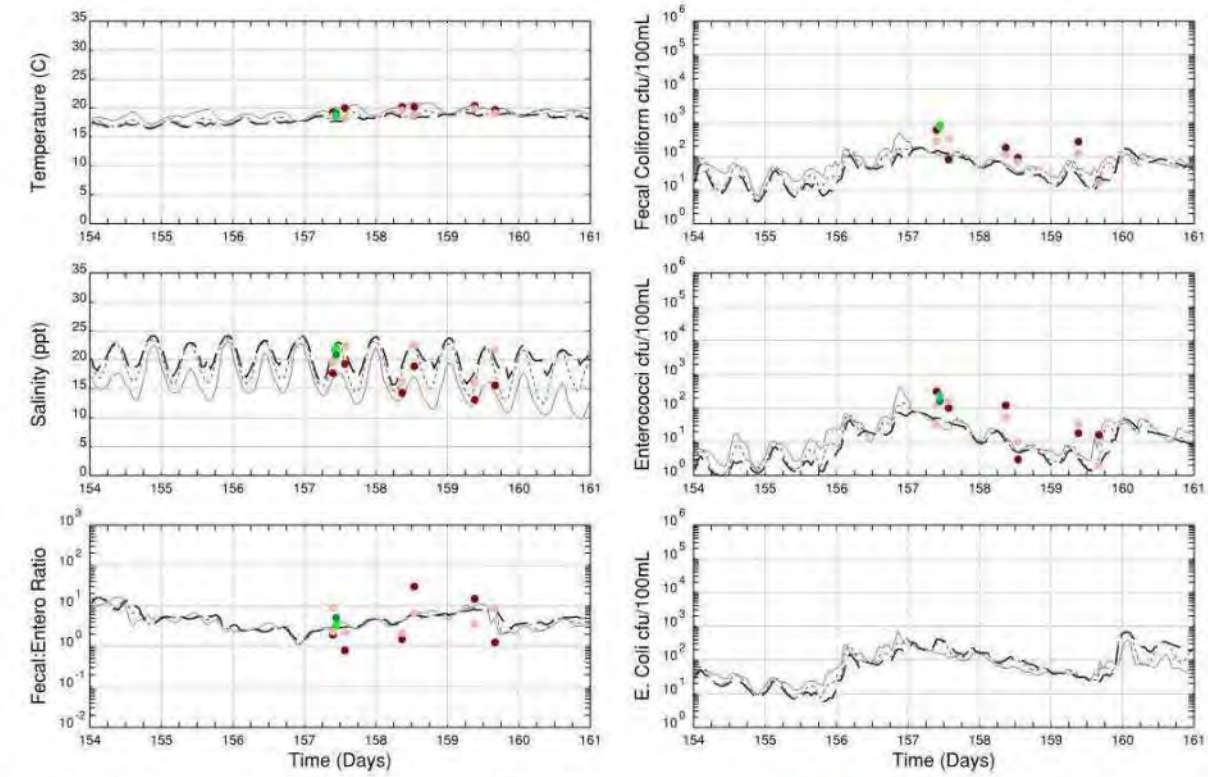


Model = 2016
Data = 2016

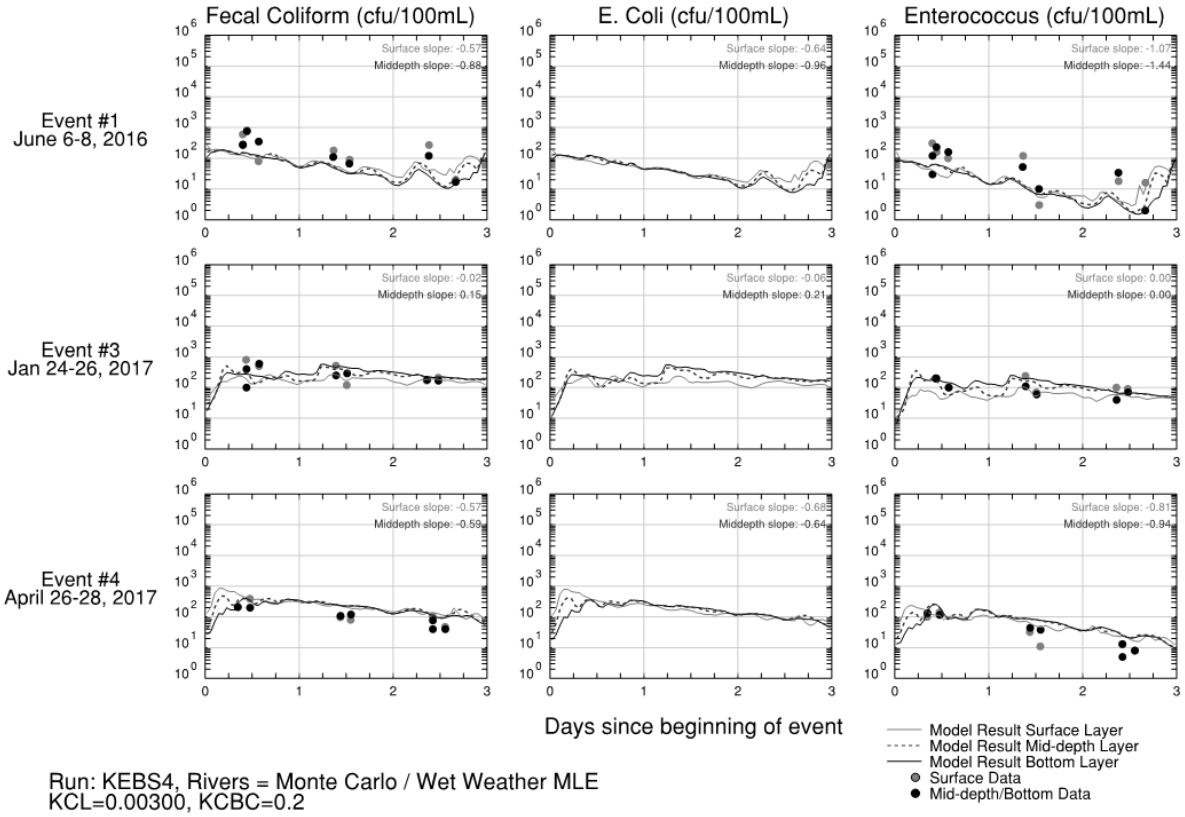
Hudson River, Upper Bay
Hudson River

SE2

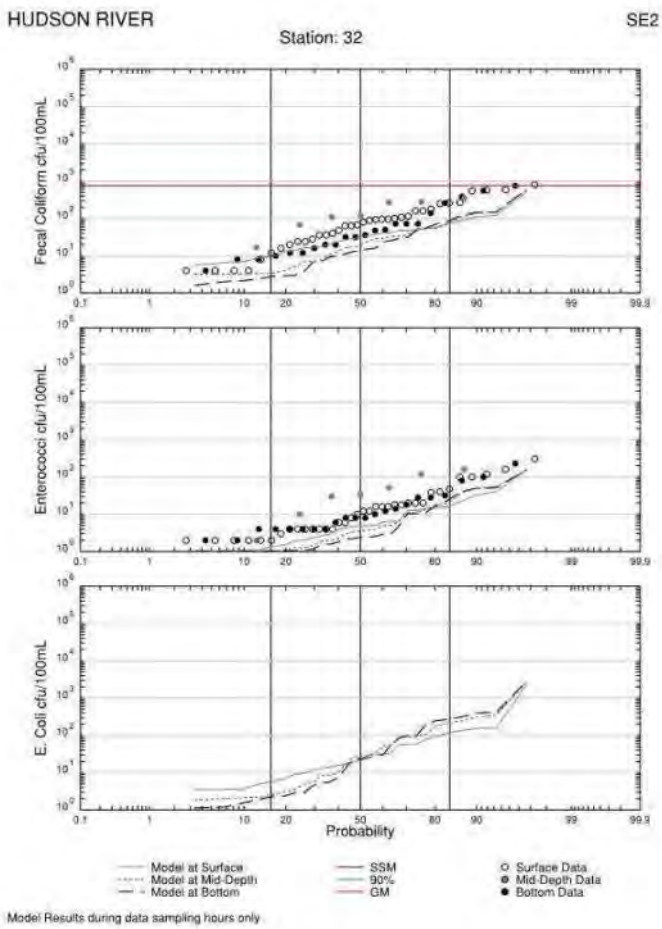
Station: 32 Event 1 (June 3-9)



Model = 2016
Data = 2016

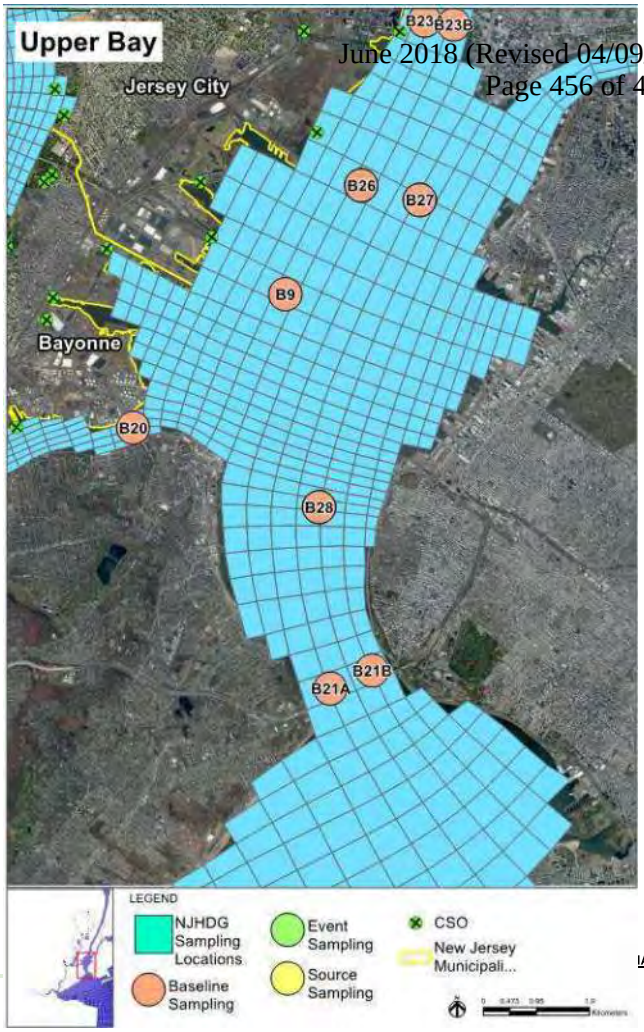


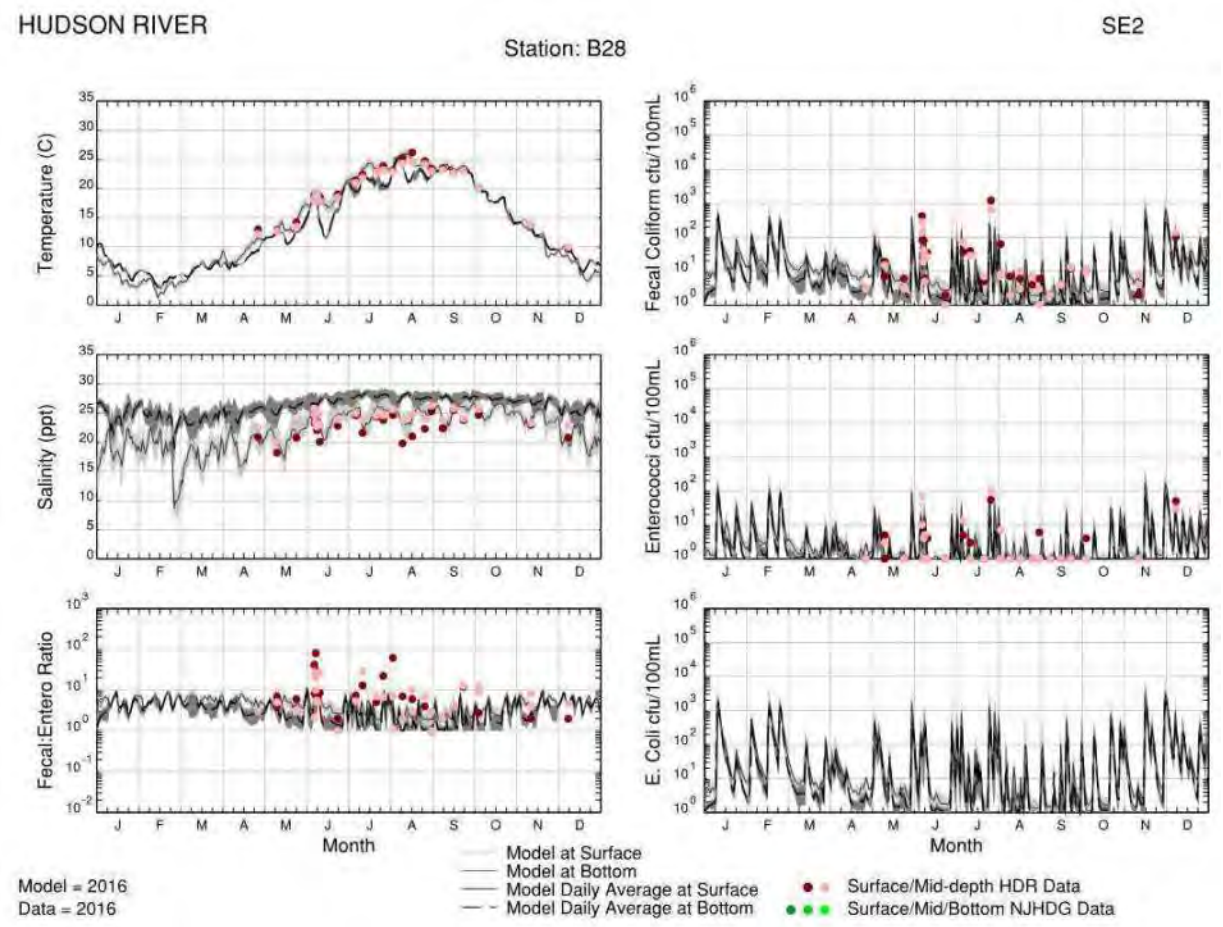
Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Model Results during data sampling hours only

Model Calibration

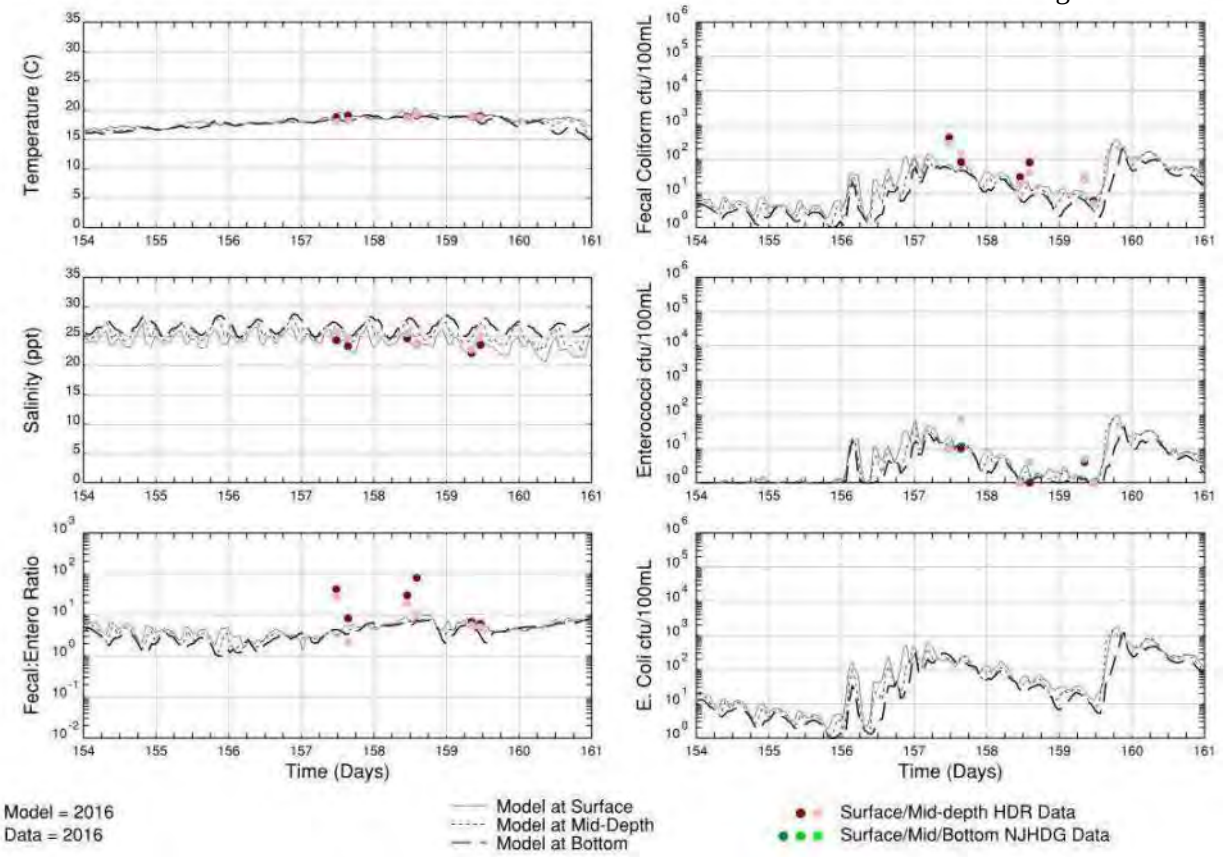




Hudson River, Upper Bay
Upper Bay

Station: B28 Event 1 (June 3-9)

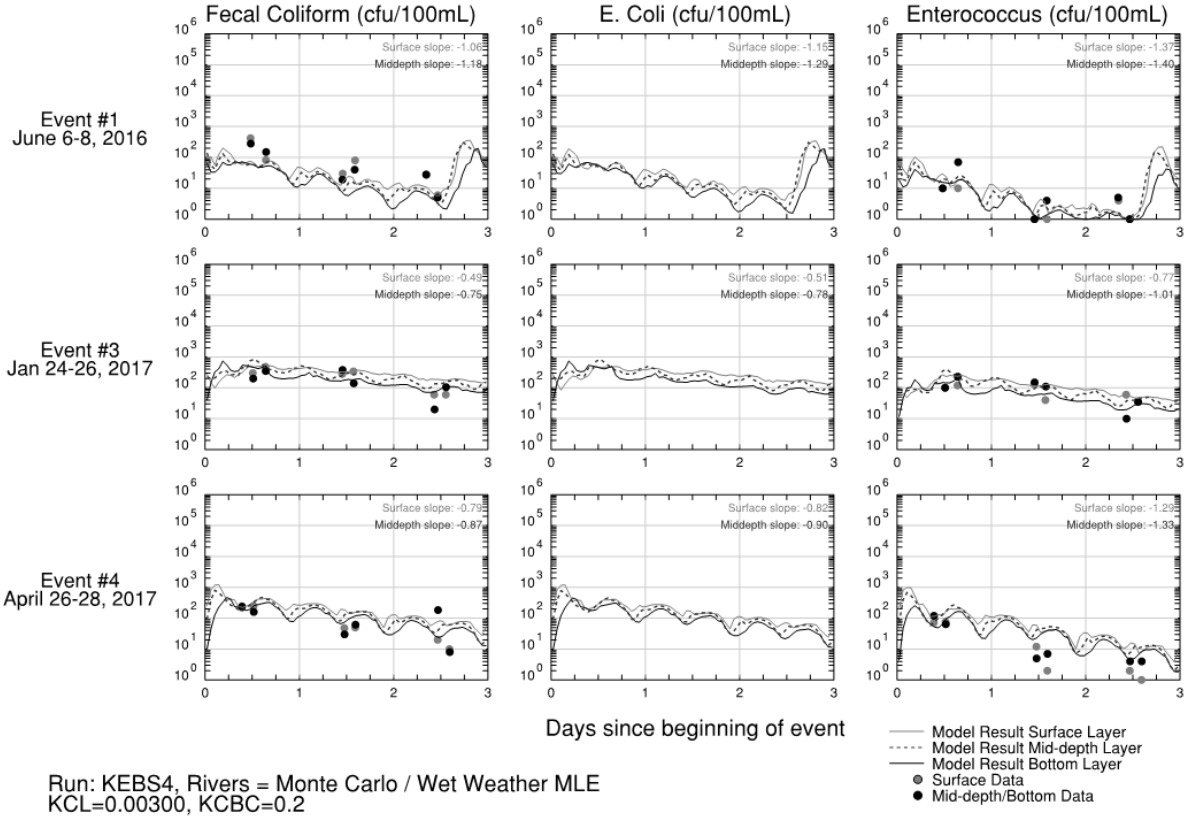
SE2



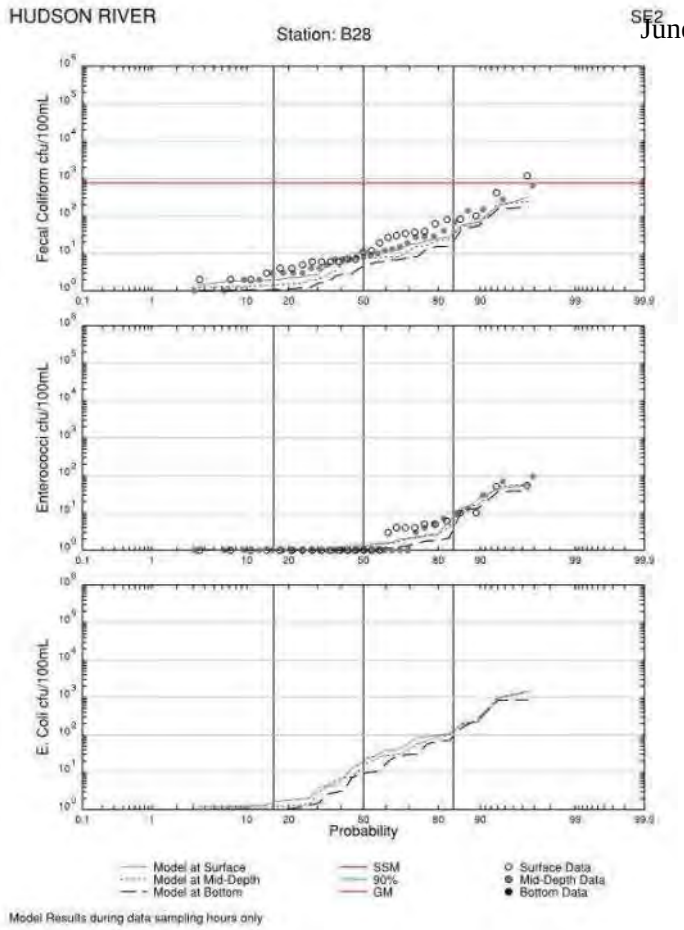
Hudson River, Upper Bay
Upper Bay

Station: B28

SE2



Run: KEBS4, Rivers = Monte Carlo / Wet Weather MLE
KCL=0.00300, KCBC=0.2



Calibration/Validation Conclusions

- The hydrodynamic model successfully reproduces the observed temperature and salinity within the area of interest during the calibration/validation periods.
- The receiving water model generally reproduces the observed fecal coliform, enterococci and E. coli concentrations within the project area during the calibration/validation periods.
- The receiving water model, as developed, will be a useful tool for comparing water quality improvements associated with CSO control alternatives.
- The model can be used to assess attainment of water quality criteria, but is more suited to assess relative attainment of alternatives than absolute attainment.

INTERAGENCY ADVISORY, CONSULTATIVE AND/OR DELIBERATIVE MATERIALS.
NOT SUBJECT TO DISCLOSURE UNDER N.J.S.A 47:1A-1 ET SEQ.
OR THE COMMON LAW RIGHT TO INSPECT PUBLIC RECORDS.

Projection Runs

- Baseline
- Gap Analysis (100% CSO Removal)
- Component Analysis
  - NYC Sources
  - NJ CSOs
  - NJ Non-CSOs
  - Upstream/Downstream Boundary Conditions
  - Dry-Weather Sources
- CSO Control Alternatives
  - Permittee Related (3)
  - Area-Wide
  - Final Selected Plan

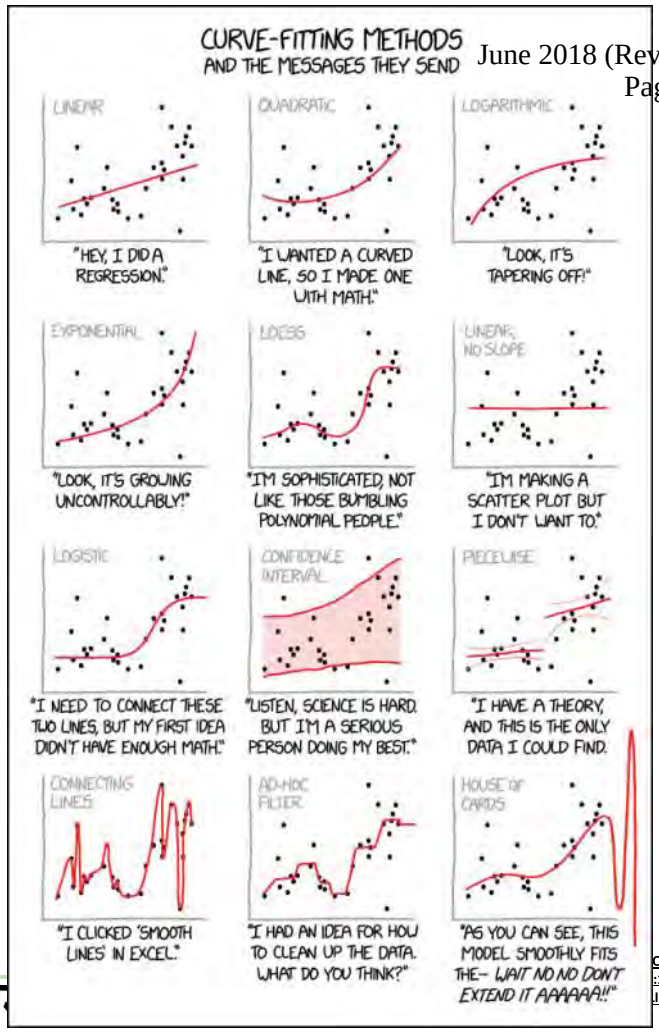
Baseline Conditions

- 2004 Meteorological Conditions
- 2015 Infrastructure
- River Concentrations at Existing Conditions
- Dry-weather loading as is

INTERAGENCY ADVISORY, CONSULTATIVE AND/OR DELIBERATIVE MATERIALS.
NOT SUBJECT TO DISCLOSURE UNDER N.J.S.A 47:1A-1 ET SEQ.
OR THE COMMON LAW RIGHT TO INSPECT PUBLIC RECORDS.

GREELEY AND HANSEN CDM Smith HDR

Final Thoughts or Questions?



From xkcd.com

APPENDIX C

Subcatchment Characteristics

Appendix B:

1. Combined Subcatchment Characteristics (Baseline Model)

Subcatchment ID	Total area (acre)	Width (ft)	% Imperv.	Effective % Imperv.	Slope (%)	Manning's N _pervious	Manning's N _impervious	Depression Storage_ pervious (in)	Depression Storage_ impervious (in)	% of Impervious without Depression Storage	Horton initial (in/hr)	Horton limiting (in/hr)	Horton decay (1/hour)
GU_C1R1C2	33.868	248.3	87.1%	43.6%	0.5	0.05	0.02	0.1	0.05	25%	5	2	2
GU_C3	5.28	81.4	89.1%	44.6%	0.5	0.05	0.02	0.1	0.05	25%	5	2	2
GU_R2	51.426	319	86.4%	43.2%	0.5	0.05	0.02	0.1	0.05	25%	5	2	2
GU_R3	20.439	183.4	80.8%	40.4%	0.5	0.05	0.02	0.1	0.05	25%	5	2	2
NB_1C_1	122.797	537.8	72.8%	36.4%	3	0.05	0.02	0.1	0.05	25%	5	2	2
NB_1C_2	18.315	171.7	52.4%	22.2%	3	0.05	0.02	0.1	0.05	25%	5	2	2

2. RTK Values for the Separate Subcatchments

Subcatchment ID	Total area (acre)	R1	T1	K1	R2	T2	K2	R3	T3	K3
NB_RiverRoad	39.2	0.001	1.000	2.000	0.001	2.000	2.000	0.001	3.000	2.000
GU_C4	13.4	0.001	1.000	2.000	0.001	2.000	2.000	0.001	3.000	2.000

APPENDIX D

NJDEP Comment Letter
Dated October 11, 2018

Email from NJDEP to PVSC
Dated December 06, 2018
Granting 45 day Extension

State of New Jersey

PHIL MURPHY
Governor

SHEILA OLIVER
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
Phone: (609) 292-4860 / Fax: (609) 984-7938

CATHERINE R. McCABE
Commissioner

October 11, 2018

Frank Pestana, Executive Director
North Bergen Municipal Utilities Authority
6200 Tonnelle Avenue
North Bergen, NJ 07047

Alberto Cabrera, Town Clerk
Town of Guttenberg
6808 Park Avenue
Guttenberg, NJ 07093

Re: Technical Comments on "Service Area System Characterization Report"
North Bergen Municipal Utilities Authority, NJPDES Permit No. NJ0029084
Town of Guttenberg, NJPDES Permit No. NJ0108880

Dear Permittees:

Thank you for your submission dated June 2018 as submitted cooperatively by both parties above. The New Jersey Department of Environmental Protection (the Department or NJDEP) acknowledges that North Bergen Municipal Utilities Authority (NBMUA) and the Town of Guttenberg have committed to a single, coordinated Long Term Control Plan. This report contains the appropriate certification statements as indicated in the Department's letter dated July 10, 2018.

NBMUA Woodcliff STP and the Town of Guttenberg submitted a work plan for the System Characterization Report on December 18, 2015 for which the Department provided comments on February 22, 2016. A revised work plan submission was dated March 22, 2016 and was approved by the Department on April 11, 2016.

This letter serves to provide technical comments on your submission.

Overall Objectives of the Sewer System Characterization

The required information for the Sewer System Characterization is included in the NJPDES CSO permit at Combined Sewer Management (CSM) Part IV.G.1. In order to provide a backdrop to some of the technical issues identified in this letter, the Department would like to note the objectives of modeling in relation to the Sewer System Characterization as contained in EPA's Guidance for Long-Term Control Plans (EPA 832-B-95-002). Specifically, once the model is calibrated and verified, the primary objectives of Combined Sewer System (CSS) modeling applications include:

- To predict overflow occurrence, volume, and, in some cases, quality for rain events other than those which occurred during the monitoring phase. These can include a storm event of large magnitude (long recurrence period) or numerous storm events over an extended period of time.

- To predict the performance of portions of the CSS that have not been extensively monitored.

- To develop CSO statistics, such as annual number of overflows and percent of combined sewerage captured as described in the CSO Control Policy.

- To optimize CSS performance as part of Nine Minimum Control (NMC) implementation. In particular, modeling can assist in locating storage opportunities and hydraulic bottlenecks and demonstrate that system storage and flow to the POTW are maximized.

- To evaluate and optimize control alternatives, from simple controls described under the NMC to more complex controls proposed in a municipality's LTCP. An example of a simple control would be to raise weir heights to increase in-line storage. The model can be used to evaluate the resulting reductions in CSO volume and frequency.

NJDEP Technical Review

In light of the above objectives, the Department's comments are as follows:

General Comments

Comment 1: Section I.3, Page 86-88, Subcatchment Area. How was it determined that the number of subcatchments was sufficient to represent the service area for both North Bergen and Guttenberg? Please provide a table with all sub-catchment input parameters for the modeled areas for each subcatchment. The table should include the following parameters: Surface Area, Basin Width, Percent Impervious and Directly Connected Impervious Area (Effective Impervious), Land Slope, Manning's Roughness Coefficients, Infiltration Coefficients and Depression Storage.

Comment 2: Table I-9, Page 98. The table does not provide the duration of overflows. The main objective of running the H&H model is to quantify volume, frequency, and duration of discharge, please refer to the permit requirement at Part IV.G.1.d.iii. Also, prior to the table it is stated that the duration for each discharge can be found in the monthly discharge monitoring reports (DMRs). This statement is confusing and should be deleted since these results are for the typical year which predated any DMR data.

Comment 3: CSO overflow volume is estimated for the typical year 2004, with an average rainfall depth of 48.37 inches, which is significantly less than the previously estimated CSO volume in historic studies for the typical year 1988 with a significantly less rainfall depth. Please provide clarification on how and why there is such a discrepancy in the estimated CSO volume. It is suggested that you re-run the model using the 1988 rainfall with the updated model, provide the results, and provide a comparison analysis.

Comment 4: Part IV.G.1.b of the permit requires a thorough review of the entire collection system that conveys flows to the Woodcliff STP, including areas of sewage overflows. Therefore, the report shall include a discussion of areas that are prone to flooding based on observed and reported incidents, including dates of occurrence, type of storm events that caused the flooding, and antecedent conditions, if known.

Comment 5: Please provide a pie chart depicting the total runoff generated from the NBMUA/Guttenberg combined sewer area and assumed water loss, i.e., water budget. For example, please provide estimated quantities of the total runoff, volume diverted to the combined sewer, direct runoff to nearby receiving waterbodies, evaporation, infiltration, etc.

Specific Comments

Comment 6: Section C.1, Page 29, Wastewater Treatment Facilities. Regarding the re-rating of the treatment plant, while the Department has issued a NJPDES permit modification to authorize the higher flow of 3.46 MGD, please clarify the timing of any plant re-rating. This has a bearing on the Evaluation of Alternatives as due on July 1, 2019.

Comment 7: Table E-2, Page 40. The report cited that a dry weather flow analysis was performed on the Woodcliff STP plant influent flow. Please clarify how the values in Table E-2 were determined and provide the data that was utilized to populate the table. For example, do these values represent an average? In addition, please clarify why there was insufficient information to differentiate the diurnal pattern between weekends and weekdays, given that the STP has an influent flow meter. Finally, please describe how the diurnal patterns were modeled.

Comment 8: Section E.4, Page 41, WWF Analysis. While the methodology used to quantify the wet weather flow is acceptable, the report does not provide a sufficient detailed analysis of the wet weather flow at all monitoring stations. Please include in the appendix all monitoring stations where wet weather flow analyses were conducted.

Comment 9: Table E-3, Page 42. Table E-3 outlines the rainfall events used in the model calibration/validation. First, specify the location of the rain gauge(s) of these rainfall events. Also, please clarify how these rainfall events compare to rainfall captured at other stations within the system.

Comment 10: Table E-3, Page 42. Table E-3 lists the rainfall events selected for model calibration/validation. Please describe the selection process. Please provide the data in tabular format that was utilized to populate Table E-3.

Comment 11: Table E-3, Page 42. Additional justification is needed for selecting the July 31, 2016 rainfall event. This event has the longest duration, 14 hours. Also, both rainfall depth and average intensity are extremely low compared to other shorter events. It is recommended that the July 29, 2016 rainfall event be used as the long duration event and add one of the events listed in Table E-4 for short duration, i.e., July 16, 2016 or July 9, 2016.

Comment 12: Section E.7, Page 42, Rainfall Monitoring Locations and Analysis. This section references that the "New York rain gauge" rainfall data as obtained from NWS ASOS was used as the source for the rainfall analysis. Please specify which New York rain gauge was used.

Comment 13: Section G.3.2, Page 57, Sewer System Quality Sampling Locations. The report states that:

> "The original Quality Assurance Project Plan (QAPP) targeted two CSO locations in the Guttenberg and North Bergen service area and eight stormwater locations that were distributed throughout the PVSC region by municipality and land use. The CSO locations can be seen in **Figure G-1**. The goal of the sampling protocol was to obtain three-wet weather events of sufficient depth, intensity, and duration for valid model calibration at each targeted location. This was the case for all eight stormwater locations; however, only one of the two CSO locations was sampled (location 001A), with the other not sampled at all due to access or other logistical issues (location 004A)."

Please discuss or reference other sections of the report as to how the lack of such data has been addressed and the model was successfully calibrated and validated.

Comment 14: Section G.3.5, Page 59, System Characterization and Landside Modeling QAPP Goals. Please ensure that the listed objectives of the system characterization and modeling agree with these objectives outlined in the Work Plan. The report should be structured to address the objectives of the Work Plan.

Comment 15: Section G.4, Page 59, Sewer System Quality Results. Under Sewer System Quality Results the report states:

> "CSO sampling teams were deployed to CSO sampling location 001A on 7/13/2017 and 8/7/2017 for precipitation events, but no overflows occurred. However, the sampling teams followed the sampling protocols and collected one pre-overflow sample during each event. The results are presented in **Table G-3**. The data represent sanitary flow but may be partially diluted by stormwater."

Please provide justification as to how the data is representative of the sanitary conditions.

Comment 16: Section I.1.1, Page 75, Existing NBMUA Woodcliff Model. Section I.1.1 contains a description of the existing NBMUA Woodcliff Model and the existing Guttenberg model. The discussion in this section focuses on the received models. Please provide either a similar discussion and model input screen for the updated models or clarify that this discussion pertains to the updated models.

Comment 17: Figure I-7, Page 81, Woodcliff STP Model. Only 45 of the 618 manholes were included in the model. Please explain the reasons for not including most of the manholes in the service area in the model and justify the rationale of the ones selected.

Comment 18: Table I-4, Page 87, Impervious and Effective Impervious Area. The information in this table should be broken down by subcatchment. Also, the percent effective imperviousness for both North Bergen and Guttenberg are low considering the urban setting of the service area; please provide further discussion and justification. Also, please provide the land use information for Guttenberg and North Bergen, including the percentage of each type.

Comment 19: Table I-5, Page 87. Please provide additional details as to how the subcatchment unit width was derived.

Comment 20: Section I.3.2, Page 88, Manning's "n" Roughness Coefficients. The report states that initial values were set to 0.02 for impervious surfaces and 0.05 for pervious surfaces. Please provide the final values used after successful model calibration. Please provide the final values used after successful model calibration and a comparison to the range of acceptable literature values.

Comment 21: Section I.3.2, Page 88, Soil Infiltration. It is unclear what soil infiltration value was chosen. Please provide such.

Comment 22: Section I.3.7, Page 89, Rainfall Derived Infiltration and Inflow (RDII). Please provide the RTK values as broken down by subcatchment.

Comment 23: Section I.5.2, Page 92, WWF Calibration. The report states that the acceptable range for simulated wet weather flow volume is within the range of -20% to +20% and the peak flow is within -15% to +25%. Please justify your selection of this range.

Comment 24: Table I-8, Page 93. Please provide all model calibration and validation results for all selected rainfall events, including an analysis of the results. Also, provide a full explanation of any calibration result that is not within the acceptable range.

Comment 25: Figure I-13, Page 95. Please provide enlarged versions of these figures. In addition, please provide the data in tabular format that was utilized to generate these figures.

Comment 26: Section I.6.2, Page 98, Percent Capture. This section should be omitted from this report as it is more applicable in the Development and Evaluation of Alternatives Report, which is to be submitted on July 1, 2019.

Comment 27: Appendix A, Combined Sewer Overflow and Stormwater Sampling Results. Please provide the data in excel format as well.

Please incorporate these changes to the report and submit a revised version to the Department no later than 60 days from the date of this letter.

Thank you for your continued cooperation.

Sincerely,

Joseph Mannick

Joseph Mannick,
CSO Team Leader
Bureau of Surface Water Permitting

C: Marzooq Alebus, Bureau of Surface Water Permitting
Teresa Guloy, Bureau of Surface Water Permitting
Susan Rosenwinkel, Bureau of Surface Water Permitting
Changi Wu, Bureau of NonPoint Pollution Control

Finizio, Marlene

From: Kobesky, Dwayne <Dwayne.Kobesky@dep.nj.gov>
Sent: Thursday, December 06, 2018 2:59 PM
To: McKenna, Bridget; Hope, Michael; Rosenwinkel, Susan; Mannick, Joe; Kempel, Nancy
Cc: Eley, Marques; Sheldon S. Lipke (slipke@SJLConsultants.com); mwitt; Finizio, Marlene; Fang, Yuan; Gibby, Eloise; Dupuis, Timothy J.; David Ksyniak (ksyniakda@cdmsmith.com)
Subject: RE: [EXTERNAL] RE: [EXTERNAL] Technical Comments on the Service Area System Characterization Report

Hi Bridget,

In response to your request for an extension of time, the Department is granting you your request of a 45 day extension to resubmit the System Characterization Reports for the PVSC District and the North Bergen MUA/Guttenberg District Reports to address the comments received from the MEG.

Please let me know if you have any questions.

Dwayne

From: McKenna, Bridget <BMcKenna@PVSC.COM>
Sent: Thursday, December 6, 2018 8:14 AM
To: Kobesky, Dwayne <Dwayne.Kobesky@dep.nj.gov>; Hope, Michael <mhope@greeley-hansen.com>; Rosenwinkel, Susan <Susan.Rosenwinkel@dep.nj.gov>; Mannick, Joe <Joe.Mannick@dep.nj.gov>; Kempel, Nancy <Nancy.Kempel@dep.nj.gov>
Cc: Eley, Marques <MEley@PVSC.COM>; Sheldon S. Lipke (slipke@SJLConsultants.com) <slipke@SJLConsultants.com>; mwitt <mwitt@chasanlaw.com>; Finizio, Marlene <mfinizio@greeley-hansen.com>; Fang, Yuan <yfang@greeley-hansen.com>; Gibby, Eloise <egibby@greeley-hansen.com>; Dupuis, Timothy J. <dupuistj@cdmsmith.com>; David Ksyniak (ksyniakda@cdmsmith.com) <ksyniakda@cdmsmith.com>
Subject: RE: [EXTERNAL] RE: [EXTERNAL] Technical Comments on the Service Area System Characterization Report

Good morning,
PVSC held its 4th MEG meeting yesterday. As a result of comments received from the MEG members, PVSC is respectfully requesting a 45 day extension to resubmit the System Characterization Reports for the PVSC District and the North Bergen MUA/Guttenberg District Reports to address the comments received yesterday.
Should you have any questions regarding this request or require additional information please call or email me.
Thanks very much,
Bridget

Bridget M. McKenna | Chief Operating Officer
Passaic Valley Sewerage Commission | 600 Wilson Avenue | Newark, New Jersey 07105
(P) 973-817-5976 | (F) 973-817-5709 | email: bmckenna@pvsc.com

---

From: Kobesky, Dwayne [mailto:Dwayne.Kobesky@dep.nj.gov]
Sent: Wednesday, December 05, 2018 9:15 AM

To: Hope, Michael <mhope@greeley-hansen.com>; Rosenwinkel, Susan <Susan.Rosenwinkel@dep.nj.gov>; Mannick, Joe <Joe.Mannick@dep.nj.gov>; Kempel, Nancy <Nancy.Kempel@dep.nj.gov>
Cc: McKenna, Bridget <BMcKenna@PVSC.COM>; Eley, Marques <MEley@PVSC.COM>; Sheldon S. Lipke (slipke@SJLConsultants.com) <slipke@SJLConsultants.com>; mwitt <mwitt@chasanlaw.com>; Finizio, Marlene <mfinizio@greeley-hansen.com>; Fang, Yuan <yfang@greeley-hansen.com>; Gibby, Eloise <egibby@greeley-hansen.com>; Dupuis, Timothy J. <dupuistj@cdmsmith.com>; David Ksyniak (ksyniakda@cdmsmith.com) <ksyniakda@cdmsmith.com>
Subject: [EXTERNAL] RE: [EXTERNAL] Technical Comments on the Service Area System Characterization Report

Hi Mike,

Thank you. Receipt confirmed.

Dwayne

From: Hope, Michael <mhope@greeley-hansen.com>
Sent: Tuesday, December 4, 2018 5:09 PM
To: Rosenwinkel, Susan <Susan.Rosenwinkel@dep.nj.gov>; Kobesky, Dwayne <Dwayne.Kobesky@dep.nj.gov>; Mannick, Joe <Joe.Mannick@dep.nj.gov>; Kempel, Nancy <Nancy.Kempel@dep.nj.gov>; DEP NJCSOProgram <NJCSOProgram@dep.nj.gov>
Cc: McKenna, Bridget <BMcKenna@PVSC.COM>; Eley, Marques <MEley@PVSC.COM>; Sheldon S. Lipke (slipke@SJLConsultants.com) <slipke@SJLConsultants.com>; mwitt <mwitt@chasanlaw.com>; Finizio, Marlene <mfinizio@greeley-hansen.com>; Fang, Yuan <yfang@greeley-hansen.com>; Gibby, Eloise <egibby@greeley-hansen.com>; Dupuis, Timothy J. <dupuistj@cdmsmith.com>; David Ksyniak (ksyniakda@cdmsmith.com) <ksyniakda@cdmsmith.com>
Subject: RE: [EXTERNAL] Technical Comments on the Service Area System Characterization Report

Good afternoon.

We are in receipt of the New Jersey Department of Environmental Protection's (NJDEP's) letter, dated October 9, 2018, which transmitted technical comments on the Service Area System Characterization (Report) for the Passaic Valley Sewerage Commission (PVSC) and the Permittees within the PVSC Sewer District. Comment No. 1 and Comment No. 28 have requested the combined sewer overflow and stormwater sampling data to be provided in Microsoft Excel format.

Attached and in response to these comments, on behalf of PVSC and the Permittees within the PVSC Sewer District, please find the requested combined sewer overflow and stormwater data in Microsoft Excel format.

Please note that the revised Report in order to address the remaining NJDEP's comments as transmitted in the above referenced letter will be sent under a separate email.

Thank you,

GREELEY AND HANSEN
Michael J. Hope, P.E.
Managing Director
1700 Market Street, Suite 2130
Philadelphia, Pennsylvania 19103
P: 215.553.7917
greeley-hansen.com

From: Kobesky, Dwayne [mailto:Dwayne.Kobesky@dep.nj.gov]
Sent: Tuesday, October 09, 2018 2:52 PM
To: McKenna, Bridget <BMcKenna@PVSC.COM>; boroughofeastnewark@verizon.net; Newark - Adebowale, Andrea <Adebowalea@ci.newark.nj.us>; 'fmargron@patersonnj.gov' <fmargron@patersonnj.gov>; 'tboyle@baynj.org' <tboyle@baynj.org>; rrussomanno@townofharrison.com; 'Smith, Robert J.' <rsmith@kearnynj.org>; Fpnbmua <fpnbmua@aol.com>
Cc: Rosenwinkel, Susan <Susan.Rosenwinkel@dep.nj.gov>; Alebus, Marzooq <Marzooq.Alebus@dep.nj.gov>; Guloy, Teresa <Teresa.Guloy@dep.nj.gov>; Mannick, Joe <Joe.Mannick@dep.nj.gov>; Ebersberger, Timothy <timothy.ebersberger@dep.nj.gov>
Subject: [EXTERNAL] Technical Comments on the Service Area System Characterization Report

Good Afternoon,

Please find the attached Technical Comments on the Service Area System Characterization Report.

Thank you,

Dwayne Kobesky
New Jersey Department of Environmental Protection
Division of Water Quality
Bureau of Surface Water Permitting
401 East State Street, P.O. Box 420
Mail Code 401-02B
Trenton, NJ 08625-0420
(609) 292-4860
Dwayne.Kobesky@dep.nj.gov

APPENDIX E

NJDEP Comment Letter
Dated February 27, 2019

Email from NJDEP to PVSC
Dated March 29, 2019
Granting 10 day Extension

State of New Jersey

PHIL MURPHY
Governor

SHEILA OLIVER
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
Phone: (609) 292-4860 / Fax: (609) 984-7938

CATHERINE R. McCABE
Commissioner

February 27, 2019

Frank Pestana, Executive Director
North Bergen Municipal Utilities Authority
6200 Tonnelle Avenue
North Bergen, NJ 07047

Alberto Cabrera, Town Clerk
Town of Guttenberg
6808 Park Avenue
Guttenberg, NJ 07093

Re: Review of Revised "Service Area System Characterization Report"
North Bergen Municipal Utilities Authority, NJPDES Permit No. NJ0029084
Town of Guttenberg, NJPDES Permit No. NJ0108715

Dear Permittees:

Thank you for your submission dated January 24, 2019 which contains a revised version of the "Service Area System Characterization Report" as well as a "Summary of Changes" document. The original submission was dated June 2018 and was in response to Part IV.D.3.b.ii of the above referenced NJPDES permit. The New Jersey Department of Environmental Protection (the Department or NJDEP) provided technical comments on your original submission on October 11, 2018 where this revised submission is in response to those comments. The Department acknowledges that both the original and revised submissions were made in a timely manner. This letter is written to provide a determination on your most recent submission.

The Department has conducted a technical review of your revised report and has the following remaining technical comments. Any comments that pertain to the October 11, 2018 document are identified as "Former NJDEP Comment" with the relevant number.

Comment 1: Section D.1.6, Areas Prone to Flooding and Sewer System Backups. As stated in Former NJDEP Comment 4, Part IV.G.1.b of the permit requires a thorough review of the entire collection system that conveys flows to the Woodcliff STP, including areas of sewage overflows. Therefore, the report shall include a discussion of areas that are prone to flooding based on observed and reported incidents, including dates of occurrence, type of storm events that caused the flooding, and antecedent conditions, if known. In response to this comment you provided information for the Town of Guttenberg stating that the "…Borough of Guttenberg does not have records indicating areas prone to flooding or sewer system backups."

The Department is aware of at least three incidences of sewer overflows in Guttenberg. As reported to the NJDEP Hotline on August 11, September 25 and December 21 of 2018 and January 24 and February 4 of 2019, an overflow occurred at a manhole in the Galaxy Towers parking lot at 7200 River Road due to periods of intense rain. Please verify with the Town of Guttenberg as to whether or not these incidents occurred and also confirm with them if they have any known areas or recordkeeping for

flooding incidents. In addition, note that special attention should be paid to any flooding issues when the Development and Evaluation of Alternatives report is prepared as due on July 1, 2019.

Comment 2: Section E.7, Rainfall Event Analysis; Section E.8, Wet Weather Event Selection for Model Calibration and Validation; and Section I.5.2, Wet Weather Flow Calibration/Validation. In the Department's October 11, 2018 letter, the selection of the July 31, 2016 rainfall event was questioned with a suggestion that the July 29, 2016 rainfall event be considered. It is unclear if the July 31, 2016 rainfall event was replaced with the July 30, 2016 rainfall event as indicated in "Table E-4: Top 10 Rainfall Events (Volume Based), 5/20/16-8/10/16"; "Table E-5: Calibration and Validation Rainfall Events" as well as in "Table I-9: Wet Weather Events for Model Calibration and Validation" of the revised report. Please clarify. (Former NJDEP Comment 11).

In addition, please provide justification for only using dates that had data from all 8 rain gauge locations. The geographic region discussed in this report is localized compared to the more regional report containing the other PVSC communities. Please discuss if rainfall variation (specifically for the NBMUA and Guttenberg service areas) is a contributing factor for the decision to want data from all 8 gauges compared to the primary gauge at Newark Airport and the closest gauge (NY Central Park). As noted in Former Comment 11 these two gauges cover both the July 9th and 16th storms which are short duration storms which are under represented in the analysis.

Comment 3: Section I.2.3, Model Evaluation Group. The Department is aware that this subject "Service Area System Characterization Report" is one of the reports that is being reviewed by the Model Evaluation Group and acknowledges that there is a new section in the revised report (Section I.2.3) describing this review. In addition, Appendix B contains summaries and meeting minutes as well as an e-mail from the Model Evaluation Group dated March 6, 2016 regarding Session 1 as held on February 5, 2016. Please provide additional information as to whether or not any other input or formal concurrence or approval has transpired with the Model Evaluation Group regarding Session 2 (March 17, 2017), Session 3 (September 15, 2017), Session 4 (December 5, 2018), or regarding the final "Service Area System Characterization Report."

Comment 4: Section I.3.3, Trunk sewer and Main Interceptor. On page 100 it is stated that "Manning's "n" values in the model are in the range of 0.010 to 0.014." It is further stated on page 100 that the "Manning's "n" may be changed during calibration to account for minor loss or additional sediment depositions in the pipe." Yet Manning's N values were included in Appendix B of the revised report as a standard value of 0.05 for pervious surfaces and 0.02 for impervious surfaces. Please confirm if there were any adjustments to the Manning's values as part of the calibration/validation process. (Former NJDEP Comment 20)

Comment 5: Section I.6.2, Percent Capture. Table I-11 of the revised report is unchanged from the July 2018 report and includes a representation of Percent Capture. This section states that "Wet weather capture was calculated for the CSO communities contributing flows to the NBMUA Woodcliff STP." This table depicts percent capture for the 2004 Typical Year and shows 89% capture for the Woodcliff STP.

As described in the October 11, 2018 letter, the Department objected to inclusion of this information in the July 2018 submission (Former NJDEP Comment 26) based on the rationale that it is more appropriate for the Development and Evaluation of Alternatives Report, which is to be submitted on July 1, 2019. However, because this table is included in the revised report without change the Department is hereby expressing its objections. The Department acknowledges that percent capture is a component of the National CSO Control Policy where this section is referenced within the Presumption Approach as follows:

"ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis."

Similar language is included in the NJPDES permit at Part IV.G.4.f.ii also as one of the criteria for the Presumption Approach:

"ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a hydraulically connected system-wide annual average basis."

While an equation was not provided within Section I.6.2 of the revised report, it appears that the resultant calculations may include separately sewered portions of the municipalities that send flow to the Woodcliff STP in the overall average. Please note the above permit language specifically references the "CSS"; therefore, any percent capture calculation that includes separately sewered communities is in direct conflict with the NJPDES permit and National CSO Control Policy.

Comment 6: Please provide a pie chart depicting the total runoff generated for 2004 from the combined sewer areas and assumed water loss, i.e., water budget (Former Comment 5). To provide further detail on an acceptable option, this chart can be generated for the total runoff generated from the modeled combined sewer area using data exported from the existing conditions hydraulic model simulation for the 2004 representative year precipitation record. The volume of precipitation falling upon the overall combined sewer area can be partitioned into 3 broad components, which is consistent with data available through the modeling software. The total annual surface runoff volume calculated to enter the modeled collection system can be divided into a treated runoff volume and an overflow runoff volume, while the balance of the water budget outflows (i.e. losses), such as evaporation, interception, infiltration, and direct runoff to water bodies, can be classified as overall water losses. In summary, a simple pie chart showing the approximate percentage of treated runoff volume, overflow runoff volume, and water losses within the combined sewer areas would suffice.

Please incorporate these changes to the report and submit a revised version to the Department no later than 30 days from the date of this letter.

Thank you for your continued cooperation.

Sincerely,

Joseph Mannick,
CSO Team Leader
Bureau of Surface Water Permitting

C: Marzooq Alebus, Bureau of Surface Water Permitting
Stephen Seeberger, Bureau of Surface Water Permitting
Teresa Guloy, Bureau of Surface Water Permitting
Susan Rosenwinkel, Bureau of Surface Water Permitting
Adam Sarafan, Bureau of Surface Water Permitting
Chang I Wu, Bureau of Nonpoint Pollution Control

Finizio, Marlene

Subject: FW: Review of Revised CSO System Characterization Report for North Bergen and Guttenberg
Attachments: NBMUA Revised Report 2 27 19.pdf

From: Rosenwinkel, Susan [mailto:Susan.Rosenwinkel@dep.nj.gov]
Sent: Friday, March 29, 2019 12:15 PM
To: Hope, Michael <mhope@greeley-hansen.com>
Subject: Review of Revised CSO System Characterization Report for North Bergen and Guttenberg

I understand this information was never forwarded. Pursuant to our discussion please provide a response to this letter by Monday, April 8.

Thanks,

Susan Rosenwinkel
Bureau Chief
NJDEP-Division of Water Quality
Bureau of Surface Water Permitting
401 E. State St, P.O. Box 420
Mail Code 401-02B
Trenton, NJ 08625-0420
Tel: (609) 292-4860
Susan.rosenwinkel@dep.nj.gov

From: Mannick, Joe
Sent: Wednesday, February 27, 2019 11:00 AM
To: Frank Pestana <FPestana@nbmua.com>; 'townclerk@myguttenberg.com' <townclerk@myguttenberg.com>
Cc: Rosenwinkel, Susan <Susan.Rosenwinkel@dep.nj.gov>; Alebus, Marzooq <Marzooq.Alebus@dep.nj.gov>; Seeberger, Stephen <Stephen.Seeberger@dep.nj.gov>; Sarafan, Adam <Adam.Sarafan@dep.nj.gov>; Wu, Chang I. <Chang.I.Wu@dep.nj.gov>; Guloy, Teresa <Teresa.Guloy@dep.nj.gov>
Subject: Review of Revised CSO System Characterization Report for North Bergen and Guttenberg

Good Morning,

Please find the attached review of revised CSO system characterization report letter.

Joe Mannick,
CSO Program Coordinator
New Jersey Department of Environmental Protection
Division of Water Quality
Bureau of Surface Water Permitting
Ph: 609.292.4860