Update on Wetland Groundwater Treatment System

Former Sinclair Refinery
Wellsville, New York

October 21, 2009

Agenda

- Introductions
- Project Team
- Site Background Information
- Project History/Regulatory History
- Remedial Design Components
- Basis of Design : Wetland Groundwater Treatment System (WGTS)
- Construction/Operational Status : WGTS
- Performance Monitoring Results : WGTS
- Proposed Path Forward/Monitoring
- Q and A

Objectives of Meeting

- Provide description of Wetland Groundwater Treatment System to NYSDEC
- Summarize SPDES sampling data
  - December 2008- April 2009
  - June 2009- October 2009
- Expectations for wetland maturity
- Path Forward

Project Team

- Atlantic Richfield : Project Manager, Eric Larson
- URS : Design, Construction Oversight, Marty Schmidt
- NAWE : Wetland Design, Scott Wallace
- COMPASS : Phase II-1 Wetland Construction
- ENVIROCON : Phase II-2 Construction

Site Background Information

- Location
  - Wellsville, NY
  - Former Sinclair Refinery now occupied by Alfred State College campus on North Parcel
  - 110 acre site adjacent to Genesee River
  - Majority of site within 100 yr floodplain


GENESEE RIVER
OU 1
OU 2
FORMER SINCLAIR REFINERY
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Project History/Regulatory History

- Project History
  - 1901 to 1958 : Operated as refinery (Sinclair Wellsville Refinery)
  - 1958 : Second major fire destroyed Sinclair Refinery
  - 1968 : Alfred State College begins operation
  - 1983 : Placed on National Priority List
    - Record of Decisions (1985 and 1991)
    - Operable Unit 1 : Central Elevated Landfill Area
    - Operable Unit 2 : Site Wide Subsurface Groundwater
  - 1985 – ongoing : Investigation, Design, Remediation of OU 1 and OU 2

Project History/Regulatory History

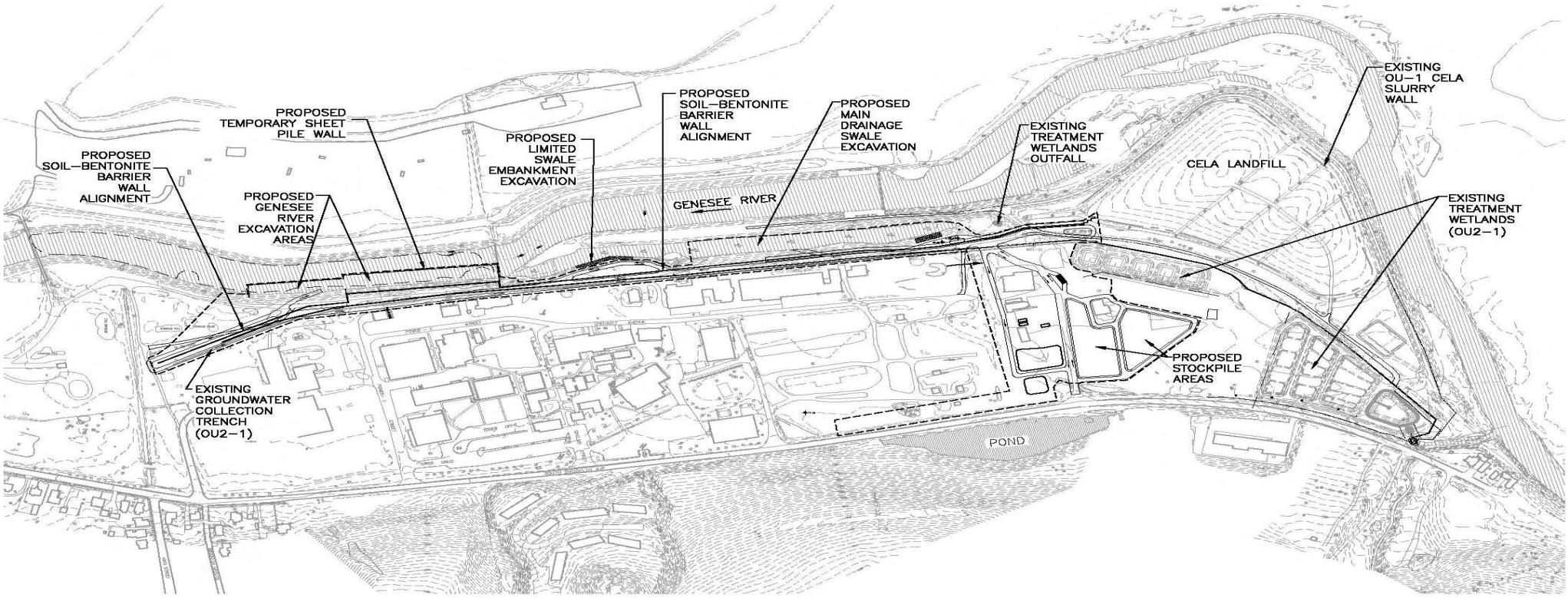
- Operable Unit 1 : CELA Landfill
  - 1992: Closure of landfill (slurry wall, multi media cap)

- Operable Unit 2 : Site Wide Subsurface Groundwater
  - 1990s: Air sparge/Soil Vapor Extraction
  - 1999 – 2008: Groundwater extraction/treatment using GAC
  - December 2008: Groundwater Treatment using wetlands initiated
  - April 2009: USEPA approves Phase II-2
  - May 2009: Upgrades to Groundwater Collection System and Wetlands
  - August 2009: NYSDEC approving extension for SPDES sampling / modified parameters

Operable Unit 2 :Remedial Design Components

- Downgradient groundwater collection trench (3,000 ft)
- Groundwater conveyance system (8 manholes with pumps and conveyance line)
- Wetland Groundwater Treatment System (Sed Pond, SFW , VFW)
- Permanent sheet pile along midslope (800 ft)
- Excavation of sediment in Main Drainage Swale (2,500 cu yds)
- Excavation of bank soils and sediment in Genesee River (temporary sheet pile and 5,800 cu yds)
- Onsite disposal of all sediment/soils in CELA
- Restoration and reuse of WAG Trail/CELA area
- Downgradient Soil-Bentonite barrier wall
- S-B Wall installation deferred pending groundwater capture results
- Performance Based Groundwater Monitoring Report in December 2009

Operable Unit 2 :Remedial Design Components

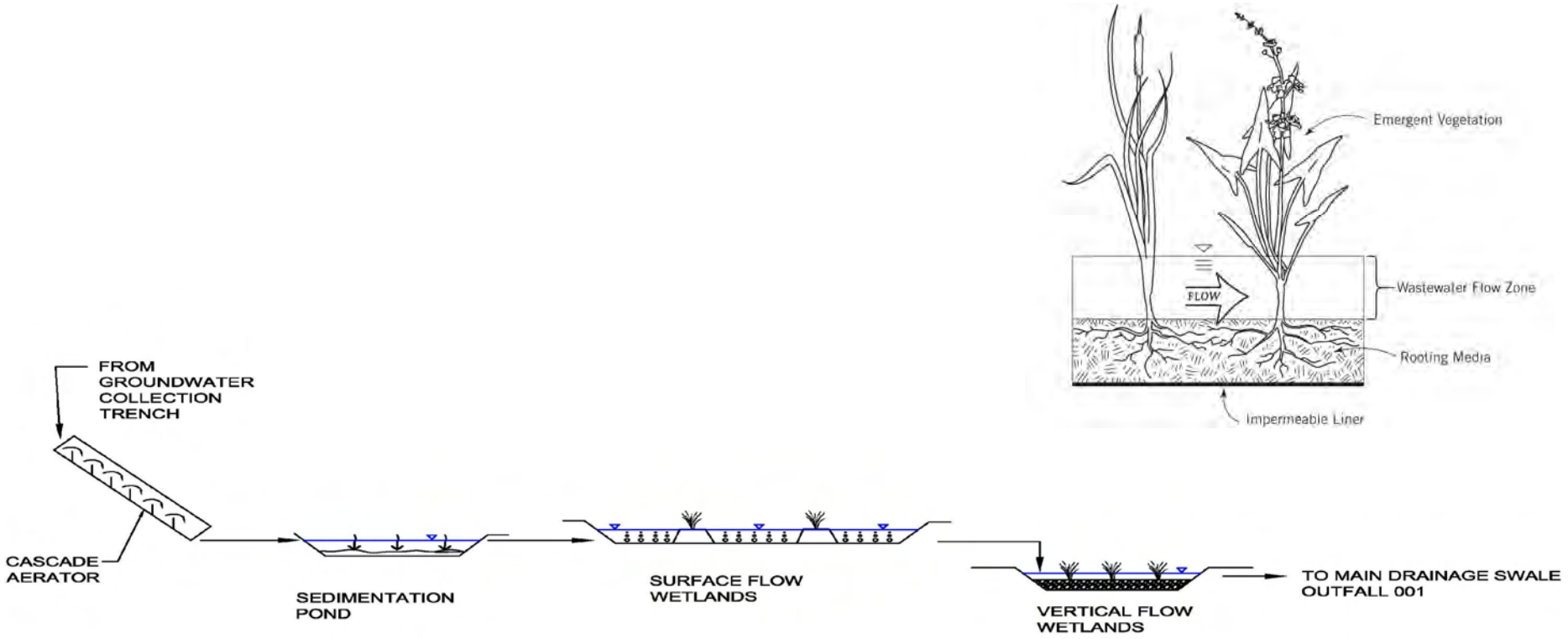


Wetland Groundwater Treatment System

- Basis of Design:
  - Multi stage aerobic process to remove organics and metals in extracted groundwater
  - Constituents of Interest (COI) from site wide groundwater analytical data
  - Use of site layout and topography to facilitate hydraulic profile
  - Design flow rate : 80-150 gpm, 14 day retention time
  - 2-3 year growth period for optimal wetland plant development

- Design Components:
  - Cascade Aerators
  - In ground Biofilter (odor control)
  - Sedimentation Pond
  - Surface Flow Wetlands (3 ponds)
  - Vertical Flow Wetlands (5 ponds)

Wetland Design Schematic Drawings



Cascade Aerators

- Purpose :
  - Oxidize metals (Fe, Mn) and allow precipitate to settle out
  - Gas exchange for organic removal (Volatile and Semi-volatile cpds)

- Design Features :
  - Divides flow equally from conveyance line discharge and splitter structure
  - 4 - 18 inch diameter, corrugated metal pipes
  - Discharges into sedimentation pond
  - In ground Biofilter added to control odors at Cascade Aerators

Cascade Aerators Summer 2008

Cascade Aerators Summer 2009

Biofilter Summer 2009

Biofilter Summer 2009

Sedimentation Pond

- Purpose:
  - Allow settling of oxidized metal precipitates
  - Periodic removal of iron sludge for drying/disposal
- Design Features:
  - 60 mil lined pond, rip rap edges, concrete bottom
  - 18,000 sq ft
  - Discharges to surface flow wetlands via gravity feed drain
  - Floating silt curtain panels added to trap oxidized metal precipitates

Sedimentation Pond Spring 2009

Sedimentation Pond Summer 2009

Open Water, Surface Flow Wetlands (SFW)

- Purpose :
  - Aeration to remove organic compounds
  - Biodegradation to remove organic compounds
  - Supplemental metals precipitation and filtering of suspended solids

- Design Features :
  - 3 pond structures, each having :
    - 3 active aeration basins
    - 2 benches for microbial growth, plant rhizosphere development
    - SFW-1: 33,000 sq ft
    - SFW-2: 29,000 sq ft
    - SFW-3: 29,000 sq ft
  - 60 mil lined pond bottom/slopes, soil benches, vegetated edges
  - Discharges to vertical flow wetlands via gravity feed drain
  - Benches planted with cattail root stock (Typha angustafolia), 1 plant each 4 sq ft in Sept 2008
  - Benches replanted with live cattail transplants (Typha a.), 1 plant each 4 sq ft in April 2009
  - 50-60 % growth expected year 1
  - 80 % growth expected year 2
  - 100 % growth expected year 3

SFW Bench Planting Fall 2008

SFW Bench Replanting Spring 2009

SFW Bench Replanting Spring 2009

SFW Summer 2009

SFW Summer 2009

SFW Aeration Spring 2009

SFW Aeration Spring 2009

SFW Aeration Summer 2009

Open Water, Vertical Flow Wetlands (VFW)

- Purpose :
  - Restoration of alkalinity lost from metal precipitation
  - Supplemental suspended solids removal

- Design Features :
  - 5 pond structures, each having :
    - 1 passive limestone gravel aeration basin
    - Gravel surface planted for microbial growth/rhizosphere development
    - 60 mil lined bottom/slopes, vegetated edges
    - Discharges to outfall 001 via siphon drains, pulsation
    - Main Drainage Swale receiving body which drains to Genesee River
  - 29,000 sq ft
  - Limestone beds planted with cattail root stock (Typha sp), 1 plant each 4 sq ft in September 2008
  - 50-60% growth expected year 1
  - 80 % growth expected year 2
  - 100 % growth expected year 3

VFW Limestone Bed Planting Fall 2008

VFW Spring 2009

VFW Summer 2009

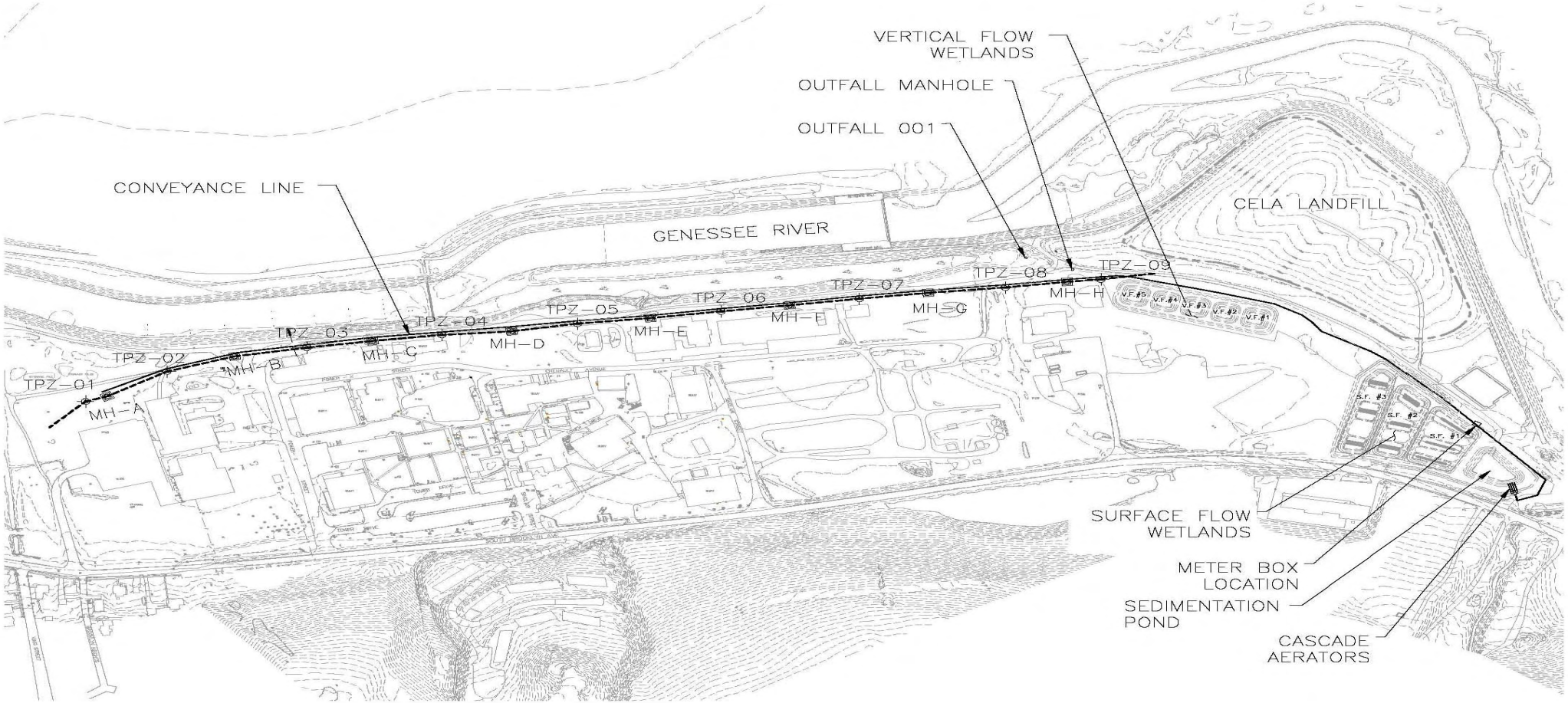
Construction of Wetland Treatment System 2007/2008

- Sequence of Work Completed
  - April – October 2007: Groundwater collection trench/sumps and sedimentation pond
  - April – August 2008: Conveyance lines, Cascade aerators, Surface flow wetlands, Vertical flow wetlands, Sedimentation pond repair, Outfall 001
  - September 2008: Water balance testing
  - September 2008: Surface and Vertical flow wetland plantings (dormant cattail root stock only)
  - December 2008: Conveyance sumps cleaning and wiring
  - December 5, 2008: System Start Up and optimization

Construction of Wetland Treatment System 2009

- Sequence of Work Completed
  - March 2009: Aeration system installed in Surface flow wetlands
  - April 2009: Conveyance line upgrades (cleaning, wyes, flow meters, distribution line modifications)
  - May 2009: Surface flow wetland live cattail replanting
  - May 2009: Aeration line repairs
  - May 2009: Meeting with NYSDEC to discuss SPDES and update on Wetland Treatment System
  - June 2009: Installation of Biofilter
  - June 2009: System Start Up
  - August- October 2009: Main Drainage Swale Remediation
  - October 2009: Phase II-2 work suspended

Conveyance / Wetland Treatment System



Current Operational Status of Wetland Groundwater Treatment System

- December 2008 : Start up
  - weekly influent/effluent sampling for current parameters and proposed SPDES parameters
  - weekly discharge flow monitoring
- Dec 2008 – April 2009 : Pumping system optimization
- April 16, 2009 : System shut down for maintenance and repairs:
  - aeration lines in SFW leaking
  - aeration lines in SFW need tie down
  - camera survey and conveyance line cleaning
  - replace tees with wyes in conveyance line
  - install Biofilter odor control at Cascade aerator structure
  - install new flow meters in MHs A - F
  - surface flow wetland replanting
  - vertical flow wetland discharge line leveling
- May 13, 2009 : NYSDEC meeting to discuss operations

Current Operational Status of Wetland Groundwater Treatment System

- June 3, 2009: System start-up
- August 2009: Amended monitoring program for SPDES sampling
  - Weekly influent / effluent sampling for revised parameters (June – August 2009)
  - Monthly influent / effluent sampling for revised parameters (September 2009 – June 2010)
  - Annual influent / effluent sampling on 12th month for full list (BOD, TSS, TDS, TKN, etc.)

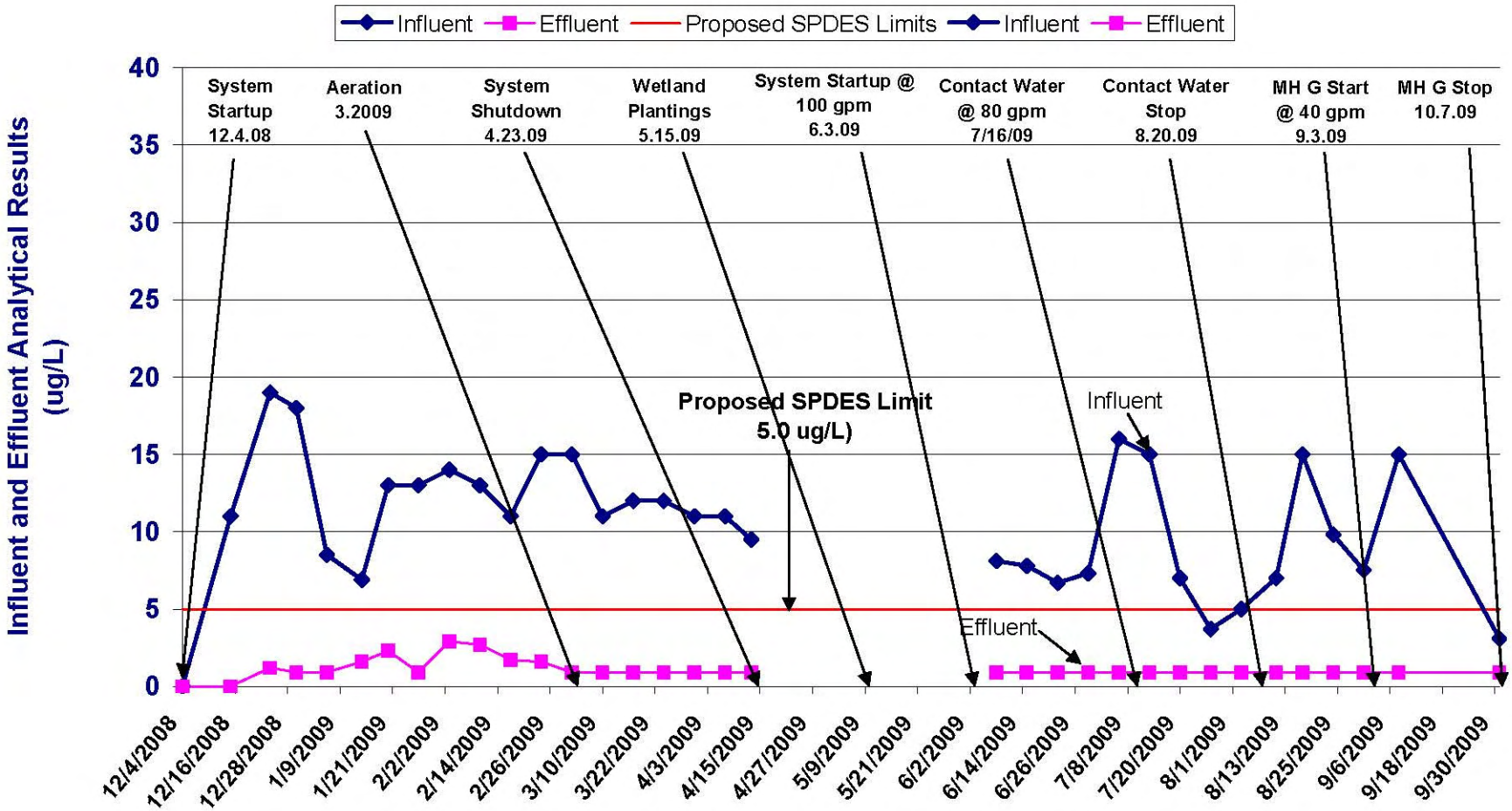
Performance Monitoring Data Review
June 2009 through October 2009

- Data collected:
  - Weekly grab samples (06/03/09 – 09/06/09)
  - Monthly grab samples (10/06/09 – 06/06/10)
  - Revised parameters
  - Reported to USEPA and NYSDEC
- Summary of Data Trends (SPDES Permit Limits):
  - COI concentrations in influent above SPDES limits:
    - VOCs: Benzene, Ethylbenzene, and Xylene (occasionally exceed)
    - SVOCs: Aniline and Nitrobenzene
    - Metals: Iron and Manganese
  - COI concentrations in effluent below SPDES limits:
    - VOCs: All - Non Detect
    - SVOCs: All - Non Detect
    - Metals: Iron and Arsenic Non Detect

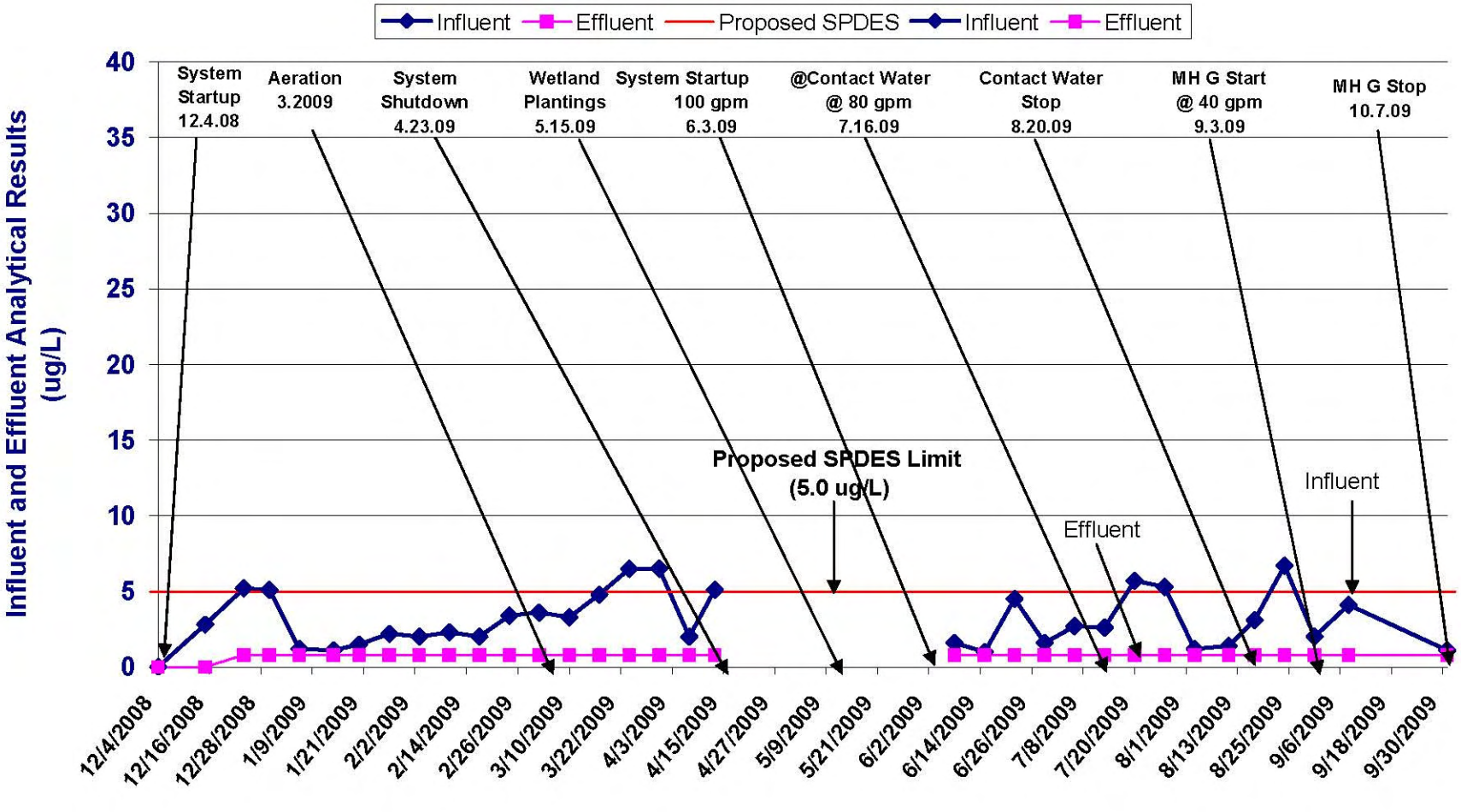
TREND MAPS

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Aniline
- Nitrobenzene
- 2-Methylnaphthalene
- Iron
- Manganese
- pH

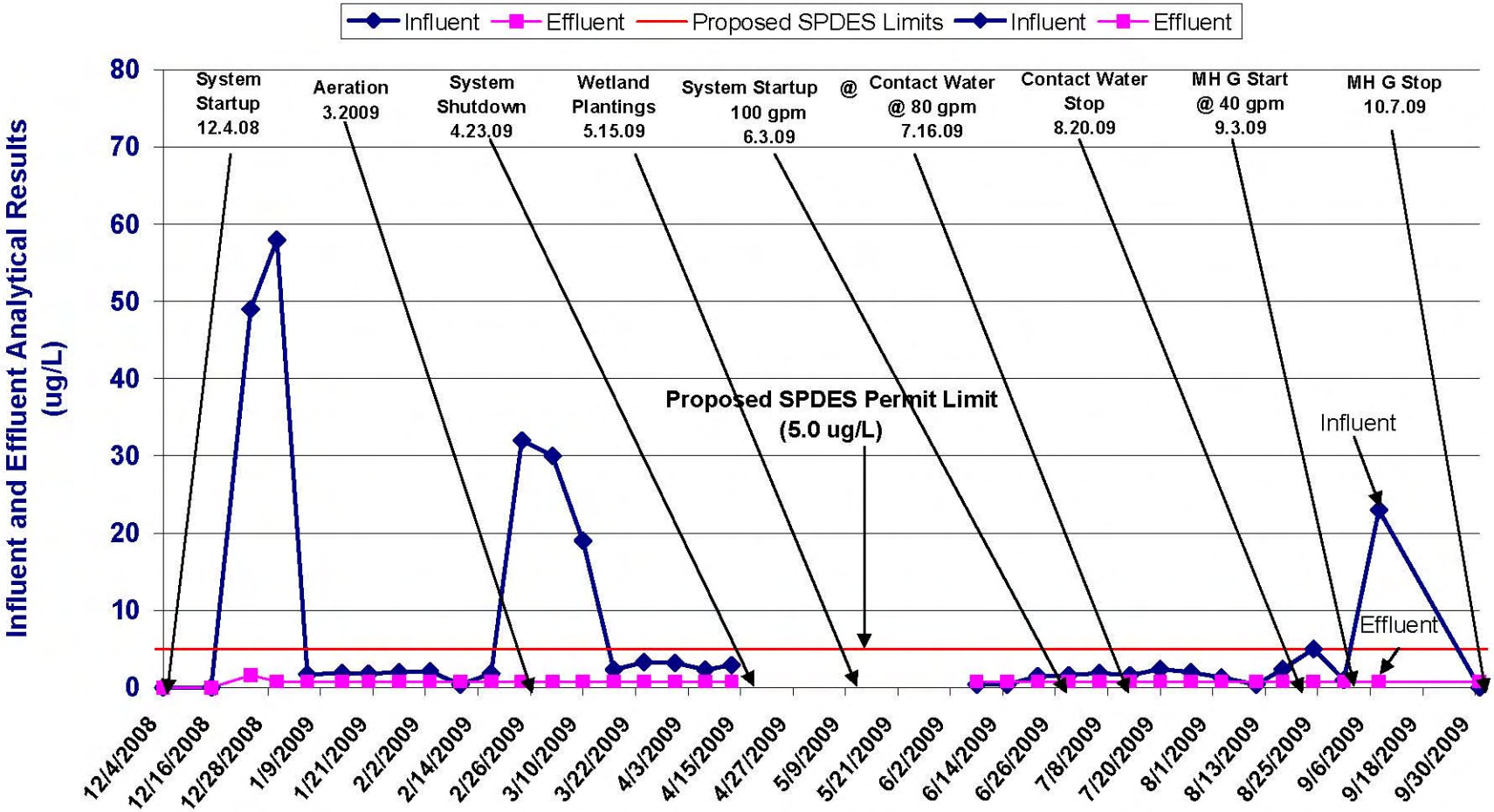
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Benzene



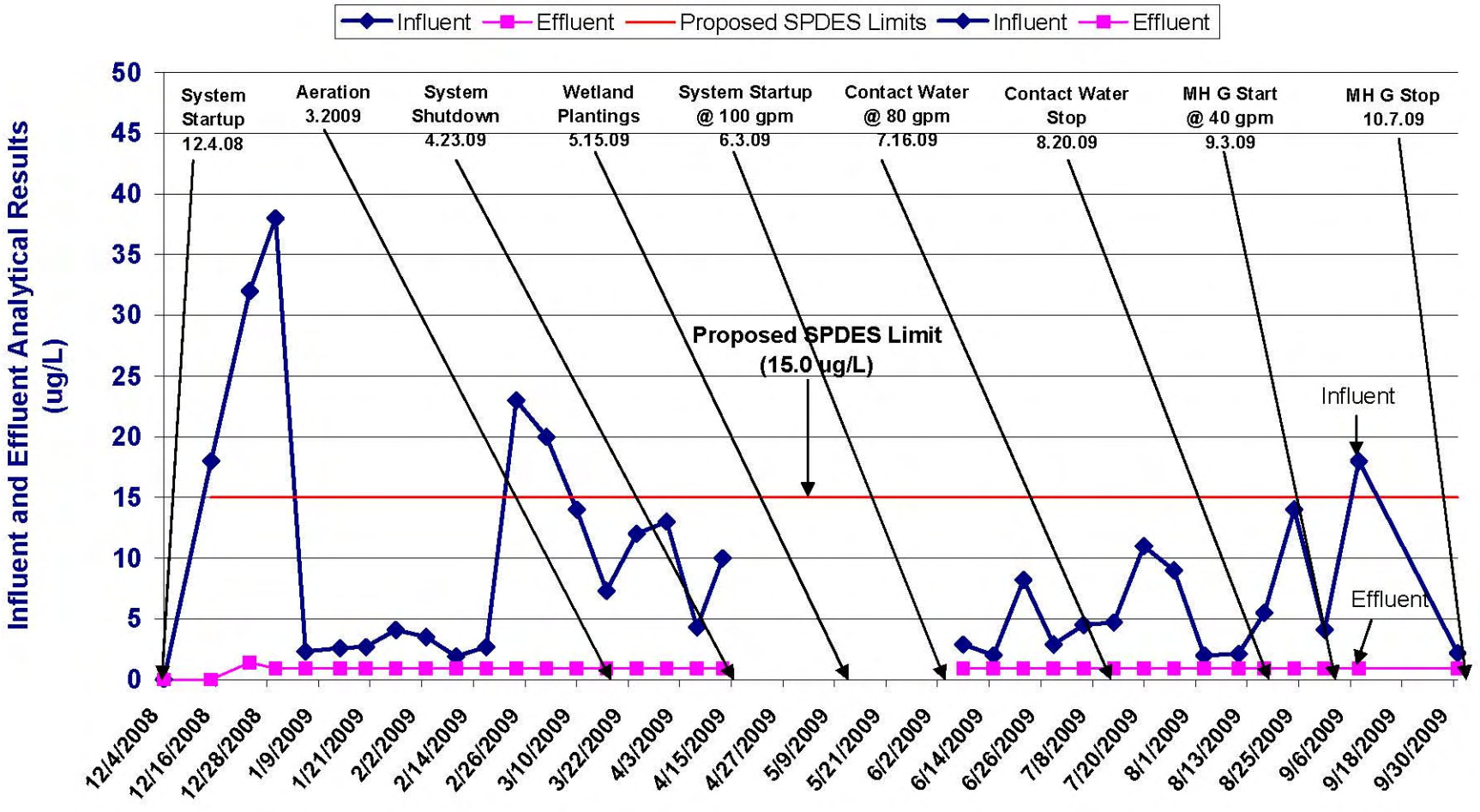
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Toluene



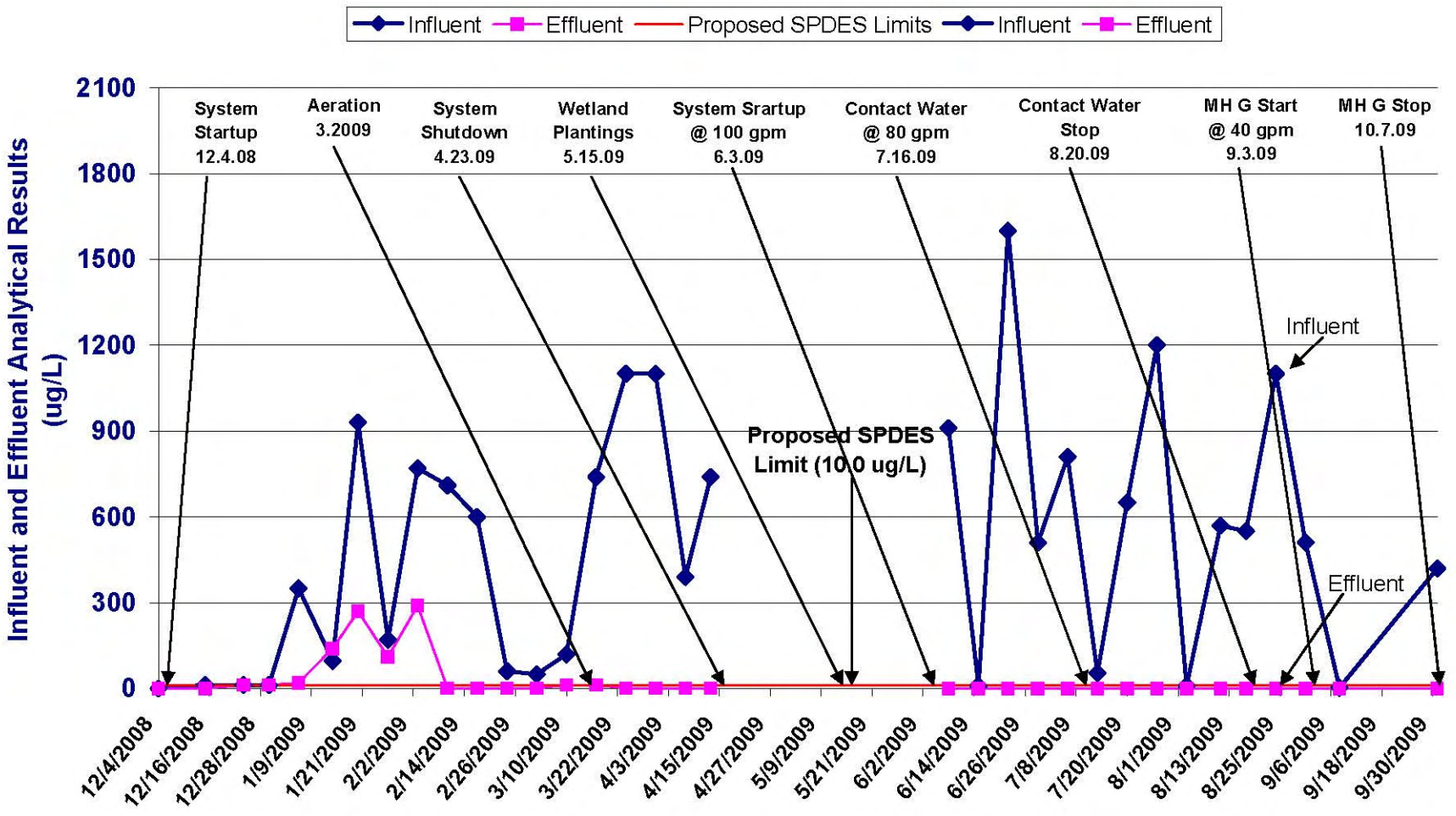
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Ethylbenzene



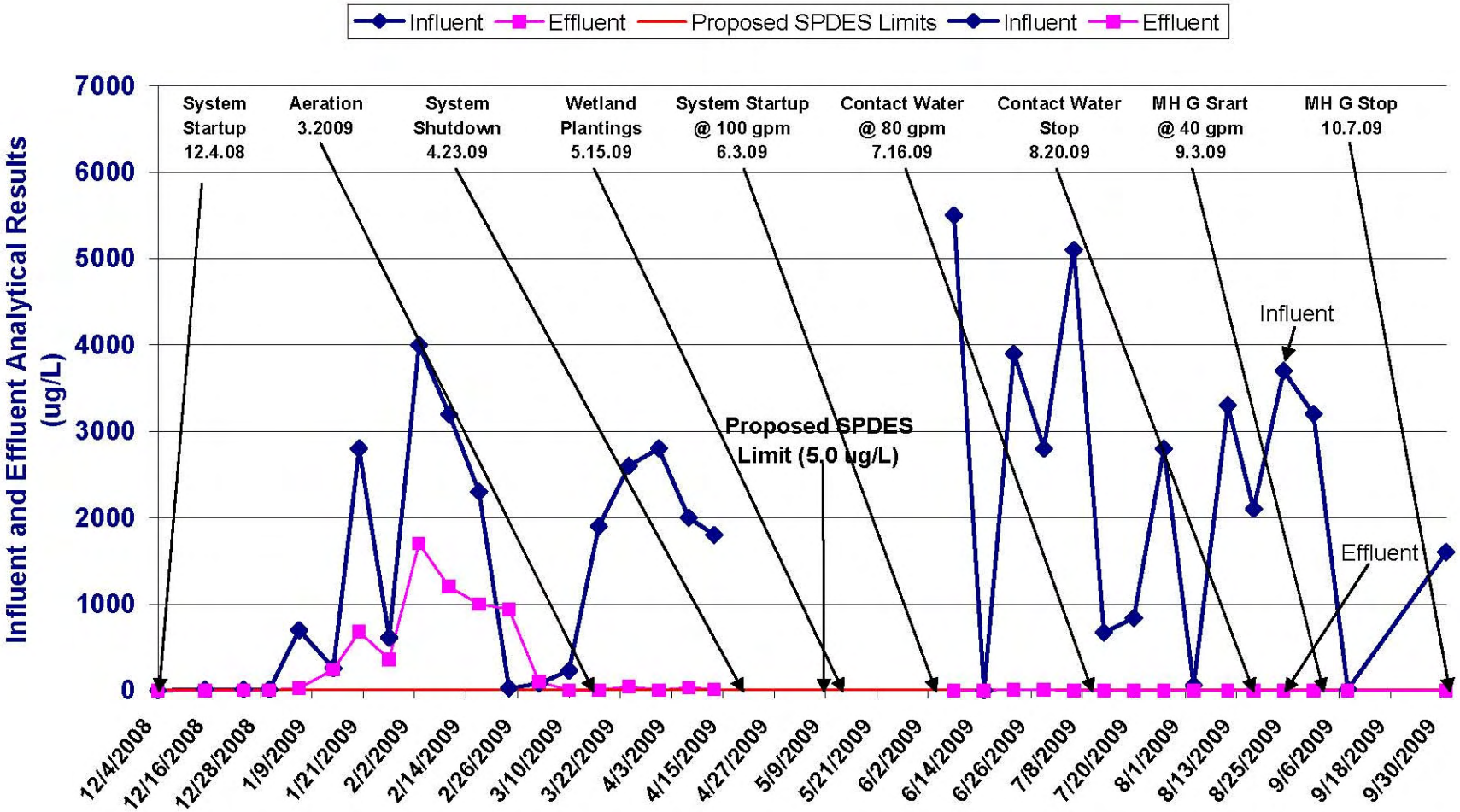
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Xylenes



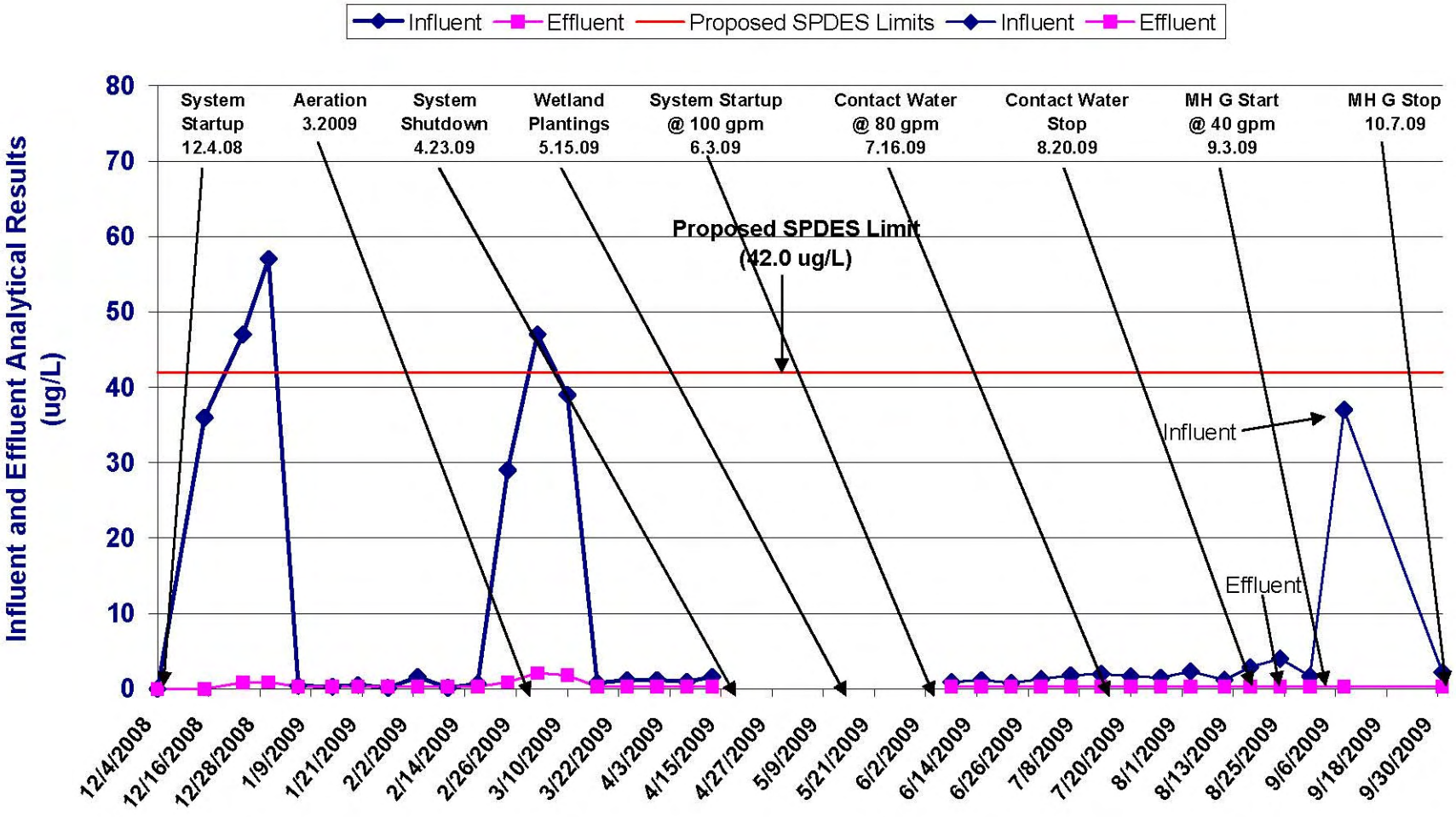
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Aniline



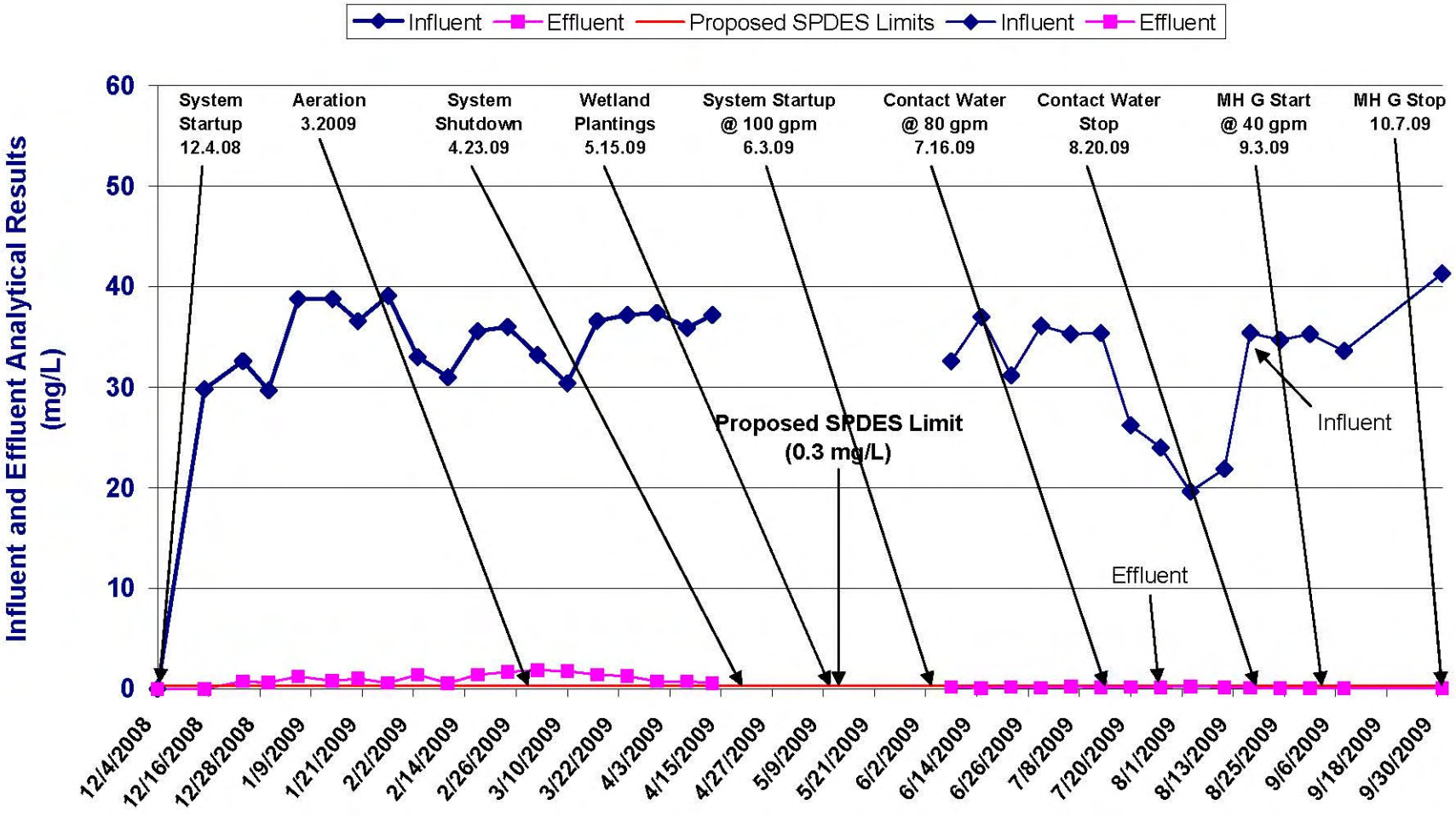
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Nitrobenzene



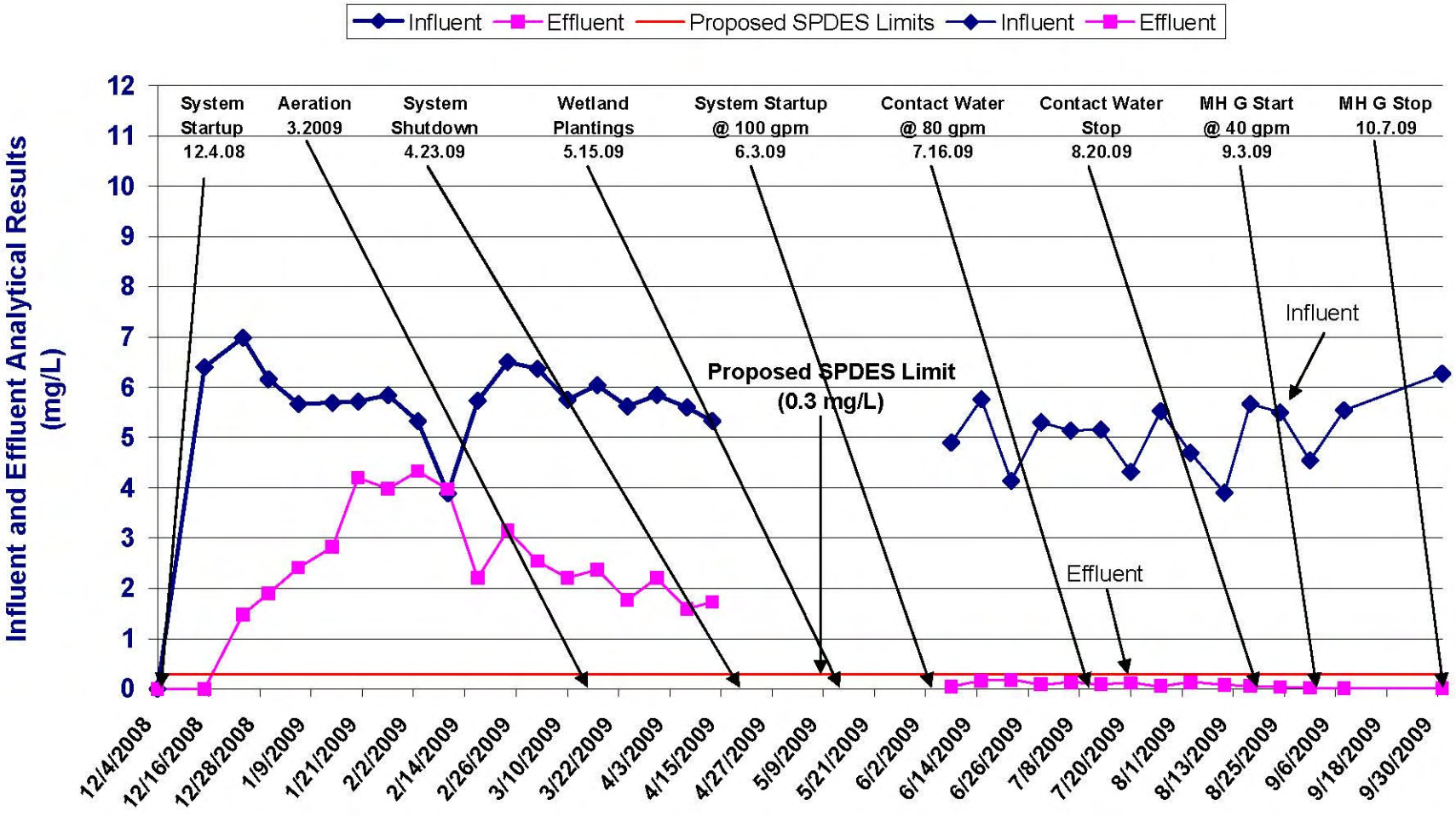
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
2-Methylnaphthalene



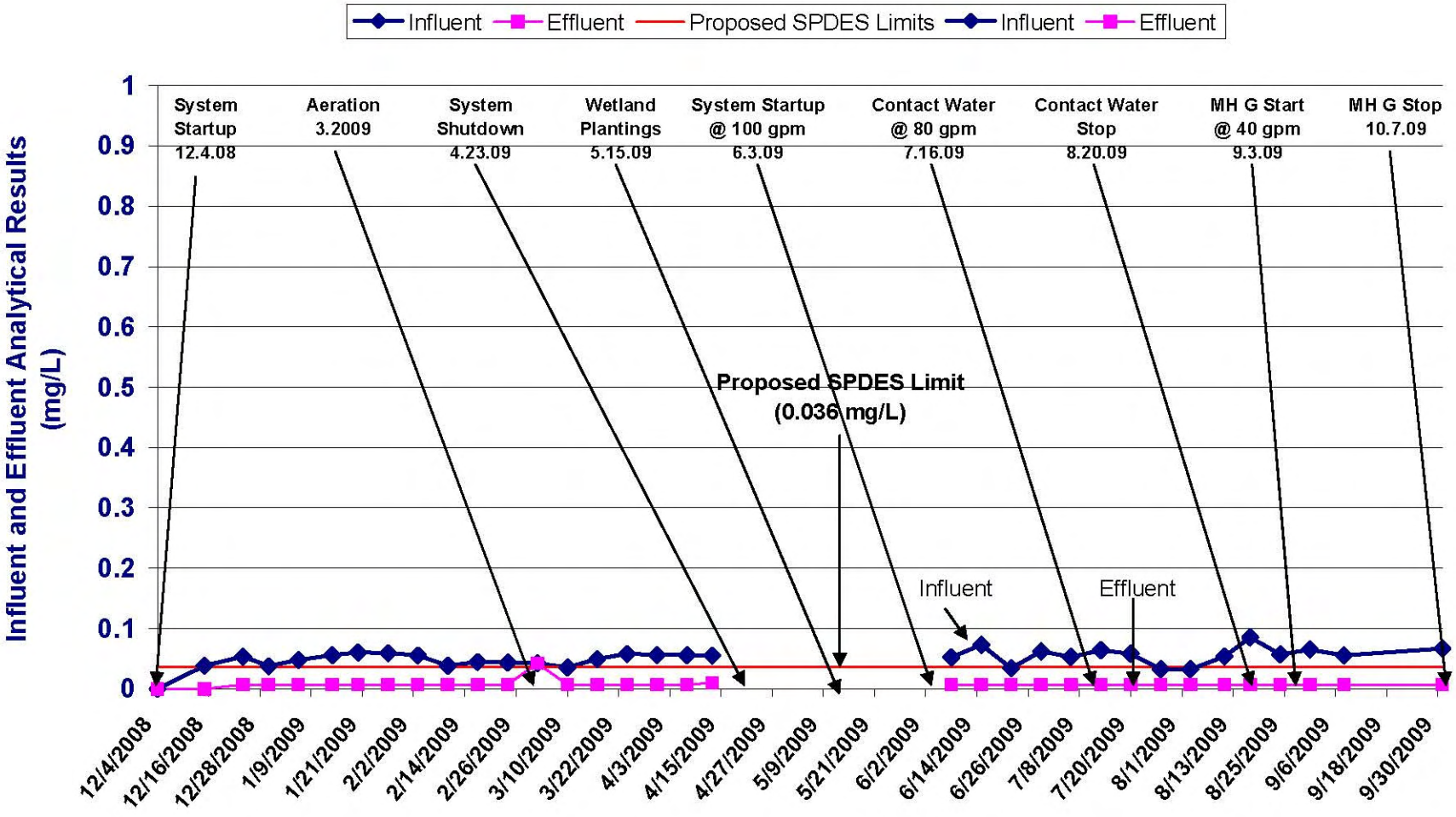
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Iron



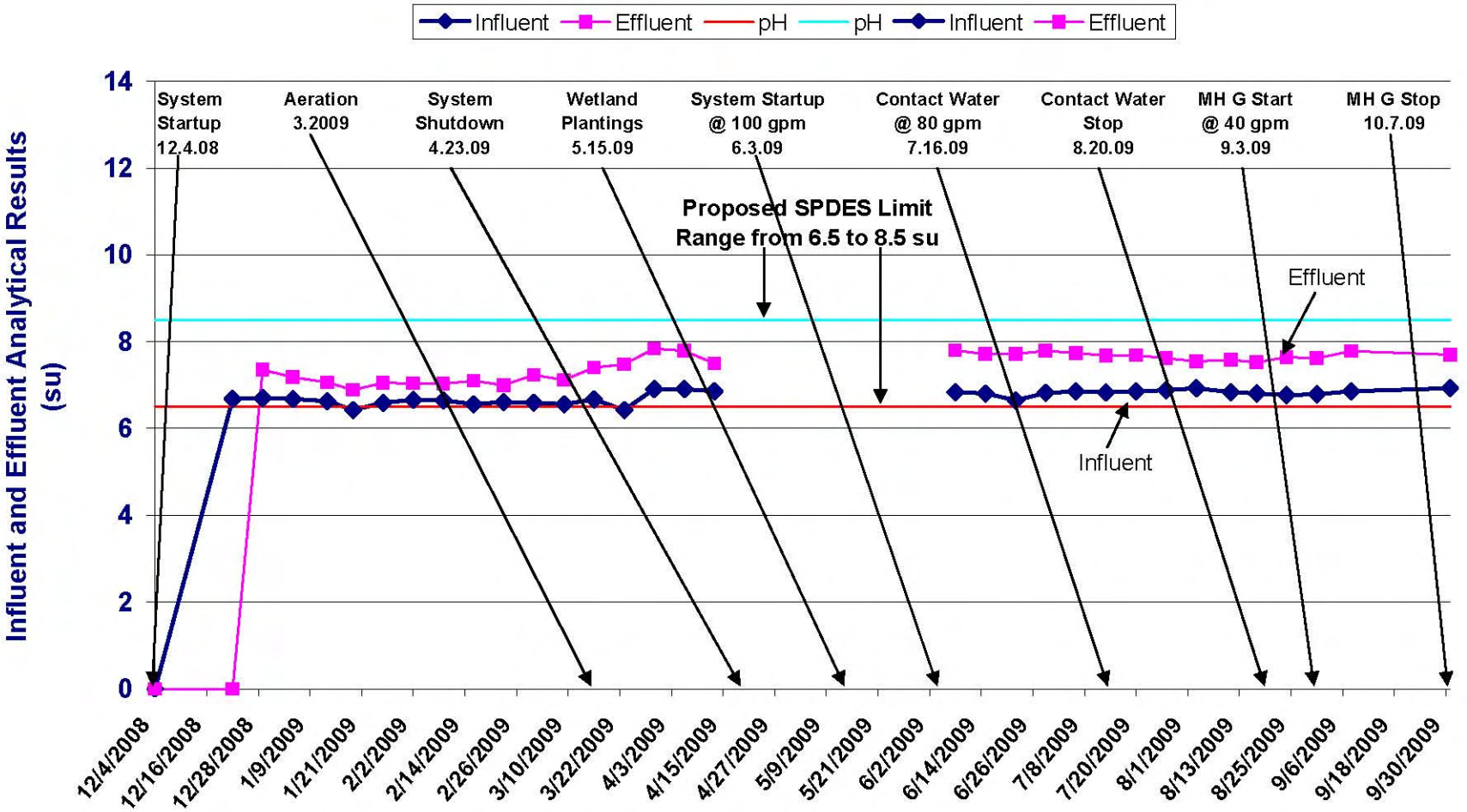
Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Manganese



Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
Arsenic



Former Sinclair Refinery Site OU2
Wellsville, NY
Proposed SPDES Permit Limit
pH



Summary of Key Parameters
Former Sinclair Refienry
SPDES Reporting
(VOCs)

Analyte	SPDES Limits	Average Influent Concentration		Average Effluent Concentration			
		Dec. 08 - Apr 09	Jun. 09 - Oct. 09	Dec. 08 - Apr 09		Jun. 09 - Oct. 09	
Benzene	5.0 µg/L	12.44	8.93	1.3		0.9	(MDL)
Ethylbenzene	5.0 µg/L	11.87	2.99	0.8	(MDL)	0.8	(MDL)
Toluene	5.0 µg/L	3.37	2.97	0.8	(MDL)	0.8	(MDL)
Xylenes	15.0 µg/L	11.74	6.21	0.9	(MDL)	0.9	(MDL)

Notes:
MDL = Method Detection Limit

Summary of Key Parameters
Former Sinclair Refienry
SPDES Reporting
(SVOCs)

Analyte	SPDES Limits	Average Influent Concentration		Average Effluent Concentration		
		Dec. 08 - Apr 09	Jun. 09 - Oct. 09	Dec. 08 - Apr 09	Jun. 09 - Oct. 09	
Aniline	10.0 µg/L	442.4	593.6	49.12	0.14	
Nitrobenzene	5.0 µg/L	1407.7	2372	353.13	1.45	
2-Methylnaphthalene	42.0 µg/L	14.7	4.17	0.55	0.28	(MDL)

Notes:
MDL = Method Detection Limit

Summary of Key Parameters
Former Sinclair Refienry
SPDES Reporting
(Metals)

Analyte	SPDES Limits	Average Influent Concentration		Average Effluent Concentration			
		Dec. 08 - Apr 09	Jun. 09 - Oct. 09	Dec. 08 - Apr 09		Jun. 09 - Oct. 09	
Iron	0.3 mg/L	34.94	31.97	1.03		0.13	
Arsenic	0.036 mg/L	0.05	0.06	0.007	(MDL)	0.007	(MDL)
Mangenese	0.3 mg/L	5.8	5.09	2.49		0.08	

Notes:
MDL = Method Detection Limit

Performance Monitoring Results

- Proposed Permit:
  - All VOCS treated to permit limits
  - All SVOCs treated to permit limits since replanting/aeration in June 2009
  - Metals (Iron, Arsenic and Manganese) treated to permit limits since replanting/aeration in June 2009
- Potential SVOCs treatment issues:
  - Treatment efficiency for VOCs and SVOCs improved in Spring 2009
    - Approximately 98 % removal efficiency for SVOCs in April 2009
    - Approximately 100% removal efficiency for VOCs and SVOCS since July 2009
  - Aniline and Nitrobenzene are currently ND in effluent samples
  - Water level in SFW raised 2 ft to accommodate cold weather operations
  - Winter operational data will need to evaluate treatment efficiency in cold months
  - Issues to evaluate include : sedimentation pond freezing, SFW and VFW freezing

Proposed Path Forward

- Restart system – June 2009
  - Groundwater extraction from Manholes A through F, approx 90 to 100 gpm
  - Extend time period for SPDES Evaluation until June 2010
- Proposed Monitoring Program :
  - Revised parameter list to include :
    - VOCs, SVOCs, metals, (Iron, Arsenic and Manganese) pH, TSS
    - Eliminate TKN, BOD, TSS, TDS, etc.
  - Weekly influent/effluent grab samples first 2 months, then monthly for next 10 months
  - Submit analytical data weekly / monthly
- Interim performance reports to NYSDEC:
  - Compare results to Revised Parameter List
  - Monthly reporting to USEPA/NYSDEC

Main Drainage Swale Remedial Scope

- Excavate approximately 3,500 cu yds of Swale sediment and bank soils
- Install temporary water diversion berm
- Restore bottom of swale to approximate original elevation grade
- Wetland / Bank Area Restoration
  - Re-planted wetland species in bottom
  - Grass / willow stakes on sides
  - Coir matting to prevent erosion
- Ongoing monitoring / storm water control structures

Main Drainage Swale Remediation
August 2009 through October 2009

Main Drainage Swale Remediation
August 2009 through October 2009

Main Drainage Swale Remediation
August 2009 through October 2009

Q and A

Examples of Wetland Treatment Growth Patterns – Casper Wyoming

- Casper Wyoming Preplanting and 1st Growing Season

Examples of Wetland Treatment Growth Patterns

- Casper Wyoming 2nd Growing Season

Examples of Wetland Treatment Growth Patterns

- Casper Wyoming 3rd Growing Season