Innovative Facility and Infrastructure Design™

WATER RECLAMATION FACILITY

The Most Colorful Experience in Wastewater

SHORT HISTORY

- **1964 ORIGINAL PLANT CONSTRUCTED**
  - Headworks
    - Separate from rest of plant
  - Aeration Basins
    - Outdoor blowers
  - Rectangular Clarifiers
  - Chlorination

SHORT HISTORY

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SHORT HISTORY

- **1988 MAJOR UPGRADES**
  - > Headworks
    - New screen, aerated grit and Parshall Flume at WWTP
  - > Administration Building
    - Indoor blowers
    - New electrical and controls
  - > Circular Clarifiers
  - > Upgraded Chlorination
  - > Aerobic Sludge Digesters from Old Clarifiers

SHORT HISTORY

- **LATER IMPROVEMENTS**
  - > Maintenance garage
  - > Shed for screen and grit collection
  - > Internal bypass
    - Around aeration and clarifiers
    - Final chlorination retained


Grinnell Rd
Grinnell Rd

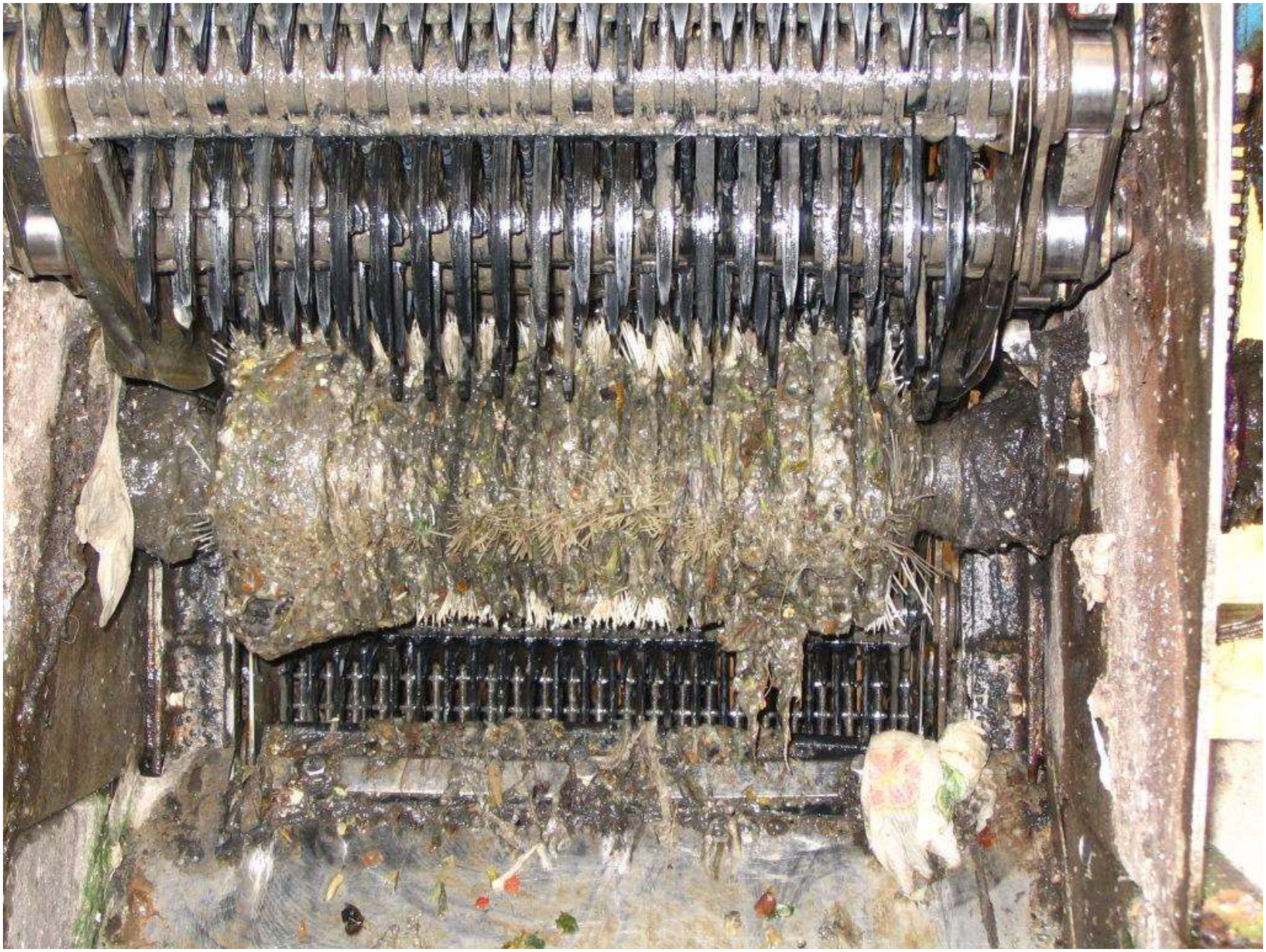
SHORT HISTORY

- **JOE BATES STARTED 2006**
- **RECENT IMPROVEMENTS**
  - Non-functional waste sludge pump replaced
  - Effluent V-Notch flow meter added
  - Improved dechlorination
  - Automatic samplers
  - Visual **Enhancements**


Grinnell Rd

OPERATING CHALLENGES

- HEADWORKS
  - > Screen
    - Old, high maintenance, poor capture
  - > Aerated Grit
    - Low efficiency
  - > Make-Shift Building
    - Uninsulated
  - > Parshall flume
    - Inaccurate due to poor hydraulic design



OPERATING CHALLENGES

- AERATION SYSTEM
  - > No Flexibility
    - Four tanks
    - Parallel operation only
  - > Only Tanks 1 & 4 On Line
    - Tanks 2 & 3 used for sludge storage

OPERATING CHALLENGES

- CLARIFIERS
  - > Single Return Sludge Suction Line
    - Unequal flows
    - Difficult to have both on line
  - > Aging Equipment
    - Rake frame bent
    - Gear box needed rebuilding
  - > Debris Problems
    - Center well blockages
    - Cause: Poor screening

OPERATING CHALLENGES

- DISINFECTION
  - > Leaking Feed Line
  - > No Flow Proportioning
  - > Improvised Dechlorination

OPERATING CHALLENGES

- HIGH FLOW PROBLEMS
  - > Permit Violations
    - MLSS Washout
    - Lingering High Ammonia
  - > Strategies for Coping
    - One Clarifier used for Storm Storage
    - Aeration Tank for Holding Solids
    - Internal Bypass Used

OPERATING CHALLENGES

- SLUDGE MANAGEMENT
  - > Insufficient Liquid Storage
  - > Disposal by Liquid Hauling Before 2006
  - > 2006 Synagro Contract for Dewatering and Land Application
  - > No On-Site Storage for Dewatered Sludge

OPERATING CHALLENGES

- BACK-UP POWER
  - > NONE!
  - > Hurricane Ike of September 14, 2008
- CONTROL SYSTEM
  - > Completely Manual
  - > No Remote Alarms


POWER SUPPLY

WWTP Improvements Project

- PROJECT DRIVERS
  - > Common Permit Violations
    - Ammonia-nitrogen (most common)
    - Also BOD_5 and TSS
  - > Phosphorus Limits in New Permit
  - > Operational Challenges
  - > Old Equipment
  - > ***CONSENT ORDER***

WWTP Improvements Project

- CRITICAL PROJECT CHALLENGES
  - > High Infiltration/Inflow
  - > Common Clarifier Return Sludge Suction Line
  - > Phosphorus Limits
  - > Low Operational Flexibility
  - > Old Equipment
  - > Sludge Management

WWTP Improvements Project

- HIGH INFILTRATION & INFLOW
  - > I/I Reduction Impractical in Project Time Line
  - > Objectives:
    - Keep biological solids in the system
    - Maintain treatment, especially nitrification
    - Increase response flexibility

WWTP Improvements Project

- HIGH INFILTRATION & INFLOW
  - > Solution Components:
    - ***Provided separate return sludge lines for each clarifier***
      - – Allows regular use of both clarifiers
      - – Undertaken as early project

WWTP Improvements Project

- HIGH INFILTRATION & INFLOW
  - > Solution Components:
    - Provided separate return sludge lines for each clarifier
      - – Allowed regular use of both clarifiers
      - – Undertaken as early project
    - ***Increased clarifier efficiency***
      - – Add current density baffles


02/04/2010

WWTP Improvements Project

- HIGH INFILTRATION & INFLOW
  - > Solution Components:
    - Provided separate return sludge lines for each clarifier
    - Increased clarifier efficiency
    - ***Added "storm flow mode" capability***
      - Electrically operated gates change where raw influent is added to the biological system
      - Allows for MLSS storage in first stage tanks
      - Is progressive as flows increase

WWTP Improvements Project

- HIGH INFILTRATION & INFLOW
  - > Solution Components:
    - Provided separate return sludge lines for each clarifier
    - Increased clarifier efficiency
    - Added “storm flow mode”
    - ***Added diversion box and 2.4 MG overflow basin***


09.30.2011


07.01.2011

WWTP Improvements Project

- MEETING PHOSPHORUS LIMITS
  - > Solution Components:
    - Biological nutrient removal
      - Added anaerobic selector chambers
        - » Three chambers of increasing detention time
        - » Covered and Mixed
      - Enhanced denitrification
        - » Mixed anoxic tank
        - » Recirculation propeller pump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WWTP Improvements Project

- MEETING PHOSPHORUS LIMITS
  - > Solution Components:
    - Biological nutrient removal
    - ***Sidestream phosphorus treatment system***
      - Chemical treatment of high-P waste streams
        - » Digester decant
        - » Dewatering filtrate
        - » Sludge pad runoff


09 30 2011

WWTP Improvements Project

- INCREASING OPERATIONAL FLEXIBILITY
  - > Solution Components:
    - Multiple Aeration Compartments
      - Allows combined series and parallel flow
      - Allows tanks to be taken off line
    - Multiple Points of Wastewater Entry
      - Allows for “Storm Mode” to hold mixed liquor
      - Reduces solids loading to clarifiers at high flows

WWTP Improvements Project

- INCREASING OPERATIONAL FLEXIBILITY
  - > Solution Components:
    - Multiple Aeration Compartments
    - Multiple Points of Wastewater Entry
    - ***Added VFDs to Blowers***
      - Controlled by DO meter in Tank 4
      - Energy consumption reduced

WWTP Improvements Project

- IMPROVED SLUDGE MANAGEMENT
  - > Solution Components:
    - ***Covered Storage for Dewatered Sludge***
      - – Allows dewatering when needed, not when fields can take sludge
      - – Additional stabilization time

WWTP Improvements Project

- IMPROVING SLUDGE MANAGEMENT
  - > Solution Components:
    - Covered Storage for Dewatered Sludge
    - ***Improved Decanting Ability***
      - Removed divider wall
      - Improved thickening
      - Decant to phosphorus treatment system

WWTP Improvements Project

- IMPROVING SLUDGE MANAGEMENT
  - > Solution Components:
    - Covered Storage for Dewatered Sludge
    - Improved Decanting Ability
    - ***Capacity for Sequencing Facultative Digestion***
      - ORP and pH probes added to each tank
      - Sequencing by controlling aeration

WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - ***Replaced Influent Screen***
    - Old screen “died” in June 2010
    - Used manual bar screen as interim measure
    - New screen on line in August 2010
    - ¼” bar spacing
    - Front cleaning rakes – no carry through
    - Tilts for maintenance

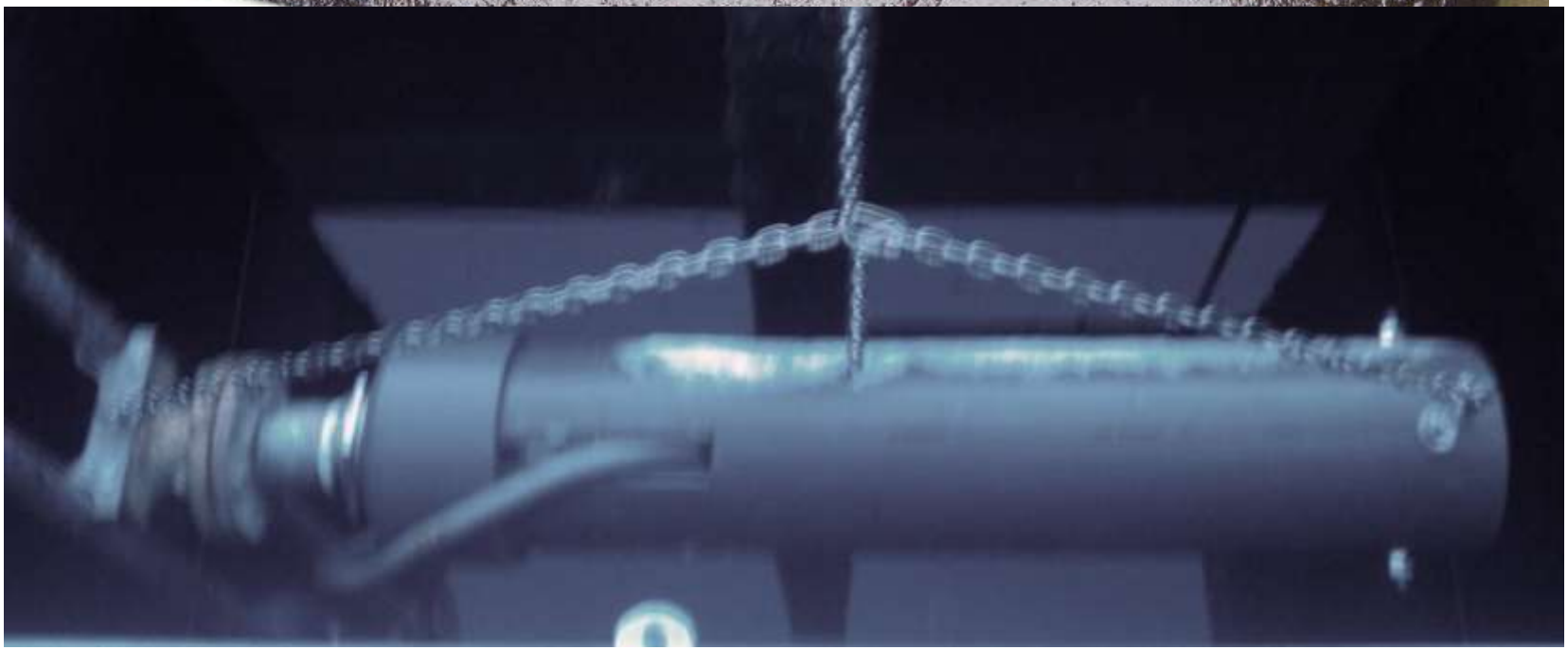
WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - > Replaced Influent Screen
  - > ***Replaced Aerated Grit System***
    - Vortex grit system
    - Grit pump
    - Grit washing


07.01.2011

WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - > Replaced Aerated Grit System
  - > Replaced Influent Screen
  - > ***Replaced Parshall Flume***
  - > ***Non-Potable Water System***
    - For grit system, sludge pressing, bisulfite feed, general wash down, etc.
    - Well pump with flow shield in chlorine contact tank
    - Hydropneumatic tank and pressure switch in screen building
    - VFD Controlled
    - High capacity yard hydrants



WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - Replaced Influent Screen
  - Replaced Aerated Grit System
  - Replaced Parshall Flume
  - Non-Potable Water System
  - ***Emergency Generator and Automatic Transfer Switch***

WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - Replaced Influent Screen
  - Replaced Aerated Grit System
  - Replaced Parshall Flume
  - Non-Potable Water System
  - Emergency Generator and Automatic Transfer Switch
  - ***Electrical Systems and Switch Gear***

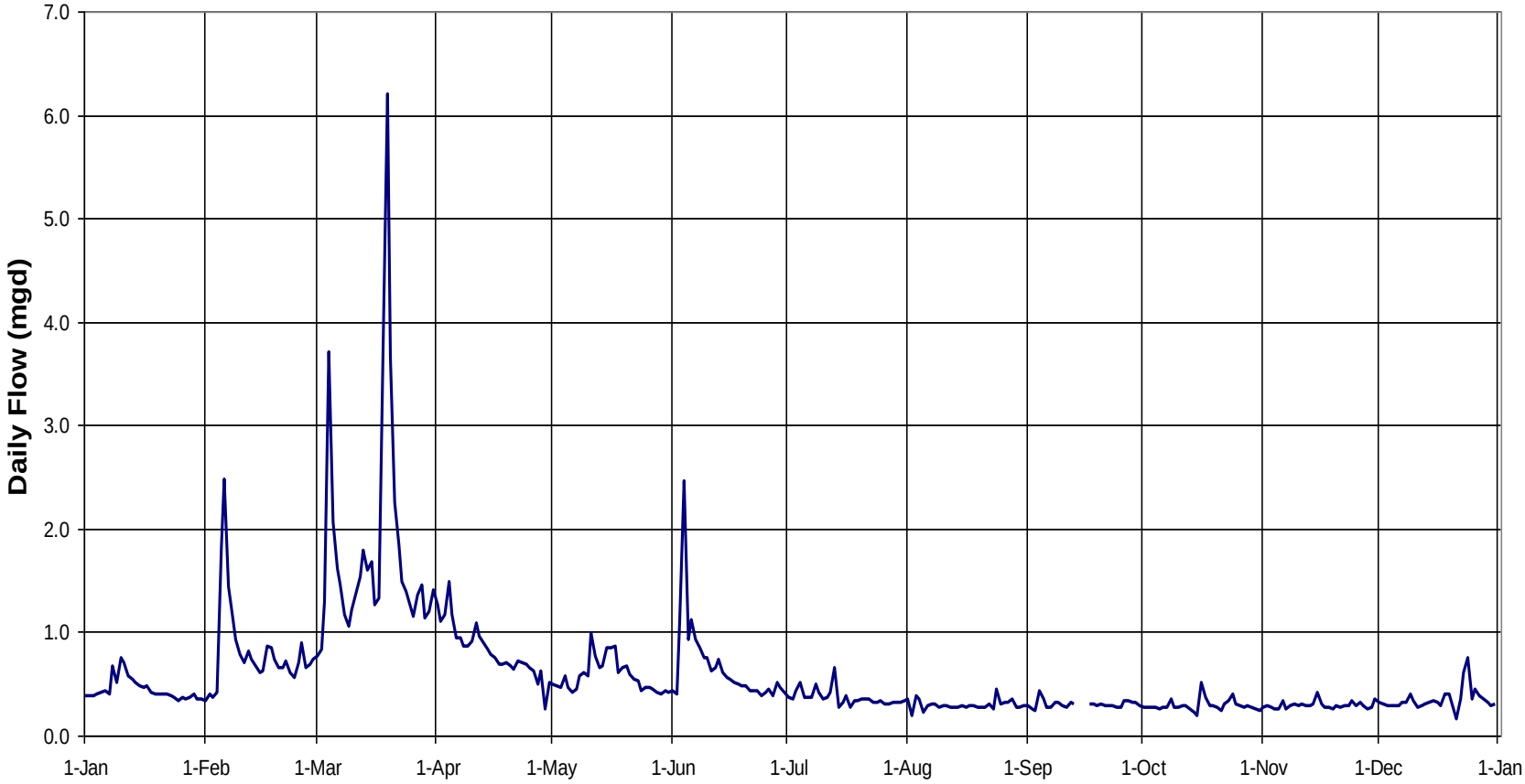

Allen-Bradley

WWTP Improvements Project

- NEW & REPLACED EQUIPMENT
  - Replaced Influent Screen
  - Replaced Aerated Grit System
  - Replaced Parshall Flume
  - Non-Potable Water System
  - Emergency Generator and Automatic Transfer Switch
  - Electrical Systems and Switch Gear
  - ***Operational Controls and SCADA***

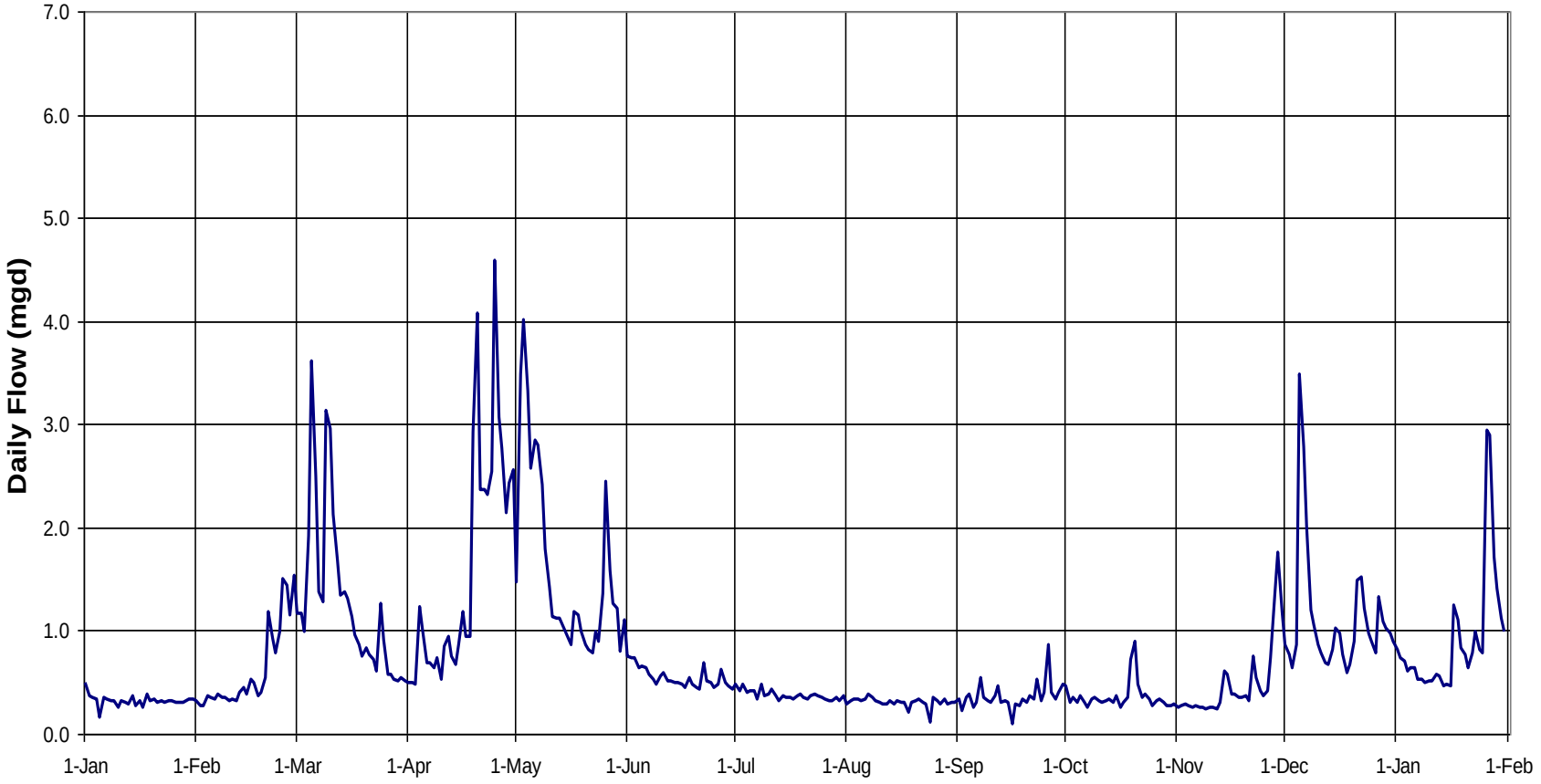
EFFLUENT QUALITY

Yellow Springs WWTP Flows - 2008



EFFLUENT QUALITY

Yellow Springs WWTP Flows - 2011 & Jan 2012



EFFLUENT QUALITY

Parameter	Weekly Limit	Monthly Limit	2008 Annual Average	2011 Annual Average
BOD5 (mg/l)	15	10	4.7	3.4
BOD5 (kg/d)	34.1	22.8	16.8	11.7
TSS (mg/)	18	12	6.0	3.5
TSS (kg/d)	40.9	27.3	19.3	16.7

EFFLUENT QUALITY

Parameter	Weekly Limit (Winter / Summer)	Monthly Limit (Winter / Summer)	2008 Annual Average	2011 Annual Average
NH4-N (mg/l)	2.9 / 1.1	1.9 / 0.7	0.4	0.09
NH4-N (kg/d)	6.59 / 2.5	4.32 / 1.5	2.0	0.34
Total P (mg/)	na / 1.5	na / 1.0	1.86	1.59
Total P (mg/)	na / 3.41	na / 2.28	2.7	2.45

PERFORMANCE EVALUATION

- OVERALL ASSESSMENT
  - ***High Flow Management Was Very Good***
    - 2011 high flows were comparable to 2008
    - Overflow basin used several times
    - Diversion box set to allow 3.4 mgd through plant
    - No loss of solids in 2011

PERFORMANCE EVALUATION

- OVERALL ASSESSMENT
  - > High Flow Management Was Very Good
  - > ***Effluent Quality Results Were Mixed***
    - BOD5, TSS and NH4-N stayed within limits for both concentration and loading
    - Effluent was extremely clear consistently
    - Phosphorus removal did not meet expectations

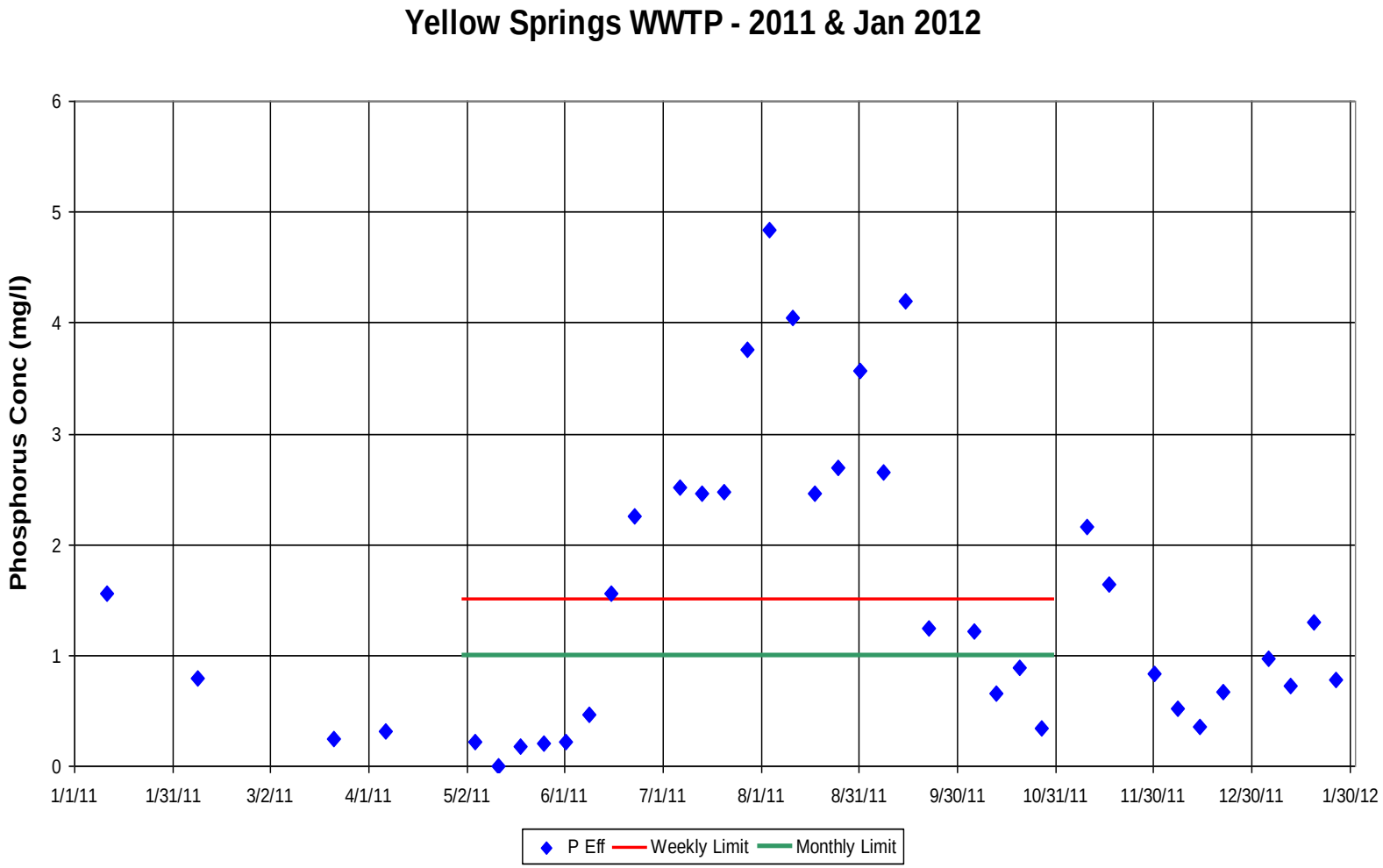
PHOSPHORUS REMOVAL

- TROUBLE SHOOTING
  - > ***Discovered malfunctioning mixer in anaerobic selector tank***
    - One mixer malfunctioned
    - Wiring for two mixer were reversed
    - Mixer improperly wired which delayed discovery of mixer malfunction
    - Easily fixed once discovered
    - Therefore selector tank couldn’t work properly

PHOSPHORUS REMOVAL

- TROUBLE SHOOTING
  - > Discovered malfunctioning mixer in anaerobic selector tank
  - > ***MLSS was too high***
    - Land application of sludge had been limited by very wet spring
    - MLSS levels still high from previous operating practices
    - Increase wastage now possible with new sludge storage
    - Therefore MLSS levels were reduced

EFFLUENT QUALITY



PHOSPHORUS REMOVAL

- TROUBLE SHOOTING
  - > Discovered malfunctioning mixer in anaerobic selector tank
  - > MLSS was too high
  - > ***Measures appear successful***
    - Biological phosphorus removal improved markedly
    - Good removal October 2011 – January 2012
    - Looking forward to good year in 2012


VILLAGE OF
YELLOW SPRINGS
WASTEWATER
TREATMENT PLANT
3935 GRINNELL RD
RECOVERY.GOV
VILLAGE OF YELLOW SPRINGS
WASTEWATER TREATMENT PLANT
IMPROVEMENTS
TOTAL PROJECT COST $2,366,000
PROJECT FUNDED BY:
AMERICAN RECOVERY & REINVESTMENT ACT OF 2009
OHIO PUBLIC WORKS COMMISSION
OEPA WPCLF
ELECTRICAL CONTRACTOR
DEBRA-KUEMPEL
PROJECT ENGINEER
LJB INC.
GENERAL CONTRACTOR
KIRK BROTHERS CO. INC.