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Wastewater Treatment Plant Review

City of Crosslake, Minnesota

November 14, 2016

0511.111502

Outline of Review

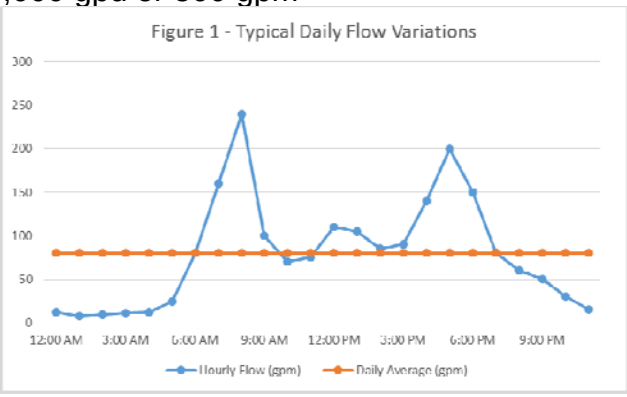
- Review overall facility capacity by unit
- Review plant utilization
- Recommend improvements
- Discuss long range plans and funding

Existing Facility

- Constructed in 2004
- Wastewater Treatment Facility Capital Improvements Study prepared by WSN dated April 2016
- Permit up for renewal in 6 months
- No permit changes expected

Existing Facility

- 150,000 gallons per day (gpd) average flow permitted capacity (Average Wet Weather Flow – AWW)
- Peak Hourly Wet Weather (PHWW) flow estimated of 720,000 gpd or 500 gpm



Main Lift Station

- 12-inch gravity line feeds into
- Current capacity 500 gpm
- High flow can cause downstream overflows
- City is replacing lift pumps with smaller pumps
- Smaller pumps is temporary fix

Pretreatment

- Fine screen too large
- Grit separation adequate size
- Pipe to oxidation ditch (6-inch) undersized!
- Pipe size problem from start-up
- Requires increasing pipe size

Oxidation Ditch

- Meets both AWW and PHWW needs
- No current issues
- Effluent piping also adequate size

Secondary Clarifier

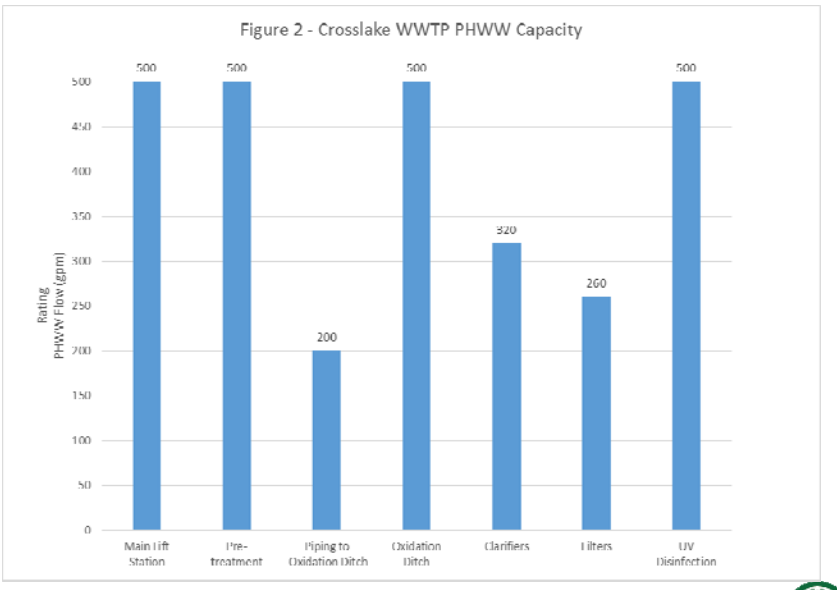
- Two clarifiers each 18’ diameter
- Rated PHWW flow capacity 317 gpm
- Units undersized to handle PHWW flow!

Tertiary Filters

- Retro-fitted from original inefficient concept by staff
- Two filters 7.5-ft diameter each
- Rated capacity 264 gpm
- Significant size limitations!

Ultra-Violet (UV) Disinfection

- Meets both AWW and PHWW requirements



Current Flows

- Current AWW 55,000 gpd
- Peak one day flow 100,000 gpd
- Approximately 35% WWTP utilization on AWW basis
- Essentially 100% capacity on peak flow basis
- Requires flow equalization tank to buffer peak flows and maximize plant capacity

Flow Equalization / Backwash Holding Tank

- Primary WWTP issues are limited clarifier and filter capacity
- Constructing additional units difficult and costly
- Flow equalization and backwash holding can reduce peak flows and alleviate clarifier and filter size issues.

Flow Equalization / Backwash Holding Tank (cont.)

- Tank stores peak flows and pumps back during low flow periods
- Eliminates peak shock loads to clarifiers and filters
- Recommend installing between pretreatment and oxidation ditches
- Corrects piping bottleneck after pretreatment
- Allows plant to achieve permitted AWW capacity

Other Priority Items

- SCADA
- RAS/WAS valving and biosolids wasting
- Filter backwash holding tank and automation
- Ferric chloride flow pacing
- Generator sizing

Project Implementation

- Capacity issues should be addressed within the next 1-2 years
- Cost savings to do one large project versus phasing over 2-3 years
- Overall cost estimate $900,000-$1,200,000

Long Range Planning and Funding

- WWTP has significant remaining capacity
- Recommend growth plan on how to utilize capacity
- High median household income limits financing program
- Providing service to unsewered areas may make eligible or SRF low interest financing
- Recommend rate evaluation to determine project's impact on rates

Summary

- Approach is to fix hydraulic limitations of WWTP
- Other priority items
  - Flow Equalization/Backwash Holding Tank
  - SCADA Control System
  - Filter Backwash Supply Tank and Automation
  - RAS/WAS Valve Modifications
  - Ferric Chloride Flow Pacing
- City has great resource in WWTP capacity – need plan for utilization

Review of WSN Recommendations

- Control Building
  - Expand operations area
    - Already completed
  - SCADA System
    - Current facility has limited automation
    - SCADA systems critical to efficient operation

Pretreatment Building

- Air Blower
  - Piping undersized
  - Recommend new blower with enclosure
  - Recommend replacing air lift pump with self-priming pump
- Door Hardware and Hinges
  - Very corrosive environment
  - Most cost effective for staff to replace

Pretreatment Building (cont.)

- SCADA Controls
  - Recommend as part of overall SCADA
- Flowmeter replacement
  - Recommend replacement with connection to SCADA system

Pretreatment Building (cont.)

- Increase Height of Control Structure
  - Effluent pipe is too small
  - Wall height is poor fix
  - Significant issue as it restricts plant capacity
  - Recommend replacing pipe to fix root problem

Oxidation Ditches

- Brush Guard Replacement
  - Normal wear and tear
  - Most cost effective for staff to replace as needed
- Add Anoxic Zone for Denitrification and pH Control
  - May increase operator license requirements
  - pH control may be better handed with flow pacing ferric chloride
  - Voluntary addition may preclude grant eligibility

Final Clarifiers

- Building Insulation Cladding
  - Recommended to protect insulation
  - Already completed
- Skimmer Arm and Skirting Replacement
  - Skimmer arm broken and needs replacement

Final Clarifiers (cont.)

- Flow Pacing Ferric Chloride
  - Critical to maintain permit compliance
  - Overdosing impacts pH, corrodes metal and increases biosolids
  - Flow pacing standard particularily for variable flow facilities
  - Expect cost savings in reduced chemical usage

Wet Well (Plant Drain)

- Install Transducer and Modify Controls
  - Recommend flow equalization tank to fix root problem
  - Transducer not required with flow equalization tank

Sludge Pumps (RAS & WAS)

- Automatic Sludge Wasting
  - Original design is manual process
  - Minimum daily but preferably multiple times per day wasting
  - Significant staff time impact
  - Recommend automating with motorized valves and SCADA controls

Aeration Tank Modifications (Biosolids Storage Tank)

- Replace Aeration System
  - Original air piping design lacked risers above water level
  - Pipes filled with sludge and plugged
  - Need additional mixing around pump
- Sludge Pump Piping
  - Currently utilizing common pipe
  - Reduces operational flexibility
  - Recommend dedicated piping to each pump

Aeration Tank Modifications (cont.)

- Add Additional Biosolids Storage Tanks
  - Generally additional storage is good
  - Freezing concern with above grade tanks
  - Mixing required but would be difficult to install
  - Recommend more detailed cost analysis of contract disposal and reed beds
  - Determine if additional storage is required

Final Filter Modifications

- Original concept did not work
- City retrofitted to more traditional style
- Manual backwashes (multiple times per day) significant staff burden
- Filters are undersized and exasperate backwashing frequency
- Recommend converting to automatic backwash system with SCADA control
- Upsize plant drain lift pumps

Final Filter Modifications (cont.)

- Backwash water provided from holding tank
- Tank is too small to wash both filters
- Recommend adding additional tankage
- Tank should be dedicated to backwash
- Well water is option but effluent recycle works
- Siting a well at the plant site difficult with setbacks

Electrical Generator

- Does not run all critical components
- Additional motors may be required with future improvements
- Recommend replacing with larger unit with capacity for future loads