WASTEWATER TREATMENT FOR WATER REUSE THAT OFFSETS POTABLE WATER DEMAND

MAY 2015

RETTEW
We answer to you.

Presentation Overview

- University Area Joint Authority (UAJA)
- Water Reuse
- Why Wastewater Reuse at UAJA?
- UAJA Wastewater Treatment
- UAJA Advanced Wastewater Treatment
- UAJA Reuse

University Area Joint Authority

UAJA

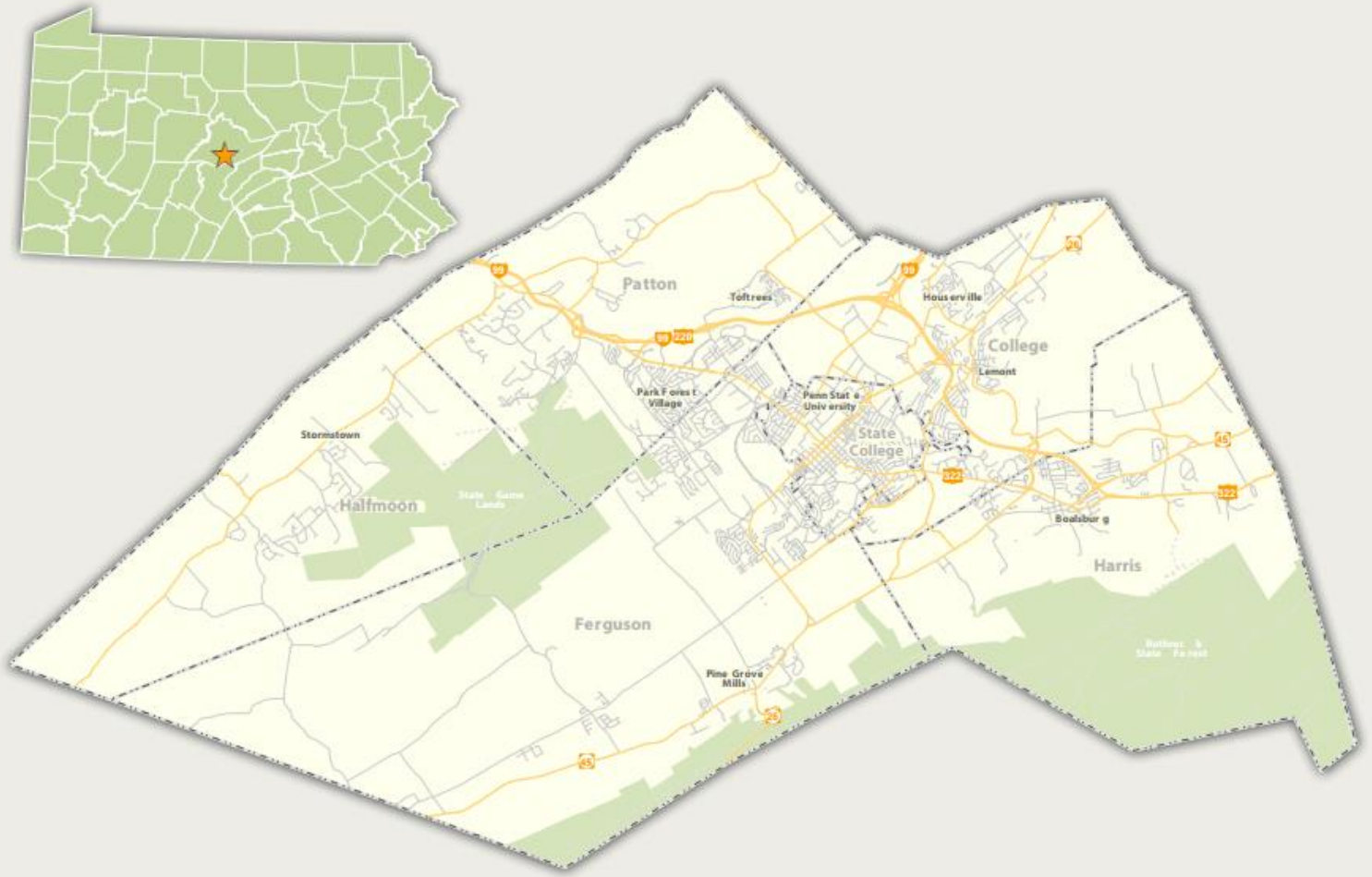
- Pennsylvania municipal authority providing wastewater collection, treatment, and reuse in central PA
- Serves the greater State College area
  - (Home to Penn State University)
- Total population served approximately 92,000

University Area Joint Authority

UAJA

- 52 employees, managers and staff providing operations and management
- Total assets in excess of $300 million
- Average residential customer user rate +/-$400 per year for wastewater disposal

University Area Joint Authority



Overview Map of the Centre Region's Municipalities and location in Pennsylvania

University Area Joint Authority

UAJA

- Wastewater treatment facility is called the Spring Creek Pollution Control Facility
- Advanced WWTF with tertiary effluent standards and water reclamation
- Currently rated for treatment of 10.56 MGD hydraulically and 50,000 lbs/day of BOD_5
- Only permitted to discharge 6.0 MGD

University Area Joint Authority

Spring Creek

- Designated by PA DEP as a high quality, cold water fishery
- Spring fed creek with world class brown and rainbow trout population
- Decreasing baseflows in Spring Creek from growth, coupled with increasing wastewater discharge led to increases in water temperature

University Area Joint Authority

Spring Creek

- Completion of 316A temperature impact study (extremely rare for Municipal Authority)
- Results found that flows in excess of 6.0 MGD could harm aquatic environment
- Places restrictions an both quantity and quality of discharge from WWTP

University Area Joint Authority

Spring Creek

- Tertiary standards with biological nutrient removal requirements:
  - Hyd capacity 10.6MGD
  - Avg flow 5.2 MGD
  - BOD/TSS 10 mg/l
  - Total nitrogen 6 mg/l
  - Total phosphorus 0.13 mg/l

University Area Joint Authority

Beneficial Reuse

- To meet regulatory restriction and provide for future, proceeded with beneficial reuse project
- Project consisted of:
  - EPA 503 Class A biosolids production facility with in-vessel composting (Since 1992)
  - Advanced water reuse facility with indirect potable reuse
  - Constructed wetlands

Water Reuse

EPA uses the terms “water reuse” and “water recycling” interchangeably and states that it is “*reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a ground water basin (referred to as ground water recharge).*”

EPA further distinguishes between:

- Potable Reuse vs. Non-potable Reuse
- Direct Potable vs. Non-direct Potable Reuse

Water Reuse


Water Quality
Raw Water
Drinking Water
Wastewater
Secondary Treatment
Tertiary Treatment
Advanced Treatment
Reuse*
Reuse*
Reuse*
* Level of treatment depends on the reuse application

Water Reuse

Water reclamation and reuse standards in the United States are the responsibility of state and local agencies—there are no federal regulations for reuse.

- The EPA 2012 updated guidelines for water reuse states that "30 states […] have adopted regulations and 15 states have guidelines or design standards that govern water reuse".

- The Water Reuse Association lists 44 states with regulations and/or guidelines for water reuse; including:
  - Delaware
  - District of Columbia
  - Maryland
  - New Jersey
  - Pennsylvania
  - Virginia

Water Reuse

- Water supply scarcity
  - Increasing demand for potable and other urban demands, such as landscape irrigation, commercial, and industrial needs
  - Increased agricultural demands
  - Increasing populations
  - Groundwater aquifers used by over half of the world population are being over drafted (Brown, 2011)
  - It is becoming less acceptable to use water once and dispose of it

Water Reuse

- Efficient resource use:
  - Water and energy are intertwined—energy production requires large volumes of water, and water infrastructure requires large amounts of energy
  - Water reused for specific uses can reduce energy use by eliminating the need to treat to drinking water standards and can be performed locally
  - Water reuse can achieve two benefits: offsetting water demands and providing water for energy production

Water Reuse

- Environmental and public health protection:
  - Environmental concerns over negative impacts from increasing nutrient discharges from WWTP is resulting in mandatory reductions in the amount of nutrients (N and P) and flow
  - “By eliminating effluent discharges for all or even a portion of the year through water reuse, a municipality may be able to avoid or reduce the need for costly nutrient removal treatment processes or maintain waste load allocations while expanding capacity”

Water Reuse

- Power or steam generation
- Irrigation/crop management
- Oil and gas hydraulic fracturing

- Petrochemical steam, cooling and process
- Microelectronics to obtain ultrapure
- Water Augmentation of potable supplies

Water Reuse

- Provides a resource that they need
- Saves money
- Have no other choice
- Promotes internal goals
- Helps with public relations

Why Wastewater Reuse at UAJA?

- Area supplied entirely with groundwater supplies for drinking water
- Reviewed options from interbasin wastewater transfer to refrigeration of effluent
- Community chose water reuse over other options as it provided sustainable, long-term approach and could balance growth and its impacts

Why Wastewater Reuse at UAJA?

- Decreasing baseflows in Spring Creek from growth, coupled with increasing wastewater discharge led to increases in water temperature
- Groundwater recharge was ultimate goal, with community, commercial and industrial reuse occurring along pipeline corridor
- Indirect potable reuse and groundwater recharge will enter zones of contribution of community drinking water supplies

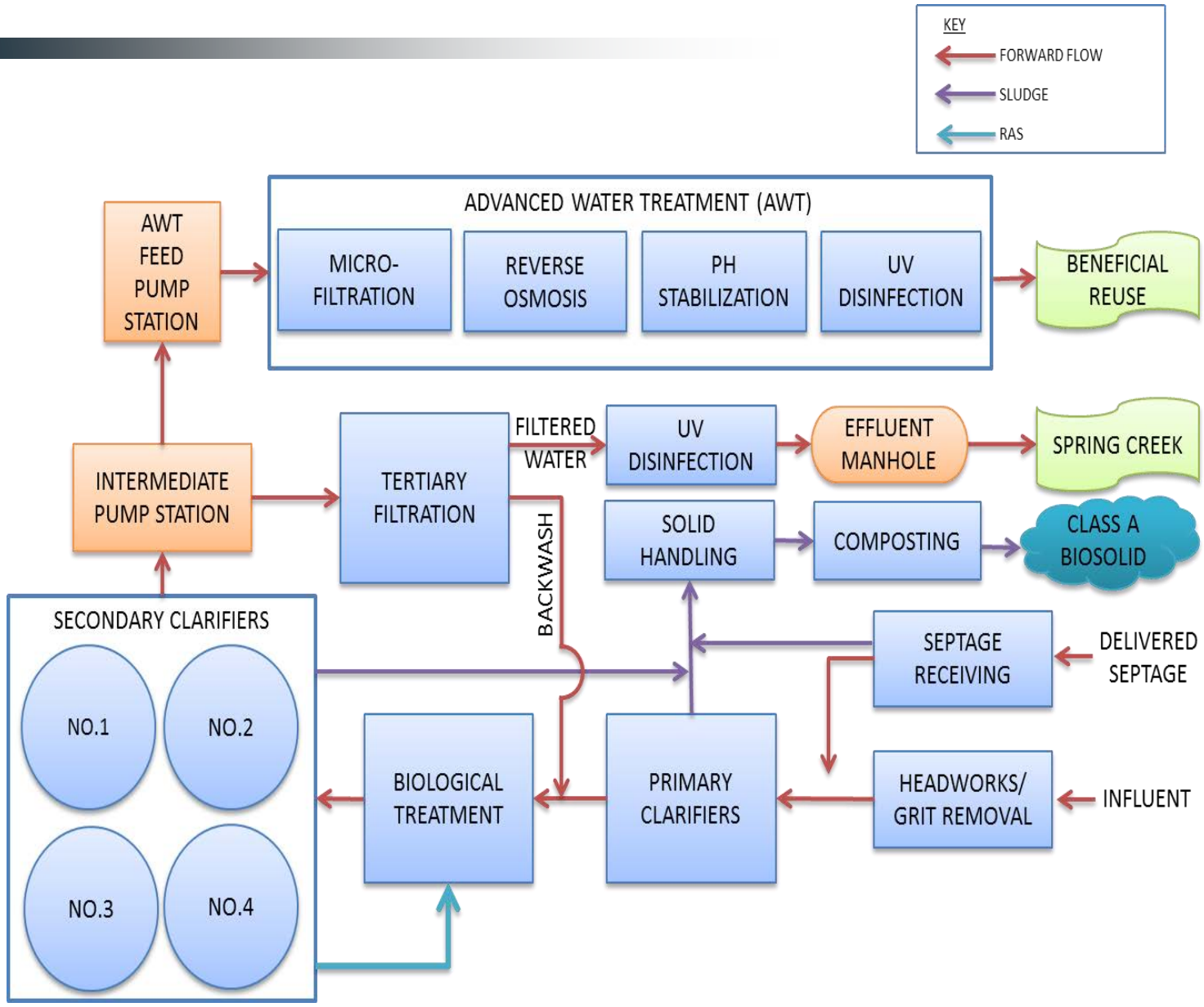
UAJA Wastewater Treatment

- Primary Treatment consists of:
  - Four primary clarifiers
- Secondary treatment consists of:
  - Extended aeration
  - Secondary clarifiers
- Tertiary treatment consists of:
  - Eight, anthracite coal, mono-media tertiary filters
    - Polish the plant effluent
    - Insure that the water discharged to Spring Creek meets the stringent permit limitations required

UAJA Wastewater Treatment

- Final plant effluent is disinfected before being released to Spring Creek
  - Disinfection is accomplished by using chlorine
  - Sulfur Dioxide is used to remove chlorine from the water

UAJA Wastewater Treatment



UAJA Advanced Wastewater Treatment

- Conventional wastewater treatment:
  - Settling
  - Biological process
  - Disinfection step

- Advanced treatment:
  - Any treatment process that goes beyond conventional treatment
  - Any treatment steps beyond these are considered advanced treatment

UAJA Advanced Wastewater Treatment

- UAJA has several advanced treatment processes:
  - Chemical removal of Phosphorus from the water
  - Filtration (identical to filtration systems in drinking water treatment plants)
  - Dechlorination
- Microstraining (500 micron)
- Pressure microfiltration (Evoqua CMF)
- Biofouling control
- Low pressure reverse osmosis (Koch ULP)

UAJA Advanced Wastewater Treatment

Existing Installation

- Microstraining (500 micron)
- Pressure microfiltration (Evoqua CMF)
- Biofouling control
- Low pressure reverse osmosis (Koch ULP)

UAJA Reuse

- Reuse customers are supplied through an 8-mile transmission main, from UAJA to
  - The Dale Summit industrial park,
  - Customers and uses
    - Hotel (irrigation/laundry/swimming pool)
    - Industrial laundry
    - Car wash
    - Governmental (HVAC)
    - Country club (irrigation/swimming pool)
- To the Slab Cabin Run sub-watershed
  - Working on construction of first wetland for groundwater recharge under construction

UAJA Reuse

2015 Status Report

- Operational for nine (9) years
- Initial capacity of reuse = 1.0 MGD (20% of plant)
- Reused over 500 million gallons at customers

UAJA Reuse

Reuse Water to Supplement Potable Demand

- Water Rates vary, generally around $4.00 / 1,000 gallons
- Reuse rate is $2.00/1,000 gallons
- For one service area – if take existing customer, must reimburse drinking water authority – make $0.00

Questions

Thank you for your attention and interest. For more information:

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