Brick Utilities Source Water Monitoring Program

NJ Water Monitoring Council Meeting

February 9, 2011

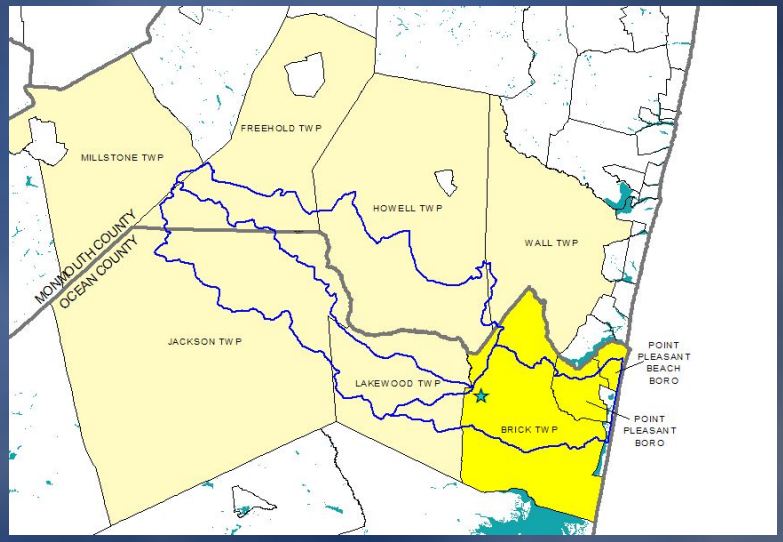
Robert Karl
Source Water Supervisor

BRICK UTILITIES
THE BRICK TOWNSHIP MUNICIPAL UTILITIES AUTHORITY

Brick Township MUA
System Overview

- Provide drinking water to >100,000 people in Brick, Point Pleasant, Point Pleasant Beach, and Howell

- Drinking water and sewer collection service for Brick Township (wastewater sent to OCUA)



Brick Township MUA
System Overview (cont'd)

- Source water flexibility
  - Metedeconk River surface water intake
  - One-billion gallon pumped raw water storage reservoir
  - Additional water supplied by wells screened in the P-R-M & Kirkwood-Cohansey Aquifers
  - Aquifer Storage and Recovery (ASR) Well

Brick Township MUA
System Overview (cont'd)

Brick Township MUA
System Overview (cont'd)

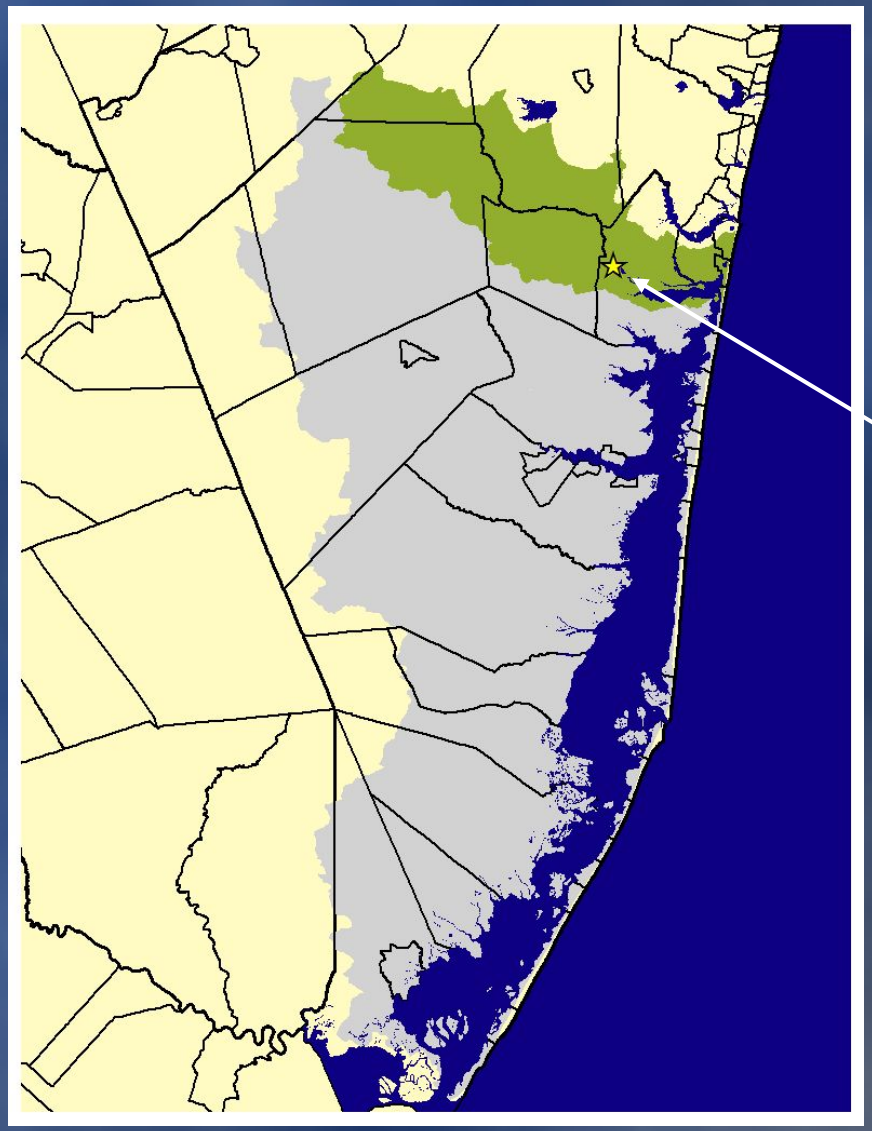
Why a reservoir…?

- **Short-term peak demands during summer months coupled with drought conditions are problematic without storage**
- **Northern Ocean County is located in Water Supply Critical Area #1 → Mandated water supply reductions from confined aquifers**
- **The 1996 New Jersey Statewide Water Supply Plan identified a significant projected water supply deficit for northern Ocean County**

Brick Township MUA
System Overview (cont'd)

- 16 MGD conventional treatment plant
- Split treatment train capability
- Supervisory Control & Data Acquisition (SCADA)
- Water Treatment Facilities Study 2008
  - Goal was capacity increase to 22 MGD
  - Various alternatives examined
  - Recommendation: Retrofit dual-media (anthracite & sand) gravity filters w/ membrane filtration (MF)

BTMUA and Metedeconk Watershed in Relation to the Barnegat Bay Watershed



Source Water Protection & Management

Philosophy

- Health of aquatic systems is declining nationwide
- Acute/chronic anthropogenic impacts
- Water industry: More effective to protect source than rely on WTP
- BTMUA relies on water quality/quantity of Metedeconk River and aquifers
- Obligation to protect our source water

Source Water Protection & Management

Key Aspects

- Dedicated staffing and resources
- Water supply management
  - Watershed, reservoir, groundwater (incl. ASR)
- Water diversions
  - Allocation, availability, conjunctive use, environmental considerations
- Water treatment
  - Water quality
  - Blending sources
- Research participation (e.g. Water Research Foundation)

ALL OF THESE THINGS INVOLVE MONITORING

Source Water Monitoring Program

Two key objectives:

1. **Support function for water treatment operations**
   - **Daily treatment decision-making**
   - **Source selection**
     - **Finished water quality (weather, sewer spills, hazmat incidents, algae blooms, taste & odor, etc.)**
     - **Treatment efficiency (chemical usage, energy, system demands, etc.)**
   - **Focus of real-time and daily watershed monitoring; weekly/monthly reservoir & well monitoring**

Source Water Monitoring Program

Two key objectives:

2. **Assessing long-term water supply issues/trends**
   - **Watershed health**
   - **Reservoir development**
   - **Well/groundwater trends**
   - **Research projects/studies**
     - **Water treatment (e.g. NOM/DBP precursors)**
     - **Emerging contaminants occurrence/fate (e.g. pharmaceuticals, PFOA, algal toxins, etc.)**
     - **Global warming/sea-level rise implications**
   - **Focus of quarterly or less frequent (or as-needed) watershed, reservoir & well monitoring**

Brick Reservoir Monitoring Program

Reservoir Overview

- Capacity: 0.86 billion gallons
- 120 acre site
- Approx. 90 acres under water
- Pumped water storage – no stream flow or directly contributing watershed
- Water delivery to reservoir via Metedeconk River intake
- Initially filled during a one-month period in April - May 2004 to normal pool Elevation 100
- Depth of 33 - 46 ft
- Outlet Works Tower with sluice gates @ Els. 87 (-13 ft), 71 (-29 ft) and 54 (-46 ft)

Brick Reservoir Monitoring Program

Reservoir Overview (cont.)

- Aeration system consists of two (2) LayerAir Model PIP8 Layer Aerators
  - Provide a mixed, aerated bottom water layer and enhanced mixing and aeration of the epilimnion by way of vented air from each tower
- Full artificial circulation diffusers at each tower station
- Liquid chemical delivery capabilities to the deep layer, surface layer, or full water column
- Two fishing/observation stations
- Public walking path & parking facilities

Brick Reservoir Monitoring Program

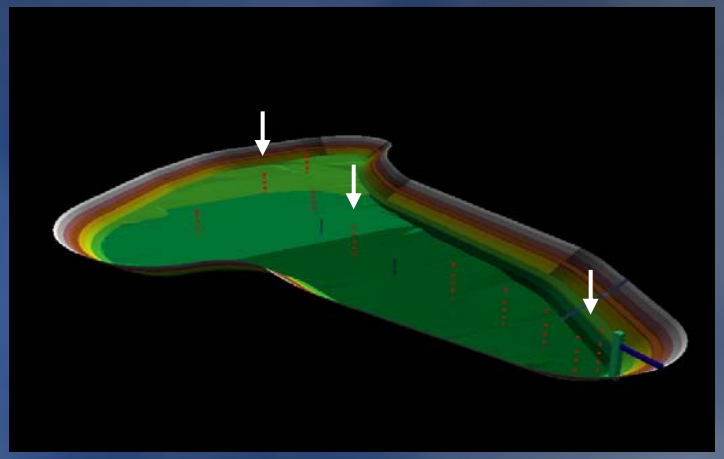
Reservoir Management Goals

- Assure the reservoir remains a high quality reserve raw water source that is available at all times
- Develop a healthy ecosystem
- Minimize chemical treatments for algae and taste-and-odor control to the greatest extent practical
- Keep the reservoir site aesthetically pleasing to the public
- Maintain full pool level to the greatest extent possible

Brick Reservoir Monitoring Program

- Extensive baseline water quality data collected since initial filling in 2004
- Monitoring plan updated annually
  - Assure critical parameters are monitored at appropriate frequencies
- Seasonal sampling schedule
  - Seasonal stratification / growing season
  - “Summer” (April – October) – weekly via boat
  - “Winter” (November – March) – monthly via boat

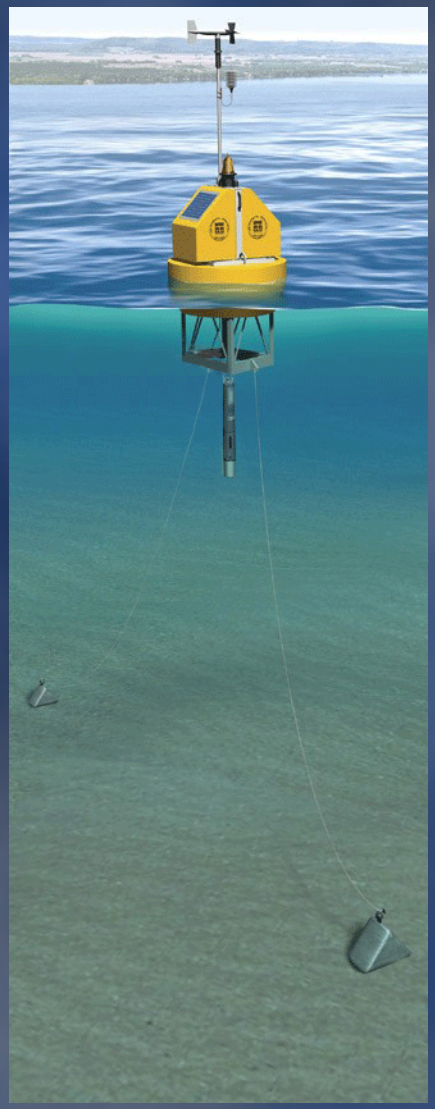
Brick Reservoir Monitoring Program



- Three (3) sampling stations
- Profiles at 1 meter intervals
- Grab samples at surface and sluice gate depths
- Straw phytoplankton sample
- Metedeconk monitoring data important to reservoir management (e.g. nutrient loading)
- Data stored in relational database

Brick Reservoir Monitoring Program

- Secchi Disk
- pH
- Temperature
- Dissolved Oxygen
- DO Saturation
- Specific Conductance
- Total Dissolved Solids
- Chlorophyll (sensor)
- ORP
- Turbidity
- Blue-green algae (sensor)
- Algae ID & Quant.
- Zooplankton ID & Quant.
- Nitrate
- Nitrite
- Ammonia
- Phosphorus (TP, DP, o-P)
- Soluble Silica (SiO_2)
- Alkalinity
- Chlorophyll A,B,C, Pheophytin
- DIC, DOC, TOC
- TKN
- TSS
- Metals
- VOC's
- Fecal Coliform
- TPH
- Oil & Grease
- Geosmin & MIB
- Fish Community

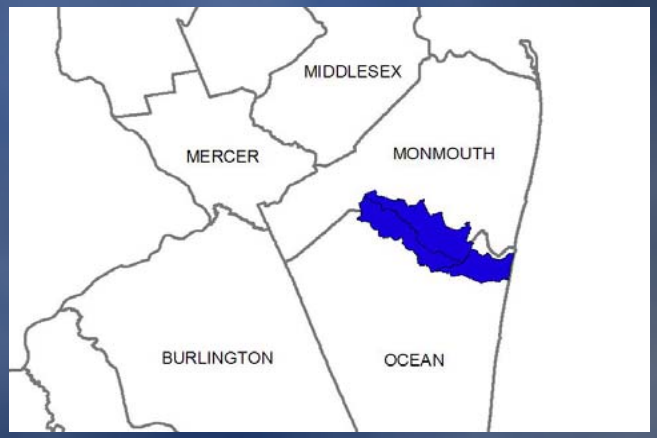


The Metedeconk River

- Metedeconk River has been BTMUA's primary source of water since ~1990
- 70 square miles of the watershed is located upstream of the BTMUA's surface water intake
- North and South Branches
- Watershed is divided fairly evenly between Monmouth and Ocean Counties

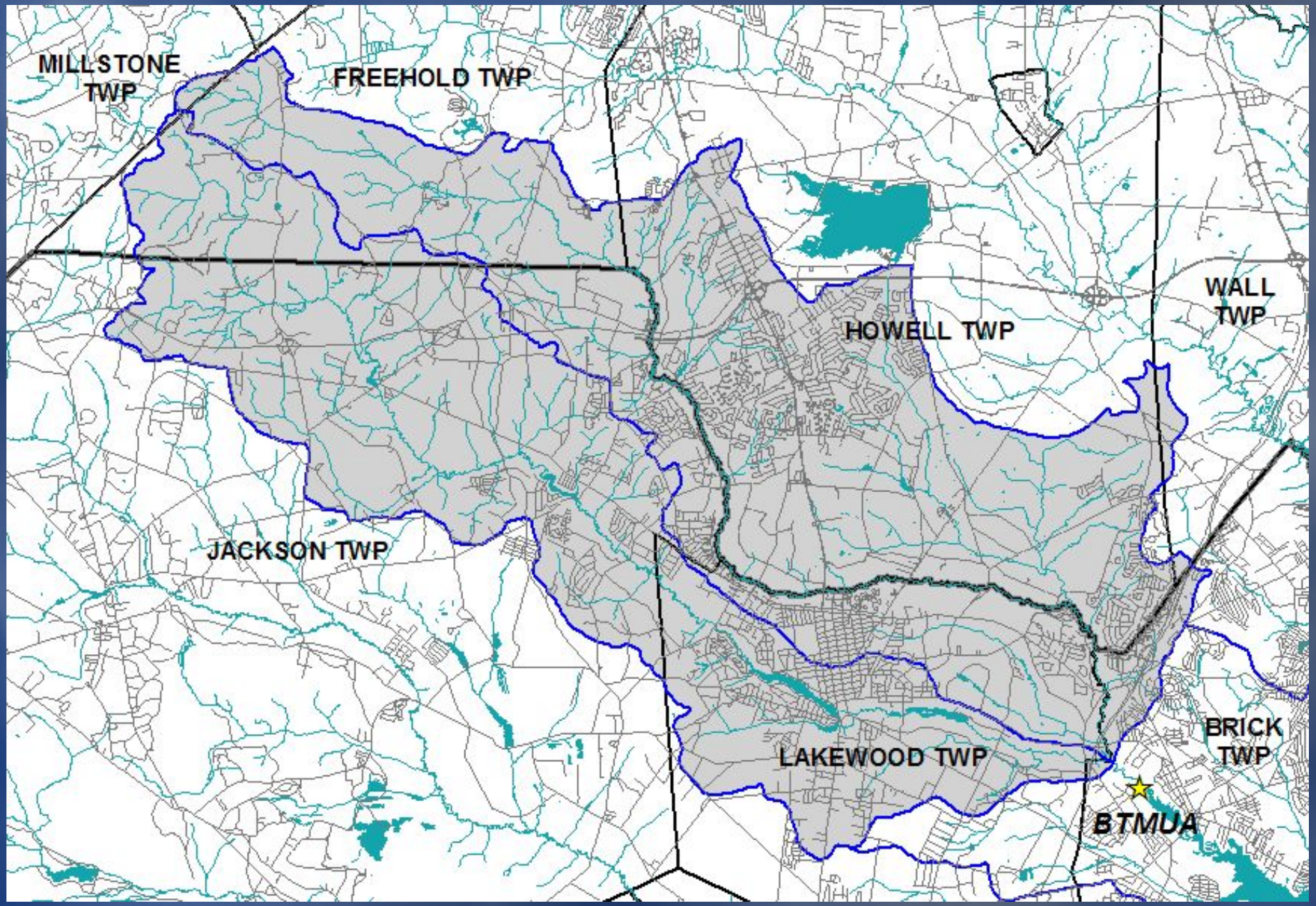
Monmouth County

- Freehold
- Howell
- Millstone
- Wall



Ocean County

- Brick
- Jackson
- Lakewood


MILLSTONE TWP
FREEHOLD TWP
HOWELL TWP
WALL TWP
JACKSON TWP
LAKEWOOD TWP
BRICK TWP
BTMUA

The Metedeconk River Watershed

- Northern-most watershed “naturally” contributing to the Barnegat Bay
- Watershed characteristics are typical of the Barnegat Bay region:
  - Sandy, well-drained soils
  - Abundance of wetland areas
  - Gentle topography with few slopes > 5%
- Largely undisturbed riparian corridor (C1)
- Baseflow (i.e. groundwater stream discharge) accounts for roughly 70% of the flow in the Metedeconk River
- Few discharges - stormwater/NPS is main concern

Metedeconk Watershed Monitoring Program

Objectives

- Ensure Metedeconk River water quality is acceptable for potable water supply
  - Public health (e.g. MCL's, emerging contaminants)
  - Aesthetics (taste and odor)
- Ensure water quality is acceptable for reservoir storage
- Identify specific sites that could jeopardize water quality/quantity
- Identify long-term trends in water quality/quantity and problem parameters
- Support programs aimed at protecting or restoring water quality
  - Regulatory (CWA/Integrated Report/SWQS/TMDL's)
  - Watershed management planning
  - Barnegat Bay Partnership

Metedeconk Watershed Monitoring Program

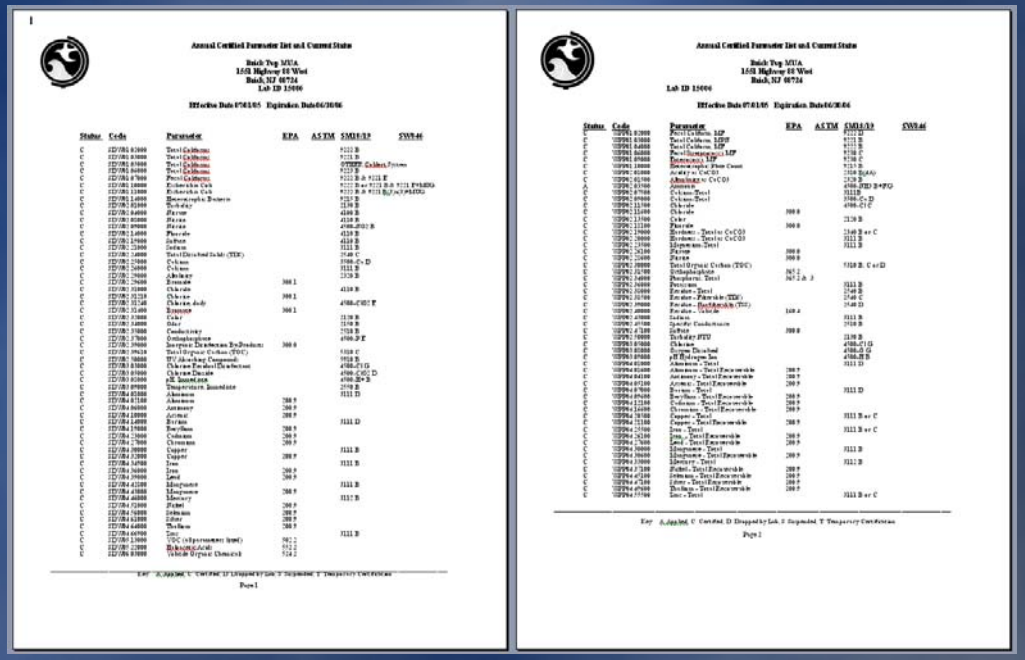
Approach/Methods

- Surface water grab samples & field measurements
- Real-time instruments → SCADA (alarms and archive)
  - Multi-parameter data sondes
  - S::CAN (continuous absorbance spectrum low UV to visible, 220-720 nm)
- Composite sampling (storm, reservoir filling)
- Sampling procedures and QA/QC
- Results entered into relational database
- Automatically updated queries/reports
- Periodic program evaluation and revision
- Quick turnaround from BTMUA's State-certified lab

Metedeconk Watershed Monitoring Program

BTMUA Laboratory

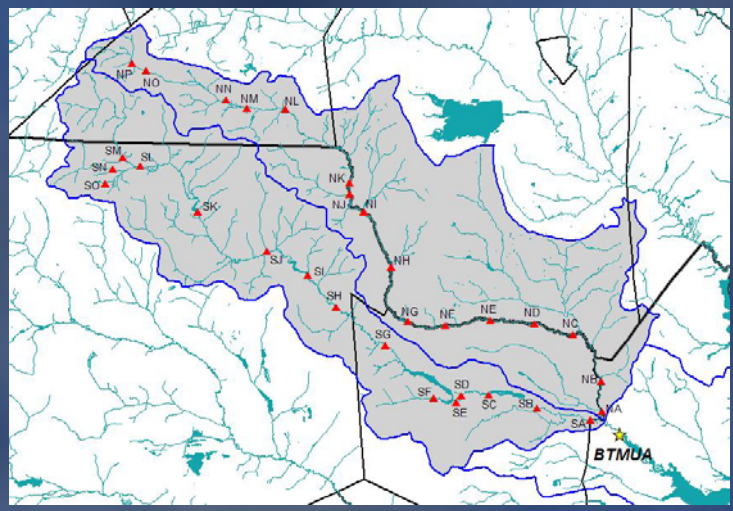
- BTMUA's regulatory and operational monitoring requirements
- Source water, treatment, distribution
- Numerous water utility clients



Metedeconk Watershed Monitoring Program

Daily Sampling

- Water treatment operations focus
- Field measurements and key in-house lab parameters
  - DO, Temperature, pH, Turbidity, Sp. Conductance/TDS, Ammonia
  - Fecal Coliform, E. Coli, TOC, VOC, Geosmin/MIB
- Sampling frequency weighted towards intake
  - Time of travel considerations
- Weekly schedule presently
- Sites of concern monitored
- Intake testing more comprehensive
- Quick turnaround by BTMUA lab
- Forge Pond salinity



Metedeconk Watershed Monitoring Program

Quarterly/Biannual/Annual Sampling

- Long-term watershed health focus
- Subset of daily sampling sites
- Baseline data collected
- Major considerations in sampling design
  - SWQS (Parameters, HUC14 coverage)
  - Land use
- Field measurements and key lab parameters
  - ICPMS metals, Hg, TSS, TDS (lab), BOD/COD, TP, o-P, NO_3, NO_2, NH_4, TKN, Cl^-, SO_4^{-2}, Hardness, O&G, TPH
  - Additions as needed

Metedeconk Watershed Monitoring Program

Resources Required

- Approximately $150,000 annually required to maintain watershed and reservoir monitoring programs
  - Field staff
  - Capital costs (instruments, equipment)
  - Operating costs (materials, supplies, fuel, instrument maintenance & repairs)
  - Laboratory analytical costs (BTMUA and contract labs)

WQDE

- Training, defining fields, formatting data, initial upload to database
  - 155 hours for one individual (~3.5 weeks)
  - Paul Morton very helpful
- Updates ~2 hours/month

Metedeconk Watershed Monitoring Program

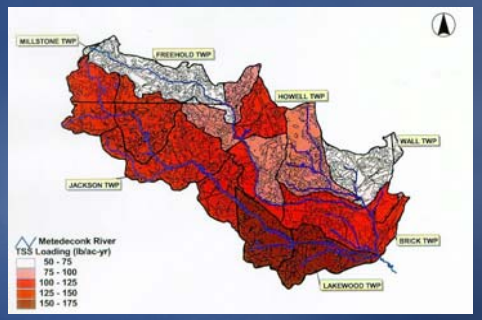
Issues/Challenges

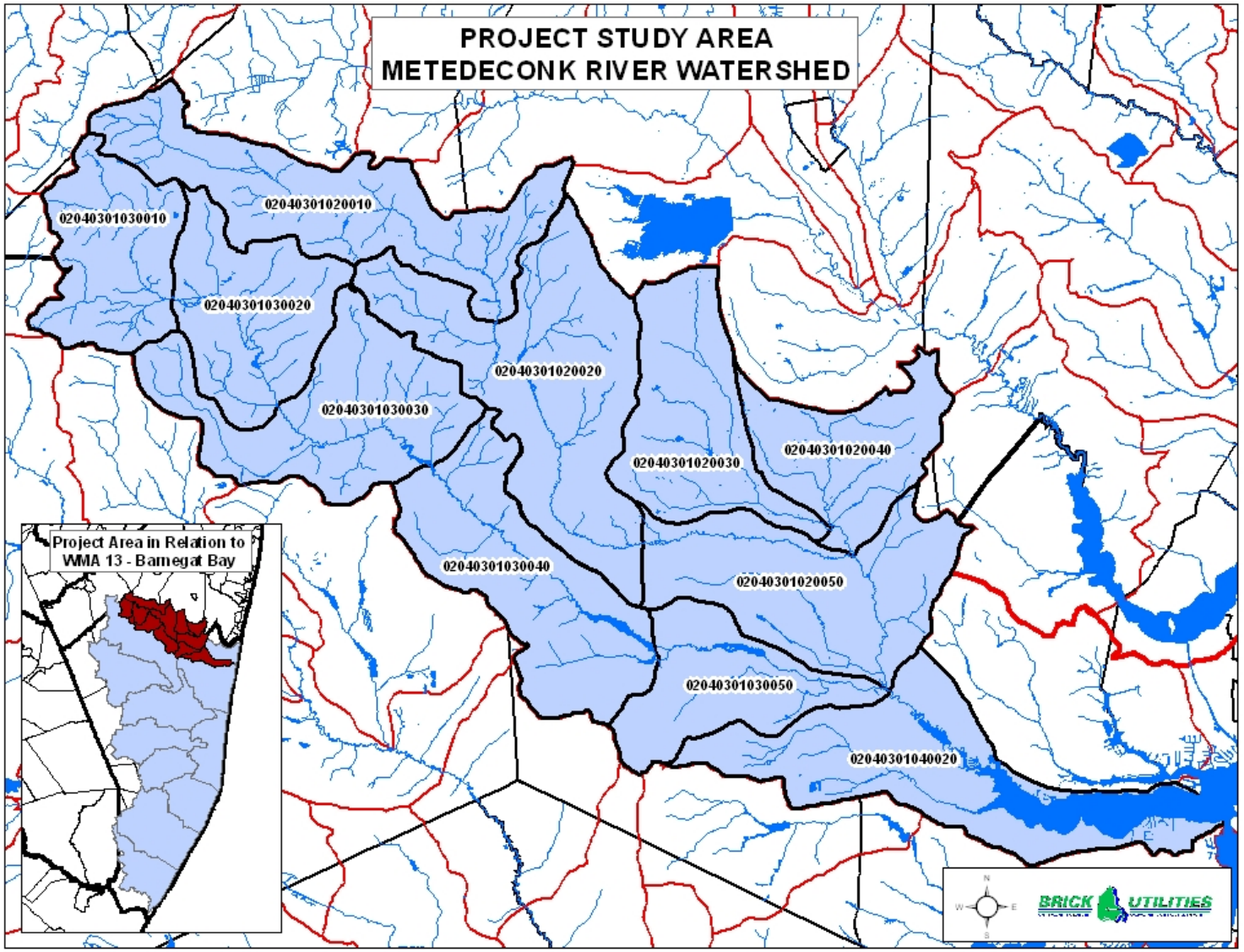
- Data management and integration
- Identifying/incorporating new technology (e.g. s::can)
- Maintaining the most efficient program possible, given the objectives
  - Evaluating what is truly necessary
  - Are there better ways to meet the objectives?
- Is our stewardship philosophy appropriate given the costs?
  - Spill/contamination events are rare
  - Water quality is consistently very good
- Remote monitoring “sonde” stations prone to lightning, vandalism, flooding

Metedeconk Watershed Monitoring Program

Benefits/Uses of Monitoring Data

- Watershed Management
  - Pollutant loading/modeling
  - Track and illustrate water quality changes over time
  - Evaluating BMP/restoration effectiveness
  - Studies
    - Watershed Management Plan – Phase 1 Characterization
    - Trust for Public Land Source Water Stewardship Pilot Project
    - Metedeconk Watershed Protection & Restoration Plan (underway)




PROJECT STUDY AREA
METEDECONK RIVER WATERSHED
02040301030010
02040301020010
02040301030020
02040301020020
02040301030030
02040301020030
02040301020040
02040301030040
02040301020050
02040301030050
02040301040020
Project Area in Relation to
WMA 13 - Barnegat Bay
BRICK UTILITIES

Metedeconk Watershed Monitoring Program

Benefits/Uses of Monitoring Data (cont.)

- Better operational decision-making
  - WTP operations relies heavily on source water data
- Evaluating treatment disruptions
- Value to other agencies/programs (e.g. NJDEP, BBP)
- Research/investigations/studies (BTMUA, WRF and others)
- Climate change/sea level rise evaluation
- “Eyes and ears” on the watershed daily to identify potential problems
- Public relations (customers, State/county/local government, agencies, emergency responders, utilities, watershed community)

Robert Karl
Source Water Supervisor
Brick Township MUA
1551 Highway 88 West
Brick, NJ 08724
(732) 458-7000 ext. 271
rkarl@brickmua.com

BRICK UTILITIES
THE BRICK TOWNSHIP MUNICIPAL UTILITIES AUTHORITY