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CITY OF MEDICINE

Department of
Water Management

South Durham Water Reclamation Facility Upgrades and Strategies to Address Jordan Lake Rules

March 19, 2014

EPA WaterSense PARTNER

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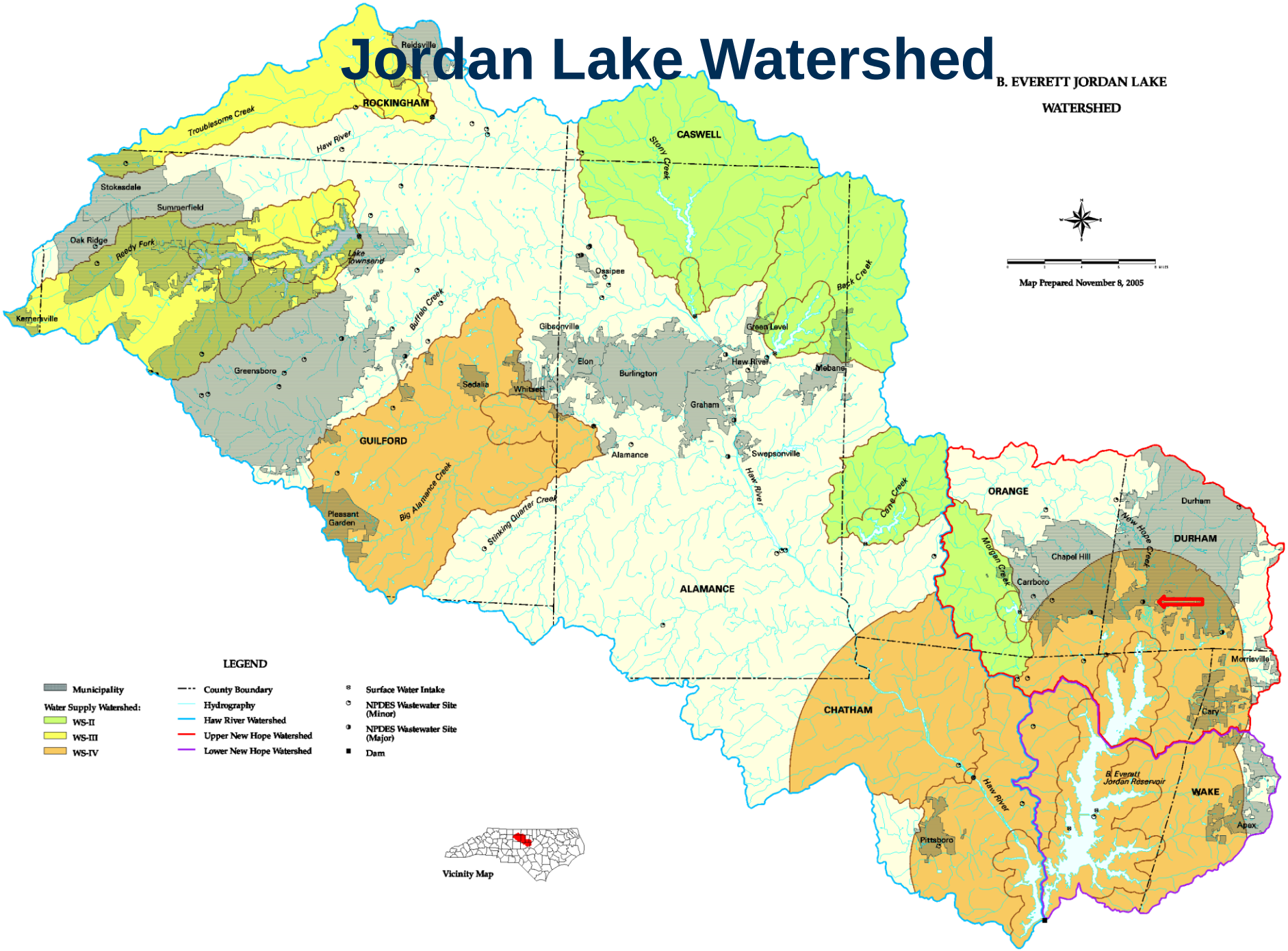
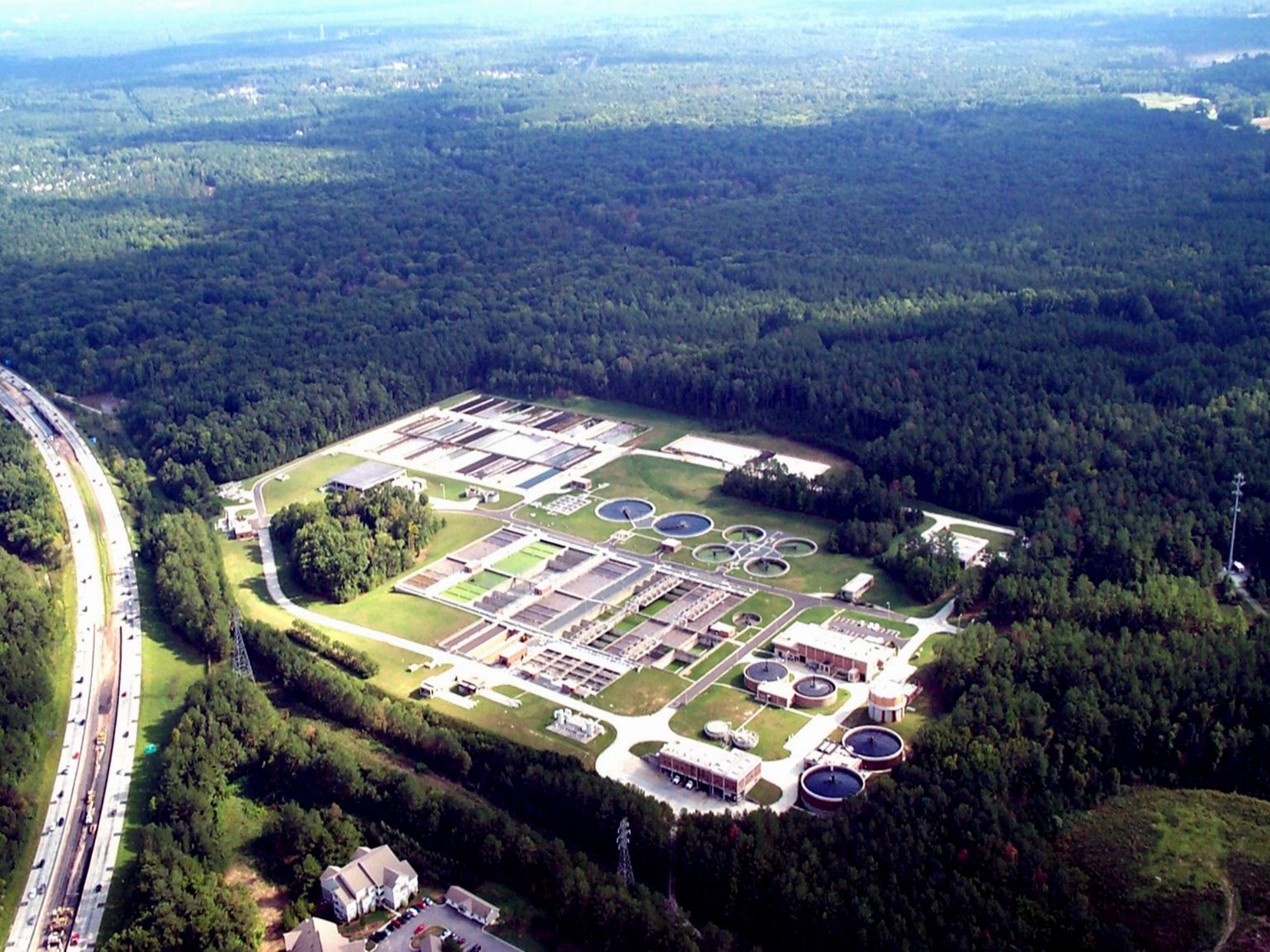
Jordan Lake Watershed



Outline

- History of South Durham WRF
- Strategies implemented to date
  - Optimization Study
- Planned upgrades to address rules
  - 2011 Master Plan
  - Capital Improvements
- Cost of compliance



South Durham WRF - History

- Discharges into New Hope Creek
- Built in 1984 at a cost of $19M
  - Capacity of 10 MGD.
- Upgraded in 1990 for phosphorous removal $8M
- Expanded in 1995 for $49M
  - Capacity increase to 20 MGD
  - Biological nitrogen removal
- Added sludge handling facilities in 1998 for $7M
- By 2007 SDWRF had decreased N discharges by 56% and P by 80%
- Excellent compliance history

SDWRF Optimization Study

Completed in December 2009 at cost of $24,000; recommendations implemented:

- Process changes based on calibrated BioWin™ Model
- Installation of on-line monitoring
- Minor physical improvements
- Investigate supplemental carbon addition
  - Successful pilot study at SDWRF
- Evaluate side stream removal and treatment
  - Successful Ostara pilot study

Nutrient Reductions to Date

Year	Nitrogen (lbs/yr)			Phosphorus (lbs/yr)	
	Current Limits	2016 Limits	SD discharge	2016 Limits	SD discharge
2013	334,900	185,345	220,445	14,053	7,009
2009	334,900	185,345	281,842	14,053	17,754

22% reduction in N

60% reduction in P

SDWRF – 2011 Master Plan

- Twenty year planning window
- Total cost of plan $750,000 ~ 25% for N/P
- Recommendations to meet 2016 Jordan Lake Rules nutrient reductions
- Implementation of conventional technologies
  - Effluent Reuse
  - Enhanced Nutrient Removal through:
    - Supplemental Carbon Feed
    - Modifications to tanks and piping
    - Side stream treatment
  - Future
    - Deep bed denitrification filters

Operational Costs at SDWRF to meet TP reduction

Total Phosphorous

- No new construction required
- Increase in chemical costs of approximately $100,000/year
  - Requires year round chemical feed
- Additional biosolids handling costs estimated at $15,000 - $20,000/year

Estimated Costs at SDWRF to meet TN reduction

Department of Water Management

Total Nitrogen

- New construction required – Estimate $11.1M total, 2 phases
- Annual chemical costs estimated at $1 M/year
  - $0.5 Supplemental Carbon
  - $0.5 pH adjustment
- Costs could increase significantly if new filters or more advanced technology required

SDWRF – Capital Improvements

- On-line nutrient monitoring - 2012
  - $711K
- 2014 construction - ~$7.83M
  - AnitaMox side stream treatment ($2.06M)
  - Structural improvements ($130K)
  - Equipment upgrades ($440K)
  - Supplemental Carbon Facilities ($4.2)
  - Process modifications ($1.0M)

SDWRF – Capital Improvements

- 2016 construction - $3.2M
  - Structural Improvements ($2.16M)
  - Equipment upgrades ($574K)
  - Process modifications ($600K)

SDWRF – Total Costs for 2016 Compliance

- Phosphorus reduction
  - $120K (annual operational)
- Nitrogen reduction
  - $11.1M (construction)
  - Operational
    - $1.0 M (annual chemicals)
    - ? Energy

Total cost = $12.43M

Future Considerations

Additional side stream treatment process

- Ostara Nutrient Recovery (or similar)
  - Diverts filter press filtrate (liquid) with high concentrations of phosphorus to the Ostara reactor
  - Eliminates retreatment of high phosphorus waste stream at head of plant, reducing the loading by almost 90%
  - Allows biological process to focus on nitrogen removal

Summary

City of Durham is committed to:

- Investing in implementation of strategies to reduce Nitrogen and Phosphorus discharges into Jordan Lake
- Building on successes to date
- Meeting all regulatory requirements & deadlines
- Maintaining the water quality of Jordan Lake as a water supply source
  - Durham has a 10 MG allocation from Jordan Lake for drinking water purposes
- Using rate payer dollars resourcefully