

# ***Historical Reconstruction of the Water-Distribution Systems: Hadnot Point and Holcomb Boulevard***

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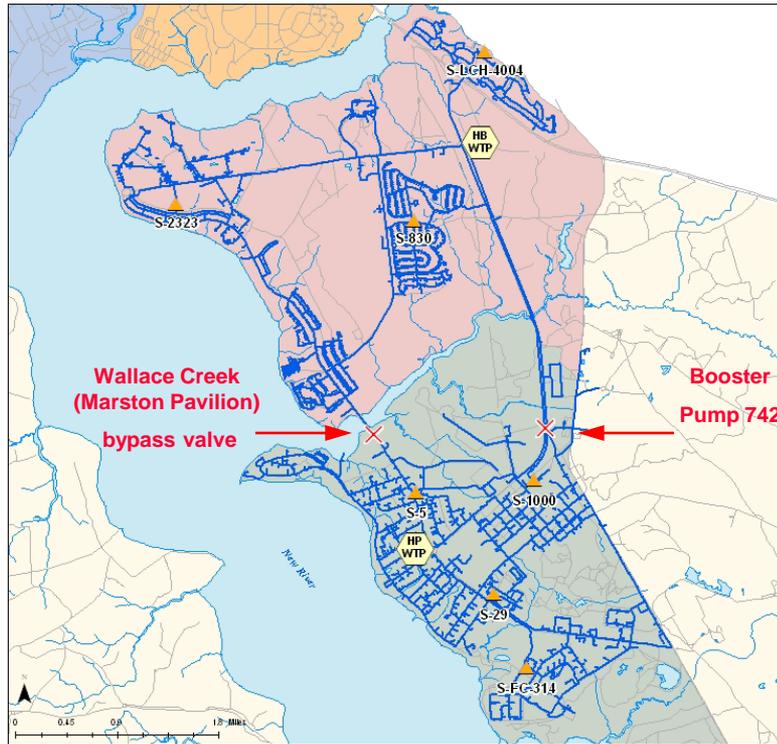
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# Overview

- Background
- Water-Distribution System Model
  - all-pipes calibration results
- Interconnection
  - transfer of water between systems
- Historical Reconstruction
  - preliminary scenario results

# Water treatment plant service areas

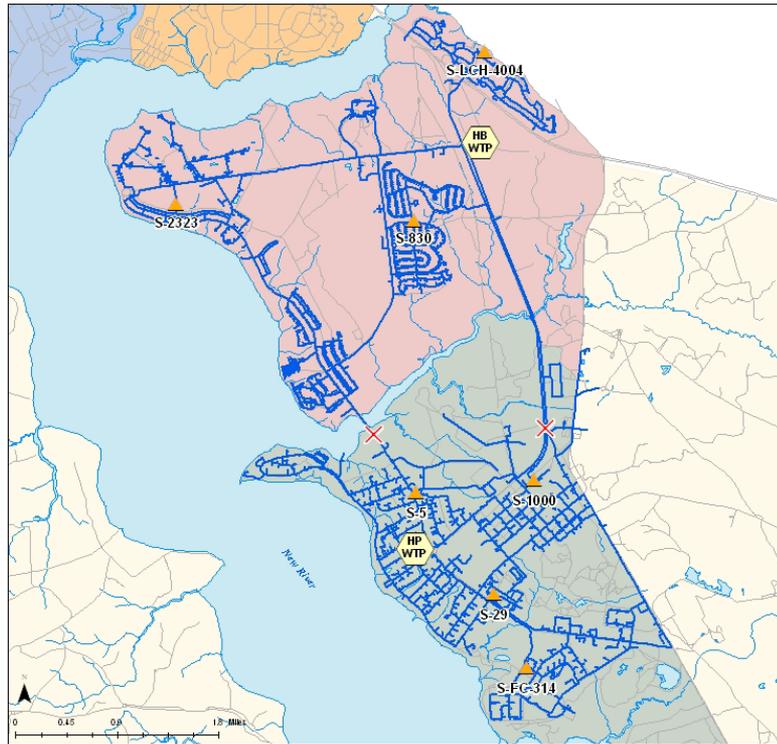


## Explanation

▲ Elevated Tanks	Historical water-supply areas
— Water Pipelines	Montford Point
— Roads	Tarawa Terrace
	Holcomb Boulevard
	Hadnot Point

- Hadnot Point
  - 74 mi of pipelines
    - ▲ approx 71% PVC
  - 4 elevated tanks:
    - ▲ all 300,000 gal
  - Delivered water:
    - ▲ approx. 2.3 MGD (2004)
- Holcomb Boulevard
  - 73 mi of pipelines
    - ▲ approx 67% Cast Iron (CI)
  - 3 elevated tanks:
    - ▲ S-830 = 300,000 gal
    - ▲ LCH-4004 = 200,000 gal
    - ▲ S-2323 = 200,000 gal
  - Delivered water
    - ▲ approx. 1.0 MGD (2004)
- Interconnections
  - Wallace Creek bypass valve
  - Booster Pump 742

# Significant events: 1941 through 1987

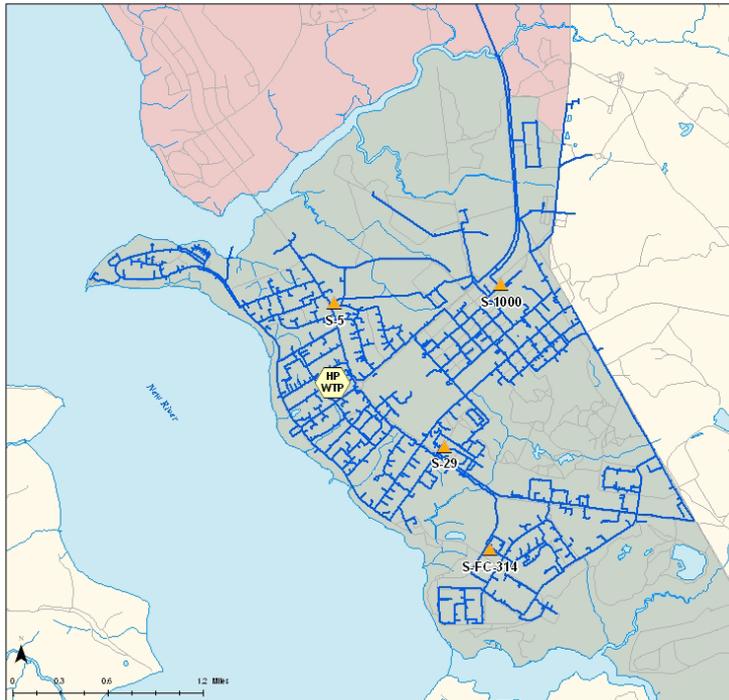


## Explanation

▲ Elevated Tanks	Historical water-supply areas
— Water Pipelines	Montford Point
— Roads	Tarawa Terrace
	Holcomb Boulevard
	Hadnot Point

- 1941: Hadnot Point water treatment plant comes on-line
- 1952: Tarawa Terrace water treatment plant came on-line
- 1972: Holcomb Boulevard water treatment plant came online in June of 1972
- Nov 1984-Feb 1985: Several supply wells shut down due to VOC contamination
- Jan27-Feb4 1985: (9 day period) Marston Pavilion interconnection opened continuously
- 1987: Holcomb Boulevard water treatment plant expanded to provide water to Tarawa Terrace and Camp Johnson water-distribution system areas
- 1987: Tarawa Terrace water treatment plant taken out-of-service (March) and demolished

# Hadnot Point Water-Distribution System: All-pipes Model



## Explanation

- |                      |                               |
|----------------------|-------------------------------|
| ▲ HP Elevated Tanks  | Historical water-supply areas |
| — HP Water Pipelines | Montford Point                |
| — Roads              | Tarawa Terrace                |
|                      | Holcomb Boulevard             |
|                      | Hadnot Point                  |

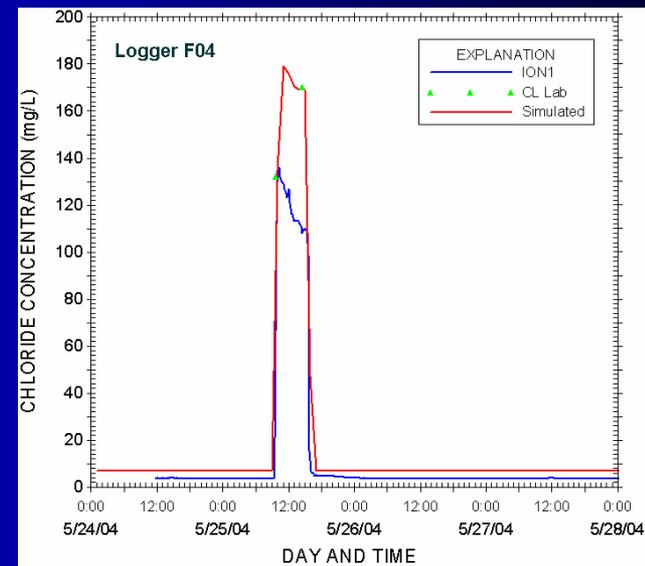
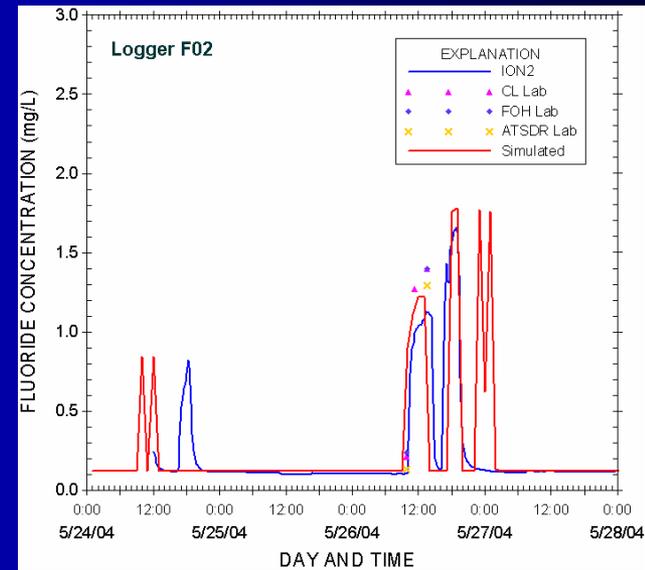
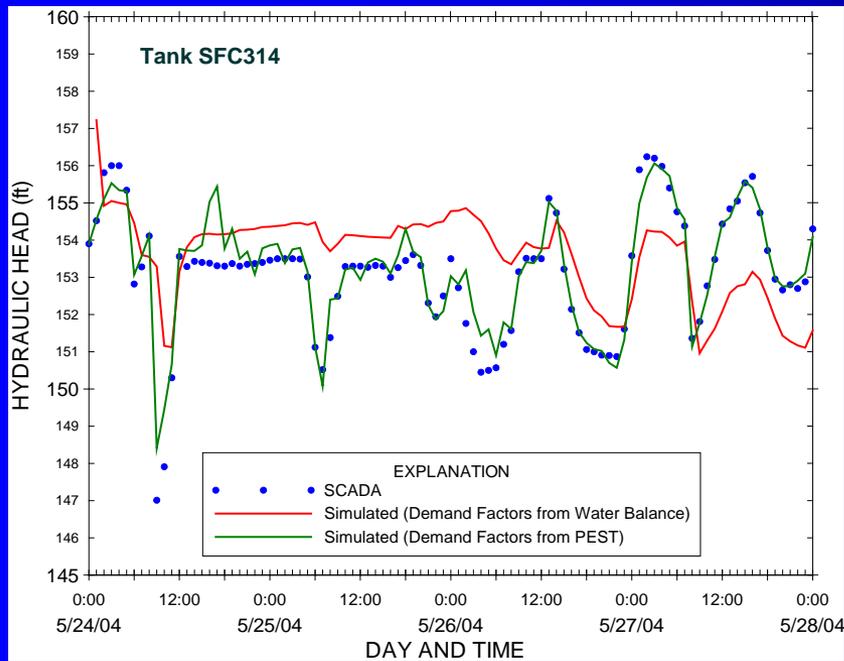
## ● EPANET 2

- Simulates spatially distributed contaminant concentrations throughout the network
- Performs extended period simulations of hydraulic and water quality behavior within the network

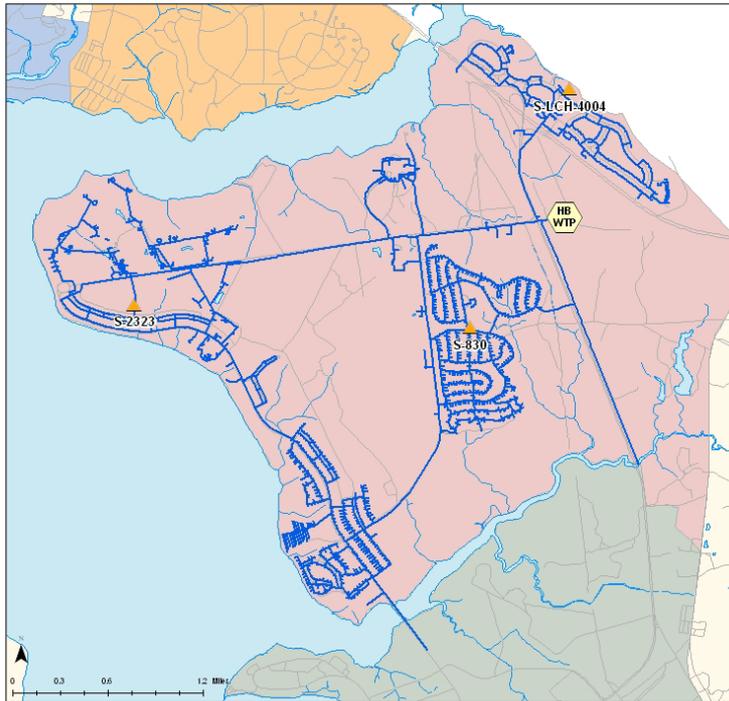
## ● Hadnot Point

- 3904 junctions; 4012 pipes
- Hydraulic and Water Quality Field Test
  - ▲ May 24-27, 2004
  - ▲ Calcium Chloride ( $\text{CaCl}_2$ ) and Sodium Fluoride (NaF) injection at HP WTP

# Hadnot Point: Calibration Results



# Holcomb Boulevard Water-Distribution System: All-pipes Model

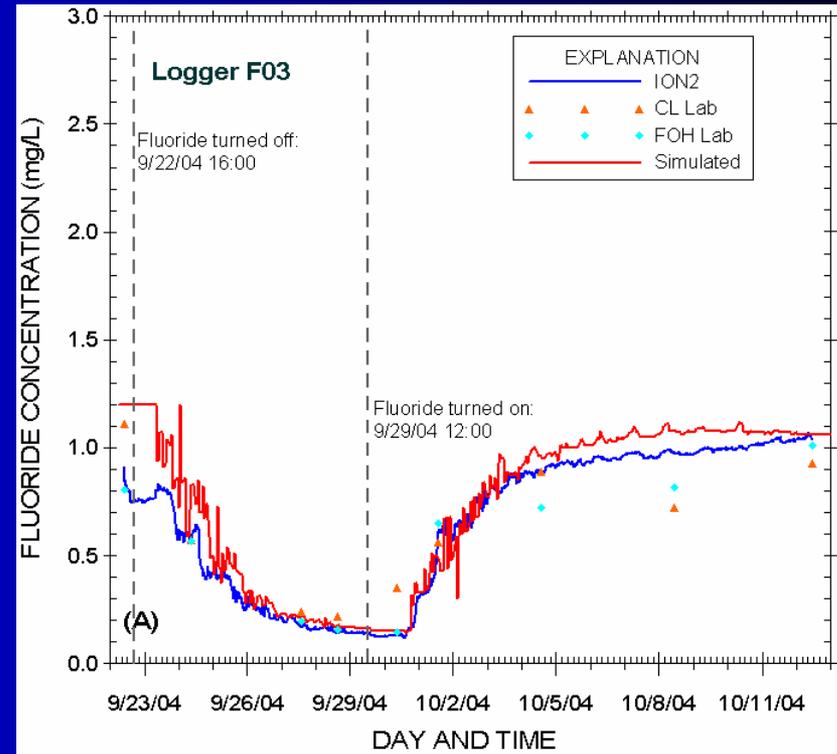
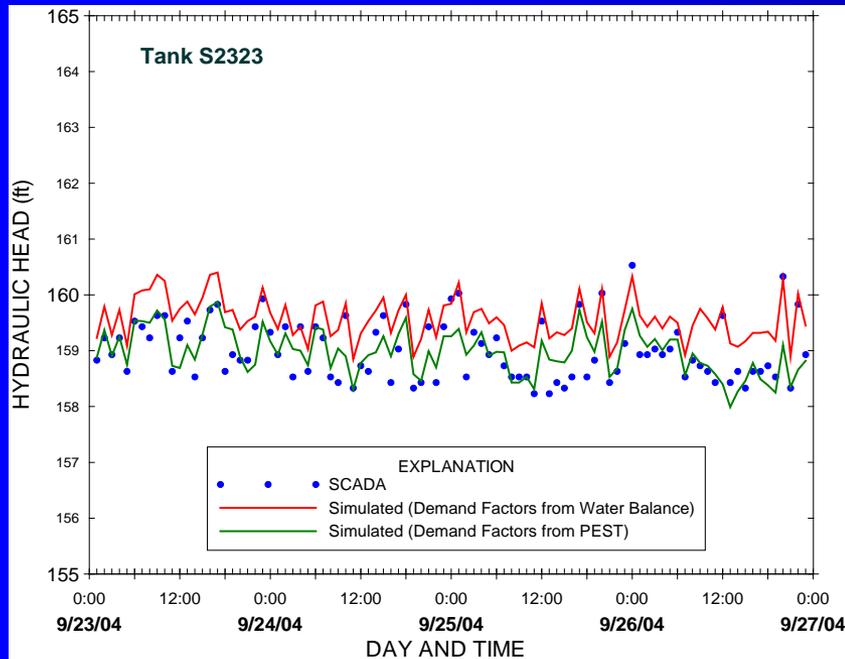


## Explanation

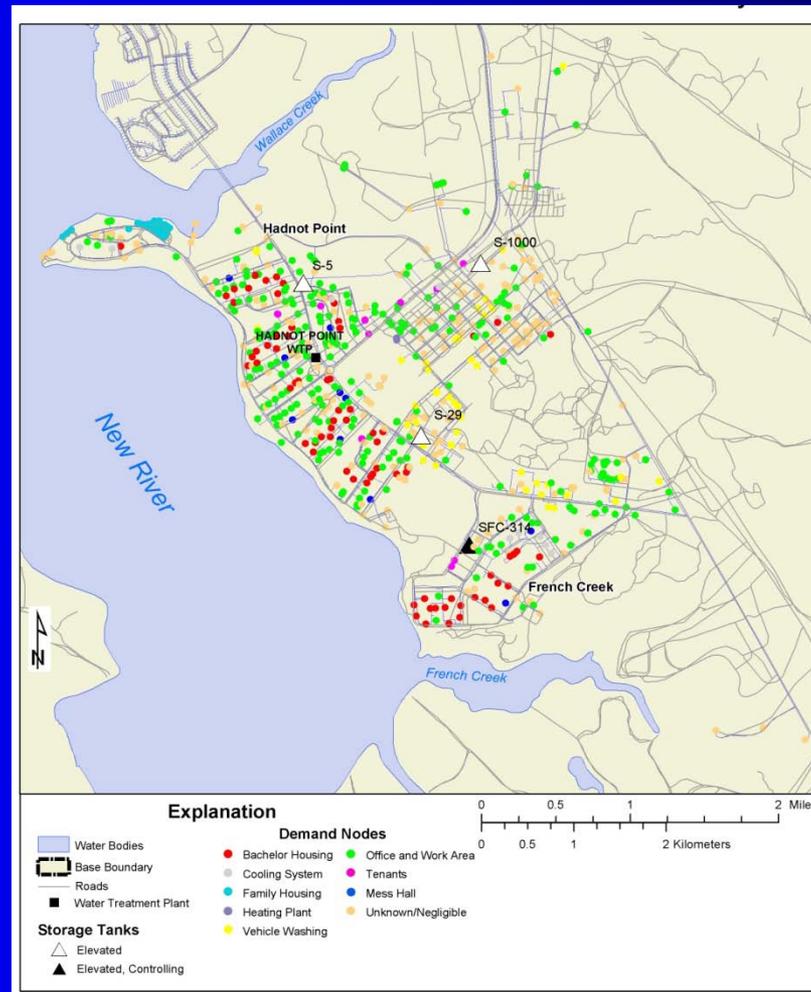
- |                    |                                      |
|--------------------|--------------------------------------|
| HB Elevated Tanks  | <b>Historical water-supply areas</b> |
| HB Water Pipelines | Montford Point                       |
| Roads              | Tarawa Terrace                       |
|                    | Holcomb Boulevard                    |
|                    | Hadnot Point                         |

- Holcomb Boulevard
  - 4782 junctions; 4909 pipes
  - Hydraulic and Water Quality Field Test
    - ▲ Sept-Oct 2004
    - ▲ Shut off fluoride feed at HB WTP

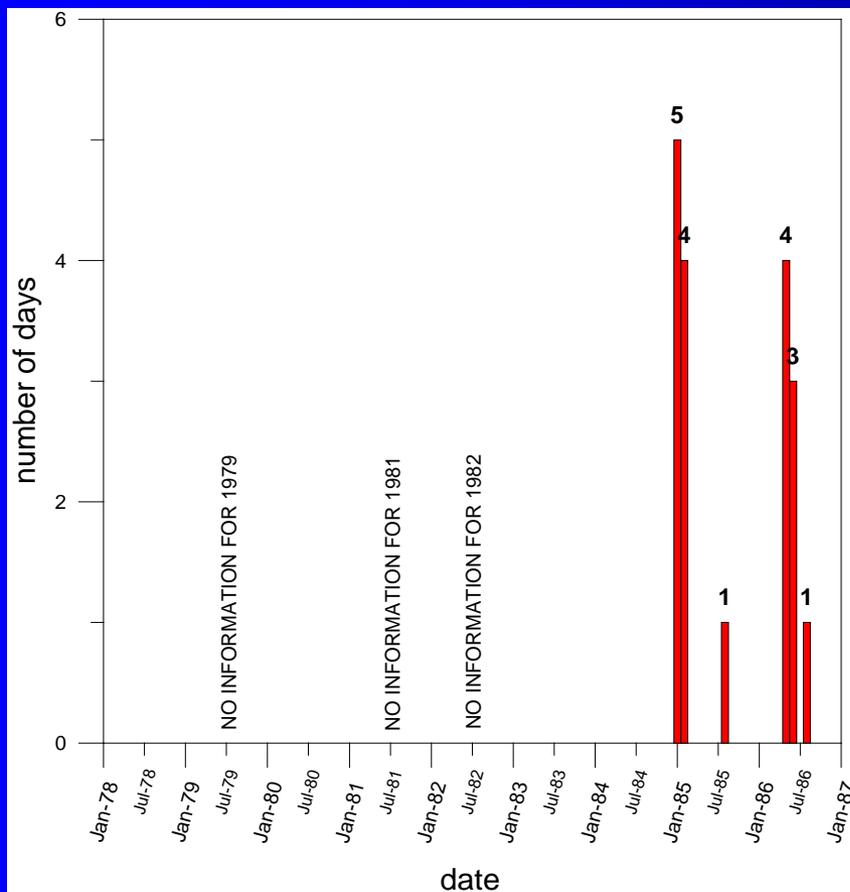
# Holcomb Boulevard: Calibration Results



# PEST Derived Demand Factors



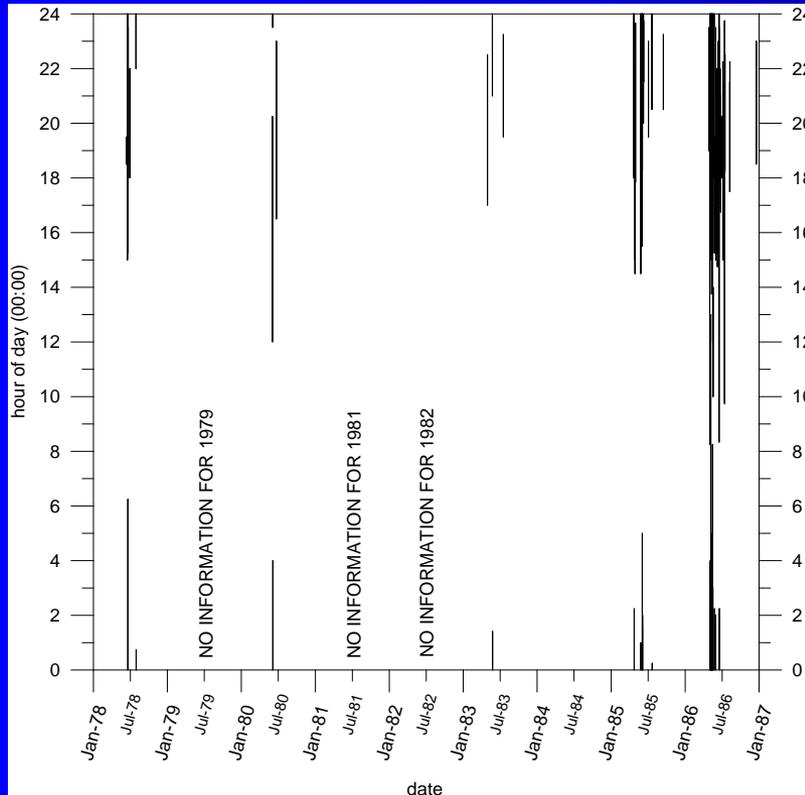
# Interconnections: BP-742 and Wallace Creek (Marston Pavilion) Bypass Valve



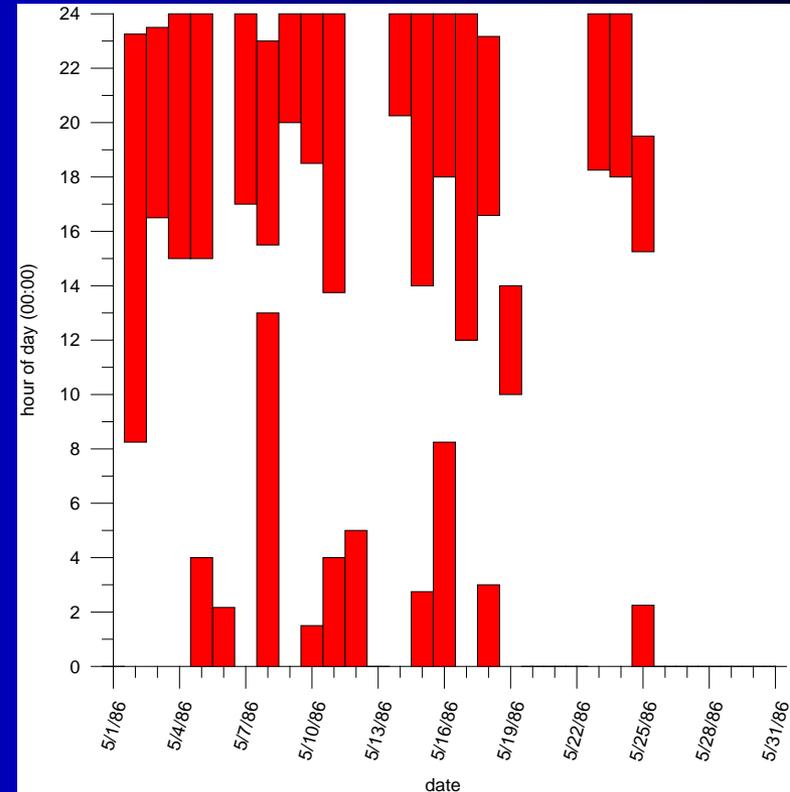
- Camp Lejeune Log Books
  - 1978-1986
  - Log book data gaps:
    - ▲ 1972 to 1977
    - ▲ Nov. 1978 to Nov. 1979
    - ▲ Aug. 1980 to July 1982
    - ▲ BP-742 not operated in 1984
  
- Booster Pump 742 Operations
  - ~700 gpm rated capacity during study timeframe
    - ▲ pump replaced with ~300 gpm rated capacity (currently out-of-service)
  - operated mostly in late spring to early summer (April, May, June, and July)
  - operated more frequently in mid-1980's than in late 1970's or early 1980's
  
- Wallace Creek (Marston Pavilion) bypass valve
  - Operated around 18 different days between 1978 and 1986
    - ▲ Continuously for 9 days Jan27-Feb4 1985

# Booster Pump 742 Hourly Operation

January 1978 –  
December 1986



May 1986

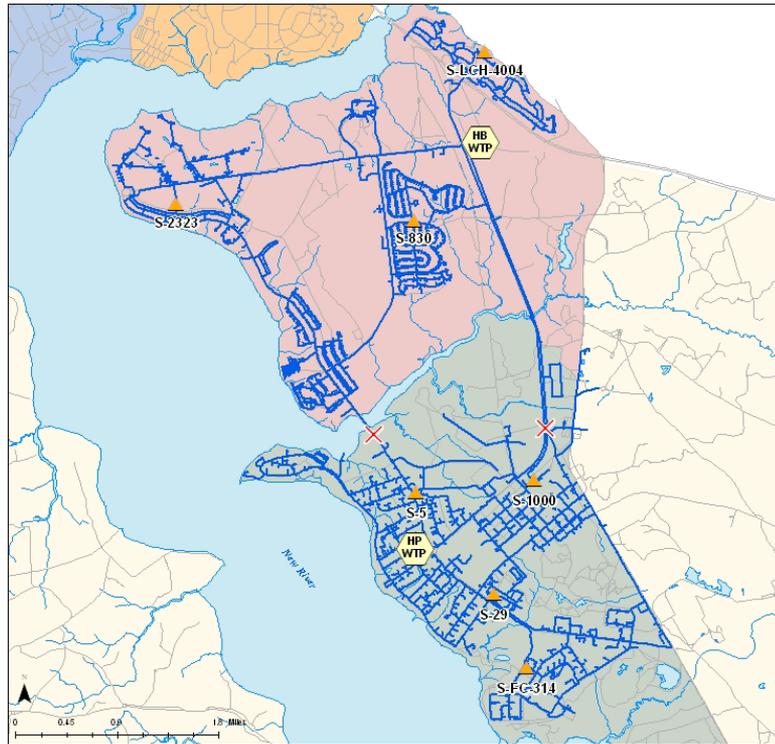


\*\*\* DRAFT - SUBJECT TO CHANGE \*\*\*

# Booster Pump 742 “Typical” Operation Scenarios

- Booster Pump 742 operated most frequently in May 1986
- Hours of operation according to log book information
  - 1986 (worst case)
    - ▲ ~1900 hours to 2400 hours
    - ▲ (7pm to midnight)
    - ▲ operated about half the days during the month
  - 1980 (typical case)
    - ▲ ~1730 hours to 2345 hours
    - ▲ (5:30pm to 11:45pm)
    - ▲ operated about three days during the month
  - Camp Lejeune former and current water utility staff confirmed BP-742 usually shut off at 2400 hours when operators shift over

# Water-Distribution Systems Overview

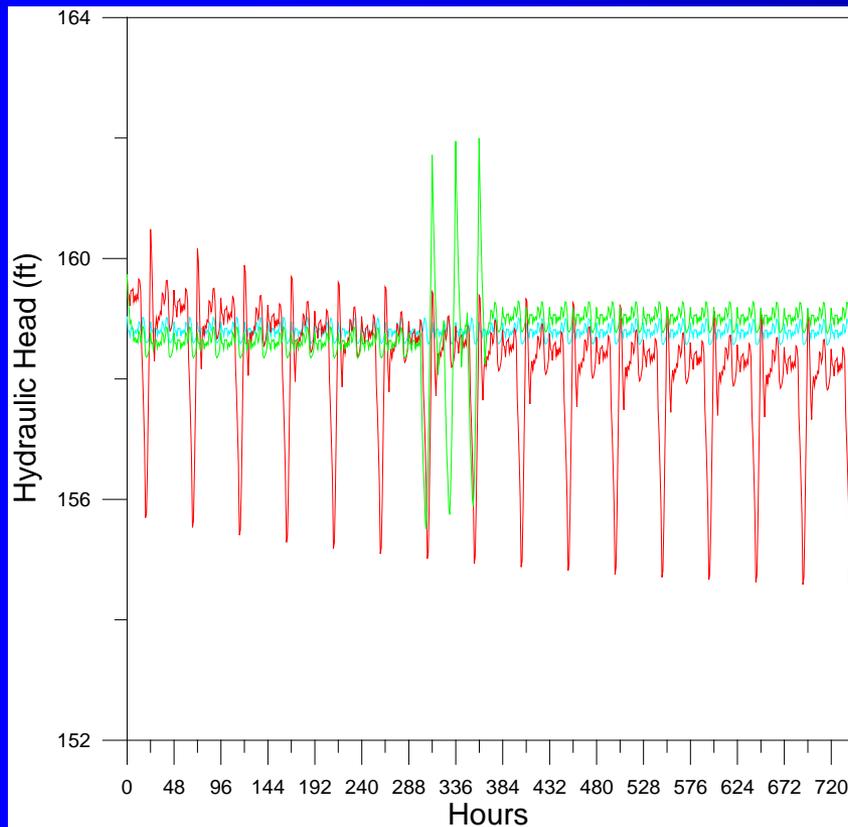


## Explanation

Elevated Tanks	<b>Historical water-supply areas</b>
Water Pipelines	Montford Point
Roads	Tarawa Terrace
	Holcomb Boulevard
	Hadnot Point

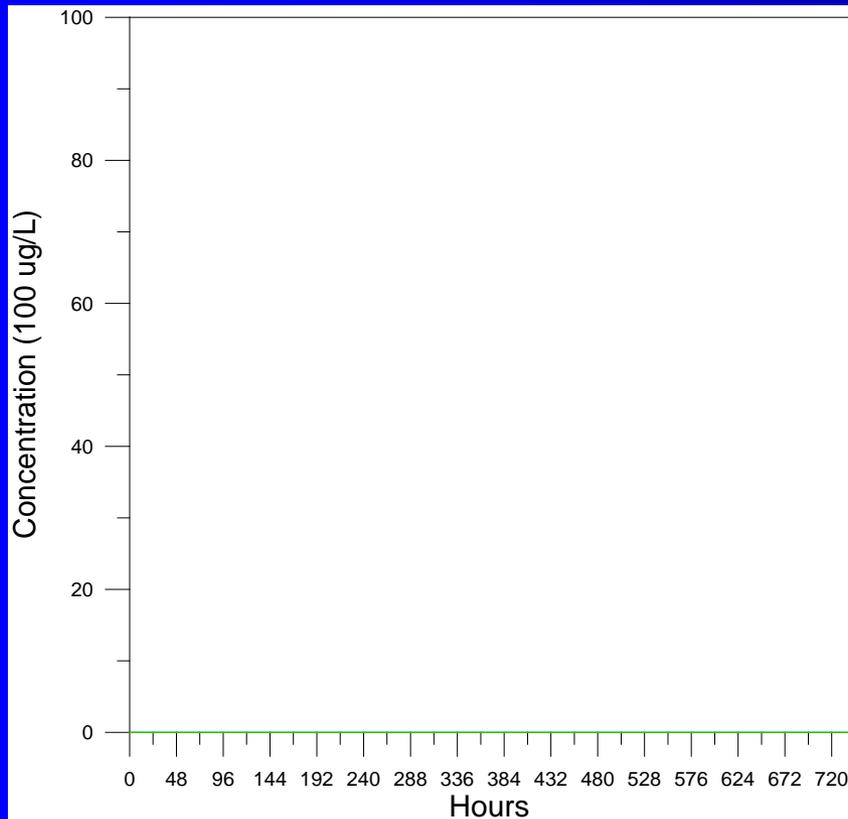
- Hadnot Point
  - Hadnot Point WTP
  - Controlling tank SFC-314
- Holcomb Boulevard
  - Holcomb Boulevard WTP
  - Controlling tank S-2323
  - Berkeley Manor tank S-830
  - Golf courses located near Paradise Point area (S-2323)
    - ▲ Irrigated with potable water during study timeframe
- Interconnections
  - Marston Pavilion bypass valve
  - Booster Pump 742

# Historical Reconstruction: Holcomb Boulevard Controlling Tank S-2323



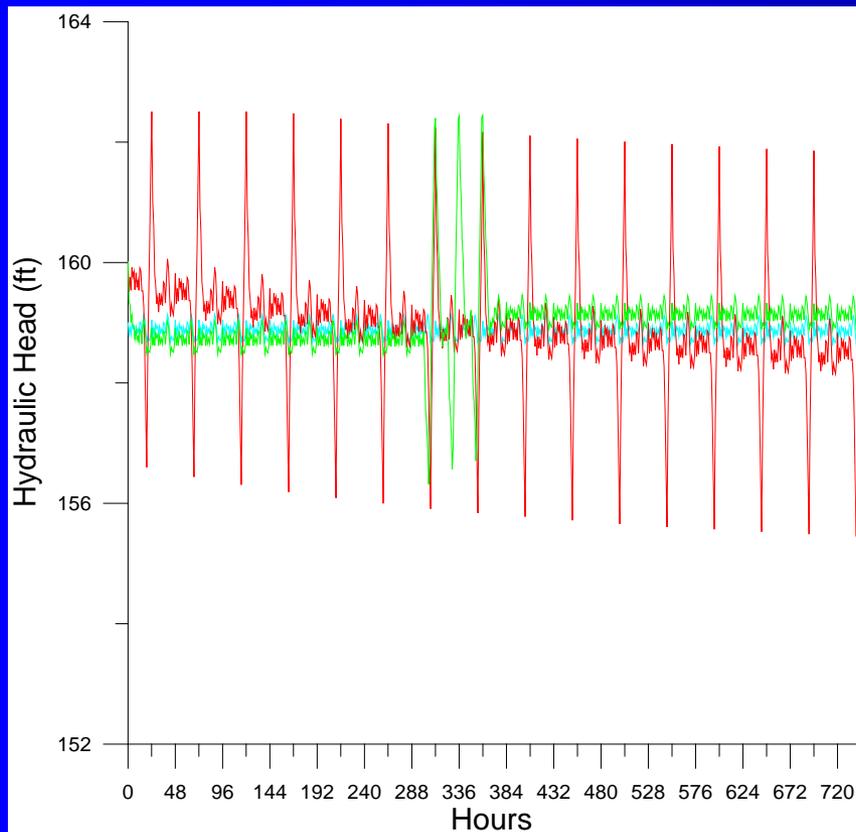
- Hydraulic Head (ft)
  - NO INTERCONNECTION
    - ▲ No water transfer
      - May 2004 EPS
  - BP-742 INTERCONNECTION
    - ▲ open every other day
      - May 1986 EPS
    - ▲ open three days in middle of month
      - May 1980 EPS

# Historical Reconstruction: Holcomb Boulevard Controlling Tank S-2323



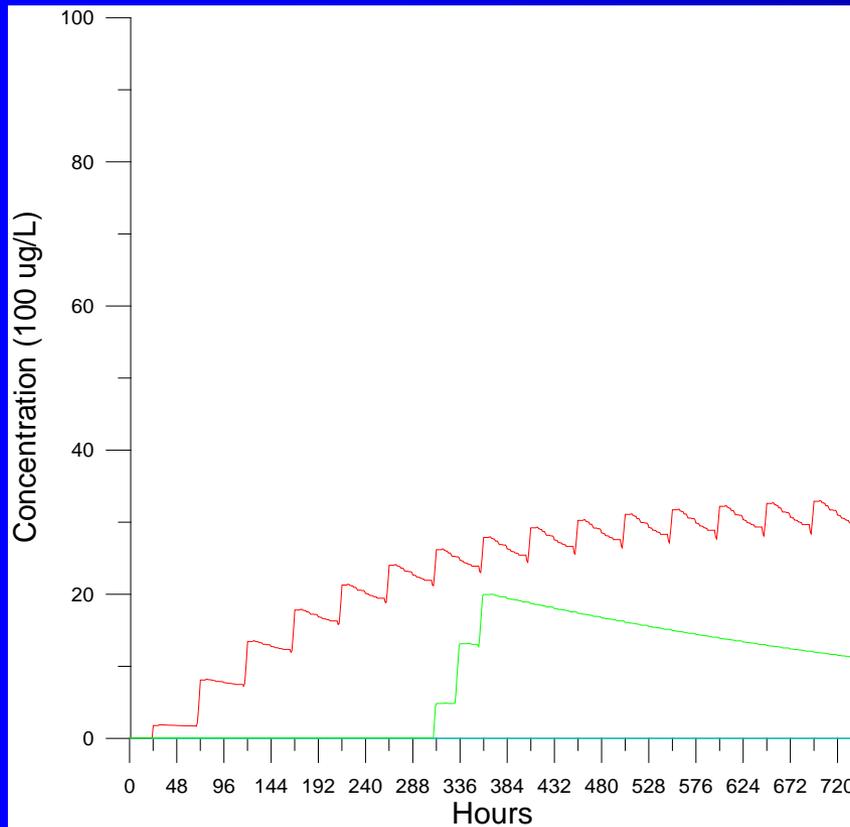
- Concentration  
(100 ug/L at HP WTP)
  - NO INTERCONNECTION
    - ▲ No water transfer
      - May 2004 EPS
      - 0% HP water at S-830
  - BP-742 INTERCONNECTION
    - ▲ open every other day
      - May 1986 EPS
      - 0% HP water at S-830
    - ▲ open three days in middle of month
      - May 1980 EPS
      - 0% HP water at S-830

# Historical Reconstruction: Berkeley Manor Tank S-830



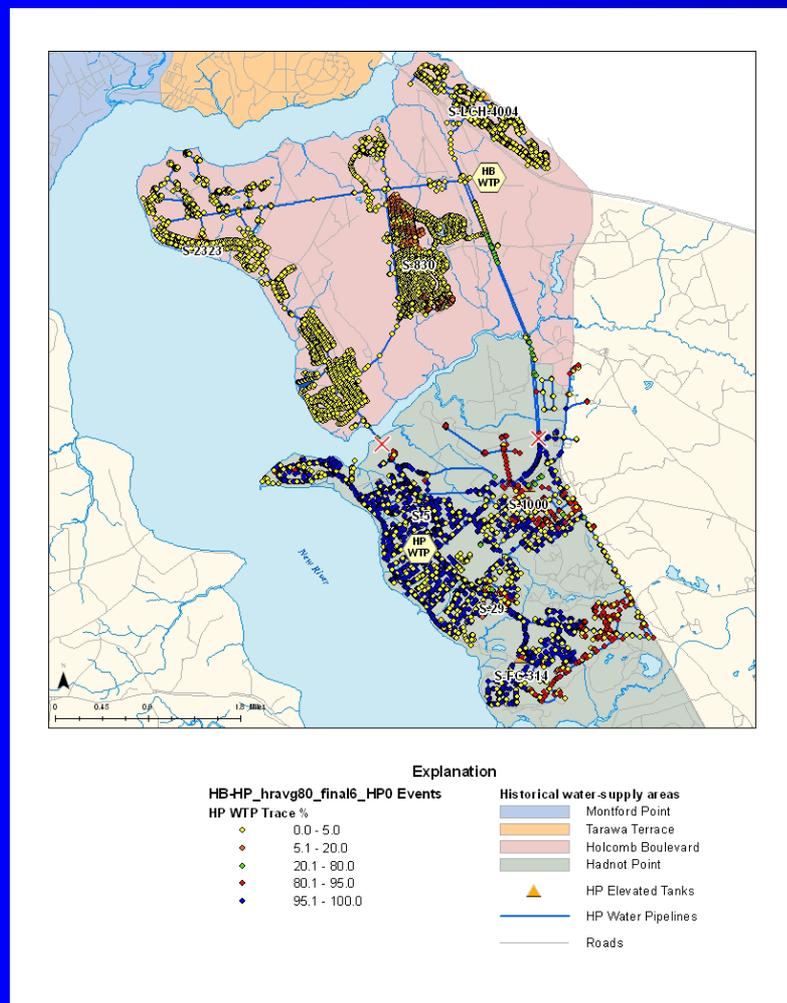
- Hydraulic Head (ft)
  - NO INTERCONNECTION
    - ▲ No water transfer
      - May 2004 EPS
  - BP-742 INTERCONNECTION
    - ▲ open every other day
      - May 1986 EPS
    - ▲ open three days in middle of month
      - May 1980 EPS

# Historical Reconstruction: Berkeley Manor Tank S-830



- Concentration (100 ug/L at HP WTP)
  - **NO INTERCONNECTION**
    - ▲ no water transfer
      - May 2004 EPS
      - 0% HP water at S-830
  - **BP-742 INTERCONNECTION**
    - ▲ open every other day
      - May 1986 EPS (worst case)
      - ~22% HP water at S-830
    - ▲ open three days in middle of month
      - May 1980 EPS (typical case)
      - ~8% HP water at S-830

# Historical Reconstruction: Distribution Results



- Concentration (100 ug/L at HP WTP)
  - NO INTERCONNECTION
    - ▲ no water transfer
      - May 2004 EPS
  - BP-742 INTERCONNECTION
    - ▲ open every other day
      - May 1986 EPS
    - ▲ open three days in middle of month
      - May 1980 EPS

# ***Future Considerations – Historical Trends***

- Explore using climatic data, (which is directly related to when the golf courses were irrigated) along with known Booster Pump 742 operating conditions from 1978 to 1986 to estimate historical BP-742 operations from 1973 to 1977.
  - don't need operations from 1968 to 1972 because Holcomb Boulevard WDS received all its water from Hadnot Point WTP during this timeframe

# *Future Considerations – Historical Reconstruction*

- Interconnections
  - Model each month BP-742 was operating with actual log book data
    - ▲ this will not be a “typical” scenario but instead will be “actual” occurrence
    - ▲ this will still be run as extended period simulation
    - ▲ estimate BP-742 operating conditions from 1972-1977
      - Use BP-742 log book operating data along with existing climatic data from 1972-1986 to plot historical trends
  - Model Marston Pavilion bypass valve openings
    - ▲ Already conducted preliminary simulations and it appears Wallace Creek bypass valve opening has little influence on Holcomb Boulevard WDS
      - Did this with BP-742 pumping, might want to run scenario with just Marston Pavilion valve bypass valve opening
  - Model 9 day event (Jan-Feb 1985) when Marston Pavilion bypass valve opened continuously

***Thank You!***

Questions and Discussion