City of Richmond Interim After-Action Assessment Report

HNTB

March 3, 2025

Report Outline



- Introduction
- Investigation Process
- Water Treatment Plant Overview
- Event Description
- Investigation Findings
- Recommendations



Investigation Process

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WTP tour

Staff interviews

- 14 interviews conducted to date.
- Former Director April Bingham was contacted by City staff by phone February 17 and February 18.
- Former Director Bingham declined to participate, and that information was conveyed to HNTB.
- HNTB's contact information was provided to Former Director Bingham February 28.
- Interview planned with Bob Steidel week of 3/3.
- Document and records review
 - Initial document request at site visit.
 - Numerous follow-up requests.

WTP Overview



- Pumping filtered water from clearwells to finished water basins is a critical step
- Plant power
 - Two (2) main feeders from Dominion Energy.
 - Switchgear SG 6 and SG 7 operated in either Winter Mode or Summer Mode.
 - Summer Mode mitigates risk when a main feeder loses power. SG 7 is redundant for SG 6.
 - Manually operated backup generators.
 - UPS units provide battery backup power to control system and filter effluent valves.



Event Description



- WTP was operating in Winter Mode for power supply.
- Main Feeder 1 went out. Main Feeder 2 still had power.
- Power did not automatically transfer from Main Feeder 1 to Main Feeder 2 due to an equipment failure and the WTP completely lost power.
- The backup battery powered system did not close the filter effluent valves.
- Water level increased in both clearwells until it flooded the plant basements and submerged equipment and critical electrical equipment.
- Standby pumps were used to pump water out of the basements, but they were not able to pump at the rate required to overcome water coming through the filters.
- The water in the basements damaged equipment which resulted in a complete WTP outage for nearly 36 hours.
- Byrd Park Reservoir was at less than half-capacity due to on-going construction. Distribution system was at greater risk to meet demands if WTP production was lost.

Investigation Findings and Recommendations





- WTP Basement Flooding and Dewatering
- Storm Preparation
- Power Systems
- Staffing
- Training
- Operating Procedures
- Asset Management and Maintenance
- Communication

WTP Basement Flooding and Dewatering



• Findings:

- Flooding (< 3 feet) is a common occurrence.
- 15 minutes or less for operators to react.
- A primary difference between past events and this event was that WTP had power in past events.
- Dewatering pumps have limited effectiveness.

- Verify filter effluent valve fail safe positions are set to close or reprogram to close.
- Add clearwell high level floats that signal control system to override filter effluent valve commands to close the valves.
- Ensure all filter valve actuators are rated as watertight.
- Install visual indicators and remote open/close switches for filter effluent valves.
- Install dewatering pumps without suction head issues, higher capacity and permanent piping.
- Seal clearwells as much as possible.
- Raise critical electrical systems above the basements as much as practical.

Storm Preparation

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• Findings:

- Limited proactive preparation at WTP.
 - Generators were tested on January 4.
 - Fuel tanks and chemical tanks were filled.
 - Mechanics on site for snow removal.
- Standby pumps not adequately prepared for event of power outage; Plant 1 pump suction hose disconnected.

Recommendations:

 Develop standardized agenda for start of shift or shift change meetings. This agenda should include safety and emergency operating plan reminders as well as a log or record of all shift meetings.

Power Systems

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• Findings:

- Winter Mode puts the WTP at greater risk. Bus tie in SG 6 becomes singular critical component.
- Close coil in SG 6 bus tie cabinet failed (root cause of event).
- UPS did not close filter effluent valves.

- Operate the WTP in Summer Mode at all times.
- Develop a bus tie failure plan, ensure all electrical staff are properly trained on the plan, and clearly display the plan on each bus tie cabinet.
- Provide a filter effluent valve UPS with a parallel duplicate backup UPS in each plant; sizing and operation to meet requirements of Chapter 7 of the VA Electrical Code for legally required systems.
- Change the programming in Plant 1 SCADA to match Plant 2 when SCADA is on UPS power.
- Install SCADA UPS with minimum runtime of one hour; sizing and operation to meet requirements of Chapter 7 of the VA Electrical Code for legally required systems.
- Provide automatic transfer system for the existing backup generator system.

Backup Power Systems

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- Virginia Electrical Code requires WTP facilities have two (2) power sources, a primary and a backup.
- Richmond WTP has two (2) feeds from Dominion Energy that serve as primary and backup.
- Backup generators are a tertiary power supply source.



Staffing



• Findings:

- Typical staffing for operation of WTP is three (3) operators. Occasionally reduced to two (2) when an operator calls in and coverage cannot be found.
- Two (2) operator vacancies as of January 6.
- Division of operations and maintenance may lead to communication issues.
- Several operators noted they did not know what to do during event.

- Consider staffing WTP with mechanical and electrical staff during storm events that have risks of power outages. If staffing at this level is not feasible, implement all other recommendations and develop severe storm event response protocol with maintenance staff response time of 30 minutes or less.
- Consider the addition of a float operator to each shift, so that typical staffing is four (4) operators per shift.

Training and Operating Procedures



• Findings:

- No formal safety training, established training procedures, or training manuals readily available to staff.
- Missing or outdated standard operating procedures (SOPs).
- Staff had not received adequate training on the Emergency Operations Manual and were unaware of its location.
- Emergency Operations Manual lacks process-specific actions for operators to take in the event of power outage.

- Implement safety program for all staff that complies with 12VAC5-590-560.
- Develop SOPs for plant operation, establish a comprehensive training system for staff on SOPs, and implement a regular update schedule for the SOPs.
- Expand DPU Emergency Operations Manual to include scenario-specific and process-specific actions for plant staff to follow during emergency events. Ensure plan is kept current and readily accessible per 12VAC5-590-505.

Asset Management and Maintenance



• Findings:

- No separate asset management plan.
- Limited access for operations staff to enter corrective maintenance work orders.
- Maintenance work orders have minimal amount of detail.
- Recurring preventative maintenance work orders overlap, increasing administrative workload for maintenance staff.
- Preventative maintenance work orders frequently extend past required due dates.

Recommendations:

 Develop and implement an asset management plan that includes maintenance and replacement of water system assets.

Communication

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• Findings:

- Inadequate internal and external communication during the event.
- Lack of clearly defined leadership and decisionmaking roles during event response.
- Not all staff members were equipped with radios for the entire duration of the event response.
- Notification not issued to staff prior to power being restored.
- Initial notification to external stakeholders did not adequately express severity.
- Notification to Henrico and Chesterfield asking to reduce demands at 7 AM.
- Hanover was not notified until 2 PM.
- VDH was not notified until they contacted DPU.
- Severity communicated to external stakeholders at 2:30 PM.
- Public notification was through boil water advisory at 4:26 PM.

Recommendations:

 Establish communication protocol to notify wholesale customers and other large users immediately in event of WTP outage to reduce consumption. Review contact information monthly so that contacts are up to date.

Next Steps



- Additional interviews:
 - April Bingham.
 - Bob Steidel.
- Continued review of information and evaluation of changes to interim report.
- Final report: April 3.
- Organizational Development Presentation: April 7.



Questions