

# City of Richmond After-Action Assessment Report

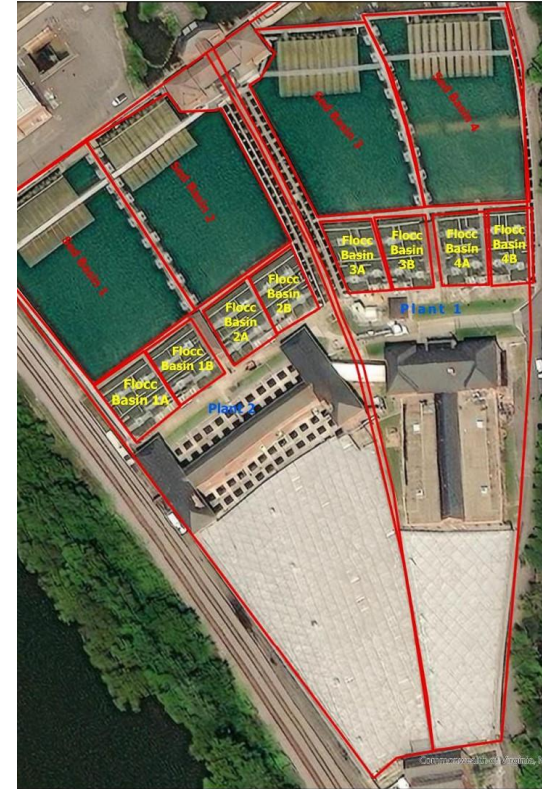
April 7, 2025



- Introduction
- Scope of Investigation
- Investigation Process Updates
- Causes of Failure
- Investigation Findings
- Recommendations
- Corrective Actions in Progress



- Review the events that occurred on January 6 that led to the WTP failure.
- Determine root cause of the event through systemic breakdown of contributing factors.
- Provide recommendations for improvement.



- 14 staff interviews conducted on site in January.
- Additional interviews since March 3:
  - Bob Steidel, former Deputy CAO of Operations.
  - Matthew Longshore, Hanover Utilities Director, & Staff.
  - George Hayes, Chesterfield Utilities Director, & Staff.
  - Ricky Hatfield, Capital Project Manager.
  - Sabrina Joy-Hogg, Interim CAO.
  - E-merge Systems Staff.
  - Jeff Gray, Senior Policy Advisor to CAO.
  - Stephen Willoughby, Director of DECPR.
  - Mayor Danny Avula.
- Coordination with Henrico County Utilities.
- 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.



- Coordination with Hagerty Consulting's Incidence Response Assessment and Improvement Plan.
- Continued review of documents and records provided by DPU.
  - Numerous data requests. DPU provided all necessary documents.

- Root cause was failure of the transfer switch in Switchgear 6.
- Upon loss of power, UPS system failed to close filter effluent valves.
- With flow of water continuing through the filters, basements began to flood.
- Standby pumps were not prepared in advance. Once started up, they were not able to pump at the rate overcome water coming through the filters
- Flooding in basement damaged pumps and critical electrical equipment.
- Equipment failures led to a complete WTP outage for nearly 36 hours, resulting in the need for a Boil Water Advisory.
- Failure was compounded by lack of planning, lack of standard and emergency procedures, and poor communication.



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

## ■ 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.

Grey Text – Previous Findings and Recommendations

**Bold Text – New Findings and Recommendations**

## ■ Recommendations:

- 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. Engineering design is required.
- Ensure all filter valve actuators are rated as watertight. (DPU has indicated this has been completed.
- 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.

## ■ 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.
- Several preparatory calls held about the incoming winter storm hosted by City and Virginia Department of Emergency Management. Power outage at WTP was not discussed.

## ■ 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.
- Implement seasonal risk assessment. Involve all WTP staff to identify potential risks to assets based on seasonal conditions and remind them of emergency procedures.

## ■ Findings:

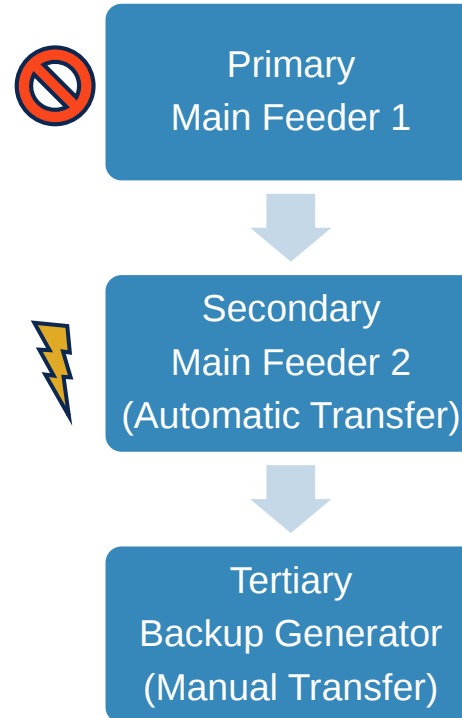
- Winter Mode puts the WTP at greater risk. Bus tie in SG 6 becomes singular critical component.
- Close coil in SG 6 bus tie cabinet failed (root cause of event).
- UPS did not close filter effluent valves.
- Existing UPS units were undersized and had additional loads placed on them.

## ■ Recommendations:

- 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.
- Provide automatic transfer system for the existing backup generator system.

- 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 and manual power supply source.
  - Intended to be used when both power feeds are out.
  - Main Feeder 2 still had power, so first step was to transfer power to that that feed.

## Winter Mode of Operation



## ■ Findings:

- Delays in restoring SCADA caused by:
  - Hard shutdown of SCADA system occurred once UPS units drained.
  - Components of control panels failed once power was restored.
  - Instances of tripped breakers as equipment was being dried out.

## ■ Recommendations:

- Change the programming in Plant 1 SCADA to match Plant 2 when SCADA is on UPS power.
- Install SCADA UPS with minimum runtime of 1.0 hours; sizing and operation to meet requirements of Chapter 7 of the VA Electrical Code for legally required systems.
- Develop an SOP for operators to manually shut down the SCADA system if a failure appears imminent to safeguard against a hard shutdown.

## ■ 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.
- Many WTP staff worked 16-plus hours at a time in response to crisis.

## ■ Recommendations:

- 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.
- Review and re-evaluate organizational structure of operations and maintenance staff at the WTP.
- Develop an emergency staffing plan to provide adequate relief for responding leadership and staff.

## ■ 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.
- Minimal training & development for managerial staff.

## ■ Recommendations:

- Review 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.
- Implement reoccurring formal training for WTP management staff, including emergency response.

## ■ 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.
- Delays in implementation of capital projects identified in planning efforts.

## ■ Recommendations:

- Develop and implement an asset management plan that includes maintenance and replacement of water system assets.
- Evaluate existing CIP, Master Plan, and other planning efforts. Develop a plan to re-prioritize the implementation of these projects.
- Perform a holistic review of planning, engineering, and procurement processes for capital projects. Identify inefficiencies and develop a corrective action plan.
- Restructure preventative maintenance schedule to reduce overlap for same set of assets.

## ■ Findings:

- Inadequate internal and external communication during the event.
- Lack of clearly defined leadership and decision-making 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.
- Several instances of miscommunication or misinformation.
- City officials were not made aware of the severity until approximately 1 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.
- Develop a crisis communication plan:
  - Establish clear protocols for communicating with staff and internal stakeholders, ensuring staff alignment with DPU response.
  - Develop clear protocols for communicating with external stakeholders. Ensure external parties (wholesale customers and regulatory agencies) are notified immediately and updated regularly.
  - Regular training of relevant staff on crisis communication plan.

- Summer Mode is normal operating mode.
- Operations staff have been trained in switchgear operation and transitioning WTP to generator power.
- Maintenance staff (mechanics and electricians) will be on site if the EOC is activated.
- Organization charts for operations and maintenance staff are currently undergoing revisions.
- Generator ATS is part of current capital project.
- DPU has engaged another consultant to replace the UPS units.
- Installation of visual indicators.
- Remote open/close switches for filter effluent valves underway.
- DPU has ensured all filter valve actuators are rated as watertight.
- Re-prioritization of projects in CIP.

# Questions

