UNIVERSITY OF NOTRE DAME

FACILITIES DESIGN AND OPERATIONS

Utilities & Maintenance

Water System Procedure

February 15, 2024 Rev. 9

Revision No. 1 edits are indicated by italics.

Definitions

Aquifer – The saturated underground formation that will yield usable amounts of water to a well or spring. The formation could be sand, gravel, limestone or sandstone. The water in an aquifer is called groundwater.

Backflow – The flow of water or contaminants into the public water supply distribution system from a source other than the public water supply. Two acts are necessary for backflow to occur. (1) There must be a link between potable water and another source. This physical arrangement is called a cross connection; and (2) There must also be a pressure difference between the two sources. As water follows the path of least resistance, it will always flow from a higher to a lower pressure. Therefore, a decrease in system pressure or an increase in pressure from the customer side can cause backflow.

Backflow Prevention – The best defense for backflow is a proactive backflow prevention program requiring backflow preventers in areas where backflow can occur.

Backflow Prevention Device – Installed at the water connection, will reduce water pressure and will change the hydraulics of the system downstream.

Bacteria – Single-cell microorganisms that typically reproduce by cell division. Although usually classed as plants, bacteria contain no chlorophyll. Many different types of bacterial organisms are often found in drinking water. Most municipally treated water is generally free of bacteria due to the addition of chlorine. Some forms of cyst type viruses have a degree of immunity to chlorine due to the cocoon-like shell around the virus. These types of organisms such as Cryptosporidium, Giardia Cyst and Giardia Lambha, have a physical size of three to seven microns and can be effectively removed by sub-micron filtration. Some bacteria are helpful to humans, others are harmful.

Chain of Custody – A written record that shows who handled a sample over what periods of time from the beginning to the end of the sampling and testing process.

Coliform – Coliforms are naturally present in the environment. Fecal Coliforms and E. coli come from human and animal fecal waste. Total coliform is used as an indicator that other potential harmful bacteria may be present.

Contaminants – Adversely affect public health and can occur in drinking water with a frequency and at levels that pose a threat to public health. US EPA has set standards for (90)contaminants, seven (7) of which are new standards that became enforceable on January 1, 2002

Cross Connection – The link between potable water and another source. This physical arrangement is called a cross connection. Any physical arrangement, including cross connection control devices not in working

order, either continuously or intermittently, with any secondary source of supply, sewer, drain, conduit, pool, piping, storage reservoir, plumbing fixture, or other device, which contains, or may contain, and is capable of impacting to the public water supply, contaminants, contaminated water, sewage, or other waste or liquid of unknown or unsafe quality.

Cross Connection Control Device – Any device or assembly, approved by the IDEM Commissioner for construction on or installation in water supply piping, which is capable of preventing contaminants from entering the public water supply distribution system

Cross Connection Control Hazard – Any facility which, because of the nature and extent of activities on the premises, or the materials used in connection with the activities or stored on the premises, would present an immediate or potential danger or health hazard to users of the public water supply should backflow occur.

E. coli – E. coli microorganisms come from human and animal fecal waste and ,. can cause gastrointestinal illness (e.g., diarrhea, vomiting, and cramps).

Flush – To run large quantities of water through an item (e.g., water main).

Public Water System – (PWS) A public water supply for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such a system has at least fifteen service connections or regularly serves at least twenty-five individuals daily at least sixty days out of the year. The term includes any collection, treatment, storage, and distribution facilities under control of the operator of such a system, and used primarily in connection with such a system and any collection or pretreatment storage facilities not under such control that are used primarily in connection with such a system.

Sanitary Survey – On-site IDEM review to inspect the water source, facilities, equipment, wellhead protection information, operation, maintenance, monitoring compliance and other important aspects of a public water system.

Total Coliform – (including fecal coliform and E. coli) – Coliforms are naturally present in the environment. Fecal Coliforms and E. coli come from human and animal fecal waste. Total Coliform is used as an indicator that other potential harmful bacteria may be present.

Wellhead Protection Area (WHPA) – The land surface and subsurface areas surrounding a well field through which water or contaminants can enter the ground and move toward the well field within a specified time period.

Wellhead Protection Plan (WHPP) – A written plan to protect wellhead from reasonably foreseeable potential sources of contamination.

System Description:

The University of Notre Dame operates a campus potable water system, which consists of production wells, an elevated storage tank, water softeners, hot water heaters, cold potable water distribution, hot potable water (supply and return) distribution and various associated appurtenances.

The system operates independently of other water systems and as such has no direct backup connections.

The University's potable water is drawn from 7 wells, located across the campus, and pumped directly into the distribution system. The groundwater source is the St. Joseph Aquifer, a sole source aquifer with excellent ground water quality and availability. As such the University neither fluorinates nor chlorinates its potable water. System pressure is controlled by the University's elevated storage tank level. The table below provides additional details on the major aspects of the system:

Features[1]	Description[2]
Well No. 1	Installed 1952, rated 1,050 GPM, has emergency power backup
Well No. 2	Installed 1957, rated 1,100 GPM, has emergency power backup
Well No. 3	Installed 1946, rated 650 GPM
Well No. 5	Installed 1965, rated 500 GPM
Well No. 6	Installed 1969, rated 1,000 GPM
Well No. 7	Installed 1995, rated 1,000 GPM, has emergency power backup
Well No. 9A[3]	Installed 2013, rated 1,500 GPM, has emergency power backup
Elevated Tank	Installed 1954, 500,000 gallon capacity
Cold Potable Distribution System	Various materials (cast/ductile), various install dates, sizes typically 4" to 14", estimated installed piping 26.5 miles, direct buried
Hot Water Heaters	Steam to Hot Water Heaters (3) located in Power Plant and South Campus Hot Water Facility
Hot Water Potable Distribution System	Various materials (galvanized/fiberglass/copper/black iron), various install dates, sizes typically 1" to 8", estimated installed piping 9.8 miles, typically located in steam distribution tunnels

Operator Certifications

In order to operate a public water system it is required to have appropriately certified operators based on the system size, level of treatment and type of system. In the University's case this requires certification at a minimum of Distribution System Medium (DSM) based on system size and Water Treatment 3 (WT-3) based on the fact that a portion of the water used in the system is softened (hot water). Operator certifications are mandated and facilitated by the Indiana Department of Environmental Management (IDEM).

Regulatory Requirements

Wellhead Protection

In 2001, the University developed a Wellhead Protection Plan, as mandated by federal and state law. The purpose of this plan is to identify potential sources of well contamination, develop management strategies to prevent groundwater contamination as well as emergency contingency plans in the event of a well water contamination event. The Wellhead Protection Plan established a Wellhead Protection Area, within the boundary of this area, the University is responsible for protecting its well water resources. The Wellhead Protection Plan was most recently updated in 2021. Refer to this plan for further details.

Sanitary Surveys

Every three years, IDEM performs a "sanitary survey" of the public water supply system. This inspection is initiated by IDEM and involves a review of pertinent water system records and reporting, as well as an inspection of the University's potable water wells and elevated tank.

[1] *Note Well No. 4 has been retired, Well No. 8 serves non-potable irrigation water to the Warren Golf Course*

[2] *To see current well capacity ratings consult the well log book and its associated well test reports*

[3] *Well No. 9 was abandoned and re-drilled during initial construction as Well No.9A*

Annual Reporting

The University files an annual report with the Indiana Department of Natural Resources (IDNR) accounting for the volume of water withdrawal from the aquifer.

Cross Connection Control & Backflow Prevention

In order to protect the University's water supply from contamination caused by back-siphoning, the University requires that connections from the potable water supply system to other campus non-potable systems including, but not limited to such applications as irrigation, fire suppression and process water, be equipped with backflow prevention. These devices are required by IDEM under 327 IAC 8-10 to be inspected annually and undergo repairs if inspection reveals unsatisfactory results. The Notre Dame Fire Department inspects backflow prevention devices that are installed at fire suppression system connections to the potable system. The Landscape Department using an outside contractor inspects backflow prevention devices that are installed on the campus irrigation systems. **The Utilities Department contracts the inspection of the remaining backflow prevention devices to an outside contractor.** All reports are provided to Utilities and are kept in the central file. For further details on this program and to find an inventory of cross connection control devices see Engineering/Cross Connection Control/Device Lists.

Water Sampling

Schedule

The University is required by IDEM to sample its public water supply system on a periodic basis (Monthly, quarterly, and annually) for potential contaminants. The following is a general list of monitoring requirements, however, these requirements may vary occasionally at IDEM's discretion.

Total Coliform Bacteria Sampling – Eight sites per month are sampled. Per the University's Sampling Plan, the campus is divided into 4 quadrants, with two samples drawn from each quadrant per month. The schedule for sampling can be found on the Power Plant Drive (T:\Water\Water Sampling\Total Coliform Sampling\Water sampling matrix.xls). The University's Site Sampling Plan is attached as Appendix A. The Site Sampling Plan divides campus into four quadrants, each containing 10-14 facilities to be sampled. Two facilities from each quadrant are sampled each month. Over a one-year period, each facility in the Site Sampling Plan is sampled 2 - 3 times if the facility is an active connection.

Nitrate – Samples must be collected annually at each point of entry (well)

Lead and Copper – Samples must be collected every three years (2017 being a baseline year). Based on the population served, the University is required to collect samples from 20 different buildings that are higher risk locations for lead. Sampling must take place and be reported to IDEM from June 1 – September 30 during the sampling year. The following table shows which buildings the University has designated for lead and copper sampling.

Main Building	Farley Hall	Grace Hall	LaFortune	Rockne Mem.
Alumni Hall	Fire Department	Joyce Center	Pangborn Hall	Westlake Hall
Breen-Phillips Hall	Fisher Hall	Holy Cross House	North Dining Hall	South Dining Hall
Corby Hall	Flanner Hall	Keenan Hall	ROTC	Zahm Hall

It is worth noting that to our knowledge the campus does not have any lead piping, that said there may be other potential sources for lead such as lead solder and low levels of lead in plumbing fixtures. Lead solder was banned in

1984 and fixtures should be lead-free. Older facilities have typically had galvanized piping rather than soldered copper, and newer buildings with soldered copper tend to be newer than the lead solder ban.

Regardless experience has taught is that this sampling should occur after we have flushed the campus buildings as many are not used during the summer and water can remain stagnant and increase the risk of levels of lead or copper leaching and being above the action levels. Flushing may not occur within six (6) hours of testing. Samples are to be taken a minimum of 6 hours and not more than 12 hours post flushing. Coordination between regular campus flushing of buildings and testing is key, as well as flushing of sampling points used for the buildings.

Sampling is required to be taken at a kitchen or bathroom cold water faucet.

Testing compliance is based on achieving a 90 percentile pass level, hence eighteen out of twenty samples must be below the action levels in order to be in overall compliance. Any facilities above the action level should be further flushed and retested to ensure they achieve sampling below the action level.

IDEM finds acceptable expanding the testing regimen to include additional facilities to assess if system based actions are needed, for instance an additional round of tests to a new group of facilities is an acceptable means of reaching the 90 percentile pass level. An example would be to test an additional twenty facilities, with say three failed action level tests in the original round and having all of the second test round pass, thus creating three failed tests out of forty for a success rate greater than 90%.

All testing results are to be posted using the IDEM furnished notice within thirty (30) days of receipt of the test results. It is prudent to alert Residence Life and or other building managers to make them aware of the posting going up regardless of the results so they can direct any questions immediately back to Utilities personnel familiar with the testing and results.

Radionuclides – Samples must typically be collected every six years from each well. The baseline year for testing was 2016.

Inorganic Chemicals (IOCs) – Samples must be collected every three years. Inorganic chemicals include antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium.

Volatile Organic Compounds (VOCs) – Samples must be collected every three years. The term VOC applies to organic (carbon based) chemicals with properties that allow them to be present as a gas under typical room pressure.

Synthetic Organic Compounds (SOCs) – Samples must be collected every three years. The term SOC applies to organic chemicals that are less volatile than VOCs, such as pesticides, defoliants, and fuel additives.

Asbestos – The University has received an asbestos waiver for the 2020-2028 compliance cycle.

Consumer Confidence Report (CCR)

The University is required to provide an annual water quality report to its customers. This report must be published in the campus newspaper (The Observer), as well as on a University web page. Typically this report is due by July 1, however, since the Observer is not published in the summer, IDEM has allowed the University to publish at the end of August when students return from summer break.

Water Sampling & Reporting Protocols

Sampling Staffing

Routine coliform sampling is performed by certified operators within the Utilities Department who are trained in proper sampling techniques.

Sampling Technique

All facilities that are regular IDEM sampling sites are equipped with dedicated sampling taps, typically located near the service entrance to the facility. Sample locations are equipped with smooth nosed sampling taps.

When required for alternative sample sites within other facilities should be chosen based on a number of factors including sanitary conditions (avoiding bathrooms) and faucet types (removable aerators preferred). Kitchenettes and break rooms are generally considered good sampling locations; however, all locations shall be evaluated on a case-by-case basis. A survey of each sampling site should be performed to be aware of and to record any potential sources of contamination.

Obtain from test lab or secure inventory properly stored and prepared sample bottles that are sealed and contain the necessary preservatives prescribed for water sampling testing. Verify that the reagents are not expired.

Typically, it is preferred that this procedure be performed by two individuals, one person is designated as Clean Hands (CH) and the second person as Dirty Hands (DH). Although specific tasks are assigned at the start to CH and DH, some tasks overlap and can be handled by either, as long as the prescribed care is taken to prevent contaminating the sample.

CH and DH should wear appropriate disposable, nitrile gloves during the entire sampling operation and change gloves frequently, usually with each change in task. Note that wearing multiple layers of gloves allows rapid glove changes. Gloves must be appropriate to withstand any acid, solvent or other chemical substance that will be used or contacted. At no time during the sampling process should CH contact with either a gloved or ungloved hand any contaminating surface.

For sterilization purposes a clean spray bottle with a 50% bleach/water solution should be used.

Extreme caution shall be practiced while collecting samples so that the sampling technique does not cause the introduction of bacteria into the sample. The following steps shall be followed:

1. Located the dedicated sampling tap (smooth nosed, at or near the service entrance) in the facility being tested.
2. CH wearing a clean set of gloves shall label the sample bottle with sample site, date, time and name of sampler. Remove plastic wrapping from a 100 mL sample bottle. (re-gloving thereafter)
3. If for some reason the dedicated sampling tap is not used the DH shall remove the aerator from the faucet.
4. DH shall flush cold water until water temperature is 65º F or below.
5. DH shall turn cold water off.
6. DH shall spray the faucet inside and out and let stand for two minutes.
7. DH to resume flushing cold water for five minutes and keep running. Verify the temperature remains under 65º F.
8. DH shall spray the outside of the sample bottle and lid with bleach solution and place inverted on a sterilized section of a nearby surface adjacent to the sampling site.
9. DH shall throttle water back to a slower flow rate for sampling (pencil sized stream).
10. DH shall spray the gloves of CH with bleach solution.
11. CH shall rinse bleach solution thoroughly from gloves.
12. CH shall hold the sample bottle and remove the lid from the sample bottle.

13. CH and DH shall avoid unnecessary activity in the vicinity of the bottle, such as coughing/talking, to avoid self-contamination of the sample.
14. CH shall fill the sample bottle to the bottom of the bottle neck. Avoid overfilling the bottle which may cause the preservative contained in the bottle to overflow.
15. CH shall place the sample bottle lid on the sample bottle and tighten.
16. Note if at any time during the sampling process issues or concerns occur that could have possibly contaminated the sample, sample bottle, gloves or other items involved in the sample collection process all items should be disposed of and the sampling process repeated.
17. CH shall complete the chain of custody form with the required information (location, date, time, name of sampler(s)).
18. CH or DH may deliver samples directly to the laboratory or if more samples are to be collected that day, sample bottles shall be placed in an iced cooler. Under no circumstances should a sample be delivered to the laboratory more than 18 hours after it has been drawn even if it has been chilled.

Laboratory Process

Once the samples are gathered and the chain of custody form is filled out, the sample bottles are to be transported to a certified laboratory. Delivery of samples to the lab should occur the same day the samples are taken, unless by an exception provided to the samplers by an authorized Utilities person. Chain of custody for the samples are signed over to the lab upon delivery. Copies of the chain of custody document should be sent to the Senior EHS Specialist.

Samples delivered to the laboratory are to be tested in accordance with the Revised Total Coliform Rule (RTCR). Typically, a Microbiology Total Coliform/E. coli (presence/absence) test is performed. To assess the level of contaminants in a sample, an MPN (Most Probable Number) test can also be requested.

Laboratory Reporting

For routine coliform testing, the laboratory shall provide an official written report to the University using State Form 53297 or equivalent within 1 to 2 business days of sample receipt. The laboratory shall also confirm all state submissions with the University. The written report shall also include a copy of the chain of custody form that was submitted with the sample.

Should a test indicate "presence" for total coliform as per the regulations an E. coli test will be subsequently performed by the lab.

If a test indicates "presence" for E. coli the test laboratory will be instructed to immediately contact by phone a Utilities representative. Such instructions shall be included as part of any purchase order or contractual agreement between the University and certified testing laboratory who is performing compliance testing for the University. The laboratory will be instructed to ensure that calls are made until a person is notified of such a test result. Such a result will be promptly communicated to the Utilities management team and action to address the situation will be taken as detailed elsewhere in this procedure. More details on how to address such issues is provided in the E. coli Presence section to follow.

Assessments, Public Notices and Reporting

Routine

Lab results from routine monthly samples are emailed to both the Water System Operator and the Sr. Environmental & Safety Specialist periodically throughout the month as samples are analyzed. The reports are analyzed for "presence" / "absence" total coliform and E. coli. Sampling reports are submitted electronically to IDEM by the testing laboratory.

Total Coliform Presence

If a routine monthly coliform sample tests "present" for coliform, the laboratory performing the analysis will notify the IDEM. A University representative with knowledge and experience shall also reach out to the IDEM to confirm their receipt of the test results and to further discuss any issues and follow up sampling. The University shall within 24 hours of notification of the "present" sample test results:

- Re-test the sampling site where the original sample was taken
- Sample one facility upstream within five service connections
- Sample one facility downstream within five service connections
- Test any well that was operating at the time when the first total coliform test was taken.
- Optionally, as a non-compliance sample test, a second sampling site within the same facility can be tested. Such a test may be sampled for information only[4]

If subsequent testing of all compliance required samples return "not present" for coliform the results are to be shared with the IDEM and no further action or public notice is necessary.

If two or more routine samples in one month indicate "present" for total coliform a Level 1 Assessment must be performed. A **Level 1 Assessment** is a basic examination of the public water system performed by the approved responsible party of the entity. Level 1 Assessments shall:

- Investigate the public water system for and correct "sanitary defects" that are identified, some examples include but are not limited to:
    - Cracked Well casing
    - Missing Well cap
    - Improper air gaps
    - Leak in a distribution line
    - Improper grading around a well casing
- Review of events that could have created the water quality issue
- Changes in the distribution system operations or maintenance that may have affected the water quality
- Review of source or treatment issues that may have bearing on the water quality
- Review of existing water quality data
- Assessment of inadequacies in sampling sites, protocols or processing

The University shall issue additionally a **Tier 2 public notice** to its water system customers as soon as practical but no later than 30 days after notification of the "presence" test result. The Tier 2 public notice shall advise customers that the potential for adverse effects on human health has occurred, but do not pose an immediate risk as well as what options users may have to further protect themselves should they have a compromising health condition.

Note also if a second trigger occurs requiring a Level 1 Assessment in a rolling 12-month period a **Level 2 Assessment** is required.

E. coli Presence

[4] Sampled at UND discretion, be sure to mark the chain of custody from appropriately as a "non-compliance sample"

If total coliform is found by the laboratory to be present on any water sample, the lab will automatically test the sample for the "presence" of E. coli. If E. coli is present in a sample, the lab shall immediately notify the University via phone call. As part of an agreement to perform lab analysis labs will be required to provide verbal communication of E. coli "presence" results to a designated Utilities Department administrator. The following persons will be called in succession until a personal conversation occurs:

- Power Plant Manager
- Sr. Environmental & Safety Specialist
- Director of Utilities
- Sr. Director of Utilities & Maintenance
- Assistant Vice President of Utilities & Maintenance
- Power Plant Main Control Room

In the event of an E. coli "present" test result or repeated occurrences of total coliform "present" samples within a rolling 12 month period, the University **must notify IDEM by the end of the day** that the University is notified by the lab.

The University shall perform a **Level 2 Assessment** for an E. coli "presence" test result and repeated occurrences of total coliform "present" samples within a rolling 12-month period. A Level 2 Assessment is a more in-depth examination of the source water, treatment, distribution system and relevant operational practices, which must be performed by an approved third party, the state itself or a public water system staff or management member with the required certification and training. A Level 2 Assessment shall be performed by a party certified by IDEM and shall include, but not be limited to:

- Same elements as the Level 1 Assessment, with greater detail
- Review of events that could have created the water quality issue
- Changes in the distribution system operations or maintenance that may have affected the water quality
- Review of source or treatment issues that may have bearing on the water quality
- Review of existing water quality data
- Assessment of inadequacies in sampling sites, protocols or processing
- Any person conducting a Level 2 Assessment shall not have conducted a previous Level 1 Assessment for the same system within a rolling 12-month period.

The University shall issue a **Tier 1 public notice** to its water system customers as soon as practical but no later than 24 hours after notification of the "presence" test result. The Tier 1 public notice shall include instructions for customers to follow a boil order or stop use order and direct them to an alternative source of water if or when provided.

Correct any discovered sanitary defects and complete the assessment form which is to be submitted to IDEM within 30 days of notification of the "presence" sample.

Monitoring or Reporting Violations

A Tier 3 public notice is required should any violations that does not have a direct impact on human health occur. This typically includes violations of monitoring or reporting requirements. Such notices are required within 12 months of the violations.

Water System Inspections

In order to better assure water quality, the following inspections will be conducted at critical assets within the system.

Wells

Routine inspections for mechanical, electrical, security and good housekeeping measures are to be performed regularly. Inspections should include but not be limited to visual inspections of pumps, piping, valves, check valves, controls, wiring, packing, screens, drains, improper storage or locating of potential contaminants in the sanitary zone around the well. Well houses shall be kept in a clean, sanitary condition. If routine inspections warrant corrective actions, immediate measures shall be taken to correct the issues.

On an annual basis wells are inspected and flow tested by a third party well service contractor who report any deficiencies they discover in well condition or performance. Overhauls and remedial work is performed based on a review of their findings.

In cases where the wells are powered by emergency generators the generators and ATS's should be tested and properly maintained.

Elevated Tank

Routine inspections for mechanical, security and good housekeeping measures are to be performed regularly. Inspections should include cathodic protection system (on an annual basis), internal tank inspections and cleanings (on a 3–5-year basis as needed), visual inspections of the structure, exterior, access ways, overflow points and necessary air gaps.

Hydrants

Hydrants are to be routinely tested for fire flows by the Notre Dame Fire Department, additionally the Utilities Department performs annual flushing of mains to remove debris, sand and other foreign materials from the system mains.

Well Testing

Well water sample testing occurs on a periodic basis, determined by the University's standard monitoring framework, established by IDEM. Sample bottles are provided by the laboratory for the particular tests that are required each quarter/year. Each well is installed with a smooth-bore sampling tap from which the water sample is taken. Sample bottles are to be filled per laboratory instructions, which are provided with the sample bottles.

System and Facility Flushing and Flow Testing

In order to mitigate any possibly undue influences in water sampling results, it is imperative that all flushing activities be coordinated with the Utilities & Maintenance Department. Notification of flushing activity must be made at least two (2) business days prior to the flushing. In cases where hydrants are used in an emergency situation, notification of such activities to the Utilities & Maintenance Department shall occur within four (4) hours of this event.

During all flushing activities, the residual pressure of the main is to be continuously monitored and maintained at a pressure greater than 20 psi. During all hydrant flow testing, the static, residual, and pitot tube pressures are to be monitored and recorded. Copies of all hydrant test reports shall be provided to the Utilities & Maintenance Department.

Internal within the Utilities & Maintenance Department, notification of flushing and testing shall be shared to the certified water system operators, Sr. Environmental & Safety Specialist, Director of Utilities, Sr. Director and Assistant Vice President of Utilities & Maintenance.

Emergency Response

Water system emergencies vary, but may include water main contamination or well contamination. The University has developed various plans, which typically include emergency procedures to address the situations if they arise. These plans should be reviewed annually (with documentation) and revisions made as necessary.

Wellheads

The University developed a Wellhead Protection Plan in 2001 and is updated every 5 years. The plan delineates a wellhead protection area, a boundary within which the University will take measures to ensure that its groundwater source is protected from potential contamination (e.g. leaking underground storage tanks, spills, etc.). Additionally, the plan contains an Emergency Contingency Plan that outlines procedures for the following types of emergencies:

1. Electrical Power Failure
2. Mechanical Failure of a Well
3. Spills
4. Major Leak or Distribution System Failure
5. Fire or Explosion
6. Loss of Water Supply

The Wellhead Protection Plan was initially issued in 2011 and is updated on a 5-year schedule. For more information, the Water Emergency Contingency Plan can be found at:

K:\Water\WHPP\2021 WHPP Update\Water Emergency Contingency Plan_CURRENT.pdf

System Contamination

In the event of a confirmed total coliform (after repeat test) or any E. coli water system contamination, the University will notify all affected water system customers and, if necessary, issue a boil order or stop-use order. Other options for alternative water supplies will be employed if possible until the system is determined to be clear of contamination.

The University will perform water quality testing in an effort to determine the magnitude of the contamination, its delineation as well as the cause. Utilizing system valves, the area of contamination will be isolated and/or contained to the extent possible. Flows and flushing techniques can be used to contain the contamination in a specific area allowing for system flushing to be conducted along with regular re-testing to be performed until the water is deemed safe to consume. Actions must be taken to ensure contaminated water from one part of the system are not allowed to flow into an uncontaminated area. In the case of a specific facility or tap the section will be either isolated or only allowed to have flow into the facility or tap such that contamination cannot be transferred to the system.

Facility Contamination

In the event of a confirmed total coliform (after repeat test) or any E. coli facility contamination, the University will notify the affected facility's occupants, and if necessary, issue a boil order or stop use order. Options for alternative water supplies will be employed until the facility is determined to be clear of contamination.

Actions must be taken to ensure contaminated water from the facility is not allowed to be back siphoned into the system. This can be accomplished by either valving the facility off or by establishing a continuous flow of water from the system to the facility. Water quality testing will be performed to determine the level of contamination and the facilities water system flushed until it is clear of contamination.

Construction Standards

System Materials

The University standard for new and replacement water mains are cement-lined ductile iron pipe or HDPE pipe. Water mains less than 4" in diameter generally utilize copper piping. Disinfection of new and replacement water mains shall be performed in accordance with AWWA Standard C651-99.

Connections to Distribution System

All Utilities water system connections shall be approved by the Utilities & Maintenance Department and shall require a Utilities Water System Connection Permit. Permit requestors shall refer to the Utilities Water System Connection Procedure for details on how to request and receive a permit. Permit requestors shall also comply with all applicable aspects of both the Water System Procedure and the Utilities Water System Connection Procedure.

New Construction

Newly installed water mains greater than 18' in length must pass two consecutive total coliform tests prior to allowing water from the pipe to flow into the water distribution system. No flushing shall occur between tests. The contractor is responsible for the disinfection, sampling and testing of the water line by a certified lab.

Contractors are encouraged to model their sampling techniques based on industry best practice, much of which is reflected in the sampling technique section of this document.

Prior to placing the water line in service, the contractor shall present all test reports performed to the Utilities & Maintenance Department for their review and approval.

Temporary Connections

All temporary connections to the University's water system by contractors shall be approved in writing by the Utilities & Maintenance Department. Backflow prevention devices are required on all contractor connections. Current test reports for backflow prevention devices to be utilized shall be provided to the University prior to connection. In extreme cases the University may provide a backflow prevention device if necessary. See the Potable Water Temporary Connection Procedure for more details.

Facilities/Systems – Cross Connection Control

Depending on the type of facility or system (ex. Irrigation) being connected to the water system, and whether or not cross connection hazards exist, a connection to a facility or system may require a cross connection control device. Further details on this issue are available by referring either to the applicable codes which include, but may not be limited to 327 IAC Article 8 (Cross Connection Control Code), 675 IAC Article 16 (Indiana Plumbing Code) or 675 IAC Article 22 (Indiana Fire Code). For additional supporting information, see the Utilities Department Position Paper on Cross Connection Control (filed under Engineering\Cross\Connection Control\Utilities Department Position on Cross Connection Control).

Final determination for the installation of cross connection controls either on a building service or sub system should be discussed and approved by the Utilities Department Engineering staff.

Cleaning/Disinfection

New and repaired pipes shall be cleaned and disinfected in accordance with AWWA Standard C651-99.

Repairs

Should a water main break occur, contractors working with the Utilities and Maintenance Department shall assess the ability to reduce pressure on the line section and make a repair to the line. If a minimum pressure of 20 psi can be maintained ensuring that no back siphoning has occurred, a repair clamp may be applied and the line returned to service.

Should a water main break or other failure occur whereby pressure on the line section or service is lost and the potential for back siphoning exists then the section in question must be isolated, disinfected as necessary and tested to pass two consecutive total coliform tests. In such cases, the requirements for new construction of water lines entering service still apply.

Caution shall be taken to ensure the following conditions are maintained during water main repairs to prevent contamination to the water system

- Soil shall not be in contact with or be allowed to enter into the main, a well shall be dug under and around the main to create a free air gap and to hold any water leaking from the main
- Standing water in the trench shall not be allowed to be in contact with or enter the main, dewatering may be necessary to avoid contamination
- The broken main shall be cleaned, scraped and disinfected outside (and inside if possible) at the point of repair and beyond
- Repair clamps, joints, valves or sections of pipe are to be properly disinfected prior to use
- Tools, tapping machines and other equipment shall be properly disinfected
- Repairs or any visible joints shall not leak or weep

References:

IDEM Revise Total Coliform Rule – in.gov/idem/cleanwater/2494.htm

EPA Office of Water (4601M), Office of Ground Water and Drinking Water, Distribution System Issue Paper, New or Repaired Water Mains - https://www.epa.gov/sites/productin/files/2015-09/documents/neworrepairedwatermains.pdf

USGS National Field Manual for Collection of Water Quality Data, Chapter A4 Collection of Water Samples – https://water.usgs.gov/owq/FieldManual/chapter4/pdf/Chap4_v2.pdf